I-70 Mountain Corridor PEIS Cumulative Impacts Technical Report

August, 2010

With Corrections March 2011

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Revision and Errata List
I-70 Mountain Corridor PEIS Cumulative Impacts Technical Report
March 2011

The following list represents revisions to the *I-70 Mountain Corridor PEIS Cumulative Impacts Technical Report* (CDOT, August 2010).

Page	Item
6	The following technical reports in **Section 2.3** are updated to include their associated March 2011 revisions and errata lists. (Note, the *I-70 Mountain Corridor PEIS Air Quality Technical Report* (CDOT, August 2010) does not have an associated revision and errata list.) ■ *I-70 Mountain Corridor PEIS Social and Economic Values Technical Report* (CDOT, August 2010) and *Revision and Errata List* (CDOT, March 2011) ■ *I-70 Mountain Corridor PEIS Wetlands Technical Report* (CDOT, August 2010) and *Revision and Errata List* (CDOT, March 2011) ■ *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, August 2010) and *Revision and Errata List* (CDOT, March 2011) ■ *I-70 Mountain Corridor PEIS Land Use Technical Report* (CDOT, August 2010) and *Revision and Errata List* (CDOT, March 2011) ■ *I-70 Mountain Corridor PEIS Historic Properties Technical Report* (CDOT, August 2010) and *Revision and Errata List* (CDOT, March 2011) ■ *I-70 Mountain Corridor PEIS Biological Resources Technical Report* (CDOT, August 2010) and *Revision and Errata List* (CDOT, March 2011) ■ *I-70 Mountain Corridor PEIS Recreation Resources Technical Report* (CDOT, August 2010) and *Revision and Errata List* (CDOT, March 2011)
41	Table 5 on page 41 has been moved to the discussion regarding wildlife habitat on page 26.

Page	Item
77	The number of historic properties potentially affected by the Action Alternatives is revised. The first paragraph and subsequent four bullet points on page 77 are replaced with the following text: "A summary of anticipated direct impacts to historic properties associated with the Action Alternatives, a large proportion of which are in Clear Creek County, is provided below. The actual number of historic properties affected could be higher or lower depending on the final eligibility determinations of these properties, additional properties that may be identified through intensive survey, and measures that are implemented to avoid impacts to properties. ■ The Minimal Action Alternative results in direct impacts to 48 historic properties in the Corridor. ■ The Transit alternatives have potential direct effects on up to 65 properties in the Corridor. ■ The Highway alternatives affect up to 56 historic properties in the Corridor. ■ The Combination alternatives have the greatest effect to historic properties because they have the largest footprints. Up to 70 properties in the Corridor are affected by the Combination alternatives. ■ The Preferred Alternative falls in the range of impacts of the other Action Alternatives and directly affects between 57 and 67 properties in the Corridor."
83	The four bullet points in the section **Cumulative Impacts: Air Quality** are revised to include the underlined text as follows: ■ "Emissions from vehicles on roadways, <u>which can increase due to congestion and induced growth</u> ■ Emissions from stationary commercial and industrial facilities (considered minimal in the Corridor) ■ Re-entrained dust <u>and particulates</u> from roadway sanding <u>and winter maintenance activities</u> ■ Urban area emissions including wood burning and dust from construction sites, <u>which can increase due to induced growth</u>."
84	The following text is added to end of the paragraph in the section **Visibility (from vehicle emissions, re-entrained dust, wood burning and dust from construction)**: "However, dust and micro-particulates from electric generating units, oil and gas development, and other earth disturbance occurring outside of the Corridor may contribute to continuing NO_x emissions that affect visibility."
87	The seventh bullet in **Section 5, Mitigation** is revised to state, "Implement the SWEEP Memorandum of Understanding and recommendations of the SWEEP Committee to address stream impairment and benefit aquatic resources."

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Section 1. Introduction and Background

The *I-70 Mountain Corridor PEIS Cumulative Impacts Technical Report* describes the regulations and guidance related to cumulative impacts, the methodology used in this Tier 1 analysis, potential cumulative impacts of the PEIS alternatives and mitigation. This Technical Report serves to support findings in **Chapter 4** of the *I-70 Mountain Corridor Programmatic Environmental Impact Statement* (CDOT, 2010) prepared by the Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA) (the lead agencies.)

1.1 Overview of Issues, Regulations and Coordination

Federal regulations in 40 Code of Federal Regulations 1508.7 define cumulative impacts as those that:

- Result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.
- Can result regardless of what agency (federal or non-federal) or person undertakes such other actions.
- Can result from individually minor but collectively significant actions taking place over a period of time.

It is difficult to predict future conditions because of unforeseen events and changes in technologies and evolving economic cycles. The lead agencies examine cumulative impacts to determine if any resources are reaching a level where there may be a fundamental change in the health of the resource because of its overall capacity to support a population (from a biological standpoint), its ability to rejuvenate itself, or its ability to serve in the same role it has in the past.

The scope of this first tier cumulative impact assessment does not provide a comprehensive analysis of the Corridor ecosystems or socioeconomic environments. Rather, the focus of this first tier assessment is to evaluate the inter-relationships between the transportation network and community values and environmental resources within the Corridor and surrounding counties, National Forests, and watersheds; and to identify possible cumulative impacts that may result from reasonably foreseeable future actions, from project alternatives, and from both of those combined.

Chapter 6 of the *I-70 Mountain Corridor PEIS* (CDOT, 2010), provides an overview of project scoping. The scoping of cumulative impact issues was conducted in association with federal, state, and local agencies; special interest groups; the I-70 Mountain Corridor Advisory Committee; and communities and residents along the Corridor.

In their scoping comments, the Environmental Protection Agency highlighted the likelihood of impacts on aquatic resources and the natural and human environment if greater access to mountain recreation, resort, and “high-amenity” residential areas is provided. Regarding the scope of cumulative impact analysis and key environmental resources, Environmental Protection Agency identified wetlands, water quality, air quality, threatened and endangered species and other fish and wildlife, and cultural and community resources. The Environmental Protection Agency also mentioned that the baseline for comparing impacts on the environment should be based on today’s affected environment, at a minimum, and should include a historical baseline where appropriate (Environmental Protection Agency 2001). In subsequent meetings and letters (Environmental Protection Agency 2002a, 2002b), Environmental Protection Agency continued to stress the importance of the cumulative evaluation, emphasizing the previous assertion that “local and regional land use plans will be influenced by anticipated, expanded access to I-70” (Environmental Protection Agency 2001).

The following issues were identified for the resources of concern, based on a review of the lingering influences of past actions, present impacts, and induced growth effects from alternatives:

- **Air quality.** Dust and particulates from I-70 winter maintenance and from emissions. Possible cumulative effects from project alternatives were identified as increased emissions due to increased congestion and/or vehicles on I-70, increased winter maintenance and sanding, and increased emissions due to possible induced growth.
- **Wildlife and Threatened, Endangered, and Special Status (TES) species.** Habitat loss, collisions, increased barrier impacts, effects of winter maintenance, effects on "high-value" fisheries as defined by the Colorado Division of Wildlife. The most important wildlife cumulative effects issues associated with Action Alternatives include planned development in the Corridor, possible induced growth associated with alternatives, fragmentation of habitat, and barrier effects on wildlife movement.
- **Wetlands.** Includes loss of wetlands and decreases in functional value from changes in hydrology, increased sedimentation from accelerated erosion and runoff rates, and increased exposure to contaminants. Adding lanes to roads requires additional winter maintenance materials that often affect wetlands/other waters of the US at downstream locations. Additional disturbance from earthmoving results in increased sedimentation, and additional impervious surfaces result in increased runoff rates and contaminant input. Such effects are associated with not only the Action Alternatives but also reasonably foreseeable future projects, including induced growth and expected development in general.
- **Water resources.** Winter maintenance, water quality, stream morphology (channelization), spills from transport on I-70. Water resources cumulative effects issues associated with the Action Alternatives include water quality impacts from roadway winter maintenance, highway stormwater runoff, stormwater runoff from existing and planned development, historic mining activities, water supply and growth issues, physical impacts on streams (encroachment, channelization), and impacts on stream hydrology and habitat.
- **Social and economic values.** Action Alternative footprint impacts on communities and growth-related impacts. Cumulative effects on Corridor growth, development, and the regional economy.
- **Recreation**. Increased accessibility to recreation areas. Recreation resources cumulative effects issues include possible increased pressure for recreational visitation to national forests associated with the Action Alternatives.
- **Visual.** Changes in the "rural character" of the landscape. Visual resource cumulative effects issues associated with the Action Alternatives include the visual impacts on I-70 travelers, recreational users, and residents.
- **Historic communities.** Cumulative effects on historic communities (National Historic Landmark District, Historic Districts, and potential historic areas).

The overarching issue that drove the methodology was the concern from the Environmental Protection Agency, the U.S. Forest Service and the local communities about the inducement of growth associated with a transportation project capacity increase.

This issue originally surfaced during the 1998 Major Investment Study:

- Page ES-9 states that "A potential for indirect and secondary impacts exists resulting from increased development through the corridor due to improved mobility between Colorado's populated Front Range and the mountain communities. The Fixed Guideway Transit is anticipated to increase the number of commuters relocating to the mountain communities. This will serve to reduce the rural character of the corridor."

- Page ES-10 states, "The EIS will define the cumulative and secondary impacts of all of the Vision Elements. The effect of improved mobility in the corridor on development trends and on fragmentation of wildlife habitat, the effects of more permanent and second home residents on the mountain ecology need to be carefully addressed."

The PEIS scoping process reiterated this concern. Working together with the Environmental Protection Agency, the lead agencies developed the methodology of using zoning and land use plans as a surrogate for a traditional cumulative impact assessment. This approach is appropriate for use at this first tier level. This analysis was also folded into the land use analysis as fully described in the *I-70 Mountain Corridor PEIS Land Use Technical Report* (CDOT, August 2010).

Section 2. Methodology

The methodology that was developed for the *I-70 Mountain Corridor Programmatic Environmental Impact Statement* (CDOT, 2010) combines traditional cumulative impacts analysis (such as that identified in the *CDOT NEPA Manual* (CDOT, 2008) with unique approaches for this project developed by the lead agencies, along with the Environmental Protection Agency. The methodology consists of the following steps:

1. Identify the resources to consider in the analysis
2. Define the study area to be used
3. Define the timeframe for the analysis
4. Define the current health and historical context for each resource
5. Identify past, present and reasonably foreseeable future projects to be considered
6. Identify future land use as characterized by county zoning classifications
7. Define direct and indirect (including induced growth) effects of the project alternatives on the resources
8. Determine possible future cumulative impacts on the resources, including effects of past and present actions, direct and indirect effects of the project alternatives and effects of future reasonably foreseeable future actions
9. Identify mitigation strategies

2.1 Resources to Analyze

Table 1 includes information about the resources, the timeframe of analysis and methods used to analyze the resource.

Table 1. Timeframe and Data Source for Cumulative Impacts

Cumulative Study Resource	Timeframe of Baseline Data	Source Data	Method
Air Quality	2009 Monitoring Data	EPA MOBILE6 air quality modeling, conducted on a countywide basis. Modeling data is from CDPHE.	EPA MOBILE6 2035 air quality modeling, based on future traffic conditions and emissions, assuming future regulatory and technical factors
Wildlife Habitat and Vegetation	1999 and 2008	CDOW Wildlife Resource Information System 2008 mapping of key habitats. Vegetation mapping from 1999 was Geographic Analysis Program from Colorado Vegetation Classification Project.	GIS overlay of land use on key habitat areas (deer, elk, bighorn sheep, songbirds)
Wetlands	1980 and 2009	National Wetland Inventory 1980 mapping from USFWS; color infrared photography flown for Corridor in 2000; mapping of fens was done in 2009.	GIS overlay of land uses within 200 feet of water resource features (NWI mapping)

Table 1. Timeframe and Data Source for Cumulative Impacts

Cumulative Study Resource	Timeframe of Baseline Data	Source Data	Method
Water Quality	2006 (TDML Monitoring)	Water quality monitoring program and modeling of phosphorous in watersheds	EPA BASINS water quality model and FHWA Driscoll stormwater runoff model
Stream Systems	1980	National Wetland Inventory 1980 mapping from USFS; historic aerial photography, before I-70	GIS overlay of land uses within 200 feet of water resource features
Social and Economic Values: Land Use	2002	County and municipal land use planning and zoning maps	Before I-70 aerial photographs compared to the existing I-70 footprint to estimate loss of structures and developed land
Social and Economic Values: Growth	2002	Past trends in population and I-70 traffic growth, Colorado Department of Local Affairs (DOLA) 2035 projections, and 2035 baseline traffic	Regression analysis of county populations and I-70 traffic; evaluation based on past 15-year trends in population and I-70 traffic growth, DOLA 2025 projections and Gross Regional Product 2035 projections, and 2035 baseline traffic
Social and Economic Values: Economics	2002	Existing regional economic conditions, DOLA 2025 economic projections, and 2035 Baseline traffic conditions	Analysis of tourism spending and recreational travel; REMI model baseline scenario; evaluation based on existing regional economic conditions, DOLA 2035 economic projections, and Baseline traffic conditions
Recreational Resources	Recreational sites updated in 2009	Existing and 2025 projected ARNF and WRNF visitation and recreational use	Analysis of USFS recreational use in relation to I-70 traffic: recreational trips. Evaluation based on available data for existing and 2025 projected ARNF and WRNF visitation and recreational use. The 2025 projection of visitors to the USFS lands is not updated because Forest Plan revisions are done on an as-needed basis. The life of most Forest Plans is 15 to 20 years and, therefore, projections past 2025 are not available at this time.
Visual Resources	2002	County and municipal land use planning and zoning	GIS overlay of land uses within I-70 viewshed to characterize planned changes in landscape character
Historic Communities	2009	Reconnaissance Survey in I-70 Mountain Corridor (updated in 2009)	Evaluation based on available historic (before I-70, 1956) and existing conditions aerial photography; existing national and state listing of historic properties, windshield survey, and local input on additional historic sites

2.2 Study Area

The geographic scope for the analysis of cumulative impacts encompasses the portions of the Eagle River, Blue River, and Clear Creek watersheds adjacent to I-70 that are within the immediate development influence zone, based on a compilation of future land use zoning (see **Figure 1**). In addition, cumulative effects on the regional economy and employment from alternatives are addressed within a nine-county

region, including Garfield, Eagle, Pitkin, Summit, Lake, Park, Grand, Gilpin, and Clear Creek counties. The Colorado River watershed was not included in the cumulative impacts study area because Action Alternative impacts would be extremely limited (interchange at Glenwood Springs) or nonexistent in the Colorado River watershed.

2.3 Timeframe for the Analysis

The timeframe for the cumulative impact analyses extends from before I-70 was constructed, to 2050 and is summarized in **Table 1** on the previous page. This includes the influences of historic mining in Clear Creek County, as well as impacts that have persisted from the period before I-70 was built to the projected timeframe of 2050. Past timeframes include the influences of historic mining (before I-70) and growth (1985–2000). Current time frames vary from 1980 to 2009, depending on the resource (see **Table 1** for details). Future projections are made to 2050 for all resources except social and economic values, for which the timeframe is 2035. Please see the following Technical Reports for more detailed discussions of analysis time frames:

- *I-70 Mountain Corridor PEIS Social and Economic Values Technical Report* (CDOT, August 2010)
- *I-70 Mountain Corridor PEIS Wetlands Technical Report* (CDOT, August 2010)
- *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, August 2010)
- *I-70 Mountain Corridor PEIS Land Use Technical Report* (CDOT, August 2010)
- *I-70 Mountain Corridor PEIS Historic Properties Technical Report* (CDOT, August 2010)
- *I-70 Mountain Corridor PEIS Air Quality Technical Report* (CDOT, August 2010)
- *I-70 Mountain Corridor PEIS Biological Resources Technical Report* (CDOT, August 2010)
- *I-70 Mountain Corridor PEIS Recreation Resources Technical Report* (CDOT, August 2010)

This extended projection period was made to allow for extended influences on economic indicators beyond the construction period, which ends in 2050.

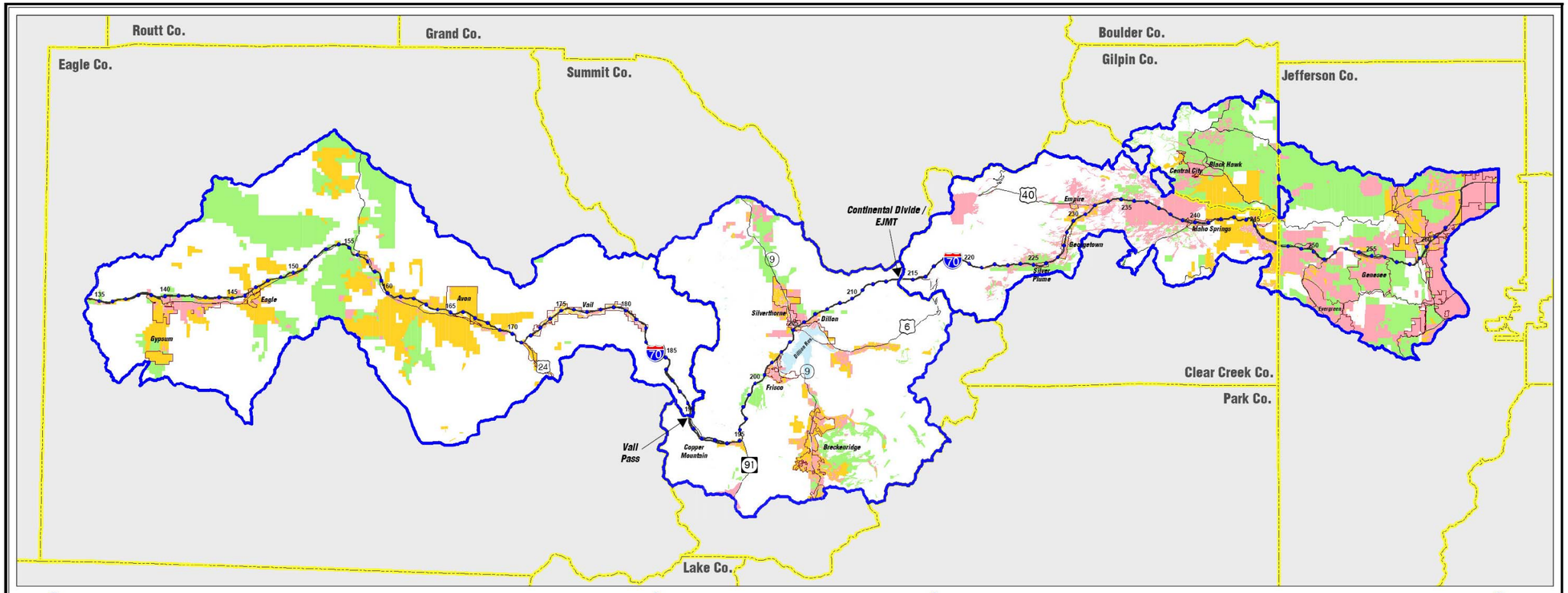
Research was conducted to characterize current trends in population growth, demographics, climate change and legislative changes, in order to provide context for possible future changes that could occur in the study area by 2050. The following resource material was used for this:

- *Water and the Colorado Economy (*Front Range Water Council, December 2009)
- *Climate Change in Colorado* (University of Colorado for the Colorado Water Conservation Board, 2008)
- *Climate Change and Aspen: As Assessment of Impacts and Potential Response*s (Aspen Global Change Institute, July 2006)
- *Going, Going, Gone* (Western Water Assessment for 5280 Magazine, April 2010)

2.4 Past, Present and Reasonably Foreseeable Future Actions

Figure 2 provides a sequence of regional growth patterns in the contiguous Rocky Mountain region of Colorado. This figure provides regional context for historic, current, and projected (to 2050) growth in the nine-county region surrounding the Corridor. The growth on this figure does not specifically consider the influence of potential induced population associated with Action Alternatives.

Figure 1. Cumulative Impacts Analysis Study Area



RESOURCE DESCRIPTION		Geographic Areas (Aggregated HUC 6 Watersheds)	Acres	Past, Present, and Future Development Activities in Corridor: COUNTY AND TOWN DEVELOPMENT — Historic and Existing (Before I-70 and 2000 Eras)	Planned Urban Development (Zoning and FLUM*)	Planned Rural Development (Zoning and FLUM*)	Total	FOREST MANAGEMENT, RECREATION, OPEN SPACE — Special Management Areas (Wilderness, Nonmotorized, Open Space)	Active Recreation Management Areas (Developed Recreation, Motorized, Ski Areas	ROADS AND HIGHWAYS — Roads (Not including I-70)		Existing I-70 (Footprint and Roadside Cu and Fills)		Range of Direct Impacts Associated with Action Alternatives
				acres	acres	acres	acres	acres	acres	miles	acres	miles	acres	acres (unless otherwise noted)
				percent	percent	percent	percent	percent	percent	percent		percent		percent
SELECTED HUC 6 WATERSHED AREAS	Watershed areas in acres (HUC 6) adjacent to I-70 Corridor (including existing and future development)	Eagle River	342,820	13,167	39,377	47,703	100,247	149,932	91,507	900	13,642	56	1,653	33 to 202
				4.0%	11%	14%	29%	44%	27%	4%		0.5%		0.010% to 0.06%
		Blue River	222,420	10,476	13,261	16,789	40,526	140,796	45,830	600	9,094	24	1,039	7 to 96
				5%	6%	8%	18%	63%	21%	4%		0.5%		0.003% to 0.04%
		Clear Creek	287,370	37,597	59,915	68,856	196,713	50,277	67,097	1,490	23,500	46	1,589	97 to 308
				13.0%	21%	24%	68%	17%	23%	8%		0.6%		0.034% to 0.11%
		Total	**852,610**	**61,240**	**112,553**	**133,348**	**337,486**	**341,005**	**204,434**	**2,990**	**46,236**	**126**	**4,281**	**111 to 140**
				7%	**13%**	**16%**	**40%**	**40%**	**24%**	**5%**		**0.5%**		**0.01% to 0.02%**

U.S. Department of Transportation Federal Highway Administration
DOT Department of Transportation
JFSA J.F. Sato and Associates

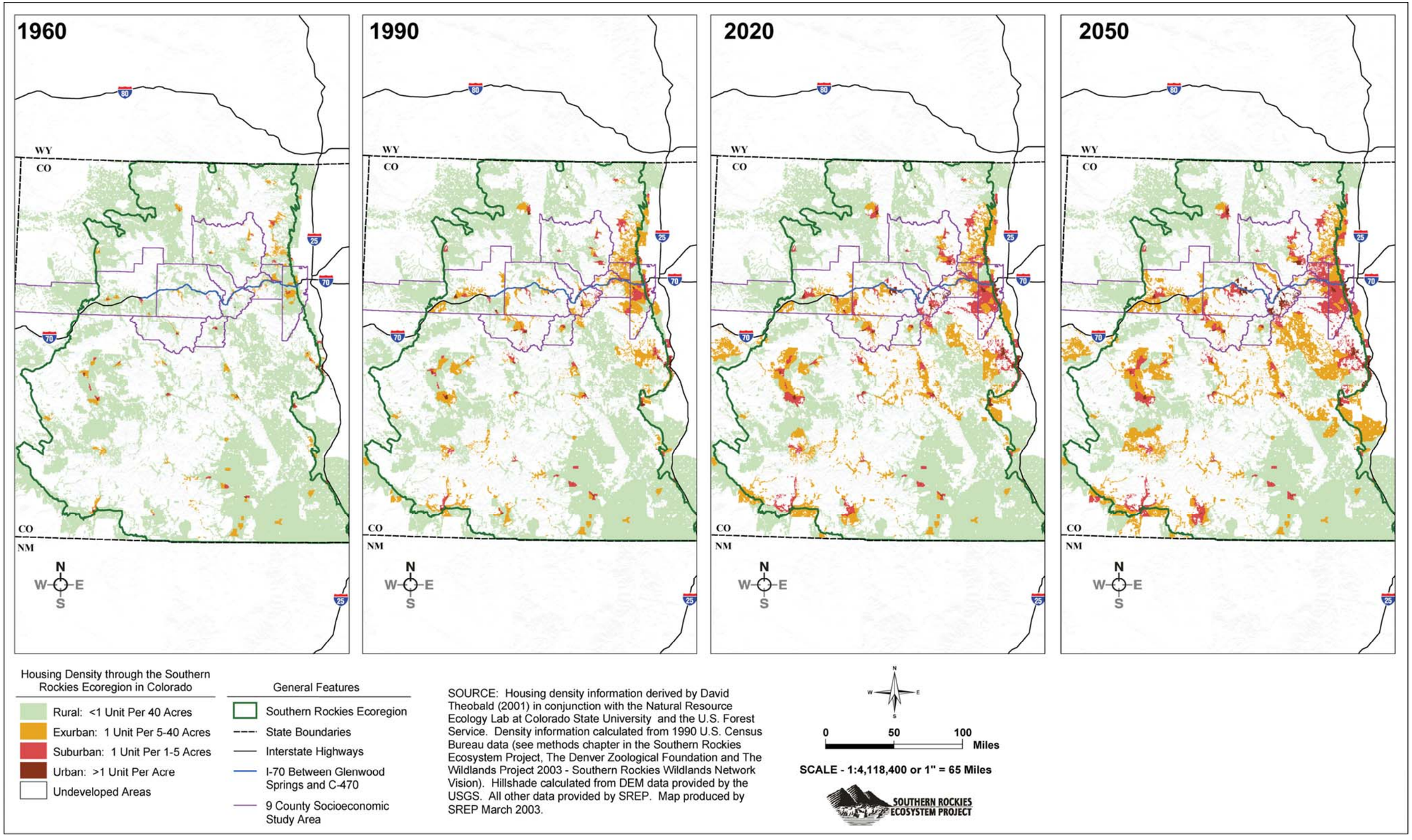
Existing Development (includes mining - Clear Creek Co.)
Planned Urban Development
Planned Rural Development
Forest Management / Open Spaces
Watershed Study Area
Surrounding Counties

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers

N W E S

SCALE - 1:468,000 or 1" = 39,000'

Figure 2. Housing Density Through Time in the Southern Rockies Ecoregion in Colorado



The total area of planned urban and rural development in the combined watershed area (approximately 246,000 acres) is four times the existing developed area (61,240 acres). Planned development is expected to increase the total developed area within the watersheds from approximately 7 percent to 35 percent (approximately 307,000 acres) by 2050. The remaining watershed area is in forest management, recreation, and open space uses. Existing I-70 is estimated to represent 0.5 percent of the evaluated land area, while other roads and highways represent 5 percent of the area. The area reported for roads and highways overlaps with the developed and forest management land area. **Chart 1** shows the relative percentages of land use types by watershed and for the total three-watershed areas, as well as the total watershed.

Table 2 and **Table 3** include specific Reasonably Foreseeable Future Actions that are identified for the study area.

2.5 Characterization of Future Land Use

The overlay of the Geographic Information Systems development layers onto the baseline mapping of environmental resources within the watersheds with the land use patterns allows the quantification of regional impacts within the watershed study area, including the Eagle River, Blue River, and Clear Creek watersheds. The interaction among the development, land management, and highways and roads overlaying the environmental resources provided the basis for analyzing trends and patterns of past, present, and planned future changes to the study area. Cumulative impacts at the watershed level are tied to the indirect impacts from induced growth on resources. Direct impacts on resources are generally localized and minor compared to the indirect growth-related impacts on environmental resources.

Possible induced growth in Eagle and Summit counties could lead to pressure for additional development (beyond planned development). Growth-related impacts on the environment are key components of the cumulative assessment. The cumulative assessment includes (1) evaluating the influence that the capacity and mobility changes of alternatives may have on the distribution of future land use patterns and (2) quantifying possible effects of induced growth on environmental resources.

The framework for estimating induced growth indirect impacts is described in detail in the *I-70 Mountain Corridor PEIS Land Use Technical Report* (CDOT, August 2010).

The use of zoning and land use planning as a surrogate for traditional cumulative impact analysis is an appropriate methodology for identifying possible cumulative effects at this first tier level. This methodology allows for the identification of critical environmental resources, which should be examined at a more localized level during Tier 2 processes. It also flags those resources for which coordinated planning for mitigation strategies can be started early in the project development process.

Chart 1. Past, Present, and Reasonably Foreseeable Future Actions in Watershed Study Area

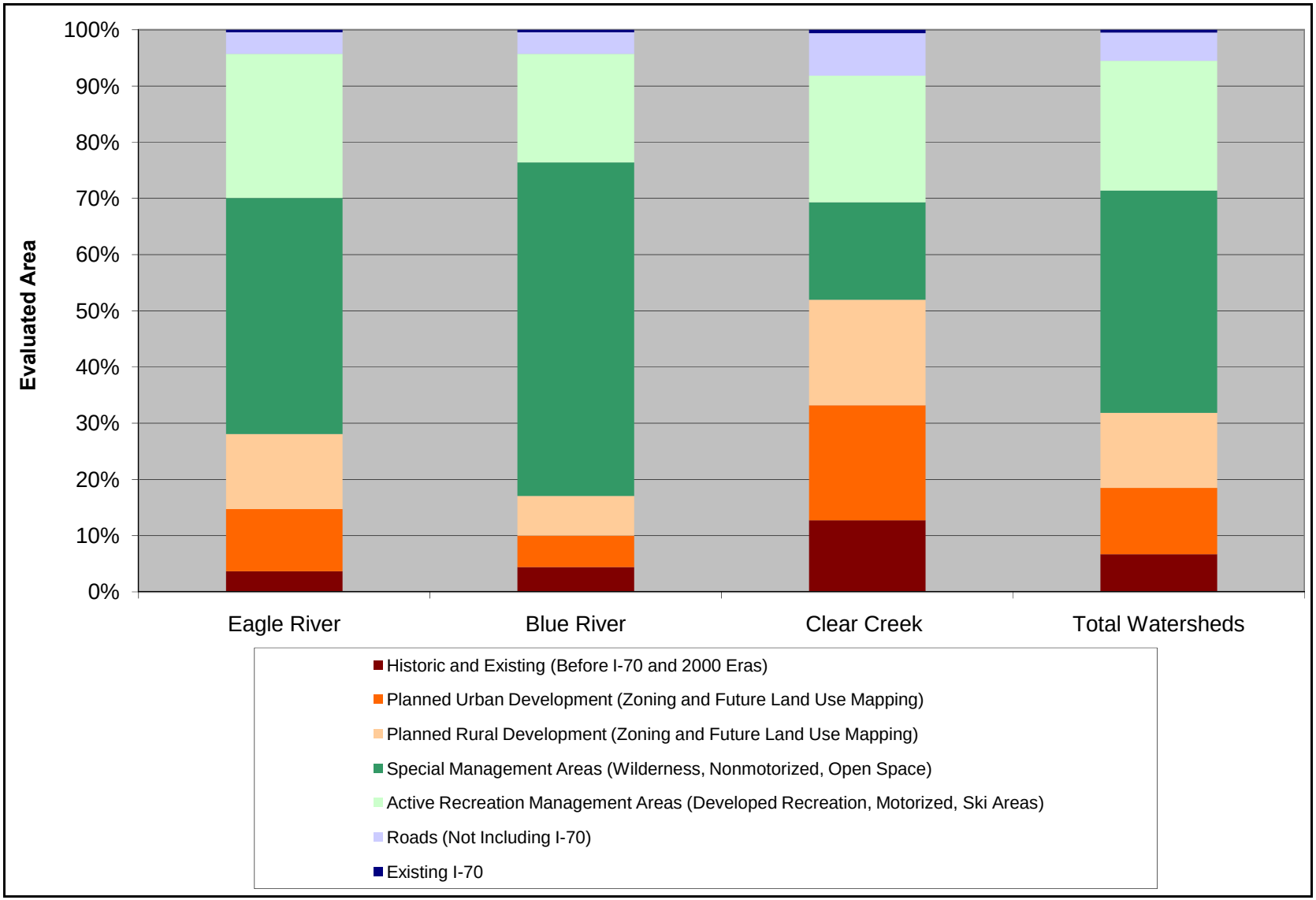


Table 2. Reasonably Foreseeable Future Actions by County

Project	Description	Source
Garfield County		
Energy	Energy has emerged in northwest Colorado as a major economic driver. Natural gas development and other natural resource industries are playing an increasingly important role in the northwest Colorado economy. In 2006, these industries accounted for 15 percent of total direct and secondary employment in the overall region but a far more concentrated proportion in various subareas of the four county region.	Northwest Colorado Socioeconomic Analysis and Forecasts Associated Governments of Northwest Colorado 144 E. 3rd Street, Suite 206 Rifle, CO 81650-2318 Prepared by BBC Research & Consulting April 4, 2008
	Gas drilling is projected to continue to increase through 2015 then remain relatively stable through the end of the forecast period (2035).	
	The general view within the industry is that Garfield County well development will continue forward at a fairly consistent rate of about 1,000 wells per year over the next 10 to 15 years. Given about 3,900 wells at present, this implies an ultimate total of about 15,000 to 20,000 wells in the county by 2023.	
Eagle County		
Eagle River Meadows	Located in Edwards proposes 380 residences and 291,000 sq. ft. of commercial – geared primarily toward medical uses.	Robert Narracci, AICP Planning Manager PO Box 179 500 Broadway, Eagle 81631 Phone: (970) 328-8750 Fax: (970) 328-7185
Wolcott	This Planned Unit Development is essentially proposing an entire new unincorporated 'Town' centered around the I-70 / Wolcott interchange. Proposes 2,000+ residential units and an as yet to be determined amount of commercial, industrial and institutional square footage. A longtime Vail Valley developer has unveiled a plan to build a sub-division in Wolcott that will be "less than half the size of Edwards," a press release says. Rick Hermes wants to build 2,000 single-family homes and a variety of other housing units on 1,100 acres along the Eagle River over the next two decades. http://www.vaildaily.com/article/20100415/NEWS/100419752/1078&ParentProfile=1062	

Table 2. Reasonably Foreseeable Future Actions by County

Project	Description	Source
Battle Mountain Resort in Minturn	In May 2008, 367 of Minturn's voters backed the council's decision to annex 4,300 acres of the 5,300-acre Battle Mountain parcel. That annexation deal called for nearly $200 million in public benefits from the Ginn Company — everything from a new recreation center to a new wastewater treatment plant to new parks and sidewalks. In exchange, Battle Mountain, on the soaring slopes south of town, would begin the approval process on a $1 billion project that would include 1,700 new homes, a private 18-hole golf course, a private ski area and two gondolas Another golf developer in the Vail Valley, Cordillera, plans to participate in the Battle Mountain development, build a private slope-side club and offer reciprocal golf memberships.	http://www.minturn.org/battleMtn/PDF/BoltsLakeVillageDesignPhilosophy.pdf The Colorado Independent: http://coloradoindependent.com/36035/minturn-mayor-not-worried-over-suspended-resort-development
Eagle County Airport Expansion	In 2006 an Instrument Landing System (ILS) was commissioned and in 2007 a BI-6 radar system was added which has increased the arrival acceptance rate. The effect of these navigational aids is twofold: allowing aircraft to land in lower visibility conditions and increasing the rate at which the airport can accept the arriving aircraft in low visibility conditions.	http://www.eaglecounty.us/Airport/About_the_Airport/History/
	Other recent projects for the Eagle County Regional Airport include the completion of a 1,000 foot runway expansion and rehabilitation of the existing runway in the summer of 2009 to make room for bigger aircraft.	http://www.eaglecounty.us/Airport/About_the_Airport/History/ http://www.allvoices.com/s/event-5600119/aHR0cDovL3d3dy52YWlsZGFpbHkuY29tL2FydGljbGUvMjAxMDA0MTMvTkVXUy8xMDA0MTk4ODgvLTEvUlNT
Summit County		
	Summit County very rarely allows for development outside of its zoning, usually only when development rights are brought from another property. Zoning is capped.	Summit County Planning Office Kristin Dean Senior Planner 970-668-4207 kristind@co.summit.co.us
Copper Mountain and Keystone Ski Resorts	No expansion anticipated.	
Mountain House, Keystone	558 Condo Units, 40,000 sq ft of commercial space. No upzoning is required.	
	25 acre property, single family lots, zoned R1, no upzoning required.	
Wayside Inn	Change from motel to 65 condominium units. Change in use and density, but may never be built.	
Breckenridge Ski Resort	Proposed expansion of intermediate terrain, one lift and several trails within permit	Truckey, Mark

Table 2. Reasonably Foreseeable Future Actions by County

Project	Description	Source
	boundary. Forest Service currently conducting an environmental analysis which has not been released.	Assistant Director Community Development Town of Breckenridge markt@townofbreckenridge.com (970)453-3184
Jefferson County		
Lyons Ridge Residential Subdivision	230 lots on 289 acres near the intersection of US Hwy 285 and C470. Rezoning was approved in 2008. Subdivision was applied for in 2008, the applicant is still working on it, but at a fairly slow pace.	Heather Gutherless Planner Jefferson County hgutherl@jeffco.us (303)271-8718
Table Mountain Gateway	Near the proposed Cabela's at SH 58 and I-70, rezoning for 33.4 acres of commercial. This was rezoned in 2007. Nothing has happened since the rezoning.	
White River National Forest Ski Resort Expansions		
White River National Forest no longer does ski area expansions as defined by allowing growth in the size of their operations beyond land allocation decisions made in the 2002 Forest Plan.		Rich Doak White River National Forest (970)945-3267 rdoak@fs.fed.us Roger Poirier's phone # is 970-945-3212
Breckenridge ski resort	The U.S. Forest Services is about ready to release a DEIS analyzing the effects of the Breckenridge ski resort creating new terrain on Peak 6, within their current permit boundary.	
Gold Peak	This past year Vail proposed to add terrain onto Gold Peak and increase the lift served area in the Back Bowls. Work in the Back Bowls was approved, but not Gold Peak.	
Buttermilk	Additional actions, including a ski jump venue at Buttermilk have been approved.	
Skico	Skico is asking for some additional runs in select locations.	
A-Basin, Montezuma Bowl	A-Basin opened up Montezuma Bowl as lift served terrain just a couple years ago as well.	
Keystone, Bergman Bowl	Keystone proposed to add on their proposal to add terrain in Bergman Bowl in the next couple years.	
Arapahoe Roosevelt National Forest Ski Resort Expansions		
Winter Park Resort	No immediate plans to expand outside their existing permit boundary.	MIKE RICKETTS Recreation Special Uses Sulphur Ranger District Arapaho-Roosevelt NF Ph. 970-887-4133
	There has been some discussion relative to the Zero Creek area and adding that to the permit but nothing formal has been submitted. Zero Creek was considered but eliminated from detailed analysis in the EA. Adding Zero Creek in the future would be driven by boundary management issues. Monitoring is ongoing.	
	Winter Park Resort does have room to expand within their existing permit area under the accepted 2005 Master Development Plan. However, WPR still has uncompleted projects authorized by the April 28, 2006 Decision Notice, WPR Phase I Projects. I would guess they will complete those projects before proposing a new round (Phase II) of projects from their MDP.	

