

4.1.2 Hydrology/Hydraulics/Stream Morphology/Floodplains

Within SS 2, Clear Creek generally flows in an easterly direction at a gradient of approximately 4 percent. Numerous perennial streams enter Clear Creek within this section, including Dry Gulch, Herman Gulch, Kearney Gulch, and Grizzly Gulch at the eastern terminus of this SS. Most of the 4 miles of stream and associated tributaries in SS 2 are of natural subalpine stream morphology, which includes braided channels and wetlands.

4.1.3 Wetland and Riparian Ecosystems

Palustrine scrub/shrub wetlands occur intermittently throughout SS 2, primarily in association with Clear Creek. This wetland type occurs continuously from Dry Gulch downstream to the Wood's Mountain flood wash drainage between Herman Gulch and Bakerville, and near Bakerville. Palustrine emergent wetlands occur locally in association with the scrub/shrub wetlands near Herman Gulch and the Wood's Mountain flood wash drainage. Also near Bakerville, palustrine, forested wetlands occur in association with scrub/shrub wetlands. Palustrine scrub/shrub wetlands also extend from Clear Creek into Dry Gulch. Riparian areas generally occur adjacent to Clear Creek throughout SS 2.

4.1.4 Aquatic-dependent Communities

Although there are no records concerning the fish communities upstream from Bakerville to the Eisenhower Tunnel, the Colorado Division of Wildlife (CDOW) 1988 fish sampling efforts at Bakerville resulted in the collection of rainbow trout (*Oncorhynchus mykiss*), Snake River cutthroat trout (*Oncorhynchus clarkii* sp.), hybrids of the two species, and a "few" brook trout (*Salvelinus fontinalis*). The CDOW began stocking rainbow trout in 1973 and Snake River cutthroat trout in 1985 at unspecified locations in Clear Creek between the headwaters downstream to Georgetown (CDOW, 1998).

The boreal toad (*Bufo boreas*) is a federal endangered species candidate and is listed as endangered by the State of Colorado. The boreal toad usually occurs at elevations between 8,000 and 11,900 feet. This species of toad requires water for breeding and is therefore found along streams, shallow ponds, and wet boggy meadows. During the non-breeding season, this toad inhabits upland areas of alpine and subalpine forests. Occurrences of the boreal toad have been documented in SS 2, primarily within the wetlands associated with Herman Gulch and the streamside habitat and wetlands between Herman Gulch and Bakerville.

There are several recreational opportunities within SS 2. This SS is located in the Arapaho and Roosevelt National Forests and, as such, is accessible to the public. The Loveland ski areas are popular recreational areas because of their relative closeness to the Denver metropolitan area. Fishing is another potential recreational activity along Clear Creek and its perennial tributaries in this area.

4.2 Issues

4.2.1 Historical Mining (Mineral) Influences

Although not documented, the excavation of the mineralized geology in SS 2 and natural erosion processes could potentially contribute metals to Clear Creek. The creek's potential exposure to minerals is associated with I-70 rock cuts and the natural weathering and erosion of the mineralized geology. No abandoned mines are known to drain in to this SS.

4.2.2 Adjacent Land Use

Adjacent land uses impacting Clear Creek have not been identified.

4.2.3 Highway-related Construction, Operation, and Maintenance Activities

Accidents involving the transportation of hazardous materials on I-70 impact Clear Creek. Because I-70 is a designated hazardous materials route the potential for such incidences to occur exists. Winter road conditions (ice and snowpack) are considered responsible for frequent accidents within this SS.

Highway runoff containing chemical deicers and traction sand used for winter maintenance on I-70 and stored in the Herman Gulch area enters Clear Creek. The runoff affects total dissolved and suspended solids and metals concentrations and sedimentation of the stream channel throughout SS 2. Studies investigating these affects of deicers are ongoing. Current water quality monitoring by CDOT in SS 2 is designed to assess the concentrations of constituents (contained in the chemical deicers) and suspended sediment in the creek during snow melt/storm events, which is when these constituents would be transported to the stream.

