2012 EAGLE RIVER WATER QUALITY MANAGEMENT PLAN

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1.0 WATERSHED OVERVIEW

1.1 Geography and Hydrology

The Eagle River watershed lies almost entirely within Eagle County (a small portion of northeast Pitkin County lies within the watershed) and encompasses a 944 square mile (604,160 acres) area in northwestern Colorado.

The Eagle River originates near the southeastern border of the County and flows northwesterly for about 35 miles to Dowd Junction, and then westward to the Colorado River at Dotsero. Principal tributaries of the Eagle are: Turkey Creek; an easterly tributary near Red Cliff; Cross Creek, a southerly tributary emerging from the Holy Cross Wilderness near Minturn; Gore Creek, emerging from the mountains east of Vail and flowing through the Town of Vail; Beaver Creek, a southern tributary near Avon; Milk Creek, a northern tributary near Wolcott; Brush Creek, a southern tributary and the largest tributary downstream from Gore Creek; and Gypsum Creek, a southern tributary joining the Eagle River at Gypsum. A map of the watershed in shown in Figure E-1.

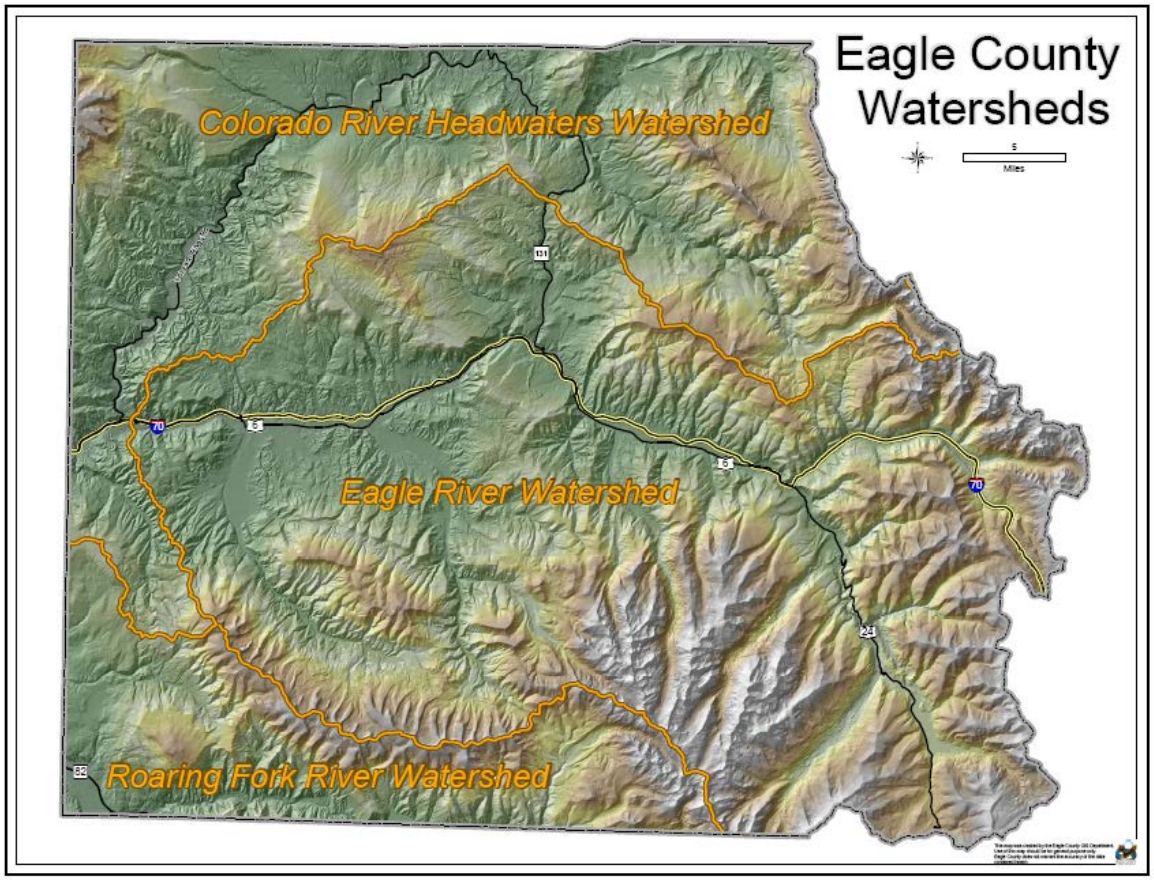
In the upper Eagle watershed (Gore Creek and the Eagle River above Dowd Junction), average annual precipitation is 28 inches, two-thirds of which falls as snow. In the lower areas of the watershed (below Dowd Junction), annual precipitation ranges from 12 to 19 inches, with about 60% falling as snow. Seventy-five percent of the annual runoff occurs between May and July as a result of snowmelt. Major snow fall typically occurs February through April.

Thunderstorm activity from July through September produces significant, although short lived rainfall events. Stream flows have marked seasonal variability, with highest flows occurring during the snow melt period, and low flows, sustained by ground water, occurring August through April. Stream flow also varies from year to year based on snow pack, with wet year flows being several times greater and longer in duration than dry years. Historical annual average yield (total streamflow) for the Eagle River is estimated to be approximately 414,000 acre feet below Gypsum Creek (Eagle River Assembly, Phase I Report, September 1994). Consumptive use in the Eagle River basin accounts for approximately 63,000 acre feet of the average annual yield of 414,000 acre feet; the greatest consumptive use in the basin is transmountain diversion which exports approximately 34,000 acre feet to the Front Range annually. Transmountain diversions are taken in the headwaters during May-June peak flows, significantly reducing the annual peak and flushing flows important to maintain the ecological and geomorphic health of the Upper Eagle.

Several small storage reservoirs and one larger reservoir exist in the watershed. Homestake Reservoir is located high in the southern portion of the watershed.

This reservoir has a storage capacity of 44,360 acre-feet and a surface area of 320 acres. The reservoir is used for eastern slope diversions; however, since 1998 approximately 1,500 acre feet are reserved for in-basin releases. Two reservoirs are owned and operated by Climax Molybdenum Company on their property: Robinson and Eagle Park Reservoir (Industrial Pond 4), with a combined current capacity of 6,000 acre-feet. Climax has remediated Eagle Park Reservoir and over 2,100 acre feet are available for use in the Eagle River basin. The Black Lake Reservoirs are located at the headwaters of Gore Creek. These two reservoirs have a combined capacity of 425 acre feet, and are used by the Town of Vail to augment stream flows in Gore Creek and replace water diverted for snow making. Nottingham Lake in Avon has a storage capacity of 100 acre-feet. Sylvan Lake provides Brush Creek approximately 511 acre feet of storage, some of which is regularly used to augment flows to Brush Creek during low flow periods. Additionally, the Town of Gypsum acquired LEDE reservoir to augment flows to Gypsum Creek in 2006 and 431 acre feet are available for use.

Figure E-1. Eagle River Watershed Map.



Four trans-basin diversion projects carry water from the headwaters of the Eagle River to the Arkansas River basin. These projects divert an annual average of 34,000 acre-feet during the snowmelt period. In 1994, it was estimated that additional conditional water rights for out-of-basin diversions could yield an additional 100,000 acre feet if they were all developed (Eagle River Assembly Phase I Report**,** 1994).

1.2 Land Uses and Population Characteristics

Public lands (Forest Service at approximately 380,000 acres and the Bureau of Land Management at approximately 95,000 acres) account for 77% of the total Eagle River watershed. The major population centers are Vail, Eagle-Vail, Avon, Edwards, Eagle, and Gypsum. The 2009 July census for Eagle County was approximately 54,971 people. The average annual growth rate of the county from 1990 through 1999 has been 5.4% (Department of Local Affairs), though this has tapered considerably after recession of 2008. The 2000 US Census population estimate was 41,659, and there were an additional 9,813 part-time residents. In 2008, the Town of Vail's transient bed base inventory was estimated to accommodate 17,343 visitors at one time [accessed via Town of Vail website]. In combination with the 18,000 beds of Beaver Creek Resort and several hundred more transient units in Avon, the Upper and Middle Eagle areas can accommodate another 35,000 visitors in addition to the almost 14,000 full time residents of the area.

Economic and land use activities in Eagle River watershed include: tourism and recreation; mining (largely historic); agriculture (including logging); and urban development. The major mining areas in the county are the Eagle Mine, located near Minturn; and the Climax Molybdenum Mine located on the continental divide at Fremont Pass. Agricultural products consist mainly of livestock, hay, and timber, with most of the irrigated farmland located in the Eagle River valley downstream from Gore Creek to Dotsero. Urban development in the county is primarily associated with the build out of the relatively new (Vail, Avon, Edwards) and historic (Minturn, Eagle, Gypsum) municipalities in the basin.

In the Eagle River watershed there are 29 community, transient non-community, and private drinking water systems, serving a combined total population of 80,792 persons [Colorado Department of Public Health and Environment, Water Quality Control Division, January 13, 2011]. Nineteen of the systems are reliant upon ground water and ten systems are reliant upon surface water.

In 1994, the Eagle River Assembly estimated that to increase flows to minimum stream flow levels identified by the CWCB to protect the environment to a reasonable degree, up to 4,000 acre feet of water needs to be stored and released into the Eagle River during dry times of the year. The report estimated that up to 6,000 acre feet may be needed to ensure minimum instream flow as the County approached buildout of development approved as of 1994. At

roughly the same time Eagle County estimated that there were approximately 11,000 existing approved unbuilt dwelling units in the watershed (ERWP, 1996). In 2009, Eagle County estimated that there were 18,009 existing approved unbuilt dwelling units in Eagle County, with a potential for another 5,134 units (Ivey, Terra Cognito GIS, Eagle County Build Out and Visualization Report Residential Build Out Results 2009, Accessed on May 5, 2010, http://www.eaglecounty.us/Planning/Long_Range_Planning/Build_Out_Analysis/

1.3 Watershed Water Quality Management

Watershed management of water quality and stewardship in the Eagle River watershed has a history commensurate with settlement of the area. Initially, water quality was concerned with ranching stewardship. Originally the Soil Conservation Service in 1935, the NRCS has long worked with large ranch and agricultural landowners through conservation planning and assistance designed to benefit water quality. Since the rapid urbanization of the watershed over the last 50 years, municipalities have largely acquired riparian buffers and installed storm sewer systems where necessary. In the late 1980's, an effort composed of local, state, and federal agencies, as well as ranchers, environmentalists, and recreational interests undertook a number of soil conservation projects (mainly nonpoint source projects in the Milk and Alkali Creek areas).

In 1986, the abandoned mill and mine workings that long leached heavy metals into the Upper Eagle above Minturn were place on the EPA National Priorities List as a Superfund Cleanup site. Two years after the Eagle Mine was added to the National Priorities List as a Superfund Cleanup site, a citizens' group called Eagle River Environmental Business Alliance (EREBA) was formed to monitor the EPA cleanup. Dedicated volunteers staffed EREBA, consolidating the interests of various stakeholders to accomplish the cleanup.

In 1994, local communities and Eagle County, recognizing the need to address issues related to the Eagle River on an integrated basis began an effort called the Eagle River Watershed Plan (ERWP). The ERWP was adopted by the County and Towns in the Eagle Valley. The ERWP organizes goals and policies by topic: water quantity; water quality; recreation; wildlife; and land use issues in an integrated manner. To date, many of the goals and objectives of this effort have been implemented by Eagle County and partners that assisted in preparation of the Plan. The ERWP recommended that a citizen's group be formed to implement and monitor the Plan.

Simultaneously, the 1996 Regional 208 Water Quality Management Plan was developed during the Eagle River Watershed Plan effort, using the public outreach and input efforts of that plan. This Plan focuses more attention on the specifics of water quality - the assessment, point and nonpoint source issues, and recommendations. Both plans are attempts to identify issues related to

Eagle River as a community resource, and means of protecting, and in some cases enhancing the existing uses of this asset.

By the time of adoption of the ERWP, there were a number of people working in separate local groups with overlapping participants. These groups included EREBA, the Black Gore Creek Steering Committee, the Eagle River Clean Up, the Community Pride Clean Up (I-70 Clean Up), the 208 Water Quality Plan, and the individuals who had been so active in the White River National Forest Association and the development of the Eagle River Watershed Plan. All these different groups formed the basic starting committee system from which the Eagle River Watershed Council was subsequently formed, and in July 2004, incorporated as the Eagle River Watershed Council, Inc (ERWC) a 501(c) (3) non-profit.

While remedial work continues to this day to reduce the zinc load leaking into the Eagle from the mine and waste rock sites, the Eagle River Watershed Council works to preserve and protect the Eagle and Colorado River Watershed through a variety of projects. The ERWC commissioned a science-based study of the Eagle River watershed from Colorado State University to set priorities for future projects within the watershed. The study was completed in 2005 and its evaluations and recommendations have formed the basis for the projects the ERWC subsequently instituted. In 2010, the Council released a 'State of the Rivers Report' highlighting various water quality issues throughout the drainage and making recommendations on key updates to the 1996 ERWP (link here: http://www.erwc.org/ProjectsPrograms/StateoftheRiver.aspx).

2.0 WATERSHED WATER QUALITY ASSESSMENT

Streams in the Eagle River watershed are classified for protection of cold water aquatic life (trout), primary contact recreation (recreation use in place); water supply and agricultural uses. Generally speaking, water quality of the Eagle River is very good with few exceptions. During most of the year, the river and its tributaries exceed the water quality standards set to protect its designated uses.

In spite of good overall water quality, some segments of the Eagle River are not fully supportive of their designated uses, i.e. some of the uses previously mentioned are impacted by poor water quality. The Eagle River from Belden to the confluence with Gore Creek has been determined by the Colorado Water Quality Control Division to be not supporting designated uses due to metals contamination (cadmium, zinc, and manganese). The lower portion near the mouth of Cross Creek has been designated as not supporting its designated uses due to metals contamination (cadmium, zinc and manganese). The mainstem of Gore Creek from confluence of Black Gore to the Eagle River and from Gore Creek to the confluence with Rube Creek have received a temporary modification for temperature until 2013. Temporary standards are less stringent than statewide standards established to allow full utilization of designated uses of

the stream segment. Temporary modifications are intended to allow time for clean up of existing pollution problems.

Black Gore Creek, and to a degree Gore Creek, have been known to have persistent problems related to traction sand loading and hill-slope erosion into streams along Interstate 70 from Vail Pass to East Vail. In 2002, the Water Quality Control Commission added Black Gore Creek to the State's 303(d) list of impaired waters not meeting stream designations because of excessive sediment loading from winter sanding operations on I-70 and related stream-habitat degradation. Adoption of the TMDL by early 2011 is expected. Gore Creek and the Eagle River are water quality limited segments with load allocations requiring advanced wastewater treatment for ammonia removal for discharges at Vail and the Upper Eagle Valley to meet standards for un-ionized ammonia.

Other water quality concerns in the Eagle River watershed include the impact of sediment on aquatic life in Black Gore Creek (and potentially Gore Creek), and the potential impact of increases in nutrient concentrations as a result of point and nonpoint sources in addition to elevated metals loading from the Eagle mine.