Table 3. Reasonably Foreseeable Future Transportation Projects

Project	General Description	Limits	Responsible Agency	Status
SH 119, US 6, US 40	Blackhawk to US 40 – safety improvements (curve straightening, lighting, improve shoulders, minor widening)	SH 119, US 6 to Blackhawk and US 6, I-70 to Golden	Colorado Department of Transportation Region 1	Various stages of planning and Design
SH 82 Bus Rapid Transit	Addition of Bus Rapid Transit infrastructure on SH82 between Glenwood Springs and Aspen.	SH 82 MP 0-40	Roaring Fork Transportation Authority	Various stages of design and obtaining clearances.
Eagle County Airport interchange	Construction of a new interchange on I-70 approximately 4 miles west of the existing Eagle Interchange.	I-70 MP 142-144	Colorado Department of Transportation Region 3/Eagle County	ROW acquisition is almost complete. Final design is almost complete. Project plans will be shelved.
East Eagle Interchange	Construction of a new interchange on I-70 approximately 2 miles east of the existing Eagle Interchange.	I-70 MP 148-151	Colorado Department of Transportation Region 3 / Town of Eagle (locally funded following the 1601 process)	Environmental Assessment is almost complete (as of August 10, 2010).
Parachute Interchange	Construction of a new interchange on I-70 approximately 3 miles west of the existing Parachute Interchange.	I-70 MP 70 – 73	CDOT Region 3/ Garfield County	Environmental Assessment is signed. The Finding of No Significant Impact (FONSI) is in review process (as of August 10, 2010).
Guanella Pass Road	full paving	US 285 to Georgetown	Central Federal Lands	Phase 1 completed in 2007; Phase 2 currently under construction
US 285	from Conifer to Bailey – widening from 2 to 4 lanes with some grade separated interchanges added	Bailey to Foxton Road in Conifer	Colorado Department of Transportation Region 1	Various sections built including Richmond Hill and Deer Creek Interchanges; Shaffers Crossing Interchange is currently under construction; Pine Jct Interchange is currently under design; Shaffers Crossing to Richmond Hill is has not started design.
Entrance to Aspen	Final phase of capacity improvement project of SH 82.	SH 82 MP 39.8 – 40.45 (Maroon Ck. Rd. to 7th and Main St.)	Colorado Department of Transportation	The Record of Decision is signed. Re-evaluation is complete. No funding identified for construction of final phase.

Table 3. Reasonably Foreseeable Future Transportation Projects

Project	General Description	Limits	Responsible Agency	Status
South Bridge	Construction of a new bridge south of Glenwood Springs over the Roaring Fork River.	SH 82 MP 4-7	Colorado Department of Transportation Region 3 / Glenwood Springs	Environmental Assessment in process.
Summit Stage	Summit Stage is planning bus improvements	Summit Stage New Maintenance Facility	Summit County and Colorado Department of Transportation Region 1	Currently under Construction
C-470	Kipling to E-470 – widening from 6 to 8 lanes with major interchange reconstruction at US 85	EA is currently on hold from Kipling to E-470; may get extended to I-70	Colorado Department of Transportation Region 6	On hold
Jefferson Parkway	Adding the new tolled highway	C470 to Northwest Parkway	Local Agency/private tollway authority project	In design
SH 93	Widening of SH 93 between Golden and Boulder	Golden to Boulder	Colorado Department of Transportation or Jefferson County	In initial planning stages
SH9	Breckenridge to Frisco – widening from 2 to 4 lanes	Breckenridge to Frisco	Region 1	Various sections have been constructed including the Breckenridge and Farmers Korner sections; Valley Brook to Coyne Valley and Coyne Valley to Tiger Road are under construction; Tiger Road to Agape Church is in design; Farmers Korner to Crown Point has not started design.
SH 9	Minor Widening north of Silverthorne	North of Silverthorne to Grand County Line	Colorado Department of Transportation Region 1	Constructed in 2005
Georgetown Roundabout	New roundabout just east of I-70 Exit 228	n/a	Colorado Department of Transportation	In design

Table 3. Reasonably Foreseeable Future Transportation Projects

Project	General Description	Limits	Responsible Agency	Status
			Region 1 and City of Georgetown	
Georgetown Hill Rock Attenuation	Rock fall attenuation at 10 Chutes along Georgetown Hill from MP 226-227	MP 226-227	Colorado Department of Transportation	Ongoing; Construction will not be completed for 4-5 years
Straight Creek Sediment Control	Sediment Control along Straight Creek	SH 9 to EJMT	Colorado Department of Transportation Region 1	Ongoing; construction will not be completed for 2-3 years
Clear Creek Sediment Control	Sediment Control Feasibility Study	EJMT to MP 224 (Kermitts)	Colorado Department of Transportation Region 1	Consultant selected in April 2010

Section 3. Description of Alternatives

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

3.1 Minimal Action Alternative

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

3.2 Transit Alternatives

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

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

3.2.1 Rail with Intermountain Connection

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

3.2.2 Advanced Guideway System

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

3.2.3 Dual-mode Bus in Guideway

This alternative includes a guideway located in the median of the I-70 highway with dual-mode buses providing transit service between the Eagle County Regional Airport and C-470. This guideway would be

24 feet wide with 3 foot high guiding barriers and would accommodate bidirectional travel. The barriers direct the movement of the bus and separate the guideway from general purpose traffic lanes. While traveling in the guideway, buses would use guidewheels to provide steering control, thus permitting a narrow guideway and providing safer operations. The buses use electric power in the guideway and diesel power when traveling outside the guideway in general purpose lanes. This alternative includes the same Minimal Action Alternative elements as described previously for the Rail with Intermountain Connection Alternative.

3.2.4 Diesel Bus in Guideway

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

3.3 Highway Alternatives

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

3.3.1 Six-Lane Highway 55 mph Alternative

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

3.3.2 Six-Lane Highway 65 mph Alternative

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

3.3.3 Reversible Lanes Alternative

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

3.4 Combination Alternatives

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

Combination Rail and Intermountain Connection and Six-Lane Highway Alternative—This alternative includes the 55 mph six-lane highway widening between Floyd Hill and Eisenhower-Johnson Memorial Tunnels, the Rail and Intermountain Connection transit components, and most of the components of the Minimal Action Alternative. The exception is that only one of the Minimal Action auxiliary lane improvements (from Morrison to Chief Hosa westbound) is included.

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

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

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

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

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

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

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

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

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

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

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

3.5 Preferred Alternative—Minimum and Maximum Programs

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

3.6 No Action Alternative

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

Section 4. Cumulative Impacts

4.1 Land Use

The development of the Corridor has influenced land use patterns in the Corridor over the past 30 years, and a relationship between growth in traffic and population in the Corridor region (past 30 years) suggests that changes in travel demand in the future also will affect growth in the region. The analysis of induced growth from alternatives is tied to past relationships of I-70 traffic and land use. The potential influence of induced or suppressed travel demand on land use development patterns, population, and employment projections in the Corridor region vary by alternative and by Corridor county and watershed. The "gray" section of the bar chart illustrated on **Chart 2** indicates indirect impacts on land use associated with induced growth from alternatives. This estimate of induced growth provided the basis for quantifying the effects of induced growth on wildlife habitat, wetlands, water resources, social and economic values, and visual resources. In contrast, the "black" section of the bar chart reflects cumulative impacts due to the change from existing to planned land use. **Chart 2** illustrates the impacts of the different distribution of population resulting from Transit, Highway, and Combination Alternatives. Although Transit Alternatives would have the potential to induce more population growth than the Highway Alternatives, it is assumed that growth would take place in urban areas and would result in fewer acreage impacts. The Combination Alternatives would have the potential to increase developed land by approximately 18 percent increase beyond planned growth by 2035. Highway Alternatives would have the potential to increase developed land by 9 percent, and Transit Alternatives by almost 3 percent. Note that the likelihood of such impacts occurring would depend on factors such as local planning and land use restrictions and infrastructure limitations. The Preferred Alternative would result in a range of potential impacts, from 3 percent to 18 percent by 2035.

In the coming years, water quality and water supply will greatly influence growth and future development.

The extent and capacity of public water and wastewater infrastructure, including treatment plants, public water supply systems, and wastewater treatment facilities, also will play a role in future development. The *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, August 2010) and the Water Resources **Section 3.5** of this technical report discuss water quality and availability issues specific to local planning and growth.

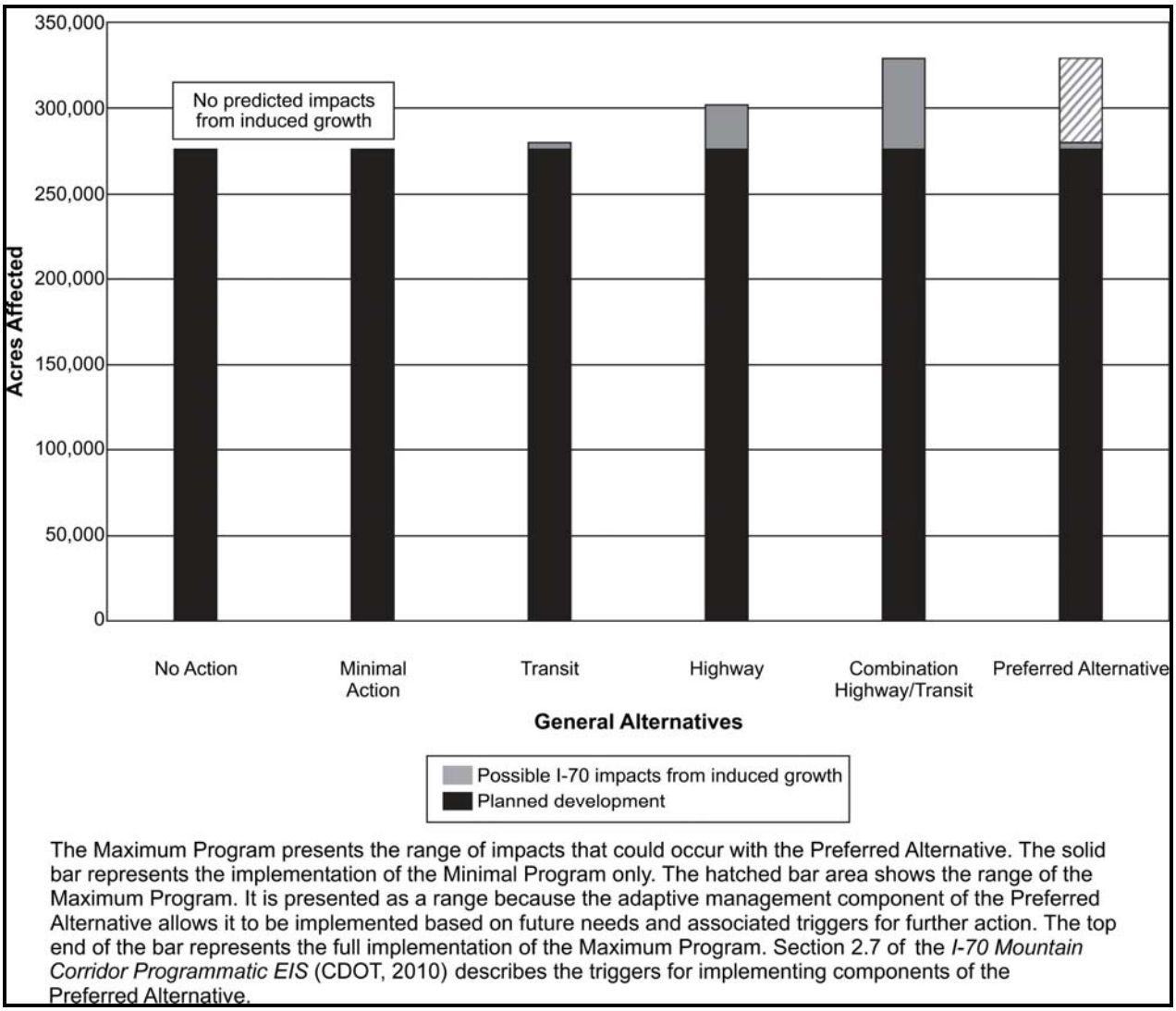
Summary: The change in land use historically in the Corridor has been one of the most obvious, visible changes. The change in the Corridor from large ranchland adjacent to US 6 in the 1960s to the many higher-density residential and commercial uses that exist today has transformed Corridor character. Planned Corridor growth without improvements to I-70 is anticipated to affect around 275,000 acres of currently undeveloped land. The Action Alternatives could add an additional 3 percent to 18 percent of developed land to this planned Corridor growth. The effect of this over time (and to 2050) is likely to vary substantially, depending on a number of factors, such as the availability of water, the quality of the water, the health of the recreation resources (dependent on economic conditions, climate change, mountain pine beetle ecological changes and others), and the overall economic health and character of the local jurisdictions.

When combined with the past, present, and reasonably foreseeable cumulative impacts to land use, the lead agencies expect the transportation improvements to the Corridor to contribute to substantial cumulative changes in land use in the cumulative impacts study area as shown on **Figure 3**. Land use changes, over time, typically occur in a linear relationship to the development or infrastructure project that resulted in a land use change. If local agencies manage land use change in a coordinated manner, these cumulative changes may not be detrimental to the Corridor and could provide benefits to residents and visitors. However, if land use changes occur without effective management or coordinated planning

efforts, these cumulative changes could overwhelm Corridor communities and subsequently affect quality of life, community services and infrastructure, and the overall character of mountain communities.

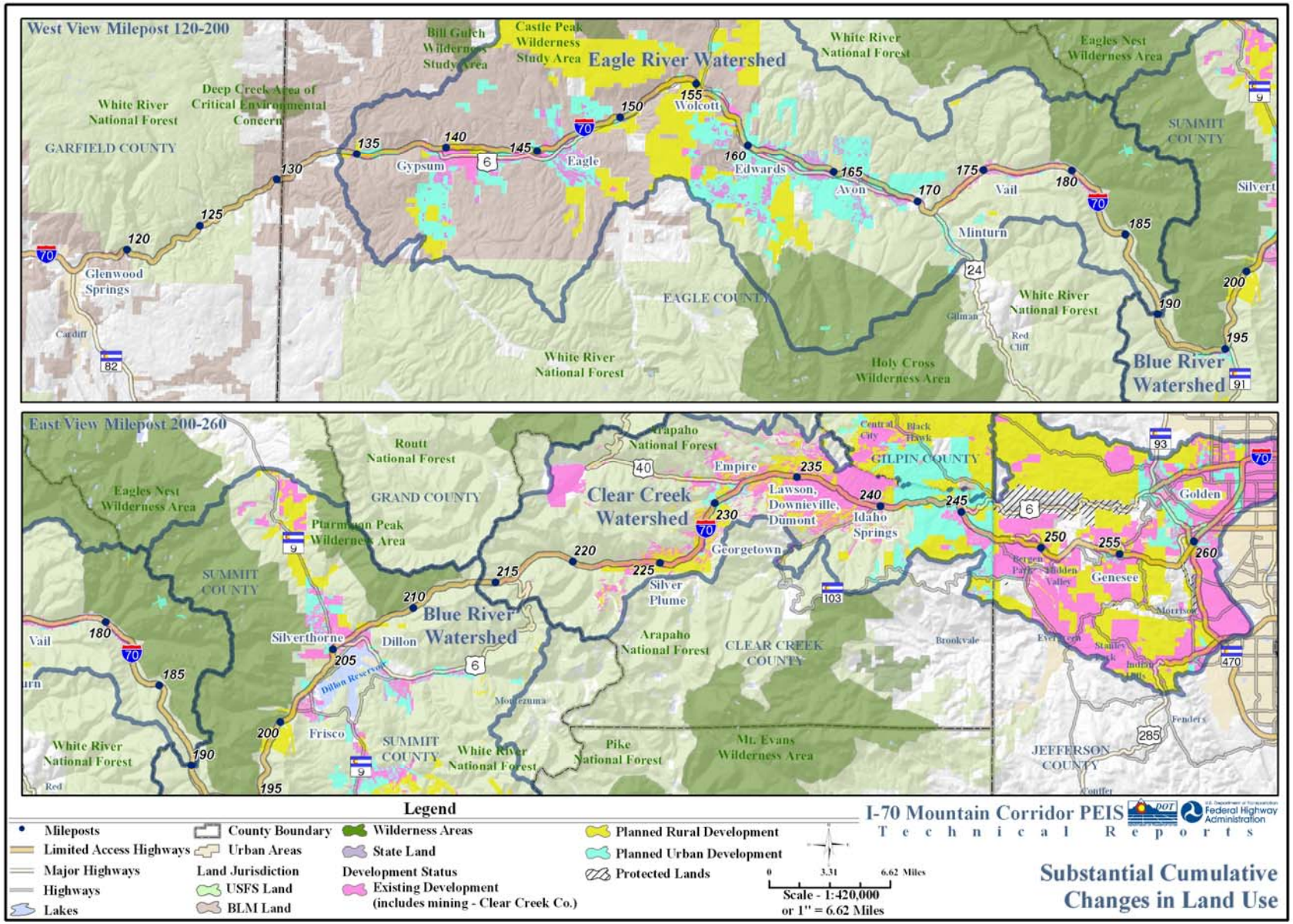
The adaptive management approach of the Preferred Alternative (described in **Section 2.9** of this Technical Report) allows transportation improvements to be implemented over time, which may allow communities to appropriately manage the indirect effects associated with those improvements.

Chart 2. Corridor Cumulative Impacts on Land Use by 2035



The Maximum Program presents the range of impacts that could occur with the Preferred Alternative. The solid bar represents the implementation of the Minimal Program only. The hatched bar area shows the range of the Maximum Program. It is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. The top end of the bar represents the full implementation of the Maximum Program. Section 2.7 of the *I-70 Mountain Corridor Programmatic EIS* (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.

Figure 3. Substantial Cumulative Changes in Land Use



4.2 Biological Resources

The Corridor is completely encompassed within the Southern Rockies Ecoregion, a continuous diverse ecological network of lands through portions of Wyoming, Colorado, and New Mexico (see **Figure 4**). A series of interrelated factors have altered the natural function of the Southern Rockies Ecoregion (Southern Rockies Ecosystem Project, The Denver Zoological Foundation and The Wildlands Project 2003). These factors include:

- Loss and decline of native species
- Loss and degradation of terrestrial and aquatic ecosystems
- Loss and fragmentation of wildlife habitat
- Invasion by exotic plants and animal species
- Pollution and climate change

As a part of the Southern Rockies Wildlands Network Vision, a relative level of threat and human impact was digitally modeled, based on land cover, housing density, and road information covering the Southern Rockies Ecoregion. The level of threat is to the viability of the existing native wildlife and plant species. Based on this modeling, the percentage of high-level threat and human impact through the Corridor cumulative effects study area would be 2.5 times greater than that of the rest of the Southern Rockies Ecoregion as a whole (see **Table 4** and **Figure 4**). The Corridor bisects the entire width of the Southern Rockies Ecoregion and, as such, intersects natural wildlife movement corridors and linkage areas at numerous locations.

The cumulative effects of road and highway construction, recreation, and population growth in the Corridor have resulted in habitat loss and habitat fragmentation. State projected population growth and human development through the Corridor will continue to affect the natural ecological functions of the ecoregion.

Table 4. Relative Area of Threat: Southern Rockies Ecoregion

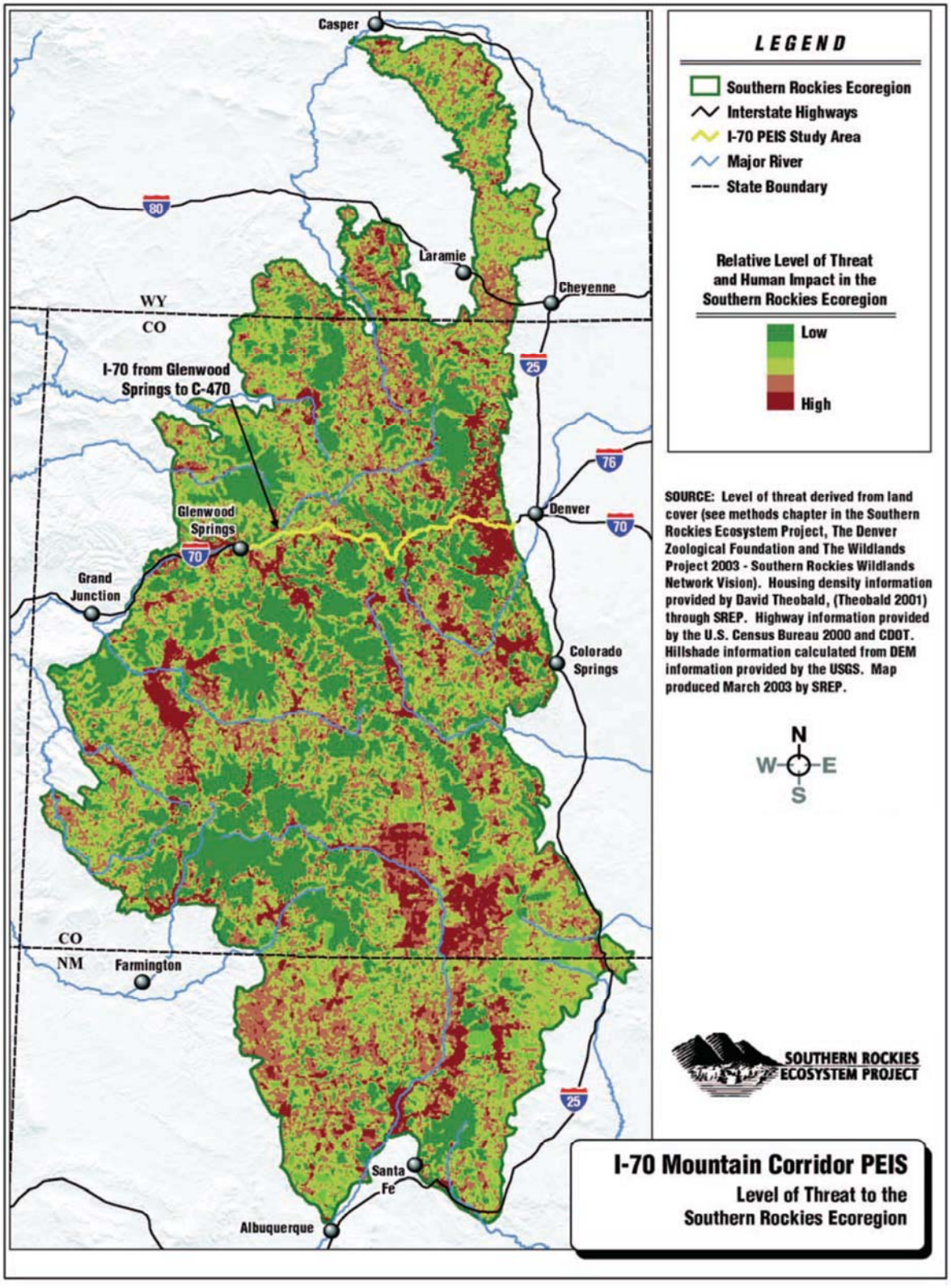
	Total Area (Square Miles)	Area of High Threat and Human Impact (Square Miles)	Percentage of Total Area Ranked as High Threat and Human Impact
Southern Rockies Ecoregion	64,410	6,624	10%
Corridor Cumulative Effects Study Area	1,264	313	25%

Corridor vegetation mapping information was available from US Forest Service, Bureau of Land Management, and Colorado Division of Wildlife Geographic Information System (GIS) vegetation map layers. The mapping includes numerous vegetation classes, areas of development (where vegetation was not mapped), and barren/exposed rock areas. The vegetation classes were grouped into two general categories for GIS overlay cumulative impact analyses:

- **Forested Vegetation.** Forested vegetation includes the following vegetation classes: Aspen Forest, Spruce-Fir Forest, Spruce-Fir Mixed Forest, Aspen with conifer, Blue Spruce Forest, Douglas-fir Forest, Engelmann Spruce Forest, Engelmann Spruce Mixed Forest, Cottonwood Forest, Lodgepole Pine Forest, Lodgepole Pine Mixed Forest, Piñon/Juniper Forest, Mixed Conifer Forest, and Mixed Forest.
- **Non-Forested Vegetation.** Non-forested vegetation includes the following vegetation classes: Grass/Forb, Mountain Mahogany, Rabbitbrush, Sagebrush, Sedge/Rush, Serviceberry, Shrub, Snowberry, Willow, Big Sagebrush, Bare Ground Tundra, Irrigated

Agriculture, Mixed Tundra, Mountain Big Sagebrush, Subalpine Meadow, and Xeric Upland Shrub.

Figure 4. Level of Threat to the Southern Rockies Ecoregion



A Geographic Information System overlay analysis was performed to determine impacts from planned rural and planned urban development to the forested and non-forested vegetation categories. The results are shown in **Appendix A**. Impacts on the forested vegetation category from planned development would comprise 102,680 acres, or 22 percent of the total mapped area. Impacts on the non-forested vegetation category from planned development would comprise 69,910 acres, or 39 percent of the total mapped area. Because mapped existing and historic development did not include mapping of any vegetation in these areas, existing and historic impacts on vegetation could not be determined. However, a general idea of overall cumulative impacts (by alternative) to vegetation from planned development and possible induced growth can be discerned based on the land use impacts shown on **Chart 2**. Direct impacts on vegetation (see **Section 3.2**, Biological Resources) would be relatively minor in comparison.

Affected Environment: Wildlife Habitat

Cumulative impacts on key wildlife habitats are assessed within watersheds along the Corridor. Issues range from habitat loss, collisions, increased barrier impacts, and effects of winter maintenance. Primary wildlife issues include the potential for fragmentation of habitat and barrier effects on wildlife movement.

The following charts show impacts from planned development that are likely to affect key wildlife habitats:

- Chart 3, Deer Habitat Affected Environment
- Chart 4, Elk Habitat Affected Environment
- Chart 5, Bighorn Sheep Affected Environment
- Chart 6, Songbird Habitat Affected Environment

Chart 3. Deer Habitat Affected Environment

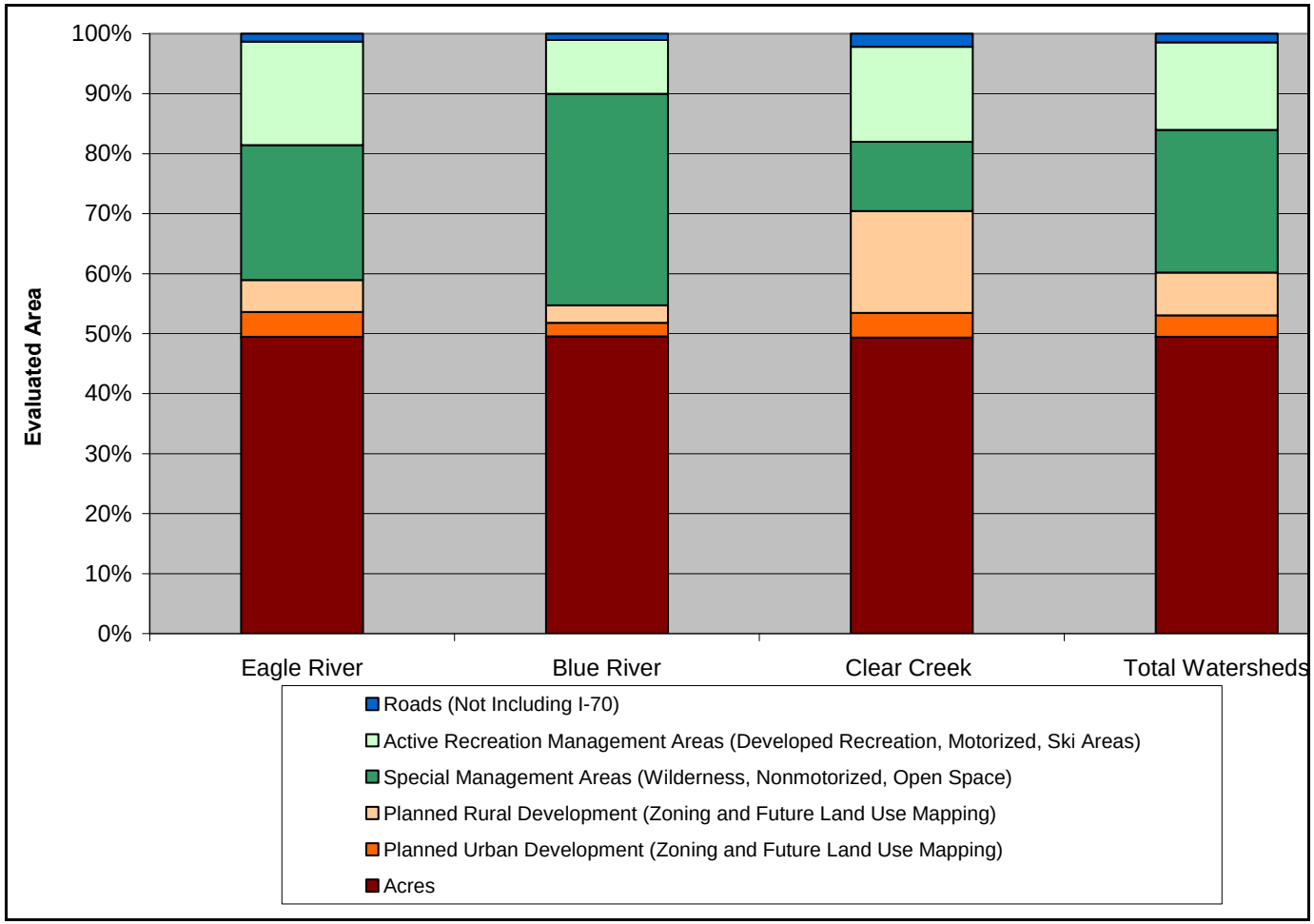


Chart 4. Elk Habitat Affected Environment

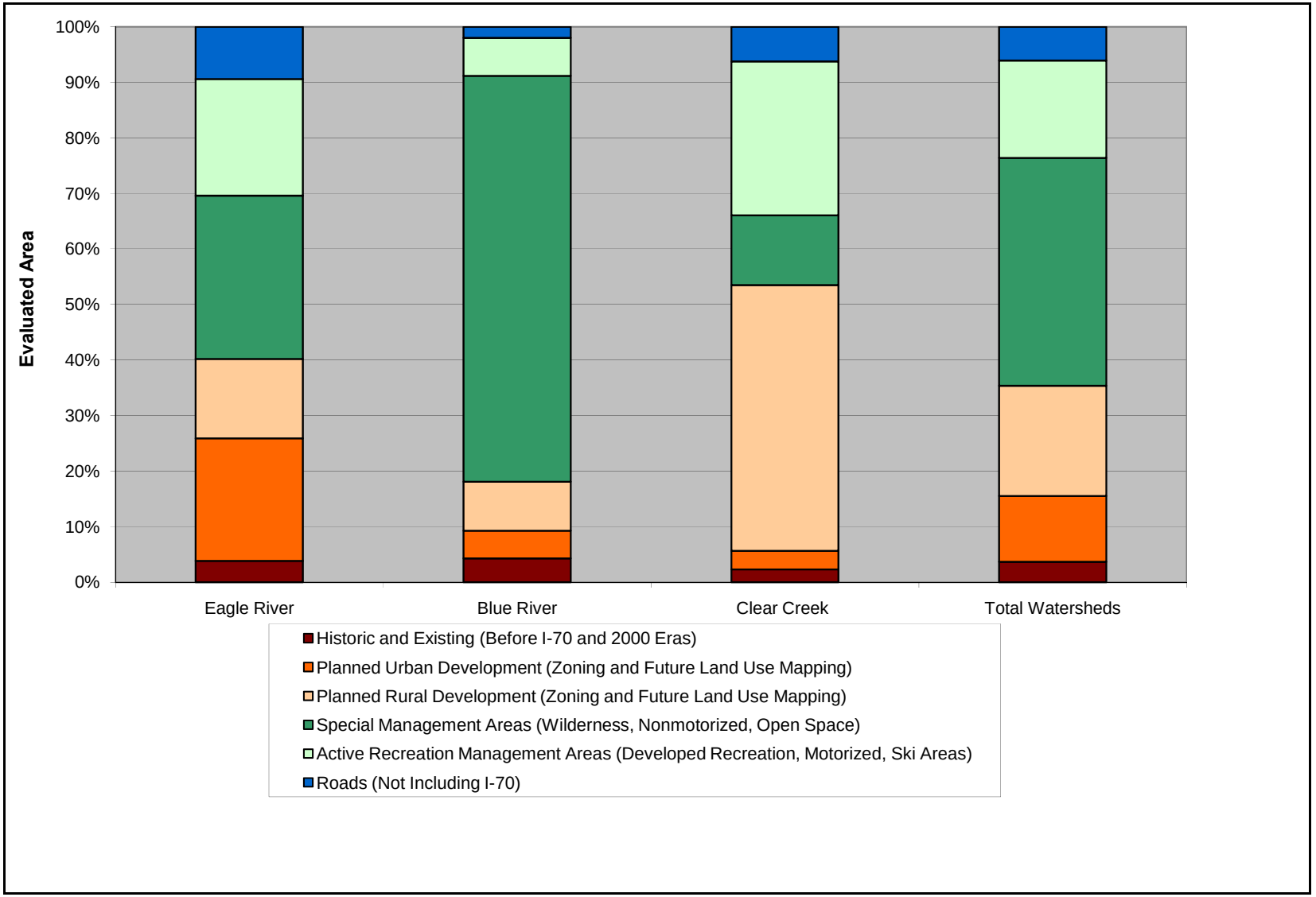


Chart 5. Bighorn Sheep Affected Environment

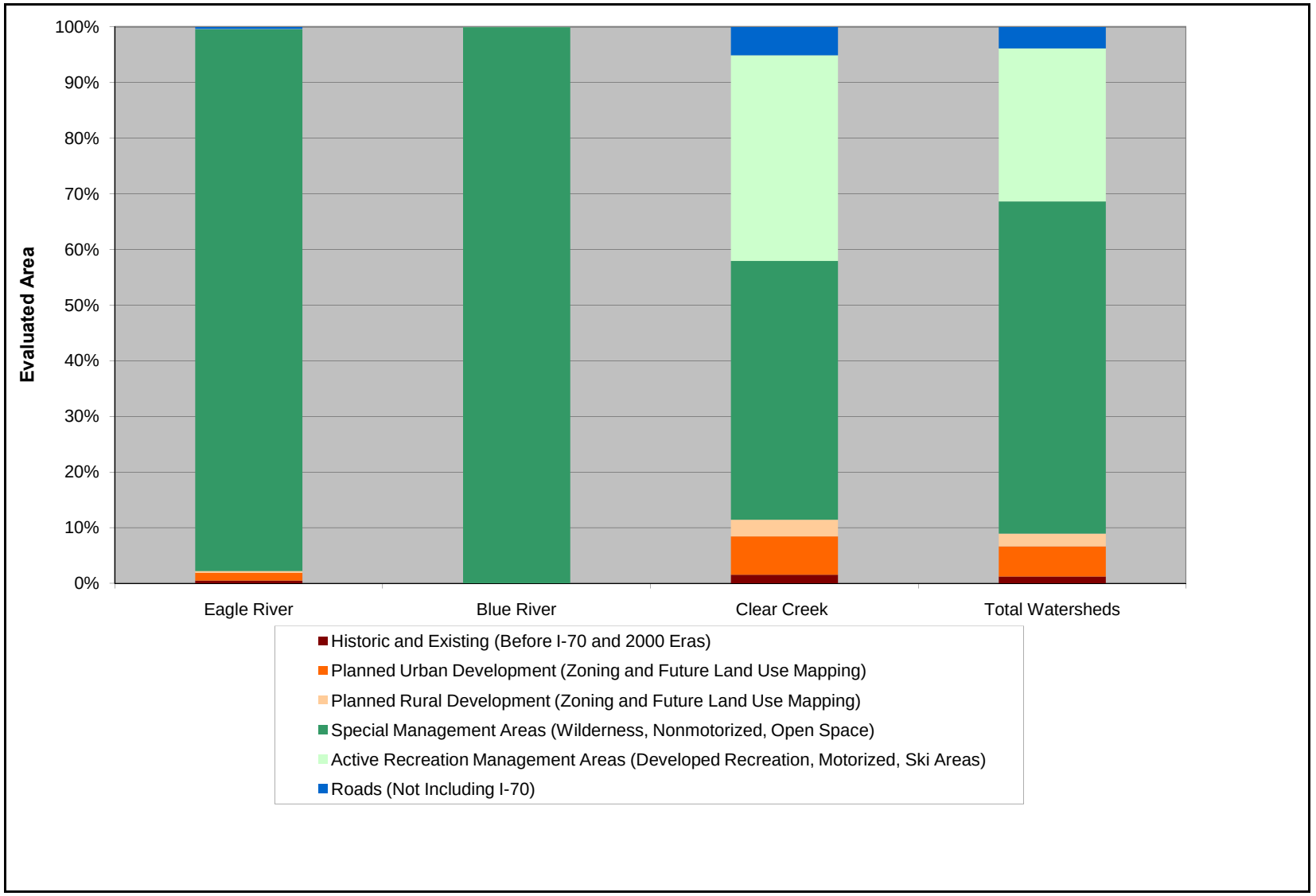


Chart 6. Songbird Habitat Affected Environment

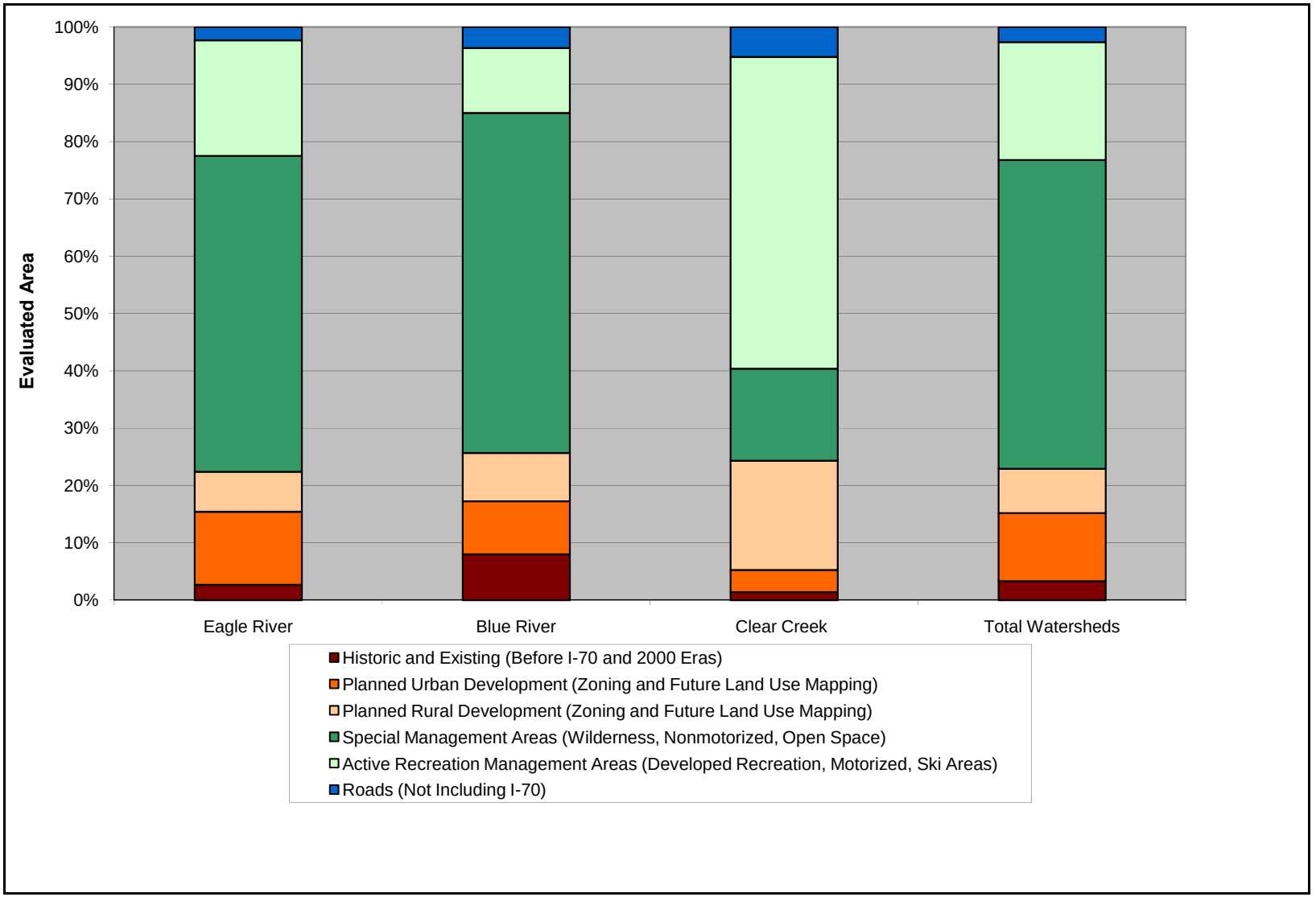


Figure 5, **Figure 6**, and **Figure 7** also show impacts from planned development to key wildlife habitats. Development not only causes habitat loss but also fragments habitat into smaller units and changes movement patterns.

