2.0 CIMARRON WATERSHED CHARACTERISTICS

The Cimarron Basin was sampled by the Surface Water Quality Bureau (SWQB) from March to November 2006. Surface water quality monitoring stations were selected to characterize water quality of perennial stream reaches of the Cimarron River and its tributaries. Water quality impairments identified during this survey are addressed in this document.

2.1 Location Description

The Cimarron River Watershed (US Geological Survey [USGS] Hydrologic Unit Codes [HUC] 11080002) is located in northeastern New Mexico (NM) and is bounded by the Sangre de Cristo Mountains to the west and the Canadian River and Great Plains to the east. The Cimarron River watershed where it enters the Canadian River southeast of Springer, NM to its headwaters drains approximately 2673 square kilometers (1032 square miles). Elevation ranges from 3792 meters (12,441 feet) atop Baldy Mountain to 1759 meters (5770 ft.) at the USGS Gage 07211000 in Springer, NM.

The Cimarron River watershed is located in Omernik Level III Ecoregion 21 (Southern Rockies) in the headwaters and Level III Ecoregion 26 (Southwestern Tablelands) in the lowlands. Therefore, the vegetation of the Cimarron Watershed includes both the Rocky Mountain and Great Plains floras (Omernik 2006). As presented in **Figure 2.1**, land use is 51% forest, 31% grassland, 16% shrubland, 2% agricultural, and <1% urban.

Historic and current land uses in the watershed include farming, ranching, mining, recreation, and municipal related activities. Much of the land ownership adjacent to the river is private with the exceptions of Forest Service land at higher elevations and a small portion of the Valle Vidal in the headwaters of the Ponils (**Figure 2.2**). The elevation range for the various sampling sites in the survey was 5781 feet (ft.) to 8445 ft. above sea level. Annual precipitation ranges from 30 inches in the mixed conifer forests at higher elevations to 15 inches in the semiarid grasslands at lower elevations (NRCS 2007).

Local wildlife includes deer, elk, bear, antelope, turkey, chipmunk, squirrel, beaver, coyote, red fox, porcupine, raccoon, bobcat, mountain lion, and a few bighorn sheep. Golden eagles, long billed curlew, and other birds may be seen in the area. Several species within this watershed are listed as either threatened or endangered by both State and federal agencies. Endangered species include the Southern redbelly dace (*Phoxinus erythrogaster*), Southwestern willow flycatcher (*Empidonax traillii extimus*), Least tern (*Sterna antillarum*), Black-footed ferret (*Mustela nigripes*), and Holy Ghost ipomopsis (*Ipomopsis sancti-spiritus*). Threatened species include the Arkansas River shiner (*Notropis girardi*), Suckermouth minnow (*Phenacobius mirabilis*), Arkansas River speckled chub (*Macrhybopsis tetranema*), Bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), and Piping plover (*Charadrius melodus*).

