

# 2012 NWCCOG REGIONAL WATER QUALITY MANAGEMENT PLAN

## VOLUME II - WATER QUALITY PROGRAM DEVELOPMENT

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## 2012 NWCCOG REGIONAL WATER QUALITY MANAGEMENT PLAN

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## EXECUTIVE SUMMARY

The Guidelines for Water Quality Planning in Colorado require annual updates of the Areawide Water Quality Management Plans under Section 208 of the Clean Water Act. The Purpose of the Northwest Colorado Council of Governments (NWCCOG) 2011 Regional Water Quality Management Plan is to satisfy the requirement for an update of the Plan to reflect the progress in plan implementation. A second purpose of the Plan is to address the current focus on water quality planning from a watershed perspective.

The NWCCOG Regional Water Quality Management Plan (208 Plan) 2011 revision is intended to provide an update of the technical aspects 2002Pplan and provide an opportunity for the NWCCOG Board to re-evaluate the 208 Plan policies. The Plan is structured to satisfy the requirements established under the applicable State Guidelines and to satisfy local planning requirements, which dictate a flexible and innovative approach to water quality planning to avoid future water quality problems.

The 2011 208 Plan is composition remains unchanged with two volumes and a set of technical appendices. Volume I is presented in a policy plan format and describes the program recommendations to protect and enhance the level of water quality consistent with the requirements of the Federal Clean Water Act. Volume I is intended to provide the direction for water quality decisions resulting from activities which have the potential to generate both point and nonpoint sources of water quality degradation in the Region. Volume I of the plan is organized around six policies which will lead to maintaining and improving water quality in the region. Under each policy, Implementation Recommendations are presented for use by agencies who have and will continue to implement the plan. These management agencies are identified in Policy 6 of Volume I, and the rationale for their selection is discussed in Chapter 5 of Volume II - Management Systems.

Volume II describes the water quality program development in a format similar to the specific items contained in Colorado's planning guidelines. Volume II draws on material contained in previous 208 Plan submittals and from technical appendix information.

Volume II provides supporting information for the development and adoption of water quality management policies currently in practice in Region XII. The appendices provide supporting technical information regarding specific water quality issues addressed in the plan.

Table VII-1 provides a summary of the requirements for water quality planning established under the State Guidelines compared to the elements contained in the 2011 NWCCOG 208 Plan. While it is clear from this table that the Policy Plan (Volume I) together with the technical appendices contain all of the State required elements, a two-volume format was chosen to increase the utility of the 208 Plan.

Table VII-1 Water Quality Planning Elements

208 Plan Element	Plan Policy (Vol. I)						Vol · II	Appendices							
	1	2	3	4	5	6		1	2	3	4	5	6	7	8
	Facility location							X	x			X	X		
Facility needs							x			X					
Facility capacity							x			X	X				
Facility timing							x			X					
Population projections							x		X						
Service area										X					
Treatment level				X			x			X					
Permit conditions							x			X					
Wasteload allocations				X			x			X					
NPS information							x						x	x	
Management agencies						X	x					x			
WQ standards recommend	X						X								
Hydrologic modifications		X					x								x
Stream setbacks			X				x						x	X	
Silviculture activity			X				x								X
Construction activity			X				x						x	X	
Urban runoff	X		X				X						x	X	
Onsite wastewater systems				X		X	x								X
Chemical management					X		x						x	X	
WQ assessment	X						x								
BMP recommendations		x	X	x	x	X	x						x	X	
Water efficiency		X	X				x						x		
Model ordinances			x		X		x						x	X	
Mine drainage management	X						x						x		
Agricultural management		x	X	x			x							x	

## 1.0 INTRODUCTION

In 1972 the US Congress overrode a presidential veto to pass the Federal Water Pollution Control Act Amendments of 1972 (PL92-500), also known as the Clean Water Act. This Act has been further amended with significant changes in 1977 (PL95-217) and 1987 (PL100-4). The Clean Water Act states that the ultimate objective of the Act is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters".

In beginning the process of water quality improvements, the Clean Water Act identified a number of planning programs to be initiated at various levels of government.

In Colorado, the Colorado Water Quality Control Commission (WQCC) is responsible for regulating water quality through the establishment of water quality classifications, designations, standards, and control regulations to protect the beneficial uses of the streams and lakes in the state.

To maximize efficient use of resources, Section 208 of the Act established an areawide approach to planning for the abatement of pollution. Section 208 provided criteria to design local plans, based on an integrated and comprehensive planning process. The state of Colorado has continued to use regional planning agencies as defined in the Act.

The Northwest Colorado Council of Governments (NWCCOG) was designated the areawide waste treatment management planning authority, under Section 208, in February 1976 by the governor of Colorado. NWCCOG develops and maintains the Areawide Water Quality Management Plan (208 Plan) as a means of preserving and enhancing state water quality standards and classifications for both surface and groundwater.

The Northwest Colorado Council of Governments' planning region includes Eagle, Grand, Jackson, Pitkin and Summit Counties. These counties include portions of two river basins: the Colorado River Basin and the North Platte River Basin.

The state is divided into seven geographic divisions for the administration and distribution of water in Colorado, under the Office of the State Engineer and the Division of Water Resources. These divisions do not neatly correspond to the planning regions with respect to the Water Quality Management Plans. The following information comes, in part, from "Colorado Water" produced by the League of Women Voters, 1992, and the USGS publication entitled "Hydrology of Area 58, Northern Great Plains and Rocky Mountain Coal Provinces, Colorado and Utah", (1987).

## 1.1 The Colorado River Basin

The Colorado River basin extends from Loveland and Berthoud Passes on the east to the state line on the west, an east-west length of approximately 200 miles. The north-south boundaries are generally between 50 to 100 miles wide. The major tributaries include the Fraser, the Williams Fork, the Blue, the Eagle, and the Roaring Fork rivers. The basin, including the Gunnison basin, which is not part of this plan, encompasses 13,132 square miles (8,404,480 acres).

Agriculture is still the dominant water user, with diversions of 1,719,801 acre-feet in 2011 for the irrigation of approximately 238,000 acres (SWSI, 2004). Industrial diversions total approximately 3,773 acre-feet in 2011.

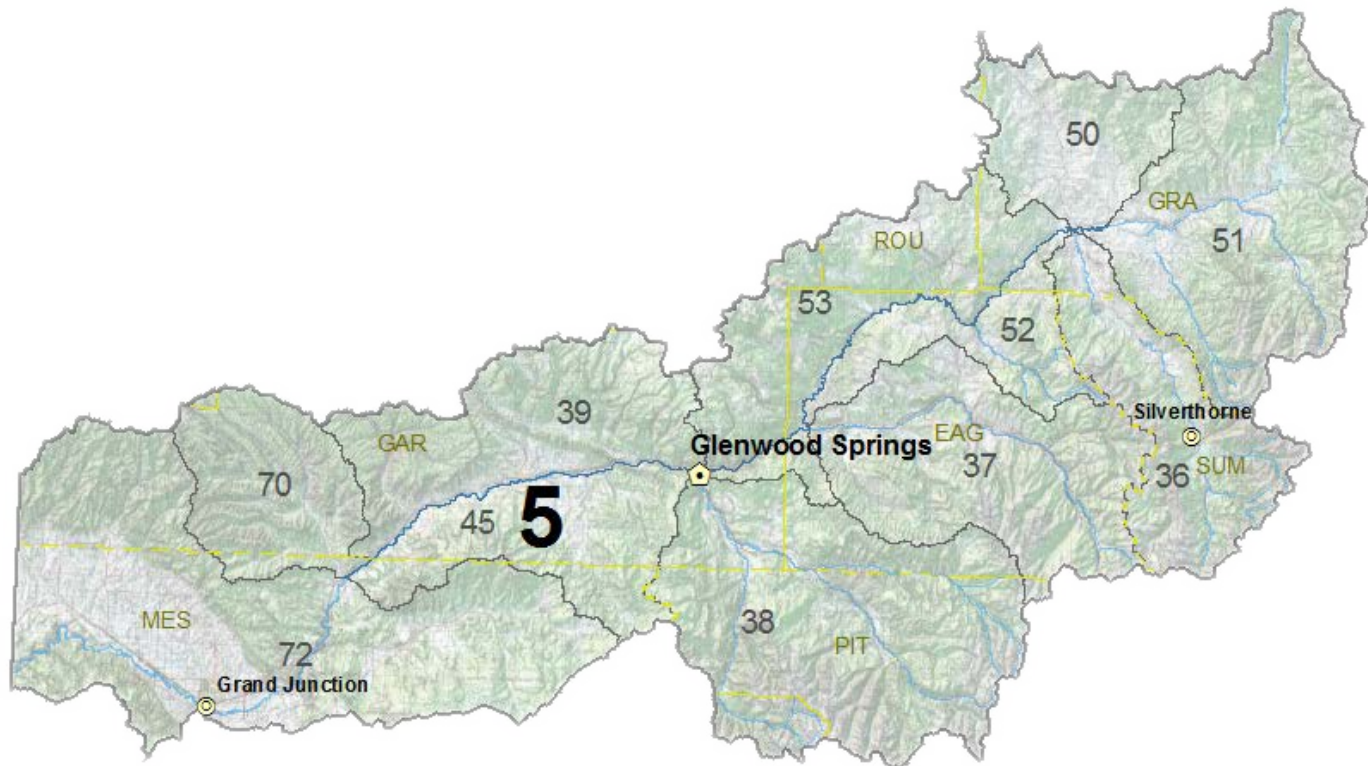
The 1981-2010 average of trans-basin water diversions total 506,980 acre-feet per year from the Colorado River basin to Front Range cities and agriculture (see Appendix 8). The Colorado-Big Thompson and the Windy Gap projects supply approximately 200,000 to 250,000 acre-feet of water for agriculture and municipalities on the Front Range. The Roberts and Moffat tunnels supply approximately 90,000 to 150,000 acre-feet of water per year to the Denver metropolitan area (the 2010 thirty-year average is 116,540 af). The Boustead, Twin Lakes, Busk-Ivanhoe and Homestake tunnels and diversions supply approximately 127,500 acre-feet of western slope water to Colorado Springs, Aurora, and agriculture in the Arkansas River basin. Other Continental Divide diversion such as the Columbine, Ewing and Wurtz ditches increase the diversion of water to the Arkansas River to an average of over 130,000 acre-feet.