As shown on **Figure 5**, within the watershed study area, existing development occupies approximately 9 percent (approximately 9,900 acres) of key deer habitats. Under current plans, total development would increase to 52 percent (approximately 55,700 acres) within key deer habitats. The remainder of the watershed area key deer habitats would continue as forest management, recreation, and open space uses, which would protect key deer habitats within the watershed study area. Deer habitat is not anticipated to be affected by any development activities in the Blue River watershed.

As shown on **Figure 6**, within the watershed study area existing development occupies approximately 4 percent (approximately 3,500 acres) of key elk habitats. Under current plans, total development would increase to 44 percent (approximately 40,000 acres) within key elk habitats. The remainder of the watershed area key elk habitats would continue as forest management, recreation, and open space uses, which would protect key elk habitats within the watershed study area. The greatest impacts on elk habitat are anticipated in the Eagle River and Clear Creek watersheds.

As shown on **Figure 7**, within the watershed study area existing development occupies approximately 1 percent (approximately 1,000 acres) of key bighorn sheep habitats. Under current plans, total development would increase to 11 percent (approximately 9,300 acres) within key bighorn sheep habitats. The remainder of the watershed area key bighorn sheep habitats would continue as forest management, recreation, and open space uses, which would protect key bighorn sheep habitats within the watershed study area. Bighorn sheep habitat is not anticipated to be affected by any development activities in the Blue River watershed.

The watershed study area existing development occupies approximately 3 percent (approximately 3,400 acres) of quality songbird habitats. Total development is anticipated to increase to 24 percent (24,000 acres) within quality songbird habitats. The remainder of the watershed area key songbird habitats would continue as forest management, recreation, and open space uses, which would protect quality songbird habitats within the watershed study area.

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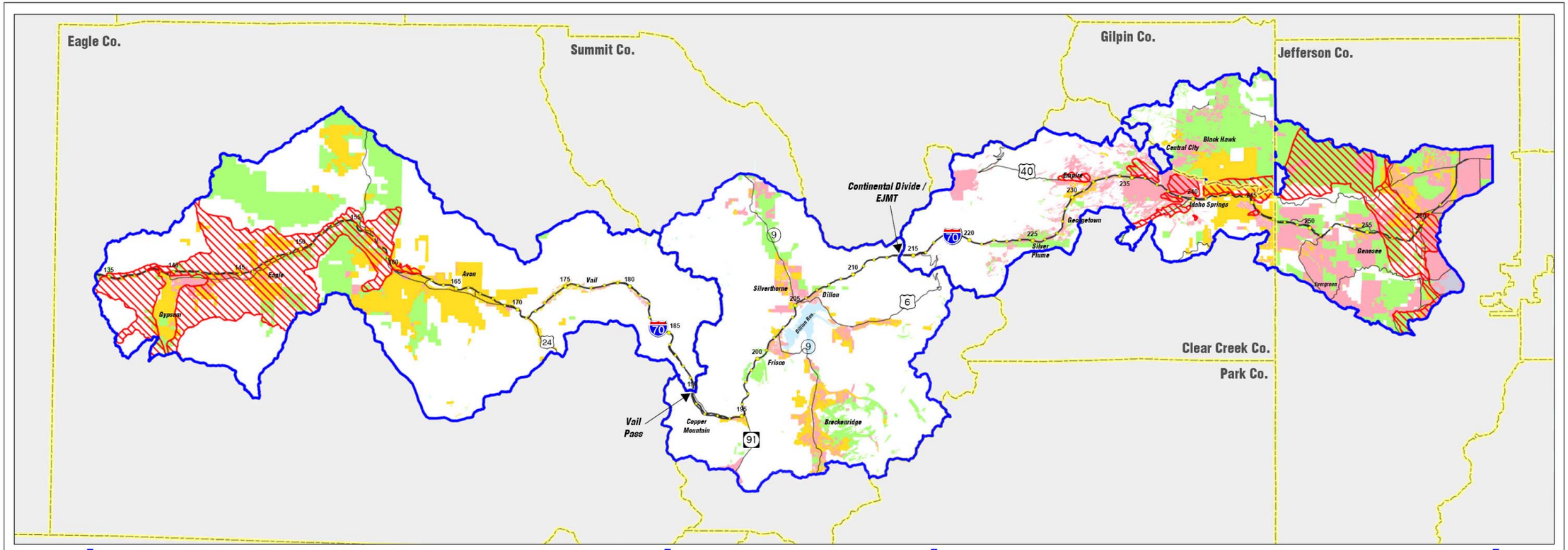
Figure 5. Regional Impacts on Key Deer Habitats



EAGLE RIVER WATERSHED Study Area | **BLUE RIVER WATERSHED Study Area** | **CLEAR CREEK WATERSHED Study Area**

RESOURCE DESCRIPTION	Geographic Areas (Aggregated HUC 6 Watersheds)	Acres	Past, Present, and Future Development Activities in Corridor: COUNTY AND TOWN DEVELOPMENT — Historic and Existing (Before I-70 and 2000 Eras)	Planned Urban Development (Zoning and FLUM*)	Planned Rural Development (Zoning and FLUM*)	Total	FOREST MANAGEMENT, RECREATION, OPEN SPACE — Special Management Areas (Wilderness, Nonmotorized, Open Space)	Active Recreation Management Areas (Developed Recreation, Motorized, Ski Areas)	ROADS AND HIGHWAYS — Roads (Not including I-70)		Existing I-70 (Footprint and Roadside Cut and Fills)		Range of Direct Impacts Associated with Action Alternatives
			acres	acres	acres	acres	acres	acres	miles	acres	miles	acres	acres (unless otherwise noted)
			percent	percent	percent	percent	percent	percent	percent		percent		percent
Deer severe winter range and winter concentration areas (acres)	Eagle River	65,392	4,946	5,911	9,049	19,906	12,782	29,989	240	3,638	No data on historic habitat displacement associated with construction of I-70		Analyzed by species, not by watershed basin
			8%	9%	14%	30%	20%	46%	6%				
	Blue River	0	0	0	0	0	0	0	0	0			
			0%	0%	0%	0%	0%	0%	0%				
	Clear Creek	41,931	4,956	7,447	23,372	35,775	3,027	7,407	212	3,247			
			12%	18%	56%	85%	7%	18%	8%				
	Total	**107,323**	**9,902**	**13,358**	**32,421**	**55,681**	**15,809**	**37,396**	**452**	**6,885**			**4 to 122**
			9%	**12%**	**30%**	**52%**	**15%**	**35%**	**6%**				**0% to 0.11%**

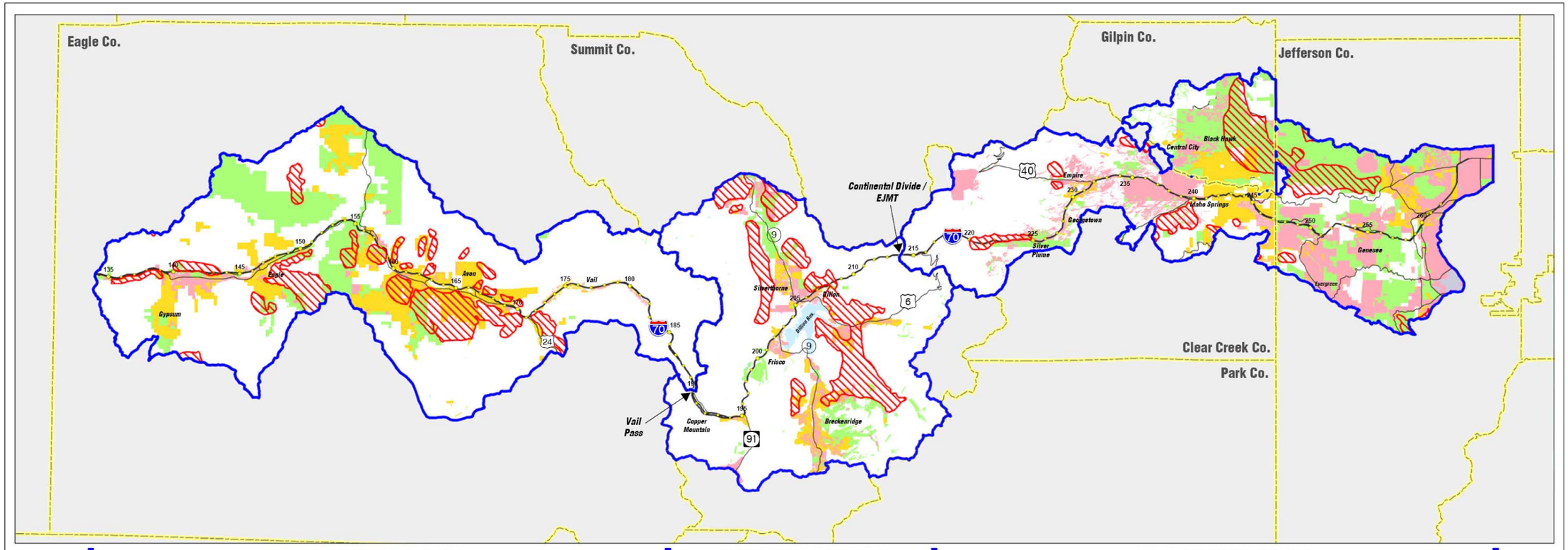
Existing Development (includes mining - Clear Creek Co.)
Planned Urban Development
Planned Rural Development
Forest Management / Open Spaces
Key Deer Habitats
Watershed Study Area
Surrounding Counties

0 3 6 12 Miles

SCALE - 1:468,000 or 1" = 39,000'

N W E S

Figure 6. Regional Impacts on Key Elk Habitats



RESOURCE DESCRIPTION	Geographic Areas (Aggregated HUC 6 Watersheds)	Acres	Past, Present, and Future Development Activities in Corridor: COUNTY AND TOWN DEVELOPMENT — Historic and Existing (Before I-70 and 2000 Eras)	Planned Urban Development (Zoning and FLUM*)	Planned Rural Development (Zoning and FLUM*)	Total	FOREST MANAGEMENT, RECREATION, OPEN SPACE — Special Management Areas (Wilderness, Nonmotorized, Open Space)	Active Recreation Management Areas (Developed Recreation, Motorized, Ski Areas)	ROADS AND HIGHWAYS — Roads (Not including I-70)	Existing I-70 (Footprint and Roadside Cut and Fills)	Range of Direct Impacts Associated with Action Alternatives
			acres	acres	acres	acres	acres	acres	miles / acres	miles / acres	acres (unless otherwise noted)
			percent	percent	percent	percent	percent	percent	percent	percent	percent
Elk severe winter range, winter concentration areas, and calving areas (acres)	Eagle River	33,840	1,431	8,201	5,305	14,937	10,912	7,806	230 / 3,486	No data on historic habitat displacement associated with construction of I-70	Analyzed by species not by watershed basin
			4%	24%	16%	44%	32%	23%	10%		
	Blue River	29,598	1,320	1,535	2,713	5,568	22,510	2,108	40 / 606		
			4%	5%	9%	19%	76%	7%	2%		
	Clear Creek	27,099	734	1,798	17,091	19,623	3,221	5,956	104 / 1,680		
			3%	7%	63%	72%	12%	22%	6%		
	Total	**90,537**	**3,485**	**11,534**	**25,109**	**40,128**	**36,643**	**15,870**	**374 / 5,772**		**15 to 62**
			4%	**13%**	**28%**	**44%**	**40%**	**18%**	**6%**		**0.02% to 0.07%**

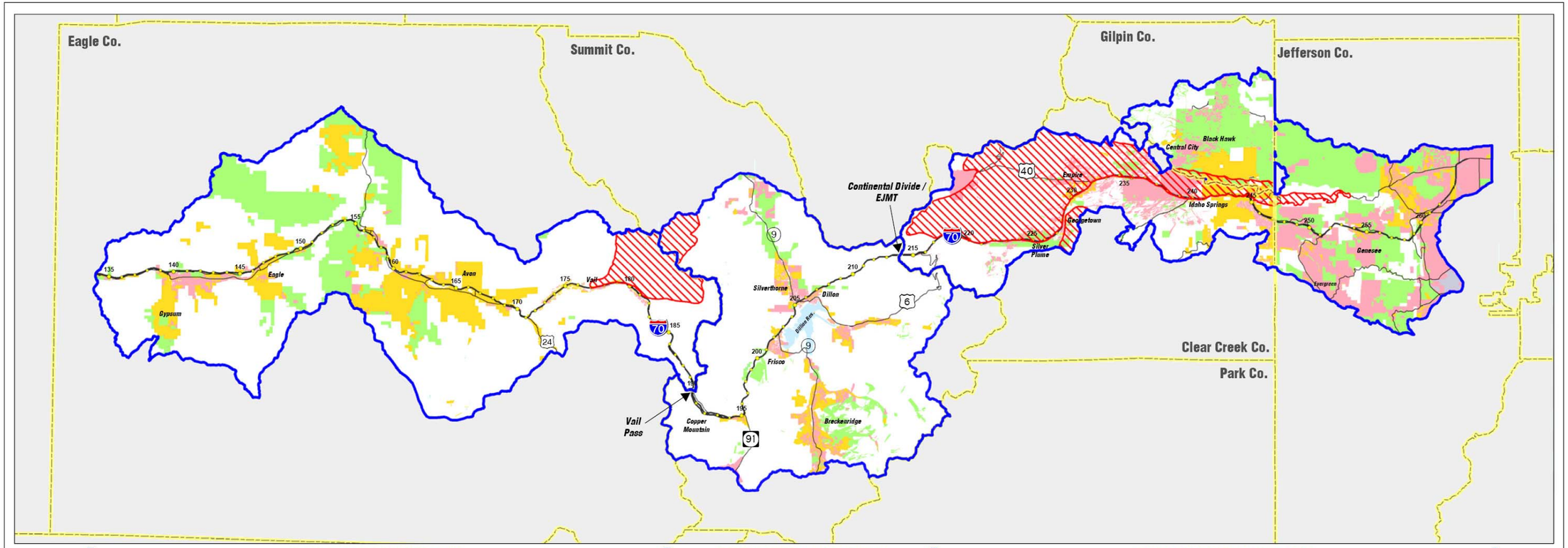
Existing Development (includes mining - Clear Creek Co.)
Planned Urban Development
Planned Rural Development
Forest Management / Open Spaces
Key Elk Habitats
Watershed Study Area
Surrounding Counties

0 3 6 12 Miles

SCALE - 1:468,000 or 1" = 39,000'

N W E S

Figure 7. Regional Impacts on Key Bighorn Sheep Habitats



RESOURCE DESCRIPTION	Geographic Areas (Aggregated HUC 6 Watersheds)	Acres	Past, Present, and Future Development Activities in Corridor: COUNTY AND TOWN DEVELOPMENT — Historic and Existing (Before I-70 and 2000 Eras)	Planned Urban Development (Zoning and FLUM*)	Planned Rural Development (Zoning and FLUM*)	Total	FOREST MANAGEMENT, RECREATION, OPEN SPACE — Special Management Areas (Wilderness, Nonmotorized, Open Space)	Active Recreation Management Areas (Developed Recreation, Motorized, Ski Areas)	ROADS AND HIGHWAYS — Roads (Not including I-70)	Existing I-70 (Footprint and Roadside Cut and Fills)	Range of Direct Impacts Associated with Action Alternatives
			acres	acres	acres	acres	acres	acres	miles / acres	miles / acres	acres (unless otherwise noted)
			percent	percent	percent	percent	percent	percent	percent	percent	percent
Bighorn Sheep summer range, winter range, lambing areas (acres)	Eagle River	15,752	72	226	53	351	15,532	16	4 / 61	No data on historic habitat displacement associated with construction of I-70	Analyzed by species, not by watershed basin
			0.5%	1.4%	0.3%	2.2%	98.6%	0.1%	0.4%		
	Blue River	4,560	0	0	0	0	4,553	4	0 / 0		
			0%	0%	0%	0%	100%	0%	0%		
	Clear Creek	67,343	927	5,039	2,961	8,927	27,716	22,230	204 / 3,119		
			1.4%	7.5%	4.4%	13.3%	41%	33%	4.6%		
	Total	**87,655**	**999**	**5,265**	**3,014**	**9,278**	**47,801**	**22,250**	**208 / 3,180**		**67 to 262**
			1%	**6%**	**3%**	**11%**	**55%**	**25%**	**4%**		**0.08% to 0.30%**

Existing Development (includes mining - Clear Creek Co.)
Planned Urban Development
Planned Rural Development
Forest Management / Open Spaces
Key Bighorn Sheep Habitats
Watershed Study Area
Surrounding Counties

0 3 6 12 Miles

SCALE - 1:468,000 or 1" = 39,000'

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Affected Environment: Threatened and Endangered Species

Threatened and Endangered Species in the Corridor have been affected by increased human intrusion into their habitats and by habitat losses and intrusion into movement corridors from land development. Most of the habitat for these species occurs on U.S. Forest Service and Bureau of Land Management lands, which afford management and protection from direct habitat losses. However, increased use of these areas for recreation has increased the potential for human disturbance to wildlife and vegetation.

The more mobile species, such as lynx and wolverine, have large home ranges that are likely to be affected by future land development. Lynx linkage areas have been identified on U.S. Forest Service and Bureau of Land Management lands along the Corridor and include the following areas:

- Dowd Canyon connects north and south habitats. Residential development on the north along the Eagle River and to the south toward Minturn is expected to affect lynx crossing in this area.
- West Vail Pass is an ideal linkage between habitats and might be affected by increased winter recreation use.
- Officers Gulch connects habitat between the Tenmile Mountain Range, the Leadville area, and the Eagles Nest Wilderness Area. Continued development of the Breckenridge area will affect this linkage, which is the principal lynx habitat connection between Copper Mountain and Frisco.
- Laskey Gulch is part of a large linkage area that connects Loveland Pass, Peru Creek, and Jones Gulch. Continued development in parts of this linkage (such as in Keystone Resort, Jones Gulch, Breckenridge-Frisco area) will affect species movements.
- Herman Gulch connects lynx habitat and also contains boreal toad habitat along the Clear Creek drainage. Increased recreation that occurs from increased access and population centers outside the area is likely to affect the more sensitive species (such as lynx).

Alternatives: Direct impacts on key wildlife habitats from the Action Alternatives are limited to approximately 111 to 443 acres (representing 0.02 to 0.3 percent of the total evaluated area). These impacts are relatively minor when compared to baseline conditions; impacts from existing and planned development would affect 10 percent to 49 percent of the total evaluated area. **Table 5** shows estimated impacts for the baseline condition and alternatives.

Table 5. Cumulative Impacts (acres) on Key Wildlife Habitat in the Corridor

Alternative	Deer	Elk	Bighorn Sheep	Songbird	Total Wildlife	Increase over Baseline
Baseline	45,800	36,600	8,300	20,600	111,300	
No Action	45,800	36,600	8,300	20,600	111,300	0%
Minimal Action	45,800	36,600	8,400	20,600	111,400	0%
Transit	46,000	36,800	8,500	21,000	112,300	1%
Highway	50,000	40,100	8,700	25,000	123,800	11%
Combination	53,500	45,000	8,900	29,000	136,400	23%
Preferred Alternative	46,000 to 53,500	36,800 to 45,000	8,500 to 8,900	21,000 to 29,000	112,300 to 136,400	1% to 23%

Areas of key wildlife habitat, threatened and endangered species movement areas, and linkage interference zones could experience increased pressure from induced development from the Combination

and Highway Alternatives, due to the considerable induced growth that local planners expect there. (This induced growth is a conservative estimate of a possible future scenario that may not be sustainable.) This is particularly the case in the Eagle River Watershed. The alternatives all include implementation of mitigation strategies to reduce the barrier effect of the Corridor and its improvements. Cumulative impacts that could affect threatened and endangered species include increased human intrusion into their habitats, habitat losses, and effects to their movement corridors from land development. Most of the habitat for these species is on U.S. Forest Service and Bureau of Land Management (BLM) lands, which provide some protection from direct habitat losses. However, increased use of these areas for recreation could place additional stress on these species (see recreation discussion below).

Summary: The past and present effects of I-70 construction and residential and commercial growth in the Corridor have substantially changed the health of the natural vegetation communities; wildlife; and threatened, endangered and special status species, resulting in habitat loss and fragmentation. This relationship has generally been a linear relationship between the action and the damage to the resource. Reasonably foreseeable future actions (such as ski area expansions and ongoing commercial and residential development) are likely to continue to negatively affect Corridor wildlife and fisheries resources, in a linear fashion. The Action Alternatives result in further impacts to 1 percent to 23 percent of existing acres of wildlife habitat.

A Landscape Level Inventory of Valued Ecosystem Components (ALIVE) Memorandum of Understanding, described further in **Section 3.2.7** and **Section 3.19**, of the *I-70 Mountain Corridor PEIS* (CDOT, 2010) defines actions that could partially mitigate impacts associated with the barrier effect of the Action Alternatives. Actions defined in the Stream and Wetland Ecological Enhancement Program (SWEEP) Memorandum of Understanding, described further in **Section 3.2.7** and **Section 3.19** of the *I-70 Mountain Corridor PEIS* (CDOT, 2010), partially mitigate impacts to riparian areas, wetlands, and streams within the Corridor. The impacts of Corridor improvements are substantial when combined with the past, present and reasonably foreseeable cumulative impacts to biological resources, and based on the effectiveness of implemented mitigation. Local agencies' adoption of land use policies that preserve open space adjacent to the crossings is a key to effective mitigation of wildlife crossings.

4.3 Wetlands

Cumulative impacts on wetlands are assessed within watersheds along the Corridor. There is a range of issues related to loss of area and decreases in functional value, defined as a change in wetland function from a more productive function, such as wildlife habitat, to a function that is more basic, such as pollution abatement. Loss of area is primarily caused by construction (earthmoving) but also by increased runoff rates, stream incision, and loss of hydrology. Similarly, decreases in functional value (for example, habitat) may be caused by loss of hydrology and by input of sediments and contaminants from developed areas, including impervious surfaces. Functional value is also decreased by invasion of introduced and weedy plant species.

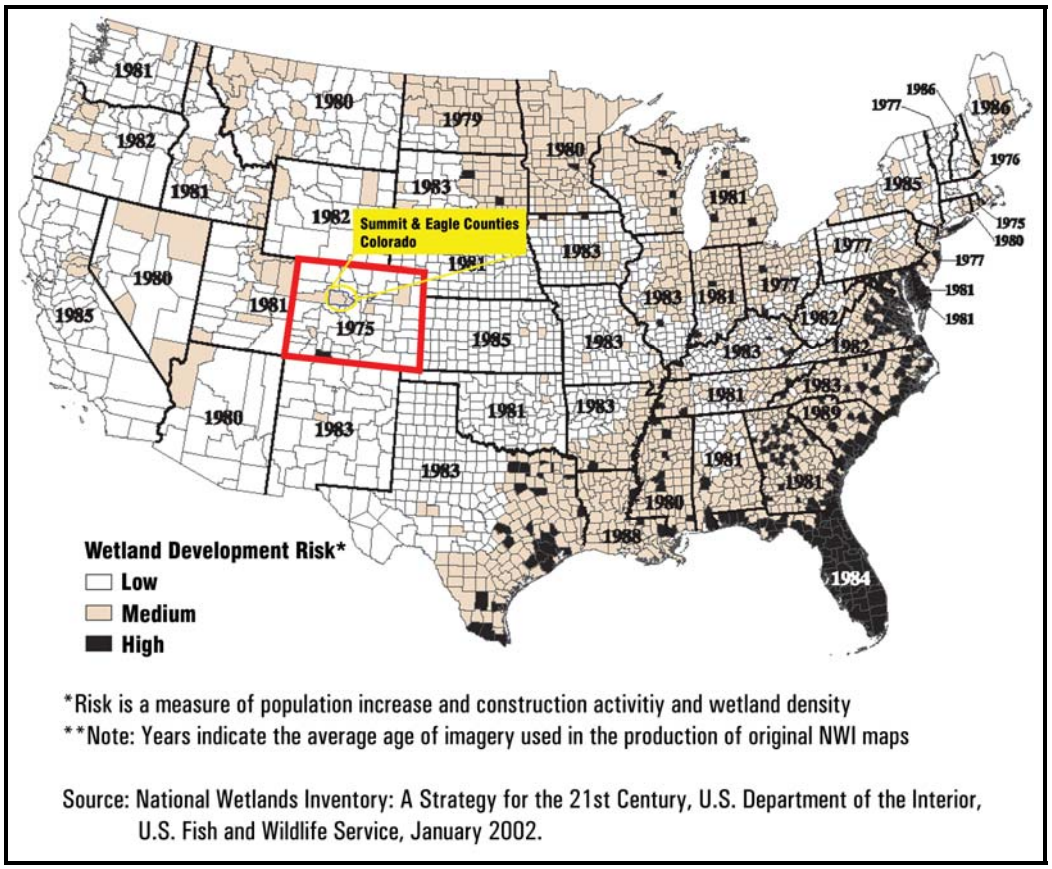
Corridor wetlands have been affected by historic mining practices, including runoff from waste materials, placer mining, mine drainage into wetland areas, mineralized rock, and disturbance of mining materials from urbanization and highway construction. However, historic mining impacts on Corridor wetlands are not well documented and, therefore, were not available for inclusion in the assessment of cumulative impacts. Wetland impacts from the construction of existing I-70 are not documented because much of I-70 was constructed during a time when these impacts did not require Corps of Engineers permits. Because I-70 was constructed primarily along valley floors adjacent to many of the drainage systems in the corridor, impacts on wetlands were likely extensive.

The effects of continued population growth and development pressure on the ecological integrity of aquatic ecosystems are of national concern, as recognized by the U.S. Fish and Wildlife Service in *Goal 1*

–*Strategic Mapping*, of the *National Wetland Inventory: A strategy for the 21st Century* (2002). This report states "As the US population continues to grow, additional stresses resulting from human activities will be placed on wetlands."

As shown on **Figure 8**, the U.S. Fish and Wildlife Service (2002) has rated the wetland development risk (low, medium or high) of population and construction activity increases to wetlands for each county of the lower 48 states to prioritize areas to update existing National Wetland Inventory (NWI) maps. In Colorado, two counties in the Corridor, Eagle and Summit, have been assigned a medium risk rating, indicating a concern for development to affect wetlands.

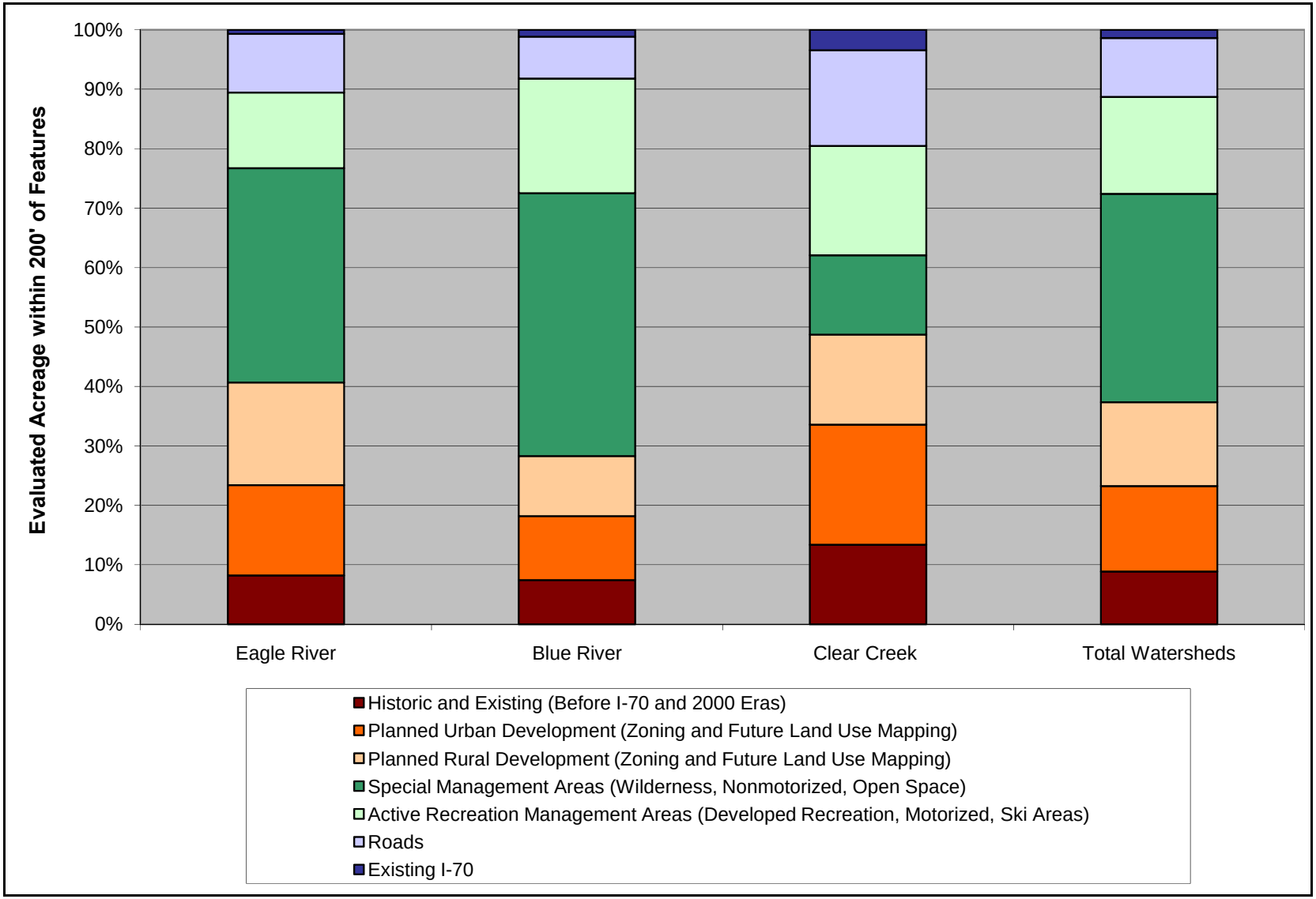
Figure 8. Potential Development Pressures on Wetlands



Impacts from existing and planned development to wetlands within the watershed study area are illustrated in **Appendix A** located at the end of this Technical Report. Historic, existing, and planned development within 200 feet of wetlands is quantified and illustrated on **Chart 7**. In addition, forest management, recreation, and open space uses, as well as roads including I-70, within 200 feet of wetlands are quantified. Potential impacts on wetlands at the watershed level were considered to be likely within 200 feet of the wetlands, which is the area that is susceptible to increased sedimentation, runoff, and loss.

Within the watershed study area, existing development occupies approximately 10 percent of the evaluated area within 200 feet of wetlands. Planned development would increase impacts within 200 feet of wetlands from the existing development impacts of 10 percent (6,600 acres) to 49 percent (32,000 acres) of the evaluated area. The remainder of the watershed area within 200 feet of wetlands would continue as forest management, recreation, and open space uses, which would protect wetland resources within the watershed study area.

Chart 7. Wetlands Affected Environment



The cumulative effects of stream channelization from highway construction and development within the Corridor have resulted in urbanized waterways and changes in stream morphology, including loss of wetlands and loss of functional value. Stream morphology is altered as the stream channel is constricted and floodplain areas are eliminated by highway fill material. As a result, wetlands are often confined to narrow areas along the stream bank. Several streams along I-70 have these characteristics, especially as they pass through urbanized areas. Stream hydrology is also affected by stream channel constriction and less surface area, generally causing water velocity to increase. This increase in velocity can result in erosion of streambed and bank material, which can result in deposition of sediment in wetland areas where the stream energy gradient is lower. The consequences of changes to stream channel morphology are generally long term and can translate into long-term potential cumulative impacts on wetlands.

Alternatives: Action Alternatives have relatively minor direct impacts to water resources and wetlands (up to 0.3 percent of the developed area) when compared to potential impacts from induced growth and development. In the Eagle River watershed, Transit Alternatives increase impacts slightly over baseline conditions (additional increase of approximately 500 acres) because of the ability to concentrate induced growth in urban areas. Highway and Combination Alternatives increase impacts by 3,000 acres and 5,000 acres respectively. The Preferred Alternative ranges in impacts from 500 acres to 5,000 acres. In the Blue River and Clear Creek watersheds, the lead agencies anticipate no increases in impacts with the Transit and Highway Alternatives, because the induced growth from these two alternatives would not impact estimated wetland areas. Combination Alternatives have the potential to induce growth and development in the Blue River watershed (increasing acreage impacts by approximately 2,200 acres). Preferred Alternative impacts range from no impacts to 2,200 acres. This induced growth is a conservative estimate of a possible future scenario that may not be sustainable. In the Clear Creek watershed, wetland impacts from the Combination Alternatives and the Preferred Alternative Maximum Program would be limited to direct impacts because no induced growth impacts are anticipated.

Summary: Nationally and within Colorado there is a loss and degradation of wetlands from development-related impacts occurring in a generally linear fashion. Reasonably foreseeable future actions without mitigation could continue this existing trend of wetland loss. Although the Action Alternatives increase the amount of Corridor wetland impact in the future, when combined with the past, present and reasonably foreseeable future cumulative impacts to wetlands, the lead agencies do not expect the Action Alternatives to deviate from the existing trend of wetland loss on the national, state, or Corridor level. [*National Water Summary on Wetland Resources*, U.S. Geological Survey Water Supply Paper 2425, as found on http://water.usgs.gov/nwsum/WSP2425 (U.S. Geological Survey, 1999).] To minimize the impact of the Action Alternatives on this existing trend, the project at Tier 2 will adhere to wetland mitigation guidance/regulation for wetland impacts and would adhere to the requirements of Stream and Wetland Ecological Enhancement Program.

Within the Corridor the past actions of ski area development, I-70 construction, and residential and commercial development have all resulted in loss and degradation of Corridor wetlands.

4.4 Water Resources

4.4.1 Historic Mining

The affected environment for historic mining cumulative impacts includes a portion of the Eagle River watershed and the entire Clear Creek watershed. Existing conditions represent impacts on water quality from runoff from historic mining waste materials, placer mining, mine drainage into streams, mineralized rock, and disturbance of mining materials from urbanization and highway construction.

Cumulative impacts from historic mine waste materials are represented by existing conditions combined with direct impacts reflected in zinc and copper from highway runoff. Zinc and copper contributions from I-70 were evaluated for each alternative using the ”Pollutant Loadings and Impacts from Highway Stormwater Runoff” (Driscoll, et al., 1990). Water quality monitoring results indicate that metals loading occurs only in highly mineralized or historic mining areas. Corridor streams affected by metals include Tenmile Creek and Clear Creek. Heavy metals in runoff are primarily the result of historic mining activities, and impacts from highway runoff sources are minimal in comparison. However, disturbance of historic mining materials and mineralized rock has occurred as a result of I-70 construction, allowing dissolution and transport of heavy metals in stormwater runoff.

Blue River Watershed

The source of metals in Tenmile Creek is primarily upstream of the Corridor at the Climax Mine. I-70 does not intercept appreciable amounts of mine waste materials in lower Tenmile Creek and, therefore, does not substantially influence metals loading in the Blue River watershed.

Clear Creek Watershed

In the Clear Creek watershed, I-70 was constructed through mineral deposits and mine waste residue using cut-and-fill methods. In these areas, I-70 runoff has the potential to contribute metals loading to Clear Creek through the process of erosion and sediment transport, as well as dissolution of soluble metal salts. These mechanisms have the potential to increase metal loads in Clear Creek and can be directly related to I-70 construction. Water quality sampling results indicate increased metals concentrations in runoff from I-70 and its associated shoulders and median areas between Idaho Springs and Dumont. This is also likely to be the case in the Georgetown Hill and Silver Plume areas that were heavily mined, although no data are yet available to support this contention.

