2002 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 7.

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 stream flow for the Eagle River is estimated to be 415,000 acre feet below Gypsum Creek (Eagle River Assembly, Phase I Report, September 1994).

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 300 acres. This reservoir is used exclusively for eastern slope diversion except for in-basin releases of 500 acre-feet per year beginning in 1998. 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 marketed some of their water rights that are currently not being used. The Black Lake Reservoirs are located at the headwaters of Gore Creek. These two reservoirs have a combined capacity of 300 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.

Figure 6. 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. 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 1999 July census for Eagle County was approximately 34,950 people. The average annual growth rate of the county from 1990 through 1999 has been 5.4% (Department of Local Affairs). The 2000 US Census population estimate was 41,659, and there were an additional 9,813 part-time residents. The combined hotel and condominium bed base for 2001 was estimated to be 16,990 [Vail Valley Tourism and Commerce Board, 2001].

Economic and land use activities in Eagle River watershed include: 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 construction of condominiums and homes along Gore Creek and the Eagle River.

In the Eagle River watershed there are 27 community, transient non-community, and private drinking water systems, serving a combined total population of 42,523 persons [Colorado Department of Public Health and Environment, Water Quality Control Division Colorado Open Records Act request, NWCCOG December 10, 2001]. Twenty-one of the systems are reliant upon ground water and six systems are reliant upon surface water. This information does not include individual systems serving less than 25 people.

1.3 Watershed Water Quality Management

An effort called the Eagle River Watershed Council, composed of local, state, and federal agencies, as well as ranchers, environmentalists, and recreational interests undertook a number of projects (mainly nonpoint source projects in the Milk and Alkali Creek areas) in the mid to late 1980s. This group is no longer active. Another group, the Eagle River Environmental and Business Alliance (EREBA), was awarded a Technical Assistance Grant to communicate clean up activities to the community and to represent the community in reviews of documents and activities associated with the Eagle Mine.

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. The Plan, supported by the towns, the County, state and federal agencies, and local interested citizens, is attempting to address: water quantity; water

quality; recreation; wildlife; and land use issues in an integrated manner. The Plan was completed in 1996. The Plan was adopted by most of the Towns in the Eagle Valley and Eagle County.

The 1996 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.

A group called the Eagle River Watershed Council, has formed which has consolidated the efforts of the EREBA and the Eagle River Watershed Plan Implementation Committee. NWCCOG is working with the Council to establish a local long-term water quality and quantity forum. The development of this 2001 revision was accomplished with input from the Council's Technical Committee.

2.0 WATERSHED WATER QUALITY ASSESSMENT

Streams in the Eagle River watershed are classified for protection of cold water aquatic life (trout), secondary contact recreation (incidental contact); water supply and agricultural uses. Generally speaking, water quality of the Eagle River is very good.

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 Eagle River from Gilman to its confluence with Gore Creek and from Gore Creek to the confluence with the Colorado River have received seasonal temporary modifications for manganese, under the water quality standards due to acid mine drainage. 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.

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. The Eagle River from Gore Creek to the Colorado River is classified as not supporting designated uses due to manganese contamination. Black Gore Creek is not supporting designated uses due to sediment loading from winter sanding operations on I-70.

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.

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

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.

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 an 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.

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.

The wastewater flow into the municipal wastewater treatment plant at Red Cliff significantly exceed 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 is due to severe infiltration/inflow (I/I) problems. The town is continuing to study the problem and has been working with the Department of Local Affairs and the Water Quality Control Division to find a viable solution. The Department of Local Affairs Energy Impact Assistance Grant advisory committee recommended partial funding to address collection system improvements in 1996. A renewal discharge permit was issued in 2001 with a design capacity of 70,000 gallons per day as a 30 day average, and 119 pounds of BOD per day. A compliance schedule has been set for a report on the sewer line project and an evaluation of influent flows and hydraulic capacity of the facility.

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. Number 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 a 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 5)

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 Paramount, 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 continues to exceed the temporary modification to the water quality stream standards (the temporary stream standard is 850 ug/l December- April and 355 ug/L May–November). Zinc also continues to exceed 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. (Paramount), 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.

Viacom's 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 show 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 supports the development of site-specific standards for this Superfund Site using the three biological metrics proposed, and has provided comments on the draft document.

2.2 Gore Creek (Eagle River Segments 1, 6 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 has been formed to assist in the addressing the sediment impacts

from I-70. The Northwest Colorado Council of Governments has voluntarily provided meeting facilitation and support for the group and the Technical Subcommittee.