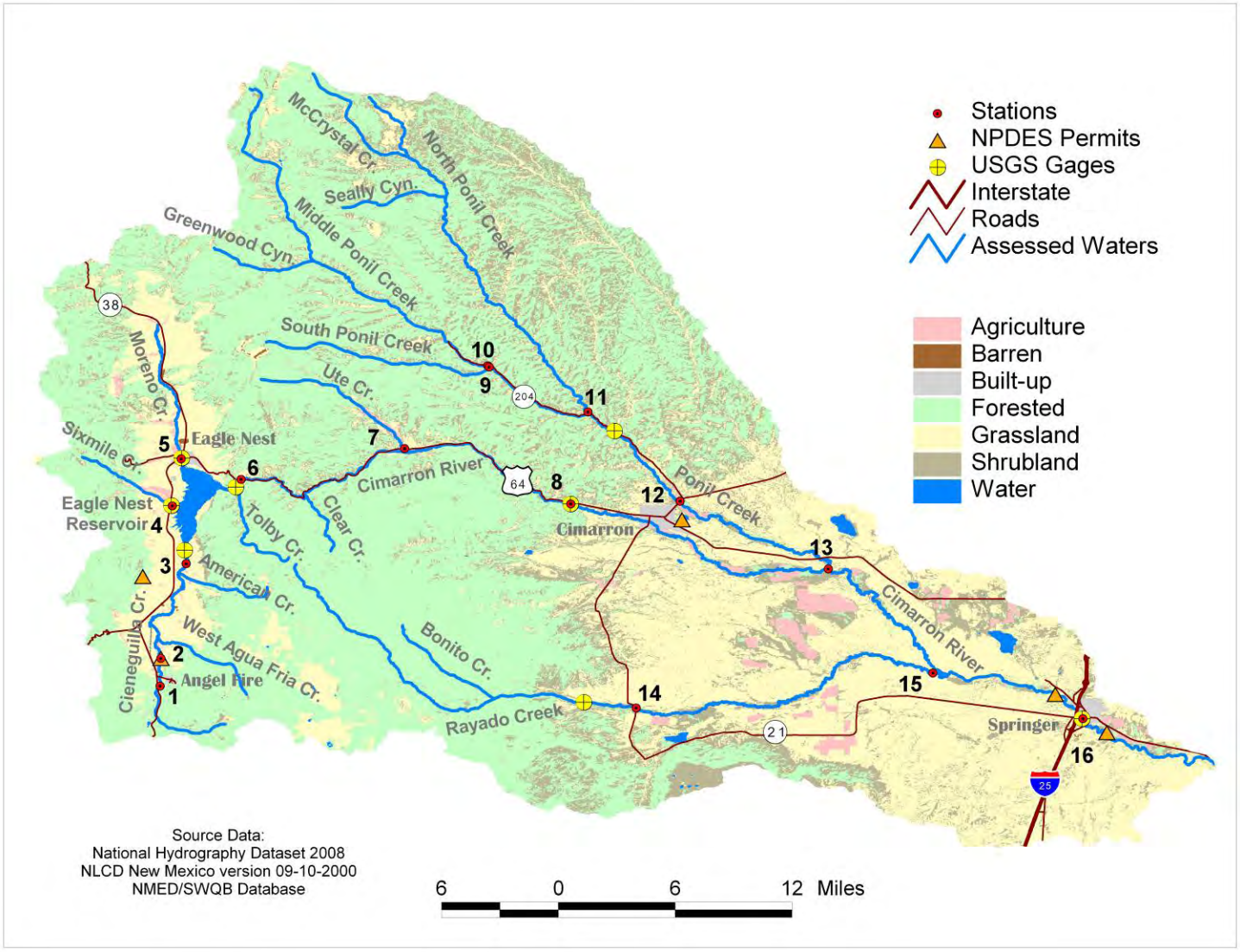


Figure 2.1 Land Use and 2006 Sampling Stations in the Cimarron Watershed. See Table 2.1 for station information.

