

I-70 Mountain Corridor PEIS Biological Resources Technical Report

August 2010

Revised March 2011

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Section 1. Introduction

This *I-70 Mountain Corridor Programmatic Environmental Impact Statement (PEIS) Biological Resources Technical Report* supports the information presented in **Section 3.2, Biological Resources**, of the *I-70 Mountain Corridor PEIS* (CDOT, 2010). It identifies:

This technical report presents the affected environment and potential for impacts on general vegetation, protected species, and aquatic resources. Also presented here are:

- Methods used to identify biological resources and determine potential impacts of alternatives
- Coordination with local, state, and federal agencies
- Description of the biological resources in the Corridor
- Consequences of the Action Alternatives evaluated in the *I-70 Mountain Corridor PEIS*
- Considerations for Tier 2 Processes
- Proposed mitigation for biological resources

Section 2. Background and Methodology

In general, the lead agencies determined effects on biological resources by overlaying a project footprint of each alternative on a Geographic Information System containing the locations of the specific resource, such as vegetation, wildlife habitat or fisheries. The project footprint includes the physical footprint of the alternatives plus an additional 30 feet on each side. The 30 feet includes a 15-foot construction disturbance zone and an additional 15-foot sensitivity zone. Direct impacts occur where resources are located directly beneath the project footprint. Indirect impacts, occurring either farther away or later in time, are beyond the Action Alternatives footprint. **Chapter 2** of the *I-70 Mountain Corridor PEIS* provides descriptions of Action alternatives.

It is recognized that impacts are not always directly proportional to the roadway width, and therefore some impacts may be misrepresented. By including a 30 foot buffer around the physical project footprint, a degree of conservatism was introduced to the analysis to account for stressors and adjacent land uses that were not considered during the first tier of analysis.

Impact analysis typically focuses on acres of impact. This impact measurement is well suited for the use of broad scale Geographic Information System analysis for first Tier document, as it provides a ready comparison amongst the range of alternatives. Qualitative discussion is included, but is general and proportional to the project footprint. Tier 2 processes will include additional discussion of impacts that are not measured in the acres, such as, but not limited to, the impact of erosion on adjacent vegetation, noxious weed invasion, hydrologic modifications due to earthwork, and road effects on wildlife.

Background and methodology are discussed with greater specificity within each of the subsections pertaining to vegetation, protected species, and aquatic resources.

Section 3. Description of Alternatives

This section summarizes the alternatives considered in the *I-70 Mountain Corridor PEIS*. A more complete description of these alternatives is available in **Chapter 2** of the PEIS and in the *I-70 Mountain Corridor PEIS Alternatives Screening and Development Technical Report* (CDOT, August 2010).

3.1 Minimal Action Alternative

The Minimal Action Alternative provides a range of local transportation improvements along the Corridor without providing major highway capacity widening or dedicated transit components. The Minimal Action Alternative includes elements of the Transportation System Management family and the Localized Highway Improvements family, including: transportation management, interchange modifications, curve safety modifications, and auxiliary lanes. These elements are also incorporated into the other Action Alternative Packages.

3.2 Transit Alternatives

Four Transit alternatives are considered in the PEIS as a reasonable range representing the Fixed Guideway and Rubber Tire Transit families:

- Rail with Intermountain Connection Alternative
- Advanced Guideway System Alternative
- Dual-Mode Bus in Guideway Alternative
- Diesel Bus in Guideway Alternative

3.2.1 Rail with Intermountain Connection

The Rail with Intermountain Connection Alternative would provide rail transit service between the Eagle County Regional Airport and C-470. Between Vail and C-470 the rail would be primarily at-grade running adjacent to the I-70 highway. The segment between Vail and the Eagle Count Airport would be constructed within the existing Union Pacific Railroad right-of-way. A new Vail Transportation Center, including new track, would be constructed between Vail and Minturn to complete the connection between the diesel and electric trains. This alternative also includes auxiliary lane improvements at eastbound Eisenhower-Johnson Memorial Tunnels to Herman Gulch and westbound Downieville to Empire and the other Minimal Action Alternative elements except for curve safety modifications at Dowd Canyon, buses in mixed traffic and other auxiliary lane improvements.

3.2.2 Advanced Guideway System

The Advanced Guideway System Alternative would provide transit service between the Eagle County Regional Airport and C-470 with a 24-foot-wide, 118 mile, fully elevated system. The Advanced Guideway System Alternative would use a new technology that provides higher speeds than the other Fixed Guideway Transit technologies studied for the PEIS. Any Advanced Guideway System would require additional research and review before it could be implemented in the Corridor. Although the Federal Transit Administration-researched urban magnetic levitation system is considered in the PEIS, the actual technology would be developed in a Tier 2 process. This alternative includes the same Minimal Action elements as described previously for the Rail with Intermountain Connection Alternative.

3.2.3 Dual-mode Bus in Guideway

This alternative includes a guideway located in the median of the I-70 highway with dual-mode buses providing transit service between the Eagle County Regional Airport and C-470. This guideway would be 24 feet wide with 3 foot high guiding barriers and would accommodate bidirectional travel. The barriers direct the movement of the bus and separate the guideway from general purpose traffic lanes. While traveling in the guideway, buses would use guidewheels to provide steering control, thus permitting a narrow guideway and providing safer operations. The buses use electric power in the guideway and diesel power when traveling outside the guideway in general purpose lanes. This alternative includes the same Minimal Action Alternative elements as described previously for the Rail with Intermountain Connection Alternative.

3.2.4 Diesel Bus in Guideway

This includes the components of the Dual-mode Bus in Guideway Alternative except that the buses use diesel power at all times.

3.3 Highway Alternatives

Three Highway alternatives are advanced for consideration in the PEIS as a reasonable range and representative of the Highway improvements, including Six-Lane Highway 55 mph, Six-Lane Highway 65 mph, and Reversible/HOV/HOT Lanes. The Highway alternatives considered both 55 and 65 mph design speeds to 1) establish corridor consistency and 2) address deficient areas within the Corridor. The 55 mph design speed establishes a consistent design speed throughout the Corridor, which currently does not exist. The 65 mph design speed further improves mobility and addresses safety deficiencies in key locations such as Dowd Canyon and the Twin Tunnels. Both the 55 mph and the 65 mph design speed options are augmented by curve safety improvements, but the 65 mph design speed constructs tunnels in two of the locations: Dowd Canyon and Floyd Hill/Hidden Valley.

3.3.1 Six-Lane Highway 55 mph Alternative

This alternative includes six-lane highway widening in two locations: Dowd Canyon and the Eisenhower-Johnson Memorial Tunnels to Floyd Hill. This alternative includes auxiliary lane improvements at eastbound Avon to Post Boulevard, both directions on the west side of Vail Pass, eastbound Frisco to Silverthorne and westbound Morrison to Chief Hosa, and the Minimal Action Alternative elements except for buses in mixed traffic and other auxiliary lane improvements.

3.3.2 Six-Lane Highway 65 mph Alternative

This alternative is similar to the Six-Lane Highway 55 mph Alternative; it includes the same six-lane widening and all of the Minimal Action Alternative elements except the curve safety modification at Dowd Canyon. The higher design speed of 65 mph alternatives requires the curve safety modifications near Floyd Hill and Fall River Road to be replaced with tunnels.

3.3.3 Reversible Lanes Alternative

This alternative is a reversible lane facility accommodating high occupancy vehicles and high occupancy toll lanes. It changes traffic flow directions as needed to accommodate peak traffic demands. It includes two additional reversible traffic lanes from the west side of the Eisenhower-Johnson Memorial Tunnels to just east of Floyd Hill. From the Eisenhower-Johnson Memorial Tunnels to US 6, two lanes are built with one lane continuing to US 6 and the other lane to the east side of Floyd Hill. This alternative includes one additional lane in each direction at Dowd Canyon. This alternative includes the same Minimal Action Alternative Elements as the Six-Lane Highway 55 mph Alternative.

3.4 Combination Alternatives

Twelve Combination alternatives, combining Highway and Transit alternatives are considered in the PEIS. Four of these alternatives involve the buildout of highway and transit components simultaneously. Eight alternatives include preservation options, the intent of which is to include, or not preclude, space for future modes in the I-70 Mountain Corridor. The Combination alternatives all include the Six-Lane Highway 55 mph Alternative for highway components.

Combination Rail and Intermountain Connection and Six-Lane Highway Alternative—This alternative includes the 55 mph six-lane highway widening between Floyd Hill and Eisenhower-Johnson Memorial Tunnels, the Rail and Intermountain Connection transit components, and most of the

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components of the Minimal Action Alternative. The exception is that only one of the Minimal Action auxiliary lane improvements (from Morrison to Chief Hosa westbound) is included.

Combination Advanced Guideway System and Six-Lane Highway Alternative—This alternative includes the 55 mph six-lane highway widening between Floyd Hill and Eisenhower-Johnson Memorial Tunnels and the Advanced Guideway System transit components. It includes the same Minimal Action Alternative elements as the Combination Rail and Intermountain Connection and Six-Lane Highway Alternative.

Combination Bus in Guideway (Dual-Mode) and Six-Lane Highway Alternative—This alternative the 55 mph six-lane highway widening between Floyd Hill and Eisenhower-Johnson Memorial Tunnels and the dual-mode bus in guideway transit components. It includes the same Minimal Action Alternative elements as the Combination Rail and Intermountain Connection and Six-Lane Highway Alternative.

Combination Bus in Guideway (Diesel) and Six-Lane Highway Alternative—This alternative includes the 55 mph six-lane highway widening between Floyd Hill and Eisenhower-Johnson Memorial Tunnels and the diesel bus in guideway transit components. It includes the same Minimal Action Alternative elements as the Combination Rail and Intermountain Connection and Six-Lane Highway Alternative.

Combination Rail & Intermountain Connection and Preservation of Six-Lane Highway Alternative—This alternative includes the Rail and Intermountain Connection Alternative and preserves space to construct the Six-Lane Highway 55 mph at a later point.

Combination Advanced Guideway System and Preservation of Six-Lane Highway Alternative—This alternative includes the Advanced Guideway System and preserves space to construct the Six-Lane Highway 55 mph at a later point.

Combination Bus in Guideway (Dual-Mode) and Preservation of Six-Lane Highway Alternative—This alternative includes the Combination Bus in Guideway (Dual-Mode) Alternative and preserves space to construct the Six-Lane Highway 55 mph at a later point.

Combination Bus in Guideway (Diesel) and Preservation of Six-Lane Highway Alternative—This alternative includes the Bus in Guideway (Diesel) Alternative and preserves space to construct the Six-Lane Highway 55 mph at a later point.

Combination Preservation of Rail and Intermountain Connection and Six-Lane Highway Alternative—This alternative includes the Six-Lane 55 mph Highway Alternative and also preserves space to construct the Rail and Intermountain Connection at a later point.

Combination Preservation of Advanced Guideway System and Six-Lane Highway Alternative—This alternative includes the Six-Lane 55 mph Highway Alternative and also preserves space to construct the Advanced Guideway System at a later point.

Combination Preservation of Bus in Guideway (Dual-Mode) and Six-Lane Highway Alternative—This alternative includes the Six-Lane Highway Alternative and also preserves space to construct the Bus in Guideway (Dual-Mode) at a later point.

Combination Preservation of Bus in Guideway (Diesel) and Six-Lane Highway Alternative—This alternative includes the Six-Lane Highway Alternative and also preserves space to construct the Bus in Guideway (Diesel) at a later point.

3.5 Preferred Alternative—Minimum and Maximum Programs

The Preferred Alternative provides for a range of improvements. Both the Minimum and the Maximum Programs include the Advanced Guideway System Alternative. The primary variation between the Minimum and Maximum Programs is the extent of the highway widening between the Twin Tunnels and the Eisenhower-Johnson Memorial Tunnels. The Maximum Program includes six-lane widening between these points (the Twin Tunnels and the Eisenhower-Johnson Memorial Tunnels), depending on certain events and triggers and a recommended adaptive management strategy.

3.6 No Action Alternative

The No Action Alternative provides for ongoing highway maintenance and improvements with committed funding sources highly likely to be implemented by the 2035 planning horizon. The projected highway maintenance and improvements are committed whether or not any other improvements are constructed with the I-70 Mountain Corridor project. Specific improvements under the No Action Alternative include highway projects, park and ride facilities, tunnel enhancements, and general maintenance activities.

Section 4. General Vegetation

4.1 Introduction

This section of the Technical Report addresses general vegetation communities and species present in the Corridor, including communities listed by the Colorado Natural Heritage Program. For federally listed species, refer to **Section 5.3.1** of this Technical Report and the Biological Report, which also includes Forest Sensitive and Management Indicator Species (MIS) fish species (**Appendix A**).

4.2 Background and Methodology

Both the 1999 Colorado Gap Analysis Project and 1997 United States Forest Service provided Geographic Information Systems data were used to map vegetation communities in the Corridor. The United States Forest Service considers the vegetation mapping units and classification system to be suitable for the evaluation of general Corridor-wide habitats. Analysis of rare and imperiled plant species was based on the August 2008 Colorado Natural Heritage Program list. This list has since then been updated, in July 2010, and only one difference exists for vegetation communities in the Corridor. This change is detailed in **Table 1**. The Colorado noxious weeds lists were obtained from the Colorado Department of Agriculture in July 2009 and updated again in August 2010. Individual county-based noxious weed programs were obtained and reviewed in July 2009. This information, as applicable, was placed into a Geographic Information System and displayed on maps with the project aeriels to provide baseline information for existing conditions within the I-70 Mountain Corridor.

Lead agencies determined effects on biological resources by overlaying a project footprint of each alternative on a Geographic Information System containing the locations of the specific resource, such as vegetation, wildlife habitat or fisheries. The project footprint includes the physical footprint of the alternatives plus an additional 30 feet on each side. The 30 feet includes a 15-foot construction disturbance zone and an additional 15-foot sensitivity zone. Direct impacts occur where resources are located directly beneath the project footprint. Indirect impacts, occurring either farther away or later in time, are beyond the Action Alternatives footprint. **Chapter 2** of the *I-70 Mountain Corridor PEIS* provides descriptions of Action alternatives.

4.3 Affected Environment

The Corridor contains a diversity of vegetation types that correspond to changes in elevation (approximately 11,200 feet at the west side of the Eisenhower-Johnson Memorial Tunnels to 6,000 feet at C-470), as well as geographic variability along the 144-mile Corridor. The project area is characterized by “life zones” that differentiate broad changes in vegetation communities with increasing elevation of the mountains. These include Foothill, Montane, Subalpine, and Alpine zones, which are characterized by specific vegetation and animal species.

A combination of GAP and United States Forest Service data were used to map the following vegetation communities existing in the Corridor:

- Alpine Meadows—Tundra
- Aspen Forest
- Barren Land
- Douglas-Fir (*Pseudotsuga menziesii*) Forest
- Grass/Forb Meadows
- Lodgepole Pine (*Pinus contorta*) Forest
- Mountain Shrubland
- Piñon-Juniper
- Ponderosa Pine (*Pinus ponderosa*) Forest
- Sagebrush Shrubland
- Spruce-Fir Forest

Rare Plant Communities—Colorado Natural Heritage Program

Table 1 shows the 2008 rare plant communities that were identified in the *I-70 Mountain Corridor PEIS*. Those communities with a rank of S4 (apparently secure) or S5 (secure) are shaded in **Table 1** and are not listed in the *I-70 Mountain Corridor PEIS*.

Table 1. Rare Plant Communities Designated by CNHP

CNHP Identified Species Makeup of Community	Rank
Thinleaf Alder-Red-osier Dogwood Riparian Shrubland (<i>Alnus incana/ Cornus sericea</i> Shrubland)*	G4 S3 (Vulnerable)
Montane Riparian Forest (<i>Populus angustifolia/Alnus incana</i> Woodland)	G3 S3 (Vulnerable)
Montane Riparian Woodland (<i>Picea pungens/Betula occidentalis</i> Woodland)	G2 S2
Cottonwood riparian forest (<i>Populus angustifolia /Cornus sericea</i> Woodland)	G4 S3 (Vulnerable Imperiled)
Drummonds Willow/Mesic Forb (<i>Salix drummondiana/Mesic</i> Forbs Shrubland)	G4 S4 (Apparently secure—uncommon but not rare; some cause for long-term concern due to declines or other factors)
Montane Willow Carrs (<i>Salix geyeriana - Salix monticola/Calamagrostis canadensis</i> Shrubland)	G3 S3 (Vulnerable)
Western Slope Sagebrush Shrublands (<i>Artemisia cana</i> ssp. <i>viscidula / Festuca idahoensis</i> Shrub Herbaceous Vegetation)	G3? (Vulnerable—inexact) SU (Unrankable currently due to lack of information or due to substantially conflicting information about status or trends)
Montane Aspen Forest (<i>Populus tremuloides/Tall</i> Forbs Forest)	G5 S5 (Secure—Common; widespread and abundant)
Subalpine Riparian Willow Carr (<i>Salix planifolia/Caltha leptosepala</i> Shrubland)	G4 S4 (Apparently secure)
Montane Wet Meadows (<i>Carex aquatilis</i> Herbaceous Vegetation)	G5 (Secure) S4 (Apparently secure)

Table 1. Rare Plant Communities Designated by CNHP

CNHP Identified Species Makeup of Community	Rank
Montane Woodlands (<i>Pinus aristata</i> / <i>Juniperus communis</i> Woodland)	GU SU (Unrankable)
Upper Montane Woodlands (<i>Pinus aristata</i> / <i>Trifolium dasyphyllum</i> Woodland)	G2 S2 (Imperiled)
Lower Montane Woodlands (<i>Pinus aristata</i> / <i>Festuca thurberi</i> Woodland)	G5 S2 (Imperiled in the State)
Subalpine Forests (<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium myrtillus</i> Forest)	G5 S5 (Secure)
Foothills Ponderosa Pine Scrub Woodlands (<i>Pinus ponderosa</i> / <i>Cercocarpus montanus</i> / <i>Andropogon gerardii</i> Wooded Herbaceous Vegetation)	G2 S2? (Imperiled—inexact)

*Per the 2010 CNHP Rare Plant Community list, the Thinleaf Alder-Red-osier Dogwood Riparian Shrubland (*Alnus incana*/ *Cornus sericea* Shrubland) ranking has been changed to G3 G4 S3 (<http://www.cnhp.colostate.edu/download/list/communities.asp>)

G1—Globally critically imperiled; typically five or fewer occurrences
 G2—Globally imperiled; typically 6 to 20 occurrences
 G3—Globally vulnerable; typically 20 to 100 occurrences
 G4—Globally apparently secure; usually > 100 occurrences
 G5—Globally demonstrably secure although it may be rare in parts of its range.

S1—State critically imperiled; typically five or fewer occurrences
 S2—State imperiled; typically 6 to 20 occurrences
 S3—State vulnerable; typically 20 to 100 occurrences
 S4—State apparently secure; usually > 100 occurrences
 S5—State demonstrably secure

Noxious Weeds

Table 2 provides the 2010 list of noxious weeds occurring in the Corridor by county.

Table 2. Noxious Weeds Commonly Occurring in Corridor Counties

Scientific Name	Common Name	Garfield County	Eagle County	Clear Creek County	Summit County	Jefferson County	State Weed List ^a	CDOA ^b Mapping Program
<i>Cirsium vulgare</i>	Bull thistle				X		B	X
<i>Breca (Cirsium) arvense</i>	Canada thistle	X	X	X	X	X	B	X
<i>Anisantha (Bromus) tectorum</i>	Cheatgrass or Downy brome						C	X
<i>Cichorium intybus</i>	Chicory	X					C	
<i>Vitella (Clematis) orientalis</i>	Chinese clematis			X	X		B	X
<i>Madia sativa</i>	Coast tarweed				X			
<i>Arctium minus</i>	Common burdock	X	X				C	
<i>Tanacetum vulgare</i>	Common tansy				X		B	
<i>Dipsacus fullonum</i>	Common teasel					X	B	
<i>Linaria dalmatica</i>	Dalmation toadflax	X	X		X		B	X
<i>Hesperis matronalis</i>	Dame’s rocket				X		B	X
<i>Acosta (Centaurea) diffusa</i>	Diffuse knapweed	X	X	X		X	B	X
<i>Convolvulus arvensis</i>	Field bindweed			X			C	X
<i>Cynoglossum officinale</i>	Houndstongue	X	X		X	X	B	X
<i>Aegilops cylindrica</i>	Jointed goatgrass	X					B	X

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Table 2. Noxious Weeds Commonly Occurring in Corridor Counties

Scientific Name	Common Name	Garfield County	Eagle County	Clear Creek County	Summit County	Jefferson County	State Weed List ^a	CDOA ^b Mapping Program
<i>Tithymalus esula</i>	Leafy spurge	X	X		X	X	B	X
<i>Anthemis cotula</i>	Mayweed chamomile				X		B	
<i>Centaurea pratensis</i>	Meadow knapweed				X		A	X
<i>Carduus nutans</i>	Musk thistle	X	X	X	X	X	B	X
<i>Hieracium aurantiacum</i>	Orange hawkweed			X		X	A	X
<i>Leucanthemum vulgare</i>	Oxeye daisy	X		X	X		B	X
<i>Lepidium latifolium</i>	Perennial pepperweed				X		B	X
<i>Carduus acanthoides</i>	Plumeless thistle	X	X		X		B	X
<i>Lythriyum salicaria</i>	Purple loosestrife	X				X	A	X
<i>Acroptilon repens</i>	Russian knapweed	X	X	X	X	X	B	X
<i>Elaeagnus angustifolia</i>	Russian olive	X					B	X
<i>Tamarix chinensis</i> , <i>T. arvilflora</i> , and <i>T. amosissima</i>	Salt cedar	X					B	X
<i>Matricaria perforata</i>	Scentless chamomile		X		X		B	
<i>Onopordum acanthium</i>	Scotch thistle	X	X			X	B	X
<i>Acosta maculosa</i>	Spotted knapweed	X	X	X	X	X	B	X
<i>Cardaria draba</i>	Whitetop (Hoary cress)	X	X	X	X	X	B	X
<i>Carum carvi</i>	Wild caraway		X				B	
<i>Centaurea solstitialis</i>	Yellow starthistle	X			X	X	A	X
<i>Linaria vulgaris</i>	Yellow toadflax	X	X	X	X		B	X

^a State A list contains species designated for statewide eradication, B list species are managed to stop continued spread, C list species are left to local jurisdictions and use of integrated weed management controls are supported

^b Colorado Department of Agriculture

Source: State Noxious Weed List, Colorado. Department of Agriculture, <http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1174084048733> and Rules Pertaining to the Administration and Enforcement of the Colorado Noxious Weed Act (8 CCR 1203-119, 2003) includes county lists, accessed August 2, 2010.

Eagle County designated noxious weeds are found at http://www.eaglecounty.us/Weeds/Weed_Information/. Listing is the same as the state list.

Summit County lists several weeds in addition to those listed by the state:

- Black henbane (*Hyoscyamus niger*)
- Common mullein (*Verbascum thapsus*)
- Myrtle spurge (*Euphorbia myrsinites*)
- Poison hemlock (*Conium maculatum*)
- Sulfur cinquefoil (*Potentilla recta*)
- Cheatgrass (*Bromus tectorum* L.)
- Field bindweed (*Convolvulus arvensis*)
- Orange hawkweed (*Hieracium aurantiacum*)
- Salt cedar (*Tamarix chinensis*, *T. parviflora*, and *T. ramosissima*)
- Wild caraway (*Carum carvi*)

Summit County designated noxious weeds are found on the following website:
<http://www.co.summit.co.us/Weeds/weeds.htm>.

Clear Creek County lists the following:

- Bull thistle (*Cirsium vulgare*)
- Perennial pepperweed (*Lepidium latifolium*)
- Scentless chamomile (*Matricaria perforate*)
- Chicory (*Cichorium intybus*)
- Common mullein
- Cheatgrass

The designated noxious weeds are found on the following website: http://www.co.clear-creek.co.us/depts/Weeds/Weeds/CC_noxious_weed.htm

Jefferson County lists the following:

- Chinese clematis (*Clematis orientalis*)
- Cyprus spurge (*Euphorbia cyparissias*)
- Myrtle spurge
- Plumeless thistle (*Carduus acanthoides*)
- Salt cedar
- Common mullein
- Yellow toadflax (*Linaria vulgaris*)
- Dalmation toadflax (*Linaria dalmatica*)
- Russian olive (*Elaeagnus angustifolia*)
- Oxeye daisy (*Leucanthemum vulgare*)

Jefferson County designated noxious weeds are found on the following website:
http://co.jefferson.co.us/weed/weed_T71_R0.htm.

4.3.1 Influence of Climate Change and the Mountain Pine Beetle on Corridor Habitat

A description of the influence of the mountain pine beetle on Corridor habitats is being prepared in coordination with the United States Forest Service and the United States Fish and Wildlife Service.

An initial literature search on the issue indicates a connection between climate change and the extent of the mountain pine beetle infestation.

Breshears et al. examined the impact of recent drought on piñon pine (*Pinus edulis*) trees in western North America, focusing on the relationships among tree die-off, temperature, and rainfall. They found that the 2000–2003 drought was not as dry as the previous drought of 1953–1956 but that it occurred during a warmer period and, hence, might illustrate drought effects in the future. Their analysis shows that the recent drought caused a rapid regional-scale loss of overstory trees mainly due to infestation by mountain pine beetles, outbreaks of which are commonly caused by water stress; whereas the 1950’s drought affected mainly older trees, the 2000’s drought killed trees of all ages. Similar widespread drought in this century could cause large changes in carbon storage and dynamics, fluxes of near-ground solar radiation, and patterns of runoff and erosion, as well as alter microclimate feedbacks between the land and atmosphere and reduce the production of piñon nuts, an important food source for a number of species of birds, small mammals, and local people (Smith 2005).

In a more recent study, researchers from the United States Geological Survey, the United States Forest Service, and six universities, including the University of Colorado at Boulder, examined historical data from 76 different forested areas in three regions across the West and found that mortality rates were rising across the board due to climate change (Science, 2009).

Thomas T. Veblen, a geography professor at the University of Colorado at Boulder, said the combination of increased wildfires, drought, and mountain pine beetles has devastated some of the state’s forests. Temperatures in Colorado’s subalpine forests, which are 8,500 to 10,000 feet in altitude, have risen markedly over the past 50 years during all seasons. According to Veblen, mountain pine beetles have

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killed about 3.5 million acres of lodgepole pine forests in northwestern Colorado over the past decade, wiping out 90 percent of pine forests in that area.

One example of the forest devastation is evident in the Rocky Mountain National Park. Drought has left trees too weak to fight the invading beetles (strong, healthy trees use sap to keep them out). Another factor is how uniform forests had become after nearly a century of fire suppression: Pure stands of feeble old trees succumb to beetles more readily than diverse forests. Finally, warmer-than-average temperatures in recent years have stimulated beetle reproduction and let larvae thrive throughout the winter. Rocky Mountain National Park has not experienced the cold snaps that have curtailed previous beetle outbreaks (Bastone, 2009).

The United States Forest Service has confirmed that the *I-70 Mountain Corridor PEIS* should note that the beetle infestation is changing conditions on the ground, that the changes are ongoing but the extent and breadth of change are not necessarily predictable, and that the most appropriate time to address those changing conditions is during Tier 2 processes. There is no change to the vegetation mapping or wildlife habitat characterization and mapping by the United States Forest Service (2009a).

4.4 Environmental Consequences

4.4.1 Direct Impacts

Direct impacts on vegetation occur when construction of new roadway or transit infrastructure removes existing vegetation. This decreases the natural function of the landscape and removes wildlife habitat. Loss of habitat results in a loss of foraging, nesting, and resting and denning areas for wildlife, which includes protected species. Generally, Alternatives with the largest footprint, the Highway Alternatives and the Combination Alternatives, have the greatest impact on vegetation because roadway expansion causes the greatest amount of land disturbance. The Advanced Guideway System Alternative has the fewest direct impacts due to its smaller footprint. The Preferred Alternative has a range of potential impacts comparable to nearly all the Action Alternatives. Potential impacts of the alternatives are described below. For vegetation impacts per alternative see **Table 3**, **Table 4**, and **Table 5**

No Action Alternative

The No Action alternative would consist of several planned or permitted projects, which are described in **Chapter 2, Description and Comparison of Alternatives**, of the *I-70 Mountain Corridor PEIS* (CDOT, 2010). Impacts on vegetation would also include current maintenance practices, construction activities at each improvement project and development that is occurring along the Corridor. No additional direct impacts on vegetation are anticipated to occur under the No Action alternative.

Minimal Action

The Minimal Action Alternative affects 76 acres of forested land, 89 acres of non-forested land, and 26 acres of barren land. Total impacts on vegetation in the Corridor by the Minimal Action Alternative are 191 acres.

Transit

The Rail with Intermountain Connection Alternative affects a total of 200 acres of vegetation in the Corridor. The Bus in Guideway alternatives have the greatest impact on vegetation among Transit alternatives, with a total of 240 acres being affected. The Advanced Guideway System Alternative has the lowest effect of all alternatives, at 157 acres of vegetation in the Corridor.

Highway

The Reversible/HOV/HOT Lanes alternative displaces more vegetation (233 acres) than the Six-Lane Highway 55 mph (221 acres) and Six-Lane Highway 65 mph (196 acres) alternatives.

Combination

The Combination Six-Lane Highway with Rail and Intermountain Connection alternative affects 334 acres of vegetation. The Combination Six-Lane Highway with Advanced Guideway System alternative affects 269 acres. The Combination Six-Lane Highway with Bus in Guideway alternatives results in the greatest impact among all alternatives, with a total of 337 acres affected.

Preferred Alternative

The Preferred Alternative has a range of potential impacts comparable to nearly all the Action Alternatives.

Table 3. Total Vegetation Impacts (acres)

Alternative	Previously Disturbed	Total Forested Vegetation	Total Non-Forested Vegetation	Barren Land	Total Vegetation Impacts
No Action		NA	NA	NA	NA
Minimal Action	339.4	75.8	89.2	26.1	191.0
Rail with IMC	610.8	118.5	64.2	16.8	199.5
AGS	570.4	90.8	54.8	11.4	156.9
Dual-Mode/Diesel Bus in Guideway	818.2	110.4	98.6	31.0	239.9
Six-Lane Highway (55 mph)	494.4	98.8	96.1	26.1	221.0
Six-Lane Highway (65 mph)	484.5	102.7	81.5	11.5	195.8
Reversible/HOV/HOT Lanes	520.4	107.2	99.8	26.1	233.1
Combination Six-Lane Highway with Rail and IMC	891.0	166.9	131.0	35.6	333.5
Combination Six-Lane Highway with AGS	834.8	126.9	113.6	28.0	268.5
Combination Six-Lane Highway With Dual-Mode/Diesel Bus in Guideway	1007.7	161.1	138.7	36.8	336.6
Preferred Alternative*	669.8-835.6	82.5-133.6	89.1-113.6	19.3-28.0	197.4-268.5

*The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. **Section 2.7** of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.

Key to Abbreviations/Acronyms

IMC = Intermountain Connection

AGS = Advanced Guideway System

HOV = High Occupancy Vehicle

HOT = High Occupancy Toll

mph = miles per hour

Table 4. Total Forested Vegetation Impacts (acres)

Alternative	Aspen Forest	Douglas-Fir Forest	Lodgepole Pine Forest	Pinon-Juniper	Ponderosa Pine	Spruce-Fir Forest	Total Forested Vegetation
No Action	NA	NA	NA	NA	NA	NA	NA
Minimal Action	2.1	5.2	3.2	20.9	37.2	7.2	75.8
Rail with IMC	4.6	6.9	7.1	20.9	61.1	17.9	118.5

Table 4. Total Forested Vegetation Impacts (acres)

Alternative	Aspen Forest	Douglas-Fir Forest	Lodgepole Pine Forest	Pinon-Juniper	Ponderosa Pine	Spruce-Fir Forest	Total Forested Vegetation
AGS	2.0	6.2	1.9	26.2	45.9	8.5	90.8
Dual-Mode/Diesel Bus in Guideway	6.0	5.2	2.3	35.1	51.2	10.6	110.4
Six-Lane Highway (55 mph)	2.1	5.2	3.5	20.9	53.5	13.7	98.8
Six-Lane Highway (65 mph)	0.6	10.6	3.5	20.9	53.4	13.8	102.7
Reversible/HOV/HOT Lanes	2.1	6.0	4.0	20.9	57.4	16.9	107.2
Combination Six-Lane Highway with Rail and IMC	5.6	9.4	9.2	20.9	93.5	28.2	166.9
Combination Six-Lane Highway with AGS	2.9	7.1	5.3	26.2	62.8	22.6	126.9
Combination Six-Lane Highway With Dual-Mode/Diesel Bus in Guideway	6.2	7.9	5.4	35.0	84.7	21.9	161.1
Preferred Alternative*	2.5-2.9	7.0-12.0	4.7-5.4	26.2	33.5-64.6	8.2-22.8	82.5-133.6

*The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. **Section 2.7** of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.

Key to Abbreviations/Acronyms

IMC = Intermountain Connection
HOV = High Occupancy Vehicle

AGS = Advanced Guideway System
HOT = High Occupancy Toll

NA = not applicable
mph = miles per hour

Table 5. Total Non-Forested Vegetation Impacts (acres)

Alternative	Alpine Meadows-Tundra	Grass/Forb Meadow	Mountain Shrubland	Sagebrush	Total Non-Forested Vegetation
No Action	NA	NA	NA	NA	NA
Minimal Action	0.0	7.5	49.0	32.7	89.2
Rail with IMC	0.0	13.6	27.8	22.7	64.2
AGS	0.0	6.6	20.2	28.0	54.8
Dual-Mode/Diesel Bus in Guideway	0.0	11.5	37.0	50.1	98.6
Six-Lane Highway (55 mph)	0.0	8.3	55.1	32.7	96.1
Six-Lane Highway (65 mph)	0.0	7.0	40.8	33.7	81.5
Reversible/HOV/HOT Lanes	0.0	8.2	58.8	32.7	99.8
Combination Six-Lane Highway with Rail and IMC	0.0	19.2	78.3	33.5	131.0

Alternative	Alpine Meadows-Tundra	Grass/Forb Meadow	Mountain Shrubland	Sagebrush	Total Non-Forested Vegetation
Combination Six-Lane Highway with AGS	0.0	12.1	62.9	38.7	113.6
Combination Six-Lane Highway With Dual-Mode/Diesel Bus in Guideway	0.0	15.5	71.4	51.8	138.7
Preferred Alternative* Minimum Program 55 mph	0.0	10.9-12.1	41.3-62.9	36.9-38.7	89.1-113.6

*The Preferred Alternative is presented as a range because the adaptive management component allows it to be implemented based on future needs and associated triggers for further action. **Section 2.7** of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.

Key to Abbreviations/Acronyms

IMC = Intermountain Connection
HOV = High Occupancy Vehicle

AGS = Advanced Guideway System

NA = not applicable

HOT = High Occupancy Toll mph = miles per hour

4.4.2 Indirect Impacts

Indirect impacts on vegetation, including riparian habitat, include the effects of winter roadway maintenance associated with deicers. Impacts are greatest nearest the highway, but splash, runoff, and aerial drift can affect vegetation over 300 feet from the highway. These salts can damage the needles and photosynthetic tissue of coniferous trees, and result in lower germination rates. Also, land disturbance caused by construction and increased traffic within the Corridor create favorable conditions for the introduction and further spread of noxious weeds into adjacent lands. These lands include wildlife habitat located on public lands, such as National Forests and designated wilderness areas.

Alternatives that add more traffic lanes (such as the Highway and Bus in Guideway Alternatives) require additional winter maintenance leading to increased impacts compared to alternatives with less new roadway construction.

Environmental Effects of Deicers

Activities for maintenance of traction and mobility on the highway are known to increase sediment and contaminants in runoff to adjacent waterways. This occurs when snowmelt and rainfall runoff drains from the highway and shoulder areas into waterways and streams. To assess the impacts on receiving streams, CDOT has conducted a monitoring program since 2000 for direct snowmelt and stormwater runoff from I-70, as well as in adjacent runoff-impacted streams. The pollutant constituents—suspended solids, phosphorus, chloride (sodium and magnesium), copper, and zinc—have been identified in water quality monitoring as priority pollutants associated with the operation of I-70 due to their potential toxicity or threat to aquatic habitat or public water supplies. Although other constituents/pollutants are identified in urban highway runoff, such as trace metals related primarily to vehicle wear (FHWA, 1990), they are considered secondary pollutants in the I-70 Mountain Corridor and were not studied for the PEIS.

The Colorado Department of Transportation has increased the use of liquid deicers since 1996. Starting in 2002 (also a dry year), the data generally show a decreasing trend in sand usage and a corresponding increase in liquid deicer use throughout the Corridor. The change from sanding to chemical deicers was undertaken to avoid the impacts associated with sand (sediment deposition).

Colorado Department of Transportation maintenance data compiled after the 2001 suggest significant changes in winter maintenance material usage. A trend away from sand/salt toward more widespread use of sand/slicer mixture and liquid deicer salts is shown, particularly in the higher elevation areas including

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the east and west tunnel approaches and Vail Pass. This shift in materials has been measured in receiving stream water quality, particularly in Black Gore Creek and Straight Creek. Both streams have draft or completed total maximum daily loads (TMDLs) for water quality impairment from I-70. Black Gore Creek data show a decreasing trend in sediment loading and an increase in chloride concentrations and loads. Straight Creek and Upper Clear Creek also show an increase in chloride concentrations and loads in recent years.

Some of the earlier literature surrounding the water quality effects of deicer usage included pre-2001 studies such as the Lewis (1999) study, which was published before highway runoff water quality data were available for I-70 Corridor streams. The 1999 study estimated that stream chloride concentrations could increase by as much as 5 times from snowmelt runoff events. Subsequent CDOT data show that increases in chloride concentrations of more than 100 times are common each winter.