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.

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.

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.

2.3 Lower Eagle River Watershed (Eagle River Segments 9, 10, 11, and 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 9)

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 an 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"]

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].

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. 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 Council obtained a 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.

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.

2.3.5 Gypsum Creek (portion of Eagle River Segment 10)

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.

2.4 Colorado Water Conservation Board Watershed Instream Flows

Appendix 14 lists the Colorado Water Conservation Board's (CWCB) instream flow filings in the Eagle River watershed. 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.

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 11, along with their Colorado Discharge Permit System number and their hydraulic capacity.

Table 11. Eagle River Municipal Wastewater Treatment Facilities

CDPS Permit #	Facility Name	Responsible party	Hydraulic capacity, MDG
CO-0021385	Red Cliff	Town of Red Cliff	0.070
CO-0021369	ERW&SD Vail	ERW&SD	2.700
CO-0024431	ERW&SD Avon	ERW&SD	4.300
CO-0037311	ERW&SD Edwards	ERW&SD	1.920
	Red Sky Ranch	Holland Creek Metro District	0.027 (peak)
CO-0021059	Eagle	Town of Eagle	0.546
COG-584001	Gypsum	Town of Gypsum	0.960
	Dotsero Mobile Home Park	Dotsero MHP	0.002
	Two Rivers Village	Two Rivers Village District	0.150

Red Cliff Wastewater Treatment Plant

The Red Cliff wastewater treatment facility is a 70,000 gallon per day maximum hydraulic capacity activated sludge plant providing secondary treatment, constructed in 1972. It has average flows of 225,000 gallons per day and peak flows frequently exceed 500,000 gallons per day. It is well over its capacity 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. The 1994 draft 201 plan estimated the cost of upgrading wastewater facilities for Red Cliff to be 3.9 million dollars. The July 1993 population estimate of Red Cliff was 302. According to a May 1994 draft 201 plan for the plant, the population is 440. Additional work is being done by the town to examine alternatives and decrease costs for providing wastewater treatment to the community. A new 201 Plan was released in May of 1995. The recommended alternatives in this 201 Plan included: repair collection system and treat flows using Upper Eagle Valley Consolidated Sanitation District facilities ($6,400,000); repair collection system and treat

flows using a submerged rotating biological contractor ($4,530,000); and no improvements to the collection system and treat flows of 100,000 to 900,000 gpd using a dual system of screening, filtration, and disinfection for high flows and a physical/chemical treatment process for low flows ($2,080,000). The Department of Local Affairs Energy Impact Assistance Grant advisory committee recommended partial funding to address collection system improvements in 1996.

A renewal discharge permit was issued June 29, 2001 with a design capacity of 70,000 gallons per day as a 30 day average, and 119 pounds of BOD per day. A compliance schedule has been set for a report on the sewer line project and an evaluation of influent flows and hydraulic capacity of the facility. Ammonia removal is not required due to the size of the facility and flows in the Eagle River. The discharge permit expires July 31, 2006.

Vail Wastewater Treatment Facility

The Vail wastewater treatment facility is a 2.7 million gallon per day (MGD) tertiary treatment facility which treated an average flow of 1.88 MGD in 2000. The peak weekly flow was 2.77 MGD. The aeration capacity of the plant was upgraded in 2000 to serve 7,500 SFEs (single family equivalents). The design capacity of the plant is now 7,450 pounds of BOD per day based on a 30 day average. The plant treats for ammonia removal and has ammonia concentration discharge limits.

There is a system interconnect with the Avon plant which will allow peak flows in excess of the plant's capacity to be treated down valley. Biosolids are moved to the Avon Wastewater Treatment facility via gravity flow through a trunk line. The Vail facility discharge permit expires in 2006.

Avon Wastewater Treatment Plant

The Avon Wastewater Treatment Plant is a tertiary treatment facility. It underwent an expansion that was completed in December of 1996 increasing its capacity to 4.3 MGD. Included in the expansion was a new headworks process, primary sedimentation tanks, and ATAD digesters with the ability to pre-thicken waste sludge. De-watering the sludge is made possible with centrifuges. A state to the art odor control process was also installed to treat any fugitive odors. Flow and loading to the plant vary throughout the year. An average flow is approximately 2.1 MGD and peak flows are 3.5 MGD. The solids handling process treats the sludge to a Class A biosolids product. Effluent monitoring standards include pH, BOD, total suspended solids, fecal coliform, and ammonia. BOD and total suspended solids must also meet an 85% reduction rate. The plant serves an estimated population in excess of 15,000 people and also processes the waste solids from Vail Wastewater Treatment Plant. The expansion is expected to meet the needs of the Avon, Minturn, and West Vail area through the year 2015. The Avon WWTP discharge permit expires December 31, 2003.