The cumulative effects of land use changes on metals loading in Clear Creek are not likely to change appreciably from existing conditions. Instead, development of residential, commercial, and urban areas may create a landscape that reduces metal mobility in heavily mined areas such as Clear Creek. For example, mine waste may be removed or covered with impervious materials (such as in parking lots) or vegetation. In Central City and Black Hawk (in Gilpin County), much of the mine waste residual has been removed and disposed of offsite, used as structural fill, or paved for parking lots and roads. This land cover change results in a net reduction in metals transport when compared to formerly exposed mine waste piles. In addition, the construction of I-70 has effectively “capped” mine waste in situ with pavement throughout many areas of Clear Creek County. This capping has likely resulted in reduced metal transport from many of the formerly exposed mine waste piles.

4.4.2 Streams

An analysis of stream encroachment and channelization due to I-70, as well as other developments, was conducted by overlaying the current I-70 footprint and adjacent roadside cut-and-fill slopes on historic (1956) aerial photography.

Geographic information system layer data (locations of existing and planned development; streams, open water, wetlands) were used to estimate disturbance to these water resources within the watershed areas. A conservative 200-foot impact zone is used in the analysis. The 200-foot zone was selected to generally represent impacts from encroachment, direct loss of the resource, and indirect impacts such as increased sedimentation, increased recreational use, and habitat and water quality degradation. Existing and historic impacts on water resources are provided for comparison with planned development impacts and I-70 impacts. Existing and planned development would account for 46 percent of the evaluated watershed area of Eagle River. Planned development is expected to increase stream/open water/wetlands impacts by more than three times the existing acreage (comprising 32 percent of the evaluated area) in the Blue River

watershed. Impacts on streams/open water/wetlands are expected to increase by more than four times existing conditions due to planned development in the Clear Creek watershed. This area amounts to 85 percent of the evaluated watershed area.

4.4.3 Water Quality

Phosphorus was selected to represent overall cumulative water quality impacts due to its ability to reflect sediment/suspended solids in runoff. High levels of phosphorus can result in water that is toxic to aquatic life. [See *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, August 2010) for more details.] Stream total phosphorus concentrations are influenced by roadway runoff, as well as other nonpoint sources (including sources from planned development) that contribute sediment loading. Point source discharges from wastewater treatment plants also contribute to phosphorus loading in receiving waters. The BASINS model was used to determine water quality impacts in terms of phosphorus loads. The BASINS model, which stands for Better Assessment Science Integrating Point and Nonpoint Sources, is a watershed model that integrates data and assessment tools in a customized Geographic Information Systems environment for performing water quality analysis. Water quality impacts from stormwater runoff reflect possible increased sediment and contaminants from development and roadways. Note that the I-70 highway area was modeled to include all disturbance areas, not just the road surface. Therefore, I-70 contributions generally represent existing conditions, as well as contributions by the Action Alternatives themselves. This land use scale model is not sensitive enough to differentiate among Action Alternatives.

Planned development in the Corridor is expected to increase phosphorus loads by 23 percent from existing conditions (see **Chart 8**). I-70 contributes 6 percent of the total existing/planned development phosphorus load. The greatest impacts on water quality from planned development are indicated in the Eagle River watershed (see **Chart 9**).

Corridor water quality can also be affected by water supply issues. Water supply diversions can decrease stream flows (and the ability of a stream to dilute potential contaminants) and increase concentrations of potential pollutants. Corridor growth and development are expected to increase water supply demands.

Eagle River Watershed

The total phosphorus load was computed using the BASINS model for each of 84 drainage sub-basins. Planned development is estimated to increase phosphorus loads by 34 percent. I-70 contributes 7 percent of the total existing/planned development phosphorus load.

To facilitate comparison of principal areas, the watershed was divided into the Upper Eagle River (above Dowd Canyon), Gore Creek, Middle Eagle River (above Wolcott), and Lower Eagle River basins. In addition, separate model runs were executed to calculate the total phosphorus for each drainage sub-basin intersected by I-70 to isolate the relative percent contribution of loading from the highway. I-70 follows Gore Creek through the Vail Valley and the middle and lower Eagle River to Dotsero. Drainage sub-basins indicating high phosphorus loads under existing conditions include Gore Creek, Mill Creek, and Middle Eagle River. Results indicate that the total annual contribution of phosphorus loading from I-70 runoff to Gore Creek is 24 percent. The I-70 phosphorus contribution to Middle Eagle River is 11 percent, and lower Eagle River is 8 percent. These watershed locations are shown on **Figure 3.4-1** of the *I-70 Mountain Corridor PEIS* (CDOT, 2010).

Chart 8. Water Quality Affected Environment, Phosphorus Load

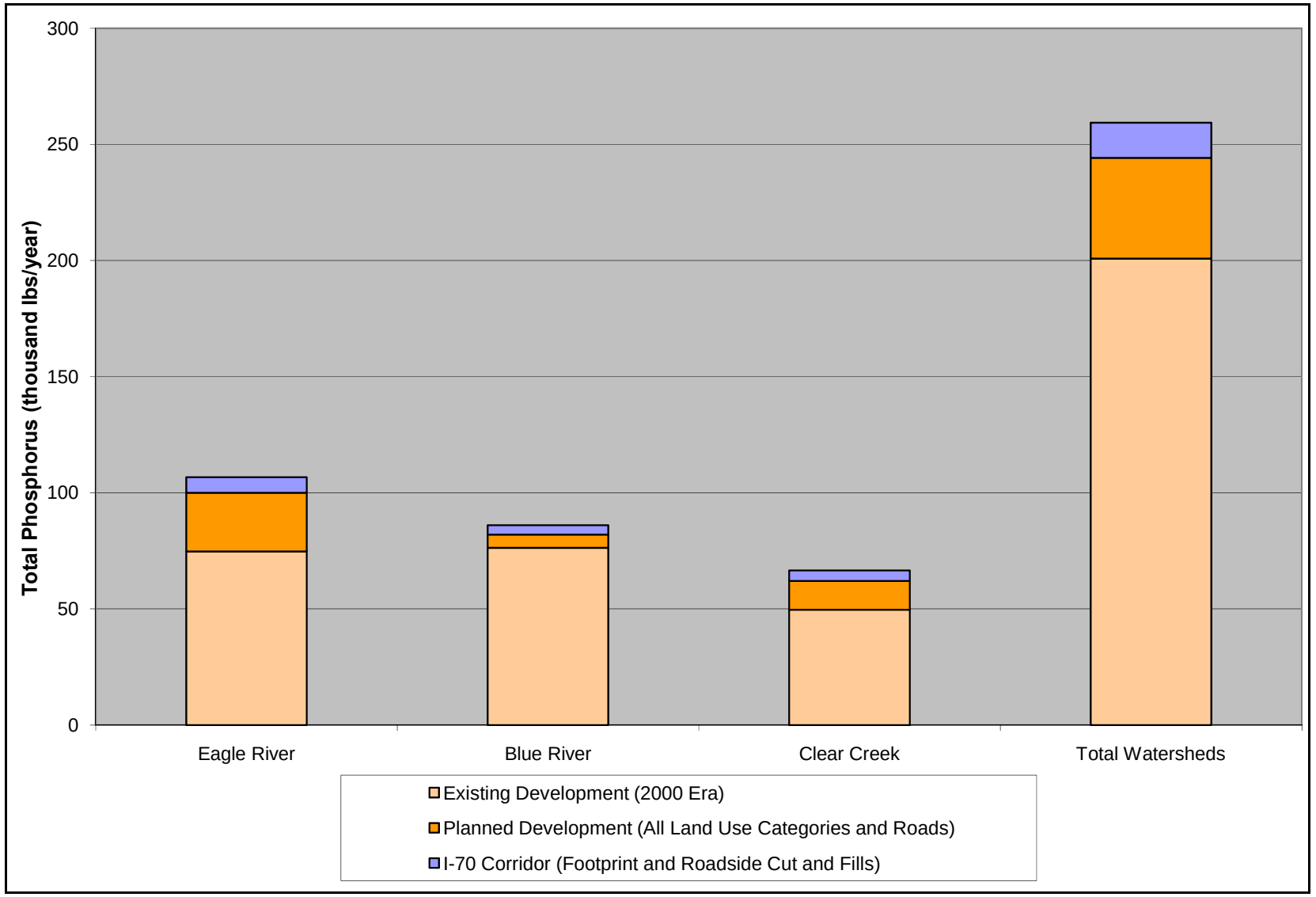
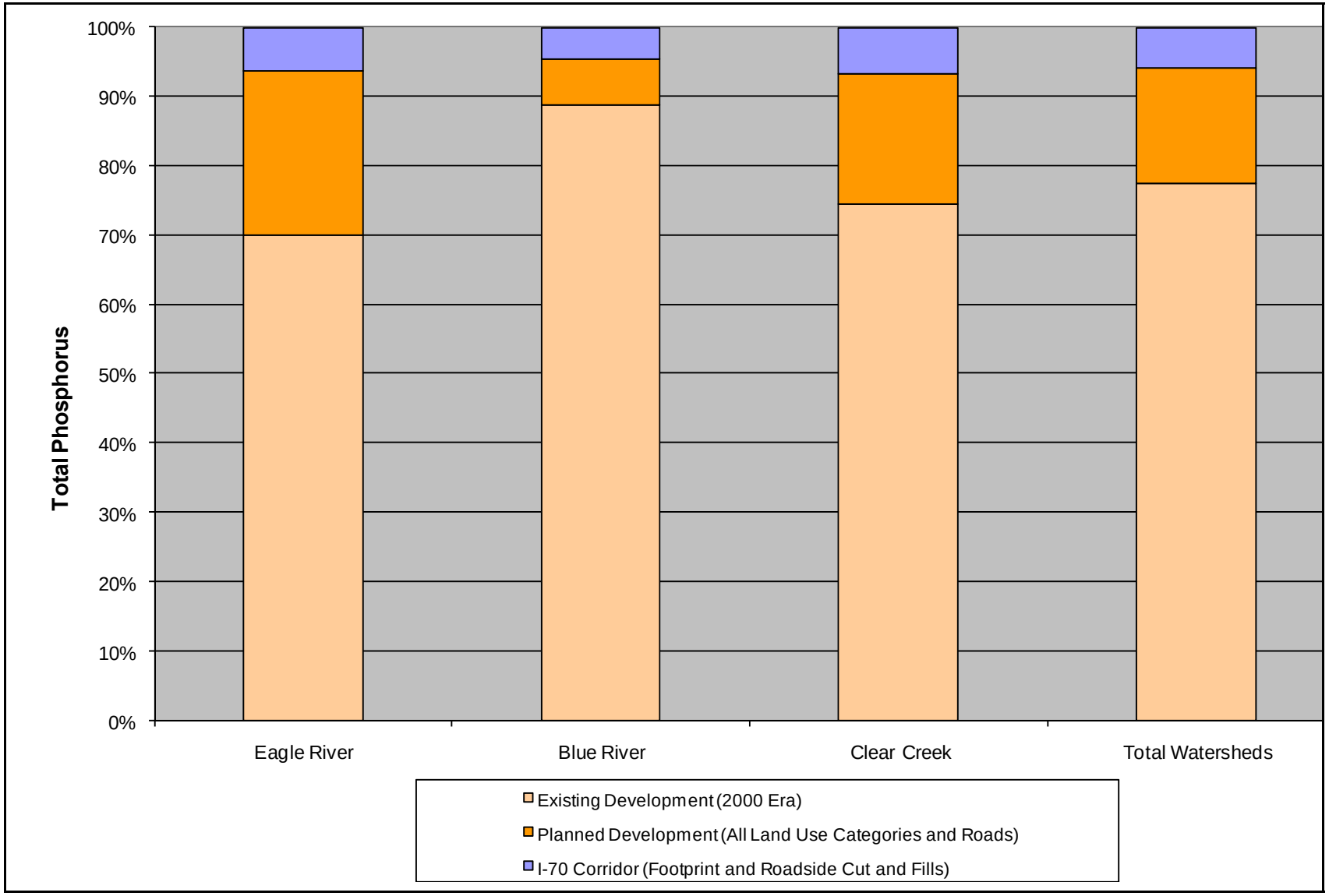


Chart 9. Water Quality Affected Environment, Planned Development Impacts



Blue River Watershed

The Blue River watershed encompasses Summit County. The total phosphorus load for the watershed was computed using the BASINS model for each of 63 drainage sub-basins. Planned development is estimated to increase phosphorus loads by 7 percent. I-70 contributes 5 percent of the total existing/planned development phosphorus load.

To facilitate comparison of principal hydrologic units, the watershed was divided into major tributary areas including the Snake River, Tenmile Creek, Blue River mainstem above Dillon Reservoir, Middle Blue River above Green Mountain Reservoir, and lower Blue River below Green Mountain Reservoir. Results indicate I-70 has high phosphorus impacts in localized watersheds. The principal drainage basins showing the largest overall increase in total annual phosphorus loading between existing and future planned development conditions include the Blue River above Dillon and the Blue River at Silverthorne. Drainage sub-basins with high existing phosphorus loads from existing land uses include the Blue River at Breckenridge, Blue River at Gold Hill, and Blue River at Silverthorne (indicative of a high level of development).

I-70 follows Tenmile Creek to Wheeler Junction and West Tenmile Creek to the summit of Vail Pass. Tributary streams in this area that can be directly affected by runoff from I-70 include West Tenmile Creek, Lower Tenmile Creek, Officers Gulch, Uneva Lake, North Tenmile Creek, and Meadow Creek. Results indicate that the total contribution of annual phosphorus loading from I-70 runoff to Tenmile Creek above Dillon Reservoir is 11 percent. I-70 intersects the Blue River at Silverthorne. Tributary streams in this area that are directly affected by runoff from I-70 include Straight Creek and Salt Lick Gulch. Results indicate that the total annual contribution of phosphorus loading from I-70 runoff to a 3-mile stretch of the Blue River in this area is 24 percent (between Dillon Dam and Bushee Creek).

Clear Creek Watershed

The Clear Creek watershed encompasses Clear Creek County, along with portions of Gilpin and Jefferson counties. The total phosphorus load for the watershed was computed using the BASINS model for each of 23 drainage sub-basins. Planned development is estimated to increase phosphorus loads by 28 percent. Existing I-70 contributes 4 percent of the total existing/planned development phosphorus load.

To facilitate comparison of principal hydrologic units, the watershed was divided into major tributary areas including Upper Clear Creek, West Fork Clear Creek, Middle Clear Creek above Idaho Springs, Lower Clear Creek through Idaho Springs, North Fork Clear Creek, and Lower Clear Creek from US 6 to Golden. Drainage sub-basins with high total phosphorus loads include Clear Creek mainstem from South Fork to North Fork, and Eureka Gulch (indicative of a high level of development). The principal drainage basins showing the largest overall increase in total annual phosphorus loading between existing and future planned development conditions include Middle and Lower Clear Creek, North Fork Clear Creek, and Lower Clear Creek US 6 to Golden. Results indicate I-70 to have high impacts in localized watersheds. I-70 bisects or parallels tributaries or the mainstem of Clear Creek throughout the Corridor. Model results indicate that the total annual contribution of phosphorus loading from I-70 runoff to Upper Clear Creek is 30 percent, I-70 contributions to Middle Clear Creek are 14 percent, and I-70 contributions to Lower Clear Creek are 7 percent.

4.4.4 Stream Morphology and Habitat

The cumulative effects of stream channelization from highway construction and development within the Corridor have resulted in urbanized waterways and changes in stream morphology including loss of riparian vegetation and aquatic habitat. Stream morphology is altered as the stream channel is constricted and floodplain areas are eliminated by highway fill material. As a result, riparian vegetation is often confined to narrow areas along the stream bank. In addition, these areas are subject to annual flooding that can destroy any riparian vegetation that becomes established. Several streams along I-70 have these characteristics, especially as they pass through urbanized areas.

Stream hydrology is also affected by stream channel constriction and less surface area, generally causing water velocity to increase. This increase in velocity can result in erosion of streambed and bank material, which is deposited further downstream in lower gradient areas where the stream energy gradient is lower. Although stream bank/bed erosion also occurs as a natural process in Corridor streams, stream channelization for the construction of I-70 and U.S. 6 and U.S. 40 has exacerbated the degradation and aggradation of (or deposition of sediment in) areas of stream channel.

There are two examples within the Corridor where stream aggradation appears to be occurring as a result of past channel disturbances:

- Clear Creek is heavily constricted and channelized along I-70 upstream of the town of Silver Plume. The stream appears to be depositing material in a lower gradient section on the upstream end of Silver Plume.
- The Gore Creek channel was rerouted to accommodate construction of the Vail Golf Course in the 1960s. This section of Gore Creek appears to be aggrading as evidenced by the deposition of large volumes of sand and gravel material.

The consequences of changes to stream channel morphology are generally long term and can translate into long-term potential cumulative impacts on aquatic and riparian habitat, water conveyance, flooding, infrastructure, and roadway and urban development in these areas. Any of the transportation alternatives that would result in further stream constriction or channelization (which includes all Action Alternatives) would likely have long-term cumulative impacts.

Clear Creek Watershed

A detailed study of existing habitat conditions and I-70 disturbance was available for the Clear Creek watershed. The study allowed cumulative impacts on stream habitat in this watershed to be assessed based on existing habitat conditions. Comparable information was not available for the Eagle River and Blue River watersheds, and these issues are addressed qualitatively for these watersheds.

A *Catalog of Stream Habitat Quality for Clear Creek and Tributaries* (Colorado School of Mines, 2002) is a project to catalog habitat quality of Clear Creek stream reaches along the Corridor. The catalog documents the existing physical habitat conditions of Clear Creek and its major tributaries to identify stream reaches in key need of restoration, and characterizes major constraints on habitat quality in the watershed. The assessment evaluated 10 habitat parameters applying a systematic (EPA) numeric scale from 0 to 20 to rate each parameter. The following habitat parameters were evaluated:

- Epifaunal substrate cover
- Substrate embeddedness
- Velocity/depth regimes
- Sediment deposition
- Channel flow status

- Channel alteration
- Pool percentage
- Bank stability
- Vegetative protection
- Riparian width

The Colorado School of Mines study indicated that I-70 construction/operation and Corridor urbanization are major causes for poor habitat conditions in many reaches of Clear Creek under existing conditions.

4.4.5 Cumulative Impacts: Water Resources

Cumulative impacts on water quality from the various sources in the Corridor combine in a relationship that is multiplicative—that is, they combine in a compounding manner so that the resource receives greater negative effect as different sources combine.

Sources that result from historic mining waste materials and mineralized rock include the following:

- Runoff from historic mining waste materials
- Disturbance of placer mining areas by stream flow
- Mine drainage into streams
- Runoff from mineralized rock
- Disturbance of mining materials from urbanization and highway construction

Cumulative impacts on water quality from historic, existing, and planned development include the following:

- Stormwater runoff from roadways, urban and rural areas (various land use types) reflected in phosphorus loads impacting water quality and associated resources (such as wildlife and recreation)
- Sand and deicer loads from roadway winter maintenance

Physical impacts on streams and from historic, existing, and planned development include the following:

- Encroachment/impacts on stream functions (hydrology and aquatic/riparian habitat caused by development activities, increased recreation, and roadway construction)
- Direct disturbance or channelization of streams caused by development activities and roadway construction

The magnitude of impacts on water resources from historic mining is based on existing metals loading and identified impaired segments in Corridor streams. Contributing impacts from I-70 roadway disturbance of mining materials are considered minimal in comparison to historic mining. The magnitude of cumulative impacts on water quality from existing and planned development is determined using the BASINS stormwater runoff model. I-70 impacts on water quality are determined based on the FHWA Driscoll stormwater runoff model. Continued water quality monitoring activities will address possible cumulative effects of alternatives and are coordinated by the SWEEP committee.

Impacts from Historic Mine Waste Materials

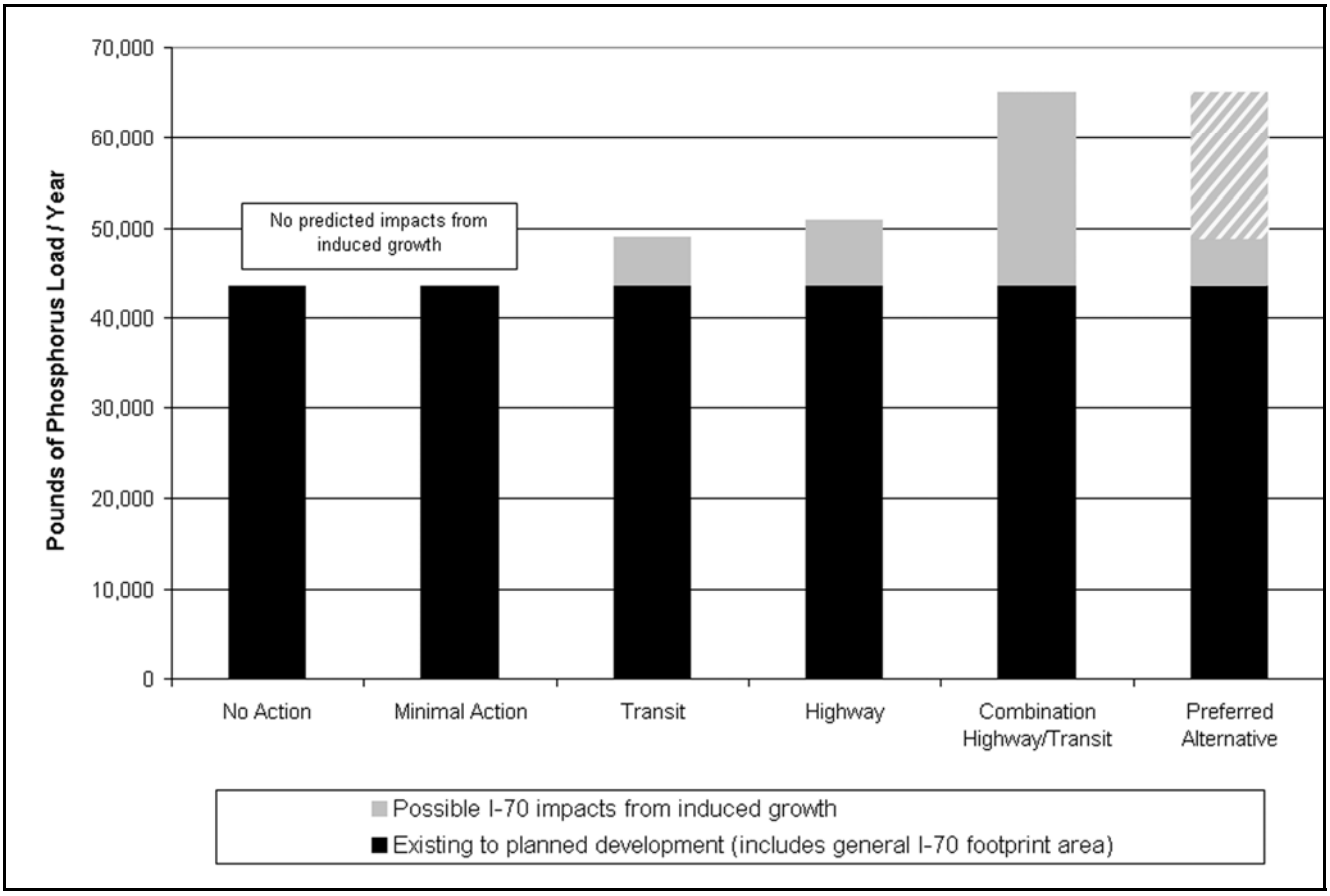
Cumulative impacts on metals loading in the Clear Creek watershed from the Action Alternatives are considered to be minimal because I-70 associated mitigation activities are expected to decrease metals loading in stormwater runoff. Because the construction of existing I-70 has effectively “capped” mine waste in situ with pavement throughout many areas of Clear Creek County, as noted above, metal

transport from many of the formerly exposed mine waste piles has been reduced. This will continue to be the case for any of the proposed alternatives, particularly where more pavement is used. However, new or substantially larger rock cuts that intercept highly mineralized zones or surface mine wastes that remain exposed might create additional metal transport and loading in Clear Creek. Mitigation of such impacts will be addressed during Tier 2 processes and during the construction and operation of I-70. Mitigation activities are expected to improve existing water quality conditions in relation to runoff and metals leaching from historic mine waste materials. Construction and operational details in these specific areas will be required before any predictions of water quality impacts can be made.

Impacts on Water Quality

Most of the cumulative impacts on water quality in Corridor streams will be the result of planned urban and rural development, which increases both point and nonpoint source loads of total phosphorus (see **Chart 10**). As noted earlier, direct impacts from I-70 are generally included in the changes from existing to planned development in the BASINS modeling study.

Chart 10. Cumulative Impacts on Water Quality



The Maximum Program presents the range of impacts that occurs with the Preferred Alternative. The solid bar represents the implementation of the Minimum Program only. The hatched bar area shows the range of the Maximum Program. It is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. The top end of the bar represents the full implementation of the Maximum Program. ***Section 2.7*** *of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.*

Secondary water quality impacts from possible induced growth would be more localized to areas of Eagle and Summit counties. Transit Alternatives are expected to possibly induce growth in urban areas with transit centers including Eagle, Avon, Vail, Dillon, and Silverthorne. Highway and Combination Highway/Transit Alternatives are expected to possibly induce some amount of dispersed growth in rural areas, possibly leading to the greatest cumulative impacts on water quality from new development activities (including possible induced growth). Induced growth associated with Combination Alternatives has the potential to increase phosphorus loads by an additional 50 percent beyond the expected change due to planned development.

The Preferred Alternative has a range of possible water quality impacts, from a lower phosphorus load similar to the Transit Alternatives to a higher amount more similar to the Combination Highway/Transit Alternatives.

Eagle River Watershed

Modeling results indicate I-70 to have high phosphorus impacts in localized Eagle River basins. The principal drainage basins showing the largest increase in total annual phosphorus loading between existing and future planned development conditions are Gore Creek and Middle Eagle River. The greatest impacts on stormwater quality from the Action Alternatives would be the result of possible induced growth and development. Transit, Combination Highway/Transit Alternatives (including the Preferred Alternative), and to a lesser extent Highway Alternatives have the potential to induce growth and development in the Eagle River watershed and might cause additional impacts on water quality as shown on **Chart 11.** Transit Alternatives are expected to concentrate induced growth in existing urban areas and around transit centers. This type of growth may increase wastewater treatment plant discharges and/or create the need for additional facilities. Alternatives that include highway improvements are more likely to affect water quality through more dispersed development activities.

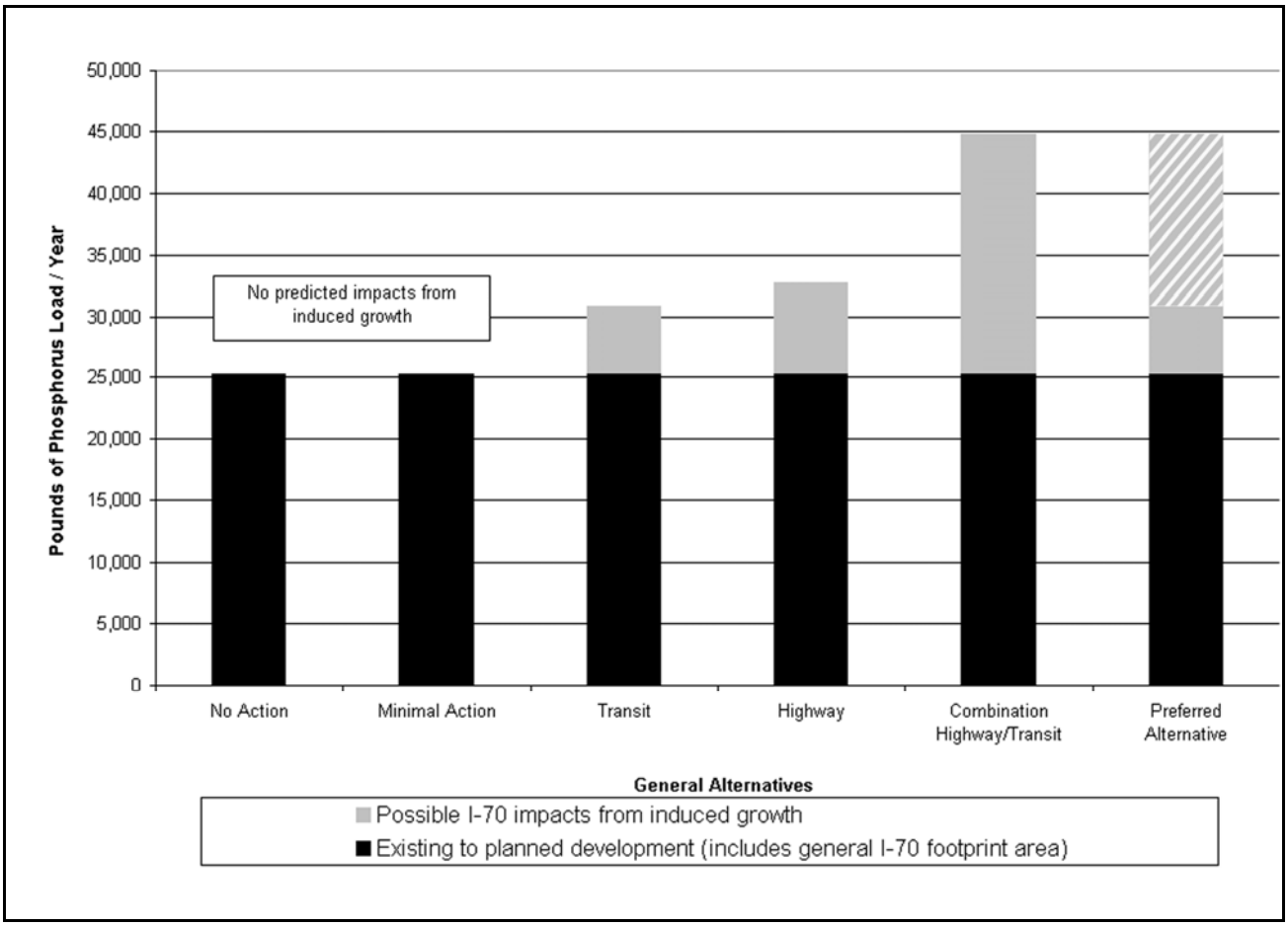
Blue River Watershed

The principal drainage basins showing the largest overall increase in total annual phosphorus loading between existing and future planned development conditions include the Blue River above Dillon and the Blue River at Silverthorne. Localized impacts from phosphorus loading from I-70 runoff are greatest for Tenmile Creek above Dillon Reservoir and a 3-mile stretch of the Blue River (between Dillon Dam and Bushee Creek). The greatest cumulative impacts on stormwater quality from the Action Alternatives would be the result of possible induced growth and development in the Blue River watershed associated with the Combination Highway/Transit Alternatives (an additional 42 percent over the expected change due to planned development) (see **Chart 12**). Localized cumulative impacts are expected to be greatest in basins associated with Dillon and Silverthorne based on previous trends and transit center locations.

Clear Creek Watershed

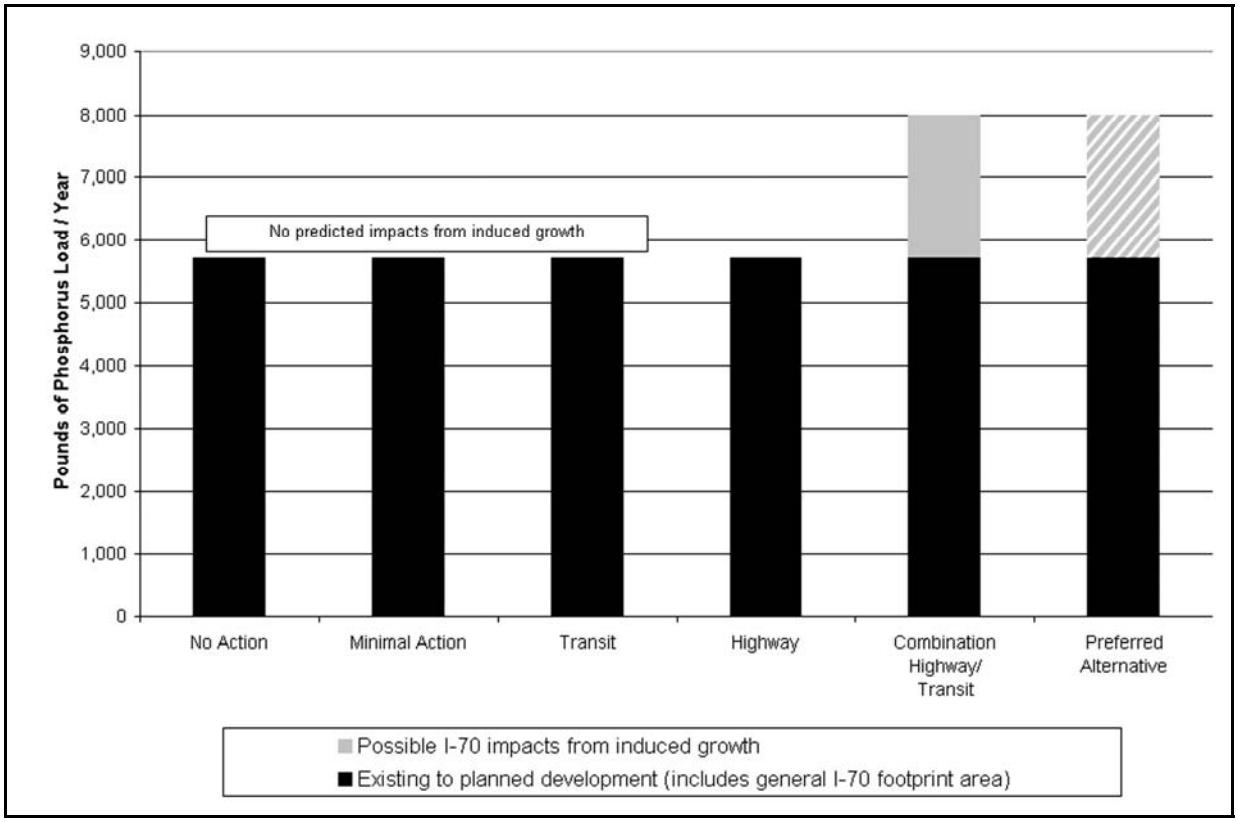
The principal drainage basins showing the largest overall increase in total annual phosphorus loading between existing and future planned development conditions include Middle and Lower Clear Creek, North Fork Clear Creek, and Lower Clear Creek (U.S. 6 to Golden). No impacts from induced growth are predicted for the Clear Creek watershed because of geographic constraints to new development and because past trends have not identified a direct tie between traffic volumes and development in Clear Creek County. Cumulative impacts in Clear Creek watersheds are expected to be greatest for alternatives with impacts in the Middle and Lower Clear Creek basins. Although all Action Alternatives affect these basins, the greatest impacts on streams are associated with the Combination Six-Lane Highway with Rail and Intermountain Connection, Six-Lane Highway, and Rail with Intermountain Connection Alternatives. The Preferred Alternative has a range of possible impacts. If the Maximum Program is implemented, impacts are similar to the Combination Alternatives.

Chart 11. Eagle River Watershed Cumulative Impacts on Water Quality



The Maximum Program presents the range of impacts that occurs with the Preferred Alternative. The solid bar represents the implementation of the Minimum Program only. The hatched bar area shows the range of the Maximum Program. It is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. The top end of the bar represents the full implementation of the Maximum Program. ***Section 2.7*** *of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.*

Chart 12. Blue River Watershed Cumulative Impacts on Water Quality



The Maximum Program presents the range of impacts that occurs with the Preferred Alternative. The solid bar represents the implementation of the Minimum Program only. The hatched bar area shows the range of the Maximum Program. It is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. The top end of the bar represents the full implementation of the Maximum Program. ***Section 2.7*** *of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.*

4.4.6 Impacts on Streams and Stream Habitat and Morphology

Eagle River Watershed, Eagle County

Direct impacts from Action Alternatives could increase impacts on streams by 0.8 to 1.0 percent. The greatest impacts on streams, wetlands, and open waters from Action Alternatives are the result of possible induced growth and development. Transit, Combination Highway/Transit Alternatives, and to a lesser extent Highway Alternatives have the potential to induce growth and development in the Eagle River watershed. The Preferred Alternative has a range of possible impacts. If the Maximum Program is implemented, impacts are similar to the Combination Alternatives. Alternatives with Transit components are expected to have the greatest cumulative impacts on basins associated with Eagle, Avon, and Vail. Because the Gore Creek and Middle Eagle River basins are associated with the greatest increases in planned development, these basins are most affected by cumulative effects from the Action Alternatives.

Blue River Watershed, Summit County

Existing I-70 impacts 1.3 percent of the evaluated area. Although Rail with Intermountain Connection, Advanced Guideway System and the Preferred Alternatives Minimum Program have minor direct impacts

on streams, all alternatives are indicated to negligibly contribute to cumulative impacts (area impacts are approximately the same as existing conditions). The greatest impacts on streams, wetlands, and open waters from the Action Alternatives result from possible induced growth and development. Combination Highway/Transit Alternatives and the Preferred Alternative Maximum Program if implemented have the potential to induce growth and development in the Blue River watershed. Induced growth pressure and possible impacts on streams and stream morphology are indicated to be greatest in basins associated with Dillon and Silverthorne.

Clear Creek, Clear Creek County

Action Alternative impacts were evaluated to determine which stream reaches had the potential for additional channel disturbance and related stream morphology impacts based on historic I-70 impacts. Existing I-70 impacts account for 3.4 percent of the existing/planned development area. Clear Creek stream reach impacts are evaluated by alternative in the following text. The information is provided to give a sense of localized cumulative impacts from the Action Alternatives.