2.1 Upper Eagle River Watershed (Eagle River Segments 1, 2, 3, 4, 5a, 5b, 5c, 6, and 7a, 7b)

Water quality in the upper reaches of the Eagle River is excellent. A 1993 study by Hydrosphere for Vail Associates' Snowmaking Water Supply Facilities 1041 permit application, found that water quality in the east fork of the Eagle River is generally within standards for all parameters, with occasional exceedances of standards for dissolved silver and total recoverable iron. However, persistent water quality degradation caused by drainage from the Eagle Mine area is the primary water quality concern in the Upper Eagle River.

Fish sampling for Climax Molybdenum Company on the East Fork of the Eagle River in 1994 found brook trout, brown trout and mottled sculpin. Density and biomass estimates were 614 trout per hectare (248 per acre), and 27 kg per hectare (24 pounds per acre). 1994 fish populations were lower than in 1990 and 1991, however, the population age structure and presence of young of the year indicate a stable, naturally reproducing trout population in this section of the watershed. The presence of sculpin, a sensitive fish species, indicates good water quality. The macroinvertebrate community found at the site had a preponderance of species sensitive to water quality perturbations. Ephemeroptera (mayflies) were represented by seven species, and plecoptera, (stoneflies), coleoptera (beetles), diptera (flies), and turbellaria (flatworms) were also collected. Species densities were lower in 1994 than in 1991.

Since 2005, fish sampling conducted through the Eagle Mine and reference

reaches upstream and downstream have indicated that sculpin are very abundant both upstream and downstream of the Eagle Mine, but zinc concentrations within the mine site reaches preclude the colonization of this native fish. The sampling also indicates that Rainbow trout have not colonized the Eagle River through the Eagle Mine site due to elevated metal concentrations (Colorado Division of Wildlife, John Woodling and Kendall Bakich, summary provided for ERWC Eagle Mine Limited presentation 'Fish studies of the Eagle River at the Eagle Mine Site: Results of restoration activities from 1990 to present, Part 2. 2005-2010, viewed January 18, 2011)

Water delivery from Climax Dam 4 (Eagle Park Reservoir) at the headwaters of the East Fork of the Eagle River (owned by Climax Mine) is assisting in stream flows in the Eagle River. The water stored in the reservoir meets all water quality standards for segment 3. Delivery began in 1998 and is nearly continuous at 3 – 10 cfs from late November to mid-March.

Over the last twenty years, the wastewater flow into the municipal wastewater treatment plant at Red Cliff significantly exceeds the plant's hydraulic capacity due to several issues. One is that a large majority of the citizens allow their domestic water to run continually during the colder months in order to prevent their pipes from freezing and bursting. The other cause of the overloading of plant capacity was due to severe infiltration/inflow (I/I) problems. This hydraulic overload compromised biological treatment, and the plant effluent discharge was regularly in exceedance for fecal coliform in addition to biochemical oxygen demand (BOD) parameters In 2010, the Town was completing an over $5 million dollar upgrade to renovate the wastewater plant and piping and resolve these water quality issues.

The Division of Wildlife has a sampling site below Red Cliff as a reference station for the Eagle Mine Site. Trout population estimates have been conducted each year, beginning in 1990. Numbers of trout per acre have ranged from 234 to 534, and pounds per acre have ranged from 70 to 148. In April 2000, the brown trout population estimate was 291 per acre, and 58 pounds per acre [Annual biological Assessment of the Eagle Mine Superfund Site, Eagle County Colorado, John Woodling and Ann Widmer, April 2000]. These numbers are indicative of highly productive waters ("Gold Medal Waters" designation has a criteria of greater than 40 pounds per acre). Gold medal waters must also have at least 12 trout 14 inches or longer per acre on a sustained basis, must be at least 2 miles long and at least 50 surface acres in aerial extent. Sculpin have also been found consistently at this site. Macro invertebrate species diversities at this site in 1993 and 1994 were 3.1 and 4.0, respectively. Sampling in 1999 at the Red Cliff site for macro invertebrate diversity showed a diversity index of 3.79 (this index was dropped in 2000. The 2000 report, identifies the number of taxa collected (39), percent Ephemeroptera (31), number of Ephemeroptera taxa (9) and EPT taxa richness (26) [Annual biological Assessment of the Eagle Mine Superfund Site, Eagle County Colorado, John Woodling and Ann Widmer, April

2000].

The USGS has water quality sampling sites on the East Fork of the Eagle River and on the Eagle River at Red Cliff.

2.1.1 Eagle River from Belden to Gore Creek (Eagle River Segment(s) 5a, 5b, 5c)

The Eagle Mine and its related facilities is a primary source of water quality pollution in the watershed. The mine is located adjacent to the Eagle River, upstream of Minturn. Mining impacts have caused concentrations of numerous metals to exceed standards adopted by the Water Quality Control Commission for protection of aquatic life and drinking water. The stream segment most affected by the mine is from Gilman to Gore Creek. In this six mile stretch, aquatic habitat and water quality is significantly degraded. Insect life and fish populations are extremely limited. Historically, water quality in this area has been worse during low stream flow periods, as higher flows during spring runoff diluted the metals present in site runoff. Downstream of Gore Creek, metal concentrations due to the impacts of the mine can also exceed stream standards, although less frequently.

The Eagle Mine has been designated a Superfund site and many aspects of the historic mining operation are being reclaimed. Water quality in the Eagle River associated with the Eagle Mine has improved due to actions by the Colorado Department of Health, the
Environmental Protection Agency, and CBS, Inc. (the current owner of the Eagle Mine site). Biological monitoring by the Division of Wildlife in 1994 found a very limited fish population below the mine, where no fish previously existed.

A 1976 investigation of the Eagle River and its tributaries upstream from the Eagle Mine area, indicated that it contained water suitable for all uses, based on results of the chemical and biological analyses. The Eagle River downstream of the mining area had pH and concentrations of dissolved solids, dissolved copper, dissolved cyanide, dissolved and total iron, and dissolved lead which exceeded water quality standards. [Water Quality Survey of the Eagle River Basin -1975, Colorado Water Quality Control Division, 1976].

Cross Creek upstream from the mining activities had a benthic diversity of 2.47, indicating water of a suitable quality for all uses. Cross Creek downstream from the discharge of the tailings ponds had a reduced benthic population and increases in specific conductance and in concentrations of hardness and dissolved solids. Two other tributaries in the Minturn area, Two Elk and Grouse Creek, had diverse benthic communities and water of suitable quality for all uses. Based on benthic populations, it was determined that there has been a substantial improvement in the water quality of the Eagle River in the Minturn

area during the last several years, even though the toxicity problem caused by ground water seepage of dissolved metals from the tailings pond to the Eagle River still existed. Prior to the 1976 study cited above, an investigation in 1966 (US Department of the Interior, 1968) documented the complete elimination of bottom dwelling organisms in the Eagle River downstream from the tailings ponds of the New Jersey Zinc Corporation (Eagle Mine, now owned by Viacom, Inc.).

A remedial investigation of the Eagle Mine in 1985 indicated that elevated concentrations of zinc exist in the Eagle River below the confluence with Gore Creek to the Town of Eagle. Elevated levels of lead, cadmium, and copper were pervasive in the surface water, sediment, and macroinvertebrates from the mine to Gore Creek. Concentrations of cadmium, copper, and lead in surface water regularly exceeded EPA acute and chronic criteria from the roaster piles down to Eagle. Zinc concentrations exceeded EPA criteria from the roaster piles down to Eagle. The study concluded that surface water contamination and associated effects to aquatic life may have decreased over the last 35 years.

Colorado Water Control Division monitoring data shows 44% of zinc samples and 18% of copper samples exceed EPA aquatic life criteria over the period 1977-1987 at the mouth of Cross Creek. The concentrations are highest in the last three years of this period. Total manganese concentrations exceed state standards consistently with a ten-year average concentration of 3.3 mg/L.

The 1987 Colorado Nonpoint Source Pollution Assessment reports that from Red Cliff to Edwards cadmium, copper, lead, dissolved manganese, and zinc are acutely and chronically toxic to aquatic life seasonally and exceed agriculture and waster supply standards for the same parameters. The Eagle Mine is identified as a major source of these problems. Cross Creek is also identified as contributing elevated concentrations of metals. Negative impacts to both fish populations and drinking water resulting from metal concentrations are observed downstream to Edwards.

Data collected by Dames and Moore in 1994 indicates that at station E-14 (Eagle River below Cross Creek), iron and manganese continue to exceed state drinking water standards and chronic standards for aquatic life. Zinc continues to exceed the chronic aquatic life standard of approximately 0.045 mg/L (based on hardness).

The Division of Wildlife has performed biological assessments on the Eagle River Superfund site from 1990 through 2000. Results of the 1994 sampling program documented improvement in portions of the Eagle River aquatic community including somewhat higher numbers of aquatic invertebrates at some sites and brown trout at all sites. This sampling program will continue in future years. According to DOW data, manganese exceeded the temporary modification to the water quality stream standards (the temporary stream standard was 850 ug/l

December- April and 355 ug/L May–November). Zinc also exceeded the temporary seasonal water quality standard of 740 ug/l (December – April) and 240 ug/l (May – November).

Active remedial clean-up of the Eagle Mine site under a 1988 court ordered consent decree began in 1988. A second consent decree, the three party consent decree between Viacom International, Inc. (formerly Paramount, now CBS), the Colorado Department of Public Health and Environment, and the EPA signed in 1995. Remedial work and monitoring continues under the CDPHE Unilateral Administrative Order which is in full effect. This includes evaluation of runoff from roaster piles on the steep slopes. Currently no biological compliance is required, only biological monitoring.

CBS's (formerly Viacom) restoration efforts have included putting in new wells, replacing contaminated soil in the Maloit Park wetlands, removing hazardous materials from the Gilman site, consolidating metals byproducts piles from mining and smelting and capping them, removing old transformers containing PCBs, and dropping water levels in the Mine. In 2000 dissolved zinc levels below the mine generally range from 0.06 to 0.9 mg/l. [Eagle Mine Annual Site Monitoring Report 2000, URS March 15, 2001]

Fish and macroinvertebrate data show continued improvement from population information collected in the early 1990's [Annual Biological Assessment of the Eagle Mine Site Superfund Site, John Woodling and Ann Widmer, Division of Wildlife, April 2000]. The data showed that metal concentrations fluctuate in a seasonal manner, with lowest concentrations occurring in June and July during runoff season, and highest concentrations in March and April when stream flows are at the lowest levels. The number of aquatic macroinvertebrates and taxa have increased at sites 3,4, and 5 in the time period 1995-2000. Brown trout populations decreased at all sites in 1996 and 1997, however increases occurred at sites 2,4,5, and 6 in 1998 and at sites 2-5 in 2000. Brown trout population estimates at sites 2.9, 3, 4, and 5 were significantly higher in 2000 than in any other year through the eleven-year monitoring period.

Water quality has been monitored below Minturn by Battle Mountain High School as part of the Division of Wildlife's River Watch Program. Data indicates the presence of cadmium, copper, iron, manganese and zinc, with zinc regularly exceeding the acute aquatic life standard. Dissolved oxygen and pH appear fine.

The State and EPA have proposed the development of site-specific water quality standards based on a 'healthy biological community', in a draft document titled "Eagle Mine Site Approach to Defining 'Healthy' Biological Community" dated March 2002. NWCCOG generally supported the development of site-specific standards for this Superfund Site using the three biological metrics proposed, and has provided comments on the draft document.

More recently the River from Redcliff to the confluence with Gore Creek and through the Eagle Mine Site supports a brown trout population which is somewhat impaired by concentrations of these heavy metals. Water quality in this reach does not meet the table value standards for Cold Water Aquatic life (Class 1) set by the Colorado Water Quality Control Commission with regard to these heavy metals. As a result, sculpin do not inhabit the Eagle River from Belden downstream to the confluence with Gore Creek. Very few rainbow trout are found in this same river reach.

Considerable progress has been made since designation of the Eagle Mine as an EPA Superfund Site in 1984. In 1984, the River below the mine did not support a fishery. Work since that time, including stabilization of mine waste and tailings and the construction of a water treatment facility for mine drainage, has resulted in a much cleaner river. Now, the River supports a slightly impaired Brown Trout population.

On June 9, 2008 the Colorado Water Quality Control Commission held a Public Rulemaking Hearing to reconsider water quality standards in the Colorado River basin, including the Eagle River. Several parties, including CBS (the current owner of the mine), Ginn Development, the Town of Minturn, Eagle River Water Users, ERWC - Eagle Mine Ltd. and the Eagle River Watershed Council participated in the hearing. The focus of participation by these groups was on appropriate standards for segments 5a, 5b, 5c, and 7b of the Eagle River. These segments are affected by the mining in the vicinity of the Superfund site. These segments include the Eagle River from the Eagle Mine at Belden to the confluence with Gore Creek.

The adopted standards are per segment. For Eagle River Segment 2, the Eagle River mainstem and all tributaries upstream of Belden, Colorado and the Eagle Mine Site, the Commission adopted "Table Value Standards" for all metals except zinc. The Commission adopted a special zinc standard designed to protect sculpin. Sculpin are the most sensitive species for which zinc toxicity are available. The segment will not meet the sculpin standard just upstream of Belden and is listed on the State 303d list for impaired waters. A program must be adopted to bring the lower end of the site into compliance. The Colorado Water Quality Control Division made this proposal and was supported by the Commission. This step will result in a removal of more zinc from the Eagle River.

Eagle River Segment 5a is the Eagle River mainstem from Belden to Tigiwon Road. The Commission adopted the proposal brought forward by Hazardous Materials and Waste Management Division for cadmium, copper and zinc. The cadmium standard is based on a new arithmetic analysis of existing toxicity data. The copper standard is a recalculation of a copper standard based on the Tubifex worm as the most sensitive species. The zinc standard is a recalculation of a zinc standard based on the rainbow trout as the most sensitive species in the database. This standard will not protect rainbow trout but will protect brown

trout to some degree. This section was removed from the 303(d) list of impaired waters as a result of a TMDL being approved by the EPA for copper and zinc.

Eagle River Segment 5b is the Eagle River mainstem from Tigiwon Road to the south end of Minturn, Colorado. The Commission mostly adopted the proposal brought forward by Hazardous Materials and Waste Management Division for cadmium, copper and zinc with one exception. The Commission also adopted a seasonal standard for zinc. The cadmium standard is based on a new arithmetic analysis of existing toxicity data. The copper standard is a recalculation of a copper standard based on the most sensitive mayfly the most sensitive species. The commission adopted a seasonal zinc standard for this segment. The standard during the months of January through April is a recalculation of a zinc standard based on the rainbow trout as the most sensitive species in the database. This standard will not protect rainbow trout but will protect brown trout to some degree. The standard for the rest of the year (May through December) is a recalculation based on the sculpin and the most sensitive species. This standard will not protect sculpin but does protect the brown trout. This seasonal standard will help protect the success of the remedy to this date.