Edwards Wastewater Treatment Plant

The Edwards Facility is a 1.92 MDG secondary treatment plant which currently receives

average daily flows of 1 MGD and peak daily flows 1.5 MGD. The plant can serve an estimated population of 24,500 at 0.17 pounds of BOD per person per day, or a total of 4,165 pounds of BOD per day. 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. Chronic ammonia discharge limits vary by month from 3.1 to 18 mg/l total ammonia.

In order to produce high quality biosolids, new waste sludge processing facilities were added into this recent facility upgrade. The ATAD system will meet the Federal 503 Class A requirements. All Class A biosolids are sold for soil enhancement around the community. The Edwards discharge permit expires July 30, 2005.

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 that 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.

Eagle Wastewater Treatment Plant

The Town of Eagle operates a wastewater treatment facility (extended aeration, activated sludge plant) with a rated capacity of 0.546 MGD. The Town completed the project and began operations on December 1, 1997. Flow rates as of February 1998 are 0.292 MGD. The Plant is not required to meet ammonia effluent limits, but the plant is required to monitor ammonia discharge concentrations. Sludge disposal is currently accomplished through contracted mobile de-watering and thereafter hauled. In 2000 the highest daily flow was 439,000 gallons (in September), and the median daily flow was approximately 345,000 gallons per day. The Town will be studying sludge disposal alternatives because of the phase out of the Eagle River Water and Sanitation District's composting program. Discharge is to the Eagle River downstream of Brush Creek (segment 9 of the Eagle River). The discharge permit for this facility expires December 31, 2003.

Gypsum Wastewater Treatment Plant

The Gypsum wastewater treatment plant is a secondary treatment 0.35 MGD aerated lagoon system with chlorination and dechlorination of effluent which discharges to the Eagle River in Gypsum. It receives average flows of 0.177 MGD and peak flows of 0.286 MGD. The plant does not have ammonia discharge limits, but is required to monitor ammonia discharge concentrations. Sludge disposal occurs on a five to ten

year basis due to the lagoon treatment. The plant serves the Town of Gypsum and the Eagle County Airport. A renewal permit for the existing facility was issued December 1999, with an expiration date to December 31, 2004.

An extended aeration mechanical plant with secondary clarification and nitrification/de-nitrification ("Aeromod" system) is currently under construction and should be operational 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. No ammonia removal is required, however there is a requirement for monitoring ammonia effluent concentrations. The Town will be composting biosolids to Class A standards on the site with a facility designed by Engineered Compost Systems. The permit for this facility was issued January 1, 2001 and expires December 31, 2004.

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 proposed planned unit development housing project 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 has extended the Site application permit for this facility to October 9, 2002. The proposed facility includes two lift stations, and an extended aeration activated sludge process ("Aeromod" System) followed by sand filtration and ultraviolet disinfection. [This facility is also mentioned in the Upper Colorado River Water Quality Management Plan]

3.1.2 Population Projections

Population projections for the county and the municipalities in the Eagle River watershed are listed in Table 12. The percentage permanent population increase from 1980 to 1990 was 64.6%, and from 1990 to 2000 was 90.0%.

Table 12. Eagle County Population Estimates and Projections - Permanent Population[1]

Entity	1980	1990	2000	2000 projected[2]	2010	2020
Eagle County (excluding Basalt)	12,791	20,932	38,978	29,091	49,835[3]	63,507[3]
Avon	640	1,798	5,561	2,893		
Eagle	950	1,580	3,032	2,014		
Gypsum	743	1,750	3,654	2,379		
Minturn	1,060	1,066	1,068	1,387		

Red Cliff	409	297	289	356		
Vail	2,261	3,659	4,531	4,731		

[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 Demographer's Office
[3]: Population projection, State Department of Local Affairs, State Demographer's Office, October 2000 projection
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]. Peak Skier numbers at Vail are estimated to be 16,000 per day and at Beaver Creek 6,500 skiers per day [John Garth, Vail Valley Tourism and Convention Bureau, personal communication, December 10, 2001]

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 wastewater treatment system at Red Cliff needs to be improved. The 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.

