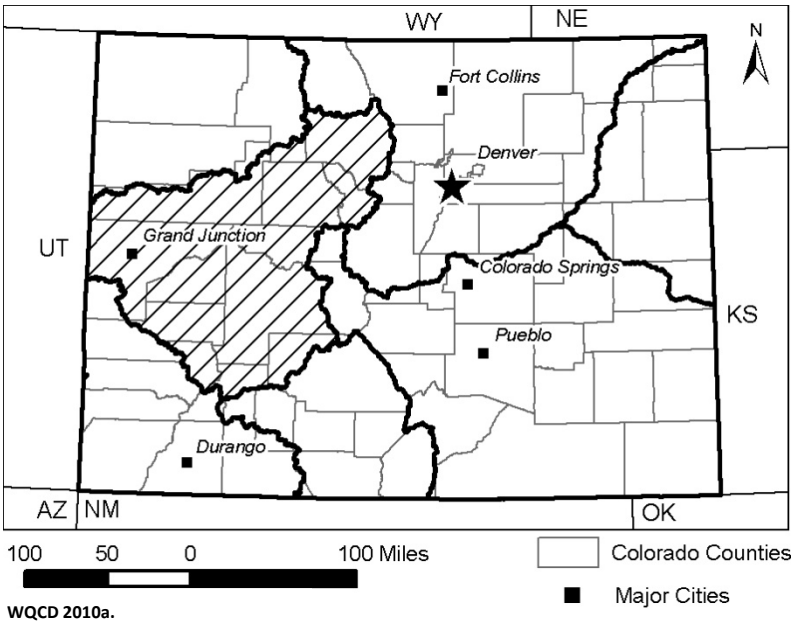
Chapter 7
Colorado River Basin Plan
(Regulations 33, 35, and 37)

Exhibit 7-1. Colorado River Basin Physical Location



WQCD 2010a.

Exhibit 7-2. Colorado River Basin Summary Statistics

Ecoregions (Level IV):[1]	20. Colorado Plateaus (b-c, e) 21. Southern Rockies (a-i)	**Surface Area:**[2] **Stream Length:**[3]	17,830 square miles 24,708 miles
Threatened and Endangered Species (federal and state):[2]	Threatened: 9 Endangered: 14 State Species of Concern: 21	**Major Land Cover:**[2]	Forest and Shrubland
Counties:	Delta , Eagle, Garfield, Grand, Gunnison, Hinsdale (portion), Mesa (portion), Montrose (portion), Ouray, Pitkin, Routt (portion), Saguache (portion), Summit (portion)	**No. of Assessed Lakes/Reservoirs:**[4, 5] **Corresponding Acres:**	33 49,006
Population:[6]	380,689	**No. of Groundwater Aquifers:**[2]	5
Major Population Centers:[2]	Grand Junction, Glenwood Springs, Montrose, and Gunnison	**Approximate No. of Publicly Owned Treatment Works:**[7]	130
Water Quality Planning Regions (in total or in part):[8]	10, 11, and 12	**Known Primary Water Quality Stressors:**[4]	Cadmium, copper, dissolved oxygen, *Escherichia coli*, iron, lead, manganese, mercury, pH, sediment, selenium, temperature, and zinc

[1] See appendix B for a description of key ecoregional characteristics.
[2] CWCB 2004.
[3] WQCD 2002.
[4] WQCC 2010d; WQCD 2010a.
[5] The number of lakes/reservoirs and the corresponding acres only include the lakes that have been assessed by the Water Quality Control Division and do not reflect all of the lakes/reservoirs present in the basin.
[6] CWCB 2010.
[7] USEPA 2010a, 2010c; WQCD 2010b.
[8] See exhibit 2-2 in chapter 2 for the names of the Water Quality Planning Regions and counties covered.

This basin chapter and the SWQMP as a whole are primarily water quality documents. They are based on readily available, peer reviewed water quality information, particularly the 2010 Integrated Water Quality Monitoring and Assessment Report (2010 Integrated Report or Clean Water Act (CWA) section 305(b) report).[1] *Both the Water Quality Control Commission (WQCC) and the Water Quality Control Division (WQCD) are aware of many other water quality data sources. Organizations and other parties with water quality data are encouraged to get involved in "calls for data" for the biennially completed CWA section 305(b) reports. The data sources that are used in forthcoming CWA section 305(b) reports will subsequently be used in future iterations of the SWQMP. Other key water quality regulations and policies used in the chapter are tabulated in Appendix A.*

7.1 System Description

7.1.1 Location and Physical Setting

The Colorado River Basin encompasses approximately 17,830 square miles and includes drainages for the Colorado and the Gunnison Rivers. The Colorado River's headwaters are within the Rocky Mountain National Park, and from there the river flows southwest for approximately 230 miles through Grand, Eagle, Garfield, and Mesa Counties before exiting the state into Utah. Major tributaries to the Colorado River include the Fraser, Blue, Eagle, and Roaring Fork Rivers. The Gunnison River originates at Almont, Colorado, at the confluence of the Taylor and East Rivers. It then flows past the city of Gunnison and passes through three reservoirs—Blue Mesa, Morrow Point, and Crystal Reservoirs. The Gunnison River then meets the North Fork of the Gunnison River west of the town of Hotchkiss. The Uncompahgre River is a major tributary to the Gunnison River; it joins the Gunnison near the town of Delta (CWCB 2004).

Elevations in the Colorado River Basin range dramatically from 13,000 feet at the headwaters to approximately 4,300 feet where the Colorado River exits the state. The Gunnison River alone has elevation changes greater than 9,500 feet from the headwaters to the Uncompahgre Plateau in the southwest portion of the basin (CWCB 2006a, 2006b). A map of the basin showing the Colorado River and the Gunnison River and their major tributaries is provided as exhibit 7-3 (at end of chapter).

7.1.2 Ecology

The boundaries of the Colorado River Basin fall within two distinct level III ecoregions (Chapman et al. 2006). Approximately 71% of the basin falls within the Southern Rockies Ecoregion, and the remainder falls within the Colorado Plateaus Ecoregion (exhibit 7-4 at end of chapter). Key characteristics of these and the more specific level IV ecoregions, such as physical characteristics, elevation, land cover, climate, geology, and soil types, are provided in appendix B.

[1] The Integrated Reports are prepared by the WQCD on a biennial basis and are approved by the WQCC as Regulation No. 93: *Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List,* 5 CCR 1002-93 (WQCC 2010d; WQCD 2010a).

The Colorado River Basin contains several endangered and threatened species and several species of state concern, as summarized in exhibit 7-5 (at end of chapter). There are 14 federally and/or state-listed endangered species (four fish, three bird, four mammalian, and three plant species) and nine federally and/or state-listed threatened species (two fish, three birds, two mammalian, and two plant species). An additional plant species is a federal candidate for listing. Finally, Colorado has 21 species of concern in the Colorado River Basin (five fish, two amphibians, two reptiles, nine birds, and three mammalian species) (CDOW 2010; CWCB 2004).

Exhibit 7-6 (at end of chapter) shows the locations of environmental and recreational uses (i.e., nonconsumptive uses) in the Colorado River Basin.[2] The use categories include environmental focus areas, environmental and recreational focus areas, and recreational focus areas (CWCB 2009a). The nonconsumptive uses shown are only meant to provide information on environmental and recreational uses in the basin and not to dictate future actions or impact any water rights (CWCB 2009a).

The Colorado Division of Wildlife (CDOW) has designated the Blue River from Dillon Reservoir Dam to the Colorado River, Gore Creek from Red Sandstone Creek to Eagle River, Colorado River from Windy Gap to Toublesome Creek, Fryingpan River from Ruedi Reservoir Dam to Roaring Fork River, Roaring Fork River from the Crystal River to the Colorado River, and Gunnison River from Black Canyon to the North Fork of the Gunnison River as gold medal fisheries and considers them areas of high recreational value. In addition, the 15-Mile Reach, the stretch of the Colorado River from the Grand Valley Diversion Dam to the Gunnison River, is an area of environmental concern because of its valuable habitat for endangered and threatened fish species (CWCB 2004).

7.1.3 Climate

Because of the diverse terrain and changes in altitude, the climate in the Colorado River Basin varies dramatically from alpine conditions in the east to semiarid in the west. In addition, due to the topography of the basin, winters are often extremely cold and summers can be extremely warm. Likewise, precipitation varies drastically from 10 inches in the valleys to 40 to 45 inches in the high mountains. Exhibit 7-7 (at end of chapter) shows a contour (isohyetal) plot of the average annual precipitation throughout the basin (CWCB 2004).

7.1.4 Land Ownership and Land Cover/Use

[2] In 2005, the Colorado legislature established the Water for the 21st Century Act, which established an Interbasin Compact Process that provides a permanent forum for broad-based water discussions in the state. The law created two new structures: the Interbasin Compact Committee (IBCC) and the Basin Roundtables. As part of the IBCC, the Basin Roundtables are required to complete basin-wide needs assessments; an assessment of consumptive water needs and an assessment of nonconsumptive water needs. In 2009, the Colorado Water Conservation Board released a draft report entitled, *Nonconsumptive Needs Assessment Focus Mapping.* The focus mapping described in the report is part of the Basin Roundtables' assessment of nonconsumptive water needs.

The federal government owns 73% of the land in the Colorado River Basin. Twenty-six percent of the remaining land is privately owned, and 1% is owned by the state of Colorado. Exhibit 7-8 (at end of chapter) provides a map of land ownership by basin.

Land cover in the Colorado River Basin is shown in exhibit 7-9 (at end of chapter) and summarized in exhibit 7-10. Forest and shrubland are the predominant land cover types in the basin, covering approximately 55% and 21% of the basin, respectively. Rangeland and forests are the predominate feature in the upper parts of the Colorado Basin, while planted and cultivated areas are concentrated in the Uncompahgre Valley. Large areas throughout the basin remain forested (CWCB 2004).

Exhibit 7-10. Colorado River Basin Land Cover Data[1]

Land Cover	Basin-wide		Statewide	
	Area (sq. miles)	Percent of Total	Area (sq. miles)	Percent of Total
Grassland	2,935	16.4%	41,051	39.5%
Forest	9,781	54.8%	29,577	28.4%
Shrubland	3,701	20.7%	16,883	16.2%
Planted/cultivated	765	4.3%	13,737	13.2%
Barren	447	2.5%	1,219	1.2%
Wetland	2	0.01%	80	0.08%
Open water	151	0.8%	590	0.6%
Developed	69	0.4%	923	0.9%
TOTAL	**17,851**		**104,067**	

[1] The CWCB Colorado River Basin boundaries are different from the SWQMP Colorado River Basin boundaries. Land cover data for the SWQMP Colorado River Basin was estimated by summing the CWCB Colorado River Basin data and the CWCB Gunnison River Basin data.

Source: CWCB 2004.

7.1.5 Demographic and Socioeconomic Conditions

Population growth has exploded in the urban areas of the Colorado River Basin over the past several years, primarily in Grand Junction and Glenwood Springs, which are the two most populous cities in the basin. The population in the Colorado River Basin is projected to increase by about 148 percent between 2009 and 2050 under medium economic development assumptions, from 380,689 to 945,400. Mesa County is projected to account for much of the population growth in the basin; population will remain relatively flat in Montrose, Gunnison, Delta, and Pitkin Counties during the same period. Exhibit 7-11 (at end of chapter) shows the population projections for the Colorado River Basin.

As shown in exhibit 7-12, tourism jobs constituted the largest portion of basic sector employment in 2007, followed by regional and national service jobs and household basic jobs. Household basic jobs are expected to grow at the fastest rate of any sector between 2007 and 2050, but tourism is expected to remain the basin's largest base of employment. Mining is the only sector in the basin that is expected to experience a decrease in employment by 2050 (CWCB 2010).

Exhibit 7-12. Colorado River Basin[1] 2050 Employment Projections, Medium Growth Scenario

Sector	2007	2050
Agribusiness Jobs	9,500	13,800

Sector	2007	2050
% of Total Jobs	3.7%	2.5%
Total % Growth	NA	45.3%
Mining Jobs	7,000	3,500
% of Total Jobs	2.7%	0.6%
Total % Growth	NA	-50.0%
Manufacturing Jobs	4,700	6,100
% of Total Jobs	1.8%	1.1%
Total % Growth	NA	29.8%
Government Jobs	11,100	15,300
% of Total Jobs	4.3%	2.8%
Total % Growth	NA	37.8%
Regional/National Service Jobs	31,300	63,200
% of Total Jobs	12.0%	11.5%
Total % Growth	NA	101.9%
Tourism Jobs	58,200	119,700
% of Total Jobs	22.4%	21.9%
Total % Growth	NA	105.7%
Household Basic Jobs	30,000	100,100
% of Total Jobs	11.5%	18.3%
Total % Growth	NA	233.7%
Total Basic Jobs	151,800	321,900
% of Total Jobs	58.4%	58.8%
Total % Growth	NA	112.1%
Resident Service Jobs	108,300	225,500
% of Total Jobs	41.6%	41.2%
Total % Growth	NA	108.2%
Total Jobs	260,100	547,400
% of Total Jobs	100.00%	100.00%
Total % Growth	NA	110.5%

[1] The CWCB Colorado River Basin boundaries are different from the SWQMP Colorado River Basin boundaries. Employment data for the SWQMP Colorado River Basin was estimated by summing the CWCB Colorado River Basin projections and the CWCB Gunnison River Basin projections.

