CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter. This chapter presents the description of the affected environment, direct/indirect effects, and cumulative effects.

The Forest Service has inventoried and mapped all existing roads and trails for consideration under White River National Forest jurisdiction. These include forest roads and trails as well as user-created roads and trails. Sources for the update included previous inventories, Forest Service field managers, and information submitted by the public.

The mapping is based on U.S. Geological Survey (USGS) quad maps, USGS ortho-photos, project maps, and field verification. These maps were presented to the public during public meetings for further review and input. All roads and trails were identified by type and use. This mapping was entered into a geographic information system (GIS) program for analysis.

A series of assumptions were made concerning the effects of the travel management plan as it relates to the analyses. Those assumptions include:

- There will be no new road or trail construction as a result of any alternative;
- The only ground-disturbing activities resulting from implementation of the alternatives will be routine maintenance activities and decommissioning/rehabilitation of existing roads and trails;
- There will be changes to the category of uses among motorized, mechanized, and non-motorized/non-mechanized uses that will result in various levels of impacts across the forest;
- There will be two different types of physical impacts analyzed: (1) impacts related to the actual footprint of the road or trail, and (2) disturbance activities resulting from the use of the travelways; and
- Travelways identified for decommissioning/rehabilitation may take years to resemble surrounding habitats.

Air Resources

Introduction

Air pollution can affect human health, reduce visibility, and contribute to acidic deposition in sensitive, high-elevation lakes. Air quality on the forest is potentially affected by land management and development activities both on and off the forest. Potential impacts on air quality on the forest include regional haze caused by transported pollutants from large power plants located in the southwestern United States. Industrial sources nearer to the forest such as power plants, mines, and oil and gas extraction activities contribute to local and regional air pollution. Urbanization and resort development near the forest bring additional impacts on localized air pollution, such as wood-burning stoves and de-icing of winter roads. Wildfires are also an air quality concern when their smoke inundates communities and other sensitive areas.

Air pollutants related to travel management activities can include vehicle emissions and fine particulate matter created primarily by dust from vehicle travel over a dry and unpaved road surface.

Key Indicators

Key indicator: Visibility and concentrations of particulate matter.

Measure: This air quality analysis is qualitative and compares road miles and their corresponding risk of creating adverse air quality. Quantitative analysis is more meaningful at the project level.

Affected Environment

Air quality on the White River National Forest rates among the best in the country. No violations of ambient air quality standards have occurred on the forest, nor have any activities on the forest caused violations of these standards elsewhere. All areas of the White River National Forest currently meet air quality standards.

The Clean Air Act outlines different levels or classes of air quality protection. Class I or II areas include designated wilderness areas (of August 7, 1977) that are 5,000 acres or greater in size. These areas have the most stringent degree of protection from current and future air quality degradation. Under the Clean Air Act, the Forest Service has "…an affirmative responsibility to protect the air quality related values (including visibility)…" within a class I area it manages. There are three class I wilderness areas on the White River National Forest: Maroon Bells-Snowmass, Eagles Nest, and Flat Tops. Class II wilderness areas in Colorado are given similar air quality protection under the Colorado Clean Air Act. Class II wilderness areas on the forest include Collegiate Peaks, Hunter-Fryingpan, Raggeds, Holy Cross, and Ptarmigan Peak.

Vehicle emissions include nitrogen oxides, hydrocarbons, fine particulate matter, and carbon monoxide. Ozone, a secondary pollutant, forms from a combination of nitrogen oxides, hydrocarbons and sunlight. Fine particulate matter is often an issue with dry gravel-surfaced roads where vehicle travel often results in dust suspended in the air. Vehicle emissions and fine particulate matter stirred up by vehicle travel over unpaved road surfaces have not been identified as a major air quality issue on the White River National Forest.

Application of cinders and sand to surfaced roads to facilitate traction during icy conditions can result in significant dust once the roads dry out. The White River National Forest does not manage any roads that require de-icing.

Environmental Consequences

General, Direct, and Indirect Effects

Air quality impacts from vehicle emissions are influenced by the effectiveness of the smog control devices on cars, amount of traffic, and duration of engine idling. Quantitative analyses of road impacts on air emissions, visibility, and fine particulate matter are more appropriately applied to specific projects. The scope of this analysis is such that broad assumptions must be relied on to estimate impacts between alternatives. The assumption behind this analysis is that miles of open roads and motorized trails are directly proportional to their impacts on air quality.

Table 3.1 shows miles of each road and motorized trail type under each alternative, including all roads with some type of motorized use and trails with motorized use (including open to public, special use). The no action alternative would result in the greatest miles of open roads and motorized trails and, therefore, might result in greater annual vehicle emissions. Alternative G would result in the least number of motorized miles.

Table 3.1—Miles of road by alternative

	Alternative A	Alternative F	Alternative G
Level 2 roads (high clearance)	1605	1457	1224
Level 3 and 4 roads (passenger cars)	366	366	366
Level 5 roads (paved surface)	13	13	13
Motorized trails	152	160	198
Total	**2,136**	**1,996**	**1,801**

The impacts of road dust from unpaved roads and motorized trails depend on factors such as the amount of travel, size and speed of the vehicle, climatic conditions, and geology. This analysis focuses on roads and trails most likely to see regular dust entrainment. These include maintenance level 2 roads (unsurfaced, high clearance roads), level 3 and 4 roads that are often gravel surfaced, and motorized trails.

On the forest, road dust typically becomes an issue related to resource extraction activities when there is concentrated travel by large vehicles on unpaved roads. Examples of these activities include timber harvesting and oil and gas development, both of which require road access. These situations are remedied through project-specified mitigations, such as requiring the operator to manage dust by watering or other dust-abatement methods.

The assumption is that the greater the miles of road and trail, the greater the risk of entrained dust and impacts on nearby visibility. Table 3.2 displays the miles of unpaved forest roads (maintenance levels 2, 3 and 4) and forest motorized trails open to the public within the forest that would result under each alternative.

Table 3.2—Miles of road/motorized trail by alternative - dust

	Alternative A	Alternative F	Alternative G
Level 2 roads (high clearance)	1605	1457	1224
Level 3 and 4 roads (passenger cars)	366	366	366
Motorized trails	152	160	198
Total	**2,123**	**1,983**	**1,788**

Both action alternatives would reduce dust impacts from current available road travel on the White River National Forest. Alternative G would result in the least number of miles of unpaved travel surfaces on the forest.

Road impacts on air quality can be seen more at the local level, where sustained vehicle traffic creates dusty, low-visibility conditions on the road itself. Dust abatement can be applied to roads where chronic dusty conditions create a nuisance and potential safety issue. To date, no adverse impacts on overall air quality, visibility, or fine particulate matter in surrounding wilderness areas or population centers have occurred as a result of vehicle emissions or dust created by unpaved roads on National Forest System lands. Because no new road construction would occur under any alternative, it is unlikely that the selection of any alternative would change this situation.

In winter, snowmobile emissions are dispersed across thousands of acres across the forest. The numbers are low enough that their contribution cannot be measured at a forest-wide or even a regional scale. The effects are isolated, temporary occurrences. The emissions are considered at the level of an irritant to non-motorized winter recreationists. This mainly occurs where both non-motorized and motorized winter recreation activities directly overlap in high numbers. This effect occurs mostly at trailheads and shared trails. The effect occurs when the two meet for seconds to minutes.

Cumulative Effects

Cumulative actions considered include current and future oil and gas development (vehicle and industrial emissions), smoke from wildland fires, and regional and local growth resulting in additional air pollutants. All of these actions contribute to emissions of nitrogen oxides, carbon monoxide, volatile organic compounds, sulfur dioxide, and particulate matter. Recent analysis of proposed natural gas development in the Alkali Creek area on the Rifle District disclosed cumulative impacts on class I visibility in all three wilderness areas on the WRNF. The primary source of visibility impacts is from major upwind industrial sources (Hell's Gulch EA 2008).

Although vehicular travel on unpaved roads can be heavy during resource management activities such as timber harvest, mining, and oil and gas development, these activities are typically regulated by local, state and/or federal agencies that require dust abatement measures to mitigate the air quality impacts of sustained and heavy traffic use.

Implementation of any alternative, including the no action alternative, would not cumulatively create any measurable effects across the forest. No decision within the range of those considered in this analysis can be differentiated in terms of cumulative air impact. There are no unavoidable adverse, irreversible or irretrievable effects on air quality as a result of any alternative.

Domestic Livestock Grazing

Introduction

Domestic livestock grazing is a historical use on the White River National Forest. Grazing is managed under the grazing permit system. Permits specify permittee responsibilities for maintenance of range improvements and salting necessary for the management of livestock while on the forest. Improvements include fences, water developments, ponds, and corrals. Access to these improvements is critical for proper management of the allotment. Access by grazing permittees varies from motorized to non-motorized use. Periodic motorized access is needed. Access that is exclusive to the permittee should be authorized in the grazing permit, allotment management plan, or annual operating instructions. Numerous trails exist to facilitate proper distribution of livestock within allotments. These trails are maintained by the grazing permittee and are considered range features; therefore, they are not included as features in the transportation system.

Key Indicators

Key indicator: Potential conflict between livestock and recreationists.

Measure: Miles of road and trail within active allotments.

Key indicators: Increase in forage production.

Measure: Miles of road proposed for decommissioning within active allotments.

Affected Environment

The forest supports numerous viable livestock operations. Approximately 44 percent of the forest is within active allotments. Localized urbanization, increases in property values, and the complexities of managing livestock in areas with high recreation use have led to a decline in the desirability and feasibility of some allotments for livestock production. Many roads and trails that are used by people are also used to facilitate management of livestock and forage resources. Some roads and trails that cross allotments can lead to conflicts between livestock and recreation users. People's presence can disturb livestock, and livestock can make roads and trails rough.

Environmental Consequences

General Effects

Impacts are allotment-specific and depend on the individual operation and the designation placed on roads within those allotments. Some allotments have extensive road systems, while some are more remote; some operations depend on motorized travel, while some use non-motorized methods, such as horses.

Management of the transportation system can have both positive and negative impacts on livestock grazing. While roads and trails facilitate the movement of livestock and provide access to range improvements for construction and maintenance, roads and trails also can remove natural barriers; create livestock drift problems; and increase the need for additional fences, gates, and cattle guards. Heavy recreational use of roads and trails, both motorized and non-motorized, can disrupt livestock distribution. Gates frequently are left open and cattle drift from desired locations. Conflicts between recreation use and

livestock cause livestock to move into areas that might not be the desired area for grazing, which can result in over-use of forage in some areas.

Acreage occupied by existing roads and trails is eliminated from forage production. The obliteration, recontouring, and revegetation of roads can return those areas to a forage-producing level.

Direct and Indirect Effects

Direct and indirect effects on domestic livestock grazing were estimated by analyzing the miles of roads and trails open or closed to the public. Table 3.3 presents miles of roads and trails open to the public within active grazing allotments. Table 3.4 presents miles of roads and trails within active grazing allotments that are planned for decommissioning.

Table 3.3—Miles of roads and trails open to the public within active grazing allotments on the White River National Forest

	Alternative A	Alternative F	Alternative G
Miles of open motorized roads and trails within active grazing allotments	1,255	1,255	1,058
Miles of open mechanized trails	365	362	202
Miles of open foot/horse trails	553	556	646

Table 3.4—Miles of roads and trails to be decommissioned within active grazing allotments on the White River National Forest

	Alternative A	Alternative F	Alternative G
Miles decommissioned routes within active grazing allotments	0	427	656

These tables demonstrate that Alternative G will have less motorized activity, but possibly more foot and horse activity, within active allotments. When comparing the effects of the alternatives with regard to road and trail decommissioning on forest-wide forage production, the differences among alternatives are insignificant in relation to the 1,300,000 acres within active allotments. Once a road or trail is decommissioned, motorized access by the grazing permittee, as well as the general public, on that road would be prohibited. Roads that are closed to the public but available for permittee operations under the authority of the grazing permit would have little to no impact on the grazing permittee's operation.

The impacts of travel management on livestock grazing can be both positive and negative. The more miles of roads and trails that exist on an allotment, the easier the access is for livestock management, yet the higher the potential for conflict with recreational users. The conflict between recreation and livestock management may even become more pronounced as more and more recreation users visit the forest. Conflicts with other users or loss of accessibility due to road decommissioning usually result in increased labor cost to managing livestock.

Cumulative Effects

The White River National Forest has one of the largest number of allotments in the region. The ability to graze on forest lands helps to keep the livestock industry viable and contributes to the overall economy of the area. Tourism and recreation in the area are increasing in great numbers as well. Conflicts over the same land base can occur. The travel system can help not only to access the allotments, but also to direct people through or around allotments. Other conflicts may occur when timber production or natural gas production creates roads in allotment areas.

Fire Management

Introduction

Fire management on the forest includes reaction to wildland fire situations and a prescribed fire program. Each wildland fire ignition is managed with an appropriate suppression response. Decisions are made to provide the suppression alternative that results in the least safety risk, least cost, and least loss of resources. Prescribed fire and fuels reduction are used to reduce the potential risk of severe wildfires.

Key Indicators

Key indicator: The ability to access land for fire management.

Affected Environment

The forest plan permits the responsible line officer to select an appropriate suppression response to wildfire starts in many areas of the forest based on management considerations. Aggressive initial attack is commonly used where there is an imminent threat to public safety and/or improvements on private lands. The range of available alternatives for an appropriate suppression response is influenced by factors such as land management objectives and the proximity to the wildland-urban interface. The determination of the appropriate suppression response for a specific wildfire considers firefighter and public safety, the potential for resource damage, and projected suppression costs.

Many designated wilderness areas, as well as non-wilderness areas on the forest, have an option to manage natural ignitions (lightning) as wildland fire use incidents. Wildland fire use involves the management of a lightning-caused fire during a long period of time to mimic as closely as possible the role of fire in the ecosystem. The fire is managed using pre-determined prescriptive parameters; prescribed management actions are identified as the fire perimeter hits trigger points during the course of the incident.

Environmental Consequences

General, Direct, and Indirect Effects

The road system on the forest can assist with the decision about which fire suppression resources are mobilized for a wildfire. Where roads are present, suppression resources such as engines and hand squads are used. Conversely, helitack and smokejumpers respond to backcountry wildfire incidents where roads are not present. In some cases, temporary roads can be built during response to a wildfire.

The presence or absence of roads can affect the range of alternatives considered to treat hazardous fuels profiles. The use of mechanized equipment to treat natural fuel accumulations generally requires road access to the project area. Similarly, road access improves the efficiency of holding resources during prescribed burning operations by permitting access for engines. There is not a direct correlation between project cost per unit area to accomplish fuels treatments and the presence or absence of roads.

Regardless of alternative, the number of acres available for fire management activities would remain constant. The alternatives may vary slightly in which resources are used for a particular wildfire, but those differences are too speculative to analyze.

None of the alternatives in the travel management plan would prevent the use of aviation assets, off-road vehicles, or the use of heavy equipment as necessary to initiate the appropriate suppression response for a wildfire. Therefore, no alternative would create inaccessible areas on the forest.

Alternative G proposes fewer roads than existing conditions. The forest plan also calls for the decommissioning of roads across the forest over the life of the plan. Although population is expected to grow in the wildland-urban interface zones across the forest, the effects on fire suppression activities cannot be predicted. Although the forest road system may influence the type of suppression activities, it will not affect the number of acres of forest available for fire suppression activity.

Cumulative Effects

This cumulative analysis considers historical fire data on the forest and the influence of road access. It considers the likelihood of effects of the road system on future wildland fires. It also considers the likely increase in population of the surrounding communities.

Statistics show that lightning naturally causes most fire ignitions in this region. The second most common fire start is human-caused. As population increases into an area, it may be assumed that there would be a higher chance of wildland fire; however, several other factors must be taken into account. Fires that are started by humans are individual instances and cannot be predicted. Factors in these circumstances also include weather conditions and fuel conditions.

Implementation of any of the alternatives would not have any cumulative effects on fire suppression.

Heritage Resource Management/Tribal Interests

Introduction

Road access can negatively affect heritage resources because roads provide access to discovery and unmanaged exploration of sites. This access is perceived as a link to potential vandalism or destruction of heritage resources and values. It has been stated with regard to vandalism that the "closing of trails and roads, and erection of physical barriers have proven to be the most effective deterrents to date" (Nickens 1992).

Conversely, ease of access can be viewed as a means for education about and interpretation of sites and the stories they tell, where these uses are allowed or encouraged.

Key Indicators

Key indicator: Ability to access sites and special use areas by Ute tribal members to practice traditional uses.

Measure: Routes decommissioned that were traditionally used to access sacred sites.

Key indicator: Ability to appropriately access interpretive sites for public use.

Measure: Number of interpretive sites available for public use.

Key indicator: Number of sites and special-use areas protected through management activities such as limiting, altering, or closing access.

Measure: Number of sites or special-use areas with increased or decreased access and type of access.

Affected Environment

At present, there are more than 2,300 known heritage resources on the White River National Forest. These resources vary from small campsites and large habitation areas to special places that may include an entire landscape. They include the remains and records of the past that are at least 50 years old; as well as sites, places, and values of cultural, religious, or traditional importance.

These resources are important for their potential to provide an understanding of long-term human adaptation to the environment and their presence on the landscape. They also have the potential to yield information regarding patterns of history and culture. Such cultural resources are recorded as "historic properties" or "historic resources." They include any prehistoric or historic district; cultural landscape; or traditional cultural property or value, site, building, structure, or object listed in or eligible for inclusion in the National Register of Historic Places (NRHP).

These resources are non-renewable and tell of life-ways and life-styles that reflect thousands of years of unique and successful adaptation to the high elevations of the Rocky Mountains. Federal laws mandate, and the forest plan allows for, the management and use of heritage resources and special-use areas as well as the protection of these resources.

Environmental Consequences

General Effects

The ability to protect heritage resources and special-use areas within the forest is influenced by the road system. Thus, a reduction or increase in capacity could have a positive or negative effect.

A disadvantage of an extensive road and trail system with regard to heritage resource management and special-use areas is the increased chance of vandalism and destruction of heritage values by humans. Statistically, the more access humans have to an area, the greater the amount of irreversible and irretrievable damage that can occur to heritage resources, including tribal special-use areas.

Direct and Indirect Effects

Road use and maintenance inevitably affect sites either directly or indirectly. Examples of direct effects are ground disturbance of surface and sub-surface deposits that would have otherwise remained intact. Indirect effects can be due to erosion from road surfaces that expose site deposits or cover them up, preventing future discovery or management. Other indirect effects include increased visitation leading to vandalism, collection, destruction, and/or erosion. In addition, the dumping and intermixing of intrusive modern debris on sites due to maintenance and use is also considered an impact.

The heritage staff of the White River National Forest analyzed all alternatives proposed in this travel management plan within areas of concern that were known to contain a high density of heritage resources or traditional Ute special areas. The *Heritage Specialist Report* is the documentation of this analysis and is proprietary information kept in locked files under the provisions of the Archaeological Resources Protection Act.

For direct effects, the study focused on those roads and trails where an increase in use is proposed and where potential ground-disturbing closures are proposed (Table 3.5).

Table 3.5—Miles of roads and trails where a change in use is proposed on the White River National Forest

	Alternative A	Alternative F	Alternative G
New routes planned for construction	None	None	None
Non-system routes that are to be authorized	None	None	280
Currently authorized routes planned for closure	None	None	512
Non-system routes to be rehabilitated	None	960*	690*
Routes planned for upgrade to motorized use	None	None	290
Changes to current road prisms such as new bridges and reroutes	None	None	None

**Does not include routes that were considered already decommissioned/removed from system.*

In general, most of the actions proposed in the alternatives examined in this analysis appear to have low potential for direct effects on the integrity of any known heritage resources. Potential direct effects on heritage resources will be addressed at the project level. For example, if a road is proposed to be decommissioned or rehabilitated, a heritage inventory will be conducted and mitigation measures will be developed as needed based on the methods used to conduct closure.

Compared to existing conditions, Alternatives F and G would present a better situation for the protection of heritage sites because of the overall reduction of roads and trails

through decommissioning and the classification of system routes (Table 3.6). Based on comparison of the number of miles of roads and trails, the types of use, and the locations thereof, Alternative G would provide for the most protection of heritage resources. Alternative F was ranked second, and Alternative A was determined to be the least desirable from a heritage resource point of view.

Table 3.6—Sites directly affected by alternatives on the White River National Forest

Site	Alternative A	Alternative F	Alternative G
5GF3181 impacts by FSR 804.1	Currently open to high clearance vehicles	Open to licensed and unlicensed vehicles	Closed to the public
5EA1519 impacts by FSR 734.1	Currently open to licensed and unlicensed vehicles	Same as A	Open to all uses but ATV, motorcycle
5GF2844 impacts by way N7907.1	Way is closed	Way is closed	Way is authorized for motor vehicles < 50” wide
5GF2874 impacts by way 601.4D	Way is closed	Way is closed	Way is closed
Baylor Park area sites Pipeline road 300.1P	Open to mtn bikes, animal, hiking	Open to mtn bikes, animal, hiking	Open to animal, hiking only
5GF2842 impacts by 1854.1	Currently open to mtn bikes, animal, hiking	Open to motorcycles, mtn bikes, animal and hiking	Open to animal, hiking only
5GF2875 impacts by 634.1	Currently open to licensed and unlicensed vehicles	Same as A	Closed to the public
5RT2298 impacts by 2034.1	Currently open to mtn bikes, animal, hiking	Same as A	Open to animal, hiking only
5EA197 Camp Hale	Currently open to licensed and unlicensed vehicles	Closed to the public	Closed to the public

The preferred alternative, Alternative G, proposes to authorize a way through historic property 5GF2844. Currently, there exists a spider web network of unauthorized ATV routes through this property. Establishing one route through the property will limit the unauthorized uses.

Alternative G proposes to reduce the motorized use of a route that bisects historic property 5EA1519. However, this may not adequately address the protection needs of this property. A site-specific protection plan should be developed for this property.

All alternatives would maintain access to interpretive sites. The travel management plan provides the basis from which interpretive site plans can be developed, where access can be specified and controlled.

Many prehistoric Ute nation sites are found on the forest. These sites relate to their history and traditions. Some of these sites are sacred and carry a special meaning to the Ute tribe. Access to these sites by tribe members can be accommodated on open roads and trails or through special-use permit when necessary.

Cumulative Effects

Trends during the past decade saw increased usage of National Forest System lands near urban centers or along transportation corridors such as I-70 that adversely affected sites and/or cultural landscapes. Designated roads or trails have taken visitors to formerly inaccessible areas. Higher numbers of skiers and snowmobiles mean that more people can access historic sites such as old buildings. The result is that sites once protected by their very isolation have more potential to become damaged or vandalized because of increased access. Networks of trails adversely affect heritage resources by altering the cultural landscape through fragmentation of traditional cultural properties. Segmentation of historic routes (such as ancient Indian trials, wagon, and stage roads) causes loss of data and site integrity, and these effects multiply with increased use. Increasing use produces increasing damage, with the ultimate effect being loss of educational and interpretive values.

The expected increases in population along the I-70 corridor will likely mean an increase in recreation use on the forest. New technology has extended human access into previously remote areas in increasing numbers. The designation of any action alternative as the travel plan for the White River National Forest would reduce the potential for access to heritage sites from the existing condition. This reduction, the concentration of use into those available areas rather than dispersed use across the forest, and forest plan direction to continue to decommission unnecessary system roads would not create any measurable cumulative effects on heritage resources.

Minerals

Introduction

By virtue of their geology and geomorphology, national forests are a principal storehouse of the nation's mineral and energy resources. The search for and development of these resources are legally mandated uses of National Forest System lands, except for lands formally withdrawn by acts of Congress or by executive authority.

On a federal mineral lease, the lessee has a vested right to develop the mineral resource, subject to lease terms and any stipulations that may be attached to the lease. For oil and gas development, the Forest Service reviews, approves, and administers the surface use plan of operations (SUPO), a part of the application for a permit to drill (APD). The Bureau of Land Management (BLM) administers and approves the drilling operations.

The White River National Forest contains leasable, locatable, and salable minerals. The Forest Service cooperates with BLM to manage these resources. The forest plan provides goals, objectives, standards, and guidelines for management of these resources.

Key Indicators

Key indicator: Land available for locatable mineral entry and/or minerals leasing.

Affected Environment

Leasable Minerals

Federally owned leasable minerals include fossil fuels (such as coal, oil, gas, and oil shale), geothermal resources, phosphates, sulfur, and uranium. These minerals are subject to exploration and development under leases, permits, or licenses granted by the Secretary of the Interior, with Forest Service consent or consultation. At this time none of the following mineral resources are leased: coal, geothermal, phosphates, sulfur, and uranium. The only leasable minerals presently leased on the White River National Forest are oil and gas.

In 1993, forest staff completed the Oil and Gas Leasing EIS (USDA Forest Service/WRNF 1993). A record of decision (ROD) was approved on May 26, 1993. This is a forest-wide decision and it is currently in effect. The forest plan incorporated the oil and gas leasing decision; however, a few adjustments were made as result of forest plan direction. Decisions based on that analysis include designation of lands available for leasing, and stipulations on available lands. This information is incorporated by reference.

Mineral leasing activities will continue to comply with direction in the forest plan. At the time this document was prepared, most available lands within the planning area with known potential had already been leased.

Locatable Minerals

Locatable minerals are those valuable deposits subject to exploration and development under the General Mining Law of 1872 and its amendments. These resources are commonly referred to as “hardrock” minerals and include gold, silver, molybdenum, iron, copper, zinc, lead, and alabaster.

Lands open to operations under the General Mining Law include all areas of the national forests except those formally withdrawn from mineral entry either by Congress or the Secretary of the Interior or otherwise exempted. On the White River National Forest, approximately 80 percent (750,000 acres) of the existing withdrawals are in designated wilderness areas. The remainder is associated with developed recreation and administrative sites. The Forest Service requests withdrawals through the BLM when necessary to protect capital investments, unique natural features, or management options.

The only ongoing operation on the forest is an alabaster and marble mine near Redstone. Each year, the forest authorizes six to eight small, short-term operations for various mineral resources.

Locatable mineral potential does exist on the forest. Assessment of its potential can be found in the following documents: Mineral Resource Potential and Geology of the White River National Forest and the Dillon Ranger District of the Arapaho National Forest, Colorado (Toth et al.1993) and Regional Mineral Appraisal of the Leadville 2 Degree Quadrangle Colorado (USDI Bureau of Mines 1993). These reports identify levels of high, moderate, and low potential for locatable, leasable, and salable (other than building stone) minerals on the forest and include maps showing locations of this potential.

The forest plan included decisions by management area where locatable mineral exploration and development are allowed (USDA Forest Service/WRNF 2002a).

Salable Minerals

Salable minerals, or common varieties, generally are found as deposits of sand, clay, gravel, and stone that provide materials for construction and road surfacing. Disposal of these minerals is by mineral material permit or contract at the discretion of the Forest Service. Decisions to issue permits for salable mineral will be made on a case-by-case basis.

Environmental Consequences

General Effects

Leasable mineral interests are entitled to reasonable access to and use of the surface under the forest plan and appropriate mineral development regulations, unless specifically limited by the terms of their lease, permit, or plan. Restrictions, designations, and prohibitions developed through the travel management plan will not limit vehicular access for leasable mineral exploration and/or development conducted according to the terms of an approved permit, notice, plan, lease, contract, or other authorization.

The travel management plan will not affect the access to, quantity of, or quality of locatable minerals. Management areas are either available for mineral entry or not available for entry based on the forest plan.

Leasable, locatable, and salable minerals project proposals will continue to be evaluated on a site-specific basis.

Direct and Indirect Effects

There would be no direct or indirect effects on leasable, locatable, or salable mineral resources resulting from implementation of the travel management plan. Authorizations for access, development, and exploration for mineral resources would continue to occur in accordance with the forest plan, Oil and Gas Leasing EIS and ROD, applicable mineral

exploration and development regulations, and any special terms and conditions attached to the lease or permit.

Because of the demand for clean-burning fuels, an increase in exploration, leasing, and development of oil and gas resources can be expected (see appendix C of the Oil and Gas Leasing EIS). During the years 2003 through 2008, the White River National Forest and adjacent BLM lands have seen a sharp increase in leasable minerals project proposals.

Locatable mineral uses on the forest are expected to remain at current levels. Generally, exploration and development will be associated with a dramatic increase in price. However, because of the potential reserves yet to be developed on the forest, we can expect that development will occur eventually in those areas of moderate to high potential.

The public demand for sand and gravel can and will be met primarily on private lands. Sand and gravel deposits on the forest will primarily be used by the Forest Service and its contractors for surfacing National Forest System transportation routes and recreation areas. Public demand for building stone from the White River National Forest is high, and demand for topsoil is low to moderate.

Cumulative Effects

Energy and mineral resources have been numerous and accessible enough to provide a viable industry with opportunities for development for more than 100 years. Present reserves will continue to provide opportunities well beyond the next planning cycle. Since mineral and energy resources are fixed both geographically and geologically, impacts are generally associated with management prescriptions and standards that prohibit development. The more acres removed (leasable—administratively, unavailable; locatable—withdrawn) from mineral development, the more long-term impacts on the mineral resources in use. It should be noted however, that lands that are already leased or that have mineral claims will retain their rights based on the conditions that were made at the time of lease or permit.

Since the travel management plan does not propose to remove additional acres from mineral development, no cumulative effects on mineral resources are expected from its implementation.

While the travel management plan does not affect lands that may be leased or developed, the development of leases can effect travel management and associated experiences. In areas that have a high potential for development, currently the area south of Rifle, a network of specialized roads may be necessary. Also, current roads on the system may need to be upgraded for the type of traffic necessary for natural gas production. The decisions for additional roads are made under the National Environmental Policy Act (NEPA) required for well development. It is within these documents that the effects to the travel system and forest are analyzed.

Authorizations for access, development, and exploration for mineral resources will continue to occur in accordance with the forest plan, applicable locatable mineral exploration and development laws and regulations, and any special terms and conditions attached to the lease or permit.

Noxious Weeds

Introduction

Noxious weeds are defined as alien plants that aggressively invade or are detrimental to native plant communities. Exotic plants introduced from other parts of the world arrive without their natural enemies (insects and disease) to keep them in check. This helps give them a selective advantage in competition with native vegetation.

Once established, the spread of noxious weeds becomes responsible for the reduction of biodiversity by crowding out native plants; the displacement of wildlife that depend on these native plants; and the disruption of watershed function, soil chemistry, nutrient flow, and energy flow. Left unchecked, noxious weeds can pose a significant threat to ecosystem health.

Weed seed is transported on roads and trails by motorized as well as non-motorized means. Humans, vehicles, equipment, horses, livestock, wildlife, wind, and water spread noxious weed seed. Roads and trails provide corridors for the spread of noxious weeds from adjacent areas. Soil disturbances associated with the maintenance and decommissioning of roads and trails create potential habitat for their invasions. Evaluations are done at the project level to include appropriate prevention and mitigation measures for weed control. However, once established, the weeds can spread to adjacent undisturbed habitat types.

Key Indicators

Key indicator: Habitat available to noxious weed infestation.

Measure: Total miles of roads and trails by alternative.

Key indicator: Currently accessible weed habitat made unavailable to new infestations.

Measure: Total miles of road and trail by alternative to be decommissioned.

Affected Environment

Presently it is estimated that 89,000 acres are infested with noxious weeds on the White River National Forest. Forty species of noxious weeds are known to occur on the forest and eight are known to be adjacent.

Noxious weeds can be expected to occur in higher densities along roadways, in areas disturbed by timber harvests, campgrounds, recreation trails, trailheads, livestock, utility corridors, gas lines, and ditches; however, they are also known to invade otherwise healthy, undisturbed plant communities.

Through risk assessment of noxious weed introduction and spread for proposed projects or activities, appropriate prevention and mitigation measures are implemented. Soil disturbances associated with the maintenance and decommissioning of roads and trails are actions that require evaluation and appropriate management practices implemented at the site-specific level.

Environmental Consequences

Direct and Indirect Effects

This analysis used road and trail information in each alternative to assess the relative risk of spreading noxious weeds (table 3.7). For overall potential spread, this analysis based that risk on the extent of public use of roads and trails: the more roads and trails that are open for use, the greater the potential for noxious weed spread.

The decommissioning of roads reduces the potential for the dispersal of seed by motorized vehicles; however, earth disturbance associated with certain decommissioning methods can create habitat for noxious weeds to get established. The decommissioning of roads without revegetation reduces the movement of seed but does little to reduce the available habitat or prevent establishment once seed enters the area. The early treatment and revegetation of these roads and trails can reduce the risk of noxious weed establishment by stabilizing the site and providing competition.

Table 3.7—Measures for comparing potential for noxious weed spread due to roads and trails

	Alternative A	Alternative F	Alternative G
Miles of open public roads and trails	3,970	3,972	3,681
Miles of road and trail to be decommissioned or rehabilitated	0	1,251	1,485

Alternatives A and F would have the most miles of road and trail open to the public and the highest levels of road and trail maintenance. Alternative A would also leave the most roads and trails, though not part of the system, still left untreated. Therefore, this alternative has the greatest potential for spreading noxious weeds through earth-disturbing activities and dispersal of weed seed. When comparing open miles of roads and trails along with roads and trails to be rehabilitated, on the whole, alternative G would have the least amount followed by alternative F. The no action alternative would be the least effective alternative.

The selection of any alternative that would reduce available weed habitat, the concentration of use rather than dispersed use across the forest, and forest plan direction to continue to decommission unnecessary system roads would help reduce the spread of noxious weeds.

Cumulative Effects

The transportation system provides a vector for dispersal of noxious weed seed. Increased population growth in adjoining communities and recreation use on the forest has the potential to increase weed infestation risk. This potential, in combination with other earth-disturbing activities, will continue to provide conditions that allow for an increase of noxious weed infestations on the forest.

Cooperation between the Forest Service, other federal land agencies, counties, towns, and private citizens to recognize and reduce the introduction and spread of weeds on both private and public lands is necessary to combat the spread of noxious weeds.

Recreation Management

Introduction

With well over 9.6 million annual visits to forest recreation facilities, the White River National Forest is the most visited national forest in the nation, by more than 50 percent above the next highest visited unit (*2002 National Visitor Use Monitoring Survey* [Kocis et al. 2003]) and receives more annual visitors than any national park. People who visit the forest for scenic drives account for an additional 11 million visits annually.

The eastern boundary of the White River National Forest is less than 60 miles from the Denver metropolitan area. Interstate 70 (I-70) bisects the forest and provides quick and easy access from the Denver area and for traffic movement within the forest itself. Traffic through the Eisenhower/Johnson tunnel increased 45 percent between 1991 and 2002 (CDPOR 2003). People visiting the forest may arrive by plane from any of four commercial airports, by train, by commercial tour bus, and by auto travel.

The White River National Forest has long been considered a primary recreation destination in the winter because of its world-class ski resorts. However, more recently, the primary recreation growth now occurs in the non-downhill skiing activities during the winter and in many of the summer activities (USDA Forest Service/WRNF 2002b).

Most visitor use originates from locations outside the forest. The demographic breakout shows 36 percent of forest visits are from communities within the forest, 30 percent are from Colorado Front Range communities, 3 percent are from other locations in Colorado, 8 percent are from Texas and southwestern United States, and 12 percent are from the Midwest. The remaining 11 percent of visitors come from other locations including 3 percent from international locations (Kocis et al. 2003).

Visitor use continues to grow in both the number of potential activities and the number of people participating in each activity. As visitor use growth occurs, personal expectations about the quality of experience can cause increased conflicts among user groups.

If one generalization can be made from the body of knowledge about recreationists, it is that people vary enormously in what they desire from their recreational pursuits. (ROS, p. III-8) Diversity represents an important characteristic of any recreation system. Managing opportunities for recreation to promote a diversity of experiences is crucial for social equity (Watt 1972, from p. III-9 ROS). But diversity is only a means to an end. Quality recreation, producing desired satisfaction and benefits for participants, is the objective and concern of both managers and recreationists (ROS, p. III-9).

Trail and Road System

While there are some exceptions, such as the Ute Trail and the adoption of old stock driveways, the forest's trail system was largely created for foot and horse use and access. Many trails were adoptions of user-created trails accessing popular areas and attractions. Likely, the most concentrated effort to actually construct recreational trails was during the Civilian Conservation Corps (CCC) era.

Trail design needs are different for mountain bikes, motorcycles, and ATV's. Where these uses are allowed, the users have tried to adapt to trails built for hikers and horses. In very few cases, the Forest Service has reconstructed and upgraded trails to accommodate these uses. More often, these users have created their own trail systems because the Forest Service system did not meet their desires.

Nearly all of the forest's road system was created either for timber removal, mining, or for transporting the public through the forest to another destination. Thus, this system is also less than ideal for the primary purpose of today's recreation needs. Trying to satisfy some motorized and mechanized users and keep them on the existing system has become a management challenge.

The ability for the visiting public to move around within the forest is key to the many recreation activities available. Most resource-based recreation occurring in the U.S. occurs within ½-mile of the transportation system (Cordell and Bergstrom 1989). For some activities, such as mountain biking and snowmobiling, both the travel capability of the vehicle and the activity itself are principal components of the recreational experience. Visitors are not only using vehicles for the traditional use of transportation from one point to another; the activity of operating the vehicle in a forested setting also becomes a part of the recreational experience. In many circumstances, the desired recreation experience itself may be the travel activity in a forest setting. In other circumstances, the forest is where people come to participate in an activity because the forest is a convenient venue for the activity or because the activity is not provided on private lands; in these cases the enjoyment of the activity is not dependent on a forest setting.

Evolution of Recreational Travel Management

Travel restrictions of varying degrees have been in place on the White River National Forest since the 1950s. In 1978, the forest published its first travel management map outlining area travel strategies. The map was typically updated annually.

In 1984, the forest completed its first forest plan as mandated by the National Forest Management Act. The following year the forest published what is our most current travel management map to reflect decisions made in the 1984 forest plan. In 1985, a forest supervisor's order was signed to implement decisions in the 1984 plan. The primary focus of the 1985 supervisor's order was a designated routes policy for motorized use during the snow-free period. There were very few areas in summer where motorized use was allowed off designated routes. In the 1984 forest plan and subsequent 1985 travel management map, there were very few restrictions to mountain bike, horse, and foot travel other than a prohibition against mountain bicycles in designated wilderness.

The winter travel strategy differed from summer in that it was more of an open travel policy. Winter motorized use was allowed to go anywhere except in areas such as congressionally designated wilderness, on downhill ski areas, or in wildlife winter range. The large area of the forest that appeared to be open to winter motorized use was not usable, from a practical standpoint, due to topographic limitations, dense vegetation, and limited capabilities of the machines themselves.

The 2002 forest plan revision made some programmatic changes to travel management. In the summer, the changes primarily affected mountain bike use. A decision was made to restrict mountain bike and other mechanized uses to designated roads and trails only. Although this decision only affects a small proportion of the total mountain bike use, it addresses the issue of user-created mountain bike trails. The forest plan also requires all motorized use to stay on designated routes, which resulted in elimination the few areas of off-road and trail motorized travel that remained from the 1984 plan.

For winter travel, the forest plan allocated more of the non-wilderness land base into management areas that contain strategies focusing on wildlife concerns and non-motorized recreation. The forest plan also calls for designation of winter routes and play areas for certain management area strategies. For example, in the areas designated 5.5 forested landscape linkages, which include a total of 83,500 acres across the forest,

winter travel is now restricted to designated routes and play areas. Winter motorized travel in wildlife winter range, in particular management area prescriptions 5.41, 5.42 and some of 5.43, continues to be restricted to designated routes and play areas only. Some previously "open to motorized use" areas were changed to "non-motorized" because of physical resource limitations such as steep terrain and dense timber that prevented motorized use from occurring. The forest plan showed a drop in total available acreage for winter motorized use from 1,197,000 acres to 941,000 acres. Much of the change came about due to better mapping capability and removal of extremely steep slopes or locations inaccessible to motorized use from the motorized acreage inventory. A limited number of those areas that were changed to non-motorized use in the forest plan revision were actually being used for winter motorized use. A few of the changes remain controversial with some forest users.

Incorporating December 2005 National Motorized Travel Regulations

In December of 2005, the Forest Service published a new national travel management regulation, Travel Management: Designated Routes and Areas for Motor Vehicle Use (the travel rule) relating to designated routes and areas for motor vehicle use. This rule is part of a larger effort to get a handle on the detrimental effects of unmanaged recreational motorized use and to better focus on providing high quality recreational opportunities for the motorized users in appropriate locations. The direction in the travel rule focused primarily on summer motorized off-highway vehicle (OHV) use. Much of the direction in the travel rule, such as requiring a system of designated roads, trails, and areas, has already been implemented by previous forest decisions.

There are, however, some requirements in the travel rule that necessitate changes on the part of the forest to come into compliance. The forest has updated this document to further incorporate direction in the travel rule into this second version of the draft environmental impact statement and draft travel management plan.

The travel management plan is one component to help achieve the objectives of the travel rule. Other components of the travel rule will be implemented by the forest as directed in the regulations provided in the rule. The travel management plan for the White River National Forest not only incorporates direction from the travel rule, but also sets direction for all travel to meet forest plan direction and management goals.