Eagle River Segment 5c is the Eagle River mainstem from the south end of Minturn, Colorado to the confluence with Gore Creek. The Commission adopted the proposal brought forward by Hazardous Materials and Waste Management Division (HAZMAT) for cadmium, copper and zinc. The cadmium standard is based on a new arithmetic analysis of existing toxicity data. The copper standard is a recalculation of a copper standard based on the most sensitive mayfly the most sensitive species. The Commission adopted a zinc standard for this segment based on a recalculation of the database based on the sculpin and the most sensitive species. This standard will not protect sculpin but does protect the brown trout. In 2005, this section was added to the 303(d) list for cadmium as a result of a more stringent cadmium standard being adopted in the Basic Standards hearing of 2005.

The water quality standards adopted by the Commission will be a pertinent issue in the 5 year review of Superfund Site activities. In this review, CBS (Viacom), as a responsible party, and the Hazardous Materials and Waste Management Division will attempt to arrive at an agreement that defines the future cleanup that will be required. Through the negotiations, the Hazardous Materials and Waste Management Division seeks further cleanup activities that is expected to result in a reduction of zinc loading to the River of between 37 and 43 pounds per day. Current zinc loading is approximately 120 pounds per day, thus the proposed further action will likely cause a 33% reduction. While this level of reduction will certainly cause an improved aquatic environment and healthier brown trout population, it is not expected that water quality will be improved to the extent necessary for the Eagle River to support a healthy rainbow trout population in the reach between the Eagle Mine and Gore Creek.

2.2 Gore Creek (Eagle River Segments 1 and 8)

A 1976 study by the Water Quality Control Division concluded that the major tributaries to Gore Creek had water of suitable quality for all uses, with the exception of Black Gore Creek, where substantial quantities of sediment resulting from extensive road construction (Interstate 70) were measured. Daily suspended sediment data collected by the USGS indicated a mean concentration of 1,720 mg/L and a suspended sediment load of 1,290 tons in Black Gore Creek [Reconnaissance Evaluation of Surface Water Quality in Eagle, Grand, Jackson, Pitkin, Routt, and Summit Counties, Colorado, USGS, Open file 79-420, 1979].

The State Water Quality Control Division listed Black Gore Creek on the State's list of Impaired Waters (303(d) list) for sediment. A group called the Black Gore Creek Steering Committee was formed to assist in the addressing the sediment impacts from I-70. The Northwest Colorado Council of Governments had originally provided meeting facilitation and support for the group and the Technical Subcommittee, and the last several years the Eagle River Watershed Council had assumed some coordination of annual meetings and updates from this workgroup. In 2000, the Colorado Department of Transportation issued a Sediment Action Control Plan to determine planning strategies for controlling sedimentation from I-70, including the identification of implementation measured and costs. A final TMDL is anticipated for adoption by the WQCD by early 2011.

A 1980 study of upper Eagle Valley by Engineering Science, Inc. found the tributaries of Gore Creek to have high water quality, with the exception of Black Gore Creek, which was impacted by sediments, due to the construction of Interstate 70. Exceedances of stream standards for cadmium, lead, and manganese were found to occur in Gore Creek, during spring runoff, but were attributed to soils and geology of the basin. A 1990 report by Advanced Sciences, Inc. characterized water quality in Black Gore Creek, Gore Creek, and the Eagle River above and below the confluence of Gore Creek for the Vail Valley Consolidated Water District for a proposed enlargement of the Black Lake Reservoirs. That report found that the primary concern in the Gore Creek watershed is a recurring water quality standards exceedance of manganese, a condition which appears to be cause by the composition of rock minerals in Black Gore Creek. Secondary concerns are infrequent standards exceedances of copper, total iron, and silver infrequently, or occasionally exceeding stream standards at a few locations in the Gore Creek system.

The USGS was commissioned to develop a database and retrospective analysis of the Gore Creek watershed by the Gore Creek partnership (Town of Vail, Vail Associates, Eagle River Water and Sanitation District, and Upper Eagle Regional Water Authority). Key findings of the "Gore Creek Watershed Colorado – Assessment of Historical and Current Water Quality, Water Quality, and Aquatic Ecology, 1968- 98" [Kirby Wynn, USGS, personal communication 2001] are

discussed below.

Surface-water nutrient concentrations generally increased as water moved downstream through the Town of Vail, but concentrations at the mouth of Gore Creek were typical when compared to national data for urban/undeveloped sites. Since the 1970's ammonia concentrations decreased and nitrate concentrations increased at the mouth because of changes in wastewater treatment methods. Total phosphorus concentrations were significantly lower at the mouth of Gore Creek during 1995-97 when compared with concentrations for the 1970s and 1980s, part of the difference being caused by dilution from the higher than average stream flows during 1995-97. Recent total phosphorus concentrations were somewhat elevated when compared to the US EPA recommended level of 0.1 mg/l for control of eutrophication in flowing water.

Historically, suspended sediment associated with construction of I-70 in the early 1970s has been to primary concern. However, recent data indicate that stream-bed aggradation of sediment originating from I-70 traction sanding currently is a greater concern. About 4,000 tons of coarse sand and fine gravel enter Black Gore Creek each year. Suspended-sediment concentrations were low in Black Gore Creek; however, bedload-transport rates of as much as 4 tons per day have been measured. Snowstorms in September and October have resulted in accumulation of traction sand in pools that otherwise could serve as brown trout spawning habitat in Black Gore Creek. The accumulated coarse sediments may reduce available over-wintering habitat for fish and macroinvertebrates.

Water samples collected during spring and fall of 1997 from five alluvial monitoring wells located throughout the Town of Vail found low nutrient concentrations, but high radon values (greater than 300 pCi/L). Low levels of bacteria and methylene blue active substances indicate that there is little or no wastewater contamination of shallow ground water.

Differences in the macroinvertebrate community structure were found among sites in Gore Creek. More than 80% of the macroinvertebrate community at sites located farthest upstream was composed of mayflies, stoneflies, and caddisflies, indicating favorable water quality and habitat conditions. The relative percentages of midges and sludge worms greatly increased in the downstream reaches of Gore Creek, which drains relatively larger areas of urban and recreation land uses, indicating the occurrence of nutrient and organic enrichment in Gore Creek. The macroinvertebrate community in Black Gore Creek indicated adverse effects from sediment deposition. The lower four miles of Gore Creek, downstream from Red Sandstone Creek, have been designated a Gold Medal fishery in recognition of the high recreational value of the abundant brown trout community. Gore Creek contained twice as many trout as a reference site with similar habitat characteristics in Rocky Mountain National Park. Moderate increases in nutrient concentrations above background conditions have increased the growth and abundance potential for aquatic life in

Gore Creek, while at the same time, aesthetic and water quality conditions have remained favorable. The fish community has benefited from enhanced biological production in the downstream reach of Gore Creek. Increases in algal biomass and macroinvertebrate abundance, in response to higher nutrient concentrations, provide ample food resources necessary to support the abundant fish community.

Trace element data for surface water, ground water, streambed sediment, fish tissue, and macroinvertebrate tissue indicate that concentrations are generally low in the Gore Creek watershed. Silver concentrations were low in stream-bed sediment samples. However, the concentration of silver was elevated in brown trout fish livers and caddisfly samples collected at the mouth of Gore Creek, compared to samples collected from sites representing mining and other land uses in Colorado and the Nation. Manganese concentrations commonly exceed the 50 ug/L stream standard in Black Gore Creek. Elevated manganese concentrations were primarily attributable to the sedimentary geology of the area.

The USGS investigated travel–time characteristics of Gore Creek and Black Gore Creek in 1997 [USGS Water Resources Investigation Report 02-4037]. During May, discharges ranged from 82 to 724 cfs at two USGS flow gaging stations – Black Gore Creek and Gore Creek at mouth. September discharges ranged from 3.6 to 62 cfs. Estimated peak travel times for Black Gore Creek ranged from 5.4 to 0.4 hours for 20 to 200 cfs, and for Gore Creek, 5.5 to 0.3 hours for 20-800 cfs.

As of late 2010, a nuisance algae, didymosphenia geminata (commonly known as ‘rock snot’) has been increasingly observed in Gore Creek. This algae commonly occurs in streams with low flows and low nutrient concentrations and can colonize new areas through accidental transplant between streams. Trace metals are generally low or below detectable levels and are not considered an issue. Total dissolved solids are not especially elevated but USGS and others reported and upward trend that suggests it may be associated with increased use of chloride salts to control ice on roadways and other paved areas.

2.2.1 Gore Creek above Black Gore Creek (portion of Eagle River Seg. 1)

A study done in 1993, by Resource Consultants and Engineers, Inc. for the Summit Water Quality Committee, used the headwaters of Gore Creek at an elevation of about 9,600 feet as an undisturbed site for comparison with Straight Creek in Summit County. The study examines sediment, benthic macroinvertebrates, and fish populations. Benthic macroinvertebrate at the two Gore Creek sites were 3.61 and 3.7, with 17 taxa and densities on the order of 750 - 1,000 organisms per square meter. Cutthroat trout were the only fish species collected, with an estimated density of 274 - 447 fish per hectare, and a

biomass of 20.4 - 34.3 pounds per acre.

2.2.2 Gore Creek below Black Gore Creek (Eagle River Segment 8)

A 1987 Environmental Assessment, done as part of the 1041 permit application to Eagle County for the enlargement of Black Lake Reservoir Number 1 indicated good water quality in Black Gore Creek. The mean suspended sediment concentration in Gore Creek at Vail was 88 mg/L and the suspended sediment load was 204 tons. The sediment increase in Black Gore Creek affected the sediment discharge in Gore Creek at Vail.

A 1975 assessment of waste loads for the Eagle River and Gore Creek found that water supply stream standards were not exceeded for dissolved oxygen, temperature, dissolved solids, pH, or fecal coliform bacteria. The study found dissolved oxygen concentrations of less than 6.0 mg/L in Gore Creek at the Big Horn subdivision and at the confluence with the Eagle River. Minimum summer values were 3.9 mg/L at the subdivision and 3.6 mg/L at the confluence. The average concentrations were about 8.5 mg/L, but the minimum values are critical for support of aquatic life. According to the EPA, a dissolved oxygen concentration of 3 mg/L occurring in a stream for even part of a day causes diminished feeding and growth of the fish population. However, from eight years of record at these sites on Gore Creek, the Water Quality Control Division (WQCD) found no deficiencies in dissolved oxygen concentrations. The total ammonia concentration did not exceed the assimilative capacity of the Eagle River, but exceeded the assimilative capacity of Gore Creek downstream of the sewage treatment plant. Unionized ammonia concentrations down stream from the Vail wastewater treatment plant on Gore Creek exceeded 0.02 mg/L. It was concluded that the water quality, in terms of the unionized ammonia, was degraded at the mouth of Gore Creek and the Eagle River at Gypsum and Avon.

Further investigations were prompted by these findings and more detailed studies were conducted by the WQCD, in 1976, at sites located in the upper Eagle River, Gore Creek, and the lower Eagle River. Based on chemical and biological results, it was determined that Gore Creek upstream from Vail had water of suitable quality for all uses and a benthic community diversity of 3.21. However, in 1975, Gore Creek downstream from the Vail wastewater treatment plant to its confluence with the Eagle River contained unionized concentrations as high as 0.077 mg/L. In conjunction with the unionized ammonia concentrations, the study determined that the benthic community was adversely affected, with diversities less than 3.0 downstream, as compared to 3.4 upstream of the treatment plant. Furthermore, an investigation of the fish population found that twice the number of trout were collected in half the time upstream of the treatment plant, as compared with downstream of the plant. According to the Water Quality Control Division (1976), Gore Creek, from Vail to its mouth, was not capable of supporting fish and was unsuitable for swimming because of

municipal discharges and nonpoint sources of pollution.

Fertilizer from golf courses has contributed to elevated nutrient levels. The WQCD water quality monitoring data indicates consistently high phosphorus concentrations from 1977 to 1987. Bacterial infections of trout in this reach of the river were also reported. The effects of bacteria are most prominent under conditions of low flow, high temperature, and catch and release fishing.

A portion of this segment (below Red Sandstone Creek) is now designated as a Gold Medal fishery (1988). This designation was further confirmed by the Division of Wildlife (DOW) with fish shocking surveys completed in September 1982 and October 1992 below Red Sandstone Creek. Again on April 8, 2000 the DOW did a fish shocking and confirmed the Gold Medal Status to this section of Gore Creek. The 1982 survey found brook, brown and rainbow trout, with a biomass of 58 pounds per acre, the 1992 survey found brown and rainbow trout, with a biomass of about 80 pound per acre (the Gold Medal designation requires a minimum biomass of 40 pounds per acre, along with several other criteria noted on page 7). DOW surveys were also done in the vicinity of the golf course in 1984 and 1990, again showing an increase in biomass over time.

In a USGS factsheet (186-99) by Kirby Wynn dated December 1999, a fish-community assessment of Gore Creek is documented that took place in 1998. Fish collected at all four sites included mottled sculpin, and cutthroat, brook, brown and rainbow trout. Generally, trout were larger and more abundant at downstream sites within the Gold medal fishery reach of Gore Creek than at sites farther upstream. The gold medal trout fishery appears to benefit from the increased nutrients, algal biomass and food resources associated with urban land uses in the Town of Vail. The CDOW intends to conduct fish shocking surveys on Gore Creek in 2011.

A joint project by the NWCCOG Water Quality Program and the Town of Vail between 1992 and 1994 was conducted to: posture the Town of Vail for likely stormwater discharge permit requirements; determine if there are existing negative water quality impacts in Gore Creek which could be attributed to nonpoint sources of pollutants; and to evaluate potential sources of pollutants in order to gain information for developing effective pollution control strategies. The study found that suspended and dissolved solids, salts, phosphorus, ammonia, nitrate, and nitrite concentrations increase in Gore Creek as it runs through town. Dissolved solids and salts (both above and below Vail), phosphorus, nitrate, and nitrite concentrations (below Vail) have increased between 1979 and 1991 because of growth and increased traffic along I-70. Dissolved oxygen, fecal coliform, cadmium, copper, manganese, and zinc concentrations have improved during the same period of time. Increases in silver concentrations appear to correspond to the Upper Eagle Valley Consolidated Sanitation District (UEVCSD) Vail wastewater treatment plant discharge.

The joint project included water quality monitoring in Gore Creek following application of a fungicide to the Vail Golf Course. No pesticide was detected. Sediment sampling in the water hazards on the golf course found fairly high levels of mercury, and traces of DDE (a breakdown product of DDT) and 2,4 D (a component of the broadleaf herbicide "Trimec", which is applied to the golf course and is also available to the public). In response to the elevated mercury concentrations in sediments and because the golf course water hazards are commonly used as a recreational fishery, the USGS, in cooperation with the Gore Creek Watershed Partnership collected brown and brook trout muscle tissue samples from 2-3 year age class fish in the large water hazard near Pulis Bridge in 1998. Those results indicated that mercury concentrations were below background levels.

The joint stormwater project estimated stormwater pollutant loading to Gore Creek. It was estimated that 196,000 kg of sediment, 210,300 kg of dissolved solids, 22,000 kg of Biological Oxygen Demand, 7,200 kg of oil and grease, 400 kg of ammonia, 1,000 kg of phosphorus, and 750 kg of zinc flow into Gore Creek each year with stormwater runoff. These loads are significantly lower than load estimates made in 1980 by Engineering Science, Inc. in their report " Upper Eagle Valley Nonpoint Source Assessment and Control Plan", but are nevertheless significant. A report on the project entitled "Vail Nonpoint Source Management Plan" includes results of the study, and policy and engineering recommendations for further improving the quality of stormwater runoff.