Most of the annual stream flow in the perennial streams results from snowmelt during the months of May, June and July, when the high elevation deep snow pack melts. Stream flow characteristics have changed significantly from natural conditions due to reservoir storage. Stream flow is highly variable, both within any given year and between individual years. Low flows on perennial streams are sustained by flows from groundwater, gradual melting of perpetual snow fields and reservoir releases.

Surface water storage (including the Gunnison basin) exceeds 2.3 million acre-feet, with most of this storage in a few large reservoirs. This storage capacity is approximately 60 percent of the average annual stream flow in the basin. The storage capacity in Colorado basin portion of NWCCOG's region is 1,208,080 acre-feet.

The Northwest Colorado Council of Governments is responsible for producing the Water Quality Management Plan for the upper portion of the Colorado River basin. Essentially, the planning area includes all the major tributaries previously mentioned, but excludes the area downstream of Eagle County (this includes the confluence of the Roaring Fork and Colorado River at Glenwood Springs). The drainage area for this basin, the Upper Colorado River basin, is approximately 6,010 square miles (3,846,400 acres). Figure VII-1 illustrates the Colorado River Basin, the Upper Colorado portion is typically described as that portion upstream from Glenwood Springs..

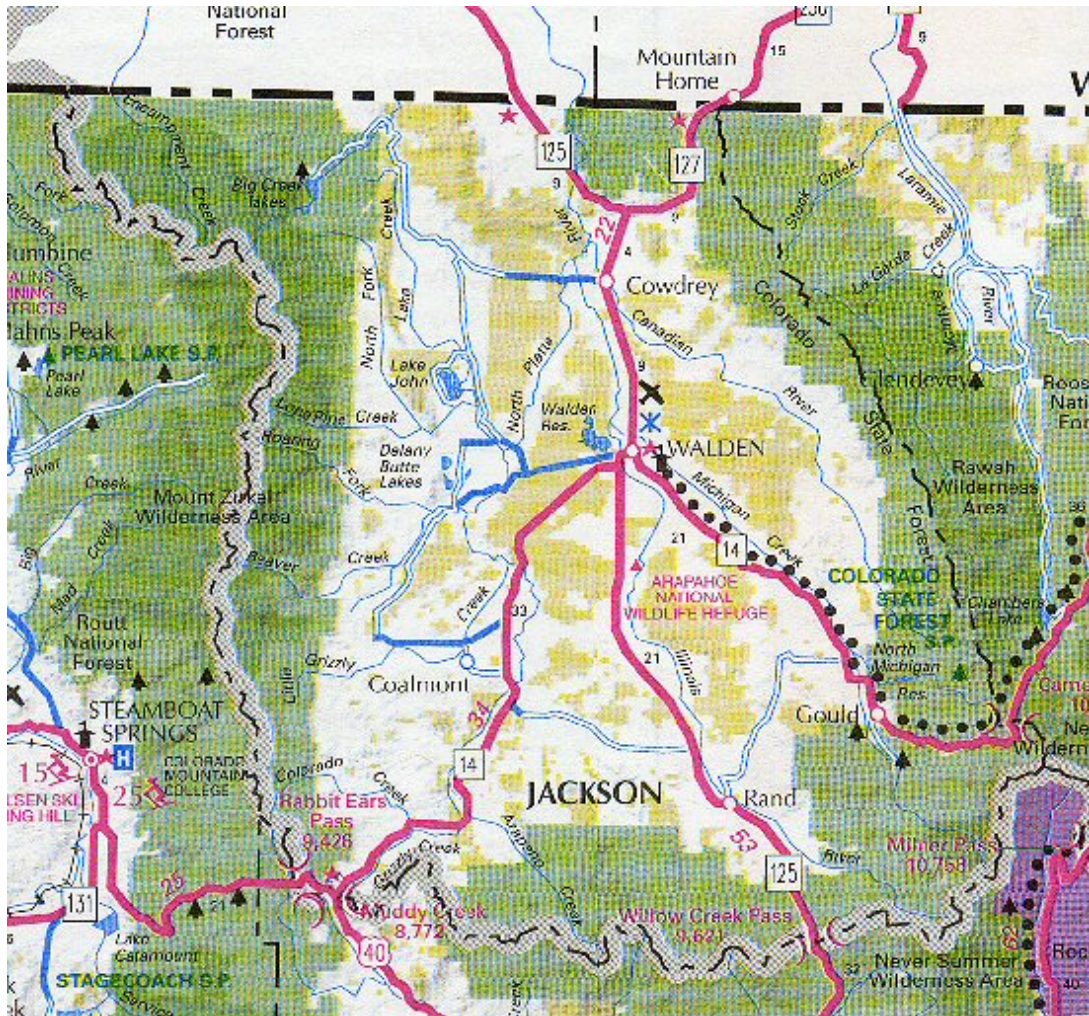
Figure VII-1. Upper Colorado River Basin Map.



## 1.2 THE NORTH PLATTE RIVER BASIN

The headwaters of the North Platte River basin are located in Jackson County (Figure VII-2). Ranching, mining, and logging are the predominant economic activities in the County. The population of Jackson County in 2000 was 1,557 persons and 1,390 in 2010. A significant aspect of the North Platte River in Colorado is the Nebraska versus Wyoming Decrees (325 US 589 (1945), and 345 US 981 (1953)) which limits the State of Colorado from diverting more water than that needed to irrigate 145,000 acres of land in Jackson County, prohibits storing more than 17,000 acre feet of water in any year for irrigation purposes, and prohibits the export of more than 60,000 acre feet of water out of basin in any ten year period.

Figure VII-2. Upper North Platte River Basin Map.





## 2.0 REGIONAL WATER QUALITY ASSESSMENT SUMMARY

Most of the streams in Region XII are very high quality, supporting all desired uses (although not in every stream reach). This general assessment is supported by the “assessment of water quality of each watershed in Chapter 8 of this Volume. Additional water quality data and analyses over the past twenty years continues to show that, in general, waters of the region are of better quality than required by State standards. For examples, see USGS Water Resources Investigation Report 99-4181 “Characterization of selected biological, chemical, and physical conditions at fixed sites in the Upper Colorado River Basin, Colorado, 1995-1998” and USGS Circular 1214 “Water Quality in the Upper Colorado River Basin, Colorado 1996-1998”.

The emphasis of water quality planning in Region XII is largely directed toward preserving this existing high quality. There are some areas, however, where improvement of water quality is necessary and reasonable to restore beneficial uses, particularly with regard to acid rock drainage from historic mining areas.

The water quality assessment includes specific sections on both point and nonpoint source water quality issues in each of the region's watersheds. The assessment provides the basis for ranking problems within the region. Considering water quality problems which need to be corrected to meet the objectives of the federal Clean Water Act throughout the region, the following are listed in order of priority (highest, or most serious, to lowest):

Nonpoint Source Pollutants From Development Areas

Acid Rock Drainage

Point Source Discharges From Developed Areas

Hydrologic Modifications From Water Projects

Large Area Soil Disturbance Activities

Roadways and Pavements

This qualitative ranking is based on the existing or potential seriousness of the impact, miles of stream affected or likely to be affected, and the degree of present or potential control of the problem.

Five of the six significant water quality issues in Region XII are nonpoint source issues. The State's 305(b) Report which discusses water quality threatened stream segments (individual segments are discussed in the individual watershed plans in Sections 2 and 8) are point source oriented because the system for identifying threatened segments is point source oriented. Point source controls will be applied to prevent damage to the threatened stream segments. The real challenge for water quality management lies in the area of nonpoint source control. Each problem category is briefly discussed below and is discussed in detail in Chapter 8 of Volume II under the status of watershed water quality assessments and nonpoint source control programs in the watersheds.

## Nonpoint Source Pollutants from Development Areas

Nonpoint source pollution from development areas is a significant issue in Region XII, and more specifically in the Upper Colorado (Fraser River Valley), Blue, Eagle, and Roaring Fork watersheds. Water pollutants in nonpoint source runoff from urbanizing areas include nutrients (nitrogen and phosphorus), sediment, heavy metals, petroleum products, and organic pesticides. In Summit County, roughly one quarter of the phosphorus contributed to Dillon Reservoir is generated by nonpoint source runoff from human activities in the watershed. Preventing eutrophication in Dillon Reservoir requires tight controls on nonpoint sources. Dillon Reservoir presents an example of the types of issues that are likely to increase in seriousness throughout the State in the future. As the rural West Slope grows, the areas contributing to construction-related erosion and urban runoff will also increase.

## Acid Rock Drainage

Acid rock drainage impedes attainment of water quality standards for several streams in the Blue, Eagle, and Roaring Fork watersheds. These streams are described in the Colorado Inactive Mine Reclamation Plan produced by the Colorado Division of Minerals and Geology and in the water quality assessments contained in Chapter 8 of Volume II of this plan. Of particular concern are: Cross Creek and the Eagle River near Minturn; and French Gulch, Peru Creek, and the Snake River in Summit County.

## Point Source Discharges from Developed Areas

Point source discharges in Region XII are typically well managed. Advanced wastewater treatment is often required for ammonia removal to protect fisheries and advanced phosphorus removal is required in the Dillon and Reservoir watershed. Continued attention to point sources is needed to ensure that the region's high quality water streams are protected.

## Hydrologic modifications From Water Projects

Hydrologic modifications are changes in stream channels, stream flows or the timing of those flows, generally resulting from water projects. Water quality impacts accompany major water use and development projects. The amount of water available to dilute natural and human induced pollutants is reduced, costs for wastewater treatment are increased due to lower stream flows (lower dilution flows), fish are stressed more often when low flows are combined with factors such as higher water temperatures and poor food supplies, water supply uses are eliminated when water is not present in a stream, stream channel morphology is impacted as the stream volume is reduced in relation to the stream cross-section which results in higher water temperatures and lower stream capacity to move sediment [Effects of Flow Diversion on Downstream Channel Form in Mountain Streams, Sandra Ryan and Neil Caine, Completion Report 176, December 1993, Colorado Water Resources Research Institute; Applied Fluvial Geomorphology, Dave Rosgen, 1995]. Some recreational uses are also dependent on stream flows, such as rafting and boating in lakes. Water use and development projects are listed as a significant water quality issue in the region in terms of potential to degrade existing high

levels of water quality because of the number of uses affected and the extent of impact. All basins in the region are potentially affected by hydrologic modifications. Hydrologic modifications resulting from existing and projected water use and development projects in Region XII are also discussed in more detail in Section 4.2.2 of this Volume.