Motorized Mixed Use on Roadways

The new national motorized travel management rule requires the forest to designate motor vehicle use by vehicle class, and if appropriate, time of year (CFR 212.51). The travel rule also requires the responsible official to consider effects on National Forest System natural and cultural resources; public safety; provision of recreational opportunities; access needs; conflicts among uses of National Forest System lands; the need for maintenance and administration of roads, trails, and areas that would arise if the uses under consideration are designated; and the availability of resources for that maintenance and administration (36 CFR 212.55). The forest plan already encourages the forest to emphasize public safety in the development and use of the travel system. (USDA Forest Service/WRNF 2002a, p. 2-37)

The forest is currently managing the transportation system based on decisions in the 1984 forest plan, the subsequent 1985 Forest Supervisor's closure order, and addendums to the order based on more recent decisions. The 1985 order did not differentiate between the types of motorized vehicles on roads. This distinction was not an issue at the time because there were still very few non-highway legal motorized vehicles and drivers using the forest. As the use of ATVs and similar vehicles began to grow, the Forest Service

took a position that these were a legitimate use of some routes and locations on the national forests.

All motorized use was managed under a hierarchical system. In this system the forest maintained a roadway for the highest level of motorized use, such as passenger cars, and then, by default, all other motorized and non-motorized uses were automatically allowed on that roadway. No analysis of whether mixing all of these uses was safe or appropriate was done. Nor were any other factors really considered, such as the quality of the recreational experience, potential for user conflicts, or whether the user could legally get to the road on other roads also legally open to that use. The route was simply open for use by all motorized travel. Only in cases where serious safety problems had been identified would the forest consider restricting certain uses.

This system placed a burden on all users of the roadways to understand they could encounter a variety of uses on the roads at any time. It was up to the user to know and obey state traffic laws pertaining to their use.

This system worked adequately when use levels were lower and almost all drivers were old enough to understand all of the implications of driving on public roadways. Circumstances have changed significantly since 1985. Between 1995 and 2003, off-highway vehicle registrations in Colorado have risen by 223 percent, or an average of 18 percent annually (SCORP, p. 15). Recreation use outside downhill skiing doubled between 1992 and 2002 on the forest. (Data on the increase between 2002 and 2007 is not yet available at the printing of this draft document. That data will be incorporated into the final document if available.)

The travel rule specifies many factors when considering whether to allow mixed use on a road. One key factor is safety. Mixed use is defined as authorizing highway legal and non-highway legal motorized vehicles to use the same road. For Colorado, that equates to licensed and unlicensed vehicles. Under the travel rule, the responsible official is required to make independent decisions on the safety of each motorized use on each of these routes. Several studies were conducted in the summers of 2006 and 2007 based on Forest Service manual direction to assist the responsible official in making informed decisions on vehicular use. Considerations in the studies included "(1) Speed, volume, composition, and distribution of traffic on roads; and (2) Compatibility of vehicle class with road geometry and road surfacing"(36 CFR 212.55(c)).

The initial focus for the White River National Forest was on the maintenance level 3, 4 and 5 roadways where forest staff had identified that there may be some safety concerns. Either all, or parts, of several roadways across the forest were determined to be unsafe for mixed motorized use. On routes that were determined not to be safe for mixed motorized vehicle use, and where the factors causing that determination cannot be practically mitigated, the recommendation to the decision-maker is to close these routes to non-highway legal motorized vehicle use.

The closure of these routes to mixed motorized use also has a direct effect on routes which branch from these main arterials. These branch routes may not have been individually determined to be unsafe for mixed motorized use; however, the increased infrastructure needs, management controls, and monitoring likely required to keep them open to this use could greatly outweigh any public benefit. In travel system planning, the forest looked at entire transportation systems for the various types of uses in lieu of trying to keep several smaller, and more difficult to manage, opportunities scattered over the entire landscape.

Access to Recreation Opportunities

The forest considers public access to special attractions and general forest areas for highway legal motorized vehicles in this document. A second component of access, which involves whether the users of non-highway legal vehicles may also be authorized to drive to certain destinations need to be considered. Often, users of the forest must rely on state, county or local roadways to access forest roads and trails. State law prohibits non-highway legal motorized vehicle use on public roadways unless the jurisdiction controlling the roadway has made a formal declaration to allow that use (Colorado State Law, Title 33, Article 14.5).

The forest will work with the various state, county and local agencies to determine where non-highway legal vehicles may be legally used on routes under the control of these entities. Decisions in the final travel management plan will reflect the legality and practicality of users of non-highway legal motor vehicles being able to access areas of the forest before being allowed in those areas. The practicality analysis includes factors such as availability of adequate trailhead parking and whether the travel route most likely to be used is legal even though there may be other legal options that are unlikely to be used.

Provision for Recreation Opportunities

In addition to safety and access, the rule also requires the responsible official to consider the provision of recreation opportunities. Alternative C in the first draft looked at maximizing recreational opportunities as the top priority. Consideration of the appropriateness and quality of those opportunities was introduced as a component in Alternative D as it related to reducing user conflict.

In April 2006 the forest developed a forest recreation strategy. In this document, the forest identified some general management goals for the recreation programs. This strategy comes under the framework laid out in the 2002 forest plan and is intended to assist the forest in focusing its limited resources. The strategy does not make site-specific decisions, which will continue to be made through NEPA analysis such as in this travel management plan.

The forest does not begin to have enough resources to accommodate all visitors who would like to have their individual, and very specific, recreational experiences in the location they choose. Thus, a major component of the strategy was to identify what this forest can reasonably provide in terms of visitor experiences that are more unique to our land base and capabilities.

No existing recreational opportunity is proposed to be eliminated from the forest. However, instead of trying to provide all opportunities in all locations possible, the forest will provide opportunities in appropriate locations and of sufficient quantity and quality to be sustainable, manageable, and remain as good visitor experiences.

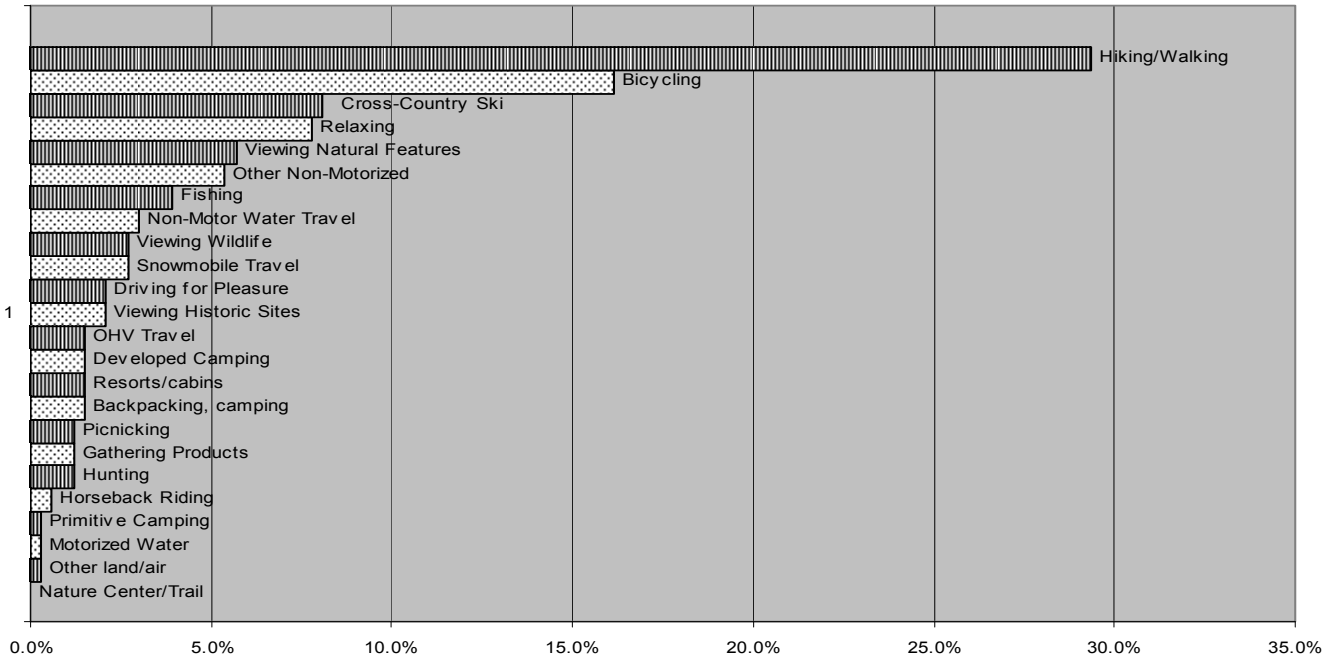
Forest Use Levels

Recreational use and travel on the forest has changed dramatically in the last 20 years since the previous travel management decisions. These changes have primarily come about due to changes in technology and user numbers. Travel management strategies that may have worked previously need to be changed in order to have a sustainable transportation system and quality recreation opportunities into the future.

Recreation use on the forest in 1984 was estimated at 1.36 million recreation visitor days outside of developed sites (USDA Forest Service 1984). By 2000, recreation visitor days were estimated to be at nearly 4.69 million (USDA Forest Service/WRNF 2002b).

The *National Visitor Use Monitoring Survey* (Kocis et al. 2003), was conducted on the White River National Forest between October 1, 2001, and September 30, 2002. This study showed the White River as the most visited forest and indicated almost 70 percent of this use takes place as downhill skiing. Even after subtracting out all of the forest's downhill skiing use visits, the White River still clearly ranks in the top 10 nationally in terms of total recreation use according to national visitor use monitoring (NVUM) figures.

Figure 3.1 shows a chart of the major activities and percent participation rates based on single visits to the forest. Downhill skiing has been excluded because Forest Service routes are not necessary for access to the ski areas.

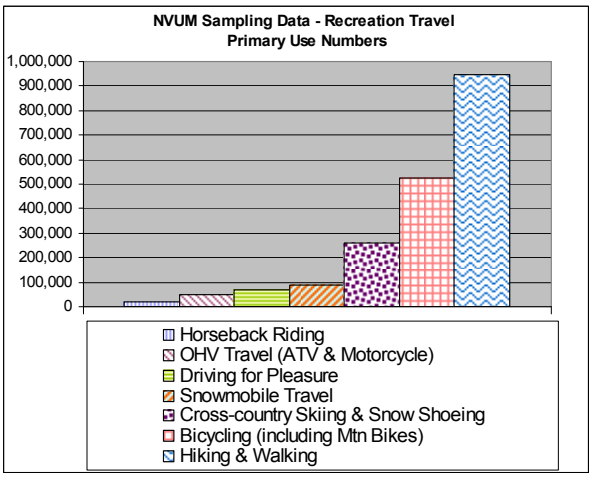


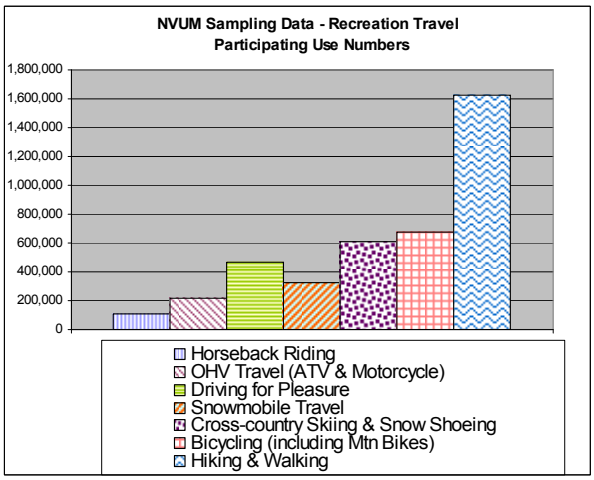
Note: Down Hill skiing equaled 70.8 % of total
The remaining 30% of uses are identified above and percentages adjusted to exclude downhill skiing
Source: Kocis et al. 2003

Figure 3.1—Forest visitor use by activity, 2002

The primary purpose for a visit to the forest and the variety of activities a person engages in while on the forest each provide a different perspective on demand. Figure 3.2 identifies recreation travel-related activities based on the forest's 2002 NVUM surveys displayed graphically, as percentages of use, and as visit numbers. The primary activity figures only represent those individuals who identified the activity listed as their primary reason for their forest visit. In addition to including the primary activity numbers, the participation numbers also pick up those visitors who used this mode of travel in their visit, though the mode of travel wasn't the primary activity. Examples of participation without being a primary activity would include: visitors with a primary activity of camping who also brought along their ATV to ride, or a visitor who hiked to do a primary activity of fishing.

ACTIVITY	PERCENT WHO SAID IT WAS THEIR PRIMARY ACTIVITY - NVUM ACTUAL	ADJUSTED PERCENTS FOR LAND BASED RECREATION TRAVEL ACTIVITIES ONLY	NUMBER OF FOREST VISITORS WHO SAID IT WAS THEIR PRIMARY ACTIVITY	NUMBER OF FOREST VISITORS WHO PARTICPATED IN ACTIVITY
Horseback Riding	0.2%	1.0%	19,349	106,420
OHV Travel (ATV's, dirt bikes, etc)	0.5%	2.5%	48,373	212,840
Driving for pleasure on roads	0.7%	3.5%	67,722	464,378
Snowmobile Travel	0.9%	4.5%	87,071	328,934
Cross-country skiing, snow shoeing	2.7%	13.4%	261,213	609,496
Bicycling, including mountain bikes	5.4%	26.7%	522,425	677,218
Hiking or Walking	9.8%	48.5%	948,105	1,625,323
Totals	**20.2%**	**100.0%**	**1,954,258**	**4,024,609**





Source: USDA Forest Service/WRNF 2002a

Figure 3.2—Allocation of recreation visitor days (RVD) in top ten recreation activities on the White River National Forest, 2002

Analysis for the forest plan showed that recreation use levels on the White River National Forest will likely increase at a faster rate than national participation averages because of the above-average increase in the populations of counties within the forest and the Colorado Front Range (USDA Forest Service/WRNF 2002b).

User Conflict

As more people and differing types of use continue to increase, it is inevitable that user conflicts will also continue to escalate. Conflict on multiple-use trails has been defined more succinctly as “goal interference attributed to another’s behavior” by the National Recreational Trails Advisory Committee of the Federal Highway Administration (USDOT/FHA 1994). Goal interference occurs when a user comes into direct or indirect (seeing the effects of another use) contact with another user type and is impeded from accomplishing the desired purpose of his or her recreation (Badaracco 1976). Conflict is more often characterized as one-sided than two-sided. For example, while backpackers may perceive OHV uses as disruptive to their experience, it is less likely that OHV users will find backpackers disruptive to their experience (Jackson and Wong 1982).

In winter, conflicts on the forest are more apparent as the motorized and non-motorized winter users vie for limited space for their individual pursuits. The limitations of realistically useable terrain available to each user group, the shortage of maintained winter access points, individual users’ incongruent expectations, and the unwillingness on the part of some members of each group to share their experience with the other group all can contribute to winter use conflicts.

From a practical standpoint, an average cross-country skier traveling away from an access point is generally within 3 miles of the access point (Cordell and Bergstrom 1989).

This makes much of the non-motorized winter area, such as wilderness, inaccessible to most users. Additional issues such as avalanche potential, dense vegetation, winter water crossings, and slope make additional areas unsuitable for skiing. In many cases, these same physical features can also make areas unavailable to motorized users even where motorized use is allowed.

The ski hut system has expanded the terrain available to cross country skiing, but only to the number of skiers limited by the hut system capacity. The ski huts were almost all constructed in winter motorized management area prescriptions because of the open nature of the previous winter travel management strategy forest-wide and the need for road access for maintenance. Decisions were made in the forest plan to restore a non-motorized experience around some of these ski huts.

Further complicating the user conflict problem in winter is the limited number of good, maintained access points. These points are traditionally located in motorized management prescriptions that allow motorized uses adjacent to plowed roads utilized to access the sites. Yet, at some of these locations, cross-country skiers are looking for a non-motorized experience and expect the motorized user group to give up space in favor of the skier's experience. The situation at Vail Pass is a good example of this issue. Additional winter access points and improved trailheads are needed in some locations. Analysis for new development of trailheads will be done through a future analysis process.

Perhaps the greatest conflict between cross-country skiers and snowmobilers on a trail is an inequity in responsibility (Cordell 1999). Generally, the snowmobiler has contributed in some manner to trail maintenance while the skier, on the other hand, may be seen as a trespasser using the trail without investment and, in some cases, expecting a non-motorized experience on routes created and maintained by the motorized users.

A more recent conflict has arisen with the increase in people wanting to use all-terrain vehicles year round. Generally unable to traverse unpacked snow, these machines are capable of travel on packed snow under the right conditions. When conditions are not optimal, they may get stuck frequently and can rapidly tear up the smoothly packed snow surface desired by snowmobilers and cross-country skiers. Additional issues occur as these wheeled vehicles make contact with and damage vegetation and land in an effort to get unstuck.

Conflicts also occur among various user groups in summer, most commonly between motorized and non-motorized uses as well as mountain bikers and horse riders. Conflict normally exists whenever incompatible activities occur, and normally include three elements that contribute to the incompatibility of activities: spatial and temporal proximity, dominance over the environment, and dependence upon technology (Bury et al. 1983).

Safety is a frequently cited reason when reports are received about an incident between the groups. Additionally, members of each group lay claim that the other is more harmful to the trail system. Depending on the soil type and/or the timing and volume of use, each user group could be correct.

Cordell (2004) states in chapter V of his outdoor recreation participation trends analysis that studies by Cordell and others on various forest users found that conflict related to mountain bike use was an important issue (Chase 1987, Chavez et al. 1993a, Jacoby 1990, Tilmant 1991, Viehman 1990, Watson et al. 1991). Often, mountain bike riders are seen as interlopers on trails that were previously used by others. Tilmant (1991, cited in Cordell 2004) found that hiker complaints about mountain bike riders included aesthetics,

personal beliefs, and the desire for solitude. Equestrian groups raised concerns related to safety (Chavez 1999, cited in Cordell 2004).

Several public comments received during the forest planning process were very critical of horse use on trails, related to trail damage and manure left by the horses, especially in easily accessible public areas with high horse and hiking use (USDA Forest Service/WRNF 2002b, appendix A).

Unmanaged off-road vehicle use is currently considered one of the four major threats to national forests because of impacts on resources and associated social conflict issues. A survey of Montana OHV users identified that while 76 percent of OHV users agreed that users should avoid riding cross-country, over 20 percent thought it was okay to "sometimes" ride cross-country and the remaining 3 percent stated that they should never avoid riding cross-country (Montana Fish, Wildlife & Parks 2006).

Groups such as the Rocky Mountain Recreation Initiative are advocating separation of motorized and non-motorized user groups on trails for the purpose of reducing user conflict and ensuring a satisfying experience for all trail users (Rocky Mountain Recreation Initiative 2002). Similarly, in support of their activities, the Colorado Off-Highway Vehicle Coalition sponsored an analysis to demonstrate the economic benefits derived from their participants (Hazen and Sawyer 2001).

The potential for conflict exists among all user groups, and even among the different members within a user group, when personal expectations of the desired experience are not being met. Not all use conflicts on the forest are totally recreation-based. In addition to recreation, the National Forest System provides a wide array of resource-based opportunities such as timber harvest, livestock grazing, mining, and oil and gas exploration. Complaints about cow manure on hiking trails are common, as well as plowing of roads in winter for commodities such as timber and oil and gas production, which makes them impassible for cross country skiing and snowmobiling. Conflict arising from these non-recreation uses is considered within the analysis process for the decisions about managing these individual activities.

Conflict situations may be caused by management trying to allow too many options for users where the situation may be of marginal quality to meet the user expectations. By simply allowing activities to occur in an area, the visitor heads into that area expecting to fulfill their personal expectations. When the experience offered in that location fails to meet expectations, the user will sometimes create their own experience rather than going to another location. This can create conflict with other visitors because the one visitor is now infringing on the experience of others.

Lastly, conflict occurs when forest users knowingly partake in unauthorized uses. Fortunately, only a small percentage of the total forest visitors fall into this category. However, as forest use increases, the total number of visitors in this category also increases.

An associated problem created by unauthorized use occurs when visitors who normally would not violate will observe and follow the unauthorized behavior of others. As time passes and management does not commit resources to stop the problem, it becomes accepted and continues to expand and grow as an accepted activity. At some point the users begin to feel entitled to continue this activity even though it developed during circumstances under which it was not allowed. Often times, once a trail has been established by users, it is perceived to be "open for use" (Brooks and Champ, 2006).

In a time of flat budgets, increasingly more management resources are needed to deal with this problem, taking the management funds and support away from activities the

forest does want to provide. Management aimed at focusing some uses into more concentrated and better managed areas can isolate these individuals and reduce the complexity and resources needed to manage unauthorized use.

Key Indicators

Key indicator: Recreation opportunity within ½-mile of a road or trail.

Measure: Total road and trail miles by alternative and by use type.

Key indicator: Recreation capacity for each use by alternative.

Measure: Persons at one time (PAOTS) available for each use by alternative.

Affected Environment

The forest currently has 2,049 miles of forest roads and 1,921 miles of forest trails officially open to recreational use in the summer. An additional 1,095 miles of unauthorized roads and trails occur on the forest (labeled user-created routes) and are being used by recreationists. Some of these routes are left over from previous management activities that ended long ago; others originated from ongoing management activities; and still others were illegally created by users for various purposes. However created, these user-created routes are almost all being used for some recreation activities at the present time.

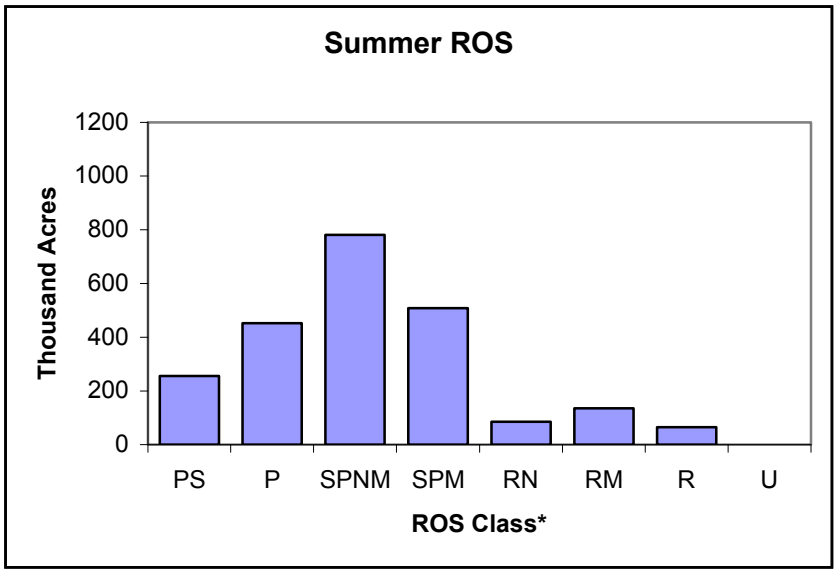
While site specific road and trail analysis was not completed in the forest plan, many of the decisions that were made set sideboards on the road and trail-specific decisions which will come from this analysis. Decisions made in the forest plan are not being revisited in this document.

Recreation Setting

Visitors have different preferences for the recreation setting in which they like to recreate and for the activities in which they want to participate. For some forest visitors, traveling on a primitive road with other members of their club is ideal. Other visitors prefer traveling in an unroaded setting with few other visitors, if any, present.

With recognition of such differences in user preferences, the primary aim of managing outdoor recreation is to provide an environment in which visitors can enjoy a satisfying experience. By managing the natural resource setting and the activities that occur within it, forest managers provide for a range of recreation opportunities. These opportunities can be expressed in terms of three principal components: activities, setting, and experience. For the purposes of management, the range of possible combinations of activities, settings, and probable experience opportunities has been represented in terms of a spectrum or continuum. This continuum is called the recreation opportunity spectrum (ROS).

A more complete discussion of the decisions made on ROS condition classes is available in the forest plan (USDA Forest Service/WRNF 2002b). Figures 3.3 and 3.4 display summer and winter acreages assigned to each ROS class.



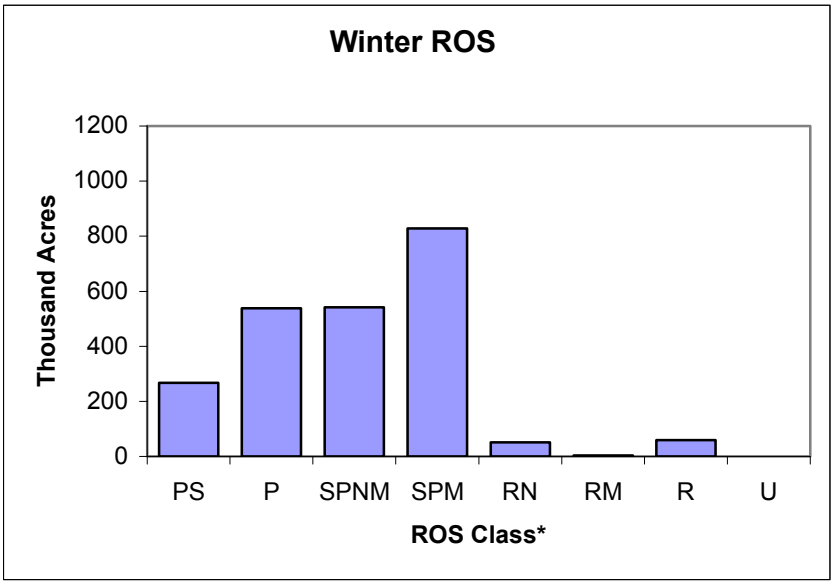
Abbreviations—

PS: pristine; P: primitive; SPNM: semi-primitive non-motorized; SPM: semi-primitive motorized; RN: roaded natural; RM: roaded modified; R: rural; U: urban

NOTE: Motorized use is excluded in the semi-primitive non-motorized, primitive and pristine ROS class

**Few acres exist in the urban ROS class and do not show on the charts at this scale.*
Source: USDA Forest Service/WRNF 2002a

Figure 3.3—Acres in each ROS class, summer, White River National Forest.



Abbreviations—

PS: pristine; P: primitive; SPNM: semi-primitive non-motorized; SPM: semi-primitive motorized; RN: roaded natural; RM: roaded modified; R: rural; U: urban

NOTE: Motorized use is excluded in the semi-primitive non-motorized, primitive and pristine ROS class

**Few acres exist in the urban ROS class and do not show on the charts at this scale.*
Source: USDA Forest Service/WRNF 2002a

Figure 3.4—Acres in each ROS class, winter, White River National Forest.

New and Changing Uses

Technology has contributed to significant changes in the amount and types of uses placed on the national forest transportation system. Off-highway vehicles were just coming onto the scene when the first forest plan was completed in 1984. OHV registrations in Colorado increased 223 percent between 1995 and 2003, to around 75,000 OHV registrations in 2003. Colorado snowmobile registrations continue to grow at a rate of around 4 percent annually (CDPOR 2003). The changes in technology for these machines allow them to travel in more areas, with less rider skill than was required in the past.

The mountain bike was barely more than a novelty in 1984. In 2003, 69 percent of Colorado households owned at least one bicycle, with 74 percent reporting they sometimes bicycle (CDPOR 2003). In 2002, an estimated 677,000 visits on bicycles occurred on the forest, with the use dominated by mountain biking (Kocis et al. 2003).

Cycling downhill at Colorado ski areas is becoming a major recreation attraction and significant source of revenue. In 2002, over half of all summer visitors to the resorts biked at one of the ski areas in the state. Seventy percent of the bicyclists at ski areas were from out of state (CDPOR 2003). Extreme sports have become popular for several activities; downhill (fall line) mountain biking is just one example of this trend.

Technological advancements in snowshoes, cross-country ski equipment, and hiking boots have allowed a greater range and number of individuals to more easily participate in these activities. Winter conflicts are occurring in some areas where skiers are more frequently using snowmobiles to access backcountry areas for a powder, downhill skiing experience. Conflicts also can occur when people use snowmobile trails for cross-country skiing and snowshoeing.

In addition to those uses mentioned above, privately owned snowcats and aircraft are becoming more common on the forest. Mountain boards, similar to skate boards but with larger wheels and altered suspensions, are being used on several roads and trails. Sailboards are being used over snow, and parachutes are being used for both over-the-snow and over-land travel in conjunction with skis or bikes. Hummer vehicles and all-terrain vehicles are being fitted with tracks to go over the snow. Available on the market are full-size OHVs capable of climbing over obstacles that would have easily stopped a Jeep just 10 years ago. It is unknown whether any of these uses will grow on the forest or what new methods of transportation may appear in the future.

All of these new and changing technologies and uses contribute to the challenges of travel management on the forest.

Hunting and Fishing

Transportation to hunting opportunities is one of the more controversial travel issues for the public. During the fall hunting seasons especially, the forest currently expends a disproportionate percentage of management time and maintenance resources for the number of visitors who hunt compared to the number of visitors involved in other activities on the forest.

Hunting, fishing and wildlife watching are significant activities and economic necessities for many communities adjacent to the forest. Nationally, recent U.S. Fish and Wildlife surveys have indicated a downward trend in the total number of hunter and angler numbers. From 2001 to 2006 the number of anglers dropped 12 percent and the hunter count decreased by 4 percent (U.S. Fish and Wildlife, 2006). The same survey indicated an 8 percent increase in wildlife watching.

While it is unknown how those trends relate directly to the White River National Forest, there is reason to believe that existing extenuating circumstances on and adjacent to the forest may neglect or at least minimize the effects of these trends. Top angling professionals (Field and Stream 2008) have recently identified Glenwood Springs as the number one ranked fishing community in the nation. With an estimated population of over 40,000 animals, the White River Elk Herd has been proclaimed as the largest migratory elk herd in North America. Based on the above citations, the White River National Forest can expect to receive continued focus and visitation from both local as well as national hunters and anglers.

All areas of the forest (except private land in-holdings) are open to hunting and fishing. While angling use occurs throughout much of the year, the majority of hunting use is concentrated during the fall big game seasons. There are 16 game management units which encompass the forest. These units have been managed as both limited use units as well as general season units allowing unlimited licenses.

Three basic categories of hunters exist: backcountry, hiker, and vehicle/OHV supported hunter. The backcountry hunter usually hunts from horseback or is packed to a remote location. The hiker hunter will generally hike 1-4 miles from a road or roadside camp to access a hunting area. The vehicle hunter enjoys traveling to a hunting area by vehicle or OHV and often desires to be able to retrieve game with motorized vehicle support. During the past 15 – 20 years, the forest has witnessed a significant increase in ATV use during the hunting season. This increase has resulted in the creation of additional conflicts among hunters with differing philosophies. Over 40 percent of resident big game hunters and 30 percent of non-resident big game hunters indicate that the most frequent and negative access problem was finding areas that are not crowded. Seventy percent of hunters support the designation of more areas where the number of big game hunters is limited (Manfredo 1992). In a survey conducted of OHV users in Montana, over 78 percent of those surveyed stated that OHV users should access the area they intend to hunt on legal routes and then should hunt on foot. However, in the same survey, more than 58 percent of those surveyed admitted they at least sometimes travel off route to retrieve down game (Montana Fish, Wildlife & Parks 2006).

In 2003 the Congressional Sportsmen's Foundation sponsored a survey to specifically collect information related to access to federal hunting lands in Colorado. The following captures just some results from this study (Access to Federal Hunting Lands in Colorado 2003):

- Access to national forest/grassland lands had the highest rating for all types of lands for access (73 percent rated it excellent or good).
- Those respondents who have hunted on federal public land in the past 10 years in Colorado were asked to indicate whether more or less access, or the same level of access, should be provided to hunters on federal public lands in Colorado by various modes of transportation (e.g., by foot, horse, ATV). Access by foot had the highest percentage saying that *more* access should be provided (49 percent). Horse access also had a relatively high percentage favoring *more* access (32 percent). All three motorized modes of access had the highest percentages saying that *less* access should be provided: 70 percent said that there should be less motorbike access, 56 percent said that there should be less ATV access, and 29 percent said that there should be less truck access.
- The most common interference problem was with those on ATVs (18 percent of respondents reported interference by ATVs), with resident hunters being slightly

more likely than nonresident hunters to have experienced a conflict with ATV users. The second highest conflict was with mountain bikes (10 percent).

Hunting

While the White River National Forest receives use from a wide range of big and small game hunters, the majority of use occurs during the fall deer and elk seasons. National visitor use monitoring data collected in 2002 identified that only 0.4 percent (38,698 visitors) of the total visitors identified hunting as their primary activity (Kocis et al. 2003).

To further evaluate and quantify the timing and amount of hunting use on the forest, the forest has computed the total deer and elk hunter recreation days on the forest using numbers generated from the Colorado Division of Wildlife 2006 harvest surveys. The evaluation identified the number of hunters and hunter recreation days for each big game management unit located on the White River National Forest and multiplied these numbers by the estimated percent of forest use for each season. Percentages were based on historic use during normal weather conditions. Under normal conditions, the majority of hunters utilize National Forest System lands during the earlier seasons and, due to the movement of animals to lower lands as the seasons progress, a decrease in hunter percentages on the forest occur during each of the latter seasons. The following percentages were used to measure the recreation days on the forest for each season: early season = 98 percent, archery & muzzle loading = 93 percent, 1st rifle (elk only) = 85 percent, 2nd rifle (1st combined) = 80 percent, 3rd rifle = 65 percent, 4th rifle = 50 percent, and late season = 25 percent.

Figures 3.5 and 3.6 identify the results of these computations. Note that all private land, ranching for wildlife, and late season deer hunt numbers where excluded from these figures. While it may be expected that some hunters hunt both deer and elk during the combined seasons, the analysis did not separate those use numbers, thus resulting in the duplicate counting of those hunter and recreation days. Also, it is expected that many hunting camps include people, friends and family, who may not be hunting during the time but are accompanying other license holders. These “accompanying” visits are also not captured within this analysis.

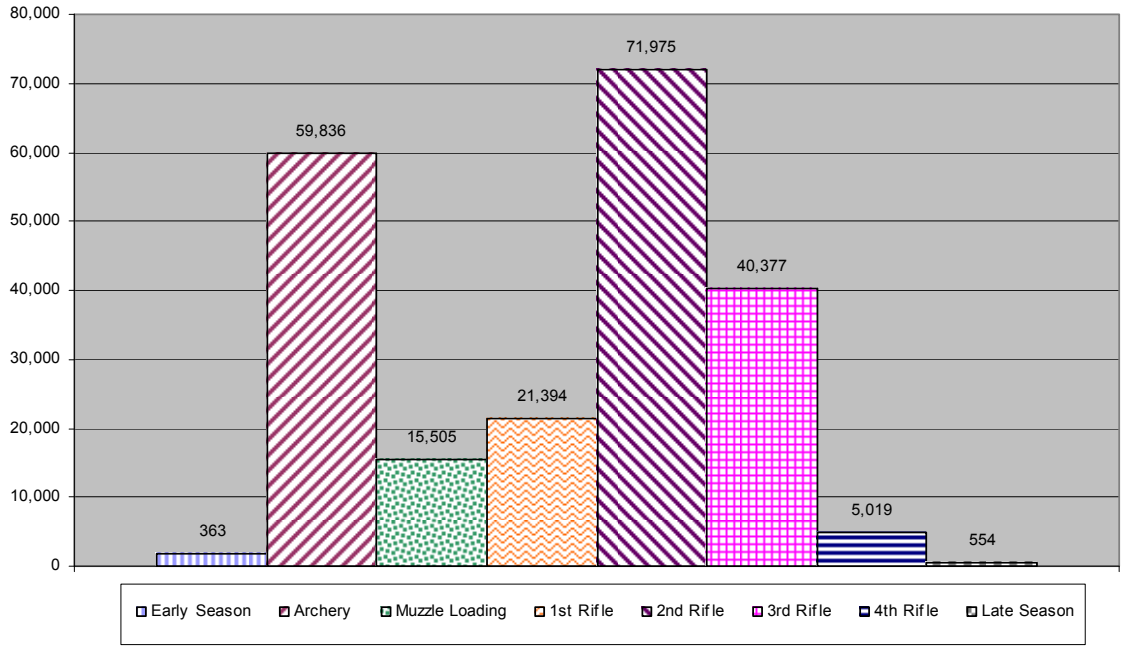


Figure 3.5— Number of hunting recreation days on the White River National Forest

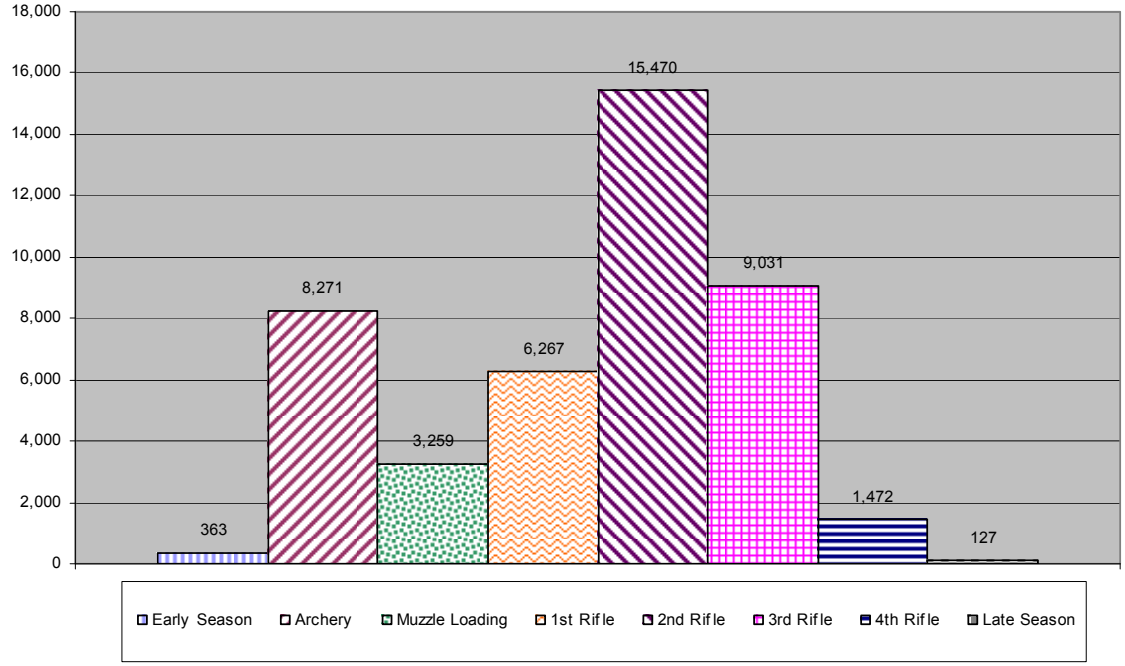


Figure 3.6— Number of hunters by hunting season on the White River National Forest

While the above numbers are slightly different from the numbers generated through the 2002 NVUM sampling process, these analyses resulted in relatively comparable overall numbers (less than 14 percent difference) between the two. It should also be noted that the 2002 White River use estimates were actually performed in fall of 2001 immediately following the 9/11 disaster and a major fire season. All recreation use sampled nationally on National Forest System (NFS) lands in the year following 9/11 were down compared to surrounding years.

The quantity of hunters on the forest during this two month period, coupled with an increase in the percentage of hunters who use ATVs to access their hunting areas, fuels the existing philosophical differences between motorized and non-motorized hunters. The lack of clear travel route designations in some areas, resulting in the inability for each type of hunter to fully understand where motorized access is allowed versus areas where non-motorized hunters may go to avoid encounters with motorized equipment has led to many of the conflicts (see wildlife section for description of impacts on big game from motorized use and transportation section for effects on road maintenance due to hunting traffic).

The Forest's Role in Meeting Future Demand

The mission of the Forest Service is to provide multiple benefits and opportunities. However, the land-base on a single forest is not large enough, nor are managerial resources great enough, to provide all of the opportunities desired by recreationists. The greater the variety of unique opportunities a forest attempts to provide, the more diluted its capability for providing quality opportunities.

National forests need to provide visitors a focused, high quality outdoor recreation program based on prioritized needs within the capacity of existing human and financial resources. Coordination with other outdoor recreation provider agencies is necessary in order to identify respective roles and niches (Colorado Recreation Strategy, p. 11). If the opportunities the forest is providing are very similar to opportunities the same visitors are provided in adequate supply elsewhere, a non-essential duplication of effort is occurring.

Between 2004 and 2006 the White River National Forest analyzed who the visitors to the forest were, what some of their expectations were, and where the White River National Forest should be focusing recreation management efforts to position the forest for the future. It was evident that the White River National Forest is best known for the attraction of visitors to the resort community areas and to the undeveloped wild lands, and that this is where forest efforts should be focused (Recreation Site Facility Master Plan 2005). Use on the White River National Forest is dominated by downhill skiing in the winter and non-motorized activities in the summer (NVUM 2002). A review of data indicated other entities, such as neighboring forests, serve far more visitors in motorized backcountry activities (NVUM 2002).