More recent maintenance data show that deicer application rates have increased in many areas, and stream data indicate that the chronic aquatic life chloride standard (230 mg/L) is exceeded every year in high elevation streams receiving I-70 runoff. The chloride concentrations in high elevation streams along I-70 can be 100 times or more greater than normal (background) levels, as a result of highway runoff. The primary forms of chloride (sodium and magnesium) used on I-70 are highly soluble and, therefore, highly mobile in the environment. Once in solution, these compounds travel rapidly into the streams and through the aquatic environment. Water quality standards are commonly exceeded during winter.

Numerous constituents of winter maintenance materials can impact vegetation, as discussed below.

Evaluation of Alternative Anti-Icing and Deicing Compounds Report No. CDOT-2009-1: Summary of Environmental Effects Conclusions

As a result of concerns raised about the use of chloride-based salts because of their corrosion impact on motor vehicles and highway bridges, CDOT commissioned a study from the Western Transportation Institute of Montana State University to evaluate potassium acetate, sodium acetate/formate blend deicers, and potassium formate as alternative anti-icing and deicing compounds relative to sodium chloride (NaCl), salt/sand mixtures, and magnesium chloride (MgCl₂) currently used by CDOT (Shi et al. 2009).

Colorado Department of Transportation has shifted from using primarily NaCl and sand to using MgCl₂ liquid deicers for wintertime operation and maintenance of state and national highway systems over the past several years. According to the field experience of CDOT personnel, MgCl₂ outperformed the salt-sand mixture as a deicer. Compared with the salt/sand mixture, MgCl₂ has proved to be more effective, less toxic, and less corrosive and to significantly decrease the amount of sediment entering Colorado's streams and particulates entering its air (Shi et al. 2009).

While impacts on roadways and associated infrastructure were the focus of the Shi, et al. study, environmental impacts were also assessed in some detail, and these findings are summarized in this Technical Report. All deicers have impacts on the environment, and these impacts vary depending on the formulation and location of application of the deicer compound. Abrasives (such as sand) contribute to suspended solids in water runoff and reduced air quality. Deicers (chlorides, acetates, and formates) become dissolved in runoff. The Shi, et al. report recommends further testing for many of the deicers. Following is a brief synopsis of the environmental effects conclusions of this study.

Abrasives

Application of abrasives, such as sand, can contribute to the concentration of small particles in the atmosphere.) The Environmental Protection Agency regulates particulate matter that is smaller than 10 microns in diameter (PM₁₀). Excessive PM₁₀ can lead to a designation of "non-attainment" under the Clean Air Act. Complete information on air quality is provided in **Section 3.1, Air Quality**, of the *I-70 Mountain Corridor PEIS* (CDOT, 2010). Other issues associated with the use of abrasives include increased water turbidity, clogging of streams and stormwater drains, and reduced oxygenation.

Chlorides

Chloride associated with potassium, magnesium, and calcium would be more toxic to aquatic life and should be managed at lower concentrations. Chloride concentrations as high as 10,000 mg/L and 18,000 mg/L have been recorded in winter following road salting, and generally the highest salt concentrations in surface waters are associated with winter or spring thaw flushing events. However, these high concentrations generally dilute quickly.

Project-specific information on mean chloride concentrations and drinking water standards can be found in the *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, 2010).

Studies on chloride effects on plants affirmed the results of the Factors Impacting the Health of Roadside Vegetation Study completed for CDOT (Trahan and Peterson 2007). See **Appendix B** for the vegetation study.

Acetates and Formates

Acetates have been studied as an alternative to chloride-based products for snow and ice control because of reduced environmental impacts. However, acetates are more expensive, and acetate decomposition may result in anaerobic soil conditions and oxygen depletion in surface waters. High levels of any of the acetates and formates are considered problematic for both aquatic life and plant health.

Acetate-based deicers contribute to the increase in biological oxygen demand (BOD), which reduces the available oxygen for organisms in both soil and aquatic environments. Sodium acetate/formate studies have shown that during spring runoff, short periods of BOD in receiving waters may occur, and this substance has been found to cause increased turbidity, hardness, and alkalinity in water.

Acetate is readily biodegraded by organisms. Sodium acetate/formate has been demonstrated to have positive impacts on pine and sunflower growth by acting as a fertilizer at concentrations of 0.5 g/kg; however, detrimental effects on plants at higher concentrations of 4g/kg have been observed. Potassium formate concentrations less than 4g/kg have been found to have detrimental effects on vegetation.

Decomposition of calcium magnesium acetate (CMA) has been shown to take approximately three times longer in water than in soils. CMA can enhance plant growth because it improves soil permeability and provides calcium and magnesium that may have been depleted in areas where heavy salt use has resulted in soil compaction.

Factors Impacting the Health of Roadside Vegetation Report No. CDOT-DTD-R-2005-12 and Supporting Research

Following is a synopsis of a deicer study commissioned from the University of Northern Colorado that had commenced in 2004, and was completed in 2007 (Trahan and Peterson 2007). The purpose of the study was to provide an ecological impact assessment of factors affecting the health of roadside vegetation in the state of Colorado, including potential biotic and abiotic plant stressors and deicer applications (Trahan and Peterson 2007). In addition to the synopsis, supporting research is presented following Trahan's conclusions (Supporting Research), see **Appendix B**.

Determination of the Extent and Mode of Colorado Roadside Vegetation Exposure to Deicers and the Relationship to Tree Health

- **Trahan's conclusions**—Conifers along Colorado roadways showed substantial foliage damage, in both photosynthetic tissue in needle tips and needle base damage. Foliage damage in roadside conifers correlated significantly with the presence of salt ions in plant tissues, and in all cases, chloride content in needle tissue correlated with foliage damage. As the sodium and chloride content in needle tissues increased, so did observed levels of foliage injury in Colorado roadside pines. Levels of sodium and chloride in the tissues of roadside ponderosa and lodgepole pines exceeded levels known to damage foliage even in late fall, which indicated that the salts remain

in the needle tissue year-round and cause long-term stress to the trees. Splash zones and aerial drift contribute to salt deposition more than 328 feet from the roadway.

- **Supporting research**—Many abiotic and biotic factors affect the health of roadside vegetation, including the application of $MgCl_2$ dust suppression products, although foliar chloride concentrations are more strongly related with foliar damage than magnesium. Three hundred seventy kilometers (230 mi) of forested, shrubland, meadow, rangeland, riparian, and wetland roadside habitats were surveyed along major nonpaved roads in two Colorado counties. Severely damaged (greater than 50 percent damage) vegetation ranged from 6.4 percent to 11.4 percent of roadside cover, with the most severely damaged vegetation occurring downslope from the road. Percent of plants with severe or moderate damage increased with increasing $MgCl_2$ application rates for roadside aspen (*Populus* spp.), Engelmann spruce (*Picea engelmannii*), and lodgepole (*Pinus contorta*) and ponderosa pines.

Chloride toxicity in woody plants initially develops as a marginal necrosis on deciduous leaves, or a tip burn, or necrosis on conifer needles. Generally, the higher the foliar chloride concentrations, the more extensive the necrosis becomes. Some symptoms associated with exposure to deicing salt spray, aerosols, or road dust differ from root absorption. The side of the tree facing the road may exhibit more damage, and needles may have surface deposits of salt crystals or dust. Trees exposed to $MgCl_2$ aerosols are often, but not always, in soils with high $MgCl_2$ concentrations and thus may show a range of symptoms (Goodrich et al. 2008).

Evaluation of Photosynthesis and Leaf Level Gas Exchange in Colorado Roadside Conifers Prior to and Over a Deicing Season

- **Trahan's conclusions**—Leaf-level photosynthesis rates were reduced during late winter and early spring, but no differences were noted in the summer and late fall. This may indicate the ability of the plant to have a level of recovery during the growing season. Higher levels of chlorotic (yellow or whitening) and necrotic foliage along Colorado roadsides resulted in an overall canopy photosynthesis reduction. Although previous controlled experiments have shown correlations of decreased photosynthetic rates and the presence of salt ions, these correlations were not found in the field study. Stomatal diffusion (passage of water vapor and carbon dioxide through the small pores of a plant necessary for photosynthesis process) may have been impaired during deicing season due to the presence of resuspended road particulates that coat the plants.

Laboratory Investigation and Comparison of the Effects of Various Sand/Salt Mixtures and Liquid Deicers on Plant Health, Photosynthesis (Leaf-Level Gas Exchange), and Seed Germination

- **Trahan's conclusions on plant health and leaf-level gas exchange**—Laboratory investigation and field site study areas both resulted in significant foliar injury in ponderosa and lodgepole pine saplings, and complete sapling mortality occurred with higher concentrations of $MgCl_2$ (FreezeGard).

Sapling damage from exposure to $MgCl_2$ is believed to be caused from chloride exposure rather than magnesium. In the deicer mixture, toxicity may be exacerbated because of the heavier concentration of chloride anions when compared to a salt/sand application. Direct foliar contact with $MgCl_2$ resulted in more plant injury than exposure through the soil. Aerosol sprays of $MgCl_2$ and NaCl produced similar results as a non-selective herbicide, with conifers showing a particular sensitivity.

Photosynthesis and water use efficiency decreased within one hour of foliar application of any concentration of $MgCl_2$ to ponderosa pine saplings. Stomatal conductance (a numerical measure of the maximum rate of passage of either water vapor or carbon dioxide through the stomata, or small pores of the plant) was not observed, implying a reduction in the capacity of the plant to fix carbon, both of which are necessary to complete the photosynthesis cycle. Full strength exposure

of $MgCl_2$ to lodgepole saplings resulted in depressed levels of net carbon assimilation (the conversion of nutrients into living tissue), stomatal conductance, transpiration (the loss of water by evaporation), and corresponding higher water use efficiency.

Sand/salt mixtures resulted in the least effects on sapling health and physiology.

- **Supporting research on plant health and leaf-level gas exchange**—“Field and greenhouse studies have found direct application of $MgCl_2$ to be more damaging to plant foliage than $NaCl$, causing decreased photosynthesis rates on exposed foliage adjacent to roadways. Many studies have indicated that needle necrosis, twig dieback, and bud kill are associated with areas of heavy deicing salt usage, with trees and foliage down wind and facing the roadside more heavily affected than trees further away” (Shi et al. 2009).
- **Trahan’s conclusions on seed germination**—As exposure to deicer concentrations increased, germination percentages decreased in western wheat grass (*Pascopyrum. smithii*), green needle grass (*Stipa viridula*), and Idaho fescue (*Festuca idahoensis*). Of the three species evaluated, western wheat grass demonstrated the highest overall deicer germination tolerance, followed by green needle grass and Idaho fescue. The least amount of germination was seen in Ice Ban, Caliber M-1000, Caliber M-2000, and CDOT $MgCl_2$ (FreezGard). In all cases, as deicer concentration increased, germination decreased. As expected from the published literature, no germination was observed in seeds of any species exposed to full roadbed application strength of any tested deicer. Seeds exposed to sand/salt had significantly higher germination than any other salts tested, as would be expected considering the lower level of salinity of the deicer.

Only seeds previously exposed to $MgCl_2$ deicer (FreezGard) and Caliber M-1000 underwent full germination recovery after a period of deicer exposure. Seeds previously exposed to NC-3000 and Ice Slicer displayed the least amount of germination recovery. These data suggest that the suppression of seed germination by $MgCl_2$ deicer (FreezGard) and Caliber M-1000 is a function of osmotic inhibition (the pressure exerted by the flow of water through the seed coat is inhibited). Germination suppression by other tested deicers may be more related to an associated toxicity. Of the species tested, western wheat grass exhibited the greatest percentage of germination recovery (mean average 78 percent), followed by green needle grass (mean average 69 percent) and Idaho fescue (mean average 52 percent).

Germination decreased as exposure to FreezGard deicer concentration increased in native Colorado plants, including common gaillardia (*Gaillardia aristata*), James’ galleta or curly grass (*Hilaria Jamesii*), slender wheatgrass (*Elymus trachycaulus*), mountain brome (*Bromus marginatus*), blue gamma (*Bouteloua gracilis*), Engelmann spruce (*Picea engelmannii*), blackeyed Susan (*Rudbeckia hirta*), ponderosa pine (*Pinus ponderosa*), and rabbitbrush (*Chrysothamnus nauseosus*).

In all cases non-viable seeds occurred most often at intermediate salt concentration exposures due to fungal contamination, suggesting that deicer stress may act synergistically with environmental pathogens to impact seed viability.

- **Supporting research on seed germination**—Tolerance to $NaCl$ for some vegetation, specifically pine seedlings, is as low as 67.5 ppm in soils. For seed germination and root growth to occur for grasses and wildflowers, the $NaCl$ concentration in soil should be less than 100 ppm. Some woody and herbaceous species, however, tolerate up to 200 ppm of $NaCl$ (Shi et al. 2009).

Assessment of Leaf Water Status in Conifer Trees Within Designated Plots Accounting for the Presence of Drought Stress Prior to and Throughout the Deicing Season

- **Trahan’s conclusions**—Drought stress in the roadside environment could not be linked to foliage injury in Colorado roadside conifers. No significant differences were observed in water stress between trees adjacent to roadside or distant from the roadside in either the winter or

throughout the growing season. Although roadside trees may experience higher levels of insolation (a measure of solar radiation energy received on a given surface area in a given time) due to vegetative cover loss, these results indicate that water stress is not directly contributing to tissue death in roadside vegetation. While significant differences were seen in water stress by site location, water stress failed to significantly correlate with distance from the roadside or any measure of foliar injury. Leaf tissue pre-dawn water potentials also did not correlate with measures of salt exposure.

- **Supporting research**—A duplicate of this specific type of test on conifers was not found. However, in a study conducted in Connecticut on woody ornamentals, symptoms of deicing salt injury resemble those associated with root damage or drought stress, which vary with salt concentration, length of exposure, and plant species. Common symptoms include foliar browning, tip necrosis, marginal scorch, leaf/needle drop, tip and branch dieback, stunting, premature fall coloration (on deciduous species), death of vegetative and flower buds, and, in extreme situations, outright tree death. One diagnostic feature of salt injury is that “spray zone” symptoms are often confined to the side of the tree or shrub facing the road and usually occur within 30 to 50 feet of the road. Additionally, a gradient of damage can often be seen with trees or shrubs closer to the road showing more damage than those farther back. Woody ornamentals show considerable variation in their relative tolerance to deicing salts. However, research has demonstrated that trees and shrubs that have been weakened by drought stress are more sensitive to deicing salts than their healthy counterparts (Douglas 2007).

Direct and Indirect Assessment of Other Factors Potentially Deleterious to Roadside Vegetation Including: Pollution, Nutrient Availability, Disease, and Insect Impacts in Areas Where Deicer Stress May Be a Concern

- **Trahan’s overall conclusions**—The data suggest that salinity in Colorado roadside soils does not for the most part appreciably affect nutritional balance in the shoot and leaf tissues of lodgepole and ponderosa pines. The UNC report states that this conclusion is further backed by studies conducted on maritime pine by Saur et al., and studies on roadside sugar maples conducted by Hall et al.
- **Trahan’s conclusions on pollution**—Trees and soils along roadsides exhibited increased levels of pollutants and trace metals. Specifically, significantly elevated levels of sulfur in needle and twig tissue, nitrogen and copper in needle tissue, and lead in twig tissue and soils were observed, and the content of sulfur and nitrogen content decreased as distance from the roadbed increased. Needle sulfur concentrations have been linked to stomatal uptake of sulfur dioxides and needle nitrogen concentrations to dry or wet deposition of atmospheric nitrous oxides, and foliar necrosis correlated weakly but significantly with uptake sulfur and nitrogen.

Ozone damage has been linked to “weather fleck” and leaf mottling in deciduous species, and the damage patterns are similar to salt damage patterns. However, it should be noted that although ozone damage patterns are similar to salt damage patterns, ozone is a widely distributed pollutant, and given that foliar injury is significantly concentrated in the roadside environment points instead to a localized causative agent.

- **Supporting research on pollution**—Similar findings were found in a study conducted on vegetation composition, soil parameters, and deposition on coniferous trees in southern Germany in 2005. The results suggested that motorways have an impact on the vegetation composition near roads. The vegetation is mainly affected by the deposition of nitrogen deriving from fuel combustion and by basic substances added to road salt. Vegetation near motorways was strongly influenced by traffic-borne nitrogen (Bernhardt-Römermann et al. 2005).
- **Trahan’s conclusions on nutrient availability**—The surface profile of Colorado roadside soils was of relatively poor quality compared to soils further away from the roadside environment.

Roadside study site soils exhibited significantly lower levels of major plant nutrients, including total nitrogen, potassium, calcium and phosphorus. Additionally, soil organic matter and total organic carbon content was significantly reduced adjacent to the roadbed than in soils further away. Overall decreases in soil organic matter, total nitrogen, and potassium levels explained only up to 7 percent of the variation in crown necrosis and, therefore, are highly unlikely to be prime causative agents in foliar injury. Leaching of soil magnesium, potassium, and calcium cations due to the presence of elevated sodium levels was also observed.

As soil potassium, calcium, and phosphorous levels and conifer needle and twig calcium increased, a corresponding decrease in photosynthesis rates was observed, which may be related to overall soil salinity, as leaf photosynthesis rates were reduced in relation to the overall levels of total soluble salts in roadside soils.

Although significant degradation of the nutrient status was observed in roadside soils, only the total organic carbon in conifer needle tissue was significantly lower in roadside trees in comparison to off-road study trees, which suggests that roadside soils still offer a sufficiency of most mineral nutrients for vegetation growth and physiology.

- **Trahan's conclusions on disease and insect impacts**—Study site trees exhibited only minor damage attributable to disease, insect, animal, and abiotic damage that was unlikely to have an impact on their health and physiology. Previous examinations of sodium-damaged ponderosa pines in Denver also exposed to fungi, insects, or nematodes that could be implicated as causal agents of foliar injury.
- **Supporting research on disease and insect impacts**—The Washington State Department of Transportation (WSDOT) reports that scientists representing the United States Forest Service in Washington State were well aware of the needle browning phenomenon and explained that in the scheme of all forest diseases, they had little concern over the browning that may be caused by deicing. The United States Forest Service views the browning as a temporary event and have a more profound concern over chronic forest disease like bus worm, pine beetle, and fungus, which are filling northwest trees in great numbers (WSDOT 2007).
- **Overall study conclusions (Trahan)**—Although some degree of pollutant exposure and alternations of nutrient balance no doubt have an impact on Colorado roadside conifers, the correlations formed with measures of tree health and physiology explained very little of the observed variation. In contrast, accumulation of salt ions in plant tissue formed robust correlations with conifer foliar injury. Observed disease, insect, animal, and other abiotic damages could not be linked to reductions in tree physiology or foliar injury.

Winter Maintenance Strategies

Impacts on vegetation and aquatic life would occur with or without the proposed project because CDOT is already using deicing procedures along I-70. The impact from the proposed project would cumulatively add to the deicing process with the increased magnesium chloride ($MgCl_2$) or sodium chloride ($NaCl$) used for additional pavement.

Examination of specific mitigation measures, and the effects as a result of project-specific activities will be assessed by the Stream and Wetland Ecological Enhancement Program (SWEEP) during Tier 2 processes. Mitigation strategies for water quality and streams are described in the *I-70 Mountain Corridor PEIS* (CDOT, 2010).

The *I-70 Mountain Corridor PEIS* mitigation measures are primarily focused on sediment control. The Sediment Control Action Plans specify physical-based control rather than chemical and address chloride loading only to the extent that chloride can be captured with the sand. In contrast to salt, which cannot be

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easily controlled once in solution, sediment from traction sand is relatively easy to control using conventional structural best management practices.

The Colorado Department of Transportation Maintenance Division will continue to research alternative deicers and traction materials and methods and their potential impacts on the adjacent environment and to develop long-term directions that address the issue of increased contaminants in runoff to adjacent waterways. There will be an update from the Mitigation Issue Task Force and the SWEEP Committee.

The Colorado Department of Transportation's winter maintenance group met on July 13, 2009, to discuss winter maintenance and water quality trends. The purpose of this meeting was to initiate possible future adjustments to winter maintenance practices in the Corridor that maintain a balance between driver safety and influence of deicing salt and sand materials on the environment. The following notes indicate the strategies under discussion.

Colorado Department of Transportation Winter Maintenance Meeting

The following are summaries of conclusions from the CDOT Winter Maintenance meeting, see **Appendix C** for the meeting minutes:

■ Operational mitigation measures

- Early closure—Due to public safety concerns, Corridor communities and emergency response agencies increasingly support early road closure if a storm is expected to be severe due to public safety concerns. This would reduce overall material use since no material would be applied until the storm plays out. Operational efficiency can also be achieved by clearing snow and applying chemicals before opening the road where traffic interferes with maintenance operations.
- Speed management—Use signage to control speed in difficult driving conditions and to reduce speeds approaching areas where traffic begins to back up.

■ Management of sand and deicer materials

Based on Maintenance staff comments, the top three factors for controlling use of sand and deicers were (1) heavy traffic, (2) training, and (3) experience.

- Heavy traffic—The general philosophy has been to keep the road open. Possible mitigation measures would include early road closure.
- Training/education—Frequently, some operators tend to use more material than is needed, and material application is sprayed outside the travel lane. Due to high workloads for Maintenance staff, training must be short and focused. Discussion must balance between keeping the roadway safe and reducing use of deicers.
- Experience—Difficulty in keeping experienced Maintenance staff is the result of low pay (relative to adjacent municipalities), long hours, and perceived lack of respect from other CDOT staff. Turnover rates in the mountains are exceedingly high. Inexperienced operators tend to use far more material than experienced ones. Reduction in turnover will significantly reduce winter maintenance material use.

Possible mitigation measures would include initial planning for snowstorm events. Variables discussed in the meeting include the following:

- It is possible to manage the amount of sedimentation by picking up and disposing of used traction sand; however, it is not possible to manage salt going into the stream except for percentage and type of salt used in the mix.
- Ice slicer is more concentrated than rock salt; therefore, consideration needs to be given to the type of salt used in sand/salt mixes.

- Liquid magnesium chloride can be more effective than solid salt but does not work in all conditions.
- Chloride concentration varies among the different salt products and some type of conversion table would be useful for determining how much of a product is needed.
- **Other management considerations**
 - Additional weather stations are needed to plan application amount. Problems exist with receiving weather signals in parts of the Corridor. Also, conditions vary significantly with elevation, even along a few miles of roadway. Drivers tend to spread materials to address the worst possible weather along a patrol length. More weather stations (and automated equipment) would allow the operators to vary materials usage within their patrols.
 - Automated systems need to be installed on more equipment for operators to respond to differing weather conditions within their patrols. Currently, only 10 percent of the equipment used in the Corridor is automated. The other 90 percent of operators have to stop, leave the truck cab, walk to the back, and change the spreader/sprayer volume manually—all in the middle of snowstorms or blizzards. It is more efficient (and safer) for operators to set volumes to the largest amount needed and keep driving. Automated equipment would also help less experienced operators control materials use.
 - Calibrated spreaders would eliminate “guess work”.
 - Consistent data are needed on truck loads to determine effectiveness of the program. The driver fills out a logbook, but it is based on his estimate rather than on any direct measurement. Since Total maximum daily loads are based on sand usage, consistent data are critical to meeting regulations. Automatic data recorder could be used for bucket loader size. A scale for the loader buckets would provide a better means for tracking material usage. Weight scale for the truck could be used; however; this needs to consider the condition of the truck and material being loaded if either is covered with snow or frozen material.
 - Contractor removal of the sand has proven to be very expensive. Cost-benefit of increasing CDOT maintenance sand cleanup costs needs to be evaluated as tradeoff against contractor costs.
 - Options need to be evaluated consistently for net present value.
- **Maintenance of future auxiliary lanes**

A map showing the auxiliary lanes that may be implemented as part of the Preferred Alternative was provided. The anticipated timeline for auxiliary lane construction is unknown. **Table 6** identifies the locations for proposed auxiliary lanes.

Table 6. Proposed Auxiliary Lane Locations

Location	Eastbound	Westbound
West Vail Pass	mp 180–190	mp 180–190
Frisco to Silverthorne	mp 203–205	
Eisenhower-Johnson Memorial Tunnels	mp 216–218.5	mp 216–221
Empire to Downieville	mp 232–234	mp 232–234
Mount Vernon Canyon		mp 252–258

In areas where auxiliary lanes are planned, CDOT Maintenance has suggested that at times the fast lane would be plowed with little or no sand or deicer material applied. Material would be applied to the other two lanes to keep them open to vehicles that cannot handle snow conditions or drivers who prefer to take less risk because of the road conditions.

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Therefore, adding a third lane does not result in a direct correlation for an additional 33 percent of sand or deicer material. Depending on how the roadway is maintained, the actual factor may be closer to a 10 percent increase.

Transportation Research Board

The Transportation Research Board (TRB) has completed the Guidelines for the Selection of Snow and Ice Control Materials to Mitigate Environmental Impacts, Report No. TRB 577 (2007), which provides a downloadable interactive decision tool software (TRB 2007). The overall objective of the project was to develop guidelines for selecting snow and ice control materials based on their properties and common site-specific conditions near roadways on which these products would be used. To develop the guidelines, 42 products were obtained that represented the 2004 United States and Canadian market in terms of product type (NaCl, MgCl₂, CaCl₂, CMA, and KA), manufacturers, regional sources, and additives. Abrasives were not included in the test program, given that material sources are too numerous and varied. All products received full chemical analysis. Aquatic toxicity testing was conducted on 15 snow and ice control products following Environmental Protection Agency standard test methods for chronic exposure to various levels of aquatic biota, including vertebrates, invertebrates, and algae. Following is a brief synopsis of the findings (TRB 2007):

“Although it is likely that the most sensitive organisms would be affected in some way at dilutions that could be expected at the margin of a roadway for many snow and ice control materials, it is also true that dilutions greater than 500:1 can be expected within a relatively short distance beyond the roadway. Therefore, the toxicity data imply that there could be an impact zone relatively close to the roadway, bounded by dilutions that offset acute or chronic toxicities close to the roadway.”

4.4.3 Construction Impacts

Additional temporary disturbance to vegetation is expected during construction. The temporary removal of vegetation may result in some small animal mortality, and big game or bird species leaving the area. Forested lands will take the longest to return to their original state and grasslands will recover quickest.

4.4.4 Impacts in 2050

By 2050, potential effects of climate change and the dynamic natural response to mountain pine beetle infestation could alter the existing terrestrial and aquatic habitat along the Corridor. These potential changes include, but are not limited to, alterations to existing vegetation communities, water quality concerns due to runoff from forests in early succession, and changes to the hydrologic cycle. The changes in habitat, and subsequent change in species present, alter the wildlife management efforts of the United States Fish and Wildlife Service, United States Forest Service, and Colorado Division of Wildlife, so the project could affect species currently not found in the Corridor but occurring there in the future. Continued habitat loss may occur due to commercial and residential development but may taper off by 2050 because of limited water resources and land use management. Benefits from the ALIVE and SWEEP Memoranda of Understanding could improve wildlife movement and protect aquatic resources, respectively.

4.4.5 Tier 2 Considerations

Lead agencies will conduct further analysis of direct and indirect impacts on vegetation during future project-specific Tier 2 processes. These actions include the following:

- Lead agencies will perform surveys for protected species and their habitat. The United States Fish and Wildlife Service, United States Forest Service, and Colorado Division of Wildlife will provide relevant and updated species lists. This information will be incorporated into project design to avoid or minimize effects on such species. Lead agencies will complete a biological

assessment and biological report, using the Tier 1 process as a foundation, to analyze impacts on protected species.

- Lead agencies will discuss the influence of the mountain pine beetle on the forested communities and its effects on wildlife habitat, in coordination with the United States Fish and Wildlife Service and United States Forest Service.
- Lead agencies will evaluate potential mitigation for winter maintenance effects based on current research.
- Lead agencies will adhere to any new or revised laws or regulations pertaining to vegetation.
- Lead agencies will develop specific best management practices for each project.
- Lead agencies will develop specific and more detailed mitigation strategies and measures.
- Lead agencies will consider opportunities for enhancement on a project-by-project basis.
- Lead agencies will develop a Tier 2 Biological Impacts Plan to include analysis of sensitivity zones, terrestrial impacts, habitat connectivity, and cumulative impacts.

4.4.6 Mitigation

A phased approach to construction provides the opportunity for adapting transportation solutions to the environmental sensitivity of the I-70 Mountain Corridor over time. The phased approach allows ongoing opportunities to avoid and minimize environmental impacts, establish effective mitigation, and employ I-70 Mountain Corridor Context Sensitive Solutions strategies. In summary, the overall mitigation strategies provide the opportunity to reduce impacts on wildlife habitats and enhance the compatibility of the I-70 Mountain Corridor with regional wildlife movement and habitat connectivity. **Section 3.19, Mitigation Summary**, of the *I-70 Mountain Corridor PEIS* (CDOT, 2010), also provides additional discussion of mitigation strategies.

How will vegetation and habitat impacts be minimized?

The Colorado Department of Transportation will identify areas of potential habitat restoration, in coordination with the United States Forest Service and local entities. Removal of trees and shrubs for implementation of Action Alternatives will be done during the non-nesting periods per the Migratory Bird Treaty Act. Also, mitigation of protected bird and fish species will comply with South Platte Water Related Activities Program and the Platte River Recovery Implementation Program.

How will the spread of noxious weeds be minimized?

The Colorado Department of Transportation will manage the clearing and earthmoving operations to minimize the potential for weeds to infest new areas and/or increase in abundance through the construction disturbance area. This includes the application of best management practices to all construction sites to manage open soil surfaces and topsoil stockpiled for reuse, including landscape and planning designs that incorporate the use of native vegetation and integrated noxious weed controls. The Colorado Department of Transportation will prepare and implement Noxious Weed Management Plans for all projects, which are usually completed just prior to construction so as to reflect the most recent federal and local noxious weed lists and guidance.

How will winter maintenance and deicer impacts be minimized?

The Colorado Department of Transportation will limit the effects of winter maintenance by controlling the runoff of contaminants and winter maintenance materials to the greatest extent possible. The Colorado Department of Transportation will continue to refine its approach to winter maintenance in an effort to decrease the use of deicers and traction sand. Mitigation strategies will be designed to be complementary to the existing Sediment Control Action Plans on Straight Creek, Black Gore Creek, and Clear Creek.

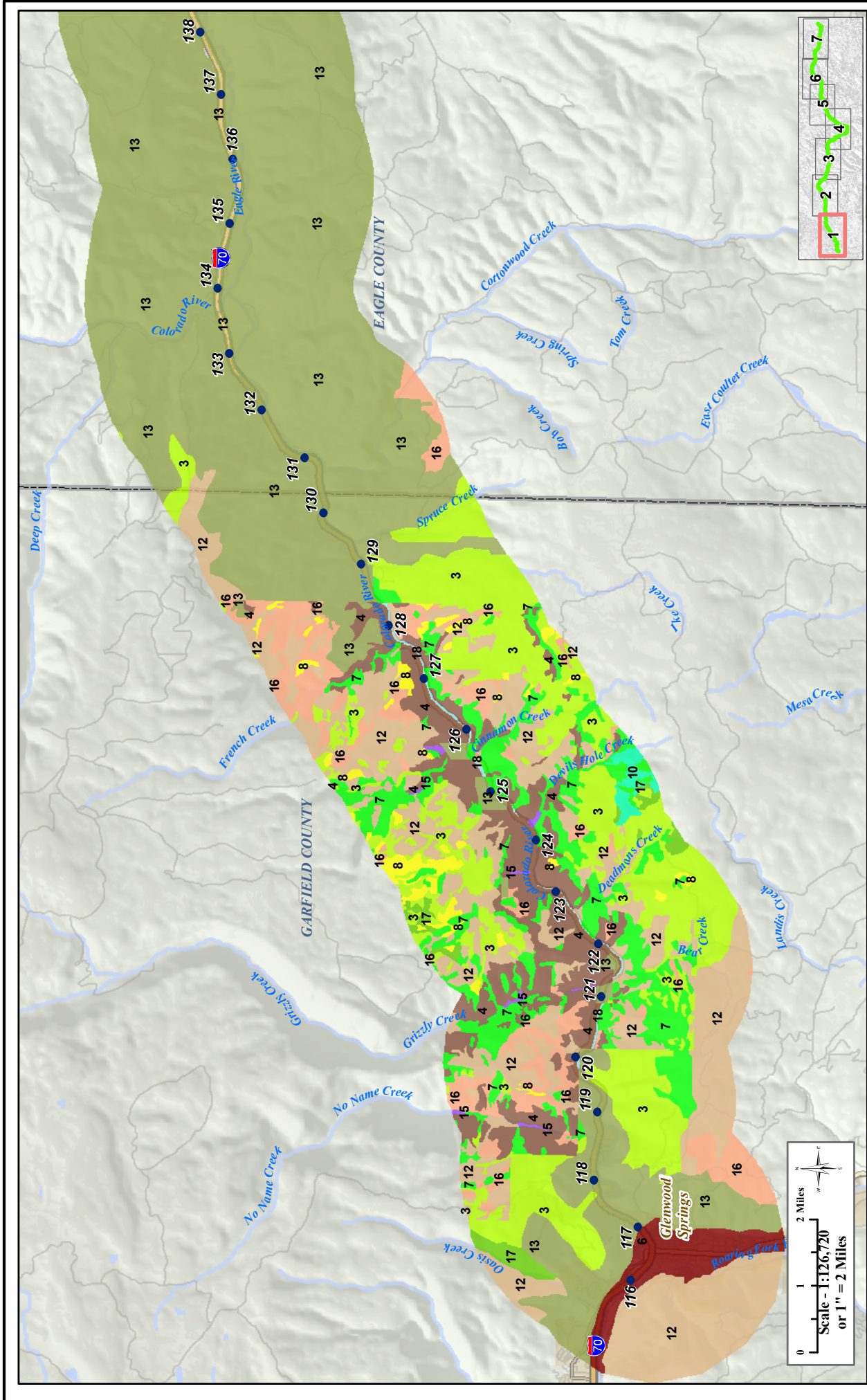
How will habitat connectivity be improved and animal-vehicle collisions reduced?

Lead agencies will follow the processes outlined in the ALIVE Memorandum of Understanding (see **Appendix E, ALIVE Memorandum of Understanding**, of the *I-70 Mountain Corridor PEIS*) to reduce animal-vehicle collisions and increase habitat connectivity throughout the Corridor. This includes, but is not limited to, the use of underpasses or overpasses dedicated to wildlife movement, fencing, berms, and vegetation to guide wildlife to crossing structures and signage to alert motorists of wildlife presence.

The ALIVE program provides a starting point for, and ensures Agencies' participation in development of, subsequent analyses during Tier 2 processes and implementation of long-term impact mitigation measures within the context of a Corridor-long landscape-based ecosystem approach to Corridor impacts on wildlife needs and conservation measures. It is understood by all parties to the memorandum of understanding that because the I-70 Mountain Corridor project is anticipated to span many years, the description of the linkage interference zones, species affected and recommended mitigation strategies are subject to change through time. All parties agree to coordinate to update the memorandum of understanding, if necessary, during Tier 2 processes and in those respective environmental documents.

4.5 Vegetation Resource Maps

Figure 1 through **Figure 7** show vegetation resource impacts for the Corridor.



