The environmental and socioeconomic consequences associated with each individual restoration project in the proposed restoration alternative were identified in Chapter 3. This chapter provides a description of the cumulative impacts of the proposed alternative and compares these impacts to those of the no-action alternative.

Over the long term, the proposed restoration projects that together form the proposed restoration alternative identified in this draft RP/EA would provide positive environmental and socioeconomic benefits for the upper Arkansas River Valley. The analysis of impacts assumes that all of the Tier 1 and Tier 2 restoration projects would be implemented. If funding is not sufficient for implementation of all Tier 2 projects, then the cumulative impact of restoration (both positive and negative) would be lessened. Analysis of the impacts of Tier 3 projects would occur at a later date when more information becomes available regarding these projects.

5.1 Environmental Impacts of the Proposed Alternative

Overall, the cumulative environmental impact of the proposed alternative would be positive because natural resources would benefit from the proposed restoration actions. Descriptions of impacts for specific categories of environmental resources are detailed below.

5.1.1 Water Resources

Over the long term, the proposed alternative will have a net positive impact on water resources in the upper Arkansas River Valley. During implementation of the in-stream restoration projects in the 11-mile reach of the Arkansas River, there would be temporary increases in sediment transport and in the turbidity level of surface water because of the presence of heavy equipment in the stream channel and along the riparian corridor. These impacts would be temporary, because the restoration activities ultimately would stabilize and revegetate stream banks and result in a long-term decrease in erosion and improvement in water quality. Temporary impacts would be minimized by following BMPs for in-stream work and conforming to all requirements of the permits that would be necessary to conduct the project.

Other projects in the proposed alternative also would have long-term positive impacts on water resources. The project to obtain better equipment for noxious weed control would help to protect water quality from pesticide runoff and residues, because the equipment allows more targeted spraying of weeds with a lower volume of herbicide. The Dinero Tunnel water quality monitoring project would detect the emergence of contaminated seeps or springs upgradient of the plugged Dinero Tunnel, and would help ensure that downstream water quality is protected by triggering corrective actions if necessary. The project to develop an EE/CA for the Venture Mine and Sugarloaf Mine dumps would ultimately lead to improved surface water and groundwater quality in the Lake Fork through remediation of mine waste piles. Finally, the Canterbury Tunnel rehabilitation project would restore the beneficial use of a groundwater resource as a drinking water supply.

5.1.2 Vegetation Resources

The restoration projects in the proposed alternative would enhance vegetation resources in riparian, floodplain, and upland habitats. The Arkansas River in-stream restoration project would result in increased cover of native riparian vegetation, through fencing to exclude cattle and replanting of native species. The weed control projects would result in improved control of noxious weeds and emerging weed threats, and would help protect native vegetation from being crowded out by weeds. The erosion control on roads project would result in recovered vegetation where vegetation had been damaged by motorized travel on informal trails. The project to develop native plant propagation at the Hayden Ranch would improve wetland and forestry revegetation efforts by providing locally adapted nursery stock. Revegetation of the Hayden Ranch would result in a direct improvement to native vegetation by increasing the cover of native plants through direct seeding. Finally, development of forest and grazing management plans also would benefit vegetation through improved management and decreased risk of widespread pine beetle attacks in areas where the forest cover is diversified.