Red Cliff wastewater treatment facilities must be improved to meet wastewater treatment standards.

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 is currently being explored by the Eagle River Water and Sanitation District.

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.

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.

The potential exists for future mining in the Eagle River watershed. If the activity is not strictly regulated, water quality could be negatively affected.

3.3.3 Hydrologic Modifications

3.3.3.1 Trans-basin Diversions.

Current trans-basin diversions account for approximately 6% of the total stream flow in the watershed (Eagle River Assembly, Phase I Report, 1994). In 2000 29,506 acre-feet of water in the Eagle River watershed were diverted out of the basin (2000 Annual Report ,State Engineer's Office, Division V Water Resources diversion records). Out of basin diversions are 100% consumptive, i.e. none of that water is returned to replenish the stream. These diversions include: the Homestead Tunnel (27,333 acre-feet per year, 2000 ten year diversion average); the Wurtz Ditch (2,854acre-feet per year, ten year diversion average); Columbine Ditch (1812 acre-feet per year, ten year diversion average); and Ewing Ditch (1,083 acre-feet per year, ten year diversion average). 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-Piney and 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 300 acre-feet of Homestake Reservoir project water to the Eagle River upon request by in-basin interests during low flow periods.

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 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 and Alkali 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 and Alkali Creeks, and how much these sources of sediment actually impact aquatic resources in the Eagle River. Additional information on these topics would be useful in determining appropriate next steps.

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. For more information on the Eagle Mine clean up, contact the Viacom Project Manager at Eagle Engineering Services, the Colorado Department of Public Health and Environment's Hazardous Materials Division Project Manager, or the EPA Project Manager.

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.

For more information contact the Town of Vail Community Development Department Senior Environmental Planner or the Northwest Colorado Council of Governments' Water Quality Program.

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.

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. 300 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, which has been approved by the town and the County in the Eagle River watershed. The Plan includes chapters on water quantity, water quality, wildlife, recreation, and land use, as well as implementation recommendations.

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. Since 2001, USGS monitoring and assessment and database management efforts for the Gore Creek watershed have been combined with similar efforts for the Eagle River watershed, described in section 4.1.9.
They combined funding efforts to establish a USGS National Water Quality Assessment Program site at the mouth of Gore Creek and have applied for Great Outdoors Colorado funding to assist in the creation of the database and management program.

4.1.7 Eagle River Watershed Council

In 2000 the Eagle River Watershed Council was officially formed with a Board of Directors, bylaws, and 501(c)(3) non-profit status. The Council has been very involved in the Eagle Mine Clean-up and the Black Gore Creek Steering Committee.

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. The Committee hopes this will help them obtain federal funding to address the sediment impacts caused by the I-70.

4.1.9 USGS Retrospective Analysis

The USGS has been contracted to develop a water quality database, design and implement a long-term monitoring program, and conduct a comprehensive retrospective analysis of the data. Detailed information about the project can be found at http://co.water.usgs.gov/projects/CO326e/CO326e.html. Cooperators in the study include: Eagle County, Eagle River Water and Sanitation District, Upper Eagle Regional Water Authority, Vail Associates, Town of Vail, Red Cliff, CDOT, Town of Eagle, City of Aurora, Colorado Springs, Colorado River Water Conservation District, Eagle River Watershed Council, Town of Gypsum, and the Town of Eagle. The USGS has conducted synoptic water-quality, stream habitat, macroinvertebrate, and algal community samplings in August 2000 and August 2001 in order to establish current low-flow baseline conditions. Quarterly to monthly water quality data are collected at 6 sites along the Eagle River and at the mouth of Gore Creek. The database, including a map-based web interface has been established, and the data collection and analysis is on going though 2004. In addition to availability via the Internet, data are also published in Volume 2 of the annual USGS data report for Colorado.

4.2 Future Project Needs

A recommended watershed project is the establishment of a watershed water quality group, as discussed in the Eagle River Watershed Plan. Other potential projects include further work on Milk and Alkali Creeks, and public education on nonpoint source water quality impacts and minimization practices.

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 (using Natural Resource Damages monies);
- 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;
- and 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 1996, the streamside setbacks in place in Eagle County vary by locality. Eagle County and 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.

Eagle County is the only jurisdiction 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.