I-70 Mountain Corridor PEIS

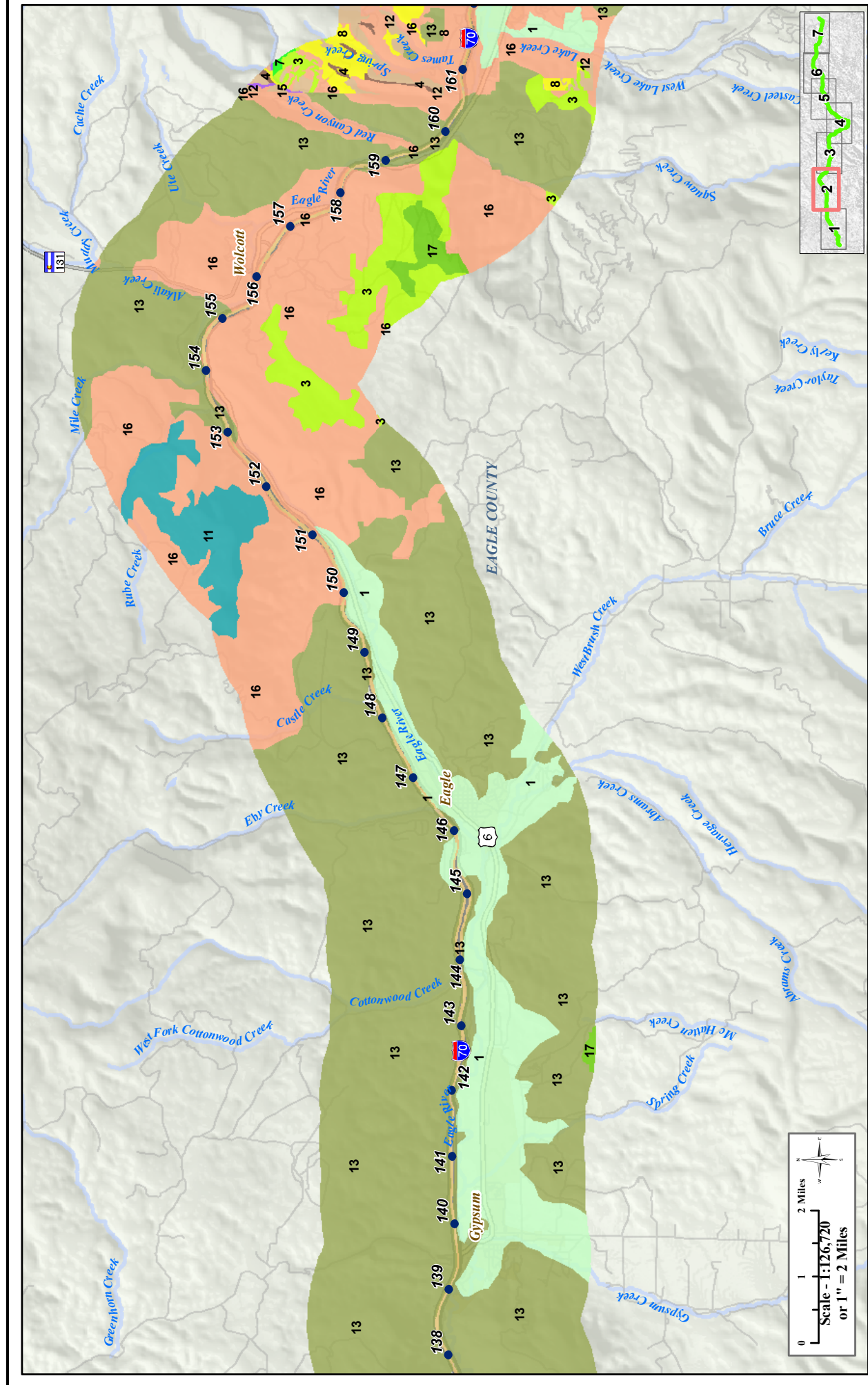
T e c h n i c a l R e p o r t s

U.S. Department of Transportation
 Federal Highway Administration

Legend

	Mileposts		County Boundary
	Limited Access Highways		Urban Areas
	Major Highways		USFS Land
	Highways		BLM Land
	Lakes		

	1	Agricultural
	2	Alpine Meadows-Tundra
	3	Aspen Forest
	4	Barren Land
	5	Bristlecone - Limber Pine Forest
	6	Developed
	7	Douglas-Fir Forest
	8	Grass / Forb Meadows
	9	Lakes & Ponds
	10	Lodgepole Pine Forest
	11	Mixed Forest
	12	Mountain Shrubland
	13	Pinyon-Juniper Woodland
	14	Ponderosa Pine Forest
	15	Riparian Forest and Shrub
	16	Sagebrush Shrubland
	17	Spruce - Fir Forest
	18	Wetland (general) / Water



I-70 Mountain Corridor PEIS

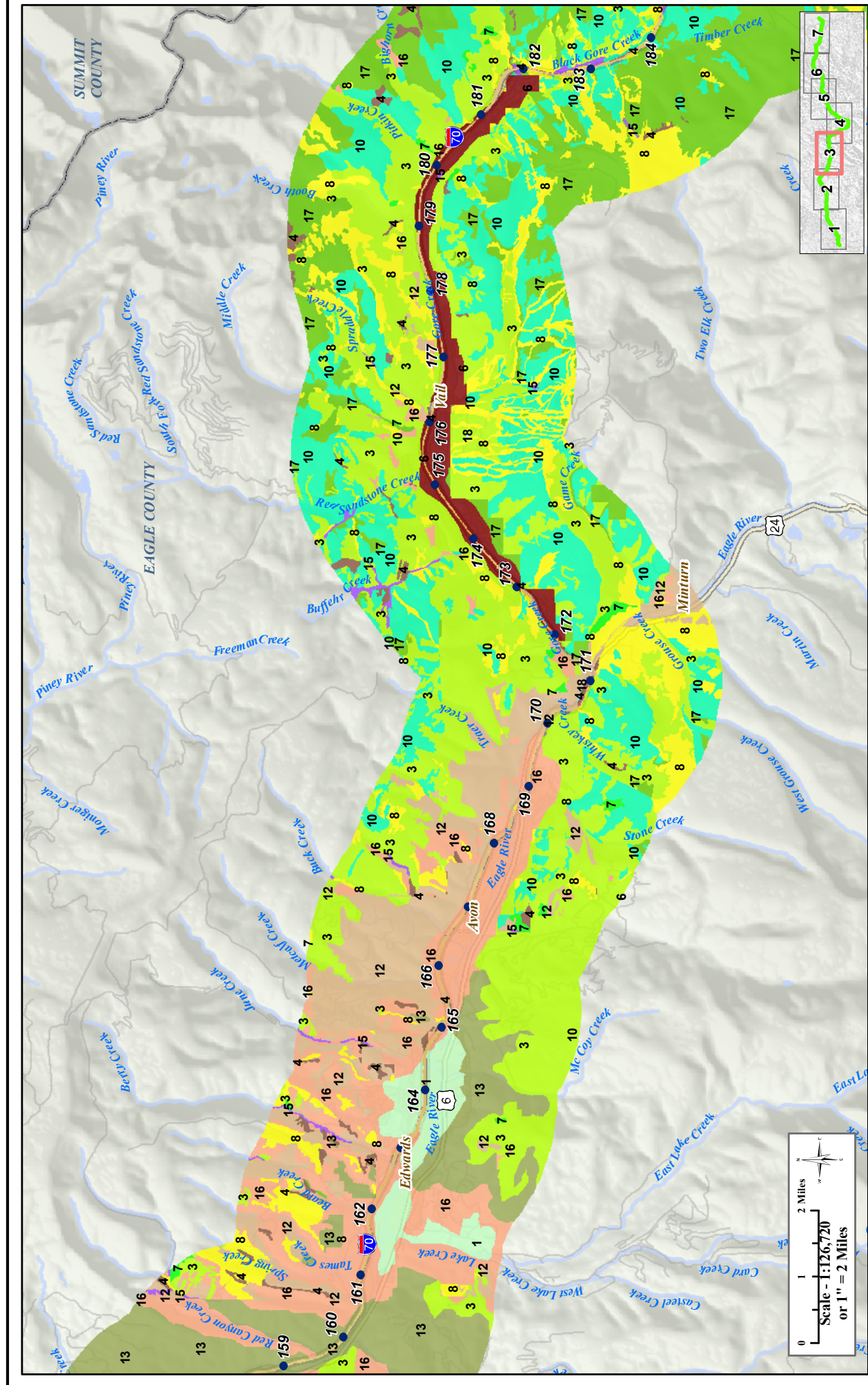
U.S. Department of Transportation
Federal Highway Administration

T e c h n i c a l R e p o r t s

Vegetation

Map 2 of 7

Legend	
	Mileposts
	Limited Access Highways
	Major Highways
	Highways
	Lakes
	County Boundary
	Urban Areas
	USFS Land
	BLM Land
	Vegetation Types
	1 Agricultural
	2 Alpine Meadows-Tundra
	3 Aspen Forest
	4 Barren Land
	5 Bristlecone - Limber Pine Forest
	6 Developed
	7 Douglas-Fir Forest
	8 Grass / Forb Meadows
	9 Lakes & Ponds
	10 Lodgepole Pine Forest
	11 Mixed Forest
	12 Mountain Shrubland
	13 Pinyon-Juniper Woodland
	14 Ponderosa Pine Forest
	15 Riparian Forest and Shrub
	16 Sagebrush Shrubland
	17 Spruce - Fir Forest
	18 Wetland (general) / Water



I-70 Mountain Corridor PEIS
 U.S. Department of Transportation
 Federal Highway Administration

T e c h n i c a l R e p o r t s

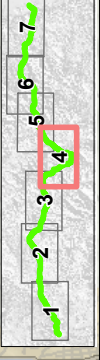
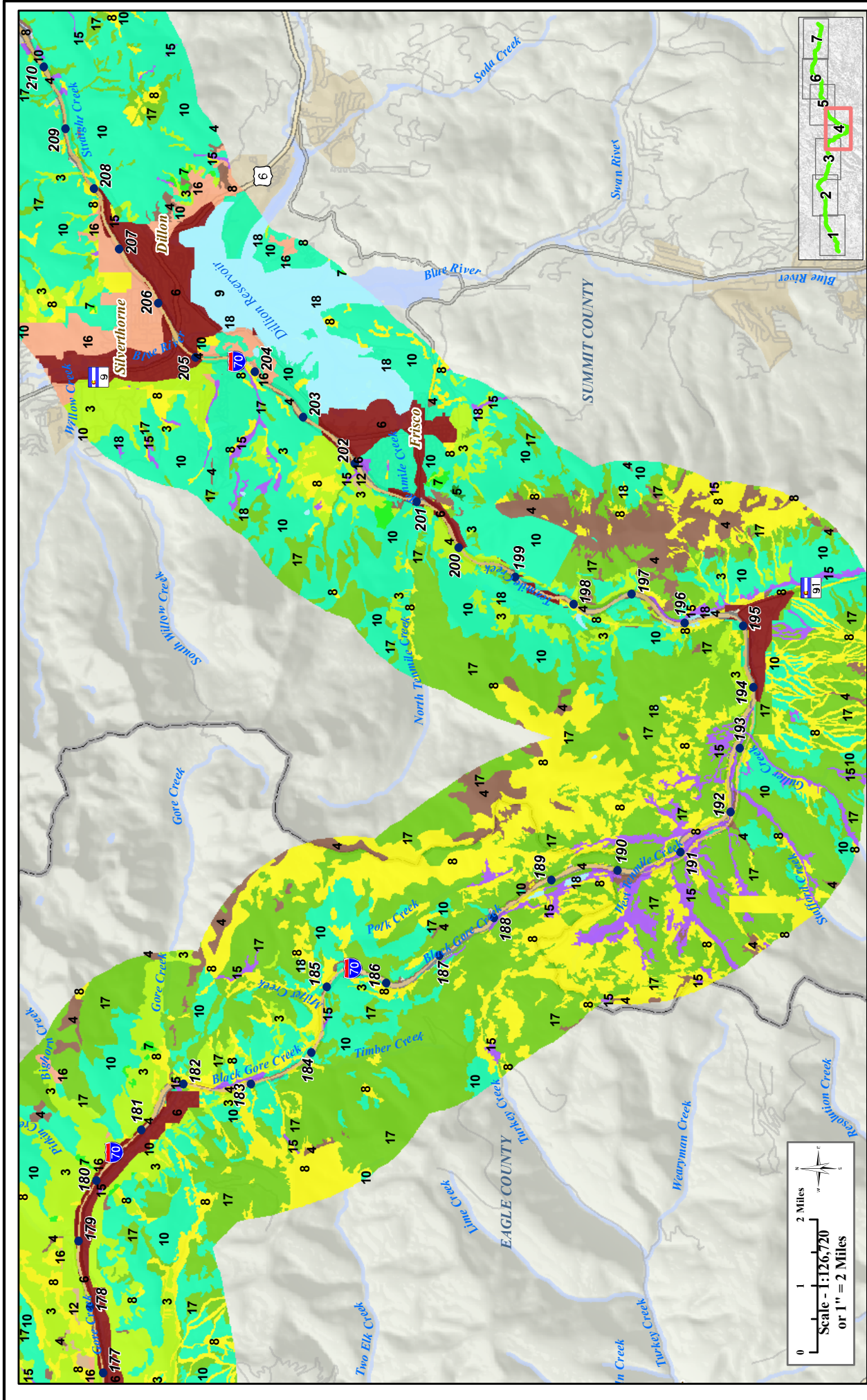
Vegetation
 Map 3 of 7

Legend

● Mileposts	▭ County Boundary	▭ Vegetation Types
▭ Limited Access Highways	▭ Urban Areas	1 Agricultural
▭ Major Highways	▭ USFS Land	2 Alpine Meadows-Tundra
▭ Highways	▭ BLM Land	3 Aspen Forest
▭ Lakes		4 Barren Land
		5 Bristlecone - Limber Pine Forest
		6 Developed
		7 Douglas-Fir Forest
		8 Grass / Forb Meadows
		9 Lakes & Ponds
		10 Lodgepole Pine Forest
		11 Mixed Forest
		12 Mountain Shrubland
		13 Pinyon-Juniper Woodland
		14 Ponderosa Pine Forest
		15 Riparian Forest and Shrub
		16 Sagebrush Shrubland
		17 Spruce - Fir Forest
		18 Wetland (general) / Water

Scale - 1" = 126,720
 or 1" = 2 Miles

Scale - 1" = 2 Miles



Legend

	Mileposts		County Boundary
	Limited Access Highways		Urban Areas
	Major Highways		USFS Land
	Highways		BLM Land
	Lakes		

Vegetation Types

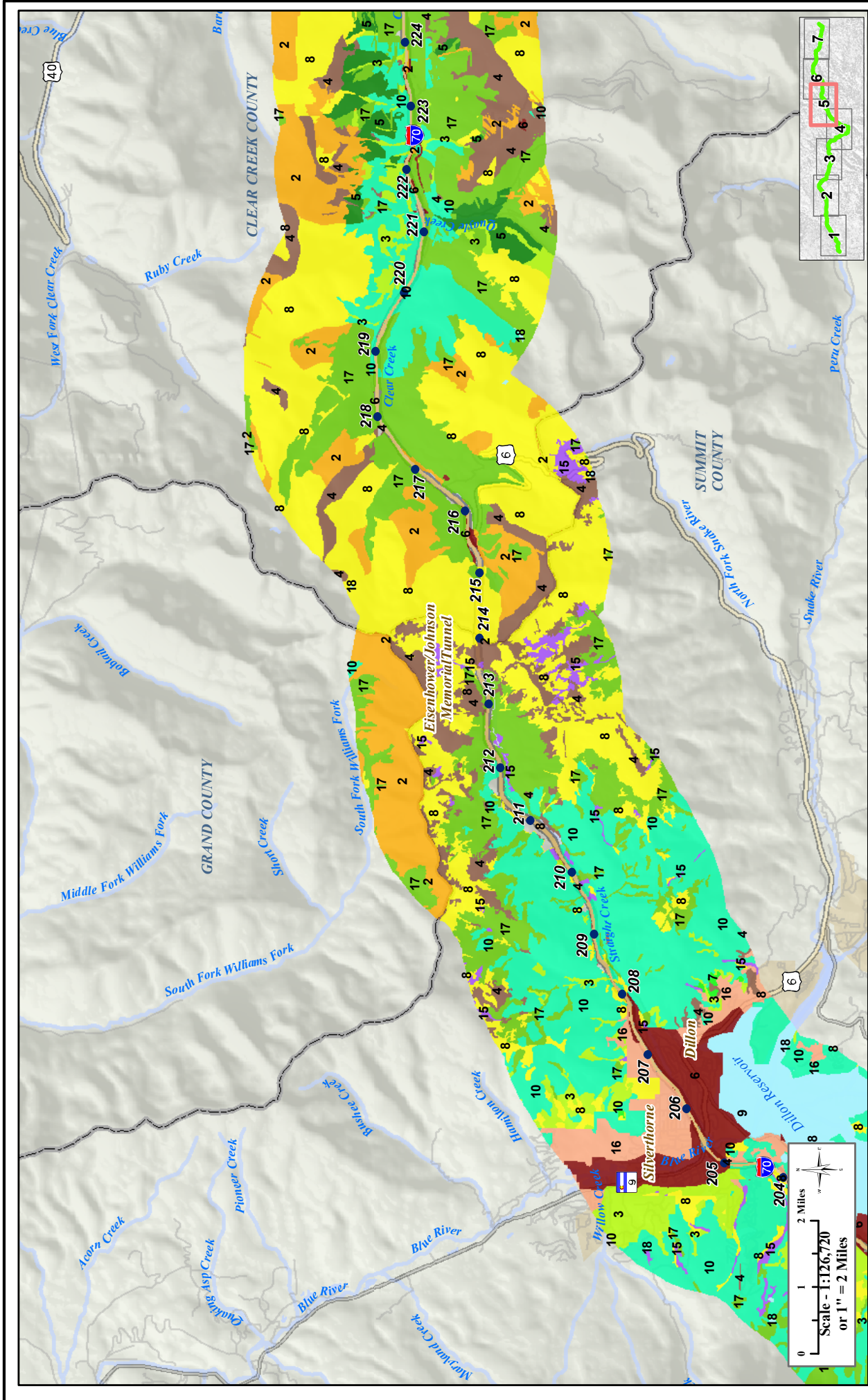
	1	Agricultural
	2	Alpine Meadows-Tundra
	3	Aspen Forest
	4	Barren Land
	5	Bristlecone - Limber Pine Forest
	6	Developed
	7	Douglas-Fir Forest
	8	Grass / Forb Meadows
	9	Lakes & Ponds
	10	Lodgepole Pine Forest
	11	Mixed Forest
	12	Mountain Shrubland
	13	Pinyon-Juniper Woodland
	14	Ponderosa Pine Forest
	15	Riparian Forest and Shrub
	16	Sagebrush Shrubland
	17	Spruce - Fir Forest
	18	Wetland (general) / Water

I-70 Mountain Corridor PEIS

T e c h n i c a l R e p o r t s

U.S. Department of Transportation
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Vegetation
Map 4 of 7



I-70 Mountain Corridor PEIS

T e c h n i c a l R e p o r t s

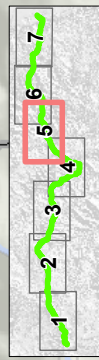


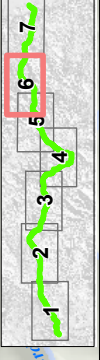
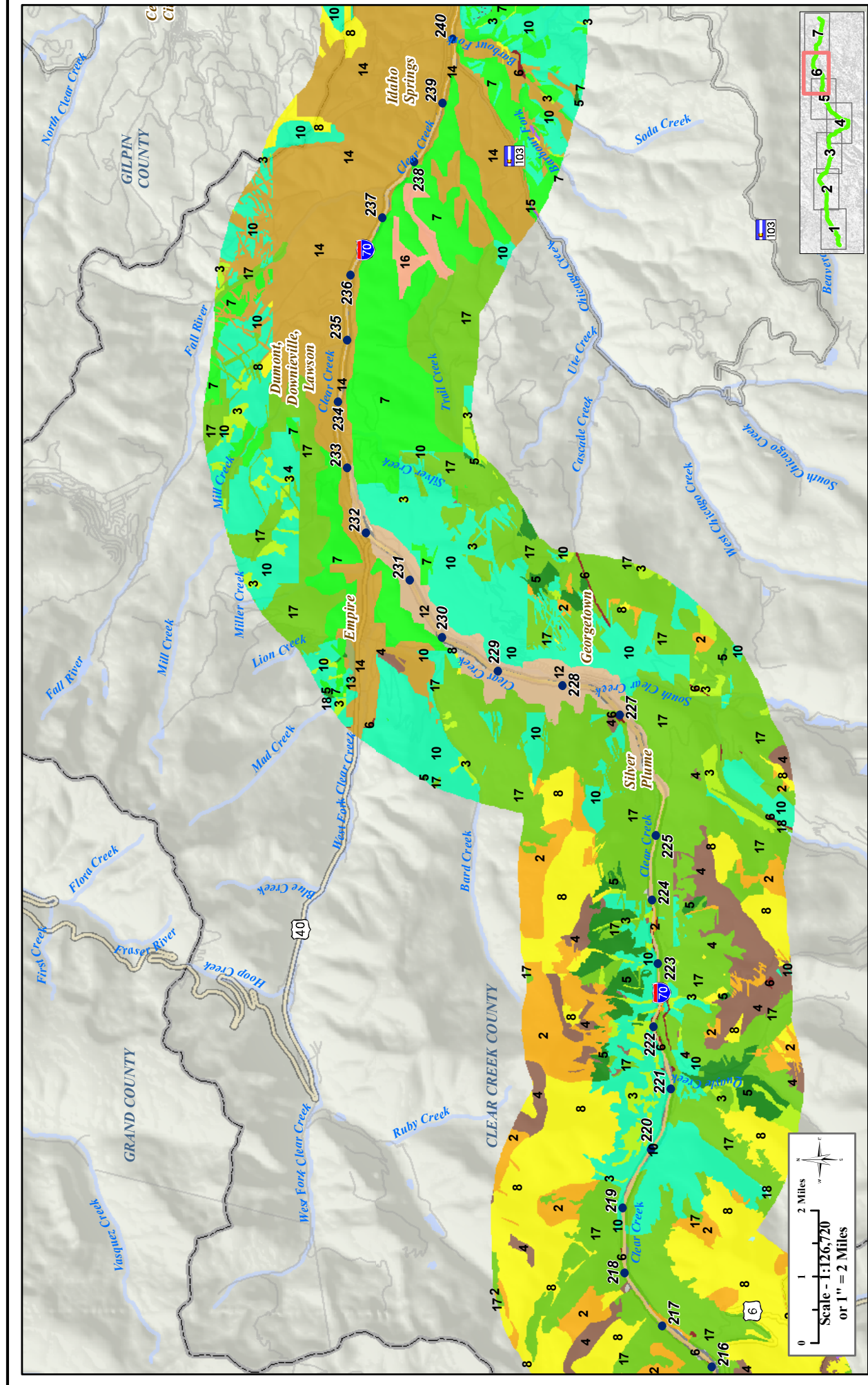
Vegetation

Map 5 of 7

- | | | | | | |
|--|-------------------------|--|-----------------|--|-------------------------------------|
| | Mileposts | | County Boundary | | Mixed Forest |
| | Limited Access Highways | | Urban Areas | | 11 Mountain Shrubland |
| | Major Highways | | USFS Land | | 12 Sagebrush Shrubland |
| | Highways | | BLM Land | | 13 Spruce - Fir Forest |
| | Lakes | | | | 14 Pinyon-Juniper Woodland |
| | | | | | 15 Wetland (general) / Water |
| | | | | | 16 Developed |
| | | | | | 17 Douglas-Fir Forest |
| | | | | | 18 Grass / Forb Meadows |
| | | | | | 9 Lakes & Ponds |
| | | | | | 10 Ponderosa Pine Forest |
| | | | | | 11 Riparian Forest and Shrub |
| | | | | | 12 Lodgepole Pine Forest |
| | | | | | 13 Limber Pine Forest |
| | | | | | 14 Bristlecone - Limber Pine Forest |
| | | | | | 15 Aspen Forest |
| | | | | | 16 Barren Land |
| | | | | | 17 Alpine Meadows-Tundra |
| | | | | | 18 Agricultural |

Legend

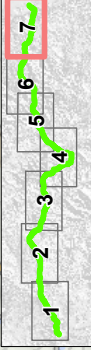
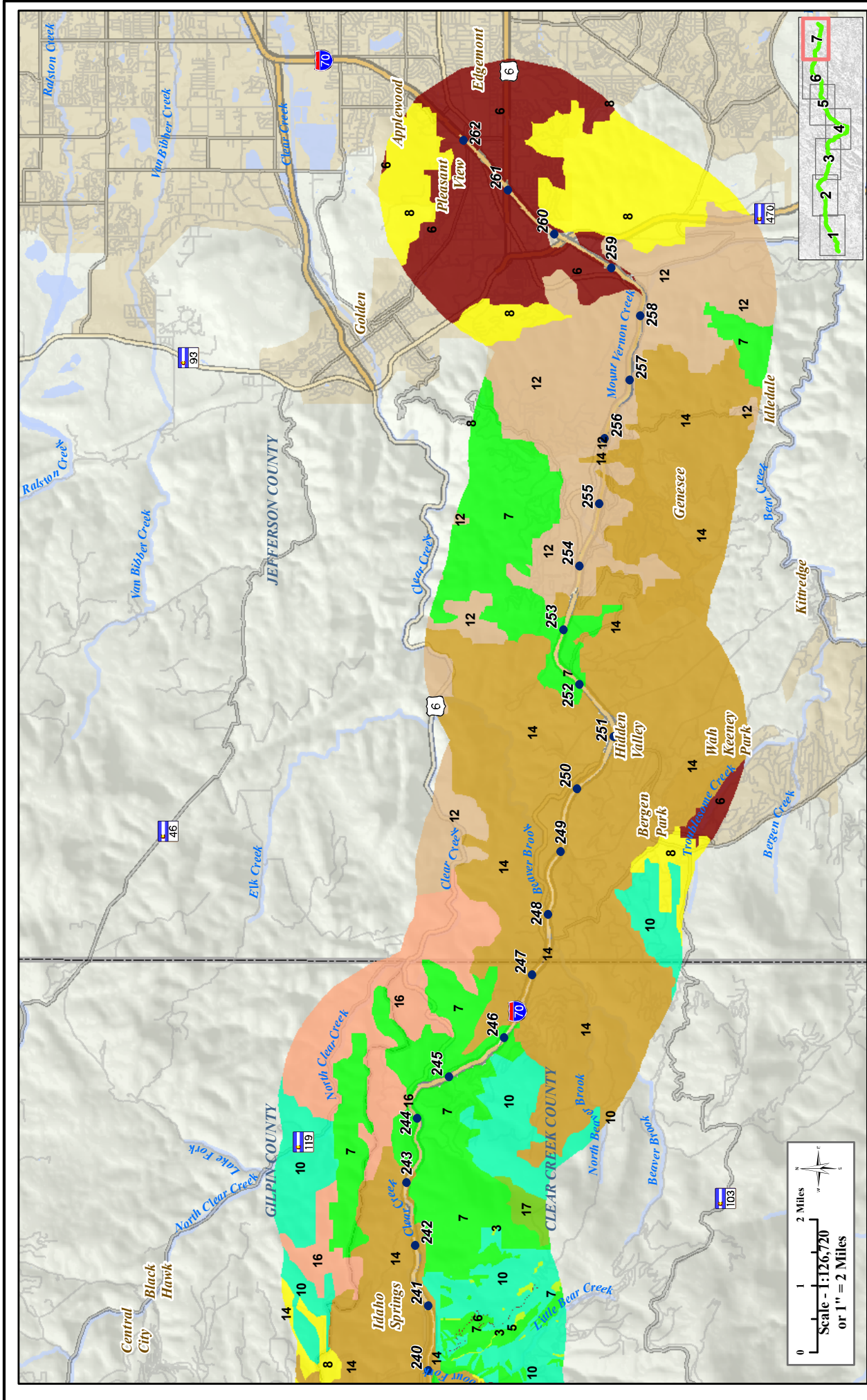




- Legend**
- Mileposts
 - County Boundary
 - Limited Access Highways
 - Major Highways
 - Highways
 - Lakes
 - Urban Areas
 - USFS Land
 - BLM Land

- Vegetation Types**
- 1 Agricultural
 - 2 Alpine Meadows-Tundra
 - 3 Aspen Forest
 - 4 Barren Land
 - 5 Bristlecone - Limber Pine Forest
 - 6 Developed
 - 7 Douglas-Fir Forest
 - 8 Grass / Forb Meadows
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I-70 Mountain Corridor PEIS



I-70 Mountain Corridor PEIS

- Legend**
- | | | | | | |
|--|-------------------------|--|-----------------|--|------------------------------------|
| | Mileposts | | County Boundary | | Vegetation Types |
| | Limited Access Highways | | Urban Areas | | 1 Agricultural |
| | Major Highways | | USFS Land | | 2 Alpine Meadows-Tundra |
| | Highways | | BLM Land | | 3 Aspen Forest |
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| | | | | | 16 Sagebrush Shrubland |
| | | | | | 17 Spruce - Fir Forest |
| | | | | | 18 Wetland (general) / Water |

Section 5. Threatened, Endangered, Sensitive, and other Special Status Species

5.1 Introduction

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat. This Section of the Biological Resources Technical Report focuses on the individual species effects determinations under the ESA and related United States Forest Service Management Plan provisions. For the detailed assessment and comparative analysis of each species leading to these determinations, refer to the Biological Report in **Appendix A**.

5.2 Background and Methodology

Lead agencies sought input from the following agencies to determine protected species within the I-70 Mountain Corridor:

- **United States Fish and Wildlife Service**—Upon request, the United States Fish and Wildlife Service provided a list of threatened, endangered, and sensitive species potentially occurring along the I-70 Mountain Corridor. As required by the United States Fish and Wildlife Service, a Programmatic Biological Assessment—a study prepared to determine the likely effects of a project on federally listed species, proposed species, or designated critical habitat—has been submitted to the United States Fish and Wildlife Service. Coordination with the United States Fish and Wildlife Service has been ongoing and all data has been updated as of 2010.
- **United States Forest Service**—Upon request, the Arapaho and Roosevelt and White River National Forests provided lists of threatened, endangered, and sensitive species, United States Forest Service-sensitive animal, plant and aquatic species, management indicator species, and other species or habitats occurring on forest lands to be analyzed for this project. As required by the United States Forest Service, a Biological Report—a study prepared to determine the likely effects of a project on federally listed species, United States Forest Service-sensitive species, management indicator species, and other species or habitats on United States Forest Service land—has been submitted to the United States Forest Service. Coordination with the United States Forest Service has been ongoing and all data has been updated as of 2009.
- **Bureau of Land Management**—Provided a list of sensitive species located on Bureau of Land Management properties along the I-70 Mountain Corridor. This list is still valid, as it has not been updated by the Bureau of Land Management since 2000.
- **Colorado Division of Wildlife**—Provided input on 2010 state-listed and other special-status species, as well as wildlife habitat. State listed and other status species have been updated for 2010, and wildlife habitat data was updated in 2008.

The Colorado Department of Transportation determined the likely presence of protected species by the presence of suitable habitat and known distribution records. Many protected species are “unlikely to occur in the area,” and further consideration of these species was not included in the study. In addition to analysis of direct impacts on protected species within the I-70 Mountain Corridor, depletion to the Platte River or Colorado River basins constitutes an action that may affect, and is likely to adversely affect, threatened, endangered, and sensitive species that depend on the river for their existence. These effects will be determined during Tier 2 processes as site-specific biological assessments are prepared as agreed to with the United States Fish and Wildlife Service. The lists of threatened, endangered, and sensitive species potentially occurring along the I-70 Mountain Corridor are subject to change. Ongoing coordination will occur to ensure that current lists are used in project analysis.

Lead agencies examined habitat connectivity and animal-vehicle collisions through an interagency committee known as “A Landscape Level Inventory of Valued Ecosystem Components” (ALIVE). The committee identified 13 areas where the I-70 Mountain Corridor interferes with wildlife migration, including elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), and Canada lynx (*Lynx canadensis*). These locations are referred to as linkage interference zones. By focusing on areas of known migration and wildlife use, and creating wildlife crossings, animal-vehicle collisions can be reduced and habitat connectivity increased. A Memorandum of Understanding, signed in April 2008, details the responsibilities of each agency in addressing animal-vehicle collisions. See **Appendix E, ALIVE Memorandum of Understanding**, of the *I-70 Mountain Corridor PEIS*, (CDOT, 2010).

The area of potential effect (APE) is the area of a plant or an animal’s habitat that could be affected either directly or indirectly by the proposed alternatives. The likelihood of occurrence of each TES animal species initially listed as potentially occurring in the APE was determined by the presence of suitable habitat, known distribution records, and relative abundance. Numerous TES animal species were determined to be “unlikely to occur in the APE.” Because no project-related effects to these species are anticipated, no further consideration of these species will be included in the PEIS unless new information warrants further analysis.

The Colorado Department of Transportation determined effects on biological resources by overlaying a project footprint of each alternative on a Geographic Information System containing the locations of the specific resource, such as vegetation, wildlife habitat or fisheries . The project footprint includes the physical footprint of the alternatives plus an additional 30 feet on each side. The 30 feet includes a 15-foot construction disturbance zone and an additional 15-foot sensitivity zone. Direct impacts occur where resources are located directly beneath the project footprint. Indirect impacts, occurring either farther away or later in time, are beyond the Action Alternatives footprint. **Chapter 2, Summary and Comparison of Alternatives**, of the *I-70 Mountain Corridor PEIS* (CDOT, 2010) provides descriptions of project alternatives.

5.3 Affected Environment

The likelihood of occurrence of each threatened, endangered sensitive, or other special status (TES) animal species initially listed as potentially occurring in the APE was determined by the presence of suitable habitat, known distribution records, and relative abundance. Many TES animal species were determined to be “unlikely to occur in the APE,” and further consideration of these species was not included in the study. The I-70 Corridor traverses through important lynx (*Lynx canadensis*) habitat, especially along Vail Pass; however, many areas above 8,000 feet along the Corridor are considered lynx habitat, which could be affected by construction activities.

Previous disturbance and ongoing maintenance activities limit suitable habitat in the I-70 Mountain Corridor right-of-way, but there is the potential for occurrence of protected plant species. Species such as moonwort rely on ground disturbance and can benefit from construction or maintenance activities. Colorado Division of Wildlife has mapped elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), and bighorn sheep (*Ovis canadensis*) habitats for areas along the Corridor. Direct and indirect disturbances to these habitats are likely to adversely affect these species due to planned and induced growth and due to those areas directly affected by Action Alternatives. Elk populations have increased over the last 20 to 25 years and are affected in parts of the Corridor by winter range reduction and disturbance to calving habitat, for example, by recreational users. Mule deer populations have been declining, probably in response to management that favors elk and livestock. However, maturation of forest habitats in the absence of frequent fires and competition for fawning grounds and winter range with elk are also thought to be factors in recent mule deer population decreases. Bighorn sheep have generally increased through

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reintroductions into historic habitat, but suitable habitat is limited, and lambing habitat is especially critical to most populations.

One of the most notable effects of development along the Corridor over approximately the last 120 years is habitat fragmentation. Habitat fragmentation occurs when large patches of habitat are divided into smaller patches, and the connections between these smaller patches are compromised or lost. Factors that reduce connectivity between habitats include community development and associated road systems. Human intrusion into adjacent habitats from these areas further reduces the amount of habitat available to wildlife.

I-70 currently crosses many traditional wildlife movement and migration routes, creating a barrier or restricting wildlife movement and reducing access to key habitat. These areas are termed wildlife linkage interference zones. The extent to which I-70 has affected wildlife is difficult to quantify, although its construction, along with other roads in the vicinity, caused considerable habitat fragmentation. Noise from traffic also affects the use of adjacent habitat by some species, depending on their sensitivity.

5.3.1 Threatened, Endangered, and Candidate Species

Regulatory Overview

Under the ESA, a species is **endangered** if it is likely to become extinct within the foreseeable future throughout all or a significant portion of its range. A species is **threatened** if it is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. A **candidate** species is one for which concerns remain regarding their status, but for which more information is needed before they can be proposed for listing under the ESA as threatened or endangered.

Species

Table 7 and **Table 8** provides a list of threatened, endangered, and candidate species that were considered in the I-70 Mountain Corridor PEIS, based on a list of threatened, endangered, and candidate species that may be present on the I-70 Corridor provided by the United States Fish and Wildlife Service dated June 10, 2010 (see **Appendix B** of this Technical Report).

Table 7. Threatened and Endangered Species

Common Name	Species	Status	Species Included	Reason for Exclusion (or inclusion with plant species)	Notes
Birds					
Whooping crane	<i>Grus americana</i>	Endangered	Yes		
Least tern, Interior population	<i>Sterna antillarum</i>	Endangered	Yes		
Piping plover	<i>Charadrius melodus</i>	Threatened	Yes		
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Threatened	No	No habitat or species in the APE. In Colorado, owls are known to inhabit Mesa Verde National Park (www.rmbo.org) and other areas in the state, such as the Wet Mountains and Dinosaur National Park. Suitable habitat may occur in Glenwood Canyon, but no activities associated with any alternatives are proposed in the canyon (mp 117 to mp 129). The APE does not extend into any critical habitat. www.fws.gov/ifw2es/mso	

Table 7. Threatened and Endangered Species

Common Name	Species	Status	Species Included	Reason for Exclusion (or inclusion with plant species)	Notes
Mammals					
Black-footed ferret	<i>Mustela nigripes</i>	Endangered	No	Are largely dependent on prairie dogs. No prairie dog towns have been documented in the APE. Potential habitat exists off Forest lands in Eagle and Garfield counties. Prairie dogs do not exist on the White River National Forest. Potential habitat occurs on the Arapahoe and Roosevelt National Forest, but there are no records of prairie dogs.	Biological Assessment only
Preble's meadow jumping mouse	<i>Zapus hudsonius preblei</i>	Threatened	Yes		Excluded in Biological Report—not on Forest lands
Canada lynx	<i>Lynx canadensis</i>	Threatened	Yes		
Fish					
Pallid sturgeon	<i>Scaphirhynchus albus</i>	Endangered	Yes		
Razorback sucker	<i>Xyrauchen texanus</i>	Endangered	Yes		
Bonytail chub	<i>Gila elegans</i>	Endangered	Yes		
Colorado pikeminnow	<i>Ptychocheilus lucius</i>	Endangered	Yes		
Humpback chub	<i>Gila cypha</i>	Endangered	Yes		
Greenback cutthroat trout	<i>Oncorhynchus clarki stomias</i>	Threatened	Yes		Also MIS on the Arapahoe and Roosevelt National Forest
Plants					
Colorado butterfly plant	<i>Gaura neomexicana</i> ssp. <i>coloradensis</i> —(Rydb.) Raven & Gregory	Threatened	No	Does not occur in the APE; all locations downstream from the Corridor are on side tributaries outside the areas that could be affected by water depletions in the Platte River drainage (Mayo 2004).	
Colorado hookless cactus	<i>Sclerocactus glaucus</i> —(J.A. Purpus ex K. Schum.) L. Benson	Threatened	No	No plants or habitat recorded in the APE. Plant is endemic to desert shrub communities west of Glenwood Springs (S. Popovich pers. comm. 2007). Is found west of the White River National Forest but not on Forest lands (K. Giezentanner pers. comm. 2007). Populations occur on benches along the Green, Colorado, and Gunnison rivers. No construction activities are proposed along the Colorado River in Garfield County.	
Ute ladies'-tresses orchid	<i>Spiranthes diluvialis</i> - Sheviak	Threatened	Yes	Plants and potential habitat present outside National Forest System Lands, but in APE; downstream effects possible (Clear Creek and Platte River drainages).	
Western prairie fringed orchid	<i>Platanthera praeclara</i> —Sheviak & Bowles	Threatened	Yes	No plants or habitat along Corridor; nearest locations in Nebraska; downstream effects possible (mainstem Platte River).	

Table 7. Threatened and Endangered Species

Common Name	Species	Status	Species Included	Reason for Exclusion (or inclusion with plant species)	Notes
Invertebrates					
Uncompahgre fritillary butterfly	<i>Boloria acrocneuma</i>	Endangered	No	No habitat or occurrence in vicinity of the Corridor. Preferred habitat is stands of snow willow at elevations greater than 13,200 feet in the San Juan Mountains of southwest Colorado (ecos.fws.gov/docs/frdocs/1991/91-14970.html and www.butterflyrecovery.org). Surveys conducted in areas surrounding Loveland Pass have excluded this area as occupied habitat (K. Giezentanner pers. comm. 2006). The maximum elevation of project alternatives would occur at 11,200 feet and would not enter suitable habitat for this species.	