As a basis for comparison with other types of water quality degradation, a few numbers may be useful. According to State Engineer Office Division V records, Region XII trans-basin diversions to the eastern slope totaled 606,817 acre-feet in 1993. At the USGS Colorado River gage below Glenwood Springs, total flows for water year 1993 equaled 2,874,000 acre-feet [USGS Water Resources Data Colorado Water Year 1993, Volume 2. Colorado River Basin]. Based on rough estimates for water consumption for various uses (as estimated by the Division V Engineer, in-basin consumption in 1993 was about 318,000 acre-feet. Thus, the total consumption in the basin was approximately  $\frac{1}{4}$  of the total stream flow, and the trans-basin diversions amounted to approximately two-thirds of this consumption.

For the water year 2000, trans-basin diversions from State Water Resources Division 5 totaled 555,273 acre-feet. In 2000 the ten-year average was 480,766 acre-feet. At the USGS Colorado River gage below Glenwood Springs, total flows for water year 2000 equaled 2,110,000 acre-feet, and the average for water years 1967-2000 is 2,522,000 acre-feet. [USGS Water Resources Data Colorado Water Year 2000, Volume 2. Colorado River Basin].

In-basin water use can also raise water quality concerns. Included in these concerns are: conversion of agricultural water to municipal use (loss of groundwater recharge); change in timing of return flows (specifically related to snow making); and "de-watering" stream segments between water diversion and wastewater return flows; and the "consumptive use" of various beneficial water uses. In-basin consumption can be calculated using general figures of 10% consumption for municipal use, 20-% consumption for snow making, and approximately 1.8 acre-feet per acre irrigated for agriculture (Water Division V estimates).

#### Large area soil disturbances

Large area soil disturbance activities such as mining, grazing, timber harvesting, and ski area expansion present the potential for large water quality impacts. The US Forest Service has identified areas where excessive soil loss from existing timber harvest operations require remedial actions to protect water quality. In addition, large area surface mining operations can contribute excessive soil loss. At present, these operations are well managed under permits from the Colorado Division of Minerals and Geology and the US Forest Service. All watersheds in Region XII are potentially vulnerable to water quality impacts resulting from large area soil disturbances.

#### Roadways And Pavement

Water quality problems associated with roadways and pavements include sediment and associated nutrients resulting from road cuts and fills, continuing erosion of unstable slopes adjacent to roads, erosion of unpaved road and parking surfaces, and road sanding operations. To a lesser degree, heavy metals, petroleum products, and

hazardous materials spills along roadways near waterbodies also have been documented to impact water quality. The Colorado Department of Transportation has a program underway to address these concerns while also considering public driving safety and existing funds and needs. All watersheds in Region XII are potentially vulnerable to water quality impacts from this type of activity, although the major areas of concern are in those areas where development has or is occurring.

### 3.0 CLASSIFICATIONS AND STANDARDS SYSTEM

#### 3.1 Overview of Colorado's Classifications and Standards System

The system for assigning surface and groundwater classifications and standards is administered by the Water Quality Control Commission and Division and is based on adopting use classifications that identify those uses to be protected on a stream segment and then adopting numerical standards for specific pollutants to protect those uses.

Use classifications and numeric water quality standards have been adopted for streams, lakes, and reservoirs throughout each of the State's river basins. Within each basin, waters are divided into individual stream segments for classification and standard setting purposes. Water quality standards are applied in a regulatory context principally through Colorado Discharge Permit System (CDPS) where point source dischargers are regulated to ensure that water quality standards are met.

Site-specific water quality classifications are intended to protect all existing uses of state waters, and any additional uses for which waters are suitable or are intended to become suitable. The current use classification categories are: recreation (class 1a, 1b, or 2); agriculture; aquatic life (cold or warm water, class 1 or 2); water supply; and wetlands.

For each classified stream segment, numeric water quality standards are adopted that are intended to maintain water quality at a level sufficient to protect the classified uses. There are three potential approaches to the adoption of site-specific numeric standards. First, table value standards (TVS) are based on criteria set forth in three tables contained in the Commission's Basic Standards and Methodologies for Surface Waters 31 5CCR 1002-31). These are levels of pollutants determined to be generally protective of the corresponding use classifications, and are applied in most circumstances, unless site-specific information indicates that one of the following approaches is more appropriate. Second, ambient quality-based standards - i.e. standards based on the existing instream quality, may be adopted where natural or irreversible pollutant levels are higher than would be allowed by table value standards, but are determined adequate to protect classified uses. The third option is to adopt site-specific standards where a bioassay or other site-specific analysis indicates that alternative numeric standards are appropriate for protection of classified uses.

In addition to water quality classifications and standards, either of two water quality based designations may be adopted in appropriate circumstances. An "Outstanding Waters" designation may be applied to certain high quality waters that constitute an outstanding natural resource. No degradation of outstanding waters by regulated activities is allowed. A "Use-Protected" designation may be applied to waters with existing quality that is not better than necessary to support propagation of fish, shellfish,

and wildlife and recreation in and on the water. The quality of these waters may be altered so long as applicable water quality classifications and standards are met. Waters that are not given one of these designations are subject to the State's Antidegradation Review requirements before any new or increased permitted water quality impacts are allowed.

### 3.2 Existing Water Quality Standards

The surface waters of the region have been divided into stream segments and classified by the Water Quality Control Commission. Certain stream segments in the region with known water quality problems have been identified, and are classified as either Water Quality Limited, Partially Supporting, or Not Supporting Designated Uses, as presented in each of the watershed plans.

#### 3.2.1 Table Value Water Quality Standards

Most of the stream segments in our region meet or exceed table value standards. These standards are based on levels of pollutants determined to be generally protective of the corresponding use classifications. Additional information on the specific stream segments can be found in each of the watershed plans. The Basic Standards and Classifications which are applicable to the Region, including the basis and purpose for the standards and classifications can be found at:

[http://www.cdphe.state.co.us/regulations/wgcregs/33\\_2012\(01\).pdf](http://www.cdphe.state.co.us/regulations/wgcregs/33_2012(01).pdf)

#### 3.2.2 Outstanding Waters in the Region

Outstanding Waters designation is applied to certain high quality waters that constitute an outstanding natural resource. No degradation of these waters is allowed. The following stream segments in our region are currently designated "Outstanding Waters".

Mainstem of the Colorado River and tributaries in Rocky Mountain National Park or which flow into Rocky Mountain National Park (Upper Colorado River Segment 1)

All tributaries to the Colorado and Fraser Rivers within the Never Summer, Indian Peaks, Byers, Vasquez, Eagles Nest, and Flat Tops Wilderness areas (Upper Colorado River segment 9)

All lakes and reservoirs within Rocky Mountain National Park, and Never Summer, Indian Peaks, Byers, Vasquez, Eagles Nest and Flat Tops Wilderness areas (Upper Colorado River segment 11)

North Fork of the Swan River, including all tributaries and wetlands, from the source to the confluence with the Swan River (Blue river segment 4b)

All tributaries to the Blue River, including all wetlands, within the Eagle Nest and Ptarmigan Peak Wilderness areas (Blue River segment 16)

All lakes and reservoirs within the Eagle Nest and Ptarmigan Peak Wilderness areas (Blue River segment 21)

All tributaries and wetlands to the Eagle River system within the Gore Range-Eagles Nest and Holy Cross Wilderness areas (Eagle River segment 1)

Abrams Creek, including all tributaries and wetlands, from the source to the eastern boundary of United States Bureau of Land Management lands (Eagle River segment 10b)

All lakes and reservoirs within the Gore Range-Eagles Nest and Holy Cross Wilderness areas (Eagle River segment 13)

All tributaries to the Roaring Fork River system, including all wetlands, in the Snowmass/Maroon Bells Holy Cross, Raggeds, Collegiate Peaks and Hunter/Frying Pan Wilderness Areas (Roaring Fork River Segment 1)

All lakes and reservoirs in the Snowmass/Maroon Bells Holy Cross, Raggeds, Collegiate Peaks and Hunter/Frying Pan Wilderness Areas (Roaring Fork River Segment 11)

All tributaries to the North Platte and Encampment rivers, including all wetlands, in the Mount Zirkel and Never Summer and Platte River Wilderness Areas (North Platte River Segment 1)

All lakes and reservoirs within the North Platte and Encampment rivers, including all wetlands, in the Mount Zirkel and Never Summer and Platte River Wilderness Areas (North Platte River Segment 8)

### 3.2.3 Use-Protected Waters in the Region

Use-Protected designation is applied to waters of the state that the Water Quality Control Commission has determined do not warrant the protection provided by "Outstanding Waters" designation or the antidegradation review process. The quality of these waters may be altered so long as applicable water quality classifications and standards are met. The following are the stream segments in our region which are designated "Use Protected".

Mainstem of the Blue River from the confluence with French Gulch to point on half mile below Summit County Road 3 (Blue River segment 2a)

Snake River – including all tributaries and wetlands, from the source to Dillon Reservoir, excluding Camp, Deer, Chihuahua, North Fork, and Keystone Creeks, and Jones Gulch (Blue River Segments 6a and 7).

French Gulch - from 1.5 miles below Lincoln (site) to confluence with Blue River (Blue River Segment 11).

Waters that are not given the designation of "Outstanding Waters" or "Use Protected" are subject to the State's Antidegradation Review requirements before any new or

increased permitted water quality impacts are allowed. More information on stream standards can be found in each of the watershed plans under Water Quality Standards and Classifications.

#### 4.0 REGIONAL WATER QUALITY ISSUES

##### 4.1 Point Source Impacts

Point sources discharges can be defined as discharge of water from a discernible, confined, and discrete conveyance, such as a pipe, ditch, channel or conduit, from which pollutants are, or may be discharged. Point sources do not include irrigation return flows. The point source impacts within our region come from three types of sources that are permitted by the Colorado Department of Public Health and Environment's Water Quality Control Division under the Colorado Discharge Permit System (CDPS). These sources are: Municipal Dischargers; Industrial Dischargers; and Construction Activities.

###### 4.1.1 Municipal Dischargers

Municipal wastewater dischargers include both public and private dischargers which treat domestic and commercial wastewater. The general pollutants of concern from these facilities are: toxins such as metals and ammonia which are harmful to aquatic life; suspended material, mostly organic wastes, which use up oxygen in the water to decompose; nutrients, such as nitrogen and phosphorus compounds, which cause algae growth; and pathogens (organisms which cause disease). The Water Quality Control Division has authority to permit facilities which discharge over 2,000 gallons per day. Most individual septic systems discharge less than this amount and are permitted under County regulations that are required by the State to meet certain minimum state-wide standards. Specific municipal dischargers are discussed in Chapter 3 of each of the watershed plans under Point Source Water Quality Issues and in Appendix 3. Domestic wastewater facility discharge permits are written by the state with EPA oversight.

