CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

A. Background

This section describes the current condition of resources in the Study Area, and the potential effects that the proposed action and its alternatives may have on these resources. Impacts to the environment are considered in terms of their direct, indirect and cumulative effects. Definitions for these effects are as follows (40 CFR 1508.7 and 1508.8):

- **Direct effects –** Effects caused by the action and occurring at the same time and place.
- **Indirect effects –** Effects caused by the action, but occurring later in time or further removed in place.
- **Cumulative effects –** Incremental impacts of the proposed activities when added to other past, present and foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions.

Direct, indirect and cumulative effects can result from the No Action Alternative. These effects would occur through the continuation of ongoing management practices and activities.

The cumulative effects analysis considers activities on all lands in the project vicinity. Activities that have been occurring for many years, are currently ongoing, or are expected to continue into the near future include: logging; road building; road use and road maintenance; recreational activities; prescribed burning, wildland fires and wildland fire suppression; and mining and mineral exploration.

As discussed above, effects discussed in this chapter focus primarily on direct, indirect and cumulative long-term effects resulting from the implementation of an alternative. Any short-term effects from new trails related primarily to construction would be temporary and minor. Short-term effects from construction would include temporary noise, dust, and trail closure that may result in minor disturbance to humans and wildlife. Short-term impacts would be minimized by design criteria and best management practices outlined in Chapter 2.

The mileages for the Twin Lakes area bridge crossing options, in Alternatives B and C, vary. Impact assessments include the entire length of the alternative(s) and utilize the Lake Creek bridge option around Twin Lakes. If additional impacts would result from the implementation of the Twin Lakes bridge option, they are specifically noted.

B. Economic and Social

1. Recreation

a. Affected Environment

The 2000 National Survey on Recreation and the Environment (NSRE) reports that 94% of Colorado residents participate in some type of outdoor activity. Other Colorado State Park studies estimate that a full 90% of all Coloradoans are trail users, with the average Colorado family using a trail approximately 78 times per year. In 2003, 76% of people in the South Central region of Colorado where the Study Area is located, reported participating in trail recreation and 55% reported participating in tent camping. Approximately 45% reported participating in some type of motorized trail recreation (State Comprehensive Outdoor Recreation Plan 2003). Furthermore, 31% of people indicated that their preferred destination was a wilderness area with little or no development, while 23% of people indicated that their preferred destination was an area of forests and lakes, with limited trails, camping, boating, and fishing. These uses are anticipated to steadily increase as population and recreational demands within Colorado and the South Central region continue to grow in the future.

Opportunities for hiking and pack and saddle stock use are numerous within the Study Area. A major goal of the project would be to create a non-motorized, long-distance hiking and pack and saddle stock trail within the Study Area. Non-motorized trail resources greater than five miles in length (typically considered long-distance or overnight trails) are described below, by District:

- *Salida Ranger District:* Approximately 300 miles of trail exist; approximately 120 miles are motorized. Of the available trails, 30 miles are on non-motorized trails greater than five miles in length.
- *Leadville Ranger District:* Approximately 250 miles of trail exist; there are no motorized trails on the District. Of the available trails, 140 miles of trail are over five miles in length.
- *Gunnison Ranger District* (from Crested Butte, south of Pearl Pass along the CDT to Highway 50, east of Highway 135): Approximately 360 miles of trail exist; approximately 290 miles are motorized. Of the available trails, 40 miles are on non-motorized trails greater than five miles in length.

Overall, trails on the three Districts are currently in poor-fair condition due to a maintenance backlog. Much of this backlog is due to a lack of maintenance funding in recent years and the fact that many of these trails were not originally designed or laid out for the present use levels and types, therefore these trails require a higher than normal level of maintenance. Many of the existing routes were originally constructed for logging and mining purposes and have been grandfathered into the Forest Service trail system. Additionally, on the Gunnison Ranger District, motorized use on trails not originally designed for non-motorized use contributes to the backlog. Presently, the Colorado and Continental Divide trails, as well as many routes on the "Fourteeners" in the Study Area, are in relatively good condition due to the number of volunteers that these trails attract to maintain and complete deferred maintenance activities. The Colorado

Trail Foundation, Continental Divide Trail Alliance, and the Colorado Fourteeners' Initiative provide the primary volunteer base for work on these trails.

The Study Area includes portions of the San Isabel National Forest, which is part of the larger PSICC. The PSICC has one of the largest recreation workloads in the Forest Service Region 2 due to its proximity to the Denver/Colorado Springs/Pueblo metropolitan areas, which is currently one of the four fastest growing population centers in the United States. Visitor use in the Forest for FY01 was estimated at 3.87 million visits, placing the PSICC in the top ten recreation forests nationally.

Recreation opportunities in the San Isabel National Forest are numerous, according to the 2002 National Visitor Use Monitoring (NVUM) project completed by the Forest Service in the PSICC. Results from this study revealed that the top five recreation activities were viewing natural features, relaxing, viewing wildlife, pleasure driving, and hiking/walking – all of which are scenery-dependent activities. According to the PSICC NVUM, "scenery" or "attractiveness of the forest landscape" were the most important attributes to visitors' recreation experience. This was true for all three use areas inventoried (wilderness, developed day use sites, and general forest areas) out of fourteen possible attributes. Within the Study Area, recreational opportunities include hiking, backpacking, fishing, hunting, mountain biking, climbing, wildlife viewing, nordic skiing, downhill skiing, scenic driving and off-highway vehicle (OHV) use. One of the primary activities in the area is hiking, with the "Fourteeners" being a major attraction to the area.

Climbing "Fourteeners" has become a popular Colorado activity - increasing 300% over the past decade (unpublished data compiled by the Forest Service, Leadville Ranger District). Mount Massive, located in the Mount Massive Wilderness (Leadville Ranger District), is one of 54 peaks in Colorado above 14,000 feet in elevation. It is the second highest peak in Colorado and the second highest peak in the Sawatch Mountain Range. Trailhead registers indicate that a minimum of 9,500 people climb Mount Massive annually (U.S. Forest Service 2005a).

The Collegiate Peaks Wilderness, within the San Isabel National Forest, is one of the ten largest wildernesses in the state of Colorado and it is the largest wilderness in the Study Area. It contains more "Fourteeners" and high peaks than any other wilderness area in the lower 48 states. The Collegiate Peaks Wilderness has eight peaks over 14,000 feet in elevation. Additionally, there are many peaks over 13,800 feet offering multiple hiking and climbing opportunities. Timberline lakes and high mountain streams offer excellent fishing and scenery as well (Colorado Wilderness 2005).

The Gunnison National Forest is part of the larger Grand Mesa, Uncompahgre and Gunnison National Forests. The GMUG receives fairly heavy use; estimated visits for FY 2003 were approximately 3.38 million (U.S. Forest Service 2005b). Recreational opportunities in the Gunnison National Forest are numerous and include hunting, fishing, boating, hiking, camping, OHV use, skiing, and nature viewing among others. The NVUM project was completed in 2003 by the Forest Service in the GMUG. Results from this study revealed that the top five recreation activities were viewing natural features, viewing wildlife, downhill skiing, hiking/walking, and

relaxing. Like the PSICC, “scenery” and the “condition of the environment” were consistently one of the attributes of highest importance to recreational users on the GMUG.

Other recreation destinations in the Study Area include the Twin Lakes Reservoir, part of the larger Arkansas-Fryingpan Project, a multi-purpose water body jointly administered by the BOR and Forest Service. The BOR administers the 2,440 surface acres of water and the Forest Service administers the surrounding campgrounds, picnic areas, and parking lots. The reservoir provides outstanding fishing opportunities for Rainbow, Brook, and Mackinaw trout. Currently, the CDT meanders around the east end of the reservoir. The Arkansas River, below Twin Lakes Reservoir, provides some of the best whitewater recreation opportunities for rafting and kayaking in the state, with rapids ranging from Class II through Class V+. Numerous commercial rafting companies operate out of the Buena Vista/Salida area.

Fishing opportunities in the Study Area provide for some of the best trout fishing in Colorado. Some of these areas include the headwaters of the Arkansas River, the mainstem of the Arkansas River, the Upper South Platte River, Mirror Lake, Twin Lakes, Taylor Park Reservoir, Turquoise Lake, Clear Creek Reservoir, and numerous other high mountain lakes and streams on either side of the Continental Divide.

Two of the primary roads that provide access to the Study Area are designated as scenic byways. Highway 24 from Leadville to Twin Lakes and Highway 82 in the Twin Lakes vicinity (immediately east of the Study Area) comprise portions of the Top of the Rockies National Scenic and Historic Byway. Highway 135 between Crested Butte and Gunnison, southwest of the Study Area, is also a Colorado State Scenic Byway.

Other recreation opportunities in the Study Area include the numerous outfitter guided recreation opportunities for hiking, snowmobiling, mountaineering, and horseback riding. Additionally, numerous recreation events occur within the Study Area such as mountain bike races, footraces, fishing derbies, snowshoe races, cross-country ski races, and motorized events.

Two additional long-distance hiking trails are also located within the Study Area and provide different experiences from the CDT. These include the Colorado Trail and the American Discovery Trail (ADT). The Colorado Trail stretches from Denver to Durango, and is intended to preserve a sense of community through participation in trail activities as well as to support environmental education and an appreciation for the value of Colorado’snatural systems. The Colorado Trail is maintained by the non-profit Colorado Trail Foundation (CTF) in cooperation with the Forest Service. Although the CTF supports a non-motorized trail suitable for hikers, mountain bikers (with the exception of in wilderness areas), and pack and saddle stock users, portions of the trail are open to motorized use and run concurrently with existing roads.

The ADT was founded in 1989 by the American Discovery Trail Society as the nation's first coast-to-coast trail, spanning a total of 6,800 miles from Delaware to California. Within Colorado, the ADT follows portions of both the Colorado Trail as well as the CDT. Within the Study Area, the ADT follows the CDT from Winfield to Taylor Park. Although the intent of the ADT is to provide for a non-motorized recreation experience, much of the trail runs along existing roadways.

The CDT is one of eight long distance National Scenic Trails in the United States; it is considered to be one of the three "Crown Jewels" of the National Scenic Trails. The other trails in this category include the Appalachian Trail (AT) and the Pacific Crest Trail (PCT), and all three offer primitive, challenging, and high quality recreation experiences. The CDT is considered the most rugged long-distance National Scenic Trail, and trail users have an opportunity to enjoy a greater diversity of physical and natural qualities than on any other extended trail. The CDT within the Study Area is arguably one of the most scenic and gratifying stretches along its entire length. The diversity of scenic resources as defined by terrain (elevation, water, sky, rock, etc.), vegetation (spruce-fir, tundra, shrubland, grassland, riparian, etc.), diurnal and seasonal change (light, ice, texture, color, etc.) are outstanding.

No user counts have been conducted for the CDT in the Study Area. However, for comparison purposes, the Appalachian Trail receives an average of four million visitors per year along any one portion of its length, yet only 200 to 300 users thru-hike its entire length (Appalachian Trail Conference 2005). Respectively, approximately 180 users thru-hike the entire length of the Pacific Crest Trail (Pacific Crest Trail Association 2005) annually. The Monarch Crest Store, located on CDT at Monarch Pass, receives and holds packages for "thru-hikers". According to a store representative, 57 packages were received for thru-hikers in 2004. As of June 2005, they had received 11 packages. Additionally, the store is a common starting point for northbound day hikers and southbound mountain bikers. The store representative estimates that 20-30 day hikers (5,400 annually) and 200-300 mountain bikers (54,000 annually) leave from the store daily during periods of high use. Developed trailheads, picnic areas, campgrounds and their use levels within the Study Area are shown in Table 3-1. Table 3-2 shows use levels for motorized versus non-motorized use on other trails near the existing CDT and Colorado Trail. Table 3-3 shows the overall number of special use permits, corresponding service days, recreation residences, and active leases in each of the three ranger Districts within the Study Area.

Table 3-1. Use Levels at Developed Trailheads, Picnic Areas and Campgrounds Along the Existing CDT and Colorado Trail.

Facility	Existing CDT	Colorado Trail
Tennessee Pass Trailhead	High	High
Uncle Bud's Hut	High	High
Bear Lake Trailhead	Medium	Medium
Timberline Lake Trailhead	Medium	Medium
Mayqueen Campground	High	High
Butcher Boy Picnic	Medium	Medium
Fish Hatchery Access	Medium	Medium
Elbert Creek Campground	Medium	Medium
Main Massive Trailhead	High	High
Halfmoon Campground	Medium	Medium
N. Elbert Trailhead	High	High
S. Elbert Trailhead	High	High
Twin Lakes Historical District	High	High
Parry Peak Campground	High	High
Twin Peaks Campground	High	High
Lakeview Campground	High	High
Interlaken Trailhead	High	High
Sheep Gulch Trailhead	Low	Low
Rockdale Historical Site	Low	N/a

Facility	Existing CDT	Colorado Trail
Winfield Historical Site	Medium	N/a
South Fork Trailhead	Medium	N/a
Vicksburg	N/a	Medium
Missouri Gulch Trailhead	N/a	High
Colorado Trail/Clear Creek Trailhead	N/a	Low
Pine Creek Trailhead	N/a	Low
Frenchman Creek Trailhead	N/a	Low
Tincup Pass CR. 267	High	N/a
CDT Tincup Pass Trailhead	Low	N/a
Alpine Tunnel National Historic District	High	N/a
Alpine Tunnel Trailhead	High	N/a
FDR. 295 Hancock	High	N/a
Hancock Lake Trailhead	Medium	N/a
Middlefork Trailhead	Medium	N/a
FDR. 230 Middlefork	Medium	N/a
Boss Lake Trailhead #1420	Low	N/a
Monarch Ski and Snowboard Area	Low	N/a
Old Monarch Pass Trailhead	Medium	N/a
FDR. 237 Old Monarch Pass	High	N/a
CR. 365 North Cottonwood	N/a	High
Silvercreek Trailhead #1776	N/a	High
Avalanche Trailhead	N/a	Medium
CR. 306 Cottonwood Pass	N/a	High
FDR. 322 Mt. Princeton	N/a	Medium
Mt. Princeton Trailhead	N/a	Low
Chalk Creek Trailhead	N/a	Medium
Bootleg Campground	N/a	Low
Little Browns Creek Trail #1430	N/a	Medium
Browns Lake Trail #1429	N/a	High
Browns Loop Trail #1427	N/a	High
Mt. Shavano/Tabeguache Trail #1428	N/a	High
Mt. Shavano/Tabeguache Trailhead	N/a	High
Angel of Shavano Trailhead	N/a	Medium
Angel of Shavano Campground	N/a	Medium
Goat Wadi Recreation Site	N/a	Medium
North Fooses Creek Recreation Area	N/a	High
South Fooses Trailhead	N/a	Medium
Monarch Crest Trailhead	High	N/a
Texas Creek Trailhead	Low	N/a
Mirror Lake Campground	Medium	N/a
Garden Basin Trailhead	Low	N/a
Timberline Trail Trailhead	Low	N/a

Source: Leadville, Salida, and Gunnison Ranger Districts

Key:

N/a = Segment is not part of the alternative.

None = Not allowed.

Low = Low probability of encountering other users on any given day.

Medium = Probability of encountering a few (less than five) other users on any given day is likely.

High = Probability of encountering numerous other users (more than five) on any given day is likely.

Table 3-2. Use Levels for Trails Near Existing CDT and Colorado Trail.

Trail Section	Existing CDT		Colorado Trail	
	Motorized	Non-Motorized	Motorized	Non-Motorized
Tennessee Pass – Bear Lake Trailhead	None	Medium	None	Medium
Bear Lake Trailhead – Timberline Lake Trailhead	None	Medium	None	Medium
Timberline Lake Trailhead – Kearney Park	None	Medium	None	Medium
Kearney Park – Main Massive	None	High	None	High
Main Massive- S. Elbert	None	High	None	High
S. Elbert – Interlaken	Medium	High	Medium	High
Interlaken – Hope Pass	None	Medium	None	Medium
Hope Pass – Sheep Gulch	None	Low	N/a	N/a
Sheep Gulch – South Fork	High	Medium	N/a	N/a
South Fork – Lake Ann	None	Low	N/a	N/a
Sheep Gulch – Colorado Trail/Clear Crk	N/a	N/a	High	Medium
Colorado Trail/Clear Crk – Cottonwood Crk	N/a	N/a	None	Medium
Lake Ann #592	None	Low	N/a	N/a
Timberline #414 Lake Ann – Sanford Creek	High	Low	N/a	N/a
Timberline #414 Sanford Creek – Garden Basin	High	Low	N/a	N/a
Monarch Crest #531	Low	High	Low	High
Tincup Pass CR. 267	High	Low	N/a	N/a
CDT Tincup Pass Trailhead	None	Low	N/a	N/a
Alpine Tunnel Trailhead	None	High	N/a	N/a
FDR. 295 Hancock Road	High	Low	N/a	N/a
Hancock Lake Trailhead	None	Medium	N/a	N/a
Middlefork Trailhead	None	Low	N/a	N/a
FDR. 230 Middlefork	Medium	Low	N/a	N/a
Boss Lake Trailhead #1420	None	Low	N/a	N/a
Monarch Ski and Snowboard Area	None	Low	N/a	N/a
Old Monarch Pass Trailhead West	None	Low	N/a	N/a
Old Monarch Pass Trailhead East	Low	Low	N/a	N/a
Silvercreek Trailhead #1776	N/a	N/a	None	Medium
Avalanche Trailhead	N/a	N/a	None	Medium
FDR. 322 Mt. Princeton	N/a	N/a	High	Low
Mt. Princeton Trailhead	N/a	N/a	None	Low
Chalk Creek Trailhead	N/a	N/a	None	Medium
Little Browns Creek Trail #1430	N/a	N/a	None	Medium
Browns Lake Trail #1429	N/a	N/a	None	High
Browns Loop Trail #1427	N/a	N/a	None	High
Mt. Shavano/Tabeguache Trail #1428	N/a	N/a	None	Medium
Mt. Shavano/Tabeguache Trailhead	N/a	N/a	None	Medium
Angel of Shavano Trailhead	N/a	N/a	None	High
Goat Wadi Recreation Site	N/a	N/a	None	Medium
North Fooses Creek Recreation Area	N/a	N/a	Medium	Medium

Trail Section	Existing CDT		Colorado Trail	
	Motorized	Non-Motorized	Motorized	Non-Motorized
South Fooses Trailhead	N/a	N/a	None	Medium
Monarch Crest Trailhead	Low	High	N/a	N/a
Texas Creek	Low	N/a	N/a	N/a
Mirror Lake	Medium	N/a	N/a	N/a
Garden Basin	Low	N/a	N/a	N/a

Source: Leadville, Salida, and Gunnison Ranger Districts

Key:
N/a = Segment is not part of the alternative.
None = Not allowed.
Low = Low probability of encountering other users on any given day.
Medium = Probability of encountering a few (less than five) other users on any given day is likely.
High = Probability of encountering numerous other users (more than five) on any given day is likely.

Table 3-3. Annual Special Use Permits, Service Days, Recreation Residences, and Leases in the Study Area.

Type	Ranger District		
	Leadville	Salida	Gunnison
Special Use Permits	25	29	12
Service Days	13,372	13,556	4,491
Recreation Residences	14	2	6
Leases	0	0	0

Source: Leadville, Salida, and Gunnison Ranger Districts

Because both the San Isabel and Gunnison National Forests support a variety of user types, conflicts occur on segments of the trail that are used by both motorized and non-motorized visitors. Approximately 19 miles of the CDT within the Study Area allow for motorized trail use and 19 miles are located on motorized roadways; approximately 39 miles (47%) of the existing trail are open to motorized use. Four-wheel drive vehicles, street legal motorcycles, non-street legal OHVs, and non-licensed motorcycles may travel motorized sections of the trail, creating a potential safety hazard and diminished recreation experience for non-motorized users.

The alternatives are located in 13 MAs (Table 3-4). See Chapter 1 for descriptions of each MA and Appendix D for a complete list of alternative mileages in each MA. All MAs permit non-motorized trails; however, MAs 8 (B&C) and 3A provide the best opportunities for a non-motorized, primitive, recreation experience; additionally, MA 8 (B&C) also prohibit mechanized use.

Table 3-4. Trail Miles per Recreation Specific Management Area.

Management Area	Alt A	Alt B	Alt C
1B Downhill Skiing and Winter Sports	3.2	0.4	3.3
2 (2A/2B) Motorized and Roaded Recreation Opportunities	40.0	20.1	30.5
3A Semi-primitive Non-motorized Recreation Opportunities	8.3	3.7	8.3
8A Pristine Wilderness Setting	0.0	0.0	0.0
8B/8C Primitive and Semi-Primitive Wilderness Setting	7.1	16.3	20.3
Other non-recreation oriented MAs (4B, 5B, 6B, 7A, 7D, 9A, 9B)	22.5	48.5	27.7
TOTAL	81.1	89.0	90.1

Source: EDAW GIS

All alternatives traverse various classifications of the Recreation Opportunity Spectrum (ROS) within both the PSICC and GMUG Forests. The CDT crosses the following ROS zones: Urban (U), Rural (R), Roaded Modified (RM), Roaded Natural (RN), Semi-Primitive Motorized (SPM), Roaded Natural Non-Motorized (RN-NM), Semi-Primitive Non-Motorized (SPNM), and Primitive (P). The greatest number of trail miles lie within the Roaded Natural (RN) and the Semi-Primitive Non-Motorized (SPNM) classifications. None of the alternatives would result in a change to the ROS zone prescriptions. Table 3-5 shows the number of trail miles per ROS zone in each alternative for the two Forests.

Table 3-5. Trail Miles in ROS Zones by Alternative.

ROS Zone	Alt A	Alt B	Alt C
PSICC			
U	N/a	N/a	N/a
R	0.6	6.1	0.8
RN	21.25	35.3	23.7
SPM	9.2	13.41	19.0
SPNM	19.6	17.9	19.8
P	0.0	16.3	6.5
GMUG			
R	0.1	N/a	0.1
RM	1.3	N/a	1.1
RN	8.7	N/a	0.3
SPM	15.1	N/a	0.3
RN-NM	1.8	N/a	1.8
SPNM	3.6	N/a	16.7
Total	**81.1**	**89.0**	**90.1**

Source: EDAW GIS

b. Environmental Consequences

Key factors considered in the evaluation of direct, indirect and cumulative impacts of the alternatives include:

- Public access.
- Recreation opportunities and experiences.
- Crowding and density issues.
- Consistency with Forest Plan Management Areas, ROS direction, and Visual Quality Objectives.
- Health and Safety.

(1) Effects Common to All Alternatives

(a) Direct Effects

Increasing demand for dispersed, primitive recreation opportunities is common to all alternatives. As demand increases, the ability to provide these opportunities becomes more difficult. The direct effects of increasing demand on recreation resources include user conflicts, noise, crowding, litter, inappropriate human waste disposal, and diminished opportunities to view wildlife. Any new recreational amenity or additional trail construction will result in improvement of the overall recreational experience for some users. However, user experiences will vary depending on the components of each alternative. Trail maintenance needs will continue to increase under all alternatives as a function of either increased use or increased trail length.

(b) Indirect Effects

Increasing demand for dispersed, primitive recreation opportunities is common to all alternatives. As demand increases, the ability to provide these opportunities becomes more difficult. Indirect effects to recreation resources common to all alternatives include impacts generally associated with visitor use, such as trespassing, campsite proliferation, the creation of informal trails, and the deterioration of the trail facility.

(c) Cumulative Effects

There are a number of future projects planned for the Study Area. Planned projects include a number of fire prevention measures including thinning, prescribed burning, and mechanical treatments. These actions may temporarily result in closures and restrict recreation opportunities in the following areas: the Westside of the Salida Ranger District, the Twin Lakes area, the Box Creek Area, and the Northwest area of the Leadville Ranger District.

Other planned projects include road and trail maintenance, parking lot resurfacing, design and construction of the Monarch Pass Trailhead, the opening of three Forest Service historic cabins for public rentals in the Clear Creek area, restoration efforts at the Interlaken Historic Site, and improvements to the Main Mt. Massive Trail.

Past projects that may have negative impacts on recreation and visual resources include four electric transmission corridors in the vicinity of Turquoise Lake, White Pine, Old Monarch Pass, and Monarch Pass.

(2) Alternative A - No Action

(a) Direct Effects

Under this alternative, current motorized and trail management direction would continue to guide management of the CDT in the Study Area. The existing trail includes approximately 19 miles of motorized use, 42 miles of non-motorized use and 19 miles of shared-road. Areas not in designated wilderness are also open to mechanized travel such as mountain bikes.

Currently, the north side of the Lake Ann Pass trail segment does not accommodate pack and saddle stock use. This trail segment was not constructed to pack and saddle standards.

Additionally, for some non-motorized users, the quality of the experience along the trail has been diminished by regular contact and conflicts with motorized recreation users. Additionally, as OHV use continues increase throughout the state, there may be an increase in motorized visitor density leading to management issues such as user group conflicts, backcountry crowding, safety, increased trail maintenance, and further diminishment of visitor satisfaction. Other conflicts between motorized and non-motorized users could occur on State Highway 82 at Lake Creek. Due to the closure of the current crossing because of BOR safety regulations, users must cross the bridge on State Highway 82 posing potential safety concerns. Since no alternative route is available, the State of Colorado will not prohibit non-motorized use on this road (CRS 42-4-805). Due to allowable vehicle speeds, measures to slow vehicles before the bridge crossing may not be feasible. Trail users on the bridge are at risk. According to Federal Highway Administration Studies (FHWA-HRT-04091), at speeds of over 40 miles per hour, there is an 80% chance of fatality if there is a collision between a vehicle and a pedestrian. Hikers with special needs (e.g., ADA) and pack and saddle stock users are especially susceptible to accidents.

(b) Indirect Effects

Non-motorized visitors who have historically used the trail for traditional uses such as hiking, camping, or pack and saddle stock use will become displaced as a result of motorized/non-motorized conflicts and will be forced to find other areas to recreate. Likewise, motorized user satisfaction may decrease if conflicts continue. Dissatisfaction among users may lead to the creation of informal trails in an attempt to avoid sections heavily traveled by other user groups. Trail condition will deteriorate as a result of constant motorized use and wear, unless reconstructed to accommodate such use. Ruts, rocks, and other obstacles created by motorized users may make the trail too technical for non-motorized users (especially pack animals). Unnecessarily difficult trails would cause a loss of appeal for hiking these sections of the CDT.

(c) Cumulative Effects

Past projects that may have long-term impacts on recreation opportunities include timber sales in the Taylor Park area. Planned projects that may impact recreation resources include fuels management (e.g., mechanical thinning, prescribed fire) projects near the Old Monarch Pass Road and the Tincup townsite of the Gunnison Ranger District, area maintenance at Monarch Ski Area on the Salida Ranger District, and improved parking access to Sheep Gulch.

(3) Alternative B

(a) Direct Effects

Alternative B would utilize the majority of the existing 90-mile segment of the Colorado Trail between Halfmoon Creek and South Fooses Creek as the CDT corridor. Within this corridor 76.8 miles of non-motorized Colorado Trail will be officially "located" as the CDT, and 12.1 miles of the Colorado Trail presently located on motorized roads will be utilized on an interim basis as connections to these non-motorized segments. The result will be the direct effect of reducing the miles of motorized routes traversed by CDT users from 38.8 miles to 12.1 miles (a reduction of 26.7 miles). Annual monitoring would be completed as part of this Alternative to evaluate interactions between motorized and non-motorized recreational users and overall satisfaction levels related to the nature and purpose of the CDT. If monitoring reveals the evidence of conflicts between user groups, or unacceptable "satisfaction" levels with regard to the nature and purpose of the CDT on specific segments of this alternative, future reroutes would occur on a case-by-case basis and would include subsequent NEPA analysis. This alternative would also have the direct effect of increasing the amount of singletrack trail available to mountain bike use by 2.6 miles. The amount of existing routes presently open to mountain bike use would not change for this alternative.

As required by the CDT Comprehensive Plan, this route is within the "zone of concern" (within 50 miles of the Continental Divide) identified for the purposes of legal rights-of-way. However, this route alternative does not closely adhere to the location criteria outlined by the CP, as it is well to the east of the Divide and primarily traverses lower elevation forests. The majority of this trail, 54 miles or 65% of the trail, is below timberline (Table 3-6). Less than 2 miles of the trail are within one mile of the actual Continental Divide (Table 3-7). This alternative is primarily located in forested environments and therefore lacks many of the scenic opportunities associated with the Continental Divide in the Sawatch Range (Table 3-8). This alternative lacks many of the natural, cultural, historic, scenic, and backcountry attributes of the Continental Divide.

Table 3-6. Trail Miles by Elevation (feet).

	Alternative A	Alternative B	Alternative C
8,000-8,999	0.0	11.3	0.0
9,000-9,999	14.6	47.1	13.0
10,000-10,999	26.1	20.8	24.2
11,000-11,999	33.6	9.8	30.8
12,000+	6.9	0.0	22.2
Total	81.2	89.0	90.2

Source: EDAW GIS

Table 3-7. Trail Miles within One Mile of the Continental Divide.

	Miles within One Mile of the Continental Divide
Alternative A	28.5
Alternative B	2.2
Alternative C	42.4

Source: EDAW GIS

Table 3-8. Trail Miles in Forested versus non-Forested Environments.

	Forested	Non-Forested
Alternative A	48.3	32.8
Alternative B	69.6	19.3
Alternative C	45.4	44.7

Source: EDAW GIS

Visitor density would increase as two sets of trail user groups (CDT users and Colorado Trail users) would be concentrated into a single trail corridor. Increased visitor density may lead to management issues such as user group conflicts, backcountry crowding, safety issues, demands for increased trail maintenance, and overall diminished visitor satisfaction.

As described as Chapter 2 Section B. *Alternatives Considered In Detail*, this alternative includes two options for a proposed bridge (Lake Creek bridge or Twin Lakes bridge). Either bridge option could result in modifications to existing visual resources by introducing new lines, colors, and forms. The PSICC Forest Plan directs that recreational and scenic resources in the Twin Lakes bridge area be managed for the Visual Quality Objective of Partial Retention, with an ROS of Roaded Natural north of Deception Point and Semi-Primitive Nonmotorized south of Deception Point. The Lake Creek bridge area is managed for Partial Retention of visual resources and Roaded Natural recreational experiences. For both options, the PSICC Forest Plan directs that scenic resources in the area be managed to maintain or improve the quality of recreation opportunities. Management activities must blend with the natural setting, and should be designed to enhance or provide more viewing opportunities in selected areas. Enhancements aimed at increasing positive elements of the landscape to improve visual variety may also used.

If implemented, the Twin Lakes b-ridge option would be constructed in a manner to permit currently allowed recreational activities to continue with the exception of sailing between the two lakes; the bridge clearance would be too low to allow a crossing with the mast up. According to the Forest Service, very few sail boats, but many other boats, have been witnessed on Twin Lakes in the last couple of years. The construction of Twin Lakes bridge would provide a direct positive impact for users of the CDT by providing a safer option to directly access the south-side of Twin Lakes rather than walking near Highway 82, and would contribute a high level of user satisfaction for thru-hikers, as well as day hikers including persons with disabilities. Although the Twin Lakes bridge option could result in a visual change to the naturally-appearing lake edge setting, it would not conflict with Forest Plan visual and recreational direction if designed to emulate the historical character of Interlaken Historic Site directly south of the bridge. Additionally, the construction of a Twin Lakes area bridge crossing will create additional recreation opportunities for day users in the area by providing additional access to the Interlaken Historic Site and by forming a loop trail around the reservoir.

The Lake Creek bridge would also comply with Forest Plan visual and recreational direction by removing the need for recreationists to use the narrow bridge crossing on State Highway 82. The Lake Creek bridge option would have a positive direct impact on the safety of trail users.

The Study Area contains GMUG and PSICC Management Areas that require projects to achieve the Visual Quality Objectives (VQO) of Preservation, Retention, Partial Retention, Modification, and Maximum Modification within one full growing season following project completion. The short-term direct effect to scenic resources would be soil and vegetative disturbance during and following construction. Long-term visual changes resulting from project implementation would include new lines on the landscape and trail structures, such as water bars, signage, and bridges. Trails built to the "most difficult" standard (i.e., leaving roots, embedded rocks, and some logs intact) would allow the existing landscape character to remain intact; in wilderness areas, trails will emulate game trails to the greatest extent possible. A properly sited, constructed and maintained single-track trail for non-motorized use does not conflict with existing PSICC and GMUG Forest Plan VQO direction.