Stream Habitat and Channelization

- **Mainstem 1 (milepost 221 to Georgetown/milepost 227.5).** In Clear Creek Mainstem 1, stream reaches 3, 4, 6, and 9 indicate additional encroachment from Action Alternative footprints. Reaches 3, 6, and 9 are already heavily modified by I-70, whereas reach 4 is only slightly modified. Reaches 3 and 6 are heavily affected by existing I-70 channelization and winter maintenance activities. The cumulative impacts from the Combination Alternatives (including the Preferred Alternative Maximum Program if it is implemented) are detrimental in these reaches, especially in the higher quality reach 4. In addition, construction disturbance zone impacts from Combination Alternatives are indicated for reach 2, which is categorized as pristine. Footprint impacts are indicated for reach 9 for all alternatives, except the Advanced Guideway System and Bus in Guideway Alternatives. Reach 9 has been channelized for I-70 construction, and riprap was used on both banks. The Transit Alternatives have the least cumulative impacts on Mainstem 1 of Clear Creek.
- **Mainstem 2 (Georgetown/milepost 227.5 to milepost 237)**. In Clear Creek Mainstem 2, eight stream reaches would be affected by Action Alternative footprints. Reach 3 is categorized as slightly modified (highest habitat score for Mainstem 2), and footprint impacts are indicated for the Reversible/HOV/HOT Lanes and Combination Highway/Transit Alternatives. I-70 encroachment has constricted reach 5 into a straight channel, and additional footprint impacts are indicated for all alternatives, except the Bus in Guideway Alternatives. Reach 9 (moderately modified) is shown to have the greatest footprint impacts from the Combination Six-Lane Highway with Rail and Intermountain Connection and Combination Six-Lane Highway with Advanced Guideway System Alternatives. The greatest impacts on Mainstem 2 are from the Combination Alternatives, followed by the Rail with Intermountain Connection, Preferred Alternative Maximum Program if it is implemented, and Reversible/HOV/HOT Lanes Alternatives. The least impacts are from the Advanced Guideway System and Bus in Guideway Alternatives.
- **Mainstem 3 (milepost 237 to milepost 245).** Twelve reaches of Clear Creek Mainstem 3 indicate impacts from Action Alternatives. The greatest footprint impacts are indicated for the Rail with Intermountain Connection Alternative. Stream reaches 2, 3, and 12B (moderately modified) are footprint-affected by all Action Alternatives. Reach 2 begins at the bridge next to the Idaho Springs Visitor Center and is constricted by I-70 and the mountainside. Sand from winter maintenance is causing sedimentation in the channel. Reach 3 begins at the I-70 overpass in Idaho Springs and ends at the upstream corner of the Argo Mine property. The reach has been channelized through Idaho Springs and riprap is used to stabilize banks. High footprint impacts on reach 12A (slightly modified) are indicated for the Rail with Intermountain Connection and

Six-Lane Highway 65 mph Alternatives. The least impacts on Mainstem 3 are from the Bus in Guideway Alternatives, followed by the Advanced Guideway System Alternative.

Although the eastern Corridor area (Clear Creek watershed) is not subject to possible induced growth from project alternatives, historic impacts and footprint/construction disturbance impacts associated with project alternatives are associated with possible substantial cumulative effects. **Chart 13** illustrates historic impacts in relation to direct impacts from project alternatives. The greatest footprint impacts are associated with the Combination Alternatives and the Preferred Alternative Maximum Program, if implemented.

Impacts on Fisheries/Riparian and Aquatic Habitat

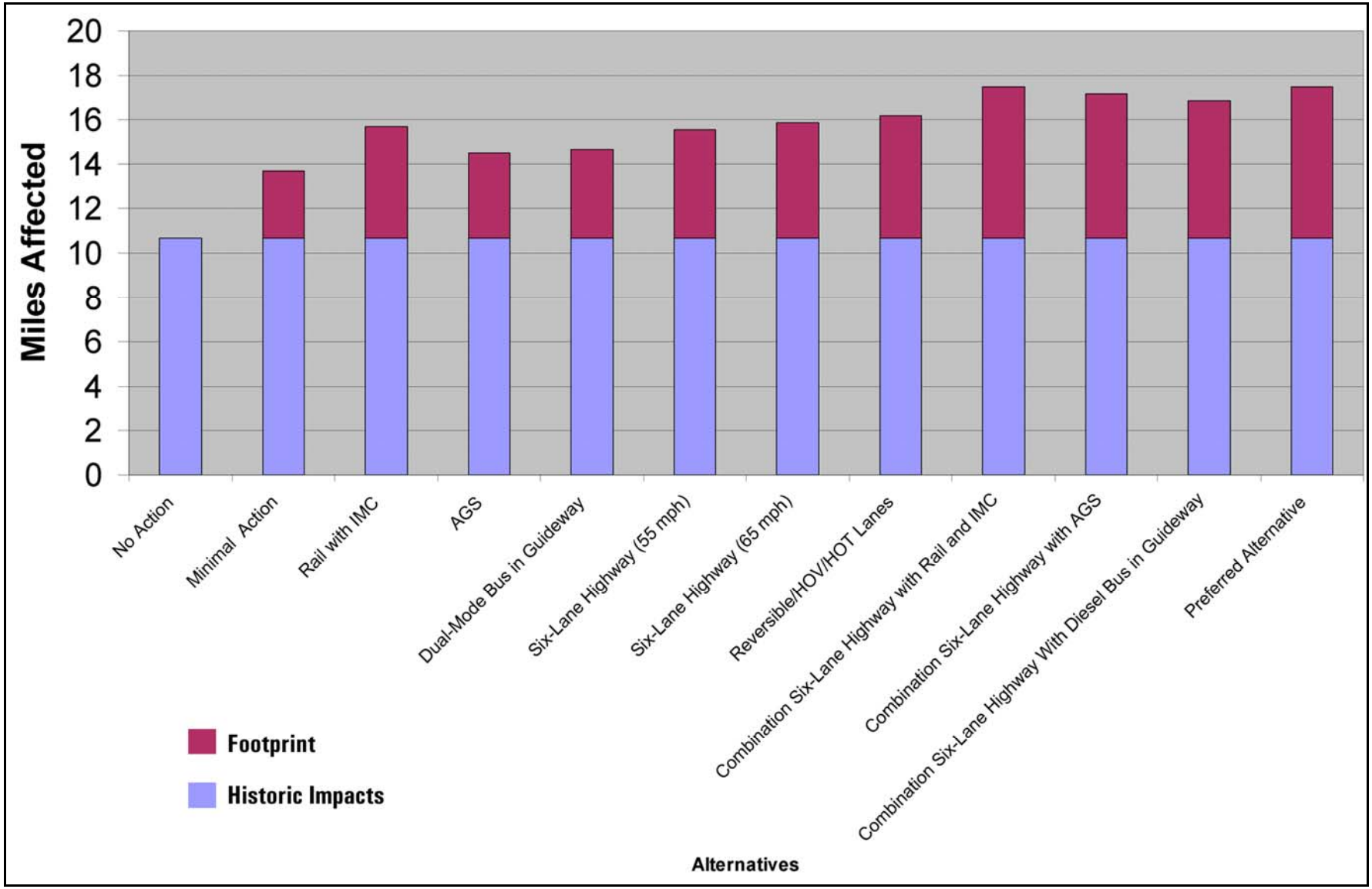
Impacts from planned development are estimated for aggregated water features including streams, wetlands, and open waters. Acreage impacts on streams/open water/wetlands would increase fourfold due to planned development. This amounts to 49 percent of the evaluated area. Impacts on fisheries, and riparian and aquatic habitats are reflected in these impacts from planned development and possible induced growth associated with Action Alternatives. Development activities and increased urbanization would be associated with increased sedimentation, stormwater runoff contaminants, and discharge levels to streams. These factors cause degradation of water quality and fishery value, and changes to stream flow characteristics and aquatic habitat. Encroachment from development causes disturbance and loss of riparian habitat.

Cumulative effects on fisheries includes urban and rural growth and planned development/possible induced development and subsequent effects on stream encroachment, water quality, and fish habitat. Increased population results in a corresponding recreational demand on fisheries. The greatest cumulative impacts on fisheries and riparian/aquatic habitat is associated with the Highway and Combination Alternatives (including the Preferred Alternative Maximum Program if it is implemented) in the western Corridor (Eagle River and Blue River watersheds) due to possible induced growth. Direct impacts on streams from project alternatives have high cumulative impacts on fisheries and riparian/aquatic habitat in the Clear Creek watershed. However, alternative mitigation also offers opportunities for habitat restoration.

Summary: Straight Creek and Black Gore Creek and upper Clear Creek are impaired streams due to sediment loading and the first two currently have Sediment Control Action Plans to develop mitigation strategies for them. A Sediment Control Action Plan is currently under development for Clear Creek as well. The Colorado Department of Transportation is also continuing a water quality monitoring program for suspended solids, phosphorus, chloride, copper, and zinc, pollutants associated with roadways, and adjusting winter maintenance activities to minimize traction sand, sodium chloride and magnesium chloride impacts from highway runoff on receiving streams. The Action Alternatives would further implement permanent water quality sediment catchment basins along other streams that would help improve the water quality along the Corridor. This would indirectly add benefits to water quality from erosion associated with vegetation losses, which may occur from climate change and from other land use changes. Total phosphorus loads are expected to increase along the Corridor as a result of planned land use changes by 2050 and the Action Alternatives could further increase phosphorus and other pollutant loadings from old mining waste but the sediment catchment basins will help trap these phosphorus and other pollutant loads and keep them from entering the waterways.

Impacts associated with the Action Alternatives could also be mitigated by the implementation of stream restoration and other activities as described in **Section 3.4** of the *I-70 Mountain Corridor PEIS* (CDOT, 2010) and as emphasized by the SWEEP to help off-set impacts from the initial construction of I-70. The No Action Alternative would not include these additional sediment catchment basins or stream restoration activities and would therefore result in the greatest negative impact from a cumulative standpoint. When combined with the past, present and reasonably foreseeable future cumulative impacts, the Action

Chart 13. Clear Creek Watershed Cumulative Impacts on Streams



Alternatives would not be expected to have a noticeably negative impact on water resources and water quality and could actually show a beneficial result to water quality in the Corridor over time.

4.5 Social and Economic Values

Historic Impacts from I-70 Construction

An overlay of the current I-70 footprint and adjacent roadside cut-and-fill slopes on historic aerial photography (1956 and 1962) was completed to analyze and quantify historic losses of developed areas due to initial construction of I-70. Before I-70 communities in the Corridor (west of the Continental Divide) have predominantly grown around the I-70 footprint and have not been directly disturbed by the footprint except for areas of historic mining activity located in Clear Creek County. Photographic analysis for developed areas disturbed by I-70 construction for select locations are presented on the maps located at the end of this Technical Report.

Historic losses of developed town areas and historic structures are documented only for communities in Clear Creek County. Approximately 35 acres of Clear Creek County developed lands were lost due to the original I-70 construction (based on 1956 and 1957 photography). The following losses were identified for Clear Creek County communities:

- Idaho Springs: approximately 8 acres lost within 161 acres of developed land
- Dumont: approximately 4 acres lost within 45 acres of developed land
- Downieville: approximately 6 acres lost within 16 acres
- Lawson: approximately 2 acres lost within 23 acres
- Georgetown: approximately 3 acres lost within 65 acres
- Silver Plume: approximately 12 acres lost within 65 acres
- Historic structures lost to I-70: approximately 80
- Historic loss of forest due to the I-70 construction: approximately 175 acres

Population Growth

The Corridor counties (nine-county Corridor area) are projected to grow by 100 percent from 2000 to 2025. The Corridor growth rate is more than twice the growth rate expected along the Front Range. This growth will be reflected in planned development, as well as infrastructure needs, job growth, increased recreational use, and increased commuting. Eagle and Summit counties are shown to be most sensitive to population growth in relation to I-70 traffic growth. Baseline conditions for evaluation of cumulative effects include 2025 Colorado Department of Local Affairs (DOLA) population projections and 2035 Baseline peak I-70 trips/Average Annual Daily Traffic.

Water Supply

Population growth is associated with numerous possible infrastructure expansions such as roads, schools, emergency services, and utilities. Tier 1 studies have focused on water supply as a critical issue for the Corridor. The water supply in the Corridor and in the Denver metropolitan area (which gets much of its supply from Corridor sources) is a major concern in terms of both availability and quality. The additional Corridor population projected for 2035, along with the estimated peak seasonal population (tourism, recreation, second homes) is estimated to increase Corridor water demand by almost 100 percent (or double the existing demand)..

More information about this analysis is contained in **Appendix A** of the *I-70 Mountain Corridor PEIS Water Resources Technical Report* (CDOT, 2010).

Economic Growth

According to 2035 DOLA projections, several economic indicators of the Corridor economy are expected to grow as shown in the following charts:

- Chart 14, Eagle County Growth Cumulative Impacts
- Chart 15, Summit County Growth Cumulative Impacts
- Chart 16, Corridor Regional Growth Cumulative Impacts

The Corridor economy is driven by tourism and second homes. DOLA projections do not consider the influence of I-70 traffic, although I-70 access is integral to the delivery of goods and services, commuters, tourists, and local business. Continued I-70 congestion during peak weekends and at localized commuting areas is expected to suppress DOLA economic projections as assumed in the REMI economic model for the No Action alternative. In addition, economic benefits from Action alternatives (except construction benefits) would not begin until completion of the alternative as assumed in 2025.

More information is contained in the *I-70 Mountain Corridor PEIS Social and Economic Values Technical Report* (CDOT, August 2010).

Cumulative Impacts: Social and Economic Values

Cumulative effects on social and economic values are:

- Impacts on population growth from induced or suppressed I-70 peak traffic associated with alternatives (induced/suppressed growth)
- Impacts on communities and regional populations (housing, commuting patterns, infrastructure) from changes in growth and economic conditions
- Impacts on community and county plans from changes in expected growth and economic conditions
- Impacts on economic conditions (economic indicator parameters: employment, personal income, and GRP) from alternatives and from projected growth

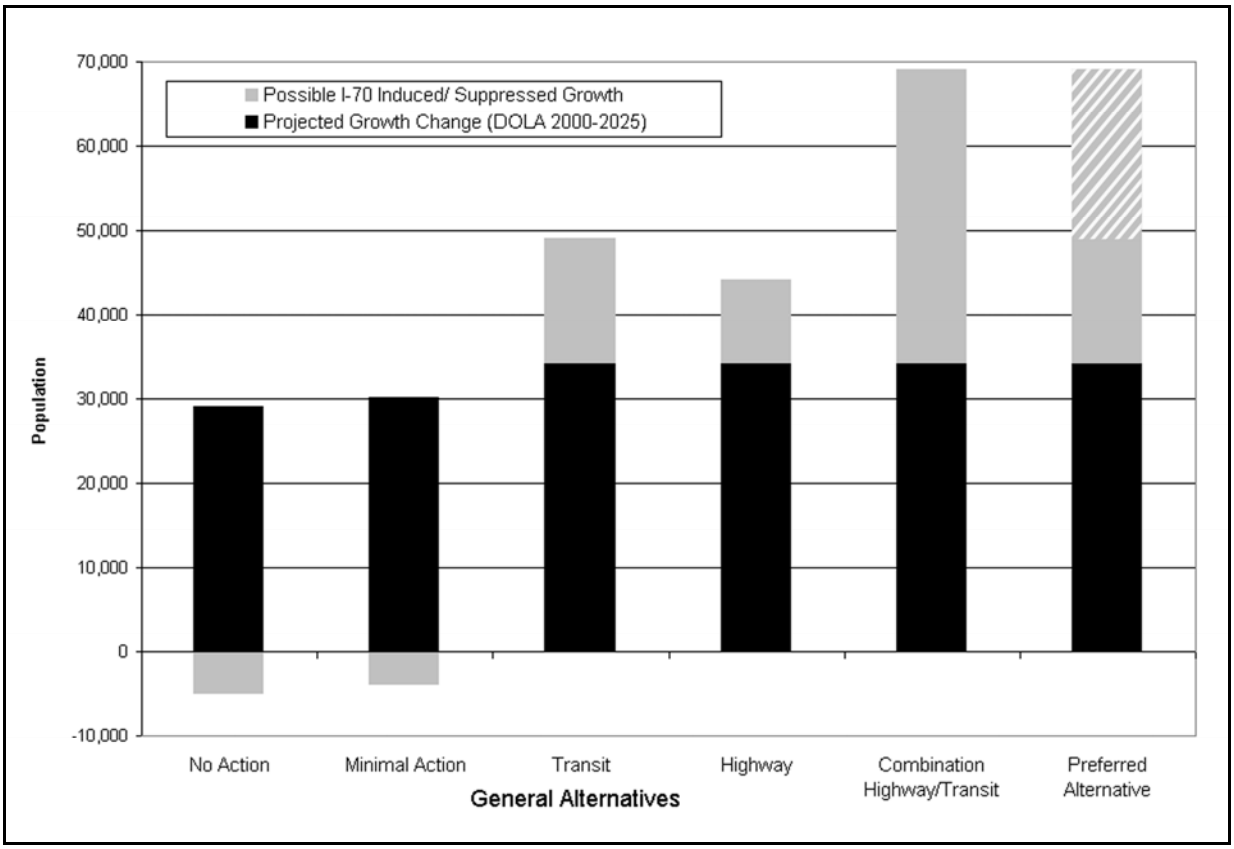
The magnitude of cumulative effects is based on projections for population and economic growth in relation to alternative indirect impacts.

Growth Impacts

Corridor Localized Impacts

Induced growth associated with the Transit and Combination Highway/Transit alternatives in Eagle County increases these growth pressures and leads to substantial cumulative impacts as shown on **Chart 14**. The Combination alternatives double growth pressure in Eagle County. Alternatives with Transit components are expected to concentrate growth in urban areas with transit centers including Eagle, Avon, and Vail. Highway and Combination alternatives are expected to allow some amount of dispersed growth in rural areas and might cause increased pressure for community and county planning. In addition, induced growth in Eagle County translates into increased commuting and cause induced growth impacts on adjacent counties such as Garfield County.

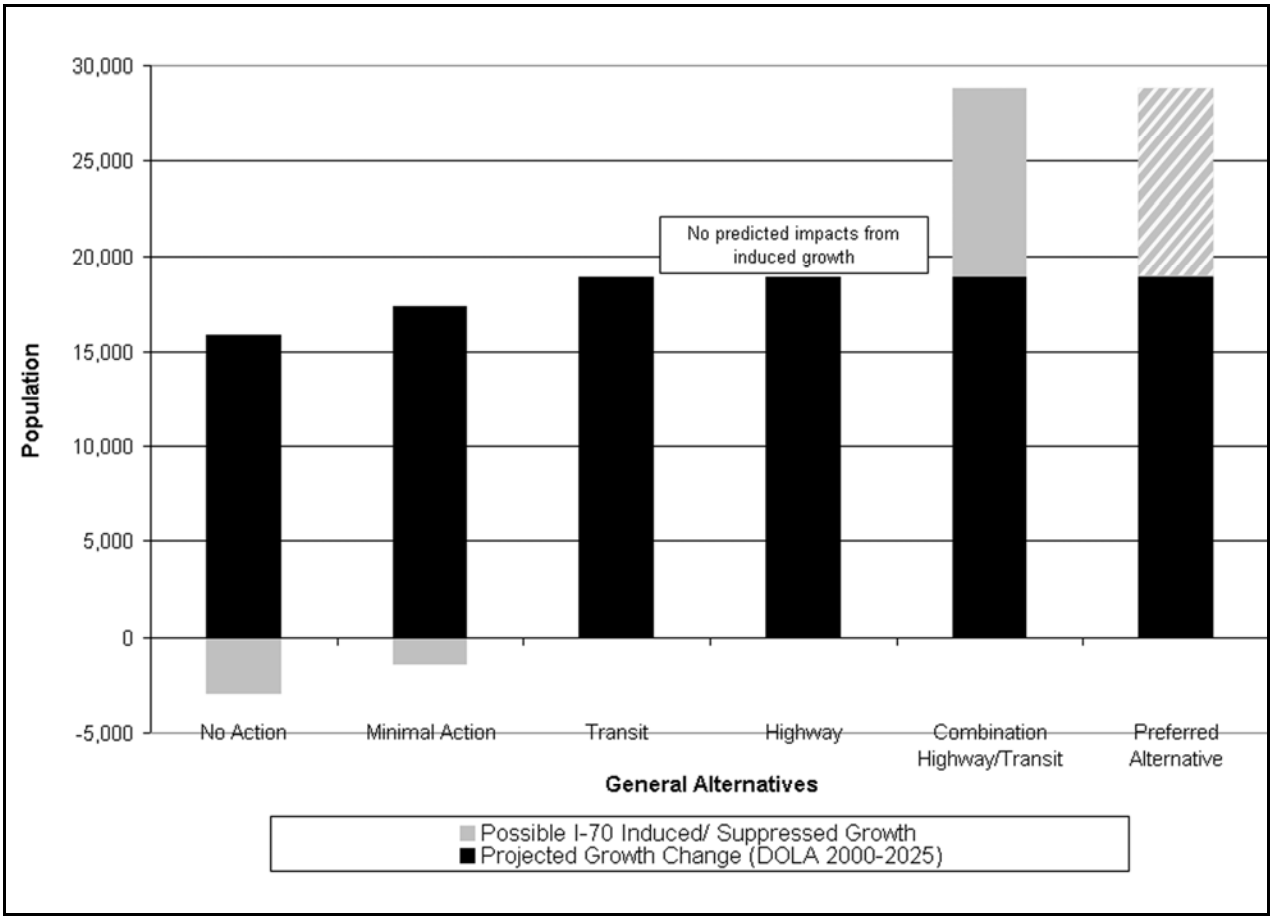
Chart 14. Eagle County Growth Cumulative Impacts



The Maximum Program presents the range of impacts that occurs with the Preferred Alternative. The solid bar represents the implementation of the Minimum Program only. The hatched bar area shows the range of the Maximum Program. It is presented as a range because the adaptive management component of the Preferred Alternative allows it to be implemented based on future needs and associated triggers for further action. The top end of the bar represents the full implementation of the Maximum Program. ***Section 2.7*** *of the I-70 Mountain Corridor PEIS (CDOT, 2010) describes the triggers for implementing components of the Preferred Alternative.*

Induced growth associated with the Combination Highway/Transit alternatives in Summit County could increase these growth pressures and lead to substantial cumulative impacts as shown on **Chart 15**. The Combination Highway/Transit alternatives (including the Preferred Alternative Maximum Program if implemented) increases growth pressure by more than 30 percent. Alternatives with Transit components are expected to concentrate growth in urban areas with transit centers including Dillon and Silverthorne. Highway and Combination alternatives are expected to allow some amount of dispersed growth in rural areas and might cause increased pressure for community and county planning.

Chart 15. Summit County Growth Cumulative Impacts



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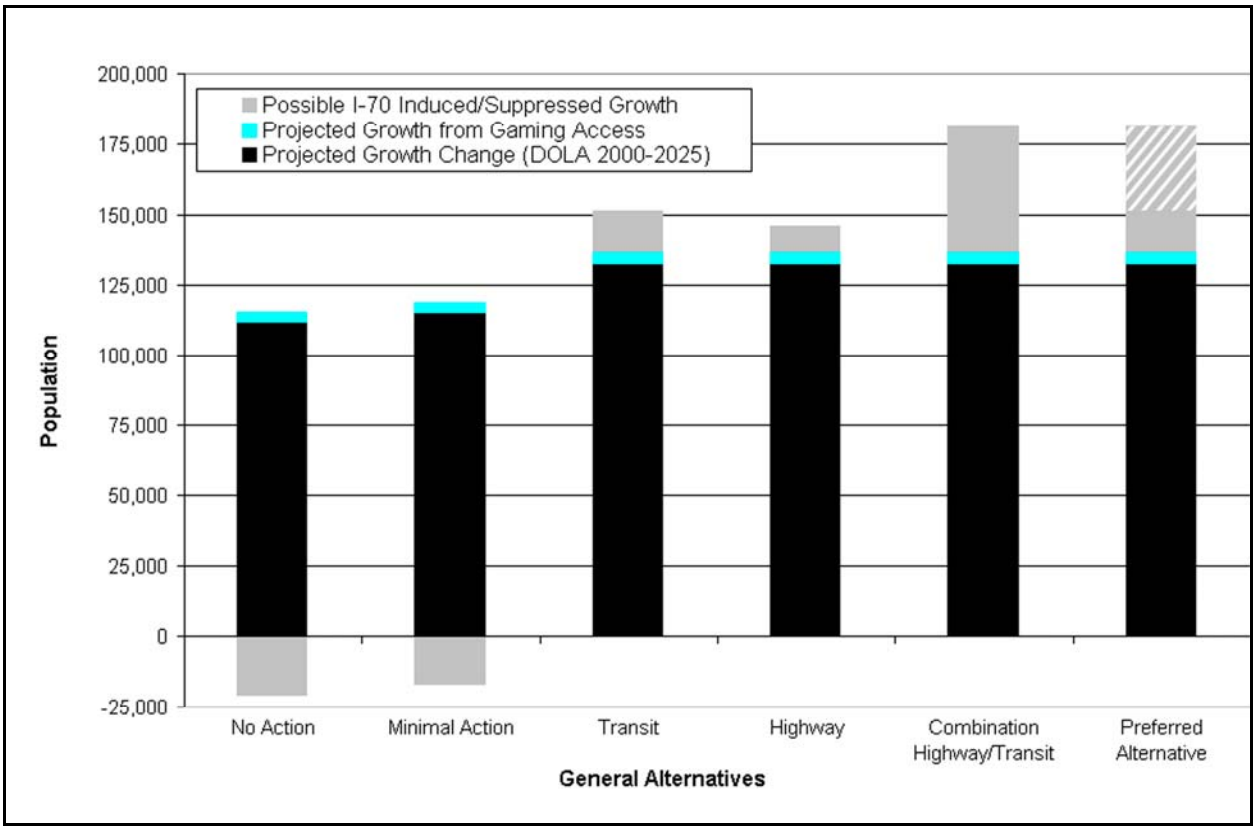
Regional Impacts

Induced growth associated with the Combination Highway/Transit alternatives in the Corridor increases existing growth pressures and leads to substantial cumulative impacts as shown on **Chart 16**. The Combination Highway/Transit alternatives increase growth pressure by 25 percent. Alternatives with Transit components are expected to concentrate growth in urban areas with transit centers. As stated for "Localized Impacts," Highway and Combination alternatives are expected to allow some amount of dispersed growth in rural areas and might cause increased pressure for community and county planning. Corridor induced growth pressure has secondary impacts on numerous resources and could extend impacts on areas outside the Corridor due to employment needs and commuting.

Chart 16. Corridor Regional Growth Cumulative Impacts



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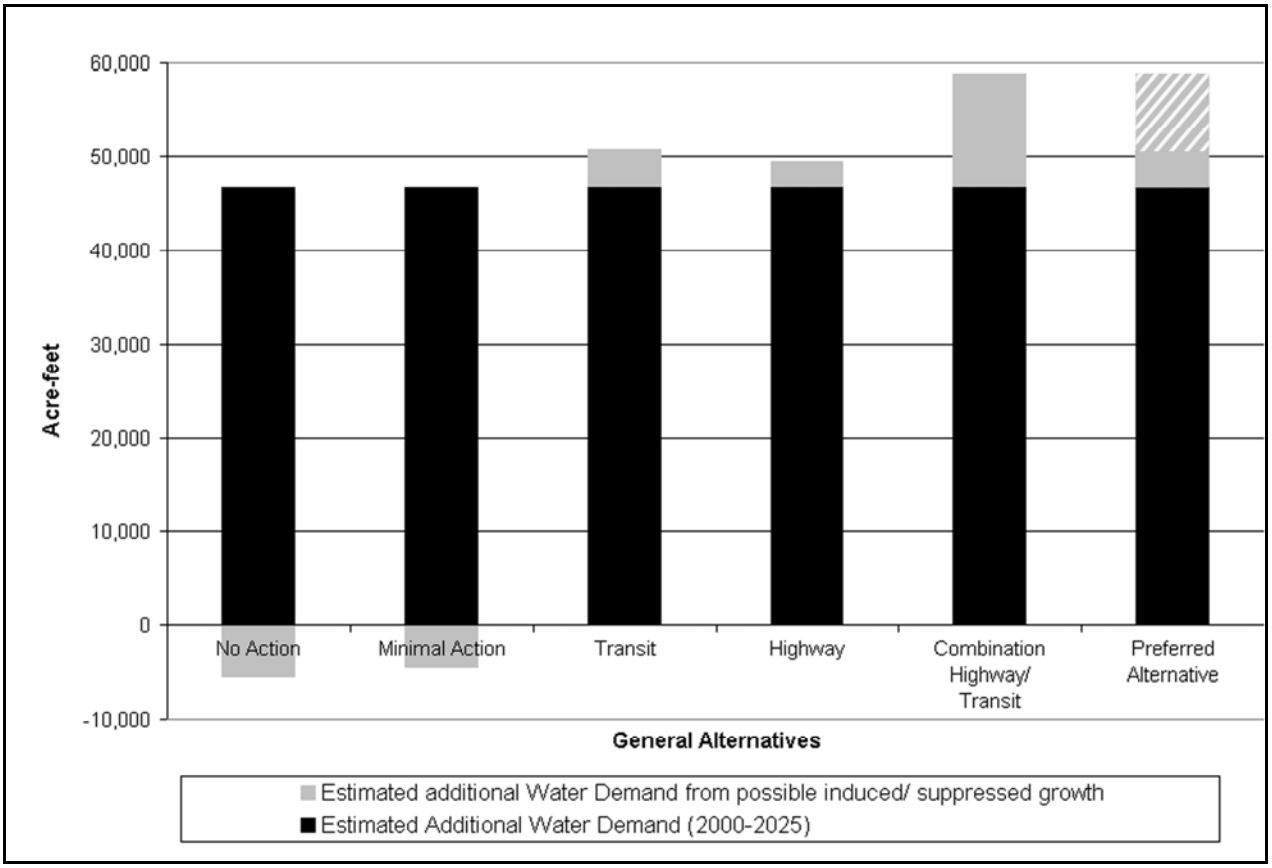
Water Supply

Suppressed or induced population growth has direct impacts on water supply demand in the Corridor area. **Chart 17**, Cumulative Impacts on Corridor Water Supply, illustrates possible impacts on water supply demand.

Chart 17. Cumulative Impacts on Corridor Water Supply



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Economic Impacts

Cumulative impacts are shown for major economic indicators by alternative on the following charts:

- Chart 18, Cumulative Impacts on Regional Employment
- Chart 19, Cumulative Impacts on Regional Personal Income
- Chart 20, Cumulative Impacts on Regional GRP

The greatest cumulative impacts on economic indicators are predicted for the No Action and Minimal Action alternatives. These alternatives might suppress regional employment projections by half of the projected change. The No Action and Minimal Action alternatives might suppress regional personal income and GRP by 25 percent of the projected changes. Counties with resort destinations that contribute the most to the existing tourism economy (Eagle, Pitkin, Summit, and Grand) have the greatest cumulative impacts from the No Action and Minimal Action alternatives. Although induced growth is not indicated for Clear Creek County, the cumulative economic effects of construction associated with Highway and Combination Highway/Transit alternatives (including the Preferred Alternative Maximum

Program if it is implemented) are substantial. Additional effects might be reflected in the state economy through state taxes.

Summary: When combined with past, present, and reasonably foreseeable future actions and events, the Action Alternatives, except for the Minimal Action Alternative, are expected to have a substantially beneficial impact on economic (job and tax) growth in the Corridor for all counties except for Clear Creek County. The growth in Clear Creek County is expected to be minimal, if at all. However, such growth places additional pressure on property values, community services, and other social infrastructure. The Action Alternatives, when combined with past, present, and reasonably foreseeable future actions and events, result in substantial indirect impacts on quality of life, community services, and local infrastructure unless mitigating actions are undertaken by local agencies. Cumulative effects on social and economic values are not linear but have a multiplicative effect over time. The adaptive management approach of the Preferred Alternative (defined in **Section 2.9** of the *I-70 Mountain Corridor PEIS* (CDOT, 2010)) allows agencies to implement transportation improvements over time, which may allow communities to appropriately manage the indirect impacts associated with those improvements.

Chart 18. Cumulative Impacts on Regional Employment

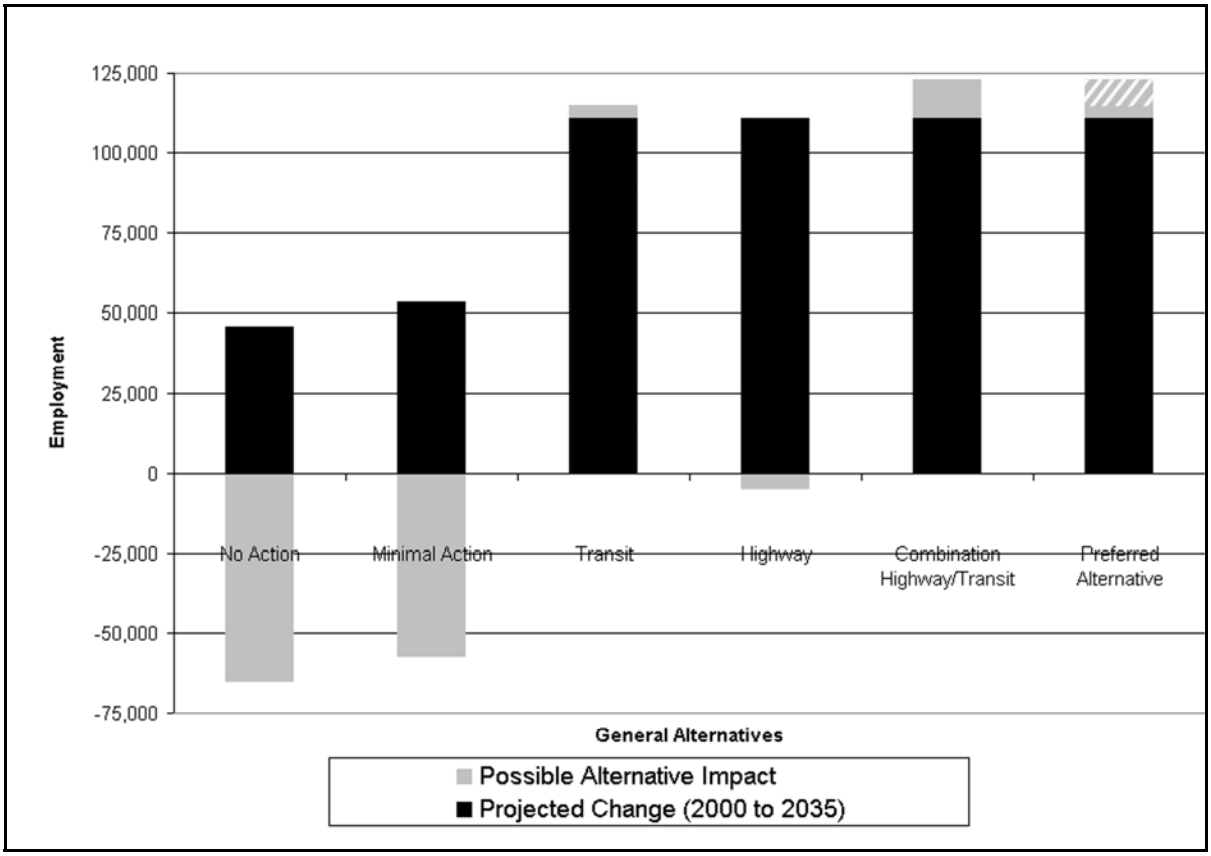

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Chart 19. Cumulative Impacts on Regional Personal Income

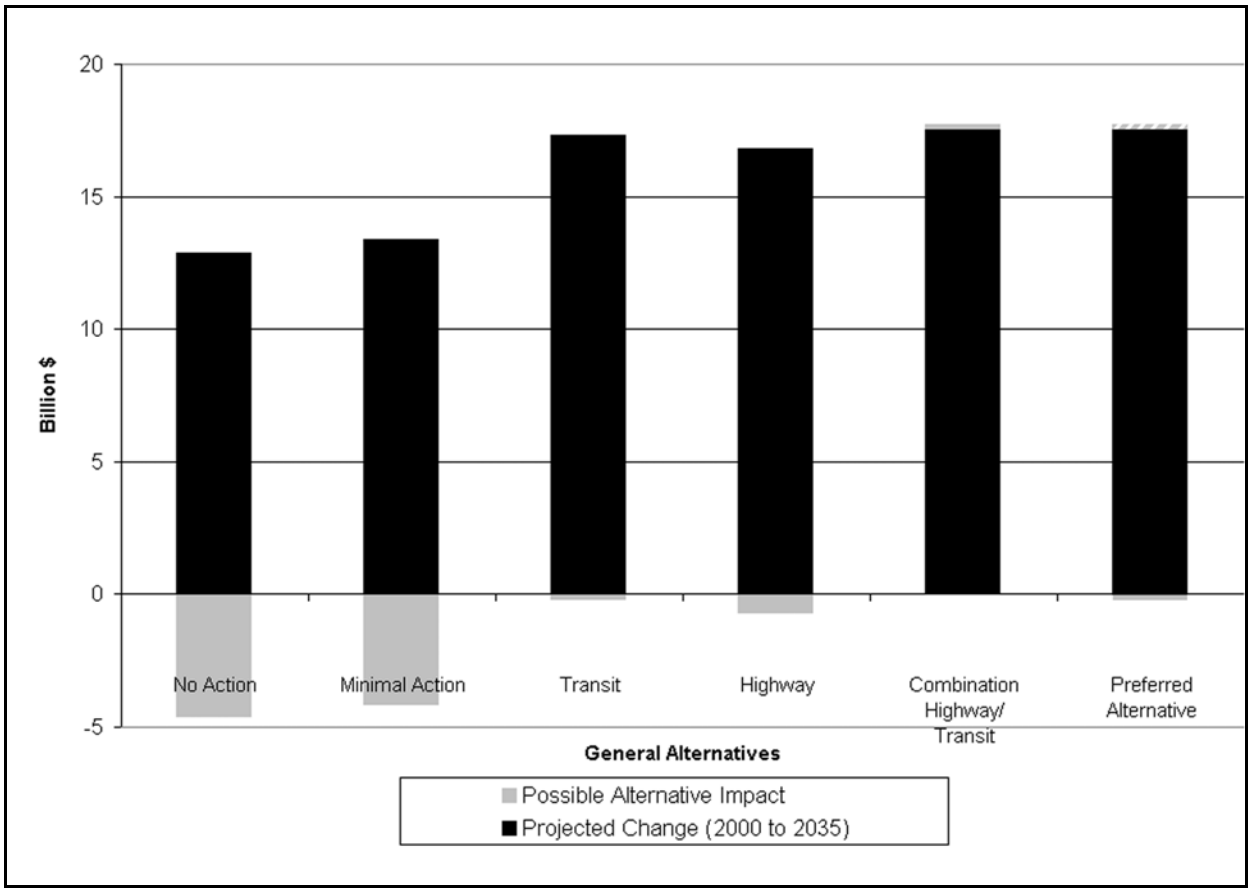

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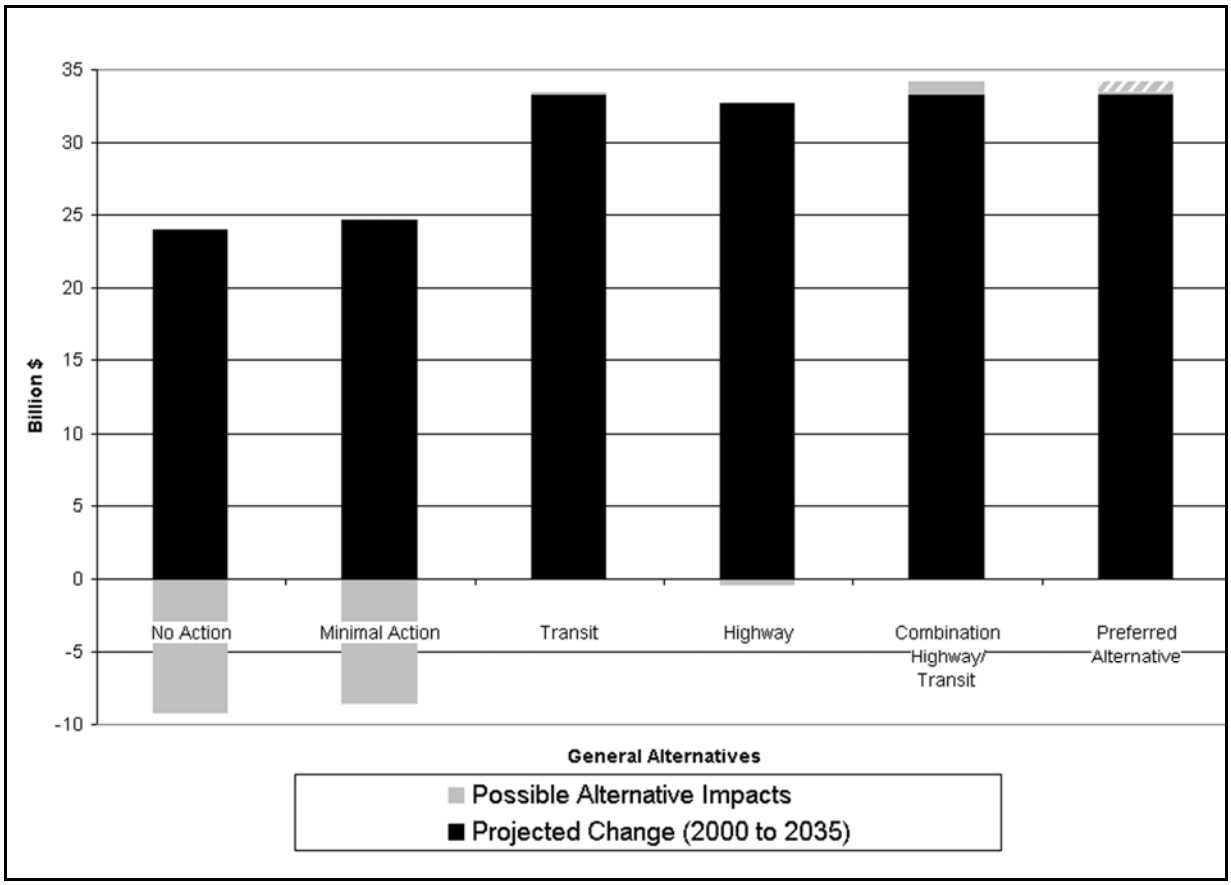
Chart 20. Cumulative Impacts on Regional GRP



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4.6 Recreation Resources

Baseline: The U.S. Forest Service has indicated that demand for recreation is such that the agency cannot maintain any additional parking or new trailheads. Recreation use of U.S. Forest Service lands is at or over use capacity now. Land managers are struggling to maintain existing trails because of increasing use levels and declining maintenance budgets. Also, there is increased use of backcountry trails and roads not originally designed for intensive uses. The U.S. Forest Service has granted expansions of the major ski resorts in the Corridor, while participation in other winter activities has grown. Summer visitations also have increased.