The state defines major municipal wastewater treatment plants as those discharging greater than 1 million gallons per day (MGD). In the area covered by this plan there are 14 major municipal wastewater treatment plants: five in the Blue; three in the Upper Colorado; three in the Eagle; and three in the Roaring Fork.

###### 4.1.2 Industrial Dischargers

There are a limited number of major industrial dischargers in Region XII. They all hold valid discharge permits and they are all operated under the terms of their permits. For the most part, industrial dischargers within our region are mining operations. Discharges from these facilities are also permitted by the Water Quality Control Division. Potential pollutants from industrial facilities in our region generally include: sediment, which is a source of nutrients and also can "smother" the bottom of streams; heavy metals, and hazardous materials spills and leaks. Specific "major" industrial dischargers are discussed in the appropriate watershed plan under Point Source Issues - Industrial Activities.

Industrial discharges are permitted by effluent and industry type. There are three major industrial permits within Region XII: the Eagle Mine; and Freeport-McMoRan which operates the Henderson and Climax facilities. Industrial discharge permits are written by the state with EPA oversight.

There are a number of specific point sources within the region which do not have permits. These are inactive or abandoned mines which have a discharge from the mine. These sites have been identified by the Department of Minerals and Geology, and some are known to impact the classified uses of specific stream segments. The significant sites are discussed in the appropriate watershed plans.

#### 4.1.3 Construction Activities

Construction activities which disturb more than one acre of land are considered to be an industrial activity under the Clean Water Act and require a stormwater discharge permit. As the activity is required to be permitted, it is considered a point source discharge, although the requirements of the permit are generally "Best Management Practices" directed towards controlling nonpoint source pollutants and hazardous materials spill prevention. The Water Quality Control Division issues these permits. The potential pollutants of concern are similar to the other industrial pollutants - sediment, and hazardous material spills.

Point sources from construction dewatering activities are also controlled through the Water Quality Control Division's permitting process.

Most local governments in the region have regulations to provide additional water quality protection during construction activities. Most of the regulations focus on erosion and sediment control requirements, although many also include stream and wetland setbacks, and other measures which reduce water quality impacts from construction sites. Each watershed water quality management plan in Chapters 4 and 5 contains watershed specific information on this subject.

#### 4.2 Nonpoint Source Impacts

Nonpoint sources of pollution can be defined as those sources resulting from diffuse sheet flow of stormwater or snowmelt runoff or reduced stream flows. Nonpoint sources include: runoff from mine tailing piles, roads, residential, and commercial land uses; irrigation return water, and clear-cut areas; failing or inadequate septic systems; and hydrologic modifications. Hydrologic modifications are changes in water quality resultant from reservoirs, releases from reservoirs, or water diversions. The impacts of this type of nonpoint source pollution has been previously discussed (Volume I, Policy 2, and earlier in this volume). The State has a Nonpoint Source Management Program which was originally approved by the EPA in May of 1989 is designed to address the problems identified in the State's "Nonpoint Assessment Report" (January 2012 draft can be found at <http://www.cdphe.state.co.us/op/wqcc/Hearings/AAH/NPSmanplan/NPSManagementPlanJan2012Draft.pdf> )



#### 4.2.1 Land Use and Disturbance

Development of land for residential, commercial, agricultural, and industrial use can have significant water quality impacts, especially when viewed cumulatively. Some of the nonpoint source issues related to land development include stormwater runoff, impacts of septic systems, habitat disturbance and loss, and recreational impacts. There are numerous pollutants which come from general land use activities. Runoff pollutants include: sediment; nutrients; heavy metals such as zinc, lead, copper, cadmium and nickel; salt; PCBs; pesticides; petroleum products; and asbestos.

#### 4.2.2 Inactive Mines

The impacts of mining have been previously discussed in the point source section, however, nonpoint source water quality impacts have also been identified in our region. These impacts are a result of runoff which comes in contact with mine tailing, waste rock, and roaster fines piles. These "left overs" of mining activities contain heavy metals, and sulfide products which form sulfuric acid when exposed to water. Heavy metals are toxic to aquatic life at low concentrations and also act as "stressors" at sub-lethal concentrations. Acidity can also cause aquatic life mortality and act as a stressor to aquatic life.

A number of inactive mine sites have been identified in the watershed plans as impacting water quality in the region. The stream segments are:

##### Blue River Watershed

- Peru Creek
- French Creek
- Upper Blue River (Segment 2)
- Upper Snake River

##### Eagle River Watershed

- Cross Creek
- Upper Eagle River (Segment 5)
- Eagle River (Segment 5)

##### Roaring Fork Watershed

- Thompson Creek
- Coal Creek

Policy 1, Water Quality, recommends actions to reclaim these sites and minimize the associated water quality impacts.

#### 4.2.3 Development

Land development practices can impact water quality through increased pollutant loads, increased runoff (both in quantity and velocity), and wetland and riparian habitat losses, as described below. A nonpoint source water quality management plan produced by the Northwest Colorado Council of Governments for the Town of Vail in 1995 indicated that the runoff water pollutants of most concern include: sediment, dissolved solids (salt);

petroleum compounds, nutrients, and heavy metals.

Population estimates in the NWCCOG region only partially show the extent of development and growth in the region. Two additional variables also need to be considered regarding development and growth (and infrastructure needs) in the region. One variable is the “transient” visitor to the region who relies on infrastructure (e.g. hotels, motels, etc.) which are not part of the population estimate. The other variable is the second homeowner, who maintains a secondary residence in the region, but does not add to the population estimate.

These two variables are extremely important considerations in growth and development in the region, and again, are not reflected in the population estimates and population growth projections in the watershed plans. For example, in 2001, second homes are estimated to represent 85% of the housing stock in Winter Park, 73% in Vail, 70% in Grand Lake, and 60% in Summit County.

#### 4.2.3.1 Stormwater

Stormwater runoff concerns are not only limited to pollutants (such as nutrients, sediments, metals, and organic contaminants), but also to timing and quantity of water. Increases in impervious surfaces such as roads, houses, etc. increase the amount of runoff and increase the rate at which the runoff occurs. This can lead to increased flooding which impacts water quality by increasing erosion and therefore sediment and nutrient inputs.

#### 4.2.3.2 Onsite Wastewater Systems

Another land use concern is an increase in density and design of onsite wastewater systems (septic systems) - especially those constructed on marginal sites (poor soils, fractured bedrock, and high groundwater tables) which can lead to high inputs of nutrients (phosphorus and nitrate), and potentially harm human health through transmission of water-borne pathogens.

In November 1998 the Denver Regional Council of Governments published “Individual Sewage Disposal Systems: Colorado Issues Review and Task Force Recommendations”, which was prepared for the Individual Sewage Disposal Systems Task Force. Representation on the Task Force included representatives from 20 County Health Departments (including Eagle, Grand, Jackson, Pitkin, and Summit counties), and the Northwest Colorado Council of Governments. This report states “Onsite wastewater treatment is a proven treatment and disposal option. Properly designed and constructed onsite systems are cost-effective, efficient and nonpolluting.” However, the report also states “Septic system ‘failures’ have been documented in Colorado by a variety of local governments and other agencies. Numerous studies and water testing programs in Colorado have documented groundwater contamination attributed to on-site systems”. Constituents of concern include pathogenic bacteria and virus contamination of groundwater, the movement of nitrate into groundwater, the movement of phosphorus through valley alluvium or thin mountain soils, and varieties of household chemicals and hazardous waste disposal. The Report provides Task Force Recommendations. This 208 Plan supports the Task Force’s Recommendations, especially those related to

licensing, registration, and permits.

In 2000 the Colorado Department of Public Health and Environment established a Individual Sewage Disposal System Steering Committee. The committee has produced a “Summary Characterization of Onsite Wastewater System Impacts”. The summary states, “[t]he potential risk posed by onsite wastewater systems varies greatly depending on an number of factors. Onsite wastewater systems pose relatively greater water quality risks when: a) They are present in high numbers and high density; b) They are present in areas served by private drinking water wells that are shallow or poorly constructed; c) They are improperly sited, particularly in sensitive environments; d) They were installed prior to 1973 when uniform design and siting standards were first established; and/or; e) When they were not properly designed, installed, operated and/or maintained.”

The Committee has developed recommendations, see: .

<http://www.cdphe.state.co.us/op/wqcc/Reports/ISDSRecommendations020214.pdf>

NWCCOG is generally supportive of the recommendations in the Report, which include the development of a performance-based management system, additional State funding to support local government oversight of septic systems, development of performance criteria, ability of local governments to develop renewable permits, and development of a strategy to manage seepage.

The Committee is continuing to meet with the intent of providing the Water Quality Control Commission and Board of Health with additional recommendations regarding permitting of onsite wastewater systems.

#### 4.2.3.3 Wetland and Riparian Area Losses

Habitat disturbance and loss is another significant issue associated with land development which has secondary impacts to water quality. The habitats referred to are: wetlands, riparian areas, floodplains, and shorelines which provide natural filtering of pollutants, flood water buffering, and provide shading which reduces water temperature and algae growth.

Scientific evidence shows that these areas are environmentally sensitive and that disturbance of these areas can negatively impact water quality. “Chase et al. (1995) after reviewing available literature, determined that 100 ft was the most reasonable width if a standard fixed-width riparian buffer was to be chosen to protect New Hampshire’s streams and river for all functions and values.” This paper also states “ it is important to note that effective buffer widths will change from region to region and as a function of buffer conditions, management objectives, and in-stream characteristics”. “ Smaller headwater streams are typically more vulnerable to water quality and quantity impacts as they are less able to dilute or buffer impacts such as sedimentation, solar heating, nutrient loading, or base flow alterations (e.g. water withdrawal).” These authors, working under the direction of the State of Maine Planning Office, advocate for a two-zone, variable outer buffer width, as they can be designed to take into account site-specific conditions and desired buffer functions. [Journal of the American Water Resources Association, vol. 6, number 36, December 2000, Method to Identify Effective Riparian buffer widths for Atlantic Salmon habitat protection, A.E. Haberstock

et.al.]