One of the goals stated in the forest plan is to emphasize providing a wide range of motorized, mechanized, and non-motorized recreation opportunities and difficulty levels spread across the forest (USDA Forest Service/WRNF 2002a, p. 2-37). Even though the focus for the forest may be on resort related (more structured) and primitive setting (generally non-motorized) related activities (recreation niches), the forest still needs to provide some high quality recreational experiences to backcountry (dispersed including motorized) related activities.

Nearly 800,000 acres of forest are currently available for designated motorized travel routes in the summer and approximately 700,000 acres are available for open motorized travel in the winter (USDA Forest Service/WRNF 2002b). This does not necessarily

mean that all types of motorized use will be available in all areas. There may be large areas of the forest where one or more motorized use and visitor experience will be emphasized over others. The long-term quality, manageability, and sustainability of the activities will be considered when making these decisions.

National Forest System lands are finite. While it is the agency's goal to provide for public use, the agency also has a responsibility to manage the land resources. Given the limitations, it is not likely that each forest can be expected to meet all current and future demand for activities that are allowed in the National Forests. As demand continues to increase, there will ultimately be limits on the amount of use that can be sustained. Increased use requires additional expenditures, maintenance, management, and enforcement. With the reality of increasing pressures from use of primitive settings, regimentation and control of visitation may be necessary to protect the integrity of the opportunity and to ensure its use into the future. This is particularly true where management objectives call for the preservation of naturalness (Fazio and Gilbert 1974, Stankey 1979, from ROS, p. III-18).

A lack of active management of some uses in the past has resulted in a change in users and use patterns on the forest. More than 20 years ago, researchers documented how a change in circumstances, such as greatly increased use, affects the opportunities and experiences available (Forest Service ROS 1986, p. III-21–III-25). Clark describes this as a process of "invasion and succession" (Clark et al. 1971, from ROS, p. III-24). Quite often these changes occur more slowly over time. Existing users are displaced because they are no longer receiving their desired experience and the new users fill the void left by the departing users. These changes generally occur outside the agency making conscious management decisions. Although some users are vocal about their changes in experience, the loss of recreational opportunities largely goes unnoticed until well down the road when the new and sometimes less desirable use pattern is set.

Changing Recreation Management to a Visitor Focus

Traditionally, the forest has managed the recreation program based on general physical features such as the miles of trail open to bicycles, the acres open to snowmobiling in the winter, and the number of campsites available for camping. Uses were generally allowed unless there were serious enough issues to force the forest to take management action to reduce the problems.

A common misperception is thinking that providing any opportunity equates to providing everything needed for a quality recreation experience. The designation of a physical road or trail as open for a given activity is only the beginning of providing a satisfying visitor experience. Decisions about what routes will be open to which uses will require consideration of the forest's management ability to provide a complete experience.

Nationally, the Forest Service is committed to improving the capability of the national forests and grasslands to provide diverse, high quality recreation opportunities (USDA Forest Service/WRNF 2002a, p. 1-10). Not all visitor demands can be met on each individual forest. Difficult decisions need to be made regarding which visitors will have an opportunity for a quality recreational experience and which visitors may have to seek out alternative locations for their desired experiences.

In April 2006, the forest reaffirmed the 2002 decision to provide high quality recreation opportunities by creating a matrix of forest-wide recreation strategies based on forest niche and providing quality visitor experiences (Forest Management Matrix 2006). These strategies focus on providing sustainable high quality experiences in appropriate

locations; however, that does not mean all current opportunities will be offered in the same quantities and locations.

Trail System Budget and Finance

The forest currently has approximately 1,948 miles of identified summer system trails. For fiscal year 2007, the budget for the entire forest was $652,423 to perform all management, maintenance and capital improvement on the trail system. The forest reported an accomplishment of 422 miles of trail maintained to standard. The definition used for this reporting was only to meet critical safety and legal standards and did not include meeting standards for cleanliness or resource protection.

By 2012, a forest strategy in the forest plan is to have 30 percent of the trail mileage that is currently rated poor or critical receive appropriate maintenance or reconstruction (USDA Forest Service/WRNF 2002a, p. 1-10). Other strategies include improving the safety and economy of the roads, trails, facilities, and operations and providing greater security for the public and employees. This includes decommissioning 22 miles of roads each year and an emphasis on maintenance and reconstruction of the existing road and trail system to standard (USDA Forest Service/WRNF 2002a, p. 1-4, 2-37). These strategies are not requirements, but rather are methods listed to help attain goals and objectives. They help the forest to set priorities to meet the goals set forth in the forest plan.

Often times, the adoption of user-created routes into the official travel system costs as much as it would to plan and construct a route from the beginning. Environmental sustainability was not considered in the formation of user-created routes, and there may be additional costs to rehabilitate sections that need to be fixed or replaced. Designated or new travel ways will be open to appropriate motorized or mechanized use unless financing is not available for maintenance necessary to protect resources (USDA Forest Service/WRNF 2002a, pg 2-36). All user groups will need to become more involved in trail maintenance and management on the trails they use for the forest to be able to sustain its current extensive trail system. User-created routes not adopted in this decision will be slated for rehabilitation. While this too costs money, this expenditure is a one time cost and helps to return the ground to a natural state, which can also enhance surrounding recreation experiences.

Forest Service trail budgets are not expected to significantly increase in the near future. Because the forest is currently falling far short of being able to manage and maintain the current trail system, before adding new routes, the forest will need to review whether they have the capability to reasonably ensure that the new route is manageable and sustainable. Proponents for new routes will likely be asked to assist the forest with planning, construction, and maintenance of new routes. Partnerships, grants, and volunteers all greatly contribute to the sustainability of the trail system.

Though the forest clearly cannot afford to maintain the existing transportation system to standard at current budget levels, this is not the only financial consideration when it comes to deciding what the final system needs to look like and what visitors it will serve. The economies of local communities are heavily dependent on revenues associated with visitors recreating on the forest. Total economic benefit of forest activities was analyzed in the forest plan. In 2000, it was estimated that the economic effects of monies spent by visitors in pursuit of recreation on the forest, excluding ski area use, was nearly $91 million. Projections are that by 2010 it will be nearly $114 million (USDA Forest Service/WRNF 2002b, appendix B, p. B-33). Nearly all recreational activities on the forest are dependent on the forest's transportation system in some manner.

Keeping any level of transportation system open above the forest's ability to maintain it will result in a continued deterioration of the overall system. The Forest Service will continue to concentrate limited resources on the more heavily used routes and those having the most safety and environmental issues. Eventually, evaluations may have to be made as to how much to invest in a route and whether a route should be retained based on the amount of use and the ability to retain sound condition. This may have some effects on local economies, as more use is concentrated on those routes kept open and users are no longer achieving their desired recreation experience.

Maintenance of the travel routes is only one cost associated with providing road and trail opportunities. Additional costs are associated with general management of the system, law enforcement, tracking of maintenance needs, managing user conflicts, signing, and public information and planning. The more funding that continues to be redirected from maintenance activities for other items, the more rapidly the routes themselves will decline.

The costs of some management activities are set and cannot be reduced. Other costs can be reduced through proper transportation system planning and design by authorizing uses on routes that can be environmentally sustained. Such management can result in cost reductions by reducing time spent, managing user conflicts, decreasing the need for law enforcement, and reducing trail maintenance. An estimated cost comparison for the implementation of the travel plan alternatives is included in the transportation section.

Special Trails and Areas

The Continental Divide National Scenic Trail (CDNST extends for about 3,100 miles from Canada to Mexico and crosses the forest from Tennessee Pass to Loveland Pass (a distance of about 67 miles). Some of this route close to Loveland Pass is still being developed. On the western side of the forest, much of the CDNST route is coincident with two other trails: the Colorado Trail (CT) and the American Discovery Trail (ADT). These trails are discussed in detail in the forest plan (USDA Forest Service/WRNF 2002b).

The forest has 61 miles of national recreation trail: the Wheeler-Tenmile Trail (23 miles), the Tenmile-Vail Pass Trail (30 miles), and the Two Elk Trail (8 miles). The Wheeler-Tenmile Trail partially coincides with the CDNST, Two Elk, ADT, and Colorado Trail.

In addition to designated trails, other trails are crucial for access to special places. There are 10 peaks over 14,000 feet in elevation on or bordering the edge of the forest. "Peak bagging" Colorado's 14,000-foot peaks has become very popular in the past several years. Ascents on the state's "fourteener's" have increased 300 percent in the past decade from 65,000 to 200,000 per year (CDPOR 2003). Many of the peaks that lie in wilderness have never had designated routes to the summits. Heavy use has resulted in multiple trails and resource impacts.

More than 103,000 visitors come annually from around the world to view the three 14,000 foot peaks surrounding Maroon Lake and to hike trails in this area. Because of the constant high number of summer visitors to the Maroon Valley, a mandatory bus system was set in place to serve this location. Hanging Lake receives an estimated 140,000 visitors annually on the mile-long trail to Hanging Lake in Glenwood Canyon.

Environmental Consequences

General Effects

Recreation use is expected to continue to increase in all alternatives. The increase in each type of use will likely vary by alternative and ultimately be limited by the quality of the recreational experience an individual user has.

Aside from downhill skiing, most of the recreational use that occurs on the forest in non-motorized activities would be as shown in figure 3.1. However, the non-motorized uses tend to require less area for a day's use experience due to slower travel times associated with non-motorized travel. For instance, the average snowmobile rider in Colorado travels around 50 miles in a day (Hazen and Sawyer 2001). In contrast, most cross-country skiers stay within 3 miles of a winter access point for their daily activity, although some may expand that distance to approximately 6 miles of travel per day, more or less, depending on the opportunity available for loop trails within that area (Cordell and Bergstrom 1989).

This does not necessarily mean that the snowmobiler needs eight times as much area as does the skier. Conversely, the fact that skier/snowshoe visit numbers are three times higher than snowmobiling use numbers and have a faster growth rate (USDA Forest Service/WRNF 2002b) does not mean skiers and snowshoers need three or more times as much area than snowmobilers. Other factors such as crowding, the willingness on the part of a user to recreate in the same area more frequently, and a willingness to share with other use types weigh in on the amount of resources allocated to a particular use. Expectations of crowding and the setting also play significant roles in the decisions. Users are generally willing to accept a greater number of visitor contacts in a more developed setting than is acceptable in remote backcountry. This makes the decision to assign specific uses to individual roads and trails a decision based on social factors as much as a decision based on raw numerical data.

Roads and Trails

While the road and trail systems may be shared, different users have varying preferences on which transportation system they prefer to use for the quality of their experience. Although they can legally hike on roadways or motorized trails, most hikers seek a single-track trail experience away from roadways and motorized trail uses. Mountain bikers often prefer single-track experiences but generally accept sharing the more primitive road experiences with other users more than hikers do. All-terrain vehicle and motorcycle groups tend to be more tolerant of full-size vehicles on primitive roadways. However, they still look for trail experiences where the chances of encountering a variety of other user groups are reduced and where they can have a better backcountry experience than can on a highly developed roadway.

No single measure can provide conclusive direction on how to best allocate limited resources for all these diverse user groups. Even within a particular user group, the participants have differing expectations for their recreational experience. Ultimately, a variety of measures and professional judgment must be used in the allocation process.

Direct and Indirect Effects

The analysis for recreation use on travel ways was completed in two distinct parts. The first of these parts involved identifying and performing a site-specific evaluation on each of the roads and trails under Forest Service jurisdiction on the forest.

It included reviewing each road and trail as identified in alternative A, the no action alternative, to determine if it met the direction set in the forest plan for both the management area prescription and the ROS management goals. System roads and trails that were found to be consistent with forest plan direction are identified in alternative F. The other alternatives took into consideration unauthorized routes identified. Once the cross-check on the no action alternative (current condition) was completed, a multi-disciplinary team from each of the ranger districts evaluated each road and trail on their district and proposed a management strategy consistent with the alternative themes for Alternatives C, D, and E for the first draft of this document. The same checks as were done for Alternatives C, D, and E in the first draft were also completed for Alternative G in this second draft.

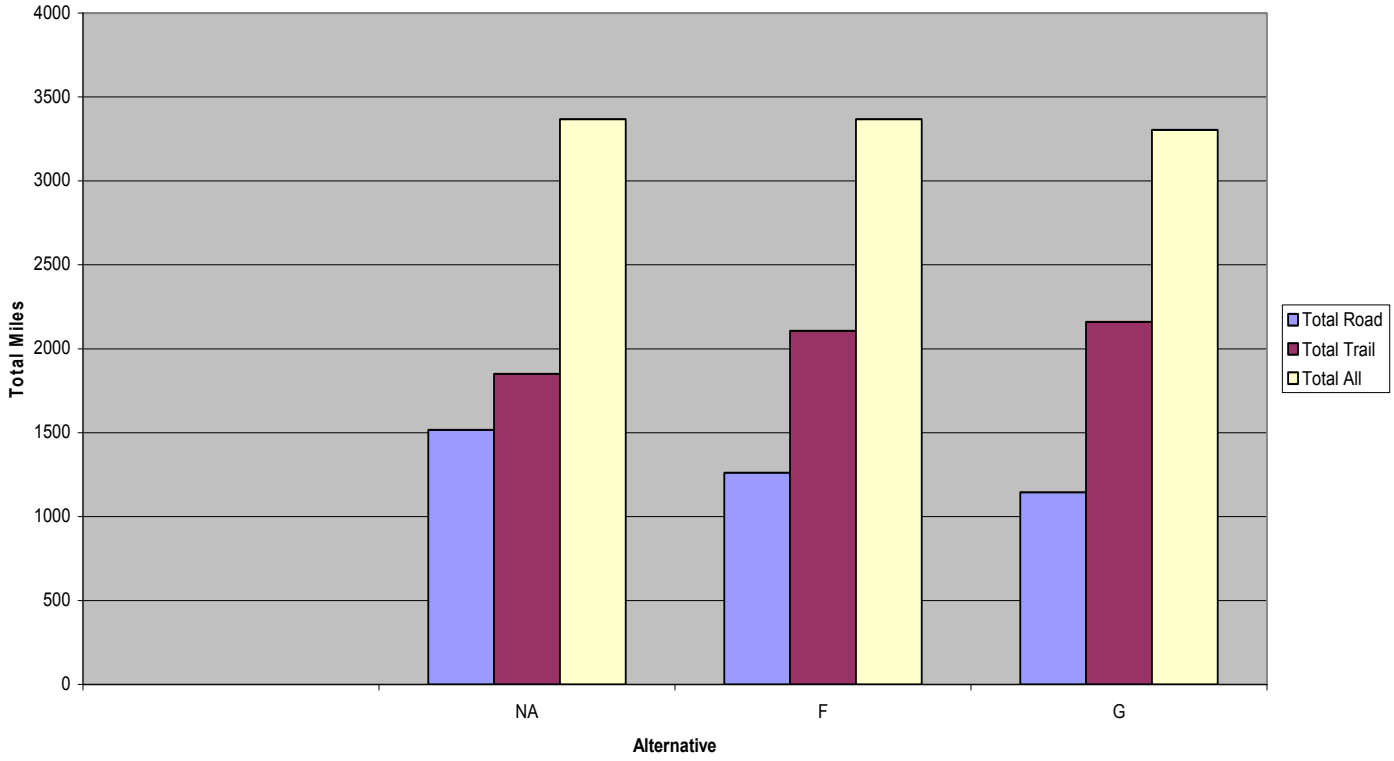
The second part of the recreation analysis involved compiling site-specific information for a forest-wide analysis as described in this EIS.

Summer Season

Most resource-based recreation use occurs within ½-mile of a road or trail (Cordell et al. 1990). When analyzing an overall forest program, it is logical to assume that the maximum number of miles of road and trail open to the most uses will provide the maximum overall volume of recreational opportunities on the forest. Such an assumption does not consider the quality of the individual user experience. A comparative analysis of total open road miles of all types is done in the transportation and infrastructure section of this analysis.

Rather than just comparing general recreational access, some activities are transportation type activities where the travel route is a key part of the experience. These include hiking, horseback riding, mountain biking, ATV use, and motorcycling. While some activities may legally take place on maintenance level 3 through level 5 routes, it is generally considered that the majority of the aforementioned users are only using these higher level routes as access to get to their desired activity rather than as a quality component of the activity itself.

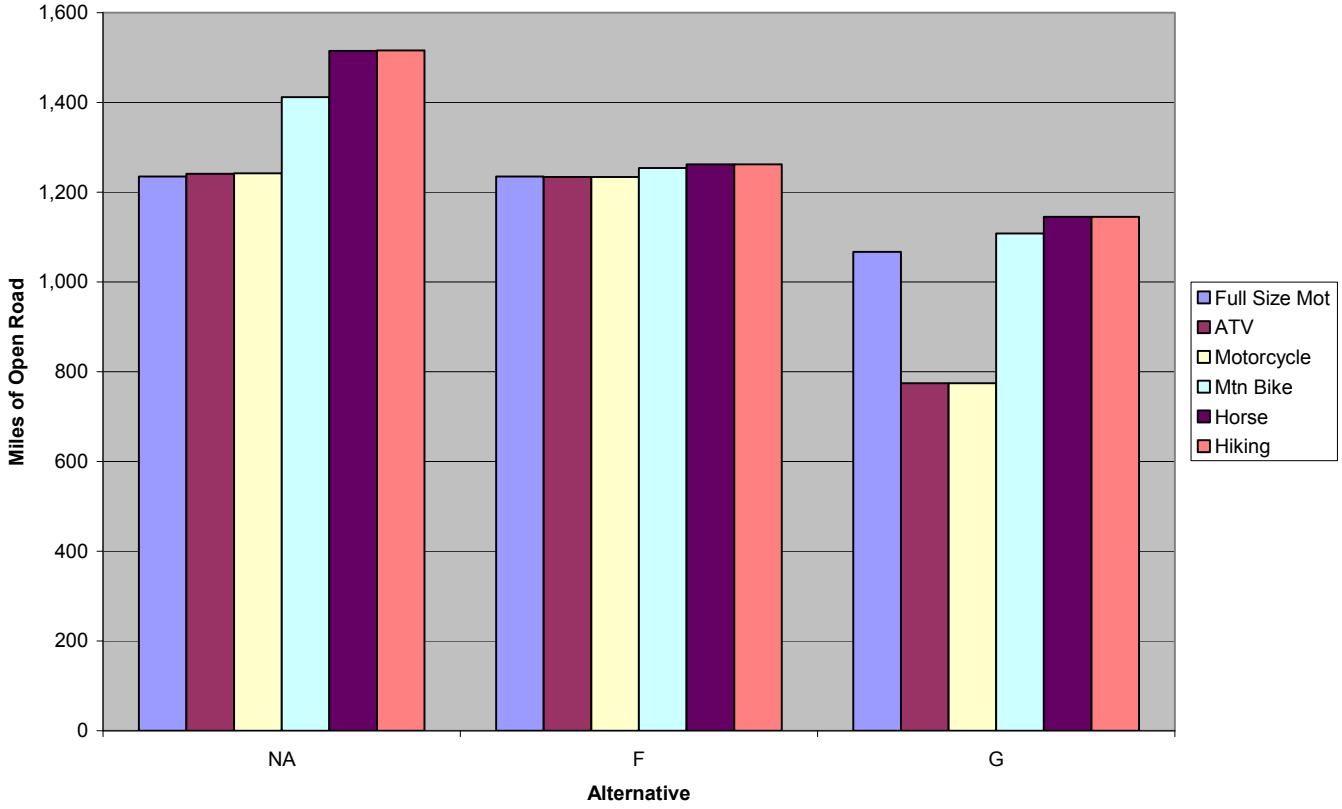
Figure 3.7 shows the total open level 2 roads and trails mileage by alternative. Alternative A would have the highest total miles open for travel, followed by Alternatives F and G, respectively.



Source: White River National Forest, GIS data

Figure 3.7—Total miles of roads and trails by alternative

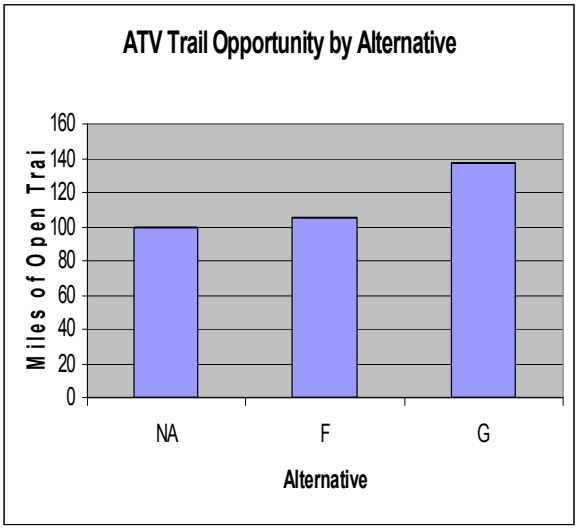
Figure 3.8 gives a comparison of the total number of open level 2 road miles by alternative by use. Alternative A, the no action alternative would have the most miles of open level 2 roadways for all uses, followed by Alternatives F and G.

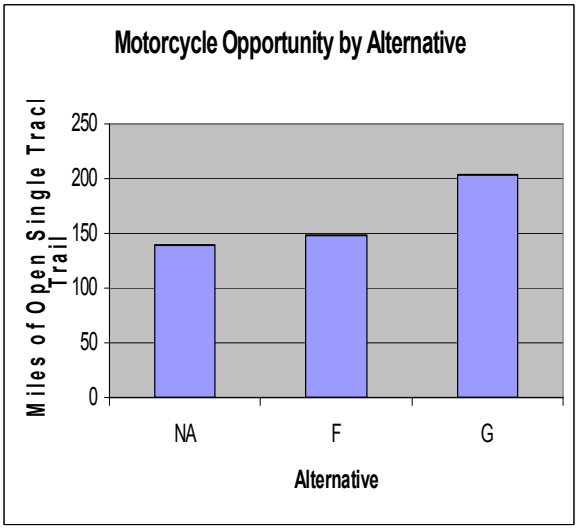


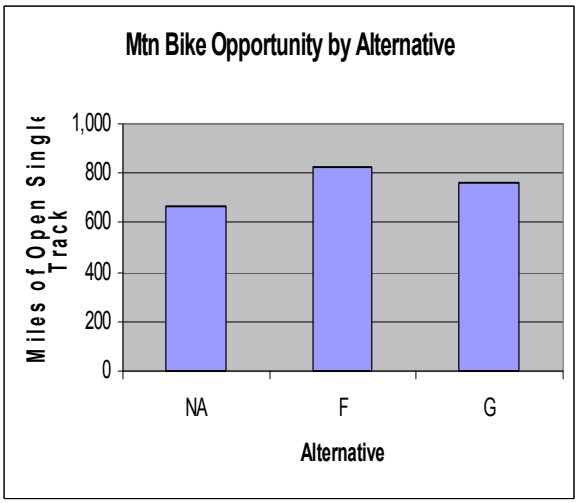
Source: White River National Forest GIS data

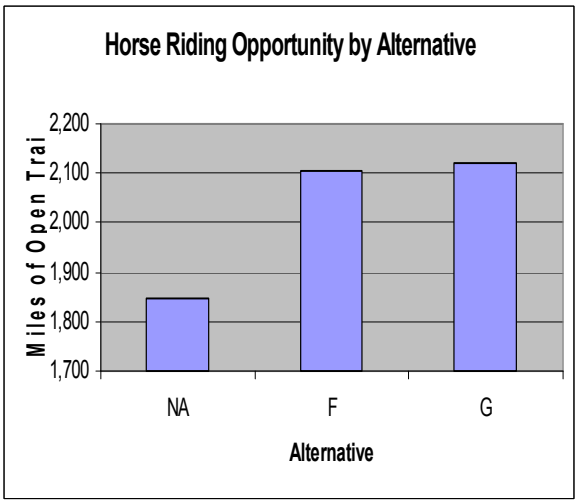
Figure 3.8—Open roads by alternative and use type

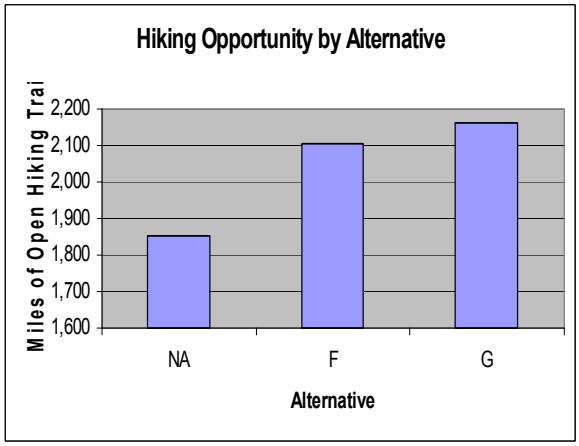
Figure 3.9 provides comparisons of the total number of open trail miles by alternative by use.











Source: White River National Forest GIS data

Figure 3.9—Recreation opportunities by alternative

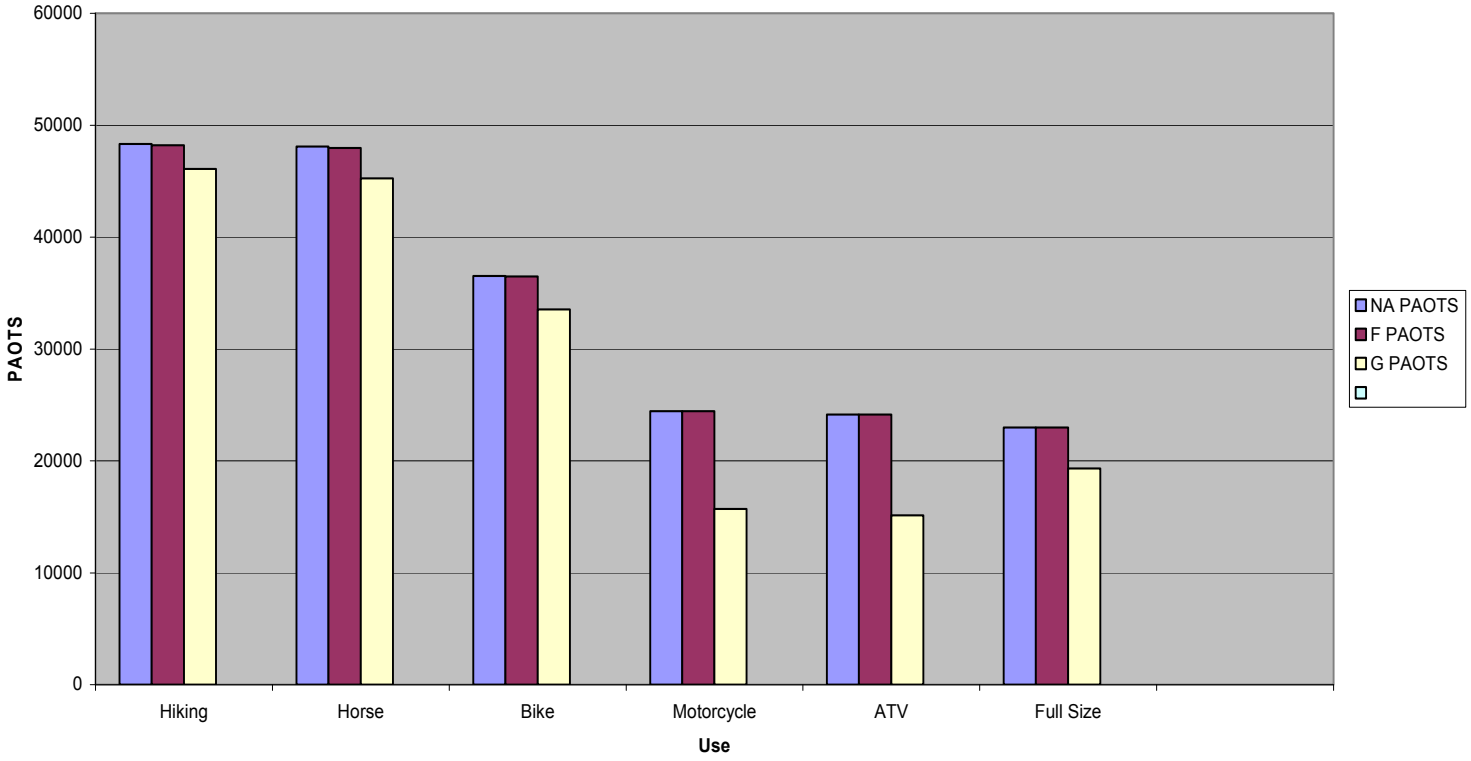
Although the total level 2 road miles drop from Alternative A to F and G, the total trail miles increase, with Alternative G offering the most trail miles of these alternatives. This is the result of converting level 2 and level 1 roads to trails and the adoption of new trails into the forest's system. While Alternative G would have the greatest total trail miles open for hikers, horses, ATVs, and motorcycles, the total trail miles open for mountain bikes is highest in Alternative F. This is due to making conscious decisions regarding which trails to allow mountain bikes on instead of a policy of allowing them on all system trails outside of wilderness, as would be done in Alternative F. Trails, such as those that only access wilderness or are unsuitable for mountain bikes, would not be designated in Alternative G.

Capacity is measured in the number of persons at one time (PAOTS) that may occupy a set distance of road/trail. In addition to looking at the total number of open miles, the number represented by capacity also takes social factors associated with crowding into account.

The capacity of urban settings is greater because physical facilities are designed and constructed to accommodate more use. The people who visit those settings also tend to be more accepting of development, managerial controls, and a higher number of other users. In contrast, people looking for solitude are not as accepting of large numbers of users or the managerial controls and development necessary to handle intensive use. Therefore, the capacity of the backcountry areas is lower.

Figure 3.10 displays the capacity, expressed in persons at one time (PAOTS), available for each use by alternative. The individual activity columns consider only the total capacity for a particular use and not other uses taking up capacity. Because many of these uses rely on a shared transportation system, the total capacity available for a combination of all shared uses would be less than the sum of adding all the individual uses. Not included in this analysis are capacities of level 3, 4 and 5 roadways. These routes are primarily considered to be for general forest access and transportation rather than a part of the recreational experience. Because these routes tend to be in areas of higher development and higher willingness of the visitor to accept less solitude, removal of these routes from the analysis does significantly lower PAOT capacities across all alternatives from those displayed in a similar graph in the first draft.

Alternative A would have the highest capacity for use on the forest. Alternative F is only slightly less for horse and hiking use than alternative A and nearly equal for biking, motorcycling, all-terrain vehicle and full size vehicle use. Alternative G has the least available capacity for use in all categories due primarily to the reduction of level 2 roads across the forest.



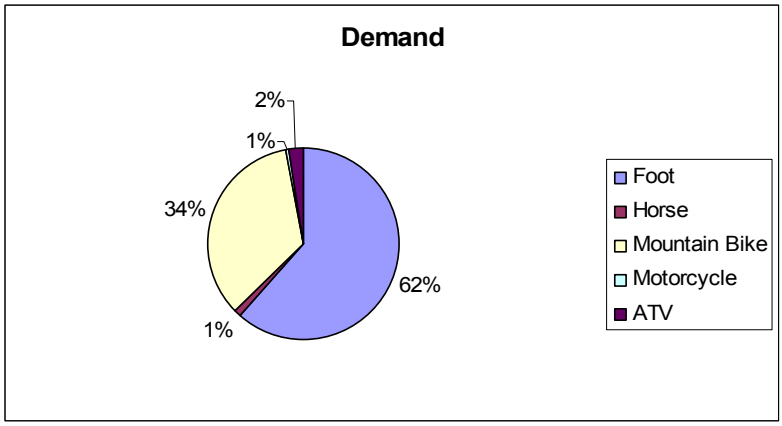
Source: White River National Forest GIS data

Figure 3.10—Capacity, in PAOTs, on roads and trails by user type. not including capacity on Level 3, 4 and 5 roadways

Supply Versus Demand

A discussion point that often arises when offering recreational opportunities is the balance of supply and demand. All users seem to argue for an equitable distribution of the available opportunities among the various user groups.

Discussions also often focus on what defines a quality experience for a particular user. While the quality of experience is a very individual and personal opinion, enough basic assumptions may be made to perform an analysis. Demand is often measured by the number of persons measured engaging in a particular activity or purchasing a particular product. Figure 3.11 is a graphical display of demand in visits as identified from actual use figures from the forest's visitor use monitoring survey in 2002.



Source: Kocis et.al. 2003, based on 2002 NVUM survey

Figure 3.11—Demand by user type

For travel management purposes, supply may be calculated using the number of miles of opportunity available to a particular user group. However, a strict measurement of all miles available does not evaluate what miles may actually be desired and used by a particular user group, nor does it take into account a balance to compare what is expected per visit by user type.

In this comparison it is assumed that for each visit a hiker will travel an average 5 miles on trails, a horseback rider 15 miles on trails, a mountain bicyclist 15 miles on trails and roads open to that use, an ATV rider 35 miles on roads and trails open to that use, and a motorcyclist 60 miles on roads and trails open to that use. For this analysis, roads of level 3 and higher are not considered to be a good recreational experience for any of the above uses, although some may be legal to travel down these routes as connectors.

Figure 3.12 gives a comparison of the supply based on average travel mileage per visit, as compared to the other use types. This is not a comparison of whether total demand for any particular use is over or under-served in total volume, but rather a comparison of the balance of opportunities available to each user group through the travel system for each alternative.

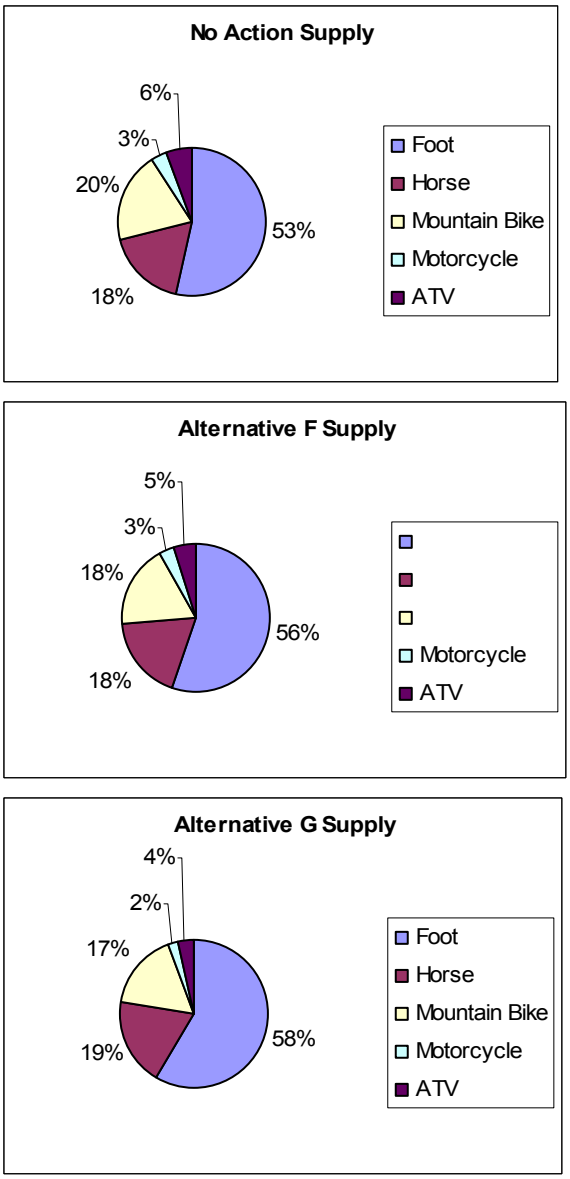


Figure 3.12—Supply balance among types by alternative

In a comparison with demand from figure 3.11, figure 3.12 shows that no alternative is close to balancing the supply and demand for all activities. However, for hiking, motorcycle, and ATV use, Alternative G comes the closest to having supply and demand meet. In this alternative the amount of supply for hiking is roughly 5 percent less than the demand, while the supply for both ATV and motorcycle opportunity is greater than current demand. Alternative A gives the largest percentage to mountain bikes, largely because it allows for mountain bikes on all trails outside of wilderness. In all alternatives, the supply for horse use greatly exceeds demand, largely because most all trails open to hiking are also open to horses.

The number of routes designated for each type of travel varies between each alternative. While each alternative will reduce existing road densities, each also strives to provide sufficient access to maintain motorized vehicle hunting access. Dispersed camping associated with hunting is only minimally affected. Camping is allowed within 300 feet

of a motorized road or trail. Known dispersed camping locations will continue to have motorized access where resource damage is not an issue.

Under the current situation, motorized access and use has increased to the point where, during the hunting seasons, animals are forced to retreat to either relatively inaccessible locations on the forest such as deep canyons or large pockets of dark timber or completely off the forest to private lands or other areas where the general public does not have access. Overall, by maintaining a limited amount of motorized access to hunting areas and by increasing the acres of wildlife habitat areas that are outside the motorized zone of influence, the overall hunting experience on the forest is expected to improve. Alternative G provides for a greater opportunity to experience hunting with less motorized conflict due to a lower mileage of level 2 routes, followed by Alternative F and Alternative A.

The forest alone does not have the resources to ensure a completely sustainable trails system in any of the alternatives presented. The Forest Service will continue to rely heavily on resources besides congressional appropriations for the operation, maintenance, and management of roads, trails, and other facilities needed to serve forest users. Unless congressional appropriations increase dramatically and keep up with increased trail use, some user groups will need to greatly increase their involvement in assisting the forest with trail maintenance. Volunteer labor, grant acquisition, or user fees can help to continue the long term availability of these routes.

Ski Area Roads and Trails, Winter and Summer

Ski area winter and summer operations are permit-dependent. In addition to the downhill ski areas, many other special-use permittees, such as resorts, outfitters and guides, huts, and owners of in-holdings, may be permitted to construct and maintain roads and trails specific to their operations (permitted routes). Many of these permitted routes may not be open to the general public.

Permitted routes generally are analyzed through processes associated with individual permits. Other than ski areas, these permitted routes are scattered across the forest and have little effect overall on travel management for the general public. The construction and maintenance of permitted routes typically are the responsibility of the permittee.

The current summer permitted routes for ski areas are the same in all summer alternatives. No permitted routes on ski areas are proposed to be added or changed in this analysis process. This analysis and decision will serve to combine and affirm previous management decisions on these routes. Any proposals for changes from the existing permitted situation will go through the ski area master development planning process as well as site-specific environmental analysis.

Winter Season

The process used for winter recreation was similar to the summer analysis process. The ranger districts performed site-specific mapping and review by resource specialists by alternative prior to compiling all site-specific data into a forest-wide analysis.

As previously mentioned, user conflicts tend to be high in winter months. Motorized and non-motorized winter recreationists use many of the same access points for their activities, and most of the area around these access points is typically open for motorized use. While the majority of both user groups do get along, the motorized users argue that cross-country skiers and snowshoers have the whole forest to recreate on. They do not consider from a practical perspective that the average cross-country skier travels less than 6 miles per visit, and that many non-motorized areas are located 10 miles or more from a

winter access point. They further argue that the skiers can access all of the terrain that is open to snowmobiles.

On the converse side, among other arguments, the skiers represent that there are few areas actually accessible that are not open to motorized use. They further argue that the effects of motorized use (largely noise), even in areas adjacent to their use area, degrades their experience.

Because all alternatives follow land allocation decisions made in the 2002 forest plan, there is no difference between alternatives in the number of acres open to motorized use. All alternatives have 1,213,800 acres available for motorized use and 1,017,700 acres in which motorized use is prohibited. Of the1,017,700 acres, 836,000 acres are in either existing designated wilderness or proposed wilderness.

The difference between the alternatives is based on acres where motorized travel is open or restricted to designated routes. Alternative A and Alternative F both have 441,300 acres where motorized use must stay on designated routes, while Alternative G has a total of 507,300 acres where motorized travel must stay on designated routes. The primary reason for restricting motorized travel to designated routes is to accommodate wildlife concerns. Also, some of the acres that were converted from open motorized to restricted to designated routes were stems from isolated parcels that were too small to accommodate open motorized travel.

Cumulative Effects

The White River National Forest continues to be the most visited tract of publicly owned land in the nation. This trend is not anticipated to change anytime in the near future and, more likely, will only continue to increase in the short-term.

Recent studies on national outdoor recreation participation showed that more than 82 percent of the national population indicated that they walk for pleasure, more than 52 percent drive a vehicle for pleasure, more than 32 percent day hike, 21 percent mountain bike, 18 percent drive off-highway vehicles, 10 percent backpack, 7 percent horse back ride on trails, 5 percent snowmobile, 3 percent cross-country ski, and 2 percent snowshoe. From 1999 to 2004 the trend was for continued increases in participation in most activities (Cordell 2004).

The 2003 Colorado Statewide Comprehensive Outdoor Recreation Plan (CDPOR 2003) identifies the top choice for recreation destinations for 50 percent of the state's population as being wilderness areas with little or no development and forests and lakes with limited trails, camping, boating and fishing opportunities. Echoing the national data trends, 74 percent of Colorado residents indicate that they have participated in non-motorized trail-dependent recreation (hiking and mountain biking) in the past 2 years, while 31 percent indicate they have participated in motorized trail recreation in that same period (CDPOR 2003).

The Federal Highway Administration and Colorado Department of Transportation have an analysis underway to determine how best to relieve the congestion on I-70 caused primarily by recreation traffic. In their analysis, they identify that 77 percent of summer recreational travelers and 70 percent of winter recreational travelers driving to the White River National Forest via I-70 are from Colorado's Front Range (USDOT/FHA and CDOT 2004). Their analysis further identifies that current recreational use is being suppressed because of traffic congestion on I-70. Future improvements to travel along I-70 could potentially increase use levels above those anticipated based on local population increases and general user participation increases.