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 unionized ammonia standards (0.02 mg/L). The unionized fraction of ammonia in the water depends on stream pH and temperature. 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

Facility: Avon Wastewater Treatment Facility Discharge to: Eagle River
Wasteload allocation: 3.1 – 10 mg/L total ammonia Period: monthly

Facility: Edwards Wastewater Treatment Facility Discharge to: Eagle River
Wasteload allocation: 3.1 – 18 mg/L total ammonia Period: monthly

7.0 WATER QUALITY MONITORING NEEDS

7.1 Existing Monitoring Efforts

Entities monitoring water quality in the Eagle River watershed include: 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. Additional information on specific monitoring efforts can be found in Appendix 5 (Select Water quality Data From Region XII, with References For Expanded Water Quality Data).

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 is being reduced to one station. The Gore Creek Partnership is addressing this issue in the Gore Valley, and this effort could be extended to include the entire Eagle River watershed.

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.

7.2 Water Quality Monitoring Needs

Accordingly, the Eagle River Watershed Plan, and this plan are recommending 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.

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.

Additional physical and biological data is needed to determine the status of Black Gore Creek as to whether it meets the State's guidance as a stream impacted by sediment. This is indicated by the segment being on the State's monitoring and evaluation appendix list to the 1998 303(d) list. The Black Gore Creek Steering Committee's Technical Committee has initiated sampling on Black Gore Creek to assist the State in its determination.

NWCCOG recommends that Milk, Ute and Alkali Creeks (Eagle River segment 10) 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 and designated "use-protected". This evaluation would be useful in determining if additional efforts are necessary to address the sedimentation issue in this segment.

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 are listed in Table 16. The Eagle River watershed had 12 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 1; 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 2000 "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 2002" prepared by the Water Quality Control Division under Section 305(b) of the Clean Water Act, the Eagle River segment 9 (Eagle River from Gore Creek to the Colorado River) is listed as impaired as a result of manganese. As stated in section 2.3.1, due to changes in the Basic Standards in 1999, this segment is now in attainment of standards, which is defined as existing in-stream manganese concentrations as of January 1, 2000.

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. The State's 1998 303(d) list for the Eagle River watershed lists three segments (Table 13).

Table 13. 303(d) Listed Segments

Segment	Description	Status	Impairment	Priority
COUCEA05	Eagle River, Belden to Gore Creek	Partially supporting	Cd, Zn,	Low
COUCEA07	Cross Creek, lower portion near mouth	Not supporting	Cd, Zn,	Low

All three segments are listed due to metals concentrations. Three of the segments are in the upper reaches of the Eagle River (and include Cross Creek), and are listed as a low priority.-

NWCCOG recommends segment 9 be removed from the State's 303(d) list as a result of the Basic Standards changes in 1999 which allows existing quality as of January 1, 2000, for concentrations of iron, manganese, and sulfate.

One stream segment is listed for monitoring and evaluation for potential impairment as a result of sediment impacts from I-70 (Black Gore Creek portion of Eagle River segment 6).

Monitoring and Evaluation Recommendation for 2002 303(d) List

The Northwest Colorado Council of Governments recommends that Milk, Ute and Alkali Creeks (Eagle River segment 10) 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 and designated "use-protected". 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

The recommendations for water quality standards and regulations in the Eagle River watershed follow.

8.2.1 Support of Existing Standards and Temporary Modifications

It is recommended that the existing standards and temporary modifications in the Eagle River watershed be continued.

Work to improve water quality in all three stream segments with temporary modifications is continuing. A 1993 Record of Decision for the Eagle Mine site will ensure that continued progress will be made in improvements to Eagle River water quality. The Water Quality Control Division, the Environmental Protection Agency, and Viacom, Inc. have agreed to examine the development of aquatic biological goals for the site and the impacted aquatic environment.

NWCCOG is supportive of the State's antidegradation provision and protection of high quality waters. NWCCOG is concerned, however that currently classified Recreation Class 2 waters will be reclassified as Recreation Class 1a unless a Use Attainability Analysis (UAA) is completed. It is likely that Recreation Class 2 is the appropriate classification for some of these segments. It is also unlikely that UAAs will be completed for all the segments in Region XII, due to financial and time constraints. In the Eagle River watershed these waters are:

Segment 11 – Alkali Creek

There are no current municipal discharges to this segment.

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. If new wilderness areas within the watershed are approved by Congress, NWCCOG recommends investigations of waterbodies within those areas for appropriate ness of "outstanding waters" designation.