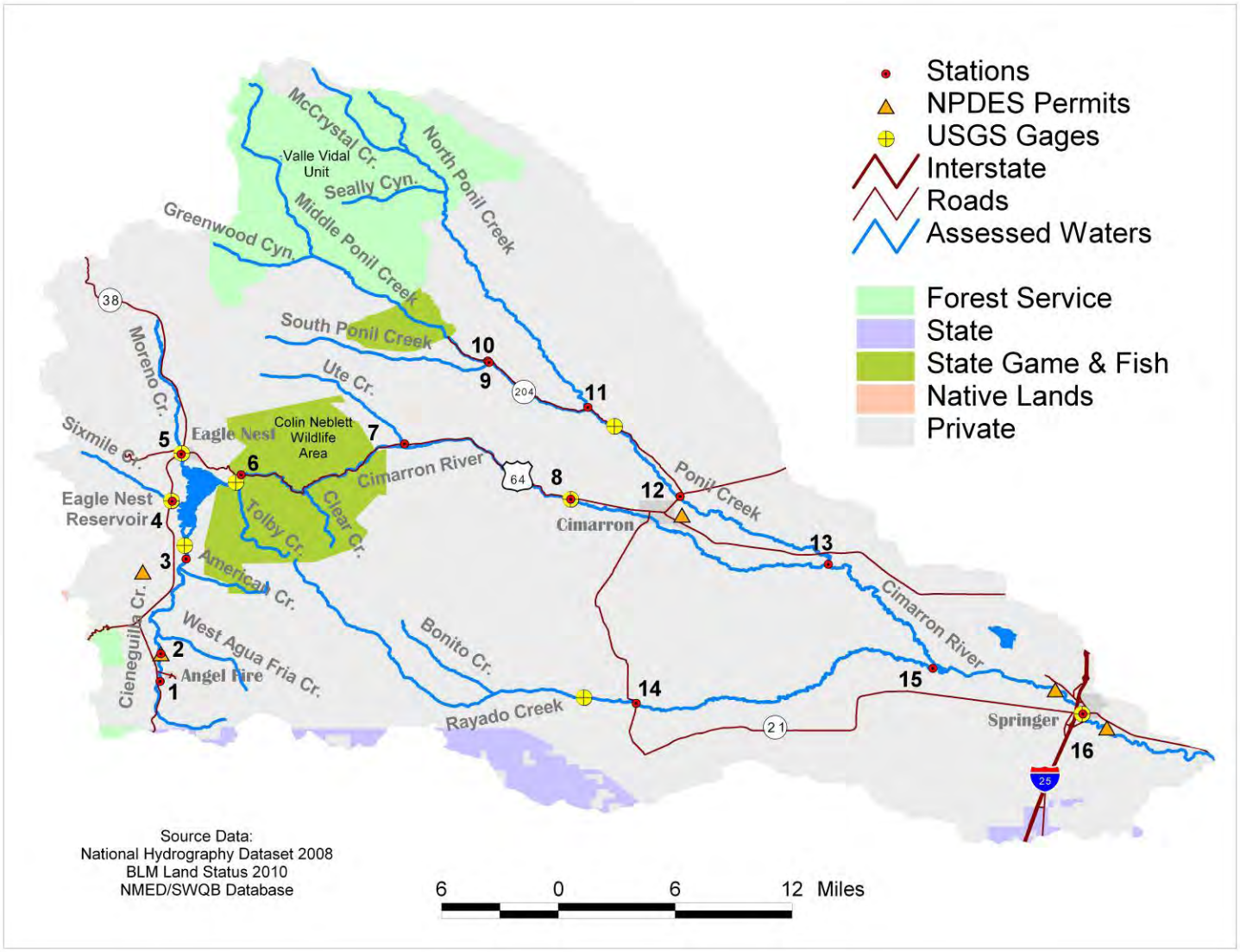


Figure 2.2 Land Management and 2006 Sampling Stations in the Cimarron Watershed

2.2 Geology and Land Use

Both the bedrock geology and the hydrology of the Cimarron watershed are complex. The Cimarron River and its tributaries originate in the Sangre de Cristo Mountains. Cieneguilla, Sixmile, and Moreno Creeks form the headwaters of the Cimarron River. After their convergence into Eagle Nest Lake, the Cimarron River flows east-southeast through Cimarron Canyon State Park and the villages of Ute Park, Cimarron, and Springer. The river empties into the Canadian River several miles southeast of Springer, NM.

The geology of the Cimarron Watershed is characterized by sandstone, shale, mudstone, and claystone that are flanked by limestone or calcareous rocks in the western headwaters, mafic volcanic rocks and metamorphic rocks in the southern headwaters, and intrusive or plutonic

rocks in the central watershed (**Figure 2.3**). Taking a closer look, Cimarron Canyon has two distinct terrains that are separated by the Fowler Pass fault near Clear Creek. The rocks on the northeast side of the fault have been intruded by gabbro and granite, both coarse-grained plutonic rocks. The rocks on the southwest side of the fault were once sedimentary or igneous rocks that were heated and squeezed under tremendous pressure deep within the earth's crust turning them into metamorphic rocks and forming the lineation and banding characteristic of many of them. They consist predominantly of quartz, feldspar, and hornblende.