(b) Indirect Effects

Parking lots at heavy use trailheadss may have to be expanded to accommodate additional trail users. It is expected that increased use, and thus a need for expanded parking facilities will be needed, such as at South Fooses Creek, if popularity of the trail increases.

The potential for campfires to escape and start wildland fires exists. New campsites below treeline would increase the possibility of fire start. Due to improved access to the south side of Twin Lakes and the Interlaken Historic Site, wildland fire occurrences due to escaped campfires, vandalism, illegal camping, and litter in this area could increase. Because of the Special Order prohibiting camping around Twin Lakes and the increased Forest Service enforcement presence, a function of improved access, these impacts could be reduced to result in no net increase.

Visitors who seek solitude and other primitive qualities would be disappointed with the conveyance with the Colorado Trail. This would result in a trail experience already available in other areas in Colorado, increased number of users, and a lack of high-country access. Overall satisfaction with the recreational opportunities on the CDT would likely decrease. Concentrating use into this single trail corridor may also result in a decrease in resource condition, which could also contribute to the loss of appeal for certain users.

(c) Cumulative Effects

Cumulative effects of Alternative B would be the same as those described above under "Cumulative Effects Common to All Alternatives."

(4) Alternative C – Proposed Action

(a) Direct Effects

The Proposed Action would have a positive, direct impact to primitive recreation use opportunities and user satisfaction along the CDT between Halfmoon Creek and Monarch Pass, and this alternative is consistent with the National Trail Systems Act of 1978. Motorized routes that CDT users traverse in this segment would be reduced from 38.8 miles to zero. The realignment of the trail close to the divide would also have a direct positive effect by increasing access to natural, cultural, historic, scenic, and backcountry attributes of the Continental Divide without compromising the existing scenic integrity of viewsheds due to new facilities. Under Alternative C, there would be an overall increase in non-motorized recreation opportunities without negatively impacting motorized opportunities. There would be a net increase of approximately 32 miles of trail in the area. Increases in the total trail length would help to better disperse trail users and separate out various user types. By rerouting the trail and limiting it to non-motorized users, there would be an overall reduction in visitor density on both the CDT and the former CDT segments still open to motorized use. This would lead to improved CDT user experiences and an increase in motorized user satisfaction in areas no longer designated as the CDT route. This reduction in visitor density could also help to reduce management issues, such as user group conflicts, backcountry crowding, safety issues, and increased trail maintenance, as well as providing for a more sustainable trail system within the Study Area.

It is expected that there would be an increase in use on the CDT due to a more attractive alignment, specifically along the Twin Lakes-Winfield, Winfield-Lake Ann, and Cottonwood-Tincup segments. Lake Ann and Woodchopper Basin are anticipated to see an increase in use from weekend and day hikers as these areas would be more accessible due to the trail realignment. They are also desirable camping areas as they offer a water source as well as good campsite locations. These areas are in designated wilderness and provide for a primitive use experience. With increased use on the trail and an increase in user-created campsites, personal sanitation and waste disposal problems may also increase.

Additionally, there are other areas that may see an increase of use from overnight camping as they may be desirable camping locations. These include: Hunt Lake basin including Boss Lake, upper reaches of Middle Fork, Hancock and Upper Hancock lakes, Tunnel Lake, alpine lakes in upper North Chalk Creek basin, Woodchopper basin, alpine areas of South Texas Creek basin, Texas Creek, tree line areas in upper Prospector Gulch, Lake Anne, Winfield, alpine lake in upper Little Willis Gulch, Twin Lakes area, and Mount Elbert trailhead and the nearby Lily Lake area. These areas are already used by hikers, and would see more use from an anticipated overall increase in trail use. The area around Winfield has several tracts of private property with small cabins and potential conflicts could arise in this area. The parking area for the Mount Elbert trail head in Bartlett is currently relatively small and difficult to maneuver. Hikers utilizing these parking areas may be forced to park lower down the jeep trail away from the trailhead.

Much of the new trail will be non-mechanized, such as between Cottonwood Pass and Tincup Pass. Approximately 44 miles of non-mechanized trail would further provide a unique hiking and pack and saddle stock experience consistent with the values of the CDT.

As described in Chapter 2 Section B. *Alternatives Considered in Detail*, this alternative includes two options for a proposed bridge (Lake Creek bridge or Twin Lakes bridge) in order to create an easterly alignment around Twin Lakes. Either bridge option could result in modifications to existing visual resources by introducing new lines, colors, and forms. The PSICC Forest Plan directs that recreational and scenic resources in the Twin Lakes bridge area be managed for the VQO of Partial Retention, with an ROS of Roaded Natural north of Deception Point and Semi-Primitive Non-motorized south of Deception Point. The Lake Creek bridge area is managed for Partial Retention of visual resources and Roaded Natural recreational experiences. For both options, the PSICC Forest Plan directs that scenic resources in the area be managed to maintain or improve the quality of recreation opportunities. Management activities must blend with the natural setting, and should be designed to "to enhance or provide more viewing opportunities in selected areas." Enhancements aimed at increasing positive elements of the landscape to improve visual variety may also used.

If implemented, the Twin Lakes bridge option would be constructed in a manner to permit currently allowed recreational activities to continue, with the exception of sailing, between the two lakes; the bridge clearance would be too low to allow a crossing with the mast up. According to the Forest Service, very few sail boats, but many other boats, have been witnessed on Twin Lakes in the last couple of years. The construction of Twin Lakes bridge would provide a direct positive impact for users of the CDT by providing a safer option to directly access the south-side of Twin Lakes rather than walking near Highway 82, and would contribute a high level of user satisfaction for through-hikers, as well as day hikers including persons with disabilities. Although the Twin Lakes bridge option could result in a visual change to the naturally-appearing lake edge setting, it would not conflict with Forest Plan visual and recreational direction if designed to emulate the historical character of Interlaken Historic Site directly south of the bridge. Additionally, the construction of a Twin Lakes crossing will create additional recreation opportunities for day users in the area by providing additional access to the Interlaken Historic Site and by forming a loop trail around the reservoir.

The Lake Creek bridge would also comply with Forest Plan visual and recreational direction by removing the need for recreationists to use the narrow bridge crossing on State Highway 82. The Lake Creek bridge option would have a positive direct impact on the safety of trail users.

The establishment of 15-20 new campsites will directly affect users' experience by providing high quality camping locations buffered from trails and water sources. These new campsites will directly affect users' safety by providing campsites below treeline, and subsequently, shelter from storms. Designing and identifying stock and large group campsites, would help to reduce potential conflicts between user groups.

The Study Area contains GMUG and PSICC Management Areas that require projects to achieve the VQO of Preservation, Retention, Partial Retention, Modification, and Maximum Modification within one full growing season following project completion. The short-term direct effect to scenic resources would be soil and vegetative disturbance during and following construction. Long-term visual changes resulting from project implementation would include new lines on the landscape and trail structures, such as water bars, signage, and bridges. Trails

built to the "most difficult" standard (i.e., leaving roots, embedded rocks, and some logs intact) would allow the existing landscape character to remain intact; in wilderness areas, trails will emulate game trails to the greatest extent possible. A properly sited, constructed and maintained single-track trail for non-motorized use does not conflict with existing PSICC and GMUG Forest Plan Visual Quality Objectives direction.

(b) Indirect Effects

Parking lots at heavy use trailheads may have to be expanded to accommodate additional trail users. It is expected that increased use, and thus a need for expanded parking facilities will be needed at Alpine Tunnel, Tunnel Gulch, Cottonwood Pass, and Winfield if popularity of the trail increases.

Over time, as use in these areas increases, backcountry crowding may occur, resulting in a drop in user satisfaction since many CDT users are seeking solitude and little or no interaction with other users.

The potential for campfires to escape and start wildland fires exists. New campsites below treeline would increase the possibility of fire starts. Prescribed fire projects may have temporary impacts on trail users.

(c) Cumulative Effects

Past projects that may have long-term impacts on recreation opportunities include timber sales in the Taylor Park area.

Planned projects that may impact recreation resources include fuels management projects near the Old Monarch Pass Road and the Tincup townsite of the Gunnison Ranger District, area maintenance at Monarch Ski Area on the Salida Ranger District, and improved parking access to Sheep Gulch.

(5) Comparison of Alternatives

Alternatives A and B would not provide a primitive hiking and pack and saddle stock experiences throughout the entire length of the Study Area because both alternatives would continue to utilize motorized sections. Due to the distance from the Continental Divide, Alternative B would not fully capture all of the characteristics associated with the CDT as identified in the National Trails System Act and the CDT Comprehensive Plan. Alternative C would provide the most primitive hiking and stock experiences of all alternatives.

Alternative A would provide an experience of the Continental Divide. Alternative B would only partially provide an experience of the Continental Divide. Alternative C would provide the most complete experience of the Continental Divide.

2. Wilderness Management Areas

a. Affected Environment

In 1964 Congress passed the Wilderness Act, legally designating certain federal lands as Wilderness Areas in order to assure that increasing population and expanding settlement did not modify all areas within the United States (The Wilderness Act, P.L. 88-577). According to the Wilderness Act, designated wilderness is:

> …Recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which 1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; 2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation (Sec. 2(c), P.L. 88-577).

Wilderness is a unique and vital resource. In addition to offering primitive recreation opportunities, it is valuable for its scientific and educational uses, as a benchmark for ecological studies, and for the preservation of historical and natural features (Forest Service Manual 2320, U.S. Forest Service 1990b). These areas contribute to the ecologic, economic, and social health and well being of our country. There are two designated wilderness areas within the Study Area: the Mount Massive Wilderness and the Collegiate Peaks Wilderness.

The Mount Massive Wilderness was initially proposed to be an addition to the immediately adjacent Hunter-Fryingpan Wilderness. Due to a technical oversight, the Mount Massive Wilderness was designated, separate from the Hunter-Fryingpan Wilderness, in 1980. The Continental Divide is the boundary between the two wilderness areas. The Mount Massive Wilderness encompasses approximately 30,540 acres of the San Isabel National Forest. Elevations range from 10,000 to 14,421 feet. Although the Mount Massive Wilderness is within the project Study Area boundary, the CDT included within this analysis does not cross it.

The Collegiate Peaks Wilderness, also designated by Congress in 1980, encompasses approximately 168,000 acres and overlaps three National Forests: the Gunnison, the White River, and the San Isabel. Within the Study Area, the Collegiate Peaks Wilderness overlaps the San Isabel and Gunnison National Forests and includes 113,608 acres of wilderness. The name comes from the many peaks within the wilderness named after famous universities. The wilderness contains more “Fourteeners” and high peaks than any other wilderness area in the contiguous United States. The headwaters of the Arkansas, Gunnison, and Roaring Fork rivers drain from the Continental Divide. Elevations range from 9,500 to 14,000 feet; the Collegiate Peaks Wilderness has the highest average elevation of any wilderness area in the lower 48 states. Expansive alpine tundra, high lake basins, glacial river valleys and dense forests comprise the landscape.

Wilderness use throughout the Mount Massive and Collegiate Peaks wildernesses varies widely, depending on location. Use associated with the climbing of "Fourteeners" is high in both wilderness areas and use is low to moderate in all other areas of the two wildernesses. Annually, approximately 9,500 users attempt to climb to the summit of Mount Massive, a popular "Fourteener" within the Mount Massive Wilderness. Within the Collegiate Peaks Wilderness, the most popular "Fourteener" is Mount Missouri. This peak attracts approximately 8,000 users annually. Solitude, a key value of the wilderness resource, can be difficult to find on most "Fourteeners" in these two wilderness areas. Throughout the remainder of these wilderness areas, opportunities to experience solitude are presently high, especially on weekdays.

Wilderness condition and physical impacts vary, depending on the location. Just as use is primarily associated with "Fourteeners", negative physical impacts such as damaged campsites, deteriorated climbing routes, improper disposal of human waste, and damage to tree line vegetation for firewood gathering are also associated with the "Fourteeners". The Colorado Fourteeners' Initiative (CFI), in partnership with the Forest Service, has been involved in an ongoing effort to improve resource conditions, especially the stabilization of climbing routes. Physical impacts throughout the remainder of the wilderness are relatively low. However, localized campsite and camping impacts within 100 feet of trails and streams are present.

The management of wilderness must ensure that human influences do not impede natural forces and successions. Planning and management of the wilderness should be conducted in such a manner so as to preserve the wilderness character of the area (FSM 2323.14, U.S. Forest Service 1990b). Regarding the management of recreation opportunities within wilderness areas, such as the CDT, the Forest Service Manual clearly states that one of the main objectives is to "provide outstanding opportunities for solitude or a primitive and unconfined type of recreation" (FSM 2323.11, U.S. Forest Service 1990b).

Regional direction of the Forest Service calls for the management of three tiers of wilderness opportunity classes: semi-primitive, primitive, and pristine. Semi-primitive wilderness management area prescription directs that management activities be integrated in such a way that human use leaves only limited and site-specific evidence of those activities (PSICC Forest Plan); interaction with other users is expected to be low to moderate. System trails are allowed in semi-primitive wilderness. Primitive wilderness is managed so that evidence of human activities is minimal; interaction with other users is expected to low. Low-standard ("most difficult") system trails are allowed in primitive wilderness. Pristine areas are managed so that evidence of human activities is essentially non-existent; interaction between users is non-existent or very low in pristine areas. System trails are not permitted in pristine areas. Currently, there are no pristine wilderness areas on the San Isabel National Forest or on the Gunnison National Forest within the Study Area. However, two areas straddling the San Isabel and Gunnison National Forest boundaries (within the Study Area) currently exhibit the necessary characteristics for the prescription of pristine management areas. One area (8,700 acres) includes the North Fork of Clear Creek, Church Basin and Silver Basin. The second area (4,600 acres) includes the North Fork of Texas Creek and the head of the Lake Fork Basin. It is possible that these two areas will be recommended to be changed to pristine management area prescription (8A) in the upcoming PSICC and GMUG Forest Plan revisions.

b. Environmental Consequences

Key factors considered in the evaluation of direct, indirect, and cumulative impacts of the alternatives include:

- Public access.
- Recreation opportunities and experiences.
- Crowding and density issues.
- Management and preservation of wilderness character.
- New trail facilities in Wilderness areas.

(1) Effects Common to All Alternatives

(a) Direct Effects

All of the alternatives cross the Collegiate Peaks Wilderness because they all include trail mileage within the wilderness boundaries (Table 3-9). The loss of wilderness character and values due to human influence and human presence is a potential direct effect. Additional direct effects include site disturbances and traces of human activity, such as litter, fire rings, gathered woodpiles, human waste, and vegetation disturbed by campsites.

Table 3-9. Miles of Trail in the Collegiate Peaks Wilderness.

Forest	Alt A	Alt B	Alt C
GMUG	3.6	0.0	13.8
SI	3.1	16.3	6.5
Totals	**6.7**	**16.3**	**20.3**

Source: EDAW GIS

(b) Indirect Effects

Indirect effects of trails located in these areas will likely improve the recreational experience of users seeking a primitive wilderness experience intrinsic to the CDT.

(c) Cumulative Effects

Hiking and climbing "Fourteeners" is increasingly popular. The Study Area contains the highest concentration of "Fourteeners" in the state. The CDT provides access to summit routes. Non-profit stewardship groups, such as the Colorado Fourteeners' Initiative, have been involved in ongoing efforts to create sustainable routes and to rehabilitate unacceptable impacted routes to the "Fourteeners" in the Study Area. Cumulative impacts to wilderness character and purity would result as there is more development and use of these peaks within wilderness.

The Timberline Trail, a motorized trail, borders the Collegiate Peaks Wilderness for 17 miles. Sights and sounds from this trail will have cumulative impacts on the wilderness resource.

(2) Alternative A – No Action

(a) Direct Effects

Currently, the present location near the spine of the Continental Divide in the Collegiate Peaks Wilderness invites use into the primitive and pristine basins adjacent to the trail, particularly those basins that provide outstanding opportunities for loop travel. The impacts of unofficial use are resulting in the development of user created routes.

(b) Indirect Effects

Social trails would continue to develop in poorly marked areas. Vegetation and soil impacts would occur as a result of continued and increasing visitor use, and natural erosion.

(c) Cumulative Effects

Cumulative effects of Alternative A would be the same as those described above under "Cumulative Effects Common to All Alternatives."

(3) Alternative B

(a) Direct Effects

Alternative B relocates the existing trail segment between Clear Creek and Middle Cottonwood Creek from the western half of the Collegiate Peaks Wilderness to the existing Colorado Trail on the eastern edge of the wilderness. This relocation will increase the mileage within the wilderness from 6.7 miles (Alternative A) to 16.3 miles (Table 3-9). The CDT realignment in this alternative would not require the construction of additional trail in the Collegiate Peaks Wilderness.

By realigning the CDT with the existing Colorado Trail, the eastern section of the wilderness would see a significant increase in visitation as the trail would be accommodating two user populations. As such, this particular area of the wilderness may experience increased resource pressure, such as loss of solitude, increase in campsite impacts, and increases in user created trails as a result of the concentrated visitor use along this one corridor. Subsequently, this alternative would result in the reduction of human influence on the west side of the Collegiate Peaks Wilderness, especially in adjacent areas to basins that have primitive and pristine character.

(b) Indirect Effects

This particular area of the wilderness (eastern) may experience increased resource pressure, such as increases in campsite impacts, increases in user created trails, and increases in horse-related impacts as a result of the concentrated visitor use along this one corridor.

Over time, the physical condition of the Lake Ann area within the Collegiate Peaks Wilderness may improve as a result of less use by CDT hikers and little or no use by CDT pack and saddle users.

(c) Cumulative Effects

Cumulative effects of Alternative B would be the same as those described above under "Cumulative Effects Common to All Alternatives."

(4) Alternative C – Proposed Action

(a) Direct Effects

Alternative C includes 9.8 miles of new trail construction within the Collegiate Peaks Wilderness in an area that currently has no trails. The direct effects to the wilderness resource in this area may include wilderness fragmentation, decrease in opportunities for solitude, horse-related impacts, campsite development, visual impacts, and obvious evidence of human influence.

The realignment proposed with this alternative, located near the spine of the Continental Divide in the Collegiate Peaks Wilderness, would potentially perpetuate use into the primitive and pristine basins adjacent to the trail, particularly those basins that provide outstanding opportunities for loop travel (see Alternative A – Direct Effects for a description of the problem). The impacts of unofficial use are resulting in the development of user created routes.

Trail construction in the wilderness would temporarily affect user experiences and infringe on wilderness values. Temporary construction related disturbances would include: noise; increased and concentrated human presence; vegetation trampling as a result of transporting construction and restoration materials (both materials generated from trail construction and materials found dispersed throughout the basin); and the loss of solitude and opportunities for isolation due to the presence of work crews and volunteers.

Alternative C provides for the use and enjoyment of the wilderness, consistent with the Wilderness Act of 1964. This alternative also includes the closure of five trails and the downgrading of one trail within the wilderness (a total of 10 miles). These actions will directly improve wilderness resource conditions in the basins that these trails access. There would be no net increase in the miles of trail in the wilderness because of these closures.

(b) Indirect Effects

The additional mileage in the wilderness would inevitably increase the backcountry acreage accessible to visitors. Furthermore, by bringing the trail into conformance with the intent of the CDT, the trail could see an increase in visitation. The combination of an increased accessible area and increased visitation could result in impacts to resource conditions over time if not managed and regulated properly.

One potential indirect effect of this alternative is the probable addition of campsites and related impacts (e.g., human waste disposal) occurring along the trail. Relocating the trail closer to the Continental Divide, in an effort to better fulfill the intent of the CDT, would attract more visitors and subsequently, more campsite options along the trail. The addition of a new travel corridor within the wilderness increases the possibility for the introduction of non-native species into the wilderness if not closely monitored and managed.

(c) Cumulative Effects

Cumulative effects of Alternative C would be the same as those described above under "Cumulative Effects Common to All Alternatives."

(5) Comparison of Alternatives

All alternatives will have the potential for impacts associated with increased use if the trail is not managed properly. Alternative A has the least potential, Alternative B has moderate potential, and Alternative C has the highest potential to impact wilderness resources. Alternatives A and C have similar potential to impact adjacent primitive and pristine areas. The impacts of Alternative B to adjacent primitive and pristine areas would be less than Alternative C. Alternative A and B would not increase the amount of area accessed by trail in the wilderness. Alternative C would result in a no net increase in trail in the wilderness (10 miles of new construction and 10 miles of trail closures).

3. Socioeconomics

a. Affected Environment

The Study Area is located in Lake, Gunnison, and Chaffee counties. The largest municipalities in the Study Area are: Leadville, Salida, Buena Vista, Salida, and Poncha Springs. Table 3-10 shows the relative growth and expected growth for each of these counties and municipalities from 1890-2030. While modest growth is shown for Chaffee and Gunnison counties, and the communities of Buena Vista, Salida, and Poncha Springs, there was very little growth in Lake County. The drastic decline of the mining industry in and around Leadville resulted in a major reduction in the population of the community (Colorado Demography Office 2005). Growth is projected to continue in the counties over the next 25 years; over 27,000 people are expected to move into the three counties by the year 2030.

Table 3-10. Population Estimates for Communities Near the Study Area.

County	1890	2000	2030
Lake	14,663	7,812	18,403
Chaffee	6,612	16,242	27,386
Gunnison	4,3659	13,956	19,639
Municipality	**1890**	**2000**	**2030**
Leadville	10,384	2,821	n/a
Buena Vista	1,317	2,195	n/a
Salida	2,586	5,504	n/a
Poncha Springs	101	466	n/a

Source: Colorado Demography Office Website. Accessed June, 2005.

In 2000, there were 2,977 households, and 1,914 families residing in Lake County. The average household size was 2.59 persons with a population density of 8/km² (21/mi²) and 3,913 housing units. The median age in Lake County was 30 years while the median income for a household in the county was $37,691. Approximately 23% of people worked in the arts, entertainment, recreation, accommodation and food services industries, while 11% worked in retail trade, both of which may experience direct financial benefits from spending by CDT trail users. Approximately 13% of the population was considered to be in poverty. The 2005 Census reports that approximately 68% of people own a home in Lake County; the median value of homes is $115,400 (U.S. Census Bureau 2005).

In 2000, there were 6,584 households, and 4,365 families residing in Chaffee County. The average household size was 2.26 persons with a population density of 6/km² (16/mi²) and 8,392 housing units. The median age in Chaffee County was 42 years while the median income for a household in the county was $34,368. Approximately 15% of people worked in the arts, entertainment, recreation, accommodation and food services industries, while 12% worked in retail trade, both of which may experience direct financial benefits from spending by CDT trail users. Approximately 12% of the population is considered to be in poverty. The 2005 Census reports that approximately 73% of people own a home in Chaffee County; the median value of homes is $152,800 (2005).

In 2000, there were 5,649 households, and 2,965 families residing in Gunnison County. The average household size was 2.30 persons with a population density of 2/km² (4/mi²) and 9,135 housing units. The median age in Gunnison County was 30 years while the median income for a household in the county was $36,916. Approximately 22% of people work in the arts, entertainment, recreation, accommodation and food services industries, while 14% work in retail trade, both of which may experience direct financial benefits from spending by CDT trail users. Approximately 15% of the population is considered to be in poverty. The 2005 Census reports that approximately 58% of people own a home in Gunnison County; the median value of homes is $189,400.

Tourism contributes to the local economies of these three counties as users access the Forest for day and overnight trips. In Lake County approximately 17% of all jobs are tourism related, accounting for 12% of the total personal income received in the county. In Chaffee County, approximately 27% of all jobs are tourism related, accounting for 19% of the total personal

income received. Finally, in Gunnison County 36% of all jobs are tourism related, accounting for 29% of the total personal income received (Colorado Demography Office 2005).

The Forest Service NVUM survey for the PSICC indicates that the average expenditures for goods and services within a 50-mile radius of a recreation site is approximately $280 per person, per trip. In a typical year, visitors to the Forest spend an average of $2,874 on all outdoor recreation activities including equipment, trips, memberships, and licenses. These numbers, may include multiple national forest visits, as well as visits to other forests or parks. (U.S. Forest Service 2002).

In March 2005, the Forest Service co-hosted a public meeting with the Twin Lakes Improvement Association. The purpose of the meeting was to present and discuss the overall CDT reroute project. The public response was very focused on the conceptual development in the vicinity of Twin Lakes. The meeting attendees were in significant opposition to the concept of a bridge at Deception Point, between the lakes. During the scoping process, the Forest Service received numerous letters equally supporting and opposing the placement of a bridge between the lakes.

Current Forest Service funding is not adequate to meet the demands to provide and maintain recreation facilities. Typically, projects and maintenance are completed with the assistance of volunteer groups and outside funding sources or non-traditional funding sources such as National Forest Foundation grants, Colorado State trail grants, and earmarked funding from Congress.

The estimated costs of implementing each Alternative are found in Table 3-11.

Table 3-11. Cost Estimate by Alternative.

	Alternative A	Alternative B	Alternative C
New Trail Mileage / Reconstruction	0.0	7.6	58.1
Estimated Average Cost Per Mile	$30,000	$30,000	$30,000
Construction / Reconstruction Costs (includes bridges less than 20 feet)	$0	$228,000	$1,740,000
Twins Lakes Bridge Construction Cost	n/a	$1,000,000	$1,000,000
Lake Creek Bridge Construction Cost	n/a	$200,000	$200,000
Annual Trail Maintenance Cost	$10,000	$10,000	$10,000
Deferred Maintenance Cost	$300,000	$200,000	$0
Annual Monitoring	$20,000	$20,000	$0
Total Cost With Twin Lakes Bridge Option (including trail)	n/a	$1,458,000	$2,750,000
Total Cost Without Twin Lakes Bridge Option	$330,000	$658,000	$1,950,000

Source: USFS.
* Cost may differ from original estimates due to changes in material costs and contingency factors.

b) Environmental Consequences

(1) Effects Common to All Alternatives

(a) Direct Effects

The direct effects include the cost of implementing the project. These costs could be off-set by volunteer efforts and grant monies to support the construction, reconstruction or maintenance of the CDT. The costs for the project consider parameters outlined in the CDT Proposed Action Implementation Project Segment Narratives and Costs and regional Forest Service cost guidelines. Construction costs are estimated at an average of $30,000 per mile; true costs may vary between $10,000 and $100,000. Construction costs include tread construction, switchbacks, installation of drainage structures and signage, and stream crossings less than 20 feet in length. Project construction would be accomplished by Forest Service crews, volunteers, Youth Conservation Corps (YCC) crews, and private trail contractors.

The annual maintenance costs are estimated to be the same for each Alternative, since volunteers presently maintain the Continental Divide and Colorado Trails in this area. Maintenance will continue to be conducted by the Continental Divide Trail Alliance (non-motorized sections), the Colorado Trail Foundation, and other groups. Annual costs associated with volunteer maintenance include $10,000 to support volunteer recruitment and coordination efforts, purchase tools and supplies, and to fund other support costs.

The proximity of the CDT to local tourist activity centers adds to the ability of these centers to market local recreational opportunities and attract tourists.

(b) Indirect Effects

It is assumed (see Recreation section) that there will be an increase in the number of CDT users, over time for each alternative. An increase in tourist traffic in nearby localities would have a positive impact on local economies.

(c) Cumulative Effects

The cumulative effect of any other tourist based improvements in the region may result in a net increase in tourism and its associated revenues.

(2) Alternative A – No Action

(a) Direct Effects

Alternative A would incur the least cost to implement; it would cost $330,000. Alternative A includes monitoring costs necessary to identify areas in which there is ongoing conflict between motorized and non-motorized recreation users. As Alternative A provides users with the same recreation opportunities they currently have, there would be no direct effects to socioeconomic resources.

(b) Indirect Effects

The deteriorated trail condition and continued non-compliance with the intent of the CDT may result in a gradual decline in user satisfaction, leading to a reduction in interest and use (or demand) of the trail. It has been shown that the attractiveness or quality of a recreation site can act as an important determinant of demand for recreation (Loomis and Walsh, 1997). A decline in visitation levels may negatively affect local commercial enterprises and reduce the overall regional economic impact of the CDT.

Alternative A would include approximately $300,000 in deferred maintenance costs. Deferred maintenance would be necessary to make the trail compliant with Forest Service Standards and Guidelines and to ensure a sustainable trail over time. Deferred maintenance would be necessary due to a lack of initial engineering and proper trail construction as well as cumulative damages related to inadequate maintenance.

(c) Cumulative Effects

Cumulative effects of Alternative A would be the same as those described above under "Cumulative Effects Common to All Alternatives."

(3) Alternative B

(a) Direct Effects

The cost to implement Alternative B includes reconstruction of the trail north of Twin Lakes, annual monitoring, annual maintenance, deferred maintenance, and a crossing of either Lake Creek or between the two lakes at Twin Lakes. With relatively little new trail construction, the cost to implement Alternative B would be $658,000 with the Lake Creek bridge option. The Twin Lakes bridge option would cost approximately $1.5 million. Alternative B includes monitoring costs necessary to identify areas in which there is ongoing conflict between motorized and non-motorized recreation users. Presently, no additional funding has been identified for this alternative.

The Lake Creek bridge option would not result in any additional direct economic impacts to the Twin Lakes community. However, Twin Lakes would experience some direct economic benefits with the construction of the Twin Lakes bridge. The bridge may become a tourist attraction for people seeking a scenic day hike, campers at the local campground, or visitors at local historic sites, including Interlaken.

Moving the trail from backbone of the Continental Divide, partially within Gunnison County, to the eastern front of the Sawatch Range would result in a shift in economic impacts to eastern communities and counties. Improvements to the trail north of Twin Lakes and relocating CDT users to the Colorado Trail may result in benefits to local businesses in Buena Vista, Salida and Leadville because of the change of the trail's proximity to these town centers. The trail's close proximity to these towns may result in increased sales, the need for extended hours, and growth

of local businesses. As trail use increases, the demand for lodging, food, and athletic gear also increases in adjacent commercial centers (York County 2002).

Buena Vista, Salida and Leadville have tourist based economies. These larger communities presently accommodate a large number of tourists each year, therefore the estimated increase in visitors would be absorbed by the existing infrastructure. Additional visitors resulting from this alternative would not alter the character of these mountain communities. However, any increase in visitation to the Twin Lakes area may result in a noticeable impact to the character of the community because of the relatively small amount of present tourist activity and associated tourist infrastructure. The social impacts would be noticeably greater if the Twin Lakes bridge option were implemented.

(b) Indirect Effects

Because this alternative would not provide for a continuous non-motorized route from one end of the Study Area to the other, it will not fully capture all of the characteristics of the CDT as identified in the National Trail Systems Act, and the CDT Comprehensive Plan. Therefore the implementation of this alternative could result in a gradual decline in user satisfaction, leading to a reduction in interest and use (or demand) of the trail. Annual monitoring would be completed as part of this alternative to evaluate interactions between motorized and non-motorized recreational users and overall satisfaction levels related to the nature and purpose of the CDT. This alternative would move users further away from the Continental Divide, thereby altering, or altogether removing the high-country recreation experience explicitly defined in the National Trails System Act of 1978 (to “provide the hiker and rider an entree to the diverse country along the Continental Divide…”).

Alternative B would include approximately $200,000 in deferred maintenance costs. Deferred maintenance would be necessary to make the trail compliant with Forest Service Standards and Guidelines and to ensure a sustainable trail over time. Deferred maintenance would be necessary because the existing Colorado Trail is designed and maintained for approximately the existing level of use. A significant increase in trail use will require deferred maintenance activities to accommodate this increase in use.

(c) Cumulative Effects

Non-compliance with the intent of the CDT may result in a gradual decline in user satisfaction over time, leading to a reduction in interest and use (or demand) of the trail. It has been shown that the attractiveness or quality of a recreation site can act as an important determinant of demand for recreation (Loomis and Walsh 1997). A decline in visitation levels would result in less regional economic benefits.

(4) Alternative C – Proposed Action

(a) Direct Effects

Alternative C would cost the most to implement, approximately $2 million. The majority of the cost would be related to new trail construction and reconstruction (42.3 miles and 15.8 miles, respectively). The cost of implementation for Alternative C, with the new Twin Lakes bridge would increase to $2.8 million. Approximately 75% of the implementation costs have been tentatively allocated through a Great Outdoors Colorado (GOCO) Legacy grant. This money is only available for use under this alternative. This grant project is partnership between CDTA, Colorado State Trails, Lake, Chaffee, and Gunnison counties, GOCO, and the U.S. Forest Service.

