

### 3.2 Biological Resources

#### 3.2.1 Introduction

This section discusses the vegetation and principal wildlife species and habitats within the Corridor. Several of the issues pertaining to vegetation and wildlife habitat are closely linked and considered common in the analysis of impacts. Loss of vegetation, for example, is also a loss of habitat for certain wildlife species.

From an ecological standpoint, the Corridor presents several complex issues for transportation planning and impact assessment. I-70 passes through numerous “life zones” in Colorado, from foothills to alpine. Therefore, project alternatives may affect a wide variety of ecological resources, including but not limited to the following: unique and rare plant communities, wildlife migration patterns; wildlife habitats including summer and winter ranges; and aquatic resources. Note: Fisheries are addressed in section 3.5, Fisheries. Wetlands, fens/springs, other waters of the US, and riparian areas are addressed in section 3.6, Wetlands, Other Waters of the US, and Riparian Areas, and threatened, endangered and special status (TES) species are addressed in section 3.3, Threatened, Endangered, and Other Special Status Animal and Plant Species.

**Vegetation Issues**

- Loss of vegetative cover
- Loss of sensitive and rare plant communities
- Effects of winter maintenance
- Introduction and spread of noxious weeds

**Wildlife Issues**

- Barriers to wildlife movement and mortality from animal-vehicle collisions
- Direct habitat loss and fragmentation
- Intensified impacts on adjacent habitats (road effect zone)
- Indirect effects of increased population growth and land use change on habitats

The biological study used existing ecological data and a limited inventory of dominant vegetation along the Corridor. Each data set represented a layer of spatial information that is combined with other layers for analytical purposes. Analysis involved a geographic information system (GIS) overlay of alternative footprints and construction disturbance zones to identify and quantify impacts in terms of loss of habitat. Impacts on wildlife habitats and movement patterns were then evaluated based on the anticipated effects of construction, operation, and maintenance of alternatives. Appendix A, Environmental Analysis and Data, further describes this assessment approach and the analysis results.

Interference with wildlife movement due to the barrier effects created by I-70 and the influences of alternatives is considered to be one of the most serious issues affecting wildlife in the Corridor. “Linkage interference zones” were identified along the Corridor where the barrier effects of I-70 impede traditional wildlife movement or habitat linkage areas. 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.”

#### 3.2.2 Affected Environment

The description of the affected environment is organized according to life zones, which are areas or belts of land that have plant and animal assemblages that correlate to elevation, latitude, and climate. Life zones differentiate broad changes in vegetation communities and correlate with changes in growing season length and precipitation (Merriam 1899; Marr 1967). Most life zones occur at more than one location along the Corridor, as shown on Figure 3.2-1 and Figure 3.2-2.

The Corridor contains a diversity of vegetation types that correspond to changes in elevation (approximately 5,800 feet at Glenwood Springs, to 11,200 feet at the west side of the Eisenhower-Johnson Memorial Tunnels (EJMT), to 6,000 feet at C-470), as well as geographic variability along the 144-mile Corridor. The project area along the Corridor can be characterized by four life zones: Foothills, Montane, Subalpine, and Alpine (CNAP 1998).

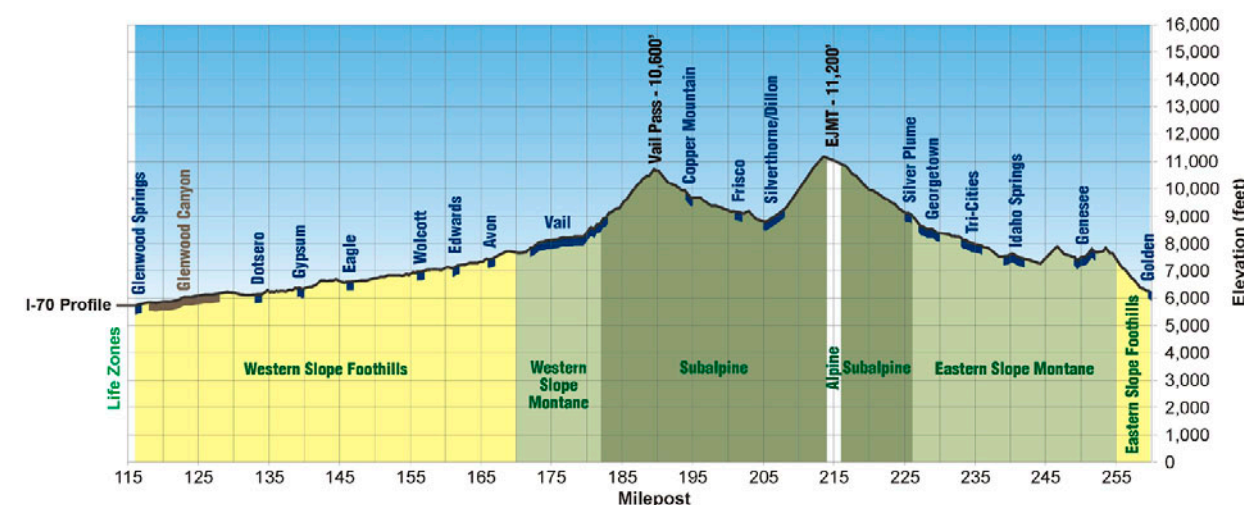
Recognized elevation ranges and plant communities of the life zones vary somewhat because of aspect, and in some cases classification differences (Nelson 1977, Hoffman and Alexander 1983, Hess and Alexander 1986, CNAP 1998). The basic vegetation types of each zone are described below. Certain vegetation and animal species are associated with or characterize the life zones.

Figure 3.2-1 illustrates the life zones and elevations along the Corridor. Alternatives assessed in this PEIS would be located between the Eagle County Airport and C-470. The distribution of the life zones and descriptions of associated linkage interference zones are provided in Table 3.2-1. Appendix F, Biological Resources and Wetlands Documentation, provides species scientific nomenclature.

**Supporting Documentation**

- Appendix A, Environmental Analysis and Data
- Appendix F, Biological Resources and Wetlands Documentation
- Resource Maps 3.2-1 through 3.2-2, Vegetation
- Resource Maps 3.2-3 through 3.2-7, Key Wildlife Habitats
- Resource Maps 3.2-8 through 3.2-22, Wildlife Linkage Interference Zones

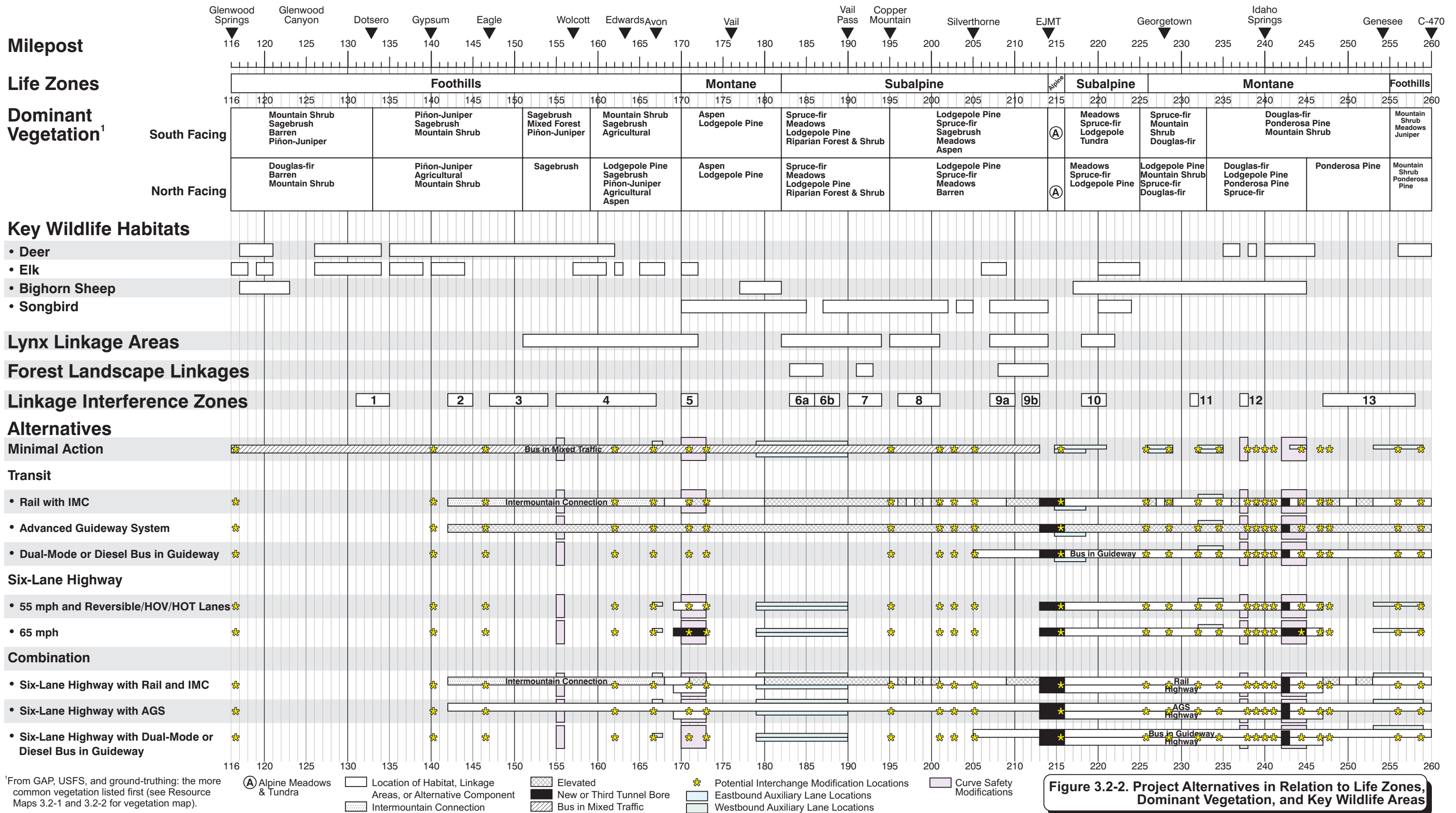
Figure 3.2-1. Life Zones and Elevations



In Appendix F, the following subsections provide lists of vegetation and wildlife species by life zone:

- Biological Report, Arapaho-Roosevelt and White River National Forests
- Plant, Wildlife, and Noxious Weeds Found in the Corridor
- Wetland Identification and Mapping Methods

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**Figure 3.2-2. Project Alternatives in Relation to Life Zones, Dominant Vegetation, and Key Wildlife Areas**

### 3.2.2.1 Influence of Past Activities

A number of factors have influenced natural ecosystems within the Corridor, including community development, mineral exploration, grazing, increased fire frequency, and, conversely, fire suppression. These factors have contributed to the composition of vegetation and wildlife habitats, erosion, and the increase and spread of weeds, including those that are considered noxious.

Human development has had perhaps the greatest effect on natural systems throughout the Corridor (WRNF 2002). Relatively large areas of vegetation have been removed or altered in conjunction with the larger concentrations of developments. 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. If individual animals cannot move freely between habitat patches, entire populations may become separated. As a consequence, each of these smaller populations becomes more susceptible to genetic degradation and extirpation from a single catastrophic event, such as a disease outbreak (Jackson 1999). Recent resort development, including ski areas and golf courses, has also reduced the amount of habitat available in some parts of the Corridor. Human intrusion into adjacent habitats from these areas further reduces the amount of habitat available to wildlife. Another effect of development is the introduction of weed species that often gain a foothold when land is cleared for construction.

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 (WRNF 2002). Noise from traffic also affects the use of adjacent habitat by some species, depending on their sensitivity. The road effect zone, as defined by Forman and Alexander (1998), varies depending on adjacent terrain and habitats, with noise extending further into more open habitats than forest. Other road effects along I-70 include the change of both surface and groundwater flows that are bisected and often channeled beneath I-70 in culverts.

### 3.2.2.2 Vegetation Types in the Corridor

Vegetation of the Corridor is described according to life zones, which are altitudinal or latitudinal bands of characteristic plant and animal communities. The elevation limits of the life zones and the vegetation types in any specific location may vary due to gradients in environmental factors related to site-specific conditions (Weber 2001a, Mutel and Emerick 1992). See Figure 3.2-1 and Figure 3.2-2, Appendix F, Biological Resources and Wetlands Documentation, and Map 3.2-1, which is located in the Resource Maps section, for other summaries of the vegetation types.

The descriptions of the vegetation within the 2-mile wide corridor are based on limited ground-truthing and on information from the US Forest Service (USFS 1997) and the Geographic Analysis Program (Colorado Vegetation Classification Project 1999). Riparian forest and shrub vegetation typifies stream courses throughout the Corridor, and both are described in section 3.6, Wetlands, Other Waters of the US, and Riparian Areas.

#### Foothills Zone

The Foothills Zone (6,000 to 7,600 feet in elevation) is relatively complex because of variable topography and moisture gradients (Weber and Wittman 2001a) and generally contains woodland vegetation that is intermixed with shrubland and grassland vegetation, depending on slope exposure and soils. The vegetation composition and structure are different between the Western Slope and Eastern Slope (CNAP 1998, Mutel and Emerick 1992).

#### Western Slope

Interspersed woodland and shrubland characterize the Foothills Zone on the Western Slope, which extends from Glenwood Springs for more than 50 miles to east of Avon. Piñon-juniper woodland (Utah juniper) occurs throughout much of the Foothills Zone on the Western Slope and dominates the Corridor for 20 miles east of Glenwood Canyon. These pygmy forests have a diverse but sparse understory that often includes various shrubs that are also dominant in adjacent shrublands (CNAP 1998, Mutel and Emerick 1992). Adjacent to the woodlands are basin big sagebrush and mountain big sagebrush shrublands, the latter on moister sites and often extending to above 9,000 feet on south exposures (Weber and Wittman 2001a, b). Rabbitbrush is common in these communities. Other typical shrubs associated with the basin big sagebrush include shadscale and greasewood on alkaline sites, whereas snowberry and numerous grasses and forbs occur on the moister sites. Mixed mountain shrubland of Gambel or scrub oak and mountain mahogany occurs above the woodland on moister sites, often extending into the Montane Zone. Serviceberry and snowberry also typify these communities.

Barren lands are localized and occur in or east of Glenwood Canyon. These areas are composed primarily of cliffs or rocky areas with very little vegetation, such as parts of Glenwood Canyon, or localized alkaline areas with very sparse, shrubby vegetation such as saltbush and greasewood. In Glenwood Canyon, the vegetation types are quite different from those throughout most of the Foothills Zone. They include forest vegetation types typical of the cooler and moister Montane Zone and are described below with that zone. In Glenwood Canyon, the predominant vegetation type is Aspen forest. Douglas-fir forests are also present, and mixed mountain shrubland is common with areas of sagebrush shrubland.

Another community that is cooler and moister than other Foothills Zone areas is a mixed forest type of aspen and coniferous species, which characterizes an area northwest of Wolcott.

#### Eastern Slope

The Corridor includes about 5 miles of the Eastern Slope Foothills Zone, where woodlands, shrublands, and meadows are interspersed. West of this there are about 15 miles of transition to the Montane Zone, which is discussed below. Dry meadows (for example, blue grama, little bluestem, Junegrass, needle-and-thread, and various forbs) are common on the lowest elevations of the Front Range (CNAP 1998, Mutel and Emerick 1992) and predominate at the far east end of the Corridor. Mixed mountain shrubland is the dominant vegetation for about 5 miles west to approximately Mount Vernon Canyon. This vegetation type typically includes mountain mahogany accompanied by skunkbrush sumac, wax currant, antelope bitterbrush, and other shrubs, grasses, and forbs (CNAP 1998, Mutel and Emerick 1992). Juniper woodlands (Rocky Mountain juniper or western red cedar) combine with mountain mahogany, skunkbrush sumac, and antelope bitterbrush to form several community types of this zone within the Arapaho and Roosevelt National Forests (ARNF) (Hess and Alexander 1986).

#### Montane Zone

The Montane Zone extends from approximately 7,600 to 9,000 feet in elevation (Nelson 1977, CNAP 1998), is dominated by forests, and differs on the Western and Eastern Slopes.

#### Western Slope

The Western Slope Montane Zone stretches for about 12 miles from near Minturn to Vail East Entrance. Two types of forests are typical of the Western Slope montane forests along the Corridor and both also extend through much of the Subalpine Zone. Lodgepole pine forests typically occur in association with past fires, often as dense forests with sparse understory (CNAP 1998, Mutel and

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Emerick 1992). More open forests typically contain shrubs, including kinnikinnick, common juniper, and broom huckleberry (grouse whortleberry). Aspen forests usually occur on previously disturbed sites with deeper, moister soils than lodgepole pines. Aspen understory varies from grassy species such as Thurber's fescue, slender wheatgrass, and blue wild rye on drier sites to a rich assemblage of herbaceous and shrubby species in moister sites, where chokecherry, snowberry, serviceberry, Colorado columbine, meadowrue, and golden banner are common (CNAP 1998, Mutel and Emerick 1992). Douglas-fir forests occur in this zone but are not common in the Corridor. Ponderosa pine, which typifies the Eastern Slope Montane Zone, is nearly absent in the White River National Forest (WRNF) (Hoffman and Alexander 1983).