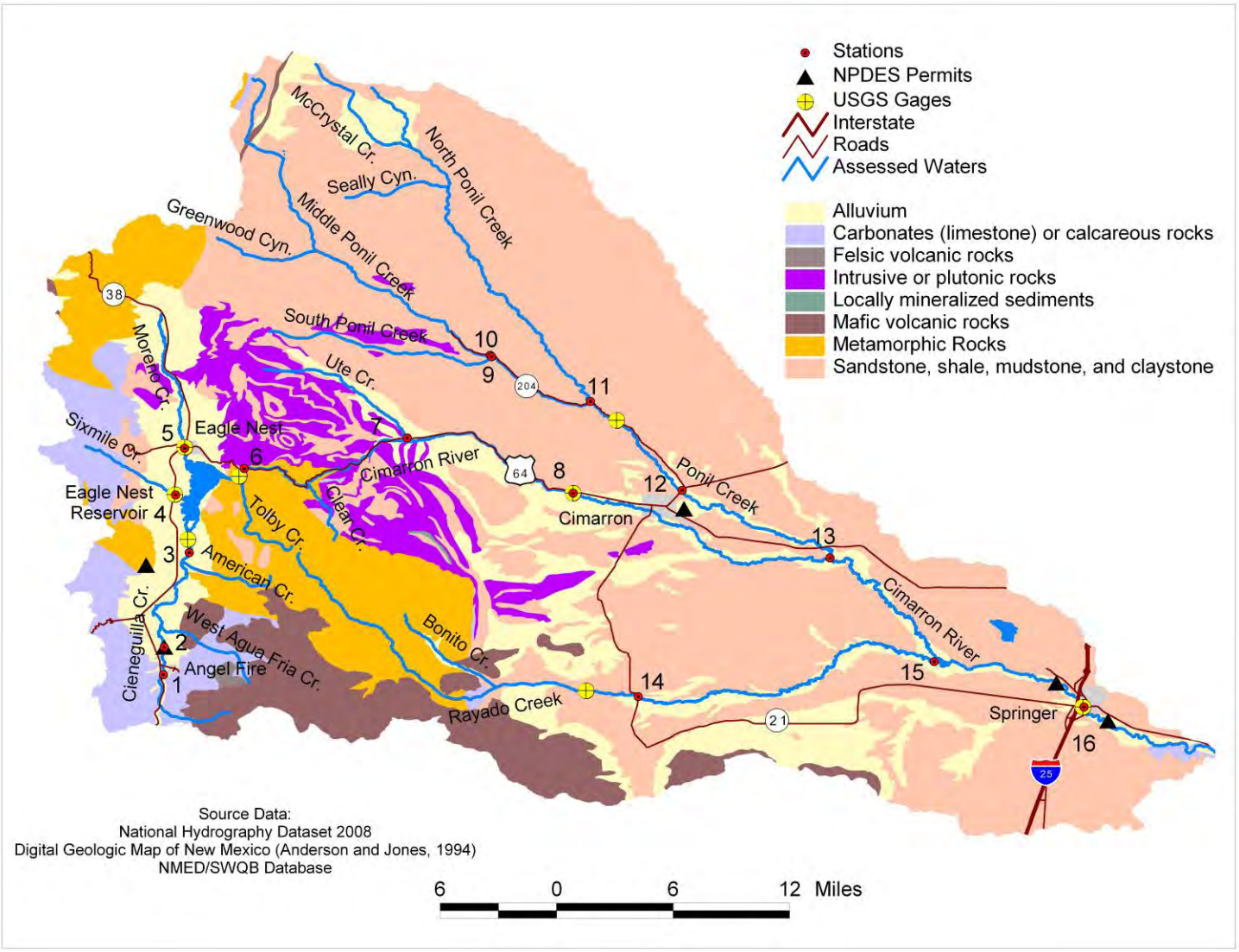


Figure 2.3 Geologic Map of the Cimarron Watershed and 2006 Sampling Stations

2.3 Water Quality Standards and Designated Uses

Water quality standards (WQS) for all assessment units in this document are set forth in sections, 20.6.4.306, 20.6.4.307, and 20.6.4.309 of the *Standards for Interstate and Intrastate Surface Water s*, 20.6.4 New Mexico Administrative Code, as amended through August 1, 2007 (NMAC 2007). These standards have been approved by EPA for Clean Water Act purposes.

