Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II

Prepared By:

Wright Water Engineers, Inc.
1666 N. Main Ave. Suite C
Durango, CO. 81301
(970)259-7411

Wright Water Engineers, Inc.

June 2020

151-032.021

– UPPER UNCOMPAHGRE RIVER BASIN –
WATER SUPPLY PROTECTION AND ENHANCEMENT PLAN PHASE II

TABLE OF CONTENTS

Page

END OF PLAN

TABLES

FIGURES

MAPS

APPENDICIES

Table of Acronyms Used in This Plan

Acronym	Term
AF	Acre-Feet
AW	American Whitewater
CDPHE	Colorado Department of Public Health and Environment
CDSS	Colorado Decision Support Systems
CDWR	Colorado Division of Water Resources
cfs	cubic feet per second
COAGMET	Colorado Agricultural Meteorological Network
Cow Creek Gage	CDWR Gaging Station: Cow Creek Near Ridgway Reservoir (COWCREEKCO)
CW1	Cold Water Class 1
CW2	Cold Water Class 2
CWCB	Colorado Water Conservation Board
CWP	Colorado Water Plan
Dallas Creek Gage	USGS Gaging Station: 09147000 Dallas Creek Near Ridgway, CO
Delta Gage	USGS Gaging Station: 09149500 Uncompahgre River at Delta, CO
GBIP	Gunnison Basin Implementation Plan
IPPs	Identified Projects and Processes
ISF	Instream Flow
IWR	Irrigation Water Requirement
Olathe Gage	CDWR Gaging Station: Uncompahgre River Near Olathe (UNCOLACO)
Tri-County	Tri-County Water Conservancy District
TU	Trout Unlimited
Uncompahgre River near Ouray Gage	USGS Gaging Station: 09146020 Uncompahgre River Near Ouray, CO
Uncompahgre River near Ridgway Gage	USGS Gaging Station: 09146200 Uncompahgre River near Ridgway, CO
Upstream of South Canal Gage	CDWR Gaging Station: Uncompahgre River Upstream of South Canal (UNCUPSCO)
USBR	United States Bureau of Reclamation
USDA	Unites States Department of Agriculture
USFS	United States Forest Service
USGS	United States Geological Survey
UUB	Upper Uncompahgre Basin
UVWUA	Uncompahgre Valley Water Users Association
UWP	Uncompahgre Watershed Partnership
WSRA	Water Supply Reserve Account
WWE	Wright Water Engineers, Inc.
YEH	Yeh and Associates

1.0 INTRODUCTION

The Upper Uncompahgre River Basin (UUB) is located on the western slope of Colorado and is generally bound by Ouray County (see Map 1). The municipalities in the study area include the City of Ouray and Town of Ridgway. During 2015 and 2016, Wright Water Engineers, Inc., (WWE), prepared an initial study of the UUB titled the Upper Uncompahgre Water Supply Protection and Enhancement Project, (2016 UUB Report). The primary purpose of the 2016 UUB Report was to identify current and future water shortages (gaps) to Municipal, Industrial, Irrigation, and Environmental uses. Background and a summary of conclusions from the 2016 UUB Report are provided in Section 3.0. This Study is intended to build on the 2016 UUB Report and identify projects and processes (IPPs) to better manage existing water supplies and develop additional water supplies to help meet the water shortages identified in the 2016 UUB Report.

This project was funded by the Colorado Water Conservation Board (CWCB) Water Supply Reserve Account (WSRA) and matching funds from the Ouray County, City of Ouray, Town of Ridgway, Tri-County Water Conservancy District, Ouray County Water Users Association, Trout Unlimited, Uncompahgre Watershed Partnership, Shavano Conservation District, and the Colorado River Water Conservation District.

Activities funded by the Water Supply Reserve Fund (WSRF) to develop this UUB Water Supply Protection and Enhancement Plan Phase II (UUB Phase II Plan) include coordination of stakeholders and formation of a Steering Committee, modeling objective and scenarios, working with the Steering Committee in development and evaluation of various water supply and management strategies, and identifying water supply and efficiency projects, plan preparation and administration.

The objectives of this UUB Phase II Plan are as follows:

- Coordinate with project stakeholders and form a Steering Committee.
- Work with the Steering Committee to identify specific stream management projects, which could reduce both consumptive and non-consumptive water gaps in the UUB.
- Develop models which can be used to quantify the potential for select water supply and management strategies to reduce both consumptive and non-consumptive water user gaps.
- Work with the Steering Committee to develop and evaluate water supply and management strategies, utilize models to quantify their benefits, further evaluate select water supply and management strategies, and assess the feasibility of each project.
- Identify water supply and efficiency projects.
- Prepare UUB Water Supply Protection and Enhancement Plan Phase II Plan.

This project was originally envisioned as a Stream Management Plan; however, the focus of the study did not include sufficient ecological (including aquatic life) analysis to fund as a Stream Management Plan, and the project was partly funded under the WSRF. The authors of the report have reached out for information from Colorado Parks and Wildlife and have reviewed reports from the Uncompahgre Watershed Partnership and others. It is important to note that ecological (including aquatic species) information was not developed as part of this report and the study relies solely on the work of others in this area.

