3.15 Paleontology

3.15.1 What is paleontology and why is it important to this project?

Paleontology, or the study of fossils and ancient life forms, tells the story of the history of life on Earth. Paleontological resources are managed for their scientific and educational values and to promote public enjoyment.

A variety of federal, state, and local regulations and policies protect paleontological resources. These include the National Environmental Policy Act (NEPA), federal Antiquities Act of 1906, National Natural Landmarks Program, Federal Land Policy and Management Act of 1976, and the recently enacted federal Paleontological Resources Preservation Act. Colorado's Historical, Prehistorical, and Archaeological Resources Act, also known as the State Antiquities Act, governs fossils on state-owned lands. As an indication of the importance of paleontological resources in Colorado, the Colorado Department of Transportation (CDOT) maintains a dedicated Paleontology Program to evaluate potential effects on paleontological resources for all construction and maintenance activities.

3.15.2 What study area and process was used on this project to analyze paleontological resources?

The study area for paleontology includes the rock formations surrounding the I-70 Mountain Corridor that may be encountered during construction of the Action Alternatives. Professional paleontologists identified and evaluated these formations to determine those with high or moderate potential to contain scientifically important paleontological resources. This potential is called paleontological sensitivity. Sensitivity analysis relies on four widely accepted paleontological resource assessment criteria developed by the Society of Vertebrate Paleontology, the United States Forest Service, the Bureau of Land Management, and the National Academy of Sciences, respectively. Using these criteria, along with information about the local formation conditions in the Corridor, the paleontologists assigned an overall sensitivity ranking to each of the geologic units in the Corridor. Impact analysis considers the potential disturbance of sensitive geologic units for each alternative.

3.15.3 What agencies have CDOT and FHWA coordinated with and what are their relevant issues?

Qualified paleontologists performed the assessment of paleontological resources in the Corridor. Their assessment included a comprehensive literature review, museum records search, and review of geologic maps. Through these efforts, the paleontologists coordinated with museum and academic professionals who have expertise in the Corridor. In addition, the lead agencies consulted with the Bureau of Land Management and United States Forest Service, who manage a portion of the Corridor's lands and paleontological resources. These organizations and agencies recommended that standard assessment and mitigation strategies be employed on projects in the Corridor but did not raise any specific concerns. Data collection and coordination to identify geologic formations with fossil potential occurred early in the study (2001 to 2003). The characterization of paleontological resources along the Corridor remains current because the geologic formations that may contain fossils are millions of years old and have not changed in the past several years.

3.15.4 What are the areas of paleontology interest identified in the Corridor?

The Corridor includes 40 mapped geologic units. Of these, three are classified as highly sensitive for paleontological resources, and 19 are classified as moderately sensitive. The remaining 18 geologic units have little or no potential for important paleontological resources. As shown in **Figure 3.15-1**, sensitive areas in the Corridor, west to east, generally include the first 42 miles from Gypsum to Vail Pass, the 6.6 miles east of Frisco, and the last 1.6 miles of the Hogback near C-470. The *I-70 Mountain Corridor PEIS Paleontological Resources Technical Report* (CDOT, March 2011) provides descriptions and sensitivity rankings of all formations.

3.15.5 How do the alternatives potentially affect paleontological resources?

The No Action Alternative does not affect paleontological resources. Action Alternatives could affect paleontological resources if sensitive geologic units are directly disturbed during construction. Impacts on paleontological resources are often highly localized and require more detailed design or even construction to assess fully. Relative conclusions about impacts on paleontological resources, however, can be drawn at Tier 1. Alternatives that include actions along the portions of the Corridor identified as sensitive have a greater potential effect than those that occur in areas of low or no sensitivity. Likewise, alternatives with larger footprints have a greater scope of potential impacts on bedrock than those requiring little bedrock disturbance.

None of the Action Alternatives avoid disturbing important geologic units, which occur generally between mileposts 140 and 192, 202 and 207, and 259 and 260. Curve safety modifications, interchange modifications, and auxiliary lane construction potentially affect sensitive geologic units and are included to some extent in all Action Alternatives. The Highway alternatives and Bus in Guideway Alternatives potentially affect additional resources because of wider footprints required for travel lanes. The Transit alternatives may have less of an effect because they have a narrower footprint and do not include curve safety modifications common to the other alternatives. The Combination alternatives have higher levels of potential impact because they have both the widest footprints and the longest reaches. The Preferred Alternative initially has impacts similar to the Transit alternatives; if fully implemented, the impacts are more similar to those of the Combination Alternatives. As noted previously, however, field survey and additional design information are required to assess impacts on paleontological resources. This work is anticipated to occur during Tier 2 processes and during final design and construction. See the *I-70 Mountain Corridor PEIS Paleontological Resources Technical Report* (CDOT, March 2011) for additional information.

Paleontological resources are affected by direct disturbance to geologic units, and indirect effects are not anticipated.