In 2010, with coordination of the Eagle River Water and Sanitation District and the Eagle River Watershed Council, an Urban Runoff Group was formed to address current non-point source issues in the Gore and Eagle drainages and work towards current inventory and assessment of all non-point source issues affecting the watershed. This stakeholder group is working to keep Gore Creek off of the 303(d) list, an action expected to be proposed based on the State Water Quality Control Commission (WQCC) recently adopted aquatic life assessment methodology. As proposed by the WQCC, Gore Creek could be placed on the State’s 303(d) list as a result of low aquatic life assessment scores for Gore Creek upstream of the Vail Wastewater Treatment Plant. Achieving removal of Gore Creek from this list would take many years if not decades since the reasons for low aquatic life assessment scores is unknown at this time but do not appear directly correlated to the WWTP discharge.

In view of the economic impacts placing Gore Creek on the 303(d) list of impaired waters may have on the area, the Urban Runoff Group is conducting stormwater sampling and creating an Eagle River Water Quality Improvement Plan for consideration during the WCQD 2012 303(d) listing cycle as a Category 4b demonstration plan. The first phase of this plan is focused on Gore Creek, however, it is anticipated that this plan will be included in the update to the 1996 Eagle River Watershed Plan currently underway.

2.3 Lower Eagle River Watershed (Eagle River Segments 9a,9b, 10a,10b, 11,12)

The Eagle River downstream, from Gore Creek to its confluence with the Colorado River at Dotsero, is affected by wastewater discharges, irrigation return flows, mineralized groundwater seepage, and runoff from highly erodible soils.

There is a major natural source of chloride from rocks in the area of Lake Creek, immediately downstream from Edwards. Farther downstream, specific conductance and concentrations of dissolved solids and hardness increase.

2.3.1 Mainstem Eagle River from Gore Creek to Dotsero (Eagle River Segment 9a and 9b)

In 1997-1998 the State Water Quality Control Division obtained EPA funding to conduct a nutrient enrichment study of the Eagle River watershed. The USGS was contracted to perform the collection and analysis for chemical and biological samples, assess the habitat, nutrient concentrations, algal and macroinvertebrate communities. Five sites along the Eagle River were sampled in September 1997 and February 1998 for water chemistry, algae and macroinvertebrates. The Division also conducted monthly water samples and performed a synoptic survey of the Eagle River in March 1999. The habitat at each of the sites was considered optimal or sub-optimal. The water quality data from USGS and the Division showed similar trends. The nutrient concentrations were low at the upper most station on the Eagle River above Gore Creek. The concentrations then increased at each successive station as loading from wastewater treatment facilities and nonpoint sources entered the River, until reaching a peak at station at Eagle Springs golf Course (near Wolcott). The nutrient concentrations then decreased to station 5 at Gypsum probably due to dilution from larger tributaries such as Brush and Gypsum Creeks which have relatively low nutrient concentrations. The major sources for nutrients (both nitrogen and phosphorus)in the watershed are municipal wastewater treatment facilities (approximately 70% of the nitrogen load at Wolcott and 90% at Gypsum, and more than 90% of the phosphorus load). With respect to the algae community, each station was dominated by diatoms (more than 97% of the algal biomass). The USGS considers the Eagle River below Gore Creek to be un-enriched to moderately enriched. The macroinvertebrate communities showed a distinct shift in dominant groups, with caddis flies increasing in numbers downstream, and midges dominating the Gypsum site in February. The Shannon-Weaver diversity index showed a “fairly significant drop in diversity from the upper site to Wolcott, before increasing again at Gypsum. These decreases in diversity mirror the increase in nutrient concentrations and an argument could be made that nutrient loads are degrading the biological communities”. “Based on chlorophyll-a levels,

the River would have to be considered moderately enriched at this point in time . However, with continuing growth in the basin associated increases in nutrient loads from wastewater treatment plants, the potential for increasing algal growth and nuisance conditions should be considered relatively high. While it cannot be ascertained to be a problem at this time, it could portend future shifts in the biological structure of the River which could potentially affect the existing good to excellent fishery. While the study provided a snapshot in time of nutrient levels and associated conditions in the Eagle River and established some baseline conditions in relation to future growth and nutrient loading in the basin, it did not verify the complaints as to the various nuisance conditions in the River." [Phil Hegeman, personal communication WQCD DRAFT "Summary Report on 1997-98 Investigation of Nutrient Enrichment in the Eagle River"]

More recently, in 2010 the Eagle River Water & Sanitation District (ERWSD) has undertaken nutrient studies linked to macroinvertebrate populations in anticipation of proposed statewide nutrient criteria. Generally, the ERWSD found that benthic macroinvertebrates are impacted more in the reach of Gore Creek upstream of the Wastewater treatment plant than downstream of the plant discharge. The basis for these results remains inconclusive due to the complexity of accurately identifying specific stressors or a combination of stressors that are leading to known aquatic life impairment, and non-point source urban stormwater runoff may or may not be the cause for degraded macroinvertebrate community conditions found.

Impacts associated with stormwater and urban runoff in the Vail/Avon corridor were identified in the 1987 Non Point Source Assessment and the Black Lake Reservoirs 1041 Application. The pollutant of concern was sediment, although cadmium, lead, salinity, nutrients, and oxygen demand were also documented. As part of the Eagle Mine monitoring efforts, the Division of Wildlife has a monitoring site on the Eagle River at Arrowhead. Fish populations at this site have increased substantially since 1991 when two passes captured 70 trout, to 1994 when two passes captured 290 trout (biomass estimates were 74, 188, and 228 pounds of brown trout per acre in 1992, 1993, and 1994 respectively). Macroinvertebrate species diversity at this site in 1993 and 1994 were 2.98 and 3.66 respectively. In 1997,more brown trout were found below Two Elk Creek (Site 3) and Cross Creek (Site 4) than at Arrowhead (Site 6). The number per acre at the Arrowhead site was estimated to be 175, with an estimate of 90 pounds per acre. Two factors were suggested for the decline: increased fishing pressure and decreases in water quality. At this site water quality standards for cadmium, manganese, and zinc continue to be exceeded, according to 1997 DOW data. Sculpin, a fish indicative of high water quality, have been found to be recolonizing the Eagle River below Wolcott in 2000. Sculpin were also collected at site 6 (Arrowhead) in 1994, 1996, 1997,1998, 1999, and 2000 [Annual Biological Assessment of the Eagle Mine Superfund Site, Eagle County, Colorado John Woodling and Ann Widmer, Division of Wildlife, April 2000]. Between 2005 and 2010, sculpin continue to appear in abundant numbers both

above and below the Eagle Mine site as a result of lower zinc levels (Colorado Division of Wildlife, John Woodling and Kendall Bakich, summary provided for ERWC Eagle Mine Limited presentation 'Fish studies of the Eagle River at the Eagle Mine Site: Results of restoration activities from 1990 to present, Part 2. 2005-2010, viewed January 18, 2011)

Fish kills have been observed in the lower Eagle River on an occasional basis from Edwards to Gypsum. Furunculosis (a circulatory bacterial infection) has been the primary agent responsible, but the decrease in resistance to bacterial infections has been ascribed to the increase in general stress experienced by the fish. Brown trout are the most susceptible, with the large fish succumbing first. The stress is a result of higher water temperatures, low dissolved oxygen concentrations, loss of habitat, and handling of fish being returned to the river. According to Bill Heicher, District Wildlife Manager, each year a few dead trout are found in this area during late summer low flows, but "larger scale" fish kills have not occurred since 1988-1987 [Bill Heicher, personal communication, 2001]. In 2001, the DOW estimated a Furunculosis fish kill in the hundreds (browns and rainbows), due to weeks of hot weather and low river flows.

Average zinc concentrations at Edwards for the period 1988 through 1992 (167 mg/L) exceed the state's water quality standard using the average hardness at this site for that period (164 mg/L as Ca CO3).

A review of Water Quality Control Division monitoring data from 1977 to 1994 indicates total phosphorus concentrations on the Eagle River exceed Environmental Protection Agency recommended levels (0.05 mg/L) and increase from the confluence with Gore Creek downstream to Gypsum. Concentrations are highest over the three years from 1984 to 1987, with an average concentration of 0.218 mg/L. Average concentration for the period 1977 to 1994 at Gypsum is 0.102 mg/L.

Water quality data is collected by Eagle Valley Middle School in Eagle, Gypsum and below Gypsum, as part of the Division of Wildlife's River Watch Program. In Eagle, pH and dissolved oxygen appear good (although samples have not been collected during the summer low flow period) from 1997 - 1999. Cadmium and copper are detected infrequently, and zinc does not exceed the acute aquatic life standard, although it is regularly detected. Mean hardness for this station is 211 mg/L.

Occasional exceedances occur on the drinking water standard for manganese (50ug/L dissolved manganese). This standard is a secondary standard, based on aesthetics and not on health effects. With changes in 1999 of the State's Basic Standards, existing ambient conditions of manganese will become the new standard for this segment.

In Gypsum, dissolved oxygen is low during the winter low flow period (summer

samples are not collected) and metals concentrations generally meet water quality standards. Below Gypsum, water quality appears good although dissolved copper concentrations are higher than in town.

Data collected by the Eagle Valley High School on the Eagle River upstream of Gypsum Creek between 1990 and 1994 indicated occasional exceedances of the drinking water standard for manganese, one exceedance of the temperature standard, and a mean hardness of 300 mg/L.

A review of Water Quality Control Division data collected at Dotsero from 1977 to 1994, indicate that all water quality standards are met at this site, with the exception of an occasional exceedance of manganese and fecal coliform standards. Total phosphorus concentrations at this site for the period of record average 0.082 mg/L.

2.3.2 Beaver Creek (portion of Eagle River Segments 1 & 6)

Beaver Creek has been studied extensively by the Water Quality Control Division because of ski resort development in this area. The results indicate that the stream has seasonal changes in water quality, with increased concentrations of alkalinity, hardness, and dissolved solids occurring at lower flows.

2.3.3 Milk and Alkali Creeks (Eagle River Segment 11)

Milk and Alkali Creeks join the Eagle River from the north in the vicinity of Wolcott, and have been identified as contributing a very substantial amount of nonpoint source sediment and salt. Milk and Alkali Creeks have a combined land area of 63 square miles (40,320 acres). Public lands in these areas account for 56% of the total land area. The geology of the area is dominated by Pierre shale, Niobrara formation (calcareous shales and marly limestone), and Benton shale. Permeability is slow, surface runoff is rapid, and the hazard of erosion is high. Water quality samples collected by the Denver Water Department in 1976 in Alkali Creek had a specific conductance exceeding 600 umho/cm for at least one sampling period, and Muddy Creek, a tributary to Alkali Creek, had a dissolved solids concentration of 1,178 mg/L and a specific conductance of 1,180 umho/cm.

Milk, Alkali, and Muddy Creeks were reported in the 1987 NPS Assessment to be significant sediment sources to the Eagle River. Approximately 59% of salinity samples taken in the lower Eagle River were above 500 mg/L. Saline soils as well as urban and highway salt runoff are identified as the source of the elevated salinity concentrations.

The Bureau of Land Management (BLM) has monitored water quality in Milk and Alkali Creeks between 1987 and 1996 sporadically during the summer, and have found total dissolved solids concentrations during low flow periods to average

about 1,000 mg/L. Total salt load from the public lands in the two watersheds was estimated to be 2,600 tons per year. Sediment concentrations as high as 12,000 mg/L have been recorded by the BLM during spring runoff (this data was probably collected in 1987-1989). Impacts to the fisheries in the Eagle River have been documented by the DOW (1971, 1982, and 1989). The BLM has completed a management plan for that portion of the land which they hold, and have begun implementation of that plan. Additionally, the Eagle River Environmental and Business Alliance obtained an EPA 319 grant in 1989 to construct check dams and drop structures on private lands in critical areas of these watersheds.

Macro invertebrate studies were done as part of the project in 1988 and 1992. Stations above and below Milk and Alkali Creeks on the Eagle River all had a mix of tolerant and intolerant species, with no major differences between sites. Overall, water quality and instream habitat conditions appeared better at all stations in 1992 than in 1988.

USGS sampled Alkali Creek in March 2000. Dissolved manganese was at 119 ug/L, total iron of 530 ug/L, specific conductance of 1110 uS/cm, suspended solids of 31 mg/L, and total dissolved solids concentrations were 768 mg/L at a flow of 1.4 cfs

USGS also sampled ¾ mile downstream of Milk Creek on the Eagle River in 2000 and 2001 on 14 different dates in each water year. In 2004, a reconnaissance- level feasibility assessment for a new 55,000 to 105,000 acre foot in-channel reservoir (Wolcott Reservoir) in lower Alkali Creek determined that much of the sediment runoff from this drainage would be trapped by the reservoir and thus reduce a portion of the Lower Eagle sedimentation problem.

2.3.4 Brush Creek (Eagle River Segment 12)

Brush Creek is mainly affected by nonpoint sources of pollution. Downstream from Eagle, Brush Creek had a specific conductance of 427 mg/L and a dissolved solids concentration of 630 mg/L in August 1975. Benthic diversity decreased downstream, from 3.33 to 2.38, indicating water quality degradation in the downstream reaches of Brush Creek, primarily from irrigation return flow. The US Forest Service sampled Brush Creek at several sites upstream from Eagle since 1973, and concluded that the water upstream from Eagle is acceptable for all uses.

USGS has sampled Brush Creek at the mouth in 2000 and 2001 and the East Fork of Brush Creek in 2000. Data collection included chemistry, aquatic invertebrates, and algae. In 2008, excessive blooms of filamentous algae were noted in the lower reaches of Brush Creek just upstream from the Town. Previous algae monitoring by the USGS did not find a similar occurrence.

Eagle County required the developers of Adams Rib Ranch, a new private golf course community on Brush Creek, to provide baseline water quality monitoring prior to construction, during construction and on an on-going basis thereafter. The monitoring is designed to ensure that pre-existing water quality conditions are well understood before development and that any potential development impacts are addressed.

2.3.5 Gypsum Creek (portion of Eagle River Segment 10a)

Gypsum Creek has water of suitable quality for all uses in its upstream reaches. Increased specific conductance and increased concentrations of alkalinity, hardness, sulfate, and dissolved solids were measured downstream. The increases are possibly the result of irrigation return flow and mineralized ground water seepage. Ground water from the Eagle River Evaporite, west of Edwards, and the Pierre shale, north of Wolcott, is the most mineralized water in the lower Eagle River watershed. Limited recent data indicate dissolved solids are at moderate levels, and generally lower than in the Eagle River near Gypsum. Trace metal and nutrient concentrations are generally low prior to 2006. Little recent water quality data is available to determine if noteworthy changes have occurred to the water quality of Gypsum Creek as land uses have changed from ranching to residential and golf course residential uses over the last ten years.

2.4 Colorado Water Conservation Board Watershed Instream Flows

A description of the Colorado Water Conservation Board's (CWCB) instream flow filings including those found in the Eagle River watershed can be found at: http://cwcb.state.co.us/technical-resources/instream-flow-water-rights-database/Pages/main.aspx . These filings are located on most of the tributaries and mainstem of the Eagle River.