A final report by SAIC prepared for Summit County Community Development Division, entitled "Summit County Wetland Functional Assessment" (April 7, 2000), provided management recommendations for wetlands protection, including wetland buffers. "Based on the information presented in this report and review of other studies and similar setback regulations, we believe that a minimum 100-foot buffer should be instituted for all Summit County wetlands that meet one or more of the following criteria: 1. Over one acre in size individually or cumulatively; 2. Habitat for State or federally listed threatened or endangered species; 3. Habitat for focal listed species with established setback/impact zones; 4. Part of a beaver complex, 5. Adjacent to a water body (e.g. stream, river, pond, lake, reservoir).

The Northwest Colorado Council to Governments endorses the use of a variable outer-buffer beyond a 25-foot minimum inner buffer adjacent to waterbodies. In numerous studies [Wetland Buffers: An Annotated Bibliography, State of Washington Shorelines and Coastal Zone Management Program, Washington State Department of Ecology, 1992, Stream Stewardship, Department of Fisheries and Oceans, Province of British Columbia, Canada, 1986, and others], it has shown that 25 feet is the *minimum* setback necessary to achieve any water quality protection. NWCCOG's recommendation of an outer buffer, of up to 100 additional feet, should take into consideration wetland or riparian functions and values, proposed land use and mitigation activities.

#### 4.2.4 Agriculture & Silviculture

Agriculture and silviculture (logging) activities can cause increased sediment, nutrients, and dissolved solids from associated land disturbance and fertilizer applications. In addition, crop and forage production is responsible for large water withdrawals for irrigation, and riparian and wetland disturbance and loss which has secondary impacts on water quality. Much of the more recent logging activities are related to damages inflicted by bark beetle in the NWCCOG Region, see: <http://www.nwccog.org/index.php/programs/rural-resort-region/cbbc>

Policy 3, Land Use and Disturbance, deals with the impact of land use and development throughout the region. The policy recommendations are being implemented at the local government level and at the federal level for those land use agencies which have the appropriate authority. With respect to agricultural and silvicultural impacts, the policy recommendations are voluntary implementation of Best Management Practices.

It should be noted that agricultural Best Management Practices, especially those related to livestock grazing, ranch management practices, and logging are being widely implemented throughout Region XII. The ranchers, the Natural Resources Conservation Service, the Bureau of Land Management, and the US Forest Service are actively involved in implementing BMPs.

#### 4.2.5 Recreation Impacts

Another set of issues related to land development is recreation impacts to waterbodies, such as stream bank erosion and lack of proper sanitation facilities. Increased

population density generally results in greater demand for recreational opportunities, which are often centered around water, especially in mountain communities. Water quality impacts associated with recreation are usually related to habitat disturbance, which as previously stated, has secondary impacts. Water diversion for recreational uses, such as irrigation of golf courses and snow making also impact water quality, as a result of runoff and consumptive water use at critical times.

In the June 2001 Journal of the American Water Resources Association, King et al. demonstrated increased nitrate/nitrite and orthophosphate loading from a municipal golf course managed at a “moderately intensive” level. The study indicated “the potential for nutrients applied to golf courses to exit the course in stream flow, which may contribute to water quality degradation (such as algal blooms and low dissolved oxygen) . . .” The results also support the need for turf system managers to carefully manage nutrient inputs.

Policy 3, Land Use and Disturbance, deals with the impact of land use and development throughout the region. The policy recommendations are being implemented at the local government level and at the federal level for those land use agencies which have the appropriate authority.

Policy 4, Domestic, Municipal, and Industrial Wastes, includes recommendations regarding siting of facilities to reduce nonpoint source impacts.

Policy 5, Chemical Management, includes recommendations for storage, handling, transportation, disposal, and application of materials, in such ways to minimize nonpoint source water quality impacts.

#### 4.2.6 Water Use and Development

The State's Nonpoint Source Management Program includes a "Hydrologic Modification Nonpoint Source Management Program" which is intended to identify and develop programs for minimizing adverse nonpoint source water quality impacts associated with hydrologic modifications. Hydrologic modifications are defined in the program as: reservoirs; releases from reservoirs; diversions; and other spatial and temporal changes of the movement and circulation of flow of water.

The USGS did a study titled "Estimated Water Use in Colorado, 1985" [Water Resources Investigations Report 88-4101, 1989] documenting water use by county. According to that report irrigation, followed by hydropower generation, domestic, livestock watering, commercial, and thermal power generation, are the principal uses of water in Region XII. More recently, CWCB has attempted a similar assessment of water use and future water needs in the Statewide Water Supply Study (<http://cwcb.state.co.us/water-management/water-supply-planning/Pages/SWSI2010.aspx>).

Water use and development can result in water quality impacts caused by reductions in stream flows. This document identifies water quality impacts from water diversions for out of basin needs and in basin needs separately. Generally, water used for domestic or agricultural purposes is not fully consumed; some portion of the diverted water remains as "wastewater" or "return flow" which is directed back to a stream. For domestic use,

the consumptive use is generally 10% of the diverted volume. For snow making, the consumptive use is generally considered to be about 20% of the diverted volume and water is usually applied at 1 acre-foot per acre of terrain [Colorado Ski Country USA]. Agricultural return flows are quite variable, but can range from 15 to 60% in consumptive use. For water that is taken out of the watershed, there is no return flow to the basin, while water which is used in-basin is returned to the stream at some point, generally not too far downstream. Thus in-basin use is not 100% consumptive, while trans-basin usage is 100% with respect to the basin of origin.

The principal consumptive uses in the region are: agricultural (irrigation and stock watering; trans-basin diversions; domestic and municipal; snow making; and reservoir evaporation.

#### 4.2.6.1 Hydrologic Modifications

The term hydrologic modification refers to changes in hydrologic conditions (changes in stream channels, stream flows or the timing of those flows) due to man's actions on the natural environment. Changes to the natural hydrology of a watershed occur from the construction of reservoirs, diversions, and infiltration galleries. Water quality impacts can include nutrient concentrations increases, dissolved oxygen decreases, temperature increases, changes in chemistry and turbidity, and detrimental deposition of sediment.

The term "hydrologic modifications" generally refers to modifications as reservoirs, releases from reservoirs, diversions, channelization and other spatial and temporal changes in the movement and/or the circulation of water.

A project initiated by the Northwest Colorado Council of Governments' Quality Quantity Committee called the "Upper Colorado River Project" was initiated in 1998 and sought to quantify both the in-basin and trans-basin water quantity needs, expected to arise in the next twenty-five years. Considerations included: municipal demands, minimum and optimum flows for fish; reservoir levels; kayaking and rafting flows; wastewater treatment facility discharge permit 1E3 and 30E30 flows; existing and conditional water rights; and population projections. This study is intended to assist in identifying future water quality and quantity concerns, and potential opportunities for minimizing impacts of future water development activities in the Blue and Upper Colorado River (to the confluence with the Blue River) watersheds. <http://www.nwccog.org/docs/qq/UPCO%20Final%20Report.pdf>

Hydrologic modifications have also resulted from in-stream mining impacts. For example, the Blue River between the Swan River confluence and Breckenridge was mined using mechanical dredge boats. As a result of the dredge mining, a natural stream channel no longer exists. In portions of this stream segment, water is absent from the surface during late summer, fall and winter, and flows through the sorted dredge spoils as subsurface flow. The negative impacts from this type of hydrologic modification which includes loss of instream flow, loss of instream and riparian habitat, bank stability, and loss of a functioning aquatic ecosystem. While these impacts are not directly related to water quality, they should be addressed through future permits for mining, and the development of projects to restore the effects of historical practices.

##### 4.2.6.1.1 Trans-basin Diversions

Region XII is impacted by trans-basin diversions, which as previously noted, are 100% consumptive for the basin from which the water is taken. Water quality impacts arise from the loss of high quality water from the basin and changes in the stream's hydro-morphology which reduces natural scouring and affects habitat.

It should be noted that, generally speaking, during the two critical low flow periods (late summer and early winter) trans-basin diversions are not in priority.

The 1981 to 2010 average acre-feet of water diverted out of the NWCCOG portion of Division 5 (which includes Grand, Summit, Eagle, and Pitkin counties) as 506,980 acre-feet (Appendix 8). On a month to month basis this represents for 10% (May) to 41% (February) of the entire flow of the Colorado River at Glenwood Springs. . The average trans-basin diversions at Dotesero range from about 9% (May) to as much as 64% (January) of the stream flows in the Upper Colorado River watershed.

#### 4.2.6.1.2 In-Basin Diversions

Water usage in the basin includes irrigation, hydropower, domestic, commercial, and industrial uses. Generally speaking, in-basin diversions consume 10-50% of the water diverted or used.

According to State Engineer's Office of Water Resources, Division 5 2010 Annual Report, irrigation diversions represent about 90% of in-basin water diversions in the Upper Colorado River basin including the Roaring Fork watershed. Table VII-2 below is based on the above referenced report and includes uses in Water Districts 39, 45, 70, and 72 which are below the confluence of the Roaring Fork.

Table VII-2. Estimated In-basin Water Diversions, 2010 – Division 5 Water Resources

Use	Water Year 2010 Water diversions acre-feet
Irrigation	1,719,801
Storage	502,008
Municipal	63,959
Commercial	642
Domestic	5,763
Livestock	47,721
Industrial	3,773
Recreation	7,939
Fishery	441,099
Augmentation	5,861
Recharge	229
TOTAL	2,798,795

#### 4.2.6.2.1 In-Basin Changes in Water Usage

Historically (and currently), the most significant water use in the region has been for irrigation purposes. The 1988 USGS report "Estimated Use of Water in Colorado, 1985" [USGS, 1989] estimated that 952.82 million gallons per day (MGD), or 2,924 acre-feet

per day were used in our region for irrigation. The next highest usage was hydropower generation at 497.72 MGD. Domestic and commercial usage was estimated to be 11.6 and 4.68 MGD, respectively. As the region becomes more developed, changes in land uses will result in changes in water usage in the basin.

#### 4.2.6.2.2 Municipal and Domestic Usage

As illustrated in the previous table, municipal and domestic diversions of water are less than one-twentieth of the irrigation diversion in the basin. Additionally, Municipal water consumption is much less than that of agriculture, in other words, less of the water diverted is actually “used up” during its use and thus a larger percentage of the water diverted is returned to the stream.

According to the Colorado Department of Public Health and Environment’s Water Quality Control Division public water supply records, the NWCCOG region includes 90 community systems, 86 transient non-community systems, and 10 private systems (186 systems total). 151 of those systems are reliant upon ground water (including 8 under the influence of surface water), and 35 systems are reliant upon surface water sources. The population (resident, non-transient and transient population) served by these systems is estimated to be 265,690 people. The total number of taps for these systems is 56,865. Additional information on domestic usage is available in the watershed management plans and Appendix 4.