Source: CWCB 2010.

7.1.6 Water Withdrawals

Water quantity and quality issues are intertwined, particularly in arid western states where water can be scarce (CFWE 2003). Water quantity issues tend to be more contentious than quality issues. Water rights are protected under Colorado's constitution and several state statutes, including the Colorado Water Quality Control Act. Colorado water law establishes water use rights for a variety of purposes including farming, drinking, manufacturing, recreation, protection of the environment, and all of the use categories listed in exhibit 7-13 below (CFWE 2003). Public and private entities involved in watershed protection in Colorado have grown to appreciate that the two worlds of water quality and quantity are inexplicably linked and are working together more frequently to combat water quality/quantity problems.

In 2005, the U.S. Geological Survey (USGS), in cooperation with the Colorado Water Conservation Board (CWCB), estimated total surface water and groundwater use in the Colorado

River Basin to be approximately 3,536.33 million gallons per day (Mgal/d). Use was estimated for the following categories: irrigation for crops, irrigation for golf courses, public supply, domestic, industrial, livestock, mining, and thermoelectric.[3] Exhibit 7-13 shows the total water withdrawals in the basin and the state as a whole for these categories. The predominant uses of water in the basin were for agriculture at 3,409.68 Mgal/d (96%), followed by public supply at 66.74 Mgal/d (2%) and thermoelectric at 38.78 Mgal/d (1%).

Exhibit 7-13. Colorado River Basin Total Water Withdrawals[1] in Colorado, 2005

Use Category	Withdrawals by Use Category		
	Withdrawals (Mgal/d) (percent of total basin withdrawals)	Total Withdrawals All of Colorado (Mgal/d)	Withdrawals in Colorado River Basin as Percent of Total Withdrawals in State
Agriculture (crop irrigation & livestock)	3,409.68 (96.42%)	12,354.91	27.60%
Irrigation (golf course)	9.85 (0.28%)	40.64	24.24%
Public Supply[2]	66.74 (1.89%)	864.17	7.72%
Domestic[3]	4.27 (0.12%)	34.43	12.41%
Industrial	5.13 (0.15%)	142.44	3.60%
Mining	1.87 (0.05%)	21.42	8.71%
Thermoelectric	38.78 (1.10%)	123.21	31.48%
Totals	**3,536.33** *(or 3,964.22 thousand acre-feet per year)*	**13,581.22** *(or 15,224.55 thousand acre-feet per year)*	**26.04%**

[1] The CWCB Colorado River Basin boundaries are different from the SWQMP Colorado River Basin boundaries. Water withdrawal data for the SWQMP Colorado River Basin was estimated by summing the CWCB Colorado River Basin data and the CWCB Gunnison River Basin data.

[2] The term "public supply" is water supplied by a publicly or privately owned water system for public distribution, sometimes also known as a "municipal-supply system" or "community water system" (CWS). Any water system that serves drinking water to at least 25 people for at least 60 days of the calendar year or has at least 15 service connections is considered a public supply system. In addition to providing water to domestic customers, CWSs also deliver water to commercial, industrial, and thermoelectric power users (USGS 2010).

[3] The term "domestic" refers to water used for household purposes, such as washing clothes, cleaning dishes, drinking, food preparation, bathing, flushing toilets, and watering lawns and gardens that are not served by public-supply systems (USGS 2010).

Source: USGS 2010.

The CWCB recently completed a projection of municipal and industrial (M&I) surface water use needs to the year 2050 for the state.[4] The projections will provide relevant parties in the state

[3] The term "public supply" refers to "community water systems" as that term is defined under the federal Safe Drinking Water Act. Community water systems (CWSs) are any water system that serves drinking water to at least 25 people for at least 60 days of the calendar year or has at least 15 service connections. In addition to providing water to domestic customers, CWSs also deliver water to commercial, industrial, and thermoelectric power users. The term "domestic" refers to the portion of the population not served by a "public supply" (USGS 2010).

[4] In 2003, the Colorado General Assembly authorized the CWCB to implement the Statewide Water Supply Initiative (SWSI), an 18-month basin-by-basin investigation of the state's existing and future water needs. As part of that effort, the CWCB assembled water users (farmers, ranchers, municipalities, industrial users, recreationalists, and environmentalists) to plan for the future. That effort resulted in the completion of the *Statewide Water Supply Initiative* Phase I Report in November 2004 and a Phase II report in November 2007. Both reports focus on all water uses, not just M&I. Since that time, the CWCB has undertaken another investigation to project M&I surface water use needs to the year 2050 for the state. The result of that investigation is reported in the document *State of Colorado 2050 Municipal and Industrial Water Use Projections*, dated July 2010. The report is part of the Basin

with a basis for discussing and addressing the state's future M&I water needs. In this report, the CWCB estimated M&I water demand in the Colorado River Basin to be at 79,297 acre-feet per year (AFY) (70.7 Mgal/day) in 2008 and at 184,495 AFY (164.6 Mgal/day) for 2050 under medium growth economic assumptions. The water demands are projected to be 171,395 AFY (153 Mgal/day), under medium growth assumptions, if passive conservation is employed (CWCB 2010). [5]

M&I water needs in the Colorado River Basin are expected to be nearly 1.3 times higher than 2008 levels by the year 2050. The counties with the highest forecasted M&I water demands in the Colorado River Basin are Mesa, Montrose, and Gunnison (CWCB 2010).

All of the self-supplied industrial (SSI) water needs in the Colorado River Basin are from snow-making industries and thermoelectric facilities in Grand, Summit, Eagle, Garfield, Mesa, Gunnison, Pitkin, and Montrose Counties. Snow making industry demands are expected to increase from 3,340 AFY in 2008 to 5,390 AFY in 2050 under medium growth economic assumptions for Grand, Summit, Eagle, Garfield, Mesa, Gunnison, and Pitkin Counties. Thermoelectric industry demands are expected to increase from 1,900 AFY in 2008 to 4,900 AFY in 2050 under medium economic assumptions for Pitkin County (CWCB 2010). [6]

7.1.7 Hydrography and Hydrology

7.1.7.1 Surface Geology

The underlying bedrock in the Colorado River Basin consists predominately of crystalline and sedimentary rocks. The mountain ranges are mostly composed of Precambrian metamorphic rocks that have been uplifted with the exception of the West Elk and Elk Mountains. The West Elks were formed by uplifting caused by igneous intrusions, and the Elk Mountains were formed by folding and nearly horizontal faulted sedimentary rocks. In the western portion of the basin, sedimentary beds that are several thousand feet thick overlie Precambrian rocks. Alluvium, consisting of stream, landslide, terrace, and glacial deposits, is present throughout the valleys (CWCB 2004). It should also be noted that soils derived from the various shallow geologies and deposited materials are a prime consideration in water quality planning.[7]

7.1.7.2 Surface Water

Roundtables' assessment of consumptive water needs in the state as required by the Water for the 21st Century Act, which was passed by the Colorado legislature in 2005.

[5] Passive conservation accounts for the retrofits of existing housing and commercial construction with high-efficiency toilets, clothes washers, dishwashers, and the like as implementation of the baseline efficiency standards established under the 1992 National Energy Policy Act occurs (CWCB 2010).

[6] Actual surface water and groundwater withdrawals listed in exhibit 7-13 differ from the current and projected municipal and industrial (M&I) surface water use and self-supplied industrial (SSI) water needs. Source information is different for water withdrawal data and M&I and SSI data and should therefore not be directly compared.

[7] Soil variations occur on a local and regional scale and should be taken into consideration when addressing water quality problems. Information on soil conditions can be found through the Natural Resources Conservation Service (NRCS) Web Soil Survey at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm. The website can be used to access soil maps and soil descriptions, interpretations, and characteristics. The information can be used at a relatively broad scale as well as on a site-specific basis.

The Colorado River Basin has a greater combined flow than all the other river basins in Colorado. The Elk Mountain Range separates the Colorado River drainage from the Gunnison River drainage. The Colorado River and its tributaries drain approximately 9,830 square miles, and the Colorado River alone accounts for approximately 44% of the water leaving the state. The Gunnison River and its tributaries drain approximately 8,000 square miles (CWCB 2004, 2006b).

To monitor stream flow, numerous USGS stream flow gauges are maintained in the Colorado River Basin. Exhibit 7-14 summarizes the mean annual stream flow, period of record, and drainage area for 11 drainages, all of which the CWCB recently selected to summarize historical flows in the basin across a broad spatial scale. As indicated in the exhibit, mean annual flows are highest in the Colorado River near the Utah state line and in the Gunnison River near Grand Junction, Colorado. The locations of the selected gauges are shown in exhibit 7-15 (at end of chapter). Also shown in the latter exhibit are major surface water diversions and segments with decreased instream flow.

Exhibit 7-14. Colorado River Basin Summary of Selected USGS Stream Gauges

Site Name	USGS Site Number	Mean Annual Stream Flow (AFY)	Mean Annual Stream Flow (cfs)[1]	Period of Record (years)	Drainage (square miles)
Blue River below Green Mountain Reservoir	09057500	328,785	454	1942-2002	599
Eagle River below Gypsum	09070000	412,586	570	1946-2002	944
Roaring Fork at Glenwood Springs	09085000	877,836	1,213	1906-2002	1,451
Plateau Creek near Cameo	09105000	128,999	178	1936-2002	592
Colorado River near Kremmling	09058000	733,654	1,013	1962-2002	2,382
Colorado River near State Line	09163500	4,555,526	6,292	1913-2002	17,843
Taylor River at Almont	09110000	236,409	327	1910-2002	477
Gunnison River near Gunnison	09114500	523,465	723	1910-2002	1,012
Tomichi Creek at Gunnison	09119000	124,055	171	1937-2002	1,061
Uncompahgre River at Delta	09149500	218,442	302	1938-2002	1,115
Gunnison River near Grand Junction	09152500	1,783,759	2,464	1896-2002	7,928

[1] cfs = cubic feet per second.
Source: CWCB 2004.

In addition, it should be noted that mountain snowpack can have significant impacts and can cause variations in surface water quality and quantity on an annual basis. The Natural Resources Conservation Service (NRCS) Snow Survey Program provides mountain snowpack data and streamflow forecasts for the western United States. Common applications of snow survey data include water supply management, flood control, climate modeling, recreation, and conservation planning. Additional information on the NRCS snow survey program can be found at http://www.co.nrcs.usda.gov/snow/.

7.1.7.3 Groundwater

Groundwater in the Colorado River Basin is predominately located within the Alluvial and Bedrock aquifers. Exhibit 7-16 (at end of chapter) shows these two aquifers and the location of

wells in the Colorado River Basin with a permitted or decreed yield of 500 gallons per minute (gpm) or higher (CGS 2003).

Saturated alluvial deposits form the most productive aquifers. Yields range from 1 to 750 gpm but more commonly average 20 to 40 gpm. The largest number of wells is in the Alluvial aquifer. The saturated thickness of the alluvium in the basin is represented by the interval from the water table to the underlying bedrock. As a result, canyon sections of the Colorado River where bedrock is exposed alluvium have a limited saturated thickness. Saturated alluvial thickness averages 21 feet in the spring and 15 feet in the fall (CWCB 2004). Private wells are used throughout the basin for domestic and agricultural uses. As noted previously, as population has increased in some areas, so too has the number of on-site septic systems.

7.2 Water Quality Classifications and Standards

7.2.1 Sub-Basin Boundaries

As discussed in chapter 3, "Current Statewide Water Quality," Colorado's seven major drainage basins have been subdivided into sub-basins as a means to present data at somewhat smaller scales throughout this document. The sub-basins are aggregations of the various stream segments on which the WQCD provides assessment data in its biennial 2010 *Integrated Water Quality Monitoring and Assessment Report* (2010 Integrated Report) developed by the WQCD and approved by WQCC. For the purposes of this report, the Colorado River Basin has been subdivided into four sub-basins:[8]

- **Upper Colorado:** The Upper Colorado River Sub-basin is composed of segments of the Colorado River mainstem and tributaries from the headwaters to its confluence with the Roaring Fork River, as shown in exhibit 7-17 (at end of chapter). The tributary drainage areas of the Colorado River included within this sub-basin, are quite large and include Blue River, Eagle River, and Roaring Fork.
- **Lower Colorado:** The Lower Colorado River Sub-basin is composed of segments from the confluence of the Colorado River with the Roaring Fork River to the Colorado/Utah state line, as shown in exhibit 7-18 (at end of chapter).
- **Upper Gunnison:** The Upper Gunnison River Sub-basin is composed of segments of the Gunnison River mainstem and tributaries from the headwaters to the inlet of Blue Mesa Reservoir, as shown in exhibit 7-19 (at end of chapter).
- **Lower Gunnison:** The Lower Gunnison River Sub-basin is composed of segments of the Gunnison River mainstem and tributaries from the inlet of Blue Mesa Reservoir to its confluence with the Colorado River, as shown in exhibit 7-20 (at end of chapter). The tributary drainage areas of the Colorado River included within this sub-basin, are include the North Fork of the Gunnison River and the Uncompahgre River.