This Alternative would create a trail that serves to "provide the hiker and rider an entree to the diverse country along the Continental Divide in a manner which will assure a high quality recreation experience while maintaining a constant respect for the natural environment" as defined in the National Trail Systems Act of 1978. It would comply with the National Trail Systems Act by establishing a trail that provides a primitive, non-motorized experience primarily for hiking and pack and saddle stock.

New bridges, including the Twin Lakes bridge option would contribute to a high level of user satisfaction for trail users. The Lake Creek bridge option would not result in any additional direct economic impacts to the Twin Lakes community. However, Twin Lakes would experience some direct economic benefits with the construction of the Twin Lakes bridge. The bridge may become a tourist attraction for people seeking a scenic day hike, campers at the local campground, or visitors at local historic sites, including Interlaken.

For some users, the realignment and improvement of the trail are of great importance and will influence their choice of recreation destinations. It has been shown that the attractiveness or quality of a recreation site can act as an important determinant of demand for recreation (Loomis and Walsh 1997). The ability to better meet recreational demand could be a benefit to local commercial enterprises, include camping concessionaires, local stores and other associated entities, therefore increasing regional economic benefit. Existing businesses along the trail would benefit from increased sales, extended hours, and employment. As trail use increases, so does the demand for lodging, food, and athletic gear. New food, accommodations and recreation based businesses may also result from the new users (York County 2002). Economic benefits would occur in communities within the region such as the town of Twin Lakes, as well as the communities of Buena Vista, Salida and Leadville.

Buena Vista, Salida and Leadville have tourist based economies. These larger communities presently accommodate a large number of tourists each year, therefore the estimated increase in visitors would be absorbed by the existing infrastructure. Additional visitors resulting from this alternative would not alter the character of these mountain communities. However, any increase in visitation to the Twin Lakes area may result in a noticeable impact to the character of the community because of the relatively small amount of present tourist activity and associated tourist infrastructure. The social impacts would be noticeably greater if the Twin Lakes bridge

option were implemented. However, this alternative would also be consistent with the Forest Plan which states that resource activities such as trail construction and recreation site development add to local economies by providing jobs, goods, and services.

(b) Indirect Effects

The relocation of the CDT to a location that meets the original intent of the trail would result in a higher degree of public awareness of the trail. Magazines and guidebooks would discuss the new trail. The rerouted trail would have the potential to become an international tourist destination as it would improve the quality of the highest, continuous trail in the United States.

This alternative's trail alignment would be built so as to minimize maintenance needs, primarily due to low trail grades (less than 15%); subsequently, the long-term annual maintenance costs would be relatively low.

(c) Cumulative Effects

As improvements in the recreation system in the region, these areas will become more attractive and overall recreational use will increase. As trail segments such as these receive attention from the hiking and stock user communities, the overall use of the trail should increase, benefiting the local economies. Improvements to the recreational amenities of the area and increased visitation should serve to improve the larger retail sector of the economy through direct expenditures at retailers such as outdoor equipment outfitters, grocery stores, and gas stations. Additionally, indirect expenditures may be seen in the hospitality industry such as restaurants and hotels**.**

(5) Comparison of Alternatives

Alternative A would cost the least to implement. There would be little or no change to social and economic benefits in the surrounding communities.

Alternative B would result in moderate costs to implement. Under Alternative B the amount of traffic on the Colorado Trail alignment would increase due to a shift of users from the current CDT alignment. This would benefit the local economies of the nearby towns of Salida, Buena Vista and Leadville.

Alternative C would cost the most to implement; regardless of the bridge option chosen for the Twin Lakes area. Alternative C would continue to attract existing CDT users as well as an additional sub-set of CDT users who are attracted to the realignment because of its non-motorized nature, proximity to the Continental Divide, and primitive characteristics. Overall, Alternative C would see a net increase in visitor use and would provide the greatest economic benefit to local communities.

Alternatives B and C include the option to build a bridge between the lakes at Twin Lakes Reservoir. The option to build the Twin Lakes bridge is considerably more expensive than the option to simply reroute the existing trail at the east end of the reservoir onto a new Lake Creek bridge. A new bridge at Twin Lakes may create a destination spot for visitors other than CDT users and result in increased visitor activity in the town of Twin Lakes. The bridge would attract

additional visitors and the surrounding towns may experience economic benefit. The increased use at Twin Lakes as a result of the bridge could potentially change the character of the town of Twin Lakes.

Expected annual maintenance costs are the same for each alternative. However, Alternatives A and B would require deferred maintenance and the associated costs.

C. Biological Resources

1. Terrestrial Wildlife (including Federally Listed, Forest Service sensitive, and Management Indicator Species)

The organization of this resource analysis section deviates from the organization of all other resource sections (except Fisheries and Aquatics). This section is organized as follows: a. Affected Environment, b. Environmental Consequences, c. Effects by Species, d. Determination of Effects, and e. Comparison of Alternative.

a. Affected Environment

The Study Area is within the montane forest of the Southern Rocky Mountain geographic area and is centered on the Sawatch Range. It includes watersheds that flow west to the Colorado River and east to the Arkansas River. Elevations range from 8,000 to over 14,000 feet. Terrestrial vegetation and habitats are varied depending on elevation, aspect, and topographic features, and include areas of sagebrush (*Artemisia* spp.), ponderosa pine (*Pinus ponderosa*), aspen (*Populus tremuloides*), lodgepole pine (*Pinus contorta*), mixed conifer of Douglas-fir *(Pseudotsuga menziesii*), and Engleman spruce (*Picea engelmannii*) to areas of sub-alpine fir (*Abies bifolia)* and alpine tundra. Aquatic habitats include streams, creeks, and ponds, fens, and wetlands. Rock features are common, especially at higher elevations, and include steep rock faces, rock slides along slopes, and rock and boulder fields in flatter areas.

There are a multitude of wildlife species within the Study Area because of the varied habitat types and elevation ranges. Separate Biological Evaluations (BE) were produced for wildlife and plant species which include an evaluation of Federal and Forest Service sensitive species. An MIS Report containing additional information on the potential project effects on MIS was also completed. The two BE's and the MIS report are contained in the project record.

The structure, composition, and landscape pattern of vegetation in the Forests, particularly the lower montane zone, has been substantially altered from its pre-European conditions by cumulative human impacts. These vegetation changes, combined with hunting/trapping pressure, extirpation of large predators, and more recent land development have altered the distribution and abundance of wildlife species. Within the Study Area and immediate vicinity, the greatest threats to wildlife are the development of private lands, increasing unmanaged recreational use of public lands, and events that affect large geographic areas or populations, such as drought, catastrophic fire and disease (e.g., chronic wasting disease, chytrid fungus, and

West Nile virus) as well as invading organisms (e.g., pine and spruce beetles (*Dendroctonus* spp) and New Zealand mudsnail (*Potamopyrgus antipodarum*)).

For this EA, the action (or analysis) area is defined as the 90 mile proposed CDT corridor for all species except for the Canada lynx (*Felis lynx canadensis*). Lynx will be analyzed at the Lynx Analysis Unit (LAU) scale and boundaries for these will go beyond the Study Area. There are eight LAUs in the action area: Tennessee Pass, Cottonwood Pass, and Monarch Pass on the San Isabel National Forest; and Upper Taylor, Grizzly Peak, Tincup, Pitkin and Upper Tomichi on the Gunnison National Forest.

Species listed as Federally threatened and endangered, Forest Service Management Indicator Species (MIS) as well numerous Forest Service sensitive species occur or have potential to occur in the Study Area (see examples, Figure 3-1). Terrestrial and aquatic wildlife species listed as Federally threatened and endangered within the Study Area are listed in Table 3-12. Forest Service sensitive wildlife species that were eliminated from analysis are presented in Table 3-13; those species for which an analysis was conducted are shown in Table 3-14. Forest Service Management Indicator Species (MIS) addressed in the analysis are shown in Table 3-15.

Table 3-12. List of Federal Threatened, Endangered and Candidate Species for Chaffee, Gunnison and Lake Counties. (from: Mountain-Prairie Region Endangered Species Program found on the internet at: http://mountain-prairie.fws.gov/endspp/CountyLists/COLORADO.htm) (USFWS 2005a).

Common Name (*Scientific Name*)	County [1]	Status [2]	Known or Suspected in Study Area	Suitable Habitat Present in Study Area	Analysis Provided [3]	Rationale for Not CarryingForward for Full Analysis
Bald Eagle (*Haliaeetus leucocephalus*)	CGL	T	Yes	Yes	Yes	
Canada Lynx (*Lynx canadensis*)	CGL	T	Yes	Yes	Yes	
Gunnison Sage Grouse (*Centrocercus minimus*)	CG	C	No	No	No	Appropriate sagebrush habitat is not present in Study Area.
Mexican Spotted Owl (*Strix occidentalis*)	C	T	No	Yes	No	No records of occurrence in the analysis area.
Greenback Cutthroat Trout (*Oncorhynchus clarki stomias*)	L	T	Yes	Yes	Yes	
Bonytail (*Gila elegans*)	G	E	No	No	No	Occurs in lower Colorado River drainage. No habitat in analysis area and no water depletions would occur.
Colorado Pikeminnow (*Ptychocheilus lucius*)	G	E	No	No	No	Occurs in lower Colorado River drainage. No habitat in analysis area and no water depletions would occur.
Humpback Chub (*Gila cypha)*	G	E	No	No	No	Occurs in lower Colorado River drainage. No habitat in analysis area and no water depletions would occur.
Razorback Sucker (*Xyrauchen texanus*)	G	E	No	No	No	Occurs in lower Colorado River drainage. No habitat in analysis area and no water depletions would occur.
Yellow-billed Cuckoo (*Coccyzus americanus*)	G	C	No	No	No	Low-elevation deciduous riparian areas not present in Study Area.
Uncompahgre Fritillary Butterfly (*Boloria acrocnema*)	CGL	E	Yes	Yes	Yes	

[1] C=Chaffee, G=Gunnison, L=Lake; [2] E = endangered; T = threatened, C = candidate; [3] Species not known or suspected to be present and with no suitable habitat present in the Study Area will not be further analyzed in this document because they would not be affected by project activities.

Table 3-13. Forest Service Sensitive Species Eliminated from Analysis.

Common name (*scientific name*)	Rationale for Not Carrying Forward for Full Analysis
MAMMALS	
fringed myotis *(Myotis thysanodes*)	Typically found only below elevations of 7,500 feet
spotted bat *(Euderma maculatum*)	Habitat of pinon juniper woodlands not in Study Area
white-tailed prairie dog *(Cynomys leucurus*)	Suitable habitat of xeric sites with mixed stands of shrubs and grasses not present in Study Area
kit fox *(Vulpes macrotis*)	Found at lower elevation grasslands, no habitat in Study Area
river otter (*Lontra canadensis*)	Larger stream habitat not present in Study Area
common hognosed skunk *(Conepatus leuconotus*)	Suitable habitat not present in Study Area
Gunnison's prairie dog (*Cynomys gunnisoni*)	Suitable habitat not present in Study Area
FISHES	
roundtail chub *(Gila robusta*)	Found in cool to warm water mid-elevation streams and rivers
southern redbelly dace *(Phoxinus erythrogaster*)	Found at elevations lower than Study Area
bluehead sucker *(Catostomus discobolus*)	Suitable habitat not present in Study Area
flannelmouth sucker *(Catostomus latipinnis*)	Habitat not present in Study Area. Found in moderate to larger rivers
INSECTS	
regal fritillary butterfly *(Speyeria idalia*)	Suitable habitat of prairie and pastures not present in Study Area
Nokomis fritillary butterfly *(Speyeria nokomis nokomis*)	Suitable habitat of desert environments not present in Study Area
BIRDS	
American bittern *(Botaurus lentiginosus*)	Suitable habitat of wetlands with tall emergent vegetation not present in Study Area
trumpeter swan *(Cygnus buccinator*)	Suitable large river and lake habitat not present in Study Area
harlequin duck *(Histrionicus histrionicus*)	Suitable habitat not present in Study Area
Gunnison sage-grouse *(Centrocercus minimus (Candidate)*	Suitable sagebrush habitat not present in Study Area
greater sage-grouse *(Centrocercus urophasianus*)	Suitable sagebrush habitat not present in Study Area
mountain plover *(Charadrius montanus*)	Suitable prairie habitat not present in Study Area
long-billed curlew *(Numenius americanus*)	Suitable habitat of grassland and open water habitat not present in Study Area
black tern *(Chlidonias niger*)	Found in wetland areas, no habitat in Study Area
yellow-billed cuckoo *(Coccyzus americanus (Candidate)*	Suitable habitat not present in Study Area
burrowing owl *(Athene cunicularia*)	Suitable habitat of dense riparian vegetation, cottonwoods and mountain shrub not present or extensive in Study Area
Lewis's woodpecker *(Melanerpes lewis*)	Primary habitat of fire-maintained old-growth ponderosa pine not in Study Area (NS)
grasshopper sparrow *(Ammodramus savannarum*)	Suitable habitat not present in Study Area
sage sparrow *(Amphispiza bellii*)	Suitable habitat not present in Study Area
ferruginous hawk (*Buteo regalis*)	Suitable habitat not present in Study Area
black swift (*Cypseloides niger*)	Suitable habitat of sheer cliffs with waterfalls not present in Study Area
northern harrier (*Circus cyaneus*)	Grasslands, croplands, wetlands, occasional alpine tundra
loggerhead shrike (*Lanius ludovicianus*)	Suitable open country habitat not present in Study Area
MOLLUSCS	
Rocky Mountain capshell snail *Acroloxus coloradensis*	Project location is at too high of an elevation, generally over the 9400 foot threshold
PLANTS – Dicots / Moncotes	**See Plant Biological Evaluation**

Table 3-14. List of GMUG and PSICC Sensitive Species Evaluated.

Common Name (scientific name)	Species Present or Suspected in Study Area (Y/N)		Suitable Habitat Present in the Study Area (Y/N)	
	GMUG	PSICC	GMUG	PSICC
Townsend's big-eared bat (*Corynorhinus townsendii*)	Yes	Yes	Yes	Yes
American marten (*Martes Americana*)	Yes	Yes	Yes	Yes
wolverine (*Gulo gulo*)	Yes	Yes	Yes	Yes
northern goshawk (*Accipiter gentilis*)	Yes	Yes	Yes	Yes
American peregrine falcon (*Falco peregrinus anatum*)		Yes		Yes
northern harrier (*Circus cyaneus*)	Yes	Yes	Yes	Yes
white-tailed ptarmigan (*Lagopus leucurus*)	Yes	Yes	Yes	Yes
boreal owl (*Aegolius funereus*)	Yes	Yes	Yes	Yes
flammulated owl (*Otus flammeolus*)		Yes		Yes
Am. three-toed woodpecker (*Picoides dorsalis*)	Yes	Yes	Yes	Yes
olive-sided flycatcher (*Contopus cooperi*)	Yes	Yes	Yes	Yes
purple martin (*Progne subis*)	Yes	Yes	Yes	Yes
boreal toad (*Bufo boreas boreas*)	Yes	Yes	Yes	Yes
northern leopard frog (*Rana pipiens*)	Yes	Yes	Yes	Yes
Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*)	Yes		Yes	
Hudsonian emerald (*Somatochlora hudsonica*)		Yes		Yes
Brewer's sparrow (*Spizell breweri)*	No	Yes	No	Yes

Table 3-15. MIS for GMUG and PSICC Forests.

GMUG MIS*	PSICC MIS	Common Name(scientific name)	Primary Habitat Type	Species Expected in Project Area		Habitat Affected by the Project	
				GMUG	PSICC	GMUG	PSICC
X	X	Abert's Squirrel (*Sciurus aberti*)	Mature ponderosa pine	No	Yes	No	Yes
X		American Marten (*Martes Americana*)	Spruce-fir	Yes		Yes	
X	X	Elk (*Cervis elaphus*)	Early succession spruce-fir, Douglas fir, lodgepole pine, aspen, and mountain shrub	Yes	Yes	Yes	Yes
	X	Brook Trout (*Salvelinus fontinalis*)	Beaver ponds, streams		Yes		Yes
X		Common Trout (*Oncorhynchus* spp)	Beaver ponds, streams	Yes		Yes	
	X	Greenback Cutthroat Trout(*Oncorhynchus clarki stomias*)	Beaver ponds, streams		Yes		Yes
X		Northern Goshawk (*Accipiter gentilis*)	Mature aspen forest	Yes		Yes	
X		Red-naped Sapsucker (*Sphyrapicus nuchalis*)	Mature aspen forest	Yes		Yes	
X		Merriam's turkey (*Meleagris gallopavo*)	Ponderosa pine, shrubland, pinon juniper, riparian	Yes		Yes	
X		Brewer's Sparrow (*Spizell breweri*)	Sagebrush shrubland	Yes		Yes	

*X= present

Forested and woodland areas occur over much of the Study Area. These areas provide cover for many wildlife species such as deer and elk, smaller mammals such as the pine marten, coyote, and a variety of bird species including woodpeckers, sparrows, and owls.

In the higher alpine areas, pika and marmots are observed especially in areas where rock fields occur. Numerous insect species are also present in the higher tundra areas with moth and butterfly species utilizing various plants in the alpine meadows being particularly evident.

b. Environmental Consequences

(1) Effects Common to All Alternatives

(a) Direct Effects

Each alternative has the potential to impact wildlife as a result of disturbance (including noise) and habitat modification. Disturbance of wildlife occurs in most cases where humans and wildlife interactions occur. Existing literature indicates that wildlife responses to disturbance are shaped by at least six factors: type of activity, recreationist's behavior, predictability of the activity, frequency and magnitude of the activity, timing (e.g., breeding season) and, relative location (e.g., above versus below, in the open versus screened by topography or vegetation). The type of animal including its life history and size, group size, sex, and age also affect responses to disturbance (Knight and Cole 1995). Learned responses might take the form of avoidance, habituation, or attraction (Knight and Cole 1995). Habituation reduces the physiological cost of dealing with an environmental stress factor, but it seldom eliminates the cost entirely. Habituated animals may have chronically elevated heart rates (Cassier and Abies 1990 in Youmans 1999). Small animals such as boreal toad may also be directly impacted by trampling.

Typically wildlife disperse when humans are encountered and little effect is noted. However during critical periods, such as when young are being born or during periods of environmental stress such as frigid weather, disturbance of wildlife can have negative effects. Newly born animals may become separated from mothers and leave them vulnerable to predation or in extreme cases starvation. Animals forced to exert energy during cold periods may use critical stored reserves to escape a perceived threat weakening their condition and making them vulnerable to starvation.

Trails can result in reductions in habitat availability and effectiveness, disruption of movement corridors, alteration of the physical and chemical environment, and increased alteration and use of habitats by humans (Trombulak and Frissell 2000). Trails are also considered vectors for the introduction and spread of non-native plant species, noxious weeds, and fungus. Noxious weed are capable of affecting wildlife habitat at the landscape scale (Canfield et. al. 1999). The presence of weeds can have an effect on the distribution of wildlife in the area as some weed populations can replace native food sources and habitat structure subsequently displacing wildlife.

Table 3-16 presents the miles of trail in important wildlife habitat areas mapped by CDOW (CDOW 2002). Miles of trail crossing important habitat for existing trails under Alternatives A and B will remain under all alternatives including Alternative C. Trail constructed under Alternative C will be additional trail in the Study Area adding to trial crossing important habitat.

Table 3-16. Comparison of Alternatives by Miles of Trail Crossing Important Wildlife Habitat Types in the Study Area.*

Species	Alternative A	Alternative B	Alternative C
Mule Deer			
Winter Range	9.25	46.78	10.56
Winter Concentration Area	6.22	19.61	7.19
Severe Winter Range	6.13	14.22	7.08
Bighorn Sheep			
Winter Range	4.29	12.22	5.30
Winter Concentration Area	0.88	0.78	1.15
Severe Winter Range	2.46	8.02	2.63
Summer Range	29.2	38.59	32.25
Production Area	2.46	2.78	3.57
Mineral Lick	0.00	0.00	0.00
Black Bear			
Human Conflict Area	0.81	6.01	1.22

Source: Colorado Division of Wildlife, EDAW GIS

*Note: Effects of alternatives are partially additive; major portions of trail in Alts. A & B will remain open regardless of which alternative is selected

(b) Indirect Effects

Indirect impacts of the three Alternatives would include an intrusion into the riparian corridor that may influence the movement of wildlife. Riparian areas are commonly used for wildlife to facilitate movement and transecting this area would fragment the corridor. Additionally, any disturbance or alteration of watershed characteristics, such as compaction or vegetation loss can have an effect on downstream areas such as increased runoff and flood volume.

(c) Cumulative Effects

Cumulative effects for federally listed wildlife species are those effects of future state, tribal, or private activities only, which are reasonably certain to occur within the Study Area or in the case of lynx, the LAU's.

Private and other non-federal lands adjacent to and within the eight LAU's within the study area are plentiful. Approximately 133,000 acres (14% of LAU's) of private land occurs within the LAU's on both Forests. Another 2,200 acres (0.2%) of the LAU's is State lands. Much of these lands are open park, alpine habitats, or at lower elevations not suitable for lynx, or have been heavily developed in the past. Private lands within these LAU's include inactive mining claims, vacation homes, ranch and grazing lands, and moderately to heavily developed areas associated with Taylor Park, Tincup, Pitkin, Whitepine, Twin Lakes, Winfield, Alpine, Romley, and Monarch or a variety of mining sites. Development continues to occur in many of these already heavily developed areas. Continued development in these areas is likely to have a minimal impact on lynx as these areas provide minimal lynx habitat due to their highly disturbed character. Although no known development is anticipated on outlying private lands, the potential exists for some development in the form of vacation home construction or continued mine development. However, due to the somewhat limited amount of undeveloped private lands and the relatively limited amount of lynx habitat on the majority of undeveloped private lands, the likelihood of major development in lynx habitat is low. If development should occur in

previously undeveloped areas, lynx habitat quality may be reduced, but the amount that could be changed to unsuitable lynx habitat is likely minimal.

Recreational use and related impacts to hydrologic resources, wetland and riparian areas, vegetation resources, as well as wilderness areas will all have cumulative effects on aquatic and terrestrial wildlife. As socioeconomic conditions (such as population growth) change over time, so will recreation use. Colorado is expected to increase in population in the future and the number of people using hiking trails is also expected to increase. Other acts of nature, such as wildfire, will also have an effect, sometime profound, on wildlife.

Future state, tribal, or private activities that may produce cumulative effects in the reasonably foreseeable future within the Study Area will be related to the following:

Commercial

- Various lodges
- Marina
- Restaurants
- Small stores
- Pitkin Comminity
- Tincup Community
- St Elmo Community
- Various summer and year round residences

Mining

- Mining
- Stonewall Mine Closure

Federal activities that may produce cumulative effects in the reasonably foreseeable future within the Study Area will be related to the following projects:

Recreation

- Mt. Antero Trail Construction

Special Use Permits

- Monarch Ski Area Master Development Plan Implementation
- Boss Lake Reservoir Reauthorization

Timber Harvest

- Twin Lakes Prescribed Burn

Wildfire and Prescribed Burns

- Twin Lakes Prescribed Burn

Range Allotments

- Range Allotment Management Plans (RAMPS) including Taylor River C&H, Pitkin, C&H, Tomichi C&H, and Agate C&H

The analysis that follows is organized by species for each alternative rather than by alternative as in the other resource analyses. Cumulative effects are similar for all species. Cumulative effects have been discussed under "Effects Common to All Alternatives".

c. Effects by Species

The following Federally listed species are analyzed in detail in the complete Biological Evaluation available in the Project Record. Information presented here is a summary of the BE determinations.

(1) Federally Listed Species

a) Bald Eagle (*Haliaeetus leucocephalus*)

Status and Environmental Baseline
The bald eagle was proposed for removal from the Federal List of Endangered and Threatened Wildlife on July 6, 1999 (USFWS 1999a). The bald eagle remains protected as threatened until delisting is final. Bald eagles are known to breed and nest in Colorado. Wintering range for bald eagles is present in the Study Area around Twin Lakes and the historic mining town of Winfield, as well as areas along the Arkansas River (NDIS 2005a). Eagles likely use these areas for night roosting and forage in the Arkansas River valley during the day. An open water area associated with the forebay of the Bureau of Reclamation pump station may also be utilized by wintering eagles as a forage area. Bald eagles are known to occur in the general area during the summer months as occasional migrants and foraging birds. No nesting territories have been identified in the Study Area.

Direct and Indirect Effects – Alternative C-Proposed Action
Minimal direct or indirect effects are anticipated from construction of Alternative C. Location of current roosting sites is unknown. Minimal effects should occur due to construction and maintenance activities or from increased human use in areas previously not visited, and from anticipated increases in visitor use. New construction of additional trail in the Twin Lakes area would be necessary; however the mileage of new trail would vary depending on the bridge option selected. Trail construction and reconstruction related to bridge construction would occur in an area where both formal and informal trails currently exist. No large trees, which might be roosting trees, would be removed but several smaller trees (6 inch dbh) are anticipated to be removed. Activity related to bridge and trail construction options will occur during summer months when winter night roosting bald eagles are not present in the Twin Lakes. Because of the relatively lower elevation of the Twin Lakes area, current visitation to this part of the CDT occurs over much of the year and during winter periods when bald eagles are in the area. Year-round recreational use would likely continue and may increase under the Twin Lakes bridge option. Bald eagles in the area are likely familiar with the presence of humans.

Wintering bald eagles in the Winfield vicinity are drawn to the area for night roosting after daytime activities in the nearby Arkansas River valley. Active trail alignments as well as jeep roads are already present in the area. The Winfield historic site is also present in the vicinity of

the winter bald eagle use area. The trail is located at a high elevation and is expected to receive minimal recreational use during the period when wintering bald eagles are present.

Direct and Indirect Effects – Alternative A-No Action –Existing CDT
A short reach of trail associated with Alternative A would pass through the vicinity of wintering bald eagle range. No construction would occur and no roosting trees would be disturbed. Recreational visitation would likely remain near current annual levels and would occur primarily during the summer months when eagles are not present. For the reasons stated above Alternative A may affect but is not likely to adversely affect the bald eagle.

Direct and Indirect Effects – Alternative B-Colorado Trail Corridor
Bridge construction options in the Twin Lakes area for this alternative would be the same as those described in Alternative C. Construction activity would occur during the period when eagles were not present (summer). As described above in effects for Alternative C, year round recreational visitation may also increase due to the presence of a new bridge providing additional access and opportunities for visitors. The Alternative B trail alignment would not pass through the Winfield.

b) Canada Lynx (*Lynx canadensis*)

Status and Environmental Baseline
Canada lynx, a federal threatened species since March of 2000 (USFWS 2000), was re-introduced to Colorado in February of 1999. Lynx generally occurs in boreal and montane regions dominated by coniferous or mixed forest with thick undergrowth, but also sometimes enters open forest, rocky areas, and tundra to forage for prey. Preferred habitat for lynx is typically cover types of spruce/fir, Douglas-fir, and seral lodgepole, which support foraging, denning and rearing of young. Lynx preferred early successional forests that contain high numbers of prey (especially snowshoe hares) for foraging and late-successional forests that contain cover for young (Koehler and Brittell 1990).

As of February of 2005, 55 lynx have been located in the Pike-San Isabel National Forest and 121 in the Grand Mesa, Uncompahgre, and Gunnison National Forest (CDOW 2005a). “Linkage areas” are important to the management of lynx. Linkage areas are broad areas of habitat where animals can find food, shelter and security, and movement opportunities. Linkage areas can be maintained or lost by management activities or developments. One linkage area is located in the Study Area in the Cottonwood Pass vicinity. This linkage area provides an east-west connection from the Collegiate Range to Taylor Park in the Sawatch Range, with a narrow forested corridor. There is heavy snowmobile use and a recent highway upgrade (U.S. Forest Service 2005c). Much of the Study Area is mapped as lynx potential habitat (NDIS 2005b).

Direct, indirect, and cumulative effect analyses area evaluated according to a Lynx Analysis Unit (LAU). The scale of an LAU approximates the size of area needed by an individual for survival and is not intended to be an actual lynx home range. LAUs are mapped to show areas important to lynx, including denning, winter, and forage areas. The Study Area overlaps eight LAUs. Three LAUs are located in the Study Area in the PSICC and five are located in the GMUG. Detailed information on each LAU can be found in the BE.

Direct and Indirect Effects – Alternative C-Proposed Action
Alternative C is intended for hikers and pack and saddle stock users. The trail would not be designed or intended for winter use. Alternative C would increase the miles of trail passing through lynx denning habitat. Direct impacts would include new habitat disturbances in known and potential lynx habitat areas. Kittens are typically born in late May to early June (U.S. Forest Service 1994). Recreational use during this period is likely. Trail users would be traveling through denning habitat possibly disturbing lynx with dens in close proximity to the trail or preventing lynx from established dens near the trail. Trail use is anticipated to increase over time, which would correspondingly increase the potential for disturbance by humans over time. Alternative C would provide over 53 miles of trail at an elevation over 11,000 feet, which is generally in alpine areas not favored by lynx. This trail is designed for hiking and pack and saddle stock use in the snow-free season and would not result in snow compaction in lynx habitat areas.

Effects to the lynx linkage area located in the Cottonwood Pass area would be minimal to nonexistent as lynx are likely accustomed to human activity that has occurred in this area for numerous years.

Direct and Indirect Effects – Alternative A-No Action –Existing CDT
Approximately 19 miles of trail currently passes through lynx denning habitat. This trail has been in this location for numerous years and lynx have likely adjusted to the presence of humans using the trail. No construction will occur under this Alternative. This trail is not used during the winter months when snow compaction can become an issue. The current trail location currently passes near the western edge of the Cottonwood Pass linkage area. Lynx utilizing the location of the linkage area where trail has been for numerous years have likely adjusted to human presence.

Direct and Indirect Effects – Alternative B-Colorado Trail Corridor
Approximately 26 miles of trail currently passes through lynx denning habitat. As with Alternative A, this trail has been in its current location for numerous years and lynx in proximity to its location have likely adapted to the human presence. Minor trail construction and reconstruction will occur, as will bridge construction. This trail is used in the winter, however due to low snowfall levels snow compaction is not an issue. The alignment of this trail does not pass near or through any link linkage areas.

c) Uncompahgre Fritillary Butterfly *(Boloria acrocnema)*

Status and Environmental Baseline
The Uncompahgre fritillary butterfly (UFB) was listed as federally endangered in 1991 (USFWS 1991). Critical habitat has not been designated for this species. Uncompahgre fritillary butterfly is now believed to be confined to small patches of habitat above 13,000 feet in the San Juan Mountains of southwestern Colorado. Populations of the UFB are associated with the snow willow (*Salix nivalis*), which provides food and cover of larvae.

Populations of this species have been located approximately 100 miles to the south west of the Study Area in the San Juan Mountains near Lake City, Colorado in the area of Mt. Uncompahgre

in Hinsdale County, Colorado and in the Red Cloud Peak area on land managed by the Bureau of Land Management (BLM) (USFWS 1994). Recent surveys at several locations where snow willow is known to occur in the Sawatch Range have resulted in no findings of Uncompahgre fritillary butterfly (Ellingson 2003, Alexander and Ellingson 2004). No populations have been identified in the Study Area.

Direct and Indirect Effects – Alternative C-Proposed Action
The proposed action would create new trail reaches in areas that are potential habitat for the UFB. Approximately 22 miles of trail would be at elevations over 12,000 feet. Snow willow was surveyed during the summer of 2005 by Forest Service biologists. Several locations of snow willow were identified along the proposed trail corridor, and rerouting of trail locations in these areas was conducted to avoid willow disturbance. Mineral Basin, located in the headwater reaches of South Cottonwood Creek, supports broad extensive stands of snow willow that could not be avoided, and consequently some areas of snow willow were crossed. Approximately 0.5 mile of trail would cross snow willow habitat resulting in the potential loss of 0.18 acres. Because of the extensive nature of this local population of snow willow, impact due to trail constructions would be relatively minor.

Direct and Indirect Effects – Alternative A-No Action –Existing CDT
Under Alternative A approximately 7 miles of trail would be located at elevations capable of supporting the UFB (elevations greater than 12,000 feet). No locations of snow willow have been identified along this trail alignment but conditions do occur for its potential occurrence.

Direct and Indirect Effects – Alternative B-Colorado Trail Corridor
The alignment of this trail would not pass through any areas above 12,000 feet elevation and would not pass through any potential habitat. Therefore, there would be no direct or indirect effects to the UFB.

