CIMARRON RIVER AND BLUE CREEK WATERSHED ASSESSMENT

CIMARRON VALLEY AND RIVER WATERSHED COALITION

CVRWC.ORG

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Prepared by:

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ERO

BUCKHORN ENGINEERING

The mission of the Cimarron Valley and River Watershed Coalition is to provide education, financial resources, communication and project implementation for improving and protecting water quality, water conservation, water use, instream flows and fisheries in the Cimarron River and its tributaries while also ensuring the long-term sustainability of the watershed's important agricultural community. The CVRWC shall operate in a collaborative manner with landowners, agencies and members of the public.

Additional information is available at the CVRWC website: cvrwc.org

This report was prepared under a grant from the United States Bureau of Reclamation (USBR) WaterSmart program by DiNatale Water Consultants, ERO Resources, and Buckhorn Engineering with invaluable guidance and direction provided by CVRWC board members Mr. Allen Distel and Mr. Cary Denison. Invaluable assistance with mapping was provided by Braden Burns with Land Information Systems.

Supplemental materials, including additional mapping, streamflow and diversion data files, stakeholder outreach materials, and a spreadsheet with a listing and initial scoring of several potential projects are available for download from the CVRWC website.

Cimarron River headwaters

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EXECUTIVE SUMMARY

The Cimarron Valley and River Watershed Coalition commissioned a watershed assessment of the Cimarron River and Blue Creek basins in southern Colorado. This project report, mapping resources, stream gage data and diversion data are intended to be go-to resources for future in-basin projects and information about the basin. Supplemental materials are available for download from the Coalitions website (crvwc.org), including a Google Earth mapping file (.kmz file type), streamflow and diversion data files, stakeholder outreach materials, and a spreadsheet with a listing and initial scoring of several potential projects. Current and potential future in-basin projects are described in the project sheets in Section 6 of this report. This Watershed Assessment is intended to be a springboard to support in-basin projects, by providing relevant information and gathering stakeholder input to identify objectives, needs, concerns.

This project would not have happened without the input and cooperation of members of the Coalition and other stakeholders in the basin. One of the primary components of this project was to engage stakeholders to draw out information, opinions, concerns, and recommendations for the watershed.

Stakeholder participation was obtained during a four-step process between March of 2022 and concluding in October of 2022 (see Section 5). As a result of the Stakeholder participation process, over 40 projects and ideas were gathered, towards 6 goals identified for overall watershed improvement. Interviews and information were collected from all major stakeholders in the watershed, including private landowners, recreators environmental organizations, Colorado Parks and Wildlife, the US Forest Service, and irrigation management companies. As a result of the Stakeholder participation process, over 40 projects and ideas were gathered, towards 6 goals identified for overall watershed improvement (see **Table ES-1** on the next page):

Table ES-1. Goals and objectives for overall watershed improvement.

Goal #	Goal Description
1	Increase flows and reduce late summer water temperatures in the Cimarron River, Little Cimarron, and Blue Creek.
2	Develop, rehabilitate and maintain critical water storage facilities (e.g., Fish Creek Reservoir #2).
3	Modernize and stabilize irrigation infrastructure; make best use of available federal funding.
4	Conserve, protect and improve where possible overall wildlife and aquatic habitat; focus on addressing noxious weeds and beetle kill timber for fire mitigation.
5	Connect private land owners/ditch companies operating in the watershed, and state and federal resource and land management agencies* to enable understanding of watershed health, and to form productive partnerships and collaborations (*USFS, BLM, CPW, USFWS, DWR, and others).
6	Increase community involvement and educational outreach in the Cimarron River and Blue Creek watershed.

1. INTRODUCTION

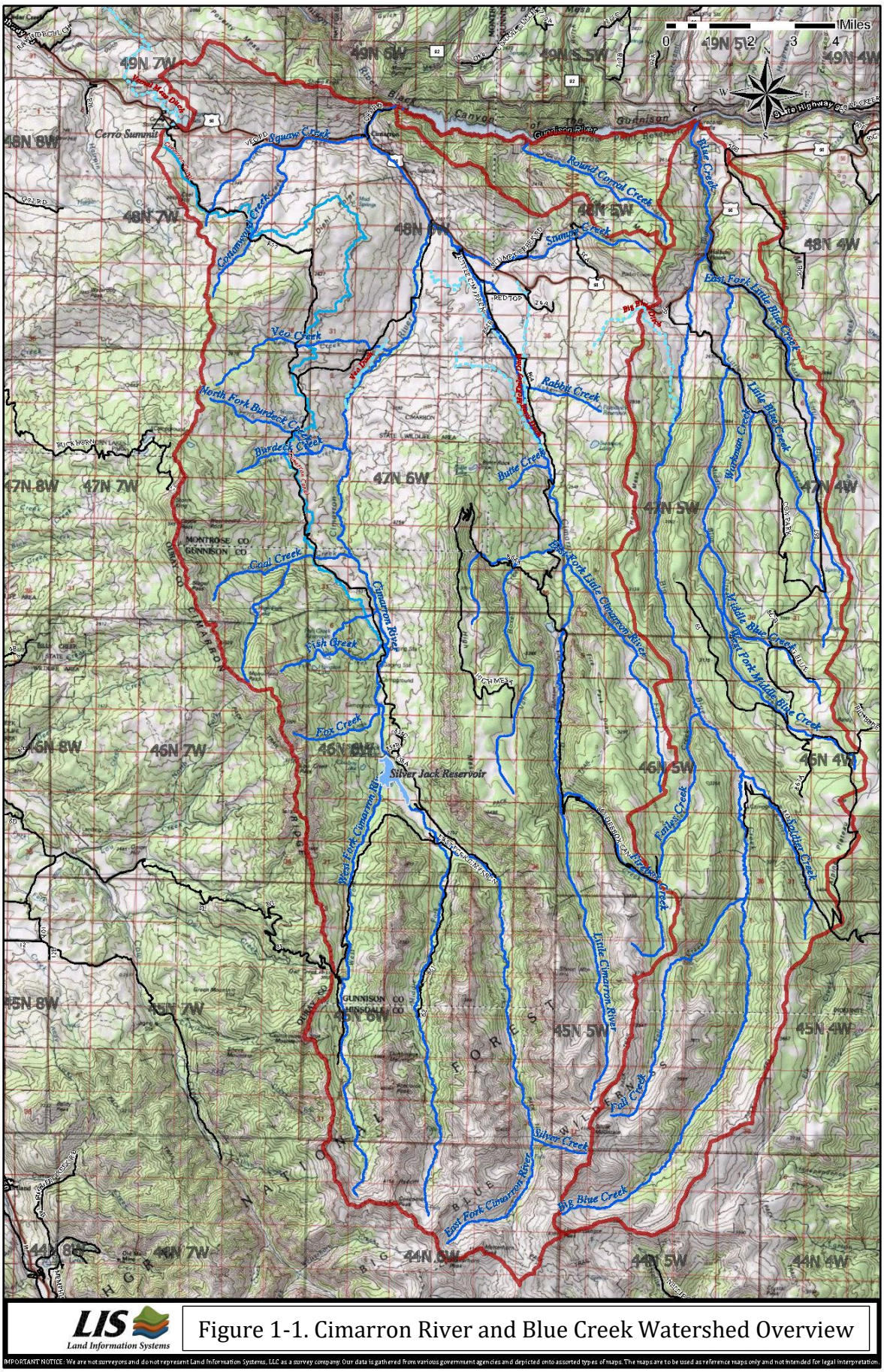
The Cimarron River and Blue Creek watersheds are located in southern Colorado with headwaters originating in the 14,000 foot peaks of the San Juan Mountains, and flowing northward toward the Gunnison River. An overview of the watersheds is shown in **Figure 1-1**. The Cimarron Valley and River Watershed Coalition commissioned a watershed assessment for these watersheds to serve as a resource for future in-basin projects and information about the basin. The watershed assessment was designed to provide a base of knowledge related to the physical and environmental setting, geologic analysis, stream gage data, water rights diversions data, and other relevant physical and environmental facets of the basin. In addition, available mapping in Google Earth format allows any user to quickly access spatial mapping, and available stream gage and diversion data allow users to evaluate the different water uses in the watersheds.

Ultimately, the data and resources provided through this watershed assessment are intended to support current projects and support future projects that can enhance various aspects of the watershed. This is accomplished by providing relevant information and gathering stakeholder input to identify objectives, needs, and concerns. Stakeholder input was an important aspect of this project, and a significant portion of the overall effort was devoted to outreach to stakeholders to draw out information, opinions, concerns, and recommendations for the watershed.

The project culminated in completion of this report, and multiple outreach meetings with stakeholders in the basin and identification of current projects and opportunities for future projects that focus on the objectives laid out in this report.

1.1 Cimarron River and Valley Watershed Coalition

The Cimarron River and Valley Watershed Coalition is a community-based organization focused on helping make the watershed a vibrant watershed flowing high quality and abundant water, healthy forests, productive agriculture, and great recreation for all to enjoy. Due to the broad scope of potential projects within the watersheds and diverse stakeholder interests, the Coalition sought out and received funding to complete a Watershed Assessment process. The purpose of this Watershed Assessment is to create a shared understanding of the state of the watershed, by providing basic documentation and assessment of the Cimarron and Blue Creek watersheds including important water features, water uses, environmental attributes, geologic features, water supply gaps, water quality impairments, and other pertinent data.



LIS Land Information Systems

Figure 1-1. Cimarron River and Blue Creek Watershed Overview

1.2 Watershed Assessment Goals

This watershed assessment is to provide information that can be viewed as an Executive Summary of the watershed. This will allow both stakeholders and those not familiar with the watershed to quickly understand the key physical, hydrological, and geologic aspects of the watershed. Identification of stakeholder goals, objectives and recommendations will lay the groundwork for future projects in the basin that can have multiple benefits for a variety of water users and needs.

Every aspect of this report and the accompanying materials available for download from the Coalition's website is aimed at making this watershed assessment a key tool and go-to resource for future projects and information about the basin. Specifically, the following supplemental materials are available for download from the Coalition website (cvrwc.org) in addition to this report document:

- Google Earth file with streams, irrigated lands, major ditches, wildlife habitat etc.
- Hydrologic data interface with stream gage data, diversion records, and water rights listing available for analysis
- Geologic mapping
- Materials used for stakeholder engagement
- Spreadsheet with a listing and initial scoring of several potential projects

Combined with this baseline information, the stakeholder goals and objectives are meant to lay the groundwork for future projects and help generate collaboration between different stakeholders and water users to develop future multiple-benefit projects. Collaboration among various stakeholders increases the funding opportunities for future projects.

Goals for the overall improvement of the watershed were determined through the collaborative stakeholder involvement process described in Section 5, and are shown in **Table 1-1**.

A recommendation is that a stakeholder process is held periodically in upcoming years to revise these goals, as needed (at least every five years). As a result of the stakeholder engagement, five projects have been selected as "next steps". However, many more project ideas and initiatives have been gathered during the stakeholder process. A spreadsheet with a complete list of project ideas developed over the course of this project is available for download with the supplemental materials available on the Coalition website.

Table 1-1. Goals for overall improvement of the watershed.

Goal #	Goal Description
1	Increase flows and reduce late summer water temperatures in the Cimarron River, Little Cimarron, and Blue Creek
2	Develop, rehabilitate and maintain critical water storage facilities (e.g., Fish Creek Reservoir #2)
3	Modernize and stabilize irrigation infrastructure; make best use of available federal funding
4	Conserve, protect and improve where possible overall wildlife and aquatic habitat; focus on addressing noxious weeds and beetle kill timber for fire mitigation
5	Connect private land owners/ditch companies operating in the watershed, and state and federal resource and land management agencies* to enable understanding of watershed health, and to form productive partnerships and collaborations (*USFS, BLM, CPW, USFWS, DWR, and others)
6	Increase community involvement and educational outreach in the Cimarron River and Blue Creek watershed

1.3 Organization of Document

This watershed assessment report was completed in two phases. The first phase was named the "Study Phase" which involved compilation of information about the watershed related to the physical environment, hydrology, and geology. Although geology is part of the physical environment, the presence of Mancos Shale and its negative impact on slope stability within the basin warranted a separate section in the report. The Physical Environment of the watershed is described in Section 2, including information related to landforms, ownership, vegetation, fisheries, and wildlife. Section 3 contains information related to the hydrology of the basin, including streamflow measurements and estimates, water rights and diversions, and environmental flow water rights and programs within the basin. Section 4 is a discussion of the geology and soils in the basin and how water use interacts with the underlying soil and geology in the basin.

The second phase of this report was named the "Discussion and Report Phase" which involved identifying stakeholder goals, objectives, and recommendations to lay the groundwork for future projects in the basin that can have multiple benefits for a variety of

water users. This phase is represented in Section 5 that discusses the stakeholder engagement process, Section 6 that identifies known projects and some potential future projects that were actively discussed during the course of the project, and Section 7 that lays out the identified goals, objectives and recommendations for the watershed moving forward.

2. PHYSICAL ENVIRONMENT

2.1 Location and setting

The Cimarron River and Blue Creek watersheds together occupy 328.6 square miles (210,292 acres) in southwestern Colorado, including portions of Montrose, Gunnison and Hinsdale counties (**Figure 1-1**). The watersheds generally have higher elevations to the south and lower elevations on the north where the Cimarron River and Blue Creek meet the Gunnison River. The watershed is approximately 25 miles north-south by 15 miles east-west. The Cimarron River watershed occupies 147,807 acres (70% of the total area) and the Blue Creek watershed occupies 62,485 acres (30% of the total) (BLM 2019). Municipalities near the watersheds include Montrose about 20 miles to the west, and Gunnison about 30 miles to the east. The small unincorporated town of Cimarron is located near the confluence of the Cimarron River and the Gunnison River along the northern watershed boundary. US Highway 50 transects the watersheds near the northern boundary. There are no other state or federal highways in the watersheds.

2.2 Land Use and Ownership

Uncompahgre National Forest occupies the most substantial portion of the watersheds (93,810 acres, or 45%), and about half of the National Forest lands are within Uncompahgre Wilderness Area. **Figure 2-1** shows the major land ownership types within the watershed. Another 25,782 acres (12%) are Bureau of Land Management (BLM)-managed lands, and 6,613 acres (3%) are state lands comprising the Cimarron State Wildlife Area (SWA). Private lands occupy 84,088 acres (40%) within the watersheds. The majority of the private lands are operating ranches (Distel pers. comm. 2021). The Cimarron Mountain Club, a “private ski ranch”, occupies 1,750 acres within the watershed.

Lands in the watersheds are largely undeveloped, with over half of the acres forested (67% or 141,498 acres of combined evergreen deciduous or mixed forest), shrubland (11.7% or 24,690 acres), or barren (5.4% or 11,407 acres) (more detail follows in Section 2.4, Vegetation).

The predominant land use is for agriculture (livestock), with 14% of the acres designated as grass pasture (29,545 acres); other hay crops (non-alfalfa) comprise a very small portion of the watershed (0.37% or 785 acres), and alfalfa comprises 0.07% or 142 acres (USGS 2022). Open space and development occupy 0.47% or 987 acres (USGS 2022).

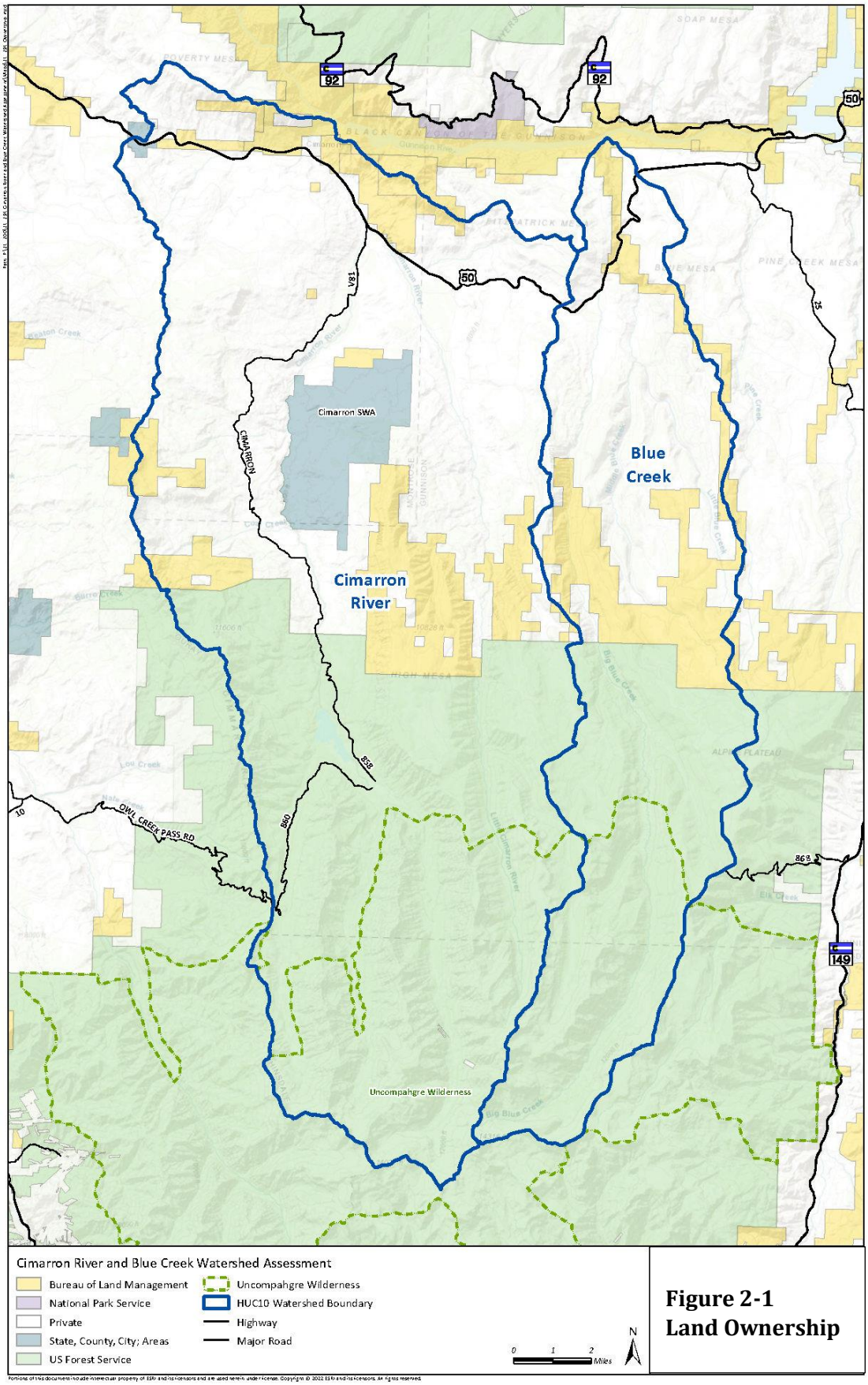


Figure 2-1
Land Ownership

Table 2-1. Land ownership within the Cimarron River and Blue Creek watersheds

Ownership	Blue Creek		Cimarron River		Total	
	Acres	percentage	Acres	percentage	Acres	percentage
USFS	30,049	48%	63,761	43%	93,810	45%
BLM	10,083	16%	15,699	11%	25,782	12%
Local (State)	-	0%	6,613	4%	6,613	3%
Private	22,354	36%	61,735	42%	84,088	40%
Total	*62,485*	*100%*	*147,807*	*100%*	*210,293*	*100%*

Approximately 24 grazing allotments are present in the watersheds; these allotments are primarily on BLM-managed lands in the middle watershed area, and along the northern watershed boundary (BLM 2022). Recreation, including camping, trail use, fishing and hunting are prevalent on public lands (BLM, USFS and CPW-managed lands) within the watershed. A total of 16 trailheads are present primarily on Forest Lands (CODEX 2022), and recreational traffic appears to be increasing steadily in the Cimarron State Wildlife Area (SWA) (CPW 2007, Miller, personal communication 2022) and likely throughout the watershed. To protect wildlife, including the Gunnison sage-grouse, the Cimarron SWA is closed each year from January 1 to July 1. After July 1, the area is open to recreators, anglers, and hunters; hunting season sees heavy pressure (Miller, personal communication 2022).

2.3 Landform and Topography

The U.S. Department of Agriculture (USDA) mapped the Blue Creek watershed (HUC 1402000208) and Cimarron River watershed (HUC 1402000209) in the Southern Rocky Mountain Major Land Resource Area and the Rocky Mountain Range and Forest Land Resource Region, which is mainly characterized by rugged mountains with some broad valleys and remnants of high plateaus (USDA and Natural Resources Conservation Service (USDA-NRCS) 2006).

The Cimarron River and Blue Creek headwaters are formed in high mountain peaks in the northern San Juan Mountains; Coxcomb Peak, Wetterhorn Peak, Matterhorn Peak, and Uncompahgre Peak rise to between 12,000 and 14,000 feet at the southern edge of the watershed. The headwaters descend rapidly, forming many forks and tributaries within a series of long, U-shaped mountain valleys towards the middle and lower portion of the watersheds before converging with the Gunnison River in the Black Canyon of the Gunnison. The confluence of Blue Creek and the Gunnison River is located at about 7,200 feet in elevation; the confluence of the Cimarron River and the Gunnison River is located downstream of the confluence with Blue Creek, at about 6,800 feet in elevation just below Morrow Point Dam. Cimarron Ridge forms the divide between the Cimarron River and the Uncompahgre River drainage to the west. The eastern divide is a rugged unnamed ridgeline

and alpine plateau, separating Blue Creek and its tributaries from the Lake Fork of the Gunnison River. See Section 4 for additional information about the geology of the watersheds.

2.4 Vegetation

Plant communities are diverse within the watersheds due to quick changes in elevation from the headwaters along the southern area, down to the Gunnison River. The National Land Cover maps 14 land cover types in the watersheds (U.S. Geological Survey (USGS) 2022a and 2022b). **Figure 2-2** shows land cover types mapped in the watersheds and Error! Reference source not found. summarizes the amount of mapped land cover types. Evergreen forest is the overall dominant land cover type and makes up approximately 83,440 acres in the higher elevations (southern portion of watershed). Other prevalent land cover types in both watersheds include mixed forest, deciduous forest, shrub/scrub, herbaceous and barren land. Open water, emergent herbaceous wetlands, and shrub/forested wetlands are described in more detail in the "Open Waters, Wetlands, and Riparian Zones" section below.