Without implementation of mitigation, the ability of the USFS to maintain the ecological health of the resource while accommodating increased pressure for recreational activity is in jeopardy.

Population increases in the Corridor, combined with increased visitation from nonresidents (primarily Denver Metropolitan area visitors), will continue to strain U.S. Forest Service amenities. The extent of these effects will depend on forest management activities, as discussed in **Section 3.12**, Recreation Resources, of the *I-70 Mountain Corridor PEIS* (CDOT, 2010).

While the economic downturn has slowed tourism in the short term, the outlook is for continued increased growth. The mountain pine beetle infestation, which is causing ongoing change in forest conditions, is altering the setting of recreation resources in these forests.

Alternatives: Recreation visitor days are measured as 12 hours of continuous activity; as such, they are less susceptible to changes in transportation access than forest destination trips, which can reflect very short site visits. Therefore, the analysis was not sensitive enough to note changes from alternatives in skier visits and recreation visitor days. However, it included estimated changes in forest destination trips by alternative. Because of reduced mobility and access, the No Action and Minimal Action Alternatives might retard the projected increases in forest destination trips. Meanwhile, the U.S. Forest Service has indicated that alternatives with transit components complement their future plans to manage access into the Corridor's National Forests through transit. Therefore, the Transit (including the Preferred Alternative Minimum Program) and Combination Alternatives (including the Preferred Alternative Maximum Program if it is implemented) increase U.S. Forest Service visitation levels, but are also better able to support U.S. Forest Service plans to control visitation impacts.

United States Forest Service planners provided forest visitation projections, including ski area visitation, for year 2020 for the White River National Forest and year 2010 for the Arapaho and Roosevelt National Forests. The lead agencies extrapolated these projections to 2025, the original planning horizon for this study. Although the planning horizon has been extended to 2035, year 2035 recreation visitor days were not estimated. The United States Forest Service has not updated their visitor projections since year 2000, and extrapolation to year 2035 would not yield significantly different trends or change the results of the analysis. Therefore, the indirect effects analysis estimates recreation impacts that occur in the year 2025.

Projected changes in forest destination trips from alternatives are as follows:

- In the Arapahoe/Roosevelt National Forest, Highway Alternatives increase winter and summer forest destination trips in 2025 by 50,000 annually. In the White River National Forest, increases would be 200,000 and 100,000 annual winter and summer trips, respectively. Visitor use in 2025 was extrapolated from 2010 Arapahoe/Roosevelt National Forest and 2020 White River National Forest visitation projections (United States Forest Service, 2000). The projections do not consider the capacity of the Corridor. They are considered to be very general estimates of visitor use. Visitor use estimates were not extrapolated for 2035. United States Forest Service visitor projections have not been updated since year 2000. Extrapolation of visitor use to 2035 would not yield significantly different trends than those extrapolated from 2025 and would not change the results of the analysis.
- In the Arapahoe/Roosevelt National Forest, the Transit Alternatives (including the Preferred Alternative Minimum Program) would increase winter and summer trips in 2025 by 200,000 each. In the White River National Forest, increases are 700,000 and 500,000 for winter and summer trips, respectively. These alternatives are more consistent with the U.S. Forest Service's desire to serve highly used recreation areas with transit and could, therefore, help mitigate and control impacts.
- In the Arapahoe/Roosevelt National Forest, the Combination Alternatives (including the Preferred Alternative Maximum Program if it is implemented) could increase winter and summer forest destination trips in 2025 by 400,000 each. In the White River National Forest, the Combination Alternatives increase winter and summer forest destination trips by 1.3 million and

1 million trips, respectively. These alternatives are more consistent with the U.S. Forest Service's desire to serve highly used recreation areas with transit and could, therefore, help mitigate and control impacts.

Cumulative Effects

Cumulative effects on recreation resources, which occur in a manner that is not linear but are rather multiplicative in nature, are defined below:

- Increased winter USFS visitation (impacts on skier visits and winter Recreation Visitor Days) due to increased winter forest destination trips from project alternative peak travel
- Increased summer USFS visitation (impacts on summer Recreation Visitor Days) due to increased summer forest destination trips from project alternative peak travel
- The change (2000 to 2025) in skier visits and winter and summer Recreation Visitor Days for the I-70 districts of White River National Forest and Arapahoe and Roosevelt National Forest (in relation to forest plan projections)

The actual magnitude of cumulative effects on USFS recreation resources would be tempered by forest management activities. However, possible visitation changes have been quantified to provide a gauge of pressure on recreation resources.

Arapahoe and Roosevelt National Forest Impacts

Possible cumulative impacts on recreation resources are summarized in **Table 6**. Note that Recreation Visitor Days (measured per 12-hour continuous activity in the forest) are not directly comparable with forest destination trips (which could reflect very short site visits) and are, therefore, not shown together in chart form. 2025 projections indicate that Arapahoe and Roosevelt National Forests (Corridor districts) skier visits and winter and summer Recreation Visitor Days are expected to increase by 0.6 million, 0.9 million, and 2.6 million, respectively, from 2000 levels. Alternative impacts from the No Action and Minimal Action alternatives decrease these projections, while the Combination alternatives increase visitation levels by 0.4 million winter forest destination trips and 0.4 million summer forest destination trips in 2025.

The 2025 projection of visitors to the USFS lands is not updated because Forest Plan revisions are done on an as-needed basis. The life of most Forest Plans is 15 to 20 years and, therefore, projections past 2025 are not available at this time.

Table 6. Cumulative Impacts, Arapahoe and Roosevelt National Forests[a]

	Winter Impacts			2025 Summer Impacts	
Alternative	2025 Annual Change in Winter Forest Destination Trips (millions)	Projected Change in Skier Visits from 2000 to 2025 (millions)	Projected Change in Winter RVDs from 2000 to 2025 (millions)	2025 Annual Change in Summer Forest Destination Trips (millions)	Projected Change in Summer RVDs from 2000 to 2025 (millions)
No Action	-0.35	0.58	0.88	-0.39	2.57
Minimal Action	-0.26			-0.29	
Transit	0.21			0.23	
Highway	0.04			0.04	

Alternative	Winter Impacts			2025 Summer Impacts	
	2025 Annual Change in Winter Forest Destination Trips (millions)	Projected Change in Skier Visits from 2000 to 2025 (millions)	Projected Change in Winter RVDs from 2000 to 2025 (millions)	2025 Annual Change in Summer Forest Destination Trips (millions)	Projected Change in Summer RVDs from 2000 to 2025 (millions)
Combination	0.39			0.43	
Preferred Alternative	0.21 to 0.39			0.23 to 0.43	

a Includes Clear Creek and Sulphur districts.

White River National Forest Impacts

Possible cumulative impacts on recreation resources are summarized in **Table 7**. Note that recreation visitor days (measured per 12-hour continuous activity in the forest) are not directly comparable with forest destination trips (which could reflect very short site visits) and are, therefore, not shown together in chart form. 2025 projections indicate that White River National Forest (Corridor districts) skier visits and winter and summer recreation visitor days are expected to increase by 1 million, 0.8 million, and 3 million, respectively, from 2000 levels. Action Alternative impacts from the No Action and Minimal Action alternatives decrease these projections, while the Combination alternatives increase visitation levels by 1.3 million winter forest destination trips and 1 million summer forest destination trips in 2025.

Table 7. Cumulative Impacts, White River National Forest[a]

Alternative	2025 Winter Impacts			2025 Summer Impacts	
	2025 Annual Change in Winter Forest Destination Trips (millions)	Projected Change in Skier Visits from 2000 to 2025 (millions)	Projected Change in Winter RVDs from 2000 to 2025 (millions)	2025 Annual Change in Summer Forest Destination Trips (millions)	Projected Change in Summer RVDs from 2000 to 2025 (millions)
No Action	-0.94	0.99	0.85	-0.76	3.04
Minimal Action	-0.71			-0.57	
Transit	0.66			0.53	
Highway	0.15			0.12	
Combination	1.32			1.04	
Preferred Alternative	0.66 to 1.32			0.53 to 1.04	

a Includes Sopris, Aspen, Eagle, Holy Cross, and Dillon districts.

Forest Service Considerations and Management Issues

The above estimates were intended to provide an indication of possible forest visitation pressure. Recreational use of forest lands and other recreational lands is not infinite. As recreation use has grown, so have pressures on the financial and environmental resources that define and support the recreation infrastructure throughout the Arapahoe and Roosevelt National Forest and White River National Forest. Data are not available to quantify these pressures. The U.S. Forest Service has already instituted some controls along I-70 to both recreational use and recreational opportunities available to the public. Quality

recreation depends on access, resource condition, facilities, and the ability to disperse and manage use across the forests.

Water Supply and Recreational Use

Water quality and quantity are essential requirements for many recreational activities such as rafting, fishing, and boating. Cumulative impacts on water quality and water supply demand from Corridor growth might affect stream flows, reservoir levels, and aquatic habitat used for recreational activities.

Summary: Past and present actions have resulted in demand for recreation resources that are already at or near capacity now. Reasonably foreseeable future actions are likely to further strain forest resources, especially by 2050, such that the ability of the U.S. Forest Service to maintain the quality of the recreation experience, while accommodating increased demand could surpass the capacity of the resource. While the Minimal Action Alternative likely suppresses projected increases in forest destination trips, the remaining Action Alternatives increase annual trips from 400,000 to over 3 million between the two forests. When combined with the past, present and reasonably foreseeable future impacts to recreation resources, the Action Alternatives noticeably diminish the quality of the recreation experience over time, unless the U.S. Forest Service implements management actions to balance visitor access with the health of the resource. The Colorado Department of Transportation is coordinating closely with the U.S. Forest Service to mitigate any I-70 impacts and will continue to do so. The adaptive management characteristics of the Preferred Alternative, when combined with its transit component, present the best potential to alleviate or manage cumulative impacts to recreation resources.

The U.S. Forest Service has indicated that the alternatives that include transit could assist to mitigate and control impacts because they would concentrate rather than disperse visitors, allowing the U.S. Forest Service more control over visitor use and associated resource management.

4.7 Visual Resources

Baseline: Visual scars from Corridor construction remain prominent along several stretches of I-70, and are most evident in the canyon environment of Clear Creek County and along Straight Creek, where existing cut-and-fill slopes dominate the setting. Recent construction of the Central City Parkway has also created prominent cut- and fill-slopes.

Existing and historic development has altered the visual setting of the Corridor and changed its rural character. Scarring from mining and Corridor construction is also evident. Planned development would continue the trend of visual character change. Along the entire Corridor, planned development would affect between 7.5 percent to 32 percent of the total acreage visible along the Corridor. All of the viewsheds reflect this percentage increase. The remaining area visible along the Corridor would remain as forest management, recreation, or open space areas.

Alternatives: Section 3.11 of the *I-70 Mountain Corridor PEIS* (CDOT, 2010) describes direct visual impacts from the alternatives. Induced development contributes to these changes as follows:

- The Transit Alternatives have substantial impacts on visual resources due to increased urbanization around transit centers in the Eagle River watershed and due to its elevated structural components.
- The Highway Alternatives have intermediate impacts on visual resources due to distribution of induced growth based on existing trends in urban and rural development in the Eagle River watershed.
- The Combination Alternatives have the greatest potential for inducing growth in the Eagle River and Blue River watersheds and,

The elevated structure needed for the Advanced Guideway System will be a new visually intrusive element along the Corridor.

therefore, have the greatest cumulative visual impacts of all the alternatives.

- The Preferred Alternative has a range of possible impacts ranging from impacts similar to the Transit Alternatives to those similar to the Combination Alternatives, if fully implemented.

Visual resources cumulative effects include the following:

- Effects on the I-70 viewshed from planned development and induced growth associated with alternatives
- Effects on Corridor residents, recreational users, and I-70 travelers from planned development, induced growth associated with alternatives, and visual characteristics of Action Alternatives
- Effects on rural character from increased development densities possibly conflicting with local planning goals

Each alternative would include various components that could affect the visual setting along the Corridor. The degree to which alternatives would affect the setting would depend primarily on the level of visual contrast associated with proposed elements and the proximity from which they are viewed. Alternative elements with the greatest potential for contrast would include the addition of structures that are large in size, numerous in quantity, and/or of high diversity in shape. The Rail with IMC and AGS alternatives (including the Preferred Alternative Maximum Program if implemented) are anticipated to result in the greatest direct impacts on visual resources. Indirect impacts on visual resources center on the potential for changes in the rural Corridor setting associated with possible induced growth and development associated with project alternatives. Currently 13 percent of the viewshed from I-70 is developed, and community plans indicate that much more of the Corridor area will be developed in the future. Planned future development (in addition to past and present development) consumes 32 percent of the Corridor viewshed area. Pressures for additional increased development from alternatives alters the highly valued Corridor character from a rural mountain character to an urban character.

Summary: Past actions, including mining, roadway construction, urban development, and ski area development, have produced localized changes in the visual character of the corridor. Residential and commercial development along the highway has been the primary driver behind the visual change in the corridor. Currently 13 percent of the land within the Corridor viewshed is developed, and according to adopted land use plans, it is anticipated that an additional 19 percent of land will be converted from vacant, undeveloped land to developed land. It is expected that reasonably foreseeable future actions of urban development and ski area expansion will continue to alter the visual character in a generally linear fashion, particularly by 2050. Additionally, the ongoing loss of pine forests because of the mountain pine beetle continues to alter the forest landscapes. The Action Alternatives introduce new visual elements into the Corridor, producing substantial visual contrast with the presence of elements, such as elevated structures and increased footprint width. Higher than expected growth projections resulting from the implementation of the Preferred Alternative could diminish the visual quality within the corridor, producing a negative cumulative impact. Commitment to the I-70 Mountain Corridor Engineering Design Criteria and Aesthetic Guidelines identified in the I-70 Mountain Corridor Context Sensitive Solutions process, combined with local planning regulations, will minimize the visual impacts generated by the Corridor.

4.8 Historic Properties

Affected Environment: Historic Communities

The cumulative impact analysis focuses on potential effects on the historic communities identified in the Corridor, including Glenwood Springs (associated Hot Springs Historic District, , and potential historic commercial district); Silver Plume and Georgetown (Georgetown-Silver Plume National Historic

Landmark District); Lawson, Dumont, and Downieville (potential historic area); and Idaho Springs (Commercial District, and potential historic area).

More than 200 individual historic properties have been identified within the Area of Potential Effect (APE). They are located both within and outside these historic communities. While they may also be subject to cumulative impacts, the scope of the cumulative analysis is on the historic communities.

Because only Minimal Action alternative interchange improvement concepts are identified for the Glenwood Springs area in Garfield County, this community is not included in the cumulative impact discussion. Tier 2 analyses will include an appropriate cumulative impact discussion for this location. All of the remaining community areas are located within the historic mining areas of Clear Creek County, including Silver Plume; Georgetown; Lawson, Downieville, and Dumont: and Idaho Springs. Each community was directly affected by the construction of I-70 in the 1960s and experienced visual and noise impacts as a result of the construction and operation of the interstate adjacent to and through the communities.

The Georgetown-Silver Plume National Historic Landmark (NHL) District is located within a larger area identified as the Silver Mining Heritage Area. This resource is a complex of mining and residential-related resources that dates to the late nineteenth century.

Historic Context for Past Actions

Most of the historic resources that remain in the Corridor are located in the Clear Creek Valley, where the past influences of mining history and settlement remain evident. For this reason, this analysis focuses on Clear Creek County historic resources. Communities in Clear Creek County were established during the Colorado gold and silver rush that began in 1858 with placer mining. Most of the early placer operations, centered on various sand bars and other creek deposits, were mined out in a few years, after which hardrock mining became the dominant form of mining in the County. The change in mining methods led to significant socioeconomic changes, stimulating the development of communities. Prospectors and placer miners became employees rather than independent operators in milling operation facilities, such as stamp mills, arastras, and smelters. Mining and milling activities in the area also led to incredible changes in the natural environment of Clear Creek County. The placer mines tore up the creek bottoms and bars in the creeks while the hardrock mines and mills often dumped waste materials directly into the waterways. The need for fuel led to clear-cutting many of the neighboring forests and, when combined with the mining and milling, caused severe degradation of local water supplies and soils.

Mining continued for the rest of the nineteenth century and into the early twentieth century until rising production costs and decreases in mineable deposits severely curtailed mining activity. Huge mills, such as the Argo in Idaho Springs, sat idle, and the age of gold and silver gave way to the post-mining era for Clear Creek County. As shown on **Chart 21** and **Chart 22**, county and community populations reached their peak from 1870 to 1900 during the mining boom. The county population declined sharply after 1890 as mineral resources were depleted and economic conditions for the mining industry took a downturn, reaching a low of a little more than 2,000 in 1930. Since then, more of Clear Creek County's economic base has been tied to tourism and recreation. Estimates of 2035 population for Clear Creek County are 14,843.

Chart 21. Clear Creek County Population, 1870 to 2000

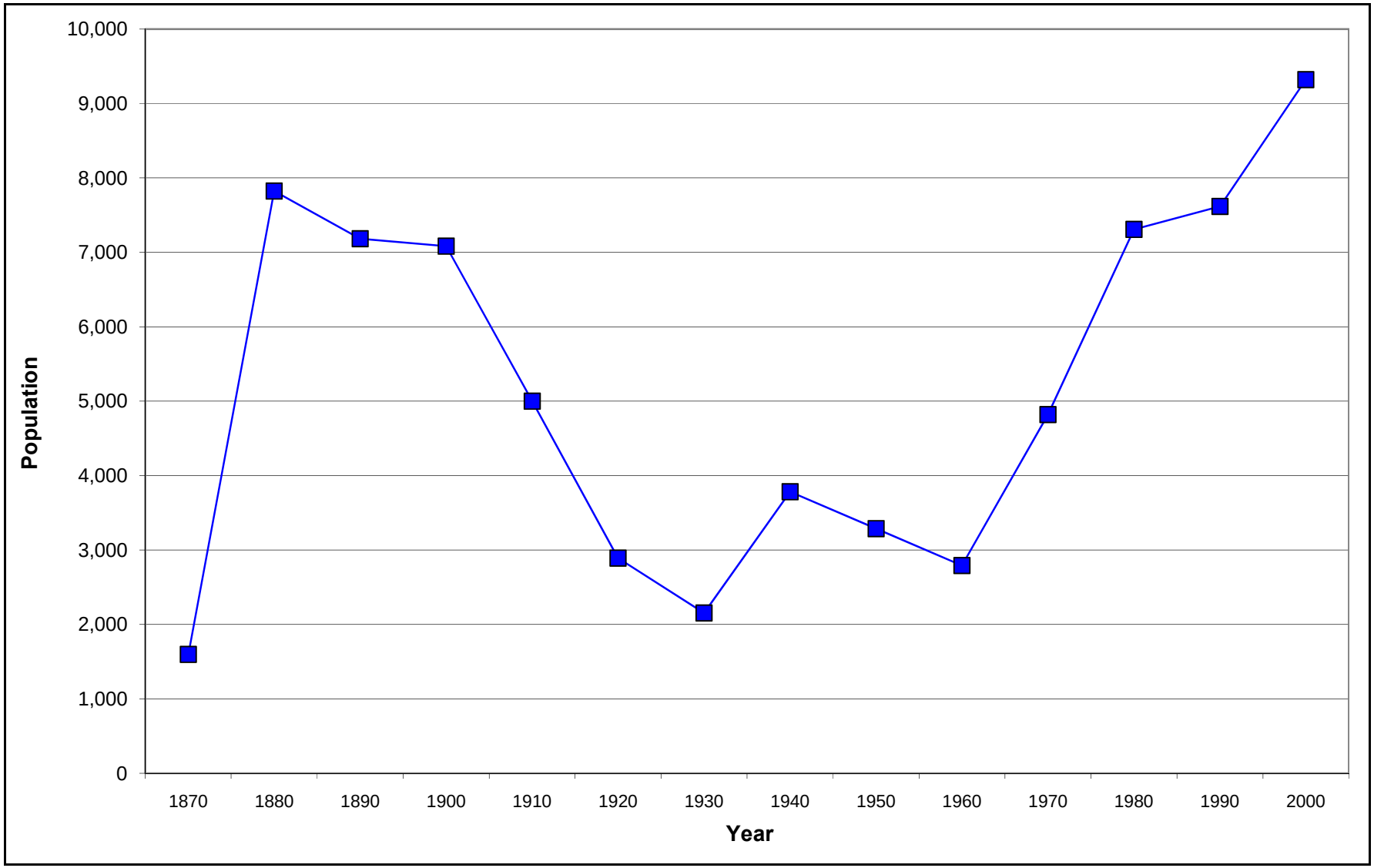

Chart 22. Community Populations in Clear Creek County, 1870 to 2000

Corridor transportation before the gold rush consisted of trails and wagon roads. However, with the onslaught of mining activity, railways up Clear Creek Canyon were in place by 1870. Stream valleys, such as Clear Creek, offered the easiest path for rail and roadway construction. Numerous railway lines served the mining industry into the early twentieth century. However, with the decline of the mining industry, most of these lines were abandoned and trains seldom went west of Idaho Springs by the 1930s. Transportation evolution in the I-70 Corridor can be tied to the growth of tourism as early as the 1860s, when rail companies published guides, offered special fares, and tried other ways to get people onto the trains for vacations. One of the highly touted attractions of nineteenth century Colorado was the Georgetown Loop on the Colorado Central Railroad.

As early as 1910, auto travel through Clear Creek County made use of wagon roads linked together and denoted by small route markers. The first Federal Highway Act (signed into law in 1916) provided federal monies to assist Colorado in the construction of US 40, which crossed Clear Creek County as far west as Empire. Later in the 1920s and 1930s, US 6 was designated; for part of its route it paralleled US 40, part of it was co-terminus with US 40, and part of it extended on west, becoming the first US highway to follow the length of the current I-70 Corridor. During the years of the Eisenhower administration, transportation planners and others felt that a system of divided highways would be necessary for national defense in any future war. Corridor developers and chambers of commerce believed such a highway would assist the local economy and lead to more tourism. After extensive lobbying by Coloradoans, the federal government determined that an interstate west out of Denver should be built to improve upon the existing US 6 and US 40 roadways, thus creating Interstate-70.

Clear Creek County and community populations began to swing upward again (although not nearly as dramatically as during the mining boom) during the early 1960s with the completion of I-70 interchanges, tunnels, and highway through Clear Creek County. County population exceeded the mining boom era population in 2000 (see **Chart 22**). **Table 8** provides a historic succession of I-70 transportation features constructed in Clear Creek County.

Initial construction of I-70 through these historic community areas occurred between the late 1950s and early 1970s. The interstate came to Idaho Springs first and progressed west through Lawson, Downieville, and Dumont and then Georgetown and Silver Plume. The westbound and eastbound bores of the Eisenhower-Johnson Memorial Tunnels were opened in 1973 and 1979, respectively. Approximately 35 acres of Clear Creek County developed lands were lost due to I-70 construction, and an estimated 80 historic structures were lost (based on 1956 photography–see maps in **Appendix A**).

Table 8. Timeline of I-70 Construction in Clear Creek County

Year	Milepost	Location Description
1957	241	E. Idaho Springs interchange
1958	239, 240	W. Idaho Springs interchange, 13th Avenue interchange
1959	244	US 6 interchange
1960	240-241	Idaho Springs bypass
1961	242, 243	Twin Tunnels, Hidden Valley interchange
1964	216	Loveland Pass interchange
1965	232, 233, 234, 235, 238	Empire Junction interchange, Lawson interchange, Downieville interchange, Dumont interchange, Fall River interchange
1966	233-239	Empire to W. Idaho Springs
1968	227-232, 226, 228	Silver Plume to Empire, Silver Plume interchange, Georgetown interchange
1970	242-244	East Idaho Springs to US 6
1971	221, 248	Bakerville interchange, Beaver Brook interchange

Table 8. Timeline of I-70 Construction in Clear Creek County

Year	Milepost	Location Description
1972	217-226, 218	Loveland Basin to Silver Plume, Herman Gulch interchange
1973	247, 214-215, 206-216	Hyland Hills interchange, EJMT westbound, Silverthorne to Loveland Basin westbound
1975	245-252	US 6 to El Rancho
1979	206-216, 214-215	Silverthorne to Loveland Basin eastbound, EJMT eastbound

Historic community photography, together with photography of the existing I-70, and simulations of proposed alternatives provide a perspective on the changes these communities have experienced and may see in the future.

Community Overview

While each community area is unique in its history, events, structures, people, and reactions to events, there are common threads of experience when related to the impact of initial construction of I-70. An example of what happened during the original construction of the interstate through Clear Creek County in the 1950s and 1960s is illustrated in an article, "Where the Road Takes You - The Impact of Interstate 70 on Georgetown, Colorado," written by Robert Autobee, a historian with the Colorado Department of Transportation. The article was published in its entirety in March 2004 in the *Historic Georgetown, Inc. Journal*, compiled for the membership of Historic Georgetown, Inc. A synopsis of this article is provided in the text box on the following page to provide an example of I-70 construction and its past influences on Corridor communities.

The sense of place of the Clear Creek County communities is strongly tied to the landscape setting and historic context. Historic preservation is a central focus of the lifestyle of these communities, and towns take an active stewardship role in the preservation of the local historic heritage. Lifestyle and social economic values are a part of the historic districts in which these people reside. The paragraphs that follow summarize each community and its historic resources that might be affected cumulatively by the Action Alternatives.

Georgetown and Silver Plume

The Georgetown-Silver Plume National Historic Landmark District represents one of the most scenic and historic of all of Colorado's mining districts. The Georgetown-Silver Plume National Historic Landmark District includes the entire commercial and residential areas of both the Georgetown and Silver Plume communities, as well as the railroad grade connecting them. Major construction of the existing I-70 alignment through these communities was completed during the mid-1960s and early 1970s. The Georgetown-Silver Plume National Historic Landmark District (listed in the NRHP in November 1966) lost the following developed land to the initial construction of I-70: 12 acres in Silver Plume and 3 acres in Georgetown. Since 1960, the population in Silver Plume has grown from less than 100 to a current population of 203, and the population of Georgetown has grown from less than 500 to a current population of 1,111 (see **Chart 22**).

Lawson, Downieville, and Dumont

The communities of Lawson, Downieville, and Dumont were started as the result of the gold and silver rush dating back to the 1860s. With the construction of I-70 in the mid-1960s, there was an estimated loss of 12 acres to these communities, as shown in **Appendix A**. The Mill Creek Valley Historical Society has documented the loss of 30 to 50 percent of their historic structures due to the construction of I-70 in the

1960s. The loss of these structures and the destruction of the former community footprints have resulted in long-term impacts on the historic heritage and sense of place of these communities. Ongoing effects noted by residents include visual and noise impacts. The Mill Creek Valley Historical Society was founded in 1981 with a mission to enrich and educate citizens about their rich mining heritage while preserving the few buildings that have been spared. The Society currently owns and manages three buildings: the Dumont School (opened 1909), the Coburn Cabin (1870s), and the Mill City House (1860). Existing individually eligible sites within 500 feet of I-70 include the Lawson School and the Dumont School.

This is a complex of domestic, residential, and commercial architectural sites and features. It dates to the late nineteenth century. The resource has the potential to be considered eligible for the NRHP as a historic area. Local parties identified the 38 individual components of this resource.

Idaho Springs

The population of Idaho Springs reached a peak of 2,500 in 1900 and dropped off during the 1920s and 1930s. As shown on **Chart 22**, the town has experienced a sequence of growth cycles since the 1930s. The Idaho Springs Commercial District contains various late nineteenth century commercial buildings focused on Main Street; the entire setting encompassing the town is a historic area that is considered eligible for the National Register of Historic Places. Idaho Springs lost 8 acres of developed land and numerous structures to I-70 construction during the late 1950s and 1960s as shown in **Appendix A**. As with the county and other historic communities, Idaho Springs is oriented around historic preservation, as represented by the Historical Society of Idaho Springs, Inc.

"Where the Road Takes You—The Impact of Interstate 70 on Georgetown, Colorado"

This is a summary of and excerpts from, "Where the Road Takes You - The Impact of Interstate 70 on Georgetown, Colorado," written by Robert Autobee, a historian with the Colorado Department of Transportation. The article was published in its entirety in March 2004 in the *Historic Georgetown, Inc. Journal*, compiled for the membership of Historic Georgetown, Inc. The following discussion focuses on aspects of the article highlighting how the I-70 alignment was influenced by efforts for historic preservation.

I-70 through Georgetown brought with it a series of unlikely circumstances. In 1956, the Eisenhower administration presented its plans to build the largest public works project in the nation's history – the Interstate Highway System. When the news reached Georgetown, the coming of the highway did not inspire its citizens to dream about the future as much as it caused many to reflect on what was important about the town's past.

The idea to preserve Georgetown sprang from a discussion in late 1958. Denver architect Jared B. Morse believed that private purchases of historic lands and structures would lead to a partnership with county and town governments and local businesses. The following year, the Colorado Historical Society secured 80 aces of the valley. Directed by James Grafton Rogers (Chairman of the Historical Society), the Society followed a multipoint strategy that would save Georgetown in advance of the interstate. Working with interested local preservationists, the Society recommended "acquiring all the land possible in the valley from Georgetown to Silver Plume." (cont'd)

(cont'd) "Where the Road Takes You…

As the 1960s began, Georgetown's preservationists awaited the interstate's arrival. The Federal Highway Administration's original plan for I-70 had the multilane highway…cutting Georgetown in half. The preservationists realized that no matter how the interstate entered the valley, it would affect some of Georgetown's and Silver Plume's historic treasures. However, they held the trump card through the Society's ownership of most of the valley between the two towns.

The Society's land grab to save the town sent the Colorado Department of Highways back to the drawing board. Designers and engineers now looked to blasting the mountainside to widen the existing US 6 and US 40 right-of-way to meet interstate standards. A handful of Georgetown's historic structures stood in the path of the interstate. This included ten houses and two city streets. Allowances were made in the highway right-of-way plans to accommodate the Georgetown Loop railbed.

As Chair of the state Historical Society and a resident of Georgetown, Rogers began the work that led to the creation of the Georgetown-Silver Plume National Historic Landmark District in November 1966. This designation from the National Park Service protected the town from federal and state highway authorities intent on building an interstate through town.

However, for most of Georgetown, preparation and preservation prevented the total destruction of the town's heritage by construction. By 1966, the town began to debate what a short strip of asphalt would mean to the town's future.

In October 1966 clearing the right-of-way between Georgetown and Silver Plume began. The Silver Plume to Empire segment of I-70 (mileposts 227 to 232) wa s completed in 1968.

Cumulative Impacts: Historic Communities

Based on the social and economic values analysis of growth effects and local input, the historic communities in Clear Creek County are not particularly susceptible to the indirect impacts associated with the growth inducing effects that Eagle and Summit counties would experience by some Action Alternatives. [These assumptions are further described in the I-70 Mountain Corridor PEIS Land Use Technical Report (CDOT, August 2010).] As a result, due to the lingering past effects of the construction of I-70, and the ongoing influence of I-70 to the historic communities in the corridor, cumulative impacts for historic properties would be driven by any non-linear added loss of integrity to the historic properties, including:

- Direct impacts on historic properties including loss of structures and property encroachment in addition to those impacts associated with the initial I-70 construction.
- Visual impacts caused by changes to the historic setting within the communities, from construction of Action Alternatives in addition to those impacts associated with initial I-70 construction. This analysis is presented in context to the sense of place for communities where even a small change would be perceived as detrimental due to sensitivity of the communities as a result of the initial I-70 construction.
- Direct effects from alternatives on historic properties as well as visual impacts on the setting would result in cumulative impacts on the Georgetown-Silver Plume NHL District, Lawson, Downieville, Dumont historic area, and the Idaho Springs historic area.

Conclusions about Cumulative Impacts to Historic Communities

Minimal direct impacts on historic properties (loss of structures and property encroachment) in addition to those impacts associated with the initial I-70 construction are expected to occur within the historic communities. All direct effects to historic properties will occur within existing I-70 right-of-way. Mitigation measures will be identified based on the type of effects identified under Section 106. Minimal cumulative direct effects are anticipated. A summary of anticipated impacts to historic properties associated with the Action Alternatives in Clear Creek County is listed below.

- The Minimal Action alternative is anticipated to result in impacts on up to 22 historic properties. All of these effects are expected to occur within existing I-70 rights-of-way.
- Transit alternatives: The Transit alternatives (Rail with IMC, AGS, Dual-Mode and Diesel Bus in Guideway) has additional potential direct effects on up to 29 properties.
- Highway alternatives: Potential direct effects due to Highway alternatives have been identified for up to 30 properties.
- Combination Highway/Transit Alternatives (including the Preferred Alternative Maximum Program if implemented): Potential direct effects due to the Combination alternatives have been identified for up to 32 properties.

Visual impacts caused by changes to the historic setting within the communities, from construction of I-70 alternatives in addition to those impacts associated with the initial I-70 construction are highly variable depending on the existing physical relationship between the community I-70, the type of alternative, and the specific community. All Action Alternatives are anticipated to result in impacts ranging from low to high depending on the level of visual contrast anticipated within the setting and the proximity in which it is viewed. It is important to note that project/setting contrast is the primary indicator of visual impacts. Because I-70 and, consequently, Action Alternatives that are closely aligned to I-70 are largely within foreground distance zones from sensitive community and recreation viewpoints, contrast associated with project elements is the primary factor in determining visual impacts.

Based on these considerations, alternatives with larger footprints or more elevated features have higher levels of visual impact than those that add fewer new transportation components. The No Action and Minimal Action alternatives, therefore, create the least visual impact. The Minimal Action Alternative provides improvements to 26 existing interchanges, climbing lanes, and auxiliary lanes. The Rail with Intermountain Connection and Advanced Guideway System Alternatives add new modes to the landscape and have the greatest single mode impact. The Advanced Guideway System Alternative generates a larger visual impact than the Rail with Intermountain Connection Alternative because it is elevated through the Corridor, with supporting piers spaced every 80 feet to 100 feet and a lattice structure underneath the guideway deck. Options that build on the existing highway and increase the footprint of the highway, including the Highway alternatives, further degrade the visual landscape by increasing manmade features but result in lesser landform contrast and lesser visual impact than the Rail with Intermountain Connection and Advanced Guideway System Alternatives. The Six-Lane Highway 65 miles per hour (mph) Alternative creates a larger impact than the 55 mph option because the former requires three new tunnel bores to accommodate the higher speed through the Corridor canyons. The Combination Alternative and the Preferred Alternative result in the greatest adverse visual impact by adding both the six-lane highway widening with curve safety improvements and the above-grade Advanced Guideway System. The range of visual impact differences between the Preferred Alternative Minimum and Maximum Programs is relatively minor given that the majority of all visual changes occur under both Programs with minimal additional impacts occurring under the Maximum Program, if it is fully implemented.

Mitigation measures for visual impacts will focus on structural elements (such as colors, textures, structure profiles) and landform characteristics (including grading technique and revegetation). Many of

these mitigation measures are further defined in the *I-70 Mountain Corridor Context Sensitive Solutions Aesthetics Guidelines*, which will be adhered to.

Local historic communities will perceive impacts to the historic sense of place, not related to the minimal direct impacts associated with the various alternatives so much as from the visual effects and visual contrast provided by alternatives.