20.6.4.306 CANADIAN RIVER BASIN - The Cimarron river downstream from state highway 21 in Cimarron to the Canadian river and all perennial reaches of tributaries to the Cimarron river downstream from state highway 21 in Cimarron.

A. Designated Uses: irrigation, warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

20.6.4.307 CANADIAN RIVER BASIN - Perennial reaches of the Mora river from the USGS gaging station near Shoemaker upstream to the state highway 434 bridge in Mora, all perennial reaches of tributaries to the Mora river downstream from the USGS gaging station at La Cueva in San Miguel and Mora counties, perennial reaches of Ocate creek and its tributaries downstream of Ocate, and perennial reaches of Rayado creek downstream of Miami lake diversion in Colfax county.

A. Designated Uses: marginal coldwater aquatic life, warmwater aquatic life, secondary contact, irrigation, livestock watering and wildlife habitat.

20.6.4.309 CANADIAN RIVER BASIN - The Mora river and perennial reaches of its tributaries upstream from the state highway 434 bridge in Mora, all perennial reaches of tributaries to the Mora river upstream from the USGS gaging station at La Cueva, perennial reaches of Coyote creek and its tributaries, the Cimarron river and its perennial tributaries above state highway 21 in Cimarron, all perennial reaches of tributaries to the Cimarron river north and northwest of highway 64, perennial reaches of Rayado creek and its tributaries above Miami lake diversion, Ocate creek and perennial reaches of its tributaries upstream of Ocate, perennial reaches of the Vermejo river upstream from Rail canyon and all other perennial reaches of tributaries to the Canadian river northwest and north of U.S. highway 64 in Colfax county unless included in other segments.

A. Designated Uses: domestic water supply, irrigation, high quality coldwater aquatic life, livestock watering, wildlife habitat, municipal and industrial water supply and secondary contact.

The numeric criteria identified in these sections are used for assessing waters for use attainability. The referenced Section 20.6.4.900 NMAC provides a list of water chemistry analytes for which SWQB tests and identifies numeric criteria for specific designated uses. In addition, waters are assessed against the narrative criteria identified in Section 20.6.4.13 NMAC, including bottom sediments and suspended or settleable solids, plant nutrients, and turbidity. The individual water quality criteria or narrative standards are detailed for each parameter in the chapters that follow.

Current impairment listings for the Cimarron River Watershed are included in the 2010-2012 State of New Mexico Clean Water Act §303(d)/ §305(b) Integrated List (NMED/SWQB 2010a). The Integrated List is a catalog of assessment units (AUs) throughout the state with a summary of their current status as assessed/not assessed or impaired/not impaired. Once a stream AU is identified as impaired, a TMDL guidance document is developed for that segment with guidelines for stream restoration. Target values for TMDLs are determined based on 1)

applicable numeric criteria or appropriate numeric translator to a narrative standard, 2) the degree of experience in applying various management practices to reduce a specific pollutant's loading, and 3) the ability to easily monitor and produce quantifiable and reproducible results. AU names and WQS have changed over the years and the history of these individual changes is tracked in the Record of Decision document associated with the 2010-2012 Integrated List available on the SWQB website.

New Mexico's antidegradation policy is articulated in Subsection A of 20.6.4.8 NMAC. It mandates that "the level of water quality necessary to protect the existing uses shall be maintained and protected in all surface waters of the state." TMDLs are consistent with this policy because implementation of a TMDL restores water quality so that existing uses are protected and water quality criteria achieved.

2.4 Water Quality Sampling

The Cimarron River Watershed was sampled by the SWQB in 2006. A brief summary of the survey and the hydrologic conditions during the sample period is provided in the following subsections. A more detailed description can be found in Canadian River Water Quality Survey Summary (NMED/SWQB 2010b).