Vegetation in evergreen forest is dominated by trees generally greater than 5 meters tall with more than 20% of total vegetation cover (USGS 2022c); species include ponderosa pine, Engelmann spruce, Douglas fir, lodgepole pine, limber pine, and bristlecone pine. Common riparian species in the upper elevations include thinleaf alder, birches, willows, and blue spruce (CPW 2007). Moving down in elevation, vegetation transitions from evergreen forest to a mixed spruce-fir complex including aspen as well as the species previously mentioned (CPW 2007). Deciduous forest areas dominate generally below 8,500 feet and have similar composition and cover, but at least 75% of the tree species shed foliage simultaneously in response to seasonal change (USGS 2022c). Deciduous forest areas in the watersheds are dominated by aspen, willows, spruce-fir, and mountain meadows, with patches of mountain shrub (Gamble oak, serviceberry, mountain mahogany, mountain big sagebrush, silver sagebrush and snowberry) (CPW 2007).

Below 7,500 feet, woodlands transition to pinyon pine and Utah juniper interspersed with grassland/shrub species including basin big sagebrush, black sagebrush, mountain big sagebrush, mountain mahogany, and Indian ricegrass (CPW 2007). Common riparian species in the lower elevations include narrowleaf cottonwood, coyote willow, chokecherry, tamarisk, and box elder (CPW 2007). Shrub/scrub and herbaceous areas are predominately covered with shrubs and perennial or annual native and introduced grasses or forbs and barren areas consist of natural occurrences of soils, sand, or rocks where there is less than 10% vegetation (USGS 2022c).

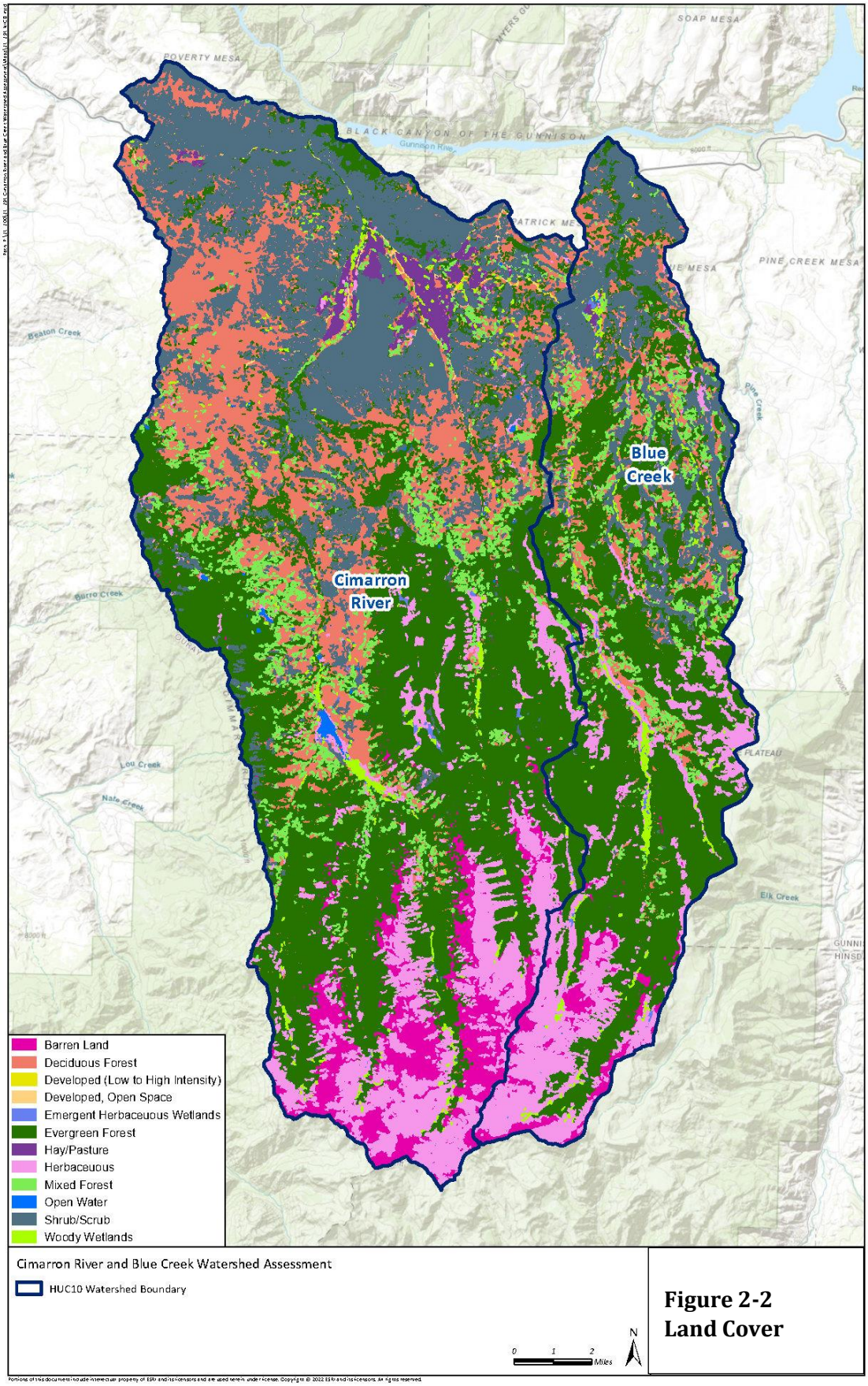


Figure 2-2
Land Cover

Table 2-2. National Land Cover Database (NLCD) areas mapped in the Blue Creek and Cimarron watersheds.

NLCD Land Cover	Size (acres)
Blue Creek Watershed	
Evergreen Forest	29,904
Deciduous Forest	10,699
Herbaceous	8,349
Shrub/Scrub	7,535
Barren Land	2,377
Mixed Forest	2,348
Woody Wetlands	604
Emergent Herbaceous Wetlands	438
Developed, Open Space	122
Hay/Pasture	56
Developed, Low Intensity	32
Open Water	18
Developed, Medium Intensity	3
Sub-total	*62,485*
Cimarron River Watershed	
Evergreen Forest	53,536
Deciduous Forest	38,144
Shrub/Scrub	25,611
Herbaceous	11,811
Barren Land	9,678
Mixed Forest	4,567
Hay/Pasture	2,299
Woody Wetlands	817
Emergent Herbaceous Wetlands	461
Developed, Open Space	453
Open Water	239
Developed, Low Intensity	181
Developed, Medium Intensity	10
Developed, High Intensity	2
Sub-total	*147,809*
Total	**210,293**

Source: USGS 2022a, 2022b

Developed areas, including low, medium, and high intensity have the least amount of cover in the combined watersheds, totaling approximately 228 acres, and consist of disturbed/sparse areas with introduced species and State listed noxious weeds (USGS 2022a).

2.5 Wetlands and Riparian Zones

According to the National Hydrography Dataset (NHD), the water drainage network and associated riparian zones includes three main forks of the Cimarron River (east, middle, and west forks), the Big Cimarron River and Little Cimarron River, a network of tributary streams, Blue Creek and tributary streams, as well as Silver Jack Reservoir, Fish Creek Reservoir and other small lakes, and ponds (USGS 2022c).

The National Wetland Inventory (NWI) classifies three systems: Riverine, Lacustrine, and Palustrine (U.S. Fish and Wildlife Service (Service) 2022a) in watersheds. **Figure 2-3** shows wetlands and waters mapped by the NHD and NWI for the watersheds. In the watersheds, the Palustrine system includes freshwater emergent wetlands, freshwater forested/shrub wetlands, and freshwater ponds. Error! Reference source not found. provides a summary of the mapped areas, including the NWI classification for each of the watersheds. **Table 2-4** lists the rivers and streams and their length in miles mapped in the watersheds by the NHD.

The riverine and lacustrine features contribute to the varied topography of the watersheds. Most of these features support a permanent water source and support well-developed wetland and riparian communities, which provide protective cover, foraging, and nesting habitat for wildlife and birds. The riverine features and associated wetland and riparian vegetation support high biodiversity movement corridors and core habitat regions for wildlife, and also add to the scenic quality of the project area.

Wetlands in the watersheds are typically dominated by willows and sedges in fringes along floodplain benches, swale complexes, and wet meadows. Emergent wetlands consist of erect, rooted, herbaceous hydrophytic vegetation that is present for most of the growing season in most years (Cowardin et.al. 1979). These wetlands are usually dominated by perennial plants (Cowardin et.al. 1979). Forested/Shrub Wetlands have woody plants as the dominant life form, with shrubs (less than 6 meters tall) and trees (at least 6 meters in height). In the western United States, forested and shrub wetlands are most common where moisture is relatively abundant, particularly along rivers and in the mountains (Cowardin et.al. 1979).

Constructed irrigation ditches and irrigation practices on private lands have contributed to wetland and riparian development in non-natural areas altering water flows from their natural course for the purposes of raising hay, alfalfa, and livestock. In some areas, these water flows are impacting vegetation in uplands and causing erosion and soil loss. An increasing trend is that fewer large landowners in the watersheds are actively and effectively managing irrigated lands (Distel, personal communication, 2021). Poorly managed irrigation water impacts the health of riparian and wetland zones and important transitional areas that buffer the riparian and wetland zones, causing erosion, vegetation loss, and weed infestations.

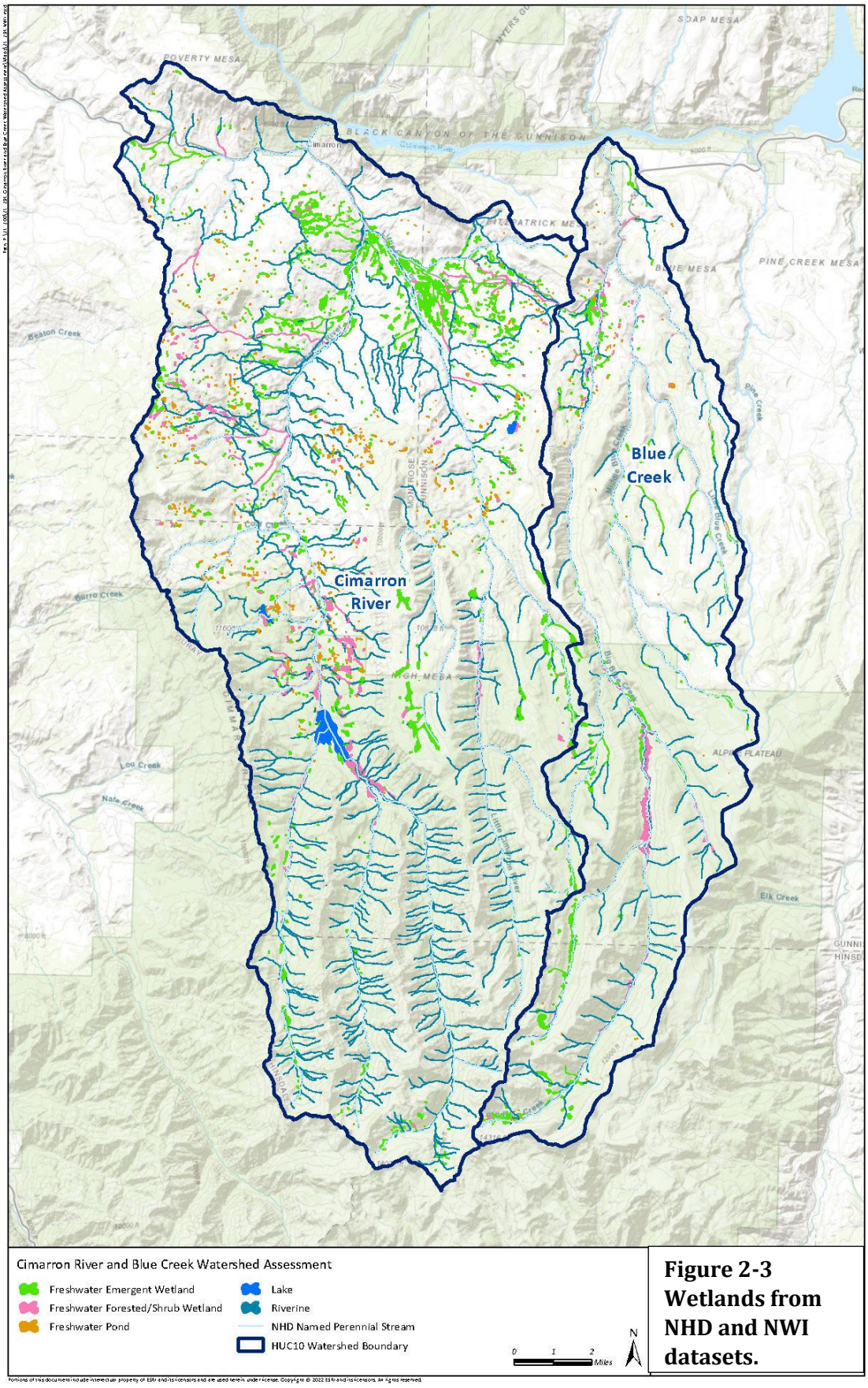


Figure 2-3 Wetlands from NHD and NWI datasets.

Table 2-3. NWI classification in the Blue Creek and Cimarron watersheds.

NWI Classification	Size (acre)
Blue Creek Watershed	
Riverine	451
Palustrine Freshwater Emergent Wetland	604
Palustrine Freshwater Forested/Shrub Wetland	365
Palustrine Freshwater Pond	88
Sub-total	*1,508*
Cimarron River Watershed	
Lacustrine (Lake)	366
Riverine	1,479
Palustrine Freshwater Emergent Wetland	2,148
Palustrine Freshwater Forested/Shrub Wetland	695
Palustrine Freshwater Pond	437
Sub-total	*5,127*
Total	**6,635**

Source: Service 2022a.

Table 2-4. Rivers and streams in the Blue Creek and Cimarron watersheds.

Rivers and Streams	Length (miles)
Blue Creek Watershed	
Big Blue Creek	28.91
Blue Creek	3.52
East Fork Little Blue Creek	5.63
Failes Creek	4.31
Fall Creek	7.09
Little Blue Creek	10.60
Middle Blue Creek	8.03
Soldier Creek	3.77
West Fork Middle Blue Creek	7.07
Workman Creek	1.00
Sub-total	*79.93*
Cimarron River Watershed	
Burdeck Creek	1.34
Cimarron River	21.86
Coal Creek	3.96
Cottonwood Creek	2.64
East Fork Cimarron River	12.51
East Fork Little Cimarron River	6.29
Firebox Creek	5.95
Fish Creek	3.12
Fox Creek	2.54
High Park Creek	2.82
Little Cimarron River	24.47
Middle Fork Cimarron River	10.17
Moore Pasture Creek	2.94
Silver Creek	1.35
Squaw Creek	5.08
Stewart Creek	1.07
Stumpy Creek	4.68
Van Boxel Creek	7.75
West Fork Cimarron River	11.53
Sub-total	*132.07*
Total miles of rivers and streams in the watersheds	**212.00**

Source: USGS 2022c.

2.6 Fisheries

The Blue Creek and Cimarron watersheds support cold water fisheries; most of the watershed is characterized as "Aquatic Sportsfish Management Waters", with Fall Creek (tributary to Blue Creek) designated as "Aquatic Native Species Conservation Waters" (**Figure 2-4**; CPW 2022a). Two fish species are mapped in the Blue Creek or Cimarron watersheds at the Hydrologic Unit Map (HUC) 12 level including the bluehead sucker (*Catostomus discobolus*) which is mapped as occurring in the northern portion of the Cimarron watershed, generally along the East Fork of the Cimarron River, Cottonwood Creek, and Stumpy Creek; cutthroat trout (*Oncorhynchus clarkii*) occur in the headwater reaches of both the Blue Creek and Cimarron watersheds, specifically along the Middle and West Fork Cimarron River, Big Blue Creek, Fall Creek, Failes Creek, and Soldier Creek (Natural Diversity Information Source (NDIS) 2021). More broadly, fish that typically occur at the higher elevations in this region include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), and lake trout (*Salvelinus namaycush*) (USDA-NRCS 2006). Some of these species are also at lower elevations, in addition to northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), and a variety of nongame species (USDA-NRCS 2006).

Water diversion and return flows from diverted water used for irrigation can cause problems for fish and fish habitat due to reductions in flows, increased water temperatures, and salinity/selenium and other mineral loading. In the Cimarron watershed, return flows from irrigation results in higher temperatures in the streams and in 2018, temperatures of 80 degrees or higher were recorded (Cary Denison, personal communication 2022).

2.7 Wildlife

The watersheds provide valuable habitat for wildlife species typically found region wide in evergreen, deciduous, and mixed forests and other vegetation communities that provide contiguous habitat, water resources, and core wildlife values such as cover and forage for various wildlife species. Wildlife habitat in the watersheds correlate to the vegetation communities and topographical features. High wildlife habitat value areas are typically dominated by native plant species, have a strong structural component, diverse species composition, and have not been degraded by human disturbance or activities, or overgrazing. Riparian and wetland areas are generally considered high-quality areas because they have high value to wildlife, filter out pollutants, and contribute to the function and value of the ecosystem. Lower quality wildlife habitat typically occurs in developed areas and areas degraded by disturbance and nonnative or weedy species.

The evergreen, deciduous, and mixed forests support nesting and foraging areas and provide cover for a variety of birds and rodents and other small mammals, as well as big game. The drainage corridors, wetlands, and riparian areas in the watersheds provide water sources, protective cover, foraging, and nesting habitat for wildlife and birds. The

drainages extend across the watersheds and support movement corridors and core habitat connections for wildlife, as well as add scenic quality. Several wildlife species dwell in the wetland and riparian vegetation communities that typically occur along drainage corridors, while others use them as passageways; therefore, there is typically high biodiversity. Protection and preservation of these areas as habitat corridors contribute to maintaining wildlife movements, distribution, and genetic exchange.

In 2021, Colorado Parks and Wildlife (CPW) released a High Priority Habitat (HPH) table that identifies species and habitats, as well as recommendations to avoid and minimize impacts on wildlife from land use development (CPW 2021, CPW 2022a). HPH areas that overlap with the Blue Creek watershed include aquatic native species conservation waters, aquatic sportsfish management waters, elk production, severe winter range, and winter concentration areas, and mule deer migration corridors (CPW 2022a). HPH areas that overlap with the Cimarron watershed include aquatic native species conservation waters, aquatic sportsfish management waters, bighorn sheep production areas, the Cimarron SWA, elk production, winter concentration, severe winter range, and migration corridors (CPW 2022a). The Cimarron Watershed also encompasses areas mapped with a bald eagle roost site and Gunnison sage-grouse occupied habitat, production area, and lek site (CPW 2022a). The Gunnison sage-grouse is discussed in more detail in the section below. **Figure 2-4** shows the mapped HPH for aquatic native species conservation waters, aquatic sportsfish management waters, the bald eagle roost site, and the Gunnison sage-grouse occupied habitat, production area, and lek sites in the watersheds. Canada lynx habitat within the USFS boundaries is also mapped on Figure 2-4.

2.7.1 Big Game Species

Resident populations of big game including elk and mule deer are found in the watersheds, in addition to moose, mountain sheep, black bear, and mountain lion (NDIS 2021, Miller pers. comm. 2022). Elk and deer generally summer in higher elevation montane and subalpine woodlands and forests; winter in the valleys in lower elevation pinyon-juniper woodlands, sagebrush shrublands, riparian corridors, and agricultural areas; and spend the majority of their seasonal transition times in mid- elevation mixed montane shrublands.

A winter concentration area for elk is mapped in the lower elevations, including the Cimarron SWA (NDIS 2021); a slightly smaller winter concentration area is mapped for mule deer in the lower elevations. A mule deer migration corridor crosses the Blue Creek Watershed and into the Cimarron River watershed within the Cimarron SWA. Elk production areas overlap most of the Blue Creek Watershed, and additional elk production areas are mapped along the upper elevations on the eastern of the Cimarron River and the mid and lower elevations of the Cimarron watershed. Moose concentration areas are mapped within several valleys in the middle elevations of the watershed area, primarily on USFS and BLM lands (NDIS 2021). Black Bear summer and fall concentration areas are mapped along a large portion of the middle and lower elevations (NDIS 2021). A black

bear human conflict area is mapped in the middle elevation along the Cimarron River, and in the lower elevations of the Blue River watershed (CODEX 2022).

2.8 Threatened, Endangered, and Species of Special Concern

The U.S. Fish and Wildlife Service lists several threatened and endangered species with potential habitat in the Blue Creek and Cimarron watersheds or that would be potentially affected by projects in these watersheds (Error! Reference source not found.).

The watersheds are mapped outside of the current known range of the gray wolf; however, reintroduction planning is underway and the watersheds may provide range and habitat in the future. The gray wolf formerly was found throughout North America including south into much of Mexico. Grey wolves were eradicated from Colorado by the 1940s; however, individual wolves have periodically migrated into the state (CPW 2022b). Management authority of gray wolves in Colorado ultimately is held with the USFWS, and the USFWS and CPW are both actively working with a Stakeholder Advisory Group and Technical Working Group to prepare for reintroduction (CPW 2022b). Colorado state statute 33-2-105.8 (which passed on November 3, 2020) directs the CPW Commission to develop a plan to introduce gray wolves in Colorado west of the Continental Divide, including a directive to restore and manage gray wolves in Colorado no later than December 31, 2023.

The Mexican spotted owl ranges throughout Utah and portions of Colorado, Arizona, Texas, New Mexico, and central Mexico. The Mexican spotted owl is listed as threatened by the Service and as a Management Indicator Species by the U.S. Forest Service. In Colorado, the Mexican spotted owl typically inhabits areas with steep exposed cliffs, canyons that are characterized by piñon-juniper, and mixed conifer forests including Douglas fir, ponderosa pine, and white fir (Andrews and Righter 1992; Service 1995). Steep-walled canyons are an integral component of Mexican spotted owl habitat in Colorado (Fletcher and Hollis 1994). Designated critical habitat occurs in eastern Colorado (69 Federal Register [FR] 53182 [August 31, 2004]). There is no mapped critical habitat for the spotted owl in the watersheds, and no known occurrences.