Table 8. Candidate Species

Common Name	Species	Status	Species Included	Reason for Exclusion (or inclusion with plant species)	Notes
Birds					
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Candidate*	Yes		Evaluated only for the Biological Assessment because of the United States Fish and Wildlife Service listing in Eagle County. Excluded from further consideration for the Biological Report.
Mammals					
Gunnison's prairie dog	<i>Cynomys gunnisoni</i>	Candidate	No	No habitat or species in the APE.	
Plants					
DeBeque phacelia	<i>Phacelia scopulina</i> var. <i>submutica</i> (= <i>P. submutica</i>)—J.T. Howell	Candidate*	No	Not in APE; occurs west and south of Rifle, in Garfield and Mesa counties.	
Parachute penstemon	<i>Penstemon debilis</i> —O'Kane and J. Anderson	Candidate*	No	No plants or suitable habitat known or suspected to occur in the APE. Plant is endemic to Green River Formation on the Roan Plateau west of Glenwood Springs (S. Popovich pers. comm. 2007). All known occurrences are well west of the Action Area.	

Candidate * = Warranted but precluded

5.3.2 Forest Sensitive Species and Management Indicator Species

Regulatory Overview

Forest Service **Sensitive** species are defined as those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by (a) significant current or predicted downward trends in population numbers or density, or (b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (Forest Service Manual 2670.5).

Management Indicator Species are animals or plants selected because changes in their population respond to the effects of Forest Service management activities. The MIS list is one of the many tools the United States Forest Service uses to provide for the diversity of plant and animal communities and to gauge the effects of management activities.

Species

Table 9 provides a list of Region 2 Forest Sensitive species that were considered in the I-70 Mountain Corridor PEIS, based on United States Forest Service sensitive species and MIS lists provided on May 14, 2009 (see **Appendix E** of this Technical Report for details). Some of these species are MIS as indicated in **Table 9**. **Table 10** provides a list of MIS that are not also Forest Sensitive and, therefore, do not appear on **Table 9**.

Table 9. Region 2 Forest Service Sensitive Species Known or Suspected to Occur on White River National Forest (WR) and Arapahoe and Roosevelt National Forest (AR), or That May Be Influenced by Project Activities

Common Name	Species	National Forest	MIS/Indicator Community	Species Included	Reason for Exclusion
Mammals					
Pygmy shrew	<i>Sorex hoyi montanus</i>	AR ^K /WR ^L	No	Yes	
Fringed myotis	<i>Myotis thysanodes</i>	AR ^N /WR ^L	No	No	There have been six observations in Colorado since 1990. None were in the Corridor, but the nearest ones were in eastern Garfield and northern Teller counties (Kienath 2004). Species and habitat have not been documented in the vicinity of the Corridor near the Arapahoe and Roosevelt National Forest (D. Lowry pers. comm. with D. Solomon 2006a). The bat is suspected to occur on the White River National Forest but is expected to be at elevations below much of the Corridor activities (K. Giezentanner pers. comm. with D. Solomon 2006a).
Spotted bat	<i>Euderma maculatum</i>	WR ^K	No	No	No habitat or species in the APE. Suitable habitat and individuals are known to occur at lower elevations than that of National Forest System Lands within the APE (Fitzgerald, et al. 1994). Known from seven Western Slope counties, but only Garfield County would have project alternatives (interchange at mp 116). No downstream effects on habitat or individuals from the project on National Forest System Lands are expected.
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	AR ^K /WR ^K	No	No	Suitable habitat only along Corridor outside National Forest System Lands. This bat is known from the western two-thirds of the state at lower elevations (7,500 feet and below) than that of National Forest System Lands within the Corridor (Fitzgerald et al. 1994), and from caves in area. No downstream effects on habitat or individuals from the project on National Forest System Lands are expected.
White-tailed prairie dog	<i>Cynomys leucurus</i>	AR ^L	No	No	No habitat or species in the APE. Prairie dog colonies exist in the eastern foothills and prairies, and potential habitat exists in Garfield and Eagle counties. Prairie dogs are not present

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Table 9. Region 2 Forest Service Sensitive Species Known or Suspected to Occur on White River National Forest (WR) and Arapahoe and Roosevelt National Forest (AR), or That May Be Influenced by Project Activities

Common Name	Species	National Forest	MIS/Indicator Community	Species Included	Reason for Exclusion
					on the White River National Forest (K. Giezentanner pers. comm. with L. Hettinger 2006b). There is potential habitat on the Arapahoe and Roosevelt National Forest, but the presence of prairie dogs has not been documented. The Corridor would not intrude on these habitats.
River otter	<i>Lontra canadensis</i>	AR ^K /WR ^L	No	Yes	
American marten	<i>Martes americana</i>	AR ^K /WR ^K	No	Yes	
North American wolverine	<i>Gulo gulo</i>	AR ^L /WR ^K	No	Yes	
Bighorn sheep	<i>Ovis canadensis</i>	AR ^K /WR ^K	Yes	Yes	
Birds					
American bittern	<i>Botaurus lentiginosus</i>	AR ^K	No	No	It is unlikely that habitat or individuals are found in the APE. This bird is a wetland-riparian obligate requiring large wetlands with dense herbaceous cover, as well as open water. Habitat in the APE is not suited to this shy and reclusive species (USFS 1997). Both the Colorado Breeding Bird Atlas and Andrews and Righter (1992) discount the presence of this species on the White River National Forest.
Bald eagle	<i>Haliaeetus leucocephalus</i>	AR/WR	No	Yes	
Northern goshawk	<i>Accipiter gentilis</i>	AR ^K /WR ^K	No	Yes	
Ferruginous hawk	<i>Buteo regalis</i>	AR ^K /WR ^K	Yes on Pawnee NG/ short-grass & mid-grass prairie	No	The species conservation assessment indicates there are an estimated 300 nests in Colorado (Collins and Reynolds 2005). No species or habitat in the APE (D. Lowry pers. comm. with D. Solomon 2006b). Colorado Breeding Bird Atlas indicates the majority of sightings were on the Eastern Plains with rare to uncommon sightings in the Colorado Plateau (CDOW 2003). The hawk has been sighted in Garfield County but is generally considered a transient in the area. The hawk is considered a transient species for the White River National Forest.
American peregrine falcon	<i>Falco peregrinus anatum</i>	AR ^K /WR ^K	No	Yes	
Northern harrier	<i>Circus cyaneus</i>	AR ^K /WR ^K	No	No	No habitat or species in the APE, as the northern harrier requires open habitats such as fields, prairies, and marshes where it can hunt for small mammals, birds, reptiles, and amphibians. It also nests in open areas on the ground (NatureServe 2006). NatureServe classifies the harrier as vulnerable in Colorado. The species conservation assessment states they use an array of habitats but generally avoid high elevations in the Rocky Mountains (Slater and Rock 2005). Also, the APE is not considered potential habitat for the harrier as the species is not a montane breeder. The Corridor is certainly not important to the species (Leukering 2006).
Greater (northern) sage grouse	<i>Centrocercus urophasianus</i>	AR ^N /WR ^K	No	No	As its name suggests, sage grouse depend on healthy sage grasslands habitat (www.nwf.org). While sagebrush occurs intermittently throughout the Corridor, but primarily in Eagle County, no impacts on sagebrush would occur on National

Table 9. Region 2 Forest Service Sensitive Species Known or Suspected to Occur on White River National Forest (WR) and Arapahoe and Roosevelt National Forest (AR), or That May Be Influenced by Project Activities

Common Name	Species	National Forest	MIS/Indicator Community	Species Included	Reason for Exclusion
					Forest System Lands. Populations have not been documented in the APE (D. Lowry and K. Giezentanner pers. comm. with D. Solomon 2006a).
White-tailed ptarmigan	<i>Lagopus leucurus</i>	AR ^K /WR ^K	No	Yes	
Long-billed curlew	<i>Numenius americanus</i>	AR ^K	No	No	No habitat or species in the APE. Curlew have been observed in Jefferson County (NatureServe 2006); however, the APE does not extend out of the foothills and does not affect any open grasslands or prairies at low elevations where long-billed curlew populations may be present.
Black tern	<i>Chlidonias niger</i>	AR ^K	No	No	In Region 2, these birds are most abundant in prairie pothole areas. The species conservation assessment (Naugle 2004) notes they may occur in isolated pockets in Colorado and Wyoming. No habitat or individuals in the APE. Kingery (1998) observed black tern on the west slope of the Rockies. The only confirmed breeding populations are in the San Luis Valley and the Arapaho National Wildlife Refuge in northern Colorado (USFWS 2006a). The APE does not extend into any of these areas.
Yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	AR ^N	No	Yes	Now excluded for the Biological Report. No occurrences of the yellow-billed cuckoo have been documented in the Corridor. Assessed in the Biological Assessment as a Candidate species.
Burrowing owl	<i>Athene cunicularia</i>	AR ^K	Yes on Pawnee NG/ prairie dog towns	No	No habitat or species in the APE. Colorado Division of Wildlife GAP maps indicate that no populations have been recorded for the APE (McDonald et al. 2004). Jefferson County is the only county affected by the Corridor that had sightings of burrowing owls in a 1999 survey of Colorado (VerCauteren et al. 2001). The APE does not extend out of the foothills to areas where prairie dog colonies may exist. No populations have been observed in the APE (USFS 2005).
Boreal owl	<i>Aegolius funereus</i>	AR ^K /WR ^K	No	Yes	
Flammulated owl	<i>Otus flammeolus</i>	AR ^K /WR ^K	No	Yes	
Black swift	<i>Cypseloides niger</i>	AR ^K /WR ^K	No	Yes	
Lewis's woodpecker	<i>Melanerpes lewis</i>	AR ^K /WR ^L	No	No	The species conservation assessment notes that the distribution of this woodpecker closely matches that of ponderosa pine in the western United States (Abele et al. 2004). Suitable habitat exists along the Corridor outside National Forest System Lands. In western Colorado, Lewis's woodpecker are fairly common summer residents in central and southwestern valleys, but rarely north of the Colorado River (NDIS website). The woodpecker is known from Arapahoe and Roosevelt National Forest lands in Jefferson County, approximately 2 miles north of the Corridor between mp 251 and mp 258. Project alternatives would not be expected to affect those woodpeckers. The woodpecker is suspected to occur on the White River National Forest but has not been confirmed.

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Table 9. Region 2 Forest Service Sensitive Species Known or Suspected to Occur on White River National Forest (WR) and Arapahoe and Roosevelt National Forest (AR), or That May Be Influenced by Project Activities

Common Name	Species	National Forest	MIS/Indicator Community	Species Included	Reason for Exclusion
American three-toed woodpecker (<i>Picoides tridactylus dorsalis</i>) [also Northern Three-toed Woodpecker (<i>Picoides tridactylus dorsalis</i>)(also <i>Picoides dorsalis</i>)]	<i>Picoides dorsalis</i>	AR ^K /WR ^K	No	Yes	
Olive-sided flycatcher	<i>Contopus cooperi</i>	AR ^K /WR ^K	No	Yes	
Purple martin arboricola	<i>Progne subis</i>	AR ^K /WR ^K	No	No	Rare passover migrant in the APE. Purple martins are uncommon breeders in the western mountains of Colorado and are accidental inhabitants of the Eastern Plains. They occur only as rare spring and fall migrants in these areas (www.rmbo.org). The species conservation assessment (Wiggins 2005a) states this western subspecies is restricted to Western Slope aspen forests and appears patchily distributed. The western third of Colorado has a positive population trend (Wiggins 2005a).
Loggerhead shrike	<i>Lanius ludovicianus</i>	AR ^K /WR ^K	No	No	Passover migrant only. Shrikes occupy the Eastern Plains of Colorado and desert shrub areas of the San Luis Valley and the desert lowlands of the Western Slope. NDIS information indicates there are no confirmed breeding records in mountain parks or the mountains. The NDIS web page (http://ndisweb.nrel.colostate.edu) indicates the species has apparently been extirpated from some areas of eastern Colorado as a breeding species but has not appeared to have declined in western Colorado. The APE does not extend into either the Eastern Plains or the desert shrublands of the Western Slope. The species conservation assessment states that shrikes currently breed throughout lower elevation areas of Region 2 and are absent only in the higher elevation areas of Colorado and Wyoming (Wiggins 2005b).
Sage sparrow	<i>Amphispiza belli</i>	WR ^L	No	No	Sage sparrows are obligate species in large (>300 acres) stands of sagebrush at the lower elevational range for sagebrush (Holmes and Johnson 2005b). Their population is densest in Moffat County followed by Mesa, Montrose, and Montezuma counties (www.rmbo.org). Sagebrush is the second largest category of shrubland on the White River National Forest (42,473 acres), and alternatives would disturb less than 38 acres, none of which would occur on National Forest System Lands.
Brewer's sparrow	<i>Spizella breweri</i>	WR ^K	Yes on WR—sagebrush shrub communities	Yes	
Amphibians					
Boreal toad	<i>Bufo boreas boreas</i>	AR ^K /WR ^K	Yes on AR—montane riparian & wetlands	Yes	
Northern leopard frog	<i>Rana pipiens</i>	AR ^K /WR ^K	No	Yes	

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Common Name	Species	National Forest	MIS/Indicator Community	Species Included	Reason for Exclusion
Wood frog	<i>Rana sylvatica</i>	AR ^K	No	No	Colorado Natural Heritage Program and Arapahoe and Roosevelt National Forest report that the wood frog occurs in Grand, Jackson, and Larimer counties in ponds of the North Platte headwaters. The only other potential water bodies at high elevation in the Corridor are Dillon Reservoir and a small, unnamed pond between Dillon Reservoir and I-70 at mp 204. This species has not been found along the APE, as the Corridor is approximately 50 miles from known locations.
Fish					
Colorado River cutthroat trout	<i>Oncorhynchus clarki pleuriticus</i>	AR ^K /WR ^K	Yes WR & AR - montane aquatic	Yes	
Lake chub	<i>Couesius plumbeus</i>	AR ^L	No	No	The lake chub is critically imperiled in Colorado, and the only observed populations exist in two Clear Creek County reservoirs in the St. Vrain drainage and two reservoirs in the upper Cache La Poudre drainage in Larimer County on the Arapahoe and Roosevelt National Forest (CDOW 2006). There are no records of the lake chub west of the Continental Divide in Colorado. The Corridor does not extend into the St. Vrain drainage or into Larimer County.
Roundtail chub	<i>Gila robusta</i>	WR ^K	No	No	The species conservation assessment states the roundtail chub is endemic to the Colorado River in Colorado and Wyoming. Historic distribution included much of Region 2, but little is actually on National Forest System Lands (Rees et al. 2005a). No populations have been documented in the Eagle River or the upper Colorado River (Rees et al. 2005a).
Bluehead sucker	<i>Catostomus discobolus</i>	WR ^K	No	Yes	
Flannelmouth sucker	<i>Catostomus latipinnis</i>	AR ^L /WR ^K	No	Yes	
Mountain sucker	<i>Catostomus platyrhynchus</i>	AR ^K /WR ^K	No	No	The distribution of mountain sucker extends into Utah from southwest Wyoming. No populations have been documented in the Eagle River or the upper Colorado River (Isaak et al. 2003). Mountain suckers have been collected in the Green River, White River basin (Piceance Creek), and Yampa River basin (Steamboat Lake) (Smith and Koehn 1971 in http://ndisweb.nrel.colostate.edu). Only one record of mountain sucker (Snyder 1981 in NDIS website above) exists from the upper reaches of the Colorado River above Grand Junction.

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Table 9. Region 2 Forest Service Sensitive Species Known or Suspected to Occur on White River National Forest (WR) and Arapahoe and Roosevelt National Forest (AR), or That May Be Influenced by Project Activities

Common Name	Species	National Forest	MIS/Indicator Community	Species Included	Reason for Exclusion
Mollusks					
Rocky Mountain capshell snail	<i>Acroloxus coloradensis</i>	AR ^K	No	No	The Rocky Mountain capshell snail is critically imperiled in Colorado and populations have been observed in Lost Lake and Peterson Lake on the Arapahoe and Roosevelt National Forest. The species conservation assessment states habitat is clean lakes with rocky substrates (Anderson 2005). Lakes in the Corridor typically have sediment substrates. The Corridor is considerably south of the two lakes with known populations. The snail is not known on the White River National Forest. The only high-elevation potential habitat in the Corridor would be west of the Continental Divide at Dillon Reservoir and a small pond between Dillon Reservoir and I-70 at mp 203.
Pygmy mountainsnail	<i>Oreohelix pygmaea</i>	WR	No	No	This species is being dismissed from full analysis of effects and impacts because there are no known occurrences of this species or of its potential habitat in the I-70 Corridor; therefore, no effects or impacts are expected
Insects					
Hudsonian emerald	<i>Somatochlora hudsonica</i>	AR ^K	No	No	The only observed populations are in aquatic habitats of Boulder and Gilpin counties including Eldora and Teller Lakes (Packauskas 2005). The APE does not extend into either county. All records for the dragonfly are within 40 miles of Boulder, Colorado, and the records are approximately 30 years old. The dragonfly has been removed from the TEPS list for the White River National Forest (K. Giezentanner pers. comm. with L. Hettinger 2006b), due to distributional records and lack of suitable habitat.
Great Basin silverspot	<i>Speyeria nokomis nokomis</i>	WR ^K	No	No	This butterfly requires moist meadows or wetlands and has been documented in 11 counties along the western and southwestern borders of Colorado but not in any counties where the Corridor is located (Great Plains Wildlife Research web page). There may be potential habitat on the White River National Forest.
Plants					
Sea pink	<i>Armeria maritima</i> ssp. <i>sibirica</i>	AR/WR	No	No	No plants or suitable habitat; prefers alpine at greater elevations than in APE.
Dwarf milkweed	<i>Asclepias uncialis</i>	AR	No	No	No plants or suitable habitat in APE; prefers lower elevation grasslands.
Park milkvetch	<i>Astragalus leptaleus</i>	AR/WR	No	Yes	
Wetherill's milkvetch	<i>Astragalus wetherilli</i>	WR	No	No	Not in APE; occurs west and north of Rifle.
Upswept moonwort	<i>Botrychium ascendens</i>	AR/WR	No	Yes	
Prairie moonwort	<i>Botrychium campestre</i>	AR	No	No	No plants or suitable habitat present in APE; prefers lower elevation grasslands.
Narrow-leaved moonwort	<i>Botrychium lineare</i> †	AR/WR	No	Yes	
Paradox moonwort	<i>Botrychium paradoxum</i>	AR/WR	No	Yes	
Smooth rockcress	<i>Braya glabella</i>	WR	No	No	Not suspected to occur in APE; prefers alpine at greater elevations (12,000 to 13,000 feet); documented in Pitkin

Table 9. Region 2 Forest Service Sensitive Species Known or Suspected to Occur on White River National Forest (WR) and Arapahoe and Roosevelt National Forest (AR), or That May Be Influenced by Project Activities

Common Name	Species	National Forest	MIS/Indicator Community	Species Included	Reason for Exclusion
					County on White River National Forest.
Lesser paniced sedge	<i>Carex diandra</i>	AR/WR	No	Yes	
Livid sedge	<i>Carex livida</i>	AR/WR	No	Yes	
Sandhill goosefoot	<i>Chenopodium cycloides</i>	AR	No	No	Not in APE; prefers lower elevation grasslands.
Rocky Mountain thistle	<i>Cirsium perplexans</i>	WR	No	No	Not present in APE; occurs in Garfield County west and south of Rifle.
Yellow lady's-slipper	<i>Cypripedium parviflorum</i> (= <i>C. calceolus</i> ssp. <i>parviflorum</i>)	AR/WR	No	Yes	
Clawless draba	<i>Draba exunguiculata</i>	AR/WR	No	No	No plants or suitable habitat in APE; prefers alpine higher than present at Eisenhower-Johnson Memorial Tunnels.
Gray's Peak whitlowgrass	<i>Draba grayana</i>	AR/WR	No	No	No plants or suitable habitat present in APE; prefers alpine higher than present at Eisenhower-Johnson Memorial Tunnels.
Roundleaf sundew	<i>Drosera rotundifolia</i>	AR/WR	No	Yes	
Dropleaf buckwheat	<i>Eriogonum exilifolium</i>	AR/WR	No	No	No plants or suitable habitat in APE; endemic to North and Middle Park areas.
Altai cotton-grass	<i>Eriophorum altaicum</i> var. <i>neogaeum</i>	AR/WR	No	Yes	
Russet cotton-grass	<i>Eriophorum chamissonis</i>	WR	No	No	APE is outside suspected range, which is south and west of the APE.
Slender cotton-grass	<i>Eriophorum gracile</i>	AR/WR	No	Yes	
Hall's fescue	<i>Festuca hallii</i>	AR/WR	No	Yes	
Lone Mesa snakeweed	<i>Gutierrezia elegans</i>	WR	No	No	APE is outside known range, which is west of APE on Rifle Ranger District.
Weber's scarlet-gilia	<i>Ipomopsis aggregata</i> ssp. <i>weberi</i>	AR	No	No	No plants suspected in APE; endemic to Rabbit Ears Pass area.
Simple kobresia	<i>Kobresia simpliciuscula</i>	AR/WR	No	Yes	
Colorado tansy-aster	<i>Machaeranthera coloradoensis</i>	AR/WR	No	Yes	
Adder's-mouth	<i>Malaxis brachypoda</i>	AR	No	No	No plants or habitat in APE; prefers lower elevations.
Budding monkeyflower	<i>Mimulus gemmiparus</i>	AR	No	Yes	
Kotzebue's grass-of-Parnassus	<i>Parnassia kotzebuei</i>	AR/WR	No	Yes	
Harrington's beardtongue	<i>Penstemon harringtonii</i>	AR/WR	No	Yes	
DeBeque phacelia	<i>Phacelia scopulina</i> var. <i>submutica</i>	WR	No	No	Not in APE; occurs west and south of Rifle.
Front Range or Rocky Mountain	<i>Potentilla rupincola</i>	AR	No	Yes	

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Table 9. Region 2 Forest Service Sensitive Species Known or Suspected to Occur on White River National Forest (WR) and Arapahoe and Roosevelt National Forest (AR), or That May Be Influenced by Project Activities

Common Name	Species	National Forest	MIS/Indicator Community	Species Included	Reason for Exclusion
cinquefoil					
Porter's feathergrass	<i>Ptilagrostis porteri</i>	AR/WR	No	Yes	
Ice cold buttercup	<i>Ranunculus karelinii</i> (= <i>R. gelidus</i> ssp. <i>grayi</i>)	AR/WR	No	No	No plants or suitable habitat in APE; prefers alpine higher than present at Eisenhower-Johnson Memorial Tunnels.
Dwarf raspberry	<i>Rubus arcticus</i> var. <i>acaulis</i> (= <i>Cylactis acaulis</i>)	AR/WR	No	Yes	
Hoary willow	<i>Salix candida</i>	AR/WR	No	Yes	
Autumn willow	<i>Salix serissima</i>	AR/WR	No	Yes	
Sphagnum	<i>Sphagnum angustifolium</i>	AR/WR	No	Yes	
Baltic sphagnum	<i>Sphagnum balticum</i>	AR/WR	No	Yes	
Sun-loving meadowrue	<i>Thalictrum heliophilum</i>	WR	No	No	Recorded outside APE on the White River National Forest west and south of Rifle.
Lesser bladderpod	<i>Utricularia minor</i>	AR/WR	No	Yes	
Selkirk's violet	<i>Viola selkirkii</i>	AR/WR	No	Yes	

Notes:

K—Species currently documented to occur on National Forest System Lands.

L—Species or habitat is suspected to occur on National Forest System Lands, but unconfirmed.

N—Species not known or suspected to occur on National Forest System Lands; however, it may occur in planning area vicinity. Requires evaluation whether indirect effects from project alternatives may occur.

*†*Includes plants corresponding to morphology of *B. "furcatum."*

Table 10 provides a list of MIS not included on **Table 9**, based on United States Forest Service MIS lists provided on May 14, 2009 (see **Appendix E** of this Technical Report for details).

Table 10. MIS (Not Previously Covered in Table 3) That May Occur or Be Influenced by Project Activities(Rocky Mountain Region—TEPS Species, May 2009)

Common Name	Species	National Forest	Management Indicator Community (MIC)	Species Included	Reason for Exclusion
Mammals					
Elk	<i>Cervus elaphus</i>	AR/WR	Young to mature forest & openings	Yes	
Mule deer	<i>Odocoileus hemionus</i>	AR	Young to mature forest & openings	Yes	

Table 10. MIS (Not Previously Covered in Table 3) That May Occur or Be Influenced by Project Activities(Rocky Mountain Region—TEPS Species, May 2009)

Common Name	Species	National Forest	Management Indicator Community (MIC)	Species Included	Reason for Exclusion
Cave bats	All species	WR	Caves and mines	No	Nine caves were surveyed for bats in Garfield and Eagle counties, most of which were on non-Forest Lands (Siemers 2002). Six species and 163 individuals were observed. The majority of caves were south and east of Glenwood Springs and not in the Corridor. No Corridor alternatives would extend into Glenwood Canyon. Given that most caves are located outside the Corridor, no effects would be expected on cave bats.
Birds					
American pipit	<i>Anthus rubescens</i>	WR	Alpine grasslands	No	This species is strongly associated with alpine grasslands for breeding and rearing of young (USDA 2006). The pipit is common in all mountain ranges in Colorado (www.rmbo.org). No alpine habitat would be affected by project alternatives.
Virginia's warbler	<i>Vermivora virginiae</i>	WR	Dense shrub habitat	Yes	
Hairy woodpecker	<i>Picoides villosus</i>	AR	Young to mature forest structural stages	Yes	
Pygmy nuthatch	<i>Sitta pygmaea</i>	AR	Existing and potential old-growth forest	Yes	
Golden-crowned kinglet	<i>Regulus satrapa</i>	AR	Interior forests	No	This bird prefers dense spruce-fir forests. They are common in Colorado in the summer between 6,000 and 10,000 feet, much more so west of the Continental Divide than in the east. This species requires interior forest habitat with old-growth characteristics, especially the interiors of spruce-fir forests (Kingery 1998). Because project alternatives closely follow the existing alignment, often within the area of existing disturbance, they are not anticipated to affect this habitat type.
Mountain bluebird	<i>Sialia currucoides</i>	AR	Forest openings	Yes	
Warbling vireo	<i>Vireo gilvus</i>	AR	Aspen forest	Yes	
Wilson's warbler	<i>Wilsonia pusilla</i>	AR	Montane riparian areas and wetlands	Yes	
Fish					
All Trout	All species	WR	Montane aquatic	Yes	
Brook trout	<i>Salvelinus fontinalis</i>	AR	Montane aquatic	Yes	
Brown trout	<i>Salmo trutta</i>	AR	Montane aquatic	Yes	
Insects					
Aquatic Macroinvertebrates	All species	WR	Montane aquatic	Yes	

^a Several species are addressed under multiple categories: MIS, FS sensitive, and/or federally listed.

5.3.3 Forest Service Plant Species of Local Concern

United States Forest Service, in 2009, identified the following species as “Species of Local Concern,” a formal or informal designation (depending on the Forest) that is made when species are of management concern because they may be locally rare, occur at the edges of their range, may be subject to viability issues in the future, or may need additional research, but for which a formal designation of Sensitive is not warranted at this time. The lists may be revised as new information becomes available.

Assessment of impacts on these species will be conducted during the Tier 2 processes.

- Species of Local Concern for both Forests that may have suitable habitat or occur within the APE. All common names provided by USDA PLANTS Database (2010).
 - Crenulate moonwort (*Botrychium crenulatum*)—**known to occur in APE near Vail Pass**
 - Lanceleaf grapefern (*Botrychium lanceolatum* ssp. nov. “*viride*”)(green-stemmed phenotype)
 - Leathery grapefern (*Botrychium multifidum*)
 - Pale moonwort (*Botrychium pallidum*)
 - Northern moonwort (*Botrychium pinnatum*)
 - Little grapefern (*Botrychium simplex*)
 - Grapefern (*Botrychium spathulatum*)
 - *Botrychium tunux X lineare* (possible new species)—**known to occur in APE near east side of Eisenhower-Johnson Memorial Tunnels**
 - Fairy slipper (*Calypso bulbosa*)
 - Bristlystalked sedge (*Carex leptalea*)—**known to occur in a fen near APE boundary near Vail Pass**
 - Peck’s sedge (*Carex peckii*)
 - Rocky Mountain snowlover (*Chionophila jamesii*)
 - Northern golden saxifrage (*Chrysosplenium tetrandrum*)
 - Purple marshlocks (*Comarum palustre*)
 - Bunchberry dogwood (*Cornus canadensis*)
 - Yellow coralroot (*Corallorhiza trifida*)
 - Spring coralroot (*Corallorhiza wisteriana*)
 - Clustered lady’s slipper (*Cypripedium fasciculatum*)
 - Tall cottongrass (*Eriophorum angustifolium*)—**known to occur in a fen near APE boundary**
 - Ferns, all but brittle bladderfern (*Cystopteris fragilis*)—**Some ferns are known to occur within or near APE**
 - Lesser rattlesnake plantain (*Goodyera repens*)
 - Bog laurel (*Kalmia polifolia*)
 - Northern twayblade (*Listera borealis*)—**known to occur within or near the APE**
 - Broadlipped twayblade (*Listera convallarioides*)
 - Marsh felwort (*Lomatogonium rotatum*)
 - Stiff clubmoss (*Lycopodium annotinum*)
 - Stiff clubmoss (*Penstemon caythophorus*)—**known to occur near APE**
 - Arrowleaf sweet coltsfoot (*Petasites sagittatus*)
 - Whiteveined wintergreen (*Pyrola picta*)
 - Marsh arrowgrass (*Triglochin palustre*)—**known to occur near APE**

- Species of Local Concern for the White River National Forest that may have suitable habitat or occur within the APE. All common names provided by USDA PLANTS Database (2010).
 - Oneleaf onion (*Allium sibericum*)
 - Woodrush sedge (*Carex luzulina* var. *atropurpurea*)
 - Boreal bog sedge (*Carex paupercula*)
 - Slender spiderflower (*Cleome multicaulis*)
 - Thicksepal cryptantha (*Cryptantha crassisejala*)
 - Longflower cryptantha (*Cryptantha longiflora*)
 - Smooth draba (*Draba glabella*)
 - Fewseed draba (*Draba oligosperma*)
 - Arctic alpine fleabane (*Erigeron humilis*)
 - Featherleaf fleabane (*Erigeron pinnatisectus*)
 - Largeflower wild hollyhock (*Iliamna grandiflora*)—**known to occur near APE**
 - Manystem blazingstar (*Mentzelia multicaulis*)—**known to occur in APE**
 - Splitleaf groundsel (*Packera dimorphophylla* var. *inermidia*)
 - Alpine groundsel (*Packera pauciflora*)
 - Sparse-flowered bog orchid (*Plantanthera sparsifolia* var. *ensifolia*)—**known to occur in or near APE**
 - White princesplume (*Stanleya albescens*)
 - Hapeman's coolwort (*Sullivantia hapemanii*)—**known to occur in Glenwood Canyon**

5.3.4 State Threatened, Endangered, or Species of Concern

The State of Colorado also designates threatened and endangered animal species under State Statute 33-2-105. Colorado Division of Wildlife has developed two categories of imperilment for these animal species:

- Threatened: species or subspecies not in immediate jeopardy of extinction but vulnerable because of small numbers, restricted ranges, or low recruitment or survival.
- Endangered: species or subspecies whose prospects for survival or recruitment within the state are in jeopardy.

Species can also be listed as Species of Concern (SC) by Colorado Division of Wildlife, though this is not a statutory category. Species of Concern include species that have been removed from state listing within the last five years, are proposed for federal listing as candidates, or have experienced a downward trend in numbers or distribution in the state and warrant evaluation.

Based on the Colorado Division of Wildlife species list dated July 7, 2010 (see **Appendix E** of this Technical Report for details) and consultation with CDOT's Environmental Programs Branch, the following are the only State listed species that is not also identified on any federal list and could occur in the project area:

- Midget faded rattlesnake (*Crotalus oreganos concolor*) (SC)
- Common garter snake (*Thamnophis sirtalis*)(SC)

These species are noted in the *I-70 Mountain Corridor PEIS* for the purpose of continued awareness during Tier 2 processes.

5.3.5 Bureau of Land Management Sensitive Species and Colorado Natural Heritage Program

Bureau of Land Management-listed sensitive species occur on Bureau of Land Management lands and have been designated by the State Bureau of Land Management Director as those that could easily become endangered or extinct in the state.

Colorado Natural Heritage Program tracks a number of rare species and natural communities that have not been identified as special status by the state or federal government. These species are noted in the *I-70 Mountain Corridor PEIS* for the purpose of continued awareness during Tier 2 processes. A full list is available in **Appendix F**, Colorado Natural Heritage Program Species Lists.

5.3.6 Lynx Reintroduction Update

Status Summary of Reintroduced Lynx

The Colorado Division of Wildlife produces an annual Lynx Update Report. The most recent report, dated May 25, 2009, has been incorporated into the updated Biological Report (see **Appendix G**).

In summary, Colorado Division of Wildlife is currently tracking 42 of the 103 reintroduced lynx still possibly alive. Colorado Division of Wildlife has not heard signals on 62 reintroduced lynx since at least May 25, 2008, and these animals are listed as “missing” (Table 3 of the Lynx Update Report in **Appendix G** of this Technical Report). One of these missing lynx is the unknown mortality, thus only 61 are truly missing. A number of these lynx are now missing because their collar batteries have died and Colorado Division of Wildlife can no longer pick up radio signals. Some of the missing lynx may still have functioning collars but are outside the research area. Expanded flights outside the research area during the summer and fall months may locate these missing lynx.

5.3.7 Impact of Mountain Pine Beetle on Lynx Habitat

The mountain pine beetle infestation is causing ongoing change in forest conditions. The extent and breadth of change are not necessarily predictable, however, and the most appropriate time to address those changing conditions is during the Tier process.

5.3.8 Water Depletions

Water depletions to the Platte River or Colorado River basins constitutes an action that may affect, and is likely to adversely affect, threatened, endangered, and sensitive species that depend on the river for their existence. The following discussion summarizes the information included in the Biological Assessment, Biological Report, or *I-70 Mountain Corridor PEIS*, in regards to water depletions to the Colorado and South Platte Rivers.

Colorado River Depletions

Water depletions above the confluence with the Gunnison River, which includes the area west of the continental divide along the Corridor, fit under the Programmatic Biological Opinion if they meet the following criteria:

1. Private parties must sign a Recovery Agreement (Federal agencies do not sign).
2. New depletions over 100 acre-feet require the payment of a depletion fee (2008 fee was \$17.79). For historic (prior to 1988) and depletions less than 100 acre feet, there is NO fee.
3. Re-initiation stipulations are included in all consultations.
4. Federal agency agrees to retain discretionary federal authority.

A Not Likely to Adversely Affect can be reached if there are no depletions and the following three criteria are met (and projects should strive for this):

1. No further restriction of the river channel
2. No fill placed in backwater areas
3. No reduction in amount of floodable habitat

Platte River Depletions

The Platte River Recovery Implementation Program (PRRIP) officially began in January 2007, replacing the requirement for project proponents to address project-specific offsetting measures for major depletions (more than 25 acre feet/year).

The PRRIP allows existing and most or all new water uses in the Platte River basin in Colorado, Wyoming, and Nebraska above the Loup River confluence to operate in regulatory compliance with the ESA for the four Platte “target species” in Nebraska:

- Whooping crane (*Grus americana*)
- Interior least tern (*Sterna antillarum*)
- Northern Great Plains population of the piping plover (*Charadrius melodus*)
- Pallid sturgeon (*Scaphirhynchus albus*)

This is made possible by implementing offsetting measures during the first increment of the PRRIP, including measures that will substantially reduce shortages to target flows in the central Platte River and that will obtain and restore habitat for the target species.

By agreeing to be covered by the PRRIP, proponents of water-related projects subject to Section 7 ESA consultation can ensure compliance relative to the Platte target species, can avoid the potential for prohibited “take” of these species under ESA Section 9, and can take advantage of pre-defined procedures and expectations going into the ESA consultation process. See <http://www.fws.gov/platteriver/>.

The following language is included in the Biological Assessment, Biological Report, and *I-70 Mountain Corridor PEIS*, regarding water depletions to the South Platte River.

Conservation/Minimization Measures for Federally Listed Species Downstream in the Platte River System

Depletions to the Platte River system due to CDOT activities are addressed by the State of Colorado’s participation in the South Platte Water Related Activities Program (SPWRAP) through the “Memorandum of Agreement for Implementation and Operation of the Colorado Portion of the Platte River Recovery Implementation Plan” as described in paragraph 4.a. of the Memorandum of Agreement. The State has made and continues to make financial and other contributions to the Platte River Recovery Implementation Program (PRRIP). In addition, SPWRAP has created a “Class X-1” membership specifically for and limited to the State of Colorado for diversions and depletions by State agencies that are comparatively small. CDOT falls into this category because their typical depletive activities such as wetland creation and water quality ponds, as well as water used for compaction, concrete, and dust control do not generally require large amounts of water. According to the Memorandum of Agreement, contributions previously made are deemed payment of all SPWRAP assessments for the Class X-1 membership for the duration of the First Increment of the PRRIP, which expires in 2020. However, because FHWA is funding the project, in order to satisfy their obligation under the ESA, Section 7 consultation is required.

An analysis of effects on federally listed species downstream in Nebraska resulting from the project’s Preferred Alternative will be completed during Tier 2 processes, as CDOT cannot anticipate depletions at the programmatic level of design. The Colorado Department of

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Transportation, as a Colorado State agency and participant in the PRRIP, will also complete a PRRIP template biological assessment during Tier 2 analysis and submit it to the United States Fish and Wildlife Service for streamlined Section 7 consultation provided by participation in the PRRIP. The Colorado Department of Transportation is coordinating with the United States Fish and Wildlife Service on this matter for documentation in the Biological Assessment; following streamlined consultation and the United States Fish and Wildlife Service's issuance of a biological opinion, project-level depletions will be monitored annually by CDOT and reported to the United States Fish and Wildlife Service.