Colorado statute (CRS § 37-92-102(3)) recognizes that preserving the natural environment to a reasonable degree, through the protection of instream flows and natural lake levels in natural lakes, is a beneficial use of water. Under the same statute, the CWCB is declared the exclusive agent authorized to appropriate water rights for the purpose of preserving the natural environment. It is also stated that the acquisition of the water rights to protect instream flows has to be made within the context of existing water rights appropriation regulations. Instream flows are therefore subject to appropriation dates, and the CWCB can call out water rights junior to their own for maintenance of those flows. Thus, the fact that the CWCB has filings for these instream flows does not ensure that stream flows will always exceed these minimums, as the water rights associated with these flows have appropriation dates which are not that old. Most of the appropriation dates for instream flow filings in the Eagle River watershed are between 1977 and 1980.

Enforcement of “calls” to ensure instream flows are practically nonexistent in the

Eagle River watershed. Since the CWCB holds the instream rights, they are the ones that have to place the call, and since they don't have any field personnel the instream flows are not always met. A procedure to monitor and ensure that the CWCB exercises their legal instream flow rights needs to be investigated.

The flows established are generally the minimum necessary to preserve the natural environment to a reasonable degree, and are usually fairly junior in priority. Prolonged periods of time at these minimum flows would have an impact on the natural environment and on the designated uses of that stream segment's water. There have been some discussions on the appropriateness of some of the instream flow filings, and it is recommended that the Division of Wildlife, the Division of Parks and Outdoor Recreation, and the CWCB examine the development of the instream flow filing recommendations, and potentially revise those recommendations where appropriate.

In 2005, the Eagle River Inventory and Assessment (ERIA) noted that flow regime is a variable that profoundly influences numerous ecological process in the Eagle River. The study also noted methods used to quantify instream flows on the Eagle River main stem did not address several key factors linked to low flows such as recreation, water quality, land use changes, wastewater dilution and temperature. The ERIA recommended the development of a decision-oriented tool comparable to the Instream Flow Incremental Methodology (IFIM) to more rigorously assess the potential effects of flow alterations on instream fish habitat and water quality in the Eagle River. In 2009, Eagle County submitted to the CWCB a proposal to establish a minimum instream flow water right on the mainstem of the Colorado River above the confluence with the Eagle River. In conjunction with an ongoing BLM effort to evaluate Wild and Scenic status of this reach of rthe Colorado River, an ISF water right was approved by the CWCB in 2011

3.0 WATER QUALITY ISSUES

3.1 Point Source Issues

Most of the point source issues relate to the assimilative capacity of the stream to absorb wastewater flows. Additionally, water quality impacts from historical mining activities continue to be an issue.

3.1.1 Municipal Discharges

Point source problems were extensively evaluated by the Water Quality Control Division in 1974 as part of the Colorado River Basin 303(e) Plan. Point source treatment needs, consolidation of wastewater treatment facilities, waste load allocations, treatment alternatives, and other related matters were addressed in

the basin plan. The principal problems addressed included the need for ammonia removal capability at domestic facilities to protect Gore Creek and the upper Eagle River from ammonia toxicity and the dissolved oxygen content of the streams. Since the adoption of the basin plan in 1974 and the 1978 version of the 208 plan (which incorporated its recommendations), the development of wastewater treatment facilities has generally proceeded in accordance with its recommendations. Facility plans under Section 201 of the Clean Water Act have defined the precise treatment mechanisms and locations for wastewater treatment and have implemented the recommendations of both the 208 and basin plans. A facility plan for the expansion of the Upper Eagle Valley Consolidated Sanitation District plant (currently the Eagle River Water and Sanitation District) was the subject of an Environmental Impact Statement which also focused on the relationship between growth and development activities in the area and the need for control of nonpoint sources from urban runoff and construction activities.

The major point source discharges in the Eagle River watershed are municipal wastewater treatment plants, listed in Table E-1, along with their Colorado Discharge Permit System number and their hydraulic capacity.

Table E-1. Eagle River Municipal Wastewater Treatment Facilities

CDPS Permit #	Facility Name	Responsible party	Hydraulic capacity, MGD
CO-0021385	Red Cliff	Town of Red Cliff	0.172
CO-0021369	ERW&SD Vail	ERW&SD	2.700
CO-0024431	ERW&SD Avon	ERW&SD	4.30
CO-0037311	ERW&SD Edwards	ERW&SD	2,95
CO-0021385	Red Sky Ranch	Holland Creek Metro District	0.027 (peak)
CO-0021059	Eagle	Town of Eagle	1.65
COG-584001	Gypsum	Town of Gypsum	2.0
	Dotsero Mobile Home Park	Dotsero MHP	0.002
	Two Rivers Village	Two Rivers Village District	0.150

Red Cliff Wastewater Treatment Plant

Until the Fall of 2009, the Red Cliff wastewater treatment facility was a 70,000 gallon per day maximum hydraulic capacity activated sludge plant providing secondary treatment, constructed in 1972. It had been in and out of compliance for CDPHE discharge limits for over 20 years, with average flows of 225,000

gallons per day and peak flows frequently exceed 500,000 gallons per day due to infiltration/inflow problems and extremely high water usage by the inhabitants who keep tap water running during cold weather to prevent waterline breaks (bleeding). Estimates of winter bleeding are on the order of 100,000 gallons per day. In 2009, the Town of Red Cliff obtained a $4.18 million in grant money to pay for a new WWTF and for upgrades to the sanitary sewer collection system. As of November 2010, the new WWTF project was substantially complete and should reach final completion by December 1st, 2010.

The project was the first ARRA funded water/wastewater project in the State of Colorado to be completed. The new plant consists of Biowheel mechanical technology for primary treatment as well as two clarifier basins, two equalization basins, a sludge basin and UV treatment to complete the process. The majority of improvements are enclosed within a masonry building, and the completion of the project represents a major milestone for the Town of Red Cliff, the State of Colorado and the watershed.

The 2010 Red Cliff Sanitary Sewer Collection System Project was designed to repair the sewer collection system in order to reduce inflow and infiltration, which in 2008 averaged 130,000 gallons per day with peak flows reaching as high was 570,000 gallons per day. Improvements included repairs including sealing manholes, repairing service line connections to main lines, replacing services and main lines and replacing manholes. To date, these improvements have made a significant decrease to the amount of flow coming to the sewer treatment plan during high ground water months. In the month of September 2010, flows were cut in half from 100,000 gallons per day to 50,000 gallons per day. This dramatic cut in flows will allow the sewer treatment plat to run efficiently and stay within the design capacity of 172,000 gallons per day.

The last phase of improvements to the Red Cliff Sewer system was the reduction of winter bleeder flows. Over 2009 and 2010, the Town (in cooperation with the Eagle River Water and Sanitation District) implemented a program aimed at reducing these flows which included the installation of water meters at each and every residence and business through Town. Importantly, the Town also implemented a tiered billing structure wherein all properties are billed based upon usage. The Town has also provided government assistance programs to residents to cover some or all of the costs of repairing their water lines so that winter bleeding is eliminated. Combined, the goal of these operational improvements is to provide incentive for all properties to reduce the bleeding and use water more efficiently through Town.

A renewal discharge modification permit was applied for with the new design capacity of .172 million gallons per day as a 30 day average, and 119 pounds of BOD per day. Ammonia removal is not required due to the size of the facility and flows in the Eagle River. The discharge permit modification is under review, however all tests performed on the new Sewer Treatment plant in the Fall of

2010 have been in compliance with the current permit. The Eagle River Water & Sanitation District provides full operations and management service to the Town of Redcliff WWTP.

Vail Wastewater Treatment Facility (VWWTF)

The Vail wastewater treatment facility is a 2.7 million gallon per day (MGD) tertiary facility. The flow and loading to the plant vary seasonally with the winter months being the highest loading and the fall being the lowest. There was an average flow to the plant of 1.27 million gallons per day (MGD) in 2008 and 1.26 MGD in 2009 , as compared to an average flow of 1.88 MGD in 2000.

The peak weekly flow was 1.97 MGD in 2008, and 2.0 MGD in 2009 as compared to 2.77 MGD in 2000. The aeration capacity of the plant was upgraded in 2000 to serve 7,500 SFEs (single family equivalents) and has a design capacity of 7,450 pounds of BOD5 per day. Effluent monitoring standards include pH, BOD5, total suspended solids, fecal coliform and ammonia. BOD5 and TSS must also meet an 85% monthly reduction rate.

The VWWTF has the capability to shave peak flows in excess of the designed hydraulic capacity to the Avon Wastewater Treatment Plant (AWWTF) using the existing sewer infrastructure. Biosolids are moved to the Avon Wastewater Treatment facility via gravity flow through a trunk line. The VWWTF discharge permit expires on February 29th, 2012.

Avon Wastewater Treatment Plant (AWWTF)

The Avon Wastewater Treatment Plant is a tertiary treatment facility. The flow and loading to the plant vary seasonally with winter months being the highest loading and fall being the lowest. There was an average flow to the plant of 2.2 MGD in 2008 and 2.04 MGD in 2009. The peak flow to the plant was 2.93 MGD in 2008 and 2.99 MGD in 2009. In 2000, an average flow was approximately 2.1 MGD and peak flows were 3.5 MGD

The plant underwent an expansion that was completed in December of 1996 increasing its capacity to 4.3 MGD and 9,400 pounds of BOD5 per day. Effluent monitoring standards include pH, BOD5, total suspended solids, fecal coliform and ammonia. BOD5 and TSS must also meet an 85% monthly reduction rate.

The 1996 expansion included a new headworks process, primary sedimentation tanks, and Auto Thermal Thermophilic Digestion (ATAD), solids pre-thickening, solids dewatering and a state of the art odor control system. More recent plant upgrades include a new UV system for disinfection and new redundant barscreen (2006), a new blower automation and controls system (2008). The solids handling process treats the sludge to a Class A biosolids product. The product is stored at ERWSD's Biosolids Containment Facility located next to the Wolcott

landfill and is available to developers, contractors and landfills for beneficial use or soil amendment. The plant serves an estimated population in excess of 15,000 people and also processes the waste solids from Vail Wastewater Treatment Plant and surrounding areas such as Minturn and West Vail. The plant expansion and upgrades are expected to meet service needs beyond 2015. The discharge permit expires January 31st, 2016.

Edwards Wastewater Treatment Plant (EWWTF)

The Edwards Facility is a secondary treatment plant which currently receives average daily flows of approximately 1 MGD and peak daily flows 1.65 MGD. The flow and loading to the plant vary seasonally with the winter months being the highest loading and the fall being the lowest. There was an average flow to the plant of 1.21 MGD in 2008 and 1.082 in 2009. The peak weekly flow to the plant in both 2008 and 2009 was 1.65 MGD. The plant increased capacity in 2008 to 2.95 MGD and 6,400 pounds of BOD5 per day. Effluent monitoring standards include pH, BOD5, total suspended solids, fecal coliform and ammonia. Ammonia discharge limits vary seasonally from 3.1 to 18 mg/L and meet a 2 year rolling average of 2 mg/L. Ammonia removal capability was included in the latest expansion along with UV disinfection and autothermal thermophilic aerobic digestion (ATAD) for treatment of all waste biosolids. The solids handling process treats to a Class A biosolids product to meet Federal 503 Class A requirements. The ATAD system is undergoing expansion from 2009 to 2011 to increase capacity as well as more efficient treatment. All Class A biosolids are stored at the ERWSD's Biosolids Containment Facility located next to the Wolcott landfill. The product is available to developers, contractors and landfills for beneficial use or soil amendment. The Edwards discharge permit expires January 31, 2016.

Red Sky Ranch

This facility is composed of three Water Quality Control Division permitted on-site wastewater systems discharging soil absorption fields to serve a 27 residential unit cluster and two golf course club houses. Each clubhouse system is designed for an average daily flow of 4,000 gallons per day (gpd), and peak flows of 6,000 gpd. The 27 residential units cluster system is designed for an average daily flow of 5,832 gpd, and a peak daily flow of 8,775 gpd. Along with these three State permitted systems, three additional clustered systems have been designed to serve four, six, and seven residential units, each of these systems having a design capacity to treat less than 3,000 gpd peak daily flows. Total peak daily flow from these combined systems is not expected to exceed 26,832 gpd. All the systems in the Holland Creek Metro District incorporate the same level of treatment, including de-nitrification. The Eagle River Water & Sanitation District provides full operations and management to the Holland Creek Metro District for water and sewer service.

Eagle Wastewater Treatment Plant

The Town of Eagle operates a wastewater treatment facility (extended aeration, activated sludge plant) with a rated capacity of 1.65 MGD as compared to a capacity of 0.546 MGD in 2002. Capacity improvements were completed in 2009, and also included the construction of a biosolids handling facility. Flow rates averaged approximately .5 MGD in September 2010.. The Plant is not required to meet ammonia effluent limits, but the plant is required to monitor ammonia discharge concentrations. In 2010 the highest daily flow was approximately 565,000 gallons per day and the median daily flow was approximately 460,000 gallons per day.. Discharge is to the Eagle River downstream of Brush Creek (segment 9 of the Eagle River). The discharge permit for this facility expired in May, 2010 and is operating under extension- anticipating renewal by year end.

Gypsum Wastewater Treatment Plant

The current extended aeration mechanical plant with secondary clarification and nitrification/de-nitrification ("Aeromod" system) went into service in December 2001 to replace the lagoon system at the existing site, due to hydraulic and organic capacity issues. The system is designed for 0.96 MGD average daily flow and an organic loading capacity of 2,000 Pounds of BOD per day. The facility has been engineered to allow for expansion to 2.0 MGD. The plant serves the Town of Gypsum and the Eagle County Airport. It receives average flows of .390 MGD and peak flows of .650 MD. Sludge disposal is currently through Parker Ag, a third party contractor, on a weekly basis. The biosolids composting is in the process of being moved to another site. Ammonia removal is required through ammonia effluent concentration limits. The current permit for this facility was issued July 1, 2007 and expires June 30, 2011.

Dotsero Mobile Home Park Wastewater Treatment Plant

The Dotsero Mobile Home Park wastewater treatment plant is a Rotating Biological Contactor plant (RBC) covered under the state's general permit for discharges to groundwater.

Two Rivers Village

This planned unit development housing subdivision in the Dotsero area, just below the confluence with the Eagle River, has been granted site approval for a 0.15 MDG facility (1,500 population equivalents). The Colorado Water Quality Control Division extended the Site application permit for this facility to October 9, 2002. The facility includes two lift stations, and an extended aeration activated sludge process ("Aeromod" System) followed by sand filtration and ultraviolet disinfection. By 2010, the subdivision was only partly complete and was placed under new ownership however no anticipated upgrades to the WWTP are expected at this time.

3.1.2 Population Projections

Population projections for the county and the municipalities in the Eagle River watershed are listed in Table E-2. The percentage permanent population increase from 1980 to 1990 was 64.6%, and from 1990 to 2000 was 90.0%.