According to the Service, the bonytail, Colorado pikeminnow, humpback chub, and razorback sucker are found or potentially found within the watershed areas; however, none of these species are mapped at the HUC 12 watershed level by the CPW (NDIS 2021). Primary threats to these species include streamflow regulation, habitat availability and modification, pesticides, and pollutants (Service 2002).

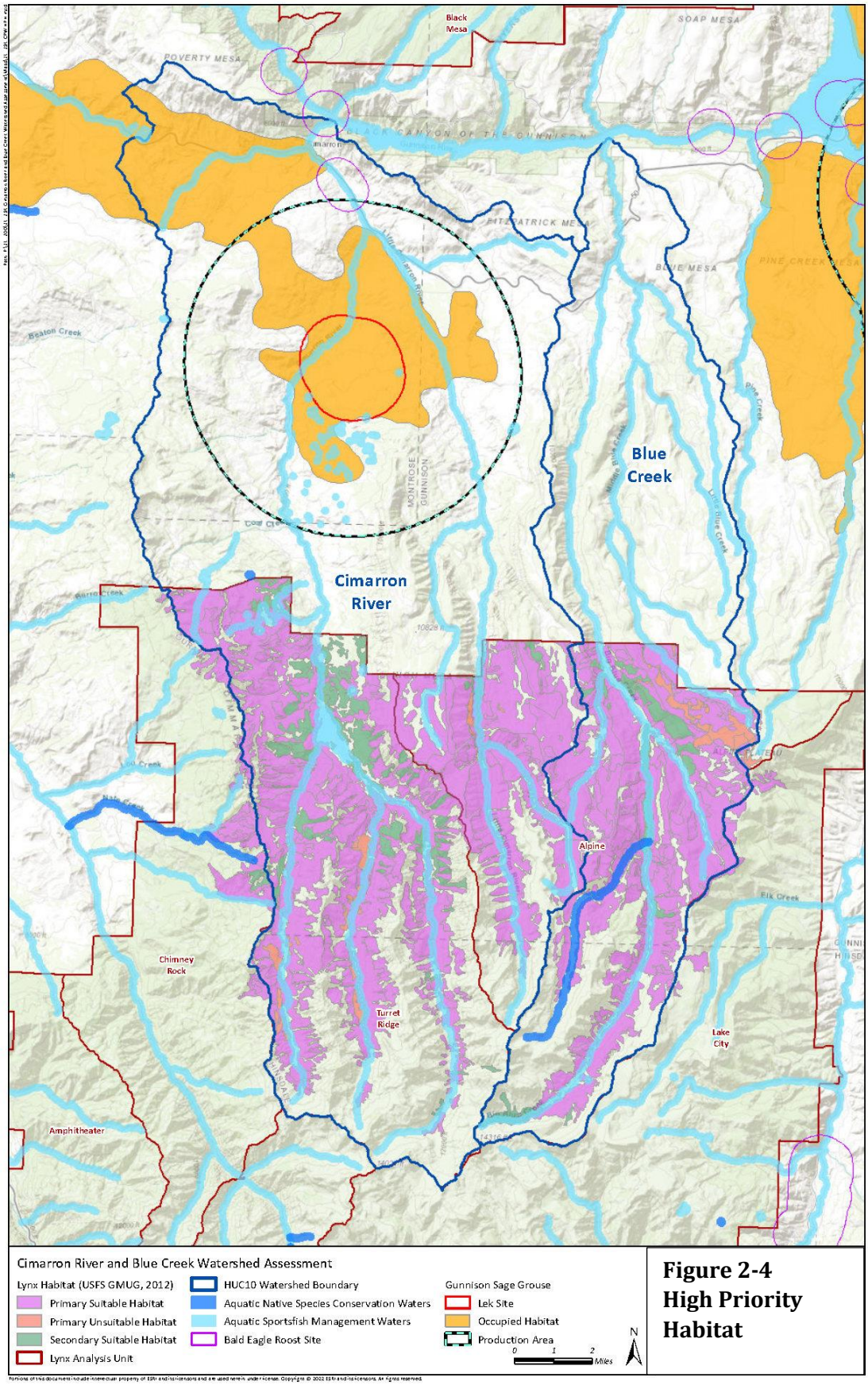


Figure 2-4
High Priority Habitat

Table 2-5. Federally threatened, endangered, and candidate wildlife species potentially found in the Blue Creek and Cimarron watersheds or potentials affected by projects in these watersheds.

Common Name	Scientific Name	Habitat/Presence in Watershed	Listing Status[1]
Mammals			
Canada lynx	*Lynx canadensis*	Climax boreal forest with a dense understory of thickets and windfalls/ The majority of the Blue Creek and Cimarron watersheds are mapped within potential habitat or predictive summer or winter range for the lynx (NDIS 2021).	T
Gray wolf	*Canis lupus*	Temperate forests, mountains, tundra, taiga, and grasslands/Watersheds are outside current known range for Gray wolf as of 2022.	E
Birds			
Gunnison sage-grouse[2]	*Centrocercus minimus*	Large expanses of sagebrush with a diversity of grasses and forbs along with healthy wetland and riparian ecosystems/Occupied habitat mapped for lower elevations.	T
Mexican spotted owl	*Strix occidentalis lucida*	Mixed-conifer woodlands and rocky canyons/Unlikely to be present in watershed.	T
Yellow-billed cuckoo	*Coccyzus americanus*	Low elevation river corridors with an overstory of mature cottonwood galleries/Foraging habitat in downstream sections of the Cimarron River, Little Cimarron River, and Big Blue Creek.	T
Fish			
Bonytail	*Gila elegans*	Backwaters with rocky or muddy bottoms and flowing pools/Not present in watershed; habitat is downstream.	E
Colorado pikeminnow (squawfish)	*Ptychocheilus lucius*	Various habitat types in large rivers of the Colorado basin/Not present in watershed; habitat is downstream.	E
Humpback chub	*Gila cypha*	Pools, riffles, rocky runs, rapids, and eddies in river canyons/Not present in watershed; habitat is downstream.	T
Razorback sucker	*Xyrauchen texanus*	Impounded and riverine habitats, eddies, backwaters, gravel pits, flooded bottoms, flooded mouths of tributary streams, slow runs, and sandy riffles/Not present in watershed; habitat is downstream.	E
Rio Grande cutthroat trout	*Oncorhynchus clarkii virginalis*	Small headwater streams with allochtthonous materials; winter habitat includes deep pools; spawns in clean gravel/Habitat extends into headwaters of Blue Creek and Cimarron watersheds.	C
Insects			
Monarch butterfly	*Danaus plexippus*	Dependent on milkweeds (*Asclepiadoideae*) as host plants and forage on blooming flowers; a summer resident/May be present in watershed's wetlands and riparian areas containing milkweeds; watersheds are not within a designated migration corridor or breeding or overwintering area for this species	C

Common Name	Scientific Name	Habitat/Presence in Watershed	Listing Status[1]
Uncompahgre fritillary butterfly	*Boloria acrocnema*	Moist alpine slopes above 12,000 feet with extensive snow willow (*Salix nivalis*) patches which serve as the larval foodplant/Habitat along the headwaters in the southern portion of the Blue Creek and Cimarron watersheds	E

[1] T = Threatened Species, E = Endangered Species, C = Candidate Species.
[2] There is critical habitat for the species within the Cimarron watershed.
Source: Service 2022b.

Two candidate species, including the Rio Grande cutthroat trout and monarch butterfly are found, or potentially found within the watershed areas. The Service maps Rio Grande cutthroat trout range extending into the headwaters of the Blue Creek and Cimarron watersheds. Monarch butterflies migrate through Colorado in the summer, although the watersheds are not within a designated migration corridor or breeding or overwintering area for this species (Service 2019). As candidate species, the Rio Grande cutthroat trout and monarch butterflies are not under federal regulation at this time.

Potential habitat for the rest of the species listed in Table 2-5 is generally more prevalent in watersheds. As such, a more detailed discussion for these species is provided below.

2.8.1 Canada Lynx (Lynx canadensis)

The majority of the Blue Creek and Cimarron watersheds are mapped within potential habitat or predictive summer or winter range for the lynx (NDIS 2021); primary and secondary suitable habitat, and unsuitable habitat on Forest Lands is shown on Figure 2-4.

The Canada lynx was federally listed as threatened on March 24, 2000 (FR 65 16052). It is considered Critically Imperiled in the state of Colorado (NatureServe 2022), and Colorado is thought to be its southernmost range (Armstrong, Fitzgerald, and Meaney 2011). Lynx habitat generally is described as climax boreal forest with a dense understory of thickets and windfalls (DeStefano 1987). In the western United States, most lynx occurrences are associated with Rocky Mountain Conifer Forest and fall between 4,920 and 6,560 feet (McKelvey, Aubry, and Ortega 2000). Subalpine forest habitat is dominated by subalpine fir and Engelmann spruce, while the upper montane forest supports lodgepole pine and aspen. Lower-elevation montane forests of ponderosa pine, Douglas fir, and riparian corridors provide connective habitat that may facilitate dispersal and movement between primary habitats and provide additional foraging opportunities (Interagency Lynx Biology Team 2013). Lynx habitat in Colorado is fragmented naturally by elevation, dry south and west exposures, alpine tundra, open valleys, and shrubland (McKelvey, Aubry, and Ortega 2000).

Travel corridors are thought to be an important factor in lynx habitat because of their large home ranges (Brittell 1989). Landscape connectivity for lynx movement may include forested mountain ridges, wooded riparian drainages, and lower-elevation forests and shrub habitat. Travel corridors are usually forested and include contiguous vegetation

cover over 6 feet in height (Brittell 1989). Lynx travel along the edges of meadows but generally do not cross openings wider than 300 feet (Aubry, Koehler, and Squires 1999). Denning sites are generally at higher elevations, and a lack of human disturbance is an important component of denning habitat.

2.8.2 Gunnison Sage-Grouse (Centrocercus minimus)

The Gunnison sage-grouse, also known as the Gunnison grouse, is a species of sage grouse found south of the Colorado River in Colorado and Utah. Historically this grouse was found in the southwestern portion of Colorado, southeastern Utah, northeastern Arizona, and northwestern New Mexico. In November 2014, the Gunnison sage-grouse was listed as a threatened species.

This species of grouse requires a variety of habitats such as large expanses of sagebrush with a diversity of grasses and forbs along with healthy wetland and riparian ecosystems. The Gunnison grouse also requires sagebrush throughout the year for food (Lupis 2006). Fringe areas bordering flood-irrigated pasture can provide important habitat for insect foraging in Colorado's arid environment.

Gunnison grouse overall range, occupied habitat, and winter range is mapped in the northern portion of the Cimarron watershed and, more specifically, a production area and brood area is mapped between the Cimarron River and Little Cimarron River, north of Butte Lake in the Cimarron watershed (see Figure 2-4) (NDIS 2021). The northern portion of the Cimarron watershed is also within mapped critical habitat for the Gunnison grouse (Cerro Summit-Cimarron-Sims Mesa Population).

The Cerro Summit- Cimarron- Sims Mesa Population is one of eight populations addressed by the Rangewide Conservation Plan for the Sage Grouse (Gunnison Sage-grouse Rangewide Steering Committee 2005). The plan outlines a conservation strategy specific to the population, as well as general conservation strategies for ranching, noxious and invasive weed management, hunting, infrastructure corridors, and more.

- Recommendation: Consult the Rangewide Conservation Plan (Plan) for the Sage Grouse, for any future projects within the boundaries of the Grouse habitat or production area, in addition to consultation with the Service. Opportunities for enhancing habitat are discussed in the Plan and may be incorporated into future projects within the watersheds.

2.8.3 Yellow-Billed Cuckoo (Coccyzus americanus)

The yellow-billed cuckoo was listed in 2014 as a federally threatened species (Service 2022c) and is considered a species of concern in the state of Colorado (CPW 2022c).

Cuckoos that occur west of the Rocky Mountain crest are considered a distinct population segment from, a regulatory standpoint (Service 2014).

In Colorado, the western subspecies (*C. a. occidentalis*) nests in scattered, isolated areas west of the Rocky Mountains (Laymon et al. 1987). The cuckoo uses wooded habitat with dense cover and water nearby, including woodlands with low scrub vegetation, overgrown orchards, abandoned farmland and dense thickets along streams and marshes. In the west, nests are often placed in willows along streams and rivers, with nearby cottonwoods serving as foraging sites. The cuckoo winters almost entirely in South America east of the Andes and migrate through Central America (Service 2016).

The Service maps the range of the yellow-billed cuckoo in the northern portion of the watersheds, buffering the downstream sections of the Cimarron River, Little Cimarron River, and Big Blue Creek. Cottonwood gallery forests could be used for forage, but nesting is unlikely within the watersheds. The nearest critical habitat (final critical habitat designated 4.21.2021, 86 FR 20798-21005) for the species is about 20 miles north of the watershed boundaries along the North Fork of the Gunnison River near Hotchkiss.

2.8.4 Uncompahgre Fritillary Butterfly (Boloria acrocnema)

The Uncompahgre fritillary butterfly was listed in 1991 as a federally endangered species (Service 1991) and is considered critically imperiled in the state of Colorado (CPW 2022d). The Uncompahgre fritillary butterfly is a species endemic to the state of Colorado with fewer than 10 known colonies, all of which are on federal (U.S. Forest Service or BLM) land (NatureServe, 2022). The species was discovered on Uncompahgre Peak, Hinsdale County, Colorado on July 30, 1978 (Service 2022d). The larval food source for this species is large patches of snow willow (*Salix nivalis*) on northeast facing slopes above 12,400 feet in elevation. The Service maps the range of the Uncompahgre fritillary butterfly along the headwaters in the southern portion of the Blue Creek and Cimarron watersheds.

3. HYDROLOGY

There are several aspects to the hydrology of the Cimarron River and Blue Creek basins. The following sections describe the stream network, including a description of river basin size, elevation, and how the different streams are connected within the basins. Section 3.2 provides information on streamflow from existing stream gages and provides estimates of flow from ungaged basins. Section 3.3 describes the major water rights and diversions. Section 3.4 includes a discussion on several of the instream flow and other environmental flow programs implemented in the basin.

Data for stream flows and diversions in this report were obtained from the State of Colorado's hydrologic database, HydroBase. Data in HydroBase can be queried in an automated fashion using a program known as TSTool. The streamflow and diversion records obtained from HydroBase are available in an Excel spreadsheet provided with the supplemental materials accompanying this report and is available for download from the Coalition website. The TSTool program files were provided to the CRVWC so that these data can be updated in the future.

3.1 River and Stream Network

The Cimarron River and Blue Creek are tributary to the Gunnison River and the combined watersheds drain approximately 328 square miles of the Gunnison River Basin. The headwaters of the Cimarron River and Blue Creek watersheds are located in the Uncompahgre National Forest which have a maximum elevation of 14,315 feet (Uncompahgre Peak). Wetterhorn Peak (14,015 ft), Redcliff (13,642 ft), Coxcomb Peak (13,656 ft), Heisshorn (13,411 ft), Matterhorn Peak (13,590 ft), Silver Horn (13,714 ft), and Sheep Mountain (13,175 ft) are among other prominent peaks in these watersheds. The lower western portion of the watershed is located in Montrose County and the lower eastern portion of the watershed is located in Gunnison County. The headwaters are located in Hinsdale County (see Figure 1-1).

The Cimarron River flows into the Gunnison River below the Morrow Point dam. Major tributaries to the Cimarron River are the Little Cimarron, and the East, Middle, and West forks of the Cimarron above Silver Jack Reservoir. Blue Creek flows into the Gunnison River below the Blue Mesa Reservoir dam, upstream of Morrow Point Reservoir. The main tributary to Blue Creek is Little Blue Creek, and upstream of this confluence, Blue Creek is known as Big Blue Creek. A schematic of the river basin layout is shown in **Figure 3-1**. Figure 3-1 shows all tributaries with decreed water rights, but does not necessarily show all tributaries, especially higher in the basin. The figure also shows the Cimarron Canal, which is the largest diversion in the two basins and diverts from the Cimarron River

mainstem below Silver Jack Reservoir and takes water out of the basin to the north and west. The Big Blue Ditch diverts water from the Blue Creek watershed and delivers into the

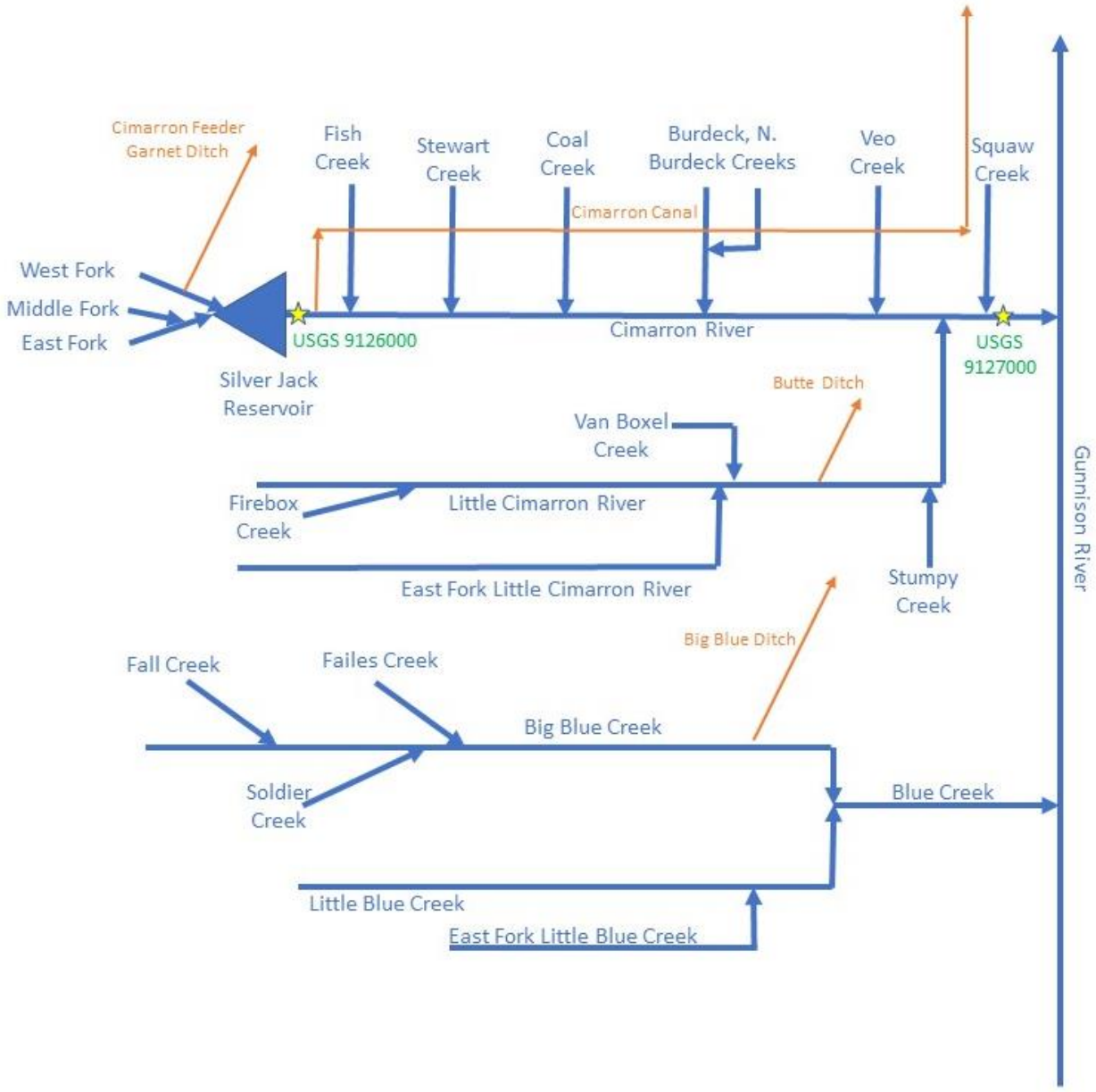


Figure 3-1. Straightline diagram schematic of the Cimarron and Blue Creek Basins

Little Cimarron watershed for irrigation. Similarly, the Butte Ditch diverts from the Little Cimarron River and irrigates lands in the Little Cimarron basin and lands to the west in the Cimarron mainstem drainage.

3.2 Stream Flows and Flow Estimates

Streamflow in the Cimarron River and Blue Creek basins is ultimately supplied by precipitation, as snow in the colder months, and rainfall in the warmer months. Snowfall accumulating in the watershed melts during the spring and the highest river flows occur in the late spring to early summer months. Rainfall also contributes to streamflow, but to a lesser extent than snowmelt. Water diverted out of the streams and used for irrigation also generates lagged return flows to the stream as irrigation water not consumed by the crop moves through the subsurface and eventually discharges to the stream system from groundwater. Average annual precipitation in the basin varies significantly with elevation, around 12 to 16 inches per year in the lower part of the basin, up to 50 inches in the higher elevations.

There is limited streamflow data in the Cimarron River watershed with long-term flow measured at two recorded gaging stations (**Table 3-1**). Figure 3-1 shows the location of these stream gages within the stream network, with both stream gages located on the Cimarron River mainstem. Stream gage 9126000 (Cimarron River near Cimarron, CO) is located below Silver Jack Reservoir and upstream of the Cimarron Canal. Stream gage 9127000 (Cimarron River Blw Squaw Creek at Cimarron, CO) is located just upstream of the confluence with the Gunnison River. The period of record for these gages overlaps only from 2011 through present day. A stream gage on the Cimarron River just upstream of the confluence with Squaw Creek was active for 1902 to 1905, and again from 1962 to 1967. There are no permanent stream gages on Blue Creek or the Little Cimarron River.

Table 3-1. Active stream gage information.

Gage Number	Station Name	Elevation (ft)	Drainage Area (sq. mi)	Period of Record	Mean Annual Stream Flow (AF)	Maximum Stream Flow (cfs)	Peak Flow Date
9126000	Cimarron River near Cimarron, CO	8,641	67	1954 - 2022	67,358	1,790	6/28/1957
9127000	Cimarron River Blw Squaw Creek at Cimarron, CO	6,880	230	1942 - 1952, 2011 - 2022	88,213	1,930	6/17/2011

Stream flows in the Cimarron River are heavily dependent on winter snowpack and runoff. Therefore, the variability in flows from spring to late summer can have wide variations, with most of the flow occurring during the spring runoff. Annual flows vary significantly as well from year to year.