Completion of compliance with Section 106 will take place during subsequent Tier 2 project–level environmental analysis, documentation, and review. A programmatic agreement (PA) for 106 compliance involving FHWA, Advisory Council on Historic Preservation, Department of the Interior, National Park Service, Bureau of Land Management, Forest Service, State Historic Preservation Officer, CDOT, and other agencies or consulting parties, as appropriate, has been executed for the PEIS. This PA defines the steps for Section 106 agency responsibilities at the Tier 2 level. Guidance for mitigation of identified cumulative impacts - is included in this document.

Summary: Past actions, such as mining, road construction, and other transportation improvements, have affected the historic integrity of communities along the Corridor, specifically in Clear Creek County where there is a higher concentration of historic and potentially historic resources. Reasonably foreseeable future actions, such as alternative energy development, planned future commercial and residential development, and some ski resort developments, by 2050 are more likely to affect the western counties along the Corridor, including Summit, Eagle, and Garfield Counties, where this document indicates there is a lower concentration of historic and potentially historic resources compared to Clear Creek County. When combined with past, present, and reasonably foreseeable future actions, the size of the Corridor, geographic constraints, and the concentration of historic and potentially historic resources, the Action Alternatives would have more of an impact in Clear Creek County and less of an impact in the western counties of Summit, Eagle, and Garfield Counties. More localized studies at Tier 2 will refine the potential for cumulative impacts to historic resources.

4.9 Air Quality

Affected Environment: Air Quality

The affected environment for cumulative impacts from air quality is based on countywide modeling for Eagle, Summit, Clear Creek, and Jefferson counties. Projected population and traffic growth could affect counties and communities beyond the immediate I-70 area. Existing air quality concerns include localized areas of traffic congestion, woodburning in urban areas, re-entrained dust from roadway sanding (winter maintenance), visibility, nitrogen deposition, and fugitive dust from development activities. Nitrogen, in the form of nitrogen oxides and ammonia, is among the many pollutants emitted by motor vehicles. Emissions of nitrogen oxides and ammonia not only contribute to visibility impairment but are also a source of nitrogen deposition in water and soil, which degrades soil and plant materials.

The Air Pollution Control Division’s decisions for establishing areas for air monitoring are based on sources of pollution: mobile and stationary dispersion characteristics, geography, and meteorology. Particulate matter is the only pollutant monitored in Garfield, Eagle, and Summit counties. Ozone is monitored in Jefferson County, and no air monitoring is done in Clear Creek County.

According to air quality modeling for the Corridor area, existing air quality parameters are well within the national standard levels. No measured violation of the carbon monoxide (CO) standard has been recorded in Colorado since 1995. Planned growth and development in the Corridor could affect air quality through increased traffic, fugitive dust from development sites, new commercial/industrial facilities, and increased woodburning. However, existing and future industrial point sources of air contaminants are negligible in the Corridor, future technological changes and regulatory controls are expected to reduce contaminants

from mobile sources (including vehicles and highway maintenance), and local air quality programs are expected to control sources of re-entrained dust, fugitive dust, and smoke from woodburning.

Cumulative Impacts: Air Quality

Air quality can be affected by the following primary sources that exist in the Corridor:

- Emissions from vehicles on roadways
- Emissions from stationary commercial and industrial facilities (considered minimal in the Corridor)
- Re-entrained dust from roadway sanding
- Urban area emissions including woodburning and dust from construction sites

The cumulative impacts analysis for air quality is based on possible increases in the above sources. The Tier 1 study provides a qualitative evaluation of the cumulative impact magnitude. Air quality parameters evaluated include CO, PM10, re-entrained dust, and air toxics.

The U.S. Environmental Protection Agency expects air quality to continue to improve as regulations are implemented and states work to meet current and recently revised national air quality standards. As new air quality regulations and cleaner car technologies are implemented, the trend of decreasing air pollutant emissions is expected to continue despite the increase in vehicle travel along the Corridor. However, this trend may slow or reverse as technological advances and regulatory controls reach their limits and can no longer offset increased travel miles. If this occurs, increases in air pollutant emissions correlate more directly with increased vehicles miles traveled.

Carbon Monoxide (from emissions from vehicles on roadways)

Carbon monoxide emissions are expected to decrease substantially in the future, as presented in **Section 3.1** of the *I-70 Mountain Corridor PEIS Air Quality Technical Report* (CDOT, 2010). Carbon monoxide emissions vary among the project alternatives. Compared to the No Action Alternative, project-related emissions range from a reduction of 9 percent to an increase of 10 percent. Emissions for the Preferred Alternative fall in the middle of this range. Compared to existing emissions, emissions under all alternatives would be substantially less than current day emissions, and none of the alternatives are likely to lead to any violations of the NAAQS. Cumulative impacts from CO emissions are not indicated.

PM_{10} (from emissions from vehicles on roadways, re-entrained dust from sanding plus emissions from wood burning and dust)

Diesel engines are the primary source of particulate matter emissions from transportation, and these emissions are expected to decrease in the future because of national mobile source control programs, including reformulated gasoline and required controls on heavy-duty diesel engines. Control programs have proven effective, and tailpipe PM_{10} emissions from mobile sources are 31 percent lower than in 1970 despite a substantial increase in travel miles (USEPA, 2010). Other sources of PM_{10} emissions in the Corridor may not decrease and may increase (due to population growth, construction, etc.) but the cumulative effect of emissions would still decrease because of decreases in tailpipe emissions.

Re-entrained dust impacts are proportional to sanding for winter maintenance. Emission control programs, such as street sweeping, mobile emission control programs, and wood burning controls, are expected to continue to control emissions. Highway maintenance improvements, such as the immediate cleanup of sand following snowmelt and the increased use of deicers in appropriate weather conditions, will reduce emissions. Re-entrained dust and fugitive dust from construction are proportional to the increase in construction-related to growth but can be managed by best management practices (see **Section 3.1**, Climate and Air Quality).Fugitive dust from gravel/rock quarries is regulated as a stationary source. Cumulative impacts from re-entrained dust are minimal.

Visibility (from vehicle emissions, re-entrained dust, wood burning and dust from construction)

The lead agencies analyzed the visibility impacts of the Action Alternatives comparing future 2035 emissions of motor vehicle pollutants and re-entrained road dust with existing (2000) emissions. Emissions were calculated for $PM_{2.5}$, SO_2, and NO_x. $PM_{2.5}$ emissions include particulates in tailpipe exhaust (carbon and sulfates), plus brake and tire wear. SO_2 and nitrogen oxides are gaseous emissions that contribute to secondary particle formation. Total daily emissions in 2035 of all pollutants contributing to visibility impairment are less in the future due to stricter standards on vehicle emissions, the lower sulfur content of diesel fuel, and other factors. Therefore, the future cumulative impacts on visibility from the Action Alternatives are less than existing conditions and no cumulative impacts are expected.

Nitrogen Deposition

The lead agencies analyzed the potential for nitrogen deposition associated with the Action Alternatives by comparing future emissions of nitrogen with Year 2000 emissions. Emissions of NO_x are 70 to 80 percent lower than 2000 emissions because of stricter standards on vehicle emissions, particularly heavy-duty diesel trucks. According to a recent NO_x emission inventory (CDPHE, 2007), NO_x emissions are projected to decrease in nearly all categories with especially large decreases (35 to nearly 100 percent) projected for road-related emissions. Future emissions of ammonia increase as traffic volumes increase because emission control technology does not reduce ammonia emissions. However, nitrogen emissions from ammonia are only 15 to 20 percent of total motor vehicle nitrogen emissions and are, therefore, offset and not an important contributor to cumulative effects.

Air Toxics

Mobile sources emit a larger portion of air toxics in the Corridor because no manufacturing and few stationary sources of air toxics exist in the Corridor. Cumulative impacts are not likely because mobile sources are the primary causes of emissions in the Corridor (that is, other sources do not contribute much), and the U.S. Environmental Protection Agency issued regulations to decrease mobile sources of air toxics by 2020. As a result of these and other controls, highway emissions nationwide are projected to be reduced by 67 to 76 percent, and highway diesel particulate matter emissions are reduced by 90 percent.

Summary: Traffic volumes and congestion, wood burning from residential development, dust from mine tailings, gravel mining, and road maintenance activities (re-entrained dust) affect air quality in the Corridor. The dry climate throughout the Corridor contributes to windblown dust issues and corresponding particulate matter emissions. However, despite growth in vehicle miles traveled, energy consumption, population, and gross domestic product, emissions of air pollutants have declined steadily since the passage of the Clean Air Act in 1970. For criteria pollutants, the Environmental Protection Agency tracked emissions data show that emissions decreased substantially, from 31 to 79 percent, depending on the type of emissions, between 1980 and 2008 (Environmental Protection Agency, 2010).

Likewise, emissions of mobile source air toxics declined by 40 percent between 1990 and 2005, and visibility in scenic areas has improved throughout the country (Environmental Protection Agency, 2010). Technological advances and stricter regulations are credited for cleaner air. The Environmental Protection Agency expects air quality to continue to improve as recent regulations are implemented and states work to meet current and recently revised national air quality standards. Reductions in air emissions of common (criteria) and toxic air pollutants in the Corridor are expected to continue through 2035 despite increased traffic and development, continued wood burning, dust from past and present mining operations, and loss of forested areas affected by the mountain pine beetle. After 2035, emissions may change to more closely correlate with vehicle miles traveled.

Global Climate Change Cumulative Effects Discussion

The federal government is addressing important national and global concerns about global climate change in several ways. The transportation sector is the second largest source of total greenhouse gases in the United States, and the greatest source of carbon dioxide (CO_2) emissions—the predominant greenhouse gas. In 2004, the transportation sector was responsible for 31 percent of all U.S. CO_2 emissions. The principal anthropogenic (human-made) source of carbon emissions is the combustion of fossil fuels, which account for approximately 80 percent of anthropogenic emissions of carbon worldwide. The consumption of petroleum products, such as gasoline, diesel fuel, and aviation fuel, accounts for almost all (98 percent) of transportation-sector emissions.

Recognizing this concern, the Federal Highway Administration (FHWA) is working nationally with other modal administrations through the Department of Transportation Center for Climate Change and Environmental Forecasting to develop strategies to reduce transportation's contribution to greenhouse gases (particularly CO_2 emissions) and to assess the risks to transportation systems and services from climate changes.

At the state level, there are also several programs underway in Colorado to address transportation greenhouse gases. The Governor's Climate Action Plan, adopted in November 2007, includes measures to adopt vehicle CO_2 emissions standards and to reduce vehicle travel through transit, flex time, telecommuting, ridesharing, and broadband communications. The Colorado Department of Transportation issued a Policy Directive on Air Quality in May 2009. The Colorado Department of Transportation developed this Policy Directive with input from a number of agencies, including the State of Colorado's Department of Public Health and Environment, the Environmental Protection Agency, FHWA, the Federal Transit Administration, the Denver Regional Transportation District, the Denver Regional Air Quality Council. This Policy Directive addresses unregulated mobile source air toxics and greenhouse gases produced from Colorado's state highways, interstates, and construction activities.

Did you know?

An average car emits one pound of carbon dioxide for every mile it is driven. So for every mile you avoid driving, you reduce the carbon dioxide added to the atmosphere by one pound.

As a part of CDOT's commitment to addressing Mobile Source Air Toxics and greenhouse gases, some of CDOT's program-level activities include:

1. Developing truck routes/restrictions with the goal of limiting truck traffic in proximity to facilities, with sensitive receptor populations, including schools. (Note: This activity is a statewide activity and does not apply to the Corridor.)
2. Continuing research about pavement durability opportunities with the goal of reducing the frequency of resurfacing and/or reconstruction projects.
3. Developing air quality educational materials for citizens, elected officials, and schools that are specific to transportation issues.
4. Offering outreach to communities to integrate land use and transportation decisions to reduce 1 growth in vehicle miles traveled, such as smart growth techniques, buffer zones, transit-oriented 2 development, walkable communities, access management plans, etc.
5. Committing to research additional concrete additives that would reduce the demand for cement.
6. Expanding Transportation Demand Management efforts statewide to better utilize the existing transportation mobility network.
7. Continuing to diversify the CDOT fleet by retrofitting diesel vehicles, specifying the types of 7 vehicles and equipment contractors may use, purchasing low-emission vehicles, such as hybrids, 8

and purchasing cleaner burning fuels through bidding incentives where feasible. Incentivizing is 9 the likely vehicle for this.

8. Exploring congestion and/or right-lane only restrictions for motor carriers.
9. Funding truck parking electrification (note: mostly via exploring external grant opportunities).
10. Researching additional ways to improve freight movement and efficiency statewide.
11. Committing to incorporating ultra-low sulfur diesel for non-road equipment statewide—likely using incentives during bidding.
12. Developing a low volatile organic compound-emitting tree landscape specification.

The Colorado Department of Transportation acknowledges that even though climate change is a global issue and no one strategy as described previously will make a noticeable difference, incremental changes such as the ones described above will result in some effect.

Because climate change is a global issue, and the emissions changes due to Action Alternatives are very small compared to global totals, the greenhouse gas emissions associated with the alternatives were not calculated. Because greenhouse gases are directly related to energy use, the changes in greenhouse gas emissions would be similar to the changes in energy consumption presented in **Section 3.16** of this document. **Table 9** shows the relationship of 2005 and projected Colorado highway emissions to total global CO_2 emissions. Colorado highway emissions are expected to increase by 4.7 percent between now and 2035. The benefits of the fuel economy and renewable fuels programs in the 2007 Energy Bill are offset by growth in vehicle miles traveled; the draft 2035 Statewide Transportation Plan predicts that Colorado vehicle miles traveled will double between 2000 and 2035. This table also illustrates the size of the Corridor relative to total Colorado travel activity.

Table 9. Annual Carbon Dioxide Emissions

Global CO2 Emissions, 2005, MMT	Colorado Highway CO_2 Emissions, 200	Projected Colorado 2035 Highway CO_2 Emissions, MMT[2]	Colorado Highway Emissions, % of Global Total (2005) 2	Project corridor VMT (Preferred Alternative), % of Statewide VMT (2005)
27,700	29.9	31.3	0.108%	6.06

Key to Abbreviations
MMT = million metric tons

[1]EIA, International Energy Outlook 2007.

[2]Calculated by FHWA Resource Center.

Section 5. Mitigation

What measures will be taken to address issues related to cumulative impacts?

Chapter 3 and **Section 3.19** of the *I-70 Mountain Corridor PEIS* (CDOT, 2010) include mitigation strategies for direct and indirect impacts to the environmental resources studied in this cumulative chapter in their respective sections. To address cumulative impacts, the following mitigation strategies can be considered by CDOT:

- The Colorado Department of Transportation will promote and assist, as possible, communities in the adoption of more comprehensive, regional growth management plans that can be applied to Tier 2 processes, since efforts to control growth greatly depend on localized planning and community political direction.
- Explore the possibility of creating grants for communities that lack the resources to develop a growth plan; work with local councils of government and the Department of Local Affairs to assist with funding such planning efforts.
- Promote the consideration of open space as community separators, and/or viewshed studies to distinguish communities, including studies led by the U.S. Forest Service and BLM.
- Coordinate with Clear Creek County communities regarding implementation of a marketing program that would include an approach to marketing for historic tourism to address the possible disparate distribution of benefits and impacts from construction activities.
- Follow the processes outlined in ALIVE Memorandum of Understanding to increase the ability of wildlife, particularly protected species, to cross the highway and transit infrastructure throughout the Corridor.
- Implement the strategies discussed previously to address Mobile Source Air Toxics and green house gas emissions.
- Continue to participate in and promote the SWEEP program. Implement the SWEEP Memorandum of Understanding and matrix of mitigation to address stream impairment and benefit aquatic resources.
- Implement the mitigation commitment to reduce the effect of the Corridor visual scars from original I-70 construction.
- Implement aesthetic guidelines prepared as part of the I-70 Mountain Corridor Context Sensitive Solutions program of the Preferred Alternative for establishing an aesthetically positive visual experience for all viewers.
- To avoid any negative effects of induced growth, Corridor counties could coordinate regional growth management. The *I-70 Mountain Corridor PEIS Land Use Technical Report* (CDOT, August 2010) summarizes all current county and municipal plans including strategies for balancing the impacts of growth with sustaining environmental quality.

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Appendix A. Maps

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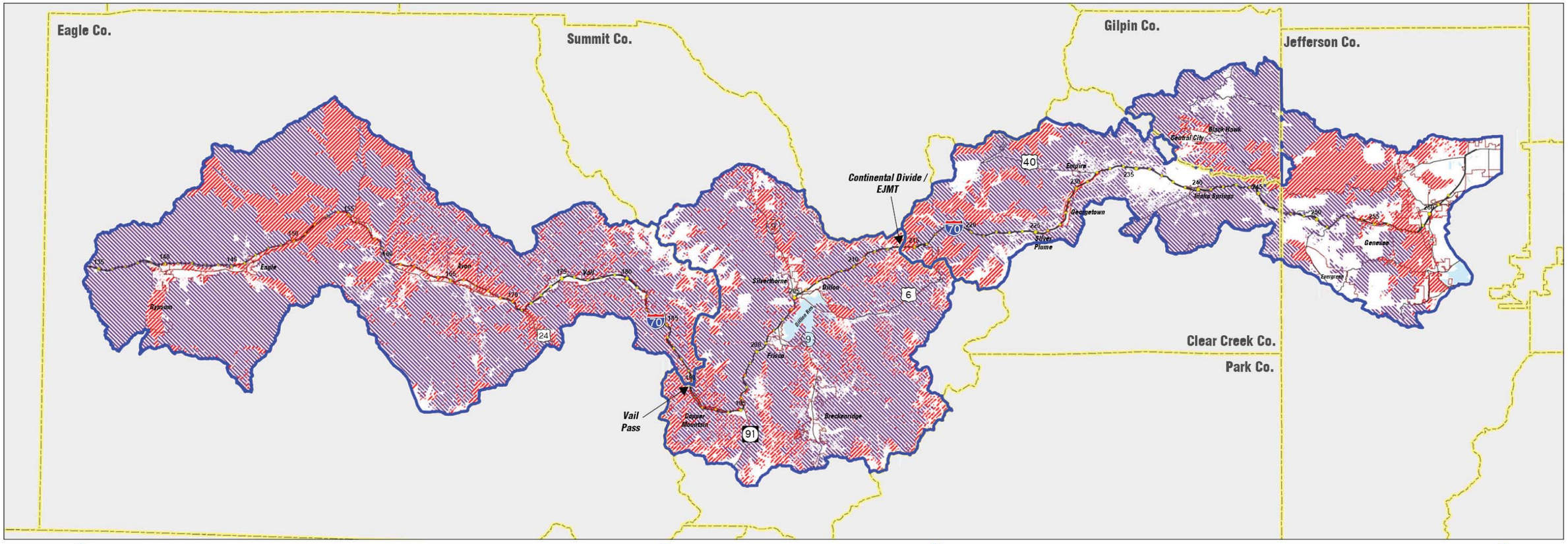


EAGLE RIVER WATERSHED Study Area

BLUE RIVER WATERSHED Study Area

CLEAR CREEK WATERSHED Study Area

			Past, Present, and Future Development Activities in Corridor								
			COUNTY AND TOWN DEVELOPMENT			FOREST MANAGEMENT, RECREATION, OPEN SPACE		ROADS AND HIGHWAYS			
RESOURCE DESCRIPTION	Geographic Areas (Aggregated HUC 6 Watersheds)	Acres	Planned Urban Development (Zoning and FLUM*)	Planned Rural Development (Zoning and FLUM*)	Total	Special Management Areas (Wilderness, Nonmotorized, Open Space)	Active Recreation Management Areas (Developed Recreation, Motorized, Ski Areas)	Roads (Not including I-70)		Existing I-70 (Footprint and Roadside Cut and Fills)		Range of Direct Impacts Associated with Action Alternatives
			acres	acres	acres	acres	acres	miles	acres	miles	acres	acres (unless otherwise noted)
			percent	percent	percent	percent	percent	percent		percent		percent
CRITICAL WILDLIFE HABITATS: Forested Vegetation	Eagle River	239,620	20,020	25,830	45,850	109,000	83,450	427	6,472	No data on historic habitat displacement associated with construction of I-70		Analyzed by species, not by watershed basin
			8%	11%	19%	45%	35%	3%				
	Blue River	135,260	6,040	8,070	14,110	96,090	24,530	188	2,850			
			4%	6%	10%	71%	18%	2%				
	Clear Creek	100,300	8,370	34,550	42,920	23,450	32,220	290	4,396			
			8%	34%	43%	23%	32%	4%				
	Total	**475,180**	**34,430**	**68,450**	**102,880**							**4 to 122**
			7%	**14%**	**22%**	**0%**	**0%**	**0%**				**0% to 0.03%**
CRITICAL WILDLIFE HABITATS: Non-Forested Vegetation	Eagle River	78,250	19,120	21,120	40,240	29,410	10,250	273	4,138	No data on historic habitat displacement associated with construction of I-70		Analyzed by species, not by watershed basin
			24%	27%	51%	38%	13%	5%				
	Blue River	48,810	1,990	3,650	5,640	26,940	15,910	98	1,485			
			4%	7%	12%	55%	33%	3%				
	Clear Creek	52,440	4,570	19,460	24,030	16,950	11,270	142	2,152			
			9%	37%	46%	32%	21%	4%				
	Total	**179,500**	**25,680**	**44,230**	**69,910**	**73,300**	**37,430**	**513**	**7,775**			**15 to 62**
			14%	**25%**	**39%**	**41%**	**21%**	**4%**				**0.01% to 0.03%**

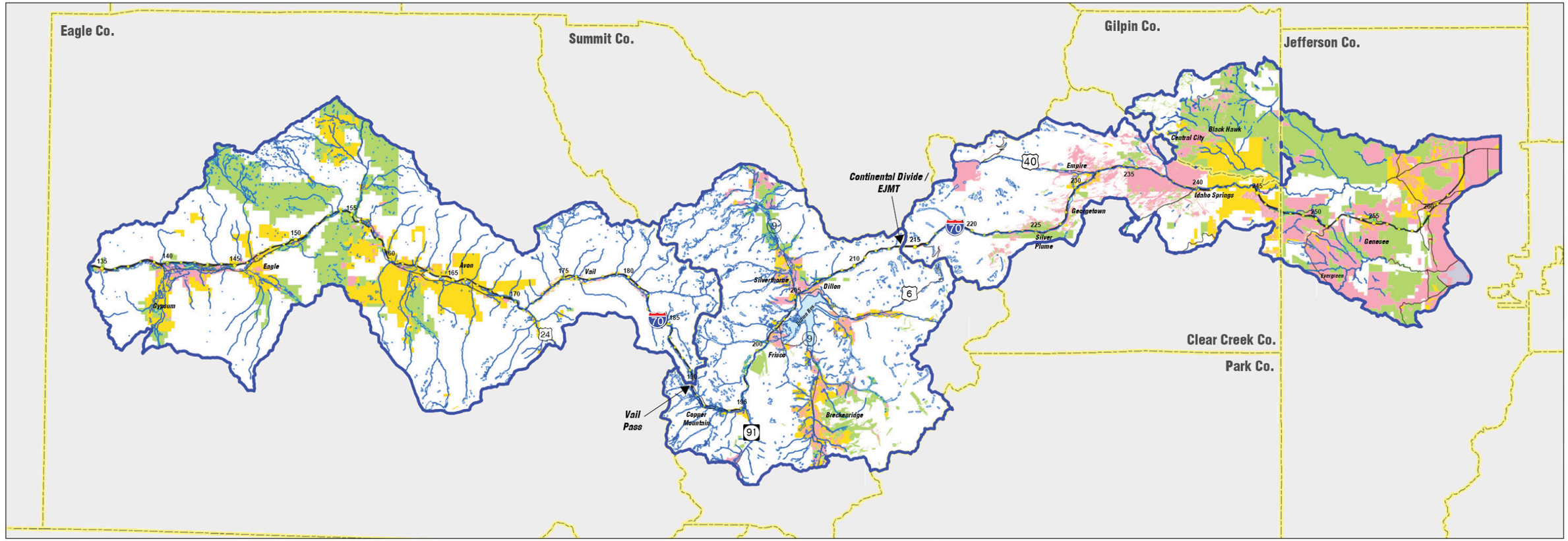
Forested Land
Grassland, Forbland, and Other
Watershed Study Area
Surrounding Counties

0 3 6 12 Miles

SCALE - 1:468,000 or 1" = 39,000'

N W E S

Figure A-1. Regional Impacts to Forested and Non-Forested Vegetation



RESOURCE DESCRIPTION	Geographic Areas (Aggregated HUC 6 Watersheds)	Acres	Past, Present, and Future Development Activities in Corridor: COUNTY AND TOWN DEVELOPMENT — Historic and Existing (Before I-70 and 2000 Eras)	Planned Urban Development (Zoning and FLUM*)	Planned Rural Development (Zoning and FLUM*)	Total	FOREST MANAGEMENT, RECREATION, OPEN SPACE — Special Management Areas (Wilderness, Nonmotorized, Open Space)	Active Recreation Management Areas (Developed Recreation, Motorized, Ski Areas)	ROADS AND HIGHWAYS — Roads (Not including I-70)		Existing I-70 (Footprint and Roadside Cut and Fills)		Range of Direct Impacts Associated with Action Alternatives
			acres	acres	acres	acres	acres	acres	miles	acres	miles	acres	acres (unless otherwise noted)
			percent	percent	percent	percent	percent	percent	percent		percent		percent
Development within 200 feet of streams, open water, and wetlands (acres)	Eagle River	27,472	2,520	4,674	5,320	12,513	11,094	3,913	200	3,031	7.9	215	Analyzed in linear feet, not acres
			9%	17%	19%	46%	40%	14%	11%		0.8%		
	Blue River	24,668	2,072	3,002	2,814	7,888	12,332	5,382	130	1,970	8.2	319	
			8%	12%	11%	32%	50%	22%	8.0%		1.3%		
	Clear Creek	13,419	2,029	3,203	3,685	11,412	2,053	2,822	174	2,857	15.5	452	
			15%	24%	27%	85%	15%	21%	21%		3.4%		
	Total	**65,559**	**6,621**	**10,879**	**11,819**	**31,813**	**25,479**	**12,117**	**504**	**7,858**	**32**	**986**	**5,996 to 32,485**
			10%	**17%**	**18%**	**49%**	**39%**	**18%**	**12%**		**2%**		

Existing Development (includes mining - Clear Creek Co.)
Planned Urban Development
Planned Rural Development
Forest Management / Open Spaces
200-foot Zone around Surface Water and Wetlands
Watershed Study Area
Surrounding Counties

0 3 6 12 Miles

SCALE - 1:468,000 or 1" = 39,000'

N W E S

Figure A-2. Regional Impacts on Surface Water and Wetlands

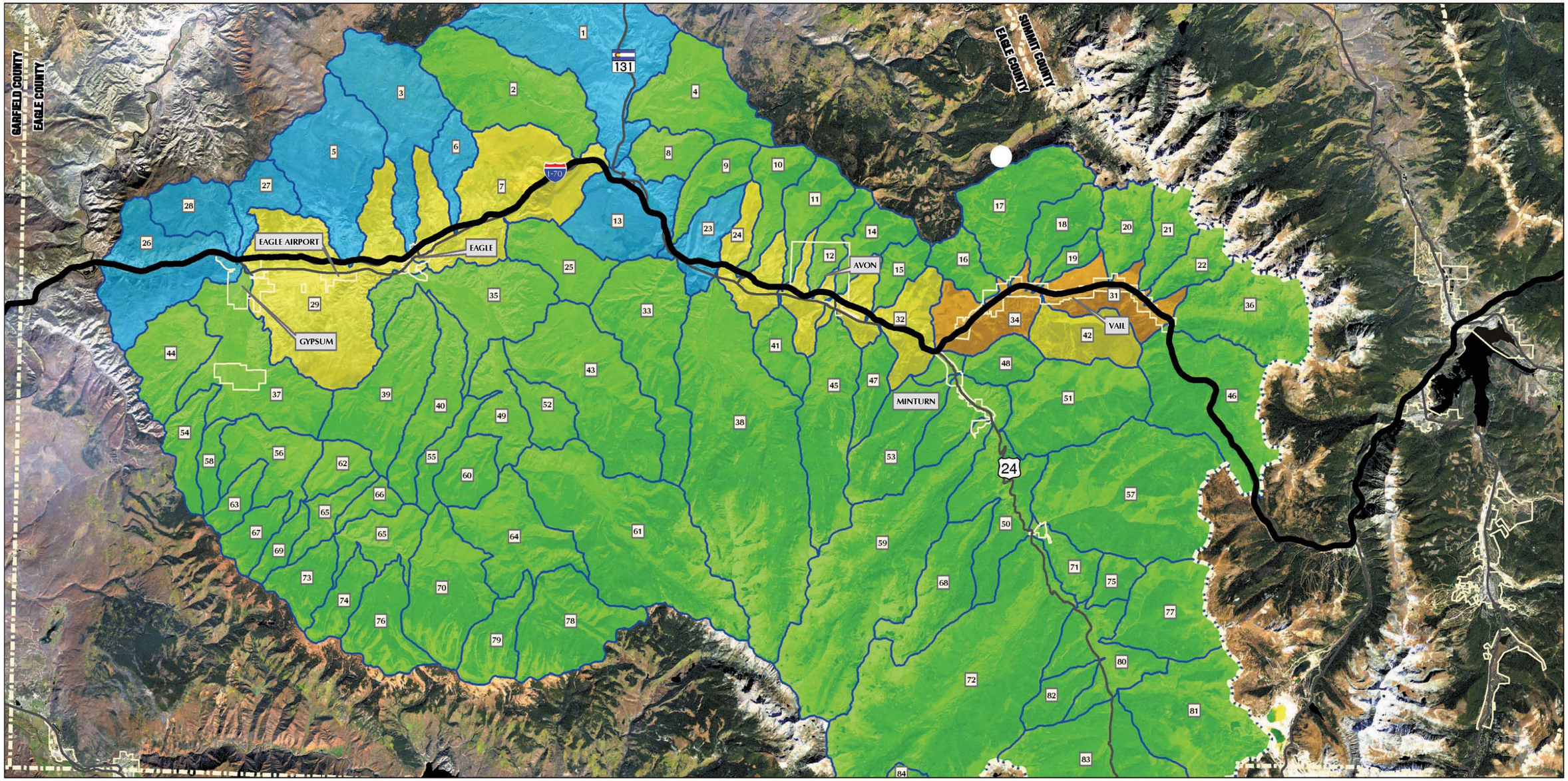


Figure A-3. Total Phosphrous Load from Existing Land Use Values, through Eagle River Analysis Area

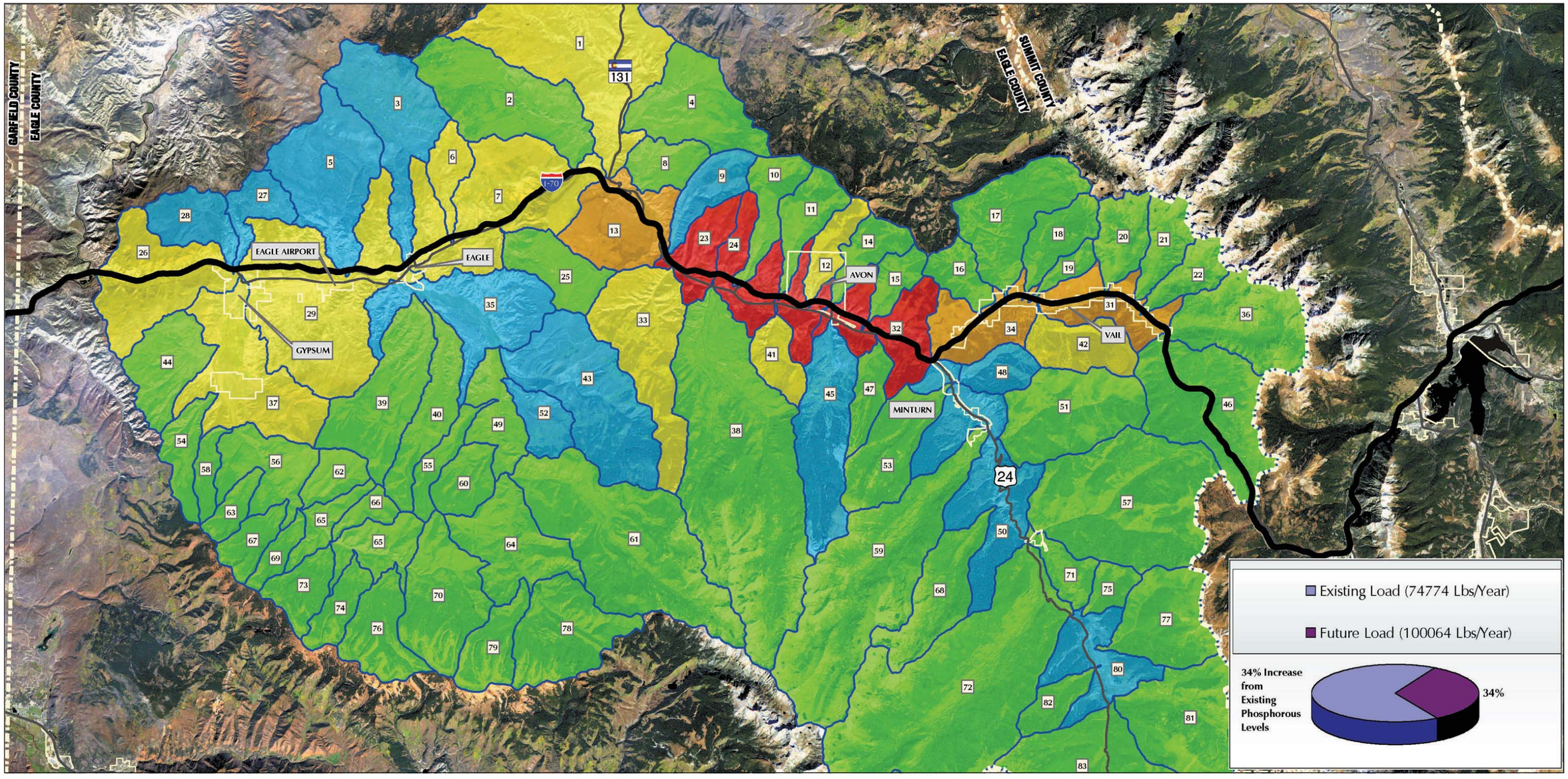
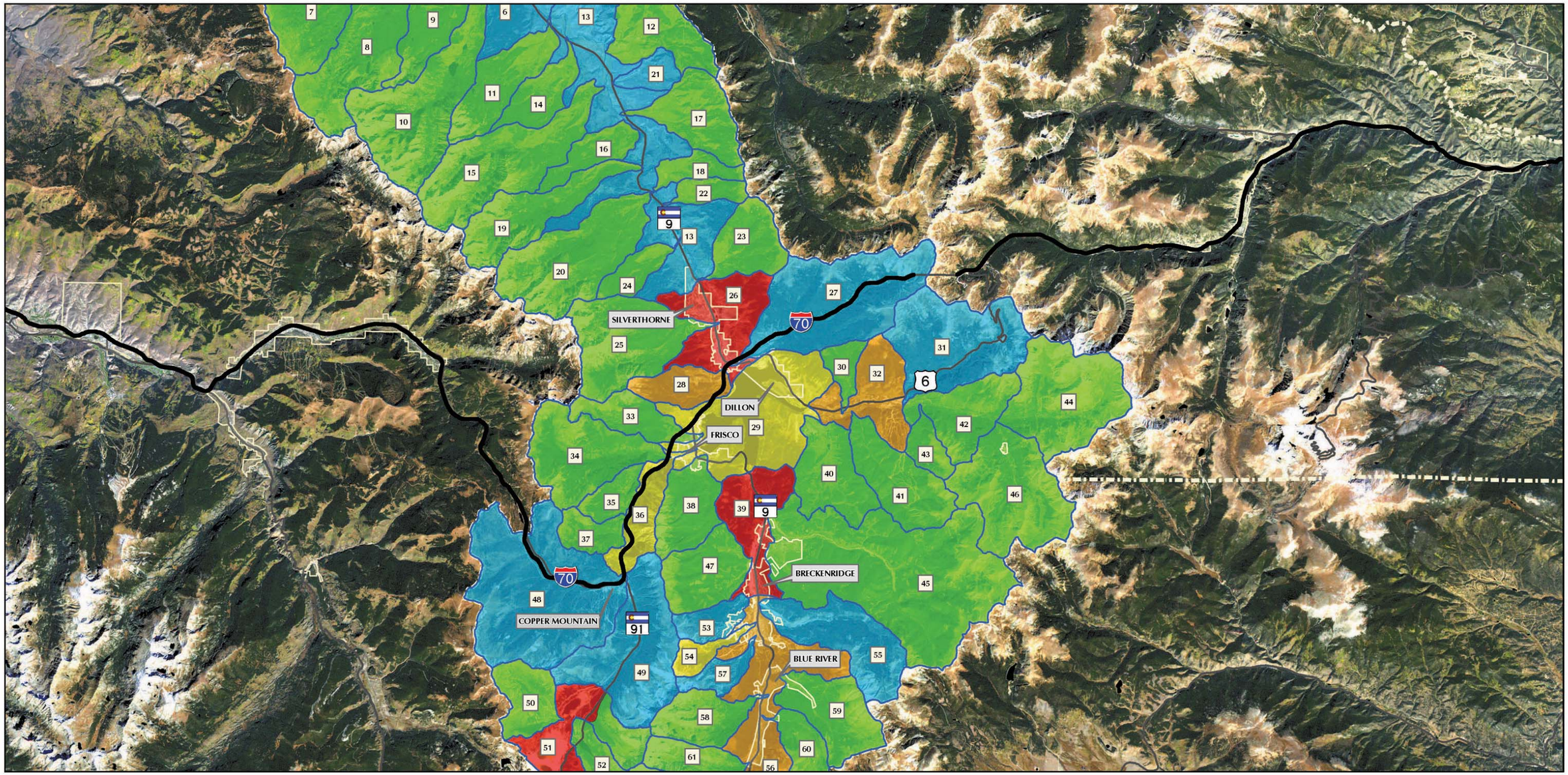


Figure A-4. Total Phosphorous Load from Future Land Use Values through Eagle River Analysis Area



Total Phosphorous (Lbs/Acre)