### Eastern Slope

Forests of various types dominate, and shrublands are scattered in the Eastern Slope Montane Zone, which is about 20 miles long in the Corridor, extending between Lawson, Downieville, and Dumont to below Genesee. Ponderosa pine forests and woodlands characterize this zone, especially at the lower elevations. Ponderosa pine woodlands are transitional from piñon-juniper or Juniper woodland (see the Foothills Eastern Slope) to moister Douglas-fir forests (CNAP 1998, Mutel and Emerick 1992, Hess and Alexander 1986). Some typical associated species of ponderosa pine include wax currant, mountain mahogany, kinnikinnick, antelope bitterbrush, blue grama, and Junegrass. Open forests on dry sites generally support abundant grasses. Douglas-fir forests occur throughout the Montane Zone on sites higher in elevation and moister than those of Ponderosa pine forests. Dense Douglas-fir forests have little understory, whereas moderately open forests contain a shrubby understory often dominated by kinnikinnick, common juniper, and ninebark (CNAP 1998, Mutel and Emerick 1992). Mountain shrublands occur in the Corridor on drier, warmer sites and were discussed in the Foothills section. Lodgepole pine forests occur as a dominant forest type in the upper elevations of the Montane Zone, primarily as a result of past fires, and were described with the Western Slope Montane Zone. Aspen forests, also relatively common on previously disturbed sites, are not common in the Eastern Slope Montane corridor. Spruce-fir forests occur at the highest Montane Zone elevations on moist, cool sites and are described below with the Subalpine Zone.

### Subalpine Zone

The Subalpine Zone occurs generally above 9,000 feet, depending on aspect, and extends to treeline at approximately 11,400 feet depending on aspect. It comprises about 50 miles of the Corridor between Vail East Entrance and the Lawson, Downieville, and Dumont area. This zone is typified by a co-dominance of Engelmann spruce and subalpine fir that occur in cool, moist sites and form Spruce-fir forests. Typical understory dominants include broom huckleberry, whortleberry (blueberry), Jacob's ladder, elk sedge, and heartleaf arnica (CNAP 1998, Mutel and Emerick 1992). Lodgepole pine and Aspen forests are well represented throughout the Corridor in this zone, primarily as a legacy of past fires, with aspen often occupying moister sites. These forests were described in the Montane Zone. Limber pine and Bristlecone pine forests, though uncommon within the Corridor, are present above Silver Plume, and generally occur on ridgetops and windy, exposed, dry sites in the Subalpine and the Montane Zones (Nelson 1977, Hess and Alexander 1986, CNAP 1998). Douglas-fir forests and Sagebrush shrublands (includes mountain sagebrush and basin big sagebrush) extend up from lower elevation zones (see above) into the warmest, driest sites in the Subalpine Zone of the Corridor.

### Alpine Zone

The alpine meadows-tundra (higher than 11,400 feet in elevation) is a treeless, windy area of low-growing plant communities that may be classified as fellfields (rockfields, moist and dry alpine meadows, and snow accumulations and wet areas). The subalpine-alpine transition area occurs at the upper limit of trees, which may include krummholz (dwarfed and twisted trees), often of Engelmann

spruce and subalpine fir, thickets of willows, and grass-sedge dominated meadows, which also contain numerous species of wildflowers (for example, alpine avens, paintbrush) (CNAP 1998, Mutel and Emerick 1992). Within the Corridor, however, alpine tundra is seldom reached; the exception is immediately above the portals of the EJMT at approximately 11,200 feet.

### 3.2.2.3 Vegetation Issues in the Corridor

Changes in hydrological regime and water quality can cause changes in plant dispersal and survival, leading to plant community shifts over time. For example, Findlay and Bourdages (2000) found significant correlations between lower plant diversity and higher densities of roads within wetlands in Canada. Because these types of disruptions affect basic ecological processes, highway impacts may extend far beyond the roadside, affecting an entire ecosystem's function (Forman 2000). Highways are widely documented to have detrimental impacts on water quality due to inputs of heavy metals, salts, and nutrients associated with the roadway (Jones et al. 2000, Trombulak and Frissell 2000). Effects from winter sanding and deicing are observed along much of the Corridor, especially at higher elevations where applications are more frequent (such as Vail Pass and the EJMT area). Lands directly adjacent to I-70 consist of sparsely vegetated and barren areas that have been affected by the initial road construction and operation of the interstate. The portion of the alternative footprint that would occur on previously disturbed areas was tabulated, as well as impacts on vegetation.

CDOT currently has efforts underway to reduce the amount of winter traction sand and deicers that are transported into adjacent areas. CDOT has implemented Sediment Control Action Plans (SCAPs) in the Straight Creek area near the EJMT and in the Black Gore Creek area on Vail Pass. The objectives of these plans are to improve control of winter deicing materials and reduce the amount that is transported off-road. (Section 3.4, Water Resources, contains a more complete discussion of winter maintenance activities.)

### 3.2.2.4 Wildlife Species in the Corridor

#### Foothills Zone

Typical mammals that inhabit the Foothills Zone include mule deer, mountain lion, bobcat, mountain (Nuttall's) cottontail, deer mouse, rock squirrel, Colorado chipmunk, and long-tailed weasel. Characteristic birds include chipping sparrow, dark-eyed junco, dusky flycatcher, green-tailed towhee, golden eagle, mourning dove, plain titmouse, and piñon jay. This is the most important zone in the Corridor for reptile habitat, providing habitat for collared lizard, eastern fence lizard, tree lizard, bull snake, and prairie rattlesnake. See Appendix F, Biological Resources and Wetlands Documentation, for a more complete list of common wildlife species associated with the above vegetation types.

#### Montane Zone

Mammals that typically occur throughout the Montane Zone include elk, mule deer, mountain lion, bobcat, coyote, beaver, porcupine, striped skunk, and black bear (see Appendix F). Some of the more common small mammals of this zone are mice, squirrels, shrews, bats, chipmunks, mountain cottontails, weasels, and woodrats. Typical avian species include hawks and owls, as well as the mountain bluebird, mountain chickadee, ruby-crowned kinglet, Steller's jay, pygmy nuthatch, and red crossbill (Appendix F). The latter two bird species are considered indicator species of mature ponderosa pine forest (Kingery 1998).

#### Subalpine Zone

Wildlife species primarily associated with the Subalpine Zone along the Corridor include elk, black bear, American marten, porcupine, yellow-bellied marmot, snowshoe hare, pine squirrel (chickaree),

and many smaller mammals (Appendix F, Biological Resources and Wetlands Documentation). Birds typical of this higher mountain region include the broad-tailed hummingbird, Clark’s nutcracker, gray jay, house wren, mountain chickadee, pine grosbeak, pine siskin, hermit thrush, Townsend’s solitaire, western tanager, yellow-rumped warbler, and red-breasted nuthatch, which is considered an indicator species of mature spruce-fir forest.

**Alpine Zone**

The Alpine Zone is typified by bighorn sheep, mountain goat, pika, short- and long-tailed weasels, chipmunk, yellow-bellied marmot, shrews, voles, and a number of bird species including American pipit, brown-capped rosy finch, Clark’s nutcracker, and white-crowned sparrow (see Appendix F for a more complete list of species).

**3.2.2.5 Wildlife Issues in the Corridor**

The primary issue affecting wildlife in the Corridor is the interference of I-70 with wildlife movement and animal-vehicle collisions (AVCs). Barriers to wildlife movement include structural, operational, and behavioral impediments to wildlife trying to cross I-70.

**Barrier Effect**

I-70, human population centers, increasing development, and human intrusion act as barriers to wildlife that historically crossed the Corridor in their migration or daily movements to access key habitats that supply forage or prey, cover, and water and provide breeding and rearing young requirement; and to repopulate additional areas. Transportation corridors and the communities that have developed have been a prominent cause of habitat fragmentation in the mountains of Colorado in general (WRNF 2002). Mountain valleys that contain important habitats and serve as wildlife migration and movement pathways are often subject to development. No quantitative data exist regarding how a road’s design regulates its barrier effect. However, it is logical to assume barrier effects increase for all species with increased road width and the addition of retaining walls, fences, raised medians, guard rails, and significant increases in volume and/or speed of traffic.

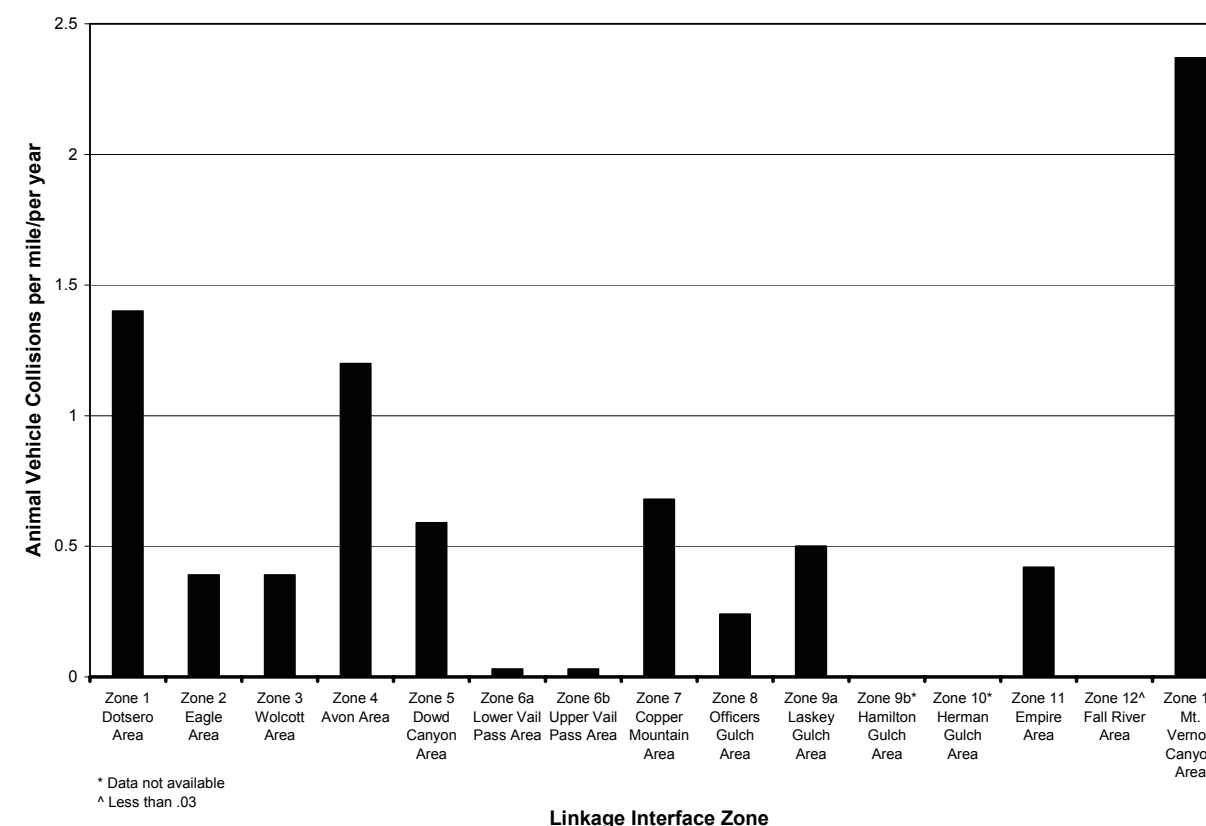
**Animal-Vehicle Collisions**

Documentation of mortality by AVCs from daily operations of highways covers a wide range of species, including mammals, birds, amphibians, and invertebrates (Trombulak and Frissell 2000). AVCs usually indicate a location where animal species are trying but having difficulty crossing the roadway.

Not all AVCs are reported or known, and it is estimated that only 16 to 50 percent of all AVCs are actually reported in the US (Romin and Bissonette 1996, Messner et. al. 2000). Data that are available for AVCs within Corridor linkage interference zones are important in identifying problem areas along I-70 (Chart 3.2-1). AVCs along the Corridor were compiled for the period 1988 to 1998 (Barnum 2002). Over this 10-year period, a total of 923 AVCs were reported. The average number of AVCs per mile per year was 0.63, but ranged from 0.0 to 5.2, with a standard deviation of plus or minus 0.79. Thus, road areas with 0 to about 1.4 AVCs per year per mile can be considered “normal.” Road areas with 1.4 or greater AVCs per year per mile should be noted as problem areas.

Additionally, information on the species involved is inconsistent throughout the Corridor because currently State Patrol does not record the species involved when reporting AVCs. However, Colorado Division of Wildlife (CDOW) records indicate that in Colorado, mule deer, elk, and bighorn sheep account for most reported AVCs. Because these three species have different habitat affinities, they are not distributed evenly throughout the study Corridor, and their contribution to AVCs probably varies by location.

**Chart 3.2-1. Animal-Vehicle Collisions in the Corridor**



**Linkage Interference Zones**

Linkage interference zones are locations along the Corridor where the evidence suggests that the existing highway’s barrier effect impedes traditional wildlife movement through certain corridors. These corridors include migration routes, as well as pathways used by a species to access required parts of its habitat on a more frequent basis. In all instances, these movement pathways connect two important components of a species’ habitat needed to complete lifecycles. Evidence used to identify probable linkage interference zones included AVC data, knowledge of historic movement patterns, and observations by agency personnel, primarily of mule deer, elk, bighorn sheep and, when data were available, carnivores. The locations and characteristics of each linkage interference zone are detailed in Table 3.2-1. Figure 3.2-2 illustrates the linkage interference zones in relation to the alternatives, life zones, and key wildlife areas. In the Resource Maps section, Map 3.2-8 illustrates wildlife linkage interference zones Corridor-wide, and Maps 3.2-9 through 3.2-22 illustrate individual linkage interference zones.

**Agency Coordination: A Landscape Level Inventory of Valued Ecosystem Components (ALIVE)**

CDOT and FHWA enlisted four other state and federal agencies—CDOW, Bureau of Land Management (BLM), US Forest Service (USFS), and US Fish and Wildlife Service (USFWS)—to participate in a program to address the barrier effect issues of the Corridor. These agencies are responsible for the protection and management of wildlife habitats and TES species. Through the combined experience and expertise of these agencies, approaches were developed during 2002 and 2003 for mitigating transportation-related impacts on wildlife movement in the Corridor. This approach is named “A Landscape Level Inventory of Valued Ecosystem Components” (ALIVE).

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Through the ALIVE committee, a wide range of ecological data were collected and evaluated, including assessments of high-value conservation sites and impaired landscape components that helped to target effective landscape level mitigation strategies. All data used were gathered in spatial formats through the use of GIS-based analytical tools. This approach supports a long-term strategy for identifying direct, secondary, and cumulative effects of project alternatives.

The focus of the ALIVE committee is:

- Designation of key wildlife habitat including Canada lynx habitat (see Map 3.3-1).
- Identification and characterization of linkage interference zones (see Maps 3.2-8 through 3.2-22).
- Analysis of specific conflict areas for wildlife roadway crossing within the linkage interference zones
- Recommendations for mitigating conflicts through wildlife crossings and other techniques including fencing and land conservation strategies. The resulting mitigation for wildlife crossings is common to both key wildlife habitats and lynx habitats. Lynx are further discussed in section 3.3, Threatened, Endangered, and Other Special Status Animal and Plant Species.

### 3.2.2.6 Important Communities, Habitats and Wildlife Species

This section describes communities, habitats, and wildlife considered important by the CDOW, USFS, and Colorado Natural Heritage Program (CNHP). Riparian communities are also considered important but are addressed in section 3.6 in conjunction with wetlands. The communities discussed below are key in that they are unique to the area, rare, and/or imperiled. They are, therefore, important for consideration of impacts from project alternatives.

#### Unique or Rare Plant Communities

Key plant communities of the Corridor include riparian habitats, old-growth forests, and subalpine meadows-alpine tundra. These communities are sensitive to disturbance because they are easily damaged by overuse or high-impact use (for example, off-road vehicles) and/or because re-establishment of the community requires a considerable time period, such as old-growth forests. Moreover, most of these communities provide habitat for a unique set of both plant and animal species.

#### Alpine Meadows-Tundra

Alpine and subalpine meadows contain species of viability concern to the USFS (WRNF FEIS 2002). These meadows are considered to be sensitive because of the thin soils, a short growing season that restricts productivity, and harsh winter conditions that restrict vegetation heights. Thus, a considerable time period is required for re-establishment of vegetation after disturbance. Vegetation of these areas is composed of a relatively rich flora of graminoid and sedge species, as well as a host of showy flowering plants. The Alpine Zone occurs only at elevations above the EJMT in the Corridor. Subalpine-alpine meadows occur at the EJMT portals.

#### Old-Growth Forests

Old-growth forests contain species of viability concern to the USFS. Direction from USFS on forest lands is to avoid active vegetation management in inventoried old-growth stands (WRNF FEIS 2002). Old-growth forests occur close to I-70 on the west side of Vail Pass at mileposts 185.5 to 186 north of the highway, and on the east side of Vail Pass at milepost 192 south of the highway. Such areas also are mapped relatively close to I-70 on the west side of EJMT at milepost 212.5 north of the highway, at milepost 213.0 south of the highway, and again for a 2.5-mile stretch east of EJMT south of the highway between mileposts 216 and 218.5. Based on USFS GIS data layers and limited field reconnaissance, most of the areas of old growth occur on slopes that are above drainages opposite the

highway and do not occur immediately adjacent to the road. The exception is the area at mileposts 185.5 to 186.0 on Vail Pass that is mapped immediately north of the highway above the cliffs that form the I-70 road cut. This stand is also part of a Late-Successional Assessment Area. The old-growth stand at this location extends to the edge of the original road cut.