[8] The WQCD identifies different sub-basins in its biennial Integrated Water Quality Reports than those provided in this document. The SWQMP aggregates water quality segments into larger sub-basins than those in the Integrated Reports simply because the resources available for this first iteration of the SWQMP did not allow for analyzing the data at finer scales.

7.2.2 Surface Water

7.2.2.1 Use Classifications

The Colorado River Basin contains a total of 196 stream segments covering approximately 18,642.85 stream miles (exhibits 7-17 through 7-20 at end of chapter). The WQCC has specified the classified uses for each of these segments in Regulation No. 33: *Classifications and Numeric Standards for the Upper Colorado River Basin and North Platte (Planning Region 12)* (5 CCR 1002-33), Regulation No. 35: *Classifications and Numeric Standards for the Gunnison and Lower Dolores River Basins* (5 CCR 1002-35), and Regulation No. 37: *Classifications and Numeric Standards for the Lower Colorado River Basin* (5 CCR 1002-37) (WQCC 2010a, 2010b, 2010c; WQCD 2010a). These uses are summarized in exhibits 7-21 through 7-25 (at end of chapter). Agriculture and water supply are the predominant uses associated with waterbody segments in the Colorado River Basin at 99% and 76%, respectively. Aquatic life cold water 1 and existing recreation uses follow closely at 72% and 66%, respectively. Considerably fewer segments are classified as not suitable for recreation (17%), aquatic life cold water 2 (14%), potential recreation (13%), aquatic life warm water 2 (9%), undetermined recreation (6%), and aquatic life warm water 1 (5%). The stream miles associated with these uses are shown in exhibit 7-26.

Exhibit 7-26. Number of Streams and Stream Miles by Classified Use

Classified Uses	No. Streams	Stream Miles	Percent of Total Stream Miles (n=18,642.85 miles)
Agriculture	194	18,633.31	99.9%
Water Supply	149	15,314.17	82%
Aquatic Life Cold 1	142	13,197.02	71%
Existing Recreational Uses[1]	130	10,973.95	59%
Aquatic Life Warm 2	17	3,999.83	21%
Not Suitable for Recreation[1]	33	3,249.38	17%
Potential Recreational Uses[1]	26	2,635.62	14%
Undetermined Recreational Uses[1]	11	2,073.20	11%
Aquatic Life Cold 2	27	1,073.88	6%
Aquatic Life Warm 1	9	366.40	2%
Total Streams	**196**	**18,642.85**	--

[1] Some segments in this basin have different recreational uses depending on the time of year (existing, not suitable, potential, and undetermined). This exhibit reflects all of the classified uses for all segments in the basin even if some are only applicable at certain times of the year.

Sources: WQCC 2010a, 2010b, 2010c; WQCD 2010a.

In its latest assessment cycle, WQCD presented information for 33 lakes in the Colorado River Basin, covering approximately 49,006 acres.[9] Exhibit 7-27 shows the classified uses for each of these lakes/reservoirs and the corresponding lake acres.

[9] Lakes are presented in WQCC's surface water quality classifications and standards regulations in several ways. A lake may be present alone as its own segment, as a combination of several lakes grouped into a segment, or as part of a segment that includes streams, lakes, and wetlands. The WQCD presented only those lakes/reservoirs it assessed during its latest monitoring cycle in appendix B of the 2010 Integrated Report. The entire universe of lakes/reservoirs in the state is not explicitly denoted in the WQCC regulations, nor are the lakes/reservoirs fully

Exhibit 7-27. Number of Lakes/Reservoirs and Corresponding Acres by Classified Use

Classified Uses	Number of Lakes	Lake Acres	Percent of Total Lake Acres (n=49,005.50 acres)
Agriculture	32	48,842.30	99.7%
Existing Recreational Uses[1]	27	47,864.70	98%
Aquatic Life Cold 1	25	46,961.60	96%
Water Supply	25	46,388.80	95%
Aquatic Life Warm 1	3	1,143.00	2%
Aquatic Life Warm 2	5	900.90	2%
Undetermined Recreational Uses[1]	2	585.00	1%
Potential Recreational Uses[1]	2	339.80	1%
Not Suitable for Recreation[1]	3	317.90	1%
Aquatic Life Cold 2	0	0	0%
Total Lakes:	**33**	**49,005.50**	--

[1] Some segments in this basin have different recreational uses depending on the time of year (existing, not suitable, potential, and undetermined). This exhibit reflects all of the classified uses for all segments in the basin even if some are only applicable at certain times of the year.

Sources: WQCC 2010a, 2010b, 2010c; WQCD 2010a.

7.2.2.2 Designations

As further shown in exhibits 7-21 through 7-25 (at end of chapter), the WQCC has designated a total of 20 waterbody segments as *Outstanding Waters*. The WQCC has designated a total of 22 waterbody segments as *Use Protected*. The meaning of these two designations is provided in section 2.2.3.1 of chapter 2, "Water Quality Planning and Management in Colorado."

7.2.2.3 Standards

Numeric standards for the Colorado River Basin are provided in the "Stream Classifications and Water Quality Standards" tables attached to Regulation Nos. 33, 35, and 37. Because new standards are often developed and existing standards are periodically revised, the standards are not summarized here. Readers should consult the actual regulations for specific details; they are available at http://www.cdphe.state.co.us/regulations/wqccregs.

denoted in WQCD's biennial Integrated Reports. Each biennial cycle, the WQCD assesses and presents information for only a subset of lakes/reservoirs in the state.

7.2.3 Lakes

7.2.3.1 Trophic Status

From July 2007 to July 2009, the WQCD monitored a total of 50 lakes and reservoirs across the state to evaluate their trophic status and to assess whether they were attaining their respective water quality standards. Of the 50 lakes and reservoirs assessed, 14 are in the Colorado River Basin (three in the Upper Colorado, four in the Lower Colorado, one in the Upper Gunnison, and six in the Lower Gunnison). During the period from 1997 to 2006, however, the Division monitored other sets of lakes and reservoirs across the state to assess their trophic status and determine whether water quality standards were being met. Of the total lakes and reservoirs assessed during the period, five are in the Colorado River Basin (one in the Upper Colorado, three in the Upper Gunnison, and one in the Lower Gunnison). (See exhibits 7-28 through 7-31.)

The *trophic state* is a means of classifying lakes on the basis of their level of biological productivity (especially algae) and nutrient status. Commonly used indicators of nutrient status and productivity include the amount of algae as measured by chlorophyll *a*, water transparency as measured by Secchi disk depth, and in-lake epilimnetic total phosphorus concentration. The WQCD broadly defines the various trophic states for the purposes of its analyses as follows:

- **Oligotrophic.** Lakes with few available nutrients and a low level of biological productivity. They are characterized by clear water, and they often support cold-water fish species.
- **Mesotrophic.** Lakes with moderate nutrient levels and biological productivity between oligotrophic and eutrophic. These lakes usually support warm-water fish species.
- **Eutrophic.** Lakes with high nutrient levels and a high level of productivity. These lakes typically support only warm-water fish species.
- **Hypereutrophic.** Lakes in an advanced eutrophic state.

Exhibit 7-28. Upper Colorado River Sub-Basin Trophic Status of Lakes and Reservoirs as Measured by WQCD During the Period 1999 to 2008

Lake	Williams Fork Reservoir	Willow Creek Reservoir	Ruedi Reservoir	Grand Lake
Segment ID No.	COUCUC08	COUCUC05	COUCRF06	COUCUC12
Elevation (feet)	7,811	8,130	7766	8367
Surface Acres	1,810	1,530	997	507
Chlorophyll *a* (µg/L)	1.20	0.84	1.63	3.7
Chlorophyll Trophic Status Index [1]	32	29	35	43
Secchi Depth (meters)	3.93	3.30	2.32	3.46
Estimated Trophic Status	Oligotrophic	Oligotrophic	Oligotrophic	Mesotrophic
Year Monitored	2007	2008	2007	1999

[1] Chlorophyll Trophic Status Index (TSI) quantifies the relationship between lake clarity measured in terms of Secchi disk transparency and algal biomass measured in terms of chlorophyll a. Lakes with the following TSI values are estimated to have the following trophic status: TSI 0-40, Oligotrophic; TSI 41-50, Mesotrophic; TSI 51-70, Eutrophic; and TSI greater than 70, Hypereutrophic.

Sources: WQCD 2002, 2010a.

Exhibit 7-29. Lower Colorado River Sub-Basin Trophic Status of Lakes and Reservoirs as Measured by WQCD During the Period 2007 to 2008

Lake	Harvey Gap Reservoir	Highline Lake	Rifle Gap Reservoir	Vega Reservoir
Segment ID No.	COLCLC09b	COLCLC19	COLCLC09b	COLCLC15
Elevation (feet)	6405	4700	5960	7984
Surface Acres	160	174	400	900
Chlorophyll *a* (µg/L)	0.52	4.17	1.35	5.60
Chlorophyll Trophic Status Index[1]	24	45	34	47
Secchi Depth (meters)	4.00	1.07	3.40	3.23
Estimated Trophic Status	Oligotrophic	Mesotrophic	Oligotrophic	Mesotrophic
Year Monitored	2008	2007	2007	2007

[1] Chlorophyll TSI quantifies the relationship between lake clarity measured in terms of Secchi disk transparency and algal biomass measured in terms of chlorophyll a. Lakes with the following TSI values are estimated to have the following trophic status: TSI 0-40, Oligotrophic; TSI 41-50, Mesotrophic; TSI 51-70, Eutrophic; and TSI greater than 70, Hypereutrophic.

Sources: WQCD 2010a.

Exhibit 7-30. Upper Gunnison River Sub-Basin, Trophic Status of Lakes and Reservoirs as Measured by WQCD During the Period 1997 to 2007

Lake	Taylor Park Reservoir	Blue Mesa Reservoir	Crystal Reservoir	Morrow Point Reservoir
Segment ID No.	COGUUG04	COGUUG25	COGUUG25	COGUUG25
Elevation (feet)	9330	NA	NA	NA
Surface Acres	2000	NA	NA	NA
Chlorophyll *a* (µg/L)	5.83	4.4	2.7	2.4
Chlorophyll Trophic Status Index[1]	48	45	40	39
Secchi Depth (meters)	6.07	3.6	NA	5.2
Estimated Trophic Status	Mesotrophic	Mesotrophic/ Eutrophic	Mesotrophic	Oligotrophic/ Mesotrophic
Year Monitored	2007	1997–2000	1997–2000	1997–2000

[1] Chlorophyll TSI quantifies the relationship between lake clarity measured in terms of Secchi disk transparency and algal biomass measured in terms of chlorophyll a. Lakes with the following TSI values are estimated to have the following trophic status: TSI 0-40, Oligotrophic; TSI 41-50, Mesotrophic; TSI 51-70, Eutrophic; and TSI greater than 70, Hypereutrophic.

Sources: WQCD 2002, 2010a.

Exhibit 7-31. Lower Gunnison River Sub-Basin, Trophic Status of Lakes and Reservoirs as Measured by WQCD During the Period 1997 to 2008

Lake	Crawford Reservoir	Eggleston Reservoir	Island Lake	Paonia Reservoir	Ridgeway Reservoir	Sweitzer Lake	Fruitgrowers Reservoir
Segment ID No.	COGULG13	COGUNF04	COGUNF04	COGUNF07	COGUUN03	COGUUN14	COGULG13
Elevation (feet)	6558	10129	10228	6455	6851	5126	5493
Surface Acres	394	164	175	350	1000	137	476
Chlorophyll *a* (µg/L)	1.99	1.46	1.40	0.45	2.03	2.47	202
Chlorophyll Trophic Status Index[1]	37	34	34	28	38	39	83
Secchi Depth (meters)	4.15	3.40	5.80	2.40	3.10	1.50	0.67
Estimated Trophic Status	Oligotrophic	Oligotrophic	Oligotrophic	Oligotrophic	Oligotrophic	Oligotrophic	Hypereutrophic
Year Monitored	2008	2008	2008	2008	2008	2008	1997–2000

[1] Chlorophyll TSI quantifies the relationship between lake clarity measured in terms of Secchi disk transparency and algal biomass measured in terms of chlorophyll a. Lakes with the following TSI values are estimated to have the following trophic status: TSI 0-40, Oligotrophic; TSI 41-50, Mesotrophic; TSI 51-70, Eutrophic; and TSI greater than 70, Hypereutrophic.

Sources: WQCD 2002, 2010a.

As presented in exhibits 7-28 through 7-31, 11 of the assessed lakes and reservoirs in the Colorado River Basin have been identified as oligotrophic, five as mesotrophic, one as mesotrophic/eutrophic, one as oligotrophic/mesotrophic, and another as hypereutrophic.