Although most use on the forest occurs during winter months on downhill ski areas, use in the summer months continues to show the most rapid growth. Discussion in the forest plan (USDA Forest Service/WRNF 2002b) provides history and background on anticipated use and demand patterns during the next several years.

Use is increasing not only on the White River National Forest but also on surrounding public lands. When land management agencies in charge managing these areas see more impacts on the land and have to deal with more user conflict, they sometimes have to implement more regulations and restrictions on their units. The White River National Forest has had a policy of designating routes for motorized and mechanized use, where these uses are allowed, for several years. The Forest Service has adopted this policy nationwide for motorized use. The BLM is also moving toward a policy of motorized travel on designated routes for the lands they administer. Within proximity of the White River National Forest, BLM lands regulated by this policy are the Castle Peak area north of Eagle, the Roan Plateau west of Rifle, and the Red Hill area near Carbondale. Both the Colorado State Parks and National Park Service have followed more restrictive travel management policies for years.

A rising population, advancements in technology in modes of transportation, and the development of new technologies for outdoor recreation will increase the demand for additional road and trail systems on the forest. At the same time, flat maintenance budgets will continue to cause the potential for a reduction in the number and quality of road and trail miles.

Roadless Area Management

Introduction

Unroaded and undeveloped areas provide the forest with opportunities to manage for potential wilderness areas, non-motorized and limited motorized recreation, and other commodity and amenity uses. Areas that are undeveloped or roadless in nature can serve a variety of purposes, depending on what is regarded as most appropriate for the site. They can be managed as research natural areas or special interest areas, used for resource production or to provide non-motorized recreation, or, if suitable, recommended as wilderness.

The forest plan assigned a range of management areas to roadless inventory areas based on the management emphasis and resource values of each area. This section addresses the social values associated with inventoried roadless areas. Values such as wildlife habitat, clean water and air, scenery, or other resources are addressed in those specific sections.

It should be noted, since inventoried roadless areas by definition do not include constructed roads, that this travel management plan only considers the following within inventoried roadless areas:

1) designation of use on system trails (motorized and non-motorized);
2) designation of use on user-created trails (motorized and non-motorized;
3) determination of which system and user-created trails should be scheduled for decommissioning.

Conversion of a user-created trail to a system road or construction of new roads within inventoried roadless areas is outside the scope of this document and would require site-specific analysis.

Key Indicators

Key indicator: Impacts on solitude and remoteness.

Measure: Miles of system trail within each inventoried roadless area.

Measure: Miles of trail to be decommissioned within inventoried roadless areas.

Affected Environment

A current inventory and analysis of roadless areas was completed during the forest plan revision process and is detailed in appendix C of the forest plan final EIS (USDA Forest Service/WRNF 2002b), hereby incorporated by reference. The current inventory also was used in the National Roadless Area Conservation Rule of January 2001 (USDA Forest Service 2001b). In May of 2005, the Department of Agriculture, Forest Service revised 36 Code of Federal Regulations, Protection of Inventoried Roadless Areas, by adopting a new rule that established a petitioning process that will provide Governors an opportunity to seek establishment of or adjustment to management requirements for National Forest System inventoried roadless areas within their states. Currently, the Forest Service is directed to utilize the January 2001 rule. Two states submitted petitions to be analyzed, Colorado and Idaho. The Forest Service is in the process of analyzing the state petitions under NEPA. Both the 2001 rule and the 2005 rule have court cases filed for and against their provisions and use. Travel management proposed in this effort complies under both rules.

There are approximately 640,000 acres of inventoried roadless areas on the White River National Forest. Of them, 37 areas totaling 298,000 acres have been evaluated as capable and available for recommended wilderness. Ten areas, each containing fewer than 500 acres, also were evaluated as capable and available for recommended wilderness in the forest plan. Motorized and mechanized use is prohibited year-round on trails in management area prescription recommended wilderness (MA 1.2). Travel management direction for inventoried roadless areas in the remaining management areas is based on forest plan direction.

Inventoried roadless areas have a variety of values, both active and passive. Passive use values "… reflect utility derived by humans from a resource." The value of passive use includes two categories: (1) things people appreciate without actually using them or even intending to use them are called "existence value"; (2) things people want to remain available for others to use and appreciate are called "bequest values" (Gucinski et al. 2002).

Environmental Consequences

General Effects

Generally, foot, horse, and mountain bike travel in inventoried roadless areas is considered compatible with roadless area characteristics and is not viewed negatively; that type of use is not further analyzed in this section. If motorized trail use is authorized in the selected alternative, the primary short-term impact on inventoried roadless areas will be on the roadless characteristics of solitude and remoteness. The number of miles of increased motorized trail use will have an inverse relationship with solitude and remoteness qualities.

Since system roads are not found within the inventoried roadless areas, the character of the area will essentially remain undeveloped, with approximately 8-10 percent of the trails open to either all-terrain vehicle and/or motorcycle use (a few trails have system road numbers but they are managed as trails). Forest plan direction prohibits summer motorized travel in inventoried roadless areas within management areas 1.2, recommended wilderness; 1.31 and 1.32, semi-primitive non-motorized; 1.5, wild rivers; and 2.2 research natural areas.

Direct and Indirect Effects

Table 3.8—Travel system in inventoried roadless areas

	Alternative A	Alternative F	Alternative G
Miles of open motorized trails	44	44	34
Miles of non-motorized trails	461	463	440
Miles of trail to be decommissioned or rehabilitated	0	198	232

Alternative A will not help to improve roadless area characteristics. Alternative F will help to improve roadless area characteristics by actively rehabilitating trails that are not needed. Alternative G is the best alternative to improve roadless area characteristic,s as it reduces miles of motorized trails and the amount of overall trails in roadless areas. It is recognized that some system trails are necessary so that people can take advantage of recreation opportunities, and system trails can be maintained to reduce the effects of use.

While some people may feel that motorized travel detracts from roadless area characteristics, it should be noted that motorized travel, limited to ATVs and motorcycles, is allowable. In Alternative G only 8 percent of the trails in roadless areas

will allow this use. The trails identified are generally concentrated networks that have been traditionally used and are considered quality recreational opportunities.

Cumulative Effects

Effects of past road construction and development in roadless areas are minimal, and there is no new road or trail construction proposed in roadless areas in any action alternative. This analysis includes only system trails and unauthorized routes that have already been constructed; therefore, there would be no cumulative effects from additional construction.

Since all alternatives would decommission some level of unclassified routes, the overall undeveloped nature of inventoried roadless areas would improve. As local communities continue to grow and the demand for nearby recreation increases, it is likely that over time the total miles of routes both on and off forest will increase. The increase in recreation use within the forest and inventoried roadless areas will likely have cumulative effects on the characteristics of solitude and remoteness.

There are no specific proposals for further road building or development in roadless areas at this time. Project proposals in the near future, especially for forest vegetation management, minerals, and natural gas development, may affect some roadless areas. These would be analyzed in the site-specific project environmental analysis and are likely to be authorized only under a special use permit rather than open for public recreational travel. The emphasis will be on temporary roads necessary for commodity or management access. For timber, these roads tend to be in place for 3-5 years, then are rehabilitated; for natural gas and minerals, the roads may be in place for 5-30 years.

Scenery Management

Introduction

In addition to production of timber and numerous other resources, forested landscapes provide beauty, which is a valuable resource to many citizens. This resource is explicitly recognized by law. The National Environmental Policy Act requires equal consideration of aesthetics and science, and the Forest Service requires application of scenery management to all National Forest System lands. Scenic resource analysis is used to minimize the impacts on scenery by human-caused development on National Forest System lands. This section describes the scenery analysis and potential impacts that may occur due to implementation of the White River National Forest Travel Management Plan.

The forest plan establishes acceptable limits of change for the scenic resource (USDA Forest Service/WRNF 2002a). The acceptable limits of change are the documented scenic integrity objectives, which serve as a management goal for scenic resources.

Key Indicators

Key indicator: Potential visual impacts in "very high" or "high" scenic integrity objective areas.

Measure: Miles of road within "very high" or "high" scenic integrity objective areas.

Affected Environment

Scenery is an integral component of all forest settings and heavily contributes to the visitors' experience. Scenic resources vary by location and existing natural features including vegetation, water features, landform, geology, and human-made elements. All activities that forest visitors experience are performed in a scenic environment defined by the arrangement of the natural character of the landscape along with components of the built environment. Scenery combines all ecological features and human elements in a landscape to provide for our experience. The composition of these attributes is what gives a landscape its character or image. Scenery, like other natural resources, must be managed in the present to maintain quality scenery for future generations and to provide a range of experiences for a variety of users of the forest.

The report of the President's Commission on America's Outdoors (USDA Forest Service/Intermountain Research Station 1987) states that America's most important attribute for recreation is natural beauty. In surveys, Americans have repeatedly identified driving for pleasure as a favorite recreational activity. The requirement of scenic roads for this activity links scenic quality to tourism, which has become a major component of local and state economies (AASHTO 1991). Driving to enjoy scenery has been the top national recreation activity for more than a decade. The White River National Forest is the most heavily visited national forest in the nation. People who drive to view scenery account for 11 million visits annually. Scenery is an integral component of all forest settings and contributes to the quality of the users' experience. Managing a natural-appearing landscape for these visitors is important.

It is important to evaluate the management of multiple resources and possible effects associated with scenic resources. Management of multiple resources has altered the natural landscape character into the existing condition of the landscape. Management decisions are not only based on multiple use, but also on providing a range of experiences

across the forest for both motorized and non-motorized customers. The most obvious and significant effects on scenic resources are from vegetation and landform alterations. Multiple resource management activities that have altered scenic resources include but are not limited to timber management, mining, oil and gas extraction, recreational facility development including ski areas, roads and trails, campgrounds and picnic grounds, utility corridors, fire management (suppression and prescribed burning), and livestock grazing. It is important to evaluate the management of multiple resources and the possible effects associated with scenic resources. The scenery management system (SMS) provides the framework to effectively manage scenic resources within an ecologically aesthetic discipline.

The varieties of features on the landscapes of the White River National Forest provide a setting for spectacular scenery in the heart of the Rocky Mountains. The forest is composed of a diverse range of landscapes, vegetation, and water features that range from 5,500 feet in elevation to peaks towering over 14,000 feet. Foothills, mountains, plateaus, alpine peaks, and canyon lands provide a range of topography. Shrubs and grasslands, aspen and spruce-fir forests, alpine turfs, meadows, and wetlands form the vegetative mosaic of the forest. Hundreds of small lakes and ponds are scattered across the forest. Large reservoirs include Green Mountain, Dillon, Homestake, and Ruedi reservoirs, which provide an aesthetic and recreational setting in the forest. The Colorado, Eagle, White, Roaring Fork, Fryingpan, Blue, and Crystal rivers are the major streams flowing through the forest.

Large panoramic vistas can be found on several locations of the forest. Distinctive features of the landscape are experienced at a smaller scale. The diversity of scenery on the forest varies from steep canyons defined by towering cliffs that only a few visitors ever see, to the international destination of the Maroon Bells—one of the most photographed areas in the nation. The eight wilderness areas on the forest contain some of the most outstanding natural landscapes of the Rocky Mountains. Trappers Lake and the surrounding Flat Tops wild lands inspired Arthur Carhart to create the wilderness concept in the early 1900s. The Trappers Lake area is now known as the “Cradle of the Wilderness.” Mount of the Holy Cross in the Holy Cross Wilderness was the site of religious pilgrimage in the early 1900’s. The awe and wonder of the beauty of these natural wild lands is a national treasure.

Three scenic byways go through the forest. The Flat Tops Scenic Byway on the north side of the forest, the West Elk Loop Scenic Byway on the south side of the forest, and The Top of The Rockies Scenic Byway on the east side of the forest provide spectacular scenery for sightseers. The forest has such a vast array of scenic areas, they cannot all be described here. Please refer to the landscape character descriptions found in the appendix of the forest plan FEIS for more detailed information (Volume 3, Appendix P, pgs. P-1 to P-44. See also Volume 1, Topic 3, Part 4, page 3-505 to 3-512). The existing condition of the scenery resource is well-documented by the scenery management system maps found within the White River National Forest GIS system. The entire forest has been inventoried for both existing and desired future conditions. There was an extensive scenery analysis and scenery specialist report completed for the forest plan. In addition there were several scenery GIS coverages developed for the forest which were used for the scenery analysis.

The Scenery Management System (SMS) has two different landscape elements which have similar names, Existing Scenic Integrity (ESI) and Scenic Integrity Objective (SIO), but are very different. The ESI is a snapshot in time of the existing condition of the landscape. The SIO is one of the components of the desired condition for scenic quality.

Scenic Integrity Objectives are derived by combining the ESI with other landscape elements. They are expressed as forest plan objectives.

Table 3.9 shows each level of scenery and compares the acres of ESI at the time of the forest plan analysis to the SIO of the selected alternative in the forest plan. The table is included in this document to illustrate the differences in the ESI and the SIO as related to the forest. For further information on the scenery-related questions which are not covered in this report, refer to the forest plan.

Table 3.9—Acres and percentage of forest at existing scenic integrity (ESI) and scenic integrity objective (SIO)

	Existing scenic integrity level		Scenic integrity objective	
Category	Acres	Percent of forest	Acres	Percent of forest
Very high	889,000	36	544,000	24
High	549,500	22	458,000	20
Moderate	950,700	38	705,000	31
Low	38,600	2	533,855	23
Very low	46,700	2	46,000	2
Unacceptably low	7,300	>1	-*	-*

** An unacceptably low SIO is never a scenic integrity objective (Source: White River National Forest GIS data)*

The forest plan identifies 7,300 acres that have an ESI of unacceptably low as shown in tables 3.9 and 3.10. Unacceptably low can describe only an existing condition and is never a management objective. Thus, all existing unacceptably low areas must be rehabilitated in accordance with forest plan direction as forest budget allows and as project opportunities arise (USDA Forest Service/WRNF 2002b, appendix Q).

Table 3.10—Acres of unacceptably low existing scenic integrity needing rehabilitation to meet scenic integrity objectives

Scenic integrity objective	Acres of unacceptably low ESI* needing rehabilitation
Moderate	5,989
Low	1,311

** ESI = existing scenic integrity*

Environmental Consequences

General Effects

The complete travel management system is one wherein the elements of design, construction, and maintenance have been integrated to provide facilities that possess the optimum of utility, safety, beauty, resource protection, and economy. Even a well-designed travel system inevitably creates a set of changes to the local landscape, and some values are lost while others are gained. In general, roads (wider than 50 inches) cause greater impacts on the scenery resource than trails simply due to the fact that they are more visible and cause changes to landforms and vegetation.

The major impacts of roads and trails are caused by their linear configuration within the natural non-linear landscape. Limited gradients, constant road widths, traveling surfaces, and vegetation removal, which contrast in texture and color from the adjacent landscape, cause further visual impacts (Agricultural Handbook #483, National Forest Landscape

Management, vol. 2, chapter 4, Roads, p.2). Current levels of trail maintenance are generally sufficient to protect soil and stream banks, but there are potential scenic effects associated with erosion, multiple "braided" trails, and damage to stream crossings.

Different phases of road development, such as building, maintaining, using, decommissioning, or abandonment, will have widely varying effects on scenery. Dust produced by vehicles moving on unpaved roads reduces visibility. Road closures potentially can have both a negative and positive effect on scenic resources. Recontouring roads can positively influence the forest setting by reducing contrast in form, line, color, and texture. When road rehabilitation is necessary, consideration will need to be given to how the rehabilitation is accomplished and viewed from other roads, trails, and viewpoints (FEIS, Vol. 1, Topic 3, Part 4, page 3-519).

The effects of roads differ over time. Some effects are immediately apparent such as the loss of solitude or the creation of edge. Other effects may become more of a visual impact after the passage of time, such as when a large storm event causes a sudden mass movement of earthen material. Road effects also differ by landscape position and behave differently based on the topography they cross (i.e., ridgetop, midslope, and valley floor roads) (USDA Forest Service 2000, p. 5,7,13,80).

A wide variety of uses occurs on the forest. Those uses, as well as new uses, are expected to continue to increase in the future. Sightseeing and driving outdoors for pleasure are examples of activities that directly use roads as part of the recreation experience. The character of scenic views and access to the views will directly depend on the road system in place. Increasing the recreational use of areas may provide scenery benefits to a larger number of people. Altering road systems can disrupt long-established access and use patterns.

Placement, scale, class, and setting of roads can also greatly affect the quality of scenic views and access to outstanding scenic vistas. It is important to be aware of the indirect effects that roads have on the scenic resource. As demand for forest recreational opportunities continues to grow, even a stable number of forest roads and a stable condition of forest roads will likely result in increased congestion, and thus lower the quality of the experience of the scenery. (USDA Forest Service 2000, p. 61-62).

Maintaining or increasing visitor access must be balanced with maintaining the scenic integrity objective in any given area.

Direct and Indirect Effects

Both of the action alternatives have the potential to alter the existing landscape in any of the scenic integrity objectives. Changes in landscapes that have been previously altered usually are more acceptable than alterations made in undisturbed landscapes.

Alternative A and Alternative F have the highest number of miles of roads within areas with high or very high scenic integrity objectives, with 273 miles. However, Alternative G is fairly close, with 258 miles. On the one hand, providing the most roads within high or very high SIO areas can provide more viewing opportunities for a greater number of people. Conversely, limiting roads within these areas will be more beneficial to the scenery. While a smaller number of people may experience the views (such as with hikers), the views will be of a greater quality (due to less dust, congestion, and impacts on other resources such as erosion).

Alternative F provides the greatest number of miles of road open to public travel over Alternative G. However, the quality of the scenic resource (natural setting) would not be as high as in Alternative G.

Alternative G will rehabilitate more routes than Alternative F, and Alternative A will not rehabilitate any. Since Alternative G provides the most miles of road to be rehabilitated, this alternative will remove the most travel route scars on the land.

Alternative G best meets the scenery management system's underlying ecological aesthetic. Under SMS, activities which improve forest health also improve forest aesthetics, and therefore move toward the forest plan long-term desired condition. The Alternative G would best protect scenic resources, although a lower number of people would have access to the scenery.

Two trails are identified as being in need of rehabilitation in the forest plan (see table 3.10 in the affected environment section above): the Ute Creek Trail #1824, and the Oyster Lake Trail #1825. In all of the alternatives both trails are open to horses and hiking. Any travel management decision should include a provision to rehabilitate these trails.

Cumulative Effects

Management of multiple resources has altered the natural landscape character, creating the existing condition of the landscape. The most obvious and significant effects on scenic resources are from vegetation and landform alterations. Multiple resource management activities that have altered scenic resources include but are not limited to: timber management; mining; oil and gas extraction; recreational facility development (including ski areas, roads and trails, campgrounds, and picnic grounds); utility corridors; fire management (suppression and prescribed burning); and livestock grazing.

A wide variety of uses occur on the forest. Those uses, as well as new uses, are expected to continue to increase in the future. Sightseeing and driving outdoors for pleasure are examples of activities that directly use roads as part of the recreation experience. The character of scenery and access to scenic views will directly depend on the road system in place. Increasing the recreational use of areas may provide scenery benefits to more people. Alteration of road systems can disrupt long-established access and use patterns.

Placement, scale, class, and setting of roads can also greatly affect the quality of scenic views and access to outstanding scenic vistas. It is important to be aware of the indirect effects that roads have on the scenic resource. As demand for forest recreational opportunities continues to grow, the use of forest roads will likely increase in congestion, and thus lower the quality of scenery (USDA Forest Service 2000c).

The area that may be indirectly and cumulatively affected includes areas outside the forest boundary; most notably as viewed from populated areas and along heavily traveled corridors. Any activities detrimental to the scenic landscape may negatively affect the quality of the tourist experience, which is a leading industry in Colorado (USDA Forest Service 1995b). Ultimately, development of private lands (which introduces contrast into the landscape such as color, reflectivity, shape, and line) adjacent to the national forest is the greatest threat to national forest scenery when viewed from primary transportation routes and key public viewpoints (USDA Forest Service/WRNF 2002a).

Socio-Economics

Introduction

The effects of the proposed project on social and economic resources were incorporated into key issues during the scoping process. Social and economic concerns are an important consideration of national forest management, and a general discussion is included.

Volume and Type of Recreation Access

People value the ability to recreate on the forest. To participate in most recreation activities, road access is required to get to trails, access points, or recreation places. Some forms of recreation require roads to actually partake in the activity (for example, four-wheel driving and driving for pleasure). There is concern that closure of any access will limit motorized users, create crowding, and create displacement. Closure of access appears to increase non-motorized experiences, but in many cases closure of access may also make it difficult for non-motorized users to get to specific places. People are also concerned with the increase in private in-holdings that limit former access points to the national forest.

Resolution of Recreation Conflict

Roads provide access; however, once people reach their destination they expect to have a certain experience. Some want to use motorized equipment, some want to use mechanized equipment, and some seek a non-motorized experience; some prefer solitude, while others seek group settings. These differences have become apparent through public comments. Many requests for separation of uses have been made so that people can participate exclusively in one activity without conflict from other use types. Others felt that separation of uses limits all users and continues to create conflict, ill will, and territorial feeling among user groups. Some people commented that the greatest conflict occurs at shared access points and from inappropriate trail etiquette.

Key Indicators

Key indicator: Amount of recreation opportunities available to users.

Measure: Miles of roads and trails and winter use areas by user type.

Affected Environment

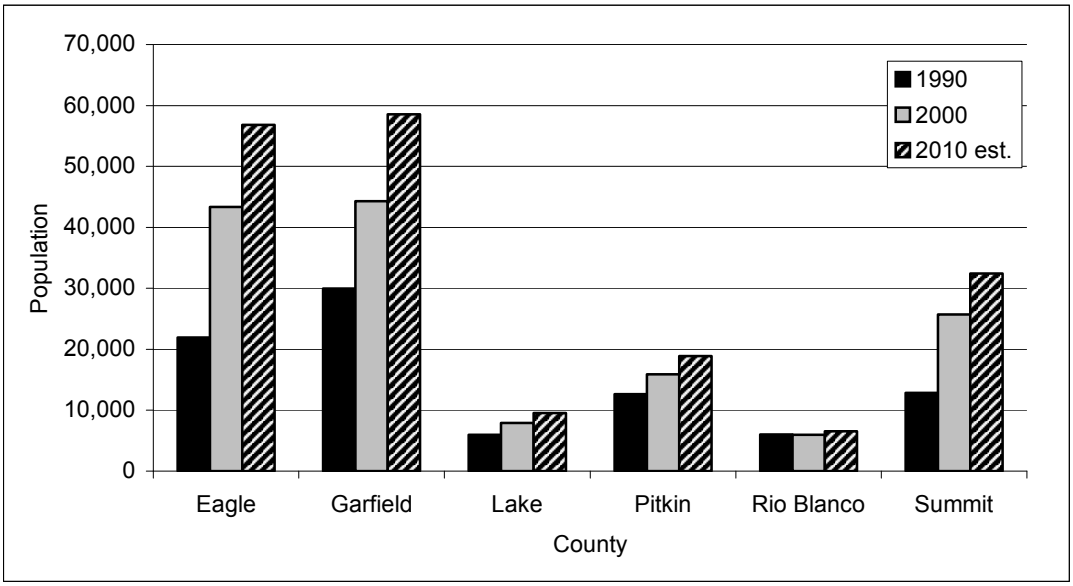
Study Area

The study area for the social and economic analysis includes six Colorado counties: Eagle, Garfield, Lake, Pitkin, Rio Blanco, and Summit. This resource report summarizes community information presented in the forest plan (USDA Forest Service/WRNF 2002b). The forest plan should be referred to for additional social and economic information.

Population

The structure of the area's population can influence the ability of the area to absorb or adapt to changes. It is important to consider any potential changes within the context of trends that are occurring outside forest planning activities.

Since 1990, the population in the six-county area has increased 60 percent, from 89,500 to 143,150; population is expected to increase another 30 percent to 182,810 by 2010 (CDOD 2004). Figure 3.13 displays the county populations for 1990, 2000, and 2010 (estimate). In the future, it is expected that the faster growing trends seen in Eagle, Garfield, and Summit counties will continue.



Source: Colorado Department of Demography (CDOD) 2004

Figure 3.13—Population by county, 1990, 2000, and 2010 (estimated)

Environmental Justice

Executive Order 12898 (February 11, 1994) directs federal agencies to focus attention on human health and environmental conditions in minority communities and low-income communities. The purpose of the executive order is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. Tables 158 and 159 of the forest plan highlight the demographic statistics for identifying potential communities of concern.

Low-income populations are more difficult to determine in the planning area because of the high cost of living, somewhat higher wages, and the many seasonal workers; normal poverty statistics are not useful in identifying those with low incomes. An analysis of housing affordability was completed as a proxy for poverty. The forest plan indicates that the proportion of relatively low-income households is probably higher than in other areas around the state.

Nine communities within the analysis area have a greater proportion of Hispanics than the statewide average. Most of these communities are home to workers who commute to the tourism centers of Vail, Aspen, and Summit County for service and retail positions. Housing as a proxy for poverty highlighted Pitkin, Eagle, and Summit counties as some of the most expensive places in Colorado to purchase a home, with Garfield County slightly above the state average, Lake County just below the state average, and Rio

Blanco County with the lowest available home prices near the White River National Forest.

Employment and Income

Employment is important to consider because one of the main functions of a region's economy is to provide jobs for residents. Personal income measures the dollars that area residents have to spend and save. The general trends in employment and income of a region put the potential impacts of changes in forest management in context of current trends and changes. In this section, general trends are outlined along with specific trends occurring in those sectors likely to be most affected by changes in Forest Service management, wood products, grazing, recreation and tourism, and mineral/oil/gas industries.

The economy around the White River National Forest is dominated by tourism. Almost 60 percent of all workers are employed in the trade and service industries. The forest plan environmental impact statement (EIS) discusses specific employment trends (USDA Forest Service/WRNF 2002b).

Per capita personal income for 2000 in the planning area on average is $35,298, similar to Colorado's average of $32,434. However, differences by county can vary remarkably. Pitkin County has a per capita income of $68,761, almost three times that of Lake County's $22,105, and twice that of those living in Garfield ($25,748) and Rio Blanco Counties ($26,039). Earnings, or income received by business owners and employees, account for a very high proportion of the income in Summit, Eagle, and Pitkin counties. A residence adjustment, however, indicates that many individuals who work in these counties take their earnings with them as they commute home to a surrounding county with a lower cost of living, such as Garfield, Lake, and Rio Blanco counties. Additional income trends are highlighted in the forest plan EIS (USDA Forest Service/WRNF 2002b).

Forest Contribution

Travel management decisions are most likely to affect tourism-related sectors, especially those involved with rental equipment or offering guided services. As highlighted in the forest plan, about 25 percent of employment in the six-county area can be attributed to Forest Service activities; most of that employment is associated with ski area activities. Direct economic impact on surrounding areas is based on users who purchase goods and services on their way to or returning from an activity on the White River National Forest. Purchases of gear and equipment made before a trip, or outside the study area, are not considered here.

Access for mining, oil and gas, livestock grazing, and wood products activities will be provided for at the project level and is not discussed further in this section.

Social Elements

Social elements are summarized in the economics affected environment section in the forest plan EIS, which includes a historical write-up for each county in the study area as well as community-specific information (USDA Forest Service/WRNF 2002b). For more specific information, please refer to the forest plan.

Lifestyle

The six counties in the study area have shared histories and are affected by the same trends, but they also are very diverse. Most of the area's development began with mining

activities, but several areas served as ranches, farms, and tourist attractions in the form of hot springs. The development of ski areas throughout the study area began a trend that continues today in the form of tourism development.

Some communities in the study area are attractive to retirees, while other communities serve as second-home locations or bedroom communities. Several communities have the most expensive real estate in the country and thus the highest housing costs in the state. The study area includes the fastest growing community in Colorado (Avon) and the second-busiest wintertime airport (Eagle, with Denver International Airport being the busiest). Interstate 70 runs through the study area, carrying recreationists from the Front Range and providing the major route for locals to move about their communities. Traffic is a year-round issue, due to recreational traffic and heavy commuting traffic between communities with affordable housing and communities with employment opportunities.

Attitudes, Beliefs, Values

For some, the value of access on the forest is directly related to personal income and jobs. Timber and non-timber production, grazing, outfitter-guide services, and special-use permits such as ski areas, all are ways people make money by using the forest. Many local businesses rely on tourists coming to the area to recreate on the forest. The ability to access and recreate on national forests is a major reason why people come to Colorado to vacation and why many decide to stay and make their living here.

The six-county area continues to be an attractive place for people to live, work, and play. Local interest groups representing various recreation user groups or environmentally concerned groups are interested and involved in forest management issues. People from outside the local area are also interested in forest management, because the White River serves as a special place for their winter vacation, destinations for weekend trips, location of a second home, or a place to which they hope to retire someday.

In recent years, with drought conditions, high fire danger, and the occurrence of several large wildfires, people are also interested in fire and fuels management on the forest, to reduce wildfire risk to their favorite places, homes, and property.

Conflict Framework

Conflicts among users of national forest resources are not simply about “competition or incompatibility between activities occurring in the same settings” (Graefe and Thapa 2004). Research into recreation conflicts emphasizes two types of conflict: goal interference conflict and social values conflict (Carothers, Vaske, and Donnelly 2001). In addition to the two types of conflicts, four factors can contribute to conflict activity: style, resource specificity, mode of experience, and tolerance of lifestyle diversity (Jacob and Schreyer 1980). Together these types and factors help to create a conflict framework that allows managers to better understand conflict and why it may occur. The next several paragraphs more fully discuss the components of the conflict framework.

Goal interference or interpersonal conflict results when a group or individual is unable to achieve recreational goals because of the activities or behaviors of others (Carothers, Vaske, and Donnelly 2001). Both groups may have the same goal but different ways of achieving it (Graefe and Thapa 2004). Goal interference can be face-to-face encounters—such as hikers encountering mountain bikers or stock users on a trail, or cross-country skiers encountering snowmobilers on a trail—that cause one group to change activities or plans because of the encounter. Goal interference also comes into play when the behaviors of one group affect another—such as cross-country skiers encountering snowmobile tracks, or noise, litter, or rowdy behavior by any group.

Goal interference conflicts often are asymmetrical, or one-way conflicts, exemplified by conflicts common to motorized and non-motorized users. Motorized users may not see any conflict with non-motorized users, while the non-motorized users feel a higher level of conflict. Goal interference conflicts can also be felt by both user groups. For example, hikers and mountain bikers may both feel their ability to achieve their recreational goals are affected by the other user group. In some cases, conflicts may exist among individuals in the same user groups—for example, hikers encountering other hikers engaging in discourteous behavior.

Goal interference conflicts are the type of conflicts that may be resolved or mitigated through management actions. One management technique used to resolve such conflicts is zoning, or a separation of uses (Carothers, Vaske, and Donnelly 2001). Separation of incompatible uses to different areas or times can address safety concerns and can provide a quality experience for recreational users.

The second type of conflict, the social values conflict, arises when different user groups or individuals do not share the same norms and or values toward resource use (Carothers, Vaske, Donnelly 2001). In this case, the point of conflict does not necessarily arise from direct encounters but may arise from people who disagree with a different user group or oppose their activity, even if that activity does not affect their experience directly. An example would be the continued opposition or conflict between hunters and non-hunters in the Mt. Evans wildlife area, even though the two uses have been separated by management (Vaske, Donnelly, Wittman, and Laidlaw 1995). People who hold different values about the hunting of wildlife may continue to oppose hunters, even if they do not come into direct contact with hunters during their activities.

Social values conflicts are more difficult to manage, because they tend to "be a reflection of one's own values and philosophies rather than a level of the conflict at the area in question" (Graefe and Thapa 2004). These social values conflicts are more likely to be resolved or improved through a common understanding of acceptable recreational uses, tolerance for these acceptable uses, and information about other user groups.

Further complicating matters are the four factors that can contribute to social values conflicts (Jacob and Schreyer 1980):

- Activity style factor: the more experience and higher skill level people have in a recreation activity, the more likely they will be to have conflict if they are unable to achieve their recreational goals.
- Resource specificity factor: the more attached people become to a recreational resource or having access to a specific area, the more likely they will have conflict if they are unable to use that area for their recreational activity.
- Mode of experience factor: the more focused and goal-oriented people are in their activity, the more likely they will encounter conflict if other groups affect their ability to meet their recreational goals.
- Tolerance of lifestyle diversity factor: the more people tend to accept or reject lifestyles different from their own, the less tolerant they are and the more conflict they will likely encounter (Jacob and Schreyer 1980).

With the increase in use of National Forest System lands and the growth in new sports and recreational activities, it seems logical to assume that conflicts among different user groups and within user groups would be on the rise. As summarized by Graefe and Thapa (2004), empirical studies found that few conflicts or problems arise when new recreational user groups are introduced into an area already used by a traditional use

group (for example, llamas in a wilderness area or snowboards in a ski area). The low level of conflict has been found to be associated with individual users and user groups using coping behaviors to reduce or eliminate potential conflict (Schneider 2000, Schneider and Hammitt 1995, Schuster 2000). Thus, while forest management can eliminate some conflicts related to goal interference, social values conflicts will likely be reduced through user group tolerance and information sharing.

Acceptable Uses

The Forest Service offers multiple uses on National Forest System lands. Not every acre is available or suitable for every use, but there is a place for most recreational uses to occur. In some cases, the Forest Service has determined that private lands are the most appropriate places for some specific activities, such as motor cross tracks; however, with management and resource protection, many recreational uses are acceptable and encouraged on forest lands. This can create some social values conflicts because not everyone values or is tolerant of recreational activities they feel are inappropriate or undesirable. These conflicts will persist unless the current and future uses of the forest are tolerated and accepted by all user groups.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

Volunteer activity to help maintain roads and trails throughout the forest would continue under any alternative. Volunteer groups are an important resource in management of the forest transportation system, with hundreds of hours of labor as well as capital being invested each year. Because volunteer work is not contracted and can change year to year, it is difficult to include exact cost savings by alternative associated with this work. Volunteer activity is acknowledged as an important piece of forest management and is assumed to be stable for all alternatives.

Community impacts based on road access will also continue under all alternatives. Some alternatives may see greater displacement of user groups; however, overall it is unlikely that changes in the recreational use on the forest would cause significant changes in the larger economy. Trends of recreational use on the forest are increasing (see recreation section), so the economies of communities surrounding the forest are expected to remain stable or increase under any action alternative.

Summer Season

See table 2.3 in chapter 2 for the miles open to public by use type.

Alternative A. Alternative A reflects the current situation, without adding user-created roads or trails to the transportation system. No additional management or changes would be implemented. This alternative does little to reduce the temptation for illegal activity. This alternative also makes no changes to reflect the desired conditions of the forest plan or expectations that arose from the plan decision. Because some trails do not allow motorized recreation, there is some level of separation of uses. However, no additional separation of uses would be implemented. Those conflicts that currently exist would likely continue under this alternative.

Alternative F. Alternative F reflects the current situation, without adding user-created roads or trails to the transportation system. However, changes would be implemented to

meet the parameters in the forest plan. Because some trails do not allow motorized recreation, there is some level of separation of uses. In addition, there would be slightly more separation of uses due to implementation of management area prescriptions, namely the change in management of some motorized areas to non-motorized. Conflicts may continue, especially in areas that have shared uses or areas where expectations such as solitude may be disrupted by neighboring activities. Although the forest plan creates areas of desired conditions and thus areas of potential expectations, there are still places and activities where conflicts may continue. Unless there is an increase in tolerance and acceptance of uses among all user groups, conflicts will remain.

Alternative G. Alternative G takes into account utilizing a limited but practical system to meet transportation and social recreation needs. This alternative separates some uses and meets forest plan desired conditions by creating a system that allows both motorized and non-motorized uses. It also considers adding routes that may be necessary for creating quality user experiences that were not previously legally available. There is an attempt to separate some uses by designing networks that best meet the desires of certain user types. However in doing so, and given the finite system, some users may feel displaced. Others will enjoy the experience if the network accommodates their preferred uses. Because the system cannot be overly extensive and resource values must be maintained, many locations have to be shared by different user types, and conflict may occur in these areas. The attempt to balance all uses, reduce conflict, and be respectful of the resources leads to the need to balance the volume of use with how much recreational opportunity is available. The areas with heavier use tend to be those areas where people experience conflicts. Those areas also tend to be easier to access and/or are close to the urban interface. Alternative G attempts to depict clearer expectations for experiences by showing recreationists where the various uses are allowed or not allowed. This will raise the level of expectations.

Alternative G also presents the complete picture and implications of implementing the licensed-only roads aspect of the travel rule. This does lead to more separation of use, but also reduces the area and concentrates where unlicensed motorized vehicles are allowed to go. This will likely affect those who are accustomed to using main routes to go from area to area on their unlicensed vehicles. There are still some areas that will accommodate unlicensed motorized vehicles. This could lead to better networks and expectations over time for these users.

It is hard to change user habits and where people go on the forest. Changes can occur, however, over time, especially when it is clear where people can go for a quality experience.

Winter Season

Both Alternative A and Alternative F reflect the decisions made in the forest plan for open motorized use. These decisions help to convey where motorized and non-motorized over-snow travel is allowed, restricted, and prohibited. Although the forest plan decision reduced open areas from the 1985 plan for open over-snow use, it provided for separation of use, thus a reduction in some winter user conflict. The decision will not to be revisited in this document. This document addresses what routes will be available in the restricted prescriptions so that motorized users can travel between open areas. Socially, some users did not like the changes in the forest plan, but others embraced the changes. There are still over 700,000 acres of land available for open over-snow motorized travel. For the winter season, Alternative G adds 237 miles of motorized routes through restricted areas so that motorized users can get from place to place. The limited number of access sites,

and therefore the need for users to share and disperse from the same trailheads, is the cause of most user conflict in winter.

Cumulative Effects

Changes based on economy, age distribution, and population can affect how people recreate. Colorado's population is expected to continue to grow and forest use will likely increase. The state of the economy, gas prices, food prices, and housing costs can affect how much discretionary income people have for recreation. As the population ages, some uses may increase in popularity while others may taper. Technological advances in equipment and trends also can affect what activities people choose to participate in.

Soils and Geology

Introduction

Within the variety of landscapes across the White River National Forest, erosion is the key natural process that is most likely to be influenced by travel management. Regardless of geology or soil type, compared to naturally permeable soil conditions that facilitate water infiltration, the compacted nature of trails and roads make these features more prone to runoff of precipitation and accelerated erosion.

Key Indicators

Key indicator: Erosion risk

Measure: Miles of roads and trails in moderate, moderately-high, and highly accelerated erosion risk classes.

Affected Environment

The White River National Forest has more than 200 ecological map units that describe soil types and the environmental factors that contribute to their formation. Describing each of these units individually is not practical for our purposes. To summarize these units in a concise but meaningful way, the soils section of the forest plan combined these ecological map units into more general landscape groups to reflect the forest's dominant landscapes of mountains, hills, valleys, and tablelands/mesas. The hills, valleys, and tablelands landscapes generally make up the northern portion of the forest (north of I-70), while the southern portion is dominated by mountainous landscapes. Table 17 of the forest plan FEIS (USDA Forest Service/WRNF 2002b) summarizes the geology, climate zones, dominant landforms, and potential vegetation of each group. It also includes the common range of natural erosion hazards within each group.

Environmental Consequences

General, Direct, and Indirect Effects

Roads and trails are linear, non-vegetative, compacted features that cross the landscape so that different modes of travel can be easily utilized. Although these features can add linear pathways of erosion and compacted soils, they do help to keep people on particular pathways rather than allowing them to travel everywhere and cause further compaction and vegetative destruction. In addition, properly engineered mechanisms can be constructed to help dissipate the effects. "The suitability of soil for a particular use depends on its response to that use. Suitability usually depends on one or more engineering properties of a soil. These properties are determined through the use of the physical characteristics and their interrelationships. The performance of engineering works will depend on the correct assessment of engineering properties to determine suitability and to predict performance of a soil for its intended use" (Johnson and DeGraff 1988, p. 97).

Landscape stability ratings (table 3.11) were developed by overlaying lithology, slope, and soils.