#### Rare Plant Communities

CNHP tracks and ranks Colorado's rare and imperiled species and habitats and provides information on these topics to promote the conservation of Colorado's valuable biological resources. CNHP was created to identify and describe areas of statewide and global conservation significance and to educate decision-makers about the impacts of various land use options. Rare plant communities also occur within the Corridor and are composed of communities that have been severely reduced in distribution by development, that are near the limit of their geographic distribution, or that represent a unique community or plant association within the landscape. Such communities, as designated by CNHP, that occur within the Corridor are:

- Foothills riparian shrubland (*Swida [Cornus] sericea*): milepost 126; Glenwood Canyon
- Montane riparian forest (*Populus angustifolia*: *Picea pungens*/*Alnus incana*), mileposts 152, 175, 185; west of Wolcott, along Gore Creek, and along Black Gore Creek
- Drummond willow/mesic forb (*Salix drummondii*/mesic forb): north of I-70 at milepost 174; Buffalo Creek
- Montane willow carr (*Salix geyeriana*/*Carex aquatilis* and *Salix monticola*/*Calamagrostis canadensis*): milepost 179; Vail Valley
- Western Slope sagebrush scrublands (*Seriphidium [Artemisia] canum*/*Festuca thurberi*): milepost 202; slopes north of I-70 near Frisco
- Montane aspen forest (*Populus tremuloides*/tall mixed forbs): milepost 203; Frisco area
- Subalpine riparian willow carr (*Salix planifolia*/*Carex aquatilis*): milepost 218; Western Slope from EJMT
- Montane woodlands (*Pinus aristata*/*Vaccinium myrtillus*): milepost 219; Western Slope from EJMT
- Foothills ponderosa scrub woodlands (*Pinus ponderosa*/*Cercocarpus montanus*/*Andropogon gerardii*): milepost 258; south of I-70 along the Hogback

Of these plant communities, foothills ponderosa scrub woodland with big bluestem and Western Slope sagebrush scrublands currently are designated "globally imperiled" (G2), one of the rarest categories, as well as "imperiled in Colorado" (S2). Designations for the other communities indicate a less precarious situation such as "vulnerable" to decreased abundance (G3, S3).

#### Key Wildlife Habitat

CDOW identifies severe winter ranges, winter concentration areas, and lambing and calving areas for large game animals.

Of the forested habitats within the Corridor, aspen and ponderosa pine forests usually support more wildlife species than spruce-fir or lodgepole pine forests, which generally contain a simpler understory (DeByle and Winokur 1985, USFS 2002). A mixture of aspen and conifers may increase animal species diversity above what either provides in pure stands (Scott and Crouch 1988). Riparian forest and shrublands, however, are much more species rich than upland forest habitats, primarily because of the high number of bird species (USFS 2002). Affiliations of animal species with these habitats of the Corridor are tabulated in Appendix F, Biological Resources and Wetlands Documentation. Terrain features also are key to habitat value and an important factor in defining key

wildlife habitat, such as bighorn sheep lambing areas, and elk and mule deer winter concentration areas.

The Wildlife Resources Information System (WRIS) mapping developed by CNHP was used to identify key habitat for mule deer, elk, and bighorn sheep along the Corridor. The designation of key habitats was coordinated with CDOW biologists and includes the following:

- Elk severe winter range, winter concentrations, and calving areas (see Map 3.2-3)
- Mule deer severe winter range and winter concentrations (see Map 3.2-4)
- Bighorn sheep summer range, winter range, winter concentrations, and lambing areas (see Map 3.2-5)

Mule deer fawning areas are scattered in various habitats and are not mapped as discrete areas.

Although elk populations have increased over the last 20 to 25 years, this species is still affected in parts of the Corridor by winter range reduction and disturbance to calving habitat (for example, by recreational users: USFS 2002). 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 (USFS 2002). Bighorn sheep have generally increased through reintroductions into historic habitat, but suitable habitat is limited, and lambing habitat is especially critical to most populations (USFS 2002).

The Migratory Bird Treaty Act of 1918 (MBTA, 16 USC 760c-760g), as amended, implements protection of migratory birds and provides that it is unlawful to take any migratory bird, part, nest, egg, or product. As such, all of the native avian species of the Corridor and their active nests are protected and have potential to be affected by the alternatives that expand the highway footprint/ right-of-way. Vegetation types (riparian and aspen forests) of the Corridor with the highest potential to be used for nest sites were used to measure the extent that songbirds could be affected by the alternatives.

The Bald and Golden Eagle Act of 1940 gives additional protection for eagle species and their nests.

### Management Indicator Species

Management indicator species are selected by each national forest “because their population changes are believed to indicate the effects of management activities” (36 CFR 291.19(a)(1)). In addition to individual species, USFS also considers some plant communities as management indicators. In general, management indicator species are selected to meet one of the following criteria: (1) they are ecological indicators; (2) they are species commonly hunted or of economic significance; or (3) they are threatened or endangered species. Appendix F includes a list of WRNF and ARNF management indicator species anticipated to occur within the Corridor and provides a biological evaluation that includes management indicator species and TES species.

Management indicator species relevant to the Corridor were selected from Forest Plan lists and include the following:

- For ARNF, mule deer, bighorn sheep, warbling vireo, Wilson’s warbler, and boreal toad
- For WRNF, MacGillivray’s warbler and snowshoe hare
- For ARNF and WRNF, brook, brown, rainbow, greenback cutthroat, Colorado River cutthroat trout, elk, and pygmy nuthatch

These species are selected because their management indicator communities (MICs) or habitats are most likely to be influenced and/or because the movement of individuals across I-70 is of concern. The management indicator species not selected are least likely to be influenced by this project and/or because similar habitat/highway crossing concerns are represented by other management indicator species. Forest Plan management indicator species that are also threatened, endangered, or special status species but not selected as Project management indicator species are evaluated only as threatened, endangered or special status species in section 3.3, Threatened, Endangered, and Other Special Status Animal and Plant Species, if influence due to the project alternatives is likely a concern.

All threatened, endangered, proposed, sensitive species, and management indicator species for the ARNF and the WRNF and for Clear Creek, Summit, Eagle, and Garfield counties were considered in the evaluation and were identified as being within the project area or potentially affected by the project alternatives. Any species, ecosystem, or MIC not listed or discussed below was determined not to occur within the project area, would not be influenced by project activities, and/or was not selected as project management indicator species and, therefore, will not be discussed further for USFS lands.

### 3.2.2.7 Noxious Weeds

CDOT’s goal is to manage existing noxious weed species and eliminate new species following the *Integrated Noxious Weed Management Plan* that was implemented in 1999 to 2000 (CDOT 2000). For any NEPA analysis, CDOT also follows the guidelines set forth in the *Federal Highway Administration Guidance on Invasive Species* (FHWA 1999), which arose from a presidential Executive Order in 1999.

According to the Colorado Noxious Weed Act (CRS 35-5.5), “a noxious weed means an alien plant that has been designated by rule as being noxious or has been declared a noxious weed by an advisory board and meets one or more of the following criteria: (1) aggressively invades or is detrimental to economic crops or native plant communities, (2) is poisonous to livestock, (3) is a carrier of detrimental insects, diseases or parasites, (4) the direct or indirect effect of the presence of this plant is detrimental to the environmentally sound management of natural or agricultural systems.”

Noxious weeds have increased in prominence in proportion to human encroachment along the Corridor, especially in response to disturbance of existing vegetation cover. All of the counties along the Corridor have implemented weed-control programs and have a list of noxious weeds that are to be controlled (see Appendix F).

Eagle County also designates species as requiring management according to Eagle County Resolution No. 2000-45 (Elzinga 2001); species of immediate concern include bouncingbet, coast tarweed, Dyer’s woad, orange hawkweed, sulfur cinquefoil, and yellow star thistle. These species are relatively new to Eagle County, and the county has asked that any infestation locations be reported to Eagle County Weed and Pest Control (Elzinga 2001).

Summit County lists musk thistle and Canada thistle and, in addition, notes scentless chamomile, oxeye daisy, and yellow toadflax as problem weeds (Summit County Weed Management Commission 2001). Chamomile and yellow toadflax are also considered to be noxious weeds.

Buckley (2001) noted in Clear Creek County the following weed species that occur as infestations along I-70: Chinese clematis, diffuse knapweed, spotted knapweed, Russian knapweed, Canada thistle, musk thistle, oxeye daisy, and field bindweed. In the Idaho Springs area, the perennial vine Chinese clematis occurs prominently along Clear Creek, forming thick mats on the trees. It also

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occurs prominently on the hillsides north of I-70 west of Georgetown and south of I-70 above Georgetown.

Jefferson County designates Canada thistle, diffuse knapweed, leafy spurge, musk thistle, purple loosestrife, Russian knapweed, and spotted knapweed as requiring management and control. The counties and CDOT have ongoing weed control programs that are intended to arrest the proliferation of these weed species.

### 3.2.3 Environmental Consequences

#### 3.2.3.1 Impact Methodology

Impacts on vegetation and wildlife habitat were determined through a GIS overlay process in which three impact zones: the alternative footprint (fp); area of construction disturbance (cd); and adjacent sensitivity zone (sz); were superimposed onto each of the above mentioned resources within the Corridor.

Impacts associated with the footprint were considered permanent, as the given resource would be covered by the transportation facility (such as additional traffic lanes, rail, or guideway). Impacts associated with construction disturbance were considered to be temporary, as this area could be reclaimed. It is important to note that temporary impacts may be short term or long term depending on the vegetation type disturbed (such as forest and the loss of trees versus grasslands). Furthermore, impacts on some forests may be permanent depending on other site conditions such as soils and slopes. Mitigation would vary in timeframe depending on the affected resource. For example, the duration required to re-establish forest vegetation is much longer than that required for grassland or shrublands vegetation.

The sensitivity zone, which extends 15 feet from the edge of the construction disturbance zone, was established to account for the likelihood of additional construction-related impacts that may affect vegetation and habitats from the alternatives. Such impacts would include erosion control activities that occur at the edge of the construction disturbance area such as inadvertent encroachment outside the designated construction disturbance area and disturbance from installing and dismantling exclusion and siltation fencing.

The sensitivity zone was also established to account for the likelihood of vegetation and wildlife habitat being affected by roadway operations, including runoff from the road. Runoff includes winter maintenance material and other contaminants such as heavy metals and fuel-based organic compounds.

#### 3.2.3.2 Direct Vegetation Impacts

This section discusses the potential direct and indirect impacts on vegetation from each alternative being considered for the Corridor. Direct impacts generally refer to losses of vegetation from the implementation of alternatives but also include effects that result from the construction of the alternative. The removal of vegetation, or habitat loss, associated with the implementation of alternatives is reported as the area needed to accommodate the alternative footprint (permanent impacts), with the area necessary to construct the alternative (temporary impacts) reported separately. Additional possible vegetation impacts caused by winter maintenance materials are discussed in section 3.2.3.3, Indirect Vegetation Impacts. Results of GIS calculations for the Minimal Action alternative, as well as action alternative footprints, construction disturbance area, and sensitivity zone, are provided for each vegetation type in Appendix A, Environmental Analysis and Data.

Because much of the construction would occur on parts of the existing right-of-way, the amount of previously disturbed area is also indicated for each alternative (Chart 3.2-2). The following discussion

of direct impacts on vegetation focuses on disturbances outside the previously disturbed area to identify additional impacts on this resource.

#### Overview

Other than the No Action alternative, the Bus in Guideway alternatives would result in the least impacts on vegetation, closely followed by the AGS alternative. Intermediate impacts would be attributed to Rail with IMC, Minimal Action, Highway, and Combination Six-Lane Highway with Bus in Guideway alternatives. The Combination Six-Lane Highway with Rail and IMC alternative would result in the greatest impacts on vegetation, closely followed by the Combination Six-Lane Highway with AGS alternative. As illustrated on Chart 3.2-2, the greatest area of disturbance associated with each alternative would occur in previously disturbed lands.

#### No Action

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 vegetation would also include current maintenance practices, construction activities at each improvement project and development that is occurring along the Corridor. Impacts associated with these projects are addressed in other environmental documents, including the *Eagle County Airport Interchange EA*, the *SH 9 EIS*, the *Gaming Area Access EIS*, and the *Hogback Parking Facility EA*. No additional direct impacts on vegetation are anticipated to occur under the No Action alternative.

#### Minimal Action

The Minimal Action alternative is anticipated to result in intermediate impacts on vegetation in the Corridor relative to other alternatives. Minimal Action components, including construction of auxiliary lanes and curve safety modifications, are anticipated to permanently remove approximately 70 acres of vegetation. Within the construction disturbance zone, an additional 52 acres of vegetation would be affected. The vegetation types anticipated to be most heavily affected would include mountain shrubland and sagebrush shrubland, which could be re-established in a comparatively short timeframe.

#### Transit

The Rail with IMC alternative would be the only Transit alternative anticipated to have intermediate impacts on vegetation in the Corridor. The other Transit alternatives are anticipated to have impacts in the least range relative to other alternatives.

The Rail with IMC alternative would permanently disturb more vegetation (76 acres) than the AGS alternative (67 acres). Within the construction disturbance zone associated with the Rail with IMC alternative, an additional 64 acres of vegetation would be affected. AGS construction disturbance zone impacts would affect 33 acres.

Of the Transit alternatives, the Bus in Guideway alternatives would have the least impact on vegetation, with approximately 44 acres of vegetation permanently disturbed by the footprint of each alternative (Chart 3.2-2). Within the construction disturbance zone associated with the Bus in Guideway alternatives, an additional 41 acres of vegetation would be affected. The Bus in Guideway alternatives would result in the least impacts on vegetation because these alternatives would have a narrow footprint and would be built over a shorter length of the Corridor, from Silverthorne to C-470. The vegetation types anticipated to be most heavily affected would include sagebrush shrubland and ponderosa pine forest.



Highway

All Highway alternatives would result in intermediate impacts on vegetation in the Corridor relative to other alternatives.

The Reversible/HOV/HOT Lanes alternative would permanently displace more vegetation (77 acres) than the Six-Lane Highway 55 mph (75 acres) and Six-Lane Highway 65 mph (58 acres) alternatives. Within the construction disturbance zone associated with the Six-Lane Highway 55 mph alternative, an additional 61 acres of vegetation would be affected. An additional 56 acres of vegetation would be affected within the construction disturbance zones of the Six-Lane Highway 65 mph alternative, and 66 acres would be affected within the construction disturbance zone of the Reversible/HOV/HOT Lanes alternative. The vegetation types anticipated to be most heavily affected would include mountain shrubland, sagebrush shrubland, and ponderosa pine forest.

Combination

The Combination Six-Lane Highway with Rail and IMC and Combination Six-Lane Highway with AGS alternatives are anticipated to have the greatest impacts on vegetation in the Corridor relative to other alternatives.

Because of the relatively wide area needed, the Combination Six-Lane Highway with Rail and IMC alternative would affect the most vegetation with 100 acres of permanent disturbance within the footprint. An additional 92 acres of vegetation would be affected within the construction disturbance zone of the Rail with IMC alternative.

The Combination Six-Lane Highway with AGS alternative also would permanently affect 100 acres. An additional 78 acres of vegetation would be affected within the construction disturbance zone.

The Combination Six-Lane Highway with Bus in Guideway alternatives would result in intermediate impacts; permanent impacts would result to 76 acres. Approximately 71 acres in the construction disturbance zone would be affected.

The vegetation types anticipated to be most heavily affected by the Combination alternatives would be mountain shrubland, barren land, sagebrush shrubland, and ponderosa pine.

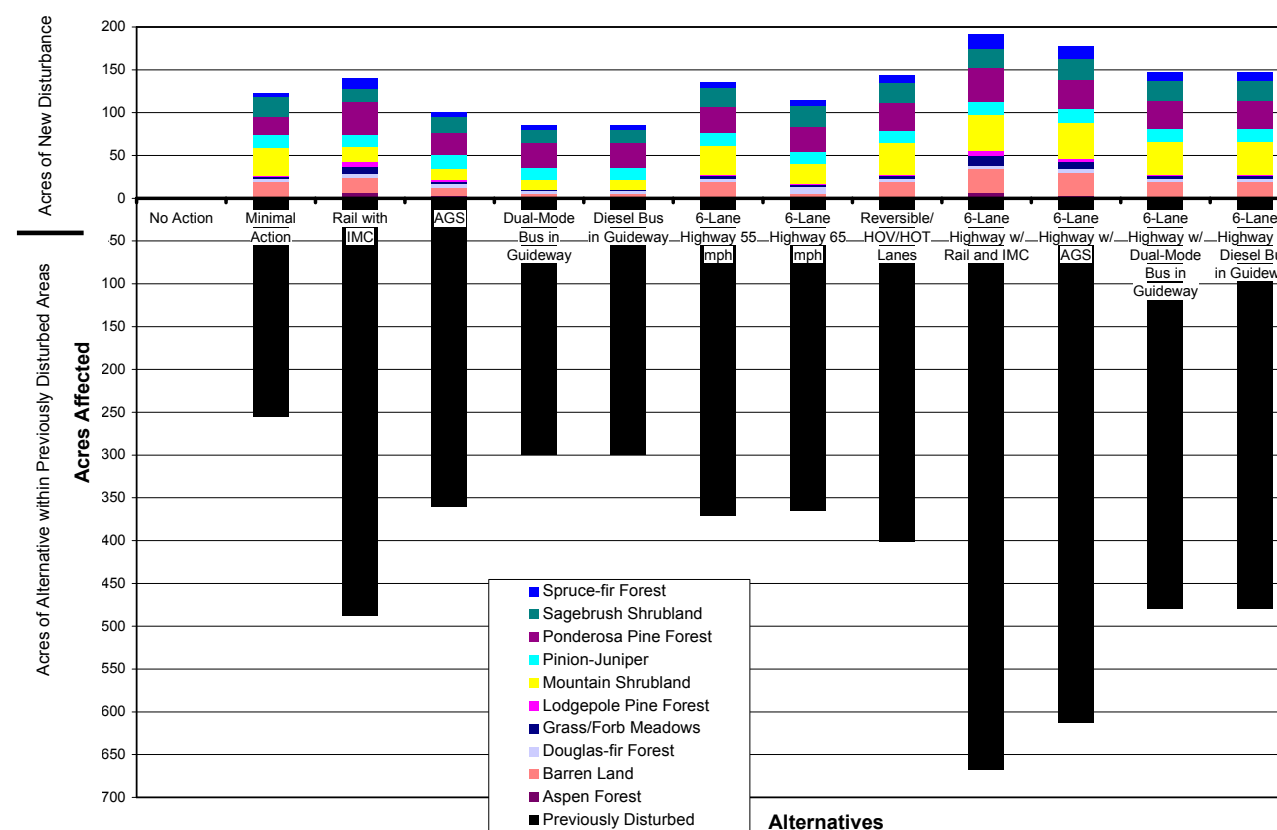
Chart 3.2-2 depicts the number of acres of impact on vegetation, by alternative.