5.1.3 Fish and Wildlife Resources

The restoration projects in the proposed alternative would enhance fish and wildlife resources in the upper Arkansas River Valley. The in-stream restoration projects are designed to improve fish habitat and increase fish populations in the 11-mile reach of the Arkansas River, with a particular focus on benefiting brown trout. Projects to protect or improve water quality in the Lake Fork (Dinero Tunnel water quality monitoring and development of an EE/CA for the Venture Mine and Sugarloaf Mine dumps) would improve fish resources in Lake Fork. Wildlife would benefit from many projects as well. The erosion control on roads project would decrease disturbance of wildlife and improve habitat conditions and connectivity. Development of forest and grazing management plans also would benefit wildlife, through the promotion of increased diversity and protection of native habitats, which would result, especially on private land, in increased cover of native riparian vegetation through fencing to exclude cattle and replanting of native species. The weed control projects would result in improved control of noxious weeds and emerging weed threats and would help protect native vegetation from being crowded out by weeds. The erosion control on roads project would result in recovered vegetation where vegetation had been damaged by motorized travel on informal trails. The project to develop native plant propagation at the Hayden Ranch would improve wetland and forestry revegetation efforts by providing locally adapted nursery stock. Revegetation of the Hayden Ranch would result in a direct improvement to native vegetation by increasing the cover of native plants through direct seeding. Finally, development of forest and grazing management plans also would benefit vegetation through improved management and decreased risk of widespread pine beetle attacks in areas where the forest cover is diversified.

5.1.4 Special Status Species

As noted previously, the T&E species whose historic range includes Lake County, Colorado, are the Canada lynx, greenback cutthroat trout, Penland alpine fen mustard, and possibly Uncompahgre fritillary butterfly. Gunnison's prairie dog is a candidate for listing. For the USFS, bighorn sheep,

northern leopard frog, and boreal toad are classified as sensitive species in Region 2. The proposed restoration actions would not affect any of these species because none are known to occur in the proposed project activity areas and there is no critical habitat in any area potentially affected by the proposed action. Elimination of motorized travel on informal trails at the Paddock State Wildlife Area would benefit Canada lynx if they pass through the area.

In general, any disturbances resulting from construction activities at the restoration sites would be of relatively short duration (one to three years). These restoration projects would provide long-term benefits to habitat for any T&E species.

5.1.5 Air and Noise

The use of heavy equipment to implement some of the projects may generate local air pollution, especially from diesel engines and noise pollution that could disturb wildlife on a temporary basis. Because the work will be temporary and will only occur during daylight hours and in limited locations, wildlife likely will be able to avoid the noise and air pollution impacts. Construction work on the in-stream habitat restoration project will proceed in phases, to minimize the area being disturbed at any single point in time.

5.1.6 Geology and Minerals

The proposed alternative would not have a negative impact on geology or mineral resources. The proposed restoration projects would not result in any change in mining activity in the area or in any change in the use of mineral resources.

5.1.7 Soils

The proposed alternative would have a positive impact on soils because many of the projects would result in decreased erosion and increased soil stability. Specifically, the in-stream restoration projects along the 11-mile reach of the Arkansas River, the erosion control on roads project, revegetation on the Hayden Ranch, and improved forest and grazing management on private land would improve soil stability and soil management.

5.2 Cultural and Socioeconomic Impacts of the Proposed Alternative

Overall, the cumulative cultural and socioeconomic impacts of the proposed alternative would be positive because the human population in the area affected by the proposed alternative would benefit from the proposed restoration actions. Descriptions of impacts for specific categories of cultural and socioeconomic considerations are detailed below.

5.2.1 Lands and Access

The proposed restoration actions that make up the proposed alternative would not conflict with Lake County or state or federal policies for land management. Land acquisition would conform to the policies of the agency accepting the land (e.g., Colorado State Parks, USFS, BLM). Parcels proposed for acquisition are expected to be consistent with existing management plans such as the Lake County Open Space Initiative and the Colorado State Parks strategic planning process for the

Arkansas River Headwaters Recreation Area. The proposed alternative would have a minimal impact on existing land use. Depending on the parcels pursued for acquisition, there could be a change in land use for a parcel from private land to public land accessible for recreation.