Based on a review of current aerial photographs and wetland maps, construction of I-70 eliminated wetlands along Clear Creek. Within SS 2, an estimated 38 acres of wetlands have been removed or encroached upon by I-70.

The installation of culverts immediately downstream from wetlands may have dewatered wetlands in SS 2 and may have altered the natural regime of the surface water and groundwater supporting the wetlands.

Construction of I-70 near Herman Gulch appears to have fragmented and possibly created boreal toad habitat in the Herman Gulch area. Breeding sites and general habitat occur between Clear Creek and I-70 downstream from Herman Gulch and north of I-70 and south of Clear Creek downgradient from Dry Gulch. Based on the current locations of the breeding sites and general habitat both upgradient and downgradient from I-70 it is likely that the construction of I-70 has affected historic boreal habitat.

4.2.4 Sedimentation

SS 2 has been affected by sedimentation originating from the application of traction sand on I-70 (Figure 4-2).

Although wetlands and riparian areas generally persist throughout SS 2 in association with Clear Creek, ongoing sedimentation from the operation and maintenance of I-70 appears to have reduced wetland areas. Vegetation that characterizes both wetlands and riparian areas has been observed to be continually buried with sediment (Figure 4-2).

In this area, sediment enters Clear Creek from highway construction, cut and fill erosion, and operation and maintenance practices. Beaver ponds occur sporadically throughout SS 2 and once served as sediment traps; however, most ponds within Clear Creek have been observed to be full of sediment and, as such, have ceased to function as traps or beaver habitat. Substrate is occasionally armored, and there are no large cobbles (observations by R. Quinlan, J.F. Sato and Associates and M. Crouse, Clear Creek Consultants during field reconnaissance).

4.2.5 Channelization/Downcutting

Clear Creek has occasionally been channelized or encroached by construction of I-70 (Figure 4-2). Of the 4 miles of Clear Creek within SS 2, approximately 0.6 mile (15 percent) has been channelized or encroached on due to highway development. The natural morphology of upper Clear Creek is described as a B2/B3 high gradient narrow mountain stream with coarse substrate and sinuosity typically greater than 1.2 (Rosgen, 1996). The current sinuosity estimated for SS 2 is 1.25, compared to an estimated historic sinuosity of 1.26. Although channelization has occurred within this SS the overall sinuosity has been relatively unaffected.

Cutting back the slope during the construction of I-70 near Wood's Mountain has facilitated downcutting of the tributary channel by straightening the natural channel and exposing relatively unconsolidated materials. The downcutting is pronounced particularly during intense precipitation events (Figure 4-2). In addition, Clear Creek's increased gradient has caused downcutting of the main channel in channelized sections of the creek.

4.2.6 Habitat Reduction and Fragmentation

Review of infrared photographs indicates the construction of I-70 removed or encroached on approximately 2 miles of wetlands near Dry Gulch, Herman Gulch, Wood's Mountain flood wash drainage, and the Bakerville area.

Suitable breeding habitat for the boreal toad was reduced or fragmented from I-70 construction. The loss of wetlands in the vicinity of Herman Gulch and downstream to Bakerville reduces the potential for the perpetuation of this endangered species in its native habitat. Additionally, the fragmentation of breeding habitat (e.g., wetlands and streams) and non-breeding habitat (subalpine forest) reduces the toad's ability to migrate to and from suitable breeding areas.

As previously mentioned, highway construction has impacted local wetlands. An estimated 38 acres of wetlands have been removed or encroached upon by highway development.

4.2.7 Water-based Recreation

Sedimentation from highway and ski area parking lot runoff appears to have affected the aquatic habitat in SS 2 due to sedimentation and the resultant embedded substrate have reduced cover and spawning habitat for rainbow and cutthroat trout, assuming these fish inhabit SS2. Additionally, the embedded substrate limits habitat for the fish-food organisms (benthic invertebrates). These effects on fish and their food base ultimately impacts angling recreation.