Summary

The least impacts outside the No Action alternative would be associated with the Dual-Mode Bus and Diesel Bus in Guideway alternatives, with the AGS alternative also expected to cause fewer direct impacts on vegetation than other alternatives. Intermediate impacts would be attributed to the Minimal Action, Rail with IMC, Highway, and Combination Six-Lane Highway with Bus in Guideway alternatives. The Combination Six-Lane Highway with Rail and IMC and the Combination Six-Lane Highway with AGS alternatives (because of footprint width and length) would have the greatest impact on vegetation (see Chart 3.2-2).

Appendix A, Environmental Analysis and Data, presents the results (acres of potential impacts) of alternative footprint, construction disturbance, and sensitivity zone overlays onto vegetation.

Chart 3.2-2. Direct Vegetation Impacts by Alternative<sup>a</sup>



<sup>a</sup> Direct impacts as illustrated in the bar chart include impacts occurring within the footprint and the construction disturbance zone.

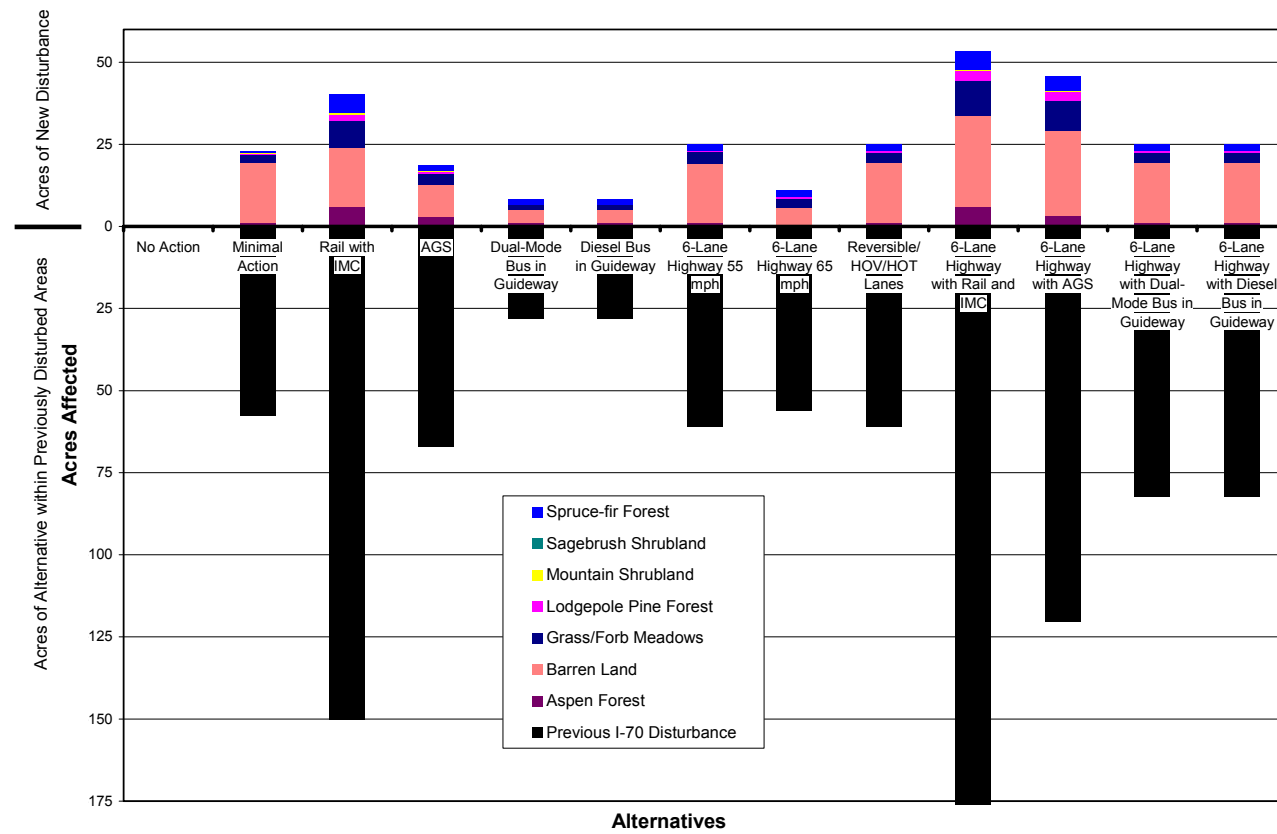
USFS Lands

Chart 3.2-3 and Chart 3.2-4 illustrate the impacts on vegetation on the WRNF and ARNF lands, respectively.

On the WRNF, the least impacts outside the No Action alternative would be associated with the Dual-Mode Bus and Diesel Bus in Guideway alternatives, with the Six-Lane Highway 65 mph and Minimal Action alternatives also expected to cause fewer direct impacts on vegetation than other alternatives. The Combination Six-Lane Highway with Rail and IMC and Combination Six-Lane Highway with AGS alternatives (because of footprint width and length) would have the greatest impact on vegetation.

### 3.2 Biological Resources

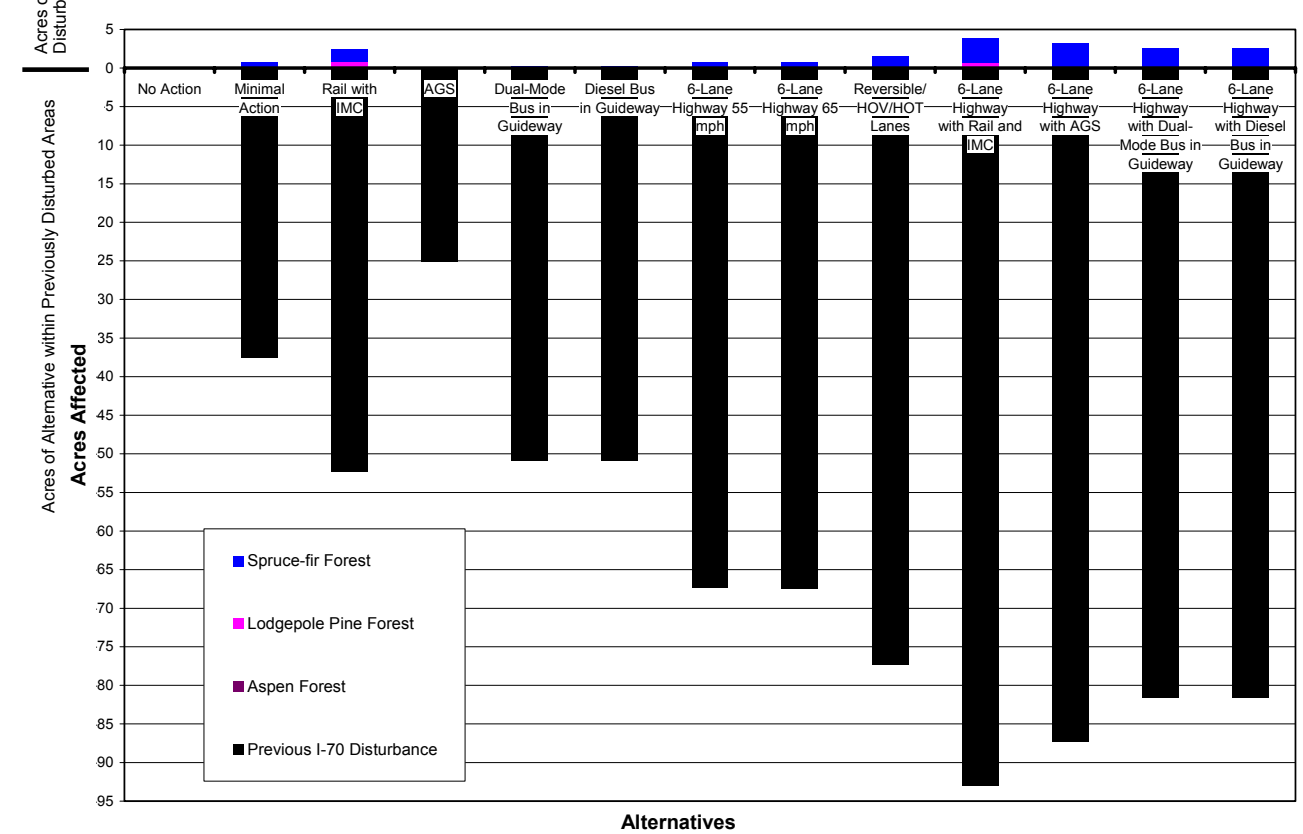
Chart 3.2-3 White River National Forest Direct Vegetation Impacts<sup>a</sup>



<sup>a</sup> Direct impacts as illustrated in the bar chart include impacts occurring within the footprint and the construction disturbance zone.

On the ARNF, the least impacts outside the No Action alternative would be associated with the AGS, Dual-Mode Bus in Guideway, and Diesel Bus in Guideway alternatives. The Combination Six-Lane Highway with Rail and IMC and Combination Six-Lane Highway with AGS alternatives (because of footprint width and length) would have the greatest impact on vegetation.

Chart 3.2-4. Arapaho and Roosevelt National Forests Direct Vegetation Impacts<sup>a</sup>



<sup>a</sup> Direct impacts as illustrated in the bar chart include impacts occurring within the footprint and the construction disturbance zone.

#### Important and Rare Plant Communities

##### Riparian Vegetation

Riparian vegetation that is adjacent to wetlands and other waters of the US would be affected directly by the Minimal Action alternatives, as well as by most of the action alternatives. These impacts are addressed in section 3.6, Wetlands, Other Waters of the US, and Riparian Areas.

##### Alpine Meadows-Tundra

This vegetation type occurs primarily above 11,400 feet in elevation, near the EJMT. No direct effects on alpine meadows-tundra are identified from the project alternatives.

##### Old-Growth Forests

The old-growth forest stand that occurs above the original road-cut cliffs on the north side of I-70 between mileposts 185.5 and 186 is within approximately 100 feet of the existing edge of I-70 and would be avoided by project alternatives. While the Minimal Action, Highway, and Combination alternatives would include westbound auxiliary lanes along Vail Pass, construction of the auxiliary lane is not anticipated to affect this area. The Rail with IMC and AGS alternatives are also proposed along Vail Pass, and likewise are not anticipated to affect this area. This sensitive resource needs to be considered in the more detailed design of alternatives at the Tier 2 level of study.

### Rare Plant Communities

None of the rare plant communities are expected to be directly affected by the proposed alternatives. All of these communities occur at some distance from the I-70 right-of-way. Indirect effects that may occur during construction or operations, including accelerated erosion and winter maintenance material runoff, would have the potential to affect riparian communities that include montane riparian forest along Gore Creek and Black Gore Creek, and montane willow carr also along Gore Creek (milepost 179). Increased winter maintenance material could affect these communities (see section 3.4, Water Resources). Intensive field surveys will be required to specifically locate these communities in relation to specific project engineering designs at the Tier 2 level of study.

### 3.2.3.3 Indirect Vegetation Impacts

In addition to loss of vegetation from construction of alternatives, operation of alternatives could have an impact on vegetation remaining adjacent to the roadway. Disturbance from construction activities increase the potential for weed invasion and soil loss from accelerated erosion.

Maintenance activities that would have the potential to affect vegetation include bridge reconstruction and replacement, roadway resurfacing, shoulder and ditch reconstruction, and winter traction sanding and deicing. Effects on vegetation from traction sanding and deicing are observed throughout the Corridor, especially at the higher elevations of the Corridor where applications are more frequent. Such areas include Upper Clear Creek and Straight Creek leading to the EJMT, and the upper area of West Tenmile Creek and Black Gore Creek on Vail Pass.

A sensitivity zone running 15 feet wide on either side of the construction disturbance zone of each alternative shows some of the area in which road effects would likely occur. Vegetation affected within this sensitivity zone is tabulated in Appendix A, Environmental Analysis and Data. While the sensitivity zone provides an indication of likely effects on adjacent vegetation, additional impacts from the operation of the existing interstate and proposed transportation facility may extend beyond this 15-foot sensitivity zone. The distance that sand and deicers can migrate from the roadway is highly variable depending on topography, stream systems, and mitigation put in place to contain this material. The amount of vegetation intercepted by the sensitivity zone would range from 53 acres (Dual-Mode Bus in Guideway and Diesel Bus in Guideway alternatives) to 108 acres (Combination Six-Lane Highway with Rail and IMC alternative).

Road effects can be mitigated with various controls. CDOT is currently implementing SCAPs for the Straight Creek and Black Gore Creek areas to improve control and capture of winter maintenance materials. CDOT is conducting ongoing deicer studies that focus on five objectives:

1. To assess the extent and mode of roadside vegetation exposure to deicers in areas with sand/salt and/or liquid applications
2. To evaluate impacts of deicer applications on photosynthesis and leaf level gas exchange in the field over time and in relation to road treatment type
3. To expand current laboratory studies to investigate and compare the effects of various sand/salt mixtures and liquid deicers on plant growth, photosynthesis, and seed germination
4. To quantify leaf water status in conifer trees within designated plots to account for the presence of drought stress before onset of treatments and during the treatment period
5. To directly and indirectly assess several other factors potentially deleterious to roadside vegetation including pollution, nutrient availability, disease, and insect impacts in areas where deicer stress may be a concern

It is also desirable to provide sufficient cross-slope drainage structures during new construction to allow for natural hydrologic conditions to be maintained on both sides of the right-of-way. See section 3.2.4, Mitigation Measures, for further exploration of these possibilities. Specific issues associated with maintaining hydrology and reducing point source releases that affect vegetation will be addressed at the Tier 2 level of study.

Indirect impacts on vegetation would include habitat loss and increased intrusion of weed species, including those considered to be noxious. Weeds are often associated with disturbance along transportation corridors. Habitat loss and intrusion of weeds also would result from disturbances associated with induced growth and development associated with project alternatives (other than No Action and Minimal Action alternatives) within the Eagle and Blue River watersheds (see section 3.9, Social and Economic Values, for a discussion of induced growth). As areas are disturbed, for example, by winter maintenance, there would be a greater potential for weed species to invade the area.

Additional impacts on habitats and vegetation would be expected from land development that is planned for private land holdings along the Corridor and would include loss of habitat from clearing actions and potential effects on rare species from increased access for recreational activities.

### 3.2.3.4 Direct Wildlife Impacts

The primary issue affecting wildlife in the Corridor is the interference of I-70 with wildlife movement and animal-vehicle collisions (AVCs). This section describes the barrier effects associated with I-70 and project alternatives. Table 3.2-1, under the column heading Linkage Interference Zones, presents a discussion of wildlife linkage interference zones and proposed mitigation recommended by the ALIVE committee.

Impacts on key wildlife habitats due to the footprint and construction of alternatives are quantified to address the losses adjacent to I-70 and are presented under Key Habitat Loss.

Section 3.2.3.5, Indirect Wildlife Impacts, presents impacts that would be associated with noise from increased traffic volumes, and operation and maintenance of project alternatives (road effect zone), as well as the impacts from induced growth associated with project alternatives.

### Barrier Effects

Barriers to wildlife movement include structural, operational, and behavioral impediments to wildlife trying to cross I-70. The potential for increased structural barrier effects was analyzed for each alternative based on horizontal (additional lanes) and vertical (walls, barriers, fencing) components that would present varying degrees of barriers to wildlife movement, depending on the alternative. The following sections describe the physical barriers associated with alternatives, the influence of existing and planned development patterns, and the related barrier effects on alternatives.

No quantitative data exist regarding how a road's design results in a barrier effect. However, it is reasonable to assume that barrier effects would increase for all species with increased width and the addition of retaining walls, fences, raised medians, guardrails, and increases in volume and/or speed of traffic.