(2) Forest Service Sensitive Species

The following Forest Service Sensitive species are analyzed in detail in the complete Biological Evaluation available in the Project Record. Information presented here is a summary of the BE determinations.

a) Townsend's Big-Eared Bat (*Corynorhinus townsendii*)

Environmental Baseline
Townsend's Big-eared Bat is considered rare or uncommon in Colorado (Fitzgerald et. al. 1994) and in the south and southeastern United States. Townsend's big-eared bat is primarily cave-dwelling, but can also roost in large diameter snags in stands of old growth, as well as man-made structures. It is found in areas of semi-desert shrublands, pinon-juniper woodlands, and open montane forest species. Foraging occurs in a variety of habitats, including stream corridors, grassland openings, and within forested vegetation. The CDOW found that Townsend's big-eared bat roosts in mines at elevations averaging approximately 7,000 feet, and this species has

been found in several mines at elevations greater than 9,000 feet (Siemers 2002). Mines are present in the Study Area, and can be found at elevations greater than 9,000 feet.

Direct and Indirect Effects

Nearly all of the reaches for trail alignments for Alternatives A, B, and C are above 9,000 feet, which is near the upper limit of the Townsend's big-eared bat. Because of the generally higher elevation of the Study Area, the likelihood that the bat would be found in the Study Area is low. Current and proposed trail alignments are not located in proximity to any abandoned buildings, mines or caves, and large diameter snags would be avoided during trail construction, so the potential for direct disturbance of roosting sites or hibernacula is low. As this species is active primarily during nighttime hours, the potential for impacts by human activity would be minimized due to reduced human activity at night. The possibility does exist for trail users to actively or accidentally access bat habitat while traveling the trails and possibly disturb bats.

b) American Marten *(Martes americana)*

Environmental Baseline

Marten occur in most areas of coniferous forest in the higher mountains of Colorado. Marten prefer late successional stands of mesic, conifer-dominated forest (preferably spruce-fir), but also occupy lodgepole pine (*Pinus contorta*), Douglas fir (*Pseudotsuga menziesii*), and occasionally cottonwood (*Populus* spp.) riparian areas. Legal marten trapping ceased in 1995 as the result of a ballot initiative, and population estimates derived from trapping information have not been collected since this time. No population estimates for Colorado have been made, and CDOW no longer collects harvest numbers for the marten due to the statewide closure to furbearer trapping. Martens can tolerate human activity (FEIS 2005a) and have been shown to be attracted to humans and human structures, possibly in search of food or shelter for short periods of time (Banci 1994). Three marten territories are known in the Study Area located in the GMUG, and only one is within a mile of the proposed trail alignment. Pine marten have been observed in the Study Area including an observation in the Illinois Creek area of the GMUG in 2005 during summer field surveys conducted by EDAW. Data is not available for the PSICC for marten locations.

Direct and Indirect Effects

Trail construction through areas of potential marten habitat would occur with Alternative C only. Though direct loss of habitat from removal of trees, stumps, logs or snags would be relatively little and designed to generally avoid suitable habitat, some small direct loss of these features would likely occur. The likelihood of these features being den locations would be low. An indirect impact would be from intrusion into areas that provide suitable habitat and/or territory for martens. Alternatives A and B are both in areas where trails are established and the only loss of habitat would occur in limited areas of reconstruction under Alternative B. Impacts associated with trail construction and any associated habitat loss, as well as introduction of trail into areas were trails currently did not exist before would add to the area of potential marten habitat impacted. Alternative C would also bring additional visitors to the area, providing additional disturbance caused by human presence.

Overall effects to marten will increase with Alternative C because more trail will be present in the Study Area due to new construction. Under Alternative A, B, and C, trails associated with Alternative A and B will remain and Alternative C would increase trail mileage approximately 40 miles over that of the existing reaches representing the existing CDT and Colorado Trail.

c) Wolverine (*Gulo gulo*)

Environmental Baseline
Wolverines are animals of boreal forests and tundra. Wolverines are now very rare or extirpated at the southern periphery of the range in Colorado (Fitzgerald et al. 1994). Sightings data indicate that wolverines have been well distributed across Colorado (Maj and Garton 1994). Recent sightings are extremely rare, generally in remote areas, and in Colorado are limited to the White River and Pike National Forests. Colorado populations may become isolated from population to the north in Wyoming by the Central Rocky Mountains and the Wyoming basin (Banci 1994). Backcountry recreation can lead to habitat alienation (NatureServe 2005). Wolverines generally are located in larger more remote territories in alpine, sub-alpine and coniferous forests and would likely occur in areas described in the Forest Plan as management type "8B/8C Primitive and Semi-Primitive Wilderness Setting."

Direct and Indirect Effects
Over 30 miles of trail would be constructed through spruce/fir and alpine communities under Alternative C. Approximately 20 miles of trail currently exists in these habitat types under Alternative B. Trail miles through the Colligate Peaks Wilderness area would be approximately 16 miles under Alternative B and 20 miles (existing trail) under Alternative C. Trail construction would occur in areas that could be potential wolverine habitat. Potential displacement from habitat caused by activities related to trail construction in these areas would be more likely to occur in the summer. Potential areas where wolverine would occur would be more likely in wilderness areas, primitive and semi-primitive wilderness management types that have areas of coniferous forest or sub-alpine or alpine settings. Approximately 7 miles of existing trail is in wilderness under Alternative A, 16 miles of trail currently exists in wilderness under Alternative B and 20 miles would be present for Alternative C.

Introduction of trail into areas where trails had not previously been present would occur under Alternative C. Over time with increased user demand, more hikers would visit these areas causing a greater potential for the disturbance of wildlife.

d) Northern Goshawk (*Accipiter gentilis*)

Environmental Baseline
Northern goshawk is typically an uncommon resident in foothills and mountains, but can be locally common in some areas. In Colorado, goshawks occur at elevations of 7,500 to 11,000 feet. Sightings above timberline occur typically in the fall. Preferred habitat includes a wide variety of forest ages, structural conditions and successional stages. Old growth forest is preferred for nesting. Nests are usually located in large trees in stands with high canopy coverage, and are often located on the lower portion of a slope and near water. Habitat for hunting includes transitional areas from forest to shrublands, forest mosaics, and riparian areas.

Northern goshawk utilize three types of habitat: nesting areas in mature forests; post-fledging areas in forest mosaics; and a large foraging area located in mosaics of forest, shrubland, and openings with perching trees.

Northern goshawks are present in the Study Area. One survey was conducted by EDAW during the summer and fall of 2005 to locate nesting pairs and nest locations, respectively (EDAW 2005b). A pair of goshawks was located during the summer survey, and one nest location was found in the same area during the fall nest search. The nest location is within 2000 feet of an existing roaded section and in the vicinity of several seasonal lodges associated with the ghost town of Winfield. In addition to the pair of goshawks and associated nest located in the Winfield area, other individuals were believed to have been heard in the area (but did not respond to the feeding calls), and a search of the area where the calls originated revealed no nest locations.

Direct and Indirect Effects

The Alternative C trail alignment passes within approximately 500 feet of this nest. A screen of conifer trees hides the nest from the proposed trail route. It is reported that incidental travel by hikers in the vicinity of active goshawk nests appears to have little impact to goshawks; however, camping and other prolonged activities in the area of the nest may cause nest failure (USFWS 1998a). In some higher elevation areas where goshawks nest occur, young goshawks may be more developed by the time hikers can access trails after the snow pack has diminished, reducing the potential of nest abandonment by adults. Screening of nest areas by vegetation, such as coniferous trees, can also reduce the influence of humans on nests. Approximately 8, 10 and 9 miles of trail will pass through forest structural stages 4A and 4B for Alternatives A, B, and C, respectively. These are the structural stages with greater potential to be occupied by nesting goshawks. As additional trail miles are to be constructed in 4A and 4B areas represented under the proposed action, Alternative C, would be an additional impact to the existing trail reaches of Alternatives A and B, as these trail reaches would remain open.

e) American Peregrine Falcon (*Falco peregrinus anatum*)

Environmental Baseline

On August 25, 1999, the peregrine falcon was delisted in the entire range as a federally listed species (USFWS 1999b) due to increases in population numbers. Peregrine falcons are occasional spring and fall migrant in western valleys, foothills, lower mountains, mountain parks, and on eastern plains; and have been observed in the winter at Monte Vista National Wildlife Refuge and very rare in western valleys and on eastern plains near foothills (USFWS 2002). Peregrines have also been observed in Rocky Mountain National Park and Grand Junction, Colorado (Craig and Enderson 2004). It is also a rare summer resident in foothills and lower mountains.

Breeding pairs nest on cliffs and forage over adjacent coniferous and riparian forests. Nesting habitat includes areas such as river cutbanks, trees, and manmade structures, including tall towers and the ledges of tall buildings. Peregrines in the Rocky Mountain and Southwest region now persist mainly on dominant cliffs that generally exceed 200 feet in height (NatureServe 2005). Most nest sites in Colorado are within one mile of water. Because peregrines are extremely sensitive to disturbance during the egg-laying, incubation, and brood-rearing periods,

protection from disturbances is essential to reproductive success (NatureServe 2005). Migrants and winter residents occur mostly around reservoirs, rivers, and marshes, but may be seen in grasslands, agricultural areas, and other habitats. The prey species are usually hunted over open habitat types, such as waterways, fields, and wetland areas such as swamps and marshes.

Direct and Indirect Effects

Trail locations associated with Alternatives A, B, and C are not in close vicinity of suitable nesting habitat of the peregrine. The trail location for Alternative B approaches to within 0.5 mile of cliffs where the falcons could nest. Trail locations for Alternatives A and C are over 10 miles away from this location. Peregrines are known to occur in an area that is relatively developed to residential lots of several acres. These birds are likely accustomed to human presence. The cliffs are relatively inaccessible to humans because of their sheer steepness, and are not attractive to climbing due to unstable rock conditions. No peregrine habitat will be disturbed during the construction or reconstruction of new trail for any of the alternatives. It is possible that incidental access by trails to areas where peregrine may be found could occur.

f) White-tailed Ptarmigan (*Lagopus leucurus*)

Environmental Baseline

White-tailed ptarmigan occur primarily in alpine tundra above tree line and occupy areas such as moist meadows, willow stands and rock outcrop. During the summer birds are widely distributed across the alpine tundra, especially in rocky areas with sparse vegetation,. Areas that are mostly snow free early in the season are used for breeding, and females with broods generally occupy on rocky, wet tundra. Nesting occurs in alpine tundra, in rocky areas or sparsely vegetated, grassy slopes. White-tailed ptarmigan have a high fidelity to breeding territory in successive years (NatureServe 2005). Ptarmigan were observed at several alpine locations across the Study Area during the summer of 2005 during EDAW field reconnaissance. Areas included the upper Hunt Lake basin, upper Chalk Creek basin above Wildcat Gulch, and Woodchopper Creek basin east of Tincup Pass.

Direct and Indirect Effects

The current alignment represented by Alternative A is generally at elevations below tree line and mostly avoids white-tailed ptarmigan habitat. Most of the alignment of Alternative B would be at elevations well below that inhabited by white-tailed ptarmigan. Alternative C would increase the amount of trail in alpine areas due to over 30 miles of new construction. This would result in the disturbance of nearly 11 acres of ptarmigan habitat. It is probable that constructed reaches would pass through areas currently occupied by white-tailed ptarmigan, increasing the potential for human disturbance. Ptarmigan are generally more vulnerable than many other wildlife species because of their relatively high intolerance to humans and other animals. Disturbance could drive females from nesting areas during critical periods. Unleashed dogs could also disrupt nesting, feeding and loafing birds. Increased hunting pressure may also occur in areas near the trail.

g) Boreal Owl (*Aegolius funereus*)

Environmental Baseline
In Colorado, boreal owls typically use late-successional, multi-layered habitats of spruce-fir and lodgepole pine interspersed with meadows. Boreal owls are secondary cavity nesters, occupying cavities excavated woodpeckers such as flickers. In Colorado, nests were initiated from mid-April to early June (NatureServe 2005). The owls usually remain resident within a multi-annual home range (Hayward and Verner 1994). Diet for this species is small mammals and sometimes birds and insects (NatureServe 2005). According to NDIS mapping (NDIS 2005c), boreal owls are known or likely to occur in the Study Area. Habitat for this owl is represented by spruce fir forest of structural stages 4C and 5, of which 33,000 acres exist in the Study Area. Approximately 92,000 acres of spruce-fir forest are also present.

Direct and Indirect Effects
Boreal owls are relatively tolerant of human activity and noise (Hayward and Verner 1994), and trail building activities related to the proposed action and alternatives should not have a measurable impact on these birds. Much of the trail reaches under different Alternatives passes through spruce-fir forest. Construction and subsequent potential loss of habitat for the owl would only occur under the proposed action, Alternative C. No trees supporting cavity nests will be removed during trail construction or reconstruction.

h) Flammulated Owl (*Otus flammeolus*)

Environmental Baseline
In Colorado, flammulated owls are uncommon to common summer residents in foothills and lower mountains. Old-growth ponderosa pine is the preferred habitat (NatureServe 2005). Other habitat types include ponderosa-Douglas-fir forests, often mixed with mature aspen. These older pine forests potentially have larger snags with cavities, and typically form open stands with well-developed grass or shrub understories preferred by the owl's prey species. Flammulated owls arrive at their breeding areas in late April and remain through October. The preferred habitat for this owl is mature ponderosa pine which is only found on the eastern portion of the Study Area in the PSICC. Ponderosa pine is a minor component in the Study Area because much of the Study Area is at elevations higher than its occupied range.

Direct and Indirect Effects
Flammulated owls are relatively tolerant of human activity and noise, and trail building activities related to the proposed action of Alternative C should not have a measurable impact on these birds. Little of the trail reaches under different alternatives passes through Ponderosa pine communities. Trail construction and potential loss of habitat for the owl would only occur under the proposed action, Alternative C and is estimated to be less than 1 mile through areas of Ponderosa pine. In this case, it would be highly unlikely that a tree supporting a cavity nest would be removed. No trees supporting cavity nests will be removed during trail construction or reconstruction.

i) American Three-toed Woodpecker (*Picoides dorsalis*)

Environmental Baseline
In Colorado, this species is generally rare but can be a locally uncommon resident in higher mountains, lower mountains, and foothills, primarily in winter. At all seasons and elevations, this species is most common in years and areas where trees have high insect populations due to disease or fire (NatureServe 2005). During the summer, it can be found from about 8,000 to 11,500 feet in elevation in close association with spruce-fir forests. During the winter, the three-toed woodpecker will migrate to lower elevation areas and can even be found in the pinon-juniper zone (Andrews and Righter 1992). Local populations are also closely associated with spruce beetle outbreaks and early post-fire habitat conditions. Large areas of spruce-fir are present in the Study Area, which are important as habitat for this bird. Other important areas are where burns have recently occurred or trees recently been killed by insects. Small localized areas such as these occur in the Study Area.

Direct and Indirect Effects
Trail reaches for all alternatives pass through favorable habitat of spruce-fir forests for this species. Approximately 24 miles of trail would cross through spruce-fir forest under the proposed action, Alternative C. Existing trail reaches associated with Alternatives A and B have approximately 20 and 13 miles, respectively, passing through spruce-fir communities. Alternative C will increase the overall miles or trail in the Study Area because trail alignments associated with Alternative A and B are existing trails will remain under all alternatives. No trail reaches would go through extensive areas where these birds would occur, such as beetle kill areas and recent burns. Areas such as these could, however, appear in the future after wildfires or prescribed burns.

j) Olive-sided Flycatcher (*Contopus cooperi*)

Environmental Baseline
In Colorado, this flycatcher is a summer resident that occurs in mature spruce-fir and Douglas-fir coniferous forest habitats and, less often, in other coniferous forests types 7,000 to 11,000 feet (Andrews and Righter 1992). It is rare locally in lower mountains and foothills, and an uncommon spring and fall migrant in western valleys, lower mountains, mountain parks, foothills, and on eastern plains. It breeds primarily in mature spruce-fir and Douglas-fir forests, especially on steep slopes or near cliffs. During migration, it can be found in all types of wooded habitats within it range. The olive-sided flycatcher is most often associated with forest openings, forest edges near natural openings, or open to semi-open forest stands. Its presence in early successional forest appears to be dependent on available mature forest (Andrews and Righter 1992). Large areas of spruce-fir and Douglas fir occur in the Study Area and habitat features such as slopes and cliffs are common.

Direct and Indirect Effects
Impacts to habitat from construction related to Alternatives B and C would be minimal as few trees will be removed. Disturbance to nesting pairs may occur in the vicinity of construction but would be localized in extent and duration. Tall trees and snags important to this species would be avoided and not be removed unless necessary. An additional 12 miles of trail through spruce-

fir habitat will be added to the Study Area under Alternative C. Existing trails associated with Alternatives B and C pass through 20 and 13 miles respectively of spruce-fir habitat and will remain open under Alternative C.

k) Purple Martin (*Progne subis*)

Environmental Baseline
Purple martins are local and scattered breeders in the Intermountain West and along the Pacific coast, from Washington south to southern California. Purple martins breed primarily along the edges of late-seral, aspen-dominated woodlands, usually near water. They are obligate secondary cavity nesters, using abandoned woodpecker cavities in isolated live aspen or aspen snags and rarely in ponderosa pine or Douglas-fir. Mud is required for the nests. Their diet consists almost entirely of insects captured in flight as they forage over mountain parks, riparian zones, reservoirs, moderate-sized forest openings, and within open forest canopies. Trends appear to be stable or increasing in the western U.S., but have declined significantly in recent years in the eastern portion of the species range (Partners in Flight 2005). Approximately 28,000 acres of aspen are located in the Study Area. Some aspen stands are located in areas where avalanches are common. Stands in these locations are typically shorter in height and not typical of late-seral stage aspen, and would not be suitable habitat.

Direct and Indirect Effects
Impacts to aspen habitat from construction related to Alternative C would be minimal. Relatively low distances, 0.5, 2.5, and 0.3 miles, of aspen would be crossed for Alternatives A, B, and C, respectively. Little of the aspen crossed would be the late-seral stands of aspen important to purple martin.

l) Hudsonian Emerald (*Somatochlora hudsonica*)

Environmental Baseline
The Hudsonian emerald dragonfly is found in the Hudsonian and Canadian zones from northern Ontario and the Alberta Rocky Mountains, and southward along the Rocky Mountain to southwestern Colorado. It is common from Alaska to Hudson Bay, but local along the Rocky Mountains to Colorado and Wyoming. In Colorado, the distribution appears to be more localized at seven different locales within a roughly 40-mile radius of Boulder, Colorado (Packauskas 2005). This may indicate that this taxon has been poorly collected in other possible habitats. The species has also been identified in Albany and Teton Counties of Wyoming. Habitat of Hudsonian emerald dragonfly are deep, sedge-bordered lakes and ponds, but also ponds with lake inlets, boggy edges, and sedge marshes. They may also be found at boggy slow streams, ditches, and sloughs. The larvae are found mostly in “mucky” edges of woodland streams and bogs. Suitable habitat is present in the Study Area, however, no known populations of Hudsonian emerald dragonflies are known in the Study Area.

Direct and Indirect Effects
Impacts to riparian areas supporting potential habitat caused by erosion would be the primary impact of this species. This would cause loss of habitat important for prey acquisition and reproduction. Riparian areas associated with existing trail reaches under Alternatives A and B

would also be effected under Alternative C as these trail reaches will not be closed. Alternative C will add potential impacts to the WIZ in the Study Area.

m) Brewer's Sparrow *(Spizella breweri)*

Environmental Baseline
The Brewer's sparrow is a sagebrush dependent species common in many areas of sagebrush steppe habitats. Sagebrush shrubland and shrubland covers 5% of GMUG within the Study Area and a total of 7.4% of the Study Area. For the purpose of this review, shrubland is included since this vegetation type could potentially contain some sagebrush in minor components.

Direct and Indirect Effects
Alternatives A and B have no direct impacts on Brewer's sparrow through GMUG. Alternative C will have a total of 0.02 mile of trail that crosses through shrubland within the GMUG, consisting of new construction. Alternative C has no trail crossing through sagebrush shrubland within the GMUG portion of the study area. As part of the project design criteria, Chapter 2, the removal of sagebrush shrubs will be minimized. Alternative A has 0.23 mile of trail crossing through shrubland and 0.21 mile of trail crossing through sagebrush shrubland. It is not known whether the sagebrush shrubland discussed above is Brewer's sparrow habitat.

Since Alternative A has existing trail through shrubland and sagebrush shrubland, camping in this area could indirectly impact Brewer's sparrow by attracting nuisance bird species. In general, campsites tend to attract nuisance species, such as common raven and magpie. Common raven and black-billed magpie are species that are known to predate on Brewer's sparrows nests. Alternatives B and C will lessen the indirect impacts to sagebrush shrubland by diverting the number of people who use the existing CDT to other areas that do not contain Brewer's sparrow habitat. Alternatives B and C could increase the risk of human related fire as discussed above. Also, the increased use associated with Alternatives B and C could introduce invasive weed seed, such as cheatgrass. Although these alternatives do not cross through sagebrush shrubland, it could make this invasive weed species more widespread throughout GMUG. GMUG has a weed management plan that will help identify and address the introduction of invasive weeds into the forest.

(3) Management Indicator Species

The following MIS are analyzed in detail in the complete MIS Report available in the Project Record. Information presented here is a summary of the MIS Report determinations.

a) Abert's Squirrel (*Sciurus aberti*)

MIS Rationale
The Abert's squirrel was selected as a PSICC and GMUG MIS because it is an ecological indicator for late succession ponderosa pine, which is a species of high economic and aesthetic values as well as for its ability to represent other species with similar habitat requirements. Also, Abert's squirrel is a species with specific habitat needs, yet covers a significant portion of the

forest in the landscape context. Although Abert's squirrel does occur within the greater GMUG, this species's habitat (ponderosa pine) does not occur within the portion of the study area that is within GMUG. For this reason, Abert's squirrel will not be addressed in association with the GMUG.

Habitat Status and Requirements

Abert's squirrel is ecologically dependent on ponderosa pine with open understory for both nesting sites and food, and therefore generally limited to open montane forests (Keith 1965). On the PSICC, surveys show approximately 92% of nests were in a tree group, with 75% having three or more interlocking canopy trees (U.S. Forest Service 2005d). Ponderosa pine vegetation makes up 2.4% of the PSICC within the Study Area and 1.8% of the total Study Area. There is no ponderosa pine in the portion of the GMUG that falls within the Study Area.

Direct Impacts

Since there is no construction, Alternative A will not result in direct impacts to ponderosa pine or Abert's squirrel habitat. All of the alternatives cross through ponderosa pine vegetation. The existing CDT (Alternative A) crosses through 0.52 mile of ponderosa pine, while Alternatives B and C cross through 5.14 and 0.72 miles (respectively), of which 4.75 and 0.30 mile (respectively) are existing trail. Although the new construction associated with Alternatives B and C will impact ponderosa pine vegetation, mature trees will be avoided, as discussed in the design criteria section of the EA (Chapter 2). Mature ponderosa pine is a relatively minor component of habitat within the PSICC and most of this vegetation type occurs at lower elevations away from the project area.

Overall effects will increase with Alternative C because more trail will be present in the Study Area due to new construction. Under Alternative A, B, and C, trails associated with Alternative A and B will remain and Alternative C will increase trail mileage approximately 40 miles over that of the existing reaches representing the CDT and Colorado Trail.

It is not anticipated that the construction of the trail associated with Alternatives B and C will fragment Abert's squirrel habitat by creating an impediment or barrier between squirrel territories. Other direct impacts could include increased hunting of squirrels and mortality due to pets. The increased trail use is likely to increase fire risk. Fire is a natural phenomenon associated with lightening strikes. However, years of fire suppression have increased fuel loads that could develop into a catastrophic fire, resulting in loss of mature and immature ponderosa pine vegetation. The PSICC has a fire management plan that will help reduce the risk of catastrophic fire.

Indirect Impacts

Alternative A is not expected to indirectly affect Abert's squirrel habitat as there will be no change to the existing condition in Abert's squirrel habitat. Indirect effects associated with Alternatives B and C would mainly be related to increased use of the altered CDT. The increased presence of dogs and humans associated with increased recreational use could affect squirrel behavior. Periodic encounters could deter Abert's squirrel from living near the trail. There are signs posted at the trailheads that dogs must be leashed. Although increased dog use

could potentially affect individual squirrel behavior, it is not expected to affect the overall population.

b) American Marten (*Martes Americana*) **or Pine Marten**

MIS Rationale
The American marten is a furbearer that was historically trapped in Colorado (Fitzgerald 1994). Marten trapping was ceased by the Colorado Division of Wildlife (CDOW) in 1995, and the November 1996 state ballot initiative (Amendment 14) closed the take of furbearers by snares. The American marten was selected as a MIS for the GMUG because: 1) it has special habitat needs during some phases of the life cycle, such as coarse woody debris, closed over-stories, interior older growth in spruce-fir forests, and 2) the public has high concern for the species and its habitat. There are no specific management directions for the marten. However, standards and guides are present for management of its preferred habitat, old-growth and mature mixed conifer stands.

Habitat Status and Requirements
The marten shows consistent close association with mesic, dense coniferous forests with complex physical structure, such as subalpine spruce-fir and lodgepole pine forests, alpine tundra, and occasionally montane forests (Yeager and Remington 1956). During winter, they prefer mature and old-growth conifer over younger-aged and deciduous cover; summer habitat use is somewhat broader. Stand structure may be more important than species composition. Preferred stand structure is low, closed (>30%), non-uniform canopies with understory or shrub cover. Dense understory, including slash or rotten logs and stumps, is necessary for denning and hiding. Large snags, large logs, large live spruce-fir trees, and squirrel middens are important characteristics of maternal dens. Resting sites in winter are usually subnivean, adjacent to or under coarse woody debris, and frequently associated with red squirrel middens. Natural fire regimes in spruce-fir forests are typically infrequent, stand-replacing events. Timber harvest, specifically small-patch clear cutting and reduction of snags and logs, has altered landscape patterns and reduced habitat quality. Spruce/fir vegetation covers approximately 17.1% of GMUG within the Study Area, 21.1% of PSICC within the Study Area, and a total of 19.8% of the Study Area.

Direct Impact
Since no new trail construction will occur in association with this alignment, Alternative A will not result in any direct impacts to marten or lodgepole pine and spruce/fir vegetation. Alternative C would result in new construction and reconstruction through American marten habitat. The majority of trees and snags will be avoided and all woody debris will be left on site as described in the design criteria section of the EA (Chapter 2). The trail width of vegetation disturbance is narrow (5 to 10 feet). Alternatives A and C cross through marten habitat in the GMUG. Alternative B is not shown since this trail alignment does not cross through the GMUG. Other direct impacts to the marten are anticipated to be minimal.

Overall effects will increase with Alternative C because more trail will be present in the Study Area due to new construction. Under Alternative A, B, and C, trails associated with Alternative

A and B will remain and Alternative C will increase trail mileage approximately 40 miles over that of the existing reaches representing the CDT and Colorado Trail.

It is not anticipated that the construction of the trail associated with Alternative C will fragment American marten habitat by creating an impediment or barrier between marten territories.

Indirect Impacts
Alternative A is not anticipated to have an indirect impact on American marten as there will be no change to the existing condition in marten habitat. The increased recreational use associated with Alternatives B and C may have some indirect effects associated with the increased use. Potential indirect impacts associated with Alternatives B and C could include disturbance of animals by recreational users and pets.

c) Elk *(Cervis elaphus)*

MIS Rationale
Elk were selected as a MIS on PSICC because: 1) the public has a high concern for this species and its habitat, and 2) the public has a high interest for hunting and viewing. The GMUG MIS lists this species because of its association with early succession spruce-fir, Douglas fir, lodgepole pine, aspen, and mountain shrubs; and its high economic importance to surrounding state and local communities.

Habitat Status and Requirements
Because elk have had a historically wide distribution, their preferred habitat varies widely (Snyder 1991). Elk tend to inhabit coniferous forests associated with rugged, broken terrain or foothill ranges. During summer, elk spend most of their time in high mountain meadows in the alpine or subalpine zones or in streambottoms (Adams 1982). Studies of elk slope preferences indicate that elk use a variety of slope percents, although they choose slopes in the 15-30% class most frequently (Skolvin 1982). Elk may use more open areas during spring and summer because of earlier spring green-up (Edge et al. 1987). During hot summer months, elk seek shaded, cool habitats (Leege 1984). Use of forage areas depends on proximity to cover. Use is typically concentrated to within 200-600 feet of cover edge (Thomas 1979). Either cover or forage may be limiting factors for elk, particularly on winter ranges or calving habitats (Roderick and Milner 1991). Forest fires that created a mosaic of thermal and hiding cover and forage areas have been shown to increase carrying capacity (Martinka 1976). Open road densities greater than 1.5 miles per square mile of habitat on summer range or one mile per square mile of habitat on winter range are also considered limiting factor (Rodrick and Milner 1991).

Direct Impacts
Since there is no construction associated with this alignment, Alternative A will not result in direct impacts to elk or associated habitat. Alternatives B and C will result in direct habitat impacts, mainly due to the loss of habitat associated with the new construction and reconstruction of trail along their alignments. Although Alternatives B and C result in the direct loss of important elk habitat, the impacts are negligible since the trail width is relatively small (approximately 24 inches wide and 48 inches of clearance for major obstacles) in comparison to the extensive area of surrounding habitat. Due to the small trail width and sporadic use, the trail

is not expected to fragment habitat by creating an impediment or barrier for migrating elk. Other direct impacts from Alternatives B and C would include increased hunting, the potential for increased poaching, and the potential for increased fire resulting from additional human use. Wildfire is a natural phenomenon caused by lightening strikes. However, past fire suppression practices have increased the amount of understory fuel and the risk of a catastrophic fire. The increased fire risk related to increased recreational use is addressed by the PSICC and GMUG fire management plans.

Overall effects will increase with Alternative C because more trail will be present in the Study Area due to new construction. Under Alternative A, B, and C, trails associated with Alternative A and B will remain and Alternative C will increase trail mileage approximately 40 miles over that of the existing reaches representing the CDT and Colorado Trail.

Indirect Impacts

Alternative A is not expected to indirectly affect elk. Alternatives B and C will provide improved access to areas previously without trails and attract more use by changing the CDT designation. Increased human use would result in improved access to areas seldom visited that provide key habitat for elk. Studies on the physiological impacts of human disturbance on ungulates indicate a habituated tolerance to predictable disturbance, with some exceptions (McMillan 1954, Denniston 1956, Banser 1976, Goodson 1978).

Alternative B will increase the number of visitors using the Colorado trail, crossing through 148.33 miles of important elk habitat. Although Alternative C will increase the number of miles through important elk habitat, this alternative has substantially less miles of trail through important elk habitat than Alternative B. In addition, Alternative B substantially increases the amount of trail users crossing through important calving production areas. In order to minimize indirect effects on calving areas, trail construction and reconstruction in these areas will not occur during the calving season (May 15 to July 15), as described in the design criteria section of the EA (Chapter 2).

Elk may adapt their behavior to the chance encounter with humans along the trail. Increased human use in key habitat areas would result in local changes in elk distribution. Key habitat near heavily traveled areas of the trail would be expected to receive less use by elk. Also, the increased trail use has a potential to bring more dogs to the area that could potentially chase or harass elk. There are signs posted at the trailheads that dogs must be leashed. Although increased human and dog use could potentially affect the distribution of local population of elk, it is not expected to affect the overall elk population.

d) Northern Goshawk (*Accipiter gentilis)*

MIS Rationale

The largest and heaviest bodied of the three North American accipiters, goshawks have long, broad wings, a long, rounded tail, and stout legs and feet (Palmer 1988, Squires and Reynolds 1997). The northern goshawk was included as a MIS by GMUG because it represents the “highly” specialized habitat of other species or groups of species that are associated with mature aspen forest.

Habitat Status and Requirements
The lower forest canopy and forest floor are utilized for hunting where birds and small mammals are sought for prey. Prey species include American robin (*Turdus migratorius*), ptarmigan (*Lagopus spp*), Stellar's jay (*Cyanocitta stelleri*), sparrows (*Ploceidaespp*), crows (*Corvus spp*), hares (*Sylvilagus spp*), pine squirrel (*Tamiasciurus hudsonicus*), chipmunks (*Eutamias spp*), mice (*Heteromyidae*) and Shrew (*Soricidae spp*). Predators of northern goshawk are bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) (FEIS 2005b).