Some opportunities for public access and recreation along the upper Arkansas River will be limited during the time when the in-stream habitat restoration project is being implemented. These impacts will occur directly from the presence of construction equipment and indirectly if the temporary increase in turbidity decreases opportunities or enjoyment of fishing or other water-based recreation. The erosion control on roads project would consolidate access on official system routes and eliminate access on user-created motorized routes. This project is planned to undergo additional NEPA review through the USFS so that the public can comment on specific plans to alter travel through the area. Ultimately, public access and recreation would benefit from implementation of the proposed alternative, through the likely acquisition of land that will provide increased recreational access to the upper Arkansas River and through enhanced fishing and other nature-based recreational opportunities as a result of improved fish and wildlife habitats.

5.2.2 Air, Noise, and Visual Resources

Because most of the restoration work is planned for locations away from residential areas, the air, noise, and visual impacts to human populations would be minimal. During the implementation of the projects, however, some temporary negative impacts would occur. As described above under environmental impacts, the use of heavy equipment to implement some of the projects would generate local air and noise pollution and could disrupt the scenic "viewshed" of the area. Because the work would be temporary and would only occur during daylight hours and in limited locations, the overall impact to air, noise, and visual resources would be limited and temporary. In addition, construction work on the in-stream habitat restoration project would proceed in phases, to minimize the area being disturbed at any single point in time. Over the long-term, protection of land parcels at risk of development would help maintain the scenic viewshed of the upper Arkansas River Valley.

5.2.3 Cultural and Paleontological Resources and Native American Religious Concerns

For all ground disturbing activities, a cultural inventory would be conducted prior to project implementation and mitigation would be applied as necessary to protect any cultural resources found. Acquisition of appropriate permits for individual projects would include consultation with the SHPO to determine if the proposed undertakings would result in adverse effects to cultural resources. For example, implementation of remedial actions at the Venture Tunnel and Sugarloaf Mine dumps area would likely result in adverse effects to cultural resources and would require mitigation options. Similar mitigation options were undertaken by BLM at the Tiger and Dinero tunnels sites, because those projects were found to have adverse effects on cultural resources.

Development of the greenhouse and nursery facility for native plant propagation at the Hayden Ranch Headquarters would be subject to the terms of a historic conservation easement held by the Colorado Historical Foundation. Construction of a greenhouse would occur in a manner consistent

with the terms of the easement, with the intent of preserving and maintaining the historic integrity of the Hayden Homestead site in perpetuity.

Other projects that are included in the proposed alternative are not expected to have impacts on cultural or paleontological resources, or to impact Native American religious concerns, because they do not involve alterations of structures or construction at the land surface that could displace artifacts.

Cultural resource inventories conducted in the vicinity of the Tiger and Dinero tunnels did not find any sites that might hold special significance for Native Americans. If sites with special significance were found at any point during the implementation of the projects included in the proposed alternative, work would cease and not resume until consultation is complete.

5.2.4 Socioeconomic Impacts

The proposed restoration projects included in the proposed alternative would have a cumulative positive socioeconomic impact on the city of Leadville and the surrounding areas. Although there would be short-term negative impacts to public access and recreation during construction of the in-stream habitat restoration project, these impacts would be outweighed by the long-term benefits to public access and recreation. These long-term benefits would result from the likely acquisition of land that would provide increased recreational access to the upper Arkansas River and through enhanced fishing and other nature-based recreational opportunities as a result of improved fish and wildlife habitats.

Each of the projects that would enhance or protect fish and wildlife habitats would help to preserve the natural resource base that is at the heart of the area's tourism and recreation-based industries and quality of life. Construction projects would have a positive economic effect on the area through potential employment opportunities, either directly or indirectly through the supply chain for materials. The general land use patterns of the area would not be affected by the projects because the proposed land protection projects would be protecting habitat that is already in a natural state. The protection projects would have a minimal or neutral impact on the local tax base because a payment in lieu of taxes would be made for acquired parcels that are taken out of the tax base. The Canterbury Tunnel rehabilitation project would provide a secure source of drinking water that would help the city of Leadville accommodate growth or development that may occur over time, as well as protecting current citizens from disruptions to their water supply in the winter months.