Table 3.11—Landscape stability ratings for travel routes

Alternative A			
Stability rating*	**Miles**	**Percent of routes on system or left as a footprint**	
None	168	3%	
Slight	2985	55%	
Low	1484	27%	
Moderately Low	654	12%	
Moderately High	64	1%	
High	49	1%	
Severe	27	1%	
Total	5431	100%	
Alternative F			
Stability Rating*	**Miles**	**Percent of routes rehabilitated**	**Reduction of impact/**
None	14	2%	8%
Slight	552	57%	18%
Low	273	28%	18%
Moderately Low	95	10%	15%
Moderately High	10	1%	16%
High	14	1%	28%
Severe	6	1%	22%
Total	964	100%	18%
		Percent of routes on the system	
None	154	3%	
Slight	2433	55%	
Low	1211	27%	
Moderately Low	559	13%	
Moderately High	53	1%	
High	36	1%	
Severe	21	0%	
Total	5431	100%	
Alternative G			
Stability Rating*	**Miles**	**Percent of routes**	**Reduction of impact/ percent**
None	17	1%	10%
Slight	678	57%	23%
Low	343	29%	40%
Moderately Low	133	11%	20%
Moderately High	9	1%	14%
High	12	1%	24%
Severe	5	0%	19%
Total	1880	100%	22%
		Percent routes on the system	
None	151	4%	
Slight	2309	54%	
Low	1139	27%	
Moderately Low	521	12%	
Moderately High	55	1%	
High	37	1%	
Severe	22	1%	
Total	5431	100%	

**Stability ratings are based on geologic lithology, soils, and slope. These three factors were combined and ranked from none to severe for potential erosional ground conditions, severe being the highest. The statistics are based on overlaying the alternative road and trail data with this data in GIS and calculating miles based on where the overlaps occur.*

Effects by Alternative

All alternatives have a low amount of roads and trails in the severe and high ranges. The majority of roads and trails fall within the slight to low ranges with some in the moderate ranges. Alternative A does nothing to improve the soil condition; it would not remove routes from the system or rehabiliate routes. Alternative F and Alternative G present similar percentages as to where routes will be located as far as stability of soils. They both rehabilitate routes and return them back to a natural state, thus improving the soil condition. This improvement occurs in all stability classes, with perhaps the most important occurring in severe to high classes.

Effects Common to All Alternatives

With all alternatives, trails and roads will continue to erode at rates above those of natural conditions. However, when properly maintained, erosion from trails and roads is typically reduced to acceptable levels. Additionally, erosion alone is not necessarily problematic (that is, soil productivity lost to roads typically is very small and does not exceed soil quality standards). Erosion within insufficient stream buffers is typically where erosion becomes problematic for water quality, as eroded material is more readily transported to stream courses as sediment. It is in these locations that priorities for engineering mechanisms to reduce sedimentation are necessary.

Cumulative Effects

In terms of cumulative effects, because every trail and road is not being decommissioned, all alternatives would continue contributing cumulatively to accelerated erosion from roads and trails in their respective watersheds. The alternatives that propose decommissioning and rehabilitation would have an overall reduction of roads and trails when compared to the existing condition, and would provide a reduction of risk from erosion due to roads and trails.

Roads and trails that are properly constructed and maintained will reduce erosion and water run-off. The ability to use the latest engineering methods, to set priorities based on resource needs, and to keep up with route maintenance is necessary to reduce erosion.

Timberland Vegetation Management

Introduction

Roads are a necessary element of the forest's infrastructure to access forested stands so that vegetation management treatments can occur and/or timber products can be removed cost-efficiently. Historically, forest vegetation management has concentrated on timber production in specified areas of the forest, commonly referred to as the suitable timber base.

More recently, the application of silvicultural methods has broadened to routinely address a variety of other resource objectives, such as wildlife habitat enhancement, scenery management, insect and disease infestations, and fuels reduction. Since the development and release of the 2006 Travel Management Draft Environmental Impact Statement, the forest has experienced dramatic increases in mountain pine beetle and spruce beetle infestations, prompting the need for increased forest management. As mandated by the Healthy Forest Initiative (HFI), the need to reduce the accumulation of heavy fuels and to reforest beetle-killed lands for the future has become one of the forest's highest priorities.

Forested stands without existing road access would require road construction from the project area to the nearest system road to facilitate treatment and product removal. Under special circumstances, forwarders, a ground-based yarding machine that provides for full suspension of the logs, can increase practical yarding distance and reduce the need for temporary roads. Roads for direct project access may exist short term or over the long term, depending on immediate needs or future administrative needs. However, this analysis assumes that any new road construction for timber access would be temporary and decommissioned after use. This assumption does not preclude project-specific environmental analysis from proposing the construction of new system roads.

The forest harvested an average of about 770 acres per year over the last 50 years, predominately salvage. The forest plan FEIS (USDA Forest Service/WRNF 2002b) selected alternative projects with an average annual harvest of 1030 acres over a 10 year period. Because of extensive bark beetle mortality, the number of treatment acres per year since 2005 are twice the amount projected in the forest plan, and that trend is expected to continue through 2010. However, the average annual harvest for the 10 year planning horizon as described in the forest plan FEIS is not anticipated to be exceeded.

The road system also provides public access for the collection of special forest products including posts and poles, Christmas trees, firewood, mushrooms, and transplants.

Key Indicators

Key Indicator: The amount of allowable sale quantity (ASQ) acreage that is accessible from the system roads.

Measure: Amount of ASQ acreage within ¼-mile of a road.

Key Indicator: The amount of ASQ acreage that is not accessible from the system roads.

Measure: Miles of temporary road construction required to access area of ASQ beyond ¼-mile of a system road.

Affected Environment

There are approximately 2209 miles of system and unclassified roads currently on the forest. This analysis considers the availability and location of system roads that can

accommodate a full-sized vehicle (FSV) as appropriate for logging truck traffic. There are just over 1,700 miles of system roads that can accommodate a FSV. Some of these roads do not comply with the forest plan direction (USDA Forest Service/WRNF, 2002a). In addition, there are over 1000 miles of non-system roads and trails supporting illegal access and reducing forest productivity.

This analysis considers all allowable sale quantity (ASQ) stands within ¼- and ½-mile of roads that can accommodate a full-size vehicle (FSV). The forest's suitable timber base, from which the ASQ is derived, totals just over 424,900 acres, including 156,486 acres (37%) in inventoried roadless areas that are currently withheld from timber management under the 2001 Roadless Rule.

Environmental Consequences

General Effects

Some of the system and unauthorized roads that can accommodate a full-size vehicle are redundant, and their decommissioning would not reduce access for timber management. Other roads on the forest access lands that are not suitable for timber management. Decommissioning these roads would not affect timber management.

Direct and Indirect Effects

Alternative A. Alternative A would manage 1739 miles of road and provide direct access to a total of 122,700 acres (29%) of suitable timber lands. The remaining 145,714 acres of ASQ stands would require some amount of road access to facilitate management. In addition, some 1095 miles of non-system roads and trails would remain as illegal access and a non-productive footprint on otherwise forested lands. This alternative represents the baseline for comparing the action alternatives F and G.

The 122,700 acres available for timber management within ¼-mile of roads typically require no additional roads to facilitate harvest, although short spurs may be desirable to locate the landing off a busy road for safety reasons. The 91,300 ASQ acres between ¼ and ½ mile would require, on average, ¼ mile of temporary road for access, and the remaining 54,400 acres beyond ½ of a road would require, on average, ½ mile of temporary road for access. Assuming the forest timber program averages a harvest of 1,030 acres per year in units averaging 30 – 50 acres, and the harvest units are located proportional to the proximity to a system road, an estimated 10.1 miles of temporary roads would be built and decommissioned each year to accommodate timber harvest activities.[2] The current road system is adequate for providing public access to collect special forest products.

The forest would retain over 1000 miles of non-system roads and trails. On average, 1 mile of road or trail footprint represents approximately 2 acres of lost soil productivity from compaction. While the reduction in productivity is relatively insignificant (0.2% of the acres of forest cover types on the WRNF), the indirect effect of illegal access may have a broader and adverse effect in terms of trampling newly established seedlings on thousands of acres adjacent to non-system roads and trails that have been harvested to remove beetle-killed trees.

[2] This is the average annual harvest acres projected through the 10 year planning horizon in the forest plan FEIS.

Alternative F. There is no difference in system road access between Alternatives A and F, and the number of miles of temporary road built and decommissioned each year remains the same. The road system would be adequate for providing public access to collect special forest products.

In total, 1251 miles of non-system roads and trails are proposed for decommissioning across all forested cover types on the WRNF. This represents some 2500 acres returned to productivity. Indirectly, decommissioning these "ways" may protect acres of reforestation from site compaction resulting from illegal access.

Alternative G. This alternative proposes to decommission approximately 57 miles of roads within the suitable timber base that are redundant; their decommissioning would not reduce access for timber management. In total, 1485 miles of roads and trails are proposed for decommissioning across all forested cover types on the WRNF. This represents some 3000 acres returned to productivity. Indirectly, decommissioning these "ways" may protect acres of reforestation from site compaction resulting from illegal access.

Alternative G would reduce the miles of road and would reduce the number of ASQ acres within ¼ mile of a system road to 101,300 acres. There would be a decrease in the ASQ acreage between ¼ and ½ mile of a system road to 75,300 acres, and an increase in the ASQ acreage beyond ½ mile of a system road to 91,814 acres. An additional 4.2 miles per year of temporary road, over those described in Alternative F, would be needed to facilitate timber harvest.

An increase of 4.2 miles of temporary roads each year would reduce the stumpage value of the timber sold. The amount would vary from project to project based on such factors as the number of miles proposed, the terrain, and the number of drainage crossings. The cost of building and decommissioning roads on the forest is estimated to average $3000/mile.

The road system would be adequate for providing public access to collect special forest products.

Comparison of Alternatives

The table displays the juxtaposition of ASQ acreage to the system roads, by alternative, and the miles of temporary road constructed and decommissioned each year to meet forest plan stand manipulation objectives. Alternative A (no action) and Alternative F are identical. Alternative G represents the reduced total miles of system roads and the number of ASQ acres accessible from the system roads. There would be no measurable difference between alternatives in the public's ability to collect special forest products.

Table 3.12—ASQ Acreage within ¼ and ½ mile of roads, and miles of temporary roads needed by alternative

Alt	Miles of road	Total ASQ acres	Roadless (IRA)		ASQ within ¼-mile of roads		ASQ between ¼- and ½-mile of roads		ASQ beyond ½-mile of roads & NOT in IRA		Miles of temp. road built and decom. annually
			Acres	%	Acres	%	Acres	%	Acres	%	
A	1,739	424,900	156,486	37	122,700	29	91,300	21	54,400	13	10.1
F	1,739	424,900	156,486	37	122,700	29	91,300	21	54,400	13	10.1
G	1,435	424,900	156,486	37	101,300	24	75,300	18	91,814	22	14.3

Cumulative Effects

Although the roads built to access timbered stands for harvest are temporary, during the life of the road they would add to the number of miles of road within the project area and may affect other resources. Temporary road construction would meet forest plan standards and guidelines, and the effects would be analyzed in the project environmental analysis prior to approval. Site-specific cumulative effects would be addressed at that time.

Transportation and Infrastructure

Introduction

The goal of the transportation system is to provide access to the White River National Forest for users by providing an efficient, safe, and economical system of roads and trails, while minimizing the effects to the local environment. Reasonable and well-designed access enhances opportunities for the forest visitor or user. The transportation system that currently serves users on the forest consists of approximately 2,209 miles of system roads and approximately 1,948 miles of system trails. An additional 1,095 miles of user-created roads and trails are currently inventoried. This section primarily addresses the road network and access. See recreation section for a detailed discussion on trails.

Road Network

Access to communities and to the roads that lead into the forest begins with highly developed interstate and state highways. Interstate 70 is a major east-west route across the United States that bisects the forest. Several resort communities exist in and around the White River National Forest. Many of the persons who live in these communities are here for the beauty of the area and the variety of recreation opportunities available. Due to the ease of access and overall increases and geographic shifts in population, several resort communities have grown rapidly along the I-70 corridor and along the state highways that connect to I-70, such as State Highway 82 leading to Aspen. These roads serve the local population for daily commutes as well as for access to the forest, and they continue to be upgraded to meet the increasing demand.

County roads (farm to market roads) are often connected to state highways. Many of these roads have been around since the area was first settled, and some lead directly into the forest. For the most part, county managed roads are designed to accommodate passenger cars, but may not always be paved or graveled.

Roads that exist on NFS lands may fall under several jurisdictions. Most are under Forest Service jurisdiction. These are called National Forest System roads. Forest Service roads are considered roads necessary for the administration, utilization, and management of public lands. The counties, State, BLM, or private citizens have received rights-of-way, or in some cases obtained jurisdiction over some of the roads on NFS lands. Rights that have been previously established will continue to be recognized under this document.

Functional Class

The roads on the forest are generally broken up into one of three classes, arterials, collectors, and local routes. An easy way to describe the total road network is through the description of a tree. A network is generally made up of the main route, or arterial (the trunk of a tree); the main branches off of the main route, called collectors (similar to the main branches from the trunk of the tree), and the several routes, or routes not as highly developed, that come off of the main branches, called local routes (like the smallest branches of the tree).

Arterials, the main trunk roads, are designed to handle higher volumes of traffic and to access key locations across the forest. Some may go from one community or major drainage system to another. These are generally the higher standard roads for the forest. Collectors are the intermediate branch roads that collect traffic from the local roads and connect to the arterials. They can vary in volume and standard.

Locals are roads that service end of road needs, like camping, trailheads, and general forest access. They are generally lower standard roads and receive the least volume of traffic.

Arterial road miles make up the smallest portion of the road network, followed by collector roads. The majority of the road network is classified as local roads.

Maintenance Levels

Roads are designed to handle different modes of travel. Passenger car roads require a higher degree of user comfort, thus they require higher levels of design and maintenance. These are defined by the Forest Service as maintenance level (ML) 3, 4, and 5 roads. In a memorandum of understanding (MOU) with the Federal Highways Administration (FHWA), the Forest Service agreed to manage the 3, 4, and 5 level roads under the Federal Highway Safety Act. Although the Forest Service and FHWA agree that NFS roads are not public roads per se, many are open to public travel. Open to public travel is defined as a road that is available except during scheduled periods, extreme weather, or emergency conditions; passable by four-wheel standard passenger cars; and open to general public use. Driving surfaces for these roads range from asphalt to aggregate to native surface, with the majority being native surface.

Maintenance level 2 roads are managed and maintained for use by high clearance vehicles. Passenger car traffic is not considered, and travel by a four-wheel drive vehicle is often recommended. Traffic is normally light, usually consisting of one or a combination of administrative, permitted, dispersed recreation vehicles, or vehicles travelling for other specialized uses. Maintenance level 2 roads are the backbone of the road system and make up 73% of the system (1,605 miles).

Administrative roads are defined as roads that are managed for administrative access to and within the national forest. These roads are generally closed to the public for full-sized vehicular use, and may be closed to other uses as well. These roads are generally either under special use permit, have specified easements, or are reserved for Forest Service access needs. These roads may be reserved for commodity access, private land access, or administrative access needs. Some are maintained by the special use permit holder to meet their access needs. They generally are not open to the public because of safety considerations and/or are not considered necessary for public access. If these roads were open to public traffic, the Forest Service would be responsible for the maintenance attributed to that public use. These roads range from ML 2 to ML 5, depending on operational needs.

Project roads include all roads that are managed for intermittent use. They are normally closed to use after the project is completed and the area has been returned to a natural vegetative state or are is the process of returning to a natural vegetative state (placed back into production). These roads might be put into service during a timber sale or other intermittent project need, and later taken out of service and put back into “storage”. The roads are kept in storage until a subsequent need arises. While in storage they are considered to be in a ML 1 category, where no motor vehicle access is allowed. Maintenance level 1 roads may allow other types of non-motorized access while in storage, such as horse or hiker. Those users are allowed to travel cross country, and generally on all routes, and these ML 1 roads do not need to be maintained for such use. Other ML 1 roads may be designated for use while closed (for horse, hiker, and/or bicycle) and will be maintained for that use.

Table 3.13—Current miles of National Forest System roads by maintenance level*

Maintenance levels	Miles
5	13
4	48
3	318
2	1,605
1	224

**Includes roads where ROW may occur on non-FS lands*
(Source: Alternative A, INFRA, current roads inventory)

Vehicle Classes

Historically, the forest has listed three classes of summer motorized vehicle use: full size motorized, ATV, and motorcycle. Now, with the non-highway legal vehicle differentiation, additional classes have been added and the titles and definitions of the other vehicle classes refined. The full size motorized class is now licensed motorized only, meant to include highway legal motorcycles as well as all other vehicles legal for use on public roadways under Colorado state law. The motorcycle class is defined to include highway legal and non-highway legal motorcycles. The ATV class is now motorized vehicles less than 50 inches in width, and generally includes licensed and unlicensed motorcycles and ATVs. An additional class is licensed and unlicensed (full sized vehicles, licensed and unlicensed motorcycles, ATVs, and UTVs). The changes are incorporated into the travel management plan.

User-created Roads

Sometimes referred to as “unauthorized” or “ways”, user-created routes are roads and trails on National Forest System lands that are not managed or recognized as part of the transportation system. Many of these routes are old timber, range, mining, or oil and gas exploration roads that no longer serve their intended purpose and were never properly closed or rehabilitated. Others have been created by off-road recreation use (motorized and mechanized). Many of these routes were created without due process and therefore are considered illegal.

Over the years, efforts have been made to close or rehabilitate these routes, particularly where excessive resource damage is occurring. Many of these routes are two-tracks (8 feet wide or less) and are relatively short (less than ¼ of a mile). Some provide access to dispersed camping sites or provide access to other recreational activities. Others were created by people driving off road to get to closer to a natural feature, retrieve game, or to collect firewood. Those who just like the experience of off-road driving create other routes. Mountain bike enthusiasts have also created their own trails and systems. Unfortunately, most of these user-created routes were not created with the benefit of design or construction oversight, and because they are not part of the system, they are not maintained.

Key Indicators

Key indicator: Cost of route maintenance

Measure: Miles of road to be maintained

Measure: Miles of trail to be maintained

Key indicator: Cost of routes to be decommissioned or rehabilitated

Measure: Miles of routes (system and user-created) to be decommissioned/rehabilitated

Affected Environment

Access

Historically, the roads on the forest were created mostly for commodity access, primarily mining, timber, and livestock production. Some were alternate routes connecting small communities. While roads still continue to provide access for natural gas production, vegetation management, transferring of livestock, and mine extraction, the majority of use today comes from public recreation.

Commodity

Currently, two large efforts are underway on the White River National Forest that require road access. First, due to national needs, emphasis has been placed on increasing production of domestic natural gas and oil. There is a large natural gas reserve that occurs in western Colorado, eastern Utah, and southern Wyoming. Though most of this reserve occurs on private and BLM land, portions underlie the western part of the White River National Forest. Utilization and improvements to the road system in these locations are necessary for gas well and facility access.

Second, there is a need to access the forest for vegetation management. The current mountain pine beetle and spruce beetle epidemics have prompted the need for increased forest management in lodgepole pine and spruce stands. As identified under the Healthy Forest Initiative, the need to prevent severe wildfires and manage forest lands for the future has led to the need to treat areas where tree mortality has occurred. On the White River National Forest, these areas are mostly on the eastern side of the forest in Summit and Eagle Counties, with some spruce beetle attacks occurring in the southern part of the forest. The need for treatment leads to several different vegetation management techniques requiring an efficient road network for access. Roads for direct project access may exist short term or long term depending on project needs. Many of these roads are temporary and are rehabilitated once the project is complete.

Other commodities include movement of livestock, mining extraction, and product gathering (firewood, for example), though on a smaller scale. Roads also provide access to private in-holdings and in some cases to areas for research and development. Special use permits can be issued to individuals and companies for road use and maintenance so that they can access and execute approved projects.

Roads are necessary for the Forest Service and other agencies (such as the Colorado Division of Wildlife) for administrative use and access to management activities across the forest.

When a project is initiated, the roads to and in the affected area are maintained by the industry. Many of the NFS roads are maintained or upgraded by the user to accommodate its specific needs. However, this only occurs where and when the project(s) are underway.

Recreation

The White River National Forest attracts a large number of visitors every year. Most are in the area to recreate, therefore access to the forest is critical for accommodating many recreation uses. A transportation system may serve as either a route to destination recreation or as the recreation location itself. For destination recreation, roads serve as the means to get to a drop-off point to engage in the recreation activity, such as a trail, trailhead, fishing site, picnic site, camping site, or scenic view. Where the road itself

serves as the focus of the recreation activity, users may participate in pleasure driving, four-wheel driving, motorcycling, ATV riding, biking, horseback riding, hiking, snowmobiling, and cross-county skiing.

The White River National Forest hosts 11 ski resorts under special use permit. The resorts construct roads that allow access to service resort infrastructure in the summer and that serve as snow trails in the winter. There are currently 211 miles of roads and trails serving ski area operations. The ski resorts are responsible for management of the roads and trails within the ski area permit boundary and bear management costs under their operations. Other special use permits for road use and access can be issued for outfitter and guide operations. Approximately 113 additional miles of road and 13 miles of trail are currently managed under the special use permit system on the forest.

While National Forest System roads still continue to service commodity and private inholding access, the roads have evolved primarily for recreation use and access. Tourism has become the primary industry for the area and the forest is a key component of most visitors' vacation experience. Very little direct revenue for forest service road maintenance comes from the recreation industry. The forest receives some annual congressional appropriations for maintenance and improvements.

The forest considers public access to recreational facilities and general forest areas for highway legal motorized vehicles in this document. A second component of access that needs to be considered involves whether the use of non-highway legal vehicles may also be authorized to drive to certain destinations. Often, users of the forest must rely on state, county, or local roadways to access forest roads and trails. State law prohibits non-highway legal motorized vehicle use on public roadways unless the entity controlling the roadway has made a formal declaration to allow that use (Colorado State Law, Title 33, Article 14.5).

The forest will work with the various state, county, and local road management agencies to determine where non-highway legal vehicles may be legally used on roads under the jurisdiction of these entities. Decisions in the final travel management plan will reflect the legality and practicality of non-highway legal motor vehicles being able to access areas of the forest. Consideration must be given to factors such as the availability of adequate OHV loading and off-loading areas and whether the road most likely to be used is legal even though there may be other legal options that are unlikely to be used.

Seasonal Limitations

Seasonal limitations are placed on roads to protect resources. Some of these restrictions are to protect the road itself. Most roads are native surface and vulnerable to accelerated erosion particularly during spring run-off and early fall snows. Other restrictions are in place to limit disturbance to wildlife and sensitive areas during critical times. At any time a decision-maker can issue an order to restrict access to protect users and/or the resource as necessary.

Management

The Chief of the Forest Service established an agenda called the Healthy Forest Initiative to improve the condition of National Forest System lands. The Initiative: Keeping America's forests and grasslands healthy requires restoring and rehabilitating damaged areas to: (1) prevent severe wildfires, (2) stop the introduction, establishment, and spread of invasive species, (3) reduce the conversion of forests and grasslands that leads to fragmentation of rural landscapes through subdivision, and (4) manage impacts of motorized recreation vehicles by restricting use to designated roads and trails.

Transportation systems can help or hinder the success of these initiatives. Providing well designed networks where access is needed and decommissioning roads where they are not necessary can help to achieve the goals outlined above.

Safety

The White River National Forest is the most visited national forest in the nation. While downhill skiing accounts for the majority of visits, summer use has dramatically increased in the past 20 years. In the past, use was light and originated from local communities. Today, use is heavy and much of the visitor use originates from locations outside the area. The forest visitor's ability to move around the forest is critical to accessing the many recreational opportunities available. As visitor use increases, concerns regarding safety conflicts also increase.

The forest is currently managing the road system based on the 1984 land and resource management plan and the subsequent 1985 forest supervisor's closure order. The 1985 order did not differentiate between the types of motorized vehicles on roads and this was not an issue at the time because there were very few non-highway legal motorized vehicles and drivers using the forest. The road system worked adequately when use levels were lower. Circumstances have changed significantly since 1985. Between 1995 and 2003, off-highway vehicle registrations in Colorado have risen by 223%, an average of 18% annually (SCORP, p. 15).

The general understanding of driving mountain roads has also changed during the last twenty years. Twenty years ago the majority of people traveling forest roads were from local communities and drivers were old enough to understand the inherent risks of traveling mountain roads as well as the driving techniques one should use to mitigate those risks. Today's drivers are from other areas, are younger, are unfamiliar with the mountain roads they are traveling, and are unaware of the risks associated with traveling different types of forest roads.

Adding to the increased use and the associated safety concerns are the technological advancements in the types and capabilities of vehicles used to travel forest roads. Advancements in today's OHVs allow machines to travel into more areas and with less operating skill than in the past. Today's visitor traveling in a standard passenger car may encounter full size four wheel drive vehicles, ATVs, motorcycles, mountain bikes, UTVs (utility type vehicles), and large commercial vehicles (tractor/trailer) all on the same road.

Most of the forest road system was developed for timber removal, mining, livestock grazing, inter-community connections, or for transporting people though the forest to another destination. The current road system was never designed to safely accommodate the volume of traffic we have today, nor was it designed to safely accommodate the many types of vehicles we see used today to access and travel around the forest.

Practicality & Manageability

Safety is only one factor to consider when deciding what types of motorized use to authorize on which roads. The Forest Service must evaluate many other factors when determining the practicality and manageability of a road for motorized use. In determining the practicality and manageability of a road or a system of roads, one must evaluate the following:

1) Are the regulations easy and clear for the visitor to understand the opportunities available?

2) Is the forest able to enforce motorized use regulations in the area?

3) Is the use of non-highway legal vehicles consistent with the current forest plan?
4) What does it costs to reduce or mitigate the identified safety issues associated with motorized use?
5) Does the road or system of roads provide the type or amount of recreational opportunity for a quality user experience? and
6) Does motorized mixed use on a specific forest road encourage or invite the user to violate regulations on roads under the control of other government entities?

The forest considered all these factors when deciding what types of motorized use should be allowed on a specific road or in a certain area.

Motorized Mixed Use

In the 2005 travel management rule, the agency acknowledges the need to mix highway legal and non-highway legal traffic on some National Forest System roads. These designation decisions will be advised by professional engineering studies and will include design features deemed appropriate by engineering studies. *Guidelines for Engineering Analysis of Motorized Mixed Use on National Forest System Roads* (USDA Forest Service 2005) outlines the procedures to be undertaken and factors to consider while analyzing the safety risks of authorizing highway legal vehicles (licensed) and non-highway legal vehicles (unlicensed OHV) to operate on the same road (motorized mixed use). Safety and engineering considerations are to be evaluated while conducting the motorized mixed use studies.

During 2006 and 2007, motorized mixed use analyses (professional engineering studies) were conducted on ML 3- ML 5 roads by the forest's engineering department. These roads are the forest's arterials and collectors and the main access routes that the public uses to get to the forest. Professional engineering analysis and judgment was used to evaluate the potential for a crash as well as the severity of an accident should a crash occur. The crash potential rating is based on roadway factors such as traffic volume & type, surface type & condition, sight distances, driving speeds, and roadway alignment (horizontal & vertical curves). Crash severity ratings were based on roadside conditions (natural ground slopes, slope/height of embankments, and large unyielding features next to the road), speed, and traffic types (the larger the difference in size of vehicles, the greater the severity). The forest conducted motorized mixed use analyses on approximately 246 miles of roads being considered for designation. These judgments determined that approximately 132 miles could be designated for motorized mixed use without increasing the safety risk to the public. Of the 114 miles determined to have an increased risk to public safety, approximately 60 miles included management options that could be implemented to reduce that risk to a manageable level.

Other Regulations

Other direction that directly influences road management includes:

- Federal and state laws;
- Code of Federal Regulations – 36 CFR 212, 251, and 261 (as modified by the rule);
- The MOU between FHWA and the Forest Service (as described above);
- Forest Service manuals and handbooks – 7000 series; and
- Forest plan direction.

All of these documents provide regulations that govern how roads should be designed, administered, and managed by the Forest Service. This list is not all-inclusive as the Forest Service is bound by all laws and regulations that pertain to public land management. Key elements from the travel rule, laws, and manual direction on road management implementation provide the ability for the Forest Service to be able to manage and administer NFS roads, particularly the ability of the forest to:

- Determine how to make roads safer for users, including what uses should be allowed;
- Enforce the rules imposed on the roads;
- Maintain the roads to standard, including the roads themselves and all structures related to the roads; and
- Provide gates, signs, and other information to help guide users.

Environmental Consequences

Direct and Indirect Effects

Effects of Roads Themselves

Roads evolved generally from trails to cart paths to wagon roads to accommodating motorized vehicles. In order to allow motorized vehicles, they have to be "constructed" with drainage, bridges, and pavement structures. When construction takes place, roads are no longer natural to the landscape. They require the ground to be exposed and flattened into a prism, and in some cases the roads require cut and fill slopes, ditches, water diversions (dips), culverts, outlet ditches (from water diversions), bridges, surfacing, and clearing. Because road prisms are not natural, water is often diverted from its natural paths and tends to run along the road prism, potentially causing erosion and sedimentation above levels that would occur naturally.

Features such as surfacing, ditches, culverts, dips, and outlet ditches are built into the design of roads to mitigate erosion and sedimentation and support the loads applied to the road (e.g. heavy trucks). These features are designed to get the water off the road prism frequently and as quickly as possible. Good design, construction, and maintenance of these features help to keep the effects from roads at a minimum.

User Effects (Indirect Uses)

Roads transport people to certain areas of the forest where people can disperse and participate in the recreational activity of their choice. Statistics show, however, that a majority of users recreate within ½ mile from a road or trail. Most resource-based recreation occurring in the U.S. occurs within ½ mile of the transportation system (Cordell and Bergstrom 1989). As a result, roads indirectly affect where people are going to have the most impact on the forest. Road location can help direct where people go. Provisions of certain recreation experiences help to define how and what people do in certain locations. Allowed modes of transportation on the roads help transport people to the best locations for certain experiences (see Recreation section).

Safety is also a main consideration when designing and maintaining road systems. Considerations for road use and design are based on modes of travel, amount of use, type of drivers, mixture of uses, geography, topography, soils, and weather conditions. Signs, gates, turnouts, surfacing, road widening, road realignment, speed limits, clearing,

parallel routes for different modes of travel, and allowing only certain modes of travel on a road or trail are all ways to mitigate for safety.

Within the constraints imposed by funding and other resources and priorities established by Congress and the Administration, the Forest Service does what it can to provide a safe experience for users traveling NFS roads. It is always the ultimate responsibility of the user to drive safely and follow all laws. The Traffic Control Devices Handbook (Institute of Traffic Engineers 2001, p. 30) and Geometric Design of Low Volume Local Roads (AASHTO 2001, p. xxii, and EM-7100-15 2005, p. 3-1) discuss designing roads for the prudent, reasonable, competent driver. The prudent driver can be best defined as cautious and careful, exercising sound judgment and making wise driving decisions, and considering all related circumstances before acting.

While roads can have both positive and negative impacts, there is no doubt that roads are necessary. The ability to travel by motorized vehicle is woven into the fabric of the American way. A well planned and developed transportation system can direct people to where they need to go, while minimizing impacts. The travel network should be developed within an interdisciplinary format, considering all resources (wildlife, vegetation, access, etc.). When systems are not well thought out, roads are not located in best place for minimal impacts, or they are developed where they are not really needed, duplicate where other roads go, or do not service the majority. The goal is to create a network of roads that serve the forest while minimizing impacts where and when possible. It truly is a balance between providing what is needed while lessening the impacts through amount or design.

The travel management planning effort has made a concerted effort to identify the transportation system in an effort to devise a system that is safe, economically sustainable, and environmentally sound. The road miles are reduced as a result of a multi-faceted strategy that is a combination of identifying the necessary road system, decommissioning what is not necessary, and converting roads or trails where appropriate. Some roads and trails are managed by special use permits, which places all maintenance responsibilities on the holder of the permit. Reductions in the user-created routes will be accomplished by adding routes to the road and trail system found to be important to the overall network, and rehabilitating the remaining routes.

The following tables display the miles by road and by trail for specific types of uses.

Table 3.14—Miles of roads, by use, on the White River National Forest*

Legend	Alternative A	Alternative F	Alternative G
Licensed motorized only	15	15	585
Licensed and unlicensed allowed	1724	1724	850
Motorized vehicles < 50” in width	9	1	5
Motorized two-wheeled vehicles	1	0	0
Mechanized (bicycles)	183	18	38
Foot and horse (pack animal)	117	9	38
Managed under special use permit	113	110	165
Closed to the public but remain on the system	47	46	30
Total road system	2209	1923	1711

**Does not include ski area roads*

Table 3.15—Miles of trails available, by use, on the White River National Forest*

Legend	Alternative A	Alternative F	Alternative G
Licensed motorized only	0	0	0
Licensed and unlicensed allowed	0	0	0
Motorized vehicles < 50” in width	100	108	138
Motorized two-wheeled vehicles	42	43	67
Mechanized (bicycles)	557	719	558
Foot and horse (pack animal)	1222	1335	1402
Managed under special use permit	13	15	47
Closed to the public but remain on the system	13	13	2
Total trail system	1947	2233	2214

**Does not include ski area trails*

Direct Costs

Road System

Each year the Forest Service is responsible for maintaining and decommissioning National Forest System roads across the forest.

Table 3.16—White River National Forest road work accomplishments, in miles, for the past five years

Year	Road maintenance	Road decommissioning	
		NFS roads*	Unauthorized
	----------Miles----------		
2003	587	1.7	6.8
2004	575	0	13.1
2005	635	1.5	2.8
2006	625	0	6.3
2007	578	0	10.8
5-year average	600	0.6	8.0

Source: Annual road accomplishment reports

Roads require various levels of maintenance and investment to stay functional. These levels are broken into those elements that are preformed on an annual or continual basis, and those that are referred to as deferred maintenance. Annual or continual maintenance includes surface grading, ditch cleaning, culvert cleaning, dust abatement, gravel replacement, and roadside clearing. Elements of deferred maintenance are improvements to mitigate the impacts of a road or to keep a road at its current operating level. Deferred maintenance generally involves longer lasting items such as replacement of culverts, rolling dips, signs, gates, ditches, outlet ditches, resurfacing, hardening a surface, adding turnouts, and realignment or widening of a road. Table 3.17 reflects the amount of money allocated from the budget to the forest for road construction and maintenance.

Table 3.17—Funding allocated to White River National Forest for roads (CMRD)

Fiscal Year	Amount Allocated
2004	$1,883,914
2005	$1,504,479
2006	$1,557,300
2007	$1,702,600
2008	$1,903,000
5-year average	$1,710,260

Source: White River National Forest budget work plans

Funding allocated to White River National Forest for roads (CMRD) for 2008 is slightly higher than funding in 2007. The funding increase is off-set by increased operating costs, so the 2008 increase is negligible. This funding trend is anticipated to continue at least through fiscal year 2010.

The forest has agreements with various counties whereby the counties assist in the maintenance of ML 3, 4, and 5 roads. Funding allocations are used in part to fund the forests' share of the work, and the counties receive reimbursement from the Highway Users Trust Fund. On average, the entire 379 mile system of ML 3, 4, and 5 roads is maintained each year under these agreements. The remaining CMRD dollars go toward ML 2 roads, and repair and improvements to all roads.

Other roads are maintained under project work such as a timber sale or oil and gas well exploration and development. The type and amount of project work varies from year to year and by location. Sometimes it coincides with roads heavily used by the public and there is a direct benefit, other times the projects are located in areas that sees little recreational use. Certain roads are managed under the special use permit program, which places all maintenance responsibilities on the holder of the special use permit.

Costs for Maintenance

Annual maintenance is minor road work that is done on a cyclical basis. Annual maintenance costs for local roads can range from $750 per mile for maintenance of dips and outlet ditches (minimal ML 2 requirements) to $4,125 per mile for light reconditioning of a local road. Light reconditioning includes the blading and shaping of the road and ditch, minor roadside clearing and brushing, cleaning corrugated metal pipe (culvert) inlets and outlets, and cleaning rolling dips, grade dips, and outlet ditches.

Annual maintenance costs for arterial andvcollector roads can range from $2,100 per mile for road surface grading and ditch cleaning, to $4,125 per mile for light reconditioning. Costs are higher because these roads tend to be wider, require a higher standard of maintenance, and may have aggregate surfacing.

Deferred maintenance costs for local roads can range from $4,125 per mile for light reconstruction, up to $9,625 per mile for moderate reconstruction, and to $16,500 per

mile for heavy reconstruction work. Deferred maintenance refers to road work that goes beyond the usual maintenance work done annually. This work is often required to repair roads that have deteriorated or where events such as landslides, flooding, or heavy spring runoff has affected the road condition. Light reconstruction work includes reconditioning of the roadbed, moderate roadside clearing and brushing, reconstruction or installation of dips, replacement or installation of smaller diameter culverts, and replacement or installation of signs. Moderate reconstruction includes light reconstruction work plus installation of medium sized culverts, moderate roadside clearing and brushing, turnout construction, spot surfacing with pitrun, and re-enforcing dips with pitrun. Heavy reconstruction includes all of the above plus heavy roadside clearing and brushing, adding dips and culverts, adding larger diameter culverts, plating over rocky sections, realignments, and adding fabric and pitrun material to soft sections.

Deferred maintenance costs for arterial and collector roads can range from $4,825 per mile for light reconstruction, up to $12,375 per mile for moderate reconstruction,and $20,625 per mile for heavy reconstruction. Again, the costs are higher because these roads generally contain more drainage features, require more safety features due to higher volumes of traffic, and are of a higher standard.

Other costs include gates, cattleguards, signs, aggregate surfacing, culverts, pit development, and mobilization. Depending on the amount of work, these costs can add up quickly, from $3,125 for a gate to $82,500 per mile for aggregate surfacing. Moderate to heavy reconstruction work many times requires a contract to accomplish the work. Additional contract costs include contract preparation, inspection, and administration.

Annual and deferred maintenance costs reflect what expenditures are necessary to keep roads to standard. Other costs, called capital improvements, are also necessary when the forest needs to upgrade or enhance a road. These upgrades include elements such as informational, regulatory, or warning signs; aggregate surfacing or hardening of the road surface; adding turnouts; replacing culverts with arch culverts to enhance fisheries; road widening; road realignments; and adding safety features such as guardrails. Capital improvements can be funded through additional money allocated by congress. National forests generally have to compete for this type of project funding. Policy requires contracting of any project that exceeds $50,000.

Finally, bridges and large culverts need to be considered when discussing road costs. Bridges and large culverts are considered facilities and are tracked and funded as facilities. According to current bridge and culvert inspections recorded in the Forest Service's database, there are 7 structurally deficient bridges and 13 functionally deficient bridges or large culverts on National Forest System roads in White River National Forest.

The Forest Service is also obligated to monitor road conditions and safety. Motorized mixed use analysis and road inspections can cost anywhere from $125 per mile for a basic inspection to $1,250 per mile for a full mixed use analysis.

The forest has averaged approximately 600 miles of road maintenance per year with an average annual budget of $1,710,260, which equates to an average of $2,850 per mile. Road maintenance costs, per mile, are approximately 227% higher than trail maintenance costs.

Trail System

Basics

Each year the White River National Forest is responsible for maintaining National Forest System trails across the forest. The following tables reflect the amount maintained and the funding that is budgeted for trails on the White River National Forest.

Table 3.18— White River National Forest trail maintenance accomplishments, in miles, for the past two years

Year	Trail maintenance
2006	627
2007	422
2-year average	520

Source: Annual work plan accomplishment reports

Table 3.19—Funding allocated to White River National Forest for trails (CMTL)

Fiscal Year	Amount Allocated
2006	$651,134
2007	$652,423
2008	$663,200
3-year average	$655,585

Source: White River National Forest budget work plans

White River National Forest trail funding for 2008 is slightly higher than funding for 2007. The funding increase is off-set by increased operating costs, so the increase in 2008 funding was negligible. This funding trend is anticipated to continue at least through fiscal year 2010.

Costs for Trail Maintenance

With about 2,000 miles of trails, the forest relies heavily on the use of volunteers (individuals and user groups) to assist with trail maintenance and reconstruction for both summer and winter use. In 2003, more than 37,800 hours of volunteer time in recreation and facilities programs was donated on the forest (USDA Youth and Volunteer Programs Accomplishment Report 2003). Especially during winter months, maintenance of trails is done almost exclusively through a combination of volunteer time and state grants. For example, on Vail Pass, maintenance is performed by a combination of partnerships, state grants, and recreation user fees; the Sunlight-Powderhorn winter trail system is maintained through a challenge cost-share agreement with local clubs.

Additional non-quantified assistance for trail maintenance comes from the general public and the numerous outfitters and guides on the forest, who are generally the first to travel down many of the routes in the spring following snowmelt. They often perform trail maintenance out of necessity to continue their permit operations.

A final category of people performing trail maintenance includes permittees whose permit, at least for part of the year, is centered on uses requiring trail networks. These permittees include: day use horseback ride outfitters, downhill ski areas, cross country ski areas, commercial snowmobile operations, and other outfitter/guides. Many of these routes are open to free public use, such as summer biking trails on ski areas. Conversely, some routes, such as winter cross-country ski areas in winter, may charge a

fee. Generally, these routes are authorized under a special-use permit and are not considered National Forest System routes

In addition to the use of allocated trails funding, the Forest Service also relies on other funding and labor to help accomplish trail work. The forest receives trust funds annually, amounting to 5 percent of the revenues taken in from various permits on the forest. This funding is to be used for maintenance of roads and trails and for fish passage studies as defined in the legislation for the fund.

The forest has averaged approximately 520 miles of trail maintenance per year with an average annual budget of $652,000, which equates to and average of $1,250 per mile. It costs approximately $18,000 per mile to reconstruct a trail to meet Forest Service standards. The cost to replace a trail bridge can range from a few thousand dollars for a small wilderness bridge of primarily native materials constructed by forest crews, to more than $200,000 for a design and construct contract on a larger multi-use trail bridge near urban areas. Trail maintenance costs, per mile, are approximately 44% of road maintenance costs.