5.3.9 Greenback Cutthroat Trout (*Oncorhynchus clarki stomias*)

It is the opinion of the United States Fish and Wildlife Service (USFWS 2009) that all rivers and streams that have been protected in the past will continue to be protected. The list of streams will probably change over time and will be addressed during Tier 2 processes. At this time, both the White River National Forest and the Arapahoe and Roosevelt National Forest are proceeding on the assumption that all populations (east and west slope) of greenback cutthroat trout are considered to be threatened (Colorado and federally) and are, therefore, protected. Habitat restoration projects are being considered as usual (USFS 2009b).

On August 19, 2008, the United States Forest Service, along with Colorado Division of Wildlife, National Forest Foundation, Miller-Coors Brewing Company, Henderson Mine Company, and Wildlands Restoration Volunteers initiated the West Fork of Clear Creek Streambank Restoration Project. The project was completed August 29, 2008. The Clear Creek Ranger District's primary goal was to improve water quality and riparian habitat conditions in the West Fork of Clear Creek drainage area to facilitate future greenback re-introduction. The creek has been surveyed for potential habitat suitability, but the determination cannot be complete until more is known about temperatures. Thermographs were placed in West Fork of Clear Creek in 2008, but were subsequently lost due to high flows, and the project remains unfinished.

Impacts on greenback trout populations have been reported in this first tier document with the caveat that this number may change in the future based on ongoing studies of the genetics of the fish in the area. Any new information will be addressed during Tier 2 processes.

5.3.10 Aquatic Macroinvertebrates

Aquatic macroinvertebrates are invertebrates that spend at least part of their life cycle in water. Such organisms include worms, mollusks, mites, and insects, with the latter being the most common. Although most insect orders contain sensitive species, three orders include species that are especially sensitive to disturbances in water quality: Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). Macroinvertebrate population discussions frequently refer to these three orders as "EPT" taxa. Macroinvertebrates are designated as MIS species on the White River National Forest to answer the following questions: (1) "Does Forest management maintain or improve water quality (including chemical quality and sediment) such that aquatic faunal communities are similar between managed and reference sites?" and (2) "Is habitat being managed to provide for other aquatic species, including trout?"

The primary threats to macroinvertebrates include alteration and loss of suitable aquatic habitat from logging, fires, river impoundment, road and railroad construction, and land clearance for agriculture and human habitation.

Impacts on stream habitat and on macroinvertebrates would occur during construction activities and during roadway operations. Construction-related impacts would probably include increased sedimentation during earthmoving operations and possible contamination from equipment fueling and maintenance. Increased contamination and sedimentation also would have the potential to increase with the addition of

lanes, transportation modes, and traffic volumes. Conversely, project construction also would provide an opportunity to reduce the current impact levels that occur from roadway runoff of contaminants and winter maintenance materials, as well as to improve reaches of stream habitat that were negatively affected by the original I-70 construction. Therefore, because some improvements to macroinvertebrate habitats are anticipated with the action alternatives, impacts would not be expected to cause a change in macroinvertebrate populations on the White River National Forest. There is no viability risk for aquatic macroinvertebrates (the potential for the population to substantially decrease is unlikely), and none of the project alternatives would threaten the viability of these organisms in the planning area or in the state.

5.3.11 Influence of Climate Change and the Mountain Pine Beetle on Corridor Habitat

See **Section 4.3.1**, Influence of Climate Change and the Mountain Pine Beetle on Corridor Habitat.

5.3.12 Barrier Effect

Progression of Linkage Interference Zones

The group reviewed the ALIVE screening of linkage interference zones list (see **Table 11**) and the linkage zone screening graphic, which re-created the evolution of the 15 linkage interference zones carried forward to the Memorandum of Understanding. The original ALIVE group initially identified 38 linkage interference zones. During subsequent meetings, these linkage interference zones were refined, combined, or eliminated to create the final list of 15. Through the review process, the group confirmed the 15 linkage interference zones presented in the Memorandum of Understanding.

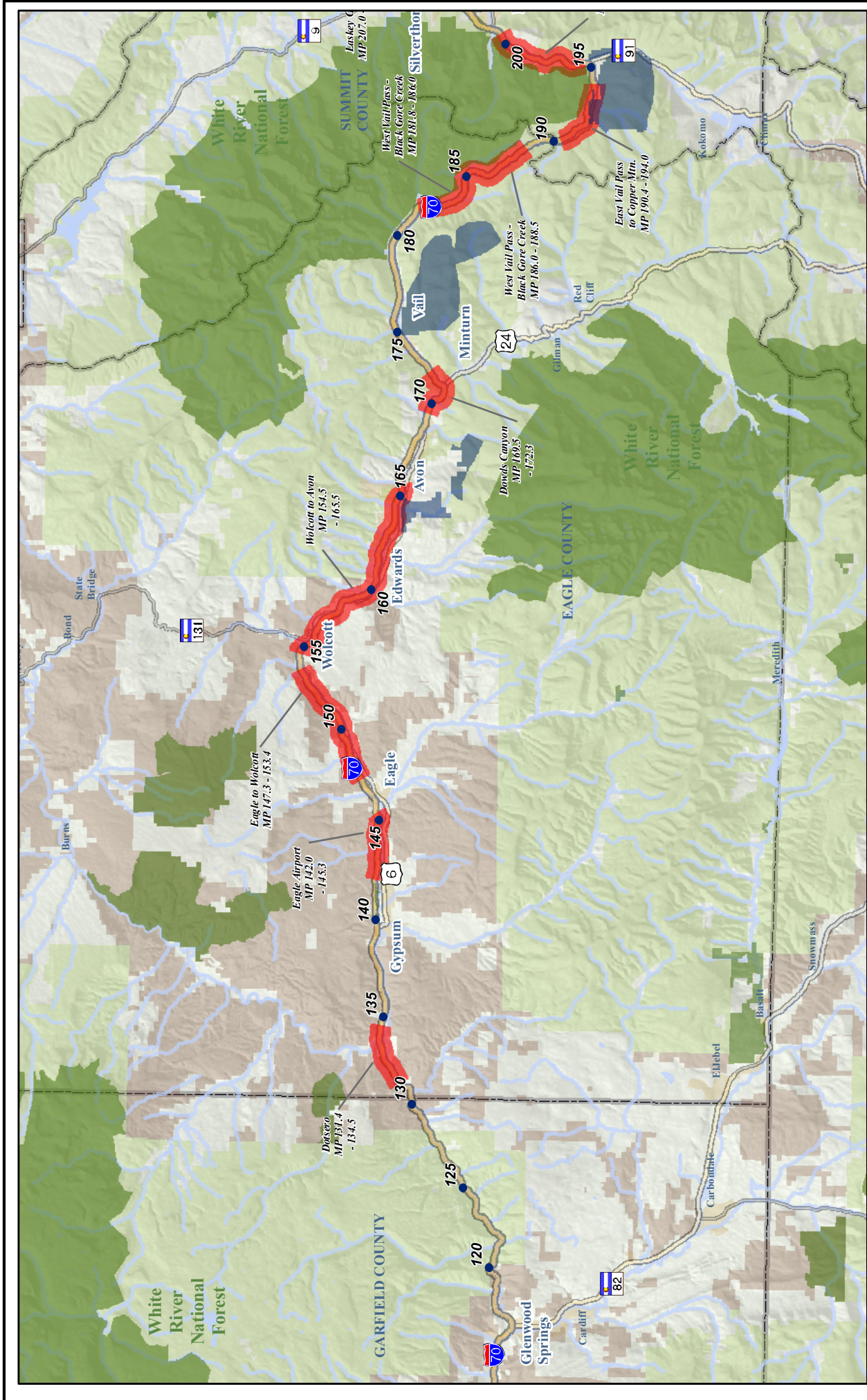
Ecological Context of Linkage Interference Zones

The context of the linkage interference zones is the interaction between I-70 and wildlife movement patterns along the Corridor and habitat linkages within the Southern Rocky Mountains in Colorado. This is a key component of the *I-70 Mountain Corridor PEIS*, the United States Fish and Wildlife Service Biological Assessment, and the United States Forest Service Biological Report for the I-70 Mountain Corridor and the focus of the ALIVE Committee Memorandum of Understanding.

Impacts on wildlife habitats and movement patterns were evaluated based on the anticipated effects of construction, operation, and maintenance of alternatives. One of the most serious issues affecting wildlife in the Corridor is interference with wildlife movement due to the barrier effects created by I-70 and the influences of alternatives. Linkage interference zones were identified along the Corridor where the barrier effects of I-70 impede traditional wildlife movement or habitat linkage areas (see **Figure 8** and **Figure 9** for maps of the locations linkage interference zones in context of the Corridor). Wildlife linkages connect important components of a species' habitat needed to complete lifecycles. Effects of winter maintenance and noise on habitats were evaluated within the I-70 "road effect zone."

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I-70 Mountain Corridor PEIS Technicial Report Wildlife Linkage Interference Zones

U.S. Department of Transportation
Federal Highway Administration

DOT
Department of Transportation

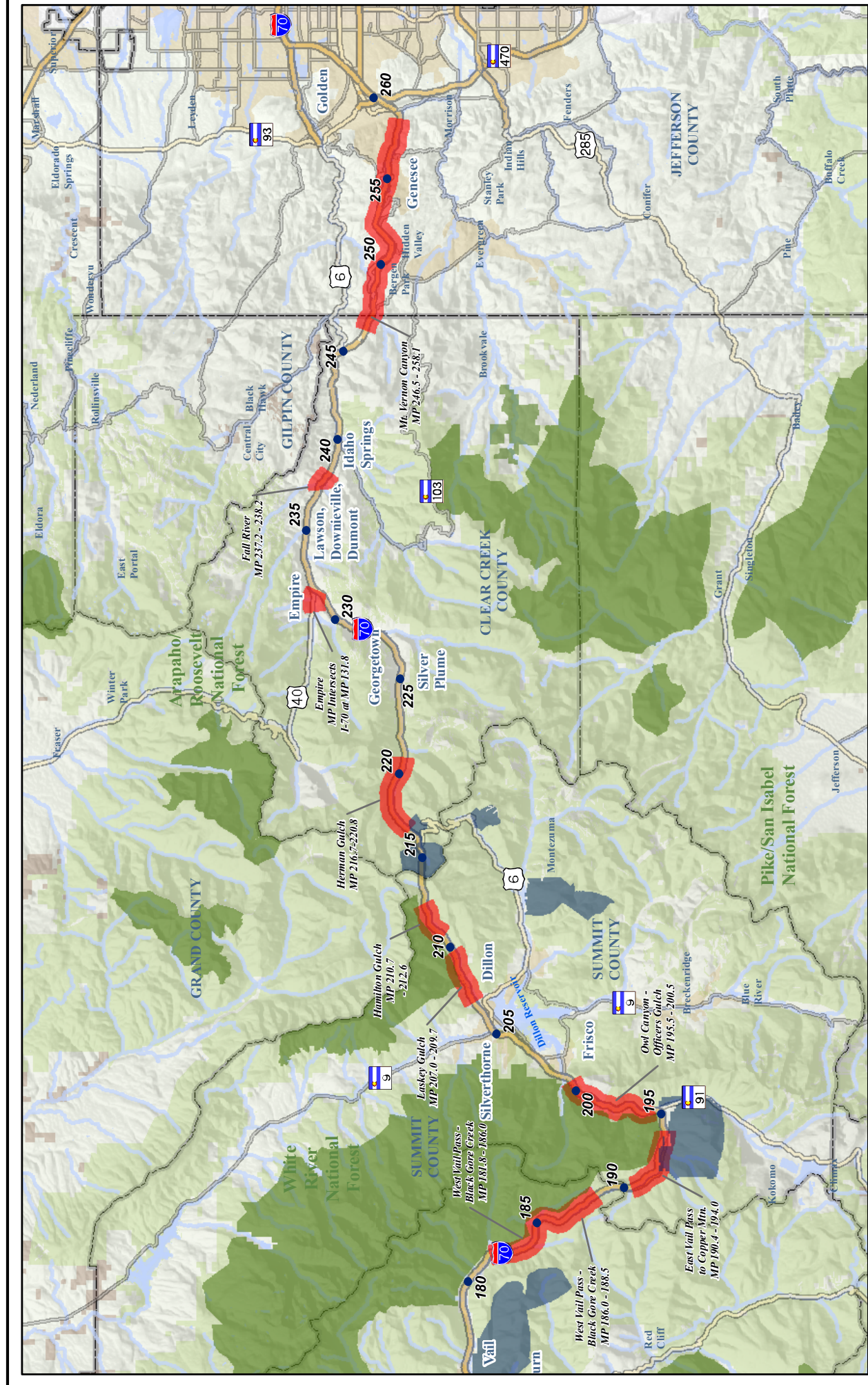
Map 1 of 2

Legend

- Mileposts
- Limited Access Highways
- Major Highways
- Highways
- Lakes
- County Boundary
- Urban Areas
- USFS Land
- BLM Land
- Wilderness Areas / Natural Areas
- Ski Areas
- Wildlife Linkage Interference Zones

Scale - 1:420,000
or 1" = 6.62 Miles

0 3.31 6.62 Miles



Legend

- Mileposts
- Limited Access Highways
- Major Highways
- Highways
- Lakes
- County Boundary
- Urban Areas
- USFS Land
- BLM Land
- Wilderness Areas / Natural Areas
- Ski Areas
- Wildlife Linkage Interference Zones

I-70 Mountain Corridor PEIS
 Technical Report
Wildlife Linkage Interference Zones

Map 2 of 2

Scale - 1:420,000
 or 1" = 6.62 Miles

0 3.31 6.62 Miles

The purpose of the Tier 1 Biological Assessment is to determine to what extent the Preferred Alternative may affect Threatened, Endangered, or Candidate species at a programmatic level. This assessment is prepared in accordance with legal requirements set forth under Section 7 of the ESA (16 USC 1536 (c)) and follows guidance described within the FHWA memorandum titled “Management of the Endangered Species Act (ESA) Environmental Analysis and Consultation Process,” dated February 20, 2002. Future project-level formal consultations for listed species may be required for Tier 2 processes conducted on specific segments of the I-70 Mountain Corridor. The Biological Assessment will address the effects of the proposed action on Threatened, Endangered, or Candidate species.

The purpose of the Biological Report is to determine the likely effects of the alternatives on federally listed species (endangered, threatened, and proposed), Forest Sensitive species, MIS, and other species or habitats potentially affected by the project alternatives at a Tier 1 level of detail. This is in accordance with direction in the 1997 revision of the *Land and Resource Management Plan for Arapaho and Roosevelt National Forests and Pawnee National Grassland* and the 2002 revision of the *White River National Forest Land and Resource Management Plan* (Forest Plans).

The ALIVE Memorandum of Understanding recognizes that the existing I-70 Corridor and the proposed future improvements pass through several life zones and ecosystems that support numerous aquatic and terrestrial wildlife species. It acknowledges that the I-70 Corridor fragments or isolates existing habitats, interferes with free movement of animals within their habitat, and reduces remaining wildlife habitat quality by making such habitat less accessible to many native species. In addition, high-traffic volumes form a difficult-to-penetrate barrier to movement, often resulting in animal-vehicle collisions and serious levels of mortality for some rare or low-density species. Therefore, over time, the benefits derived from a transportation system can come at a cost to other resources, including interference with the ability of wildlife to use the landscape in a manner that maintains population effectiveness.

The ALIVE Committee identified 15 high-priority locations (linkage interference zones) where evidence suggests that the highway’s barrier effect impedes important wildlife migration or movement routes or zones of dispersal. The ALIVE program provides a starting point for and ensures agencies’ participation in the development of, subsequent Tier 2 processes and implementation of long-term impact mitigation measures within the context of a Corridor-long, landscape-based ecosystem approach to Corridor impacts on wildlife needs and conservation measures.

Linkage Interference Zone Updates

J.F. Sato and Associates (JFSA) has updated the information provided on July 17, 2008. At the ALIVE Committee meeting related to the screening and establishment of the linkage interference zones. In response to comments, JFSA has updated information on land ownership, I-70 structural barriers, openings, and animal-vehicle collision data. The following summarizes the updated information that has been illustrated on **Figure 10** through **Figure 12**. These data provided the ALIVE Committee with comprehensive documentation of the factors influencing the locations of the linkage interference zones currently included in the ALIVE Memorandum of Understanding.

Land Ownership

Figure 10 includes recent land use—open space changes in Clear Creek County. Land use patterns do not appear to be a consistent indicator of wildlife crossing I-70. For example, animal-vehicle collisions are elevated where there is designated open space (Denver Mountain Park) and no physical barriers (in the Mount Vernon Canyon area of Jefferson County). Conversely, animal-vehicle collisions are elevated in the urbanized and developing Avon area (milepost 164 to milepost 166), where fencing and steep slopes are present.

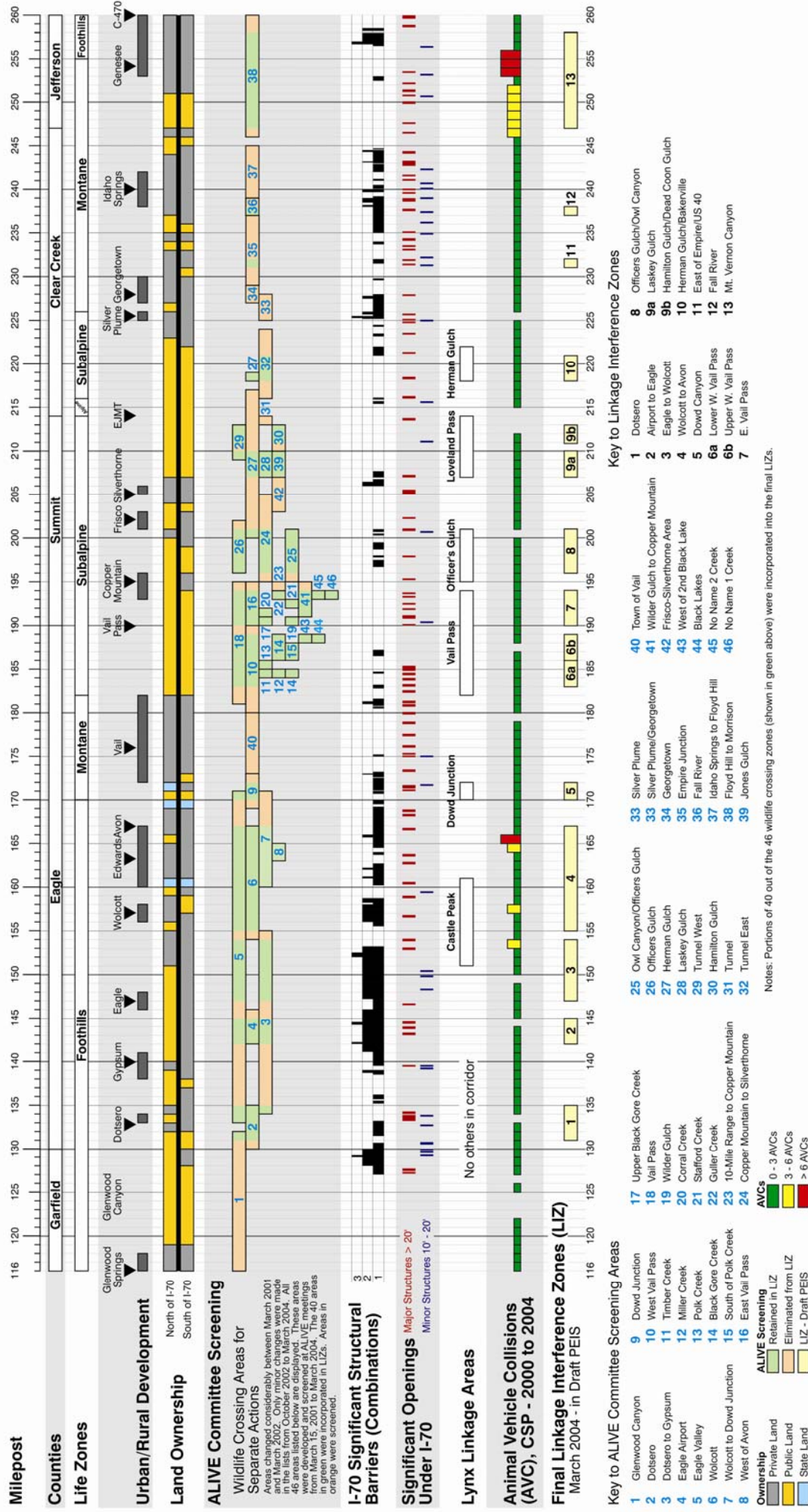


Figure 10: Linkage Interference Zones Along I-70

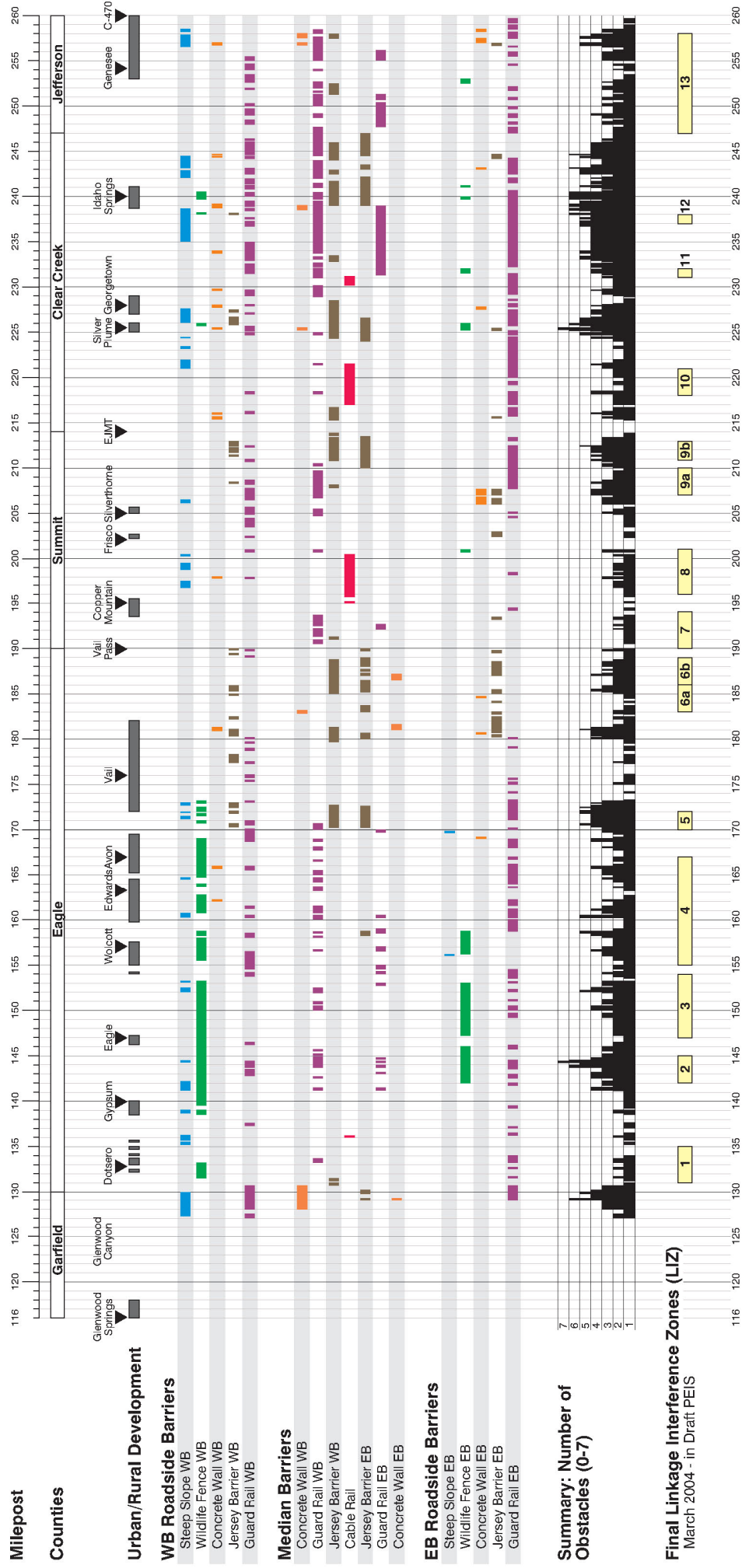
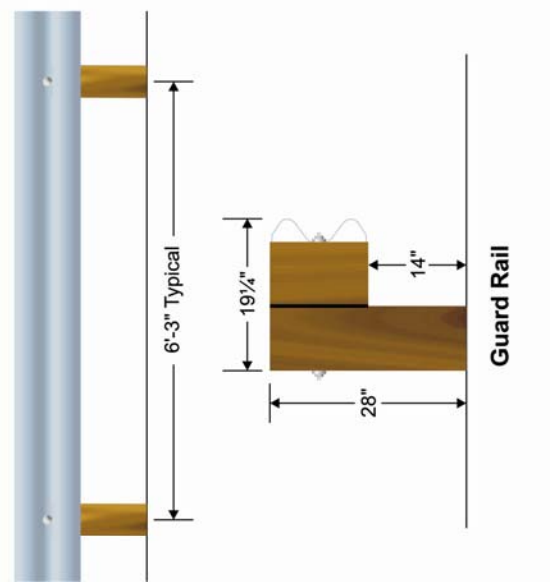
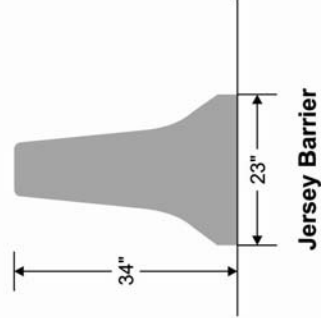
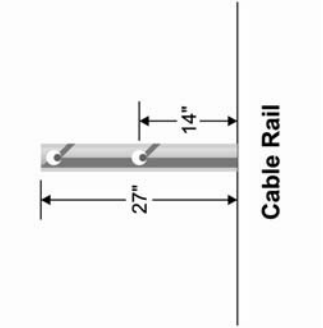
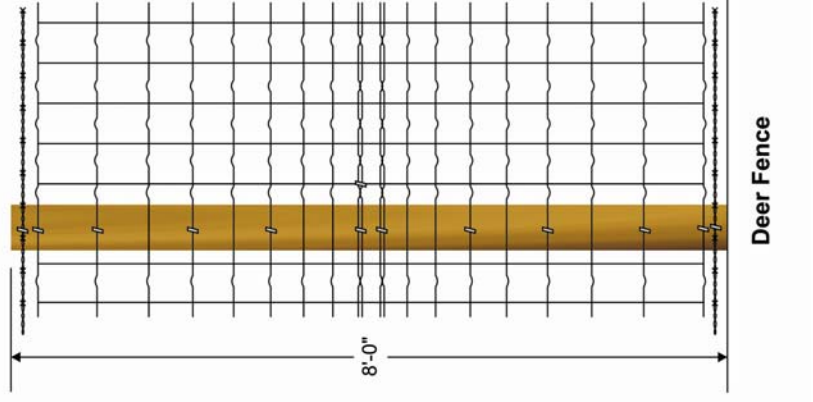


Figure 11: All Barriers Along I-70

Figure: 12 Types of Barriers



Updated Barrier Inventory—Roadside and Median Structures and Steep Slopes

The Committee requested a detailed inventory of I-70 barriers that had been mapped as part of the initial ALIVE program to better evaluate their influence on wildlife trying to cross I-70. This included specific types and locations of all road edge and median barriers and adjacent steep slopes. As these data are not available in the CDOT structure inventories, a windshield survey of the Corridor was conducted in August 2008 to identify and map the specific types of barriers from the east entrance of Glenwood Canyon at milepost 127 to C-470 at milepost 260. This also allowed the mapping of any new barriers, such as new sound walls in the Dillon area.

A spreadsheet of barriers was prepared for the median, eastbound lanes, and westbound lanes and included wildlife fencing, chain link fencing, guard rails, cable rails, cement barriers, concrete walls, retaining walls, and noise walls. Mapping of adjacent urbanized areas and steep slopes was also refined. Field spreadsheets were then digitized and the data were plotted and formatted to create the comprehensive barrier inventory illustrated on **Figure 11**. A total of seven barrier types are shown. In summary, there is a combination of urban areas and structural barriers along 123 miles, leaving 10 miles of the Corridor and the tunnel segments without some form of barrier. Descriptions of the guard rails, cable rails, cement barriers, and wildlife fences are provided on **Figure 12**.

The next step was to identify barriers that are considered significant to wildlife movement. Barriers such as guard rails, cable rails, and cement barriers are not considered significant for large and medium-sized animals because they can be jumped or crossed under. Small forms of wildlife that cannot climb or jump cement barriers are prevented from crossing unless gaps are provided between the cement barriers.

Openings Under I-70—Bridges and Other Significant Structures

Large openings, including bridges, provide existing opportunities for wildlife movement under I-70. CDOT's Log of Structures documents literally thousands of openings under I-70, ranging from 6-inch or smaller diameter pipes to bridges hundreds of feet long. For the purposes of this inventory, significant opportunities for wildlife to cross under I-70 include major structures (such as bridges) with openings greater than 20 feet, and minor structures with openings from 10 to 20 feet (pipes and culverts). A 10-foot opening size was identified as a minimum because of the requirements of large mammals. Medium and smaller-sized wildlife would use smaller openings, but they also would benefit from 10-foot openings. It should be noted that wildlife do not typically seek out an opening under a highway; openings are usually used on an opportunistic basis. If wildlife become acclimated to an opening, they may use it repeatedly. The average distance between openings would indicate that wildlife would benefit if I-70 were more permeable than it currently is.

Animal-Vehicle Collision Data

Five years of Colorado State Patrol data were summarized to provide an extended depiction of animal-vehicle collisions (see **Table 12**). The Colorado State Patrol data are recorded by mile and the actual animal-vehicle collision number in that mile for each of the five years was combined to create an animal-vehicle collision index (animal-vehicle collision/mi/yr) for that mile. There is an animal-vehicle collision index for virtually every mile of the Corridor (missing 10 plus the tunnel segments). These data are presented as vertical, colored bars on **Figure 10** representing indices from 0–3, 3–6, and greater than 6. The largest index was 8.8 in mile 255 in Mount Vernon Canyon. Previous animal-vehicle collision data for just the linkage interference zones showed highly variable and low animal-vehicle collision indices. The Colorado State Patrol data show consistent, low level animal-vehicle collision indices across almost the entire Corridor. Only 14 miles of the Corridor did not report any animal-vehicle collisions. Animal-vehicle collisions greater than 3.0 occur in 13 miles of the Corridor, as shown on **Figure 10**. The average animal-vehicle collision index was 1.26. This also tends to show that wildlife cross the highway opportunistically.

Table 12. Colorado State Patrol Accident Data, 2000-2004 I-70 Mile Markers 116—260

Mile Marker	2000	2001	2002	2003	2004	Total	/mile/yr
116			2			2	0.4
117					1	1	0.2
118		1	3	4	3	11	2.2
119			1	1	1	3	0.6
120			1		2	3	0.6
121	2					2	0.4
122	2					2	0.4
123						0	0
124						0	0
125						0	0
126					1	1	0.2
127						0	0
128	1		1			2	0.4
129	1					1	0.2
130			1	1		2	0.4
131	1				2	3	0.6
132	1	1	1			3	0.6
133						0	0
134	1	1		2	2	6	1.2
135			1			1	0.2
136				1		1	0.2
137				2	2	4	0.8
138			1	1		2	0.4
139	1	1		1	1	4	0.8
140			2		1	3	0.6
141			1	1		2	0.4
142					1	1	0.2
143		1		2		3	0.6
144						0	0
145		3	1	2	1	7	1.4
146	1	3	5	2	2	13	2.6
147			1		3	4	0.8
148		1			2	3	0.6

Table 12. Colorado State Patrol Accident Data, 2000-2004 I-70 Mile Markers 116—260

Mile Marker	2000	2001	2002	2003	2004	Total	/mile/yr
149						0	0
150				1		1	0.2
151				1		1	0.2
152	1				1	2	0.4
153	3	7	6	2	4	22	4.4
154				4	5	9	1.8
155			3	3	4	10	2
156	1	1	3	6	3	14	2.8
157		8	5	8	7	28	5.6
158	2	1	3	2	2	10	2
159		3	3	4	5	15	3
160	1	2	3	3	4	13	2.6
161	1	2	4		2	9	1.8
162	1	3	3	1	2	10	2
163	1	1	2		4	8	1.6
164		5	10	4	1	20	4
165	4	3	12	13	5	37	7.4
166	2	3	1	5	1	12	2.4
167		1		3	2	6	1.2
168	2		1	1	1	5	1
169		2		1	1	4	0.8
170		3	1	1	3	8	1.6
171	2	3		5		10	2
172		1	1	2	2	6	1.2
173	1		2	2	4	9	1.8
174			2	2	4	8	1.6
175			1	2	1	4	0.8
176	1	1	1	1	4	8	1.6
177	1	1	2	7	1	12	2.4
178	1		1	1	2	5	1
179						0	0
180		3	1		3	7	1.4
181		1	1	2	1	5	1

Table 12. Colorado State Patrol Accident Data, 2000-2004 I-70 Mile Markers 116—260

Mile Marker	2000	2001	2002	2003	2004	Total	/mile/yr
182	1	2	1	4	3	11	2.2
183	1			1	1	3	0.6
184				1	1	2	0.4
185			1	1		2	0.4
186			2		1	3	0.6
187						0	0
188		1			1	2	0.4
189		3				3	0.6
190	1		2			3	0.6
191		1		2	3	6	1.2
192		2		1	2	5	1
193	2	2	3		3	10	2
194		2	1	1		4	0.8
195	1		3	1	2	7	1.4
196			1	1		2	0.4
197	1			1		2	0.4
198	1		1			2	0.4
199			2	1	1	4	0.8
200						0	0
201					1	1	0.2
202	1	1	3	1	2	8	1.6
203					3	3	0.6
204	2	2		4	2	10	2
205				2		2	0.4
206	1		2		3	6	1.2
207				2		2	0.4
208		2			1	3	0.6
209			1	2		3	0.6
210	1		1			2	0.4
211		1	1	1		3	0.6
212						0	0
213						0	0
214						0	0

Table 12. Colorado State Patrol Accident Data, 2000-2004 I-70 Mile Markers 116—260

Mile Marker	2000	2001	2002	2003	2004	Total	/mile/yr
215				1		1	0.2
216		1				1	0.2
217	1				1	2	0.4
218		1	1		1	3	0.6
219			1		1	2	0.4
220	1	1	1	1		4	0.8
221	1		2	1	2	6	1.2
222				1	1	2	0.4
223	2		1	1		4	0.8
224		1	1			2	0.4
225						0	0
226				1		1	0.2
227			1	1	1	3	0.6
228	2	2			1	5	1
229	1	3	2			6	1.2
230	1		1		1	3	0.6
231	2	2	1	3	1	9	1.8
232	2	2	2	2	3	11	2.2
233				3	2	5	1
234			2		4	6	1.2
235	1	1		2		4	0.8
236	1		2	2		5	1
237	1	1	2			4	0.8
238		1			2	3	0.6
239				2		2	0.4
240				1		1	0.2
241		1	1	1	1	4	0.8
242	1	2	2		1	6	1.2
243			1	1		2	0.4
244	2			4		6	1.2
245			1			1	0.2
246	2	6	5	4	4	21	4.2
247	2	6	3	7	4	22	4.4

Table 12. Colorado State Patrol Accident Data, 2000-2004 I-70 Mile Markers 116—260

Mile Marker	2000	2001	2002	2003	2004	Total	/mile/yr
248	3	3	4	6	7	23	4.6
249	3	4	5	5	3	20	4
250	4	3	7	7	10	31	6.2
251	2	1	4	6	6	19	3.8
252	5	1	1	7	1	15	3
253	7	7	7	7	4	32	6.4
254	9	5	7	9	10	40	8
255	4	12	10	11	7	44	8.8
256	1	3		3	2	9	1.8
257		2		2	1	5	1
258			4	2		6	1.2
259	1	2	1	5	2	11	2.2
260		1		1		2	0.4
Total						936	

5.4 Environmental Consequences

5.4.1 Introduction

The following subsections represent the findings of this update in terms of effects determinations for ESA, Forest Service Sensitive, and MIS species. This is a broad bottom-line analysis on all species evaluated for the *I-70 Mountain Corridor PEIS*. This update incorporates the analyses of individual species conducted for the Biological Report and the Biological Assessment. Effects determinations are based on these analyses.

Tier 1 level of analysis is broad in nature and does not include surveys of TES species habitats but addresses the potential for Action Alternatives to have an effect on species. Direct and indirect impacts will be further addressed during Tier 2 processes, following specific TES species surveys. Most habitats containing TES species occur in undisturbed areas some distance from the I-70 ROW; thus, direct impacts from all alternatives are expected to be low.

5.4.2 Direct Impacts

Direct impacts were quantified based on identified TES habitat within the APE and the project alternative footprint. As habitat is correlated to vegetation type, additional information regarding direct impacts to habitat can be found in **Section 4.4.1** of this report. In addition, the effects determinations for individual protected species and a discussion of the barrier effect follow.

The *I-70 Mountain Corridor PEIS* (CDOT, 2010) examines impacts along the entirety of the Corridor. The Biological Report analyzes those species identified to exist on either the Arapahoe and Roosevelt National Forest or the White River National Forest. The analysis of these species relates only to those

impacts occurring on forest service lands. The Biological Assessment requires examination of all species protected under the Endanger Species Act, and candidate species, in the Corridor, whether or not they are on forest service lands. Due to the large presence of national forest lands along the Corridor, there is considerable overlap in the lists of protected species and the acreages of impacts appearing in the two documents, but they are not always identical.