7.2.3.2 Fish Tissue Studies

As part of its overall monitoring efforts, the WQCD also investigates fish tissues for the presence of contaminants that can be harmful to humans if ingested. WQCD uses the monitoring data to issue fish consumption advisories (FCAs) to the public as warranted. During the period July 2007 to July 2009, WQCD evaluated fish tissues from more than 112 waterbodies. Of this number, four were assessed in the Colorado River Basin for mercury, selenium, and arsenic. Two FCAs were issued to Lake Granby and Juniata Reservoir as a result of this assessment effort. Exhibit 7-32 lists the lakes/reservoirs and fish species evaluated in the Colorado River Basin.

Exhibit 7-32. Colorado River Basin Lakes and Reservoirs Assessed for Mercury, Selenium, and Arsenic During the Period 2007 to 2009

Lake (Segment ID No.)	Species Tested
Crawford Reservoir (COGULG13)	Northern Pike, Yellow Perch, and White Crappie
Lake Granby (COUCUC12)	Lake Trout
Harvey Gap Reservoir (COLCLC20)	Black Crappie, Yellow Perch, Smallmouth Bass, Bluegill, Largemouth Bass, and Northern Pike
Juniata Reservoir (COGULG4b)	Smallmouth Bass

Sources: WQCD 2010a.

The WQCD chose to test for the presence of mercury, selenium, and arsenic in fish tissue because of the harmful human health effects that may occur if these parameters are ingested. In particular, mercury adversely affects wildlife and humans, especially children and women of childbearing age. It is also the leading cause of impairment in the nation's estuaries and lakes. Mercury was cited in nearly 80% of FCAs reported by the states in the 2000 National Listing of Fish and Wildlife Advisories. Although arsenic generally bio-accumulates in fish in its less toxic organic form, human exposure is still harmful. The U.S. Department of Health and Human Services (DHHS) has determined that arsenic is a known carcinogen, and human exposure can occur by ingesting water, soil, or air contaminated by the substance. Selenium is an essential dietary element that prevents damage to tissues by oxygen. When consumed in amounts higher than the recommended daily allowance, however, it is toxic to both humans and animals, and excessive ingestion or exposure should be minimized (WQCD 2005).

Any waterbody that is issued an FCA is listed on the state's CWA section 303(d) list of impaired waters with aquatic life impairment. Total maximum daily loads (TMDLs) must be completed for all impairments. Between 1993 and 2010, WQCD issued an FCA for mercury for three waterbodies during 2009 in the Colorado River Basin. An additional FCA was issued for selenium at an unknown time (exhibit 7-33).

Exhibit 7-33. Colorado River Basin Lakes and Reservoirs in Which a Fish Consumption Advisory (FCA) Has Been Issued

Lake (Segment ID Number)	Pollutant	Species Tested	Year FCA issued
Lake Granby (COCOUCUC12)	Mercury	Lake Trout	2009
Juniata Reservoir (COGULG4b)	Mercury	Smallmouth Bass	2009
Rifle Gap Reservoir (COLCLC20)	Mercury	Smallmouth Bass, Northern Pike, Walleye	2009
Sweitzer Lake (COGUUN14)	Selenium	All fish	Unknown

Sources: WQCC 2010d; WQCD N.d., 2009a, 2009b, 2009c, 2009d, 2010a.

7.2.4 Wetlands

A map of Colorado River Basin wetlands is included as exhibit 7-34 (at end of chapter). The wetlands are those included in the U.S. Fish and Wildlife Service's (USFWS's) National Wetlands Inventory, the database the USFWS uses to periodically report to Congress on the status and trends of the nation's wetlands. Colorado's Natural Heritage Program and other entities are involved in more fully identifying and characterizing Colorado's wetlands. This information will be added when completed to future iterations of the SWQMP.

At the state level, the Colorado River Basin lies within areas supported by CDOW's Five Rivers Focus Area Committee and Gunnison Focus Area Committee.[10] The CDOW has identified the following wetland types within the Colorado River Basin: submerged aquatic, emergent marsh, wet meadow, shrublands on floodplains, riparian forests, peatlands/fens, seeps and springs, and riverine wetlands. These wetlands types are generally distinguished by water table, vegetation, and soil types (Lower Colorado River Focus Area N.d.; Gunnison Wetland Focus Area Committee 2001).

Both the Five Rivers Focus Area Committee and the Gunnison Focus Area Committee have identified important wetland areas within their respective zones (i.e., those areas having multiple values: educational, recreational, and as migratory and wintering habitat for waterfowl). Exhibit 7-35 lists the identified areas and provides descriptions. In general, all the wetland areas have conservation goals aimed at protecting wetland habitat important to nesting, migration, and brood rearing for waterfowl, water birds, and wildlife species. Other conservation goals include recreational uses and open space protection (Lower Colorado River Focus Area N.d.; Gunnison Wetland Focus Area Committee 2001).

Exhibit 7-35. Wetlands of Importance to CDOW Five Rivers Focus Area and Gunnison Focus Area Committees

Wetland Area	Focus Area Committee	Description
Uncompahgre River Corridor	Five Rivers	Along the Uncompahgre River Corridor there are several ponds and habitat areas for west slope mallards to winter. In addition, Sweitzer Lake State Park and Confluence Park are included in this area and are considered important for recreational and educational potential.
Irrigation Reservoirs in Montrose, Delta, and Mesa counties	Five Rivers	Irrigation reservoirs in Montrose, Delta, and Mesa counties provide migration and wintering areas for waterfowl and other migratory and nesting birds. Fruitgrowers Reservoir is grouped in this area and qualifies as a Globally Important Bird Area in the American Bird Conservancy's United States Important Bird Areas. These reservoirs are also important for recreational purposes, including bird observation.
Colorado River Riparian Corridor	Five Rivers	The riparian corridor along the Colorado River is particularly important to wildlife and is used by wintering Canada geese on the Western Slope of Colorado.
Riparian Areas between the Gunnison River and Grand Mesa	Five Rivers	Many of the riparian areas between the Gunnison River and Grand Mesa are important habitat for rare wildlife like the blue heron and the southwestern flycatcher in addition to other waterfowl that use the areas.
Heron Rookery on the Smith Fork Salt Wash	Five Rivers	Areas around the heron rookery are considered important wetland areas because of their potential to be developed into wetland areas in order to enhance waterfowl habitat.
Riparian Areas along the North Fork of the Gunnison River	Five Rivers	The riparian areas along the North Fork of the Gunnison River from Paonia, Colorado, to Escalante Wildlife Area provide important habitat for waterfowl, including unique species like the yellow-billed cuckoo and willow flycatcher.

[10] CDOW created the Wetlands Wildlife Conservation Program (WWCP) to focus on preserving, restoring, enhancing, and creating wetlands throughout the state. This program focuses on (1) protecting the role of wetlands in Colorado as important feeding, breeding, migratory, and brooding habitat for water birds, and (2) providing recreational uses, such as hunting, fishing, and bird watching, through wetlands (CDOW 2008). The CDOW has created 11 focus area committees under the WWCP. The committees provide a mechanism through which conservationists can share information on local wetlands, discuss wetland needs, and generate ideas for wetland protection and restoration projects.

Wetland Area	Focus Area Committee	Description
Upper East River Valley	Gunnison River	The Upper East River Valley is an area of intense recreational use and development. As a result, several areas have been set aside for conservation easements and designated natural areas through the Crested Butte Land Trust and the Colorado Natural Areas Program. The Upper East Valley has numerous glacial valleys and terminal moraines that act to pond and slow the movement of water.
Tomichi Creek	Gunnison River	The lower stretches of the Tomichi Creek have formed a vast floodplain that has been ranched for over 100 years. Upland areas that have been irrigated can support numerous wetland plant species and provide habitat for wetland wildlife, including brood-rearing habitat for the Gunnison sage-grouse.
Cochetopa Creek	Gunnison River	Privately owned portions of the Cochetopa Creek have been cleared and irrigated for long periods. These human impacts have prevented the area from supporting a willow riparian habitat. However, other areas still support a willow riparian habitat and marshlands in addition to two reservoirs that provide habitat for waterfowl and fishing opportunities.
Ohio Creek	Gunnison River	The upper portions of Ohio Creek support willow riparian habitat and fens, while the lower portions support ranchlands. A wetland mitigation bank for the area has preserved approximately 300 acres of the floodplain from development.
Gunnison River	Gunnison River	Areas along the Gunnison River support a variety of wetland complexes–willow riparian areas, narrowleaf cottonwood galleries, and wide floodplains. Conservation efforts along the Gunnison River focus on open space, water purification, flood abatement, groundwater recharge, and wildlife habitat.

Sources: Lower Colorado River Focus Area N.d.; Gunnison Wetland Focus Area Committee 2001.

7.2.5 Groundwater

7.2.5.1 Interim Narrative Standard

The Interim Narrative Standard found in section 41.5(C)(6)(b)(i) of Regulation No. 41: *The Basic Standards for Groundwater* (5 CCR 1002-41) (WQCC 2009) is applicable to all groundwater for which WQCC has not already assigned standards, with the exception of those groundwaters where the total dissolved solids (TDS) are equal to or exceed 10,000 milligrams per liter (mg/L). The Interim Narrative Standard is independent of and in addition to the statewide groundwater standards for radioactive materials and organic pollutants.

Until such time as use classifications and numerical standards are adopted for groundwater on a site-specific basis, the following standards apply for each parameter at whichever of the following levels is the least restrictive:

- Existing ambient quality as of January 31, 1994, or
- That quality which meets the most stringent criteria set forth in Tables 1 through 4 of Regulation No. 41: *The Basic Standards for Groundwater*.

The four tables from Regulation No. 41: *The Basic Standards for Groundwater* can be viewed online at http://www.cdphe.state.co.us/regulations/wqccregs for the following classified uses: Table 1: Domestic Water Supply - Human Health Standards; Table 2: Domestic Water Supply - Drinking Water Standards; Table 3: Agricultural Standards; and Table 4: Total Dissolved Solids Water Quality Standards.

7.2.5.2 Site-Specific Classifications and Standards

The WQCC has established two site-specific groundwater classifications for the Colorado River Basin, as summarized in exhibit 7-36. Exhibits 7-37 through 7-40 (at end of chapter) illustrate the classified areas. [11] These exhibits are cross-referenced in exhibit 7-36 below.

Exhibit 7-36. Colorado River Basin Site-Specific Groundwater Classifications and Standards

Site	Specified Area[1, 2]	Classifications for Confined and Unconfined Groundwater	Are Groundwater Quality Standards in Tables 1–4 Applicable?[3]
Upper Colorado River Sub-Basin			
Vail Valley Consolidated Water District Wellfields, Eagle County	See exhibit 7-37	Domestic Use Quality and Agricultural Use Quality	Yes
Town of Carbondale Wellfield, Garfield County	See exhibit 7-38	Domestic Use Quality and Agricultural Use Quality	Yes
East Dillon Water District, Summit County	See exhibit 7-39	Domestic Use Quality and Agricultural Use Quality	Yes
Upper Gunnison River Sub-Basin			
City of Gunnison Wellfield, Gunnison County	See exhibit 7-40	Domestic Use Quality and Agricultural Use Quality	Yes

[1] Specified areas pertain to confined and unconfined groundwaters within the saturated zones.

[2] Maps displayed in these exhibits are pulled directly from Regulation No. 42: *Site-Specific Water Quality Classification and Standards for Ground Water* (WQCC 2006).

[3] The groundwater quality standards included in tables 1 to 4 of Regulation No. 41: *The Basic Standards for Groundwater* are assigned to all confined and unconfined groundwater in the specified area.

Source: WQCC 2006.

7.2.5.3 Groundwater Quality

Groundwater use by the counties encompassing the Colorado River Basin varies from less than 1% in Grand and Mesa counties to a maximum of 9% in Summit County (CGS 2003). Surface water is more commonly used for domestic water supplies. Because of the shallow well depths and water levels, alluvial groundwater is readily developed in rural areas for agricultural and domestic purposes (CGS 2003). Aquifers located within the Colorado River Basin, which are shown in Exhibit 7-16, are the following:

- Alluvial Aquifers
- Piceance Basin
- Eagle Basin
- Dakota-Cheyenne
- Middle Park Basin.

Alluvial Aquifers

The distribution of alluvial deposits in the Colorado River Basin varies greatly from one reach to the next. The alluvial deposits, as mapped by USGS geologic quadrangle maps, are primarily near the towns of Eagle and Gypsum; along the Roaring Fork River and Roan Creek; and from the town of Palisade to the Colorado-Utah state line. Alluvium is very limited or nonexistent in

[11] Maps displayed in these exhibits are pulled directly from Regulation No. 42: *Site-Specific Water Quality Classification and Standards for Ground Water* (WQCC 2006).

the canyon sections of the Colorado River where the bedrock is exposed (CGS 2003). The saturated thickness of the alluvium in the basin is represented by the interval from the water table to the underlying bedrock. Test holes in the alluvium of Roan and Parachute creeks penetrated 80 feet and 70 feet, respectively, of saturated permeable sand and gravel (Welder 1987 cited in CGS 2003). For the Fraser River, alluvial saturated thickness ranges from 14 to 45 feet, averaging 21 feet in the spring and ranging from 7 to 20 feet in the fall with an average of 15 feet (CGS 2003). Private wells used for domestic and agricultural irrigation uses are common throughout the watershed (CGS 2003). See the exhibit at end of chapter 3 for map showing the distribution of alluvial deposits in Colorado.