#### 4.2.6.2.3 Industrial Usage

Industrial use of water means the use of water for purposes of producing or processing non-agricultural products or services for sale, such as manufacturing, mining, milling, land reclamation, golf course irrigation, snowmaking, and non-hydroelectric power generation. The water quality concerns associated with snowmaking are generally the removal of water from streams during critical low flow periods. Snowmaking studies have indicated that the spring peak runoff is extended in time as a result of snowmaking activities, but that runoff rates are not increased.

Although golf courses are much more efficient at using water than traditional agriculture, one of the concerns is that historical irrigation allowed groundwater recharge which provided late season groundwater returns to surface waters. With the more efficient application of water to golf courses, late season return flows to surface waters from groundwater are diminished.

In Region XII, most of the stream flow results from snowmelt, which is greatest during May, June, and July. There are two critical periods of low stream flows - late summer, and early to mid winter. The late summer period coincides with significant agricultural usage and higher stream temperatures, which can stress cold-water fish. The winter period - especially December can coincide with snow making water demands.

#### 4.2.6.3 Hydrologic Modifications Summary

Policy 2, Water Use and Development, recommends actions to reduce the water quality



impacts associated with water use and development.

Critical areas with respect to stream flows and water use and development in the region have been identified in the watershed plans. These areas include:

Blue River Watershed

Entire watershed

Colorado River Watershed

Fraser River

Colorado River below Windy Gap to Blue River confluence

Eagle River Watershed

Upper Eagle River (above Gore Creek)

Gore Creek

Lower Eagle River (Gore Creek to the Colorado River confluence)

Roaring Fork River Watershed

Upper Roaring Fork (above the Crystal River)

#### 4.2.3 Roadways and Pavement

Highways and roads contribute sediment, salts, heavy metals, and petroleum pollutants to the waters in the region. The Colorado Department of Transportation and local municipalities and counties have responsibility for managing the roads in our region. On-going activities related to this issue have focused on erosion and sediment control practices, both for new projects as well as on-going maintenance.

A study by Dr. William Lewis titled "Magnesium Chloride: A Literature Review With Emphasis on the State of Colorado" prepared in November 1997 concluded "The magnesium and chloride ions, which are in terms of mass, the main ingredients in magnesium chloride deicer, are unlikely to produce environmental effects except under unusual circumstances... Rust inhibitors are environmentally unknown for the most part. The most likely effects include metal toxicity associated with metallic inhibitors and eutrophication associated with the addition of phosphate inhibitors... Contaminants are possibly of much greater environmental interest than the main ingredients of magnesium chloride deicer."

A five-year assessment, released in August 2000 by the Canadian Government Agency Environment Canada found that the five million tons of road salts applied across the Country every winter contaminate ground water, surface water, poison wildlife and harm vegetation. Road salts included sodium chloride, calcium chloride, potassium chloride, magnesium chloride, and ferrocyanide salts. The principle salt used in Canada is sodium chloride.

A study of the impacts of use of magnesium chloride as a road de-icing compound has been initiated by the Colorado Association of Ski Towns, Colorado Department of Transportation, and the USGS. The study, to assess the possible water quality and human health impacts of the use magnesium chloride and determine whether better alternatives may exist, should be completed in the spring of 2002. The report will

provide a review and analysis of other relevant studies and data, and detailed descriptions of magnesium chloride and alternative de-icing compounds, including known impacts on human health, aquatic flora and fauna, and terrestrial vegetation. A secondary un-intended effect of the increased use of magnesium chloride as a roadway de-icer is the potential increase in water consumption related to increased vehicle washing to remove the accumulated material.

Additional information regarding the potential negative and positive impacts of the use of magnesium chloride for road surface stabilization should be developed, however the impacts of chemical de-icers should always be compared to the known problems associated with using sand for road traction..

#### 4.3 Colorado River Basin Salinity

Total dissolved solids (TDS) or salinity is of increased concern in arid and semi-arid areas when water is consumptively used. Application of irrigation water to saline soils leaches increased concentrations of TDS back to streams. Transpiration by plants and evaporation from open water further concentrates the salts.

TDS concentrations range from less than 50 mg/L in the headwaters of the Region XII watersheds, to 100,000 mg/L in saline springs in the Colorado River basins. Water with a TDS of less than 500 mg/L is preferable for water supplies. Agricultural crops exhibit a wide tolerance to TDS, with more sensitive species such as fruit trees, potentially affected at concentrations greater than 500 mg/L [USGS Open File Report 85-479, 1987]. Average concentrations for streams upstream of Glenwood Springs are all less than 500 mg/L. Downstream from Glenwood Springs, all USGS stations on the Colorado River mainstem have average TDS concentrations between 500 and 1,000 mg/L [USGS, 1987].

The Colorado River Basin Salinity Control Program is designed to reduce salt loadings to the Colorado River Basin in order to maintain standards established in 1972. Both the US Department of Agriculture and Department of the Interior are involved in programs designed to control nonpoint sources of salt loading. The Natural Resources Conservation Service, the Bureau of Land Management, and the Bureau of Reclamation are all actively involved in salinity reduction measures from a variety of sources. Farm reduction measures are handled by the Natural Resources Conservation Service. State participation in the salinity control program is coordinated through the water quality management planning process for nonpoint sources and the CDPS permit program for point sources. The Colorado River Basin Salinity Control Forum provides a forum for the states of the basin to coordinate their activities, and provide guidance to the federal agencies.

The program does not address potential salinity concerns of the Grand Valley water users - especially those of fruit growers, whose crops are less salt tolerant than other agricultural producers. A USGS report [Open File Report 87-568] states "the reach of the Colorado River between the towns of Dotsero and Glenwood Springs, Colo., represents the largest single source of dissolved solids in the Upper Colorado River basin . . . which represents 17 percent of the dissolved-sodium and 38 percent of the dissolved-chloride loads leaving the Upper Colorado River Basin... Most of this dissolved -solids load is contributed by very saline, thermal springs between the towns

Dotsero and Glenwood Springs." Another USGS report [Open File Report 84-4198] shows that the dissolved solids concentrations in the mainstem of the Colorado River jumps from 230 mg/L to 370 mg/L at the confluence of the Eagle River. This information suggests two geographical areas, one of which (the Eagle River) is within Region XII, which could be investigated for reducing salinity impacts to downstream water users.

It is important to note that a USGS study [Characteristics and Trends of Streamflow and Dissolved Solids in the Upper Colorado River Basin, Arizona, Colorado, New Mexico, Utah, and Wyoming, open File Report 87-568] found that municipal wastewater treatment plant discharges to the Colorado River and its tributaries contribute less than 5% of the total salinity at the Imperial Dam. A "significant" annual decrease in annual stream flow on the Colorado River near Glenwood Springs from 1942-49 to 1950-83 occurred concurrent with an increase in dissolved solids concentrations. These stream flow decreases and dissolved solids increases were "significant" and "highly significant" simultaneously during the months of May, June and July, which suggests that loss of stream flow is responsible for increases in dissolved solids concentrations..

Another USGS report [D. Butler, USGS, Trend Analysis of Selected Water-Quality Data Associated with Salinity-Control Projects in the Grand Valley, in the Lower Gunnison River Basin, and at Meeker Dome, Western Colorado, Water Resources Investigation Report 95-4274, 1996] found that monthly flow-adjusted salinity loads at the USGS Colorado River station near Cameo have had "highly significant" decreases for three time periods of investigation: 1970-1993; 1980-1993; and 1986-1993. The report attributes the significant decreases in salinity loads to "natural or man-induced effects in the Upper Colorado River Basin . . ."

Policy 2, Water Use and Development, recommends actions which reduce existing salt loads from areas which contribute significant salinity to the basin. NWCCOG encourages local governments and land use agencies to minimize increases in salinity of the Colorado River through the use of best management practices for nonpoint sources as recommended in Policy 2, 3 and 5.

#### 4.4 Ground Water Issues

In our region, ground water has not received the attention that surface waters receive, although there are 151 (including 8 under the influence of surface water) community ground water supply systems serving 125,624 people [Water Quality Control Division, Colorado Open Records Act Information Request, Public Drinking Water Systems in NWCCOG's area, December 10, 2001].

Data is collected by water providers relying on groundwater as part of the Safe Drinking Water Act; however, there are no known documents that summarize the collected data.

Additional information on both the quality and the quantity of ground water within Region XII is needed for proper planning.

Groundwater contamination from leaking underground storage tanks has occurred and been documented (e.g. Town of Frisco's abandonment of city well). Nonpoint source pollutants have also been detected in shallow alluvial aquifers in urban settings [USGS, Water Quality in alluvial Aquifers of the Southern Rocky Mountains Physiographic

Province, Upper Colorado River Basin, Colorado 1997, WRIR 99-4222]. The summary states “Overall, the water quality in the Southern Rocky Mountains physiographic province is suitable for most uses, but natural and human factors affect the water quality.”

Summit County Environmental Health Department’s well sampling program has also documented elevated nitrate and bacterial levels in drinking water wells in small areas of the County.

All of the Policies in Volume I are applicable to groundwater issues.

#### 4.5 Regional Nonpoint Source Project Needs and Prioritization

As identified in Chapter 2 of this Volume, the two most significant water quality priorities in the region are:

- Nonpoint Source Pollutants From Development Areas  
Areas of focus should include:  
    Urbanized areas in the Fraser River, Blue River, Gore and Eagle River, and Roaring Fork River  
Pollutants of interest include:  
    Nutrients  
    Sediment

A subset of this area of focus is related to groundwater impacts in development areas and includes impacts from septic systems and urban activities.

- Acid Rock Drainage  
Areas of focus should include:  
    Snake River Watershed  
    French Gulch  
    Eagle River in the Belden area

NWCCOG recommends that projects addressing these two issues receive the highest priority for grant funding and direction of personnel activity.

It should be noted that although Roadways and Pavement have been broken out separately, it is a subset of Nonpoint Source Pollutants from Development Areas, and should also receive high priority for activities and funding – especially in the following areas:

Fraser River  
Straight Creek  
Black Gore Creek

#### 4.6 Related Programs and Issues

##### 4.6.1 Weeds

Non-native invasive plant species can negatively impact water quality and displace native plant species that provide habitat, stream shading, stream bank stabilization and organic material that serves as the basis of the food chain in aquatic systems. Salt

cedar (also known as tamarix or tamarisk) and Russian Olive are two plant species presently replacing the native cottonwood/willow riparian habitats in the lower elevations of our region. Colorado's list of noxious weeds can be found at: <http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1174084048733>

Certain terrestrial noxious weeds also negatively impact water quality through increased soil erosion (this was shown in a Montana study which demonstrated increased soil loss in an infestation of spotted knapweed over a native bunchgrass community).