Maintenance of the trail system is only one cost associated with the trails program. Other costs include: planning, trail system design and management, volunteer program coordination, tracking, and reporting.

Decommissioning

When a system road is no longer necessary, it needs to be either converted to some other use such as a trail or allowed to be returned to the surrounding natural condition. This is called decommissioning, defined as: activities that result in the stabilization and restoration of unneeded roads or trails to a more natural state. The road or trail is put back into production and permanently removed from the transportation system. The activities range from blocking the entrance, scattering debris on the roadbed (logs, rocks, branches, & stumps), or revegetating and water barring; to removing fills and culverts, reestablishing drainage-ways, pulling back shoulders, or full recontouring of the cut and fill slopes for full obliteration.

Each road that is designated to be decommissioned, whether it is a system or user-created road, needs to have some level of treatment so that it can return to a natural state. The costs for treatment methods described above range from $250 (blocking the entrance) to $10,000 per mile (full obliteration). These methods, if effective, are a one time cost. Once returned to a natural state, the impacts of the road no longer exist and no further maintenance expenditures are required.

User-created Routes

Decisions are required to determine if the 1,095 miles of user-created routes across the forest should be added to the system as roads or trails or rehabilitated and returned to the surrounding natural condition, just as in decommissioning. The forest is making a commitment in this document to evaluate user-created routes submitted by the public, and from within the agency, that may be necessary for the road or trail system. This will also fulfill the obligation to look at user-created routes as stated in the travel rule, 36 CFR 212.52. User-created routes considered for addition were examined on the ground by forest staff as funding and time permitted. These routes were reviewed to ensure that they truly are necessary and are in good enough condition to be added to the system, and to determine if they actually exist or if they have been previously rehabilitated. Approximately 157 miles have had some type of closure or rehabilitation treatment previously applied on the ground. These routes may require further rehabilitation

treatments to be effective. All routes considered unnecessary to the system, or routes that would require major construction or reconstruction work to be brought to an acceptable standard, are going to be considered unauthorized and will be rehabilitated.

All user-created routes discovered subsequent to this document will also be considered unauthorized and will be rehabilitated as directed in the forest plan. Any route proposed after the signing of this document will be considered new construction. The process for construction of a new road or trail is quite extensive. The process includes examination of the purpose and need, travel analysis, environmental analysis, surveying, design, contract preparation, contract inspection and administration, and all construction costs.

Alternative Comparison

Some roads that were designed for passenger cars are no longer able to accommodate them. Extensive road reconstruction may be necessary to bring them back to a passenger car standard. In some cases, other roads are providing passenger car access to the same destinations. In these cases, it may not be worth the continual investment to maintain a road at a passenger car standard. Some of these roads may serve better as a four wheel drive road (4WD) or even as a 4WD road with mixed use. The forest is proposing to reduce some of the ML 3 roads to ML 2 in these cases. This is one method the forest can use to reduce maintenance costs. The vast majority of the ML 3, 4, and 5 roads will remain and be maintained for passenger car use (low clearance). Maintenanace level 3, 4, and 5 roads are maintained annually by the various counties with which the forest has agreements.

Maintenance level 2 roads do vary by alternative, and therefore the costs for maintaining them vary as well. Overall, the greater the miles of road, the more maintenance dollars are necessary. The amount of funding dedicated to road maintenance has been fairly consistent and is likely to remain at current levels. The annual budget dedicated to road maintenance is not alternative-dependent. However, the number of miles of road to be maintained and how long it may take before a road gets maintained are alternative-dependent. The more roads and miles, the longer the maintenance cycle; the longer it takes before a road is maintained, the more deterioration can occur. The more deterioration, the harder it is to maintain that road, and the greater the costs that may be incurred with maintaining the road to standard.

Ideally, ML 2 roads should be maintained every three to five years. Some may require more frequent cycles, some less. Maintenance frequency is dependant on road use (type and amount), location, soils, and weather. The more roads and miles, the harder it is to maintain the schedule. Most of the ML 2 roads are maintained or improved by the forest, although a few are maintained through approved project work. On average, the forest is able to maintain approximately 180 miles of ML 2 roads per year. This can vary depending on the type and amount of work required for each road. Since the annual allocations do not meet or exceed what is necessary to be able to maintain these roads, it is assumed that these allocations will be fully spent regardless of which alternative is selected. However, the miles of road requiring maintenance and the maintenance frequency for these roads do vary by alternative. The following table displays the expected maintenance cycle by alternative.

Table 3.20—Expected maintenance cycle of National Forest System roads on White River National Forest

	Alternative A	Alternative F	Alternative G
Miles of ML 1-5 roads maintained	2,209	1,923	1,711
Miles of ML 2 roads maintained	1,605	1,457	1,224
Miles of ML 2 roads maintained annually (historically)	180	180	180
Level 2 maintenance cycle frequency (years)	9	8	7

Source: White River National Forest, GIS data and annual road accomplishment reports

The variance in maintenance cycle frequency is moderate, a 9-year maintenance cycle versus a 7-year maintenance cycle. None of the alternatives present a scenario where the White River National Forest, under current funding allocations, would be able to meet the desired maintenance frequency of three to five years. If the travel management plan developed an alternative that was based solely on allocations for roads, it would not be able meet the purpose and need to identify and designate an official transportation system on the White River National Forest that attempts to balance the physical, biological, and social values of the forest. Many of the opportunities for the public to access the forest would be shut down.

Alternative G provides a road system with the least miles (1,702) and the most favorable economic scenario in regards to system miles requiring maintenance. This alternative reduces the road system by the greatest number of miles (a reduction of 498 miles, 23 percent). Alternative F provides a road system with the second least miles (1,923) and the next most favorable economic scenario of system miles requiring maintenance. Alternative F reduces the road system by the next greatest number of miles (a reduction of 286 miles, 13 percent). The no action alternative does not reduce the existing road system at all, and therefore provides the least favorable economic scenario; this alternative has the most system miles (2,209) requiring maintenance and no reductions in expenditures.

Alternative G provides an opportunity to improve the condition of the road system, as the maintenance frequency could be reduced by 23 percent (7 year cycle verses a 9 year cycle). Alternative F could improve the road condition slightly (12 percent frequency reduction – 8 year cycle verses a 9 year cycle). Under the no action alternative, road conditions would not improve, as the maintenance frequency would remain at 9 year intervals.

If the road maintenance frequency were to remain the same (9 years), then Alternative G provides the greatest reduction in road maintenance obligations; it reduces the road system by 23 percent. This reduction could then be redirected towards other road priorities, such as maintaining roads more often, increasing maintenance on roads experiencing greater use due to increased concentrations of use, creating signage for travel management, converting system and user-created routes to system roads or trails, decommissioning system roads, and the rehabilitating user-created routes. Alternative F would have the next greatest reduction (13 percent), followed by Alternative A with no reductions.

The forest will establish priorities for roads and then decide which items (maintenance frequency, signage, decommissioning, rehabilitation, conversion of routes, etc.) is the priority, on which roads, and in which areas.

Trail System

Table 3.21—Expected maintenance cycle of National Forest System trails

	Alternative B	Alternative C	Alternative D
Miles of trail maintained	1,948	2,234	2,214
Miles of trail maintained annually (historically)	520	520	520
Trail maintenance cycle frequency (years)	3.75	4.30	4.25

Source: White River National Forest, GIS data and annual road accomplishment reports

The maintenance frequency variance is even less for trails than for roads. If the travel management plan developed an alternative that was based solely on allocations for trails, it would not be able meet the purpose and need to develop a transportation system to meet an increasing demand for recreational travel opportunities and to provide a spectrum of quality experiences for a wide variety of forest users."

As with roads, the greater the miles of system trails, the more funds the forest will need to maintain that system. The no action alternative provides the most favorable economic scenario with the least amount of trail miles to maintain (1,948). Alternative F provides the least favorable economic scenario with the greatest number of miles to maintain (2,234 miles, an increase of 286 miles or 15 percent). Alternative G provides a slightly more favorable economic scenario than Alternative F; it results in only 20 fewer miles of trail to be maintained (2,214 miles) by increasing the trail system by 266 miles, or 13 percent.

To maintain the proposed trail system, allocations would need to increase by 15 percent for Alternative F and 13 percent for Alternative G. The forest can also decide to extend the maintenance frequency to 4.30 years, which would not require an increase in trail allocations.

As with roads, the forest will need to establish priorities for trails and then decide which items (maintenance frequency, signiage, decommissioning, rehabilitation, conversion of routes, etc.) is the priority, on which trails, and in which areas.

Decommissioning/Rehabilitation

One of the objectives of travel management planning is to identify a transportation system (roads & trails) that is truly necessary and to decommission the remaining system roads and trails that are no longer needed. It is also important to rehabilitate user-created roads that are not incorporated through the travel management planning process. For this discussion, decommissioning and rehabilitation are defined as: activities that result in the stabilization and restoration of unneeded roads or trails to a more natural state. The road or trail is put back into production and permanently removed from the transportation system. Decommissioning/rehabilitation can be accomplished through various methods such as physically obliterating the route, recontouring, scarifying, seeding, blocking the route entrance, or slashing in the route with logs and rocks. Many factors go into the amount of work needed for decommissioning/rehabilitating a route. While each route will vary in cost for decommissioning/rehabilitation, the more miles to decommission/rehabilitate, the more funding that will have to be dedicated to the effort. Some routes may have already been decommissioned/rehabilitated, however these efforts may not have been effective, and further treatment may be necessary. Table 2.4 in Chapter 2 provides a summary of the miles of roads and trails to be decommissioned or

rehabilitated. Alternative G has the greatest miles of routes to be removed from the transportation system (1,483 miles), followed by Alternative F (1,252 miles). Alternative A would remove no miles. Therefore the costs for decommissioning/rehabilitating would be greatest in Alternative G, followed by Alternative F, with no costs associated with Alternative A. It is important to remember that route decommissioning/rehabilitation, if effectively done, is a one-time cost. The benefits associated with this effort are a reduction in resource impacts that unnecessary routes may have on the land.

Summary of Costs

The following table displays the relative cost rating for each alternative relative to the transportation system identified. Each transportation cost comparison was assumed to be of equal importance and value. The lower the numerical value, the lower the anticipated cost impact.

Table 3.22—Relative cost rating for each alternative for transportation system activities

	Alternative A	Alternative F	Alternative G
Indicator: Cost of route maintenance			
Measure: Miles of road to be maintained	3 (2,209 mi)	2 (1,923 mi)	1 (1,711 mi)
Measure: Miles of trail to be maintained	1 (1,948 mi)	3 (2,234 mi)	2 (2,214 mi)
Indicator: Cost of routes to be decommissioned or rehabilitated			
Measure: Total miles of routes to be decommissioned/rehabilitated (system and user-created)	1 (0 mi)	2 (1,252 mi)	3 (1,483 mi)
Total Score	5	7	6

From a strict transportation system viewpoint, Alternative A, the no action alternative, has the least total impacts relative to cost, namely because there are no roads or trails to decommission or rehabilitate. Alternative A has the greatest miles of road requiring maintenance, but the least miles of trail requiring maintenance. It has the same overall total transportation system mileage as Alternative F, but Alternative F has slightly more trails and fewer roads than Alternative A. Alternative A does not meet the direction of the current forest plan and does nothing to meet the intent of the travel rule, as it fails to address any of the 1,095 miles of identified user-created routes on the forest.

Alternative F has the highest costs relative to the other alternatives. Alternative F has the second greatest miles of road requiring maintenance and the greatest miles of trail requiring maintenance. This alternative has the same total transportation system mileage as Alternative A, but with slightly less road mileage and slightly more trail mileage. This alternative would have the second highest decommissioning/rehabilitation cost. Alternative F reduces the total road system miles by the second greatest amount (286 miles, 13 percent), while increasing trail system by 286 miles, a one to one ratio of road reductions versus trail increases. Alternative F minimally complies with the current forest plan, and partially meets the intent of the travel rule by rehabilitating all identified miles of user-created routes. Alternative F does not add any user-created routes to the transportation system or decommission any system routes that are no longer needed.

Alternative G is second in terms of cost impacts. This alternative has the least miles of road requiring maintenance (1,711) and the second greatest miles of trail requiring maintenance (2,214). It has the least amount of total transportation system miles, 3,916 miles, which is 241 miles less than Alternatives A and F. Alternative G does have the

highest decommissioning/rehabilitation costs, as it treats a total of 1,483 miles of system routes. Alternative G reduces the total road system miles by the greatest amount (498 miles, 23 percent), while increasing trail system by 266 miles – almost a two to one ratio of roads decommissioned verses trails added. This alternative fully complies with the current forest plan and fully meets the intent of the travel rule. Alternative G is the only alternative that adds user-created routes (road, trail, historic) to the system. Alternative G provides a transportation system that best meets the needs of the forest. It creates the smallest transportation system of the three alternatives and eliminates more duplicate, unnecessary, and user-created routes than other alternatives.

Each of the alternatives, including Alternative A – no action, would cost more to implement than the current forest travel management budget. The current budget does not provide enough road maintenance and decommissioning funding to fully implement management needs. Unless routinely maintained, roads can deteriorate to a condition where travel becomes difficult, or where drainage structures no longer function properly, thus affecting other resources such as water quality. Additional funding would then be required to bring the road back to standard.

Cumulative Effects

A route identified for decommissioning is no longer needed for access. Returning the route to a natural state helps to prevent illegal use, reduce further resource damage, and mitigate unnecessary wildlife fragmentation. However, it does take funding to accomplish this. One of the factors in deciding the method for decommissioning will need to be the amount of available funding.

Over time and as funding permits, the travel management plan will be implemented on the ground. Travel management and motorized mixed use signage will allow the public to easily identify which modes of travel are allowed on which roads and trails. Decommissioning/rehabilitation of system and user-created routes will reduce the on-the-ground transportation system and actual route miles, as well as the associated maintenance costs. System and user-created routes will be converted to other uses (roads or trails), further reducing the system miles and the environmental impacts.

The forest will continue to evaluate the road and trail system in an effort to provide a safe, economically sustainable, and environmentally sound transportation system that provides the user with a quality experience. The forest will also continue to evaluate roads designated for motorized mixed use as traffic increases on these roads due to the emphasis on motorized recreation on certain roads and in certain areas.

The transportation system will continue to evolve in an effort to meet future access needs for commodities and access to recreational opportunities across the forest. On the commodity side, oil and gas production, mining, and timber harvesting will continue to use the existing road system and most likely will expand the current system. When new roads are developed, the Forest Service will decide the best location, whether they should provide temporary or permanent access, and the best way for the roads to serve not only the individual commodity need, but the overall access needs of the entire area.

As local communities continue to grow and as tourism continues to increase, more people will come to the area to visit and recreate. Projects such as the I-70 expansion and local airport expansions will make it easier for people to visit the area. The easier it is for people to visit and recreate on the forest, the greater the demand on the transportation system. This increased demand will lead to increased maintenance needs.

In order to resolve access objectives, additional analysis and decision-making may be required on specific routes and facilities. When the forest opts to resolve an access goal or is faced with an outside opportunity to resolve access goals, design and execution parameters will be developed.

Watersheds

Introduction

Healthy watersheds are critical to protecting water quality, sustaining dependent ecosystems, providing a reliable water supply, and preventing or reducing the downstream impacts of high-runoff events. In a natural state, watersheds are in a dynamic equilibrium determined by geologic and climatic variables. Significant disturbances, whether caused naturally (such as by landslides, stand-replacement fires, or floods) or by human impacts (such as travel management activities) can throw a watershed out of equilibrium. When healthy, an affected watershed can recover from such disturbances given sufficient restoration of vegetative cover. However, chronic impacts where mitigation measures are either not applied or inadequate can severely impair watershed recovery and can affect the long-term health of watershed resources as well as their benefits to ecosystems and human settlements.

Watersheds are areas of land that drain rainfall and snowmelt into a common stream, stream network, or body of water. A system of describing watersheds in terms of scale was developed by the U.S. Geological Survey, dividing them into progressively smaller nested watersheds with the first level being the largest land area relative to watersheds of successive levels. Each level is identified systematically by a hydrologic unit code number (HUC). The term HUC, level, and field often are used interchangeably. However, 4th-level watersheds are often called sub-basins; 5th-level watersheds are simply referred to as watersheds; 6th-level watersheds are known as subwatersheds; and 7th-level watersheds are called catchments.

Because the forest covers a broad range of terrain that varies in natural and human-caused land disturbances, the affected environment section here looks at the current condition of six geographic areas that roughly correspond to 4th-level HUC sub-basins. For the environmental consequences section, impacts of roads within each 7th-level HUC catchment were analyzed.

Key Indicators

The analysis for watershed health is specific to the impacts of maintenance level 1 and 2 roads on watershed resources at the 7th-level or catchment scale. Because maintenance level 3, 4, and 5 roads would not vary by alternative, they are not considered as factors in rating one alternative over the other; however, they are considered in the overall effects of the alternatives. The overall condition of each watershed (as determined for the forest plan[3]) will be considered along with the following:

Key indicator: Impacts on watersheds from the quantity of roads and trails

Measure: Road/trail density by watershed

Key indicator: Road interference with stream flow

Measure: Road-stream crossing density

[3] In the forest plan, a broad-scaled watershed condition assessment was conducted for 6th-level subwatersheds on the forest. Since then, the boundaries of many subwatersheds were revised to describe larger basin areas. Some watersheds that were identified in the forest plan as 6th-level subwatersheds are now 7th-level catchments. In addition, the watershed condition assessment was based on human and natural disturbances that do not affect or are not necessarily affected by roads.

Affected Environment

Authorized roads within the White River National Forest total about 2,610 miles. In addition there are 1,095 miles of user-created, unauthorized roads and trails on the forest. The extent of adverse impacts of an individual road depend on numerous factors such as geology; proximity to streams, wetlands, or riparian areas; level of maintenance; and use rate. While best management practices are required for all road construction and maintenance, the risk of adverse impacts on watershed resources grows with road miles.

Watersheds Evaluated

The White River National Forest forms the headwaters of the Blue, Eagle, and Roaring Fork rivers, all of which are direct tributaries to the Colorado River. Portions of the forest also lie within the headwaters of the White, Yampa, and Piceance-Yellow rivers, tributaries to the Green River. All roads administered by the forest are located within the headwaters of the Colorado River basin.

Because the forest covers a broad range of terrain that varies widely in natural and human-caused sensitivities to watershed disturbances, further description of watersheds is provided in terms of six geographic units (figure 3.14). These units roughly represent 4th-level watersheds, or sub-basins, on the forest, each with a unique set of resource management issues.

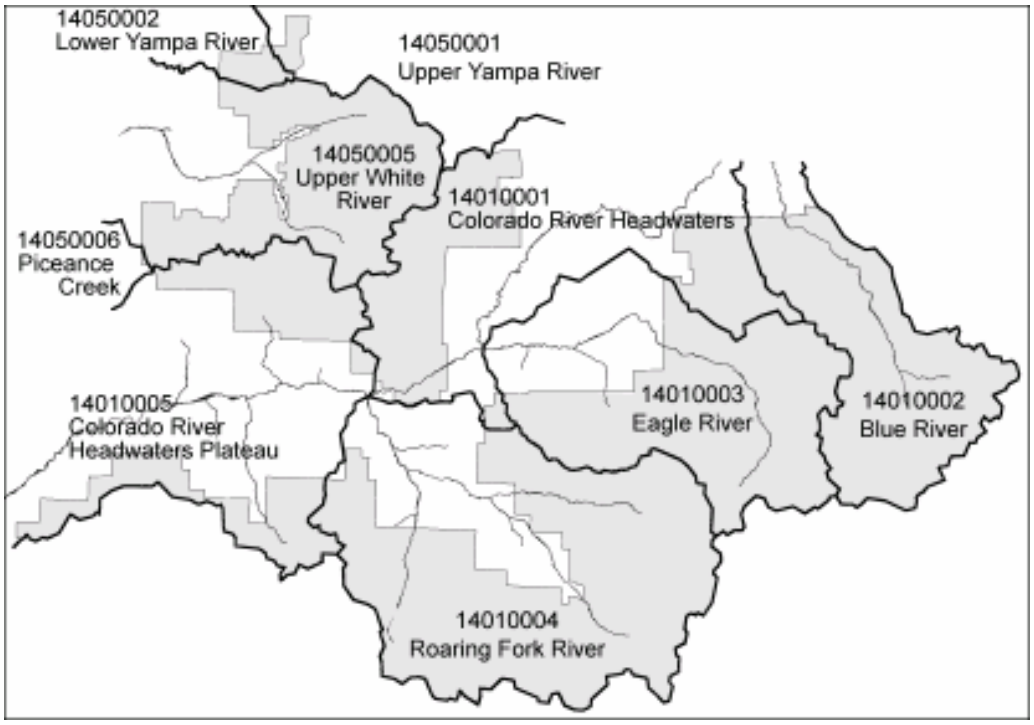


Figure 3.14—Fourth-level sub-basins on the White River National Forest, according to USGS hydrologic unit codes (HUCs)

Surface waters

Water resources on the forest include streams, wetlands, riparian areas, lakes, ponds, and reservoirs. They contribute significantly to public water supplies and to agricultural and recreational uses. They also support habitat for fisheries and wildlife and contribute to aesthetic values important to many forest users.

There are approximately 2,690 miles of perennial streams and 9,270 miles of intermittent streams on the forest. Open water comprises about 11,500 acres. An estimated 50,900 acres of riparian/wetland communities are associated with these surface waters.

Public Supply Watersheds

While most municipal use of forest water is provided to eastern slope users, western slope use has increased along with this area's population. No designated public supply watersheds are located on the forest. There are 40 watersheds on the forest that, although not officially designated as public supply watersheds, do supply water for municipal use (table 3.23). With two exceptions, road impacts have not been identified as water quality concerns in these watersheds. The exceptions are Straight Creek and Black Gore Creek; these public supply watersheds are both affected by sedimentation resulting from traction sand from I-70. The Forest Service is working with the state departments of Public Health and Transportation and with local governments to reduce sanding impacts on these creeks.

Table 3.23—Watersheds on the White River National Forest that supply water for municipal use

Name	Area served	White River National Forest district
Hunter Creek	Aspen	Aspen
Castle Creek	Aspen	Aspen
Maroon Creek	Aspen	Aspen
Snowmass Creek	Snowmass	Aspen
Roaring Fork River	Aspen	Aspen
White River	Meeker	Blanco
Straight Creek	Dillon, Dillon Valley	Dillon
North Tenmile Creek	Frisco	Dillon
North Fork of the Snake River	Arapahoe Basin Ski Area	Dillon
North Fork of the Snake River	Loveland Pass Village	Dillon
North Fork of the Snake River	Keystone	Dillon
Lehman Gulch	Breckenridge Ski Area	Dillon
North Fork of Cucumber Gulch	Blue River Water District	Dillon
North Fork of South Barton Gulch	Blue River Water District	Dillon
Cucumber Gulch	Blue River Water District	Dillon
Indiana Gulch	Breckenridge	Dillon
West Tenmile Creek	Copper Mountain	Dillon
Fryingpan River	Basalt	Sopris
Nettle Creek	Carbondale	Sopris
East Creek	Redstone	Sopris
North Fork of the Crystal River	Crystal	Sopris
Carbonate Creek	Marble	Sopris
Brush Creek	Eagle	Eagle
Mosher Creek	Gypsum	Eagle
Resolution Creek	Camp Hale	Holy Cross
Fall Creek	Gilman	Holy Cross
Cross Creek	Minturn	Holy Cross

Name	Area served	White River National Forest district
Turkey Creek	Redcliff	Holy Cross
Beaver Creek	Beaver Creek Ski Area	Holy Cross
Booth Creek	Vail	Holy Cross
Gore Creek	Vail	Holy Cross
Black Gore Creek	Vail	Holy Cross
Mill Creek	Vail	Holy Cross
Grizzly Creek	Glenwood Springs	Rifle
No Name Creek	Glenwood Springs	Rifle
East Elk Creek	New Castle	Rifle
Beaver Creek	Rifle	Rifle
Oasis Creek	West Glenwood	Rifle

Water Quality

Water quality within the forest can be affected by natural and/or human-caused factors. The primary water parameter of concern related to travel management is sedimentation originating from road erosion. The underlying geology can play a significant role in determining the impacts a road or trail has on erosion. In some areas, additional water quality concerns include water temperature (from the significant loss of riparian vegetation from roads constructed adjacent to streams and water bodies) and salinity (from the application of road salts for de-icing or dust abatement purposes).

The State of Colorado reports biannually on the status of water quality. The most recent report indicates that two stream segments that occur within the forest, Straight Creek and Black Gore Creek, are impaired because of sediment from I-70 (CDPHE 2004). No other stream segments on the forest are identified as impaired because of road runoff.

The State of Colorado also has identified stream segments where no degradation of water quality is allowed. These are called "outstanding waters," two of which occur within wilderness areas on the White River National Forest:

1) White River Basin–Segment 2: Trappers Lake, including all tributaries to Trappers Lake;
2) Roaring Fork River–Segment 1: All tributaries to the Roaring Fork River system, including all lakes and reservoirs, within the Maroon Bells-Snowmass Wilderness and the Hunter-Fryingpan Wilderness.

Wetland and Riparian Areas

Roads can affect wetlands and riparian areas directly or indirectly through changes in hydrology. Modification of surface and subsurface drainage can result in changes in moisture regimes of these areas. Road proximity can also affect water quality in wetlands and riparian areas.

There are 50,864 acres of mapped riparian and wetland areas on the forest. Although riparian and wetland areas occupy only about 2 percent of the lands managed by the White River National Forest, they are key to productive fisheries and wildlife habitat; they attenuate flooding; and they provide quality water for downstream users, continuous ground water recharge, and diverse scenery and recreation sites. Riparian and wetland areas also are important to sustaining timber and forage production.

Riparian ecosystems constitute the transition area between the aquatic ecosystem and the adjacent terrestrial system. The aquatic ecosystem includes the stream channel, lakebed, water, and the biotic communities and habitat found in these features. Wetlands in these

areas are inundated by surface or groundwater with a frequency sufficient to support vegetation or aquatic life that requires saturated or seasonally saturated soil conditions. Wetlands generally include marshes, bogs, wet meadows, river overflows, mud flats, and natural ponds. Executive Orders 11988 and 11990 direct federal agencies to avoid the loss of wetlands on federal lands.

Geographic Units

A manageable perspective on the watershed conditions on the forest is presented in terms of six geographic units, which generally are based on 4th-level watersheds, or sub-basins (figure 3.13). These six units are:

- Blue River;
- Eagle River;
- Roaring Fork River;
- Upper Colorado River;
- Lower Colorado River; and
- Upper White River.

The following descriptions include the amount of surface water and wetlands in each geographic unit. Road densities and stream density are included, as are human and natural elements of risk to watershed health. The greater the density of roads, the greater the risk of adverse watershed impacts. Stream density is an important indicator of the efficiency through which a stream system receives pollutants.

Blue River Unit. The Blue River unit is located entirely within the Dillon Ranger District. Within the unit are 590 miles of perennial streams and 890 miles of intermittent streams. Lakes and ponds occupy 3,760 acres; there are 9,760 acres of wetlands and riparian areas. About 19 percent of the riparian/wetland communities that occur on the forest are found in the Blue River basin.

Stream density is 3.1 miles per square mile. Ten streams on the forest contribute to 12 public water supply entities.

Physiographically, most of the Blue River unit is composed of high-relief, crystalline, and hard-sedimentary mountainous lands. The soils in these lands have a moderate-to-severe erosion hazard. Along the course of the Blue River, the lands fall into low-relief, mixed-sedimentary mountainous lands. The erosion hazard in these lands ranges from low to severe.

Eagle River Unit. The Eagle River unit represents the National Forest System lands that occur within the Eagle River basin, a 4th-level watershed (sub-basin). Lands within this unit fall within the Eagle and Holy Cross ranger districts. Within the unit are 570 miles of perennial streams and 1,320 miles of intermittent streams. Lakes and ponds make up 1,360 acres; wetlands and riparian areas occupy 9,050 acres. About 18 percent of the riparian/wetland communities that occur on the forest are found within the Eagle River basin.

Stream density is 3.4 miles per square mile. Eleven watersheds within this unit are a source of water for eight municipalities.

Three physiographic units are found within the Eagle River unit. The high-relief, crystalline, and hard-sedimentary mountainous lands are generally found within the Eagles Nest and Holy Cross wilderness areas. Soils in these lands have a moderate-to-

severe erosion hazard. A relatively small area around Muddy, Red Canyon, and Cache creeks, located within the northern part of the Eagle River unit, is low-relief, soft-sedimentary mountainous and volcanic mesa lands. Soils in this physiographic area generally have low fertility with a severe limitation for revegetation. Their erosion hazard potential is severe; mud and debris flows can be common occurrences. The remaining area within the Eagle River unit are lands that fall into low-relief, mixed-sedimentary mountainous lands. The erosion hazard in these lands ranges from low to severe.

Five stream segments identified by the Colorado Department of Public Health and Environment are designated "use impaired" (CDPHE 2004). Degradation of water quality in two of these segments is attributed to sedimentation resulting from road-sanding operations on I-70.

Roaring Fork River Unit. The Roaring Fork River unit represents the National Forest System lands that occur within the Roaring Fork River basin, a 4th-level watershed, or sub-basin. Lands within this unit fall within the Aspen and Sopris ranger districts. Within the unit are 710 miles of perennial streams, 2,750 miles of intermittent streams, 2,200 acres of lakes and ponds, and 11,160 acres of wetlands and riparian areas. About 22 percent of the riparian/wetland communities that occur on the forest are found within the Roaring Fork River basin.

Stream density is 3.8 –miles per square mile.

Five physiographic units are found within the Roaring Fork River unit. Most of the unit is composed of high-relief, crystalline, and hard-sedimentary mountainous lands that are generally found within the headwaters portions of the watershed. Soils in these lands have a moderate-to-severe erosion hazard.

Much of the lower Fryingpan River area and the valley portions of the Crystal River are high-relief, mixed-sedimentary mountainous lands. The erosion hazard of soils in these areas is generally moderate-to-severe, with mud and debris flows common in areas with steep, barren slopes. Soil fertility ranges from low to high and the limitation for revegetation ranges from slight to severe. Avalanche Creek annually sees mudflows substantial enough in size to close the access road into a campground.

The area around Marble, as well as along the lower slopes of the Elk Mountains, falls within the low-relief, mixed-sedimentary mountainous lands. There are a variety of soils here due to sedimentary formations as well as glacial and landslide deposits. Ratings for erosion hazard, soil fertility, and revegetation limitation vary widely. A few relatively recent and significant mudflows have occurred in the Marble area, most of which have originated within the Carbonate and Slate Creek basins (Rogers and Rold 1972).

The area around Basalt Mountain, as well as the upper reaches of Fourmile and Thompson Creeks, is low-relief, soft-sedimentary mountainous and volcanic mesa lands. Soils in this physiographic area generally have low fertility with a severe limitation for revegetation. Their erosion hazard potential is severe; mud and debris flows can be common occurrences.

The lower reaches of Fourmile and Thompson Creeks, as well as Coal Creek, are within strongly dipping, soft-sedimentary mountainous lands. These lands generally have poor stability. Soils typically have severe erosion hazard ratings with mud and debris flows common. Soil fertility is low-to-moderate and has a severe limitation on revegetation.

Upper Colorado River Unit. The Upper Colorado River unit represents lands managed by the White River National Forest that occur within the Upper Colorado River basin to Glenwood Springs, excluding the Blue, Eagle, and Roaring Fork river basins. Lands

within this unit fall within the north portion of the Holy Cross Ranger District, the northwest portion of Eagle Ranger District, a small northwest segment of Sopris Ranger District, and an eastern portion of the Rifle Ranger District. Within the unit are 330 miles of perennial streams, 1,050 miles of intermittent streams, 1,560 acres of lakes and ponds, and 8,060 acres of wetlands and riparian areas. About 16 percent of the riparian/wetland communities that occur on the forest are found within the Upper Colorado River basin.

Stream density is 3.9 miles per square mile. There are 72 7th-level watersheds, or catchments within this unit. Two watersheds within this unit provide a source of water to Glenwood Springs.

Five physiographic units are found within the Upper Colorado River unit. Volcanic plateau lands generally occur within the upper portions of Derby Creek basin. These lands are typically stable except at the margins of basalt flows, which are prone to landslides. Soils in these lands typically have a slight-to-moderate erosion hazard.

In the grasslands and forblands, soil fertility and the degree of limitation for revegetation are moderate. In the coniferous forest lands, soils are rated low for inherent fertility and severe for their degree of limitation for revegetation. The high-relief, mixed-sedimentary mountainous lands occur within the portion managed by the Sopris Ranger District as well as within the upper elevations of lands managed by the Holy Cross Ranger District. Much of the Deep and Sweetwater Creek basins are also made up of these physiographic land units. The erosion hazard of soils in these areas is generally moderate to severe, with mud and debris flows common in areas with steep, barren slopes. Sweetwater Creek saw a significant mudflow in the 1970s. Soil fertility ranges from low to high and the limitation for revegetation ranges from slight to severe.

The Derby and Sunnyside Creek basins fall within the low-relief, mixed-sedimentary mountainous lands. The variety of soils here is due to sedimentary formations as well as glacial and landslide deposits. Ratings for erosion hazard, soil fertility and revegetation limitation vary widely as well.

The lower portion of land in the Upper Colorado River basin managed by the Holy Cross Ranger District is low-relief, soft-sedimentary mountainous and volcanic mesa lands. Soils in this physiographic area generally have low fertility with a severe limitation for revegetation. Their erosion hazard potential is severe, and mud and debris flows can be common occurrences.

Finally, hard-sedimentary plateau and canyon lands can be found within the portions managed by the Rifle Ranger District, generally No Name and Grizzly creeks. These lands contain relatively flat terrain that is deeply incised by tributaries to the Colorado River. The terrain is fairly stable except in steep canyons, which are subject to rockfall. Soils in the plateau lands have a slight erosion hazard with a high inherent fertility and a slight degree of limitation for revegetation. Soils in the canyon lands are rated severe for erosion hazard. Fertility is high with a moderate degree of limitation for revegetation.

Lower Colorado River Unit. The Lower Colorado River unit represents lands managed by the White River National Forest that occur within the Lower Colorado River basin from Glenwood Springs downstream. Lands within this unit fall entirely within the Rifle Ranger District. Within the unit are 162 miles of perennial streams, 1,450 miles of intermittent streams, 300 acres of lakes and ponds, and 3,470 acres of wetlands and riparian areas. Seven percent of the riparian/wetland communities that occur on the forest are found within the Lower Colorado River basin.

Stream density is 3.9 miles per square mile. There are 71 7th-level watersheds, or catchments, within this unit. Three watersheds within this unit provide water to three municipalities.

Two physiographic units are found within lands managed by the forest in the Lower Colorado River unit. The hard-sedimentary plateau and canyon lands occur within the northeastern portion of the Rifle Ranger District, which includes Elk, South Canyon, and Mitchell creeks. These lands contain relatively flat terrain that is deeply incised by tributaries to the Colorado River. The terrain is fairly stable except in the steep canyons, which are subject to rockfall. Soils in the plateau lands have a slight erosion hazard with a high inherent fertility and a slight degree of limitation for revegetation. Soils in canyon lands are rated severe for erosion hazard. Fertility is high, with a moderate degree of limitation for revegetation.

The rest of the district contains high-relief, mixed-sedimentary mountainous lands. The erosion hazard of soils in these areas is generally moderate to severe, with mud and debris flows common in areas with steep, barren slopes. Soil fertility ranges from low to high, and the limitation for revegetation ranges from slight to severe.

Upper White River Unit. The Upper White River unit represents lands managed by the White River National Forest that occur within the Upper White River Basin as well as a few 7th-level watersheds (catchments) that drain into the Upper and Lower Yampa River and Piceance Basin. Lands within this unit fall entirely within the Blanco Ranger District. Within the unit are 330 miles of perennial streams, 1,810 miles of intermittent streams, 2,300 acres of lakes and ponds, and 9,370 acres of wetlands and riparian areas. About 18 percent of the riparian/wetland communities that occur on the forest are found within the Upper White River basin.

Stream density is 3.8 miles per square mile. There are 46 7th-level watersheds (catchments) within this unit. The White River provides a water supply to Meeker.

Two physiographic units are found within the lands managed by the White River National Forest in the Upper White River unit. High-relief, mixed-sedimentary mountainous lands occur generally in the lower elevation lands that drain into the White River as well as those that are within the Piceance basin. The erosion hazard of soils in these areas is generally moderate to severe, with mud and debris flows common in areas with steep, barren slopes. Soil fertility ranges from low to high and the limitation for revegetation ranges from slight to severe.

The higher-elevation lands within the Upper White River basin are volcanic plateau lands. These lands are generally stable except at the margins of basalt flows, which are prone to landslides. Soils in these lands typically have a slight-to-moderate erosion hazard. In the grasslands and forblands, soil fertility and the degree of limitation for revegetation are moderate. In the coniferous forest lands, soils are rated low for inherent fertility and severe for their degree of limitation for revegetation.

Resource Protection Measures

Watersheds and their streams can sustain some resource use and disturbance without serious consequences. Some watersheds, because of their geology, are more resistant to disturbance than others. Consequently, resource development and use in each watershed must be carried out in such a way that watershed and stream health are not compromised. Management on the White River National Forest will provide protection of aquatic, riparian, and wetland resources by implementing the following measures:

- Follow the watershed conservation practices (Forest Service Handbook, Region 2 supplement 2509.25), which provide standards for all management activities to protect soil, aquatic resources, and riparian areas. Each standard has one or more design criteria that describes in more detail how an activity will be conducted to protect soil productivity, stream channels, and water quality. The watershed conservation practices will limit impacts on stream health and help maintain the chemical, physical, and biological integrity of White River National Forest waters. Their use complies with non-point source pollution control regulations and the National Forest Management Act (NFMA).
- In watersheds in which the human- or naturally caused risks are high, watershed improvement or extraordinary mitigation measures may be used to offset the impacts of the proposed project. Appendix J of the forest plan (USDA Forest Service/WRNF 2002b) contains additional information regarding watershed risk ratings.

Environmental Consequences

This analysis focuses on maintenance level 1 and 2 roads as well as motorized trails, where most of the road mile differences occur among the alternatives. Alternative A includes miles of user-created routes. Comparisons among the three alternatives assume that travelways identified for decommissioning or rehabilitation are effectively closed.

Because they typically disturb more area per length than do trails, roads are a considered a major cause of erosion. Unpaved, they are vulnerable to rainfall and runoff eroding their surface. Paved or unpaved, they serve to concentrate and accelerate runoff, which can erode unarmored surfaces such as road fills and hillslopes. Without any means of detention such as vegetation or sediment basins, roads can efficiently convey sediments directly into a stream system.

Motorized travel allows greater distances to be covered over time, leading to larger areas of ground disturbance than seen by slower means of travel such as hiking, biking or horseback riding. In addition, the road prism of cut, fill, and travel surface typically disturb and occupy a wider area than trails primarily used for non-motorized travel. Table 3.24 compares the total miles of maintenance level 1 and 2 roads and of motorized trails for each action alternative.

Table 3.24—Miles of maintenance level 1 and 2 roads and motorized trails

	Alternative A	Alternative F	Alternative G
Miles of level 1 and 2 roads	1,946	1,676	1,392
Miles of motorized trails	156	164	211
Total miles	2,102	1,840	1,603

General Effects

Forest roads are generally associated with timber harvests, dispersed recreation, mining, private land access, and ski areas. They can impact the physical and biological resources necessary to sustain aquatic life (Copstead 1997). These impacts can occur in several ways:

- Disruption of a watershed's natural hydrology. Roads serve to capture surface and subsurface runoff on hillslopes, thereby interrupting natural flow paths to receiving stream channel systems. Unmitigated, the captured runoff can be delivered to stream systems more rapidly and at a higher rate of flow and can

impact the timing and magnitude of natural stream flows. Stream channels will respond to significant increases in flow rates by widening or deepening in order to carry these greater flowrates.

- Increased deposits of sediment into a stream system. Unpaved roads present a risk of eroding during rainfall and snowmelt runoff periods. Unchecked, roads can directly convey eroded sediments into a stream system. Roads constructed on unstable slopes can add to structural instability of these areas, leading to landslides and greater sources of sediments.
- Reduction of riparian, wetland and aquatic habitat. Roads constructed adjacent to a stream system can impede functional riparian habitat. Surface and subsurface water that supports wetlands and riparian areas can also be disrupted by a road and may reduce the size and function of these resources. Sedimentation and stream channel responses to increased flow rates can adversely impact aquatic habitat.

Road impacts can persist long after a travelway is closed unless measures are taken to disconnect runoff pathways into a stream channel and/or onto a road surface. Proper design and location of travelways can significantly reduce the risk of flood flows, slope failures, sedimentation, and stream channel degradation. This includes avoidance of steep slopes, high-erosion hazard areas, stream channels, riparian and wetland areas, and areas of high mass movement potential. When roads are properly planned, constructed, and maintained, their long-term impacts on watershed resources, whether or not they are open or closed to travel, are effectively reduced.