The quality of alluvial groundwater in the Colorado River Basin can vary widely, as shown in Exhibit 7-41, and is affected by natural and human influences (CGS 2003).

Exhibit 7-41. Colorado River Basin Water Quality Data for Alluvial Aquifers

River Valley Alluvium	TDS (mg/L)	Hardness (mg/L)	Radon-222 (pCi/L)[1]
North Fork Colorado	110–125	45–66	751–1,441
Fraser River	122–247	73–180	305–1,462
Blue River	169–513	100–330	709–2,054
Eagle River	77–2,716	51–1,700	685–1,239
Roaring Fork River	42–524	20–370	852–4,030

[1] pCi/L = picocuries per liter.
Source: CGS 2003.

Piceance Basin

The Piceance structural basin encompasses portions of Moffat, Rio Blanco, Garfield, Mesa, Pitkin, Delta, Gunnison and Montrose counties. It is an elongated structural depression trending northwest to southeast and is more than 100 miles long by 60 miles wide. The largest portion is in Moffat County at 4,751 square miles, and the smallest portion is in Pitkin County at 973 square miles. The saturated Tertiary rocks of the Piceance Basin are divided into two aquifer units, the upper and lower Piceance basin aquifers, which are separated by a confining unit known as the Mahogany zone. The Mahogany Formation is the principal oil shale mining zone. The thicknesses of the upper and lower aquifers average 600 and 900 feet, respectively (CGS 2003). See the exhibit at end of chapter 3 for map showing the Colorado's major sedimentary rock aquifers and aquifer systems.

The upper aquifer gains in TDS as groundwater moves from the upland recharge areas to the discharge areas, which are typically springs above the Mahogany confining layer. In the upper aquifer unit, dissolved solids increase from about 500 mg/L to 1,000 mg/L. The chemical water classification is diverse, ranging from calcium carbonate to sodium carbonate water (CGS 2003).

In the lower aquifer unit, the dissolved solids concentration increases from 1,000 to 10,000 mg/L along the basin flow paths. Waters greater than 1,000 mg/L dissolved solids are generally unsuitable for domestic potable supplies. The water in the lower aquifer is classified as a sodium-carbonate type and is influenced by the dissolution of calcite, dolomite, nahcolite, and halite (CGS 2003).

Eagle Basin

The Eagle Basin underlies approximately 1,500 square miles in north-central Colorado along the western flank of the Continental Divide. Identified sandstone aquifers include the Weber sandstone (tan and grayish-white quartz sandstone), the laterally equivalent Maroon Formation (maroon, reddish-brown and red quartzitic sandstone) and the underlying Minturn Formation (buff, grey-green, and brown sandstone). The groundwater quality of the Eagle Basin aquifers is extremely variable and dependent upon any connectivity to the Eagle Valley Evaporite rocks underlying the Minturn Formation. Beneath the evaporite rocks, which are confining units, lie the carbonate rock sequences, which include the Leadville Limestone, Gilman Sandstone, and Dyer Dolomite. See the exhibit at end of chapter 3 for map showing the Colorado's major sedimentary rock aquifers and aquifer systems. The water quality in the Eagle Basin aquifers is shown in Exhibit 7-42.

Exhibit 7-42. Colorado River Basin, Eagle Basin Water Quality Characteristics

Hydrogeologic Unit	Total Dissolved Solids (mg/L)	Sodium + Potassium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Bicarbonate as HCO_3 (mg/L)
Maroon Formation	1,820	574	524	356	534
Eagle Valley Evaporite	10,660 – 10,720	3,760 – 3,830	459 - 495	5,580 – 5,680	399 - 449
Leadville Limestone	18,500- 22,000	6,262 – 7,560	1,120 – 2,450	9,370 – 11,000	424 - 790

Source: CGS 2003.

Dakota-Cheyenne

The Dakota-Cheyenne group is an assemblage of water-yielding sandstones, shales, and mudstones that were typically deposited in deltaic environments along an ancient seaway that covered much of Colorado during the Cretaceous Period (CGS 2003). These formations are visible along the lower Blue River north of Interstate 70 (I-70) in Summit and Grand Counties, on both sides of I-70 just west of Glenwood Springs, and throughout the eastern half of Montrose County on both sides of the Uncompahgre River. The Dakota-Cheyenne Formation is quite visible to the north of I-70 near the Colorado-Utah border. These formations are known to contain coal, oil, and gas resources. Water quality in the Dakota-Cheyenne is generally good, but ranges in TDS concentrations from 250 to 25,000 mg/L (CGS 2003). See the exhibit at end of chapter 3 for map showing the Colorado's major sedimentary rock aquifers and aquifer systems.

Middle Park Basin

The Middle Park Basin encompasses about 1,030 square miles in Grand County. Groundwater in the basin is mainly associated with poorly consolidated or unconsolidated sediments that were deposited during Tertiary time. Sands and gravels were deposited near the margins of the uplifting mountains, which now surround both Middle Park and North Park basins. Silts and clays were deposited in lakes and swamps near the center of the basin. Middle Park is part of a large intermontane basin, which is also a separate and distinct groundwater basin. It is part of a synclinal structural basin that encompasses both North Park Basin in Jackson County and Middle Park Basin in Grand County. The Rabbit Ears Range bisects the syncline between North Park and Middle Park basins. As much as 7,000 feet of sedimentary deposits occur in Middle Park

Basin (CGS 2003). See the exhibit at end of chapter 3 for map showing the location and extent of Colorado's crystalline, volcanic, valley-fill, and intermontane park aquifers.

The sedimentary formations underlying North Park, like the adjacent basins to the east and west, are also aquifers serving as private and commercial water supplies. The Troublesome Formation represents the most important bedrock aquifer for many parts of the Middle Park Basin. It is 800 to 1,000 feet thick between Fraser and Granby and might contain 1.6 million to 2.7 million acre-feet of water (CGS 2003).

Water quality within the bedrock aquifers in Middle Park is generally suitable for domestic and livestock use, although there is not much data. Groundwater is a calcium bicarbonate type with a TDS concentration of less than 200 mg/L and a hardness of less than 90 mg/L (CGS 2003).

7.3 Surface Water Quality Stressors and Sources

This section of the Colorado River Basin Plan summarizes data provided in the 2010 Integrated Report developed by the WQCD and approved by the WQCC. It is important to note that the data on water quality impairments and pollutant sources, as well as segments listed for further monitoring and evaluation, are based on information that is available to WQCD today. Moreover, the data are limited to those parameters for which assessments are performed.

7.3.1 Impairments

As shown in exhibit 7-43, 46 impairments were identified in stream segments in the Colorado River Basin in the 2010 Integrated Report. The impaired segments represent 23% of the total 196 segments in the basin and 21% of total stream miles in the basin. Selenium is the cause of impairments in 18 segments. Cadmium and copper are the cause in nine segments each, while temperature is the cause in four segments. Additional pollutants causing impairments include iron, sediment, copper, and lead (in two segments each) and *Escherichia coli* (*E.coli*), pH, and manganese (in one segment each). For further information on the impaired segments, see also exhibits 7-44 to 7-47 (at end of chapter).

The 2010 Integrated Report identified eight lake and reservoir segments as impaired (exhibit 7-48 at end of chapter). These eight segments represent 24% of the total assessed lakes and 19% of total assessed lake acres, or 9,127.70 acres. Mercury and selenium are the cause of impairments in three lake/reservoir segments each, while dissolved oxygen is the cause in two segments. Exhibits 7-49 to 7-51 (at end of chapter) provide further detail.

A map showing all impaired waterbody segments (streams and lakes/reservoirs combined) is provided as exhibit 7-52 (at end of chapter).

7.3.2 Segments Listed for Further Monitoring and Evaluation

During each monitoring cycle, the WQCD typically identifies parameters with elevated concentrations in some segments in a basin. The sample results or other factors are such that WQCD is unable to make a determination as to whether the classified use in question is being attained. These segments are subsequently placed on the state's Monitoring and Evaluation

(M&E) List. In its latest monitoring cycle, the WQCD identified 44 segments basin-wide with elevated concentrations of one parameter or more, or 22% of the 196 total segments in the basin. The Lower Gunnison River Sub-basin has the greatest number of segments on the M&E List (16 of 44, or 36%). It is followed by the Upper and Lower Colorado River Sub-basins with 11 segments or 20% of basin-wide segments each. The Upper Gunnison River contains the least amount of segments on the M&E List (6 of 44, or 14%). Basin-wide, total recoverable iron, selenium, and sediment were most often identified as the parameters requiring further monitoring. These parameters are followed by dissolved oxygen, copper, *E. coli*, zinc, lead, cadmium, temperature, and sculpin zinc.[12] See exhibits 7-53 to 7-57 (at end of chapter) for details.

7.3.3 Known Sources of Stressors

Exhibit 7-58 provides a synopsis of the identified sources of stressors to the Colorado River Basin based on parameters causing impairments per the 2010 Integrated Report. The information is presented for each sub-basin and for the basin as a whole. Note that similar but even more detailed information is provided in exhibits 7-43 to 7-51 (at end of chapter). The Colorado River Basin has a total of 54 impaired waterbody segments that required development of a TMDL. Selenium accounts for greatest number of impaired segments with 21, followed by zinc and cadmium with nine segments each.

Exhibit 7-58. Colorado River Basin, Summary of Stressors for Impaired Waterbodies[1]

Sub-Basin and Watershed	Number of Impaired Segments	Impairment	Number of Affected Segments	Source of Pollutants	Number of Affected Segments	Number of Affected Segments by TMDL Priority Development Status		
						Low	Med	High
Upper Colorado Sub-Basin								
Mainstem and Tributaries	8	Temperature	4	Unknown	3	0	0	3
				Not Assessed[2]	1	1	0	0
		Selenium	1	Unknown	1	1	0	0
		Iron	1	Unknown	1	1	0	0
		Dissolved Oxygen	1	Not Assessed	1	0	0	1
		Mercury	1	Not Assessed	1	0	0	1
		Subtotal	**8**	**Total No. TMDLs**	**8**	**3**	**0**	**5**
Blue River	4	Zinc	1	Mining	1	0	1	0
		Cadmium	1	Mining	1	0	1	0
		Subtotal	**2**	Total No. TMDLs	2	**0**	**2**	**0**
Eagle River	6	Cadmium	1	Unknown	1	0	0	1
		Sediment	1	Road Runoff	1	0	0	1
		Subtotal	**2**	**Total No. TMDLs**	**2**	**0**	**0**	**2**
Lower Colorado River Sub-Basin								
Lower Colorado	11	Selenium	8	Unknown	8	2	5	1
		Sediment	1	Unknown	1	1	0	0
		E. coli	1	Unknown	1	0	0	1
		Iron	1	Unknown	1	0	0	1
		Mercury	1	Unknown	1	0	0	1

[12] Sculpin are widely distributed in North America. Mottled sculpin (*Cottus bairdi*) are among the fish species most sensitive to the toxicity of zinc (Brinkman et al. N.d.).

Sub-Basin and Watershed	Number of Impaired Segments	Impairment	Number of Affected Segments	Source of Pollutants	Number of Affected Segments	Number of Affected Segments by TMDL Priority Development Status		
						Low	Med	High
		Subtotal	**12**	**Total No. TMDLs**	**12**	**3**	**5**	**4**
Upper Gunnison River Sub-Basin[2]								
Upper Gunnison	8	Zinc	8	Unknown	3	0	0	3
				Mining	5		1	4
		Cadmium	7	Unknown	0	0	0	0
				Mining	6	0	1	5
				Upstream Source	1	0	0	1
		Copper	2	Unknown	1	0	0	1
				Mining	1	0	0	1
		Lead	2	Unknown	1	0	0	1
				Mining	1	0	0	1
		pH	1	Mining	1	0	0	1
		Manganese	1	Mining	1	0	0	1
		Subtotal	**21**	**Total No. TMDLs**	**21**	**0**	**2**	**19**
Lower Gunnison River Sub-Basin								
Mainstem	6	Selenium	4	Mining	4	0	0	4
		Mercury	1	Not Assessed	1	0	0	1
		Dissolved Oxygen	1	Unknown	1	0	0	1
		Subtotal	**6**	Total No. TMDLs	6	0	0	6
North Fork Gunnison	4	Selenium	4	Upstream Source	2	0	0	2
				Unknown	2	0	0	2
		Subtotal	**4**	Total No. TMDLs	4	0	0	4
Uncompahgre River	7	Selenium	4	Mining	3	0	0	3
				Unknown	1	0	0	1
		Subtotal	**4**	**Total No. TMDLs**	**4**	**0**	**0**	**4**
Basin-wide Totals								
Colorado River Basin	54	Selenium	21	Unknown	12	3	5	4
				Mining	7	0	0	7
				Upstream Source	2	0	0	2
		Zinc	9	Mining	6	0	2	4
				Unknown	3	0	0	3
		Cadmium	9	Mining	7	0	2	5
				Unknown	1	0	0	1
				Upstream Source	1	0	0	1
		Temperature	4	Unknown	3	0	0	3
				Not Assessed	1	1	0	0
		Mercury	3	Not Assessed	2	0	0	2
				Unknown	1	0	0	1
		Iron	2	Unknown	2	1	0	1
		Dissolved Oxygen	2	Not Assessed	1	0	0	1
				Unknown	1	0	0	1
		Sediment	2	Road Runoff	1	0	0	1
				Unknown	1	1	0	0
		Copper	2	Unknown	1	0	0	1
				Mining	1	0	0	1
		Lead	2	Unknown	1	0	0	1
				Mining	1	0	0	1
		E. coli	1	Unknown	1	0	0	1
		pH	1	Mining	1	0	0	1
		Manganese	1	Mining	1	0	0	1
		Total	**59**	**Total No. TMDLs**	**59**	**6**	**9**	**44**

[1] The term "waterbodies" is used because the regulations identify some segments as containing streams, lakes, wetlands, or some combination thereof. In other instances, the regulations identify some segments as "lake-only." In this exhibit, all relevant segments are shown.