Table E-2. Eagle County Population Estimates and Projections - Permanent Population[1]

Entity	1980	1990	2000	2000 projected[2]	2009[4]	2020
Eagle County	12,791	20,932	38,978	29,091	52,283	72,227[4]
Avon	640	1,798	5,561	2,893	7,108	
Eagle	950	1,580	3,032	2,014	6,054	
Gypsum	743	1,750	3,654	2,379	6,786	
Minturn	1,060	1,066	1,068	1,387	1,226	
Red Cliff	409	297	289	356	336	
Vail	2,261	3,659	4,531	4,731	5,027	

[1]: Information from the US 2000 Census, Denver Post Census 2000 special report, March 20, 2001
[2]: NWCCOG 1996 208 Projection based on 1994 State Demography Office
[3]: Population projection, State Department of Local Affairs, State Demography Office, October 2000 projection
[4]: October 2010 estimate from the State Demography Office, includes Basalt which is in the Roaring Fork watershed.

Note: Permanent population projections are not available for Towns.

Peak Populations

In addition to the full time population in Eagle County, the Vail Valley Tourism and Convention Bureau estimated Eagle County to have 9,813 part-time residents and an Eagle Valley bed base of 16,990 in 2001 [Vail Valley Tourism and Convention Bureau, Vail/Eagle County Information and Vail Valley Bed Base information, 2001]. Infrastructure of the Town of Vail is designed to accommodate a seasonal population of over 20,000 guests at one time (MTRIP, 2009). Beaver Creek has over 18,000 beds and, in combination with Avon's buildout of short term lodging, will accommodate as many visitors at one time as the Town of Vail (Vail Resorts, 2010).

As growth continues in the State of Colorado, both in-basin and trans-basin water

diversions will increase, leading to lower instream flows and increased water consumption. As future plant expansions are considered, it is critical that the water and sanitation districts consider the effects of increased diversion on instream flows. Reuse of wastewater should be examined as one method of reducing instream flow diversions. Additionally, pump back systems to return reclaimed wastewater to the point of diversion should also be considered to minimize instream flow depletions.

3.1.3 Industrial Discharges

Industrial discharges to the Eagle River and its tributaries include the Eagle Mine, the Eagle County airport, construction dewatering projects throughout the watershed, stormwater permit for construction activities throughout the watershed, and sand and gravel mining in the lower reaches of the Eagle River. These discharges are all permitted through the Colorado Discharge Permit System, administered by the Colorado Water Quality Control Division. These activities have, for the most part, small quantities of discharge. Occasionally these discharges affect water quality, but usually these effects are temporary in nature. The greatest concern with the discharges (outside of the Eagle Mine) is the cumulative impact (especially with respect to sediment) that these discharges have on the Eagle River.

3.1.4 Point Source Issues - Summary

In summary, the current point source water quality problems of streams in the Eagle river watershed are:

> Continuing to provide for an adequate level of ammonia removal to avoid ammonia toxicity problems in Gore Creek and the upper Eagle River. Current levels of waste water treatment are adequate to meet existing water quality standards but decreased levels of stream flow due to upstream water development projects may require higher levels of treatment to maintain existing water quality levels in the upper Eagle River. The Eagle River Water and Sanitation District was approved for temporary modification of temperature Table Value Standards at the Avon WWTP discharge that will expire in 2013.
>
> The continued control of sediment from industrial discharge permits as it relates to the cumulative impact of sediment on the Eagle River is also important.

3.2 Point Source Recommendations

The district consolidation accomplished by the Eagle River Water and Sanitation District is strongly supported by the Northwest Colorado Council of Governments, and should be used as a model for the development of regional sanitation districts whenever feasible. The economic, political, and environmental benefits of regional wastewater management cannot be overstated.

In 2010, the Red Cliff facilities wastewater treatment facilities were improved in order to meet wastewater treatment standards and improve the water quality of the upper Eagle River.

Ammonia wasteload allocations need to be carefully monitored with respect to potentially decreasing low stream flows (1E3 and 3E30 conditions).

As future water and wastewater treatment plant expansions are considered, it is critical that the districts consider the effects of increased diversion on instream flows. Reuse of wastewater should be examined as one method of reducing instream flow diversions. Another consideration should be the location of diversion and return flow structures, which should be located in close proximity to each other.

The need for a wastewater treatment facility in the Wolcott area has been explored by the Eagle River Water and Sanitation District, and in 1999 the District purchased a two acre parcel on the riverside just west of the intersection with Highway 131 for potential future use. Increased temperature monitoring will be critical to the aquatic health of the lower Eagle below Wolcott should any major development occur in the Wolcott area.

3.3 Nonpoint Source Issues

The major nonpoint source water quality issues, listed in priority order, in the Eagle River watershed include: urban and construction activities [moved from second priority to first]; mining activities (primarily historic) [moved from first priority to second]; hydrologic modifications, recreation, and agricultural activities.

3.3.1 Urban and Construction Activities

Urban and construction activities have been shown to impact water quality [Vail Nonpoint Source Water Quality Management Plan, 1995]. These impacts include sediment, nutrients, metals, fecal, and organic pollutants. Loss of riparian area vegetation through stream side development and other activities also impact water quality and the aquatic community.

An increase in nutrient loading is caused by the increased use of septic systems [Dillon Reservoir Clean Lakes Study, 1982]. Septic system management is addressed under Policy 4, which addresses domestic and municipal wastes.

Documented water quality problems from septic systems include high levels of bacteria in private and public water supplies and elevated levels of nutrients. Regulation of septic systems is performed by the County, using state and local criteria (the local criteria have to meet minimum state criteria). The state requirements for installation of septic systems have recently been upgraded (1994) to address water quality problems. A number of studies in the Blue River watershed have documented the nonpoint source increase in nutrients from septic systems, although the studies did not determine if the elevated levels were due to a few failing systems or due to the general performance of septic systems. A septic system inspection and maintenance program should be initiated in the basin to identify and correct failing septic systems.

Increased consumption of water through increased development could potentially lead to decreased instream flows and increased concentrations of pollutants, due to loss in dilution flows.

As growth continues to occur throughout the watershed, it becomes more imperative that these activities minimize and/or mitigate their impacts upon water quality, in order to protect existing quality. The Eagle River Water and Sanitation District has collected macroinvertebrate samples at eighteen locations along Gore Creek and the Eagle River in 2008, 2009 and 2010 in anticipation of pending nutrient criteria for permitted dischargers and to explore the relationship between nutrients and river health. This research has indicated a noticeable absence of certain macroinvertebrates upstream of the Vail WWTP discharge, with numbers relatively typical below the discharge. Though inconclusive, this preliminary research suggests that urban runoff in addition to embedded traction sand may affecting macroinvertebrate populations in upper Gore Creek.

3.3.2 Mining Impacts

Excessive trace element concentrations exist in Cross Creek and the upper Eagle River as a result of drainage from historical mining areas including the Eagle Mine. This site has been designated a Superfund site under CERCLA and an analysis of the sources
contributing to these surface and groundwater problems has been completed. A great deal of progress has been made in improvements in water quality and biological restoration as a result of remedial activities at the Eagle Mine Superfund site, however zinc concentrations remain a limiting factor for aquatic organisms and depresses brown trout numbers and growth rates, also precluding an abundance of native sculpin in the mine-affected stream reaches.

While remote, the potential exists for future mining in the Eagle River watershed. If the activity is not strictly regulated, water quality could be negatively affected as demonstrated by the Eagle Mine site, for many years to come.

3.3.3 Hydrologic Modifications

3.3.3.1 Trans-basin Diversions.

Total trans-basin 10-year average export diversions account for approximately 9% of the total stream flow in the watershed, or approximately 36,400 acre feet (CDSS, 2004). Out of basin diversions are 100% consumptive, i.e. none of that water is returned to replenish the stream. These diversions include: the Homestake Tunnel (30,610 acre-feet per year ten year average annual diversion yield from 1992-2001); the Wurtz Ditch (2,863 acre-feet per year, ten year average annual diversion yield from 1992-2001); Columbine Ditch (1,831 acre-feet per year, ten year average annual diversion yield from 1992-2001); and the Ewing Ditch (1,092 acre-feet per year, ten year average annual diversion yield from 1992-2001). Additionally, there are several substantial conditional trans-basin diversion rights totaling an additional 100,000 acre-feet (Homestake II has approximately 22,000 acre feet of conditional rights). It should be noted that these trans-basin diversions occur primarily during the spring runoff, and therefore do not affect instream flows during the times of critical low flow, due to senior downstream appropriations (Eagle River Assembly, Phase I Report, September 1994).

There are increased water development activities associated with trans-basin diversions to the eastern slope of Colorado including the Denver Water Department's Eagle-Colorado projects, and the expansion of the Homestake project on the upper Eagle River. These projects have the potential to increase the concentration of pollutants (through a reduction in the amount of dilution flows in the Eagle River), including ammonia and chlorine at existing point source discharges, and significantly modify the hydrology of the Eagle River. According to the Eagle Mine Remedial Investigation performed for the Colorado Department of Public Health and Environment, concentration of metals in the upper Eagle River would be increased as a result of diversions from the Homestake II project. This could affect public drinking water supplies downstream and eliminate some of the potential benefits to aquatic life, which result as a consequence of the remedial actions at the Eagle Mine site. Details of these water development projects would be evaluated at the time of review of development applications under local land use regulations.

In the 1993, water year those diversions accounted for 36,121 acre-feet of water. As a comparison, the State's Water Resources Division has estimated that in-basin diversions for that same period were 6,800 acre-feet. However, it should be noted that the trans-basin diversions generally occur during the spring runoff, when low instream flows are not a concern, while in-basin diversions occur throughout the entire year and do exacerbate low stream flows at critical times.

As a result of discussions held through the Eagle River Assembly, convened by the Colorado River Water Conservation District, Colorado Springs and Aurora

agreed to release 500 acre-feet of Homestake Reservoir project water to the Eagle River upon request by in-basin interests during low flow periods in 1998. A similar agreement in 2004 made another 500 acre feet available, and yet another 500 acre feet was made available for in basin use in 2010 through agreement with the Eagle River Water and Sanitation District.

In 2007, Boards of the Eagle River Water and Sanitation District and Upper Eagle Regional Water Authority settled a lawsuit with Denver Water wherein Denver agreed to abandon most of their water rights in Eagle County. While the settlement eliminated the possibility of a future transbasin diversion from Gore Creek, the Upper Eagle and the Piney River, it left open the possibility of a jointly developed reservoir north of Wolcott, water from which would serve West Slope purposes and as replacement or substitute water by West and East Slope water users for diversions elsewhere in the basin.

In 2010, after years of litigation, Eagle County and the cities of Aurora and Colorado Springs settled a 1995 Water Court case involving the cities' proposal for development of a groundwater project at Camp Hale and a surface water reservoir in lower Homestake Creek, which would be used for future water diversions to the Front Range. As part of this settlement, the cities have agreed to abandon significant water rights within the existing Holy Cross Wilderness Area, moving points of diversion to locations outside the wilderness boundary. Additionally, the settlement greatly reduces the potential size of both the Camp Hale groundwater project and the proposed reservoir at the mouth of Homestake Creek. Water rights which the cities obtain through the settlement will be dedicated to cooperative development under the 1998 Eagle River Memorandum of Understanding (MOU), an agreement designed to cap the amount of transmountain diversions by the cities from the Eagle River basin.

3.3.3.2 In-Basin Diversions

Throughout the Eagle River shortages in stream flow occur. A shortage is defined as an event when stream flow is lower than the CWCB instream flow amount for several consecutive days (Eagle River Assembly, 1994). Depending on the stream reach and the time of year (late summer or early winter) these shortages occur with a frequency of 1 in 2 years to 1 in 10 years (with the exception of the Eagle River between Brush Creek and the Colorado River confluence, when instream flow shortages appear to occur only during the late irrigation season in dry years).

In-basin water users divert water for domestic, irrigation, snowmaking, and industrial uses. Although the total amount of water diverted by in-basin users is less than trans-basin water users, these uses occur during periods when stream flows are low (Eagle River Assembly, 1994). It should also be noted that not all of the water diverted is consumed, with consumption ranging from 5-10% for

domestic purposes to 50-70% consumption (or greater for golf courses) for irrigation. Water withdrawals impact water quality due to increased temperatures and lower stream flows, which, as previously mentioned, lower the flow and assimilative capacity of the stream.

An additional concern is the use of water augmentation plans that allow diversions from the Eagle River and its tributaries to be made up with releases to the Colorado River which meet the need of downstream senior rights but impact stream flows within the Eagle River valley. These water augmentation plans impact stream flows and water quality.

3.3.4 Recreation

Recreational activities can have an impact on water quality. These impacts range from disturbance, soil compaction, and erosion in riparian areas, to snow making and golf course water withdrawals, to littering and associated water pollutants.

3.3.5 Agricultural Activities

Agricultural activities (from livestock grazing, hay production, and logging) have been documented to impact water quality, especially when those activities take place in riparian areas, but also when good management practices are not implemented in upland areas. Locally appropriate Best Management Practices (BMPs) are recommended for agricultural activities (see Policy 3 - Land Use and Disturbance).

3.3.6 Milk, Alkali and Ute Creeks

These creeks contribute a significant amount of sediment and salt to the Eagle River, due to the naturally high erosive soils in these drainages and poor vegetative cover. It is not known how controllable the sedimentation is in Milk, Alkali and Ute Creeks, and how much these sources of sediment actually impact aquatic resources in the Eagle River. Incision of the stream channel on the lower reach of Milk Creek is especially pervasive as compared to Alkali Creek, and sediment concentrations as high as 12,000 mg/L have been recorded during spring runoff. These drainages were assessed for a potential restoration project by the 2005 CSU ERIA.

3.4 Nonpoint source Recommendations

Policy 1: Water Quality; Policy 2: Water Use and Development; Policy 3: Land

Use and Development; Policy 4: Domestic Municipal, and Industrial Wastes; Policy 5: Chemical Management; in Volume I should be implemented by the appropriate management agencies in the Eagle River watershed to address nonpoint source issues discussed in section 3.3.

Urban runoff and construction activities in Gore Creek and the upper Eagle Valley will continue the need for control of these sources of water degradation as identified in Policy 3 - Land Use and Disturbance - Implementation Recommendations.

Water augmentation plans for proposals within the basin should be encouraged to provide augmentation water from within the basin and above the point of diversion.

Municipal, county, and other agency nonpoint source water quality improvement projects should continue to be supported by local, state, and federal funding.

4.0 WATERSHED IMPROVEMENT PROJECTS

The following projects in the Eagle River watershed have been undertaken to improve water quality in the basin.

4.1 Existing Projects

4.1.1 Eagle Mine Site Remedial Action Plan and Record of Decision

A number of actions have taken place at the Eagle Mine as a result of the Remedial Action Plan and Record of Decision. Included in these activities were: consolidation of the mine tailings (Consolidated Tailings Pile, CTP); a wastewater treatment system which cleans water from the CTP and the mine itself; a sludge dewatering system at the wastewater treatment plant; capping of the CTP; reclamation of a wetland impacted by tailings (approximately 13 acres); and monitoring activities. Water quality and the fishery appears to be improving as these activities have taken place, metals contamination still persists and is limiting productivity of aquatic life as evidenced by limitations in brown trout and native sculpin.