- 0 - 0.149
- 0.15 - 0.249
- 0.25 - 0.349
- 0.35 - 0.449
- >= 0.45

General Features

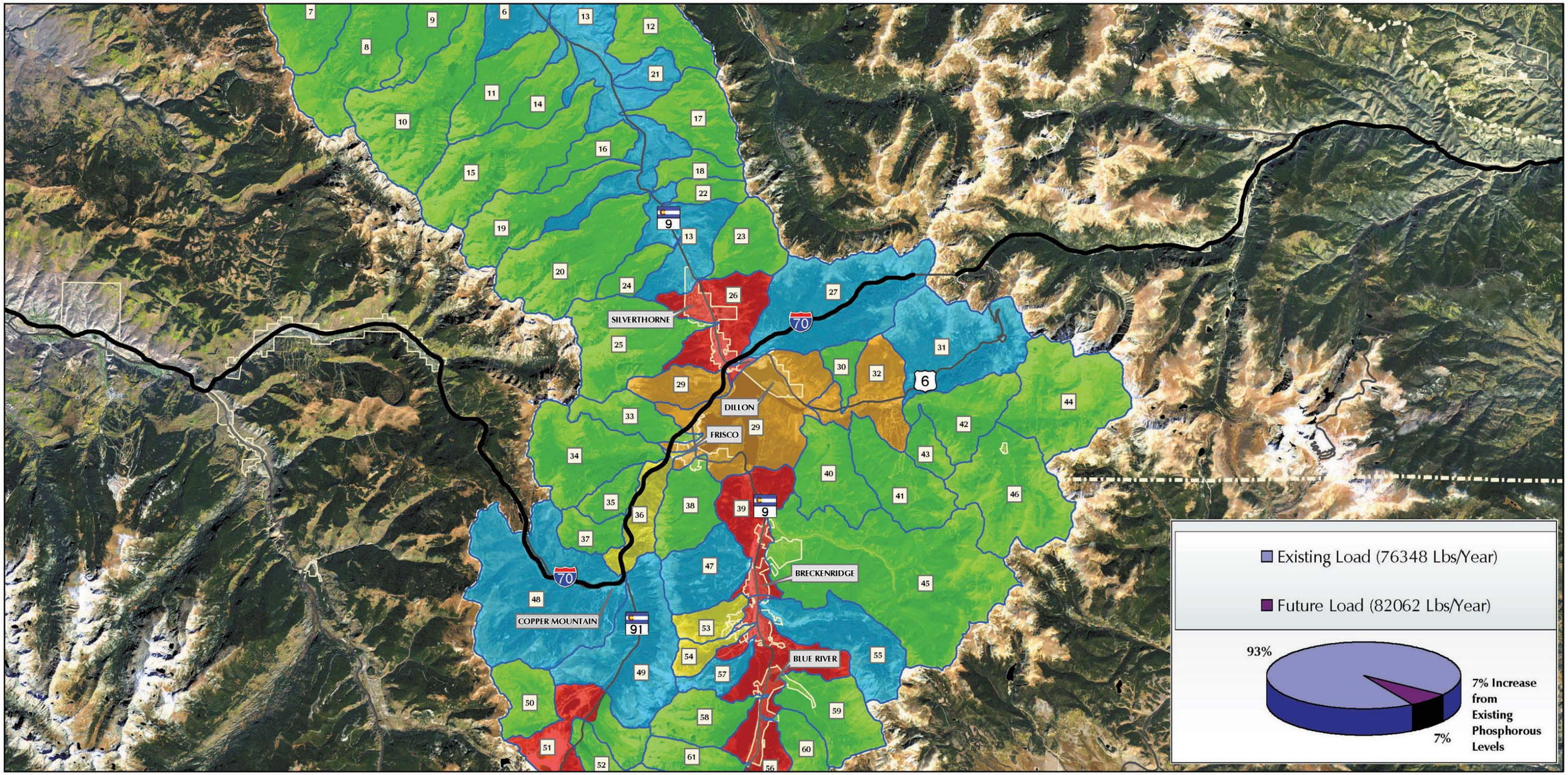
- USFS HUC6 Watershed Boundaries
- County Boundaries
- State & Federal Highways

N W E S

0 2 4 Miles

SCALE - 1:246,000 or 1" = 20,500'

Figure A-5. Total Phosphorous Load from Existing Land Use Values through Blue River Analysis Area



Total Phosphorous (Lbs/Acre)

- 0 - 0.149
- 0.15 - 0.249
- 0.25 - 0.349
- 0.35 - 0.449
- >= 0.45

General Features

- USFS HUC6 Watershed Boundaries
- County Boundaries
- State & Federal Highways

N W E S

0 2 4 Miles

SCALE - 1:246,000 or 1" = 20,500'

Figure A-6. Total Phosphorous Load from Future Land Use Values through Blue River Analysis Area

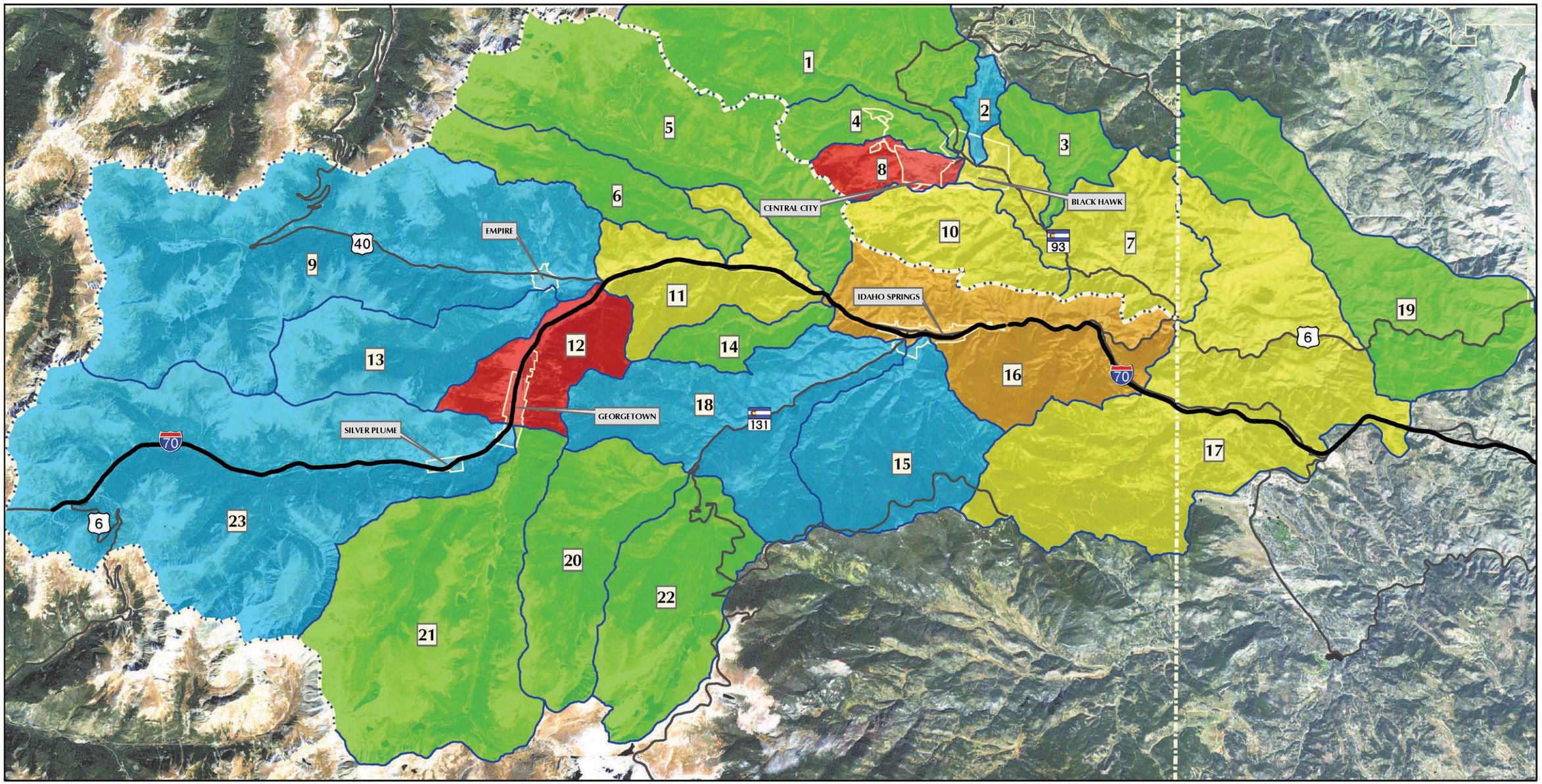


Figure A-7. Total Phosphorous Load from Existing Land Use Values through Clear Creek Analysis Area

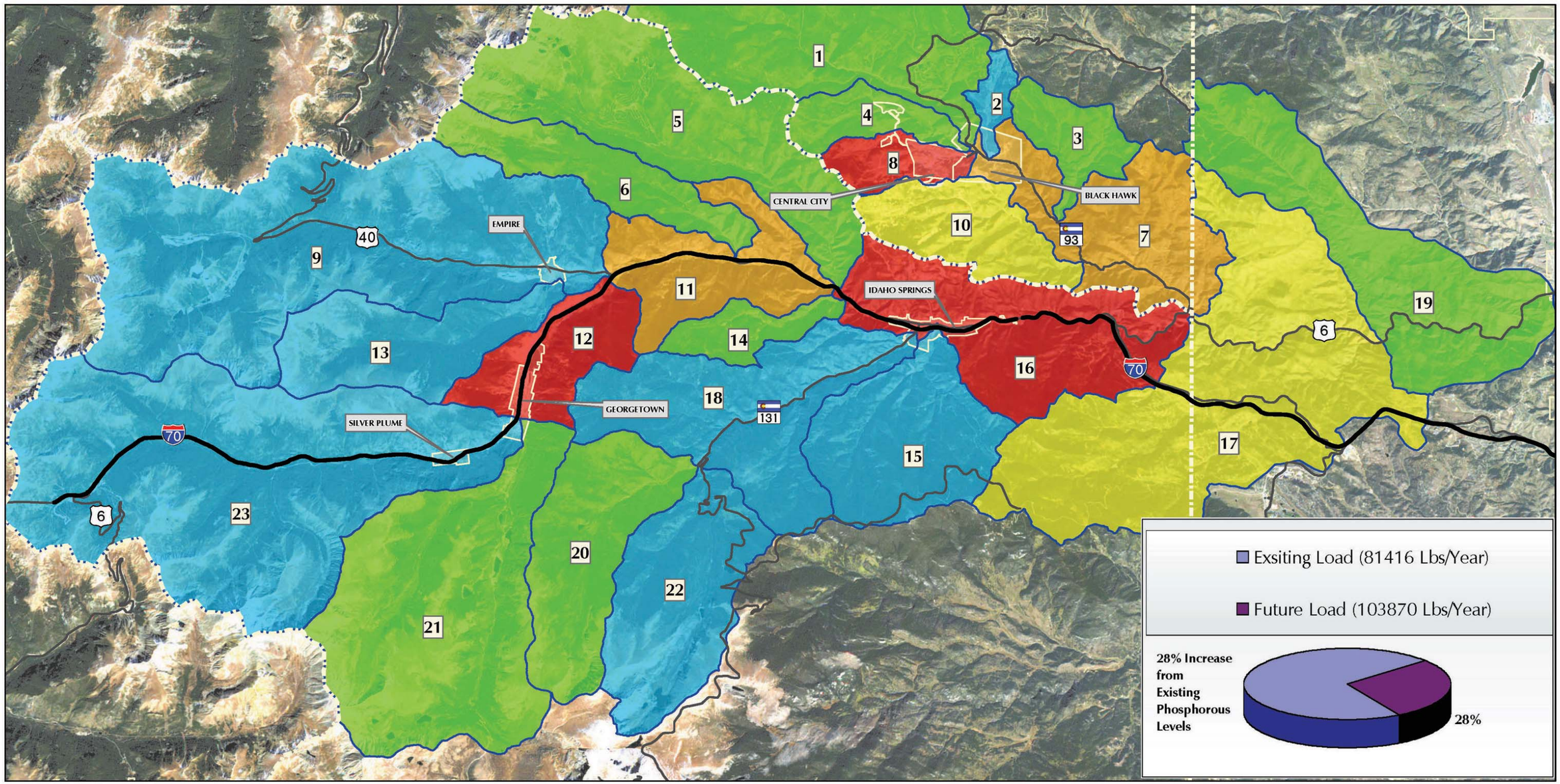
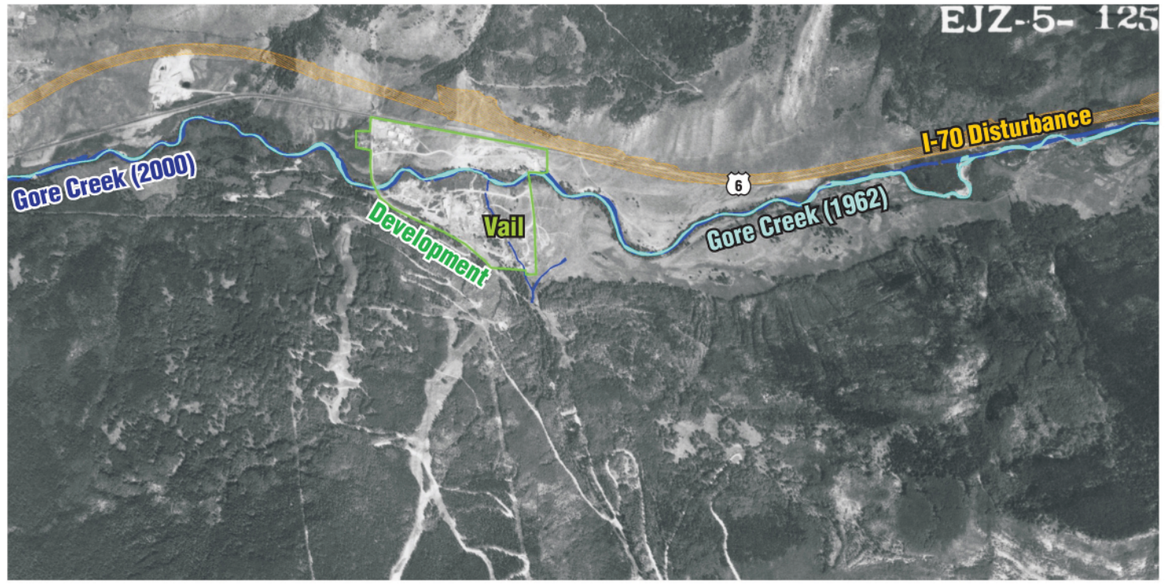
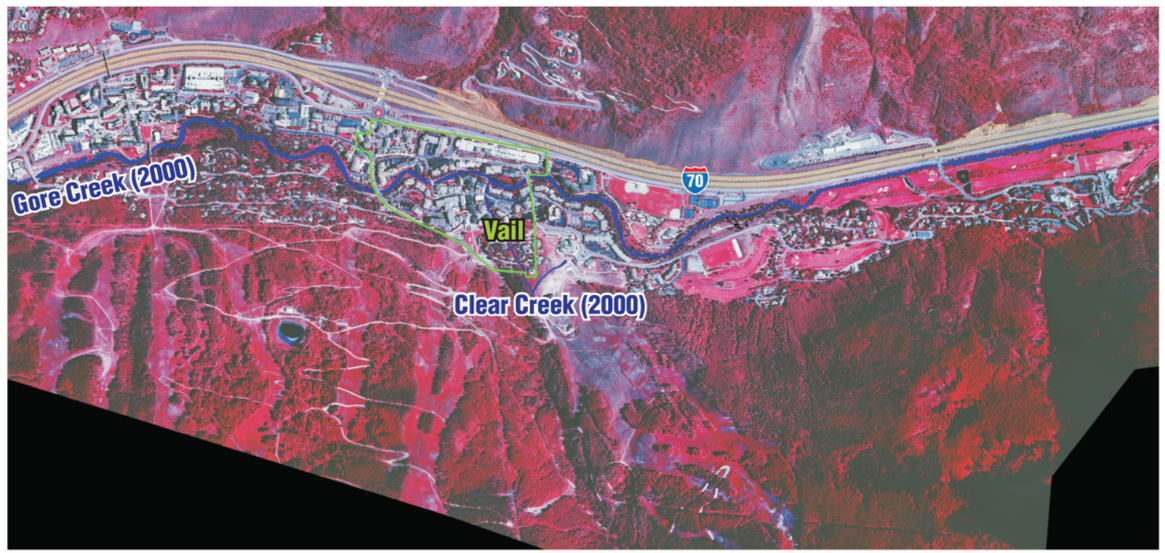


Figure A-8. Total Phosphrous Load from Future Land Use Values, through Clear Creek Analysis Area

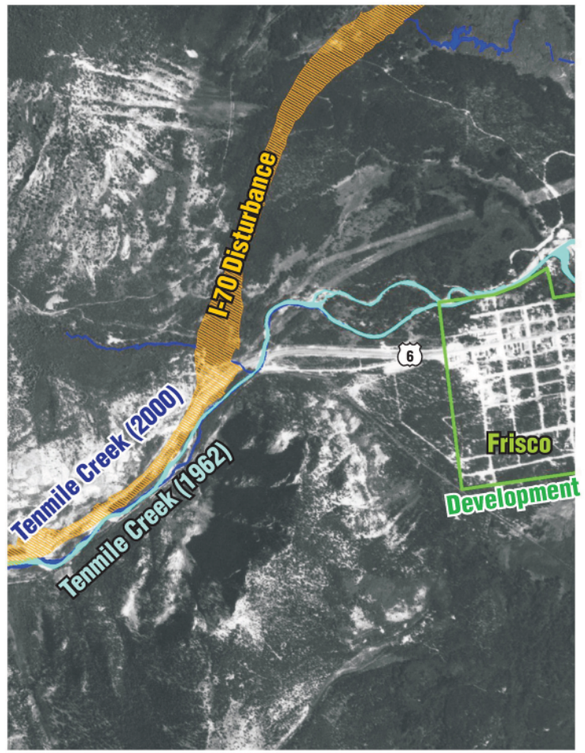
Vail - 1962



Vail - 2000



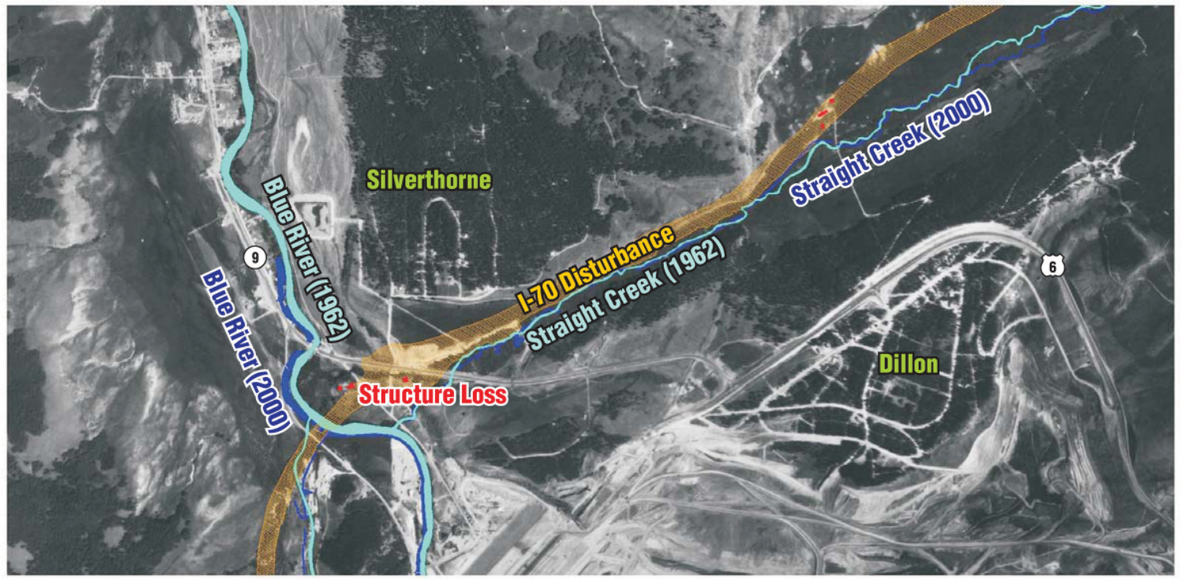
Frisco - 1962



Frisco - 2000

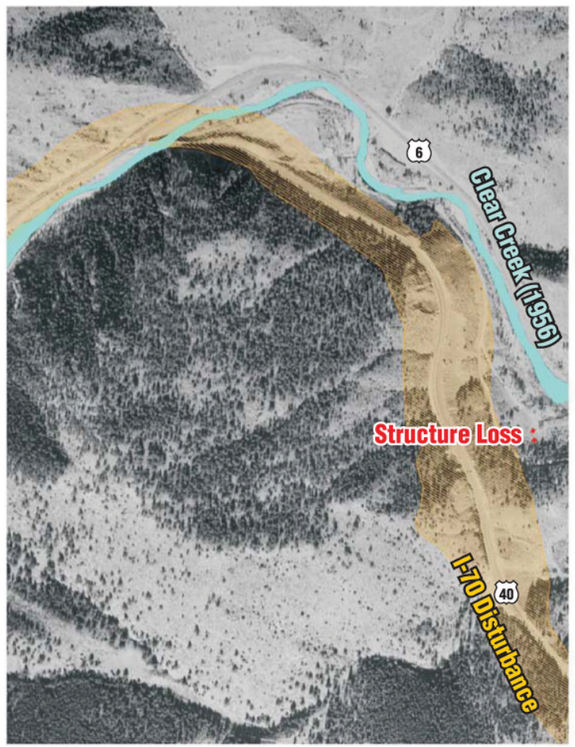
Figure A-9. Stream Alignment and Development, Pre-I-70 to Present, Vail and Frisco

Silverthorne - 1962



Silverthorne - 2000

Floyd Hill - 1962



Floyd Hill - 2000

Figure A-10. Stream Alignment and Development, Pre-I-70 to Present, Silverthorne and Floyd Hill

Silver Plume - 1957

Structures Lost Within or Adjacent to I-70 Footprint
Approximate Location of I-70 Disturbance

Figure A-11. Stream Alignment and Development Pre-I-70, Sliver Plume

Silver Plume - 2000

Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-12. Stream Alignment and Development, 2000, Sliver Plume

Georgetown - 1957

Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-13. Stream Alignment and Development Pre-I-70, Georgetown

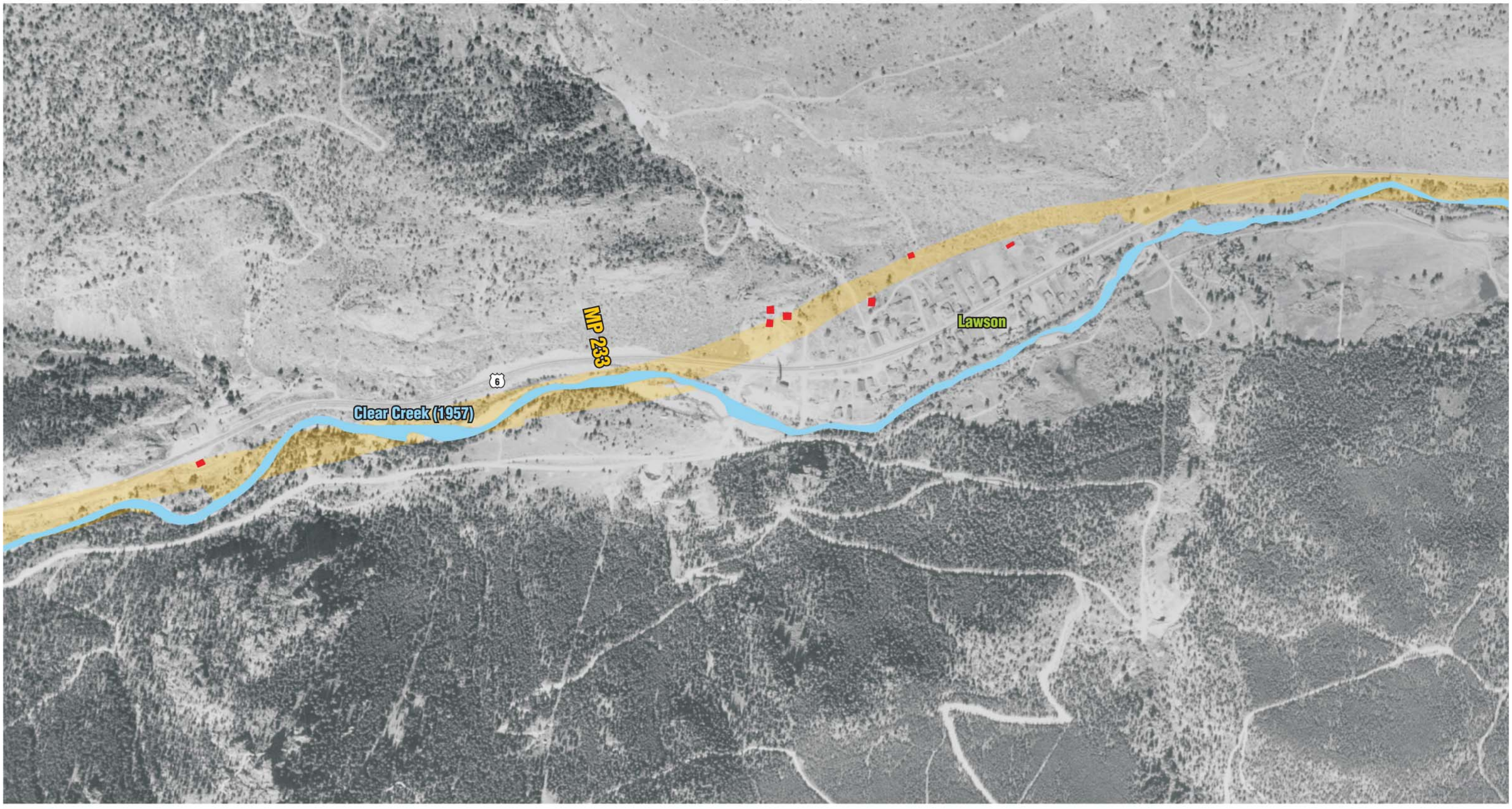
Georgetown - 2000

Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-14. Stream Alignment and Development 2000, Georgetown

Lawson - 1957



Structures Lost Within or Adjacent to I-70 Footprint
Approximate Location of I-70 Disturbance

Figure A-15. Stream Alignment and Development Pre-I-70, Lawson

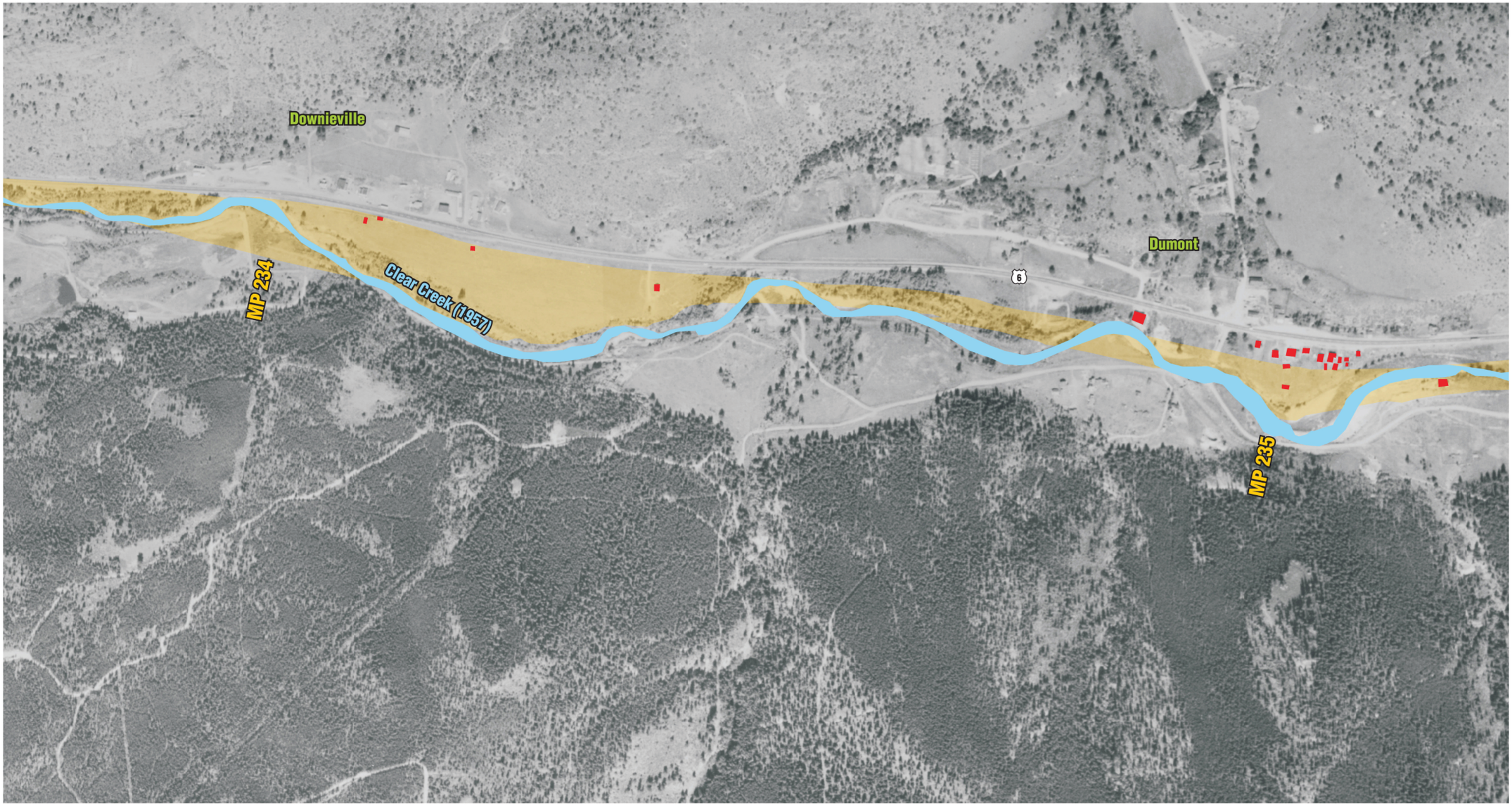
Lawson - 2000

Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-16. Stream Alignment and Development 2000, Lawson

Downieville - 1957



Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-17. Stream Alignment and Development Pre-I-70, Downieville

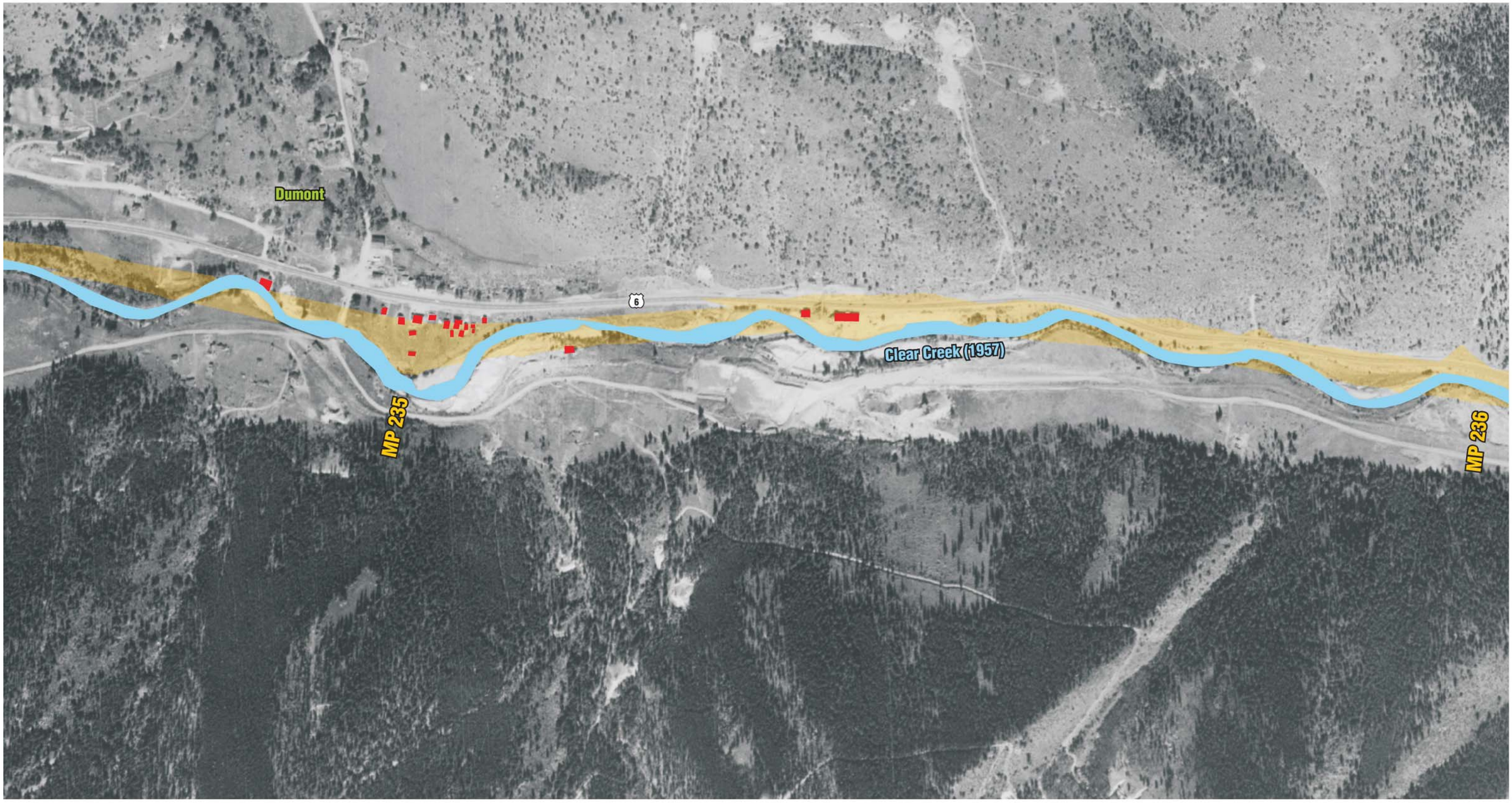
Downieville - 2000

Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-18. Stream Alignment and Development 2000, Downieville

Dumont - 1957



Structures Lost Within or Adjacent to I-70 Footprint
Approximate Location of I-70 Disturbance

Figure A-19. Stream Alignment and Development Pre-I-70, Dumont

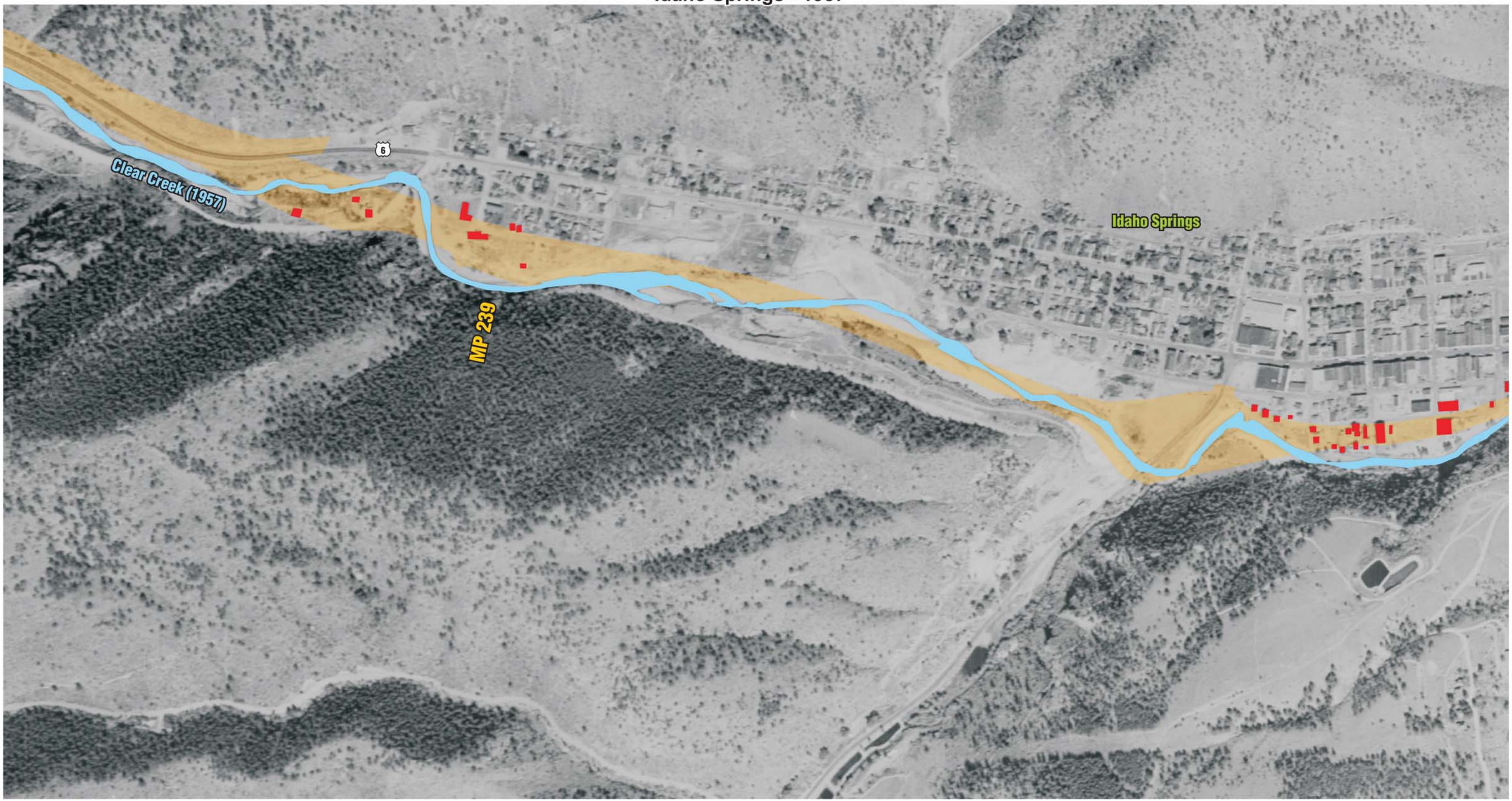
Dumont - 2000

Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-20. Stream Alignment and Development 2000, Dumont

Idaho Springs - 1957



Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-21. Stream Alignment and Development Pre-I-70, West Idaho Springs

Idaho Springs - 2000

Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-22. Stream Alignment and Development 2000, West Idaho Springs

Idaho Springs - 1957

Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-23. Stream Alignment and Development Pre-I-70, East Idaho Springs

Idaho Springs - 1957

Structures Lost Within or Adjacent to I-70 Footprint

Approximate Location of I-70 Disturbance

Figure A-24. Stream Alignment and Development 2000, East Idaho Springs