Habitat Loss

The potential habitat loss is directly related to the width of the footprint of each alternative, as well as the length of the Corridor over which it would occur. Of the Transit alternatives, the Rail with Intermountain Connection alternative would permanently affect the most habitats, much of which is key bighorn sheep range. Of the Highway alternatives, the Reversible/HOV/HOT Lanes alternative would affect more habitat than the Six-Lane Highway (55 or 65 mph) alternatives. The widest footprint would be associated with the Combination Six-Lane Highway with Rail and Intermountain Connection and the Combination Six-Lane Highway with Bus in Guideway alternatives and, consequently, would result in among the greatest impacts on key habitats. The Combination Six-Lane Highway with Advanced Guideway System alternative would have the least impact on key habitat of all of the Combination alternatives.

Key bighorn sheep habitat would be affected more by Action Alternatives than would elk or deer habitat; elk habitat would be affected least. High-quality songbird habitat (aspen [*Populus* spp.] and riparian forest) also would be one of the least affected of the key habitats analyzed, primarily because much of this habitat type along the Corridor occurs on the Western Slope (aspen) or because riparian habitats were avoided as much as possible in planning the alignments.

Note that the discussion of bighorn sheep, elk, and mule deer is located in the following section because of the species' status as Forest Sensitive (bighorn sheep) and Management Indicator Species (bighorn sheep, elk, and mule deer). Discussion of songbird habitat loss is also covered under TES because it is an indicator for migratory birds protected under the Migratory Bird Treaty Act.

Encroachment on wildlife habitat can result in loss or fragmentation of areas sensitive to breeding, rearing of young, and winter concentration. For example, elk have been affected by intrusion into calving areas, and movement corridors have been displaced by development in many of the main valleys. Past, present, and future planned development, irrespective of Action Alternatives, is expected to affect up to 51 percent of large game habitat (deer, 51 percent; elk, 39 percent; and bighorn sheep, 8 percent) within the Corridor.

Impacts on Threatened and Endangered Species

Section 7 of the ESA requires federal agencies to ensure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

Quantifiable adverse effects on federally listed species in this Tech Report are limited to lynx habitat, Preble's meadow jumping mouse habitat, greenback cutthroat trout habitat, and yellow-billed cuckoo habitat.

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Table 13 provides the 2009 effects determinations of all species included for consideration.

Table 13. 2009 Effects Determinations for Threatened, Endangered, and Candidate Species

Common Name	Species	2009 Effects Determination	
		All Action Alternatives	No Action
Mammals			
Preble's meadow jumping mouse, T	<i>Zapus hudsonius preblei</i>	Preferred Alternative May affect, likely to adversely affect. (Note that this species is no longer found on the forests and is, therefore, only evaluated with respect to the Preferred Alternative within the Biological Assessment.)	
Canada lynx, T	<i>Lynx canadensis</i>	May affect, likely to adversely affect.	Same as action alternatives.
Birds			
Whooping crane, E	<i>Grus americana</i>	Adverse Modification*	No Adverse Modification
Least tern, Interior population, E	<i>Sterna antillarum</i>	May affect, likely to adversely affect.	No effect.
Piping plover, T	<i>Charadrius melodus</i>	May affect, likely to adversely affect.	No effect.
Yellow-billed cuckoo, C	<i>Coccyzus americanus</i>	No effect—Biological Assessment only the United States Fish and Wildlife Service lists for Eagle County. Requires large blocks of riparian habitat, which are avoidable.	No effect.
Fish*			
Pallid sturgeon, E	<i>Scaphirhynchus albus</i>	May affect, likely to adversely affect.	No effect.
Razorback sucker, E	<i>Xyrauchen texanus</i>	Adverse Modification*	No Adverse Modification
Bonytail chub, E	<i>Gila elegans</i>	Adverse Modification*	No Adverse Modification
Colorado pikeminnow, E	<i>Ptychocheilus lucius</i>	Adverse Modification*	No Adverse Modification
Humpback chub, E	<i>Gila cypha</i>	Adverse Modification*	No Adverse Modification
Greenback cutthroat trout, E	<i>Oncorhynchus clarki stomias</i>	May affect, likely to adversely affect.	No effect.
Plants			
Ute ladies'-tresses orchid, T	<i>Spiranthes diluvialis</i> - Sheviak	May affect, likely to adversely affect.	No effect.
Western prairie fringed orchid, T	<i>Platanthera praeclara</i> —Sheviak & Bowles	May affect, likely to adversely affect.	No effect.

* Note: The No Action alternative would not increase the sedimentation in adjacent Clear Creek, Straight Creek, or Black Gore Creek. The planned Sediment Control Action Plan program and SWEEP mitigation will contribute to improved baseline water quality conditions over time and, therefore will have no effect on TES species. Action alternatives would have the potential to increase sedimentation due to increased impervious surfaces. As with the No Action alternative, however, water quality would have the potential to improve over time.

**Adverse modification—a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species, wherein critical habitat is the geographical occupied by the species at the time of listing, if it contains features essential to conservation, or are specific areas outside the geographical area occupied, but the area is determined to be essential for conservation.

Corridor Wide Impacts on Lynx Habitat

See **Table 14** for Corridor wide impacts on lynx habitat. For a complete analysis refer to the Biological Report.

Table 14. Corridor Wide Impacts on Lynx Habitat (acres)

Alternative	Impacts
No Action	NA
Minimal Action	126.7
Rail with IMC	166.7
AGS	82.0
Dual-Mode/Diesel Bus in Guideway	185.1
Six-Lane Highway	129.9
Reversible/HOV/HOT Lanes	131.1
Combination Six-Lane Highway with Rail and IMC	226.4
Combination Six-Lane Highway with AGS	145.4
Combination Six-Lane Highway With Dual-Mode/Diesel Bus in Guideway	208.5
Preferred Alternative*	125.3-145.4

**The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. Section 2.7 of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.*

Key to Abbreviations/Acronyms

IMC = Intermountain Connection AGS = Advanced Guideway System
 HOV = High Occupancy Vehicle HOT = High Occupancy Toll

Analysis of the projected impacts indicates that the least impact (both acres and percentage of total habitat) affects denning habitat. Intermediate impacts affect winter forage, and the greatest impact affects other (summer) habitat. It is questionable whether denning habitat, consisting of downed logs, root wads, and windfalls, if located close to the Corridor, is very suitable to a female who wants security and thermal cover for her kittens. The construction elements of noise, lights, and vibration could make potential denning habitat unsuitable within the Corridor. As a result, females will likely search elsewhere for dens with the consequence of expending more energy finding a den or selecting a den of lesser quality. Either case may degrade her reproductive success, but perhaps not that of the regional population.

Lynx winter forage habitat is projected to experience a moderate level of impact, relative to denning and other habitat. Winter foraging is essentially hunting for snowshoe hares. A major defense mechanism of hares is to become motionless and rely on their white coat to be invisible to lynx. It is speculative which animal, the hare or the lynx, would flush and run first at the approach of construction equipment. Cottontail hares acclimate to people and activity to some degree. It is not known if snowshoe hares would acclimate to the construction activities. It could be a reasonable assumption that lynx would not acclimate to construction activities, but rather would try to avoid the area altogether. It is possible the construction noise, lights, and vibration might keep hares from entering the construction disturbance zone in the first place. If so, then it is likely that lynx would have reduced hunting success near the Corridor construction activities. Less successful winter foraging could raise the potential for starvation of an individual lynx, but perhaps not that of the regional population.

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Summer habitat will be the most affected, both by acres disturbed and by percent of available habitat. However, in summer, lynx have more options, both in expanding their home range and in food items. In summer, lynx can eat squirrels, grouse, rabbits, voles, shrews, fish, and carrion. Given the construction elements of noise, lights, vibration, people, and activities, lynx may choose not to forage in the Corridor. However, if the disturbance to summer habitat includes prime hunting areas formerly used by individual lynx, then searching elsewhere for food may require more energy or travel and may reduce hunting success. Any reduction in nutrition or increase in energy expenditure to acquire the needed nutrition could adversely affect an individual lynx, but perhaps not that of the regional population.

Preble's Meadow Jumping Mouse

See **Table 15** for Corridor wide impacts on Preble's meadow jumping mouse habitat.

Table 15. Impacts on Preble's Meadow Jumping Mouse Habitat (acres)

Alternative	Impacts
No Action	NA
Minimal Action	4.1
Rail with IMC	7.2
AGS	5.9
Dual-Mode/Diesel Bus in Guideway	6
Six-Lane Highway	4.1
Reversible/HOV/HOT Lanes	4.1
Combination Six-Lane Highway with Rail and IMC	7.8
Combination Six-Lane Highway with AGS	4.8
Combination Six-Lane Highway With Dual-Mode/Diesel Bus in Guideway	7.3
Preferred Alternative*	4.8-4.8

*The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. **Section 2.7** of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.

Key to Abbreviations/Acronyms

IMC = Intermountain Connection

AGS = Advanced Guideway System

HOV = High Occupancy Vehicle

HOT = High Occupancy Toll

Because this mouse species inhabits areas of Jefferson County, and suitable habitat and an individual have been located near the Beaver Brook interchange of I-70 (approximately milepost 247.5 to milepost 248.0) (Michael, 2004), there is the potential that the project may affect individuals and/or suitable habitat. Based on the location of the Preferred Alternative, no direct loss of Preble's meadow jumping mouse habitat occurs from construction activities. Lane additions begin at milepost 247 and proceed westward, away from known Preble's meadow jumping mouse habitat. Direct effects that may occur include additional light and noise during construction, which may alter foraging and movements of the mouse. Additionally, there could be temporary effects on riparian habitat, such as water depletions and sedimentation. These effects will be mitigated after Tier 2 consultation with United States Fish and Wildlife Service, Preble's meadow jumping mouse surveys, and mitigation measure development that may include replacement of suitable habitat.

Direct impacts on habitat for the Preble's meadow jumping mouse total 4.8 acres for the Preferred Alternative, either Minimum or Maximum Program. None of this acreage is within the approximately

20,700 acres of critical habitat designated by United States Fish and Wildlife Service in Colorado. The projected loss of habitat from this project (if it were in the critical habitat) represents approximately 0.02 percent of all of the critical habitat. This relatively small amount of habitat loss is not considered likely to affect the overall Preble’s meadow jumping mouse population in Colorado.

Greenback Cutthroat Trout

See **Table 16** for Corridor wide impacts on greenback cutthroat trout habitat.

Table 16. Impacts on Greenback Cutthroat Trout Habitat (acres)

Alternative	Impacts
No Action	NA
Minimal Action	0.5
Rail with IMC	1.2
AGS	0.8
Dual-Mode/Diesel Bus in Guideway	1.1
Six-Lane Highway	0.5
Reversible/HOV/HOT Lanes	0.6
Combination Six-Lane Highway with Rail and IMC	1.3
Combination Six-Lane Highway with AGS	1.0
Combination Six-Lane Highway With Dual-Mode/Diesel Bus in Guideway	1.1
Preferred Alternative*	0.9-1.1

**The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. Section 2.7 of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.*

Key to Abbreviations/Acronyms

*IMC = Intermountain Connection AGS = Advanced Guideway System
 HOV = High Occupancy Vehicle HOT = High Occupancy Toll*

Construction or road effect zone impacts, such as increased runoff volume, runoff of highway maintenance solutions, and sedimentation, may directly affect greenback cutthroat trout in the Clear Creek population. However, the viable Dry Gulch greenback cutthroat trout populations occur upstream of I-70 by approximately 400 feet or more, which minimizes the potential for direct impacts. The maintenance of stream barriers between Clear Creek and Dry Gulch is imperative in maintaining the pure strain of greenback cutthroat in Dry Gulch. The Clear Creek population is unlikely to be reproducing, may be hybridized with other trout, may be affected by heavy metal contamination, and may exist due to trout migrating down from Dry Gulch.

Direct impacts on habitat for this species in Clear Creek are approximately 1.1 acres. This loss or impairment of habitat makes it more difficult for trout to feed and may contribute to minor crowding. Some trout may be forced to relocate up- or downstream to find new habitat, and that habitat may be less than optimal. More pressure would be placed on the trout for survival. The local population in certain reaches of Clear Creek may be negatively affected, but the regional population in Clear Creek and the South Platte River should not be affected. However, there are no direct effects on the pure strain of greenback cutthroat trout in Dry Gulch. Temporary indirect effects are also possible if water depletions are required for construction in the action area. Tier 2 processes are required to quantify these effects.

Yellow Billed Cuckoo

No occurrences of the yellow-billed cuckoo have been documented in the action area for the Preferred Alternative. However, the primary habitat type for this species does exist in the action area, that is, riparian areas with cottonwood and willow gallery forest on the west side of the Continental Divide. The Preferred Alternative may directly affect riparian vegetation in the action area, resulting in an adverse effect on the cuckoo's potential habitat.

No occurrences of the western distinct population segment of the yellow-billed cuckoo have been documented in the action area for the Preferred Alternative (CNHP, 2002). However, the primary habitat type for this species does exist in the action area, that is, riparian areas with cottonwood and willow gallery forest on the west side of the Continental Divide. The Preferred Alternative may directly affect riparian vegetation in the action area, resulting in an adverse effect on the cuckoo's potential habitat.

Direct impacts on habitat for the Yellow-billed Cuckoo total 37.5 acres. This loss of habitat serves to increase the difficulty of cuckoos in finding food, shelter, and nest sites. The cuckoos have to expend more energy foraging in less habitat to acquire the same amount of nutrition. If potential nest sites are lost, some cuckoo pairs might not be successful in reproducing. These effects might be experienced by local cuckoos, but the regional population should not be affected.

Downstream Species

Direct impacts on habitat for the Yellow-billed Cuckoo total 37.5 acres. This loss of habitat serves to increase the difficulty of cuckoos in finding food, shelter, and nest sites. The cuckoos have to expend more energy foraging in less habitat to acquire the same amount of nutrition. If potential nest sites are lost, some cuckoo pairs might not be successful in reproducing. These effects might be experienced by local cuckoos, but the regional population should not be affected.

Project-related water depletions from the upper Colorado River basin may impact four federally listed Colorado River watershed fish species in critical habitat outside the action area:

- Colorado pikeminnow
- Razorback sucker
- Humpback chub
- Bonytail chub

As a result, Section 7 consultation is required for all federal actions that cause or authorize a water depletion in the basin. The 1999 *Colorado River Programmatic Biological Opinion* addresses water depletions in the Colorado River and its tributaries above its confluence with the Gunnison River. Recovery actions outlined in the *Programmatic Biological Opinion* provide measures to avoid the likelihood of jeopardy and adverse modification of critical habitat. To offset the cost of implementing recovery actions, a one-time fee is required for new depletions greater than 100 acre-feet/year. Other provisions of the *Programmatic Biological Opinion* are that nonfederal water users are required to sign a Recovery Agreement and federal agencies are requested to retain discretionary authority in the event that consultation is reinitiated. There is no fee for historic depletions (before 1988) or depletions less than 100 acre-feet/year. As long as sufficient progress is being made toward achievement of program objectives, no additional mitigation obligations are imposed.

According to the United States Fish and Wildlife Service, any depletion to the Platte River basin (roughly defined as the Palmer Divide north and the Continental Divide east in Colorado) constitutes an action that may affect, and is likely to adversely affect, TES species that depend on the river for their existence. Threatened, endangered, and special status species downstream along the central and lower Platte River and Missouri River include:

- Whooping crane
- Interior population of the least tern
- Piping plover
- Western prairie fringed orchid
- Ute's ladies'-tresses orchid
- Bald eagle
- Pallid sturgeon

In Colorado, other federally listed species potentially affected by depletions include those that are dependent on riparian systems near the Corridor, such as the threatened Preble's meadow jumping mouse and the Ute ladies'-tresses orchid.

The State of Colorado's participation in the SPWRAP addresses depletions to the Platte River system due to CDOT activities through the "Memorandum of Agreement for Implementation and Operation of the Colorado Portion of the Platte River Recovery Implementation Plan," as described in paragraph 4.a. of the Memorandum of Agreement. The State has made and continues to make financial and other contributions to the Platte River Recovery Implementation Program (PRRIP). In addition, SPWRAP has created a "Class X-1" membership specifically for and limited to the State of Colorado for diversions and depletions by State agencies that are comparatively small. Colorado Department of Transportation falls into this category because their typical depletive activities such as wetland creation and water quality ponds, as well as water used for compaction, concrete, and dust control do not generally require large amounts of water. According to the Memorandum of Agreement, contributions previously made are deemed payment of all SPWRAP assessments for the Class X-1 membership for the duration of the First Increment of the PRRIP, which expires in 2020. However, because the Federal Highway Administration is funding the project, to satisfy their obligation under the ESA, Section 7 consultation is required.

As a Colorado State agency and participant in the PRRIP, CDOT will complete the following:

- An analysis of effects on federally listed species downstream in Nebraska resulting from the project's Preferred Alternative during Tier 2 processes, as CDOT cannot anticipate depletions at the programmatic level of design.
- A PRRIP template biological assessment during Tier 2 processes and submittal to the United States Fish and Wildlife Service for streamlined Section 7 consultation provided by participation in the PRRIP.

Colorado Department of Transportation is coordinating with the United States Fish and Wildlife Service on this matter for documentation in the Biological Assessment; following streamlined consultation and the United States Fish and Wildlife Service's issuance of a biological opinion, CDOT will monitor project-level depletions annually and reported them to the United States Fish and Wildlife Service.

Any project-related depletions to the Colorado or Platte River systems that have not been previously consulted on by United States Fish and Wildlife Service will be addressed when individual quantities of water uses for specific projects are known during Tier 2 and analysis required for documentation.

Impacts on Forest Sensitive Species

Biological Report—Impacts on the Arapahoe and Roosevelt National Forest and White River National Forest

The National Forest Management Act requires the United States Forest Service to develop, maintain, and revise plans to specify guidelines for wildlife and fish and to provide for diversity of plant and animal communities (16 United States Code 1600), which includes the identification of sensitive species (Forest Service Manual 2672.11). The United States Forest Service must ensure that actions on Forest lands do

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not contribute to loss of viability of threatened, endangered, proposed, or sensitive plant and animal species, or contribute toward federal listing under the ESA of any species (Forest Service Manual 2672.41).

Table 17 provides 2009 FS sensitive species effects determinations. For the detailed assessment and comparative analysis of each species leading to these determinations, refer to the Biological Report. **Table 17** also provides the 2009 effects determination for the No Action Alternative for additional information.

Table 17. 2009 Effects Determinations for Forest Sensitive Species

Common Name	Species	National Forest	2009 Effects Determination	
			All Action Alternatives	No Action
Mammals				
Pygmy shrew	<i>Sorex hoyi montanus</i>	AR ^K /WR ^L	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	Same as action alternatives.
River otter	<i>Lontra canadensis</i>	AR ^K /WR ^L	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	Same as action alternatives.
American marten	<i>Martes americana</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	Same as action alternatives.
North American wolverine	<i>Gulo gulo</i>	AR ^L /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	Same as action alternatives.
Bighorn sheep (also AR MIS)	<i>Ovis canadensis</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing. Change due to added Forest Sensitive status.	Same as action alternatives.
Birds				
Bald eagle	<i>Haliaeetus leucocephalus</i>	AR/WR	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing. Change due to changed status from Threatened to Forest Sensitive.	No impact.
Brewer's sparrow (also WR MIS)	<i>Spizella breweri</i>	WR	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	No impact.
Northern goshawk	<i>Accipiter gentilis</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	No impact.
American peregrine falcon	<i>Falco peregrinus anatum</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	No impact.

Table 17. 2009 Effects Determinations for Forest Sensitive Species

Common Name	Species	National Forest	2009 Effects Determination	
			All Action Alternatives	No Action
White-tailed ptarmigan	<i>Lagopus leucurus</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	No impact.
Boreal owl	<i>Aegolius funereus</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	No impact.
Flammulated owl	<i>Otus flammeolus</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	Same as action alternatives.
Black swift	<i>Cypseloides niger</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	No impact.
American three-toed woodpecker	<i>Picoides dorsalis</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	No impact.
Olive-sided flycatcher	<i>Contopus cooperi</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	No impact.
Amphibians				
Boreal toad (also AR MIS)	<i>Bufo boreas boreas</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	Same as action alternatives.
Northern leopard frog	<i>Rana pipiens</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	Same as action alternatives.
Fish¹				
Colorado River cutthroat trout (also AR MIS)	<i>Oncorhynchus clarki pleuriticus</i>	AR ^K /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	No impact.
Bluehead sucker	<i>Catostomus discobolus</i>	WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	No impact.
Flannelmouth sucker	<i>Catostomus latipinnis</i>	AR ^L /WR ^K	May adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to federal listing.	Same as action alternatives.
Plants				
Harrington's beardtongue	<i>Penstemon harringtonii</i>		May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing	Same as action alternatives

Table 17. 2009 Effects Determinations for Forest Sensitive Species

Common Name	Species	National Forest	2009 Effects Determination	
			All Action Alternatives	No Action
Front Range or Rocky Mountain cinquefoil	<i>Potentilla rupincola</i>	AR	May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing	Same as action alternatives
Narrow-leaved moonwort	<i>Botrychium lineare</i>	AR/WR	May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing	Same as action alternatives
Paradox moonwort	<i>Botrychium paradoxum</i>	AR/WR	May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing	Same as action alternatives
Upswept moonwort	<i>Botrychium ascendens</i>	AR/WR	May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing	Same as action alternatives
Altai cotton-grass	<i>Eriophorum altaicum var. neogaeum</i>	AR/WR	No impact.	Same as action alternatives
Autumn willow	<i>Salix serissima</i>	AR	No impact.	Same as action alternatives
Baltic sphagnum	<i>Sphagnum balticum</i>	AR/WR	No impact.	Same as action alternatives
Budding monkeyflower	<i>Mimulus gemmiparus</i>	AR	No impact.	Same as action alternatives
Dwarf raspberry [<i>Rubus arcticus</i> var. <i>acaulis</i>]	<i>Cylactis</i>	AR	May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing	Same as action alternatives
Hoary willow	<i>Salix candida</i>	AR	No impact.	Same as action alternatives
Kotzebue's grass-of-Parnassus	<i>Parnassia kotzebuei</i>	AR/WR	No impact.	Same as action alternatives
Lesser bladderpod	<i>Utricularia minor</i>	AR	No impact.	Same as action alternatives
Lesser paniced sedge	<i>Carex diandra</i>	AR/WR	May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing	Same as action alternatives
Livid sedge	<i>Carex livida</i>	AR	No impact.	Same as action alternatives
Yellow lady's-slipper	<i>Cypripedium parviflorum</i> (=C. <i>calceolus</i> ssp. <i>Parviflorum</i>)	AR/WR	No impact.	Same as action alternatives
Park milkvetch	<i>Astragalus leptaleus</i>	AR/WR	May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing	Same as action alternatives

Table 17. 2009 Effects Determinations for Forest Sensitive Species

Common Name	Species	National Forest	2009 Effects Determination	
			All Action Alternatives	No Action
Porter's feathergrass	<i>Ptilagrostis porteri</i>	AR/WR	No impact.	Same as action alternatives
Roundleaf sundew	<i>Drosera rotundifolia</i>	AR	No impact.	Same as action alternatives
Simple kobresia	<i>Kobresia simpliciuscula</i>	AR	May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing	Same as action alternatives
Colorado tansy-aster	<i>Machaeranthera coloradoensis</i>	AR/WR	No impact.	Same as action alternatives
Slender cotton-grass	<i>Eriophorum gracile</i>	AR/WR	No impact.	Same as action alternatives
Hall's fescue	<i>Festuca hallii</i>	AR/WR	No impact.	Same as action alternatives
Sphagnum	<i>Sphagnum angustifolium</i>	AR/WR	No impact.	Same as action alternatives
Selkirk's violet	<i>Viola selkirkii</i>	AR	May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing	Same as action alternatives

1 Note: The No Action alternative would not increase the sedimentation in adjacent Clear Creek, Straight Creek, or Black Gore Creek. The planned Sediment Control Action Plan program and SWEEP mitigation will contribute to improved baseline water quality conditions over time and, therefore, will have no effect on TES species. Action alternatives would have the potential to increase sedimentation due to increased impervious surfaces. As with the No Action alternative, however, water quality would have the potential to improve over time.

Corridor-Wide: Bighorn Sheep

In addition to its Forest Sensitive designation, bighorn sheep are a principal wildlife species in the I-70 Corridor and one of the large ungulates indicating wildlife movement corridors in the region. See **Table 18** for impacts to Bighorn Sheep habitat within the Corridor.

Table 18. Corridor-Wide Impacts to Bighorn Sheep (acres)

Alternative	Total
No Action	NA
Minimal Action	38.5
Rail with IMC	77.8
AGS	46.2
Dual-Mode/Diesel Bus in Guideway	62.0
Six-Lane Highway (55 mph)	59.3
Six-Lane Highway (65 mph)	61.5
Reversible/HOV/HOT Lanes	67.0
Combination Six-Lane Highway with Rail and IMC	93.1
Combination Six-Lane Highway with AGS	75.2

Table 18. Corridor-Wide Impacts to Bighorn Sheep (acres)

Alternative	Total
Combination Six-Lane Highway With Dual-Mode/Diesel Bus in Guideway	82.4
Preferred Alternative* Minimum Program 55 mph	32.4-77.4

*The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. **Section 2.7** of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.

Key to Abbreviations/Acronyms

IMC = Intermountain Connection

HOV = High Occupancy Vehicle

AGS = Advanced Guideway System

HOT = High Occupancy Toll

Management Indicator Species

Biological Report—Impacts on the Arapahoe and Roosevelt National Forest and White River National Forest

The National Forest Management Act requires the United States Forest Service to develop, maintain, and revise plans to specify guidelines for wildlife and fish and to provide for diversity of plant and animal communities (16 United States Code 1600), which includes the identification of MIS (Forest Service Manual 2621.1). The United States Forest Service must ensure that actions on Forest lands do not contribute to loss of viability of threatened, endangered, proposed, or sensitive plant and animal species, or contribute toward federal listing under the ESA of any species (Forest Service Manual 2672.41). MIS are selected as indicators for a forest plan or project that best represents the issues, concerns, and opportunities to support recovery of federally listed species, and provide continued viability of sensitive species (Forest Service Manual 2621.1).

Table 19 provides 2009 the United States Forest Service MIS effects determinations.

Table 19. 2009 Effects Determinations for Forest Management Indicator Species

Common Name	Species	2009 Effects Determination	
		All Action Alternatives	No Action
White River National Forest			
Elk	<i>Cervus elaphus</i>	Population effects unlikely, habitat effects unlikely.	Same as action alternatives.
Virginia’s warbler	<i>Vermivora virginiae</i>	Population effects unlikely, habitat effects unlikely.	No impact.
Aquatic macroinvertebrates ¹		Population effects unlikely, habitat effects unlikely.	No impact.
All trout ¹	Various species	Population effects unlikely, habitat effects unlikely.	No impact.
Arapahoe and Roosevelt National Forest			
Elk	<i>Cervus elaphus</i>	Population effects unlikely, habitat effects unlikely.	Same as action alternatives.
Mule deer	<i>Odocoileus hemionus</i>	Population effects unlikely, habitat effects unlikely.	Same as action alternatives.

Table 19. 2009 Effects Determinations for Forest Management Indicator Species

Common Name	Species	2009 Effects Determination	
		All Action Alternatives	No Action
Hairy woodpecker	<i>Picoides villosus</i>	Population effects unlikely, habitat effects unlikely.	No impact.
Pygmy nuthatch	<i>Sitta pygmaea</i>	Population effects unlikely, habitat effects unlikely.	No impact.
Mountain bluebird	<i>Sialia currucoides</i>	Population effects unlikely, habitat effects unlikely.	No impact.
Warbling vireo	<i>Vireo gilvus</i>	Population effects unlikely, habitat effects unlikely.	No impact.
Wilson’s warbler	<i>Wilsonia pusilla</i>	Population effects unlikely, habitat effects unlikely.	No impact.
Brook trout ¹	<i>Salvelinus fontinalis</i>	Population effects unlikely, habitat effects unlikely.	No impact.
Brown trout ¹	<i>Salmo trutta</i>	Population effects unlikely, habitat effects unlikely.	No impact.

¹ Note: The No Action alternative would not increase the sedimentation in adjacent Clear Creek, Straight Creek, or Black Gore Creek. The planned Sediment Control Action Plan program and SWEEP mitigation will contribute to improved baseline water quality conditions over time and, therefore, will have no effect on TES species. Action alternatives would have the potential to increase sedimentation due to increased impervious surfaces. As with the No Action alternative, however, water quality would have the potential to improve over time.

Corridor-Wide: Mule Deer

In addition to their MIS designation, mule deer (*Odocoileus hernionus*) are a principal wildlife species in the I-70 Corridor and one of the large ungulates indicating wildlife movement corridors in the region.

Specific Issues Related to Mule Deer in Eagle County

In response to direction from Colorado Division of Wildlife, specific attention has been paid to the impacts on mule deer winter range and on the mule deer migration corridor in Eagle County. This mule deer migration corridor is the second largest in Colorado, second only to the Piceance deer herd. During Tier 2 processes, in conjunction with strategies developed in relation to linkage interference zones in Eagle County, a more detailed analysis may be warranted on the migration corridor through which large numbers of animals migrate and the loss of which would change migration routes. Winter range and the migration corridor are both considered critical habitat within Eagle County.

The number of acres affected by alternatives within the migration corridor in Eagle County is relatively low. For most alternatives, including the Preferred Alternative, there are either no impacts or an additional 4.9 acres affected within the migration corridor. The Bus in Guideway and Combination Six-Lane Highway with Bus in Guideway alternatives will affect a further 10.7 acres within the migration corridor in Eagle County. Action Alternatives will not affect the mule deer migration corridor in any other county.

Note that mule deer winter concentration areas have been included in the evaluation of impacts on mule deer within Eagle County. See **Table 20** for impacts to mule deer within and outside of migration corridors, by County.

Table 20. Corridor Wide Impacts to Mule Deer Within and Outside Migration Corridors, by County

Alternative	Garfield			Eagle			Summit			Clear Creek			Jefferson		
	In MC	Other	Total	In MC	Other	Total	In MC	Other	Total	In MC	Other	Total	In MC	Other	Total
No Action	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimal Action	0.0	0.0	0.0	4.9	6.6	11.6	0.0	0.0	0.0	0.0	1.0	1.0	0.0	14.5	14.5
Rail with IMC	0.0	0.0	0.0	4.9	6.6	11.6	0.0	0.0	0.0	0.0	1.0	1.0	0.0	6.6	6.6
AGS	0.0	0.0	0.0	4.9	6.6	11.6	0.0	0.0	0.0	0.0	1.0	1.0	0.0	6.6	6.6
Dual-Mode/Diesel Bus in Guideway	0.0	0.0	0.0	10.7	8.5	19.3	0.0	0.0	0.0	0.0	1.0	1.0	0.0	6.6	6.6
Six-Lane Highway (55 mph)	0.0	0.0	0.0	4.9	6.6	11.6	0.0	0.0	0.0	0.0	1.0	1.0	0.0	14.5	14.5
Six-Lane Highway (65 mph)	0.0	0.0	0.0	4.9	6.6	11.6	0.0	0.0	0.0	0.0	1.0	1.0	0.0	14.5	14.5
Reversible/HOV/HOT Lanes	0.0	0.0	0.0	4.9	6.6	11.6	0.0	0.0	0.0	0.0	1.0	1.0	0.0	14.5	14.5
Combination Six-Lane Highway with Rail and IMC	0.0	0.0	0.0	4.9	6.6	11.6	0.0	0.0	0.0	0.0	1.0	1.0	0.0	21.6	21.6
Combination Six-Lane Highway with AGS	0.0	0.0	0.0	4.9	6.6	11.6	0.0	0.0	0.0	0.0	1.0	1.0	0.0	14.9	14.9
Combination Six-Lane Highway With Dual-Mode/Diesel Bus in Guideway	0.0	0.0	0.0	10.7	8.5	19.3	0.0	0.0	0.0	0.0	1.0	1.0	0.0	18.8	18.8
Preferred Alternative*	0.0	0.0	0.0	4.9	6.6	11.6	0.0	0.0	0.0	0.0	0.0-1.0	0.0-1.0	0.0	14.9	14.9

*The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. Section 2.7 of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.

Key to Abbreviations/Acronyms
 In MC = within the migration corridor
 Other = outside the migration corridor
 IMC = Intermountain Connection AGS = Advanced Guideway System
 HOV = High Occupancy Vehicle HOT = High Occupancy Toll

Corridor-Wide: Elk

In addition to their MIS designation, elk (*Cervus elaphus*) is a principal wildlife species in the I-70 Corridor and one of the large ungulates indicating wildlife movement corridors in the region.

See **Table 21** for impacts to elk habitat within the Corridor.

Table 21. Corridor Wide Impacts to Elk

Alternative	Total
No Action	NA
Minimal Action	0.3
Rail with IMC	5.0
AGS	0.7
Dual-Mode/Diesel Bus in Guideway	4.4
Six-Lane Highway (55 mph)	4.0
Six-Lane Highway (65 mph)	4.1
Reversible/HOV/HOT Lanes	6.2
Combination Six-Lane Highway with Rail and IMC	11.0
Combination Six-Lane Highway with AGS	8.7
Combination Six-Lane Highway With Dual-Mode/Diesel Bus in Guideway	12.0
Preferred Alternative*	0.8-8.7

*The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. **Section 2.7** of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.

Key to Abbreviations/Acronyms

IMC = Intermountain Connection
 HOV = High Occupancy Vehicle

AGS = Advanced Guideway System
 HOT = High Occupancy Toll

Birds Protected Under the Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (16 United States Code 760c-760g), as amended, protects migratory birds, making it unlawful to take any migratory bird, part, nest, egg, or product. Most of the avian species of the Corridor and their active nests are protected.

A broad indicator for effects by alternatives to migratory birds is the effects on all vegetation in the Corridor. **Section 4.4** of this report provides a discussion of the update of impacts on vegetation. See **Table 3, Table 4, and Table 5** of this report for impacts on vegetation in the Corridor.

Riparian and aspen (*Populus* spp.) forest vegetation were also used to measure the extent to which alternatives could affect songbirds. This is a narrower indicator of the possible impacts on the most highly diverse potential migratory bird habitat, unique to the Corridor.

See **Table 22** of this for impacts to songbird habitat within the Corridor.

Table 22. Impacts to Songbird Habitat (Aspen and Riparian Forest, acres)

Alternative	Total
No Action	NA
Minimal Action	3.0
Rail with IMC	6.6
AGS	2.7
Dual-Mode/Diesel Bus in Guideway	6.7
Six-Lane Highway (55 mph)	3.0
Six-Lane Highway (65 mph)	1.5
Reversible/HOV/HOT Lanes	3.0
Combination Six-Lane Highway with Rail and IMC	8.1
Combination Six-Lane Highway with AGS	4.1
Combination Six-Lane Highway With Dual-Mode/Diesel Bus in Guideway	7.9
Preferred Alternative*	3.7-4.1

*The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. **Section 2.7** of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.

Key to Abbreviations/Acronyms

IMC = Intermountain Connection

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HOT = High Occupancy Toll

Barrier Effect on Wildlife Movement

Most of the alternatives would increase the barrier effect of I-70. For example, the Advanced Guideway System Alternative would require a 3-foot-tall barrier to prevent oncoming traffic from colliding into the piers. Additional highway lanes also would not in themselves create physical barriers as compared to the Rail with Intermountain Connection, Bus in Guideway, and Combination alternatives, but additional lanes of traffic would increase the barrier effect during high-traffic volumes. The ALIVE Committee has developed measures to reduce the barrier effect and animal-vehicle collisions. Existing barriers identified by the ALIVE Committee that are encountered by the Preferred Alternative (minimum or maximum program, if fully implemented) would be mitigated. Existing barriers not encountered would be mitigated only through partnering opportunities with other stakeholders. Mitigation of existing barriers includes placing an overpass or underpass at key locations in linkage interference zones that would allow animals to more easily cross I-70, and installing, repairing, and maintaining wildlife fencing that would reduce contact with vehicles and help channel wildlife to crossing structures. Barrier effects would be reduced in accordance with the ALIVE Memorandum of Understanding.

Alternatives that would extend through the greatest length of the Corridor (for example, Rail with Intermountain Connection, Advanced Guideway System, and the Combination alternatives) would offer the greatest opportunities to mitigate the existing barrier effects in the linkage interference zones. Therefore, the longer an alternative, the more existing barriers would be mitigated. If an existing barrier were not encountered by an alternative, then the barrier would be altered only through partnering opportunities with other stakeholders. The No Action alternative would have the greatest impacts on wildlife because it is assumed that the existing habitat connectivity issues would not be addressed.

5.4.3 Indirect Impacts

For wildlife habitat, indirect impacts also would include road effect zones, which encompass a wide range of impacts, including noise and general disturbance from construction activities and traffic, as well as roadway input of contaminants (such as winter deicing and traction material) that affect roadside vegetation, water bodies, and riparian habitats. The potential to increase roadway impacts into adjacent and downstream habitats from winter maintenance material would be related to the amount of paved surface of the alternative. The Bus in Guideway alternatives and the Combination Six-Lane Highway with Bus in Guideway alternatives would require the greatest increase in sand and liquid deicer material. The Rail with Intermountain Connection and Advanced Guideway System alternatives would not require additional winter maintenance material. Traffic noise increases with traffic volumes, and some changes to noise structure would occur with the Transit and Combination alternatives. The Advanced Guideway System alternative would emit the least noise of the alternatives considered. Noise would likely increase the road effect zone for the more sensitive animals, which would include most songbird species and some carnivores.

Influence of Climate Change and the Mountain Pine Beetle on Corridor Habitat

A description of the mountain pine beetle infestation has been prepared in coordination with the United States Forest Service inclusion in the *I-70 Mountain Corridor PEIS*.

An initial literature search on the issue indicates a connection between climate change and the extent of the mountain pine beetle infestation.