### 3.2 Biological Resources

Table 3.2-1. Linkage Interference Zones and Recommended Mitigation

Life Zones	Linkage Interference Zones	Animal-Vehicle Collisions	Proposed Mitigation
<b>Western Slope Foothills</b> Glenwood Springs to Avon (mp 116–170)	<b>Zone 1: Dotsero (mp 131.4–134.5)</b> <u>Setting:</u> <ul style="list-style-type: none"> <li>Predominantly sagebrush with little tree cover.</li> <li>The Nature Conservancy (TNC) recently purchased the Bair Ranch property near this zone, which will enhance and preserve wildlife movement opportunities in this area.</li> </ul> <u>Wildlife Movement:</u> <ul style="list-style-type: none"> <li>Known movement corridor for deer and elk.</li> <li>Area fairly heavily used for crossing.</li> <li>Most deer and elk in this zone cross from mp 133 west to the mouth of the Glenwood Canyon, avoiding the nearby lakes south of I-70 where several developments are planned.</li> <li>Mule deer severe winter range and winter concentration areas on both sides of I-70.</li> <li>Elk winter range north of I-70.</li> <li>Located adjacent to the BLM Glenwood Canyon lynx linkage that provides movement between Flattops Wilderness and Red Tables in WRNF.</li> <li>CDOW indicates that as few as 30 percent of the roadkills in this area are ever reported.</li> </ul> <u>Existing Structures and Fencing:</u> The existing transportation underpasses in this area are not being used as wildlife crossings and are not suitable for wildlife.	1.4 per mile per year	<ul style="list-style-type: none"> <li>mp 132.5–132.8: Repair/replace wildlife fencing, as appropriate.</li> <li>mp 132.5–132.8: Redesign fence in areas prone to rockfall (approximately 100 feet); use concrete barrier/fence combination.</li> </ul>
	<b>Zone 2: Eagle County Airport to Town of Eagle (mp 142.0–145.3)</b> <u>Setting:</u> <ul style="list-style-type: none"> <li>Open piñon-juniper woodland near I-70.</li> <li>Riparian forest and shrub habitats.</li> <li>Adjacent to the Eagle River.</li> <li>Rapid development through the 1990s occurred in this area around Eagle County Airport. Planned developments in this area include Adam’s Rib, Frost Creek, and Diamond S Ranch developments south of I-70.</li> </ul> <u>Wildlife Movement:</u> <ul style="list-style-type: none"> <li>Provides for movement to and from deer and elk severe winter range, winter concentration areas, and fawning/calving habitat to the north and south of I-70.</li> <li>Mule deer severe winter range areas on north and south of I-70.</li> <li>Elk severe winter range on north of I-70 on BLM lands.</li> <li>Lands managed by the WRNF as elk habitat are located to the south of the zone.</li> </ul> <u>Existing Structures and Fencing:</u> CDOW describes this section of I-70 as a highway crossing area for big game.	0.39 per mile per year	<ul style="list-style-type: none"> <li>mp 143.1: Remove fill at bridge west of Cottonwood Creek to increase height, making it more suitable for an elk crossing.</li> <li>mp 142.0–142.3: Realign wildlife fencing in steep areas north of I-70 where rockfall damage occurs, and repair damaged fencing as necessary.</li> <li>mp 145.5: Remove berm from south entrance of passage.</li> <li>mp 143.8: Investigate potential costs for conservation easement on private land surrounding the Eagle River.</li> </ul>
	<b>Zone 3: Eagle to Wolcott (mp 147.3–153.4)</b> <u>Setting:</u> <ul style="list-style-type: none"> <li>The eastern portion of the zone is moderately forested, while the western portion closer to the town of Eagle is sparsely forested.</li> <li>Zone extends through Red Canyon.</li> <li>Steep slopes on both sides of highway for most of its length.</li> <li>Large areas of BLM lands are located to the north and south with mixed private lands in between.</li> <li>Recreation uses near the zone include numerous BLM trails.</li> </ul> <u>Wildlife Movement:</u> <ul style="list-style-type: none"> <li>Elk severe winter range southwest of I-70.</li> <li>Mule deer severe winter range, winter concentration to the south of I-70.</li> <li>Forest carnivores including bear and mountain lion frequent the area.</li> <li>Providing for lynx movement across shrub-steppe habitats from Flattops Wilderness in the east to Castle Peak in the west, the BLM has designated this zone as a lynx linkage area.</li> </ul> <u>Existing Structures and Fencing:</u> Solid 8-foot fencing exists on both sides of I-70 through the entire zone. No suitable wildlife crossing structures are currently located through this area.	0.39 per mile per year	<ul style="list-style-type: none"> <li>mp 153.8: Extend existing fencing to I-70 bridge across Eagle River.</li> <li>mp 151.8: Recommend new wildlife crossing structures to be as large as possible depending on engineering design requirements and topographic limitations of the area.</li> <li>Investigate median barriers with gaps large enough to accommodate small mammals (for example, raccoons and skunks). Place barriers every 0.25 mile.</li> <li>Investigate costs of conservation easement around mp 151.8.</li> </ul>

Life Zones	Linkage Interference Zones	Animal-Vehicle Collisions	Proposed Mitigation
<p><b>Western Slope Foothills – Continued</b> Glenwood Springs to Avon (mp 116–170)</p>	<p><b>Zone 4: Wolcott to Avon (mp 154.5–166.5)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>Sparsely forested.</li> <li>Rapid development around Avon and Edwards occurred through the 1990s.</li> <li>Significant development is still occurring through the eastern half of the zone, including 250 housing units, soccer fields, a school, and a church south of mp 163.</li> <li>The WRNF recently exchanged a 400-acre parcel of land north of mp 165 that will be developed into 300 employee-housing units on 40 acres of the property for Vail Ski Area with the remaining acreage to remain as conservation easement.</li> <li>Red Sky Ranch, a large development of 35-acre lots southwest of the zone, is being subdivided into 15-acre lots.</li> <li>The BLM recently completed a 1,400-acre land swap to private interests near the zone in exchange for lands outside Grand Junction.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>Heavily traveled by carnivores, including black bear and mountain lion (Bellyache Ridge); designated by CDOW as a human conflict area for both species.</li> <li>CDOW considers most of the area a highway conflict zone for deer and elk.</li> <li>Elk and mule deer severe winter range and winter concentration both sides of I-70. The area south of I-70 through the eastern portion of this zone contains elk severe winter range and calving areas.</li> <li>Federal lands to the north are managed by the WRNF for deer and elk winter range, while the Holy Cross Wilderness is located to the south.</li> <li>Rapid development, combined with habitats historically occupied by deer, elk, and forest carnivores has resulted in wildlife conflicts in this zone.</li> <li>The zone is located at the western edge of the Castle Peak BLM lynx linkage. BLM has designated the area between mp 154.0 and 160.0 as lynx habitat linkage.</li> </ul> <p><u>Existing Structures and Fencing:</u> This linkage interference zone currently has no CDOT wildlife fencing.</p>	<p>1.2 per mile per year</p>	<ul style="list-style-type: none"> <li>mp 153.9–mp 159.0: Add wildlife fencing on south side of I-70 between Wolcott interchange and where I-70 crosses the Eagle River. Create gaps with berms or one-way gates to enable wildlife to escape from highway side.</li> <li>Recommend new wildlife crossing structures to be as large as possible depending on engineering design requirements and topographic limitations of the area.</li> <li>mp 155.3 or 155.6: Add crossing structure across I-70 and US 6 north and west of Bellyache Ridge, just south of Alkali Creek.</li> <li>mp 159.7: Add crossing structure south of Red Canyon Creek and Bear Gulch, south and east of existing motorized underpass.</li> <li>mp 163–166.5: Add wildlife fencing on both sides of I-70.</li> <li>Investigate conservation easements for each proposed crossing.</li> </ul>
<p><b>Western Slope Montane</b> Avon to East Vail (mp 170–182)</p>	<p><b>Zone 5: Dowd Canyon (mp 169.5–172.3)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>The area has little forest cover adjacent to I-70.</li> <li>Steep slopes on the north side are a significant rockfall hazard.</li> <li>The WRNF surrounds the zone to the north and south, while pockets of residential development are located to the east and west.</li> <li>Federal lands and good habitat are located north and south.</li> <li>Wildlife fencing has been damaged.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>This is a western Vail north–south connection for wildlife movement.</li> <li>Elk winter range/severe winter range is located south of the zone.</li> <li>Important elk and mule deer migration corridor.</li> <li>Camera studies performed by CDOW have shown the area to be used by elk, deer, and mountain lion.</li> <li>Bear and lion conflict areas.</li> <li>Designated as a lynx linkage area by USFS.</li> </ul> <p><u>Existing Structures and Fencing:</u> This linkage interference zone has median and guardrail barriers along most of I-70. A concrete box culvert and several land leases by CDOW are located in this zone for wildlife movement. The existing crossing structure is long and only 10 feet in height, inhibiting the movement of large elk. Most of I-70 in this zone includes CDOT wildlife fencing on both sides, which is often damaged by rockfall on the north and winter snowplowing activities from residences to the south. A paved bike path with restricted winter usage is located near the existing crossing structure in addition to several trails and a river rafting “put in” location. Eagle County plans to expand the paved bike path to the west.</p>	<p>0.59 per mile per year</p>	<ul style="list-style-type: none"> <li>Recommend new wildlife crossing structures to be as large as possible depending on engineering design requirements and topographic limitations of the area.</li> <li>mp 170.2–172.5: Replace existing wildlife fencing with reinforced fence through rockfall area north of I-70, where current fencing has numerous holes.</li> <li>CDOT should coordinate with community at West Vail to avoid damage caused by plowing snow against fences.</li> </ul>

### 3.2 Biological Resources

Life Zones	Linkage Interference Zones	Animal-Vehicle Collisions	Proposed Mitigation
<p><b>Subalpine</b> East Vail to US 40 (mp 182–233)</p>	<p><b>Zone 6a and 6b: Upper and Lower West Vail Pass (mp 181.7–188.5)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>Coniferous forest grows to the edge of both sides of the highway through most of the zone.</li> <li>Bridges are highly effective as wildlife crossings to connect forest lands from mp 182.5–185.3.</li> <li>Eagles Nest Wilderness Area is located directly north of I-70 through most of the zone.</li> <li>The land on the southwest side of lower west Vail Pass is forest property managed as forested landscape linkage, intended to be maintained for a connection between Eagles Nest Wilderness Area to the east and the Holy Cross Wilderness Area to the southwest.</li> <li>The forest lands at the top of upper west Vail Pass are managed for year-round motorized backcountry recreation to the west and for nonmotorized backcountry recreation to the east.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>Surrounded by the WRNF, this zone is used heavily by wildlife and has a low amount of roadkill.</li> <li>Designated as a lynx linkage area by the USFS; based on habitat of the area, lynx usage is highly probable. (Note: A lynx was killed in a vehicle collision on upper west Vail Pass in 1999.)</li> <li>Bighorn sheep range north.</li> <li>Bear and lion conflict area.</li> </ul> <p><u>Existing Structures and Fencing:</u> Six open-span bridges are located contiguously in the eastbound and westbound direction of I-70 through lower west Vail Pass, although there are no existing crossing structures through upper west Vail Pass. Animals in the area are found to readily jump over median barriers but showed reluctance to cross in areas with guardrail structures (Barnum 2002).</p>	<p>0.03 per mile per year</p>	<ul style="list-style-type: none"> <li>mp 188.0 and mp 186.3: Recommend new wildlife crossing structures to be as large as possible depending on engineering design requirements and topographic limitations of the area.</li> <li>mp 188.0–186.3: Add CDOT wildlife fencing between proposed structures on both sides of I-70.</li> </ul>
	<p><b>Zone 7: East Vail Pass to Copper Mountain (mp 190.4–194.0)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>Most of zone is forested, although not as densely as west Vail Pass.</li> <li>Significant open areas exist.</li> <li>The eastbound and westbound lanes of I-70 are separated through this section with an open wetland area containing West Tenmile Creek.</li> <li>The zone is surrounded by forest property managed as forested landscape linkage, nonmotorized backcountry recreation, and primitive wilderness.</li> <li>Several parcels of private land are located within the east end of the zone, just east of Copper Mountain near the Guller Creek and West Tenmile Creek bridges.</li> <li>In addition to the Tenmile-Vail Pass National Recreation Trail that runs the length of the zone, USFS trails are located through Stafford Gulch, Wilder Gulch, Corral Creek, and Guller Creek.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>This zone is located within the USFS Vail Pass lynx linkage zone.</li> <li>CDOW indicates that wildlife cross through drainages predominantly at Smith Gulch and Guller, Stafford, Wilder, and Corral creeks.</li> <li>CDOW also noted that forest carnivores are frequently seen crossing at Stafford Creek. The forest cover is less dense in this area than that seen on west Vail Pass.</li> </ul> <p><u>Existing Structures and Fencing:</u> Five existing open-span bridge structures occur in the eastbound direction through this zone. Only one structure exists in the westbound direction, and it is not directly adjacent to a corresponding structure in the eastbound direction.</p>	<p>0.68 per mile per year</p>	<ul style="list-style-type: none"> <li>Recommend new wildlife crossing structures to be as large as possible depending on engineering design requirements and topographic limitations of the area.</li> <li>mp 192.5: Add crossing structure to westbound side of I-70 north of Stafford Creek.</li> <li>mp 193.4: Add crossing structure to westbound side of I-70 north of Guller Creek.</li> <li>Add berms and screening vegetation to guide wildlife between existing Wilder Gulch (eastbound) and Corral Creek (westbound) crossings.</li> <li>Add berms and screening vegetation to guide wildlife between existing Smith Gulch (eastbound) and Corral Creek (westbound) crossings.</li> <li>Provide space between guardrail structures and the road to allow wildlife jumping over barriers to avoid jumping directly into traffic.</li> </ul>
	<p><b>Zone 8: Officers Gulch/Owl Canyon (mp 195.5–200.5)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>Area dominated by extreme slopes on all sides; canyon opens up to Wheeler Flats area near Copper Mountain (south) and Frisco (north).</li> <li>Borders Eagles Nest Wilderness Area (west) and WRNF lands managed for nonmotorized backcountry recreation and scenic byways, which is conducive to wildlife habitat.</li> <li>This steep canyon area has several water bodies, including Uneva Lake, Officers Gulch Pond, and Wheeler Flats Ponds.</li> <li>The area is heavily forested with tree cover for wildlife use close to I-70.</li> <li>While the area is encompassed by the WRNF, the land surrounding Uneva Lake to the east of I-70 is a forest inholding, although the owners have indicated to the USFS that they do not plan to develop the land. Several other private mine inholdings are located to the east of I-70 in this area, although they are located on very steep slopes.</li> <li>The lands are managed by the WRNF as pristine wilderness, nonmotorized backcountry recreation, and scenic byways or travel corridors. The Tenmile-Vail Pass National Recreation Trail runs through the length of this linkage interference zone.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>Connection between habitats in the Gore Mountain Range and Tenmile Mountain Range, especially for carnivores.</li> <li>CDOW considers mp 200.8 a black bear movement corridor.</li> <li>Mule deer migration corridor runs parallel.</li> <li>Located within the USFS Officers Gulch lynx linkage area, providing movement between Eagles Nest Wilderness Area and the Tenmile Mountain Range.</li> <li>USFS biologists have indicated that most of the ungulate movement in the area is lateral with the highway.</li> </ul> <p><u>Existing Structures and Fencing:</u> A single box culvert is located at mp 199.6. Box culverts are viewed as acceptable structures for the area by USFS and CDOW for most carnivore highway crossing activity in the area. An interchange at Officers Gulch is used as an informal overnight truck pullover. WRNF manages an area adjacent to Officers Gulch Pond that is proposed as an overnight camping area, although the area is currently not for overnight use and USFS indicated overnight use would potentially inhibit carnivore movement.</p>	<p>0.24 per mile per year</p>	<ul style="list-style-type: none"> <li>mp 198.0, mp 199.2, and mp 200.8: Recommend new wildlife crossing structures to be as large as possible depending on engineering design requirements and topographic limitations of the area.</li> <li>Investigate amending WRNF plan to exclude overnight use of area surrounding Officers Gulch Pond, planned and secondarily managed as a campground site.</li> </ul>