Spring migration begins in early February. Nesting occurs from early April to mid-June, depending on latitude. Average clutch size is 3 eggs, with the incubation period being 32 to 43 days. Young fledge in 37 to 41 days. Winter migration begins in late August to early September. These species occupy forests of ponderosa pine, mixed conifer, Douglas fir and subalpine fir. Migrants and winter residents are observed in all types of coniferous forests and riparian forests, and are occasionally seen, during migration, in shrublands.

Northern goshawks are present in the project area. A survey was conducted during the summer and fall of 2005 to located nesting pairs and nest locations, respectively. One nest location was found in 2005 within the PSICC portion of the study area located approximately 500 feet from an area where trail construction is proposed for Alternative C and approximately 2,000 feet to where the existing trail (Alternative A) is present on a roaded section. This area is in the vicinity of several seasonal lodges associated with the ghost town of Winfield. The current trail alignment for Alternative A is also in the general area of the nest location. No northern goshawk nests were identified in the GMUG. To minimize any disturbance potential to the known nest site, construction activity should occur latter in the season after young have fledged as described in the design criteria sections of the EA (Chapter 2). Incidental travel in the area of the nest appears to have little impact to goshawks; however, camping in the area of the nest may cause nest failure (USFWS 1998). Camping may have to be restricted in areas where nests are in proximity to the trail. Aspen vegetation covers 1.8% of GMUG within the Study Area and a total of 5.1% within the Study Area.

Direct Impacts
None of the alternatives would directly impact northern goshawk habitat or nesting sites in the GMUG. All large trees that could potentially provide nesting sites for northern goshawk will be avoided.

Indirect Impacts
No northern goshawk nests have been identified in proximity to the trail alternatives that cross through the GMUG. However, northern goshawks are in the project vicinity and could nest in close proximity to the trail alternatives in the future. Construction or camping in close proximity may cause a nest to fail. If new northern goshawk nests are discovered, construction associated with Alternative C would be limited during the nesting season or until chicks have fledged as discussed in the design criteria section in the EA (Chapter 2). There are no plans at this time to restrict camping in the vicinity of the nest; however, this is a forest management decision separate from this project. As discussed above, the CDT improvements or new designation

associated with Alternative C are likely to attract more trail users and increase the risk of fire. The GMUG has a fire management plans to address this issue.

e) Red-Naped Sapsucker *(Sphyrapicus nuchalis)*

MIS Rationale
The red-naped sapsucker is designated as a GMUG MIS because of its close association with climax aspen. There are no specific management directions for the red-naped sapsucker; however, standards and guides are present for management of its preferred habitat, old-growth and mature aspen stands.

Habitat Status and Requirements
Red-naped sapsuckers are primarily associated with mature and advanced seral stages of aspen. Trees with heartrot are selected for nesting. Aspen represents less than 10% of the major Forest habitat types, yet is ranked as the second most important habitat type supporting wildlife. Red-naped sapsucker favors live aspen with rotten heartwood as a nesting tree (Winkler et. al. 1995). Fungus is a major agent responsible for causing heartrot in aspen and enters the tree through open wounds. The red-naped sapsucker is known for its characteristic drilling patterns in deciduous and pine trees. Drilling injuries on aspen encourage fungus to enter into the cambium of the tree and contributes to tree mortality through girdling. The relationship between bird damage (drilling for sap) and insect control is believed by some to contribute to a positive balance for a healthy ecosystem (DeByle and Winokur 1985). Aspen vegetation covers 1.8% of GMUG within the Study Area and a total of 5.1% within the Study Area.

Direct Impacts
Since there is no construction associated with Alternative A, no direct impacts will result to aspen or red-naped sapsucker habitat. Alternatives A and C cross through aspen vegetation in the GMUG. Alternative C could directly affect red-naped sapsucker habitat; however, all mature trees will be avoided as described in the design criteria section of the EA (Chapter 2). Alternative C has 0.22 mile of new trail construction through aspen.

The trail alignment associated with Alternative C is not expected to fragment red-naped sapsucker habitat by creating an impediment or barrier.

Indirect Impacts
Alternative A is not expected to indirectly affect red-naped sapsuckers as there is no change from existing condition to red-naped sapsucker habitats. Indirect effects associated with Alternative C would mainly result from increased use associated by the improved and relocated CDT. In addition, Alternative C has a total of 0.30 mile of trail through aspen and Alternative A has 1.07 miles of trail through aspen. Alternative C would divert a majority of the recreational use associated with the CDT through less aspen vegetation and possibly fewer red-naped sapsucker territories. Increased fire risk associated with increased use could affect aspen vegetation and red-naped sapsucker habitat. The GMUG has a fire management plan that addresses reducing the risk of catastrophic fire.

f) Merriam's Turkey (*Meleagris gallopavo)*

MIS Rationale
Merriam's turkey is a GMUG MIS; however, the March 2005 Environmental Assessment of the Management Indicator Species Forest Plan Amendment (Forest Service 2005d) for GMUG does not specify the reason for selections.

Habitat Status and Requirements
Merriam's turkey use a combination of forested and open habitats, including conifers, hardwoods, mixed woodlands, riparian areas, and open grasslands. Merriam's turkey need mature, open forests interspersed with grassy openings. The amount of openings required varies from 10-25% of the total occupied range. Scarcity of suitable roost trees may be a limiting factor. Roost trees are typically groups of over-mature trees in uneven aged stands, usually on easterly slopes sheltered from wind. Ponderosa pine is preferred over all other tree species when present, and has the following characteristics: 16-42 in. dbh, 50-100 ft high, 75% flat-topped mature or over-mature trees. Turkey must be near drinking water on a daily basis, and nests are usually within one-half mile of water. Ponderosa pine, shrubland, pinon juniper, and riparian vegetation cover 11.9% of GMUG within the Study Area and 11.3% of the total Study Area.

Direct Impacts
No direct impacts to Merriam's turkey are anticipated as a result of implementation of Alternatives A or C. Since the trail alternatives cross through the GMUG at higher elevations, it is unlikely that there is any suitable Merriam's turkey habitat affected by this project.

Indirect Impacts
No indirect impacts are expected as a result of Alternative A. Alternative C could improve access to areas where access was previously more difficult. This could increase hunting pressure on the turkey. CDOW regulates turkey and associated bag limits, and the turkey population is not expected to be substantially affected. Increased fire risk may result from increased use associated with Alternative C's changes to the CDT. The GMUG has a fire management plan that will help reduce the risk to catastrophic fire.

g) Brewer's Sparrow *(Spizella breweri)*

MIS Rationale
Brewer's sparrow is a GMUG MIS selected for its close association with sagebrush (US Forest Service 2005d).

See the BE for a description for the Brewer's sparrow. The Brewer's sparrow is an MIS for the GMUG, however there is no suitable habitat present on the Gunnison National Forest within the Study Area. The Brewer's sparrow is addressed above under Forest Service Sensitive species because a small area of habitat is present on the San Isabel National Forest within the Study Area.

(4) Determination of Effects for Terrestrial Wildlife Species

There will be no change to existing conditions for wildlife under Alternative A. Impacts to wildlife will occur from approximately 7 miles of trail construction and reconstruction under Alternative B or from approximately 42 miles of new trail construction under Alternative C. Some areas where trails have not occurred in the past will have trails under Alternative C. The summary of the effects determination for the Federally listed species is presented in Table 3-17.

Table 3-17. Summary of Effects Determinations for Evaluated Terrestrial Species.*

Federal Species	Alternative A	Alternative B	Alternative C
Bald Eagle	NLAA	NLAA	NLAA
Canada Lynx	NLAA	NLAA	NLAA
Uncompahgre Fritillary Butterfly	NLAA	NLAA	NLAA

*NLAA = may affect but is not likely to adversely affect

All alternatives may impact individual Forest Sensitive species but are not likely to result in a loss of viability on the planning area, nor cause a trend toward federal listing or a loss of species viability rangewide. In general, all alternatives could cause minor negative impacts to sensitive species or their habitat. All alternatives may temporarily disturb individuals of these wildlife species or alter their behavior patterns as a result of human activity. Alternatives B and C would both cause relatively minor habitat disturbance in the project area with Alternative C causing the most new disturbance and carrying the greatest risk to sensitive species habitat. Alternatives B and C would also remove or improve existing trails in sensitive resources.

e. Comparison of Alternatives for Terrestrial Species

Alternative C includes the most mileage of new trail construction; therefore Alternative C would result in a minor direct loss of wildlife habitat. New trail in Alternative C would be located in areas in which no trails previously existed. However, trail re-routes or improvements in sensitive habitat, such as riparian habitat areas, would allow for resource conditions to improve. Neither Alternative A nor B includes new trail construction as a major component. However, Alternative B would concentrate human use on the existing Colorado Trail corridor, near sensitive wildlife areas. The sudden increase of visitor use may have short-term impacts on wildlife while they adapt to the new use levels. Alternative A would continue the current pattern of recreational use, which would result in only minor impacts to wildlife. Most notable changes are an increase of impact to mule deer, elk, and bighorn sheep winter range for Alternative B, an increase in Alternative B of black bear-human conflict areas. Relatively, the differences between Alternative A and C are small. However, Alternative C has a small incremental increase in newly impacted areas. Overall effects will increase with Alternative C because more trail will be present in the Study Area due to new construction. Under Alternative A, B, and C, trails associated with Alternative A and B will remain and Alternative C will increase trail mileage approximately 40 miles over that of the existing reaches representing the CDT and Colorado Trail.

2. Fisheries and Aquatic Resources

The organization of this resource analysis section deviates from the organization of all other resource sections (except Terrestrial Wildlife). This section is organized as follows: a. Affected Environment, b. Environmental Consequences, c. Effects by Species, d. Determination of Effects, and e. Comparison of Alternative.

a. Affected Environment

The Study Area contains numerous watersheds that drain into the Arkansas and Lower Colorado Rivers (see Hydrology Section). These watersheds contain approximately 790 miles of intermittent streams and 845 miles of perennial streams within the Study Area that support or influence fish and other aquatic species in the Arkansas and Lower Colorado River drainages. Perennial and intermittent streams also support various amounts of riparian habitat. Riparian vegetation is important to fish because it helps maintain stream channel profiles by protecting banks with soil-binding roots and shielding banks from erosion. It also provides cover, shade (i.e., controls temperature), and provides organic matter and nutrients for aquatic and terrestrial fish food organisms (e.g., invertebrates) (Hershey and Peterson 1996).

Higher elevations resulting in cooler lake and stream temperatures support a cool water fishery of primarily trout. Greenback cutthroat trout (*Oncorhynchus clarki stomias*) is the only trout native to the Arkansas River basin. Greenback cutthroat trout populations have declined due to habitat alteration and loss, over-fishing, and the introduction of non-native trout species. The Leadville National Fish Hatchery is located 6 miles southwest of the city of Leadville. In the past, the hatchery has reared Greenback cutthroat trout but is currently rearing only the Snake River cutthroat trout.

Because much of the existing and new trail reaches are at higher elevations, near or above tree line, and natural lakes found in the area are typically shallow, only a few of these water bodies contain fish and are utilized by the public. Hancock Lake in the upper Chalk Creek Basin is a lake that supports a fishery, is actively fished by the public, and is in close proximity to the CDT. Other alpine and subalpine areas where fisheries resources are present are Boss Lake, Hunt Lake, Middle Fork, Mineral Basin in upper Cottonwood Creek, Texas Creek, and Bartlett Gulch. Larger lakes and reservoirs in the Study Area include Cottonwood Lake, Clear Creek Reservoir, Mount Elbert forebay, and Twin Lakes and are popular destinations for the fishing public where rainbow and brown trout and kokanee salmon can be caught. In addition, reaches of the Arkansas River in the Study Area are also known as a premier cold water fishery for brown trout.

Some scientists suspect that a species of chytrid fungus, *Batrachochytrium dendrobatidis* (BD), is one of the main contributing factors to amphibian population declines. This species of chytrid fungus affects the keratinized mouthpart of tadpoles and causes cutaneous infections, especially around the feet and abdomen in adults. The fungus primarily affects the toad during metamorphosis period, generally leading to death within 30 days once infection occurs. It is not known how BD is spread; however, recent studies found that BD can be transported by feathers, fur, and sediment. Humans could also potentially spread the fungus by transporting mud on the clothes and boots. A study by Colorado University has found that no BD has been discovered

within the known southern Rocky Mountain population of boreal toads within the Study Area (Pers. com. Livo 2005). Although there has not been any exhaustive surveys conducted, the Study Area contains six known populations of boreal toad, which all have tested negative for BD. There could be other undocumented populations of boreal toads and BD infection in the Study Area.

Whirling disease and the New Zealand mud snail (*Potamopyrgus antipodarum*) are concerns related to aquatic systems in Colorado. Whirling disease is a parasite that attacks various trout species and is known in the Study Area. New Zealand mudsnails are not known to the Study Area but have been identified in the Boulder, Colorado area. These two species as well as BD and can be spread by fisherman as well as animals.

Riparian areas support and are important to a variety of wildlife species such as beaver, deer, amphibians such as boreal toad and leopard frog, coldwater fisheries of brook trout, as well as numerous species of passerine birds and water dependent invertebrates such as mayflies. Indications of past and present beaver activity can be found at numerous locations throughout the Study Area. Beaver activity is important for creating habitat for aquatic species such as brook trout and aquatic insects as well as modifying riparian areas by creating wetlands adjacent to dammed open water areas.

b. Environmental Consequences

(1) Effects Common to All Alternatives

Potential direct impacts on fisheries are primarily associated the proposed stream crossings, trails located within the WIZ, and the changes that these interactions might have on the habitat attributes that are important to cold-water aquatic systems. The WIZ includes the land next to water bodies where vegetation plays a major role in sustaining the long-term integrity of aquatic systems. The WIZ includes the geomorphic floodplain, riparian ecosystem, and the inner gorge. A minimum horizontal width of 100 feet from the top of each bank (or the mean height of mature dominant late-seral vegetation, whichever is greatest) was used for this analysis (36 CFR 219.27e). In general, trails that are within close proximity to riparian zones and streams have a higher risk of indirectly influencing the biotic integrity of aquatic systems due to their potential influences on soils, riparian vegetation and the overall hydrologic and geomorphic function of individual drainages. Increased sediment delivery is a primary concern for aquatic systems. The numbers of stream crossings and the miles of trail in the WIZ per alternative are shown in Tables 3-26 and Table 3-27 in the Hydrology and Soils section.

Riparian zones (the WIZ) are major determinants of both the food resources and habitats for fish and other aquatic vertebrates (Gregory et al. 1991) and are particularly sensitive to disturbances that might alter the natural retention of inputs into stream systems. Trail removal or relocations that occur within riparian zones are therefore expected to reduce potential influences on aquatic systems more so than those that occur in upland areas.

(a) Direct Effects

All alternatives have the potential to influence aquatic systems due to the presence of trails and trail traffic. Trails primarily have direct effects on soils and vegetative attributes which indirectly influence the aquatic biota. Examples include soil compaction, erosion and sediment production that occur more frequently when trails are in close proximity to riparian zones and stream systems. Trails can also directly influence the hydrogeomorphic processes and characteristics of individual streams, which may lead to downstream influences on channel form, streambank stability, sediment transport and deposition, and ultimately aquatic habitat value and fish productivity. Stream crossings can also function as barriers to fish movement, or lead to chronic erosion that causes indirect downstream impacts on aquatic biota.

Erosion from improperly located, designed, and constructed trails can cause impacts to aquatic systems. Designating specific uses, realigning, adding, or decommissioning certain trails would address many of these concerns and could be expected to reduce direct impacts to aquatic systems.

Additionally, recreation is a widespread activity that can pose a significant threat to amphibians and their habitat. Fishing occurs in the Study Area. Final recreation destinations, such as campsites, waterfalls, and alpine lakes such as Lake Anne are riparian areas that may concurrently support amphibians. Early amphibian life stages are particularly susceptible to trampling which can result in direct mortality.

Trail effects that alter the physical condition of the habitat are often more pronounced in wet, unstable, and sensitive environments (Meyer 2002). Trails along streams can negatively affect riparian vegetation with concurrent increases in sedimentation to adjacent streams. Sediment can inhibit or kill periphyton communities, bacteria, and fungi, which are important food sources for invertebrates, amphibians, and fish (Cordone and Kelly 1961, Murphy et al. 1981).

(b) Indirect Effects

Trails have several indirect effects on aquatic systems, with increased sedimentation often being particularly influential. Sediment and erosion are the primary effects of trail use and traffic. Sediment generated from trails can be transported and deposited downstream, changing the channel morphology and watershed response to flood waters. Channels can become wide and shallow, resulting in less suitable habitat for aquatic life and providing conditions that promote increases in water temperature. Sedimentation can also result in substrate alteration of embedded gravels.

Other indirect effects include losses of vegetative bank cover from user trail construction, reduction of water quality from bank or shoreline erosion, fecal contamination, or deposition of other human refuse. Developing eggs and tadpoles are most sensitive to reduced water quality. Recreationists may attract animals such as ravens (*Corvus corax*) and jays (*Cyanocitta* spp.), thereby increasing predation.

There is potential for the introduction and spread of the BD fungus. Visitors could pass through wet areas and collect mud on clothes and boots, possibly transporting the fungus to toad habitat areas.

(c) Cumulative Effects

Aquatic habitats are sensitive to changes in the watershed and can be influenced by grazing, mining, wildland fire, timber harvesting, and rural development. Reasonably foreseeable projects that could contribute to the cumulative effects include electric transmission line right of way clearing using mechanical vegetation thinning equipment; the Salida Hydro Project, which will utilize penstock, dams, and associated facilities; summer construction projects at Monarch Ski Area; and fuel treatments as described in the Westside Environmental Assessment (2001), which would utilize a variety of methods to treat fuel loads in a dead section of the Forest.

Beaver activity can cumulatively affect aquatic habitat through relatively quick changes in flow dynamics of streams and creeks. Damming by beavers creates habitat and deep water refuge for fish as well as a variety of aquatic invertebrates. Changes to adjacent habitat through the creations of wet meadows and willow thickets provides grazing, browsing and cover opportunities for a host of animals and birds. The accumulation of small modifications and alterations of aquatic and riparian habitat can result in local or regional changes in fisheries and aquatic resources.

Cumulatively, these uses can change stream channels and sediment loads, effecting aquatic organisms.

The analysis that follows is organized by species for each alternative rather than by alternative as in the other resource analyses. Cumulative effects are similar for all species. Cumulative effects have been discussed under "Effects Common to All Alternatives".

c. Effects by Species

The following Federally listed species are analyzed in detail in the complete Biological Evaluation available in the Project Record. Information presented here is a summary of the Biological Evaluation determinations.

(1) Aquatic Federally Listed Species

a) Greenback Cutthroat Trout (*Oncorhynchus clarki stomias*)

Status and Environmental Baseline
Greenback cutthroat trout (GCT) were listed as endangered in 1973 and downlisted to threatened in 1978 (USFWS 1978). Populations of GCT are known to occur in the upper reaches of Arkansas and South Platte watersheds. Higher elevations resulting in cooler lake and stream temperatures support a cool water fishery of primarily trout. GCT is the only trout native to the Arkansas River basin. The GCT is federal and state listed as a threatened species, and also a Management Indicator Species (MIS) for the Pike and San Isabel National Forests.

Three populations of greenback cutthroat trout are in or near the project area. These are the Lake Fork Basin, Rock Creek, and Hunt Lake Basin populations. Lake Fork and Rock Creek populations are at the northern portion of the Study Area and are not in any watersheds where trail construction will occur. The Lake Fork Basin population was initially stocked in 1986 and again in 1998. Recent stocking occurred in 2004 and is anticipated again in 2006 and 2007. This population is not yet self-sustaining. The Rock Creek was stocked in the mid 1980s, and this population is self-sustaining. The Hunt Lake Basin was stocked in 2003 and again in 2004. Recent natural reproduction has already been noted of these greenback cutthroat trout by CDOW (Pers. com. Policky 2005). The Lake Fork population is still developing and not yet self-sustaining. The success of the Rock Creek population and the recent natural reproduction seen in the Hunt Lake population would indicate that these populations are at least stable.

Direct and Indirect Effects – Alternative C-Proposed Action

Approximately 4 miles of trail passes through the Hunt Lake basin and generally parallels the creek located in the basin. Various reaches of this trail will be reconstructed. Direct effects to GCT would be caused from construction activities related to trail and bridge construction and by the expansion and increased recreational use by humans. Some reaches of existing trail will also be reconstructed in areas, such as steep slopes or riparian areas to reduce impacts to resources, such as water and soil. Reconstruction of these reaches will likely improve water quality and reduce soil erosion. Reconstruction of existing trail will increase the potential for erosion and movement of sediment into waterways supporting GCT. The potential for this to occur would be greatest during construction when reaches of trail under construction are not stabilized and finished. Once completed, however, all newly constructed trail reaches would be built to current design standards using best management practices. Newly constructed trail reaches are no steeper than 15 percent over sustained reaches, which will help to minimize the potential for erosion and facilitate movement by both humans and livestock. New trail alignments were located to minimize impacts to riparian areas surrounding streams. Trail miles located in the water influence zone (WIZ) (area 100 feet either side of a water way) for the proposed action are estimated to be 5.7 miles. Reaches of new trail will impact the soil resource, but design criteria will be implemented to minimize introduction of sediment into waterways.

Anticipated increases in the number of trail users will create the potential for greater contamination of waterways by the parasite causing whirling disease, as well as chemicals (such as soaps) and other pollutants (such as feces) that may have a negative effect on aquatic species. Wading of streams by hikers in areas infected by whirling disease and the subsequent later exposure to uninfected water could cause the spread of this organism. As whirling disease is known in the Study Area, the potential for this to occur is possible.

Additional number of trail users will likely translate into additional numbers of fishermen in the Hunt Lake basin. Though a catch and release regulation is in force in this area, fish can be injured or killed during this process.

Direct and Indirect Effects – Alternative A-No Action –Existing CDT

Effects under this alternative would allow certain trail reaches in the Hunt Lake Basin that are not in appropriate locations to remain, and contribute to ongoing maintenance requirements and contribute to the potential for erosion and sedimentation. Though the trail reach in this area is

several hundred feet from the channel in places, the potential for sedimentation into the creek from short duration, high intensity storms would remain. Effects related to humans use and potential for introduction of invasive aquatic species such as whirling disease would be the same as those described in Alternative C. For reasons stated above Alternative A may affect but is not likely to adversely affect the GCT.

Direct and Indirect Effects – Alternative B-Colorado Trail Corridor
Under this alternative, the trail alignment of Alternative B would bypass the Hunt Lake Basin. No impacts would be related to the trail alignment of Alternative B, but under this alternative, the trail alignment associated Alternative A would remain as would its associated areas of trail located in areas that are not appropriate and in need of reconstruction. Users would still have access to the Hunt Lake Basin and the potential for the introduction of invasive aquatic species would remain. For reasons stated above Alternative B may affect but is not likely to adversely affect the GCT.

(2) Aquatic Forest Service Sensitive Species

The following Forest Service Sensitive species are analyzed in detail in the complete Biological Evaluation available in the Project Record. Information presented here is a summary of the Biological Evaluation determinations.

a) Boreal Toad (*Bufo boreas boreas*)

Status and Environmental Baseline
The boreal toad was previously considered a candidate for listing under the Endangered Species Act; however, on September 28, 2005, this species was removed as a candidate species (USFWS 2005b). This species remains on the Region 2 sensitive species list. The reason for removal was because it does not constitute a distinct population segment as interpreted by the FWS. CDOW ranked the Southern Rocky Mountain Population (SRMP) of the boreal toad as endangered in 1993.

Threats to boreal toad include natural predators such as common raven, gray jay, western garter snake, tiger salamander, badger, spotted sandpiper, robin, raccoon, retailed hawk, and predaceous diving beetle larvae (CDOW 2001). Vehicular use may also have an impact on amphibians in general through introduction of fuel and oil into waterways or through the disturbance of soils creating the potential for sedimentation as well as direct mortality due to crushing. The chytrid fungus, BD, which has been implicated in amphibian declines worldwide, was identified as a threat several years ago. Although BD is likely a major reason for this species decline, it is not conclusively the only cause of mortality in the population but may be a major threat. The mode of spread of BD is unknown. It is possible that recreational activities may have a role in transporting pathogens from one area to another (CDOW 2001). For example, mud could be transported from site to site via the soles of hiking boots or waders. It is possible that BD can spread by natural means such as migrating birds and mammals.

Colorado University research has indicated that no BD has been discovered within the Study Area (Livo pers. comm. 2005). Although there has not been any extensive surveys conducted,

the Study Area contains six known populations of boreal toad, which all have tested negative for BD. There could be other undocumented populations of boreal toads and BD infection in the Study Area. It is possible that BD can spread by natural means such as migrating birds and mammals and by recreational users.

Locations for boreal toad in the Study Area have been recorded in Chaffee, Gunnison and Lake counties (CDOW 2005c). Observation locations within the Study Area include Browns Creek, South Cottonwood Creek, Middle Cottonwood Creek, Texas Creek, and Lake Creek. Additional recent observations of boreal toad were reported by the Forest Service in the upper basin of North Chalk Creek south of Tincup Pass. Elevation ranges of sightings ranged from 9,250 feet to 11,450 feet. A field survey for boreal toad was conducted in areas of potential habitat during the summer of 2005 by EDAW. Approximately 30 separate locations were surveyed along the proposed route at elevations up to 12,100 feet in elevation. One toad was observed as a result of this survey and was located along Woodchopper Creek in the upper North Fork Chalk Creek Basin at an elevation of approximately 12,000 feet.

Direct and Indirect Effects

Alternative A would pass through areas that are potential boreal toad habitat. Using the water influence zone as a measure of where toads may be found, approximately 5 miles would be crossed under Alternative C. Existing trail reaches for Alternative A and B both pass through approximately 9 miles of the water influence zone. Since a major portion of the elevation range of the Study Area is within the elevation range of the toad, much of the overall Study Area located in the water influence zone can be considered suitable habitat. Potential for trampling by trail users would continue to exist. A majority of the major watersheds on the east side of the Collegiate Peaks area as well as the upper reaches of the Texas Creek basin have known populations of toads. If BD were to become introduced into any of the occupied watersheds of the boreal toad, potential for spread by humans would exist and toads may become infected.

Lower elevation ranges generally seen along the alignment of Alternative B would have potential for supporting boreal toad, though mapping indicates that observations of toads typically occur at higher elevations. Similar concerns related to Alternative A occur with this alternative.

Alternative C is generally at a higher elevation, with over 22 miles of trail over 12,000 feet in elevation compared to 6.9 miles for Alternative A and no miles for Alternative B. Few occurrences of boreal toad have been recorded above 12,000 feet. Remaining reaches of the trail would however be at elevations where toads have been recorded and potential for trampling of spread of BD would be present. Similar to Alternatives A and B, travel through these areas (especially from basin to basin) could promote the spread of BD if it were to occur in the Study Area. This would be exacerbated by the anticipated increase in users expected from this alternative. Trail reaches constructed under Alternative C would increase total miles in boreal toad habitat as trail reaches associated with Alternatives A and B would remain open. For reasons discussed above, Alternatives A, B, C may impact boreal toad, but are not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing or a loss of species viability range wide.

Areas where new construction would occur were located to avoid wetland areas, and when necessary, crossing of wetlands was done to minimize impacts. In areas of known boreal toad populations, all wet area trail crossings will utilize small puncheon bridge structures rather than armored drains or fords. These structures will minimize habitat trampling, crushing of individual toads, and will assist in preventing the spread of the BD fungus by keeping trail users out of boreal toad habitat and travelways. The local Forest Service biologist will be consulted during construction to ensure that the placement of these puncheon bridge structures meets the design need to protect the toad in these locations.

b) Northern Leopard Frog (*Rana pipiens*)

Status and Environmental Baseline
The northern leopard frog occurs from southern Canada and northern United States, south to Maryland, west into New Mexico, Arizona and eastern California. It occurs throughout Colorado, excluding most of the southeastern and east-central portions of the state and the Republican River drainage in northeastern Colorado (CDOW 2003). This species can be locally common, but have become rare or extirpated in many areas, particularly in the mountains. Habitats for this species include wet meadows and the banks and shallows of marshes, ponds, lakes, reservoirs, streams and ditches; frogs are usually found at the waters edge. Northern leopard frogs breed in shallow, quiet areas of permanent bodies of water, in beaver ponds, and in seasonally flooded areas adjacent to or contiguous with permanent pools or streams. The breeding season begins in March in lowland areas, and occurs mainly in May and June in the mountains. Larvae metamorphose into small frogs as early as late June in the lowlands and mainly July-September in the mountains. Northern leopard frogs have been known to hybridize with the plains leopard frog (*Rana blairi*) in some areas.

Direct and Indirect Effects
Habitat is present in the Study Area for the northern leopard frog; however, the only recorded observations of these were at elevations lower than the Study Area. If these frogs were to be in the Study Area, the same threats as those associated with boreal toad (discussed above) would be relevant to the northern leopard frog. The chytrid fungus is believed to affect northern leopard frogs as well as boreal toads, and the possible transfer of the fungus from basin to basin would infect frogs.

c) Colorado River Cutthroat Trout (*Oncorhynchus clarki pleuriticus*)

Status and Environmental Baseline
The Colorado River cutthroat trout historically occupied portions of the Colorado River drainage in Wyoming, Colorado, Utah, Arizona, and New Mexico. It is estimated that this species may occupy less than 1% of the historical range (NatureServe 2005). Now remaining populations occur mostly in headwater streams and lakes to habitats over 7,000 feet elevation. Colorado River cutthroat trout have hybridized with non-native salmonids in many areas, and is a major influence upon its status (CRCT Task Force 2001). Colorado River cutthroat typically require water with high dissolved oxygen content, low water temperatures in the summer, and clean gravel for spawning. In addition, they require riffle areas for food production and habitat for

young, and pools for over wintering, and summer rest. The number of pools and riffles should be roughly equal for maximum population and biomass, balancing numbers of young and old fish. In headwater streams, over wintering can occasionally be problematic for the trout, due to lack of pools of sufficient size and the formation of anchor ice.

Suitable habitat is present in the Study Area, however, no known populations of Colorado cutthroat trout are known.

Direct and Indirect Effect
Effects related to the Colorado cutthroat trout would be the same as those previously discussed above for the Greenback cutthroat trout. These primarily would be related to the influence humans have on the spread of whiling disease (already present in the Study Area) and the potential for the introduction of New Zealand mud snail. Since Colorado River cutthroat trout is not known to occur in the Study Area the probability of effects to this species would be low.

(3) Aquatic MIS Species

The following MIS are analyzed in detail in the complete MIS Report available in the Project Record. Information presented here is a summary of the MIS Report determinations.

a) Brook Trout *(Salvelinus fontinalis)*

MIS Rationale
The Forest Plan FEIS (Forest Service 1984) indicates that brook trout were selected as a MIS on the PSICC because: 1) the public has a high concern for this species and its habitat, and 2) the public has a high interest for fishing.

Habitat Status and Requirements
Optimal stream habitat for brook trout is characterized by clear, cold water; silt-free rocky substrate in riffle-run areas; well-vegetated stream banks; abundant instream cover; deep pools; relatively stable flow regime and stream banks; and productive aquatic insect populations (Raleigh 1982). Brook trout have a strong association with beaver ponds and tend to hold along undercuts, submerged brush piles, beaver houses and dam (Marlowe 1990). Beaver ponds are often overpopulated, resulting in smaller fish. Open water covers approximately 0.9% of the PSICC within the Study Area and 0.7% of the total Study Area.

Direct Impacts
Alternative A is not anticipated to have a direct impact on brook trout, due to no construction associated with this alternative. Alternatives B and C may temporarily impact brook trout habitat during the construction of creek crossings. Alternative B has three new crossings and 2 reconstructed crossings for a total of 9.35 miles of trail through PSICC WIZ. Alternative C has 25 new crossings and 5 reconstructed crossings for a total of 4.56 miles through PSICC WIZ. In addition, 19 crossings will be removed in association with Alternative C; however, these trail removals are not part of the existing CDT. Crossings may include bridges or fords and are not anticipated to impair fish movement up or downstream. Temporary construction impacts may include temporary increased siltation.