[2] "Not Assessed" indicates that if a single designated use is not assessed within the segment, then the whole segment is entered into the EPA Assessment Database as not assessed.
Sources: WQCC 2010d; WQCD 2010a, appendices A to D.

7.4 TMDLs as Water Protection Strategies

7.4.1 TMDL Basics

As noted previously in chapter 2, "Water Quality Management and Planning in Colorado," CWA section 303(d) requires states to periodically submit to EPA a list of waterbodies that are impaired, meaning that the segment is not meeting the standards for its assigned use classification. The list of impaired waterbodies is referred to as the CWA section 303(d) list. The WQCD prepares the list in conjunction with its biennial Integrated Reports. The WQCC approves and adopts the list as Regulation No. 93: *Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List* (5 CCR 1002-93) (WQCC 2010d).

TMDLs must be developed for waterbodies on the CWA section 303(d) list. A TMDL is the maximum amount of a pollutant that a waterbody can receive and still maintain water quality standards. The TMDL is the sum of the waste load allocation (WLA), which is the load from point source discharges; the load allocation (LA), which is the load attributed to natural background and/or nonpoint sources; and a margin of safety (MOS).

TMDL Equation

TMDL = WLA + LA + MOS

An important aspect of the TMDL development process includes the identification of the sources of pollutants causing impairments in the waterbody. Both point sources and nonpoint sources are identified.

7.4.2 TMDLs Required to Be Developed

Exhibit 7-59 summarizes the number of TMDLs that must be developed based on the waterbodies (streams and lake-only segments) included on the 2010 CWA section 303(d) list, which is also encompassed in the 2010 Integrated Report. The first section of the exhibit shows that a total of 59 impairments occurred in 54 distinct waterbody segments for the basin as a whole. Selenium requires the greatest number of TMDLs to be developed (21 total). The WQCD has assigned a high priority to developing 43 of the 59 TMDLs (73%). The remaining TMDLs are almost evenly distributed across the low and medium priority categories. All pollutants causing impairments, with the exception of iron and zinc, are assigned a medium- or high-priority TMDL development status. Sixty-two percent of the 21 selenium TMDLs are assigned a high priority.

Exhibit 7-59 also presents TMDL information for each sub-basin. The Upper Gunnison River Sub-basin has the lowest number of individual impaired waterbody segments when compared to the other sub-basins (15% of the 54 impaired segments in the basin as compared to 33%, 20%, and 32% for the Upper Colorado, Lower Colorado, and Lower Gunnison Sub-basins, respectively). Yet, the Upper Gunnison River Sub-basin requires the greatest number of TMDLs to be developed (36% of the 59 total TMDLs to be developed as compared to 20%, 20%, and 24%, for the Upper and Lower Colorado and Lower Gunnison River Sub-basins, respectively).

The total affected stream miles and lake acres are the lowest in the Upper Gunnison Sub-basin when compared to the other sub-basins—only 2% of total affected stream miles and 0% of total affected lake acres. The data suggest that although only a few small segments are affected in the Upper Gunnison Sub-basin, they are impacted by multiple pollutants. A thorough review of exhibits 7-43 to 7-51 (at end of chapter) and exhibit 7-59 will provide readers with a better appreciation of nuances like these.

Exhibit 7-59. Colorado River Basin Summary of Impairments, Affected Waterbody Segments, and TMDL Priority Development Status

	Total Number of Distinct Segments Impaired[1]	Affected Stream Segments		Affected Lake-Only Segments		Impairment	Number of Impaired Segments by Pollutant[1]	Number of Affected Segments and TMDL Priority Status by Pollutant		
		No. (n=196)	Miles (n=18,643)	No. (n=33)	Acres (n=49,006)			Low	Medium	High
Basin-wide	54	48	3,939	8	9,128	Temperature	4	1	0	3
						Cadmium	9	1	2	6
						Selenium	21	3	5	13
						Iron	2	1	0	1
						Zinc	9	0	2	7
						Sediment	2	1	0	1
						Dissolved oxygen	2	0	0	2
						Mercury	3	0	0	3
						E. coli	1	0	0	1
						Copper	2	0	0	2
						Lead	2	0	0	2
						pH	1	0	0	1
						Manganese	1	0	0	1
						Total No. TMDLs to Be Developed	**59**	**7**	**9**	**43**
Impaired Segments as Percent of Total Segments and Miles/Acres in Basin		**23%**	**21%**	**24%**	**19%**	**Affected Segments as Percent of TMDL Priority Status**		**12%**	**15%**	**73%**

	Total Number of Distinct Segments Impaired[1]	Affected Stream Segments		Affected Lake-Only Segments		Impairment	Number of Impaired Segments by Pollutant[1]	Number of Affected Segments and TMDL Priority Status by Pollutant		
		No. (n=76)	Miles (n=6,592)	No. (n=10)	Acres (n=25,521)			Low	Medium	High
Upper Colorado River Sub-Basin	18	16	120	2	8,322	Temperature	4	1	0	3
						Cadmium	2	1	0	1
						Selenium	1	1	0	0
						Iron	1	1	0	0
						Zinc	1	0	1	0
						Sediment	1	0	0	1
						Dissolved oxygen	1	0	0	1
						Mercury	1	0	0	1
						Total No. TMDLs to Be Developed	**12**	**4**	**1**	**7**
Impaired Segments as Percent of Total Segments and Miles/Acres in Sub-Basin		**21%**	**2%**	**20%**	**33%**	**Affected Segments as Percent of TMDL Priority Status**		33%	8%	58%

Lower Colorado River Sub-Basin	Total Number of Distinct Segments Impaired[1]	Affected Stream Segments		Affected Lake-Only Segments		Impairment	Number of Impaired Segments by Pollutant[1]	Number of Affected Segments and TMDL Priority Status by Pollutant		
		No. (n=43)	Miles (n=4,554)	No. (n=5)	Acres (n=4,402)			Low	Medium	High
	11	8	1,830	3	436	Selenium	8	2	5	1
						Sediment	1	1	0	0
						E. coli	1	0	0	1
						Iron	1	0	0	1
						Mercury	1	0	0	1
						Total No. TMDLs to Be Developed	**12**	**3**	**5**	**4**
Impaired Segments as Percent of Total Segments and Miles/Acres in Sub-Basin		**73%**	**40%**	**60%**	**10%**	**Affected Segments as Percent of TMDL Priority Status**		**25%**	**42%**	**33%**

Upper Gunnison River Sub-Basin	Total Number of Distinct Segments Impaired[1]	Affected Stream Segments		Affected Lake-Only Segments		Impairment	Number of Impaired Segments by Pollutant[1]	Number of Affected Segments And TMDL Priority Status by Pollutant		
		No. (n=33)	Miles (n=3,334)	No. (n=5)	Acres (n=12,784)			Low	Medium	High
	8	8	67	0	0	Zinc	8	1	0	7
						Cadmium	7	1	0	6
						Copper	2	0	0	2
						Lead	2	0	0	2
						pH	1	0	0	1
						Manganese	1	0	0	1
						Total No. TMDLs to Be Developed	**21**	**2**	**0**	**19**
Impaired Segments as Percent of Total Segments and Miles/Acres in Sub-Basin		**24%**	**2%**	**0%**	**0%**	**Affected Segments as Percent of TMDL Priority Status**		**10%**	**0%**	**90%**

Lower Gunnison River Sub-Basin	Total No. Distinct Segments Impaired[1]	Affected Stream Segments		Affected Lake-Only Segments		Impairment	No. Impaired Segments by Pollutant[1]	No. Affected Segments And TMDL Priority Status by Pollutant		
		No. (n=44)	Miles (n=4,163)	No. (n=13)	Acres (n=6,299)			Low	Medium	High
	17	14	1,922	3	370	Selenium	12	0	0	12
						Dissolved Oxygen	1	0	0	1
						Mercury	1	0	0	1
						Total No. TMDLs to Be Developed	**14**	**0**	**0**	**14**
Impaired Segments as Percent of Total Segments and Miles/Acres in Sub-Basin		**32%**	**46%**	**23%**	**6%**	**Affected Segments as Percent of TMDL Priority Status**		**0%**	**0%**	**100%**

[1] When the total number of TMDLs to be developed is greater than the total number of distinct segments impaired, it typically means that one or more of the impaired individual segment s is impaired by more than one pollutant. When the total number of TMDLs to be developed is less than the total number of distinct segments impaired, it typically means that one or more individual segments were identified as impaired in a previous CWA section 303(d) listing cycle. However, in the latest monitoring cycle the segments showed that they are not meeting the standard(s) for one or more assigned use classifications.

Sources: WQCC 2010d; WQCD 2010a, appendices A to D.

7.4.3 TMDLs Completed to Date

During any given assessment cycle, segments for which a TMDL has already been developed are likely to be identified as impaired. This indicates that the TMDL has not yet been implemented or the benefits of TMDL implementation have yet to be realized. The previous exhibit identifies segments in these circumstances and the applicable pollutant(s), while also showing newly identified impaired segments.

To date, the WQCD has completed and had approved TMDLs covering 27 waterbody segments in the Colorado River Basin. Of this number, 10 segments are in the Upper Colorado River Sub-basin, two are in the Upper Gunnison, and 15 are in the Lower Gunnison (exhibit 7-60). Metals and selenium are the pollutants most frequently addressed through TMDLs in the Colorado River Basin.

Exhibit 7-60. Colorado River Basin Completed and Approved TMDLs

Segment Data		Was use attained in the latest WQCD assessment?	Parameter
Segment	Segment Description[1]		
Upper Colorado River Sub-Basin			
COUCUC06c	Unnamed tributary to Willow Creek	No	Ammonia
COUCBL02	Blue River below French Gulch	Yes[2]	Cadmium
		Yes[2]	Zinc
COUCBL06	Snake River, source to Dillon Reservoir	No	Cadmium
		No	Copper
		No	Lead
		No	Zinc
		No	pH
COUCBL07	Peru Creek	No	Cadmium
		No	Copper
		No	Lead
		No	Manganese
		No	Zinc
		No	pH
COUCBL12	Illinois Gulch and Fredonia Gulch – Public Notice Draft	No	Zinc
COUCBL18	Straight Creek	No	Sediment
COUCEA05 (a, b, and c)	Eagle River, Belden to Gore Creek	No[3]	Copper
		No	Zinc
COUCEA07b	Cross Creek, source to Eagle River	No	Copper
		No	Zinc
Lower Colorado River Sub-Basin			
Currently, no TMDLs have been completed and approved for segments in the Lower Colorado River Sub-Basin.			
Upper Gunnison River Sub-Basin			
COGUUG30	Henson Creek – Public Notice Draft	Yes[2]	Copper
		No	Zinc
COGUUG31	Palmetto Gulch – Public Notice Draft	Yes[2]	Copper
		No	Zinc
Lower Gunnison River Sub-Basin			
COGULG01	Gunnison River from North Fork Gunnison River to the Uncompahgre River	Yes[2]	Selenium
COGULG02	Gunnison River from the Uncompahgre River to the Colorado River	No	Selenium
COGULG04a	Tributaries to the Gunnison River	No	Selenium

Segment Data		Was use attained in the latest WQCD assessment?	Parameter
Segment	Segment Description[1]		
COGULG04b	Lower Kannah Creek	No	Selenium
COGULG04c	Red Rock Creek	No	Selenium
COGUNF03	North Fork Gunnison River below Lazear	No	Selenium
COGUNF05	Leroux Creek and Jay Creek	No	Selenium
COGUNF06a	Short Draw	No	Selenium
COGUNF06b	Big Gulch and Cottonwood Creek	No	Selenium
COGUUN02	Uncompahgre River, source to Red Mountain Creek	No	Cadmium
		No	Copper
		No	Zinc
COGUUN03a	Uncompahgre River, Red Mountain Creek to Montrose	No	Cadmium
		No	Copper
		No	Iron (Trec)
COGUUN04b	Uncompahgre River from LaSalle Road to Confluence Park	No	Selenium
COGUUN04c	Uncompahgre River from Confluence Park to the Gunnison River	No	Selenium
COGUUN06a	Red Mountain Creek, source to East Fork Red Mountain Creek	No	Zinc (sculpin)
COGUUN12	Tributaries to the Uncompahgre River	No	Selenium

[1] Some segment descriptions might not precisely match the descriptions in Regulation Nos. 33, 35, and 37. This is because the TMDL is applicable to only a portion of a segment. It is that portion of the segment which is described.
[2] Parameter is not listed in appendix A of the 2010 Integrated Report as a cause for the use's not being attained in segment.
[3] Parameter is listed in appendix A of the 2010 Integrated Report only as a cause for the use's not being attained in segment COUCEA05a.
Sources: WQCC 2010d; WQCD 2002, 2006, 2008a, 2010a.