NWCCOG supports efforts to control non-native invasive plant species through early detection/monitoring and removal.

#### 4.6.2 Endangered Species

A number of aquatic and terrestrial plants and animals dependent on the aquatic environment are species that are federally listed as Endangered, Threatened, or Candidate species under the Federal Endangered Species Act. Additionally, the Federal Land Management Agencies (US Forest Service and Bureau of Land Management) and State Division of Wildlife maintain lists of sensitive species and species of special concern. Species either in our region, or outside of our region but potentially impacted by water resource related activities within our region, include the following:

##### Fish

- Bonytail (Federal and State endangered species);
- Razorback sucker (Federal and State endangered species);
- Colorado pikeminnow (Federal endangered species, State threatened species);
- Humpback chub (Federal endangered species, State threatened species);
- Colorado river cutthroat trout (State species of special concern);
- Mountain sucker (State species of special concern);
- Flannelmouth sucker (State species of special concern);
- Colorado roundtail chub (State species of special concern);
- Greenback cutthroat trout (Federal and State threatened species);

##### Amphibians

- Boreal toad (Federal candidate species and State endangered species);
- Northern leopard frog (State species of special concern);

##### Birds

- Bald Eagle (State species of special concern);
- Greater sandhill crane (State species of special concern);
- American peregrine falcon (State species of special concern);

##### Mammals

- River otter (State endangered species);
- Lynx (Federal threatened and State endangered)

##### Plants

- Penland alpine fen mustard (Federal threatened species).

The Northwest Colorado Council of Governments supports appropriate stewardship efforts to restore these species to a condition which would reduce their populations' fragile status.

#### 4.6.3 Source Water Assessment and Protection Plan

Under the Federal Safe Drinking Water Act, the State is required to complete a Source Water Assessment and Protection Program. The Plan includes the delineation of source water areas for all public water systems, a contaminant inventory, and a susceptibility analysis. The Assessment Phase was to be completed by 2003. The State has determined that regional planning agencies do not have a role in this program. All water providers are encouraged to thoroughly review all draft information produced by the State to ensure the information is correct, adequate, and appropriate. For more information on the State's program see:

<http://www.cdphe.state.co.us/wq/sw/swaphom.html>

#### 4.6.4 Wildfire Control Efforts

Wildfires have been shown to cause significant negative water quality impacts. These impacts include increases in sediment mobilization, and subsequent impacts to riparian and in-stream habitat, and increases in nutrient concentrations. The concern of wildfire has been elevated in recent years due to the devastation of local forests by pine bark beetles. The NWCCOG supports appropriate wildfire control and suppression efforts as a mechanism to protect water quality from the negative impacts of sediment deposition and nutrient eutrophication.

### 5.0 MANAGEMENT SYSTEMS

The following is a brief discussion of the existing water quality management framework under which our region operates. For further information, the 1994 Working Paper produced by the Colorado Water Quality Forum titled "Colorado Watershed Protection Approach" provides a more detailed explanation of the federal and state programs which are related to water quality protection and restoration.

#### 5.1 Clean Water Act

The federal Clean Water Act (33 U.S.C. 1251, et. seq.) forms the federal environment under which the state operates. Other related federal environmental legislation includes:

- Safe Drinking Water Act
- National Environmental Policy Act
- Endangered Species Act
- Wild and Scenic River Act
- Resource Conservation and Recovery Act
- Comprehensive Environmental Response, Compensation and Liability Act
- Clean Air Act

## 5.2 Water Quality Control Commission

The state has primacy (i.e. responsibility) for carrying out the state programs developed in the Clean Water Act. Existing state water quality laws and regulations include the following:

- Establishment of regional water quality management plans;
- Classification of state waters
- Establishment of water quality standards designations and regulations water permits.

The state permits domestic wastewater discharges based on stream segment water quality standards and stream flow to establish discharge pollutant concentrations that will protect the designated uses. Specific information on the domestic wastewater treatment plants in our region is found in each of the watershed plans and also in Appendix 3 and 8. There are approximately 14 domestic wastewater treatment plants in the region that treat wastewater beyond the secondary level (85% removal of Biochemical Oxygen Demand).

The Water Quality Control Division is developing a Source Water Assessment and Protection Program to meet and satisfy the federal requirement of the Safe Drinking Water Act. This program is aimed at protecting public water supplies from contaminants. The State's Implementation Plan was approved by EPA in February, 2000. For more information see: <http://www.cdphe.state.co.us/wq/sw/swaphom.html>

## 5.3 Point Sources

### 5.3.1 Industrial Dischargers

There are three major industrial dischargers in Region XII. Major industrial discharge permits are issued by the Water Quality Control Division under EPA oversight. The three are all mines: the Eagle Mine above Minturn in Eagle County; Climax Molybdenum Company which operates the Climax Mine in Summit County and Henderson milling facility in Grand County. They all hold valid discharge permits and are operated under the terms of their permits. Besides the major industrial dischargers there are numerous other industrial permit holders in the region. These include: sand and gravel operation permits; mining permits; construction dewatering permits; and stormwater discharge permits.

### 5.3.2 Wasteload Allocations

"Wasteload allocation" means the portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations are a means to ensure that pollutants of concern from various sources do not exceed the applicable water quality standard. Allocations are developed in those areas where a number of permitted sources are discharging to the same stream segment and the possibility exists for the stream to exceed the water quality standard for that pollutant. In this region, the pollutant which has been allocated to the greatest degree is ammonia. The wasteload allocations are developed to ensure that all permitted discharges are

treated fairly with respect to setting standards for their discharges.

#### 5.4 Nonpoint Sources

The State's approach to control of nonpoint sources is documented in "Colorado Nonpoint Source Management Program, which was adopted by the State in January 2000 and has been supplemented since then, see <http://www.cdphe.state.co.us/wq/nps>. It describes federal control programs (such as the Agricultural Conservation Program, Conservation Reserve Program, Watershed Protection and Flood Prevention Act, and Resource Conservation and Development), state programs (such as the State Revolving Loan Fund, the Water Quality Control Commission, and the Nonpoint Source Taskforce), and local programs (such as state enabling legislation, e.g. CRS 24-65.1-101 - HB1041 - protection of local resources; and CRS 29-20-101 - HB1034 - land use controls).

Local governments in the region are sensitive to impacts of growth and development on water resources. Local governments have been involved in numerous activities to protect water quality from nonpoint sources. Both land use regulations and projects are listed in each of the individual watershed water quality management plans in Chapters 4 and 5.

#### 5.5 Colorado River Basin Salinity Control Forum

The Colorado River Basin Salinity Control Forum is composed of members from the seven states in the Colorado River Basin (Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming). The Forum was established for the purpose of interstate cooperation and to provide states with the information necessary to comply with EPA regulation 40CFR, Part 120, entitled "Water Quality Standards, Colorado River System, Salinity Control Policy and Standards Procedures", and Section 303(a) and (b) of the Clean Water Act. More information on this Forum can be obtained through the Colorado Water Conservation Board, or the Colorado Water Quality Control Division. In 2008 the "Water quality Standards for Salinity" were reviewed, see <http://www.crb.ca.gov/Salinity/2008/2008%20Review.pdf>. The Forum's web site address is: <http://www.coloradoriversalinity.org/>

#### 5.6 Colorado River Headwaters Forum

The Colorado River Headwaters Forum was initiated by the Northwest Colorado Council of Governments Quality/Quantity Committee in November, 1991 to facilitate the informal, non-adversarial discussion of water issues associated with the Colorado River headwaters. The Forum, open to "interested stakeholders", meets three times a year. Important outcomes of the Forum included the development of proposed methods for developing water projects allowing for public comment prior to formal submission of a 1041 permit application and the 2002 revisions of the 208 Plan. The Forum has been less active in recent years.

#### 5.7 Regional Management Agencies



Policy 6, Management Systems, defines the recommended regional management agency structure, with regard to both point and nonpoint source controls.

## 6.0 ENVIRONMENTAL, SOCIAL, AND ECONOMIC IMPACTS OF THIS PLAN

Continued implementation of the recommended Plan will necessarily have environmental impacts as well as social and economic costs and benefits. In assessing the impacts of the Plan, the majority of its policy recommendations (the implementation recommendations) have been in effect in their substantially present form at a local level since 1979 with the Plan's initial adoption. For point sources, wasteload allocations and treatment system recommendations have existed in substantially their present form since the adoption of the 303(e) basin plans in 1974.

There has been an extensive period of time during which the Plan's recommendations have acted as policy guidance for water quality decisions within the region. As a result of these decisions, many of the recommendations of the Plan have been implemented.

This includes implementation of the point source discharge treatment levels and consolidation of municipal facilities through the recommended management agencies. It also includes implementation of nonpoint source controls for new sources of urban storm runoff, construction activities, silvicultural activities, stream encroachment, and water use and development activities.

Implementation items recommended by the Plan are the continuation of these point and nonpoint source control measures. Additional implementation recommendations include of controls for abandoned mine drainage, remedial controls for erosion due to past silvicultural activities on National Forest lands as recommended in forest management plans. Additional controls on other existing and potential nonpoint sources could be determined to be necessary by the towns or counties.

The analysis of environmental and social and economic impacts of the Plan was split between those implementation items of the Plan that have been substantially implemented and those that remain to be implemented as described.

### 6.1 Environmental Impacts

#### 6.1.1 Overview

The Federal Clean Water Act has as its policy the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters. The Plan is intended to accomplish these goals throughout the region based on the current understanding of important cause-effect factors leading to either existing or projected water quality problems. As the body of knowledge with regard to these factors continues to grow, adjustments have been made in the Plan to accomplish these broad objectives. Environmental impacts may occur as a result of implementing the Plan either as a result of adoption of the recommended controls on new potential sources of water quality degradation (preventative strategies) or as a result of recommended cleanup actions (remedial strategies).