Indirect Impacts
No indirect impacts are anticipated with Alternative A as there will be no change from the existing condition to trout habitat. Alternatives B and C could expose brook trout to additional pollution by campers and people recreating on the trails. Pollution could be in the form of trash, human waste, and chemical pollution from soaps and detergents. The additional segments of trail and increased use associated with Alternatives B and C could result in greater potential for erosion, sedimentation of riffles and spawning beds, increased water temperature, and reduced dissolved oxygen. However, erosion and sedimentation of water resources and associated MIS will be minimized by following design and trail standards during sighting and construction of the trail. Posted National Forest signs at trailheads indicate that campsites must be at least 100 feet from water resources. In addition, Alternatives B and C could provide the people fishing improved access to new creeks. Fish are regulated by CDOW, who determines catch limits. Whirling disease has been found through western Colorado. The improved access to new fishing streams could increase the spread of whirling disease to localized areas that were not previously infected. As discussed above, the potential for wildfire could increase with the increased trail use associated with Alternatives B and C. Fire creates pollution from ash and soot, as well as increases the amount of erosion in waterways during the rainy seasons following a fire. Alternatives B and C would not affect other threats to brook trout, such as logging, river impoundments, roads, railroad, land clearance, introduced trout species, and human habitation. These are forest management decisions that are not associated with this project.

b) Common Trout (*Oncorhynchus* spp.)

MIS Rationale
The March 2005 Environmental Assessment of the Management Indicator Species Forest Plan Amendment (Forest Service 2005d) for GMUG selected a species group of common trout rather than individual species. This species group all have the same habitat requirements and sensitivity to similar threats.

Habitat Status and Requirements
Trout typically require water with high dissolved oxygen content, low water temperatures in the summer, and clean gravel for spawning. In addition, they require riffle areas for food production and habitat for young, and pools for overwintering, and summer rest. The number of pools and riffles should be roughly equal for maximum population and biomass, balancing numbers of young and old fish. In headwater streams, overwintering can occasionally be problematic for the trout due to lack of pools of sufficient size and the formation of anchor ice. Open water covers less than 0.1% of GMUG within the Study Area and 0.7% of the total Study Area.

Direct Impacts
Alternative A will have no direct effects on common trout as there will be no change from the existing condition to trout habitat. Alternative B does not enter the GMUG, therefore Alternative B does not apply to this section Alternative C will have three new stream crossings, four reconstructed crossings, and a total of 0.93 mile through WIZ.

Indirect Impacts
Alternative A will have no indirect effect on common trout. Alternative C could expose common trout to additional pollution by campers and people recreating on the CDT within GMUG. Alternative C will result in fewer stream crossings and less miles of trail through WIZ than Alternative A. Pollution could be in the form of trash, human waste, and chemical pollution from soaps and detergents. The additional segments of trail and increased use associated with Alternative C could result in greater potential for erosion, sedimentation of riffles and spawning beds, increased water temperature, and reduced dissolved oxygen. However, erosion and sedimentation of water resources and associated MIS will be minimized by following design and trail standards during sighting and construction of the trail. Posted National Forest signs at trailheads indicate that campsites must be at least 100 feet from water resources. In addition, Alternative C could provide people fishing improved access to new creeks. Fish are regulated by CDOW, who determines catch limits. Whirling disease has been found through western Colorado. The improved access to new fishing streams could increase the spread of whirling disease to localized areas that were not previously infected. As discussed above, the potential for wildfires could increase with the increased trail use associated with Alternatives B and C. Fire creates pollution from ash and soot, as well as increases the amount of erosion in waterways during the rainy seasons following a fire. Alternative C would not affect other threats to common trout, such as logging, river impoundments, roads, railroad, land clearance, introduced trout species, and human habitation. These are forest management decisions that are not associated with this project.

c) Greenback Cutthroat Trout (*Oncoryhnchus clarki stomias*)

MIS Rationale
The Forest Plan FEIS indicates that greenback cutthroat trout were selected as a MIS on the PSICC because: 1) it has special habitat needs, 2) the public has a high concern for this species and its habitat, 3) it is a threatened or endangered species, and 4) it is an ecological indicator associated with water.

Habitat Status and Requirements
This species inhabits coldwater streams and coldwater lakes with adequate stream spawning habitat present in the spring of the year (USFWS 1998b). They are found almost entirely in Colorado along the Front Range of the Colorado Rocky Mountains, with small extensions into Wyoming (Behnke 1992). Greenback cutthroat trout were once abundant in all mountain foothill streams in the South Platte and Arkansas River drainages, but populations declined drastically due to habitat degradation, over-harvest, and introductions of exotic trout species. Once thought extinct by the 1930s (Green 1937), greenback cutthroat trout were discovered in two streams in 1965 and 1970. They were listed as endangered under the Endangered Species Act in 1973 (USFWS 1998b).

Existing greenback cutthroat trout populations are restricted to small, remote high elevation streams and lakes where populations often have been protected by fish movement barriers. Many of these habitats are cold and unproductive and undergo extreme flow fluctuations, leading to small, slow-growing trout populations (Young 1995). Open water covers 0.9% of the PSICC within the Study Area and a total of 0.7% within the Study Area.

Three populations of greenback cutthroat trout are in or near the project area. These are the Lake Fork Basin, Rock Creek, and Hunt Lake Basin populations. Lake Fork and Rock Creek populations are just north of the project area. The Lake Fork Basin population was initially stocked in 1986 and again in 1998. Recent stocking occurred in 2004 and is anticipated again in 2006 and 2007. The Lake Fork population is still developing and not yet self-sustaining. The Rock Creek was stocked in the mid 1980s, and this population is self-sustaining. The Hunt Lake Basin was stocked in 2003 and again in 2004. Recent natural reproduction has already been noted of these greenback cutthroat trout by CDOW (Pers. com. Policky 2005). The success of the Rock Creek population, and with the natural reproduction seen in the Hunt Lake population would indicate that these populations are at least stable.

Direct Impacts
See "Direct Impacts" for Common Trout.

Indirect Impacts.
See "Indirect Impacts" for Common Trout.

d. Comparison of Alternatives for Aquatic Species

Alternative A, the no action alternative, would not change the existing condition of nearly 9 miles in the WIZ. Consequently, fish and/or amphibian populations would not be directly or indirectly affected by this alternative. The potential for impacts to aquatic resources would be greater for Alterative B because the trail crossings of riparian areas are longer due to the nature of riparian areas at this elevation. Alternative B would include nearly 10 miles of trail in the WIZ. Alternative C includes 5.6 miles of trail in the WIZ. Alternative C includes the construction of eleven bridges and four rock fords to help avoid sedimentation and trampling impacts associated with direct stream crossings.

e. Determination of Effects for Aquatic Species

There will be no change to existing conditions for aquatic wildlife under Alternative A. Impacts to aquatic wildlife will occur from approximately 7 miles of trail construction and reconstruction under Alternative B or from approximately 42 miles of new trail construction under Alternative C. Some areas where trails have not occurred in the past will have trails under Alternative C. The summary of the effects determination for the Federally listed species is presented in Table 3-18.

Table 3-18. Summary of Effects Determinations for Evaluated Aquatic Species.*

Federal Species	Alternative A	Alternative B	Alternative C
Greenback Cutthroat Trout	NLAA	NLAA	NLAA

*NLAA = may affect but is not likely to adversely affect

All alternatives may impact individual Forest Sensitive species but are not likely to result in a loss of viability on the planning area, nor cause a trend toward federal listing or a loss of species viability rangewide. In general, all alternatives could cause minor negative impacts to sensitive species or their habitat. All alternatives may temporarily disturb individuals of these wildlife species or alter their behavior patterns as a result of human activity. Alternatives B and C would

both cause relatively minor habitat disturbance in the project area with Alternative C causing the most new disturbance and carrying the greatest risk to sensitive species habitat. Alternatives B and C would also remove trails from or improve trails in sensitive resources.

3. Vegetation (including Federally listed, Forest Service sensitive, and noxious weeds)

a. Affected Environment

Plant communities in the Study Area include mountain big sagebrush with ponderosa pine (*Artemisia tridentata* ssp. *vaseyana/Pinus ponderosa*); lodgepole pine with silvertop sedge or whortleberry (*Pinus contorta/Carex foenea* or *Vaccinium myrtillus* ssp. *oreophilum*); and subalpine fir – Engelmann spruce (*Abies bifolia – Picea engelmannii*) with pachistima (*Paxistima myrsinites*), elk sedge (*Carex geyeri*), moss, buffaloberry (*Shepherdia canadensis*), gooseberry (*Ribes montigenum*), whortleberry (*Vaccinium myrtillus* ssp. *oreophilum*), or grayleaf willow (*Salix glauca*). Alpine plant communities include Kobresia/curly sedge (*Kobresia myosuroides/Carex rupestris*); Kobresia-like sedge/alpine sandwort-alpine sagebrush (*Carex elynoides/Lidia obtusiloba-Artemisia scopulorum*); alpine rocky forblands; Sibbaldia/alpine avens (*Sibbaldia procumbens/Acomastylis rossii ssp. turbinata*); and alpine scree or fellfields with little vegetation. All of these communities occur on flat to steep slopes.

An extensive field survey to identify Federal, Forest Service sensitive, and Colorado Natural Heritage Program (CNHP) watch list species was conducted by the Forest Service during the summer of 2005. The results of this survey can be found in the CDT Halfmoon Creek to South Fooses Pass Plant Biological Evaluation contained in the project record.

On the San Isabel National Forest, two federally listed species are known or suspected to occur: *Eutrema penlandii* (alpine fen mustard), a threatened species; and, *Botrychium lineare* (narrow-leaved moonwort), a candidate species (Table 3-19). No threatened, endangered, or proposed plant species have been found to occur on the Gunnison Ranger District.

Penland alpine fen mustard occupies a narrow habitat niche. It is found on the lee side of ridges downslope from perennial snowfields that provide a year-round source of water. Penland alpine fen mustard is a perennial herb of the mustard family that grows in alpine wetlands. It is highly habitat-specific, typically being found in alpine fens on the lee side of mountain crests where deep wind-deposited snow accumulates. It is endemic to Colorado and only found in the Mosquito Range, from Hoosier Pass to Mount Sherman, in Park and Summit counties, at elevations of 12,000 to 12,800 feet. The closest known occurrence is approximately 10 miles from the trail corridor. Potential habitat is found throughout the high alpine regions of the Study Area of the Collegiate Peaks/Sawatch Range.

Narrow-leaved moonwort is a perennial herb in the adder's-tongue fern family (Ophioglossaceae). This plant is small and easily over-looked, and may not be present every year. Reproductive spores are produced in June. It is found in deep grass and forb meadows, under trees in woods, and on shelves on limestone cliffs. Locally, it occurs in coarse, decomposed granite. It has been found among the riparian transition vegetation associated with

aspen. This species is found at elevations ranging from 7,900 to 11,000 feet. Narrow-leaved moonwort ranges from Washington and Montana south to California and Colorado, and there are historic records in Quebec, Canada and Nebraska. Only nine known populations of this plant have been identified.

Table 3-19. Federally Listed Plant Species Known to Occur or with Potential to Occur in the Study Area.

Common Name	Scientific Name	Status	Known/Suspected to be Present in the Study Area?	Suitable Habitat Present?
Penland alpine fen mustard	*Eutrema penlandii*	Threatened	Yes	Yes
Narrow-leaved moonwort	*Botrychium lineare*	Candidate, Sensitive	Yes	Yes

Source: USFS.

Forty-two Forest Service sensitive species plants occur or have potential to occur due to the presence of suitable habitat located in the Study Area (Table 3-20). Four species, arctic braya (*Braya glabella*), Gray's Peak whitlowgrass (*Draba grayana*), tundra buttercup *(Ranunculus karelinii*), and hoary willow (*Salix candida*) have known occurrences near trail corridors in the Study Area. A total of 6 occurrences are known: 1 for *Braya glabella*, 2 for *Draba grayana*, 2 for *Ranunculus karelinii,* and 1 for *Salix candida.* Additionally, several rare species tracked by the CNHP also have occurrences adjacent to the trail corridor.

Arctic braya, a Forest Service sensitive plant, is a perennial herb of the mustard family (Brassicaceae) that produces flowers and fruits from July through August. It is an alpine species found on sparsely vegetated slopes. It is often found on limestone-derived soils. The species is found in Alaska and Canada with a disjunctive population in Colorado, where it is found in Chaffee, Gunnison, Park, and Pitkin counties at 12,000 to 13,000 feet. A second Forest Service Sensitive plant, Gray's Peak whitlowgrass, is also a perennial herb of the mustard family (Brassicaceae). It is a Colorado endemic found in rocky alpine areas, including talus slopes. It has been found in Clear Creek, Gilpin, Grand, Lake, Larimer, Park, and Summit counties at elevations of 11,500 to 14,000 feet. The third Forest Service Sensitive plant found in the vicinity of trail corridors is tundra buttercup, which is also perennial herb of the buttercup family (Ranunculaceae) that inhabits alpine slopes and summits and is often found amongst rocks and scree. Tundra buttercup ranges from Alaska and Canada, south to Idaho, Montana, Wyoming, Utah and Colorado. It reaches its southernmost Rocky Mountain distribution in Colorado where it is found at 12,000 to 14,100 feet in the central mountains of the state. The Colorado county distribution includes Chaffee, Clear Creek, Gunnison, Lake, Park, and Summit.

Table 3-20. Forest Service Sensitive Plant Species Known to Occur or with Potential to Occur in the Study Area.

Scientific Name	Common Name	Status	Habitat	Known / suspected to be present?	Suitable habitat present?	Rationale if not carried forward for analysis
Aquilegia chrysantha ssp. *rydbergii*	golden columbine	RIP 8,000-9,800 ft.	Streamsides and rocky ravines in the mountains.	No	No	Out of the described range and known elevation for the species.
Armeria maritima ssp. *sibirica*	Siberian sea thrift	AL, RIP 11,900-13,000 ft.	Riparian and rocky ravines in the mountains.	Yes	Yes	
Asclepias uncialis	dwarf milkweed	4,000-6,500 ft.	Shortgrass prairie, plains, and outwash mesas.	No	No	Out of the described range and known elevation for the species.
Astragalus leptaleus	park milkvetch	RIP, AS	Wet meadows, aspen	No	No	Not known to occur in this area.
Botrychium campestre	Iowa moonwort	FM, SU 3,700-10,800 ft.	Dry gravelly hillsides.	No	Yes	
Botrychium lineare	narrow-leaved moonwort	AS, GL, FM, SU, AL 7,900-9,500 ft.	Disturbed sites, grassy slopes, alpine areas and aspen forests.	No	Yes	
Botrychium multifidum var. *coulteri*	leathery grapefern	RIP, FM, LP transition 8,000-9,500 ft.	Old pasture, meadows, woodland margins, riverbanks, bottomland, RIP habitat generalist.	Yes	Yes	
Braya glabella	arctic braya	AL 12,000-13,000 ft.	Alpine tundra on calcareous gravelly soils.	Yes	Yes	
Carex diandra	lesser panicled sedge	RIP 7,400-9,000 ft.	Wet meadows and subalpine willow carrs.	No	No	Out of the described range of the species.
Carex livida	livid sedge	Rip, FEN9,000-10,000 ft.	Fens and wetlands.	No	No	Out of the described range of the species.
Cirsium perplexans	Rocky Mountain thistle	MS, PP below 8,500 ft.	Dry clay/shale hillsides. Soap Creek?	No	No	Not known to occur in this area.
Cypripedium parviflorum	lesser yellow lady's slipper orchid	AS, CON	7,400-8,500 FT.	No	No	Out of the described range and known elevation for the species.
Draba exunguiculata	clawless draba	AL, RO 12,000-14,000 ft.	Granitic alpine area on rocky slopes or fellfields.	Yes	Yes	
Draba grayana	Gray's Peak whitlow-grass	AL, SU, RO 11,500-14,000 ft.	Alpine or subalpine on tundra, gravelly slopes or fellfields.	Yes	Yes	
Draba smithii	Smith whitlow-grass	SU, AL 9,100-9,800 ft.	Upper montane, subalpine and alpine.	Yes	Yes	
Drosera rotundifolia	round leaf sundew	FEN 9100 to 10,000 ft.	Fens, floating peat mats with Sphagnum moss	No	No	Not known to occur in this area.

Scientific Name	Common Name	Status	Habitat	Known / suspected to be present?	Suitable habitat present?	Rationale if not carried forward for analysis
Epipactis gigantea	giant helleborine	RIP 4,800-8,000 ft.	Seeps, springs, riparian areas and wetlands.	No	No	Project is outside of upper known elevation for the species.
Eriogonum brandegei	Brandegee buckwheat	SA 5,700-7,600 ft.	Pinyon-juniper and sagebrush, usually on Dry Union Formation soils.	No	No	Species is a substrate specialist found at <8,000 ft.
Eriophorum altaicum var. *neogaeum*	Altai cottongrass	FEN 9,500-14,000 ft.	Fens, wetlands	Yes	Yes	
Eriophorum chamissonis	Chamisso's cottongrass	FEN 9,500-14,000 ft.	Fens, wetlands	Yes	Yes	
Eriophorum gracile	slender cotton grass	FEN 8,100-12,000 ft	Sedge meadows and floating peat mats, saturated soil to shallow water. 1 site West Elk Wilderness.	Yes	Yes	
Gilia sedifolia	stonecrop gilia	AL above 10,500 ft.	Alpine tundra.	No	Yes	
Ipomopsis globularis	globe gilia	AL 12,000-14,000 ft.	Alpine ridgetops and gravelly, calcareous soils.	Yes	Yes	
Kobresia simpliciuscula	simple bog sedge	AL, FEN	Alpine areas including tundra, fens and moist gravel.	Yes	Yes	
Machaeranthera coloradoensis	Colorado tansy aster	MS, AL, PP 8,500-12,500 ft.	Gravelly places in mtn parks, dry tundra, sandstone / limestone.	Yes	Yes	
Mimulus gemmiparus	Weber's monkeyflo-wer	FM, RIP 8,500-10,500 ft.	Granitic seeps, slopes, and alluvium amongst spruce-fir and aspen forests.	No	Yes	
Neoparrya lithophila	rock-loving neoparrya	RO, GL, FM 7,000-10,000 FT.	Pinyon juniper woodland, rocky areas, and montane grasslands.	No	Yes	
Oenothera harringtonii	Arkansas Valley evening primrose	GL 4,700-6,100 ft.	Grasslands.	No	No	Out of the described range and known elevation for the species.
Parnassia kotzebuei	Kotzebue's grass of parnassus	AL, SU, RIP 10,000-12,000 ft.	Wet rocky areas and streams in the alpine and subalpine zones.	Yes	Yes	
Penstemon degeneri	Degener's beard-tongue	PP, GL, FM 6,000-9,500 FT.	Pinyon-juniper and ponderosa pine woodlands and montane grasslands.	No	Yes	
Potentilla rupincola	Rocky Mountain cinquefoil	RO 6,900-10,500 ft.	Subalpine or montane granitic outcrops amongst ponderosa or limber pine.	No	Yes	
Primula	Greenland	RIP	Wet meadows,	No	Yes	

Scientific Name	Common Name	Status	Habitat	Known / suspected to be present?	Suitable habitat present?	Rationale if not carried forward for analysis
egaliksensis	primrose	9,000-10,000 ft.	streambanks, and willow carrs.			
Ptilagrostis porteri	Porter feathergrass	RIP 9,200-12,000 ft.	Hummocks in fens and willow carrs.	No	Yes	
Ranunculus gelidus (*R. karelinii*)	ice cold buttercup, tundra buttercup	AL 11,000-14,100 ft.	Ridgetops and peaks, in rocks and scree, where there have been low-lying snow banks or in the rivulets below them, 11,000-14,100 ft	Yes	Yes	
Rubus arcticus ssp. *acaulis*	northern blackberry	RIP 8,600-9,700 ft.	Willow carrs and mossy streamsides.	No	Yes	
Salix arizonica	Arizona willow	FM, RIP 8,300-10,800 FT.	Meadows, seeps, springs, and riparian areas.	No	No	Out of the known range of the species.
Salix candida	hoary willow	FEN, RIP 8,800-10,600 ft.	Fens, edges of streams, wetlands.	Yes	Yes	
Salix myrtillifolia	blueberry willow	RIP, FENS 9,000 – 10,500ft.?	Wetlands, streambanks, fens.	No	Yes	
Salix serissima	autumn willow	FEN 7,800-10,200 FT.	Marshes, fens and bogs.	No	Yes	
Selaginella selaginoides	club spikemoss	SF Elevation range in the state is unknown.	Marshy areas and wet spruce forests.	No	Yes	
Utricularia minor	lesser bladderwort	FEN, AQ 8,600-10,500 ft.	Shallow H2O fens, fresh H2O wetland, subalpine ponds	No	No	Not known to occur in this area.
Viola selkirkii	Selkirk's violet	SF, AS, CON 6,000-9,100 ft.	Forests from montane zone to subalpine.	No	Yes	

Key
S=suspected, **D**=Documented, **L**=Likely, **V**=Vicinity, **Bio L** = Biologically likely to occur, **Geo L** = Geographically likely to occur, **(D)**=Documented/not concern Gunnison RD
NO=North, **SO**=South

SF=Spruce Fir**, AS=**Aspen**, LP=**Lodgepole Pine**, MS=**Mountain Shrub**, SA=**Sagebrush, **GL=**Grassland**, FM =** Forest Meadow**, FEN=** Peat fen**, AL=**Alpine**, SU=**Subalpine, **RIP=**Riparian/Wetland**, AQ=**Aquatic**, RO=**Rock/Cliff/Cave/Canyon/Mines**, PP=**Ponderosa Pine, **CON** = Mix Conifer Forest

In addition to the threatened and sensitive species, other species of concern include noxious weeds, which are a threat to native vegetation. Disturbance of an area can promote the establishment of invasive species. Weed species often become established along road and trail

corridors and adjacent to parking areas. Table 3-21 below lists weeds identified by the Lake, Chaffee, and Gunnison County weed programs. In the Study Area, two populations of Canada thistle (*Cirsium arvense*) are known. Vehicles, humans and pack animals utilizing trails can introduce seeds into areas. The first site, just east of Twin Lakes Reservoir, is approximately one acre in size. The second site, located within the Collegiate Peaks Wilderness near the historic town site of Hamilton, is approximately 800 ft^2 in size.

Table 3-21. Noxious Weed Lists for Chaffee, Lake, and Gunnison Counties.

Common Name	Scientific Name
Canada thistle	*Cirsium arvense*
hoary cress (Whitetop)	*Cardaria draba*
houndstongue	*Cynoglosum officinale*
knapweed, diffuse	*Centaurea diffusa*
knapweed, Russian	*Centaurea repens*
knapweed, spotted	*Centaurea maculosa*
leafy spurge	*Euphorbia esula*
musk thistle	*Carduus nutaans*
toadflax, Dalmatian	*Linaria genistifolia* ssp. *dalmatica*
toadflax, yellow	*Linaria vulgaris*

Source: Chaffee, Lake, and Gunnison Counties.

The Biological Evaluation prepared for this project discusses Federally listed and Forest Service sensitive species with the potential to occur in the Study Area and be affected by the proposed project. A summary of the Botanical Biological Evaluation is presented in the Environmental Consequences analysis below.

b. Environmental Consequences

Table 3-22 shows total trail distance for each alternative by vegetation community. As noted previously, this information provides a frame of reference for potential direct, indirect and cumulative effects.

Table 3-22. Total Miles of Trail by Vegetation Community for Each Alternative.

COMMUNITY	Alternative A Total	Alternative B Total	Alternative C Total
Herbaceous forb and grasslands	8.5	1.2	13.4
Pinyon/juniper	0.0	0.3	0.0
Ponderosa pine	0.5	5.1	0.7
Shrubland	18.6	6.2	11.7
Douglas fir	1.0	5.6	1.5
Lodgepole pine	19.7	34.9	12.4
Aspen	6.8	9.6	6.4
Bristle cone pine	0.0	0.6	0.0
Spruce/fir	20.2	13.4	24.3
Barren/rock	4.0	0.03	15.5
Other	1.8	12.1	4.2
Total	**81.1**	**89.0**	**90.1**

Source: USFS

(1) Effects Common to All Alternatives

(a) Direct Effects

There are no direct effects to Threatened, Endangered, or Sensitive (TES) plant species that are common to all Alternatives.

(b) Indirect Effects

All Alternatives have the potential for the introduction of weeds that are capable of displacing native vegetation. Livestock grazing, motorized and non-motorized vehicle use, human activities, and wildlife movement are examples of factors that contribute to weed dispersal in the Study Area. Seed material can be introduced to an area through stock manure, by attaching to fur, mud attached to vehicles, and to clothing. Weeds are most commonly found in disturbed sites such as roads, trails, utility corridors, camping areas, parking lots and waste areas, or in hotspots of native diversity such as riparian areas. The CDT has numerous trailhead parking areas; vehicles that enter these areas could be carrying weed seeds. Pack animals and hikers may inadvertently pick up these seeds on fur and clothing and distribute them at other locations along the trail.

Noxious weeds displace native plant habitat and degrade watershed functions. They also directly compete with other plant species for light, water, and nutrients and have the potential to extirpate rare plants. Design criteria related to noxious weeds are described in Chapter 2.

(c) Cumulative Effects

Livestock grazing, timber harvest, wildland fire, fire suppression, prescribed fire and mechanical fuels treatments, mining, motorized and non-motorized recreational use, special use permits, noxious weeds, road construction and urban developments can all contribute to cumulative effects on TES plant species in the Study Area. All of the activities listed above are current and ongoing on the Salida, Gunnison, and Leadville Ranger Districts. These activities have the potential to remove, disturb, and/or modify TES plant habitat. Design criteria would be implemented in order to minimize additional disturbance or impacts to TES plants as a result of the project.

(2) Alternative A – No Action

(a) Direct Effects

There would be no direct effects on TES plants as a result of implementing Alternative A.

(b) Indirect Effects

Indirect effects of Alternative A would be the same as those described in “Indirect Effects Common to All Alternatives.”

(c) Cumulative Effects

Cumulative effects of Alternative A would be the same as those described in "Cumulative Effects Common to All Alternatives."

(3) Alternative B

(a) Direct Effects

Alternative B includes the construction and reconstruction of approximately 8 miles of trail. Direct effects associated with trail construction and reconstruction include crushing, displacing, smothering, and trampling of TES plant species. Furthermore, approximately 2.9 acres of habitat would be altered to be unsuitable for colonization and growth by TES plants.

(b) Indirect Effects

Implementation of Alternative B may lead to increased use on the Colorado Trail resulting in several indirect effects to TES plant species such as: trampling, dispersed camping, firewood gathering, fire rings, recreational stock pasturing and containment, gathering or collecting of plant materials, social trails (including unauthorized motorized use), erosion, sedimentation, and changes in hydrology and drainage. However, the resulting use would occur primarily in the lodgepole pine community where few TES plant species or noxious weeds are known.

Furthermore, weeds listed by the state are more likely to be found in lower elevations than in alpine environments. By implementing Alternative B (at a lower elevation than Alternatives A and C), increased noxious weed seed dispersal will increase along the Colorado Trail. Infestation rates may increase with visitor use. The increase in weed infestations would result in a corresponding need for increased weed management.

(c) Cumulative Effects

Cumulative effects of Alternative B would be the same as those described in "Cumulative Effects Common to All Alternatives."

(4) Alternative C – Proposed Action

(a) Direct Effects

Alternative C includes the construction and reconstruction of approximately 58 miles of trail. Direct effects associated with trail construction and reconstruction include crushing, displacing, smothering, and trampling of TES plant species. Furthermore, approximately 21.1 acres of habitat would be altered to be unsuitable for colonization and growth by TES plants. However, it should be noted that some of the habitat loss due to construction and reconstruction may be offset by naturalizing abandoned section of trail.

Of the 58 miles of newly constructed or reconstructed trail, the majority of impacts would occur within three community types: 19.1 miles would occur within the spruce/fir community, 12.5 miles would occur within areas classified as barren/rock, and 7.4 miles would occur in herbaceous forb and grassland communities largely in the alpine and sub alpine zones (Table 3-23).

Table 3-23. Miles of New and Reconstructed Trail Segments by Vegetation Community for Alternative C.

COMMUNITY	Alternative C New Construction	Alternative C Reconstruction	Alternative C Construction and Reconstruction Total	Alternative C Rehabilitation
Herbaceous forb and grasslands	6.1	1.3	7.4	0.7
Pinyon/juniper	0.0	0.0	0.0	0.0
Ponderosa pine	0.4	0.0	0.4	0.0
Shrubland	3.1	3.2	6.3	1.8
Douglas fir	0.5	0.6	1.1	0.0
Lodgepole pine	3.5	2.8	6.3	0.0
Aspen	3.3	0.8	4.1	0.0
Bristle cone pine	0.0	0.0	0.0	0.0
Spruce/fir	13.0	6.1	19.1	7.3
Barren/rock	11.6	0.9	12.5	0.2
Other	0.2	0.1	0.3	0.0
Total	41.7	15.8	57.5	10.0

Source: USFS

Increasing the number of users to sub-alpine and alpine areas where TES plants occur will increase the opportunity for the collection of these species. Some of these species have charismatic life forms, such as pincushion plants, and are sought by collectors of specimens or seed for scientific use or landscaping. As a result, some of these TES plant species may become less common due to the effects of collection and harvest.

(b) Indirect Effects

In addition to the noxious weed effects common to all alternatives, new trail construction may result in the introduction of noxious weeds to previously uninfested areas.

Implementation of Alternative C will lead to increased use in previously undeveloped areas resulting in several indirect effects to TES plant species such as: trampling, dispersed camping, firewood gathering, fire rings, recreational stock pasturing and containment, gathering or collecting of plant materials, social trails (including unauthorized motorized use), erosion, sedimentation, and changes in hydrology and drainage. The resulting use would occur primarily in alpine and sub-alpine spruce/fir and barren/rock communities. The potential for noxious weed introduction and establishment in these community types is less than for other community types. However, all noxious weed design criteria would be implemented regardless of the community type.

(c) Cumulative Effects

Cumulative effects of Alternative C would be the same as those described in "Cumulative Effects Common to All Alternatives."

(5) Determination of Effects

A determination of "no effect" for Federal and some Forest Service sensitive plant species resulted from the plant biological evaluation because these plants were not known to occur in the Study Area; are associated with fens, none of which none are crossed; or were not located during the survey conducted by the Forest Service botanist. Populations of Arctic braya, a Forest Service sensitive species, were located along reaches of new trail construction and as a result, field directed trail reroutes were completed. No other Forest Service sensitive species were located during the field survey. However, individual plants not detected during the survey could still be impacted and indirect effects may occur in areas away from the trail corridor. A summary of the Biological Evaluation effects determination follows.

Federally Threatened or Endangered Species

There will be **no adverse effects** to *Eutrema penlandii* resulting from implementation of any of the Alternatives for the following reasons (corresponding Alternatives are listed in parentheses following the rationale statement, e.g., A, B, C):

- A review of the existing information shows no known occurrences of *Eutrema penlandii* in the analysis area (A, B, C).
- No new trail construction or reconstruction would take place (A).
- The species has no potential habitat within the proposed new construction or reconstruction (B).
- The species was not found in the trail corridor during intensive botanical surveys (C).
- *Eutrema penlandii* occupies a well-defined habitat niche (downslope from perennial snowfields that provide season-long moisture) that will not be impacted by trail construction. Perennial snowfields and season-long wet soils are poor places to put a trail (C).

Therefore, there will be **no effect** to *Eutrema penlandii*.

Forest Service Sensitive Species

Alternative A - No new trail construction or reconstruction would take place with Alternative A, therefore there would be **no effects** to any of the Forest Service sensitive plant species analyzed in this document including: *Armeria scabra* ssp. *sibirica, Botrychium campestre, Botrychium lineare, Botrychium multifidum* var. *coulteri, Braya glabella , Draba exunguiculata, Draba smithii, Eriophorum altaicum* ssp. *neogaeum, Eriophorum chamissonis, Eriophorum gracile, Gilia sedifolia, Ipomopsis globularis, Kobresia simpliciuscula, Machaeranthera coloradoensis, Mimulus gemmiparus, Neoparrya lithophila, Parnassia kotzebuei, Penstemon degeneri, Potentilla rupincola, Primula egaliksensis, Ptilagrostis porteri, Ranunculus karelinii, Rubus arcticus* var. *acaulis, Salix candida, Salix myrtillifolia, Salix serissima, Selaginella selaginoides* and *Viola selkirkii*.