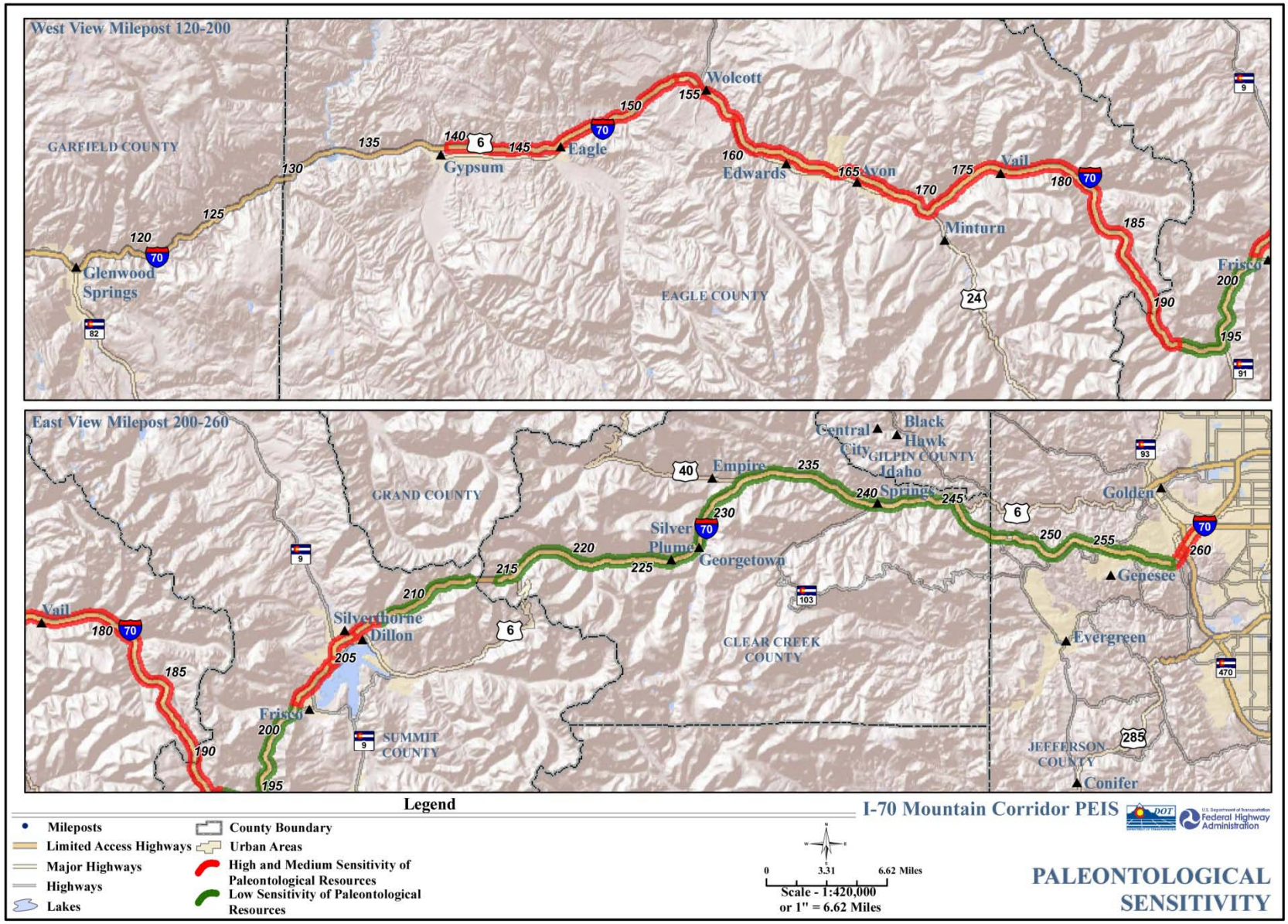
How does construction of the alternatives affect paleontological resources?

Sensitive geologic formations are disturbed during construction, exposing or damaging important paleontological resources. Impacts of construction are the same as described for direct effects above.

What are the project effects on paleontological resources in 2050?

Paleontological resources are affected by the alternatives when and if sensitive geologic formations are disturbed by construction activities. The effects on these resources relate to the timing of construction of transportation components. The longer time frame for implementation of the Action Alternatives allows important geologic formations to remain undisturbed longer.

Figure 3.15-1. Areas of Paleontological Sensitivity in the Corridor



3.15.6 What will be addressed in Tier 2 processes?

Tier 2 processes will use information gathered in Tier 1 to focus additional field surveys in areas of high or moderate paleontological potential. Tier 2 processes will include the following activities:

- Identification of any newly recorded and/or relocated previously recorded fossil localities
- An assessment of the scientific importance of identified sites
- A recommendation for mitigation if appropriate

The Colorado Department of Transportation will conduct the following activities during Tier 2 processes:

- Develop specific and more detailed mitigation strategies and measures, and best management practices specific to each project
- Adhere to any new laws and regulations that may be in place when Tier 2 processes are underway

3.15.7 What are the approaches to programmatic mitigation planning for paleontological resources?

All construction in areas of moderate or high paleontological sensitivity in the Corridor will include pre-construction survey and evaluation, construction monitoring, implementation of a Worker Awareness Training Program, and spot-check monitoring of sensitive formations during construction. All work will be overseen by the CDOT staff paleontologist or other qualified and permitted paleontologist and will follow CDOT's *Paleontology Analysis and Documentation Procedures* (CDOT, 2006). In the event of discovery of unanticipated fossil remains, such as unexpected concentrations of fossils, unusually large specimens, or unexpected discoveries in sediments, all ground disturbances in the area will cease immediately. The qualified paleontologist and appropriate project personnel will be notified immediately to assess the find and make further recommendations.

Mitigation will follow the *Society of Vertebrate Paleontology Standard Guidelines* (Society of Vertebrate Paleontology, 1995) for treatment of sensitive paleontological resources and *CDOT Paleontology Analysis and Documentation Procedures* (CDOT, 2006). **Section 3.19, Mitigation Summary** also presents mitigation strategies.