Utilizing a Technical Assistance Grant from the EPA, a local nonprofit monitoring group known as ERWC Eagle Mine Ltd. to develop technical information about the Eagle Mine Site and the water quality of the Eagle River into a format more accessible to the people of Eagle County. Information about the mine cleanup and current water quality standards are retrievable at the organization's website, http://www.erwceaglemine.org/

4.1.2 Vail Nonpoint Source Management Plan

Beginning in 1992, the Town of Vail and the Northwest Colorado Council of Governments cooperated in developing a model Nonpoint Source Management Plan for the Town of Vail, based on the stormwater permit requirements for large municipalities (greater than 100,000 population). Land use based estimates of pollutant loads were done using stormwater samples collected from various land uses, historical water quality data was statistically analyzed to determine trends, a wetland survey was performed, and various management practices were recommended. The plan was completed and approved by the Town of Vail in 1995. In 2010, Town staff are involved with an Urban Runoff Group formed to address current stormwater issues in the Gore and Eagle drainages and work towards current inventory and assessment of all non-point source issues affecting the watershed. This stakeholder group is working to address aquatic life macroinvertebrate issues that have put portions of Gore Creek on the 303(d) list. In view of the economic impacts placing Gore Creek on the 303(d) list of impaired waters may have on the area, the Urban Runoff Group is conducting stormwater sampling and creating an Eagle River Water Quality Improvement Plan for consideration during the WCQD 2012 303(d) listing cycle as a Category 4b demonstration plan. The first phase of this plan is focused on Gore Creek, however, it is anticipated that this plan will be included in the update to the 1996 Eagle River Watershed Plan currently underway.

For more information contact the Town of Vail Community Development Department Environmental Health Officer.

4.1.3 Milk and Alkali Creek Drainage Project

In 1989, the Colorado Water Quality Control Division provided nonpoint source pollution control funding (Section 319 funding) to the Eagle River Council for initiation of the Milk and Alkali Creek Project Implementation Plan. The 1989 plan included the placement of large and small rock structures, as well as straw bales structures in key locations engineered to trap sediment carried through these drainages. In 1992 the project was revised to demonstrate effectiveness of different technologies. An existing structure was repaired and additional types of structures were constructed (log deflectors, rock retaining wall, and a third rock structure) in an ephemeral drainage where two structures already existed. This was done to see if a cumulative effect on sediment trapping is demonstrated. The long term impact to water quality as a result of this project is not known. A macroinvertebrate sampling was also done on the Eagle River as part of this project. For more information, contact Eagle County Department of Environmental Health, or the Water Quality Control Division Nonpoint Source Program Coordinator. The 2005 CSU ERIA examined the potential benefits of a restoration project on Milk, Alkali and Ute Creek Drainages and made specific recommendations for the project.

4.1.4 Black Lakes Enlargement Project

The Black Lakes Enlargement Project was designed to provide additional drinking water for the Town of Vail. As part of the development of the project, some of the water was set aside to augment instream flows during low flow periods in the lower Gore Creek. As of 2010, 424 acre-feet of water from the Black Lakes is now available to augment winter low flows in Gore Creek.

4.1.5 Eagle River Watershed Plan

The Eagle River Watershed Plan Project was initiated by the Minturn Town Manager in 1994, through an application for National Park Service Trails and Corridors Grant assistance. Eagle County acted as the grant applicant. The effort has resulted in the Eagle River Watershed Plan(ERWP), which has been approved by several towns and the County in the Eagle River watershed. The Plan includes chapters on water quantity, water quality, wildlife, recreation, and land use. According to an Eagle County synopsis of goals and policies listed in the 1996 ERWP, over 40 of the 62 action items have been or are being implemented in the watershed.

In 2010, the Eagle River Watershed Council and Eagle County began an update process to the 1996 ERWP starting with the publication of a State of the Rivers Report as the first phase, a document intended to highlight current issues and opportunities in the basin before a formal Plan amendment process begins in late 2010 (the report is retrievable at: http://www.erwc.org/ProjectsPrograms/StateoftheRiver.aspx).

4.1.6 Gore Creek Partnership

A number of entities in the Gore Creek Watershed joined together in 1995 to develop a monitoring program, database, and a water quality management program. These entities include: the Town of Vail; Vail Associates; Eagle River Water and Sanitation District. The USGS has been contracted to develop a water quality database, design and implement a long-term water-quality and stream ecology monitoring program, and conduct a comprehensive retrospective analysis of the data. Since 1996, four interpretive reports describing water quantity, water quality, and stream ecology have been prepared by the USGS for the Gore Creek watershed, largely in cooperation with the Gore Creek Watershed partnership. These reports include: WRIR 99-4270, *Gore Creek Watershed, Colorado – Assessment of Historical and Current Water Quantity, Water Quality and Aquatic Ecology, 1968-98*; FS 186-99, *Fish community assessment in Gore Creek, Colorado, 1998*; FS 160-97, *Low-flow water quality characterization of the Gore Creek watershed, Upper Colorado River basin, Colorado, August 1996*.

In 1998, the Gore Creek Partnership evolved into the establishment of an Eagle

River watershed monitoring and assessment program whose partners currently include the Upper Eagle Regional Water Authority, Eagle River Water and Sanitation District, Eagle County, Town of Vail, Vail Resorts, Homestake Partners (Colorado Springs Utilities and Aurora Water), Colorado River Water Conservation District, Town of Gypsum, Town of Eagle and Denver Water. Beginning in 2001, monitoring and assessment database management efforts for the Gore Creek watershed have been combined with this larger monitoring effort for the Eagle River watershed that is described in Section 4.1.9, and has resulted in several water-resource assessment reports.

As a result, since 2001, USGS monitoring and assessment and database management efforts for the Gore Creek watershed have been combined with this larger monitoring effort for the Eagle River watershed described in section 4.1.9, which resulted in draft publication of the *USGS Assessment of Surface Water Quantity and Quality, Eagle River Watershed, 1947-2007* (Williams and others, 2010 in press). See section 4.1.10 for an update on the water quality monitoring partnership that the Gore Creek Partnership has since developed into.

4.1.7 Eagle River Watershed Council

By the mid 1990's there were a number of people working in separate local groups with overlapping participants. These groups included EREBA, the Black Gore Steering Committee, the Eagle River Clean Up, the Community Pride Clean Up (I-70 Clean Up), and individuals active on a citizen steering committee since the development of the Eagle River Watershed Plan. In 2000, the Eagle River Watershed Plan steering committee and Eagle County raised funds to hire a paid consultant. One year later, the mine cleanup remedy was declared complete- but the broad coalition of citizens, local conservation organizations, municipal and county government continued working to ensure the values of the entire watershed were protected and enhanced through a systematic approach to implementation of the 1996 Watershed Plan.

In July 2004, the Eagle River Watershed Council was officially incorporated as the Eagle River Watershed Council, Inc. ("ERWC") as a tax-exempt nonprofit corporation. While remedial work continues to this day to reduce and monitor the Eagle Mine Superfund site, the ERWC works to preserve and protect the Eagle and Colorado River watersheds through a variety of projects.

4.1.8 Black Gore Creek Steering Committee

The Black Gore Creek Steering Committee was established by Eagle County and Northwest Colorado Council of Government staff. The group membership includes: Eagle County, Forest Service, Colorado Department of Transportation, Division of Wildlife, Water Quality Control Division, USGS, Eagle River Water

and Sanitation District, the Town of Vail, the Eagle River Chapter of Trout Unlimited and the Eagle River Watershed Council. The group is attempting to reduce the impacts of sediment on Black Gore Creek. In September of 2002, the Steering Committee, lead by the Eagle River Watershed Council, was successful in getting Black Gore Creek listed on the State's 303(d) list of impaired waters and a final TMDL is pending approval from the State WQCC by early 2011.

4.1.9 Eagle River Inventory and Assessment (ERIA)

In 2005, the ERWC commissioned a science-based study of the Eagle River watershed from Colorado State University Engineering Research Center. The primary objectives of this study were to create an inclusive, baseline inventory and assessment of the 110 miles of the main stem and lower tributaries of the Eagle River, as well as develop a set of recommendations to efficiently guide future river conservation work. The report provides the community with a prioritized list of restoration and conservation projects, including brief descriptions and cost estimates. The report has become an essential tool for decision makers to ensure financial resources are spent in areas of noted ecological priority combined with strong community support.

4.1.10 USGS Retrospective Analysis and Water Quality Monitoring Partnership

The program was begun in 1998 and fully integrated the activities of the Gore Creek Partnership (described in Section 4.1.6) in 2001. The USGS was contracted to develop a water quality database, design and implement a long-term monitoring program, and conduct a comprehensive retrospective analysis of the data from many sources. The USGS has nearly completed the final study and is now focused solely on water quality trends data collection activity. USGS reports that were primarily funded through this partnership include:

Assessment of Surface-Water Quantity and Quality, Eagle River Watershed, 1947-2007 (Williams and others, 2010 in press); DS-502, *Macroinvertebrate and Algal Community Sample Collection Methods and Data Collected at Selected Sites in the Eagle River Watershed, Colorado, 2000–07*; SIR 2010-5148, *Macroinvertebrate-Based Assessment of Biological Condition at Selected Sites in the Eagle River Watershed, Colorado, 2000–07*; DS-458, *Boundary of the Eagle River Watershed Valley-Fill Aquifer, Eagle County, North-Central Colorado, 2006-2007*; SIR 2009-5082, *Groundwater Quality, Age, and Probability of Contamination, Eagle River Watershed Valley-Fill Aquifer, North-Central Colorado, 2006-2007*; DS-461, *Probability of Elevated Volatile Organic Compound (VOC) Concentrations in Groundwater in the Eagle River Watershed Valley-Fill Aquifer, Eagle County, North-Central Colorado, 2006-2007; DS-460*

Probability of Unmixed Young Groundwater (defined using chlorofluorocarbon-11 concentrations and tritium activities) in the Eagle River Watershed Valley-Fill Aquifer, Eagle County, North-Central Colorado, 2006-2007.

Beginning in 2010, the Eagle River Watershed Council manages the water quality partnership program on behalf of the partnership and provides for periodic assessment of the data to describe water-quality conditions in annual reports and through educational outreach to the community and elected boards and commissions to improve understanding and management of water quality. Detailed information about the program can be found at www.erwc.org. Current (2010) program partners include: Eagle County, Eagle River Water and Sanitation District, Upper Eagle Regional Water Authority, Vail Resorts, Town of Vail, Town of Gypsum, Town of Eagle, Aurora Water, Colorado Springs Utilities, Colorado River Water Conservation District and the Eagle River Watershed Council.

The monitoring and assessment program content has changed over the years and currently includes annual macroinvertebrate samples and bi-monthly water quality data collected at 10 sites along the Eagle River, Gore Creek and Brush Creek an beginning in 2010, an 'annual report card' on water quality conditions and periodic presentations and updates to stakeholders throughout the watershed. The database, including a map-based web interface (http://rmgsc.cr.usgs.gov/cwqdr/Eagle/index.shtml) has been established, and the data collection and analysis is currently on going (2010).

4.1.11 Basin of Last Resort and culvert replacement

CDOT had established a catch basin along the Black Gore between mile markers 183 and 182.5 in the 1970's to capture sediment released during the construction of I-70. However, little funding was available to maintain this basin, and by 2000, the pond was completely filled by sediment from traction sand.

Reconstruction of the basin in 2008 restored a last 'stop gap' measure to traction sand entering Gore Creek. The basin is expected to require regular maintenance every 3 to 5 years, and significant repairs in sediment control upstream of the basin are required in order to reduce total traction sand loading to Black Gore creek.

In 2010, CDOT maintenance of West Vail pass was shifted to the Region 3 office from Grand Junction. A renewed effort to clean out and replace non-functional culverts was initiated by the Region 3 office. In the 2010 winter season, for example, the CDOT crews utilized only 7,500 tons of traction sand and removed 19,520 tons of sand in the summer months. This included the clean out of roughly 85 culverts. In 2010, scoping and funding for the first phase of a comprehensive culvert replacement project was completed by CDOT. Culvert and drainage improvements are planned for 2011 and 2012 between mile markers 185 and 190.

4.1.12 Edwards Restoration Project

The Eagle River Watershed Council is restoring a 1.6 mile-long stretch of the Eagle River covering an area of 168 acres in the town of Edwards. The area is adjacent on the upstream end to the Eagle River Preserve – a conserved open space parcel - and on the downstream end by an unimproved public boat launch that sees high use during summer weekends. Impacts from agricultural practices, non-point source pollution and urban development have caused significant damage to this reach.

The project was identified by the 2005 CSU ERIA as a high priority segment of the river corridor with good water quality but with substantially degraded riparian habitat. The project location provides the best available opportunity in the watershed to reconnect existing high quality habitats and reestablish wetland and riparian functions on a disproportionately large scale.

Restoration, enhancement and protection have been accomplished through: stabilization of the north and south riverbanks; improved stream channel geometry and low-flow concentration to allow restoration of riffles and pools; and restoration of the riparian corridor with native species plantings on the river banks and within the floodplain. The project partners include many landowners in the reach, as well as the Eagle River Water and Sanitation District, CDOT, CWCB, Eagle County, Edwards Metropolitan District, Eagle Valley Trout Unlimited, CDPHE, and B&B Excavating.

4.1.13 Minturn Restoration Project

The Town of Minturn has improved approximately 1.6 miles of the Eagle River and the surrounding riparian corridor in an effort to mitigate some of the damages associated with past mining operations, as well as impacts from the railroad and town development in general. The project is located three miles downstream from the Eagle Mine and is adjacent to a 0.8 mile upstream reach previously restored by Minturn with Natural Resource Damage funding from Phase I.

The overall goal of this project was to return the stretch of river and surrounding lands to a naturally functioning ecosystem. The project included bank stabilization; in-channel re-grading to create a natural sequence of riffles and pools; and restoration of riparian terraces by planting native vegetation. Project partners include the United States Forest Service, Union Pacific Railroad, Trout Unlimited and the Northwest Colorado Council of Governments.

4.1.14 Brush Creek Restoration Project

A stream improvement project was initiated on 3.5 miles of stream to address eroded bank conditions and to improve trout habitat on the lower reach of Brush

Creek. The project work involved using mechanical equipment to construct gravel bars, pools, and riffles and stabilize eroding streambanks; and reconstruction of two irrigation water diversion head gates. Emphasis was on well-established practices that improve stream health and fish habitat for spawning, feeding, resting and wintering. The project included numerous plantings of small cottonwood trees, willows, and other shrub species. Disturbed sites were also replanted with a native grass/forb seed mix. The work was completed on portions of the stream on Town open space, as well as all the adjacent private properties along the 3.5-mile stretch. The project was completed in 2009, however a historic Spring flow in late 2010 will require restoration of several banks restored as part of the original project.

4.1.15 Gypsum State Wildlife Area

Colorado Mountain College and the Colorado Division of Wildlife have implemented portions of a restoration plan at the Gypsum Ponds State Wildlife Area - an area of reclaimed gravel pits composed primarily of ponds, wetlands and riparian habitats designed for recreational and educational purposes. Former gravel mining and recreational uses have resulted in extensive stream bank erosion, stressed riparian habitat, less than ideal stream channel morphology and the presence of noxious weeds.