Alternative B - There will be **no effects** to *Eriophorum altaicum* ssp. *neogeum, Eriophorum chamissonis,* or *Salix serissima* from implementation of Alternative B because these species are not known to occur in the analysis area, these species were not found in the trail corridor during field surveys, and species inhabit aquatic habitats, such as fens, which will not be impacted by implementation of Alternative B. For the remainder of the species analyzed in this document, including: *Armeria scabra* ssp. *sibirica, Botrychium campestre, Botrychium lineare, Botrychium multifidum* var. *coulteri, Braya glabella , Draba exunguiculata, Draba smithii, Eriophorum gracile, Gilia sedifolia, Ipomopsis globularis, Kobresia simpliciuscula, Machaeranthera coloradoensis, Mimulus gemmiparus, Neoparrya lithophila, Parnassia kotzebuei, Penstemon degeneri, Potentilla rupincola, Primula egaliksensis, Ptilagrostis porteri, Ranunculus karelinii, Rubus arcticus* var. *acaulis, Salix candida, Salix myrtillifolia, Selaginella selaginelloides* and *Viola selkirkii*, some individuals may be impacted. It is possible that although site-specific botanical surveys have been performed, some individuals of these species may have gone undetected. Furthermore, individuals outside of the trail corridor may be impacted indirectly. Implementation of Alternative B **may impact individuals**, but is not likely to cause a trend toward federal listing or loss of viability for any of the above-listed species.

Alternative C - There will be **no effects** to *Eriophorum altaicum* ssp. *neogaeum, Eriophorum chamissonis,* or *Salix serissima* from implementation of Alternative C because these species are not known to occur in the analysis area, these species were not found in the trail corridor during field surveys, and species inhabit aquatic habitats, such as fens, which will not be impacted by implementation of Alternative C. A large occurrence of *Braya glabella* was found in the trail corridor during botanical surveys. Some **individuals may be impacted** as a result of implementation of Alternative C. Although the trail has been rerouted to avoid the populations and limestone habitat, it is possible that individuals of any of these FS sensitive species were undetected during field surveys. Indirect effects may impact individuals outside of the surveyed trail corridor. For the remainder of the species analyzed in this document, including: *Armeria scabra* ssp. *sibirica, Botrychium campestre, Botrychium lineare, Botrychium multifidum* var. coulteri, *Draba exunguiculata, Draba smithii, Eriophorum gracile, Gilia sedifolia, Ipomopsis globularis, Kobresia simpliciuscula, Machaeranthera coloradoensis, Mimulus gemmiparus, Neoparrya lithophila, Parnassia kotzebuei, Penstemon degeneri, Potentilla rupincola, Primula egaliksensis, Ptilagrostis porteri, Ranunculus karelinii, Rubus arcticus* var. *acaulis, Salix candida, Salix myrtillifolia, Selaginella selaginoides* and *Viola selkirkii*, some individuals may be impacted. It is possible that although site-specific botanical surveys have been performed, some individuals of these species may have gone undetected. Furthermore, individuals outside of the trail corridor may be impacted indirectly. Implementation of Alternative C may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability for any of the above-listed species.

(6) Comparison of Alternatives

Alternative C would result in the most direct disturbance of vegetation, 21.1 acres, and its alignment will shift some trail use to areas of higher elevation where a predominance of barren/rock and alpine herbaceous forb and grasslands are found. Alternative B would result in

direct disturbance to 2.8 acres of habitat. Under Alternatives A, no additional vegetation will be lost to construction and reconstruction activities. Many of the effects of the Alternatives are similar, however the magnitude of impact varies based on the amount of new trail construction and reconstruction and usage levels.

D. Physical Resources

1. Hydrology and Soils

a. Affected Environment

Effects to hydrology and soils are closely related. For example, susceptibility to erosion from precipitation is usually related to soil texture. Similarly, precipitation events produce different runoff rates, depending on the soil texture. When erosion occurs and soil is lost, nearby waterways can experience an increase in sedimentation. The condition of the soil resource is often determined by the amount and type of vegetation present, which can also influence hydrologic characteristics. For the purpose of this analysis, soils and water (hydrology) will be combined because of the close relationship between these resources.

The two major river basin watersheds within the Study Area are the Arkansas River Basin and the Colorado/Gunnison River Basin, encompassing 37 sixth-level watersheds. East of the Continental Divide, water drains to the Arkansas River Basin, Colorado's largest river basin. West of the Continental Divide, water ultimately drains into the Lower Colorado River Basin. Major drainages that are near or are connected to existing trails in the Study Area include Halfmoon Creek, Herrington Creek, Lake Creek, Little Willis Gulch, Clear Creek, South Fork of Clear Creek, North Fork of Clear Creek, Illinois Creek, Prospector Gulch, Texas Creek, Middle Cottonwood Creek, Morgan's Gulch, Tunnel Gulch, Wildcat Gulch, North Fork of Chalk Creek, and Chalk Creek.

The Upper Arkansas River watershed covers approximately 5,000 square miles in central Colorado. The upper river extends 150 miles from the Continental Divide to its exit from the mountains onto the plains. The area includes all or part of four counties and six major communities. Environmental concerns relating to the Arkansas River include: (1) heavy metals contamination of surface waters and sediment from past mining practices; (2) rangeland erosion; (3) loss of riparian and wetland areas; and (4) hydrologic modification. (U.S. EPA 2005). Mine runoff has significantly degraded some high elevation tributaries to the upper Arkansas River. Downstream, agricultural practices have resulted in elevated levels of pollutants and suspended sediments. (Colorado State University 2004). The Colorado River/Gunnison Basin encompasses almost 20,000 square miles in western Colorado. Water quality is affected by various land uses within the basin, including mining operations, agriculture and municipal growth and development.

Average annual precipitation varies throughout the Study Area from a high of 21-25.5 inches along the Continental Divide to a low of 11-12 inches along the eastern shoulder of the Sawatch

Mountain Range. Most of this precipitation falls during the fall, winter, and spring seasons as snow, or during the monsoon thunderstorms of July and August. Rainfall during these monsoon events averages from a trace to several inches per event. The annual rainfall amount for the months of July and August averages 6-7 inches along the Continental Divide and 3-4 inches along the eastern portion of the Study Area. Snowfall accounts for most of the remaining annual precipitation. Correspondingly, stream runoff peaks during spring snowmelt, and during monsoon thunderstorm activity.

Within the Study Area, much of the mining has ceased and few active mines are operating, which minimizes the opportunity for new sources of contamination. Little cattle grazing occurs within the vicinity of the current and proposed trail alignments, as elevations and terrain make cattle operations difficult. A grazing allotment is present in the Cottonwood Pass area; cattle grazing was occurring in the area during the summer of 2005. Due to the higher elevations in much of the Study Area and the predominance of National Forest land, loss of riparian and wetland areas due to urban development and hydrologic modifications from water development projects is not common (Colorado Department Public Health and Environment (CDPHE) 2002).

Perennial and intermittent streams form these watersheds. A riparian habitat zone is associated with most of these streams. One key measure of this habitat is the Water Influence Zone (WIZ), which includes the land next to water bodies where vegetation plays a major role in sustaining the long-term integrity of aquatic systems. The WIZ includes the geomorphic floodplain, riparian ecosystem, and inner gorge. The WIZ is defined by a minimum horizontal width (from the top of each bank) is 100 feet or the mean height of mature dominant late-seral vegetation, whichever is greatest (36 CFR 219.27e). The minimum horizontal width of 100 feet was used for this analysis.

The Colorado Department of Public Health and Environment (CDPHE 2005) has designated beneficial uses for streams in the Study Area, including: Coldwater Class 1 and Domestic Water supply, Aquatic Life Cold 1, Recreation 1a, Recreation 2, Aquatic Life Cold 2, Water Supply, and Agriculture. These designations require that streams and water bodies be: (1) capable of sustaining a wide range of coldwater biota including sensitive species, (2) suitable for recreation on or about water bodies where ingestion of small quantities of water is probable, (3) suitable for drinking following standard treatment procedures, and (4) suitable for irrigation and livestock consumption. Minimum state water quality standards have been established in accordance with these designated beneficial uses.

All streams, lakes and reservoirs within the Mount Massive and Collegiate Peaks Wilderness Areas are currently considered under the designation of outstanding water. They are use classified as: Cold Water Aquatic Life 1, Recreation 1, Water Supply, and Agriculture. The waters, because of their pristine nature and location in wilderness areas, are not candidates for new permitted sources of pollution (CDPHE 2002).

The federal Clean Water Act requires states to compile a Regulation #93 Section 303(d) list of streams that are impaired (do not fully or partially support their beneficial uses). Federal law also requires that a Total Maximum Daily Load (TMDL) plan to improve water quality be approved prior to removing a stream from the 303(d) list (CDPHE 2004a). Most streams within

the Arkansas and Gunnison River Basin watersheds that are presently on the 2004 State of Colorado's 303(d) list are found at lower elevations and outside of the Study Area. Streams on the 303(d) list within the Study Area are: Halfmoon Creek for zinc, and Sayers Gulch and the South Fork of Lake Creek to the confluence with Lake Creek for copper. Proposed trail realignments for this project do not cross nor are adjacent to either of these stream segments. There are no streams west of the Continental Divide (Gunnison River Basin) within the Study Area that are on the 303(d) list. All streams within the Study Area are tributaries to stream segments on the 303(d) list, including the Arkansas and Gunnison rivers. No TMDL reports on streams in the Study Area have been prepared or submitted to the EPA.

The Monitoring and Evaluation List (M&E) (CDPHE 2004b), is intended to identify stream segments where there is reason to suspect water quality problems but uncertainty exists regarding one or more factors. Several streams within the Study Area, all tributaries to the Arkansas River, are on the State of Colorado's M&E 2004 List. These streams and stream segments include: the North Fork of Lake Creek between the Twin Lakes Reservoir and Canal Company Tunnel No. 1 and the confluence with the South Fork Lake Creek; Lake Creek below the South Fork of Lake Creek; Chalk Creek (all reaches) for sediment; Sayers Gulch and the South Fork of Lake Creek to the confluence with Lake Creek for aluminum lead and iron; and Chalk Creek below the Mary Murphy Mine in the Romley area for cadmium and zinc.

Human-made trails such as the CDT and Colorado Trail, as well as game trails, currently cross numerous streams and rivers in the Study Area. If not well designed or if in poor condition, trails can be both a source and a conduit for sediment. Currently, approximately 23.5 miles of the existing CDT between Halfmoon Creek and Monarch Pass do not meet Forest Service trail standards; approximately 10 miles of the existing Colorado Trail between Twin Lakes and South Fooses Pass do not meet Forest Service trail standards. These mileages do not reflect any evaluation of the condition of roads presently utilized by these two trails. These segments of trail in poor condition are likely to be impacting soil and water resources through erosion, slumping, and sedimentation.

Sediment is delivered directly to stream channels through connected disturbed areas. Connected disturbed areas are defined as "high runoff areas, like roads and other disturbed soils that discharge surface runoff into a stream or lake." Connected disturbed areas are the main source of damage in all regions (FSH 2509.25-99-2) and occur primarily at trail-stream crossings, but may also occur where there is an insufficient buffer between the trail and the stream network such that water and sediment diverted off the trail are delivered directly to the stream channel (U.S. Forest Service 1999a). In many cases, the connected disturbed area can be significantly reduced by hardening trail-stream crossings, and adding drainage structures that divert water and sediment running on the trail into a buffer strip prior to reaching the stream channel.

Some trails in the Study Area currently lie on or near the Continental Divide ridgetop where the water and riparian resources are limited to minor headwater streams and isolated riparian and wetland areas. Many of these high alpine areas are devoid of soil due to harsh climate, steep slopes and a lack of other soil-forming factors, such as vegetation. Other existing trail segments are located at lower elevations where soil formation has been active and the resulting soils are

deep. Deeper soils are typically located in areas with gentler slopes, which reduce the potential for erosion by water movement.

Soils in higher elevation areas are derived from Precambrian metamorphic rocks of gneiss and schist or from Tertiary intrusive igneous rocks primarily composed of granite and quartz monzonite (Taylor 1999). Soils in the Study Area, at lower elevations along the eastern flank of the Sawatch Range, are derived from glacial and stream deposits of silts, sands, and gravels deposited during the ice age. Glacial deposits contain boulder till and gravel in moraines and outwash. In general, the soil on glacial deposits in the mountains (3%-35% slopes) is gravelly, sandy loam (United Stated Department of Agriculture (USDA) 1975).

Three groups of alpine soils have been described by Retzer (1956). These include Alpine Turf, Alpine Meadow, and Alpine Bog. Alpine Turf is typically found on higher convex, well-drained slopes, has well-defined horizons, and is internally and externally well drained. Alpine Meadow soils are found on lower, concave slopes where surface runoff is retarded and seepage from higher areas is collected during the summer. Alpine Bog soils are found in places where water pools for long periods of time or where soil is kept wet. Soils in sub-alpine areas in the Study Area can be formed from igneous or metamorphic rock. Soils in the Study Area are highly variable, with textures ranging from coarse to fine. However, they are generally young. Soils in areas that were not glaciated can be older, deeper, and more developed. Areas of lodgepole pine forest and woodland have variable soil texture and moisture from stand to stand. Aspen can be found in a variety of soils but thrives in soils that are deeper, less rocky, and that have a more mesic soil moisture regime.

The erosion hazard risks of soils in the Study Area are highly variable due to soil type, sideslopes, vegetative cover, and natural drainage characteristics. An analysis of these properties was completed through GIS exercises, careful review of the Soil and Ecological Land Unit Survey for the Northern San Isabel and Western Pike National Forests, Colorado (U.S. Forest Service 1995), and field observations. The available GIS soils data and the Soil and Ecological Land Survey map units are both based on Order 3 Mapping. The USFS Soil Management Handbook (WO Admendment 2509.18) states, “Order 3 mapping provides only enough detail for Forest level planning. Interpretations can be used for project planning with field verification.” The coarse nature of this data in comparison to the narrow corridor width of the trail makes for difficult determinations of the suitability of trail construction within each soil type and characteristic. The coarse nature of these mapping units also makes it difficult to determine the extent to which the trail corridor traverses areas of highly erosive soils. Site-specific field observations to identify areas of potentially high and extreme hazard to soil and hydrology resources were completed during trail layout activities. Every effort was made to locate trail in areas with stable soils. Analysis and field observations indicate that the majority of unstable soils and steep sideslopes in the Study Area are located in the upper reaches of the sixth-level watersheds between Cottonwood Pass and Tincup Pass.

It is important to note that due to the nature of these relatively young landscapes, they are inherently unstable. Slopes are steep, runoff amounts can be highly concentrated, and annual cycles of freezing and thawing produce conditions where mass wasting and rockslide areas are common and natural. It is not uncommon to see evidence of rockslides and areas moved by

water, as well as examples of large rock glaciers in the Study Area. These areas are also subject to high intensity-short duration rain events that can produce gully, rill, and sheet erosion in areas that have not had any disturbance. It is a dynamic landscape that is subject to the forces of gravity and nature.

b. Environmental Consequences

(1) Effects Common to All Alternatives

(a) Direct Effects

Thirty-seven sixth-level watersheds are present in the Study Area; 28 of which are crossed by one or more of the Alternatives. Table 2-2 (Chapter 2) presents the miles of trail according to trail type (existing, new construction, or reconstruction) for each of the Alternatives. All 28 sixth-level watersheds crossed by one or more of the Alternatives currently have trails located within their boundaries. New construction related primarily to Alternative C will not impact any watersheds additional to those watersheds impacted by Alternatives A and B.

The presence of existing trails and creation of new trails can affect sedimentation if not properly designed. The proper placement and alignment of these trails is critical to protecting the soil resource. Many of the existing trails, and all new trails in the Study Area are/would be designed to reduce impacts to soils, which are primarily associated with erosion by water. Existing trail segments, regardless of the alternative, would not directly impact 303(d) or M&E streams. Trails that are constructed on steep grades have greater potential to erode soils and contribute sediment to aquatic systems. Soil compaction can compound these effects by inhibiting water infiltration causing greater runoff and higher peak flows during runoff events. User type and frequency also have an effect on the amount of soil erosion that will occur. Heavily used motorized trails will produce more erosion and have a greater potential for sedimentation of waterways than lightly used foot trails.

Sheet erosion, rill erosion, and gully erosion are processes that are more pronounced in a disturbed area. Sheet erosion is caused by surface flows of water over a broad surface, generally lowering the soil level without cutting into the soil profile. Rill erosion results from the concentration of surface water (sheet erosion) into deeper, faster-flowing channels. As the flow becomes deeper the velocity increases, detaching soil particles and scouring channels up to 30cm deep. Gully erosion is responsible for removing large amounts of soil, destroying roads and bridges, and reducing water quality by drastically increasing the sediment load in streams. Gullies are the response to excessive water in the local environment, often caused by the removal of perennial vegetation. Each erosion process can contribute to increased sediment delivery to streams as well as impacts to soil productivity, hydrologic resources and vegetation. Regardless of the Alternative, trails can impact soil resources if, through continuous or increased use, they are widened or deepened. Trails can impact soil resources by accumulating and channeling runoff, which can contribute to increased erosion because of concentrated flows.

Impacts to soils are often closely associated with impacts to hydrologic and vegetation functions. Recreational activities can result in soil compaction. Non-motorized recreational traffic disturbs and compacts soils, reducing pore space, which affects water infiltration, holding capacity, and the rooting depth of vegetation. Soils that have low organic matter content, that are finer in texture, have less rock fragments, or are wet are more susceptible to compaction. All soils, regardless of their characteristics, are susceptible to compaction in areas where multiple passes of foot or pack animal trailing take place. Soils in the Study Area are highly variable due to large differences in elevation, slope, and parent material. Soils in the low gradient bottomland areas, especially along the larger drainages, more often have finer soil textures and are more susceptible to compaction and erosion. Soil compaction is more likely to occur during wet periods of the year. If the disturbance is not continuous, natural recovery is likely to occur, especially in areas with productive soils.

Due to the general nature of the topography in the Study Area, steep slopes in a high elevation setting, it is inevitable that trails will need to be sighted to cross or ascend relatively steep slopes. Table 3-24 summarizes the miles of trail on sideslope gradients greater than 50% to slopes less than or equal to 75%, and distance across slopes with greater than 75% slopes. These sideslope parameters were used because typically trail construction on slopes between 50 and 75% require stable soil properties for long-term sustainability. Construction on slopes greater than 75% typically requires a heavy concentration of structures to ensure long-term stability. Alternatives A and B are in areas where trails are established and maintenance would address erosion areas present on steeper reaches of these trails. Without appropriate design criteria, trails located in areas of steep sideslopes, such as in Alternative C, could potentially result in increased erosion.

Table 3-24. Miles of Trail on Steep Sideslopes (>50%) for Each Alternative.

	>50%-75%	>75%
Alternative A	**4.70**	**0.15**
Alternative B	**4.63**	**0.0**
Alternative C	**8.70**	**0.48**

Source: USFS and EDAW GIS.

In many instances, impacts to vegetation also result in impacts to hydrologic functions and the soils of an area, since these resources are all closely related. Trail use can disturb soils and vegetation, which can increase erosion and sediment deposits into nearby waterways. Table 3-25 presents the net area (acres) of disturbance resulting from new construction by Alternative for the entire Study Area. The net acreage represents the difference between new construction acres and trail closure acres. These impacts are more damaging if they occur in riparian areas, especially along the banks of waterways. All alternatives have the potential to cause these types of impacts through off-trail travel or other unauthorized activities. These direct effects can also include impacts to riparian areas, wetlands, and floodplains at stream crossings. If the travel way is located through a riparian area or WIZ, direct effects can include increasing soil compaction, altering stream morphology, mobilizing substrate materials, and altering or removing stabilizing riparian vegetation. If these effects become widespread, they can cause higher peak flows and increase potential flooding downstream. Human activities in a watershed, such as recreation, can also contribute to increases in bacterial concentrations in waterways (e.g., fecal coliform).

Table 3-25. Acres of Disturbance Resulting from New Construction by Alternative.

Disturbance Type	Alternative A	Alternative B	Alternative C
New Construction	0.0	1.6	11.79

Source: EDAW GIS & USFS *Trails Management Handbook* "More Difficult" Pack and Saddle Trail Standards. Calculations based on an average trailway width of three feet (see Figure 2-5).

The greatest potential for impacts to soil and hydrologic resources is at trail crossings of waterways and at locations where trails are within the WIZ. Table 3-26 displays the miles of trail (by Alternative) in the WIZ.

Table 3-26. Miles of Trail Within the Water Influence Zone (WIZ) by Alternative.

	Alternative A		Alternative B		Alternative C	
	Intermittent	Perennial	Intermittent	Perennial	Intermittent	Perennial
Stream Type	2.6	6.3	5.2	4.3	2.3	3.4
Total	**8.9**		**9.5**		**5.7**	

Source: EDAW GIS

Tables 3-27a and 3-27b summarize the number and types of crossings of perennial and intermittent streams for each of the three alternatives.

Table 3-27a. Number of Crossings by Construction Type, San Isabel National Forest.

	Alt A	Alt B			Alt C		
	Existing	Existing	New Construction	Reconstruction	Existing	New Construction	Reconstruction
Perennial	28	40	3	2	13	8	5
Intermittent	24	45	1	0	19	17	0
Forest Total	52	85	4	2	32	25	5

Source: EDAW GIS

Table 3-27b. Number of Crossings by Construction Type, Gunnison National Forest.

	Alt A	Alt B			Alt C		
	Existing	Existing	New Construction	Reconstruction	Existing	New Construction	Reconstruction
Perennial	19	n/a	n/a	n/a	1	2	4
Intermittent	10	n/a	n/a	n/a	1	1	0
Forest Total	29	n/a	n/a	n/a	2	3	4

Source: EDAW GIS

Trail crossings of perennial and intermittent streams have a direct impact to the integrity of the hydrologic and soil resources associated with waterways, wetlands and riparian areas. The degree of this impact is directly related to the length of trail within the WIZ, the overall number of crossings, and by the percentage of crossings that are protected by trail structures such as bridges or armored fords. Table 3-28 details the number of stream crossing types (large structure, small armored structure, or no structure) by alternative for perennial and intermittent streams. Table 3-29 lists the new major structures that would be placed for each action alternative by type of structure and specific stream name. Each alternative would have some degree of impact to sensitive soil and hydrologic resources as all alternatives traverse across WIZ areas, and cross a number of perennial and intermittent streams. The degree of potential impact would vary by alternative and by type of impact. Alternative C would result in an additional 37

trail crossings of perennial and intermittent stream than what presently exists within the watersheds of interest. Alternative B would result in an additional 6 trail crossings and Alternative A would result in no additional crossings. The direct impacts would also vary by alternative as a result of the quality of these stream crossings. Alternative A would contain 42 unarmored crossings, Alternative B 37 unarmored crossings, and Alternative C no unarmored crossings. As detailed in Table 3-26 above, the number of miles of trail within the WIZ for each alternative would also vary. Alternative B would traverse the largest amount of WIZ (9.5 miles), Alternative A would traverse somewhat less of the WIZ (8.9 miles), and Alternative C would traverse almost half of the WIZ as the other two alternatives (5.7 miles).

Table 3-28. Number of Stream Crossing Types for Each Alternative.

Stream Crossing Type	Alternative A	Alternative B	Alternative C
Perennial stream with bridge or rock ford crossing	11	22	18
Perennial stream with armored trail crossing	8	11	18
Perennial stream without armor or crossing structure	27	9	0
Intermittent stream with bridge or rock ford crossing	1	0	2
Intermittent stream with armored trail crossing	18	21	33
Intermittent stream without armor or crossing structure	15	28	0
Total	**80**	**91**	**71**

Source: EDAW GIS

Table 3-29. New Stream Crossing Structures for Action Alternatives.

Crossing Type	Approx. Length of Crossing (feet)	Applicable Alternatives	Stream
Puncheon bridge	18	C	North Fork Clear Creek
Puncheon bridge	18	C	Unnamed (Silver Basin Creek)
Stringer bridge (Lake Creek bridge option)	100	B, C	Lake Creek
Puncheon bridge	16	B, C	Bartlett Gulch East
Puncheon bridge	8	B, C	Bartlett Gulch West
Stringer bridge (Twin Lakes bridge option)	300	B, C	Twin Lakes
Rock ford	6	C	Illinois Creek
Rock ford	6	C	Prospector Gulch
Puncheon bridge	14	C	North Texas Creek
Puncheon bridge	12	C	Unnamed (South Mt. Aetna Creek)
Puncheon bridge	12	C	Unnamed (Hoffman Park Creek)
Puncheon bridge	8	C	Morgan's Gulch
Puncheon bridge	8	C	Unnamed (West Fork Mineral Creek)
Rock ford	12	C	Unnamed (South Harrison Flat Creek)
Rock ford	16	C	Unnamed (North Harrison Flat Creek)

Projects that have a potential effect on large areas of the landscape (such as a long distance trail) may directly effect the quality of watersheds if the number of stream crossings, amount of soil and vegetative disturbance within the WIZ, and characteristics of areas with a high potential for soil erosion are concentrated in only a few watersheds. Evaluating these factors with respect to sixth-level watershed is thereby important. Tables C-1, C-2, and C-3 in Appendix E break out the relative amounts of impacts associated with these factors by sixth-level watershed. Close

review of these tables reveals that these factors are primarily dispersed over the range of sixth-level watersheds through which each alternative traverses. The Chalk Creek and Lake Creek Watersheds are an exception with regard to the number of stream crossings and the amount of soil and vegetation disturbance. This is to be expected as these watersheds are comparatively quite large and a large percentage of the route alignments of each alternative are located within these watersheds. Analysis of the various characteristics that contribute to a high potential for soil erosion hazard reveals that the segment of trail alignment between Tincup Pass and Cottonwood Pass as part of Alternative C does contain a moderate concentration of these factors of concern.

As described in Chapter 2, *The Watershed Conservation Practices Handbook* (FSH 2509.25) presents standards to protect soil, aquatic and riparian systems in the National Forest System (U.S. Forest Service 1999). The handbook also has specific design criteria to meet the standards using current knowledge and technology. The five areas that are covered include hydrologic function, riparian areas, sediment control, soil productivity, and water purity. All alternatives would employ these standards and design criteria to protect the watersheds.

(b) Indirect Effects

Indirect effects can result from secondary effects due to the creation of informal trails, as well as the effects of sedimentation in lower elevations of the watershed. The creation of informal social trails could directly affect soil resources by increasing the overall potential for soil erosion and compaction. Areas where significant disturbance occurs will require restoration. In areas where unplanned obstacles exist (e.g., late season snowfields, fallen trees, etc.), trail users often create temporary social trails to avoid obstacles. Occasional illegal, off-trail use also causes impacts to soils.

Sediment generated from trails can be deposited downstream, changing the channel morphology and watershed response to flood waters as well as contributing to sedimentation and turbidity of water resources in lower elevations of the watershed. Sediment deposition can cause channels to become wider and more shallow, resulting in reduced habitat for aquatic life and often providing conditions that promote increases in water temperature. Indirect effects to soil resources include increased potential for noxious weed establishment in areas where soil has been disturbed.

(c) Cumulative Effects

Impacts to soil and water resources in the Study Area would occur from recreational use as well as from other uses, including grazing, mining, wildland fire, timber harvesting, and rural development. Reasonably foreseeable projects that could contribute to the cumulative effects to soil and hydrologic resources include electric transmission line right-of-way clearing using mechanical vegetation thinning equipment; the Salida Hydro Project, which will utilize penstock, dams, and associated facilities; summer construction projects at Monarch ski area; and fuel treatments as described in the Westside Environmental Assessment, which would utilize a variety of methods to treat fuel loads in a dead section of the Forest.

As the Colorado Front Range population continues to grow, recreational users will also continue to put increasing pressures on accessible areas available for their activities. Recreational uses in

the Study Area are anticipated to increase due to proximity to the Denver metropolitan area and major travel thoroughfares (I-70 and Highway 50). No other major trail systems in the Study Area are planned, but smaller trails in the area may be constructed in the future. More use could also increase the potential for informal social trails, which negatively affect watershed soil and water condition if not properly managed. Ongoing planning initiatives will serve to coordinate recreation management and services on the PSICC and GMUG Forests.

Cumulatively, these uses can change stream channels, sediment loads, bank stability, and affect floodplain functionality. Changes in water quality at higher elevations can affect the overall response in the watersheds and on receiving waters downstream, such as 303(d) and M&E stream segments. Projects occurring in the Study Area and on adjacent lands could include treatment for insect infestation and timber management activities. Watershed condition should improve as these restoration activities are implemented. Wildfire and storms also have an effect on water quality. These events greatly influence the amount of sediment yield, especially in combination with each other.

(2) Alternative A - No Action

(a) Direct Effects

Under this alternative, there would be no change from the existing condition. Alternative A includes no new trail construction; therefore, little or no additional ground disturbance would occur. However, there would not be an opportunity to improve drainage in areas where surface erosion is occurring, and no opportunity to reroute the trail onto better locations that could further protect existing hydrologic resources. Currently, a portion of the trail that is shared with motorized and mountain bike single-track users on the Timberline Trail in Prospector Gulch is a good example of trail impacts to water and soil resources within the WIZ. The No Action alternative would likely result in a continuation and possible acceleration of the current rate of erosion associated with trail use, and a similar or higher level of sediment entering into waterways within the Study Area. As previously described, 9 miles of trail would remain within the WIZ causing ongoing, direct effects to streams and water quality. Distance of trails on slopes of 50-75% is estimated to be 4.70 miles and 0.15 miles on slopes greater than 75%.

Direct effects of poorly designed trails include increased runoff due to soil compaction, increased water concentration and velocity, increased erosion and sediment production from trail surfaces, subsequent drainage, increased possibility of pollutants, and possible altering of surface and subsurface flows.

(b) Indirect Effects

Indirect effects of Alternative A related to the creation of informal trails and sedimentation would be the same as those described above under “Indirect Effects Common to All Alternatives.”

(c) Cumulative Effects

Cumulative effects of Alternative A would be the same as "Cumulative Effects Common to All Alternatives."

(3) Alternative B

(a) Direct Effects

Under this alternative, there would be little change from the existing condition, with less than 5 miles of new trail being constructed, resulting in approximately 1.6 acres of new ground disturbance. A new bridge crossing of Lake Creek would be associated with the new trail construction, which would directly affect a small amount of riparian vegetation associated with the edge of the creek. If the option to implement the Twin Lakes bridge is selected, an additional 0.1 acre of soil will be disturbed for the trail option. Due to the size of the proposed Twin Lakes bridge and the potential need for towers adjacent or within Twin Lakes (see Appendix C), there will be the potential for short-term increases in sedimentation. Small areas needed for construction staging may also be disturbed short term, but it is anticipated that existing parking areas will be used for these activities. As discussed in Chapter 2, the BOR manages water operations in Twin Lakes. No changes to water operations are anticipated with the implementation of this option.

Direct effects of poorly designed trails include increased runoff due to soil compaction, increased water concentration and velocity, increased erosion and sediment production from trail surfaces, subsequent drainage, increased possibility of pollutants, and possible altering of surface and subsurface flows.

Negative effects to the watershed in terms of erosion and water quality would likely be lessened since new trail segments would be sited to avoid directly paralleling streams north of Twin Lakes. Approximately 9.5 miles of trail would be located in the WIZ, primarily associated with perpendicular stream crossings. Of this, 0.3 miles of trail in the WIZ would be the result of new trail construction or reconstruction. New trail segments would be designed to accommodate and shed water from precipitation events in a manner that would minimize soil erosion and sedimentation to waterways. Bridges, rock fords and other hardening methods would be used to cross streams north of Twin Lakes, reducing the potential for sedimentation. The implementation of BMPs listed in Chapter 2 would reduce the potential of negative effects. There would be no direct impacts to 303(d) or M&E stream segments as a result of new construction or reconstruction.

Overall increased use of the trail, as a result of concentrating CDT visitor use and Colorado Trail use, would likely result in a minor increase in sedimentation into nearby water bodies. Because much of the trail is located in areas of glacial and stream deposits, the soil is more consistently comprised of finer textures than higher elevation soils where areas of barren rock surface trail segments exist. The Colorado Trail also has the greatest amount of trail within the WIZ. Slopes, however, are less severe along much of this Alternative, which would slow erosion and sedimentation rates.

(b) Indirect Effects

Indirect effects of Alternative B related to the creation of informal trails and sedimentation would be the same as those described above under "Indirect Effects Common to All Alternatives."

(c) Cumulative Effects

Cumulative effects of Alternative B would be the same as those described above under "Cumulative Effects Common to All Alternatives."