Life Zones	Linkage Interference Zones	Animal-Vehicle Collisions	Proposed Mitigation
<p><b>Subalpine - Continued</b> East Vail to US 40 (mp 182–233)</p>	<p><b>Zone 9a: Laskey Gulch (mp 207.0–209.7)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>The area is moderately forested, transitioning to sagebrush closer to the town of Dillon.</li> <li>Located between Dillon and a steep pass leading to the EJMT and constructed on steep cut-and-fill slopes of I-70.</li> <li>In Dillon, condominiums have been built along the western edge of the linkage interference zone on the south side of I-70 within 0.5 miles of Laskey Gulch. Sound walls are currently being constructed adjacent to the condominiums.</li> <li>Solid median and guardrail barriers are located through the length of the linkage interference zone, and no crossing structures currently exist.</li> <li>This zone is within the WRNF and is managed as forested landscape linkage.</li> <li>Most private lands are developed in this area, although the Denver Water Board possesses several large undeveloped inholdings in the central portion of the zone.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>Laskey Gulch is an important connection for deer, elk, and bear.</li> <li>Elk severe winter range habitat north and south of I-70.</li> <li>Elk and mule deer highway conflict areas.</li> <li>Mule deer and bear migration corridors.</li> <li>Potential lynx crossing. Located within the USFS Loveland Pass lynx linkage area, this zone provides for north-south lynx movement from the Ptarmigan Peak Wilderness Area and Williams Fork River area to forest lands south of I-70.</li> </ul> <p><u>Existing Structures and Fencing:</u> CDOW noted that resident populations of elk and deer in the area were not obstructed by the golf course south of I-70 and would benefit from a crossing structure at Laskey Gulch to reconnect lands managed by the WRNF as deer and elk winter range north and south of I-70.</p>	<p>0.50 per mile per year (total zone 9)</p>	<ul style="list-style-type: none"> <li>mp 208.3: Recommend new wildlife crossing structures to be as large as possible depending on engineering design requirements and topographic limitations of the area.</li> <li>Coordinate with local planners to ensure that area zoning accommodates a wildlife structure in this location.</li> <li>Continue interagency efforts to ensure that future land planning and zoning efforts improve the viability of the wildlife corridor.</li> </ul>
	<p><b>Zone 9b: Hamilton Gulch/Dead Coon Gulch (mp 210.7–212.6)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>With the exception of cut-and-fill slopes of I-70, this area is densely forested.</li> <li>This zone includes 3- to 5-foot concrete center barrier structure throughout its length, and approximately 2,300 feet of guardrail.</li> <li>Straight Creek follows the length of the zone along I-70.</li> <li>Several large road cuts and a runaway truck ramp are located north of I-70 in this zone.</li> <li>Straight Creek and wetland areas are located below I-70 through the zone to the south. Hamilton Gulch reaches I-70 at mp 211.5, while Dead Coon Gulch lays further to the east at mp 212.2. Members of the ALIVE committee from both the USFS and CDOW commented that they felt that Hamilton Gulch and Laskey Gulch were both important and that they should both be considered equally.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>High usage by deer and elk along Hamilton Gulch and near Dead Coon Gulch to the east.</li> <li>Located within the USFS Loveland Pass lynx linkage area and managed as forested landscape linkage.</li> <li>The USFS noted that numerous elk and deer tracks are seen through the area and the zone would connect areas north of I-70 managed as forested landscape linkage and pristine wilderness to lands managed for forested landscape linkages south of I-70.</li> </ul> <p><u>Existing Structures and Fencing:</u> I-70 was constructed on large fill slopes through this zone and no crossing structures currently exist, although two 4-foot plastic pipes and one corrugated metal pipe are located in the zone. Solid median barriers and an offset height between eastbound and westbound directions of I-70 are located through the length of this zone.</p>	<p>As above</p>	<ul style="list-style-type: none"> <li>mp 212.2: Recommend new wildlife crossing structures to be as large as possible depending on engineering design requirements and topographic limitations of the area.</li> </ul>
	<p><b>Zone 10: Herman Gulch/Bakerville (mp 216.7–220.8)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>Herman Gulch is located 3 miles east of EJMT, surrounded by the ARNF.</li> <li>The forest lands are managed for scenery, ski-based areas (Loveland), and nonmotorized backcountry recreation.</li> <li>Six residential structures are located near I-70 north of the underpass at Herman Gulch.</li> <li>The Continental Divide National Scenic Trail traverses through this area along the Herman Gulch trail to the north of I-70 and along the Loveland to Bakerville trail to the south of I-70.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>Considered important lynx habitat. Herman Gulch lynx linkage area is located within this zone, designated as a connection between suitable lynx habitats to the north and south of I-70. If quality habitat north of I-70 were combined with that south of the highway, a more viable lynx range would be possible, especially if connectivity across the Corridor improved.</li> <li>ARNF has designated the area a lynx linkage zone.</li> <li>Boreal toad breeding area.</li> <li>Snowshoe hare inhabit the Mount Bethel Avalanche Path east of Herman Gulch and other avalanche paths in the area, providing forage for lynx and other forest carnivores.</li> <li>USFS and CDOW indicated that evidence existed that two female lynx were using the area as home range. A lynx was killed on I-70 by a vehicle in the area of Herman Gulch in 2000.</li> </ul> <p><u>Existing Structures and Fencing:</u> Motorists use the shoulder of I-70 as informal parking on the south side of I-70 near mp 219. Few median barriers are located through this zone, although guardrails are located through most of its length.</p>	<p>Data Unavailable</p>	<ul style="list-style-type: none"> <li>mp 217.3: Design corridor to allow free movement of wildlife under I-70 within this zone.</li> </ul>

### 3.2 Biological Resources

Life Zones	Linkage Interference Zones	Animal-Vehicle Collisions	Proposed Mitigation
<p><b>Eastern Slope Montane</b> Silver Plume to Mount Vernon Canyon (mp 233–255)</p>	<p><b>Zone 11: East of Empire on US 40 (off I-70 - approximately mp 232.0)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>• North-facing slope heavily forested; south face primarily bare exposed rock cliffs.</li> <li>• ARNF is located just to the east of this zone.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>• Steep slopes used by bighorn sheep on both sides of US 40. This zone was delineated specifically to address issues with bighorn sheep, which approach the edge of the highway to lick salt and are sometimes hit by vehicles at the edge of the I-70 and US 40 interchange. Bighorn sheep generally do not attempt to cross I-70 (except near the Henderson Mine west of this zone) but do cross US 40 and are frequently hit west of Empire.</li> <li>• Mule deer winter concentration north; mule deer highway conflict area.</li> <li>• Mountain lion conflict area.</li> </ul> <p><u>Existing Structures and Fencing:</u> CDOW stated that bighorn sheep would not use an underpass or enclosed structure to cross a roadway.</p>	0.42 per mile per year	<ul style="list-style-type: none"> <li>• Good place for overpass structure 4.2 miles west of US 40/I-70 interchange, primarily for bighorn sheep crossing.</li> <li>• Investigate using jersey barriers or other barrier structures on both US 40 and I-70 to keep sheep away from road edge.</li> </ul>
	<p><b>Zone 12: Fall River (mp 237.2–238.2)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>• Primarily forested, though not densely. No wildlife fencing. Relatively gentle slopes throughout zone.</li> <li>• Located entirely on private land with the ARNF approximately 2 miles away to the north and south.</li> <li>• Numerous residences are located along Fall River Road and several along US 40.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>• The Fall River area provides a significant break in the surrounding topography and functions as a movement corridor for mule deer, elk, bighorn sheep, mountain goat, black bear, and mountain lion.</li> <li>• CDOW noted that carnivores are frequently hit in this area, and there are concerns about elk populations becoming habituated and inhabiting the area year-round.</li> <li>• Bighorn sheep, elk, bear, and mountain lion frequent the area and are hit occasionally.</li> <li>• Resident elk living close to populated areas are a concern in this area. Elk calving 0.25 miles north.</li> <li>• Mule deer severe winter and winter concentration north.</li> <li>• This area may not be suitable for establishing habitat connectivity. CDOW does not desire populations of introduced mountain goats currently inhabiting the Mount Evans area south of I-70 to have the ability to reach areas north of I-70 and compete with native bighorn sheep.</li> </ul> <p><u>Existing Structures and Fencing:</u> Two concrete box culverts, one 4 feet in height at Georgia Gulch, the other 10 feet in height at Fall River, currently exist in this linkage interference zone. An underpass is located at the intersection of US 40 and I-70. Solid median barriers are located through the length of the linkage interference zone and a guardrail is located on the south side of I-70 through most of the zone.</p>	Reported numbers too low for average	<ul style="list-style-type: none"> <li>• Recommend new wildlife crossing structures to be as large as possible depending on engineering design requirements and topographic limitations of the area.</li> <li>• Factor improvements into bridge redesign (Fall River Road Interchange) such as a wider span and leaving adequate space along road and river for wildlife passage.</li> </ul>
	<p><b>Zone 13: Mount Vernon Canyon (mp 246.5–258.1)</b> <u>Setting:</u></p> <ul style="list-style-type: none"> <li>• Several Denver Mountain Park and Jefferson County open space properties are situated in or adjacent to this zone.</li> <li>• Mountain subdivisions have been extensively built through this area.</li> <li>• The 2,340-acre Denver Mountain Park (Genesee) extends north and south of I-70 between mp 251 and 254 and approximately 20 percent is fenced for bison rangeland adjacent to I-70. The park includes open forests and grasslands.</li> </ul> <p><u>Wildlife Movement:</u></p> <ul style="list-style-type: none"> <li>• Overall, this zone sees more reported roadkill than any other zone through the Corridor.</li> <li>• Several deer and elk highway conflict areas mapped by CDOW.</li> <li>• Bear summer and human conflict areas south of I-70.</li> <li>• Due to extensive subdivisions, elk in zone have habituated to human presence.</li> <li>• Resident elk are frequently hit by vehicles; groups of five or more elk have been killed in individual accidents in this linkage interference zone.</li> </ul> <p><u>Existing Structures and Fencing:</u> CDOW indicated that fencing in this area would be detrimental and could trap wildlife in the roadway. CDOW also indicated that it would be difficult to direct wildlife to crossing structures in this zone. No wildlife fencing and very little guardrail and median barriers exist in this zone. No suitable wildlife crossing structures currently exist for larger mammals, except for a transportation dirt road underpass at Soda Creek near mp 249.</p>	2.37 per mile per year	<ul style="list-style-type: none"> <li>• Recognized as a problem area; mitigation measures currently being evaluated.</li> <li>• Fencing throughout the length of the zone may be the only solution. However, CDOW has stated that fencing could be detrimental to the wildlife in the area and has suggested that wildlife fencing through the zone not be considered as a mitigation measure for the area.</li> <li>• Investigate costs of adding intelligent signs to warn motorists about wildlife movement.</li> </ul>



Structural

**Elements Common to all Alternatives.** All alternatives would result in some degree of landform modification to accommodate them within the mountainous terrain of the Corridor. Cut-and-fill slopes could result in barriers to wildlife movement depending on the height and steepness of the slope, whereas retaining walls generally would present more of a challenge depending on their height and length.

**Elements Associated with Transit Alternatives.** Each Transit alternative would require various vertical components. For example, where the Rail with IMC alternative would be on grade (for 70 percent of the rail alignment), security fencing would be required to keep wildlife and the public from approaching the tracks. While this security fencing is intended to protect wildlife from trains, it could trap animals that cross the road only to encounter fencing. Approximately 30 percent of the Rail with IMC alternative would be elevated, in part to avoid this conflict in sensitive locations such as Vail Pass. Elevated portions of rail are proposed to be supported on 6-foot-diameter piers located every 80 feet along its length. Due to the proximity of the elevated rail system to the existing travel lanes of I-70, a 3-foot-tall barrier would be required to prevent oncoming traffic from colliding with the piers. This “jersey barrier” is anticipated to result in a minimal obstacle to the ungulate (deer and elk) and larger carnivore species movement, but would present a major barrier for smaller animals including, but not limited to, fox, wolverine, raccoon, and skunk.

AGS, which would be a completely elevated system, is also proposed to be supported on 6-foot-diameter piers located every 80 feet along its length. Similar to elevated portions of the Rail with IMC alternative, a 3-foot-tall barrier would be required to prevent oncoming traffic from colliding into the piers. Although the barrier would present an obstacle, as described in the Rail with IMC alternative above, AGS would be elevated and would present somewhat less of an impediment than other alternatives that would contain on-grade facilities.

The Bus in Guideway alternatives would be completely on grade and located within the median. These alternatives would require two 3-foot-tall barriers topped with security fencing on either side of the bus lanes. While these barriers would allow for a narrow template and act as a guide for the buses, they are anticipated to present an impenetrable barrier to wildlife.

**Elements Associated with Highway Alternatives.** The Six-Lane Highway (55 and 65 mph) and Reversible/HOV/HOT Lanes alternatives would result in two additional 12-foot-wide traffic lanes and would also require guardrails and barriers in select locations. These alternatives are anticipated to increase the existing barrier effect to different degrees across the Corridor depending on locations of retaining walls, barriers, and guardrails.

Development Influence

I-70, human population centers, increasing development, and human intrusion act as barriers to wildlife that historically crossed the Corridor in their migration or daily movements to access key habitats that supply forage or prey, cover, and water; to repopulate additional areas; and to fulfill breeding and young-rearing requirements. Transportation corridors and the communities that have developed have been a prominent cause of habitat fragmentation in the Colorado mountains in general (WRNF 2002). Mountain valleys that contain important habitats and serve as wildlife migration and movement pathways are often subject to development.

Linkage Interference Zones

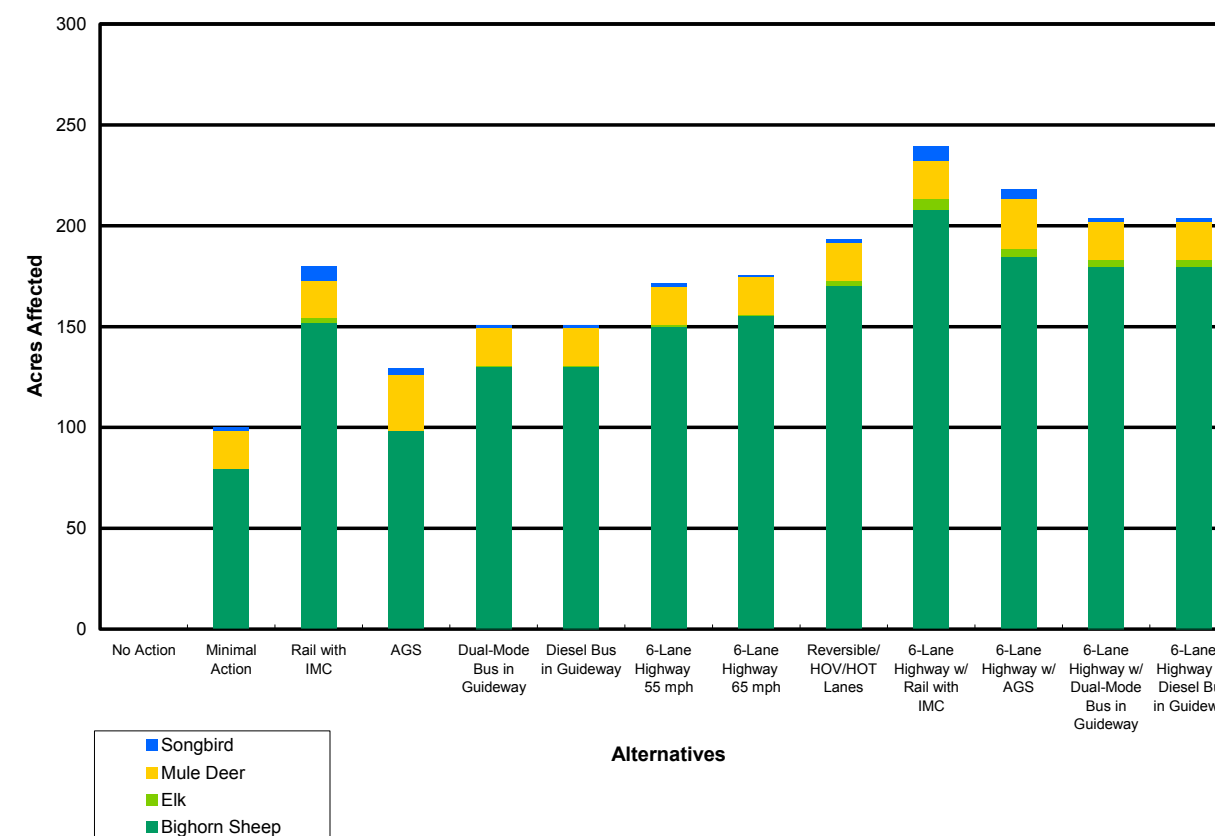
Figure 3.2-2 illustrates the location of linkage interference zones in relation to alternatives. Table 3.2-1 details the environmental consequences of alternatives in relation to linkage interference zones.

Key Habitat Loss

Direct habitat loss occurs when the implementation of an alternative removes natural cover. The magnitude of the impact depends on the overall availability of a habitat type in the project area and its role in the lifecycle of an animal. Loss of abundant habitat types may be relatively inconsequential; loss of an essential habitat type will have a greater impact, especially if it provides needed resources for a species (such as nesting/denning sites, young rearing, and important food sources).

As illustrated in Chart 3.2-5, which provides a summary of impacts on key wildlife habitat by alternative, the greatest impacts by most alternatives would be made to the bighorn sheep habitat. The following discussion explores the impacts on key wildlife of each alternative in more detail.

Chart 3.2-5. Direct Impacts on Key Habitat by Alternative<sup>a</sup>



<sup>a</sup> Direct impacts as illustrated in the bar chart include impacts occurring within the footprint and the construction disturbance zone.

The removal of habitat associated with the implementation of alternatives is reported as the area needed to accommodate the alternative footprint (permanent impacts), with the area necessary to construct the alternative (temporary impacts) identified separately. It should be noted, however, that restoring the original habitat in the construction disturbance zone might be very difficult. The construction disturbance zone (15-foot wide area adjacent to footprint of alternative) would be

### 3.2 Biological Resources

reclaimed, although habitat in this area would be altered. Results of GIS calculations for the Minimal Action alternative, as well as action alternative footprints, construction disturbance area, and sensitivity zone, are provided for key wildlife species in Appendix A, Environmental Analysis and Data. Chart 3.2-6 through Chart 3.2-9 illustrate the extent to which the footprint, construction disturbance area, and sensitivity zone of each alternative would affect each key wildlife habitat.