2.4.1 Survey Design

The Monitoring and Assessment Section (MAS) of the SWQB conducted a water quality survey of the Cimarron River Watershed between March and November, 2006. This water quality survey included 16 sampling sites (**Figure 2.1 and Table 2.1**). Most sites were sampled 8 times, while some secondary sites were sampled one to four times. Monitoring these sites enabled an assessment of the cumulative influence of the physical habitat, water sources, and land management activities upstream from the sites. Data results from grab sampling are housed in the SWQB provisional water quality database and were uploaded to USEPA's Storage and Retrieval (STORET) database.

All temperature and chemical/physical sampling and assessment techniques are detailed in the *Quality Assurance Project Plan* (NMED/SWQB 2006) and the SWQB assessment protocols (NMED/SWQB 2008). As a result of the 2006 monitoring effort and subsequent assessment of results, several surface water impairments were determined. Accordingly, these impairments were added to New Mexico's Integrated CWA §303(d)/305(b) List in 2008 (NMED/SWQB 2010a).

Table 2.1 SWQB 2006 Cimarron River Basin Sampling Stations

Station	STATION LOCATION	STORET ID
1	Cieneguilla Creek at Angel Fire Road	05Cieneg019.3
2	Angel Fire WWTP	NM0030503
3	Cieneguilla Creek above Eagle Nest Lake at gage	05Cieneg006.3
4	Sixmile Creek above US 64 near gage	05Sixmil001.4
5	Moreno Creek on NM 64 at gage	05Moreno003.7
6	Cimarron R below Eagle Nest Dam at Tolby CG	05Cimarr077.2
7	Ute Creek above US 64 at Ute Park	05UteCre000.6
8	Cimarron River above Cimarron Village at gage	05Cimarr050.8
9	South Ponil above Middle Ponil	05SPonil008.5
10	Middle Ponil Creek above South Ponil Creek	05MPonil000.1
11	North Ponil Creek above South Ponil	05NPonil000.1
12	Ponil Creek above NM 64	05PonilC014.9
13	Ponil Creek above Cimarron River	05PonilC000.1
14	Rayado Creek on NM 21	05Rayado033.8
15	Rayado Creek above Cimarron River	05Rayado001.8
16	Cimarron River at gage in Springer	05Cimarr013.4

2.4.2 Hydrologic Conditions

There are two active USGS gaging stations in the Cimarron River: the Cimarron River below Eagle Nest Dam and Cimarron River near Cimarron, NM with periods of record from 1950 to present day. The annual daily mean streamflow for the Cimarron River is 16.3 cubic feet per second (cfs) below Eagle Nest Dam and 23.6 cfs near Cimarron, NM (**Figures 2.4 and 2.5**).

During the 2006 watershed survey, daily flows in the Cimarron River below Eagle Nest Dam were below average from July through September with an annual daily mean streamflow of 14.0 cfs, approximately 14% below "normal". Likewise, daily flows in the Cimarron River near Cimarron, NM were below average from January through September with an annual daily mean streamflow of 14.9 cfs, approximately 37% below "normal" (**Figure 2.6**).