5.2.5 Environmental Justice

This alternative would benefit the residents of Leadville, including minority and low-income populations, through improvement of fishing opportunities in the upper Arkansas River, overall economic benefits to the town, and access to the drinking water resources of the Canterbury Tunnel with a lower burden of rate hikes for customers of the Parkville Water District.

5.3 Impacts of the No-Action Alternative

Under the no-action alternative, no habitats would be preserved, restored, or enhanced beyond what agencies and organizations such as Colorado State Parks, the Lake Fork Watershed Working Group, and the Lake County Open Space Initiative are already doing in the area with limited existing resources. Aquatic and riparian habitats would continue to be degraded along the 11-mile reach of the upper Arkansas River and in Lake Fork Creek. Weed control would be less effective, pose a greater risk to water quality, and not target emergent threats. Wildlife impacts caused by non-system travel at the Paddock State Wildlife Area would continue to occur. Important habitat parcels would not be protected from development risk. There would be no local source of nursery stock to support wetland and forestry revegetation programs. Finally, Leadville would continue to have inadequate drinking water supplies in the winter, with high risks of water mains freezing. Local populations would not benefit from improved fishing opportunities and increased construction activities in the area. Future generations would not have access to an improved environment.

5.4 Cumulative Impacts of the Proposed Alternative and the No-Action Alternative

The cumulative impacts of the proposed alternative and the no-action alternative are summarized in Table 5.1 and discussed below.

The Trustees selected the restoration projects included in the proposed alternative to improve natural resources as compensation for natural resource injuries. Therefore, the cumulative environmental impact from implementing the restoration projects is expected to be beneficial. Any impacts to air quality, water quality, or noise associated with implementation of the projects is expected to be minimal and short-term. The projects would result in long-term benefits to water quality, vegetation, fish, and wildlife in and around the project sites. There also would be long-term socioeconomic benefits to the city of Leadville and surrounding areas through protection and improvement of natural resources and an improved supply of drinking water. Any cultural impacts associated with implementation of remedial actions at the Venture Mine and Sugarloaf Mine dumps would be mitigated according to requirements of the SHPO.

Under the no-action alternative, there would be no positive change to habitats or wildlife beyond the actions taken by other agencies and organizations with limited funding. There would be no short-term impacts associated with project implementation and no long-term benefits from implementation of the proposed alternative. In short, the public would not be compensated for the extensive injuries to natural resources resulting from the release of hazardous substances at the California Gulch Superfund Site.

Table 5.1. Comparison of impacts by alternative

Category of impact	No-action alternative	Proposed action/proposed alternative
Habitat impacts	No additional habitats preserved, restored, or enhanced. Continued impairment of aquatic, riparian, and upland resources.	Aquatic, riparian, and upland habitats would be preserved, restored, and enhanced.
Biological impacts	Continued ongoing adverse impacts to fish and wildlife.	Improvements to fish and wildlife resulting from habitat improvements.
Cultural resource impacts	No impacts to historic properties.	Adverse effects to cultural resources could occur at the Venture site and would be mitigated by appropriate actions.
Native American religious concerns	No impacts expected.	No impacts expected.
Environmental justice	No benefits to Leadville residents, including minority and low-income populations.	Benefits to Leadville residents, including minority and low-income populations, from improved fishing opportunities and a more reliable source of drinking water.
Socioeconomic impacts	No positive indirect economic impacts on the local economy.	Construction activities would generate short-term economic benefits. Improved fishing conditions, habitat protection, and a reliable drinking water supply would generate long-term economic benefits, including benefits to the local eco-tourism economy.
Indirect impacts	No indirect impacts.	Indirect beneficial impacts expected through improved habitat for fish, birds, and wildlife in the project areas.
Cumulative impacts	Cumulative impacts would be negative because of continued degradation of aquatic, riparian, and upland habitats under current conditions.	Cumulative impacts expected to be beneficial through long-term benefits to water quality, fish, and wildlife in and around the project sites.