#### No Action

The No Action alternative would consist of several planned or permitted projects, which are described in detail in Chapter 2, Description and Comparison of Alternatives. Impacts that would be associated with these projects are addressed in other environmental documents, including the *Eagle County Airport Interchange EA*, the *SH 9 EIS*, the *Gaming Area Access EIS*, and the *Hogback Parking Facility EA*. No additional direct impacts on key habitats are anticipated to occur under the No Action alternative. Development of private land will continue to decrease wildlife habitat along the Corridor.

#### Minimal Action

The Minimal Action alternative is predicted to result in among the least impacts relative to other alternatives. This alternative would permanently affect approximately 61 acres of key wildlife habitat, with most of this being bighorn sheep habitat (48 acres disturbed). Within the construction disturbance zone, an additional 40 acres of key wildlife habitat would be affected, with the majority of this (31 acres) also being bighorn sheep habitat.

#### Transit

Direct habitat loss from construction of the Transit alternatives would vary depending on footprint width and extent along the Corridor. Construction of the Rail with IMC alternative between the Minturn interchange (milepost 171) and C-470 (milepost 260) is estimated to have intermediate impacts relative to other alternatives. This alternative would permanently affect 119 acres of key wildlife habitat, with 103 of these being bighorn sheep habitat (Chart 3.2-6). An additional 61 acres would be affected within the construction disturbance zone, with 49 of these being bighorn sheep habitat.

The AGS alternative would affect fewer acres of habitat over this same length of the Corridor, having among the least impacts relative to other alternatives. AGS would permanently disturb 96 acres of key wildlife habitat, with an additional 33 acres being affected within the construction disturbance zone.

Although the Dual-Mode or Diesel Bus in Guideway alternatives are planned for a shorter part of the Corridor (Silverthorne to C-470; mileposts 205 to 260), they would have an intermediate impact as a result of the higher level of construction disturbance zone. Ninety acres of key wildlife habitat would be permanently affected by the footprint of each of the Bus in Guideway alternatives, and an additional 60 acres would be disturbed by each alternative within the construction disturbance zone.

Each Transit alternative would have its greatest impact on bighorn sheep areas. The AGS alternative would also permanently disturb 19 acres of mule deer habitat and an additional 9 acres of mule deer habitat within the construction disturbance zone.

#### Highway

The Six-Lane Highway (55 or 65 mph) alternatives are estimated to have intermediate impacts on key wildlife habitat relative to other alternatives. Six-Lane Highway 55 mph would permanently affect 93 acres of key wildlife habitat, with an additional 78 acres affected within the construction disturbance zone. Six-Lane Highway 65 mph would permanently affect 97 acres within its footprint but would have no higher impact (78 acres) within the construction disturbance zone.

The Reversible/HOV/HOT Lanes alternative would have among the greatest impacts relative to other alternatives, with 111 acres permanently affected and an additional 82 acres affected within the construction disturbance zone.

For each Highway alternative, the greatest impacts would fall on bighorn sheep. These alternatives would be compressed to the existing right-of-way as much as possible to reduce impacts from new construction, and they are planned to extend from EJMT (milepost 213.5) to Floyd Hill (milepost 247), with a 3-mile section at Dowd Canyon.

#### Combination

Direct losses to key wildlife habitat would be more extensive for the Combination alternatives than for the Transit or Highway alternatives because a wider footprint would be required, and impacts by all Combination alternatives are, therefore, anticipated to be among the greatest relative to other alternatives.

Combination Six-Lane Highway with Dual-Mode or Diesel Bus in Guideway alternatives would each permanently affect 117 acres, with an additional 87 acres affected within the construction disturbance zone by each alternative. Combination Six-Lane Highway with AGS would permanently disturb 135 acres, with an additional 90 acres affected within the construction disturbance zone. The greatest impacts would result from the Combination Six-Lane Highway with Rail and IMC, which would permanently disturb 142 acres and 98 acres within the construction disturbance zone.

In all cases, the greatest impact would occur to bighorn sheep habitat, although the Combination Six-Lane Highway with AGS alternative would also affect a comparatively high amount of mule deer habitat (20 acres within the footprint and 12 acres within the construction disturbance zone).

Chart 3.2-6 through Chart 3.2-9 illustrate the impacts that would be associated with implementation of each alternative discretely for bighorn sheep, elk, mule deer, and high-quality songbird habitats. Additionally, these bar charts delineate the impacts on these habitats from alternative footprint, construction disturbance, and sensitivity zone.

Chart 3.2-6. Impacts on Key Bighorn Sheep Habitat

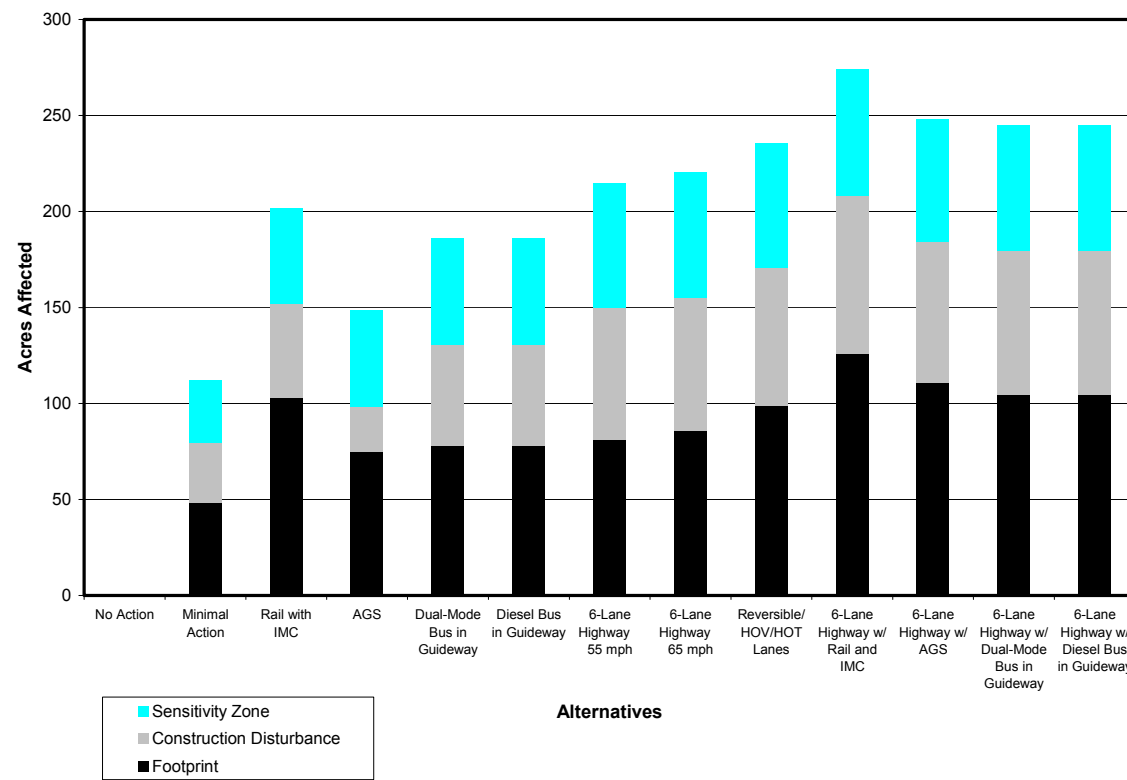


Chart 3.2-8. Impacts on Key Mule Deer Habitat

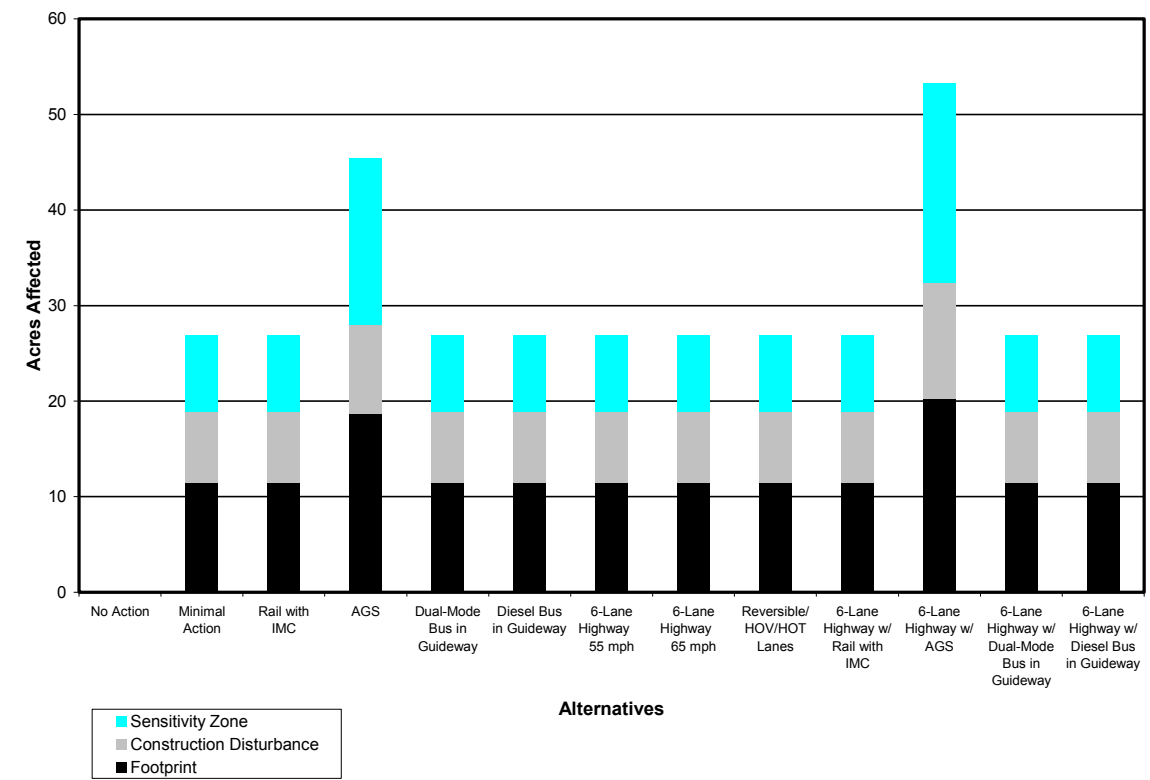


Chart 3.2-7. Impacts on Key Elk Habitat

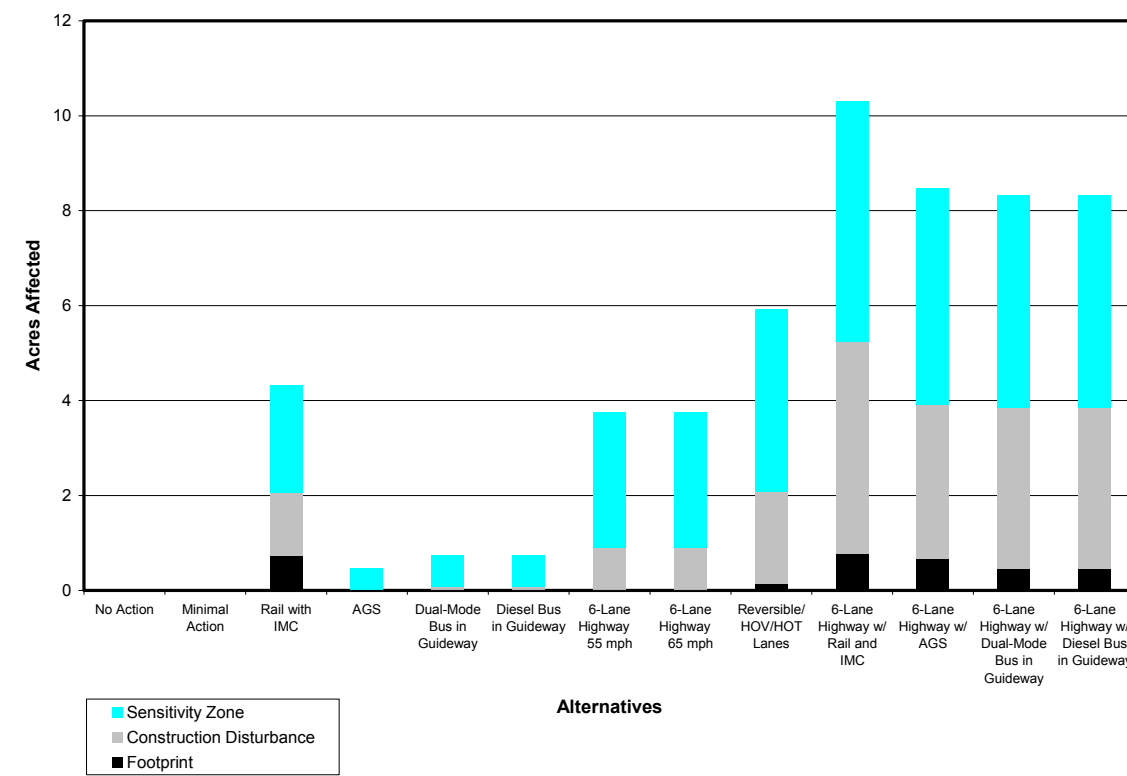
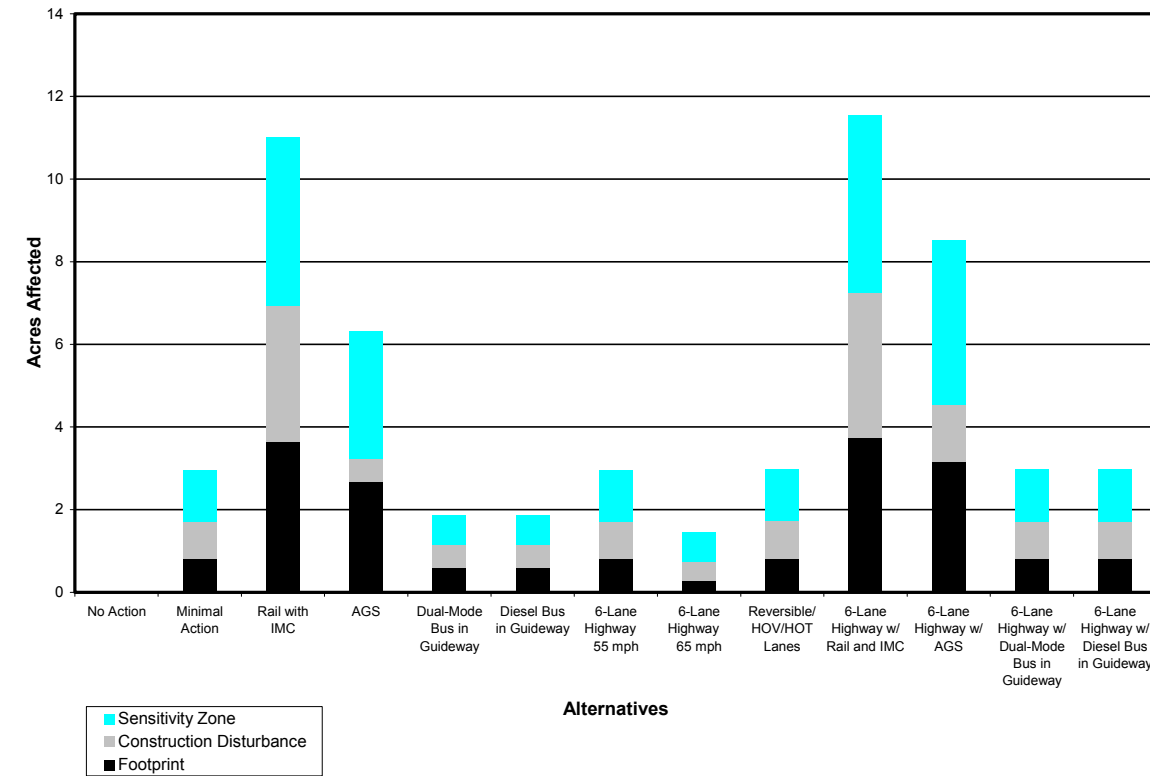


Chart 3.2-9. Impacts on High-Quality Songbird Habitat



## 3.2 Biological Resources

### Management Indicator Species Impacts

#### WRNF-Listed

Of the management indicator species listed by the WRNF, cave bats (spotted bat, Townsend's big-eared bat), black swift, sage sparrow, and Brewer's sparrow are included in section 3.3, Threatened, Endangered, and Other Special Status Animal and Plant Species, as these are designated as FS or BLM-sensitive species. Impacts on WRNF-listed species not covered in section 3.3 are discussed below, reported as disturbance within the footprint and construction disturbance zone added together.

Potential impacts on elk are based on losses to key habitat, which would range from approximately 0 acres from the Minimal Action alternative to 5.2 acres from the Combination Six-Lane Highway with Rail and IMC alternative. The Combination Six-Lane Highway with Rail and IMC alternative is also expected to affect the most habitat of the snowshoe hare, a principal lynx prey species (approximately 16.6 acres of spruce-fir habitat and 6 acres of aspen). The management indicator bird species, including American pipit, pygmy nuthatch, juniper titmouse, and green-tailed towhee, use a number of forest and shrub habitats. The Combination Six-Lane Highway with Rail and IMC alternative would cause the most losses to forested habitats and high-quality songbird (riparian forest and aspen) habitats (Chart 3.2-9). The Combination Six-Lane Highway with AGS alternative is also calculated to directly affect the most sagebrush habitat (approximately 26 acres) and thus would likely have the greatest effect on northern sage grouse. Aquatic macroinvertebrates and all trout species are likely to be affected the most by Combination alternatives (based on linear feet of streams and fisheries that could be affected by footprint and construction disturbance support activities), see section 3.5, Fisheries. Piñon-juniper woodlands occur primarily on the Western Slope, and calculations have determined that the AGS and Combination Six-Lane Highway with AGS alternatives would directly affect this habitat type the most (approximately 16 acres).