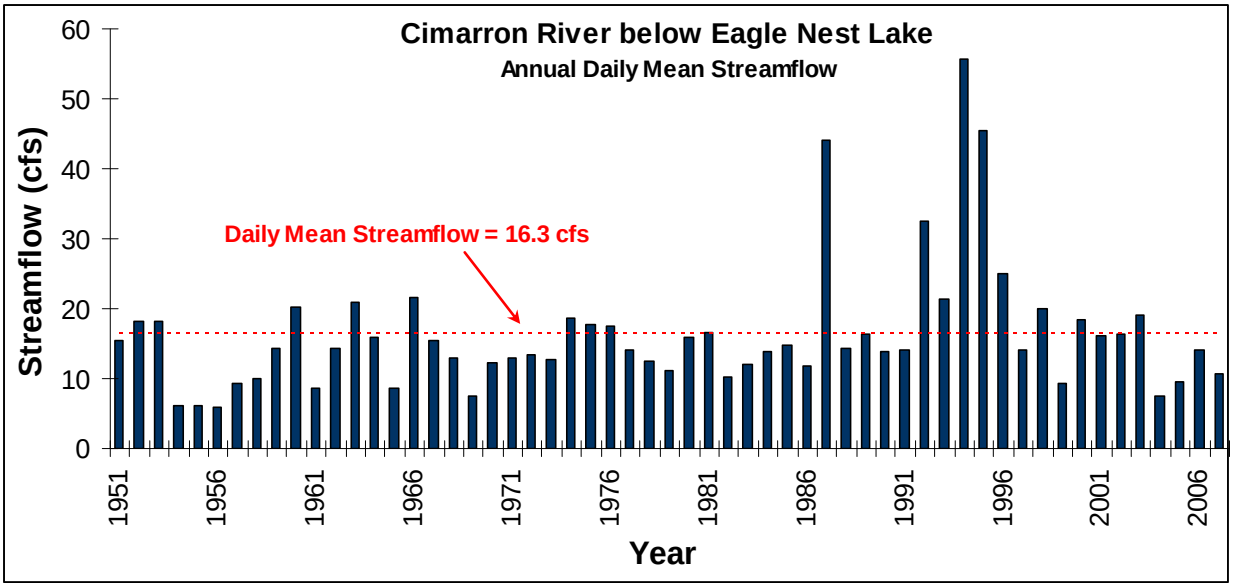


Figure 2.4 Cimarron River below Eagle Nest Dam (1951 – 2007)