At stream gage 9126000 (below Silver Jack Reservoir) the average annual flow is 67,400 acre-feet. The timing of this annual flow has changed due to the construction of Silver Jack

Reservoir, which was completed in 1971. Diversions into storage have reduced flows in the spring and releases from storage have increased flows in the mid and late summer as compared to pre-reservoir conditions. However, most of the mid and late summer increases in flow are diverted into the Cimarron Canal, just downstream of the stream gage. **Table 3-2** shows the monthly flow amounts at this gage. **Figure 3-2** shows average monthly flows at this gage before and after construction of Silver Jack Reservoir. **Figure 3-3** shows annual flows at this location and highlights the year-to-year variability in hydrology in the watershed. Silver Jack Reservoir has little impact on the annual flows because the water diverted into storage at Silver Jack Reservoir is subsequently released and flows past the stream gage, with annual flow depleted only by evaporation at Silver Jack Reservoir as compared to pre-construction flows.

Streamflows at stream gage 9127000 (Cimarron River blw Squaw Creek at Cimarron, CO) were measured from 1942 to 1952, then again from 2011 to 2022. **Table 3-3** shows these monthly flows. **Figure 3-4** shows the average monthly flows (2011 to 2022) compared to stream gage 9126000 (Cimarron River near Cimarron, CO). Figure 3-4 also shows the impact of diversions to the Cimarron Canal on streamflow. Flow below the Cimarron Canal was computed by subtracting the Cimarron Canal flows from the stream gage below Silver Jack Reservoir. As described below in Section 3.3.2, the Cimarron Canal is the largest diversion structure in the watershed and diverts a significant amount of the Cimarron River flow, but must pass some flow to downstream senior water rights. As shown in Figure 3-4, much of the flow in July, August, and September released from Silver Jack Reservoir is diverted by the Cimarron Canal. Downstream of the Cimarron Canal, this results in flows in August and September that are the lowest in the year, and may dry up entirely at downstream senior irrigation ditch headgates until additional tributaries and irrigation return flows enter the stream. The largest of these tributaries is the Little Cimarron River, which enters the mainstem about 10 miles downstream of the Cimarron Canal diversion structure. In Figure 3-4, the impact of the incoming tributaries and return flows from the Cimarron basin below the Cimarron Canal headgate and from the Little Cimarron and Squaw Creek can be seen as the difference between the ”Below Cimarron Canal” flows in orange, and the “Near Gunnison Confluence” flow in blue.

Other significant tributaries, including the Little Cimarron and Blue Creek have no active or historical stream gages. Drainage basin area and elevation can be used to roughly estimate the flow generated from these ungaged areas by comparing to a neighboring basin that is gaged. The natural flow of the Cimarron River above Silver Jack Reservoir can be estimated from the stream gage 9126000 (below Silver Jack Reservoir; Cimarron River near Cimarron, CO), change in storage at Silver Jack Reservoir, and upstream diversions out of the basin from Cimarron Feeder Garnet Ditch. This natural flow can then be used to estimate the flow emanating from the upper portions of the Little Cimarron River and the Blue Creek basins based on the area and elevation of these drainages, using a correlation of

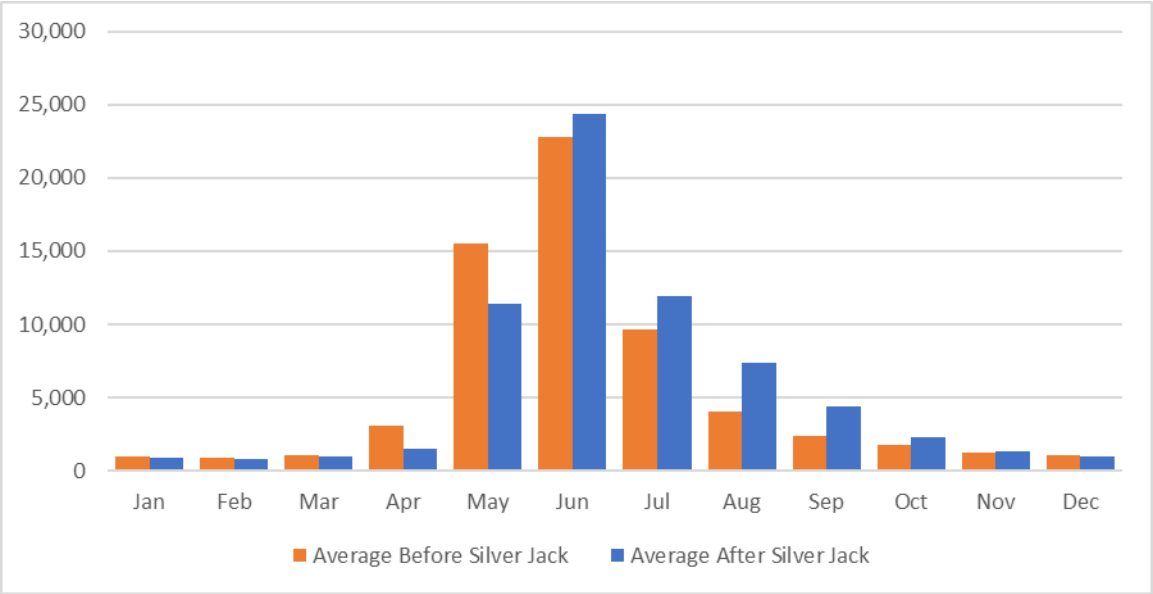


Figure 3-2. Average monthly flows at UGSG Gage 9126000 (Cimarron River near Cimarron, CO). Values in AF. Water Years 1955 1970 for before Silver Jack Reservoir data, Water Years 1972 to 2022 for after Silver Jack Reservoir data.

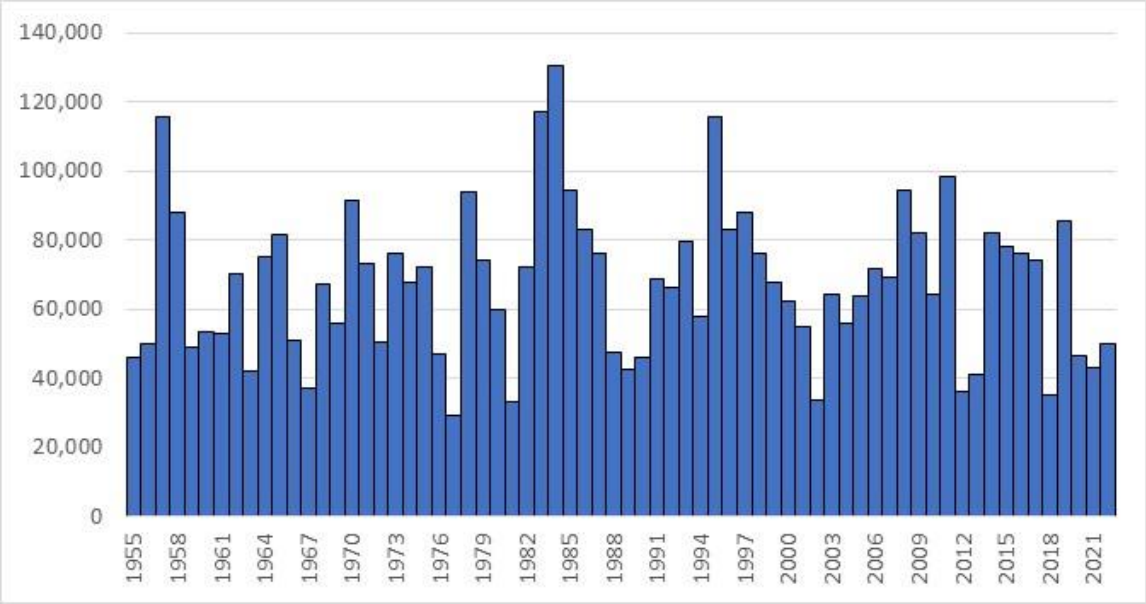


Figure 3-3. Annual flows at UGSG Gage 9126000 (Cimarron River near Cimarron, CO). Values in AF.

Table 3-2. Monthly flows at UGSG Gage 9126000 (Cimarron River near Cimarron, CO). All Values in AF.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Water Year	Annual Rank
1954										1,890	1,103	932	3,925		
1955	873	781	1,079	2,079	9,243	16,911	5,639	4,403	1,361	861	809	799	44,839	46,295	57
1956	738	633	1,170	3,398	18,934	16,580	3,193	2,045	1,016	871	901	861	50,339	50,177	51
1957	738	611	726	1,745	10,975	45,948	39,111	10,130	3,184	1,910	1,509	1,347	117,933	115,799	3
1958	1,067	831	912	2,192	26,091	37,956	8,900	3,080	2,043	1,692	1,357	1,258	87,379	87,839	11
1959	1,170	994	1,188	2,668	10,905	19,908	3,917	2,352	1,444	1,676	998	962	48,183	48,854	53
1960	899	789	1,012	5,181	11,058	22,421	5,772	1,825	994	978	883	936	52,747	53,586	47
1961	859	738	785	2,210	16,231	18,411	4,038	3,457	3,376	2,642	1,305	1,051	55,104	52,902	48
1962	1,077	1,008	901	5,720	16,568	25,492	10,090	2,499	1,958	1,420	1,079	852	68,664	70,311	31
1963	637	744	1,605	4,290	14,291	7,670	3,961	3,465	2,196	1,279	1,190	1,107	42,435	42,210	61
1964	984	920	1,047	1,857	21,928	26,642	10,953	4,800	2,394	1,498	1,216	1,170	75,409	75,101	24
1965	1,043	962	1,097	2,460	11,580	27,698	21,493	6,698	4,866	3,287	1,698	1,386	84,267	81,780	17
1966	1,170	916	1,230	4,104	15,580	14,313	4,140	1,880	1,275	1,254	954	906	47,723	50,980	49
1967	807	954	1,301	2,638	10,298	10,764	3,695	2,251	1,505	1,234	1,061	1,023	37,534	37,329	63
1968	861	803	879	1,303	12,157	30,919	8,825	6,238	1,785	1,379	1,055	893	67,096	67,088	36
1969	772	637	805	6,157	17,340	12,954	7,873	3,318	2,791	3,416	2,071	1,660	59,793	55,972	45
1970	1,498	1,162	1,113	1,853	25,149	29,632	12,700	5,804	5,381	2,803	2,007	1,375	90,475	91,437	9
1971	145	168	273	2,239	8,372	29,328	13,771	6,274	6,230	7,385	2,616	972	77,775	72,986	27
1972	1,115	938	1,275	2,202	6,278	11,786	6,083	6,282	3,433	1,833	1,347	1,057	43,629	50,365	50
1973	1,154	1,000	1,152	1,277	5,538	35,778	17,187	5,532	3,376	2,021	1,914	1,950	77,880	76,232	21
1974	1,847	1,617	1,787	1,894	14,557	21,073	6,964	7,343	4,574	2,955	996	837	66,443	67,540	35
1975	762	573	484	549	6,772	18,948	26,863	7,129	5,092	2,085	1,218	1,351	71,824	71,958	29
1976	1,349	1,265	1,355	1,680	6,030	13,549	6,821	6,809	3,445	1,547	661	613	45,125	46,957	55
1977	604	530	610	503	5,024	6,776	5,472	4,854	1,914	1,995	542	417	29,242	29,108	68
1978	463	461	600	1,133	7,904	42,173	22,995	8,815	6,192	3,842	1,394	916	96,889	93,691	8
1979	938	829	942	1,178	5,879	31,865	14,583	7,037	4,907	4,899	1,619	879	75,555	74,312	25
1980	760	829	881	1,087	3,741	24,887	9,953	6,304	3,917	2,573	813	746	56,490	59,755	42
1981	604	473	553	1,008	5,316	7,519	6,212	4,544	3,072	2,940	1,654	952	34,848	33,433	67
1982	954	853	1,160	1,394	6,988	26,470	15,870	6,792	5,939	8,301	1,002	702	76,424	71,965	28
1983	710	657	805	1,022	7,162	40,582	37,189	14,680	4,469	4,838	2,664	1,702	116,479	117,280	2
1984	1,034	855	811	1,779	25,883	47,544	27,537	8,912	6,897	6,772	1,747	1,605	131,376	130,456	1
1985	1,650	1,472	1,829	2,509	15,059	37,758	12,500	7,942	3,556	2,656	2,793	1,745	91,469	94,399	6
1986	1,700	1,630	2,168	2,110	13,404	30,681	13,518	7,517	3,162	1,496	1,513	1,630	80,530	83,085	14
1987	1,543	1,496	1,742	2,765	16,997	26,252	9,511	6,518	4,616	2,073	1,317	1,073	75,901	76,077	23
1988	1,164	940	1,031	1,488	3,527	18,191	7,410	5,679	3,412	1,712	1,008	647	46,208	47,304	54
1989	660	665	1,022	1,377	10,812	10,227	6,196	5,459	2,699	2,511	487	577	42,691	42,482	60
1990	412	374	481	654	3,322	20,928	7,153	5,580	3,437	1,240	845	630	45,055	45,916	58
1991	518	443	514	786	13,865	28,737	9,886	7,047	4,427	2,160	1,089	801	70,274	68,938	33
1992	589	609	847	1,123	17,060	22,070	9,523	6,141	4,201	2,104	713	659	65,639	66,213	37
1993	659	756	972	938	16,124	29,953	14,251	7,831	4,590	1,866	1,228	843	80,010	79,550	18
1994	707	609	776	1,059	12,185	20,002	8,025	6,974	3,537	2,267	1,208	938	58,286	57,810	43
1995	871	887	1,123	1,254	2,858	45,297	39,341	12,199	7,482	2,735	1,307	795	116,148	115,723	4
1996	799	811	770	1,789	27,079	27,073	8,547	7,466	3,981	1,492	958	964	81,728	83,152	13
1997	1,012	829	1,043	1,313	15,814	39,454	11,717	7,359	5,966	2,414	1,837	861	89,618	87,921	10
1998	781	815	1,025	1,224	14,741	24,490	12,807	8,428	6,684	2,083	1,307	1,230	75,617	76,109	22
1999	1,141	1,146	1,327	1,621	4,887	25,468	13,428	8,214	6,141	2,731	922	754	67,780	67,992	34
2000	690	718	809	1,787	20,267	16,614	7,446	6,311	3,168	2,116	1,178	1,174	62,280	62,218	41
2001	1,244	1,242	1,529	1,870	10,675	14,864	7,422	6,867	4,856	1,815	1,111	1,018	54,513	55,038	46
2002	1,069	1,012	1,103	1,946	6,577	6,492	5,086	3,921	2,799	1,263	877	785	32,930	33,948	66
2003	783	791	1,025	1,329	12,210	24,472	8,838	7,206	4,507	1,825	1,004	859	64,851	64,089	39
2004	835	686	785	1,093	16,352	16,019	7,137	6,417	3,039	1,123	914	904	55,304	56,050	44
2005	920	833	940	1,150	13,460	20,755	9,781	8,545	4,463	1,712	1,111	676	64,347	63,789	40
2006	636	582	720	1,386	25,417	19,115	7,601	7,978	4,917	2,813	1,577	631	73,372	71,850	30
2007	615	550	801	2,317	18,681	20,841	9,626	8,249	2,717	1,851	1,206	1,010	68,463	69,417	32
2008	762	712	1,010	1,452	16,096	40,517	14,404	10,251	5,092	1,997	1,771	626	94,690	94,361	7
2009	511	440	500	1,310	32,684	21,582	9,747	7,079	4,060	1,456	1,218	678	81,265	82,308	15
2010	730	666	746	1,273	11,927	25,910	7,833	7,208	4,834	2,384	1,220	631	65,362	64,480	38
2011	647	637	774	1,105	3,263	50,200	22,118	9,378	5,865	3,106	1,547	920	99,560	98,221	5
2012	809	770	996	1,365	6,302	7,343	5,516	6,385	1,263	869	877	899	33,392	36,322	64
2013	922	817	940	1,166	5,881	12,617	5,820	5,470	4,643	1,581	3,241	762	43,862	40,922	62
2014	713	1,141	1,434	2,101	16,653	33,241	10,340	7,307	3,690	1,681	1,725	1,763	81,789	82,204	16
2015	1,710	1,529	1,822	1,987	7,682	34,963	10,588	8,317	4,463	1,242	749	718	75,770	78,231	19
2016	666	627	713	1,403	8,920	38,912	9,478	7,924	5,035	1,348	1,384	832	77,240	76,385	20
2017	738	610	869	2,370	8,928	32,875	10,021	8,164	5,985	2,141	1,513	801	75,013	74,121	26
2018	653	589	677	1,210	7,772	6,834	5,529	5,279	2,077	987	602	548	32,756	35,074	65
2019	551	507	622	2,116	8,029	30,141	24,431	9,632	7,117	2,630	1,270	1,039	88,085	85,283	12
2020	915	800	810	1,294	9,019	10,673	7,452	6,940	3,929	1,152	896	922	44,803	46,771	56
2021	922	723	772	1,194	6,436	9,925	6,741	7,769	5,619	1,378	1,170	1,025	43,675	43,073	59
2022	883	805	897	1,144	11,808	10,302	7,460	7,662	5,289	1,983				49,824	52
Average	894	821	993	1,856	12,302	24,034	11,412	6,561	3,946	2,267	1,298	980	67,615	67,358	
Average Before Silver Jack	949	843	1,053	3,116	15,521	22,764	9,644	4,015	2,348	1,762	1,256	1,099	64,370	64,744	
Average After Silver Jack	891	826	988	1,453	11,369	24,328	11,921	7,366	4,403	2,325	1,285	942	68,450	68,229	
Percent change after Silver Jack	-6%	-2%	-6%	-53%	-27%	7%	24%	83%	88%	32%	2%	-14%	6%	5%	

**Silver Jack Reservoir operational in 1971*

***Annual Rank based on on water year. Larger numbers are drier, lower numbers are wetter*

Table 3-3. Monthly flows at UGSG Gage 9127000 (Cimarron River blw Squaw Creek at Cimarron, CO).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Water Year	Annual Rank
1942										1,845	2,083	1,845			
1943	1,537	1,666	2,928	12,365	19,912	29,616	6,740	7,293	2,928	2,507	2,894	2,713	93,100	90,757	5
1944	2,356	1,888	2,162	6,071	31,417	42,756	14,579	1,519	1,087	1,926	1,567	1,829	109,158	111,951	2
1945	1,910	1,888	2,747	6,179	25,423	29,766	8,067	3,860	1,351	1,970	2,664	2,376	88,200	86,512	7
1946	1,964	1,585	2,731	8,743	11,826	23,376	3,074	2,154	1,553	2,358	2,343	2,700	64,406	64,015	8
1947	1,787	926	3,118	4,893	19,653	28,158	12,478	4,542	4,356	3,358	2,846	2,533	88,649	87,312	6
1948	1,626	1,987	3,162	16,665	42,064	32,450	5,875	1,884	1,252	2,253	2,444	2,364	114,027	115,704	1
1949	2,083	2,184	2,263	10,457	23,544	43,127	15,987	2,025	1,263	1,978	2,089	2,194	109,194	109,995	3
1950	1,886	1,632	2,243	8,146	9,751	18,560	3,015	1,202	894	1,047	1,884	2,015	52,276	53,589	9
1951	1,970	1,853	2,414	3,197	11,790	19,928	3,628	2,037	1,113	1,148	1,212	1,482	51,772	52,877	10
1952	1,745	1,611	1,642	13,212	26,438	49,211	6,242	3,481	1,993					109,418	4
--- No Data 1953-2011 ---						*--- No Data 1953-2011 ---*							*--- No Data 1953-2011 ---*		
2011				4,790	8,662	63,670	25,083	6,010	3,035	3,556	3,045	2,378	120,230		
2012	1,928	1,720	3,414	4,758	4,217	2,212	2,721	2,350	1,432	1,813	1,995	1,910	30,471	33,731	9
2013	1,999	1,851	2,565	4,382	9,201	10,144	2,402	2,093	3,850	3,727	4,310	1,787	48,310	44,204	7
2014	2,041	2,910	3,461	7,196	24,946	42,360	8,380	3,206	2,700	3,687	3,323	3,415	107,626	107,025	2
2015	3,424	2,829	4,193	4,110	8,647	41,417	7,578	2,797	2,186	2,866	2,394	2,198	84,641	87,607	5
2016	2,206	2,152	3,037	5,678	12,402	45,484	5,367	2,585	2,023	2,802	2,604	2,704	89,044	88,392	4
2017	2,669	3,029	4,702	6,985	12,982	39,418	5,846	3,770	2,475	3,909	2,904	2,016	90,706	89,988	3
2018	1,663	1,474	2,135	3,397	5,890	2,191	916	996	1,141	1,741	1,041	1,118	23,703	28,632	11
2019	1,176	1,159	2,494	11,229	19,645	45,835	27,680	4,275	1,972	2,610	2,509	2,445	123,028	119,364	1
2020	2,237	1,935	2,639	3,550	7,849	6,650	1,851	1,125	1,077	1,237	1,820	1,600	33,570	36,479	8
2021	1,488	1,423	2,206	3,359	4,471	6,025	2,155	2,580	1,526	2,566	2,422	2,143	32,365	29,890	10
2022	1,780	1,150	1,508	3,813	14,609	7,463	3,017	3,533	1,619	3,204				45,624	6
Average (1942-1952)	1,887	1,722	2,541	8,993	22,182	31,695	7,969	3,000	1,779	2,039	2,202	2,205	85,642	88,213	
Average (2011-2022)	2,056	1,966	2,941	5,270	11,127	26,072	7,750	2,943	2,086	2,810	2,579	2,156	71,245	64,631	

**Annual Rank based on on water year. Larger numbers are drier, lower numbers are wetter. Separate rankings for the two time periods*

drainage area and elevation to stream discharge (Tennant et al. 2017). **Table 3-4** summarizes key information about the several hydrologic unit drainage basins within the watershed, such as the drainage basin area, and elevation statistics for these basins. Comparing these basin sizes and elevations to the Cimarron River basin, the estimated annual flows from the Little Cimarron and Blue Creek headwaters areas are shown on Table 3-4 and in **Figure 3-5**. It is important to note that Figure 3-5 shows average annual flows between 2011 and 2021 on the Cimarron mainstem with Silver Jack Reservoir and the Cimarron Canal operational. As discussed above, flows below the Cimarron Canal are significantly lower than at stream gage 912600 (below Silver Jack Reservoir; Cimarron River near Cimarron, CO), but increase as additional tributaries and irrigation return flows join the stream. Seasonal variability in these ungaged basins will be similar to those shown in the pre-reservoir graph on Figure 3-2 because there are no major reservoirs in these ungaged basins.