Restoration efforts included establishment of wetland habitat in the upper Gypsum Ponds and noxious weed mitigation, including revegetation along trails to reduce erosion.

4.1.17 Stephens Park Restoration

After years of heavy use of the stream access provided by Stephens Park (located in West Vail), including its designation as an off-leash dog use area, the stream bank and riparian vegetation was trampled and the bank heavily eroded. A restoration project was completed in late 2010 and included bank restoration and armoring and vegetative improvements. The project also included instream boulder placement intended to improve water quality while continuing to provide recreational access to Gore Creek.

4.2 Future Project Needs

A recommended watershed project in the 2002 208 Plan was the establishment of a watershed water quality group, as discussed in the Eagle River Watershed Plan. Since that time, the Eagle River Watershed Council has been established as a local nonprofit whose mission includes water quality issues and in late 2010 the group hired on a water programs director to help manage the Eagle River

watershed monitoring and assessment program. Other potential projects identified at that time included further work on Milk and Alkali Creeks, and public education on nonpoint source water quality impacts and minimization practices.

In 2005, the Eagle River Watershed Council and Eagle County hired the Engineering Research Center of Colorado State University to research and prepare an Eagle River Inventory and Assessment (ERIA). The study can be viewed at: http://www.erwc.org/Resources/EagleRiverInventoryandAssessment. The primary objectives sought by the ERIA were to create an inclusive baseline inventory and assessment of the 110 miles of the main stem and lower tributaries of the Eagle River, as well as develop a set of recommendations to efficiently guide future river conservation work. The seven recommended elements of a restoration strategy for the watershed, as prioritized in the study, included:

- Define and manage for key ecological aspects of flow regime;
- Implement restoration projects that have the potential to provide synergistic benefits across relatively large segments of the system;
- Restoration of the Upper Eagle river through Camp Hale;
- Edwards reach (including the confluence of Lake Creek) restoration project;
- Restoration of the rive channel through Gypsum Wildlife Area;
- Reduction in metals loading from the Eagle Mine;
- Belden (Eagle Mine) cribbings stabilization;
- Develop and implement a watershed strategy for addressing nutrient enrichment of the watershed;
- Develop and implement an integrated strategy to manage stormwater and riparian corridors as growth occurs;
- Develop and implement a long-term access plan for low-impact recreation;
- Protect the headwaters, existing high quality habitats and native species.

A proposal for a second phase of the ERIA applicable to the Colorado River in Eagle County has been proposed by the Eagle River Watershed Council. Additional projects in order of priority are being explored for future funding opportunities. These include:

- Continuation of the USGS Retrospective Analysis
- Erosion and sediment control (both from construction sites and from I-70, specifically in the Black Gore Creek drainage)
- In-stream flow augmentation in the Eagle River;
- Ground water sensitivity mapping exercise to be used in determining potential for groundwater aquifer contamination;
- Riparian and in-stream habitat improvement in the Upper Eagle River watershed area;
- Further studies regarding nutrient enrichment of the mainstem of the Eagle River;
- Possible means to improve the dissolved oxygen/temperature issue in the Edwards to Gypsum area;

- A Geographical Information System project for determining priority ranking for clean-up of abandoned mine tailings and failing mine tailing cribbing.
- Minimum stream flow monitoring and active exercise of the CWCB instream flow rights.

Sources of funding include EPA 104(b)3, State 319, and Natural Resources Damages funds.

5.0 LAND USE REGULATIONS APPLICABLE TO WATER QUALITY PROTECTION AND IMPROVEMENT

This section is intended to summarize existing local land use regulations applicable to water quality protection and improvement.

As of January 2011, the streamside setbacks in place in Eagle County varied by locality. Eagle County requires a 75 foot setback, the Town of Eagle require a minimum 50 foot setback from the high water mark of any live stream (which generally refers to area creeks and the Eagle River). Vail requires a 50 foot setback from the centerline of the stream. Minturn, Red Cliff, and Avon require a 30 foot setback from the high water mark. Gypsum has 25-foot stream setback regulations in place.

The Town of Eagle in actual practice attempts to implement the Eagle River Watershed Plan, which recommends a 75 foot setback and/or protection of the riparian corridor, whichever is greater. Likewise, the major development of the Westin Riverfront Resort in Avon also implemented a 75 foot setback from the Eagle River.

Eagle County and Avon are the only jurisdictions that currently exercises state enabled "1041" powers. Under the County's 1041 authority, permits are required for extensions of water and sewage treatment systems and industrial and municipal water projects. Under Avon’s 1041 authority, permits are required for major extensions of water and sewage treatment systems and industrial and municipal water projects.

Stormwater and erosion control ordinances are in place in Eagle County (which relies primarily on state standards), Vail, and Avon.

Floodplain control ordinances are in place in Eagle County, Vail and Avon.

All jurisdictions rely on federal wetlands regulations for wetlands protection and none have additional, specific provisions related to wetlands in place currently.

6.0 WASTELOAD ALLOCATIONS

6.1 Ammonia Wasteload Allocations

Most streams in the watershed are classified to protect cold water aquatic life, thus they have stringent ammonia standards. The specific stream standard is based on a formula (found in Colorado's Basic Standards, 5CCR 1002-31) that considers ambient pH, temperature, species and life stages present. Streams in the watershed tend to have higher pH values, and this has resulted in wastewater facility requirements for advanced wastewater treatment to reduce ammonia concentrations. In the Eagle River watershed, the Vail, Avon, and Edwards wastewater treatment plants have installed advanced (tertiary) treatment to decrease ammonia concentrations.

Facility: Vail Wastewater Treatment Facility	Discharge to: Gore Creek
Wasteload allocation: 1.5 - 3.5 mg/L total ammonia	Period: monthly average
Facility: Avon Wastewater Treatment Facility	Discharge to: Eagle River
Wasteload allocation: 2.7 – 10 mg/L total ammonia	Period: monthly average
Facility: Edwards Wastewater Treatment Facility	Discharge to: Eagle River
Wasteload allocation: 4.5 - 32 mg/L total ammonia	Period: monthly average

7.0 WATER QUALITY MONITORING NEEDS

7.1 Existing Monitoring Efforts

Entities monitoring water quality in the Eagle River watershed include: CBS (formerly Viacom) (Eagle Mine); the Water Quality Control Division, the Division of Wildlife; Vail Associates; Eagle River Water and Sanitation District; the USGS; the Town of Vail; the cities of Aurora and Colorado Springs; the Colorado Division of Wildlife's River Watch Program; the US Forest Service and Bureau of Land Management; and public water providers.

Historically, individual agencies have tended to monitor water quality without regard to long term goals, coordination between agencies, and other monitoring efforts. In addition, an extremely valuable long term Water Quality Control Division data collection effort at nine stations in the Eagle River watershed was reduced to one station. The Gore Creek Partnership is addressing this issue in the Gore Valley, and this effort has been extended to include the entire Eagle River watershed. The Eagle River watershed monitoring and assessment program whose partners currently include the Upper Eagle Regional Water Authority, Eagle River Water and Sanitation District, Eagle County, Town of Vail, Vail Resorts, Homestake Partners (Colorado Springs Utilities and Aurora Water), Colorado River Water Conservation District, Town of Gypsum, Town of Eagle and Denver Water. The coalition of partners has continued to fund USGS

monitoring of water quality in the basin.

USGS has been contracted by a group of interested jurisdictions to develop a water quality database of existing information (see Chapter 4). The database has been created and is currently accessible on the Internet. Part of the contract is to provide a retrospective analysis of the existing data and provide input regarding additional data needs. The retrospective analysis is pending final publication in 2011.

7.2 Water Quality Monitoring Needs

The Eagle River Watershed Plan and this plan recommended in 2002 that a committee be established to examine existing monitoring programs, compile and analyze existing data, provide for monitoring program development and execution, and public information dissemination. The recommendation supported the establishment of an Eagle River watershed monitoring and assessment program whose partners currently include the Upper Eagle Regional Water Authority, Eagle River Water and Sanitation District, Eagle County, Town of Vail, Vail Resorts, Homestake Partners (Colorado Springs Utilities and Aurora Water), Colorado River Water Conservation District, Town of Gypsum, Town of Eagle and Denver Water. The coalition of partners has continued to fund USGS monitoring of water quality in the basin, and in 2010, hired a part time water quality program manager that is working with the partners through the Eagle River Watershed Council as a Water Program Director.

Specific areas of the Eagle River watershed that warrant continued monitoring include: Gore Creek, where entities in the drainage have expressed interest in establishing a database and acquiring additional information on the state of the creek; the lower Eagle River where fish kills have historically occurred; the Eagle Mine site; potential water quality changes due to increased density of homes on septic systems; stormwater impacts from urbanized areas, and the Milk, Alkali, and Ute Creeks for additional nonpoint source sediment control projects.

Black Gore Creek, expecting a final TMDL by early 2011, is on the State's monitoring and evaluation appendix list to the 1998 303(d) list. Once the TMDL is established, additional monitoring may be required to determine compliance with the standard.

NWCCOG recommends that Milk, Ute and Alkali Creeks (portions of Eagle River segments 10a and 11) be added to the State's Monitoring and Evaluation List for determination if these segments are impacting aquatic life as a result of sediment inputs. This segment is classified Aquatic Life coldwater class 2. This evaluation would be useful in determining if additional efforts are necessary to address the sedimentation issue in this segment. Additionally, there was an exceedance of chronic dissolved selenium standard on Eby Creek and it remains on the 2010 Monitoring and Evaluation List.

Additional information is needed regarding subsurface hydrology in the Eagle River watershed. Characterization of environmentally sensitive areas for additional management of septic systems and other potential sources of groundwater impacts would provide additional information for appropriate regulation of sources.

The loss of the Water Quality Control Division's long term monitoring stations in the Eagle River watershed will significantly impact the ability of planning and management agencies in assessing the watershed's existing water quality trends, and impacts as a result of watershed projects, planning, and management.

8.0 WATER QUALITY STANDARDS AND RECOMMENDATIONS

8.1 Existing Classifications and Standards

The current water quality classifications, designated uses, and standards for the various stream segments in the Eagle River watershed can be found at: http://www.cdphe.state.co.us/regulations/wqccregs/33_2012(01)tables.pdf. The Eagle River watershed had 19 segments identified by the Water Quality Control Commission. Two of the segments have been designated "Use Protected", while the remaining ten are reviewable under the State's antidegradation regulation. Most of the segments in the watershed are classified for these uses: Aquatic Life, Cold 1; Recreation E; Water Supply; and Agriculture.

One stream segment in the Eagle River watershed is designated Use Protected **(**Milk and Alkali Creeks from their source to the confluence with the Eagle River**)**. All other stream segments in the watershed are reviewable under the State's antidegradation regulation except for Segment 1, waters in the Gore/Eagles Nest, and Holy Cross Wilderness areas, which are designated “Outstanding Waters”. Three stream segments are under temporary modifications to the water quality standards. These segments are all under the influence of the Eagle Mine site.

8.1.1 Designated Use Impairment Segments

The 2010 “ "Status of Water Quality in Colorado " Report, or 305(b) Report, lists three Designated Use Impairment stream segments in the Eagle River watershed. The three stream segments are listed because of metal concentrations in vicinity of the Eagle Mine. This list indicates stream segments, which exceed or come close to exceeding water quality standards.

In “[t]he Status of Water Quality in Colorado 2008” prepared by the Water Quality

Control Division under Section 305(b) of the Clean Water Act, the Eagle River the Eagle River from the bridge at Belden to confluence of Gore Creek is not supporting uses as a result of zinc and copper. Cross Creek from the source to confluence with Eagle River is listed as not supporting uses due to zinc and copper. Black Gore Creek is listed as not supporting uses due to sediment from highway runoff.

8.1.2 303(d) List Segments

The Clean Water Act requires that the State compile a list of those waters for which the basic effluent limitations are not stringent enough to implement water quality standards, and thus require Total Maximum Daily Load (TMDL) allocations. Table E-3The Eagle River has seven segments listed on the 2012 303(d) list and additional seven segments on the Monitoring and Evaluation list (Table E-3

Table E-3. 303(d) Listed Segments in Eagle River watershed

Segment	Description	Colorado's Monitoring & Evaluation Parameter(s)	Impairment	Priority
COUCE A05c	Eagle River, Martin Creek to Gore Creek		Cd	H
COUCE A06	Tributaries to Eagle River, Belden to Lake Creek, except specific segments / Black Gore Creek adjacent to I-70 portion		Sediment	H
COUCE A06	Tributaries to Eagle River, Belden to Lake Creek, except specific segments / Mainstem of Lake Creek from below the confluence with East and West Lake Creek to the mouth		Aquatic Life (Provisional)	L
COUCE A06	Tributaries to Eagle River, Belden to Lake Creek, except specific segments / Beaver Creek from confluence with Wayne Creek to Mouth	Aquatic Life		
COUCE A06	Tributaries to Eagle River, Belden to Lake Creek, except specific segments /	Aquatic Life		

	Red Sandstone Creek from USFS Boundary to north side I-70 Frontage Road			
COUCE A06	Tributaries to Eagle River, Belden to Lake Creek, except specific segments / Red Sandstone Creek from north side I-70 Frontage Road to confluence with Gore Creek		Aquatic Life (Provisional)	L
COUCE A08	Mainstem of Gore Creek from the confluence with Black Gore Creek to the confluence with the Eagle River.		Aquatic Life (provisional)	L
COUCE A09a	Mainstem of the Eagle River from Gore Creek to a point immediately below the confluence with Rube Creek. / From Berry Creek to confluence with Ute Creek	Temperature		
COUCE A09a	Mainstem of the Eagle River from Gore Creek to a point immediately below the confluence with Rube Creek / From Ute Creek to confluence with Rube Creek		Temperature	L
COUCE A09a	Mainstem of the Eagle River from Gore Creek to a point immediately below the confluence with Rube Creek./ Eagle River from confluence with Berry Creek to confluence with Squaw Creek	Aquatic Life	Sediment	H
COUCE A09a	Mainstem of the Eagle River from Gore Creek to a point immediately below the confluence with Rube Creek / Eagle River from Gore Creek to confluence with Berry Creek and from Squaw Creek to confluence with Rube	Sediment		

	Creek			
COUCEA10a	All tributaries to the Eagle River from Lake Creek to the Colorado River / Eby Creek Portion	Se		

Monitoring and Evaluation Recommendation for 2002 303(d) List

The Northwest Colorado Council of Governments recommends that Milk, Ute and Alkali Creeks (portions of Eagle River segments 10a and 11) be added to the State's Monitoring and Evaluation List for determination if these segments are impacting aquatic life as a result of sediment inputs. This segment is classified Aquatic Life coldwater class 2. This evaluation would be useful in determining if additional efforts are necessary to address the sedimentation issue in this segment.

8.2 Water Quality Standards Recommendations

Water quality standards (including use designations and criteria) for the Eagle River watershed are generally adequate to protect the existing uses under current conditions.

NWCCOG is supportive of the State's antidegradation provision and protection of high quality waters.

8.2.2 Outstanding Waters Designation

The Northwest Colorado Council of Governments does not currently recommend any additional waterbodies to the list of "Outstanding Waters" designation.