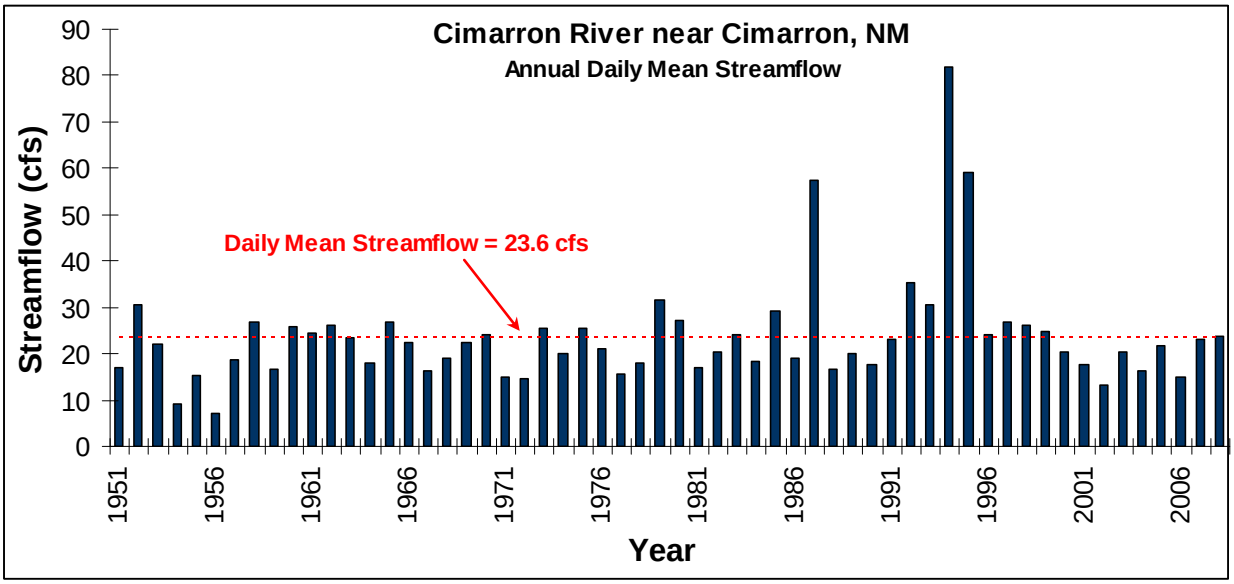
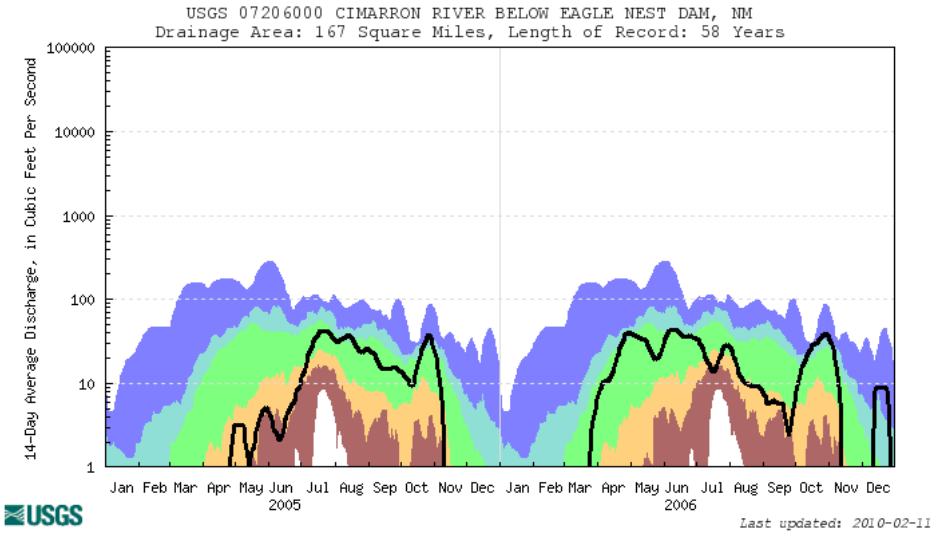
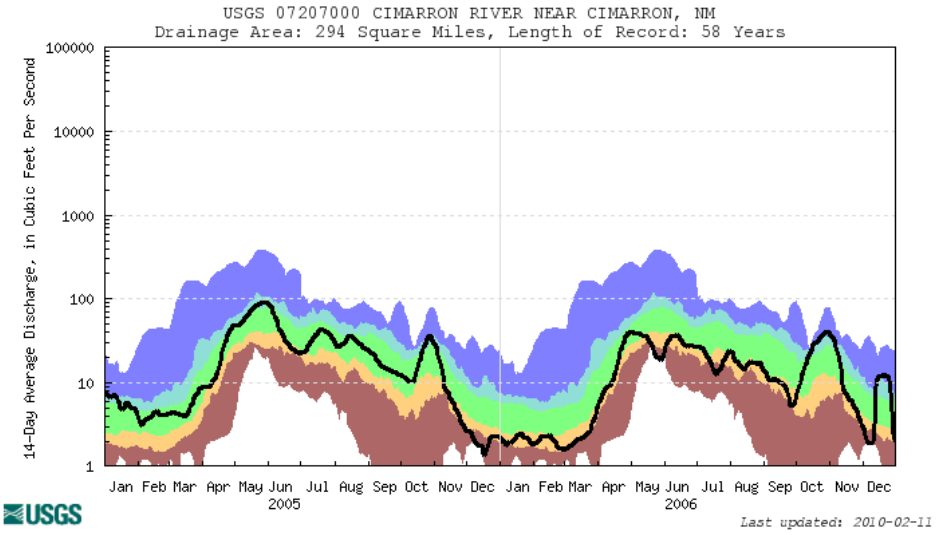


Figure 2.5 Cimarron River near Cimarron, NM (1951 – 2008)





Explanation – Percentile classes					
Lowest - 10th percentile	**10 - 24**	**25 – 75**	**76 - 90**	90th percentile - highest	**Flow**
Much below normal	Below normal	NORMAL	Above normal	Much above normal	

Figure 2.6 USGS streamflow duration hydrographs for the Cimarron River

As stated in the Assessment Protocol (NMED/SWQB 2009), data collected during all flow conditions, including low flow conditions (i.e., flows below 4-day, 3-year flows [4Q3]), will be used to determine designated use attainment status during the assessment process. For the purpose of assessing designated use attainment in ambient surface waters, WQS apply at all times under all flow conditions.