These estimates of stream discharge from the headwaters areas of the Little Cimarron and Blue Creek provide rough estimates of flow and timing, but are not substitutes for permanent stream gaging stations. Other approaches to estimating streamflow may result in different estimates. For example, the State of Colorado's water rights model, StateMod, uses a stream gage on the Lake Fork of the Gunnison to estimate flows in the Little Cimarron and Blue Creek. That method results in lower estimates of flow than shown in Figure 3-5. The StateMod estimate for flows in the Little Cimarron at about half shown in Figure 3-5, and about 20% lower on Blue Creek than shown in Figure 3-5. Flows lower in the basin are affected by diversions to irrigation, return flows, including the Blue Creek Ditch and Butte Ditch that divert water from one watershed and irrigate lands in neighboring watersheds. Additional permanent stream gaging would improve the technical support for understanding stream flow timing and magnitude in the lower part of the Little Cimarron and Blue Creek watersheds.

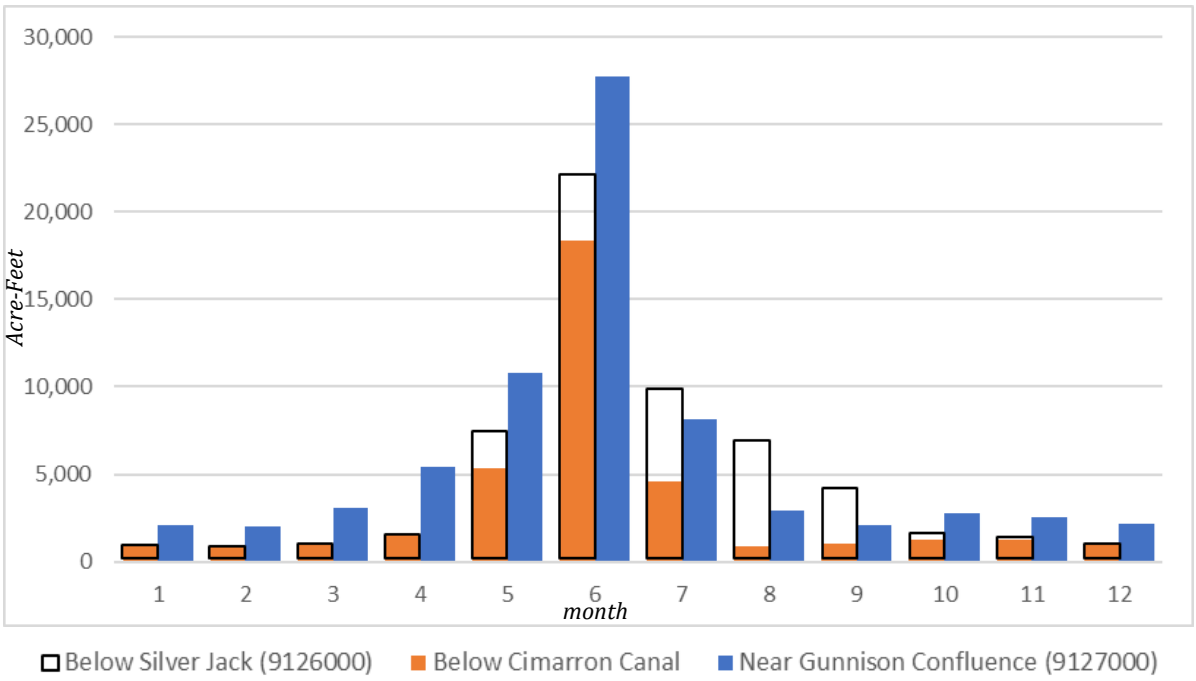


Figure 3-4. Monthly Average flow Below Silver Jack Reservoir (USGS gage 9126000 Cimarron River near Cimarron, CO), below the Cimarron Canal (calculated), and near the Gunnison Confluence (USGS gage 9127000 Cimarron River blw Squaw Creek at Cimarron, CO) during common period of record (2011-2020).

Table 3.-4. Summary of drainage basin characteristics and estimates of headwaters natural flow.

Area and Elevation Data for HUC 12 in the Cimarron River and Blue Creek Basins								
HUC12 Name	Contains Creeks/Rivers:	Area	Area	% of Total Area	Minimum Elevation	Maximum Elevation	Average Elevation	Natural Streamflow*
		acres	Square Miles	%	feet	feet	feet	acre-feet
(1) Headwaters Cimmaron River	West Fork Cimarron, East Fork Cimarron, Middle Fork Cimarron	37,710	59	18%	8,907	14,299	11,000	67,875
(2) Headwaters Little Cimarron River	Van Boxel Creek, Moore Pasture Creek, East Fork Little Cimarron, Firebox Creek, Little Cimarron	27,413	43	13%	8,417	13,671	10,672	42,341
(3) Outlet Little Cimarron River	Butte Creek, Little Cimarron, McKinley Ditch, Collier Ditch, Stumpy Creek	20,527	32	10%	7,045	10,626	8,425	
(4) Upper Cimarron River	Coal Cr, Stewart Cr, Fish Cr, Fox Creek	18,973	30	9%	8,048	11,573	9,601	
(5) Middle Cimarron River	Veo, Burdeck	26,188	41	12%	7,043	11,444	8,508	
(6) Lower Cimarron River	Squaw Creek, Cimarron	16,937	26	8%	6,776	9,714	8,063	
(7) Headwaters Big Blue Creek	Soldier Creek, Big Blue Creek	26,873	42	13%	9,445	14,314	11,174	52,000
(8) Little Blue Creek	Little Blue Creek, East Fork Little Blue Creek, Middle Blue Creek, Workman Creek, West Fork Middle Blue Creek	22,327	35	11%	8,178	11,517	9,702	
(9) Big Blue Creek-Blue Creek	Blue Creek, Big Blue Creek, Big Blue Ditch	13,267	21	6%	7,178	10,449	9,119	

**Natural Streamflow calculated from measured flows and diversions on Cimarron River, interpolated to Little Cimarron and Big Blue headwaters based on Tenant et al. 2017*

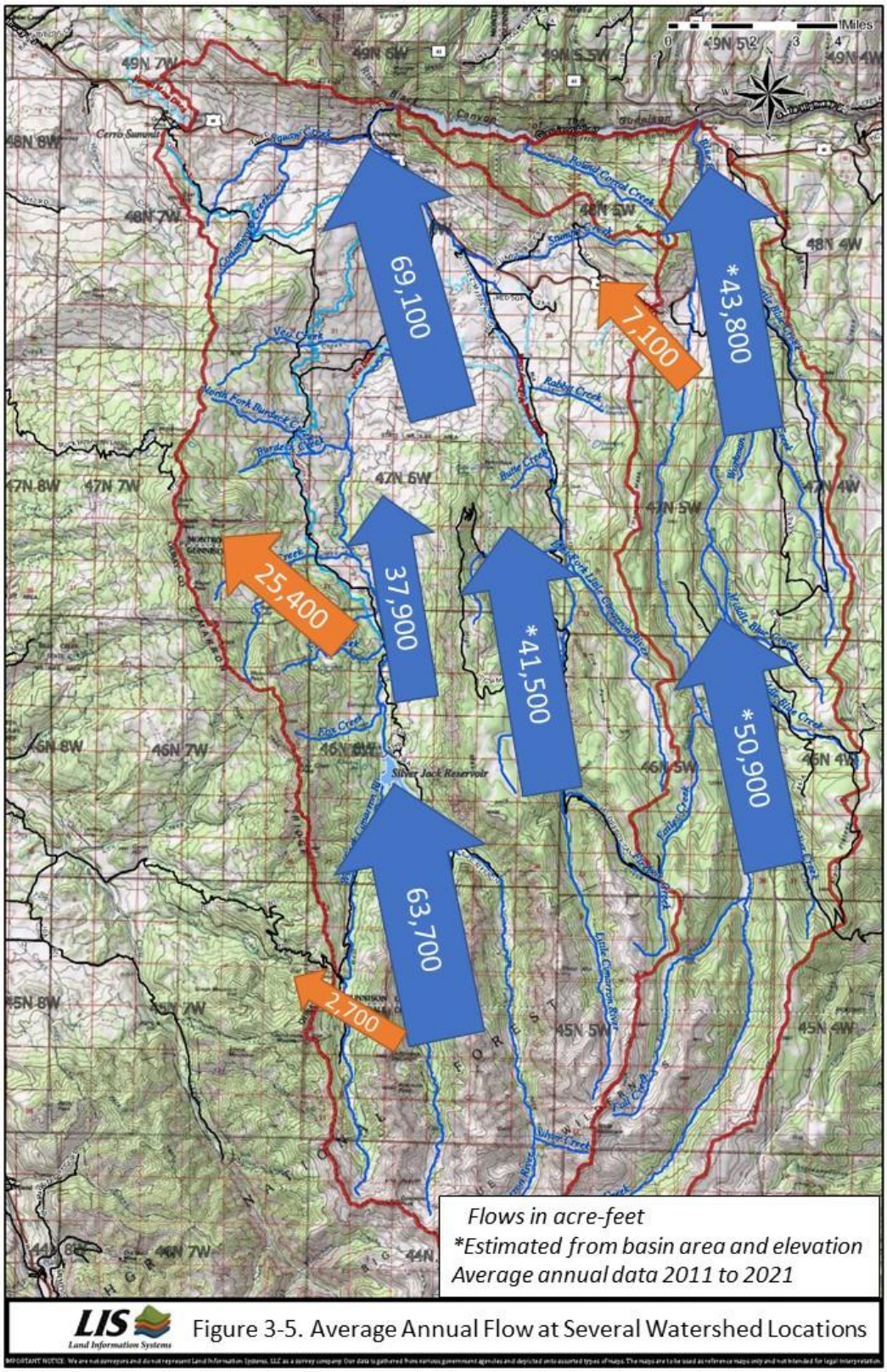


Figure 3-5. Map of gaged and estimated annual flows based on watershed area-elevation correlation.

3.3 Water Rights and Diversions

The majority of stream diversions in the Cimarron River and Blue Creek watersheds are for irrigation. The following sections describe major irrigation ditches, the Silver Jack Reservoir and associated Bostwick Park Project, and domestic, commercial, and municipal use.

3.3.1 Major Irrigation Ditches and Irrigated Area

The listing of water rights maintained by the Division of Natural Resources includes 160 ditches in the Cimarron and Blue Creek basins (included with the supplemental materials available for download from the Coalition website). However, most of these water rights do not have consistent diversion records. Based on our conversation with the water commissioner, we understand that the majority of these water rights are small and serve a single property. Some of these water rights are no longer used or have been transferred to other ditches. In discussions with ranch manager Aaron Brack on the December 2021 site visit, discussions with the water commissioner Scott King, and a review of the availability of diversion records, we identified 21 major irrigation ditches that divert in the Cimarron River and Blue Creek watersheds. **Table 3-5** is a summary of the major ditches in this section. Most of these ditches have incomplete diversion records from the Division of Water Resources. The average annual diversion amounts shown in Table 3-5 are calculated based on years with diversion records so that years without records are not considered as zero. We developed a spreadsheet to accompany this report that allows the user to select different irrigation ditches and view annual and seasonal diversions. **Figure 3-6** is a map of these major ditches along with headgate locations and irrigated acreage within the basin.

On an average annual basis, these 21 major irrigation ditches divert about 56,000 AF per year. Of this amount, about half (28,000 AF per year) is diverted at the Cimarron Canal from the Cimarron River, and an additional 2,000 AF per year is diverted at the various tributaries the Cimarron Canal intersects. Of the remaining 26,000 AF of diversions, about 7,000 AF per year is diverted at other Cimarron River mainstem ditches, 10,000 AF per year at Little Cimarron basin ditches, and 9,000 AF per year at Blue Creek ditches. In the Little Cimarron basin, the largest diversion is the McKinley Ditch with average annual diversions of 4,700 AF per year. In the Blue Creek basin, the largest diversion is the Big Blue Ditch, which diverts about 6,300 AF per year. **Figure 3-7** shows the annual diversions by basin from 1974 through 2021.

The State of Colorado's Decision Support System mapped irrigated lands in the Cimarron Basin in several different years, with the most recent effort in 2020. This dataset indicates that there are 7,740 acres of irrigated lands within the Cimarron River and Blue Creek watersheds. The irrigated acreage is all irrigated grass pasture. the majority of the irrigated

Table 3-5. Summary of major ditch water rights.

Major Ditch Rights in the Cimarron River and Blue Creek Watersheds									
WDID	Name	Water Source	Basin	Average Annual Diversions (AF)	Case No.	Priority Date	Decreed Rate (cfs)	Use	Notes
6200672	McKinley Ditch	Little Cimarron River	Cimarron	4,727	CA1319	9/1/1886	12.17	1	
					CA1745	5/10/1905	3.125	1	
					CA1745	5/10/1906	3.125	1	
					CA4742	5/1/1912	12.58	1	
					14CW3108	all prior	5.8127	1M	ADD USE OF MINIMUM FLOW
6200564	Collier Ditch	Little Cimarron River	Cimarron	1,507	CA1319	9/1/1889	4.95	1	
					CA1745	3/28/1905	3.5	1	
					CA6981	4/1/1905	4.6	1	
6200542	Butte & Butte Extension Ditch	Little Cimarron River	Cimarron	2,062	CA3516	5/11/1906	19.17	1	
					06CW0240	11/1/2006	1.7	9	
6200782	Vanderberg Ditch	Little Cimarron River	Cimarron	337	CA3516	5/11/1906	0.78	1	
					CA3516	6/15/1915	2.87	1	
					CA4742	5/1/1922	2.5	1	
6200539	Bruton #2 Ditch	Little Cimarron River	Cimarron	255	CA6981	7/1/1912	1	1	
					07CW0108	7/1/1912	0.65	1	transferred from Burton #1
6200742	Schildt-Brown Ditch	Cimarron River	Cimarron	698	CA1319	6/1/1883	1.57	1	
					03CW0168	5/30/1893	0.92	1	transferred from Brown Ditch
6200673	McMinn Ditch	Cimarron River	Cimarron	1,103	CA1319	3/31/1883	5.21	1	
					06CW0240	11/1/2006	0.27	9	Non-irrigation season only
					CA1319	5/1/1899	0.79	1	transferred from McMinn-Veo under 05CW0050
6200783	Veo Ditch	Cimarron River	Cimarron	2,270	CA1319	9/1/1883	8.6	1	
					CA4742	9/1/1911	7	1	
6200561	Cimarron Feeder Garnet Ditch	Cimarron River	Cimarron	2,940	CA1319	8/1/1890	55	1	5 cfs of the 55 abandoned in 84CW0093
6200765	Stumpy Ditch	Stumpy Creek	Cimarron	321	CA1319	9/1/1886	2.61	1	
6200707	Peterson & Riley Ditch	Stumpy Creek	Cimarron	525	CA1745	3/31/1906	0.833	1	
					CA4742	5/1/1914	5.17	1	
					W0288	7/1/1912	1	1	transferred from Bruton #3
6200564	Coal Creek Ditch	Coal Creek	Cimarron	233	CA1319	5/20/1899	1.04	1	
					CA1745	5/18/1899	4.5	1	
6200560	Cimarron Canal	Cimarron River	Cimarron	27,994	CA1319	4/1/1903	60	12	
					CA1745	3/28/1905	39	1	
					CA4742	6/1/1925	35	12	made absolute 2/21/1944 (uses added)
					CA4742	6/1/1925	51	12	enlargement
		Burdeck Creek	Cimarron	263	CA1319	4/1/1903	7	12	
					01CW0278	1/10/2001	15	1	
					08CW0070	1/10/2001	10	1	
					15CW3107	1/10/2001	5	1	
		Cottonwood Creek	Cimarron	324	CA1319	4/1/1903	25	12	
		Fish Creek	Cimarron	549	CA1319	4/1/1903	15	12	
		Spring Creek	Cimarron	148	CA1319	4/1/1903	7	12	
		Stewart Creek	Cimarron	160	CA1319	4/1/1903	15	12	
6200528	Big Blue Ditch	Big Blue Creek	Blue Creek	6,227	CA1745	6/1/1904	21.87	1	
					CA4742	8/1/1912	1.53	1	
					CA4742	5/20/1924	18.6	1	
					CA6981	5/1/1951	24	189	
6200537	Bruce Franklin Ditch	Big Blue Creek	Blue Creek	741	CA6981	8/3/1951	10	19	
					CA6981	8/3/1951	0.5	1	
					CA6981	8/3/1951	0.25	1	
					CA6981	8/3/1951	0.1	1	
6200760	Squirrel No. 1 Ditch	Big Blue Creek	Blue Creek	272	CA6981	7/1/1910	2	1	
6200761	Squirrel No. 2 Ditch	Big Blue Creek	Blue Creek	374	CA6981	10/1/1951	4	1	
6200527	Beaver Ditch	Big Blue Creek	Blue Creek	408	CA4742	7/1/1906	4	1	
6200620	Hazel Ditch	Little Blue Creek	Blue Creek	733	CA6981	10/1/1951	13	1	
6201538	Minerich Pipeline	Little Blue Creek	Blue Creek	378	92CW0207	8/4/1992	1.5	569	Fills Meiner Lake 1 and 2
6200834	Arrowhead Ditch #1	Little Blue Creek	Blue Creek	68	W1793	5/1/1973	2	8	
					79CW0055	5/1/1973	2	8Q	

Note: Use codes: 0 = storage, 1 = irrigation, 2 = municipal, 3 = commercial, 4 = industrial, 5 = recreation, 6 = fishery, 7 = fire, 8 = domestic, 9 = stock, M = minimum flow, Q = quantification for structure

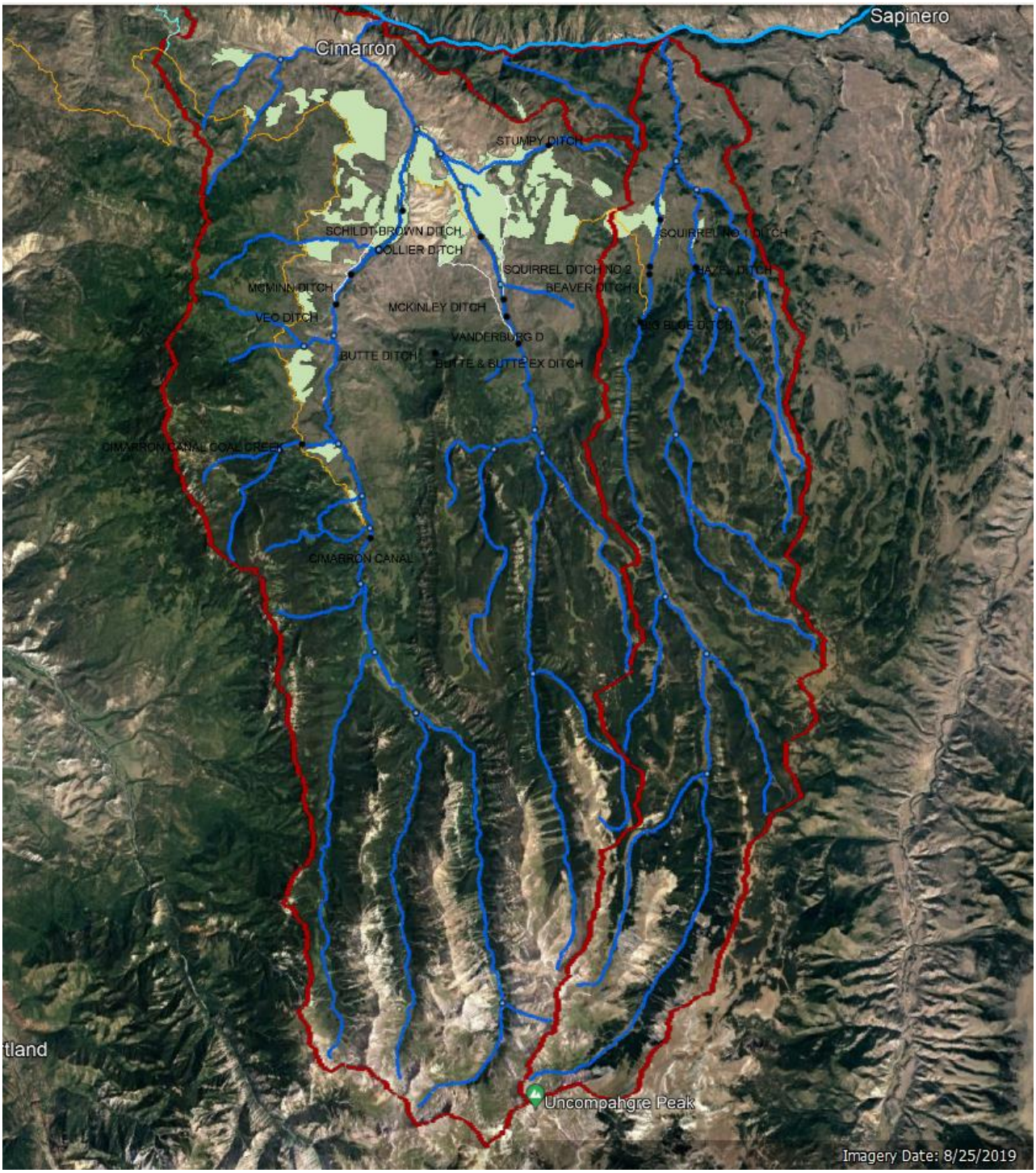


Figure 3-6. Irrigated area and major ditch headgates.