Watershed conservation practices and forest plan standards and guidelines prescribe extensive measures to protect soil, riparian, wetland, and aquatic resources. Generally, adverse impacts on these resources can be minimized when all applicable measures are applied and effective. There is a point of diminishing returns, however, where the risk rises that these protective measures will fail to be fully effective. Hence, alternatives that propose greater densities of roads may increase the risk of adverse impacts on aquatic and riparian resources.

Direct and Indirect Effects

Density. An evaluation of road and motorized trail density indicates the potential for erosion, adverse water quality impacts, and modified hydrology. Roads and the wider trails used by motorized vehicles can intercept, concentrate, and divert water. Their impacts can be mitigated, but not completely eliminated, if they are to serve as travel routes. This analysis of road and motorized trail density is based on the general assumption that areas with greater road and motorized trail density generally have a greater risk of adverse impacts.

A watershed risk assessment was conducted for linear density in each 6th-level subwatershed. A high risk rating indicated the greatest potential for adverse road impacts. Conversely, a low risk rating indicated less potential for adverse impacts. Risk ratings were defined as follows:

- **High risk:** Watersheds with 3.0 or more miles per square mile;
- **Moderate**: Watersheds with 1.5 to 2.9 miles per square mile; and
- **Low**: Watersheds with 1.4 or fewer miles per square mile.

These risk ratings were applied in this analysis to all maintenance level roads to ascertain overall road density in each watershed. These risk ratings are general; combinations of other factors such as geology and road placement also play a role in determining overall watershed impacts. In addition, road closures do not immediately eliminate hydrologic impacts. Rather, the disturbed surface takes years to stabilize, which depends on the level of success in the closure, vegetative regrowth, and other such factors. Table 3.25 compares the number of watersheds under each risk rating for each geographic unit. Alternative A includes user created roads not authorized by the forest. Alternatives F and G assume these user created roads are either closed or incorporated into the authorized road and trail system.

Table 3.25—Number of watersheds under each road density risk rating

Watershed	Square miles on NFS lands	Alternative A			Alternative F			Alternative G		
		H*	M	L	H	M	L	H	M	L
		----------Number of watersheds----------								
Colorado River Headwaters	453	0	20	30	0	12	38	0	5	45
Blue River	487	5	19	36	0	7	53	0	8	52
Eagle River	611	4	24	41	0	13	56	0	5	64
Roaring Fork River	1,018	1	15	84	0	2	98	0	2	98
Colorado Plateau	251	0	2	34	0	0	36	0	0	36
White/Yampa Rivers**	593	1	8	31	1	6	33	0	6	34
Totals	**3,413**	**11**	**88**	**256**	**1**	**40**	**314**	**0**	**26**	**329**

** H-high, M-moderate, L-low road density risk rating*

*** This watershed is a composite of four 4th Level HUCs: Upper White River, Upper Yampa, Lower Yampa and Piceance/Yellow Creeks*

For the Blue River, Eagle River, Roaring Fork River and White/Yampa River geographic areas, high road densities would be greatest under the no action alternative. For the Colorado River Headwaters and Colorado River Plateau geographic areas, there would be no change in the number of watersheds that fall in the high-density rating under any of the action alternatives.

Moderate risk road densities in all of the analyzed geographic areas would be greatest under Alternative A. The lowest moderate risk road density would occur in the Blue River under Alternative F and in the Colorado River Headwaters and Eagle River under Alternative G. There would be no change between Alternatives F and G for moderate road density risk in the Roaring Fork River, Colorado River Plateau and White/Yampa River geographic areas.

Table 3.26 identifies selected watersheds of high and moderate risk road densities under each of the three alternatives. High risk road densities are identified as shaded cells. Overall, ML 1 and 2 roads occupy more than 90 percent of the road miles in these watersheds.

Table 3.26—High and moderate risk road densities for selected watersheds, in miles per square mile (high risk densities are shaded in gray)

HUC* #	Watershed name	Alternative A	Alternative F	Alternative G
		----------Miles per square mile----------		
	Colorado River Headwaters			
14010001280102	Upper Cottonwood Creek	2.89	1.45	1.59
14010001181316	Freeman Creek	2.60	1.54	2.17
14010001250100	Lower Sweetwater Creek Composite	2.48	1.13	0.48
14010001160304	Slate Creek	2.36	1.83	1.73
14010001180102	Castle Creek	2.33	2.05	0.93
14010001180609	Rock Creek	2.12	0.94	1.66
14010001250407	Cross Creek	2.05	1.44	0.57
14010001250405	Lake Creek	1.78	1.41	0.34
	Blue River			
14010002021921	Salt Lick Gulch	5.77	0.82	1.24
14010002030101	Dillon Reservoir Composite	4.18	2.28	2.64
14010002040102	Frey Gulch	3.47	2.93	2.84
14010002010500	Deep Creek	3.14	2.24	2.11
14010002050200	Swan River	3.11	1.48	1.51
	Eagle River			
14010003050910	June Creek	3.60	2.56	1.51
14010003080912	Eagle Rvr abv Pando Composite	3.52	1.58	1.24
14010003050607	Berry Creek	3.44	2.35	1.16
14010003050606	Eagle Rvr abv Edwards Comp.	3.19	2.84	1.29
14010003020103	Old Man's Gulch	2.76	1.12	1.14
	Roaring Fork River			
14010004040104	Red Canyon	3.58	1.33	1.84
14010004030128	Rocky Fork Creek	2.92	0.99	0.75
14010004020104	Blue Creek	2.43	0.87	1.28
	Colorado Plateau			
14010005020304	Hadley Gulch	1.73	1.26	1.17
14010005010700	East Rifle Creek	1.64	1.06	1.12
	White River			
14050005030501	Coal Creek	3.15	3.01	2.12

** HUC = hydrologic unit code.*

Proximity to Stream Channel

Ideally, roads should be located as far away from streams as possible to avoid direct deposits of sediment into the drainage channel. Roads constructed near a stream pose a greater risk to water quality and to modifying hydrologic response of streamflow from runoff events. When located close to a stream channel, there is less available buffering to capture or hinder the transport of eroded material and other pollutant runoff to the stream. Because roads intercept and concentrate water, the closer they are to a drainage channel, the quicker a stream will respond to a runoff event. This can result in higher peak flows.

Significant impacts can result in greater channel erosion than natural conditions. Table 3.27 shows the miles of motorized trails and ML 1 and 2 roads within 300 feet of a stream channel.

Table 3.27—Miles of roads within 300 feet of a stream channel, by analysis areas

Analysis area	No Action			Alternative F			Alternative G		
	Roads	*Motor Trails*	*Sum*	*Roads*	*Motor Trails*	*Sum*	*Roads*	*Motor Trails*	*Sum*
Colorado Headwaters	91	9	100	83	9	92	59	1	60
Blue River	101	3	104	74	3	77	74	14	88
Eagle River	121	5	126	101	5	106	73	0	73
Roaring Fork River	104	5	109	86	6	91	70	16	86
Lower Colorado River	99	0	99	80	1	81	77	3	80
White River	126	57	183	120	59	179	101	54	155
Totals	**642**	**79**	**721**	**544**	**82**	**626**	**454**	**88**	**542**

Mileage for roads reflects maintenance level 1 and 2 roads only.

Overall, Alternative A would have the most road miles occurring within close proximity to a stream channel; Alternative G would have the fewest. Although table 3.30 provides general comparisons of alternatives for each geographic area, the actual impacts from road proximity to streams will be more apparent at a larger scale analysis such as for 7th-level watersheds (subwatersheds).

For riparian and wetland protection the same analysis above reflects the alternative that would have the least impact, as wetland and riparian areas generally occur close to streams. Alternative G would be most favorable, followed by alternative F, and lastly alternative A. Alternative A does nothing to repair or remove roads and trails near wetlands or streams, whether a part of the travel system or not. Alternative F takes measures to rehabilitate non-system routes which can aid in having less impact on wetland and riparian areas. Alternative G takes into account not only removing both system and non-system routes that are not needed or that are causing resource impacts, but also in some cases removes routes near streams in favor of duplicate routes further away from streams.

Stream Crossings

The number of stream crossings, by analysis area and alternative, is presented in table 3.28. Tabulating the number of stream crossings by roads provides an estimate of the potential for disruption of streamflow rates and sediment input.

Table 3.28—Number of stream crossings by management level 1 and 2 roads and motorized trails

Analysis area	No Action			Alternative F			Alternative G		
	Roads	*Motor Trails*	*Sum*	*Roads*	*Motor Trails*	*Sum*	*Roads*	*Motor Trails*	*Sum*
Colorado Headwaters	337	37	374	303	37	340	211	2	213
Blue River	338	15	353	235	15	250	246	53	299
Eagle River	416	27	443	341	27	368	263	0	263
Roaring Fork River	348	14	362	289	15	304	229	69	298
Lower Colorado River	338	0	338	267	1	268	274	10	284
White River	454	244	698	429	254	683	364	234	598
Totals	**2231**	**337**	**2568**	**1864**	**349**	**2213**	**1587**	**368**	**1955**

Alternative A would result in the greatest number of stream crossings; overall, Alternative G would result in the fewest. For most watersheds there would not be much difference in the number of stream crossings among alternatives. Stream health would be enhanced in those watersheds where Alternative F or G would result in less stream crossings by a road.

Cumulative Effects

Along with roads and trails, nearly all of the management activities (i.e. recreation, logging, mining, grazing, and water diversions) that are conducted on the White River National Forest have the potential to affect water resources including riparian areas, wetlands and streams. These resources can also be impacted by land use activities on lands outside of Forest Service administration and within watersheds of shared jurisdiction with the forest. The cumulative impact of these activities depends upon the effects of past and present management as well as the watershed's inherent ability to absorb additional disturbance to its biological and physical elements.

Cumulative effects to aquatic and riparian resources from forest management activities can be addressed by applying applicable watershed conservation practices and monitoring their effectiveness. When appropriate, partnerships that emphasize watershed health can be pursued in watersheds of multiple ownerships.

Wilderness

Introduction

The White River National Forest fully manages three wilderness areas and shares management of five wilderness areas with adjoining national forests. Current management emphasis allows natural processes to be maintained or improved within wilderness and is outlined in the forest plan. All motorized and mechanized vehicular use is prohibited in a national forest wilderness (USDA Forest Service 2004a, 36 CFR 261.16).

Management Direction

The overall direction for managing recreation resources on the White River National Forest includes the national strategic goals to provide outdoor recreation opportunities in natural forest settings, promote access to recreation opportunities, and provide primitive types of experience in wilderness settings (USDA Forest Service/WRNF 2002a). One of the forest-wide goals and objectives for wilderness is to improve the capability of wilderness and protected areas to sustain a desired range of benefits and values. Wilderness should be managed so that changes in the ecosystem are primarily a consequence of natural forces or within the range of natural variability and succession (USDA Forest Service/WRNF 2002a).

Applicable guidelines for management area 1.11 and the pristine recreation opportunity spectrum (ROS) category direct that trails should not be constructed or reconstructed and that when resource damage exists from concentrated use of cross-country travelways, measures be taken to correct problems. Guidelines for management area 1.12 and primitive ROS say to take the following actions when needed: (a) minimize trail impacts on scenic resources and (b) eliminate duplicate trails. Finally, in management area 1.13 and semi-primitive ROS, recreational livestock is prohibited or restricted except for through-travel use.

Desired Condition

The desired condition for recreation requires balancing the needs to provide diverse recreation opportunities, facilitate user access, and protect wilderness resource values. The desired condition for wilderness management is described below for each management area on the forest.

1.11 Pristine Wilderness: These areas provide the most outstanding opportunities for solitude and isolation. User-created trails or game trails may exist but are not maintained or designated on maps or trail guides. Recreation opportunities in this pristine ROS offer primitive and unconfined experiences.

1.12 Primitive Wilderness: Recreation is managed to protect natural conditions, provide opportunities for primitive recreation, offer a moderately high degree of solitude, and incorporate a ROS of semi-primitive non-motorized or primitive year-round. Travel is along primitive trails or unconfined.

1.13 Semi-Primitive Wilderness: These areas are managed to protect natural conditions and to provide access to primitive or pristine areas. Encounters with other users may be frequent because of concentrated use in the area. Trail and bridge construction incorporate natural designs and native materials that complement the

surrounding landscape whenever possible. Travel is primarily along a well-defined trail system.

Key Indicators

Key indicator: Impacts on solitude and remoteness in designated wilderness.

Measure: Miles of system trail open to foot and horse use.

Measure: Miles of system trail open to foot use only.

Measure: Miles of unauthorized (non-system) trails to be decommissioned.

Measure: Miles of unauthorized (non-system) trails added to the system.

Affected Environment

Approximately one-third of the forest, totaling 755,100 acres, is designated wilderness, the largest proportion of any national forest in Colorado. This represents 24 percent of the state's designated wilderness on National Forest System lands.

Figure 3.15 displays the location of existing wilderness areas on the White River National Forest. Basic establishment and acreage data are summarized in table 3.29. Further background information on wilderness is incorporated by reference to the forest plan (USDA Forest Service/WRNF 2002b).

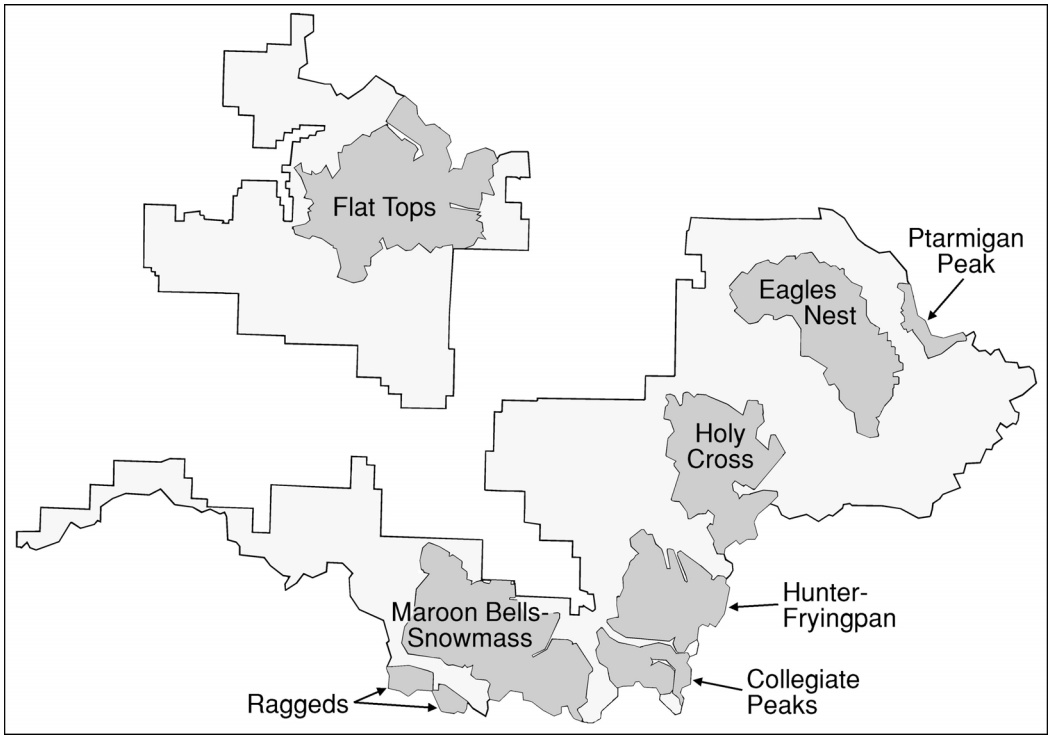


Figure 3.15—Existing wilderness areas on the White River National Forest

Table 3.29—Acres of existing wilderness on the White River National Forest

Name	Establishing law	White River National Forest	Other acreage*	Total
		----------Acres----------		
Collegiate Peaks	P.L. 96-560 12-22-80	35,482	189	35,671
Eagles Nest	P.L. 94-352 07-12-76	133,311	185	133,496
Flat Tops	P.L. 94-146 12-12-75	196,344	192	196,536
Holy Cross	P.L. 96-560 12-22-80	113,366	475	113,841
Hunter-Fryingpan	P.L. 95-237 02-24-78 P.L. 103-77 08-13-93	82,026	40	82,066
Ptarmigan Peak	P.L. 103-77 08-13-93	13,175	0	13,175
Raggeds	P.L. 96-560 12-22-80	16,793	39	16,832
Maroon Bells /Snowmass	P.L. 88-577 09-03-64 P.L. 96-560 12-22-80	161,984	1,499	163,483
Totals		**752,481**	**2,619**	**755,100**

**The "other acreage" category includes lands under private or other type of ownership. It does not include National Forest System acreage on adjoining national forests. Source: USDA Forest Service 2003.*

Recreation Activities

The Wilderness Act of 1964 limits the type of recreation activities that may occur in designated wilderness to non-motorized and non-mechanized methods of travel. Table 3.30 displays the current mileage of wilderness trails. During the snow-free season, most system and non-system trails are open to foot and horse travel. National Forest System trails are those that are maintained as system trails. Unauthorized (non-system) trails usually are not-constructed routes that are currently used by recreationists but are not maintained by the Forest Service. Many of these routes are game trails or user-created trails.

During the winter, the area-wide strategy for wilderness allows non-motorized and non-mechanized travel predominately in the modes of cross-country skiing and snowshoeing. Year-round, off-trail travel is allowed for horse and foot traffic but not encouraged because of the potential resource impacts with repeated use.

Table 3.30—Miles of trail in each wilderness area on the White River National Forest

Wilderness area	NFS trails Foot/horse	Non-system Unauthorized	Total
	----------Miles----------		
Collegiate Peaks	12.6	4.4	17.0
Eagles Nest	155.2	17.7	172.9
Flat Tops	270.9	26.6	297.5
Holy Cross	114.8	19.1	133.9
Hunter-Fryingpan	67.3	29.3	96.6
Maroon Bells-Snowmass	152.2	21.8	174.0
Ptarmigan Peak	14.2	0.0	14.2
Raggeds	10.9	0.0	10.9
Totals	**798.1**	**118.9**	**917.0**

Mileage calculations are based on GIS analysis.

Recreation Use and Capacity

Nation-wide the most popular recreation activities include walking, sightseeing, and picnicking (USDA Forest Service 2000a). The White River National Forest NVUM results (Kocis et al. 2003) estimate that there are 291,640 wilderness visits (error rate 15 percent), with most users being from Colorado and average length of stay 7.9 hours. Visitor use of wilderness areas on national forests is forecasted to grow between 0.5 percent and 1 percent per year for the next 50 years (Cordell 1999). Locally, there is an increased demand for pristine, primitive, and semi-primitive non-motorized recreation opportunities as private land is developed; the growth rate of local counties is as high as 4 percent annually, and Colorado's overall growth has increased 30.6 percent since 1990 (U.S. Department of Commerce 2004).

Theoretical capacity for recreational opportunities for wilderness and non-wilderness travel are displayed on a trail (snow-free) and area-wide (snow-covered) basis (see the capacity discussion in the recreation section of this chapter). The forest plan and travel management plan helps to establish the framework for determining recreation capacity within designated wilderness. Additional analysis will be required to determine site-specific limiting factors and establish practical capacities for these areas.

Travel Management Conflicts

Within wilderness, travel management conflicts exist. Some hikers dislike encountering horses or even the evidence of horse use in wilderness areas (Cordell 1999). Popular peaks, such as those above 14,000 feet within wilderness, receive use levels inconsistent with primitive and semi-primitive recreation opportunity guidelines. Frequently, when private land is developed near wilderness, recreationists expect nearby access to the national forest and will pioneer routes when those are not provided.

Environmental Consequences

General Effects

Short-term impacts on wilderness resources on the forest are not anticipated, because only legal uses will be considered for travel management strategies. Long-term impacts on the wilderness resource are expected only if the selected alternative adds significant additional mileage of non-system miles to the system, restricts the type of activity allowed, or decommissions part of the system, thereby changing the amount of activity allowed. Table 3.31 summarizes the number of miles of system trail open by activity; table 3.32 summarizes miles of non-system ways decommissioned and miles of non-system ways added to the system.

Table 3.31—Miles of system trails in wilderness areas, by alternative

Wilderness	Miles of system trail open					
	Foot/horse			Foot only		
	Alternative A	Alternative F	Alternative G	Alternative A	Alternative F	Alternative G
Collegiate Peaks	12.5	12.5	12.5	0	0	0
Eagles Nest	158.0	158.1	141.4	0	0	13.1
Flat Tops	269.6	269.6	261.0	0	0	0
Holy Cross	114.5	114.5	107.5	0	0	4.9
Hunter-Fryingpan	67.0	67.0	59.8	0	0	0
Ptarmigan Peak	14.1	14.1	14.1	0	0	0
Raggeds	10.9	10.9	10.9	0	0	0
Maroon Bells/Snowmass	152.4	152.4	150.9	0	0	0
Totals	**799.0**	**799.1**	**758.2**	**0**	**0**	**18.0**

Table 3.32—Miles of unauthorized (non-system) trails decommissioned or added to the system by alternative and wilderness area

Wilderness	Miles of unauthorized (non-system) trails					
	Decommissioned			Added to the system		
	Alternative A	Alternative F	Alternative G	Alternative A	Alternative F	Alternative G
Collegiate Peaks	0	4.4	4.4	0	0	0
Eagles Nest	0	17.0	6.6	0	0	10.4
Flat Tops	0	25.5	23.8	0	0	1.7
Holy Cross	0	19.4	17.3	0	0	2.1
Hunter-Fryingpan	0	29.3	29.3	0	0	0
Ptarmigan Peak	0	0	0	0	0	0
Raggeds	0	0	0	0	0	0
Maroon Bells/Snowmass	0	19.3	17.1	0	0	2.0
Totals	**0**	**114.6**	**98.4**	**0**	**0**	16.2

Direct and Indirect Effects

Recreation opportunities. No alternative proposed would add net trail miles to the system inside wilderness. Alternative F would have the greatest drop in miles followed by Alternative G, and Alternative A, the no action alternative, retains current condition. Alternative G is the only alternative that does adopt user created routes.

Prohibitions for stock. Currently, very few trails are closed to stock users. Alternative G would have mileage of trail open to hikers and not to horses. This would only affect the Eagles Nest and Holy Cross wilderness areas, at 13.1 miles and 4.9 miles, respectively. Of the entire forest trail system, this accounts for only 2 percent of the total open wilderness trail miles and far less than 1 percent of the total forest trail miles. Area-wide stock use would continue to be permitted and remains unchanged in all alternatives.

Management of unauthorized trails (non-system trails). Alternative F would decommission the most miles of non-system trails (114.6 miles), followed by Alternative G (98.4 miles). As the non-system routes are returned to their natural state, the opportunities for pristine and primitive recreation opportunities would increase, and opportunities for semi-primitive recreation opportunities would decrease.

Overall, additions to system trails would increase recreational opportunities and the capacity for recreation use. Future planning efforts, specifically the forest-wide recreation capacity analysis, will be used to address site-specific conflicts between trail recreation use numbers and wilderness management direction.

Winter recreation. The area-wide strategy for winter travel within designated wilderness will continue to allow non-motorized and non-mechanized travel both on system trails and cross-country. Designated routes may be required in areas with critical winter range habitat. No significant change in use patterns or activities from the current condition is anticipated.

Cumulative Effects

Since the Wilderness Act constrains the type of recreation activity within designated wilderness to non-motorized and non-mechanized, there are very few cumulative changes that would occur in the types of recreation activities allowed. As private land continues to develop near or adjacent to designated wilderness, the demand for access trails and eventual overall mileage of trails will continue to increase. There is currently an effort underway to add to the overall designated wilderness acreage on the forest. If successful, this proposal may add to the overall trail mileage.

Wildlife

Introduction

The National Forest Management Act (NFMA) requires the forest to maintain habitat for viable populations of all existing vertebrate wildlife species.

The forest plan established several goals, objectives, standards, and guidelines across the forest to maintain or improve habitat for terrestrial and aquatic wildlife species.

The Endangered Species Act of 1973 (as amended) requires all federal departments and agencies to conserve threatened and endangered species and the habitats on which they depend, and to consult with the U.S. Fish and Wildlife Service on all actions authorized, funded, or carried out by the agency to ensure that the action will not likely jeopardize the continued existence of any threatened and endangered species or adversely modify critical habitat (FSM 2670). In addition, the Forest Service requires an evaluation of effects on federal candidate and Forest Service sensitive species and habitat (FSM 2672.4). This evaluation is necessary to ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or animal species or cause any species to move toward federal listing. Determinations of effects on threatened, endangered, and sensitive (TES) species are based on the habitats affected and species occurrence.

In addition to this section and other sections of this EIS, for a complete picture of the terrestrial wildlife, plant, and aquatic species analysis that was completed for this project, see appendix A (Biological Assessment [BA]) for federally listed threatened and endangered species; appendix B (Biological Evaluation [BE]) for sensitive species; appendix C (management indicator species [MIS]); and the forest plan (USDA Forest Service/WRNF 2002a). The details found in those documents will not be repeated here, as they are considered a part of the analysis for decision and are available to the reader.

Assumptions were made concerning the effects of travel management on the species analyzed. These same assumptions are used for the BA, BE, and MIS analyses as well.

- No new road or trail construction is considered in the proposed action.
- The only new ground-disturbing activities resulting from the proposed action will be routine maintenance activities and decommissioning of existing roads and trails.
- Changes will be made to the category of uses among motorized, mechanized, and non-motorized/non-mechanized uses that will result in various levels of impacts on individual species across the forest.
- There will be two types of impacts on species: (1) impacts related to the actual footprint of the road or trail affecting habitat, and (2) disturbance activities resulting from the use of the travelways.
- Each species discussed may have different reactions to motorized, mechanized, or non-motorized/non-mechanized use.
- Decommissioning of identified travelways may take years to fully rehabilitate and resemble surrounding habitats.
- Alternative A, the no action alternative, is considered the current, existing situation on the forest. Alternative A is not compliant with direction in the forest plan. There are a significant number of user-created roads and trails on the forest

that are identified under this alternative. These routes are not a part of the legal White River National Forest transportation system. Motorized or mechanized use of these routes is not legal. There is currently some level of illegal activity from both motorized and mechanized users on some of these routes on the forest, which causes some level of impact on wildlife. The level of illegal use is likely to be more prevalent where prisms remain on the ground. Each of these user-created routes will either be incorporated into the system or decommissioned under Alternatives F or G. The fewer user-created routes left on the landscape, the less likely it is that disturbance to wildlife will occur. The analyses concentrate on what legal uses occur on each system by alternative.

- Alternative F is a minimal action alternative that makes Alternative A compliant with the current forest plan, current laws, and direction. For the majority of the analyses completed for wildlife species, below, the results for Alternatives A and F are very similar or identical. Alternative A differs from Alternative F in that action would be taken to rehabilitate user-created routes in Alternative F. Motorized and mechanized human use currently occurring on user-created routes impacts wildlife in a variety of ways. That use will be unauthorized on those routes scheduled for rehabilitation, and those impacts should be ameliorated as the routes are reclaimed.
- Alternative G is the preferred alternative based on the analysis from the original DEIS, public input, and the application of the national motorized use rule.
- Many of the tables displayed in this document standardize the changes in travelways for comparison purposes. To make comparisons of differing types of habitats and differing sizes of habitats for the various species considered, most analyses use density of miles of travelway per square mile of habitat or the amount of change in travelway density for each alternative, rather than the total number of miles of change within a habitat over the entire forest. For example: the addition of 10 miles of road within a species range of only 20 square miles of habitat would normally be more significant than the addition of 10 miles of road within 1,000 square miles of habitat for another species. Standardization of the analysis displays this as 0.5 new miles of travelway per square mile of habitat in the first scenario, compared to 0.01 miles of travelway per square mile of habitat for the second. It is felt that this comparison is more meaningful than a comparison of total miles of road or trail for each alternative. Similarly, it is felt that more meaningful comparisons among alternatives can be made by using the amount of change based on miles per square mile rather than overall number of miles of change for a relatively large land base across the forest.
- Travel management-related impacts on wildlife vary with the volume, timing, and type of travel; the species of wildlife in the area; the habitats involved; time of day or season of year; and a myriad of other factors. Many of the reports cite effects of roads such as:
    - Habitat fragmentation;
    - Isolation of rare and unique habitats such as bogs or alpine areas;
    - Direct effects such as collisions with animals;
    - Physical destruction of habitats;
    - Abandonment of habitats; and

  - Physiological reactions to stress related to the impacts of travel management.

- No positive benefits to wildlife have been identified from increases in travel management access. Direct and indirect effects on wildlife that have been identified in the literature indicate negative impacts on all studied species as motorized, mechanized and foot and horse uses increase.

Key Indicators

Key indicator: Impacts on wildlife from road and trail activity.

Measure: Road, trail and play area (winter) density by use by habitat type.

Key indicator: Impacts of recreation activity from road and trail use on elk.

Measure: Security habitat.

Key indicator: Impacts on aquatic species from road sedimentation.

Measure: Road density and road proximity to streams and lakes.

Key indicator: Impacts on amphibian species from roads and trails.

Measure: Road and trail proximity to habitat.

Affected Environment

The White River National Forest provides habitat to a wide range of birds, mammals, fish, reptiles, amphibians, and invertebrates, and provides habitats for plants ranging in elevations from 5,500 feet to more than 14,000 feet.

Fish and wildlife habitats are evaluated at various scales. Fisheries are associated primarily with perennial streams, lakes, and reservoirs. The areas of influence for fisheries generally include the watersheds that influence the waters. For this analysis, 6th-level watersheds (subwatersheds) were used. The area of influence for terrestrial wildlife habitat varies with each species evaluated. Some animals may have a limited distribution and home range, while others may be wide-ranging and have extensive distribution. More than 250 species of terrestrial wildlife reside on the White River National Forest, either seasonally or year-long. Seasonal conditions affect the use and location of various species.

Habitat types can be broadly described in ecological categories that occur across the forest. Each provides habitat characteristics special to various species. The ecological categories used for this analysis include: forested, mixed mountain shrub, grass/forb, riparian, aquatic, and alpine regimes. Forested areas are further broken down into conifer forest, aspen, and pinyon-juniper cover types.

Forested

Forested communities provide seasonal and year-round habitat for a wide range of wildlife species found on the White River National Forest. Deer and elk use these areas as summer range. A multitude of avian species can be found in these areas throughout the year, and mammals from shrews to bears also find important habitats within forested communities. Species of special interest within these communities include: Canada lynx, pygmy shrew, boreal and flammulated owls, American marten, northern goshawk, American three-toed woodpecker, and purple martin.

Mixed Mountain Shrub

Mixed mountain shrub communities provide important seasonal habitats for big game that migrate from higher elevation in the summer and fall, to lower-elevation, usually south-facing slopes in the winter and early spring. Elk, mule deer, and bighorn sheep are commonly found using these habitats as winter range areas. A wide range of birds and small mammals also use these habitats year-round. Several species of special interest such as sage grouse, Brewer's sparrow, and Virginia's warbler are tied to these habitats.

These areas often are adjacent to BLM and private lands, and many areas have seen heavy impacts from human development. Mixed mountain shrub habitats provide primary access points to the forest, and many trails and roads dissect these lower elevation areas. These travelways generally follow drainages and ridgelines, which are also highly used by wildlife.

Grass/Forb Meadow

Wildlife species associated with mountain grass/forb meadow habitats include many species of small mammals and birds, including the following species of special interest on the forest: pygmy shrew and elk year-round; and ferruginous hawk, loggerhead shrike, and northern harrier during migration. Both engineered and user-created travelways are commonly found in these habitats because there is no need to clear vegetation to establish a travel route.

Riparian Areas and Wetlands

Although a very limited amount of the White River National Forest is classified as riparian (less than 3 percent), riparian areas receive a disproportionate share of wildlife use. Many terrestrial and aquatic wildlife species found on the forest—including amphibians, waterfowl, and shorebirds—use riparian habitats as their primary habitat association. Roads and trails often exist in areas that also provide some of the most important wildlife habitats. Wetlands are found in association with streams, lakes, ponds, reservoirs, springs, bogs, and marshes. These wetlands range from areas that are permanently submerged with emergent vegetation to areas that are only seasonally saturated at the surface following snowmelt and vegetated by sedges, rushes, and willows. Traditionally, many of the existing travelways are adjacent to riparian and stream corridors.

Aquatic

Aquatic ecosystems include the stream channel, lake or estuary bed, water, biotic communities, and the habitat features that occur therein. Cold-water fish habitat on the forest is characterized by clear, cold water; a silt-free rocky substrate in riffle-run areas; areas of slow, deep water; well-vegetated, stable streambanks; and lacustrine (lake) habitat, which is characterized by clear, cold, deep lakes and reservoirs. Warmer-water fish species of interest occur in streams and rivers at lower elevations on the forest and downstream of the forest.

Alpine

Alpine areas have an abundance of wildlife use during the short summer season but only a few hardy species such as the white-tailed ptarmigan use alpine habitats year-round. Species of special interest in the alpine communities include: elk, wolverine, and white-tailed ptarmigan. Alpine areas also offer potential habitat for the federally listed

threatened Uncompahgre fritillary butterfly. Table 3.33 lists the species evaluated and their associated habitat types.

Table 3.33—Species evaluated and their associated habitat types

Species	Habitat Classification					
	Mixed mountain shrub	Forest	Grass/ forb	Riparian and aquatic	Alpine	Location of evaluation in this EIS
Mammals						
Townsend's big-eared bat	P	P	P	P		BE
Spotted bat	P	P	P			BE
Wolverine	P	P	P	P	P	BE
River otter				P		BE
American marten		P		P	S	BE
Fringed myotis	P	P				BE
Pygmy shrew		P	P	P		BE
North American (Canada) lynx	P	P	P	S	S	BA
Cave bats	P	P	P	P		MIS
Elk	P	P	P		S	MIS
Bighorn sheep		P	P		P	BE
Birds						
Northern goshawk	S	P	S	P		BE
Boreal owl		P				BE
Sage sparrow	P					BE
Ferruginous hawk			P			BE
Greater sage grouse	P					BE
Northern harrier	S		P	S		BE
Olive-sided flycatcher		P				BE
Black swift				P		BE
American peregrine falcon	S	P	P	P	S	BE
White-tailed ptarmigan				S	P	BE
Loggerhead shrike	P		P			BE
Lewis' woodpecker				P		BE
Flammulated owl		P				BE
American 3-toed woodpecker		P				BE
Purple martin	S	P	S			BE
Brewer's sparrow	P					BE, MIS
Columbian sharp-tailed grouse	P		S	S		BE
Mexican Spotted owl		P				BA
Bald eagle				P		BE
American pipit					P	MIS
Virginia's warbler	P					MIS
Amphibians						
Boreal toad				P		BE
Northern leopard frog				P		BE

Species	Habitat Classification					
	Mixed mountain shrub	Forest	Grass/ forb	Riparian and aquatic	Alpine	Location of evaluation in this EIS
Fish						
Colorado River cutthroat trout				P		BE
Roundtail chub				P		BE
Bluehead sucker				P		BE
Flannelmouth sucker				P		BE
Mountain sucker				P		BE
Colorado pikeminnow				P		BA
Humpback chub				P		BA
Razorback sucker				P		BA
Bonytail				P		BA
Greenback Cutthroat trout				P		BA
All Trout				P		MIS
Invertebrates						
Great Basin silverspot				P		BE
Uncompahgre fritillary butterfly					P	BA
Aquatic macroinvertebrates				P		MIS
Plants						
Carex diandra				P		BE
Cypripedium parviflorum		P				BE
Eriophorum altaicum				P		BE
Eriophorum chamissonis				P		BE
Eriophorum gracile				P		BE
Ptilagrostis porteri					P	BE
Armeria maritima					P	BE
Astragalus leptaleus					P	BE
Astragalus wetherillii	P					BE
Braya glabella					P	BE
Cirsium perplexans	P					BE
Draba exunguiculata					P	BE
Draba grayana					P	BE
Ipomopsis globularis					P	BE
Machaeranthera coloradoensis			P		P	BE
Parnassia kotzebuei				P		BE
Penstemon harringtonii	P					BE
Phacelia scopulina	P					BE
Ranunculus karelinii				P		BE
Thalictrum heliophilum	P					BE
Eutrema penlandii					P	BA

P= Primary habitat, S= Secondary habitat; BA=appendix A, BE=appendix B, MIS=appendix C

Environmental Consequences

General, Direct, and Indirect Effects: Terrestrial and Aquatic

The White River National Forest and adjacent BLM lands contain large tracts of relatively unroaded, unfragmented land that provide essential habitat to fish and wildlife. Most of these areas are associated within existing wilderness, recommended wilderness, research natural areas, backcountry non-motorized areas, and other management areas where motorized travel is restricted or prohibited. Collectively these tracts of land provide large tracts of undisturbed land important for a wide range of wildlife to provide security from motorized human activities. Natural disturbance (such as fire and avalanche), and human-caused use (such as mining, timber harvest, or private land development) contribute to the degree of habitat patchiness of the landscape. On a landscape scale, habitat security areas and wilderness contribute to regional biodiversity. Regional biodiversity refers to the pattern of habitats and species across a land area of thousands to millions of acres. This level of biodiversity has important functional ramifications. For instance, many wide-ranging animals require a variety of habitat types occurring across a large geographic area.

Several recreational based communities are located within close proximity of the forest and are sources of intense recreational activities. The towns of Aspen, Glenwood Springs, Snowmass Village, Vail, and Avon, and communities in Summit County, are associated with local ski areas and other year-round tourist activities such as mountain biking, climbing, hiking, four-wheel driving, backpacking, and pack trips. The activities centered in these towns result in high levels of human activity on the surrounding National Forest System lands. Other high-use activities across the forest include snowmobiling, all-terrain vehicle riding, motorcycling, fishing, driving for pleasure, camping, and hunting. This amount of activity is likely to reduce habitat effectiveness, increase stress, and displace animals from preferred habitats. The location of recreational activities has a significant effect on the magnitude of impact.

For big game, the greatest impact occurs where recreational activities occur within seasonal concentration areas and key habitats. The Colorado Division of Wildlife (CDOW) has provided maps of seasonal concentration areas to identify areas of concern. These maps were used during the forest plan revision to map areas of concern for specific wildlife species. Conflicts between current recreational activities and sensitive wildlife habitats have been identified on the forest. These conflicts are associated with periods of consecutive use. The maximum disturbance occurs when human activities coincide with critical wildlife use periods. Animals are stressed and/or displaced from preferred habitats to areas that are less desirable. Displaced animals also seek undisturbed habitats on adjacent private lands that contribute to game damage problems.

Activities that influence water quality have a direct effect on aquatic populations. Water quality and stream physiographic factors that influence these populations are sedimentation, water temperature, in-channel wood, water depth, and change in stream bank or shoreline vegetation. The demand from recreation requiring an increase in roads and trails can lead to additional sedimentation into waterways, straightening and simplification of channels, removal of vegetation, and blockage of passage at crossings if not properly engineered. Mining activity and timber harvesting, including the travel systems associated with these activities, and natural occurrences such as fire and landslides, also lead to changes in water quality.

Travel management-related impacts on wildlife vary with the volume, timing, and type of travel; the species of wildlife in the area; the habitats involved; time of day or season of

year; and a myriad of other factors. Several recent literature reviews of recreational impacts on wildlife have been completed. These include: *Effects of Winter Recreation on Wildlife of the Greater Yellowstone Area: A Literature Review and Assessment* (Olliff et al. 1999); *Effects of Recreation on Rocky Mountain Wildlife Habitat* (Joslin and Youmans 1999); *The Environmental Impacts of Recreation: a Bibliography* (Anon 1999); *Forest Roads: A Synthesis of Scientific Information* (USDA Forest Service 2000c); *Wildlife and Recreationists: Coexistence Through Management and Research* (Knight and Gutzwiller 1995); *Effects of Off-road Recreation on Deer and Elk* (Wisdom et al. in press); and *The Effects of Highways on Elk (Cervis elaphus) Habitat in the Western United States and Proposed Mitigation Approaches* (Ruediger et al. 2006). These exhaustive reviews of past studies contain a wealth of information concerning the impacts on wildlife from vehicular and other types of recreation use. Many of the reports cite the effects of roads on habitat fragmentation; isolation of rare and unique habitats such as bogs or alpine areas; direct effects such as collisions with animals and physical destruction of habitats; barriers to movement; abandonment of habitats; and physiological reactions to stress related to the impacts of travel management. The widespread, detrimental impacts of human disturbance on wildlife are well-documented throughout these reports.

General, Direct, and Indirect Effects: Terrestrial Species

Studies of the effect of human disturbance on wildlife have revealed there are critical periods for many species of birds and mammals (Knight and Gutzwiller 1995). The immediate postnatal period in mammals and the breeding period in birds are often the most sensitive. On the White River National Forest, elk calving normally occurs between early May to the end of June. Deer fawning and bighorn sheep lambing also occurs during this general period. The breeding and nesting season for birds generally is from March through June. Species of raptors such as the northern goshawk are extremely sensitive to disturbance during the nesting season, and repeated disturbance may cause abandonment of the nest. Activities within a quarter-mile of an active nest should be avoided from March 1 to July 31 (USDA Forest Service/WRNF 2002a). Seasonal concentration areas of concern for elk on the forest include elk calving areas, summer concentration areas, and elk security areas. The identification of these seasonal ranges and key habitat areas is based on mapping provided by the CDOW and was used to establish several of the management areas allocated during the forest plan revision.