Breshears et al. examined the impact of recent drought on piñon pine trees in western North America, focusing on the relationships between tree die-off, temperature, and rainfall. They found that the 2000–2003 drought was not as dry as the previous one of 1953–1956, but that it occurred during a warmer period and hence might illustrate drought effects in the future. Their analysis shows that the recent drought caused a rapid regional-scale loss of overstory trees mainly due to infestation by bark beetles, outbreaks of which are commonly caused by water stress; whereas the 1950s drought affected mainly older trees, the 2000s drought killed trees of all ages. Similar widespread drought in this century could cause large changes in carbon storage and dynamics, in fluxes of near-ground solar radiation, and in patterns of runoff and erosion, as well as alter microclimate feedbacks between the land and atmosphere and reduce the production of piñon nuts, an important food source for a number of species of birds, small mammals, and local people (Smith 2005).

In a more recent study, researchers from the United States Geological Survey, the United States Forest Service, and six universities, including the University of Colorado, Boulder, examined historical data from 76 different forested areas in 3 regions across the West and found that mortality rates were rising across the board due to climate change.

Thomas T. Veblen, a geography professor at the University of Colorado at Boulder, said the combination of increased wildfires, drought, and bark beetles has devastated some of that state's forests. Temperatures in Colorado's sub-alpine forests, which are 8,500 to 10,000 feet in altitude, have risen markedly over the past 50 years during all seasons. According to Veblen, mountain pine beetles (*Dendroctonus ponderosae*) have killed about 3.5 million acres of lodgepole pine forests in northwestern Colorado over the past decade, wiping out 90 percent of pine forests in that area.

One example of the forest devastation is evident in the Rocky Mountain National Forest. Drought has left trees too weak to fight the invading beetles (strong, healthy trees use sap to keep them out). Another factor is how uniform forests have become after nearly a century of fire suppression; pure stands of feeble old trees succumb to beetles more readily than diverse forests. Finally, warmer-than-average temperatures in recent years have stimulated beetle reproduction and let larvae thrive throughout the winter. The Rocky

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Mountain National Forest has not experienced the cold snaps that have curtailed previous beetle outbreaks (Bastone 2009).

The United States Forest Service has confirmed that the *I-70 Mountain Corridor PEIS* should note that the beetle infestation is changing conditions on the ground, that the changes are ongoing but the extent and breadth of change are not necessarily predictable, and that the most appropriate time to address those changing conditions during Tier 2 processes.

Effects of Deicers on Wildlife

Following is a synopsis of the findings from the literature search and from conversations with Colorado Division of Wildlife.

The most visible interaction between road salt and wildlife concerns the large ungulates, such as moose (*Alces alces*), mule deer, white-tailed deer (*Odocoileus virginianus*), elk, and bighorn sheep. Road salt attraction has been identified as a main reason for kills of bighorn sheep and a minor reason for kills of elk in Jasper National Park. Remedial efforts have included partial drainage of pools and repellent applications. Apart from death and injury due to vehicle collisions, there is no record of moose or deer suffering from salt toxicosis; however, a loss of fear of humans and vehicles while drinking salty water was documented with moose. The only documented case of small mammals exhibiting signs of salt toxicosis is Eastern cottontail rabbits (*Sylvilagus floridanus*) reported during a severe winter in Wisconsin. The role that road salt could play in the mortality of other wildlife species such as small mammals commonly killed by traffic is not known. (Brownlee, *et al.* 2000).

During spring snowmelts, salt may accumulate on right-of-ways, attracting ungulates especially where there are few or no natural mineral licks. Moose are strongly attracted to salt (NaCl) during the spring and early summer. Moose activity has been documented to increase from mid- to late-May, to be sporadic in June, and to decline in July to very low levels in August and September (Castiov 1999).

Implications associated with roadside salt licks formed by runoff of road salt include increased moose vehicle collisions and increased brain worm infections in moose and white-tailed deer (Huijser *et al.* 2007).

No studies specific to Colorado have been conducted on the effects of deicers on wildlife in the Corridor; therefore, no conclusions can be drawn at this point in time.

5.4.4 Construction Impacts

Additional temporary disturbance to protected species is expected during construction. Noise, dust, erosion, and air pollution are all examples of stresses placed on wildlife during the period of construction which can lead to displacement or morbidity due to stress. These construction activities may result in vegetation being temporarily removed, some small animal mortality, and big game or bird species leaving the area. Specific construction related mitigation will be implemented to minimize these impacts as much as possible. The area of impact will be minor compared to the area of habitat available.

5.4.5 Impacts in 2050

By 2050, potential effects of climate change and the dynamic natural response to mountain pine beetle infestation could alter the existing terrestrial and aquatic habitat along the Corridor. These potential changes include, but are not limited to, alterations to existing vegetation communities, water quality concerns due to runoff from forests in early succession, and changes to the hydrologic cycle. The changes in habitat, and subsequent change in species present, alter the wildlife management efforts of the United States Fish and Wildlife Service, United States Forest Service, and Colorado Division of Wildlife, so the project could affect species currently not found in the Corridor but occurring there in the future.

Continued habitat loss may occur due to commercial and residential development but may taper off by

2050 because of limited water resources and land use management. Benefits from the ALIVE and SWEEP Memoranda of Understanding could improve wildlife movement and protect aquatic resources, respectively.

5.5 Tier 2 Considerations

Lead agencies will conduct further analysis of direct and indirect impacts on protected species during future project-specific Tier 2 processes. These actions include the following:

- Lead agencies will perform surveys for protected species and their habitat. The United States Fish and Wildlife Service, United States Forest Service, and Colorado Division of Wildlife will provide relevant and updated species lists. This information will be incorporated into project design to avoid or minimize effects on such species. Lead agencies will complete a biological assessment and biological report, using the Tier 1 process as a foundation, to analyze impacts on protected species.
- Lead agencies will determine the effects on federally listed species that occur downstream from the I-70 Mountain Corridor in coordination with the United States Fish and Wildlife Service.
- Lead agencies will discuss the influence of the mountain pine beetle on the forested communities and its effects on wildlife habitat, in coordination with the United States Fish and Wildlife Service and United States Forest Service.
- Lead agencies will evaluate potential mitigation for winter maintenance and noise effects based on current research.
- Lead agencies will adhere to any new or revised laws or regulations pertaining to protected species.
- Lead agencies will develop specific best management practices for each project.
- Lead agencies will develop specific and more detailed mitigation strategies and measures.
- Lead agencies will consider opportunities for enhancement on a project-by-project basis.
- Lead agencies will evaluate fisheries, including localized temperature concerns.
- Lead agencies will develop a Tier 2 Biological Impacts Plan to include analysis of sensitivity zones, terrestrial impacts, habitat connectivity, and cumulative impacts.

5.6 Mitigation

A phased approach to construction provides the opportunity for adapting transportation solutions to the environmental sensitivity of the I-70 Mountain Corridor over time. The phased approach allows ongoing opportunities to avoid and minimize environmental impacts, establish effective mitigation, and employ I-70 Mountain Corridor Context Sensitive Solutions strategies. In summary, the overall mitigation strategies provide the opportunity to reduce impacts on wildlife habitats and enhance the compatibility of the I-70 Mountain Corridor with regional wildlife movement and habitat connectivity. **Section 3.19, Mitigation Summary, I-70 Mountain Corridor PEIS** (CDOT 2010), also provides additional discussion of mitigation strategies.

How will vegetation and habitat impacts be minimized?

The Colorado Department of Transportation will identify areas of potential habitat restoration, in coordination with the United States Forest Service and local entities. Removal of trees and shrubs for implementation of Action Alternatives will be done during the non-nesting periods per the Migratory Bird Treaty Act. Also, mitigation of protected bird and fish species will comply with South Platte Water Related Activities Program and the Platte River Recovery Implementation Program.

How will winter maintenance and deicer impacts be minimized?

The Colorado Department of Transportation will limit the effects of winter maintenance by controlling the runoff of contaminants and winter maintenance materials to the greatest extent possible. The Colorado Department of Transportation will continue to refine its approach to winter maintenance in an effort to decrease the use of deicers and traction sand. Mitigation strategies will be designed to be complementary to the existing Sediment Control Action Plans on Straight Creek, Black Gore Creek, and Clear Creek.

How will habitat connectivity be improved and animal-vehicle collisions reduced?

Lead agencies will follow the processes outlined in the ALIVE Memorandum of Understanding (see **Appendix E, ALIVE Memorandum of Understanding**, of the *I-70 Mountain Corridor PEIS*, [CDOT, 2010]) to reduce animal-vehicle collisions and increase habitat connectivity throughout the Corridor. This includes, but is not limited to, the use of underpasses or overpasses dedicated to wildlife movement, fencing, berms, and vegetation to guide wildlife to crossing structures and signage to alert motorists of wildlife presence.

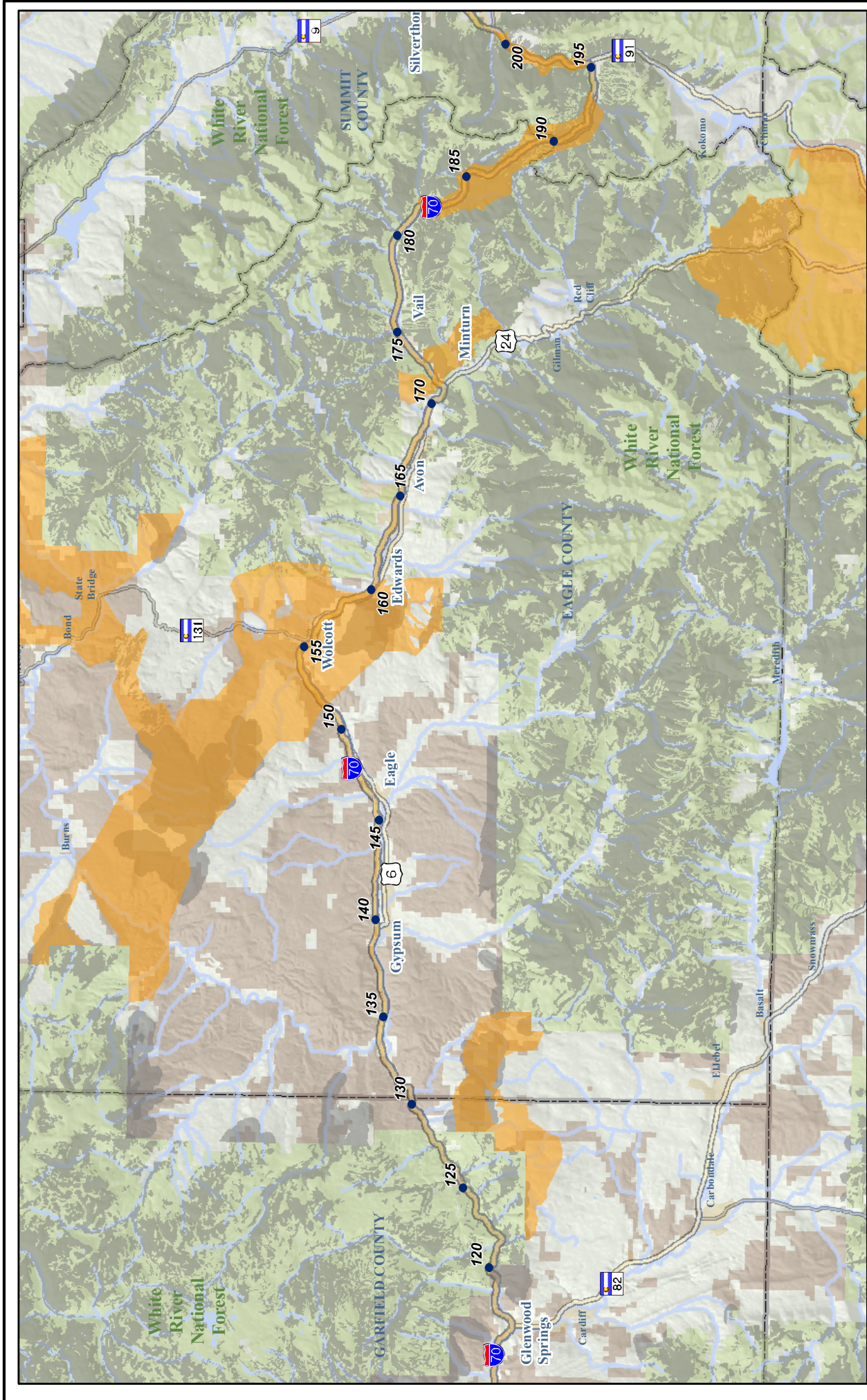
The ALIVE program provides a starting point for, and ensures Agencies' participation in development of, subsequent analyses during Tier 2 processes and implementation of long-term impact mitigation measures within the context of a Corridor-long landscape-based ecosystem approach to Corridor impacts on wildlife needs and conservation measures. It is understood by all parties to the memorandum of understanding that because the I-70 Mountain Corridor project is anticipated to span many years, the description of the linkage interference zones, species affected and recommended mitigation strategies are subject to change through time. All parties agree to coordinate to update the memorandum of understanding, if necessary, during Tier 2 processes and in those respective environmental documents.

How will aquatic habitat be protected?

Lead agencies will follow the processes outlined in the SWEEP Memorandum of Understanding (see **Appendix D, SWEEP Memorandum of Understanding**, of the *I-70 Mountain Corridor PEIS*, (CDOT, 2010)). In addition, CDOT will use best management practices and erosion control measures to reduce soil losses, soil inundation, and sedimentation in areas adjacent to the construction area and provide sufficient cross-slope drainage structures during new construction to allow natural hydrologic conditions to be maintained on both sides of the right-of-way. Fish habitat will be restored and replaced, using photo documentation to help return these areas to previous conditions.

5.7 Wildlife Resource Maps

Figure 13 through **Figure 20** present maps of wildlife resources.



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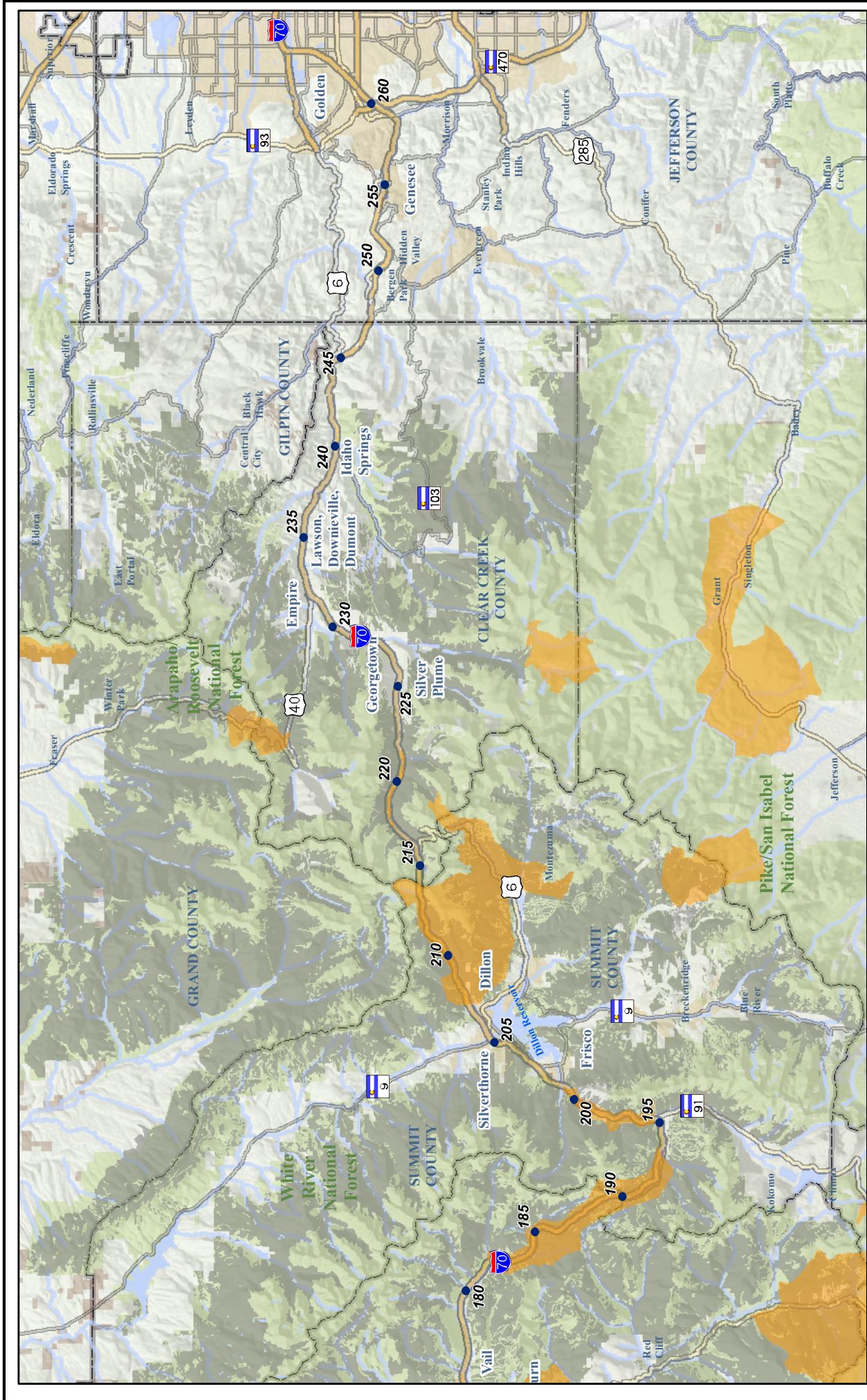
Legend

- Mileposts
- Limited Access Highways
- Major Highways
- Highways
- Lakes
- County Boundary
- Urban Areas
- USFS Land
- BLM Land
- Lynx Linkage Areas
- Lynx Habitat

Scale - 1" = 420,000
 or 1" = 6.62 Miles

0 3.31 6.62 Miles

Lynx Habitat
 Map 1 of 2



Legend

- Mileposts
- Limited Access Highways
- Major Highways
- Highways
- Lakes
- County Boundary
- Urban Areas
- USFS Land
- BLM Land
- Lynx Linkage Areas
- Lynx Habitat

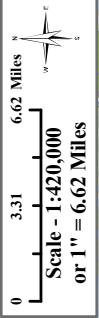
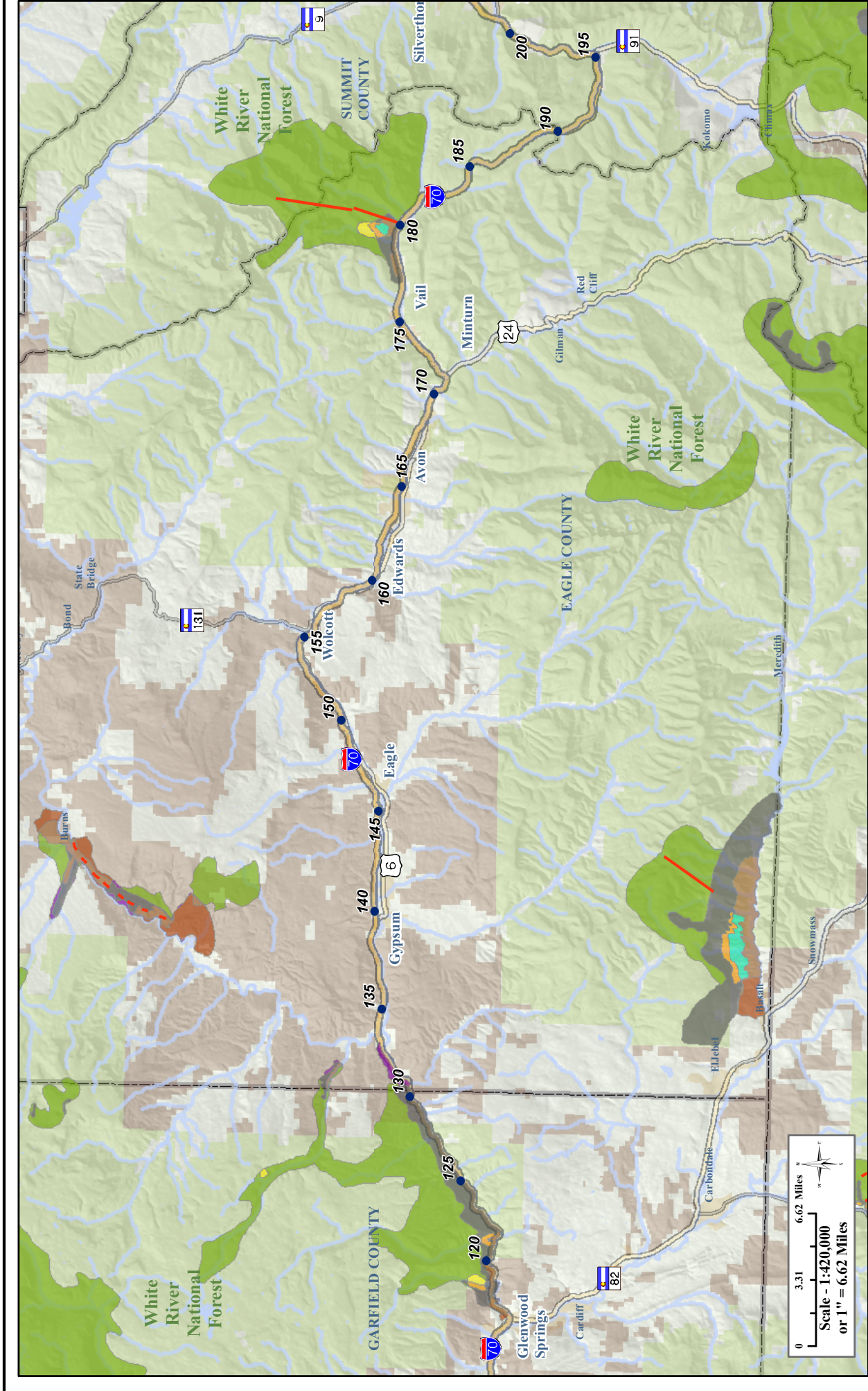
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0 3.31 6.62 Miles

Lynx Habitat
 Map 2 of 2



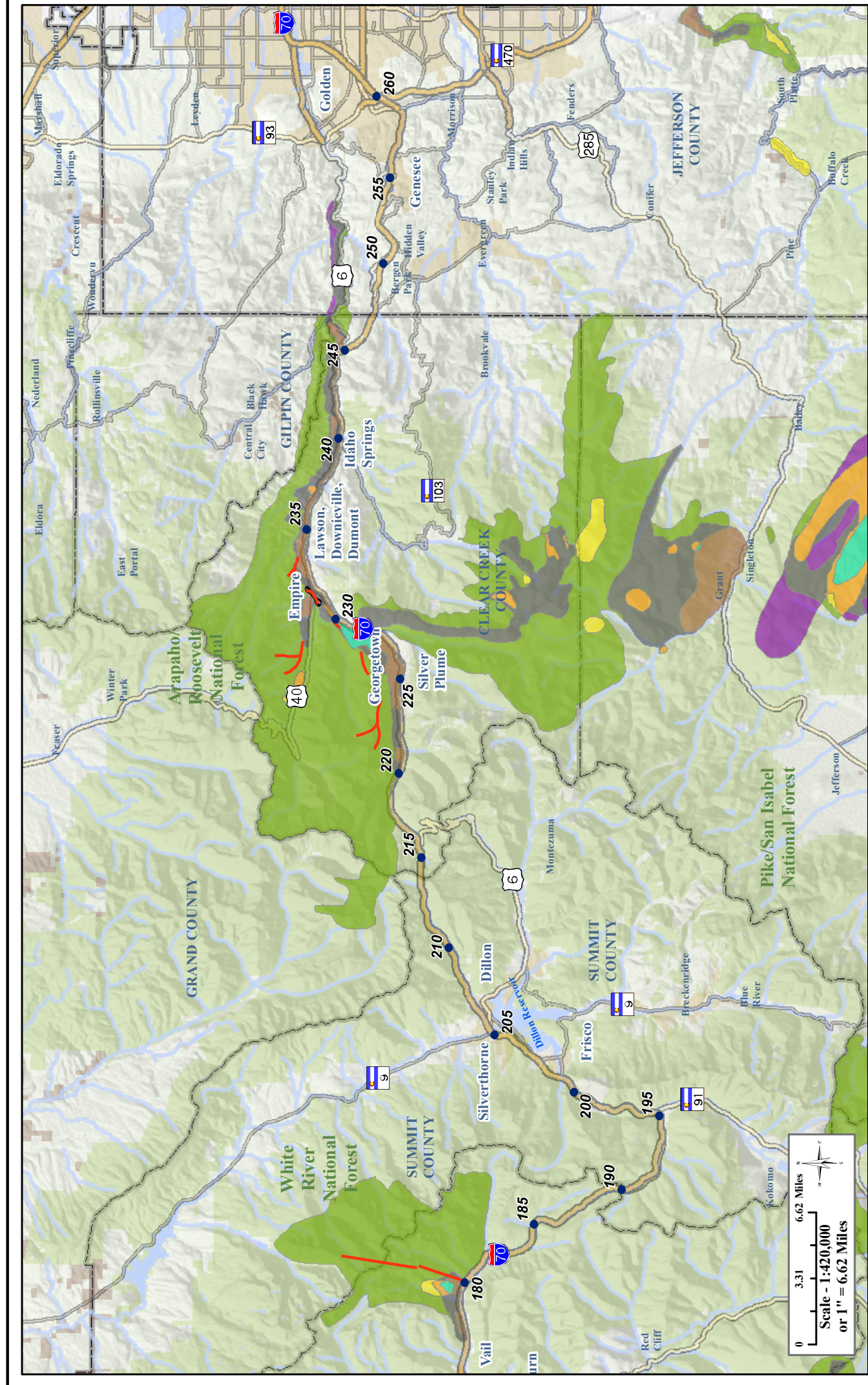
I-70 Mountain Corridor PEIS
 T e c h n i c a l R e p o r t s

DOT
 Colorado Department of Transportation

Key Bighorn Sheep Habitat
 Map 1 of 2

Legend

- Mileposts**
- Limited Access Highways**
- Major Highways**
- Highways**
- Lakes**
- County Boundary**
- Urban Areas**
- USFS Land**
- BLM Land**
- Migration Patterns**
- Migration Corridors**
- Winter Range**
- Summer Range**
- Bighorn Sheep Habitat**
- Winter and Summer Range**
- Winter Range and Winter Concentration Areas**
- Winter Range, Summer Range, and Winter Concentration Areas**
- Winter Range, Summer Range and Lambing Areas**
- Winter Range, Summer Range, Lambing Areas and Winter Concentration Areas**



I-70 Mountain Corridor PEIS
 T e c h n i c a l R e p o r t s

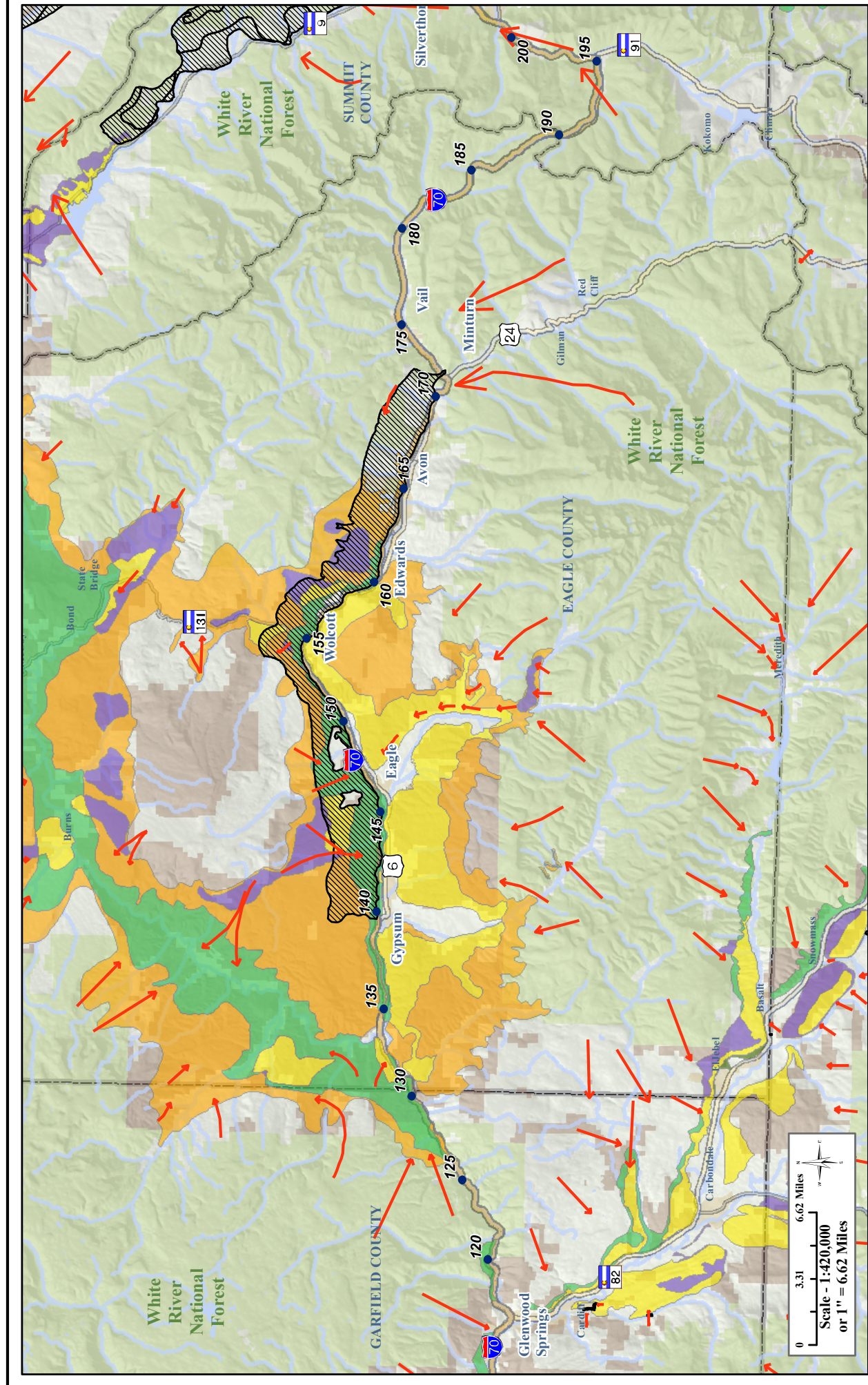
Key Bighorn Sheep Habitat
 Map 2 of 2

Legend

- Mileposts**
- Limited Access Highways**
- Major Highways**
- Highways**
- Lakes**
- County Boundary**
- Urban Areas**
- USFS Land**
- BLM Land**
- Migration Patterns**
- Migration Corridors**
- Winter Range**
- Summer Range**
- Bighorn Sheep Habitat**
- Winter and Summer Range**
- Winter Range and Winter Concentration Areas**
- Winter Range, Summer Range, and Winter Concentration Areas**
- Winter Range, Summer Range and Lambing Areas**
- Winter Range, Summer Range, Lambing Areas and Winter Concentration Areas**

Scale - 1:420,000 or 1" = 6.62 Miles

Scale - 1:420,000 or 1" = 6.62 Miles



I-70 Mountain Corridor PEIS
 T e c h n i c a l R e p o r t s

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Key Mule Deer Habitat
 Map 1 of 2

I-70 Mountain Corridor PEIS
 Mule Deer Habitat

Winter Concentration Areas, Severe Winter Range and Winter Range (Eagle Co Only)

Winter Concentration Areas and Winter Range (Eagle Co Only)

Winter Range (Eagle Co Only)

Severe Winter Range and Winter Range (Eagle Co Only)

Severe Winter Range (Eagle Co Only)

Migration Patterns

Migration Corridors

Severe Winter Range

Winter Range

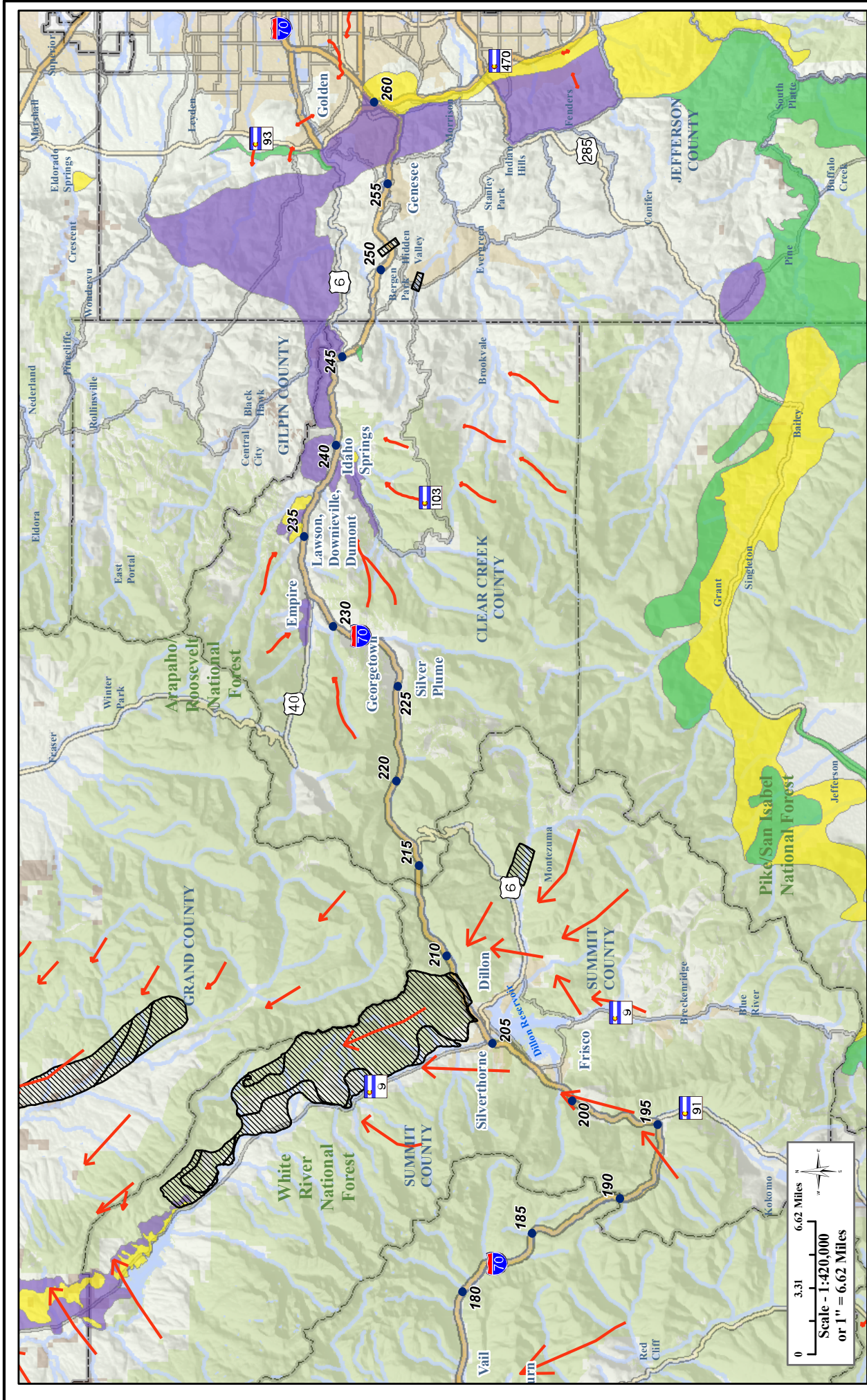
Severe Winter Range and Winter Range (Eagle Co Only)

Severe Winter Range (Eagle Co Only)

Legend

- Mileposts
- ▬ Limited Access Highways
- ▬ Major Highways
- ▬ Highways
- ▬ Lakes
- ▬ County Boundary
- ▬ Urban Areas
- ▬ USFS Land
- ▬ BLM Land
- ▬ Mule Deer Habitat
- ▬ Winter Concentration Areas, Severe Winter Range and Winter Range (Eagle Co Only)
- ▬ Winter Concentration Areas and Winter Range (Eagle Co Only)
- ▬ Winter Range (Eagle Co Only)
- ▬ Severe Winter Range and Winter Range (Eagle Co Only)
- ▬ Severe Winter Range (Eagle Co Only)
- ▬ Migration Patterns
- ▬ Migration Corridors
- ▬ Severe Winter Range
- ▬ Winter Range
- ▬ Severe Winter Range and Winter Range (Eagle Co Only)
- ▬ Severe Winter Range (Eagle Co Only)

Scale - 1" = 420,000
 or 1" = 6.62 Miles



Legend

- Mileposts
- Limited Access Highways
- Major Highways
- Highways
- Lakes
- County Boundary
- Urban Areas
- USFS Land
- BLM Land
- Migration Patterns
- Migration Corridors
- Severe Winter Range
- Severe Winter Range and Winter Range (Eagle Co Only)
- Winter Concentration Areas
- Winter Concentration Areas and Winter Range (Eagle Co Only)
- Winter Range (Eagle Co Only)
- Winter Range and Winter Range (Eagle Co Only)

Mule Deer Habitat

- Winter Concentration Areas
- Winter Concentration Areas and Winter Range (Eagle Co Only)
- Winter Range (Eagle Co Only)
- Winter Range and Winter Range (Eagle Co Only)