#### ARNF-Listed

Management indicator species that are listed by the ARNF, and not included by WRNF, include bighorn sheep and black bear. The following discussion reports on combined footprint and construction disturbance zone impacts.

Key habitat of bighorn sheep would be affected extensively along Clear Creek, east of EJMT and especially near Georgetown and the US 40 to Floyd Hill area. The Combination Six-Lane Highway with Rail and IMC alternative (approximately 208 acres) and the Combination Six-Lane Highway with AGS alternative (approximately 184 acres) would affect the most bighorn sheep habitats. Black bear habitat is difficult to measure because this species has large home ranges, using various forest types. The Combination Six-Lane Highway with Rail and IMC and Combination Six-Lane Highway with AGS alternatives would affect the greatest area of forest habitats.

#### 3.2.3.5 Indirect Wildlife Impacts

In addition to the existing and planned development described within each linkage interference zone in Table 3.2-1, project alternatives may induce additional growth as a result of increased travel demand along the Corridor. Section 3.9, Social and Economic Values, provides an analysis of induced population associated with alternatives. Chapter 4, Cumulative Impacts Analysis, provides an analysis and quantification of induced growth and resulting pressures on key wildlife habitats by watershed. A discussion of the issues associated with induced growth to wildlife habitats is provided below in Growth and Development.

This section also describes impacts associated with the operation and maintenance of project alternatives, as well as the impacts of noise from increased traffic volumes. These impacts are

presented under the Road Effect heading. The area of the sensitivity zone in each key habitat also has been tabulated as an indication for indirect effects on these habitats.

#### Road Effect

Road effect zones encompass a wide range of impacts but generally include noise and general disturbance from construction activities and traffic; and roadway input of contaminants, such as winter deicing and traction material, that affect roadside vegetation, water bodies, and riparian habitats (Forman and Alexander 1998, Forman and Deblinger 1998). The width of the road effect zone from noise and disturbance effects from traffic varies considerably depending on traffic volumes, terrain, vegetation structure, and sensitivity of the species (Singleton et al. 2002). In Colorado, both mule deer and elk were shown to avoid areas within approximately 600 feet of a road, with this effect appearing stronger in shrub cover types, as compared with forested habitats (Rost and Baily 1979). Studies also indicate that various carnivores such as grizzly bears (McLellan and Shackleton 1988), wolves (Thiel 1985, Mech et al. 1988), and bobcats (Lovallo and Anderson 1996) avoid habitats adjacent to roads.

Current road effects adjacent to I-70 on wildlife and their habitats would remain, with some exceptions. CDOT has implemented SCAPs in the Straight Creek area near the EJMT and in the Black Gore Creek area on Vail Pass to improve control of winter deicing materials and reduce the amount that is transported off-road. (Section 3.4, Water Resources, contains a more complete discussion of winter maintenance activities.)

#### Winter Maintenance

**Minimal Action.** Adding lanes to the roadway template would increase the potential for winter sanding and deicer materials to affect adjacent areas where auxiliary lanes are constructed. Sand is estimated to increase by 22 percent and deicer by 13 percent for the Minimal Action alternative. Therefore, without any changes to maintenance procedures, effects on adjacent habitats would be likely in the following areas: west Vail Pass (east- and westbound), east side of EJMT (westbound), Georgetown Hill (east- and westbound), and to a lesser extent at Empire Junction to Downieville (east- and westbound) and at Floyd Hill to nearly C-470 (westbound), which would require less material because of lower elevations. SCAPs will improve control of this material and reduce the amount that escapes the roadway surface. Approximately 42 acres of key wildlife habitats would occur within the sensitivity zone.

**Transit Alternatives.** Potential effects on adjacent habitat would include increased runoff from increased impervious surfaces, and increased sand and liquid deicer from winter maintenance.

Increasing the paved surfaces for the Bus in Guideway alternatives would result in increased runoff and also require the most winter maintenance material, with an estimated increase of up to 31 percent sand and approximately 61 percent liquid deicer. Approximately 64 acres (Rail with IMC alternative) to 71 acres (AGS alternative) of key wildlife habitat would occur within the sensitivity zone.

**Highway Alternatives.** All of the Highway alternatives would add to runoff from impervious surfaces, which may increase sedimentation-erosion aspects to adjacent habitats. These alternatives also would require approximately 22 to 30 percent additional sand and liquid deicer for winter maintenance. Approximately 77 to 78 acres of key wildlife habitats would occur within the sensitivity zone for all Highway alternatives.

**Combination Alternatives.** All Combination alternatives would require additional sand (4 to 47 percent) and deicer (7 to 68 percent). The Combination Six-Lane Highway with Rail and IMC or Combination Six-Lane Highway with AGS alternatives would require appreciably less winter

maintenance material than the Combination Six-Lane Highway with Dual-Mode or Diesel Bus in Guideway alternatives. Approximately 79 acres (Combination Six-Lane Highway with Bus in Guideway alternative) to 93 acres (Combination Six-Lane Highway with AGS alternative) of key wildlife habitats occur in the sensitivity zone.

#### Noise

Noise has the potential to affect wildlife in various ways, varying between different types of animals. Changes in normal behavioral patterns are the most apparent effects of noise on wildlife. When noise becomes an objectionable intrusion on wildlife habitats, these changes would include alterations in habitat locations and migration patterns, and abnormal behavior that could cause difficulty in mating and survival.

Noise would likely increase slightly, or change in characteristics with all alternatives, and the more sensitive species (carnivores and songbirds) may be pushed from habitats near the roadway, or habitats may contain lower population levels. As described in section 3.12, Noise, depending on location within the Corridor and project alternative implemented, noise levels are expected to increase by year 2025, which may affect some wildlife species (Singleton et al. 2002). Noise from the AGS at 80 mph could range from a sound exposure level of 86 to 93 dB(A). The “startle effect” on an animal would depend on the speed of the vehicle and distance of the receptor (Thiel 1985, Mech et al. 1988, Lovallo and Anderson 1996). A high-speed rail operation of 100 mph would have the potential for startle effect within 25 feet of the track (FRA 1998). Animals near the rail or AGS could be startled by passing trains, especially during a period of otherwise low traffic volumes (such as at night).

Noise factors may be greater for the Combination Six-Lane Highway with Rail and IMC or Combination Six-Lane Highway with AGS alternatives, although noise from rail and especially from AGS may be immersed in general traffic noise or background, except during periods of low traffic volumes. Startle effect from the Combination alternatives would be similar to that of the Transit alternatives, with isolated occurrences of train or AGS sounds at night likely to have the greatest effect on sensitive species.

Noise during construction is predicted to be louder than transit/traffic operating noise, although the impact would be temporary.

#### Growth and Development

Induced growth also has the potential to affect area wildlife; key habitats may be fragmented, and movement between habitats may be blocked. Human intrusion and disturbance are likely effects as communities expand and human populations and use of these areas increase. For example, elk, while on an upward trend in the Corridor (WRNF 2002), have been affected by intrusion into calving areas, and movement corridors have been displaced by development in many of the main valleys.

Development trends are expected to occur differently for Transit versus Highway alternatives, with more rural areas developing in response to Highway alternatives, and urban areas developing faster with Transit alternatives.

Transit alternatives would likely induce development in existing and future urban areas, while Highway alternatives could induce development similar to existing trends within urban and rural areas. Combination alternatives are anticipated to induce the greatest level of growth in urban and rural areas. Alternatives that induce growth in rural areas are anticipated to result in the greatest indirect impacts on wildlife habitats. In addition to habitat loss, land development would increase the amount of fragmentation, further deteriorate and reduce suitability of adjacent habitats, and increase the amount of human presence in habitats. Many carnivores (such as bobcats, mountain lion, and

black bear) would be affected more severely by human intrusion than other species would be, such as ungulates (hoofed mammals).

#### Summary

##### Barrier Effect

Most of the alternatives would increase the barrier effect of I-70. The exception may be the AGS alternative, if additional safety barriers are not required at grade underneath the structure, or gaps are provided for wildlife. Additional highway lanes also would not in themselves create physical barriers as compared to the Rail with IMC, Bus in Guideway, and Combination alternatives, but additional lanes of traffic would increase the barrier effect during high traffic volumes. Measures to reduce the barrier effect and AVCs have been developed by the ALIVE committee. These measures include placing overpasses and underpasses at key locations in linkage interference zones that would allow animals to more easily cross I-70, and installing and repairing wildlife fencing that would reduce contact with vehicles and help channel wildlife to crossing structures (see section 3.2.4, Mitigation Measures). Existing barriers would be mitigated if they are encountered by an alternative. The linkage interference zones and the alternatives that would cross these areas are indicated in Table 3.2-2. Alternatives that would extend through the greatest length of the Corridor (for example, Rail with IMC, AGS, Combination Six-Lane Highway with Rail and IMC, Combination Six-Lane Highway with AGS 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 is not encountered by an alternative, then the barrier would be mitigated only through partnering opportunities with other stakeholders.

##### Habitat Loss

Habitat losses would be 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 IMC alternative would permanently affect the most habitats, much of which is key bighorn sheep range. Of the Highway alternatives, the Reversible/HOV/HOT Lanes and the Six-Lane Highway 65 mph alternatives would affect more habitat than the Six-Lane Highway 55 mph alternative. The widest footprint would be associated with the Combination Six-Lane Highway with Rail and IMC alternative; consequently, it would affect the most habitats, with the Combination Six-Lane Highway with AGS alternative having the second-widest footprint. Bighorn sheep key habitat would be affected more than elk or deer habitat by these alternatives; elk habitat would be affected least. High-quality songbird habitat (aspen 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 would be avoided as much as possible in planning the alignments.

##### Road Effect Zone

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 Dual-Mode Bus and Diesel Bus in Guideway alternatives and the Combination Six-Lane Highway with Dual-Mode or Diesel Bus in Guideway alternatives would require the greatest increase in sand and liquid deicer material. The Rail with IMC and AGS alternatives would not require additional winter maintenance material. Noise from traffic will increase with traffic volumes, and some changes to noise structure would occur with Transit and Combination alternatives. The AGS 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.

### 3.2 Biological Resources

Table 3.2-2. Potential Barrier Effect on Linkage Interference Zone (LIZ) by Alternatives

				Transit Alternatives				Highway Alternatives			Combination Highway/Transit Alternatives				
		No Action	Minimal Action	Rail with IMC	AGS	Dual-Mode Bus in Guideway	Diesel Bus in Guideway	6-Lane Highway 55 mph	6-Lane Highway 65 mph	Reversible/HOV/HOT Lanes	6-Lane Highway with Rail and IMC	6-Lane Highway with AGS	6-Lane Highway with Dual-Mode Bus in Guideway	6-Lane Highway with Diesel Bus in Guideway	
WILDLIFE MOVEMENT/OPPORTUNITY TO MITIGATE LIZ	Eagle River	LIZ 1 Dotsero (mp 131.4–134.5)	N	N	N	N	N	N	N	N	N	N	N	N	
		LIZ 2 Eagle Airport to Eagle (mp 142.0–145.3)	Y	N	Y	Y	N	N	N	N	N	Y	Y	N	N
		LIZ 3 Eagle to Wolcott (lynx) (mp 147.3–153.4)	N	N	Y	Y	N	N	N	N	N	Y	Y	N	N
		LIZ 4 Wolcott to Avon (lynx) (mp 154.5–166.5)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
		LIZ 5 Dowd Canyon (lynx) (mp 169.5–172.3)	N	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y
		LIZ 6a W Vail Pass (lynx) (mp 181.7–188.5)	N	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y
		LIZ 6b W Vail Pass (lynx) (mp 181.7–188.5)	N	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y
	Blue River	LIZ 7 E Vail Pass (lynx) (mp 190.4–194.0)	N	N	Y	Y	N	N	N	N	N	Y	Y	N	N
		LIZ 8 Officers Gulch (lynx) (mp 195.5–200.5)	N	N	Y	Y	N	N	N	N	N	Y	Y	N	N
		LIZ 9a Laskey Gulch (lynx) (mp 207.0–209.7)	N	N	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y
		LIZ 9b Hamilton Gulch (lynx) (mp 210.7–212.6)	N	N	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y
	Clear Creek	LIZ 10 Herman Gulch (lynx) (mp 216.7–220.8)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
		LIZ 11 Empire (mp 232.0)	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
LIZ 12 Fall River (mp 237.2–238.2)		N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
LIZ 13 Mount Vernon Canyon (mp 246.5–258.1)		N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
<b>Rank</b>		<b>4</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	

**NOTES**

**Y** = LIZ is encountered by alternative; existing barrier would be mitigated

**N** = LIZ is not encountered by alternative; existing barrier would be mitigated only through partnering opportunities with stakeholders

**MITIGATION STRATEGIES** Based on ALIVE Committee Recommendations

Add, repair, realign, reinforce, or redesign wildlife fences

Expand underpasses

Create wildlife underpass/overpass

Add berms and vegetation screening guides to crossing structures

**IMPACT LEGEND**

= Least Impact / greatest mitigation

= Intermediate impact / intermediate mitigation

= Greatest Impact / least mitigation

NOTE: Range of numerical rank varies by resource/receptor. The rank does not imply a level of environmental significance.

### 3.2.4 Mitigation Measures

Mitigation measures for biological resources center on reducing habitat losses as soon as possible in areas that can be reclaimed, reducing existing barriers, and controlling runoff from road surfaces.

Efforts to minimize impact in Tier 1 analyses have included screening and refinement of alternatives to avoid and minimize new disturbance. Early alternative alignments that bypassed the Corridor were eliminated during the screening process due to substantially greater impacts of the new alignment. All remaining alternatives closely follow the existing interstate. Additionally, shifts in the alternative alignment and structured elements have been employed in alternative designs to avoid sensitive resources, such as old-growth forest.

Mitigation measures for biological resources will be developed and refined at the Tier 2 level of study in context of a specific project. However, mitigation measures that normally apply to construction projects to reduce impacts are addressed in the text below.

#### 3.2.4.1 Vegetation

Vegetation impacts would be minimized to the extent possible by constructing new facilities on previously disturbed areas of the I-70 right-of-way whenever possible. Other measures to reduce the magnitude of the construction would focus on maintaining hydrology on both sides of the Corridor, increasing the containment of traction sand and deicer, and re-establishing vegetation in areas used for construction as soon as feasible.

Noxious weeds occur in all of the counties and drainage basins traversed by the Corridor. Clearing and earthmoving operations must be managed in a way that minimizes the potential for weeds to infest new areas or increase in abundance through the construction disturbance area. Best management practices (BMPs) that are specified by CDOT must be applied to all construction sites to manage open soil surfaces and topsoil that is stockpiled for reuse, and Noxious Weed Management Plans will be required for all projects.

Specific mitigation measures for construction work might include:

- Salvaging topsoil for use in reclamation
- Using BMPs and erosion control measures to reduce soil losses, soil inundation, and sedimentation to areas adjacent to the construction area
- Providing sufficient cross-slope drainage structures during new construction to allow natural hydrologic conditions to be maintained on both sides of the right-of-way
- Revegetating the construction areas as soon as possible, using salvaged topsoil and native species that are adapted to conditions of the area
- Monitoring and controlling weed species

The best technology available would be used in selecting the materials applied for winter maintenance and for material containment. Specific issues and impacts associated with operation of the transportation facility will be addressed in more detail in Tier 2 studies.

Specific mitigation measures developed in Tier 2 would focus on limiting construction disturbance zones to the minimum area necessary, protecting sensitive resources along the Corridor.

#### 3.2.4.2 Wildlife

##### Barrier Effect

In developing the linkage interference zones, the ALIVE committee addressed measures that would facilitate decreasing the barrier effect of I-70 and decrease the AVCs. These measures would include providing more crossing opportunities with bridging or overpasses to the extent practical, placing more wildlife fencing, or repairing existing fencing where appropriate.

The Mount Vernon Canyon linkage interference zone is recognized as a problem area, especially for elk AVCs, and mitigation measures are currently being evaluated. Problems in developing mitigation measures for this area would include lack of locations for suitable crossing structures because of the terrain and the number of access points that are required for private properties that adjoin the I-70 right-of-way.

Table 3.2-1 provides specific mitigation recommendations developed by the ALIVE committee for each linkage interference zone throughout the Corridor. The strategies for mitigation of linkage interference zones developed for the Tier 1 stage of this PEIS are not specific to alternatives. Additional mitigation can be specified at the design level for specific alternatives during the Tier 2 phase.

##### Habitat Loss

Construction of project alternatives would be placed in the existing right-of-way to the extent possible by engineering design. This would include using as much of the already disturbed areas and median as possible to reduce impacts on adjacent habitats. CDOT will work with USFS and local entities to identify other previously disturbed areas where habitat restoration is beneficial. Removal of trees and shrubs for implementation of project alternatives would be accomplished during the non-nesting periods per the Migratory Bird Treaty Act.

##### Road Effect Zone

Impacts on adjacent habitats from the project alternatives will be reduced to the extent possible by project design, to control runoff of contaminants and winter maintenance materials, as well as control of noxious weed species in the right-of-way.

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