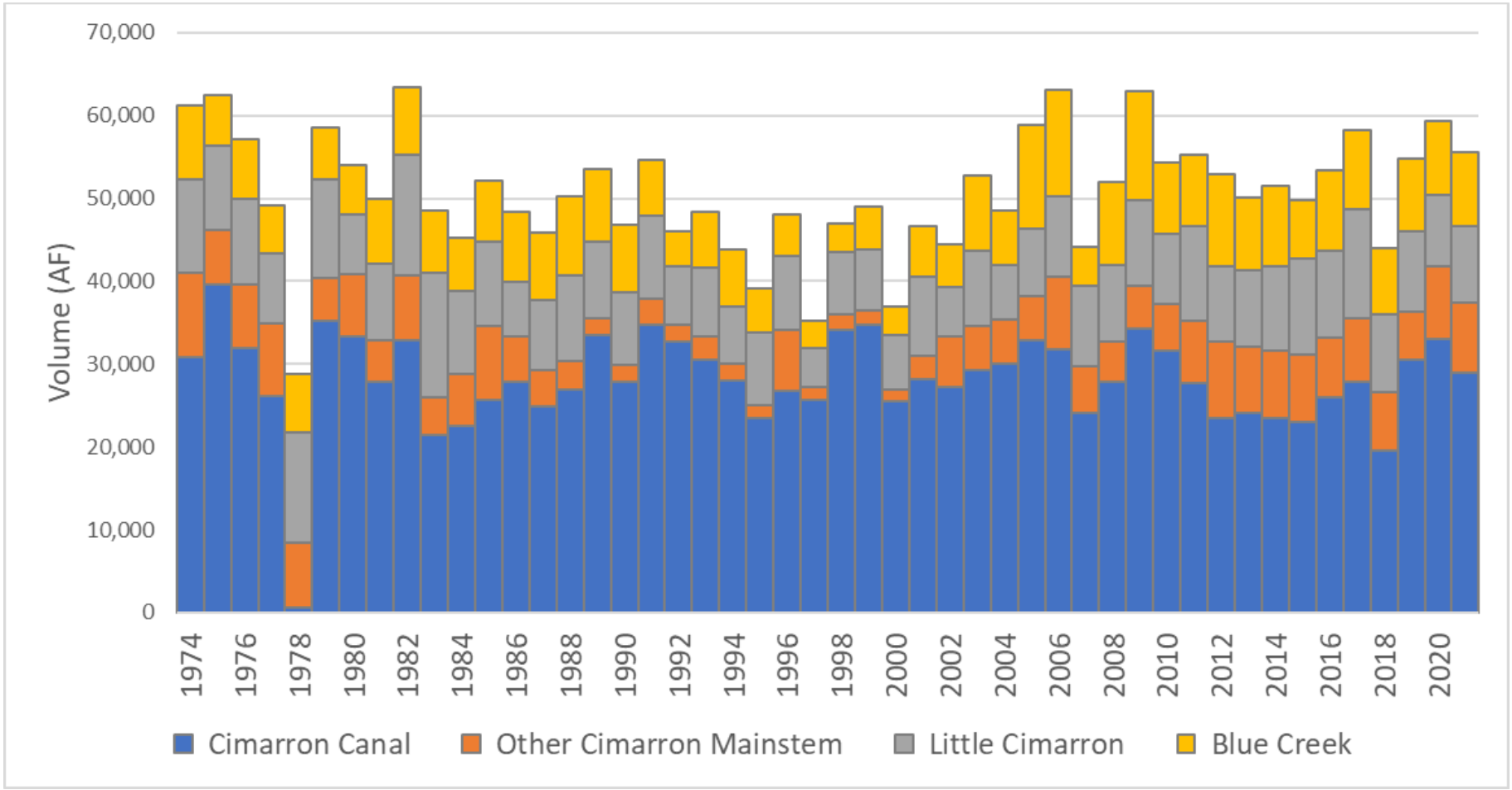


Figure 3-7. Annual diversions by basin 1974 to 2021.
**Cimarron Canal data missing for 1977.*

area is the lower portion of the basin between 7,000 and 8,500 feet in elevation. This irrigated area does not include the Bostwick Park irrigated lands because those lands are located outside of the watershed, even though they are supplied from the Cimarron Canal. There are approximately 6,100 irrigated acres in the Bostwick Park project outside the Cimarron River and Blue Creek basins.

3.3.1.1 Exports from the Cimarron and Blue Creek Basins

The Cimarron Canal is unique in that it can divert from multiple sources aside from its primary headgate on the Cimarron River. Water is diverted from the Cimarron River below Silver Jack Reservoir and delivers some water to users in the Cimarron River basin, but primarily delivers water out of the watershed to the Bostwick Park Project west of Montrose. In addition to the primary diversion from the Cimarron Canal, the diversion rate decreed from Cimarron River into the Cimarron Canal is the largest decreed rate in the Cimarron River and Blue Creek watersheds. The Cimarron Canal can also divert water from the following Cimarron River tributaries: Cottonwood Creek, Veo Creek, Brudeck Creek, Spring Creek, Coal Creek, Stewart Creek, and Fish Creek. **Table 3-6** shows the maximum diversions rates from each source into the Cimarron Canal under CA1319. Combined diversions into the Cimarron Canal cannot exceed 60 cfs under CA1319 water rights. The diversions from Coal Creek and Veo Creek to the Cimarron Canal were later abandoned. The Cimarron Canal delivers water both to in-basin irrigation use and to the Bostwick Park Project, located outside the Cimarron River basin west of Montrose. Cimarron Canal had three enlargements: 39 cfs for irrigation and domestic use with a May 8, 1913 priority date (CA4742), 51 cfs for irrigation with a June 1, 1925 priority date (CA4742), and 35 cfs for seepage losses with a priority date of June 1, 1925 (CA4742). A small portion (36/600) of the enlargement water right is used for domestic use in the City of Montrose. On average, 27,994 acre-feet are diverted from the Cimarron River into the Cimarron Canal. The Cimarron Canal delivers approximately 5,600 AF to water users in the Cimarron basin, and approximately 22,400 AF leaves the Cimarron Basin at Cerro Summit. Additional inflow at the diversion points along the canal at creek crossings offset ditch losses.

Table 3-6. Cimarron Canal water rights under decree CA1319.

CA1319 Priority Number	Diversion Point	Rate (cfs)
104	Cottonwood Creek	25
105	Veo Creek	8
106	Burdeck Creek	7
107	Spring Creek	7
108	Coal Creek	25
109	Stewart Creek	15
110	Fish Creek	15
111	Cimarron River	60

The Cimarron Feeder Garnet Ditch is another transbasin diversion that takes water from the Cimarron River watershed. The ditch was initially decreed for a rate of 55 cfs, but 5 cfs

was later abandoned. In the past 10 years, diversions typically reach 40 to 45 cfs briefly during peak runoff, but quickly tail off as available water decreases. The water diverts from the West Fork Cimarron River, which is in the headwaters of the Cimarron River watershed above Silver Jack Reservoir, and delivers water into Cow Creek, a tributary of the Uncompahgre River. This ditch does not serve irrigated lands in the Cimarron basin. Average annual diversions are 2,940 AF. Although some ditch loss will result in return flows to the Cimarron basin, most of this water is removed from the Cimarron watershed.

Two ditches divert water from one watershed within the larger Cimarron and Blue Creek basins and use water in a neighboring watershed, but not outside the Cimarron and Blue Creek watersheds. The Big Blue Ditch diverts water from Big Blue Creek and delivers water for use both within the Blue Creek basin and into the lower portion of the Little Cimarron Basin. Annual diversions from Blue Creek to Big Blue Ditch are 6,227 AF. The water commissioner estimates that approximately 95% of the Big Blue Ditch diversions are delivered into the Little Cimarron basin. The Butte Ditch diverts water from the Little Cimarron River and delivers water for use both within the Little Cimarron basin and further to the west in the Cimarron mainstem basin. Annual diversions from Butte Ditch are 2,062 AF.

3.3.2 Silver Jack Reservoir and Bostwick Park

Silver Jack Reservoir is an on-channel reservoir located on the Cimarron River, about 20 miles upstream of the Cimarron River's confluence with the Gunnison River. The reservoir was built between 1966 and 1971. The facility is located entirely in the Uncompahgre National Forest. Silver Jack Reservoir storage was decreed for irrigation and recreation use on July 1, 1955 in CA6981. Water from Silver Jack Reservoir is released for subsequent diversion into the downstream Cimarron Canal and delivery to Bostwick Park. Silver Jack Reservoir was originally decreed for a total of 44,600 AF of storage. 14,000 AF of the originally decreed storage was made absolute in W2514, and 30,600 AF was abandoned on October 14, 1975. The current capacity of Silver Jack Reservoir is 13,520 AF, including 12,820 AF of active capacity and 700 AF of inactive capacity.

The Bostwick Park Project provides a supply of irrigation water for 6,100 acres of land in the Gunnison River Basin west of Montrose, Colorado. The area was originally settled in the early 1880's, and irrigation development began around 1910. A majority of the water supply for Bostwick Park is from the Cimarron River watershed, including releases from Silver Jack Reservoir. Water delivered to the Bostwick Park Project removes water from the Cimarron River basin. Once outside the Cimarron basin, water in the Cimarron Canal, water goes to Vernal Mesa Ditch, which runs to Bostwick Park for irrigation of crops. The primary crops in the irrigated area are alfalfa, grass hay pasture, and small grains for livestock feed. Beef and cattle are the primary sources of income for this area.

3.3.3 Groundwater Use

According to state records from HydroBase, there are 149 permitted and/or constructed wells in the Cimarron and Blue Creek watersheds. 109 of these wells are domestic use, 22 are monitoring/sampling, 18 are for stock, 1 for commercial, and 2 for fishery. Some wells have multiple uses, so the number of wells is less than the total than the number of uses listed. The primary use of groundwater is for domestic use and we are not aware of any high capacity groundwater uses in the watershed.

3.3.4 Water Rights Administration

Water rights in the Cimarron and Blue Creek watersheds are subject to administration by the Division of Water Resources. The watershed is located in Water District 62, which is part of the Gunnison River basin (Water Division 4). The Cimarron River meets the Gunnison River just downstream of Morrow Point dam, the middle of the three Aspinall Unit reservoirs on the Gunnison River mainstem (Blue Mesa, Morrow Point, and Crystal reservoirs). Blue Creek enters the Gunnison River upstream of Morrow Point, but below Blue Mesa Reservoir. Both the Cimarron River and Blue Creek basins are upstream of the Gunnison Tunnel project diversion on the Gunnison River. The Gunnison Tunnel project is one of the most senior water rights on the Gunnison River mainstem with a November 1, 1905 water right for 1,175 cfs. Historically, this water right has only called in 2002 and 2003. The Redlands Canal located near Grand Junction has a January 4, 1911 water right, but has only called one time in 2002. Federal operation of releases from the Aspinall Unit reservoirs generally provides sufficient flows to satisfy these two water rights. This results in infrequent calls from the Gunnison River affecting the Cimarron River or Blue Creek. However, these water right are able to call out many of the water rights in the Cimarron and Blue Creek basins, as can be seen by comparing the 1905 and 1911 dates to the priority dates for the major ditches in Table 3-5.

We discussed water rights administration with the current District 62 water commissioner, Scott King. Based on this discussion, the primary calls affecting the Cimarron and Blue Creek watersheds are the Gunnison Tunnel and Redlands Canal from the Gunnison River. As described above, the Gunnison Tunnel and Redlands Canal has only placed a call in 2002 and 2003, but are senior to many of the Cimarron and Blue Creek water rights. Blue Creek does not typically see many in-basin calls (i.e. water rights within the basin calling water past other upstream junior water rights). The Little Cimarron and Big Cimarron Rivers frequently have in-basin calls, but these are typically only during dry irrigation seasons after spring runoff has occurred. Nonetheless, a calling water right diverts the entire flow of the stream, creating a dry-up point. Flow below a calling water right is generated from tributary inflow and return flows below the calling right. The canal users in the Cimarron and Blue Creek basins have made efforts to work together in order to minimize the amount of in-basin dry-up points.

The earliest recorded call within the Cimarron Basin on the State of Colorado's online database, HydroBase, was in 2002. Since that time, only 19 calls have been placed on the Cimarron or Little Cimarron Rivers. On the Cimarron River, water rights from the Cimarron Canal and the McMinn Ditch have been the calling right. Generally, the Cimarron Canal calls are known as bypass calls, where the calling right is the most junior priority diverting, but it bypasses water to a downstream senior water right that sweeps all remaining flow from the river (e.g. the Veo Ditch, McMinn, of Shildt-Brown Ditch). On the Little Cimarron, there have been no byass calls recorded, and calls have been placed at the Collier Ditch, McKinley Ditch, and Butte Ditch. Per the State's online records, no calls have been placed on Blue Creek.

The Gunnison River is tributary to the Colorado River and subject to the Colorado River Compact. The Compact is an agreement between Colorado, New Mexico, Utah, Wyoming (the Upper Basin States), and Arizona, Nevada, and California (the Lower Basin States). The Compact calls for deliveries from the Upper Basin States to the Lower Basin States of 75 million acre-feet over any 10-year period, delivered at Lee's Ferry, which is located just below Lake Powell near the head of the Grand Canyon. An additional amount of water may be owed to satisfy a treaty with Mexico. Lake levels in Lake Powell have fallen significantly over the past 20 years and federal agencies have taken actions to release water from Blue Mesa Reservoir (located on the Gunnison River near the Cimarron and Blue Creek basins) and Flaming Gorge Reservoir in Utah to increase Lake Powell levels. If snowpack and runoff conditions do not improve, this could affect the Upper Basin States' ability to meet the Compact requirement. This in turn could precipitate more frequent calls on the Gunnison River that could affect water rights in the Cimarron River and Blue Creek basins. Also, if the Compact obligation is not met, it is possible that some water rights in Colorado could be curtailed to satisfy the obligation. To date, Colorado's Division of Water Resources has not provided specifics on how such curtailment could be administered. However, many water planners view water rights that were perfected (i.e. in use and decreed) prior to the signing of the Compact (November 4, 1922) to be less likely to face such curtailment. Most of the water rights shown on Table 3-5 are senior to this 1922 date. However, the largest storage water right in the basin for Silver Jack Reservoir is junior to the Compact (1955 priority).

3.4 Environmental Flows (instream flows, bypass at Cimarron Canal)

The Colorado Water Conservation Board holds several decrees for instream environmental flows in the Cimarron and Blue Creek Basins. These water rights are summarized in **Table 3-7**. The location of these instream flow rights are shown schematically on **Figure 3-8**. In addition to the instream flow water rights, there are other projects that are designed to enhance streamflow for environmental purposes, described in more detail below.

Table 3-7. Decreed instream flow water rights.

Minimum Streamflows						
Basin	Stream Name	Decree	Priority Date	Location	Season	Rate (cfs)
Cimarron	East Fork Cimarron	84CW392	5/4/1984	**(1)** Confluence with Silver Creek to confluence with Silver Jack Reservoir	All Year	8
	Middle Fork Cimarron River	84CW393	5/4/1984	**(2)** Headwaters to confluence with East Fork Cimarron River	All Year	4
	West Fork Cimarron River	84CW394	5/4/1984	**(3)** Headwaters to confluence with Silver Jack Reservoir	All Year	2
	Van Boxel Creek	W-2921	7/30/1976	**(4)** Headwaters to confluence with Little Cimarron River	All Year	2
	Firebox Creek	84CW0397	5/4/1984	**(5)** Headwaters to confluence with Little Cimarron River	All Year	2
	Little Cimarron River	84CW396	5/4/1984	**(6)** Headwaters to Butte Ditch headgate	All Year	2
		16CW3064	1/26/2016	**(7)** Confluence with Firebox Creek to confluence with Van Boxel Creek	Apr 15 - Sept 30 Oct 1 - Oct 31 Nov 1 - Apr 14	11 7 4.6
	East Fork Little Cimarron River	19CW3048	1/29/2019	**(8)** Headwaters to confluence with Little Cimarron River	Jan 1 - Apr 30 May 1 - June 30 July 1 - Dec 31	1 2.8 1.2
	Cimarron River	84CW395	5/4/1984	**(9)** Confluence with Fox Creek to confluence with Little Cimarron River	Jun 1 - Oct 31 Nov 1 - May 31	25 15
		84CW398	5/4/1984	**(10)** Confluence with Little Cimarron River to confluence with Gunnison River	All Year	16
Blue Creek	East Fork Little Blue Creek	98CW0245	5/11/1998	**(11)** Headwaters to confluence with Little Blue Creek	May 1 - July 31 Aug 1 - Oct 31 Nov 1 - Mar 31 Apr 1 - Apr 30	1.65 0.6 0.3 0.6
	Little Blue Creek	83CW207	7/7/1983	**(12)** Headwaters to confluence with Blue Creek	All Year	2
		98CW227	1/29/1998	**(13)** Confluence of East Fork Little Blue Creek to confluence with Blue Creek	Apr 1 - Oct 31 Nov 1 - Mar 31	1.5 0.5
	Soldier Creek	83CW208	7/7/1983	**(14)** Headwaters to confluence with Big Blue Creek	All Year	2
	Big Blue Creek	84CW388	12/31/1984	**(15)** Fall Creek confluence to confluence with Soldier Creek	All Year	8
		02CW262	1/23/2002	**(16)** Failes Creek confluence to Big Blue Ditch headgate	May 1 - Oct 31 Nov 1 - Apr 30	11.4 10.4
	Blue Creek	84CW389	5/4/1984	**(17)** Confluence of Big Blue Creek and Little Blue Creek to confluence with Morrow Point Reservoir	All Year	7
		10CW131	1/26/2010		April 1 - July 31	4.5

Silver Jack Reservoir is required to release water during the winter months to provide 15 to 18 cfs of water downstream. In the summer, the Cimarron Canal must bypass approximately 8 cfs of water to satisfy downstream senior water rights at the Veo Ditch. Silver Jack Reservoir has a pool of up to 1,500 AF that is used for fish habitat by Colorado Parks and Wildlife and can be released in the late summer to help reduce water temperatures in the Cimarron River. If the water is simply released, it can be diverted by downstream water users because the Division of Water Resources considers this water part of the natural stream and available for appropriation and does not consider environmental flow enhancement a beneficial use under Colorado water law. However, if water released from Silver Jack Reservoir is part of a contract for downstream delivery to a recognized beneficial use, such as hydropower production in the Aspinall Unit reservoirs on the Gunnison River, water can be legally shepherded past intervening headgates and kept in the stream, with the incidental environmental benefits. Shepherding water past intervening headgates is currently a challenge due to the construction of these headgates and lack of modern bypass and measuring devices at these structures.

In 2014, the Colorado Water Trust began a project to restore late summer flows to the Little Cimarron River. The Little Cimarron River contains a 3-mile segment that had been dry in late summers. The Colorado Water Trust filed for a 2014 change of water rights in the McKinley Ditch to use 5.8 cfs to restore late summer flows and reconnect the stream in

late Summer and early Fall. This change of water rights allows the original McKinley Ditch water rights to be used for irrigation of 195 acres of pasture grass from April through July 6th. The program enables use of the original irrigation water rights while also improving stream habitat.

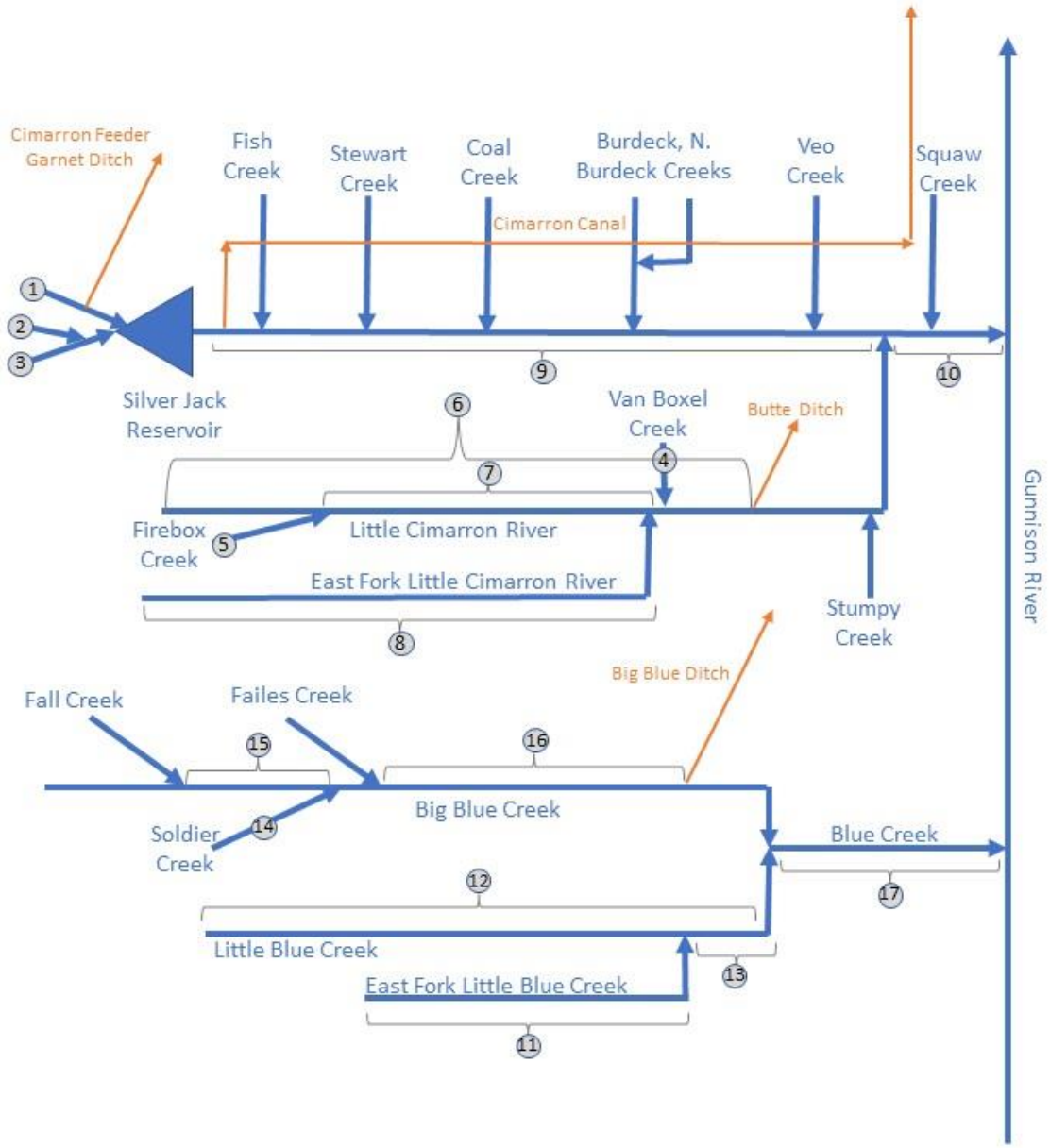


Figure 3-8. Schematic of instream flow locations.
See Table 3-7 and match numerical location identifiers for further information.