7.4.4 TMDL Implementation Strategies

Exhibit 7-61 at end of chapter summarizes information in the TMDL reports completed to date.[13] Specifically, it summarizes current and potential future strategies identified in the TMDL reports. The discussion should not be considered to be complete or exhaustive in the sense of strategies that could or should be undertaken in the basin. Moreover, the WQCD recognizes that many other entities have undertaken or are planning activities that will contribute to improvements in water quality in the basin. Finally, WQCD appreciates that the development and implementation of strategies is best undertaken in partnership with local and other stakeholders in the watersheds and basins of issue. Readers interested in understanding the array of potential strategies that could be employed in a watershed should consult chapter 4 of this document, "*Strategies for Addressing Water Quality Problems"* and appendix E.

7.5 Planned Point Source Treatment Upgrades

As shown in exhibit 7-62, there are a total of 130 public and private point source dischargers in the Colorado River Basin (59 in the Upper Colorado, 24 in the Lower Colorado, 37 in the Upper Gunnison, and 10 in the Lower Gunnison).[14] The counties with 10 or more point source dischargers include Mesa, Eagle, Garfield, Grand, Delta, Gunnison, Summit, and Montrose. Lake and Saguache Counties have only one point source discharger each.

[13] Time and resource constraints prohibited a review of TMDLs beyond those available on WQCD's website at http://www.cdphe.state.co.us/wq/assessment/TMDL/TMDLs.html.

[14] Point source dischargers only include those reported in the Clean Watershed Needs Survey 2008 database (USEPA 2010a), the USEPA ECHO database accessed June 24, 2010 (USEPA 2010d), and the Water Pollution Control Revolving Fund annual Intended Use Plan (WQCD 2010b).

Exhibit 7-62. Colorado River Basin Summary of Point Sources by County

Sub-Basin	Applicable Counties	Number of Point Sources by County
Upper Colorado	Eagle	15
	Garfield	9
	Grand	14
	Lake	1
	Pitkin	8
	Summit	12
Total Upper Colorado Sub-Basin *(as % of Total in Basin)*		**59** *(45%)*
Lower Colorado	Garfield	6
	Mesa	18
Total Lower Colorado Sub-Basin *(as % of Total in Basin)*		**24** *(18%)*
Upper Gunnison	Delta	9
	Gunnison	13
	Hinsdale	4
	Montrose	5
	Ouray	5
	Saguache	1
Total Upper Gunnison Sub-Basin *(as % of Total in Basin)*		**37** *(28%)*
Lower Gunnison	Delta	4
	Montrose	5
	Ouray	1
Total Lower Gunnison Sub-Basin *(as % of Total in Basin)*		**10** *(8%)*
Basin-wide	Delta	13
	Eagle	15
	Garfield	15
	Grand	14
	Gunnison	13
	Hinsdale	4
	Lake	1
	Mesa	18
	Montrose	10
	Ouray	6
	Pitkin	8
	Saguache	1
	Summit	12
Total All Basins	**13**	**130**

Sources: USEPA 2010a, 2010d; WQCD 2010b.

Congress authorized the Clean Water State Revolving Fund (CWSRF; called the Water Pollution Control Revolving Fund, or WPCRF, in Colorado) when amending the CWA in 1987. The purpose of the CWSRF is to help provide financial assistance to governmental agencies for the construction of projects that are listed in the state's annual Intended Use Plans (IUPs). The Project Eligibility List included in the IUPs is made up of projects for construction of publicly owned treatment works and projects/activities eligible for assistance under CWA sections 319 and 320. The Colorado IUP Project Eligibility List is comprised of the following six categories: (1) Category 1 includes those projects that improve or benefit public health or that will remediate a public health hazard; (2) Category 2 includes those projects that enable an entity to achieve

permit compliance; (3) Category 3 includes those projects that contribute to the prevention of a public health hazard, enable an entity to maintain permit compliance, or enables an entity to address a possible future effluent limit or emerging issue; (4) Category 4 includes those projects that implement a watershed/nonpoint source management plan; (5) Category 5 includes those projects that implement a source water protection plan; and (6) Category 6 includes those projects that sought funding only under the American Recovery and Reinvestment Act of 2009 and that were not already on the state's Project Eligibility List as of January 1, 2009. For the purposes of the SWQMP, projects in categories 1 through 3 were labeled as wastewater treatment facility projects; projects in category 4 were labeled as nonpoint source projects or stormwater projects; and projects in category 5 were labeled as source water protection projects. Finally, projects in category 6 were labeled as wastewater treatment facility, nonpoint source, stormwater, or source water protection depending on the nature of the project (WQCD 2010b).

A total of 84 planned treatment projects were identified for point source facilities in the Colorado River Basin.[15] Exhibit 7-63 provides a summary of the project types and includes the number of projects, the estimated costs of the projects, and the population expected to benefit. The four project types are (1) wastewater treatment facility, (2) nonpoint source, (3) stormwater, and (4) source water protection. Wastewater treatment facility projects lead the list in terms of the greatest number of scheduled projects (66 of 84, or 79%). Stormwater projects follow with a total of 9 (11%).

Exhibit 7-63. Colorado River Basin Summary of Scheduled Point Source Improvements

Project Type	Sub-Basin	Number of Projects	Estimated Cost of Projects[1]	Population Expected to Benefit from Projects	Number of Projects Reporting Population Data
Wastewater Treatment Facility	Upper Colorado	36	$147,793,500	168,169	97% (35 of 36)
	Lower Colorado	11	$56,873,000	337,181	91% (10 of 11)
	Upper Gunnison	16	$37,150,877	38,434	100%
	Lower Gunnison	3	$34,814,500	4,153	100%
Total Wastewater Treatment Facility Projects		**66**	**$276,631,877**	**547,937**	
Nonpoint Source	Upper Colorado	5	$13,890,000	25,516	100%
	Lower Colorado	1	$200,000	17,000	100%
	Upper Gunnison	1	$1,000,000	13,956	100%
	Lower Gunnison	0	$0	0	--
Total Nonpoint Source Projects		**7**	**$15,090,000**	**56,472**	
Stormwater	Upper Colorado	3	$4,400,000	9,881	100%

[15] Projects identified include only those on the state's IUP. Therefore, the list is not likely inclusive of all projects that may be occurring in the basin.

Project Type	Sub-Basin	Number of Projects	Estimated Cost of Projects[1]	Population Expected to Benefit from Projects	Number of Projects Reporting Population Data
	Lower Colorado	3	$5,050,000	11,460	100%
	Upper Gunnison	2	$1,500,000	3,850	100%
	Lower Gunnison	1	$150,000	1,036	100%
Total Stormwater Projects		**9**	**$11,100,000**	**26,227**	
Source Water Protection	Upper Colorado	1	$250,000	1,600	100%
	Lower Colorado	0	$0	0	--
	Upper Gunnison	0	$0	0	--
	Lower Gunnison	1	$50,000	866	100%
Total Source Water Protection Projects		**2**	**$300,000**	**2,466**	
All Projects	Upper Colorado	45	$166,333,500	205,166	
	Lower Colorado	15	$62,123,000	365,641	
	Upper Gunnison	19	$39,650,877	56,240	
	Lower Gunnison	5	$35,014,500	6,055	
Total All Projects		**84**	**$303,121,877**	**633,102**	

[1] Dollar amounts listed are based on what is reported in the project application for funding through the WPCRF as reported in the IUP only and are not inclusive of all projects that may be occurring in the basin.

Sources: USEPA 2010a, 2010d; WQCD 2010b.

The total estimated cost of the 84 projects in the Colorado River Basin is $303.1 million. Wastewater treatment facility improvement projects constitute 91% of the total cost at $276.6 million. They are followed by nonpoint source projects at $15 million (5%), stormwater projects at $11.1 million (4%), and source water protection projects at $300,000 (0.1%). Exhibits 7-64 through 7-67 (at end of chapter) provide additional details. In addition to project information, these exhibits also summarize NPDES permit information. It should be noted that funding gaps exist nationwide in the CWSRF for wastewater treatment projects.[16] Total funding has also not increased significantly under section 319 in spite of nonpoint sources being the leading source of water pollution nationwide.

[16] It is well recognized that the nation's infrastructure is aging and that the funds to replace this infrastructure are severely lacking. EPA recently completed its 2008 Report to Congress summarizing the results of its Clean Watersheds Needs Survey. The report presents a comprehensive analysis of capital investments necessary to meet the nation's wastewater and stormwater treatment and collection needs over the next 20 years. The report documents a total need of $299.1 billion as of January 1, 2008. This total includes capital needs for publicly owned wastewater treatment pipes and treatment facilities ($192.2 billion), combined sewer overflow correction ($63.6 billion), and stormwater management ($42.3 billion) (USEPA 2010b).

7.6 Nonpoint Source Management

Exhibit 7-68 (at end of chapter) summarizes CWA section 319 nonpoint source grant projects identified as occurring in the Colorado River Basin over the past 5 years. The objective of four of the projects was to develop watershed plans. Three of those projects also included the design and implementation of best management practices (BMPs). Budget information was identified for 12 of the 18 projects; budgets for these 12 projects totaled $2.4 million. CWA section 319 funds covered approximately 24% or $581,478 of the $2.4 million. The remaining funds were from other sources and, in part, represent the grant recipients' cost-share agreements with the WQCD.

References

Text and Figure/Table References

Brinkman, S., K. Mitchell, and N. Vieira. N.d. Toxicity of Zinc and Cadmium to Mottled Sculpin *(Cottus bairdi)*. <http://www.cdphe.state.co.us/op/wqcc/WQClassandStandards/Reg31/BasinWide2010/Responsive/31rphsWQCDexL-1.pdf>. Accessed January 14, 2011.

Chapman, S.S., G.E. Griffth, J.M. Omernik, A.B. Price, J. Freeouf, and D.L. Schrupp. 2006. Ecoregions of Colorado. Color poster with map, descriptive text, summary tables, and photographs (map scale 1:1,200,000). U.S. Geological Survey, Reston, Virginia.

CDOW (Colorado Division of Wildlife). 2008. *Strategic Plan for the Wetland Wildlife Conservation Program*. Colorado Department of Natural Resources, Colorado Division of Wildlife, Denver, Colorado.

CDOW. 2010. Species of Concern. < http://wildlife.state.co.us/WildlifeSpecies/SpeciesofConcern>. Accessed August 9, 2010.

CFWE (Colorado Foundation for Water Education). 2003. *Citizen's Guide to Colorado Water Quality Protection*. Colorado Foundation for Water Education, Denver, Colorado.

CGS (Colorado Geological Survey). 2003. *Ground Water Atlas of Colorado*. Special Publication 53. Colorado Department of Natural Resources, Division of Minerals and Geology, Colorado Geological Survey, Denver, Colorado.

CWCB (Colorado Water Conservation Board). 2004. *Statewide Water Supply Initiative*. Colorado Department of Natural Resources, Colorado Water Conservation Board, Denver, Colorado.

CWCB. 2006a. *Statewide Water Supply Initiative Fact Sheet: Colorado Basin*. Colorado Department of Natural Resources, Colorado Water Conservation Board, Denver, Colorado.

CWCB. 2006b. *Statewide Water Supply Initiative Fact Sheet: Gunnison Basin*. Colorado Department of Natural Resources, Colorado Water Conservation Board, Denver, Colorado.

CWCB. 2009. *Nonconsumptive Needs Assessment Focus Mapping*. Colorado Department of Natural Resources, Colorado Water Conservation Board, Denver, Colorado.

CWCB. 2010. *State of Colorado 2050 Municipal and Industrial Water Use Projections*. Colorado Department of Natural Resources, Colorado Water Conservation Board, Denver, Colorado.

DOLA (Department of Local Affairs). Population Totals for Colorado Counties. <http://dola.colorado.gov/dlg/demog/pop_cnty_estimates.html>. Accessed on January 20, 2011. Colorado Department of Local Affairs, Division of Local Government, Denver, Colorado.

Gunnison Wetland Focus Area Committee. 2001. *The Gunnison Wetland Focus Area Strategy: A Vision for Landscape Level Wetland Conservation in the Gunnison Basin*. Colorado Department of Natural Resources, Colorado Division of Wildlife, Denver, Colorado.

Lower Colorado Focus Area Committee. N.d. *Colorado Wetlands Initiative Lower Colorado River Focus Area Strategic Plan*. Colorado Department of Natural Resources, Colorado Division of Wildlife, Denver, Colorado.