The overall intent of the Plan is to maintain the existing high quality of the Region's streams and lakes while accommodating growth and development. A second intent is to improve water quality in degraded stream segments that are unable to support the full range of potential uses. Each of the Plan's recommendations is aimed towards one of these objectives. Maintaining and improving the Region's water quality has and will continue to have a positive effect on aquatic life and fisheries, on the provision of adequate quality and quantity of water supplies for domestic, agricultural, commercial, and industrial use, and on the ability to support high quality recreational experiences. The implementation of the Plan will indirectly benefit the wetland and wildlife resources by maintaining such areas; will result in positive impacts on aesthetic resources of the State; and will conserve soil resources. The implementation of the Plan has and will continue to require energy and capital resources necessary to provide wastewater treatment to meet water quality standards.

#### 6.1.2 Previously Implemented Plan Recommendations

Previously implemented Plan items are described in each of the watershed plans. A major remedial element of the Plan is the implementation of point source controls. The establishment of effluent limitations, wasteload allocations, treatment service areas, and recommended areas of wastewater treatment consolidation have had a positive and negative impact upon the environment. Generally, the identified treatment needs have been satisfied through grants from the Environmental Protection Agency (EPA) and the State Construction Grant and loans from the State Revolving Loan fund, along with local financing. Expansion and upgrading of collection and treatment systems were therefore subject to the National Environmental Policy Act (NEPA), and environmental impacts resulting from such impacts were addressed in either an Environmental Impact Statement (EIS) or Environmental Assessment (EA).

A summary of the types of negative environmental impacts associated with meeting previous Plan wastewater treatment requirements include: increased energy consumption where advanced wastewater treatment has been recommended for phosphorus and ammonia removal; land use impacts where additional land area is required to satisfy higher treatment levels; temporary local construction impacts on noise, dust, soil disturbance, and traffic; and impacts caused by the transportation and disposal of waste by-products resulting from higher sludge generation requirements of advanced waste treatment. Positive impacts include: improvement and maintenance of water quality in streams and lakes throughout the region; protection and enhancement of aquatic life and fishery resources; and protection and enhancement of recreational opportunities. Alternative configurations for service areas and treatment methods for wastewater facilities necessary to meet the higher recommended treatment standards and/or recommendations for consolidation were described in the EIS or EA for upgrading the individual treatment plant. These documents provide a thorough discussion of the impacts associated with providing wastewater treatment and consolidation of facilities.

In addition to point source controls, prevention strategies will continue to be implemented in order to meet the objectives of the Clean Water Act. These include: controls on nonpoint sources of water quality degradation from water use and development activities; urban runoff; construction activities, agricultural activities; use of chemicals; and encroachment on wetlands, riparian areas, and waterbodies.

Implementing these controls has and will continue to have a positive impact upon:

- wetland and riparian areas;
- protection of aquatic life and fisheries;
- protection of important wildlife habitat areas;
- stream channel stability;
- reduction of the potential damage to private property due to flooding and stream bank loss;
- maintenance and improvement of recreational opportunities;
- reduction of eutrophication of lakes and streams;
- provision of safe domestic water supplies;
- maintenance of water quality at existing high levels.

There are no identified negative environmental impacts associated with the implementation of these preventative water quality strategies.

### 6.1.3 Future Plan Recommendations

Remaining implementation items recommended by the Plan will be accomplished through the continued use of point and nonpoint source control measures. These measures include the implementation of controls for abandoned mine drainage, remedial controls for erosion, and additional controls on existing septic systems and other existing and future nonpoint sources.

Continued implementation of the point source controls recommended in this Plan will have continuing positive and negative impacts as described previously in this section under Point Source Control Impacts. In addition, new State requirements for nutrient control (2012) will necessitate some treatment plant expansions and will have environmental effects upon energy requirements and temporary local construction impacts to provide the necessary future wastewater treatment.

Continued implementation of the preventative control strategies for nonpoint sources of water quality degradation will continue to have the environmental benefits described previously.

Implementation of the recommendations for controls on existing identified mine drainage problems will have positive impacts upon the improvement of water quality and aquatic life. It would also have positive impacts on public water supplies adversely affected by mine drainage. Depending upon the type of treatment technologies selected for control of mine drainage or stormwater runoff, there may be adverse impacts to: energy requirements for treatment of the mine wastes; construction impacts necessary to remove or restore material from tailing, roaster and waste rock piles; and potential impacts to wetlands and wildlife if passive systems utilizing wetland treatment are selected for treatment of mine wastes.

Remedial water quality controls recommended by the US Forest Service for past silvicultural activities have been assessed in three separate EIS documents covering their proposed actions in their land management plans. The closure of roads, revegetation and other measures recommended to reduce sediment loads from previously logged areas will have a positive impact on water quality, vegetation and

water yields, and will protect soil resources. Road closures are consistent with recommendations for recreational and other uses of forestlands recommended in forest plans.

## 6.2 Social and Economic Impacts

### 6.2.1 Overview

This Plan is intended to serve the population and economic growth projected by local governments within the region. The majority of the projected growth and development is associated with the growth of the tourism industry in the development of winter sports recreation areas and other year round outdoor recreational activities.

The existing demographic character of the region is influenced by rapid seasonal fluctuations in population and in the demand for public and private services. In most of the Region, the peak seasonal population occurs during the ski season. Local planning efforts have recognized the desirability of utilizing existing facilities, both public and private, over a longer time frame to diversify economic activities and provide a more stable base for residents of the region. The emphasis for diversification has included the maintenance of traditional industries in the Region, including agriculture, silviculture, and mining, but the real emphasis has been upon development of a year around economy based upon expanded summer tourism.

Protection and enhancement of the environment is a key element to the potential for economic diversification and the provision of a stable economic community for residents of the region. Many examples of the potential for economic diversification relate to the protection and enhancement of water quality, such as tourism and recreation. Positive impacts of implementing this Plan include the protection and enhancement of water quality, which leads to protecting the potential recreational resources for summer tourism activities. Negative impacts of this plan's implementation include increased levels of regulation and development costs associated with protecting water quality. These are described in more detail below.

### 6.2.2 Previously Implemented Plan Recommendations

The provision of advanced wastewater treatment for selected communities has had an impact associated with the construction and operation of these systems. Higher costs for construction and operation of these systems have been passed on to system users in the form of higher tap fees and service charges. Construction costs have been supported, in part, by federal grant programs, the state revolving loan fund and energy impact assistance programs.

The cost of these systems has been in part offset by water quality benefits that are attributable to a broader population base than system users. This includes benefits to recreation and tourism opportunities in the region as a result of protection of fish and wildlife, and improved aesthetic qualities of streams and reservoirs. Recreational studies have demonstrated a strong correlation between the opportunity for water-based activities and the selection of a recreational destination. To the extent that improved water quality maintains the opportunity for recreation, there should be a continuing benefit to summer tourism with a social and economic benefit to the region in accordance with objectives for economic diversification.

Controls on nonpoint sources of water quality degradation have also had social and economic costs and benefits. Controls for construction and grading activities have increased the cost of new construction for housing and commercial development. The cost increase on a per unit basis is dependent on the type of development and may range from a few dollars to several hundred dollars.

Controls implemented on water use and development activities to protect water quality and maintain the chemical, physical, and biological integrity of the Region's lakes and streams has increased the cost to water developers of providing new major water supplies utilizing water from the region. Windy Gap and Wolford Mountain Projects in Grand County are examples of how such additional costs are factored into the project costs for extension of major water supply systems in the Region under the Plan's recommendations. Additional development costs associated with provision of minimum stream flows, wastewater treatment and water supply are examples of costs added to such projects as a result of local program requirements. Because the majority of the projects are designed to serve water users outside of the Region, the costs of mitigating such impacts has been borne largely by Eastern Slope water users while the benefits of requiring mitigation for water quality impacts have accrued to both residents and visitors to the Region.

Locally adopted regulations to protect the Region's water quality have had a social impact in terms of increased levels of government involvement in water quality concerns. Implementation of the regulations for nonpoint source controls only where necessary to meet a specific water quality goal has limited this involvement. Adoption of local regulations (as opposed to state regulation) integrated into local development review has placed responsibility closest to those impacted by the increased level of regulation.

### 6.2.3 Future Plan Recommendations

The continued implementation of this Plan will continue to have both positive and negative social and economic impacts as previously described.

Impacts due to recommended point source controls would be reduced to only those impacts associated with continued operation and maintenance of advanced wastewater treatment systems. This will reduce the continuing economic effect of higher user charges over time for those communities that have already made significant capital expenditures to provide for higher treatment levels. If expansion is necessary to accommodate growth, then both capital and operation expenses will be necessary to maintain the higher levels of treatment recommended in this Plan.

New major expansions of water development projects will be subject to financial impacts for impact mitigation similar to those described for the Windy Gap and Wolford Mountain Projects. The specifics of required mitigation under locally implemented regulations will be dependent upon the review of the impacts of water quality resulting from the construction and operation of the project. It is therefore not possible to estimate the future costs to project proponents without a detailed review of the proposed project.

## 7.0 PLAN IMPLEMENTATION

The Critical Implementation Strategy is a four-pronged approach that consists of the following:

- Public education;
- Local implementation of the policy recommendations;
- Consistent enforcement of local regulations;
- Initiation of recommended watershed improvement projects.

In order for the implementation of this plan to be effective and efficient, communication between the various management agencies needs to be facilitated. There are a number of efforts that NWCCOG is involved with that are moving in this direction. These include watershed water quality groups and the NWCCOG Water Quality/Quantity Committee. These are further discussed below.

The NWCCOG is continuing to assist in the formation, facilitation and technical assistance to local watershed water quality groups. Three groups have been formally established: the Summit Water Quality Committee (which has been established for over 25 years); the East Grand Water Quality Board, the Roaring Fork Conservancy, and the Eagle River Watershed Council.

The NWCCOG Quality/Quantity Committee, which used to be composed mainly of NWCCOG general purpose governmental entities, in 1995 formally requested participation by all the water and sanitation districts. In 2011 the Quality/Quantity Committee had 19 water and/or sanitation district members. The addition of water and sanitation districts represents a significant move forward in improving communication and participation in water quality planning and management. In this forum, management agencies responsible for both point source and nonpoint source water quality management can share concerns, ideas and direction for water quality protection and improvement.

Inherent in all of these efforts is the acknowledgement that there is a need to increase the awareness of individuals on water quality issues. This educational outreach needs to include the identification of issues, potential solutions, costs associated with solutions, and costs of inaction. Some of this information is currently available; some still needs to be developed. Through the management agencies and watershed groups, local needs and solutions will be further refined.

Through the efforts outlined above, it is expected that the four-pronged approach will result in successful implementation of this Regional Water Quality Management Plan.