(4) Alternative C – Proposed Action

(a) Direct Effects

The proposed action would result in 42.3 miles of new trail construction and 15.8 miles of trail reconstruction. As described in Table 3-25, an additional 11.79 acres (15 acres of total disturbance, 11.79 acres of net disturbance because of naturalization of 10 miles of trail closures) of soil would be disturbed for the new trail. A portion of new trail will be located within the Collegiate Peaks Wilderness, which has a number of high quality streams. If the option to implement the Twin Lakes bridge were selected, additional impacts associated with the placement of this bridge would be the same as described in Alternative B.

Construction activities for new trails in Alternative C would cause a loss of approximately 11.79 acres (based on a 3 foot wide trial corridor) of soil resources and create a potential for increased sedimentation of waterways. Impacts to the water and riparian resources would be reduced due to new reaches of trail being located on or near ridgetops and in upper headwater areas. In these locations, soils are often non-existent and the trail location is above any perennial or intermittent streams. The narrow tread width of 18 to 24 inches would result in minimal ground disturbance and the potential for affecting the hydrology or increasing connected disturbed areas in the headwaters. In many cases, trails constructed above timberline will be constructed with as little excavation or soil disturbance as possible. Construction of the trail on barren rock surfaces would have relatively little impact to soil resources or hydrology in these specific locales.

Negative effects to the watershed in terms of erosion and water quality would likely be minor since the new trail was sited to avoid directly paralleling streams. Approximately 5.7 miles of trail would be located in the WIZ, primarily associated with perpendicular stream crossings. Of this, 2.3 miles of trail in the WIZ would be the result of new trail construction or reconstruction. New trail segments would be designed to be able to accommodate and shed water from precipitation events in a manner that will minimize soil erosion and sedimentation to waterways. Bridges, rock fords and other hardening methods will be used to cross streams, reducing the potential for sedimentation. The implementation of BMPs listed in Chapter 2 would reduce the potential of negative effects. There would be no direct impacts to 303(d) or M&E stream segments as a result of new construction or reconstruction. These measures are necessary to ensure that are no new pollutants be introduced into the outstanding waters associated with the Collegiate Peaks Wilderness.

It should be noted that most stream crossings associated with new trail construction in Alternative C are perpendicular crossings that minimize the distance through the channel and associated riparian edges. Fourteen new crossings of large streams (five feet or greater in width) are anticipated. These larger streams will be crossed using four rock fords and eleven bridges designed to minimize the potential for erosion. Structures would be necessary for crossing because these streams experience high flows during spring runoff which could result in difficult and unsafe passage by foot and pack and saddle stock users. Additionally, the nature of the streambank (steep and/or unstable) may warrant structures to protect the integrity the banks. All other perennial streams are approximately one to five feet in width and would be armored utilizing various structures as described in the design criteria (Chapter 2, Section E. 2-d). Intermittent streams will be armored with appropriate structures**.**

(b) Indirect Effects

Because this Alternative traverses the highly erodible areas between Cottonwood Pass and Tincup Pass the potential for sheet erosion, rilling, gullying, and mass wasting exists. The potential for erosive impacts would be minimized through trail location, design, and management of trail user types. For example, in areas where GIS information and field observations have identified erosion hazard characteristics, these areas have been avoided where possible; appropriate trail structures (e.g., uphill and downhill retaining walls, checksteps, and causeways) would be installed; and mountain bike use would be prohibited in order to ensure a long-term sustainable trail facility.

(c) Cumulative Effects

Cumulative effects of Alternative C would be the same as those described above under "Cumulative Effects Common to All Alternatives."

(5) Comparison of Alternatives

Alternative C results in over 11 acres of new soil disturbance compared with relatively minor soil disturbances associated with Alternatives A and B (Table 3-25). Alternative C also results in new stream crossings. Alternative C's small trail tread width, design and location outside of the WIZ will minimize negative effects. Alternatives A and B also include large portions of the existing trail system in the WIZ. Because most of these existing trail segments were not originally engineered or located within present FS Standards and Guidelines as outlined in the *Trail Management Handbook* (FSH 2309.18) existing sedimentation into nearby water bodies would likely continue and may increase with increases in visitation (U.S. Forest Service 1991b). In Alternative B, this would be compounded by the location of trail in areas of glacial and stream deposits, where soils are consistently comprised of finer textures that can more easily erode.

In sum, Alternative C has the greatest potential for a large degree of soil and hydrologic resources. Alternative A and B would most likely have a larger long-term impact to these resources due to a concentration of trail mileage in sensitive areas and because of considerable trail lengths which are poorly located and designed.

2. Wetlands and Riparian Areas

a. Affected Environment

Wetlands and riparian areas are important features of the landscape. Riparian areas are often vegetated with a great diversity of grass, forb, shrub, and tree cover. These areas are important to wildlife because they provide habitat and cover, travel corridors, and multiple food sources. This environment often coincides with the Water Influence Zone (WIZ), an area of 100 feet to either side of the edge of the stream channel (see the Hydrology section). Wetlands and riparian areas are often heavily impacted by human activities, including management of livestock use and recreational uses such as fishing. Impacts to wetland and riparian resources are closely related to soil and hydrologic impacts.

Major drainages with wetlands and riparian areas that are near or connected to existing trails in the Study Area include: Halfmoon Creek, Herrington Creek, Lake Creek, Little Willis Gulch, Clear Creek, South Fork of Clear Creek, North Fork of Clear Creek, Illinois Creek, Prospector Gulch, Texas Creek, Middle Cottonwood Creek, Morgan's Gulch, Tunnel Gulch, Wildcat Gulch, North Fork of Chalk Creek, and Chalk Creek. Additional information for these areas is described in the Affected Environment - Hydrology section of this document.

Wetlands and riparian areas are associated with a variety of features including streams, creeks, ponds and lakes, and broad areas supported by seeps. Each of these can provide a different set of habitat characteristics that support a variety of plant and animal communities. Wetland and riparian areas associated with high gradient streams and creeks, which are typically found at higher elevations, are often narrow due to their incised nature. Lower gradient larger streams can support wider wetland and riparian areas and commonly have broad off channel areas interspersed with small open water oxbows, wet meadow and marsh wetland types as well as significant cover provided by shrubby willow carrs. Fens, a wetland type which can be found in the Study Area, are typically supported by groundwater, have a deep organic horizon, and can often support plant species that are not common. Ponds and lakes in the Study Area are typically alpine in location, shallow, and support a narrow band of wetland species around a rocky margin. Sedges (*Carex* spp.), rushes (*Juncus* spp.), and willows (*Salix* spp.) are common in wetland areas.

Animals with the potential to occur in wetland areas include the boreal toad, leopard frog, greenback cutthroat trout, and beaver as well as other animals that use these areas for watering. Beavers are present or have been present in the past in numerous drainage basins in the Study Area. Beavers promote the establishment of wetland species through flooding and inundation creating larger areas of sedges and willows than might normally be present without their influence.

Wetlands and riparian areas support vegetation typically adapted to wetter soil conditions. This vegetation has been classified by the USFWS (1996) as species that are obligate wetland, facultative wetland, or upland in character. Wetland and riparian species with the potential to occur in the Study Area above 8,000 feet in elevation are listed in Table 3-30.

Table 3-30. Forest Service Sensitive Plant Species with Potential to Occur in Wetlands in the Study Area.

Scientific Name	Common Name	USFWS Wetland Indicator Status*
Armeria maritima ssp. *Sibirica**	Siberian sea thrift	FAC-FACU
*Astragalus leptaleus**	Park milkvetch	OBL
Botrychium multifidium spp. *Coulteri**	leathery grape fern	FAC-FACU
*Braya glabella**	arctic braya	FACW
*Carex diandra**	lesser panicled sedge	OBL
*Carex livida**	livid sedge	OBL
*Cypripedium parviflorum**	yellow lady's slipper	FAC-FACW
*Drosera rotundifolia**	roundleaf sundew	OBL
*Epipactis gigantean**	giant helleborine	OBL
*Eriophorum chamissonis**	Chamisso's cottongrass, russet cottongrass	OBL
*Eriophorum gracile**	slender cottongrass	OBL
*Kobresia simpliciuscula**	simple bog sedge	FAC-FACW
*Malaxis brachypoda**	adder's mouth orchid	FACW
*Parnassia kotzebuei**	grass of Parnassus	OBL
*Primula egaliksensis**	Greenland primrose	OBL
Rubus arcticus var. *acaulis**	northern blackberry	OBL
*Salix candida**	hoary willow	OBL
*Salix myrtillifolia**	low blueberry willow	FACW-OBL
*Salix serissima**	autumn willow	OBL
*Selaginella selaginoides**	club spikemoss	FAC-FACW
*Utricularia minor**	lesser bladderwort	OBL

Wetland Indicator Status Key

*Code	Wetland Type	Comment
OBL	Obligate Wetland	Occurs almost always (estimated probability 99%) under natural conditions in wetlands.
FACW	Facultative Wetland	Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
FAC	Facultative	Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
FACU	Facultative Upland	Usually occurs in non-wetlands (estimated probability 67%-99%), but occasionally found on wetlands (estimated probability 1%-33%).

b. Environmental Consequences

The evaluation of effects can be described as impacts to: wetlands (based on soils, vegetation, and hydrology); riparian areas (based on a functional area in the landscape); or, the WIZ (an arbitrary buffer around a surface water feature).

(1) Effects Common to All Alternatives

Trails are typically constructed to avoid wetland areas as they are difficult to construct in and are often more costly than alternate routes. When trails must pass through wetlands, alignments are typically perpendicular to wetland features and located in an area where wetland impacts are minimized. It is important to note that the general nature of most hikers is to avoid traveling through wetland areas so social trails in these areas are not common.

(a) Direct Effects

A variety of riparian communities are found in the Study Area and it is inevitable that trails will cross some of these communities. As seen in Table 3-31, riparian areas are crossed in all three Alternatives which would result in a loss of a small amount of riparian habitat for the trail tread way. Camping and access to drinking water in the proximity of riparian areas is common and can lead to trampling of riparian and wetland vegetation.

Table 3-31. Trail miles through riparian vegetation communities.

Dominant Riparian Vegetation Type*	Alternative A	Alternative B	Alternative C
Alpine shrub	2.33	0.06	2.12
Aspen	0.43	2.46	0.26
Evergreen	1.41	3.61	1.74
Mesic meadow	0.22	0.37	0.34
Riparian shrub	1.93	1.45	1.21
Other	1.32	0.28	0.93
Total	**7.63**	**8.23**	**6.60**

*Note: This table only reflects riparian vegetation communities on the San Isabel National Forest.

(b) Indirect Effects

Small animals that utilize these areas, such as amphibian species, would be especially susceptible to trampling by humans or pack animals. Wetland areas can receive pollutants (e.g., wastewater from dishwashing, soaps, etc.). Also, it is likely that some wildlife species would utilize trails to facilitate movement through wetland and riparian areas.

(c) Cumulative Effects

Because these areas comprise only a small area of the landscape yet accommodate a variety of uses, they are particularly susceptible to degradation from cumulative impacts. Cumulative impacts that may affect wetland and riparian areas include livestock grazing and watering, and wildlife use including normal trampling, denning, and grazing. Animals such as beavers can also impact wetland areas by building dams which can flood established wetland vegetation and at the same time create conditions favorable for establishment of new wetland areas. Moose are also becoming more common in the Study Area and often utilize wetland areas where they can impact wetland soils and vegetation. Fires in the watershed may cause the deposition of ash and soil into wetland areas down gradient from burned areas. Wetlands may also be affected by altered hydrology related to forest management activities such as fuels management, forest thinning and logging, mining or by water projects diverting flow from watersheds. Mining may

also impact water quality and have subsequent impacts on wetland ecosystems. Recreation, including outfitter and guide operations, occurs in riparian and wetland ecosystems throughout the Study Area. Wetlands and riparian areas have suffered from the cumulative results of these activities in the past. However, current Forest Service policy directs that the trail be designed to minimize additional impacts such as the Forest Service Guide to Noxious Weed Prevention Practices.

(2) Alternative A – No Action

(a) Direct Effects

Alternative A includes no new construction and therefore has a low level of new disturbance to wetlands and riparian areas. Please see Section B1 – Hydrology and Soils for more potential effects.

(b) Indirect Effects

Nearly 9 miles of existing trail is located in the WIZ and an on-going but limited amount of trampling and other impacts resulting from recreational use can be anticipated. This use would primarily be associated with firewood collection, fishing and finding water sources.

(c) Cumulative Effects

Cumulative effects of Alternative A would be the same as "Cumulative Effects Common to All Alternatives."

(3) Alternative B

(a) Direct Effects

Under this alternative there would be little change from the existing condition, with less than five miles of new trail being constructed. A new bridge crossing of Lake Creek below Twin Lakes would be associated with the new trail construction, which would directly affect a small amount of riparian vegetation associated with the edge of the creek, approximately 0.6 acre. A new bridge crossing between the lakes at Twin Lakes would be associated with new trail construction, which would directly affect a small amount of riparian vegetation associated with the inter-lake area, approximately 0.56 acre.

Direct impacts to riparian areas and wetlands would include the removal, trampling, and smothering of wetland vegetation; wetland soil erosion; increased sediment production; and the conversion of wetlands to trails. Wetland areas generally require additional maintenance relative to other reaches of trail in upland positions.

(b) Indirect Effects

Nearly 10 miles of existing trail is located in the WIZ and an on-going but limited amount of trampling and other impacts resulting from recreational use would occur. This use would primarily be associated with social trails, firewood collection, fishing, water collection, camping, and stock use. Whenever possible, campsites have been located in areas that avoid or minimize impacts to riparian areas and wetlands.

Trail construction may also cause local changes in hydrology that could indirectly impact riparian or wetland areas adjacent to the trail. Changes in drainage patterns, which cause wet areas to dry more quickly, or conversely may cause prolonged inundation could make the habitat unsuitable for riparian and wetland vegetation. New construction or reconstruction of trail would result in a new access corridor for wildlife and noxious weeds to riparian and wetland areas. Current Forest Service Policy is to minimize the effects of trail construction and use in riparian and wetland areas (FSH 2309.18, U.S. Forest Service 1991b).

(c) Cumulative Effects

Cumulative effects of Alternative B would be the same as "Cumulative Effects Common to All Alternatives."

(4) Alternative C – Proposed Action

(a) Direct Effects

Although this Alternative involves construction of a large amount of new trails, only 5.6 miles of trail would be located in the WIZ affecting less than 2.0 acres of riparian habitat. Approximately 2.3 miles of trail would be constructed or reconstructed in the WIZ. New trail was located to avoid all wetlands not associated with drainage crossings. Consistent with PSICC and GMUG Forest Plans, activities within management prescription areas classified as MA 9A, which focus on riparian area management, were minimized. As discussed in Section 1B, this alternative would also result in a number of new stream crossings. Bridges and rock fords will minimize direct disturbance to riparian habitats and discourage users from using alternate routes. The new trail will be located at higher elevations where crossings tend to be shorter.

A new bridge crossing of Lake Creek below Twin Lakes would be associated with the new trail construction, which would directly affect a small amount of riparian vegetation associated with the edge of the creek, approximately 0.6 acre. A new bridge crossing between the lakes at Twin Lakes would be associated with new trail construction, which would directly affect a small amount of riparian vegetation associated with the inter-lake area, approximately 0.56 acre.

Direct impacts to riparian areas and wetlands would include the removal, trampling, and smothering of wetland vegetation; wetland soil erosion; increased sediment production; and the conversion of wetlands to trails. Wetland areas generally require additional maintenance relative to other reaches of trail in upland positions.

(b) Indirect Effects

With 6 miles of trail located in the WIZ, the amount of trampling and other impacts resulting from recreational use would be limited. The new trail may receive increased use due to improvements in its location. This may result in additional access by new users to key drainages. This use would primarily be associated with social trails, firewood collection, fishing, water collection, camping, and stock use. Whenever possible, campsites have been located in areas that avoid or minimize impacts to riparian areas and wetlands.

Trail construction may also cause local changes in hydrology that could indirectly impact riparian or wetland areas adjacent to the trail. Changes in drainage patterns, which cause wet areas to dry more quickly, or conversely may cause prolonged inundation could make the habitat unsuitable for riparian and wetland vegetation. New construction or reconstruction of trail would result in a new access corridor for wildlife and noxious weeds to riparian and wetland areas. Current Forest Service Policy is to minimize the effects of trail construction and use in riparian and wetland areas (FSH 2309.18, U.S. Forest Service 1991b).

(c) Cumulative Effects

Cumulative effects of Alternative C would be the same as "Cumulative Effects Common to All Alternatives."

(5) Comparison of Alternatives

Alternatives A and B involve little or no new trail construction and therefore would have essentially no direct effects on wetlands and riparian areas. However, both alternatives have a substantial distance through the WIZ where indirect effects associated with trail use can be expected. Although Alternative A includes the relatively high trail mileage in the WIZ, where wetlands are likely to occur, the wetland crossings for this alternative are at higher elevations, and therefore these crossings are typically shorter than wetlands crossings at lower elevations where wetland and riparian areas are typically wider. Alternative B has the greatest potential for indirect impacts to wetlands due to the relative location in the watershed; lower elevation wetlands are likely to be where riparian areas are generally broader than riparian areas higher in the watershed and wetland crossings will be longer and less direct. The potential for indirect wetland impacts for Alternative C would be the least because of the high elevation location of wetland crossings, where riparian areas are generally narrower than riparian areas lower in the watershed.

3. Cultural Resources

a. Affected Environment

Culture-Historical Context

The Study Area overlaps two prehistoric context areas: the Arkansas River Basin and the northern Colorado River Basin. The prehistoric culture sequence in the high mountains and valleys of central Colorado does not vary from one drainage basin to the other, however the terminology used to describe the sequence is not fully consistent. The Arkansas basin sequence (Zier and Kalasz 1999) is used here in favor of the northern Colorado sequence (Reed and Metcalf 1999) because more miles of trail corridor occur east of the Continental Divide; however, either would be fully applicable.

Three major stages of occupation are identified: Paleoindian, Archaic, and Late Prehistoric. The Paleoindian stage dates ca. 11,500-7800 B.P. (before present) and is concurrent with the transition from Pleistocene to Holocene climatic conditions. It is subdivided into the Clovis period (11,500-10,950 B.P.), Folsom period (10,950-10,250 B.P.), and Plano period (10,250-7800 B.P.). The Paleoindian stage is typically associated with big game hunting and is best known from the high plains to the east. Paleoindian sites are rare but do occur in the Colorado mountains, where the economy was of a generalized hunter-gatherer nature and the technology may reflect Great Basin influences. The Archaic stage (7800-1850 B.P.) is broken into three periods as well: Early Archaic (7800-5000 B.P.), Middle Archaic (5000-3000 B.P.), and Late Archaic (3000-1850 B.P.). Archaic occupants of the central mountains were also generalized hunter-gatherers who exhibited minimal economic development over the lengthy course of the stage. Period distinctions are based mainly upon changes in projectile point styles. This stage is associated with fully modern climatic conditions, and it is possible that former occupants of the high plains moved into the mountains during the relatively warm and dry Altithermal climatic episode, which corresponded temporally with the Early Archaic stage. The Late Prehistoric stage (1850-225 B.P.) is defined largely on the basis of events of the foothills and high plains, where the archaeology is better understood than in the mountains. Three internal subdivisions are the Development period (1850-900 B.P.), Diversification period (900-500 B.P.), and Protohistoric period (500-225 B.P.). The gradual development of semi-sedentism on the high plains affected only portions of the foothills of the Rocky Mountains, and the Archaic hunter-gatherer lifestyle persisted in the high country. Ceramics common to the plains do occur sporadically in the mountains. The Protohistoric period was a time of Indian-Euroamerican interaction that ended with the onset of written historical records. In the central Colorado mountains, this period can be associated mainly with Shoshonean (Ute) occupation.

The principal historical themes that are pertinent to the Study Area are (1) the fur trade, (2) American exploration, (3) prospecting and mining, and (4) transportation and railroads (Athearn 1960; Mehls 1988). The timber industry is not broken out as a separate theme because its early history is closely tied to that of mining and railroading. The fur trade era in central Colorado dates from 1811, when the first trappers entered the region, until the early 1840s. The earliest known trappers worked the upper Arkansas Valley in the Leadville area, but were pushed out of the region a few years later by the Spanish. After Mexican independence from Spain in 1821, Americans were allowed into the region, although the focal point of the industry was Taos, New

Mexico. U.S. Government explorations of the Colorado mountains began in 1843 with the first Fremont expedition and continued until the time of the Civil War. Explorations resumed after the close of the war, particularly those of a scientific nature, a prime example being the Hayden expedition of the mid-1870s. Prospecting began in the Colorado mountains in the late 1850s and was limited largely to the area east of the Continental Divide. Leadville – founded as Oro City in California Gulch near the present town – was established in 1860 around the discovery of placer gold and in a very short time boasted a population of ten thousand. The area was largely abandoned when the placer deposits played out five years later, but Leadville was reborn (and given its present name) in the 1870s with the discovery of rich silver deposits. Silver extraction dominated the regional mining industry until the Panic of 1893, at which time silver prices plummeted. Roads and trails were built into the area, mainly from the eastern plains, with the first (gold) mining boom, but railroads did not penetrate the high mountain valleys until the late 1870s when the silver boom was in full fluorescence. The Denver & Rio Grande (D&RG) and the Denver, South Park & Pacific (DSP&P) railroads reached Leadville from Buena Vista in 1880, and two years later the DSP&P built a separate line into Leadville by way of Fremont Pass. This route became the principal railroad to serve Leadville, and was eventually incorporated into the Colorado & Southern system (LeMassena 1984; Clark 2004).

Background Research and Information Sources

A Class I file search of the Study Area was conducted through the Colorado Office of Archaeology and Historic Preservation (OAHP) Compass online database. Two assessments of previously recorded sites in the Study Area were undertaken, the first employing a two-mile-wide buffer zone and the second restricted to a one-mile-wide zone (i.e., identifying all sites within one-half mile of the actual survey corridor). The large-scale file search produced approximately 220 sites of which 49% are historic, 36% are prehistoric, and 15% are multi-component prehistoric-historic. The smaller-scale file search produced 67 sites of which 48% are historic, 33% are prehistoric, and 19% are multi-component. In addition to the Compass file search, Forest Service archaeologist David Legare (Leadville Ranger District) was contacted to identify any recently-recorded sites that might not yet have been entered into the Compass database. None were noted. The historic archaeological record in the area is dominated by mines and mining-related sites. Prehistoric sites are difficult to summarize neatly; suffice to say that a hunter-gatherer lifeway characterized by residential and logistical mobility was the norm throughout the region regardless of time period.

In conjunction with the pre-field survey file search, a letter explaining the project and an alternatives map were sent to 20 representatives of eight Native American groups. The groups that were contacted consisted of the following: Southern Ute Tribe, Ute Mountain Ute Tribe, Northern Ute Tribe, Eastern Shoshone Tribe, Cheyenne and Arapaho Tribes of Oklahoma, Northern Arapaho Tribe, Northern Cheyenne Tribe, and Oglala and Lakota Nations. Comments were solicited regarding concerns that might exist for places of religious and/or cultural significance in the Study Area, including traditional cultural properties (TCPs). The Southern Ute Tribe responded that they had no objections or concerns, but wished to be notified in the event that discoveries are made of Native American sites, artifacts, or human remains. There were no other responses.

Field Survey Results

A pedestrian survey of both the existing trail slated for reconstruction and the new trail alignment involved an examination of a 100-foot corridor straddling a flagged centerline. This was conducted using a two-person team paralleling the centerline at the proper intervals. Areas deemed likely to be used as campsites by hikers were treated with a minimum 150-foot radius and were covered by parallel, back-and-forth transects. For select areas of high public use and high campsite likelihood, a 400-foot corridor, surveyed by parallel transects, was established. All sites visible from existing or proposed trails were recorded, even if those sites were beyond the defined survey corridor. Sites encountered during ingress or egress to and from the Study Areas were also recorded, even if outside the defined survey corridor.

Fourty-five new sites and isolated finds were recorded, including: 26 historic, 17 prehistoric, and 2 multi-component. Twenty-one previously recorded sites were re-evaluated, including four historic sites, 11 prehistoric sites, and six multi-component sites. In addition, the National Register Historic site of Interlaken, although not formally re-evaluated, is included in the present NEPA analysis. A brief summary of these data follows.

Nine new prehistoric sites and eight new prehistoric isolated finds were recorded. Four of these sites are evaluated as National Register of Historic Places (NRHP)-eligible. By accepted convention, isolated finds are not eligible for the NRHP. Of the 11 re-evaluated prehistoric sites, four sites are suggested for NRHP status change from ineligible to eligible.

Thirteen new historic sites and 13 new historic isolates were recorded. None of these sites is evaluated as NRHP-eligible. By accepted convention, isolated finds are not NRHP-eligible. Five historic sites were re-evaluated. There is no change in the NRHP eligibility status of these re-evaluated sites.

Two new multi-component sites were recorded and evaluated as NRHP-eligible. Six multi-component sites were re-evaluated. The original recording of these six sites accounted for two eligible sites and four ineligible sites. Re-evaluation of these sites in 2005 changed the NRHP eligibility status of two of these from ineligible to eligible. In summary, two new multi-component sites and four re-evaluated multi-component sites are evaluated as NRHP eligible.

b. Environmental Consequences

(1) Effects Common to All Alternatives

(a) Direct Effects

Existing trails would continue to deteriorate with increased rutting and erosion, particularly in areas where there is motorized use. Increased and expanded erosion might affect archeological deposits where cultural sites intersect or are adjacent to existing trails.

(b) Indirect Effects

Continued trail access would open up cultural properties for damage through vandalism and personal collection of artifacts. Without proper monitoring and/or interpretation, these resources are increasingly threatened by development, public use and vandalism and would remain in jeopardy.

(c) Cumulative Effects

Other activities within the Study Area include timber harvest, recreation, fire management, and road and trail improvement projects. All of these activities may have a cumulative effect to heritage resources in the form of increased soil erosion, increased visitor use, traffic, and vandalism. These impacts can be avoided or minimized through the implementation of appropriate site-specific design criteria through consultation with the Colorado State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation

(2) Alternative A – No Action

(a) Direct Effects

Alternative A would not result in any new trail construction and therefore no direct effects to cultural resources would be expected from construction activities. As noted in "Effects Common to all Alternatives," continuing deterioration with increased rutting and erosion, particularly in areas where there is motorized use, could affect cultural resource sites located adjacent to existing trails.

(b) Indirect Effects

Indirect effects of Alternative A would be the same as "Indirect Effects Common to All Alternatives."

(c) Cumulative Effects

Cumulative effects of Alternative A would be the same as "Cumulative Effects Common to All Alternatives."

(3) Alternative B

(a) Direct Effects

Eight prehistoric sites (one newly recorded site, six re-evaluations, one unassessed locality in the Twin Lakes area) and three historic sites (one newly recorded, two re-evaluations) are located on existing trails. Of these 11 sites, seven are evaluated as NRHP-eligible.

Design criteria or mitigation measures would be required for all cultural resources that are listed on, or are determined to be eligible for the NRHP in the trail corridor. Mitigation efforts will be

sensitive to site type and information content as well as the type of impact that is likely to occur. Design criteria and mitigation can include avoidance/protection, with or without monitoring; partial or complete archaeological excavation; controlled surface collection; photographic documentation; comprehensive technical recording, e.g., to HABS/HAER (Historic American Buildings Survey/Historic American Engineering Record) standards; treatment and maintenance, e.g., structural repair and trail armoring; and in rare cases, removal to a different location. In situations where data retrieval is called for, mitigation may consist of a combination of actions, e.g., partial excavation in conjunction with controlled surface collection.

Regardless of the Twin Lakes area crossing option selected (Lake Creek bridge or Twin Lakes bridge), the potential for additional impacts to cultural resources would increase without appropriate design criteria and mitigation strategies.

With the Twin Lakes bridge option, extensive areas may need to be armored or excavated. The new bridge would provide increased direct access to the Interlaken site as well as other cultural resources in the immediate vicinity. The Interlaken site is an abandoned resort dating to the 1880s that was removed to its present location. This site is a popular tourist destination. Increased access to the site would provide desirable, beneficial impacts relating to interpretation and public education. Public presence at historic sites tends to reduce vandalism and illegal collection of artifacts.

With the Lake Creek bridge option, design criteria and mitigation measures would be required, but to a lesser degree. The measures would be the same as for the Twin Lakes bridge, but the area involved would be considerably smaller. The Lake Creek bridge option would include the construction of an ADA compliant trail to Interlaken. This would increase access for special needs users. Increased access to the site would provide desirable, beneficial impacts relating to interpretation and public education. Public presence at historic sites tends to reduce vandalism and illegal collection of artifacts.

(b) Indirect Effects

Indirect effects of Alternative B would be the same as “Indirect Effects Common to all Alternatives.”

(c) Cumulative Effects

Cumulative effects of Alternative B would be the same as “Cumulative Effects Common to All Alternatives.”

(4) Alternative C – Proposed Action

(a) Direct Effects

Nine prehistoric sites (one newly recorded site, two re-evaluation, six unassessed localities in the Twin Lakes area), 19 historic sites (five newly recorded sites, one site already on the National Register, 13 unassessed localities in the Twin Lakes area), and three multi-component sites (two

newly recorded, one re-evaluation) are located on sections of the proposed CDT realignment. Of these 31 sites, six are evaluated as NRHP-eligible. In the cases of multi-component sites only the prehistoric components are regarded as NRHP-eligible.

Design criteria or mitigative measures would be required for all cultural resources that are listed on, or are determined to be eligible for the NRHP in the trail corridor. Mitigation will be sensitive to site type and information content as well as the type of impact that is likely to occur. Design criteria and mitigation measures can include avoidance/protection, with or without monitoring; partial or complete archaeological excavation; controlled surface collection; photographic documentation; comprehensive technical recording, e.g., to HABS/HAER (Historic American Buildings Survey/Historic American Engineering Record) standards; treatment and maintenance, e.g., structural repair and trail armoring; and in rare cases, removal to a different location. In situations where data retrieval is called for, mitigation may consist of a combination of actions, e.g., partial excavation in conjunction with controlled surface collection.

Regardless of the Twin Lakes area crossing option selected (Lake Creek bridge or Twin Lakes bridge), the potential for additional impacts to cultural resources would increase without appropriate design criteria and mitigation strategies.

With the Twin Lakes bridge option, extensive areas may need to be armored or excavated. The new bridge would provide increased direct access to the Interlaken site as well as other cultural resources in the immediate vicinity. The Interlaken site is an abandoned resort dating to the 1880s that was removed to its present location. This site is a popular tourist destination. Increased access to the site would provide beneficial impacts relating to interpretation and public education. Public presence at historic sites tends to reduce vandalism and illegal collection of artifacts.

With the Lake Creek bridge option, design criteria and mitigative measures would be required, but to a lesser degree. The measures would be the same as for the Twin Lakes bridge, but the area involved would be considerably smaller. Increased access to the site would provide desirable, beneficial impacts relating to interpretation and public education.

(b) Indirect Effects

Indirect effects of Alternative C would be the same as those described above under “Indirect Effects Common to All Alternatives.”

(c) Cumulative Effects

Cumulative effects of Alternative C would be the same as “Cumulative Effects Common to All Alternatives.”

(5) Comparison of Alternatives

Alternative A would have no new effects on cultural resources. Alternatives B and C both include construction and reconstruction of trail and therefore would have the potential for direct disturbance to cultural resources if design criteria and mitigation measures are not implemented. Both Alternatives B and C have the potential to benefit specific cultural properties by improving public access to interpretive sites.

E. Irretrievable and Irreversible Commitment of Resources

A summary of impacts, whether short- or long-term are described within each section of the EA and are summarized in Table 2-6 in Chapter 2. NEPA Section 102 C.v., the procedural requirements of the law, requires that a detailed statement include identification of "…any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented," (Section 102, C, v*). Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. According to Forest Service Handbook 1909.15, the following definitions apply (U.S. Forest Service 1992):

Irreversible. A term that describes the loss of future options. Applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity that are renewable only over long periods of time.

Irretrievable. A term that applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.

There are no known irretrievable and/or irreversible commitments of resources for this project. No non-renewable resources (irretrievable) will be used except during construction (i.e., gasoline). Since all other resources could be replaced over a reasonable time frame, they are not irretrievable. For example, vegetation could be restored if a trail was closed. Fens and jurisdictional wetlands are non-renewable resources and were avoided during trail layout. No Army Corps of Engineers 404 permit would be required for this project.