4. GEOLOGY AND SOILS

The Cimarron River and Blue Creek watersheds are on the western edge of the Southern Rocky Mountain Physiographic Province that includes the Gunnison Uplift along the northern edge of the watersheds and the San Juan Mountains to the south (see Figure 1-1). This province is characterized by mostly crystalline volcanic and metamorphic rocks that form highlands and mountain ranges, primarily uplifted during the Cenozoic Laramide Orogeny and subsequent Tertiary volcanism. The Cimarron Ridge, the western edge of the study area, is also roughly the boundary of the Southern Rocky Mountains with the Colorado Plateau Physiographic Province to the west, which is characterized by generally horizontally layered sedimentary strata with deep incised canyons ("Canyon Country") and a few outliers of volcanic and magmatic activity.

As seen on the geologic map of the study area (**Figure 4-1**), the Wilderness Area and National Forest areas in the southern half of the Cimarron and Blue Creek watersheds are dominated by San Juan volcanic and volcaniclastic rocks (mostly purple and red colors on Figure 4-1) that form very steep to vertical cliffs with high gradient stream channels in narrow valleys. This area is the northern edge of the San Juan Volcanic Field, where Tertiary volcanic breccias, andesitic and rhyolitic lava flows, and ash-flow and ash-fall tuffs, dominate the landscape. The 12,000 to 14,000-foot peaks that form the southern margin of the watersheds (i.e., Coxcomb Peak, Wetterhorn Peak, Matterhorn Peak, and Uncompahgre Peak) are composed of these volcanic and volcaniclastic materials. These high peaks and associated valleys held glaciers during multiple episodes of glacial advances and retreats in the Pleistocene. Some permanent snow fields and rock glaciers, which are talus entrained in ice, can be seen on aerial images of areas above timberline in the upper watersheds. The northern half of the watershed transitions into Cretaceous sedimentary rocks, primarily Cretaceous Mancos Shale with minor remnant Mesa Verde formation outcrops, seen as green colors on Figure 4-1).

The Mancos Shale is a marine claystone and shale that readily weathers to plastic clay, silt and fine sand. The result is a weak and slippery formation that is susceptible to erosion, soil loss, and slope failures when wetted. The weak nature of the Mancos Shale has created extensive landslide terrain in this area, as evidenced by the stippled yellow colors on the geologic map (Figure 4-1). This hummocky topography is characterized by undulating slopes, bare soil areas, disrupted vegetation, curved headwall scarps, tension cracks, rotational slumps, seepage, sag ponds, and leaning trees. Seepage from unlined canals and ditches contributes to continued failure of slopes which often causes canal, ditch and road failures when slopes become saturated.

The Mancos Shale also contains abundant salts due to its marine origin, so when the shale weathers to soil, the salts are liberated. The salts tend to accumulate in low-lying areas or in shale areas that have been saturated and then dry out, thus causing the salt to wick to the surface creating alkaline conditions. This concentration of salts can cause crop damage

and raise the pH in soils and streams. Selenium, which is problematic to fish, waterfowl and other species, is a type of salt that has also been found to be in high quantities in the Mancos Shale.

The northern half of the Cimarron River watershed and much of the Blue Creek watershed also contain intrusions and volcanic rocks forming rugged ridgelines, mesas, and buttes. Volcanic mudflow deposits from the West Elk Volcano, which was located north of the Black Canyon, form the base of many mesas in this northern portion of the watershed, while the hard caps of the mesas are made of welded ash-fall and ash-flow tuffs from eruptions within the San Juan volcanic field to the south. The northern edge of the watershed contains hard Precambrian granite and metamorphic rocks like quartzite, gneiss, and schist associated with the Black Canyon Uplift. Confinement of streams in channels cut into volcanic and sedimentary rocks that overlie the Precambrian rocks and the slow uplift of the region allowed existing rivers to continue to incise into their channels, despite the hard, underlying, crystalline rocks of the Black Canyon gorge.

The Cimarron Canal and most of the irrigated lands and ditches primarily cross Mancos Shale and shale-derived landslide terrain in the northern portions of the watersheds. The entire slopes are composed of shale that is hundreds if not thousands of feet thick, so there is a continual source of slippery shale and clay. Shale and large and small landslides are so extensive in this area (seen as green and stippled yellow on Figure 4-1, that there is no way to stabilize the slopes. These slopes have been failing naturally since before irrigation began due to the relatively high precipitation the area receives and steepness of the terrain. However, irrigation using unlined ditches and canals has accelerated the slope movement and created chronic maintenance issues.

Lining or piping canals and ditches can be an effective way to reduce seepage and unwanted saturation of soils which contribute to slope failures. Targeting problem areas with piping programs can be a way to not only slow slope movement but also conserve water for downstream users. Also, reducing flood irrigation of exposed or shallow shale, will help preserve water quality by reducing salt and selenium and keep return flow temperatures lower. These potential solutions are discussed in more detail in Section 7.

Typical soils in the southern, primarily volcanic region consist of rocky alluvial and colluvial slopes with interstitial clay and clay loam soils. Depth to volcanic bedrock is typically shallow on the steep slopes in this region. Typical soils in the northern, mixed crystalline igneous and sedimentary rock area, consist of rocky alluvial and colluvial slopes with clay and clay loam interstitial soils with generally shallow bedrock on the hard igneous rocks, and heavy clay soils on the Mancos-shale derived soils and landslide deposits. The most common soil types in the irrigated areas and slopes around the Cimarron Canal and ditches in the northern third of the watersheds is the Cerro-Swansonlake complex, 1-45% slopes (Unit 928) and the Cerro-Shermap-Curecanti Complex, 3-25% slopes (Unit 941), according to the Web Soil Survey (NRCS 2022). Both of

these mapping units are clay to clay loams with variable rock content that form on colluvium and/or landslide deposits derived from igneous and sedimentary rocks.

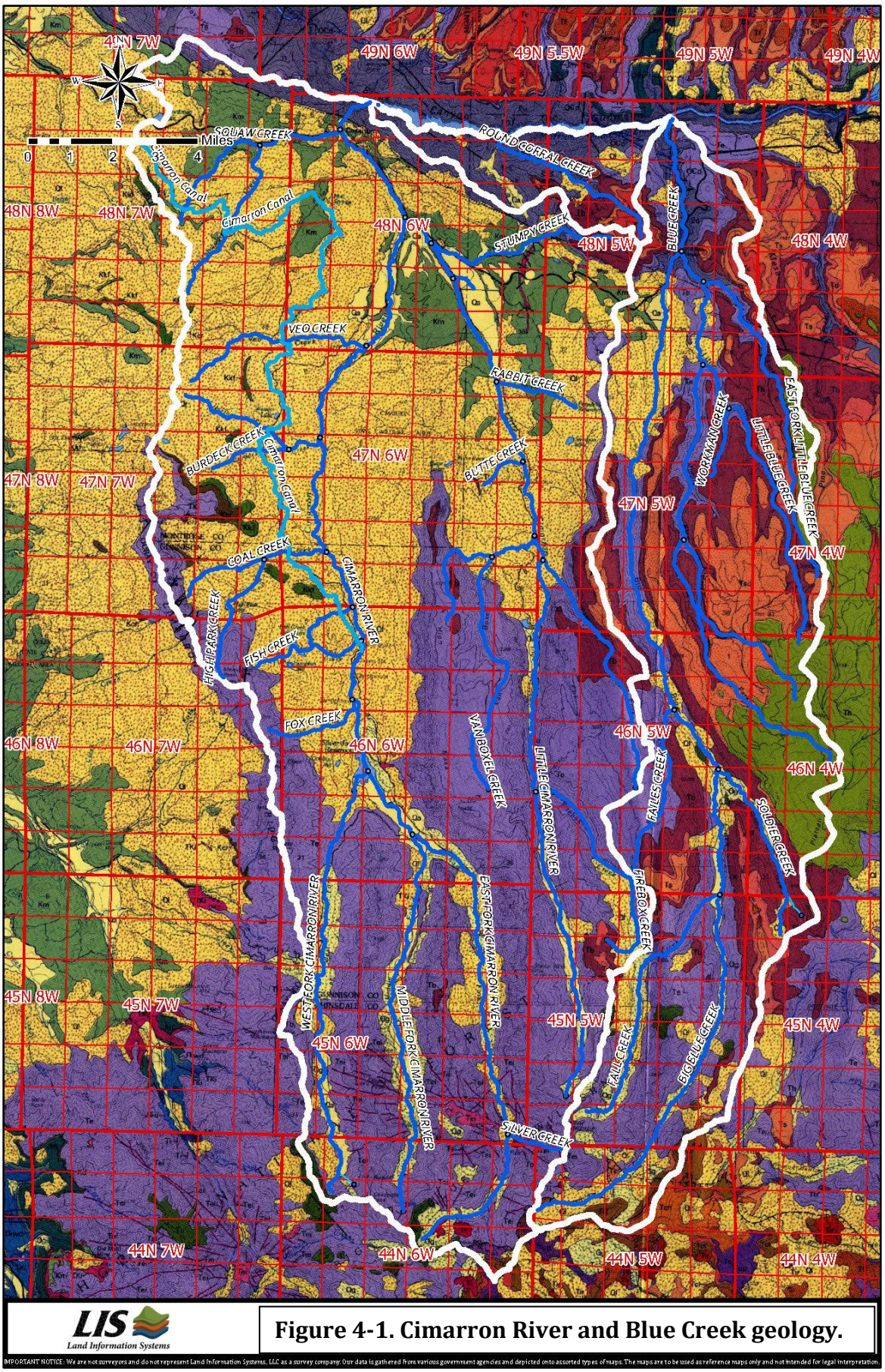


Figure 4-1. Cimarron River and Blue Creek geology.

5. STAKEHOLDER ENGAGEMENT

Stakeholder engagement was conducted during the "Study Phase" and the "Discussion Phase" of the project. During the Study Phase, stakeholders were identified and initial interviews were set up to understand major issues and concerns, as well as existing projects and operations within the basins. During the Discussion Phase of the project, these issues and concerns were formulated into a set of six basin goals. These goals will be used to assess potential future projects in terms of meeting the overall basin goals.

5.1 Study Phase Stakeholder Engagement

Basin stakeholders were initially engaged to determine issues and concerns related to the watershed planning process during the "Study Phase" of the project, between November 2021 and June 2022. Initial outreach was conducted by attending coalition meetings and conducting targeted interviews with several stakeholders including all major landowners in the watershed (the US Forest Service, Colorado Parks and Wildlife, Bureau of Land Management, and a private landowner responsible for ranch management across the watershed area), arranged during the initial on-site on December 21, 2021. In addition, feedback from stakeholders was solicited through a survey form that was prepared and distributed via the Coalition's email distribution list in March 2022, and a video clip featuring a message from the Coalition's president along with the survey form were posted to the Coalition's website. The materials used in the stakeholder outreach are available for download from the Coalition's website.

Issues of Concern documented during Study Phase interviews and surveys include:

- Maintaining flows in the rivers and streams. Flows in the Cimarron River provide critical ecosystem services; water flows drop off in the Cimarron River below the Cimarron Canal. Late season flows are critical. Note that ditch piping projects can reduce return flows from ditch seepage and potentially impact flows in nearby streams.

- Irrigation water management. Poor irrigation water management impacts the landscape through erosion, vegetation degradation, and degraded water quality as it returns to the stream system.

- Irrigation water return flows. When more water is diverted out of the river for irrigation than is needed for a full supply to the crops, the additional return flows impair water quality downstream. These return flows are warmed as

water returns to the stream, and picks up elevated levels of salts, selenium, and sediment.

- Large landowner/absentee landowner irrigation. Irrigation water that is diverted, then "dumped"- not efficiently used for crop production- creates problems for the watershed. How can this water be better managed?

- Geologic instability. Sliding/sloughing along ditches and canals creates stability issues.
- Vegetation health and weeds. Weedy areas/degradation of vegetation communities from development, grazing, recreation, and poor irrigation practices. Degraded riparian areas. Habitat should be protected to continue to support endangered species and big game.

- Recreation. Managing increased recreational use (hunting, fishing) between July 1 and Dec 31 on CPW SWA. One particular issue CPW deals with, is OHV use off-trail.

- Terrestrial habitat. The watershed is highly valuable for big game (elk, mule deer, mountain sheep, moose, black bear, and mountain lion), and the threatened Gunnison Sage Grouse and Canada Lynx. Preserving this habitat is important to stakeholders/land management agencies.

5.2 Discussion Phase Stakeholder Engagement

Stakeholder participation during the "Discussion Phase" of the project (July through October of 2022) involved the following steps:

1. Outreach and education was conducted during a barbeque event held in the watershed, on Saturday July 13, 2022. Although the barbeque was open for all stakeholders (and email distribution list used for outreach), written invitations to the barbeque were distributed via mailed postcards to all landowners with more than 80 acres (the post card invitation and distribution list is available with the supplemental materials available for download from the Coalition website). A presentation was given at the barbeque, summarizing the results of the Study Phase (also available with the supplemental materials).

2. Following the barbeque, a workshop was held on July 28, 2022, to determine the objectives or goals for overall improvement of the watershed. Five goals were developed during a 2-hour facilitated interactive workshop, with representation

from major landowners in the watershed including the US Forest Service, private landowners, environmental groups including Trout Unlimited, and water users including the Cimarron Canal Company, and Bostwick Park. During a subsequent debrief meeting, the list expanded to six goals and text of the initial five goals was refined. The goals and objectives were roughly prioritized from 1 to 6 as summarized in **Table 5-1**.

3. August and September 2022 were devoted to brainstorming project ideas and initiatives, and filtering the projects based on criteria tied to the goals and objectives that were established at the workshop. The complete project list is provided with the supplemental materials available for download from the Coalition website. All engaged stakeholders were invited to participate in ranking and prioritizing the project work for the basin. The projects described in this report were distributed to a list of all stakeholders who have been involved in the watershed assessment for review and additional refinement in the future as projects move towards implementation.

4. Stakeholders identified an important next step to engage the landowners with more than 1,000 acres. This task is outside the scope of work for the existing Watershed Assessment.

Table 5-1. Goals and objectives for overall watershed improvement.

Goal #	Goal Description
1	Increase flows and reduce late summer water temperatures in the Cimarron River, Little Cimarron, and Blue Creek
2	Develop, rehabilitate and maintain critical water storage facilities (e.g., Fish Creek Reservoir #2)
3	Modernize and stabilize irrigation infrastructure; make best use of available federal funding
4	Conserve, protect and improve where possible overall wildlife and aquatic habitat; focus on addressing noxious weeds and beetle kill timber for fire mitigation
5	Connect private land owners/ditch companies operating in the watershed, and state and federal resource and land management agencies* to enable understanding of watershed health, and to form productive partnerships and collaborations (*USFS, BLM, CPW, USFWS, DWR, and others)
6	Increase community involvement and educational outreach in the Cimarron River and Blue Creek watershed

6. ON-GOING PROJECTS AND SAMPLE FUTURE PROJECT FACT SHEETS

Through the course of the assessment, stakeholders have provided information on several existing projects that are either complete, in process, or were identified as beneficial projects. The following are brief descriptions of several of these projects. In addition, we prepared four project fact sheets for projects that are currently in the conceptual phase but were actively discussed during the project. These fact sheets are intended to provide quick key information about a project that could be used to support grant applications, presentations to the Basin Roundtable or other water-oriented organizations, and to develop potential project partnerships.

6.1 Completed and In-Process Projects

- Funding for water temperature measurement stations in Cimarron River. Water temperature measurements have been recorded at the Cimarron River near the confluence with the Gunnison River beginning in August 2022 (USGS gage 09127000, Cimarron River blw Squaw Creek at Cimarron, CO). **Figure 6-1** shows the available temperature date. Additional stations may be included with this funding.

- The McKinley Ditch water sharing project is ongoing and completed its second year of operation in 2022. In 2014, the Colorado Water Trust began a project to restore late summer flows to the Little Cimarron River. The Little Cimarron River contains a 3-mile segment that had been dry in late summers. The Colorado Water Trust filed for a 2014 change of water rights in the McKinley Ditch to use 5.8 cfs to restore late summer flows and reconnect the stream in late Summer and early Fall. This change of water rights allows the original McKinley Ditch water rights to be used for irrigation of 195 acres of pasture grass from April through July 6th. The program enables use of the original irrigation water rights while also improving stream habitat.

- Silver Jack Reservoir has a pool of up to 1,500 AF that is used for fish habitat by Colorado Parks and Wildlife and can be released in the late summer to help reduce water temperatures in the Cimarron River. If the water is simply released, it can be diverted by downstream water users because the Division of Water Resources considers this water part of the natural stream and available for appropriation and does not consider environmental flow enhancement a beneficial use under Colorado water law. Bostwick Park WCD has worked with the Colorado Parks and Wildlife and USBR to arrange for delivery of this water from Silver Jack Reservoir to the Aspinall hydropower plants on the Gunnison River, providing a beneficial

use of the water and simultaneously providing the incidental benefit of enhanced stream flows. Shepherding the water in this manner has been approved, but is challenging to implement due to physical limitations at intervening headgates.

- Rehabilitation of Fish Creek Reservoir #2 has been completed, passing final inspection in fall of 2022. The project will increase upper basin storage for supporting late season river and creek flows, fisheries, and wildlife habitat, providing approximately 350 AF of storage. Releases can be delivered down Fish Creek into the Cimarron Canal or bypassed into the Cimarron River. There are ongoing discussions between the Bostwick Park WCD and CPW to determine the most beneficial operation. For example, water delivered from Fish Creek Reservoir #2 into the Cimarron Canal in lieu of a diversion can be swapped for water released from Silver Jack Reservoir. This would allow more cooler Silver Jack Reservoir water to stay in the Cimarron River while maintaining the same volume of water deliveries in the Cimarron Canal.

- Blue Ditch headgate and potential piping project is in the study phase, funded by the Colorado River District. The improvements to the ditch diversion infrastructure and upper segment of the ditch will reduce slope instability and landslides in the area.

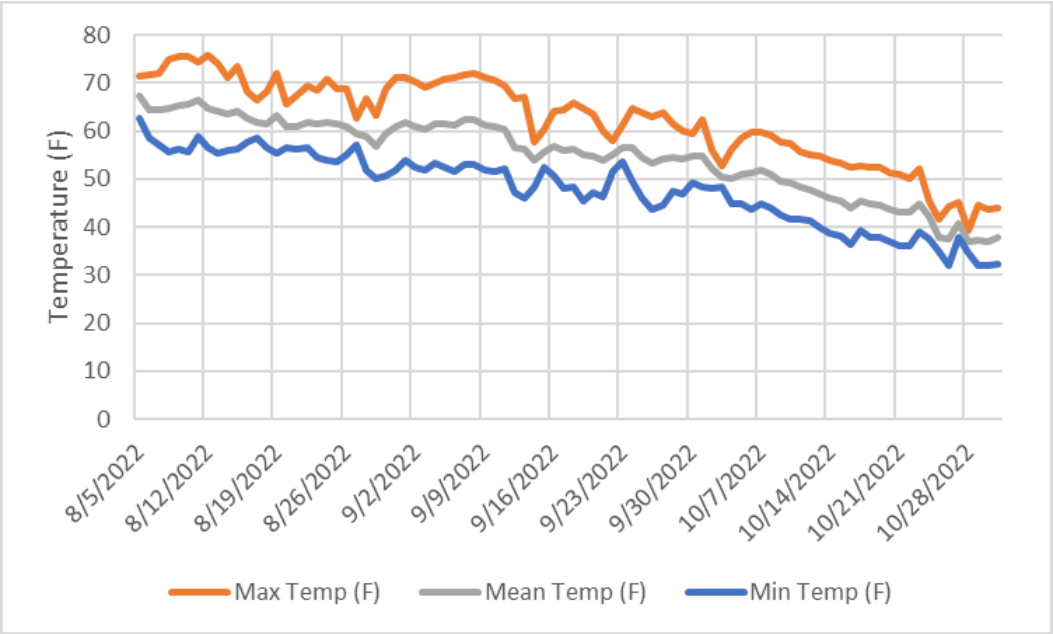


Figure 6-1. Temperature data at USGS gage 0912700 (Cimarron River blw Squaw Creek at Cimarron, CO)

6.2 Sample Future Projects

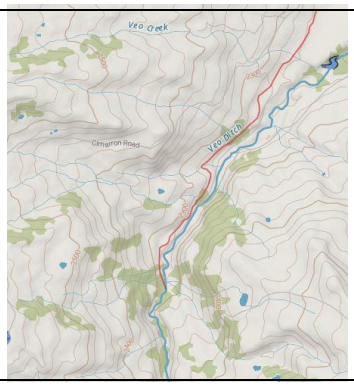
As part of the watershed assessment, we developed a watershed project fact sheet template. This template can be used as a starting point for any proposed project or initiative in the basin and allows for at-a-glance information about the project location, watershed goals it supports, cost estimates, and schedule estimates. These sheets will also support funding opportunities through various grant programs, including the Gunnison Roundtable, the Colorado Water Plan, or through various federal agencies. An electronic version of the template is available for download from the Coalition's website as part of the supplemental materials package for this project.

Over the course of the project, several ideas for projects were actively discussed. We developed fact sheets for four of these projects. As mentioned above, we envision these fact sheets as initial drafts, and they should be revised as the projects move forward.