American Elk. Elk was chosen as the primary MIS species for studying the effects of travel for a variety of reasons. It is a species for which a considerable amount of time, effort, and funding has been expended to document the potential impacts from travel management-related issues. Literature reports that elk respond negatively to human access into their range.

Effects From Human Activity

Human activities can disturb wildlife. Some activities may have serious consequences as the result of interactions between recreational disturbances and wildlife, while others have little or no effect. The type and magnitude of impacts on wildlife vary by the type of recreation activity, predictability, frequency and magnitude, timing, and location of disturbance (Knight and Gutzwiller 1995).

Impacts on big game are a significant issue related to travel management. Therefore, much of this analysis is focused on these species. Most available research on the effects of recreational activities on wildlife is related to the impacts of motorized vehicles on elk, and to a lesser extent on deer.

One study in the Pole Mountain area of the Medicine Bow National Forest in south central Wyoming provides some information on elk behavior in relation to other types of recreational activity (Ward and Cupal 1979). On the basis of radio telemetry monitoring it was demonstrated that elk prefer to be at least ½-mile from people engaged in such activities as camping, fishing, and picnicking. The heart rates of two adult cow elk and a spike bull showed definite increases on 21 of 23 occasions when people walked within 0.2 miles of the animals when they were in timber; the animals responded by moving away on 16 of the 21 occasions. Moving automobiles and trail bikes had little effect on elk resting in timber at distances of more than 0.2 miles, but the animals' heart rates increased 24 out of 41 times at closer distances. Elk also showed significant reaction when vehicles stopped within 0.33 mile. Therefore, it appears as though elk tolerate a variety of human activities beyond a threshold distance of ¼- to ½-mile (Ward and Cupal 1979).

The predictability of a given activity shapes wildlife response to it. When animals perceive a disturbance as frequent enough to be "expected" and non-threatening, they show very little overt response. For example, elk are easily conditioned to repeated patterns of human activity within their home range, but are also keenly aware of deviations from normal patterns (Thomas and Toweill 1982). Ward (1973) showed that elk seldom are alarmed at normal disturbance-type activities such as vehicular traffic, camping, fishing, or other recreational activities beyond a threshold distance of ½ mile. Activities within this distance, however, resulted in evasive movement by elk to reestablish and maintain a ½-mile buffer between themselves and the human activity.

The frequency and magnitude of disturbance affect the degree to which wildlife are affected. A number of studies have established the consistent year-round influence of motorized vehicles on elk use of preferred habitats (Thomas and Toweill 1982). Ward (1976), Perry and Overly (1977), Lyon (1979), and others have documented a decline in elk use of areas adjacent to roads. The width of the area avoided by elk has been reported as ranging from 0.25 to 1.8 miles, depending on the amount and kind of traffic, quality of the road, location, and density of the cover adjacent to the road. Elk habitat effectiveness is adversely influenced by the presence of roads and trails that are open to vehicular traffic (Hoover and Wills 1984, Thomas et al. 1979). In general, habitat effectiveness decreases in proportion to the amount of open (motorized) routes per square mile of habitat (Lyon 1983).

On the White River National Forest, the magnitude of disturbance to elk increases dramatically during the big game hunting seasons. The hunting seasons begin with archery season in late August and run consecutively through the end of the fourth rifle season in mid-November. Some areas may be included in late seasons that run into January. Roads and trails that normally receive little or no use are used heavily on a daily basis during the hunting seasons.

Hunted populations of elk, such as those on the White River National Forest, are extremely wary of people and sensitive to danger because of the annual hunting seasons. In western Montana, undisturbed elk used habitats in proportions similar to their availability (Hurley and Sargeant 1990). Disturbance by hunters had little effect on elk living in unroaded areas; however, elk living in areas with open roads spent more time away from roads and in dense cover. Other studies have documented that elk behavior changes in response to the hunting season (Hillis et al. 1991). Elk avoid areas adjacent to roads with vehicular traffic, especially during the hunting seasons. Elk movements are generally confined to habitats within a traditionally used home range but they spend more time in dense cover during hunting season than they do before the hunting season. Elk also respond to hunting pressure by moving to adjacent undisturbed areas or refuges such

as national parks (Thomas and Toweill 1982) or large tracts of private land closed to hunting.

Displacement of elk onto private land is one of the issues with current travel management on the forest. This results in several problems. Elk leave suitable habitat on the forest and go to less suitable but more secure areas on private land. Elk can cause damage to private land. Harvest objectives cannot be met because hunters do not have access to much of the private land, and the desired population reduction through harvest cannot occur. The vulnerability of elk to harvest is greater in roaded habitats than in unroaded habitats (Hurley and Sargeant 1990, Leptich and Zager 1990, Unsworth and Kuck 1990). Studies have documented that bull elk in roaded habitats are more than twice as likely to be killed during the fall hunting seasons as those in areas with very few roads (Unsworth and Kuck 1990). The annual harvest influences the population structure of big game herds as well as hunter opportunities. Areas with high harvest have fewer mature bulls within the population, which can affect herd genetics.

A variety of studies have demonstrated that elk vulnerability may be reduced, and hunter opportunity may be increased, by providing security areas for elk during the hunting seasons.

Habitat Security Areas

The habitat security areas mapped for the forest represent large (minimum of 250 contiguous acres), relatively unfragmented tracts of land. These areas are a minimum of ½ mile from any road or trail open to motorized use. Habitat security areas represent most native ecosystem types and seral stages across their natural range of variation and provide suitable habitats for those species sensitive to fragmentation and disturbance. These habitat security areas help offset the impacts of intensively roaded portions of the forest and contribute to the maintenance of viable populations of native species in natural patterns of abundance and distribution.

Table 3.34—Summary of summer travel management, by miles, on the White River National Forest

Legend	Alternative A	Alternative F	Alternative G
Licensed motorized only	15	15	585
Licensed and unlicensed allowed	1724	1724	850
Motorized vehicles < 50” in width	109	109	143
Motorized two-wheeled vehicles	43	43	67
Mechanized (bicycles)	740	737	596
Foot and horse (pack animal)	1339	1344	1440
Managed under special use permit	126	125	212
Closed to the public but remain on the system	60	59	32
Closed to the public but not decommissioned or rehabilitated	1252	0	0
Closed to the public and to be or already decommissioned/rehabilitated	0	1252	1483
Total	**5408**	**5408**	**5408**

Table 3.35—Security blocks on the White River National Forest

	Alternative A	Alternative F	Alternative G
Number of security blocks	105	105	98
Acres of security blocks	1,427,259	1,427,259	1,498,622
% of forest in security blocks	62%	62%	66%

Alternative A. Existing system roads and trails would continue to be used with the exception that within management areas that have road or trail density restrictions, some roads and trails have been identified for closure to assure compliance with forest plan direction. No unauthorized roads or trails would be added under this alternative, but these routes would not be scheduled for decommissioning in this alternative (except for routes already covered for decommissioning under existing NEPA. Table 3.34 demonstrates the amount of roads and trails left on the system. Table 3.35 displays the number of security blocks across the forest under each alternative. There would be a total of 204 blocks of security habitat that total over 1.4 million acres (62 percent of the forest) under Alternative A.

Alternative F. Alternative F is the minimal action alternative which makes Alternative A compliant with the forest plan direction and all applicable laws and regulations. Under this alternative all user-created routes are rehabilitated. No routes are adopted. No system routes are decommissioned. Tables 3.34 and 3.35 display the number of miles of roads and trails and the number of blocks of security habitat that would be open under this alternative. Although there are fewer numbers of blocks, the total acreage is the same as under Alterative A, indicating that at least some of the blocks are larger.

Alternative G. Alternative G is the preferred alternative and was designed by looking at the DEIS, public input, and implementation of the travel rule. This alternative also looks at which routes should be part of the system and which should be decommissioned or rehabilitated. This alternative has the greatest amount of security blocks.

Important Seasonal Big Game Habitats

Deer and Elk

Animals concentrate on their winter range from as early as October, until late March or April. Mule deer rely almost exclusively on browse species such as gambel oak, sagebrush, mountain mahogany, serviceberry, chokecherry, and bitterbrush. Elk prefer grass but will use browse when grass is unavailable during periods of heavy snow. Elk also tend to winter higher in elevation than deer. Elk and mule deer use the forest primarily as summer range.

Although portions of the forest provide important big game winter range, overall less than 10 percent of the winter range for deer and elk using the White River National Forest during the summer months is located within the forest boundary. Most winter range occurs at lower elevations (6,000 to 8,000 feet) on adjacent private or BLM lands. Important deer and elk winter range is identified within the forest plan as management area 5.41 and some management areas of 5.43. These management areas include most, but not all, of the important deer and elk winter range that occurs on National Forest System lands.

Key elk calving areas are located throughout the forest. The calving grounds identified are preferred calving areas, used annually by elk herds. Many 5.43 management areas delineated in the forest plan protect these important habitat areas. On the White River

National Forest, elk calving occurs from early May to the end of June, with peak activity around early June. Mule deer fawning occurs near the upper limits of their winter range, in lower elevation brush fields and forest ecotones. No specific fawning grounds have been identified on the forest.

Summer concentration areas are generally preferred areas with available cover, feed, water, and space, and are highly influenced by open road density, human activity, forage availability, and presence of cattle. During hunting seasons (late August through mid November) elk seek security areas on the forest and adjacent BLM or private lands. Security areas are remote, unroaded tracts of land that reduce elk vulnerability to harvest.

Threatened, Endangered, and Sensitive Species

Effects on threatened and endangered species are based on the habitats affected and species occurrence. Critical habitats for federally listed threatened and endangered species have not been delineated on National Forest System lands on the White River National Forest. Since no critical habitat has been identified, suitable habitat within the range of the species is considered. Federal candidate and Forest Service sensitive species have no formal critical habitat designation. Many of these species are associated with rare or unique habitats or are disjunct, remnant populations. Impacts can occur on individuals or on the population. A biological assessment (BA) for the forest plan was prepared by the Forest Service in consultation with the U.S. Department of the Interior, Fish and Wildlife Service (USFWS), to determine the effects on federally listed and proposed species. A biological evaluation (BE) for the forest plan was also prepared by the Forest Service to determine the effects on all Forest Service sensitive species and habitat Both of these documents are incorporated by reference into this analysis. Additionally, an updated BA and BE were prepared for this document. They are found as appendices A and B of this document. The reader is referred to those documents for completed impacts analyses for the respective species.

MIS

Amendment 3 to the forest plan (Dated March 6, 2006) revised the management indicator species (MIS) for the White River National Forest. The MIS from this amendment are analyzed in appendix C to address potential impacts on wildlife from implementing the various alternatives. A thorough viability assessment of species found on the White River National Forest was completed as a portion of the forest plan.

American elk is analyzed in depth, above and in amendment C. The following forest plan management indicator species objective applies to elk:

> "Manage motorized and non-motorized travel and recreation management to maintain effective use of habitat by large wild ungulates" (USDA Forest Service/WRNF 2002a).

All action alternatives of the travel management plan meet this objective. Analysis at the DAU and the forest-wide levels indicate that habitat effectiveness would be maintained or improved under all action alternatives.

For cave bats, Brewer's sparrow, American pipit, and Virginia's warbler the analysis completed in appendix C determined that in the action alternatives there may be a slight, long-term beneficial effect on overall habitat for all MIS due to road and trail decommissioning and rehabilitation. These species will continue to be monitored across the forest using the protocols developed as a part of the forest plan.

General Wildlife Habitats

The maintenance and use of routes continues to remove vegetation, logs, and rocks from route corridors. This can result in loss of habitat. The significance of the impact depends on the abundance of habitat, the magnitude of the disturbance, and the resulting fragmentation and isolation of habitats and species. Short-term impacts on habitat and/or individuals could include the loss of a nest or den site. A long-term loss could include a large-scale vegetation removal or fragmentation of old-growth forest habitat or loss of wetlands. The alternatives contain a variety of routes and uses of existing roads and trails. Under the action alternatives, some of the existing roads would no longer be used for travel and would be decommissioned and revegetated over time. There would be a long-term benefit to wildlife habitat as a result of reducing the number of routes. There is a potential for impacts on individual animals from maintenance, use, and decommissioning of roads and trails when they are located within suitable, occupied habitat. Off-route travel is prohibited throughout the forest, but some level of illegal use is expected to continue. This illegal use will continue to affect individuals of some wildlife species. Individuals can be crushed by maintenance equipment and by users on and off route. The most susceptible species are rare plants and those animals with small home ranges and/or low mobility.

For the purposes of discussing potential impacts on a wide range of wildlife species (those not included as management indicator species or as threatened, endangered, or sensitive species, which are discussed in appendices A, B, and C of this document), the forest was organized into the following general habitat classifications: alpine, forested, grassland/forbland, riparian, and shrublands. Analysis for each of these types included the number of miles of roads or trails open to the various use types for each alternative.

Alpine

Alpine areas are defined as areas that rise above the cold limits of trees. There are approximately 304,000 acres (475 square miles, or 13 percent or the forest) of alpine habitats on the White River National Forest. These areas are characterized by having severe weather conditions with very short growing seasons. Soils are generally very shallow and take many years to reestablish following disturbances. Many specialized plants and animals often live life “on the edge” in these rugged environments. One threatened plant, the Penland alpine fen mustard, and many of the sensitive plants that occur on the White River National Forest, occur in this life zone. These plants are discussed in the BA (appendix A) and BE (appendix B). White-tailed ptarmigan and several species of rosy finches have adapted to life in the alpine areas of the forest. Bighorn sheep and Rocky Mountain goat can be found in suitable alpine habitats especially during the summer months, but some areas of winter range are also located on windblown alpine slopes. Elk are often found in alpine habitats during the summer. Analysis for alpine habitats is presented in table 3.36.

Table 3.36—Travelway densities by alternative for lands within the alpine habitats on the White River National Forest

Type of use	Density (miles per square mile)*		
	Alternative A	Alternative F	Alternative G
Motorized	0.11	0.11	0.10
Mechanized	0.07	0.07	0.06
Motorized/mechanized	0.18	0.18	0.16
Foot/horse	0.26	0.26	0.26
Total	0.44	0.44	0.42
Scheduled for decommission (reduction in density)	0.00	0.00	12.47

**Approximately 475 square miles of potential habitat were analyzed for this species.*

Within alpine habitats, Alternative F does not change any authorized travelways from alternative A. Alternative G reduces authorized motorized use by about 3 miles, mechanized use by 7 miles and foot/horse use by 3 miles. Planned decommissioning of travelways would reduce open authorized travelway density in Alternative G when compared to the current, existing situation and Alternative F.

Forests

The forest category includes all the major forested types across the White River National Forest, including spruce/fir, lodgepole pine, aspen, Douglas-fir, pinyon/juniper, and blue spruce. A total of 1,581,000 acres (2,470 square miles) of forest types are found on the White River National Forest, or approximately 70 percent of the entire forest. A wide range of species of reptiles, amphibians, birds, and mammals use these habitats for various life history requirements throughout the year. These habitats are found from the lower pinyon/juniper stands on the western sections of the forest at about 6,000 feet to the spruce/fir at approximately 11,500 feet, where alpine habitats start. Elk, deer, and bighorn sheep are the species for which the most information exists, documenting potential impacts from various forms of human access to the forest. The great majority of the research done on these species indicates that they show negative reactions to close human intrusions into their habitat. Other species are likely react in similar manners to various degrees to human intrusions. Table 3.37 shows the analysis for forested habitats.

Table 3.37—Travelway densities by alternative for lands within the forested habitats on the White River National Forest

Type of use	Density (miles per square mile)*		
	Alternative A	Alternative F	Alternative G
Motorized	0.47	0.47	0.42
Mechanized	0.20	0.20	0.17
Motorized/mechanized	0.67	0.66	0.58
Foot/horse	0.35	0.35	0.36
Total	1.01	1.01	0.95
Scheduled for decommission (reduction in density)	0.00	0.25	0.30

**Approximately 2226 square miles of potential habitat were analyzed for this species.*

Within forested habitats, Alternative F decreases mechanized access by approximately 5 miles forest-wide, while increasing foot/horse use by 4 miles. Alternative G decreases motorized travelways by 110 miles and mechanized by 69 miles. This alternative increases foot/horse by 39 miles. Planned decommissioning and rehabilitation of travelways would reduce open travelway density in both the action alternatives when compared to the current, existing situation. Alternative G would have the fewest impacts on species that are affected by motorized or mechanized use of forested lands.

Mixed Mountain Shrub

Mixed mountain shrub communities are generally found in the lower elevations and are more common on the western portion of the forest. They constitute approximately 13 percent of the forest (286,000 acres) and are composed of various combinations of the following major shrub types: sagebrush (*Artemsia spp*.), Gambel oak (*Quercus gambelli)*, chokecherry (*Prunus virginianus)*, mountain mahogany (*Cercocarpus montanus*) and serviceberry (*Amelanchier alnifolia*). Analysis for mixed mountain shrub habitats is presented in table 3.38.

Table 3.38—Travelway densities by alternative for lands within the mixed mountain shrub habitats on the White River National Forest

	Density (miles per square mile)*		
Type of use	**Alternative A**	**Alternative F**	**Alternative G**
Motorized	0.99	0.99	0.85
Mechanized	0.27	0.27	0.18
Motorized/mechanized	1.26	1.26	1.03
Foot/horse	0.33	0.33	0.41
Total	1.59	1.59	1.44
Scheduled for decommission (reduction in density)	0.58	0.11	0.44

**Approximately 434 square miles of potential habitat were analyzed for this species.*

For authorized uses within shrubland communities that may support various wildlife populations, Alternative F and A are identical. Alternative G reduces motorized and mechanized road and trail density, and increases foot and horse density over Alternative A. Planned decommissioning and rehabilitation of travelways would reduce open travelway density in all the alternatives. Some additional uses are expected on established travelways by foot and horseback users. Alternative G will have the least impact species that are negatively affected by motorized and mechanized uses.

Grass/Forb Meadows

Approximately 20 percent of the White River National Forest is composed of grass/forb lands (386,000 acres). These communities are made up of a wide range of grasses and forbs; the specific mix of species depends in large part on elevation, slope, and soil types. Table 3.39 presents the analysis for grass/forb meadow habitats.

Table 3.39—Travelway densities by alternative for lands within the grass/forb meadow habitats on the White River National Forest

Type of use	Density (miles per square mile)*		
	Alternative A	Alternative F	Alternative G
Motorized	0.86	0.86	0.74
Mechanized	0.24	0.23	0.17
Motorized/mechanized	1.10	1.09	0.91
Foot/horse	0.61	0.61	0.65
Total	1.70	1.70	1.57
Scheduled for decommission (reduction in density)	0.00	0.34	0.46

**Approximately 557 square miles of potential habitat were analyzed for this species.*
**Approximately 603 square miles of potential habitat were analyzed for these areas.*

Within grass/forb habitats, Alternatives A and F allow approximately the same authorized uses. Alternative G would reduce a total of approximately 65 miles of motorized travelways and 35 miles of mechanized routes, while adding approximately 25 miles of foot and horse access. Planned decommissioning of travelways would reduce open travelway density in Alternatives F and G when compared to the current, existing situation.

Riparian

Although a very limited amount of the forest is classified as riparian (less than 3 percent at 54,000 acres), riparian areas receive a disproportionate share of wildlife and amphibian use. Riparian habitats are generally considered to be diverse in vegetation, amphibian, and animal diversity, due in large part to the presence of water. The communities that make up riparian habitats on the White River National Forest also are diverse, varying from low-elevation cottonwood/willow woodlands along stream channels, to blue spruce/dogwood-dominated forested communities, to high-elevation willow carrs. Table 3.40 presents the analysis for riparian habitats.

Table 3.40—Travelway densities by alternative for lands within the riparian habitats on the White River National Forest

Type of use	Density (miles per square mile)*		
	Alternative A	Alternative F	Alternative G
Motorized	1.03	1.03	0.91
Mechanized	0.52	0.52	0.44
Motorized/mechanized	1.55	1.55	1.35
Foot/horse	0.96	0.96	1.00
Total	2.51	2.51	2.35
Scheduled for decommission (reduction in density)	0.00	0.39	0.52

**Approximately 91 square miles of potential habitat were analyzed for this species.*

Alternatives A and F provide the same authorized uses within the riparian habitats on the White River National Forest. Alternative G reduces both motorized and mechanized uses but does increase the foot and horse access slightly (approximately 4 miles). Planned decommissioning of travelways would reduce open travelway density in Alternatives F and G when compared to the current, existing situation.

General, Direct, and Indirect Effects: Aquatic Systems

General Effects

For this analysis, it is assumed that when a road is closed it is closed effectively such that it ceases to have impacts on the aquatic system. Seventh level hydrologic unit codes (HUCs) were used for this analysis and are referred to here as "catchments." There are 388 catchments wholly or partially on the White River National Forest.

The effects of roads on aquatic organisms are well documented. A synthesis of road impact information can be found in "Forest Roads: A synthesis of scientific information" (Gucinski and Furniss 2000). Some of the key findings from this document that relate to travel management include both physical and biological effects:

Physical effects include:

- "Roads affect geomorphic process by four primary mechanisms: Accelerating erosion from the road surface and prism itself by both mass and surface erosion processes; directly affecting channel structure and geometry; altering surface flowpaths, leading to diversion or extension of channels onto previously unchannelized portions of the landscape; and causing interactions among water, sediment, and woody debris at engineered road-stream crossings."
- "Roads have three primary effects on water: they intercept rainfall directly on the road surface and road cutbanks and intercept subsurface water moving down the hillslope; they concentrate flow, either on the surface or in an adjacent ditch or channel; and they divert or reroute water from flowpaths that it would otherwise take if the road were not present."

These physical effects lead to the following biological effects:

- "Increased fine-sediment composition in stream gravel has been linked to decreased fry emergence, decreased juvenile densities, loss of winter carrying capacity, and increased predation of fishes."
- "The effects of roads are not limited to those associated with increases in fine-sediment delivery to streams; they can include barriers to migration, water temperature changes, and alterations to streamflow regimes."
- "Road-stream crossings have been shown to have effects on stream invertebrates. Hawkins and others found that the aquatic invertebrate species assemblages (observed versus expected based on reference sites) were related to the number of stream crossings above a site."
- "Several studies at broad scales document aquatic habitat or fish density changes associated with road density or indices of road density."

Effects of the travel management plan were determined by analyzing three indicators: total road miles or road density by catchment, total road miles within 300 feet of streams or rivers by catchment, and number of road crossings by catchment. Roads only were selected for this analysis since, in general, they have greater impacts on aquatic systems than trails due to their larger size and level of disturbance. Winter use was not analyzed since there is no associated ground disturbance.

Road Density

Table 3.41 displays the total number of open roads and the forest-wide road density for all alternatives. Although road density generally decreases in each action alternative, in

localized areas alternative G has more miles than alternative A-the no action alternative, which although there are improvements in some watersheds, others are more impacted.

Table 3.41—Miles of road and road density by alternative

	Alternative A	Alternative F	Alternative G
Miles of road	2610	2339	2050
Average road density (miles per square mile)	0.73	0.65	0.57

Roads Within 300 Feet of Streams

The closer a road is to a stream system, the greater the impacts on the stream and the organisms inhabiting it. Roads directly adjacent to streams can impact streams by channelizing the stream, eliminating streamside vegetation, and introducing sediment into the stream. Road-stream crossings are addressed separately.

Table 3.42 displays the total miles of maintenance level 1 and 2 roads, the percent of all ML 1 and 2 roads, and the proportion of roads to be closed within 300 feet of streams and rivers for all alternatives. Alternative A has the greatest length of open road within 300 feet of streams and rivers, followed by Alternative F. Alternative G has the least amount of road within 300 feet of streams and rivers. The percent of the road system within 300 feet of streams and rivers is consistent in all alternatives and the roads closed near streams and rivers are proportional to the overall road distribution. There are six catchments and subwatersheds with at least 5 miles of ML 1 and 2 road within 300 feet of a stream in one or more alternative (table 3.43).

Table 3.42—Miles of maintenance level 1 and 2 roads within 300 feet of streams and rivers, and the proportion of open roads and road closures within this area

	Alternative A	Alternative F	Alternative G
Miles of ML 1 & 2 road within 300 feet of streams	642	544	454
% of ML 1 & 2 roads within 300 feet of streams	33.0%	32.5%	32.6%
% of road closures* within 300 feet of streams	n/a	36.2%	33.9%

**Road closures are changes from Alternative A*

Table 3.43—Subwatersheds on the White River National Forest with at least 5 miles of maintenance level 1 and 2 road within 300 feet* of a stream or river

Watershed Name	Alternative A	Alternative F	Alternative G
Swan River	22.2	20.1	17.6
Green Mtn Reservoir Composite watershed	10.3	10.1	6.0
Straight Creek	7.7	2.7	4.5
Upper Snake	6.9	6.5	7.2
Peru Creek	6.9	5.8	6.8
Deep Creek (Blue River)	5.8	4.1	2.8

**Road miles within 300 feet are presented for all alternatives*

Road-stream Crossings

Road-stream crossings are areas where the impacts of roads are the greatest in terms of channel impacts, sediment, and potential movement barriers. Numbers of crossings presented in this section are not accurate and may be overestimated by up to 30 percent due to inaccuracies in our GIS data layers. Although not all of the crossings discussed in this section are true stream crossings, if a road segment comes close enough to the stream for it to be considered a crossing, it is probably an area of acute road impacts, though not necessarily a barrier. While absolute counts of stream crossings in this analysis are not reliable, the relative differences between alternatives is considered "very good" since the same line sets were used for each alternative (the difference is whether they are open or closed). Stream crossings from maintenance level 1 and 2 roads occur in 178 of 388 catchments. Alternative F has a 16 percent reduction in the number of stream crossings, and Alternative G has a 29 percent reduction in stream crossings (table 3.44).

Table 3.44—Number of maintenance level 1 and 2 road crossings by type of stream for each alternative

Type of stream	Alternative A	Alternative F	Alternative G
Perennial	407	330	294
Intermittent	1012	859	722
Swale	812	675	571

Macroinvertebrates

Aquatic macroinvertebrates are those invertebrates that spend at least part of their life cycle in water. These include worms, mollusks, mites, and insects. Insects are by far the most common. Most insect species spend just the immature phase (larval or nymph phase) in water.

Macroinvertebrate communities occur in all water bodies on the White River National Forest, including ponds, lakes, reservoirs, wetlands, rivers, perennial streams, and intermittent streams. Even degraded systems usually contain aquatic macroinvertebrates, however these communities look very different from those in pristine systems. Because of their wide distribution and their sensitivity to disturbance and pollutants, macroinvertebrates are widely used to monitor the health of streams and rivers.

Macroinvertebrate communities are influenced by the timing of flow and water quality in the streams in which they live. Geology, elevation, temperature, gradient, and substrate distribution are other factors that commonly influence macroinvertebrate communities. As habitats are degraded, either by chemical pollutants, increased sediment, or unfavorable changes in flow (especially severe reductions), the response of the macroinvertebrate community is typically a reduction in the number of species which occur there, and especially the number of sensitive species.

All alternatives improve the current situation by removing roads that currently exist (see discussion above under "Aquatic systems – general effect"). In the years following this decision, actions will occur to that reduce the impact of these roads. Expected treatments range from allowing a road to revegetate naturally to active recontouring. Some roads will be converted to trails. It is expected that the footprint of the travelway will be reduced when roads are converted to trails. Overall, this project is expected to improve trends in macroinvertebrate populations forest-wide by reducing the impacts of roads currently existing. The magnitude of this improvement varies by alternative, with Alternative F offering the least amount of improvement and Alternative G offering the greatest amount of improvement to forest-wide trends.

Fish

Although the primary risk factors for fish species are biological (exotic species and to some degree disease), roads can further impact these populations by creating barriers to fish movement, degrading habitat by constraining streams and eliminating riparian vegetation, introducing sediment, and providing angler access.

Colorado River Cutthroat Trout

There are 32 subwatersheds containing at least one conservation population of Colorado River cutthroat trout. The revised forest plan has a standard stating that total road density in subwatersheds containing conservation populations of Colorado River cutthroat trout may not be increased. Thirty-one watersheds with a conservation population meet that standard. **One watershed (the Blue River around Breckenridge [HUC 140100020506]) meets the standard in Alternative F, but not in Alternative G.** This subwatershed comprises 11 catchments, two of which contain conservation populations of Colorado River cutthroat trout. In these two catchments, French Gulch and Spruce Creek, while the analysis shows that the ML 1 roads are added, they are only to be used as trails. The recommendation for the final transportation management plan is to accept these ML 1 roads as trails to keep the road density down. It is also important to keep in mind that these roads are already present and not true additions, however our goal is to reduce road density in Colorado River cutthroat trout watersheds. The total road mileage and density for all subwatersheds with conservation populations of Colorado River cutthroat trout are presented in Table 3.45. A substantial number of roads are removed in all action alternatives, with Alternative G removing 20 percent of the existing road mileage. Removal of these roads would have a long-term benefit on Colorado River cutthroat trout. It is possible that reclamation activities would have a short-term negative effect due to sediment and possible direct channel impacts if crossings were removed.

Table 3.45—Total road miles and road density (in miles per square mile) for all 6th level watersheds containing a conservation population of Colorado River cutthroat trout

	Alternative A	Alternative F	Alternative G
Total miles	586	531	466
Total road density	0.64	0.58	0.51
Miles removed (compared to Alt. A)	n/a	55	120
% of miles removed (compared to Alt. A)	n/a	9%	20%

The total miles of roads and trails by use within 350 feet of known occupied cutthroat habitat are presented in Table BE-24 (appendix B). These include all cutthroat trout regardless of genetic purity. In total, motorized uses decrease slightly adjacent to occupied cutthroat trout habitat for Alternative G and do not change at all in Alternative F. In Alternative G, the level of use is reduced along 10 miles of travelway within 350 feet of occupied cutthroat stream and it is eliminated along another 10 miles. Roads would be decommissioned where travel has been eliminated. In most cases, motorized use is removed along cutthroat streams in Alternative G with three exceptions: two-tenths of a mile of road are added within 350 feet of Indiana Creek, almost a half mile is added in the Upper Main Elk watershed, and about a tenth of a mile of new ATV trail is added along Fawn Creek (presumably a crossing). Although in general, reduction of motorized use adjacent to occupied cutthroat streams has a positive long-term effect, negative effects are expected in the three populations discussed above.

Greenback Cutthroat Trout

Recent improvements in genetic analysis techniques appear to have made it possible to differentiate Colorado River cutthroat trout from greenback cutthroat trout. Although this differentiation is still considered somewhat preliminary, it is considered best available science and therefore populations identified as "GBlineage" are considered greenback cutthroat trout. The White River National Forest has five populations to date which have been identified as GBlineage: Three Licks Creek, Frey Gulch, Cunningham Creek, Park Creek, and Cache Creek. Twenty-five miles of roads are removed from the GBlineage watersheds. Some are converted to motorized trails and others are scheduled for decommissioning. Four of these watersheds would have roads decommissioned within the occupied part of the watershed. The fifth (Cache Creek) also has a trail along the creek which would be removed from the system (allowed to revegetate). There may be short-term negative impacts on these populations from decommissioning activity, however, the long-term effect would be beneficial. Alternative G decommissions more roads than Alternative F, but both offer a long-term benefit over Alternative A.

Table 3.46—Comparison of roads and motorized trails in each alternative in watersheds containing a cutthroat trout population believed to be greenback cutthroat trout

Roads and trails by alternative	Population (watershed)*				
	Three Licks (Big Hole Creek)	Frey Gulch (Frey Gulch)	Cunningham (North Fork Fryingpan)	Park Creek (North Thompson)	Cache Creek (Cache Creek)
Alt. A – roads	3.73	5.37	30.97	28.41	0.36
Alt. A – trails	0	1.42	0	0	0
Alt. F - roads	3.73	5.37	30.97	21.39	0.36
Alt. F – trails	0	1.42	0	0	0
Alt. G – roads	1.24	1.03	19.87	20.76	0.36
Alt. G – trails	2.11	5.57	8.98	0	0

**The subwatershed or catchment containing the population used for analysis is in parenthesis below the population name.*

Mountain Sucker

Mountain sucker occur primarily in the White River drainage on the White River National Forest. They are more sensitive to sediment than other local sucker species and therefore could be negatively impacted by increased road densities, or in the short term by road decommissioning activities. Road densities in occupied watersheds in general remain stable in Alternatives F and G, with a large decrease in road density in Deep Creek where mountain sucker have been reported.

Bluehead Sucker

Bluehead sucker occur primarily downstream of the forest, with the exception of the West Divide Creek watershed. Bluehead sucker are not known to be sensitive to sediment. Both Alternatives F and G reduce the road density significantly in this watershed and would therefore have a long-term beneficial effect on bluehead sucker, although the short-term impact from decommissioning activities may be slightly negative.

Roundtail Chub, Flannelmouth Sucker, Colorado Pikeminnow, Humpback Chub, Razorback Sucker, and Bonytail

These species all occur downstream of the White River National Forest in the Colorado, White, and Yampa rivers, and in some warmer tributary streams on the west side of the White River National Forest. The primary threat to these species from activities on the White River National Forest is water depletion. The proposed action does not call for any change in water distribution or use and therefore will not directly or indirectly affect these species.

Amphibians

Hydrologic alteration of breeding ponds and the risk of disease are the primary threats to amphibians from travel management. Little is known about how disease moves through the system, but it is logical that increased human contact and disturbance could increase the risk of disease introduction to breeding ponds. Ideally, all travelways should be at least 300 feet away from breeding ponds. In addition to the risk of spreading disease, increased motorized and non-motorized use increases the risk of harassment or death of individuals.

An analysis of known breeding sites for the boreal toad and northern leopard frog for all alternatives show no change in roads or trails for Alternative F and changes to two populations in Alternative G. For the Montezuma boreal toad population, 0.21 miles of mountain bike trail are added within ½ mile of the breeding pond in Alternative G. For the Sterry Lake leopard frog population, 0.34 miles of road and 1.7 miles of ATV trail would be removed within ½ mile of the breeding lake. The ATV trail to be eliminated comes within 300 feet of the breeding lake. Therefore, Alternative F will have no impact on these species compared to the no action alternative. Alternative G would have a potential minor negative impact on boreal toads and would have a long-term beneficial effect on leopard frogs (with a short-term negative effect from the disturbance associated with obliterating/closing these travelways).

Cumulative Effects for Terrestrial and Aquatic Wildlife Species

Past, present, and future actions that affect fish and wildlife on the forest include: vegetative management activities, oil/gas and mineral production, private land development, other transportation management decisions either on the forest or on surrounding lands, recreation activities, livestock grazing, fishing, big game hunting season regulations, and natural events. All these activities alter or increase human activity and change ground conditions in some regard, thus affecting wildlife living conditions and habitat quality.

Commodity production increases the use and demand on the travel system and can lead to temporary or permanent expansion of the road system. These activities can affect wildlife solitude and habitat forage, fragment migration routes, and add sediment to waterways. Individual projects may not have large impacts; however, when a large area is being developed with many projects, considerable cumulative impacts may occur. Some of the impacts can be reduced by developing efficient transportation systems and engineering roads with drainage features that help keep waterways at desired conditions for these areas.

Private land, especially in the main valleys, continues to be developed. This development causes displacement and fragmentation of wildlife. It also places a higher demand on water, which can increase the need for high-quality water and wildlife refuge on the forest. Isolated populations of animals and human-animal conflicts can result from

activities such as the proposed I-70 expansion and development patterns that dissect migration. If mitigations such as open space and wildlife crossings are implemented, animals may continue to migrate to different parts of the forest.

As human population and tourism increase in the area, more people will recreate on the forest. Consequent increases in the human influence on wildlife can cause accelerated changes in wildlife patterns. Furthermore, the more people disperse across the forest, the greater the chance for noxious weed spread, which has a direct effect on habitat forage and the quality of feed for animals.

Short-term Uses and Long-term Productivity

The National Environmetnal Policy Act requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Alternatives B, E, D, and C, from most to least, have the potential to improve long-term productivity by reducing the number of miles and trails on the landscape. Once decommissioned, these areas will have the potential to revert to vegetated conditions.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as power line rights-of-way or roads.

The implementation of any of the alternatives, including the no action alternative, would have no irreversible commitment of resources. The alternatives define the road and trail system, consider adoption of some unauthorized roads and trails into the system (except Alternative B, F? which does not consider adoption of unauthorized roads and trails), and propose decommissioning of roads and trails not needed for the transportation system. None of the alternatives consider new construction. Roads and trails can be rehabilitated when no longer needed as part of the transportation system.

Irretrievable commitment of resources would occur under all alternatives. Irretrievable commitments of resources from roads and trails exist because the travelway changes the natural landscape to a non-natural, out-of-vegetative-production landscape. The road and trail designation of the selected alternative would create temporary losses associated with maintenance of forest roads and trails. Resources affected would be scenery, vegetation (including range and timber), and associated wildlife habitats. Implementation of any of the alternatives would commit these resources over the life of the road or trail.

The alternative with the highest number of miles of designated roads and trails would also cause irretrievable commitments of the most resources. The alternatives ranked from most to least for irretrievable commitment of resources are alternatives C, D, E, and B.

Cumulative Effects

Cumulative effects are discussed under each resource section in chapter 3 and in appendixes A, B, and C as appropriate. The following discusses the past, present, and future activities that may have a potential for cumulative effects based on the travel management plan alternatives proposed in this document. The geographic scope of this discussion is the planning area and the surrounding dependent communities. The temporal scope of this discussion is the planning horizon, typically 10 to 15 years.

Past activities are those activities whose effects are still present on the landscape. They include roads built for timber production and mineral exploration, access to private lands and towns, and recreation access. Past activities also include trails that were built for recreation access and use, and livestock access and distribution. Several miles of non-system roads and trails have been created through repeated use, or are remnant from inadequate closure. Approximately 1,045 miles of non-system (unauthorized) roads and trails, and approximately 4,590 miles of system roads and trails exist across the forest. Currently, approximately 2,000 miles of the system roads and trails are National Forest System roads and 1,950 miles are National Forest System trails.

Present resource activities include vegetation treatments for wildlife and fire under the Healthy Forest Initiative; oil and gas exploration on the southwestern part of the forest; livestock grazing; and a little mining. The highest use across the forest is recreation; the area has and will continue to be one of the premier destination locations for vacationers. These activities will continue into the future.

Future activities are those reasonably foreseeable actions that may add to the cumulative effects on forest resources and social impacts. The forest plan stated a goal of road reduction across the forest. This goal was established to align the forest with the national goal for forests to “determine and provide for the minimum forest transportation system that best serves current and anticipated management objectives and public users of National Forest System lands, as identified in the appropriate land and resource management plans” (USDA Forest Service 2001a). It is reasonable to consider that the implementation of the forest plan will include a reduction in the amount of roads.

The opportunities for locals to enjoy the forest have led to an increase in population in the area. Many people have moved to the area for the recreational opportunities, especially downhill skiing. The economies of the resort communities are directly related to the activities the forest provides. Indirectly, even off-forest towns, where many of the resort employees reside with local residents, benefit from expenditures and necessities of the resort communities. These trends will likely continue into the future.

The Federal Highway Administration initiated a study to expand the capabilities of the I-70 corridor because of demand from the Denver area to transport people to the resort towns. Execution of the plan will take more than 20 years. It will increase the transportation capabilities of I-70 and allow more people to come to these resort communities at one time. It would make traveling to and through the area easier and more desirable by tourists. Many of these travelers will likely use the forest for their recreation.

Although new technologies in recreation are likely to occur over the planning period, recognizing cumulative impacts from them is speculative at this stage. This plan is not the final action in travel opportunities on the forest; rather, this is a programmatic document that sets the stage for our anticipated needs currently and in the future. If other needs arise, specific projects can be designed to address them.

Selection of any of the alternatives as the travel management plan will identify where and when different modes of transportation can occur across the forest. The travel management plan will establish the transportation system so the forest can concentrate resources to the identified system and reestablish native conditions in areas where the system is not needed. The variability of the alternatives is constrained by the mandates in the forest plan. The variability among alternatives is extremely small when viewed against the entire acreage of the planning area.

The likely increase in the I-70 corridor population, the increase in the ability of recreationists to access the forest from Colorado's Front Range, and the forest plan objective to decrease roads will affect forest resources including recreation. The selection of one alternative over another is unlikely to measurably add to those effects. The selection of one alternative over another is unlikely to change the expected population growth patterns or legal use patterns.

Cumulative impacts on forest resources would be based on the amount, timing, and location of the expected increases in recreation use. It is reasonable to expect that there may be local cumulative impacts on resources from the adoption of one alternative over another; however, across the forest the effects are very small. Those local effects may present themselves in a social context (such as increased crowding and user-conflict) or in a physical context (such as soil erosion on a specific trail). Those issues are best addressed site specifically through available management methods.