Region 12, Northwest Colorado Council of Governments. 2002 as amended. *NWCCOG Regional Water Quality Management Plan*. <http:www.nwc.cog.co.us/index.php/programs/watershed-services>. Accessed December 17, 2010.

USEPA. 2010a. Clean Watershed Needs Survey 2008 data. <http://www.epa.gov/cwns/>. Accessed June 28, 2010.

USEPA. 2010b. *Clean Watershed Needs Survey: 2008 Report to Congress.* EPA-832-R-10-002. U.S. Environmental Protection Agency, Washington, D.C.

USEPA. 2010c. *Grants Reporting Tracking System.* <http://iaspub.epa.gov/pls/grts/f?p=110:199:1611870697608659::NO:::>. Accessed August 4, 2010.

USEPA. 2010d. NPDES facility attribute information. <http://www.epa.gov/echo/index.html>. Accessed June 24, 2010.

USGS (U.S. Geological Survey). 2010. *Estimated Withdrawals and Use of Water in Colorado, 2005.* Scientific Investigations Report 2010–5002. U.S. Department of the Interior, U.S. Geological Survey, Reston, Virginia.

WQCC (Water Quality Control Commission). 2006. Regulation No. 42: *Site-Specific Water Quality Classifications and Standards for Ground Water*. 5 CCR 1002-42. Colorado Department of Public Health and Environment, Water Quality Control Commission, Denver, Colorado.

WQCC. 2009. Regulation No. 41: *The Basic Standards for Groundwater*. 5 CCR 1002-41. Colorado Department of Public Health and Environment, Water Quality Control Commission, Denver, Colorado.

WQCC. 2010a. Regulation No. 33: *Classifications and Numeric Standards for the Upper Colorado River Basin and North Platte River (Planning Region 12).* 5 CCR 1002-33.

Colorado Department of Public Health and Environment, Water Quality Commission, Denver, Colorado.

WQCC. 2010b. Regulation No. 35: *Classifications and Numeric Standards for the Gunnison and Lower Dolores River Basins.* 5 CCR 1002-35. Colorado Department of Public Health and Environment, Water Quality Commission, Denver, Colorado.

WQCC. 2010c. Regulation No. 37: *Classifications and Numeric Standards for the Lower Colorado River Basin.* 5 CCR 1002-37. Colorado Department of Public Health and Environment, Water Quality Commission, Denver, Colorado.

WQCC. 2010d. Regulation No. 93: *Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List.* 5 CCR 1002-93. Colorado Department of Public Health and Environment, Water Quality Commission, Denver, Colorado.

WQCD (Water Quality Control Division). N.d. Sweitzer Lake. Posted announcement. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2000. *Total Maximum Daily Load Assessment: Straight Creek, Summit County, Colorado*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2002. *Integrated Water Quality Monitoring and Assessment Report*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2005. *Quality Assurance Project Plan and Sampling Analysis and Assessment Plan for Fish Tissue Surveys for the State of Colorado*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2006. *Summary of TMDL Action Items for Compliance with June 30, 2006 Settlement Agreement Commitment*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2008a. *Integrated Water Quality Monitoring and Assessment Report*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2008b. *Total Maximum Daily Load Assessment: Snake River and Peru Creek Summit County, Colorado*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2008c. *Total Maximum Daily Load Assessment: Upper Gunnison Segment 31, Cadmium and Zinc, Hinsdale County, Colorado*. Colorado Department of Public Health and

Environment, Water Quality Control Division, Denver Colorado, and Lake Fork Watershed Stakeholders, Lake City, Colorado. Prepared by J. Robert Owen (consultant), Albuquerque, New Mexico.

WQCD. 2009a. *Total Maximum Daily Load Assessment: Upper Gunnison Segment 30, Cadmium and Zinc, Hinsdale County, Colorado*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver Colorado and Lake Fork Watershed Stakeholders, Lake City, Colorado. Prepared by J. Robert Owen (consultant), Albuquerque, New Mexico.

WQCD. 2009b. Juniata Reservoir Attention Anglers. Posted announcement. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2009c. Lake Granby (Granby Reservoir) Attention Anglers. Posted announcement. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2009d. Rifle Gap Reservoir Attention Anglers. Posted announcement. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2009e. *Total Maximum Daily Load Assessment: Eagle River, Cross Creek; Eagle County, Colorado*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2009f. *Total Maximum Daily Load Assessment: Gunnison River and Tributaries, Uncompahgre River and Tributaries, Delta/Mesa/Montrose Counties, Colorado*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2009g. *Total Maximum Daily Load Assessment: Illinois Gulch COUCBL12, Zinc, Summit County, Colorado*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2009h. *Total Maximum Daily Load Assessment: Red Mountain Creek/Uncompahgre River, San Juan/Ouray/Montrose County, Colorado*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2010a. *Integrated Water Quality Monitoring and Assessment Report*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

WQCD. 2010b. *State of Colorado Water Pollution Control Revolving Fund and State Domestic Wastewater Treatment Grant Intended Use Plan*. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver, Colorado.

Map References

Exhibit 7-1. Colorado River Physical Location

WQCD (Water Quality Control Division). 2010a. CDPHE 2010 305(b) Basin Classifications. Shape\hucs\12digit\hydrologic_units\wbdhu12_a_co_Clip.shp. Acquired from Water Quality Control Division March 16, 2010.

Exhibit 7-3. Colorado River Basin and Major Tributaries

ESRI (Environmental Systems Research Institute, Inc.). 2008. U.S. and Canada City Points. \ESRI\cities.sdc. Accessed April 5, 2010.

ESRI (Environmental Systems Research Institute, Inc.). 2008. U.S. and Canada Street Cartographic. \ESRI\streets.sdc. Accessed April 5, 2010.

ESRI (Environmental Systems Research Institute, Inc.). 2008. U.S. Counties. \ESRI\counties.sdc. Accessed April 5, 2010.

ESRI (Environmental Systems Research Institute, Inc.). 2008. U.S. National Atlas Water Feature Lines. \ESRI\hydroln_Clip_to_CO.shp. Accessed April 5, 2010.

ESRI (Environmental Systems Research Institute, Inc.). 2008. U.S. States and Canada Provinces. \ESRI\states.sdc. Accessed April 5, 2010.

USEPA (U.S. Environmental Protection Agency). 2010. 2010 EPA-approved National Hydrography Database (NHD) Stream Segmentation co_2010_305b_draft_str_021410.shp and 2010 EPA-approved National Hydrography Database (NHD) Waterbody Segmentation co_2010_305b_draft_wb_021410.shp. Acquired from Water Quality Control Division on March 16, 2010.

WQCD (Water Quality Control Division). 2010a. CDPHE 2010 305(b) Basin Classifications. Shape\hucs\12digit\hydrologic_units\wbdhu12_a_co_Clip.shp. Acquired from Water Quality Control Division March 16, 2010.

Exhibit 7-4. Colorado River Basin Level III Ecoregions

CEC (North American Commission for Environmental Cooperation). 2006. <http://www.cec.org/Page.asp?PageID=122&ContentID=1329&SiteNodeID=498&BL_ExpandID>. Published by USEPA (U.S. Environmental Protection Agency). Accessed April 2, 2010.

Exhibit 7-6. Colorado River Basin Nonconsumptive Needs Assessment

CWCB (Colorado Water Conservation Board). 2009a. *Nonconsumptive Needs Assessment Focus Mapping*. Colorado Department of Natural Resources, Colorado Water Conservation Board, Denver, Colorado.

Exhibit 7-7. Colorado River Basin Precipitation

CWCB. 2004. *Statewide Water Supply Initiative*. Colorado Department of Natural Resources, Colorado Water Conservation Board, Denver, Colorado.

Exhibit 7-8. Colorado River Basin Land Ownership

CDOW (Colorado Division of Wildlife). 2003. Public Access Properties. NDIS_CDOW\CDOWPublicAccessProperties\CDOWPublicAccessProperties.shp. Accessed May 18, 2010.

CSLB (Colorado State Land Board). 2009. Colorado State Land Ownership. Colorado State Land Board\slb_surface_ed_032210a.shp. Accessed May 11, 2010.

USGS (U.S. Geological Survey). 2005. National Atlas of the United States (Federal Lands). NATIONALATLAS\lands\federal\fedlanp020.shp and NATIONALATLAS\lands\indian\indlanp020.shp. Accessed April 17, 2010.

Exhibit 7-9. Colorado River Basin Land Cover

USFWS (U.S. Fish and Wildlife Service). 2009. National Wetlands Inventory. <http://www.fws.gov/wetlands/data/DataDownload.html >. Accessed June 14, 2010.

USGS. 2001. National Land Cover Database. <http://www.mrlc.gov >. Accessed April 2, 2010.

Exhibit 7-15. Colorado River Basin Key Diversions and Streamflow Gauges

CWCB. 2004. *Statewide Water Supply Initiative*. Colorado Department of Natural Resources, Colorado Water Conservation Board, Denver, Colorado.

Exhibit 7-16. Colorado River Basin Wells and Aquifers

CWCB. 2004. *Statewide Water Supply Initiative*. Colorado Department of Natural Resources, Colorado Water Conservation Board, Denver, Colorado.

Exhibit 7-17. Upper Colorado River Sub-Basin Classified Waterbody Segments

USEPA. 2010. 2010 EPA-approved National Hydrography Database (NHD) Stream Segmentation co_2010_305b_draft_str_021410.shp and 2010 EPA-approved National

WQCD. 2010a. CDPHE 2010 305(b) Basin Classifications. Shape\hucs\12digit\hydrologic_units\wbdhu12_a_co_Clip.shp. Acquired from Water Quality Control Division March 16, 2010.

Hydrography Database (NHD) Waterbody Segmentation co_2010_305b_draft_wb_021410.shp. Acquired from Water Quality Control Division March 16, 2010.

Exhibit 7-18. Lower Colorado River Sub-Basin Classified Waterbody Segments

USEPA. 2010. 2010 EPA-approved National Hydrography Database (NHD) Stream Segmentation co_2010_305b_draft_str_021410.shp and 2010 EPA-approved National Hydrography Database (NHD) Waterbody Segmentation co_2010_305b_draft_wb_021410.shp. Acquired from Water Quality Control Division March 16, 2010.

WQCD. 2010a. CDPHE 2010 305(b) Basin Classifications. Shape\hucs\12digit\hydrologic_units\wbdhu12_a_co_Clip.shp. Acquired from Water Quality Control Division March 16, 2010.

Exhibit 7-19. Upper Gunnison River Sub-Basin Classified Waterbody Segments

USEPA. 2010. 2010 EPA-approved National Hydrography Database (NHD) Stream Segmentation co_2010_305b_draft_str_021410.shp and 2010 EPA-approved National Hydrography Database (NHD) Waterbody Segmentation co_2010_305b_draft_wb_021410.shp. Acquired from Water Quality Control Division March 16, 2010.

WQCD. 2010a. CDPHE 2010 305(b) Basin Classifications. Shape\hucs\12digit\hydrologic_units\wbdhu12_a_co_Clip.shp. Acquired from Water Quality Control Division March 16, 2010.

Exhibit 7-20. Lower Gunnison River Sub-Basin Classified Waterbody Segments

USEPA. 2010. 2010 EPA-approved National Hydrography Database (NHD) Stream Segmentation co_2010_305b_draft_str_021410.shp and 2010 EPA-approved National Hydrography Database (NHD) Waterbody Segmentation co_2010_305b_draft_wb_021410.shp. Acquired from Water Quality Control Division March 16, 2010.

WQCD. 2010a. CDPHE 2010 305(b) Basin Classifications. Shape\hucs\12digit\hydrologic_units\wbdhu12_a_co_Clip.shp. Acquired from Water Quality Control Division March 16, 2010.

Exhibit 7-34. Colorado River Basin Wetlands

USFWS (U.S. Fish and Wildlife Service). 2009. National Wetlands Inventory. <http://www.fws.gov/wetlands/data/DataDownload.html >. Accessed June 14, 2010.

Exhibit 7-52. Colorado River Basin Impaired Waterbody Segments

USEPA (U.S. Environmental Protection Agency). 2010. 2010 EPA-approved National Hydrography Database (NHD) Stream Segmentation co_2010_305b_draft_str_021410.shp and 2010 EPA-approved National Hydrography Database (NHD) Waterbody Segmentation co_2010_305b_draft_wb_021410.shp. Acquired from Water Quality Control Division on March 16, 2010.

WQCD. 2010a. CDPHE 2010 305(b) Basin Classifications. Shape\hucs\12digit\hydrologic_units\wbdhu12_a_co_Clip.shp. Acquired from Water Quality Control Division March 16, 2010.

WQCD. 2010b. CDPHE 2010 303(d) Listings By Regulation and Basin Shape\303D_LISTING\REG_33_EXPORT.shp, Shape\2010_303_ME\COUC\lakes\COUC_impaired_lakes.shp, Shape\303D_LISTING\REG_35_EXPORT.shp,

Shape\2010_303_ME\COGU\lakes\COGU_impaired_lakes.shp, Shape\2010_303_ME\COLC\COLC_impaired_str.shp, Shape\2010_303_ME\COLC\lakes\COLC_impaired_lakes.shp. Acquired from Water Quality Control Division March 16, 2010.