- Shepherding Silver Jack Reservoir releases to the Gunnison River
- Veo Ditch headgate improvements and piping
- Beaver habitat restoration
- Education and involvement

<table>
<tr><td>Project Name
Shepherding Silver Jack Reservoir releases to the Gunnison River</td><td colspan="2">Project Location
Cimarron River, Silver Jack Reservoir to Gunnison River confluence</td></tr>
<tr><td>Project Sponsor(s)
USBR, Bostwick Park Water Conservancy District</td><td colspan="2" rowspan="2">  </td></tr>
<tr><td>Basin Goals Met
☒ 1) Increase flows and reduce temperatures
☒ 2) Develop water storage
☒ 3) Modernize irrigation infrastructure
☐ 4) Habitat protection
☐ 5) Connect landowners to resource agencies
☐ 6) Increase education and involvement</td></tr>
<tr><td colspan="3">Basin Goals Need Met
1) Flows will increase during critical times to reduce water temperatures in the Cimarron River. 2) Project effectively uses 1,500 AF pool in Silver Jack Reservoir. 3) Project can be expanded to improve river headgates at intervening ditches to allow for measured bypasses of water.</td></tr>
<tr><td>Project Description
This project will enhance the ability of delivering flows released from Silver Jack Reservoir for environmental purposes to be shepherded downstream past intervening headgates on the Big Cimmaron River to the Gunnison River confluence. Releases will help lower water temperatures in critical reaches of the Big Cimarron River near US Highway 50. This project includes a contractual component with the USBR and an administrative component with the DWR for bypassing intervening water rights. Degree of headgate improvements to facilitate bypass directly affects the project cost. Project could be integrated into Fish Creek Reservoir #2 operations.</td><td colspan="2" rowspan="2">  </td></tr>
<tr><td>Estimated Project Costs
$100k to $1.5M depending on construction scope</td></tr>
<tr><td>Potential Funding Collaborations / Sources
Water Plan Grant, Infrastructure Bill</td><td>Project Timeline
2023-2024</td><td>Project Start Date
2023</td></tr>
<tr><td colspan="3">Project Beneficiaries: Aquatic habitat, USBR, Veo Ditch, McMinn Ditch, possibly other ditches</td></tr>
</table>

Project Schedule	Years	Proposed Budget
Preliminary Design Analysis	Early 2023	$25k
Permitting	Late 2023	$25k
Final Design	2024	$50k
Legal Fees		$10k
Construction	Late 2024	$1M
Inspection and Maintenance	Late 2024	$100k
Other Costs: Water administration coordination meetings with USBR/DWR/Ditch Companies	Early 2023	$100k
Total		$1M to $1.5M

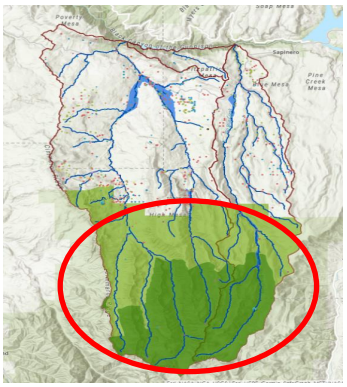
<table>
<tr><td>Project Name
Veo Ditch and Diversion Structure and piping</td><td colspan="2">Project Location
Cimarron River below Silver Jack Reservoir</td></tr>
<tr><td>Project Sponsor(s)
USBR, Bostwick Park Water Conservancy District</td><td colspan="2" rowspan="2">  </td></tr>
<tr><td>Basin Goals Met
☒ 1) Increase flows and reduce temperatures
☐ 2) Develop water storage
☒ 3) Modernize irrigation infrastructure
☒ 4) Habitat protection
☐ 5) Connect landowners to resource agencies
☐ 6) Increase education and involvement</td></tr>
<tr><td colspan="3">Basin Goals Need Met
1) Improved headgate will allow for bypass of Silver Jack releases.
3) Improved headgate and piping will increase irrigation efficiency reduce soil loss, improve slope stability. 4) Ability to byass flows will improve aquatic habatiat with fish passage and lower temperatures</td></tr>
<tr><td>Project Description
The first 500 feet of the Veo Ditch would be piped to reduce hillside slumping, erosion, and to improve water delivery to the private parcels irrigated. Since there are only push-up dams for the Veo (west side of Cimarron) and Butte (east side of Cimarron) Ditches, a diversion structure would need to be constructed with headgates and a fish bypass/ladder. The diversion structure would be a concrete structure and the piped section of ditch would be 2-3’ diameter PVC pipe.</td><td colspan="2" rowspan="2"> 
Photo: Aspen Journalism, headgate with bypass on the Roaring Fork River</td></tr>
<tr><td>Estimated Project Costs
$1.M</td></tr>
<tr><td>Potential Funding Collaborations / Sources
Water Plan Grant, Infrastructure Bill</td><td>Project Timeline
2023-2024</td><td>Project Start Date
2023</td></tr>
<tr><td colspan="3">Project Beneficiaries: Aquatic habitat, Veo Ditch, USBR</td></tr>
</table>

Project Schedule	Years	Proposed Budget
Preliminary Design Analysis	0.5	$20,000
Permitting		$0
Land Acquisition		$0
Final Design	0.2	$10,000
Legal Fees		$5,000
Construction	1.0	$920,000
Inspection and Maintenance	0.3	$40,000
Other Costs:		$5,000
Total	2.0	$1,000,000

Project Name
Beaver-based restoration and riparian reconnection

Project Location Upper regions of the Cimarron River and Blue Creek Watersheds (red circle below)

Project Sponsor(s)
CVRWC and the USFS



Basin Goals Met

☒ 1**) Increase flows and reduce temperatures**
☒ **2) Develop water storage**
☐ 3) Modernize irrigation infrastructure
☒ **4) Habitat protection**
☐ 5) Connect landowners to resource agencies
☐ 6) Increase education and involvement

Basin Goals Need Met

Beaver activity in the upper watershed appears to have declined based on anecdotal observation, possibly due to predator pressure. As a result, the three upper forks of the Cimarron river (and possibly other tributaries to the river) are generally channeled "straight" streams (refer to Photo Log in Watershed Assessment report).

Project Description

- Partner with the USFS Hydrologist to determine viable areas where beavers could be restored along the upper forks of the Cimarron River; determine any other areas where boosting beaver activity would be beneficial. An on-site visit/tour would be necessary during the summer/fall.
- Create a Beaver-based restoration plan with priority areas to be addressed, depending on available budget; seek budget funds.
- According to plan/budget, construct Beaver Dam analogues in those areas. These dams can be as simple as logs placed in the direction of flow. The backed up, pooled water provides cover for beavers allowing them to re-establish
- Consider the possibility to relocate beavers to these areas
- Consider water rights impacts and downstream diversions/irrigation infrastructure or roads that could be protected from beaver damage.

East fork of Cimarron River on USFS-managed lands is an example of a suitable area for beaver-based restoration

Estimated Project Costs
$500-$5,000/year

Potential Funding Collaborations / Sources Trout Unlimited, USFS, CPW, GOCO grant, USBR	**Project Timeline** Annually	**Project Start Date** January 2023
Project Beneficiaries (Direct and Indirect) • Direct- This project would slow and spread water pouring into the Cimarron River and Silver Jack Reservoir, assisting with subsurface water storage/"bank full" water, and aiding peak summer to late season • Indirect or long-term– Improve riparian connection, expand riparian corridor with beneficial impacts to vegetation and soil moisture; contribute to fire mitigation, over the longer term, contribute to stream sinuosity and mitigate erosion.		

Project Schedule	**Timing**	**Preliminary Estimate**
Coordinate with USFS hydrologist to obtain information and conduct desktop research based on topography and aerial imagery. Pay attention to the potential for steep, incised drainages that may not be suitable for beavers or may be challenging.	Winter/Spring 2022-2023	$0- $500
Obtain funding: Determine project needs/time/expertise, and materials, along with available budget. Determine "year 1" plan and project name.	Spring annually beginning in 2023	$0-$500.
Conduct on-site tour to confirm desktop findings in the field and refine "year 1" plan as needed. Note: Funds/time allowing, this on-site could be scoped/staffed broadly to determine beaver-based restoration potential for multiple years.	Summer 2023	TBD
Determine stakeholders involved; coordinate as needed with DWR and water users; determine environmental planning requirements with the USFS (if on wilderness esp.)	Coalition meetings beginning in 2023	TBD.
Conduct the construction per budget and plan, ideally in the narrow window just before winter when the area is still accessible (low flow conditions). Note there may be timing restrictions due to Canada lynx or other environmental resource issues.	Fall/winter annually beginning in 2023	$1,000-$15,000
Other misc. costs:		$200
Total		$1,200-$16,200

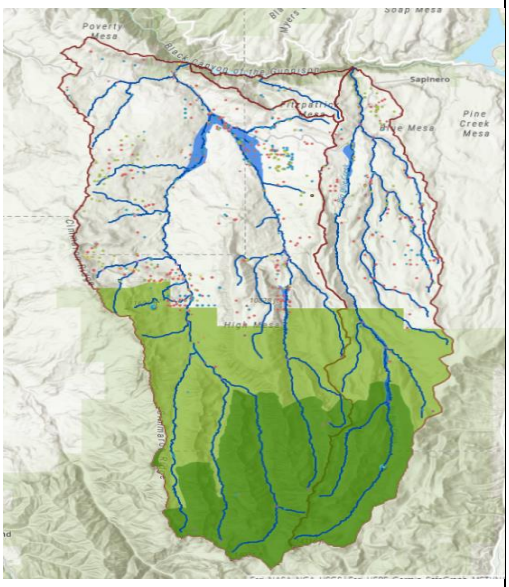
Project Name
Community Involvement and Educational Outreach

Project Location (Subbasin, County, Subdistrict)
Cimarron River and Blue Creek Watersheds

Project Sponsor(s)
CVRWC

Primary Basin Goals Met

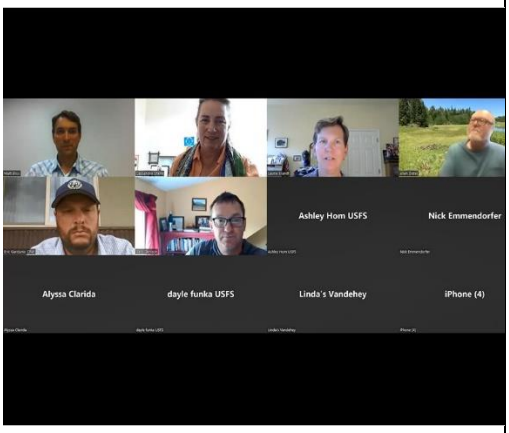
☐ 1. Increase flows and improve water quality
☐ 2. Improve water storage
☐ 3. Modernize and stabilize irrigation infrastructure
☐ 4. Improve wildlife & aquatic habitat (weeds, beetle kill for wildfire mitigation)
☒ 5. **Connect private landowners/ditch companies with state and federal land or resource management agencies for partnerships**
☒ 6. **Community involvement and educational outreach**



Basin Goals Need Met
Engage resident/local owners, absentee owners, and the public so they understand the importance and components of watershed health and participate with land managers and resource management agencies towards a common goal of increased instream flows, better water quality, and improved aquatic and wildlife habitat.

Project Description

- This project would be initiated and managed by the CVRWC to provide educational programs, landowner and public outreach, agency engagement with the owners and public, and other educational efforts towards the goal of best management of human activities in the watershed. We suggest forming an Education Committee to work out details of programs each year.
- The Education Program will be based on a foundation of monthly coalition meetings and quarterly coalition seminars (in person and Zoom). Seminars provide an opportunity for "guest speakers" to attend and present topics, followed by group discussion. A 20 minute presentation, and 20 minutes for discussion is recommended on topics ranging from water rights, irrigation best practices, geology and slope instability, value of instream flow, beavers and natural water storage, weed management, wildfire mitigation, fish ecology, endangered species, and other information (refer to the 2022 Water Assessment).
- Targeted stakeholder outreach (phone calls, mailings) will be effective and is recommended for continued



Example Zoom meeting for presentations and stakeholder participation

<table>
<tr><td colspan="3">stakeholder engagement (for example, prior to the seminars based on the topic). Refer to the 2022 Watershed Assessment's electronic supplemental resource files for stakeholder contact information and distributions lists.
• Budget may allow for the construction of kiosks with maps and brochures, in partnership with state and federal lands management agencies, for public education.</td></tr>
<tr><td colspan="3">Estimated Project Costs
$500-$5,000/year</td></tr>
<tr><td>Potential Funding Collaborations / Sources
Trout Unlimited, USFS, CPW, GOCO grant, BOR</td><td>Project Timeline
Annually</td><td>Project Start Date
January 2023</td></tr>
<tr><td colspan="3">Project Beneficiaries (Direct and Indirect)
• Direct – private landowners (more efficient irrigation practices), public (take better care of public lands), environmental improvements
• Indirect – funding and future collaborative projects due to healthy partnerships and communication</td></tr>
</table>

Project Schedule	Timing	Preliminary Estimate
Form Education Committee	Late 2022	$0
Plan production of educational materials-based on budget, priorities and need*	Spring annually beginning in 2023	TBD.
Quarterly seminars (public venue, Zoom)	Mar, Jun, Sep, Dec 2023	$2,000
Stakeholder outreach via social media, emails, texts, newspapers, and postcard mailings	Early 2023	$500
Yearly picnic	Summer annually (initiated in 2022)	$1,500(+)
Complete and disperse educational materials	Summer annually beginning in 2023	TBD.
Website updates/refresh, updated mapping educational materials production/kiosk maintenance as needed.	Fall/winter annually beginning in 2023	$300
Other misc. costs:		$200
Total		$5,000

*Educational materials could be a tri-fold brochure, website information/maps or alerts, informational video, or physical kiosk on-site at Silver Jack or other location. Audience for content basis could be broad across stakeholders, or targeted for recreators on public land, campors, hunters/fisherpeople, or irrigation water shareholders, for example.

7. IDENTIFIED GOALS, OBJECTIVES, AND RECOMMENDATIONS

Goals, objectives and recommendations were brought forward during the July 28, 2022 workshop, and discussed during the August Coalition Meeting. The following is a summary of the discussion and recommendations as it related to goals and objectives for overall watershed improvement that occurred at the workshop and subsequent follow-up discussions. Note that recommendations for next steps may overlap with other goals.

A complete listing of project and initiative ideas discussed over the course of this project is included in a spreadsheet provided with the supplemental materials associated with this report, available for download from the Coalition website.

Goal #1: Increase flows and reduce late summer water temperatures in the Cimarron River, Little Cimarron, and Blue Creek

- Add more flow monitoring gages, and technological improvements, stream flow and especially for tail water flows.
    - This could result in better management of headgate and water flows.
    - Currently, there is a flow measuring station in the Cimarron River above the Cimarron Canal headgate, and at the Cimarron Canal diversion.
    - Currently there is a temperature gage above the Cimarron Canal diversion on USFS land funded through Bostwick Park's current watershed planning grant (NRCS-PL566)
    - Adding flow monitoring at the bottom end of the system to monitor tail water would allow managers to respond in real time.

- Temperature measurement stations should be included with any new flow stations.
    - This would help CPW determine the most beneficial time to release the conservation pool of 1500 AF held in Silver Jack reservoir.

- Develop creative solutions to incentivize leaving water in the stream.
    - Continue to explore all options for administrative agreements/by-pass agreements, that can allow shareholders and ditch companies to share water with the river, especially during the critical late season.
    - Work annually with the Colorado Water Trust, Trout Unlimited, and others to stay current on all options and project for sharing water (administrative controls, leases, permanent spits, permanent transfers, etc.).
        - The McKinnley Ditch project is a unique project currently occurring in the watershed. This is just one example of a water sharing tool.
        - There are statutory tools currently known as Alternative Transfer Mechanisms (ATMs). Additional exploration of these tools in tandem may be possible to combine projects to increase leasing/sharing.
        - There are water conservation programs and other tools that allow leasing of water and can be designed with more flexibility to help agricultural producers. For example, per an interview with Tony

LaGreca (Colorado Water Trust), Tony is working on a project in the Gunnison Basin to focus the lease to re-time the use of irrigation water. Specifically, shutting off irrigation water during low flow periods, then turning back on to get some fall grazing on hay pastures. The stream is struggling when temperatures are high - this is when help is most needed.

- Bostwick Park and Cimarron Canal Company have been pushing irrigation efficiencies; this can save 15% of water, by some rough estimates. Additional steps need to be taken to ensure water conserved can be bypassed at the head headgate, so that the natural streams benefit, without negatively impacting water rights.

Goal #2: Develop, rehabilitate and maintain critical water storage facilities (e.g., Fish Creek Reservoir #2).

- Rehabilitation of Fish Creek Reservoir No. 2 completed in Fall 2022

- Cow Puncher Lakes restoration project could return streamflow and storage to a series of lakes. Water has been diverted from the historical stream, but there may be an opportunity to reduce diversions that exceed demand to keep more water in the historical channel.

- In contrast to traditional reservoirs, promotion of beaver dams was discussed. Storage created by beaver dams are very important in the Cimarron River and Blue Creek basins for holding water the higher elevations.
    - Coalition president Allen Distel has not seen a beaver above Silver Jack Reservoir in the last 30 years; Coalition member Don Stephens noticed some beavers in the Cow Puncher lake but they did not stay.
    - It is unclear if the lack of beavers is due to topography and predation (e.g., no place to dam a stream, and escape predators)
    - Recommended that this project get scoped and planned and funded, with partners. A first step is to map locations where beavers are know to occur, and identify opportunities to plant Beaver Dam Analogues to encourage them.

Goal #3: Modernize and stabilize irrigation Infrastructure; make best use of available federal funding.

- Continue monthly check-in meetings to support planning, designing, and funding the Blue Ditch rehabilitation project.

- In general: consider how the Coalition can help smaller ditch companies by providing administrative support or capacity to make best use of federal grants for feasibility, studies, design and implementation/construction.

- Continue to be creative in exploring funding sources that allow irrigation system upgrades that also address geologic hazards and protect watershed health.

- Beaver infrastructure protection and beaver dam analogues/beaver reintroduction is an area of potential funding. Construct Beaver Dam Analogues and look at rebuilding beaver populations in key areas. As part of planning this work, consider protecting infrastructure (roads, canals) from flooding, extreme weather events, and specifically from beaver activity-related damage.
    - Note: During the July 28 workshop, the USFS suggested the coalition learn more about the Gunnison STOR project.

- The Coalition and Canal Company should meet/coordinate to develop a water storage/release schedule or protocol for Fish Creek Reservoir #2; this protocol can be implemented, monitored, and adapted as needed annually. Initially CPW (Eric Gardunio) suggested release from new Fish Lakes No. 2 into the Cimarron Canal, so that less water released from Silver Jack Reservoir is diverted into the Cimarron Canal and more cold water from Silver Jack Reservoir can remain in the Cimarron River. This will also require coordination with water rights holders on Fish Creek to ensure delivery to the Cimarron Canal.

- Consider taking on new projects: Both the Veo Ditch and McMinn Ditch headgates need to be rebuilt to allow water to be bypassed and remain in the river. This is a place that needs to be concentrated on, so if administrative lease or water sharing agreements are made, the infrastructure is there to allow water to be left in the river. Improvements at these structures would also improve the use of the 1,500 AF environmental pool at Silver Jack Reservoir if water can be shepherded past these diversion structures.

- Continue coordination between DWR and Ryan Uttereiner with CPW to coordinate and ensure the 1,500 AF environmental pool stored at Silver Jack Reservoir can be shepherded by headgates, and supports Cimarron river flows. This has only happened one time in the past. This will require both an administrative component and structural improvements to intervening headgates.

- Future piping of Cimarron Canal and Garnet Ditch. These projects would be expensive and targeting specific areas would be beneficial. The impact of return flows on late season and winter baseflows in the streams should be considered when evaluating piping or lining projects.

Goal #4: Conserve, protect and improve where possible overall wildlife and aquatic habitat; focus on addressing noxious weeds and beetle kill timber for fire mitigation.

- Consider education and opportunities to collaborate to help eradicate weeds.
- Investigate and seek out funding opportunities for weed control and advocate for this funding for our public agencies responsible for weed control on public lands (BLM, CPW and USFS).
- Explore biological methods for weed control from Palisade Insectary- on public and private land.

Goal #5: Connect private land owners/ditch companies operating in the watershed, and state and federal resource and land management agencies* to enable understanding of watershed health, and to form productive partnerships and collaborations (*USFS, BLM, CPW, USFWS, DWR, and others)

- Coordinate with USFS on the fire hazard map produced by JW associates
- Coordinate with USFS on the Watershed Health Initiative studying fire resiliency; could we learn from the Taylor watershed? Could the Cimarron/Blue Watershed be a future site?
- Coordinate with USFS about the Gunnison stewardship project- potential funding and collaboration
- Coordinate with USFS about assessment info and fire management opportunities through Potential Delineation System
- Coordinate with CPW/USFS about installing beaver dam analogues upstream of the Cimarron River where flows are an issue. Note that CPW has helped in Gunnison with installing Beaver Dam Analogues (BDA's).
- Add more temperature measurement and flow measurement sites.
- Status: Within PL 566 there is a temp gauge above Cimarron Canal diversion on USFS land. Note: LIDAR can be used to project snowpack, with funding from Denver Water and BOR; hoping to expand to the entire state.
- Gunnison Basin roundtable is also helping provide funding.

Goal #6: Increase community involvement and educational outreach in the Cimarron River and Blue Creek watershed

- Establish and education and outreach committee, to plan and consider use of a small amount of annual funding aligned with the Coalition's public networking/education agenda. Allocate a modest budget to food (useful for bringing people together), as well as for other materials/marketing items or costs, and maintenance of the Coalition website and use of social media.

- Continue monthly Coalition meetings, and add quarterly special presentations (invite speakers and rotate subjects: Fire hazards, beavers, riparian protection, etc.). Align presentation topics with the six Goals and Objectives for overall watershed improvement.

- Hold an annual in-person barbeque to help engage landowners in the watershed.

- Proactively use conflict. Consider occasional use of professional facilitation (secure "on-call" support) to navigate controversial issues related to actions in the watershed. This will foster resilience and diversity among the coalition members.

- Revisit the goals and objectives, and projects, annually and every 3 to 5 years with a more in-depth workshop. Celebrate progress and successes.

- Ensure the Coalition has redundancy in leadership.

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