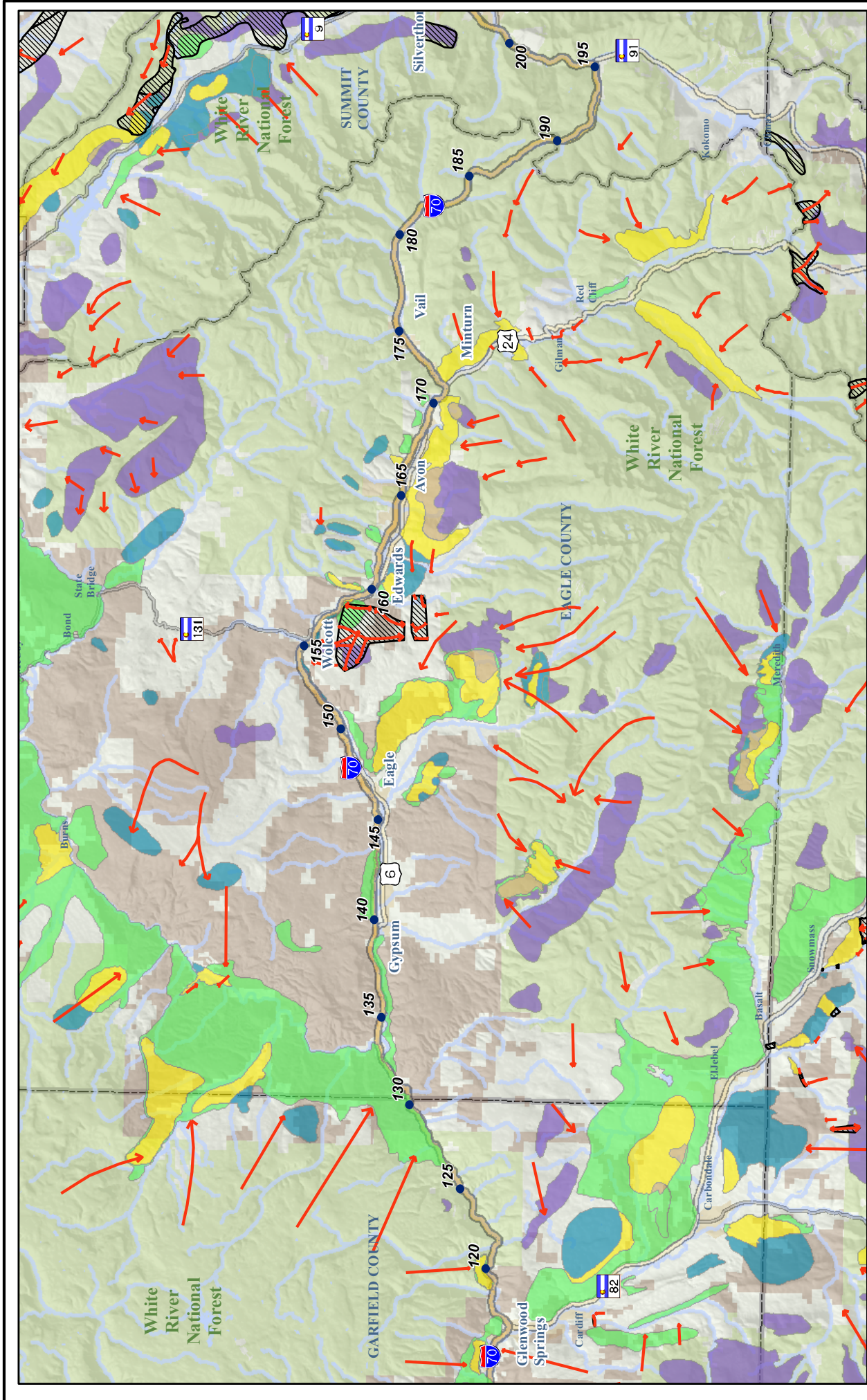
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 T e c h n i c a l R e p o r t s

Key Mule Deer Habitat
 Map 2 of 2

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0 3.31 6.62 Miles



I-70 Mountain Corridor PEIS

 T e c h n i c a l R e p o r t s

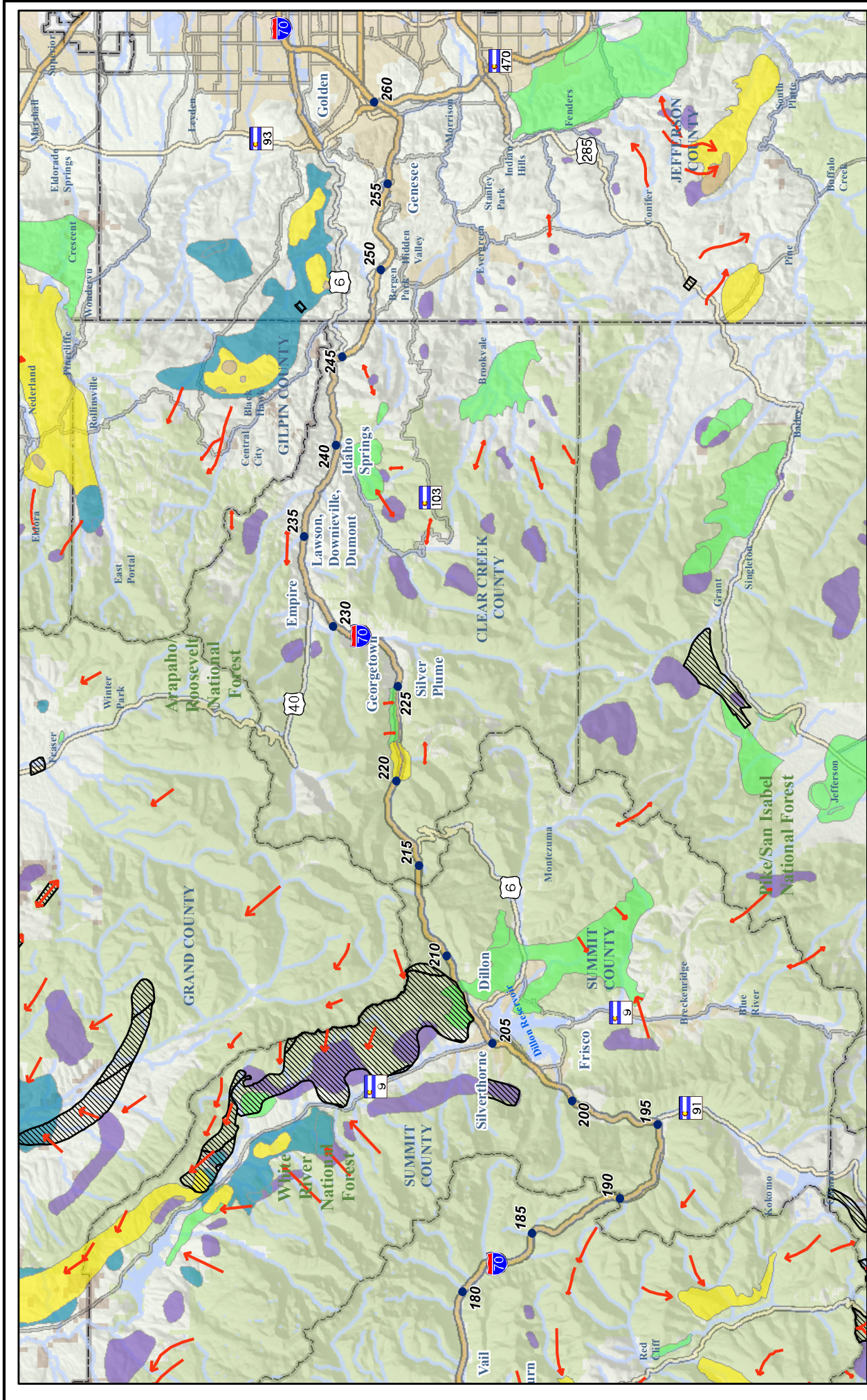
Legend

Mileposts	County Boundary	Migration Patterns	Severe Winter Range and Winter Concentration Areas
Limited Access Highways	Urban Areas	Migration Corridors	Calving, Winter Concentration and Severe Winter Range Areas
Major Highways	USFS Land	Winter Range	Winter Concentration Areas
Highways	BLM Land	Calving Areas	
Lakes			

Scale - 1:420,000
 or 1" = 6.62 Miles

3.31 6.62 Miles

Key Elk Habitat
 Map 1 of 2



Legend

- Mileposts
- Limited Access Highways
- Major Highways
- Highways
- Lakes
- County Boundary
- Urban Areas
- USFS Land
- BLM Land
- Elk Habitat
 - Severe Winter Range and Winter Concentration Areas
 - Calving, Winter Concentration and Severe Winter Range Areas
 - Winter Concentration Areas
- Migration Patterns
- Migration Corridors
- Winter Range
- Calving Areas

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Key Elk Habitat
 Map 2 of 2

Scale - 1:420,000
 or 1" = 6.62 Miles

3.31 6.62 Miles

Section 6. Aquatic Resources

6.1 Introduction

This section of the Technical Report addresses fisheries and fish species present in the Corridor watersheds that are listed as State Species of Special Concern. For federally listed species, refer to **Section 5.3.1** of this Technical Report and the Biological Report. Forest Sensitive and MIS fish species are also addressed in the Biological Report.

6.2 Background and Methodology

The Colorado Division of Wildlife, in 2009, identified important fisheries for recreational fishing purposes and fish species for State protection in the I-70 Mountain Corridor. All Gold Medal fisheries identified in the Corridor are located west of the Continental Divide, and “high-value” fisheries are located throughout the Corridor.

The Colorado Department of Transportation determined effects on biological resources by overlaying a project footprint of each alternative on a Geographic Information System containing the locations of the specific resource, such as vegetation, wildlife habitat or fisheries. The project footprint includes the physical footprint of the alternatives plus an additional 30 feet on each side. The 30 feet includes a 15-foot construction disturbance zone and an additional 15-foot sensitivity zone. Direct impacts occur where resources are located directly beneath the project footprint. Indirect impacts, occurring either farther away or later in time, are beyond the Action Alternatives footprint. **Chapter 2, Summary and Comparison of Alternatives**, of the *I-70 Mountain Corridor PEIS* (CDOT, 2010) provides descriptions of project alternatives.

6.3 Affected Environment

Gold Medal fisheries identified in the Corridor include 35 miles of the Blue River between Dillon Reservoir and Kremmling, and the lower 4 miles of Gore Creek in the Eagle River sub-basin. “High-value” fisheries have been identified in the Eagle River sub-basin, including the following streams: Eagle River, Squaw Creek, Lake Creek, McCoy Creek, Beaver Creek, Booth Creek, Pitkin Creek, Gore Creek, Miller Creek, Polk Creek, and Black Gore Creek. “High-value” fisheries in the Blue River sub-basin would include Tenmile Creek from Copper Mountain to Frisco. Segments of Clear Creek are also identified as “high-value.”

Several species of fish inhabit the rivers, streams, and lakes (reservoirs) of the Corridor, including the common carp (*Cyprinus carpio*), speckled dace (*Rhinichthys osculus*), roundtail chub (*Gila robusta*), and several species of trout. Several of these species are considered important recreational species, such as brown trout (*Salmo trutta*), and some are also considered MIS by the United States Forest Service, including brown trout, brook trout (*Salvelinus fontinalis*), and rainbow trout (*Salmo gairdneri*). Colorado River cutthroat trout (*Salmo clarki pleuriticus*) is a State Species of Special Concern. The benthic invertebrate communities that are known to inhabit or that may potentially inhabit the Corridor’s major watersheds are composed primarily of the major clean-water taxa, including mayflies, stoneflies, caddisflies, and midges. The distribution of these taxa and the number of organisms within each taxon vary in response to natural and human-generated influences throughout the Corridor.

6.4 Environmental Consequences

6.4.1 Direct Impacts

Impacts on fish species were examined within each Corridor watershed: Colorado River, Eagle River, Blue River, Clear Creek, Dillon Reservoir, and Georgetown Lake.

The impacts on fisheries were examined in terms of the number of acres of disturbance by each alternative on “high-value” fisheries, Gold Medal fisheries, and Species of Special Concern. Each category was separately identified within the Eagle River, Blue River, and Clear Creek watershed areas. Impacts on fisheries would occur primarily in the Eagle River and Clear Creek watersheds.

No Action Alternative

The No Action alternative would consist of several planned or permitted projects, which are described in **Chapter 2, Description and Comparison of Alternatives**. Impacts on aquatic resources would also include current maintenance practices, construction activities at each improvement project and development that is occurring along the Corridor.

The SWEEP Memorandum of Understanding would not be implemented, reducing the opportunity for future enhancement of aquatic resources along the Corridor.

Minimal Action Alternative

The Minimal Action Alternative would impact 24.8 acres of “High-Value” fisheries and 3.5 acres of Gold Medal waters.

Transit Alternatives

The Transit Alternatives would impact 26.2-36.8 acres of “High-Value” fisheries and 2.6-4.8 acres of Gold Medal waters.

Highway Alternatives

The Highway Alternatives would impact 28.1-29.8 acres of “High-Value” fisheries and 0.6-3.5 acres of Gold Medal waters.

Combination Alternatives

The Combination Alternatives would impact 38.2-47.3 acres of “High-Value” fisheries and 4.2-6.5 acres of Gold Medal waters.

Preferred Alternative

The Preferred Alternative would impact 31.0-39.1 (if the Maximum Program is fully implemented) acres of “High-Value” fisheries and 2.6-4.2 acres of Gold Medal waters.

Table 23 provides impacts on “high-value” and Gold Medal fisheries within the Eagle River, Blue River, and Clear Creek watersheds. The Preferred Alternative would have no impacts on Gold Medal fisheries within the Clear Creek Watershed.

Table 23. Fisheries Impacts (acres)

Fisheries Resource	Eagle River	Blue River	Clear Creek
Minimal Action			
"High-Value"	14.7	2.7	7.4
Gold Medal	2.9	0.6	0
Rail with IMC			
"High-Value"	16.6	8.8	11.4
Gold Medal	4.2	0.6	0
AGS			
"High-Value"	12.7	4.4	9.1
Gold Medal	2.0	0.6	0
Dual-Mode or Diesel Bus in Guideway			
"High-Value"	17.8	8.0	9.2
Gold Medal	3.6	0.6	0
Six-Lane Highway 55 mph			
"High-Value"	14.7	2.7	11.1
Gold Medal	2.9	0.6	0
Six-Lane Highway 65 mph			
"High-Value"	14.2	2.7	11.2
Gold Medal	0	0.6	0
Reversible/HOV/HOT Lanes			
"High-Value"	14.7	2.7	12.4
Gold Medal	2.9	0.6	0
Combination Six-Lane Highway with Rail and IMC			
"High-Value"	23.1	8.8	15.4
Gold Medal	5.9	0.6	0
Combination Six-Lane Highway with AGS			
"High-Value"	19.0	4.4	14.8
Gold Medal	3.6	0.6	0
Combination Six-Lane Highway with Bus in Guideway			
"High-Value"	22.0	8.0	14.1
Gold Medal	3.6	0.6	0

Table 23. Fisheries Impacts (acres)

Fisheries Resource	Eagle River	Blue River	Clear Creek
Preferred Alternative			
“High-Value”	19.0-19.9	4.4	7.6-14.8
Gold Medal	2.0-3.6	0.6	0.0

**The Preferred Alternative is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. Section 2.7 of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.*

Key to Abbreviations/Acronyms

IMC = Intermountain Connection

HOV = High Occupancy Vehicle

AGS = Advanced Guideway System

HOT = High Occupancy Toll

mph = miles per hour

6.4.2 Indirect Impacts

Indirect impacts on fisheries and aquatic resources associated with the development of the alternatives could result from both short-term and long-term sedimentation of substrate and the resulting impacts on the fish and benthic invertebrate communities farther downstream than in the immediate construction or operational area. The loss of or the reduction in the number of these communities could negatively affect local fishing recreation and the health of the river system overall. Other indirect impacts would include increased angling pressure on the Gold Medal streams (Gore Creek and Blue River) as a result of the anticipated increase in recreational visits [see **Section 3.12, Recreation**, of the *I-70 Mountain Corridor PEIS* (CDOT, 2010).]

Liquid deicer and traction sand are currently used in the I-70 Mountain Corridor. Liquid deicers are linked with increasing chloride levels in local streams. Traction sand causes sedimentation of streams, which can degrade habitat, impede spawning by blanketing the streambed, and reduce populations of macroinvertebrates on which fish feed. Alternatives that add more traffic lanes, the Highway and Bus in Guideway Alternatives, require additional winter maintenance, thereby leading to increased water quality impacts when compared to alternatives with less new roadway construction. For additional information see **Section 3.4, Water Resources**, of the *I-70 Mountain Corridor PEIS* (CDOT 2010).

Effects of Deicing Compounds on Aquatic Life

Activities for maintenance of traction and mobility on the highway are known to increase sediment and contaminants in runoff to adjacent waterways. This occurs when snowmelt and rainfall runoff drains from the highway and shoulder areas into waterways and streams. To assess the impacts on receiving streams, CDOT has conducted a monitoring program since 2000 for direct snowmelt and stormwater runoff from I-70, as well as in adjacent runoff-impacted streams.

The Colorado Department of Transportation has increased the use of liquid deicers since 1996. Starting in 2002, the data generally show a decreasing trend in sand usage and a corresponding increase in liquid deicer use throughout the Corridor. The change from sanding to chemical deicers was undertaken to avoid the impacts associated with sand (sediment deposition).

The Colorado Department of Transportation maintenance data compiled after 2001 suggest significant changes in winter maintenance material usage. A continued trend away from sand/salt toward more widespread use of liquid deicers is shown in the data, particularly in the higher elevation areas, including the east and west tunnel approaches of the Eisenhower-Johnson Memorial Tunnels and Vail Pass. This

shift in materials has been measured in receiving stream water quality, particularly in Black Gore Creek and Straight Creek.

Earlier studies indicated that deicers do not have adverse impacts on aquatic life in streams at existing application levels and stormwater conditions (Lewis, 1999). Maintenance data now show, however, that deicer application rates have increased in many areas, and stream data indicate that the chronic aquatic chloride standard (230 mg/L) is exceeded every year in high-elevation streams receiving I-70 runoff. The chloride concentrations in high-elevation streams along I-70 can be 100 times or more greater than normal (background) levels as a result of highway runoff. The primary forms of chlorides (sodium and magnesium) used on I-70 are highly soluble, and therefore, highly mobile in the environment. Once in solution, these compounds travel rapidly into the streams and through the aquatic environment. Water quality standards are commonly exceeded during winter.

At this stage, impacts on aquatic life from this shift in stream chloride concentrations are not well documented. This section provides the results of a literature search on the effects of the various deicing compounds on aquatic life that has been conducted since 2004. This is not a comprehensive literature search, but rather a general aquatic health overlook.

Michigan Department of Transportation

Results from a groundwater monitoring study funded by the Michigan Department of Transportation found that the roadside groundwater chlorides increased slightly after the start of winter maintenance deicing treatment on the newly opened roadway, with no long-term buildup of chlorides over the years. An average of 20 tons of salt was used per lane-mile for each winter maintenance period. National Oceanic and Atmospheric Administration records of total annual precipitation obtained for the same years indicated that the monitoring locations received an average 32 inches of precipitation. The amount of water in the total annual precipitation has adequately diluted the deicing chlorides to prevent buildup in the groundwater (Muethel, 2007).

Transportation Research Board

The Transportation Research Board (TRB) has completed the Guidelines for the Selection of Snow and Ice Control Materials to Mitigate Environmental Impacts, Report No. TRB 577 (2007), which provides a downloadable interactive decision tool software (TRB 2007). The overall objective of the project was to develop guidelines for selecting snow and ice control materials based on their properties and common site-specific conditions near roadways on which these products would be used. To develop the guidelines, 42 products were obtained that represented the 2004 United States and Canadian market in terms of product type (NaCl, MgCl₂, CaCl₂, CMA, and KA), manufacturers, regional sources, and additives. Abrasives were not included in the test program, given that material sources are too numerous and varied. All products received full chemical analysis. Aquatic toxicity testing was conducted on 15 snow and ice control products following Environmental Protection Agency standard test methods for chronic exposure to various levels of aquatic biota, including vertebrates, invertebrates, and algae. Following is a brief synopsis of the findings (TRB 2007):

Although it is likely that the most sensitive organisms would be affected in some way at dilutions that could be expected at the margin of a roadway for many snow and ice control materials, it is also true that dilutions greater than 500:1 can be expected within a relatively short distance beyond the roadway. Therefore, the toxicity data imply that there could be an impact zone relatively close to the roadway, bounded by dilutions that offset acute or chronic toxicities close to the roadway.

Winter Maintenance Strategies

Impacts on vegetation and aquatic life would occur with or without the proposed project because CDOT is already using deicing procedures along I-70. The impact from the proposed project would cumulatively

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add to the deicing process with the increased magnesium chloride ($MgCl_2$) or sodium chloride ($NaCl$) used for additional pavement.

Examination of specific mitigation measures and the effects as a result of project-specific activities will be assessed by the Stream and Wetland Ecological Enhancement Program (SWEEP) during Tier 2 processes. The *I-70 Mountain Corridor PEIS* will describe mitigation strategies for water quality and streams.

The Sediment Control Action Plans specify physical-based control, rather than chemical, and only address chloride loading to the extent that chloride can be captured with the sand. In contrast to salt, which cannot be easily controlled once in solution, sediment from traction sand is relatively easy to control using conventional structural best management practices.

The Colorado Department of Transportation Maintenance Division continues to research alternative deicers and traction materials, to evaluate methods and their potential impacts on the adjacent environment, and to develop long-term directions that address the issue of increased contaminants in runoff to adjacent waterways. There will be an update from the Mitigation Issue Task Force and the SWEEP Committee.

The Colorado Department of Transportation met on the issue of winter maintenance and water quality trends on July 13, 2009. The purpose of the meeting was to discuss winter maintenance impacts from sand and liquid deicers ($MgCl_2$ and salts), changes in winter maintenance operations, and constraints and needs for winter maintenance. Water quality monitoring data and trends were presented at the meeting. The requirements for maintaining future auxiliary lanes (eastbound and westbound) east of the Eisenhower-Johnson Memorial Tunnels and on west Vail Pass were also discussed.

6.4.3 Construction Impacts

Additional temporary disturbance to aquatic resources is expected during construction. These impacts include increased erosion, sedimentation and runoff, and spilled fuels, potentially causing reduced water quality in streams, rivers, lakes, and reservoirs.

6.4.4 Impacts in 2050

By 2050, potential effects of climate change and the dynamic natural response to mountain pine beetle infestation could alter the existing terrestrial and aquatic habitat along the Corridor. These potential changes include, but are not limited to, alterations to existing vegetation communities, water quality concerns due to runoff from forests in early succession, and changes to the hydrologic cycle. The changes in habitat, and subsequent change in species present, alter the wildlife management efforts of the United States Fish and Wildlife Service, United States Forest Service, and Colorado Division of Wildlife, so the project could affect species currently not found in the Corridor but occurring there in the future. Continued habitat loss may occur due to commercial and residential development but may taper off by 2050 because of limited water resources and land use management. Benefits from the ALIVE and SWEEP Memoranda of Understanding could improve wildlife movement and protect aquatic resources, respectively.

6.4.5 Tier 2 Considerations

Lead agencies will conduct further analysis of direct and indirect impacts on aquatic resources during future project-specific Tier 2 processes. These actions include the following:

- Lead agencies will perform surveys for protected species and their habitat. The United States Fish and Wildlife Service, United States Forest Service, and Colorado Division of Wildlife will provide relevant and updated species lists. This information will be incorporated into project

design to avoid or minimize effects on such species. Lead agencies will complete a biological assessment and biological report, using the Tier 1 process as a foundation, to analyze impacts on protected species.

- Lead agencies will determine the effects on federally listed species that occur downstream from the I-70 Mountain Corridor in coordination with the United States Fish and Wildlife Service.
- Lead agencies will discuss the influence of the mountain pine beetle on the forested communities and its effects on wildlife habitat, in coordination with the United States Fish and Wildlife Service and United States Forest Service.
- Lead agencies will evaluate potential mitigation for winter maintenance based on current research.
- Lead agencies will adhere to any new or revised laws or regulations pertaining to biological resources.
- Lead agencies will develop specific best management practices for each project.
- Lead agencies will develop specific and more detailed mitigation strategies and measures.
- Lead agencies will consider opportunities for enhancement on a project-by-project basis.
- Lead agencies will evaluate fisheries, including localized temperature concerns.
- Lead agencies will develop a Tier 2 Biological Impacts Plan to include analysis of sensitivity zones, terrestrial impacts, habitat connectivity, and cumulative impacts.

6.5 Mitigation

A phased approach to construction provides the opportunity for adapting transportation solutions to the environmental sensitivity of the I-70 Mountain Corridor over time. The phased approach allows ongoing opportunities to avoid and minimize environmental impacts, establish effective mitigation, and employ I-70 Mountain Corridor Context Sensitive Solutions strategies. In summary, the overall mitigation strategies provide the opportunity to reduce impacts on wildlife habitats and enhance the compatibility of the I-70 Mountain Corridor with regional wildlife movement and habitat connectivity. **Section 3.19, Mitigation Summary**, also provides additional discussion of mitigation strategies.

How will vegetation and habitat impacts be minimized?

The Colorado Department of Transportation will identify areas of potential habitat restoration, in coordination with the United States Forest Service and local entities. Removal of trees and shrubs for implementation of Action Alternatives will be done during the non-nesting periods per the Migratory Bird Treaty Act. Also, mitigation of protected bird and fish species will comply with South Platte Water Related Activities Program and the Platte River Recovery Implementation Program.

How will winter maintenance and deicer impacts be minimized?

The Colorado Department of Transportation will limit the effects of winter maintenance by controlling the runoff of contaminants and winter maintenance materials to the greatest extent possible. The Colorado Department of Transportation will continue to refine its approach to winter maintenance in an effort to decrease the use of deicers and traction sand. Mitigation strategies will be designed to be complementary to the existing Sediment Control Action Plans on Straight Creek, Black Gore Creek, and Clear Creek.

How will aquatic habitat be protected?

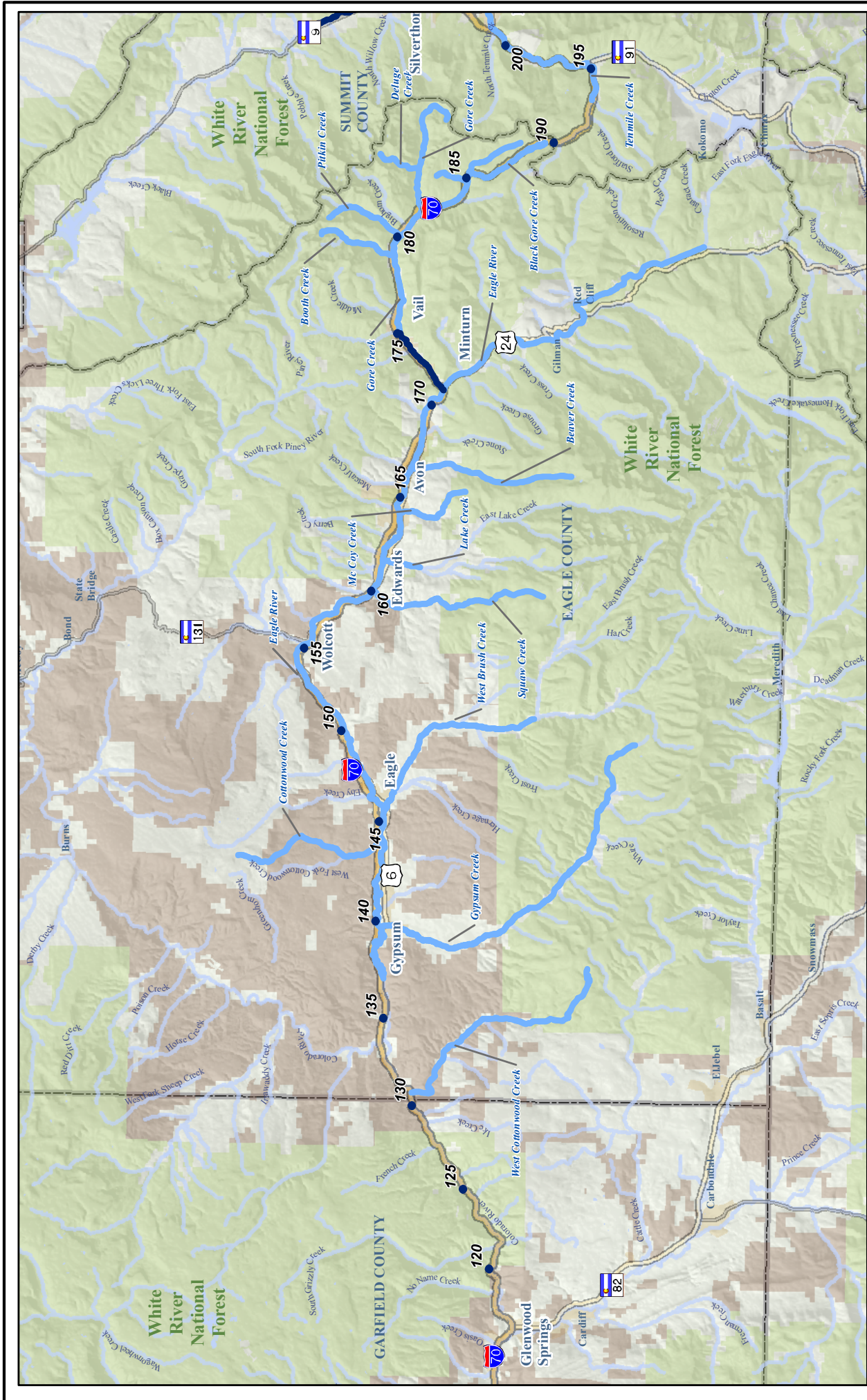
Lead agencies will follow the processes outlined in the SWEEP Memorandum of Understanding (see **Appendix D, SWEEP Memorandum of Understanding**, of the *I-70 Mountain Corridor PEIS*, [CDOT, 2010]). In addition, CDOT will use best management practices and erosion control measures to reduce soil losses, soil inundation, and sedimentation in areas adjacent to the construction area and provide

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sufficient cross-slope drainage structures during new construction to allow natural hydrologic conditions to be maintained on both sides of the right-of-way. Fish habitat will be restored and replaced, using photo documentation to help return these areas to previous conditions.

6.6 Fisheries Resource Maps

Figure 21 and **Figure 22** provide maps of fishery resources.



Legend

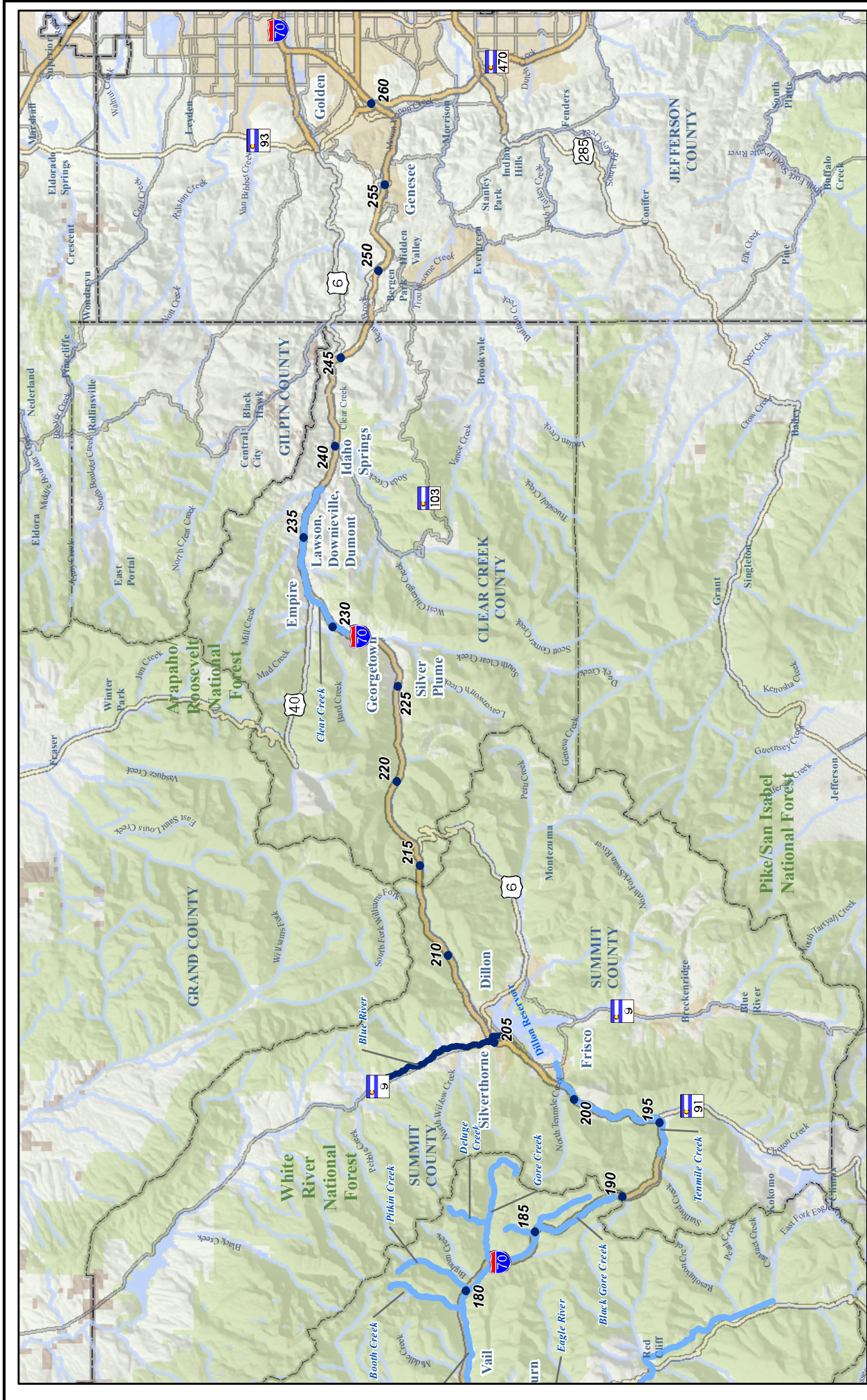
- Mileposts
- Limited Access Highways
- Major Highways
- Highways
- Lakes
- County Boundary
- Urban Areas
- USFS Land
- BLM Land
- Gold Medal Fisheries
- High Value Fisheries

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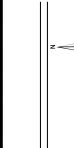
U.S. Department of Transportation
 Federal Highway Administration

0 3.31 6.62 Miles
 Scale - 1:420,000
 or 1" = 6.62 Miles

Fisheries
 Map 1 of 2



I-70 Mountain Corridor PEIS
 Technical Report



Legend

- Mileposts
- Limited Access Highways
- Major Highways
- Highways
- Lakes
- County Boundary
- Urban Areas
- USFS Land
- BLM Land
- Gold Medal Fisheries
- High Value Fisheries

Scale - 1:420,000
 or 1" = 6.62 Miles

0 3.31 6.62 Miles

Section 7. Agency Coordination

The United States Fish and Wildlife Service was consulted regarding Platte River depletions and mitigation.

The Colorado Division of Wildlife was consulted to confirm the status of Gold Medal and “high-value” fisheries designations.

The United States Fish and Wildlife Service was contacted by letter requesting updated information on August 15, 2008. The United States Fish and Wildlife Service replied by letter dated August 28, 2008 (see **Appendix D** of this Technical Report), providing lists of threatened, endangered, and candidate species in the vicinity of the I-70 Corridor.

The United States Fish and Wildlife Service was consulted regarding Platte River depletions and mitigation and also regarding the treatment of greenback cutthroat trout and the bald eagle.

Colorado Division of Wildlife was consulted for updates on the reintroduction of lynx in Colorado.

The United States Forest Service was contacted for updated information on federally listed species that may occur on the Arapahoe and Roosevelt National Forest and the White River National Forest. The following updated lists were reviewed (see **Appendix E** of this Technical Report):

- Region 2 Regional Forester’s Sensitive Species (with Forest Service highlighted subset indicating White River National Forest species) provided May 14, 2009
- White River National Forest MIS lists (with notes indicating whether species have habitat affected by the project) provided May 14, 2009
- Comments on Threatened and Endangered species list for I-70 PEIS, White River National Forest, provided May 14, 2009
- ARP Threatened and Endangered/Sensitive Species/MIS Lists (with Forest Service bolded subset indicating species that occur within the I-70 Corridor, have habitat within the Corridor, or are potentially affected by the project) provided May 14, 2009

The United States Forest Service was also contacted for information on the effects of the mountain pine beetle on forest habitat.

The Bureau of Land Management was consulted to confirm that the 2000 Bureau of Land Management Sensitive species list available on the Bureau of Land Management website is the most up-to-date list available.

Section 8. References

8.1 Rare Plant Communities

Colorado Natural Heritage Program: <http://www.cnhp.colostate.edu/list.html>.

8.2 Noxious Weeds

Colorado Department of Agriculture, Plant Industry Division website:
<http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1174084048733>. To view weeds by county, see the Department’s Interactive County Weed Map:
<http://www.ag.state.co.us/NoxiousWeed/default.html>.

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State list with A, B, C designation: <http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1174084048733>.

Colorado weed mapping program: <http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1167928184069>.

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Summit County designated noxious weeds: http://www.co.summit.co.us/Weeds/summit_weeds.htm.

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Seven appendices support the Biological Resources Technical Report:

- Appendix A provides the likely effects of the alternatives on federally listed species (endangered, threatened, and proposed), U.S. Forest Service (USFS)-sensitive species, management indicator species (MIS), and other species or habitats potentially affected by the project alternatives located on U.S. Forest Service land.
- Appendix B is a report commissioned by CDOT researching the effects of deicers on vegetation in relationship to other potential stresses. This study provides an ecological impact assessment of factors affecting the health of roadside vegetation in the state of Colorado including potential biotic and abiotic plant stressors and deicer applications.
- Appendix C is the meeting minutes from the CDOT Winter Maintenance Meeting, dated July 13, 2009.
- Appendix D provides the U.S. Fish and Wildlife Species List, is the list of the Threatened, Endangered, and Candidate species analyzed in the I-70 Mountain Corridor PEIS.
- Appendix E provides the White River National Forest and Arapahoe and Roosevelt National Forest Service species lists and the Colorado Division of Wildlife State Species of Concern list. These species were analyzed in the I-70 Mountain Corridor PEIS.
- Appendix F provides the Colorado Natural Heritage Program Species List, which consists of Colorado's rare and imperiled species. These species were analyzed in the I-70 Mountain Corridor PEIS.
- Appendix G provides the latest update provided by the Colorado Department of Wildlife regarding the status of Canada lynx in Colorado.

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