2.0 STEERING COMMITTEE

A local steering committee was formed by Ouray County to inform and support the development of this Water Supply Protection and Enhancement Plan Phase II. This committee was comprised of staff and managers of Tri-County Water Conservancy District (Tri-County), City of Ouray, Town of Ridgway, Ouray County Water Users Association, Shavano Conservation District, Trout Unlimited, Uncompahgre Watershed Partnership, and representatives for local ranches, ditch companies and Ouray County citizens. See Table 1 for a more complete list of Steering Committee representatives, meeting attendees and meeting topics. See Appendix A for the Ouray County Resolution which established the Steering Committee.

A total of five Steering Committee meetings were held throughout the development of this UUB Phase II Plan. Table 1 provides a summary of the key subjects discussed during each meeting, and the attendees who signed in at least one of the meetings. The Steering Committee provided valuable insight to develop this UUB Phase II Plan, and ultimately guided the project and management recommendations presented herein.

3.0 KEY FINDINGS FROM 2016 STUDY AND PHASE II PLAN DEVELOPMENT

In September of 2016, Wright Water Engineers Inc., (WWE), in coordination with Ouray County, developed the 2016 UUB Report which assessed the existing and future water needs and identified water supply shortages (gaps) for agricultural, domestic, municipal, industrial, recreational and environmental water uses, and presented initial options for minimizing shortages for existing and future water uses within the Upper Uncompahgre River Basin, located in Ouray County, Colorado (see Map 1 and Map 2). The 2016 UUB Report reviewed the following regions in the Upper Uncompahgre River Basin:

- Region 1: Uncompahgre River Downstream of Ridgway Reservoir (see Map 3)
- Region 2: Dallas Creek and its tributaries (see Map 4)
- Region 3: Uncompahgre River Upstream of Ridgway Reservoir (see Map 5)
- Region 4: Cow Creek and its tributaries (see Map 6)

Key findings from the 2016 UUB Report and preparation of this Plan included the following:

- The streamflow gages on the Uncompahgre River both above and below Ridgway Reservoir, Dallas Creek and Cow Creek all show annual streamflow during a dry year is

less than 50 percent of average annual streamflow during average years. This is characteristic of watersheds that rely heavily upon high elevation snowpack and the effect of climatic variability on streamflows.

- There is very little manmade storage water available for water users located in the Upper Uncompahgre Basin (UUB). While Ridgway Reservoir is located in the UUB, the irrigation supply is currently contracted for use for irrigators located downstream in Montrose and Delta County. Ridgway Reservoir is also a source of the municipal water supply exchange that enable Project 7 to divert water from the Gunnison Tunnel for potable water distribution in portions of Delta, Montrose, and Ouray Counties. Ridgway Reservoir also provides augmentation water; however, given existing CWCB instream flow water rights located immediately above the reservoir on the Uncompahgre River and Dallas Creek, there is a problem with the use of Ridgway Reservoir augmentation water supply by water users located upstream of the reservoir during dry years.

- Agriculture water use is the largest consumptive use of water in the UUB with just shy of 16,000 acres of irrigated land according to CDSS. The calculated annual Irrigation Water Requirement (IWR), a measure of potential irrigation consumptive use, is 35,200 AF. According to the Gunnison StateMod Model developed for the Colorado Decision Support System (CDSS), there is approximately a 12,400 AF consumptive use shortage in a dry year (2002) and a 3,800 AF consumptive use shortage averaged over the period of record. Shortages at the diversion structures are greater.

- The Gunnison StateMod Model showed that Ridgway Reservoir may be available for water users in the UUB by exchange and direct delivery at a maximum water depletion of 4,500 AF during a moderately dry year and an average of 2,100 AF, which may help alleviate shortages throughout the UUB due to downstream calls from the Montrose and Delta Canal. Water supply availability at UUB water users headgate and local administration in the UUB are important components for calculating exchange potential and direct delivery and the Gunnison StateMod Model includes these components.

- Recreational and environmental water uses are a top priority for protection and enhancement to protect the scenic value in Ouray County. Improvements to conveyance structures and on farm efficiencies for inter-basin ditches to protect the source stream basin should be considered. Inter-basin ditches are ditches that divert water from one stream basin and irrigate land in another stream basin, however both streams are part of a larger river basin. For example, diversions of water from Cow Creek for irrigated lands located in the Dry Creek and Alkali Creek Drainages (see Map 6 and Table 4). Cow Creek, Dry Creek and Alkali Creek are all tributaries to the Uncompahgre River.

- WWE recommends pursuing projects that have benefits across agricultural, municipal, domestic, industrial, environmental, and recreational water uses.

- Based on discussions with irrigators, the Water Commissioner, and a review of diversion records, there is typically more water diverted in the spring when water is more readily available, and diversions are typically reduced in the late summer due to physical water

supply limitations. This practice results in percolation into groundwater, both the alluvial and non-alluvial (shale) formations and may increase late summer flows due to the delay in groundwater return flows. However, it also may increase selenium and salinity loading to receiving waters from irrigated areas overlying Mancos Shale.

4.0 DEVELOPMENT OF ADDITIONAL INFORMATION IN THIS PHASE II PLAN

4.1 Basin Hydrology

As discussed above, the streamflow gages on Dallas Creek, Cow Creek, and the Uncompahgre River above Ridgway Reservoir all indicate annual streamflow during a dry year can be less than 50 percent of average annual streamflow during average years (see Table 2 and Table 3). This information highlights the importance and variability of snowmelt and precipitation for water supply availability. There is also a lack of natural and manmade storage in parts of the UUB that could carry over storage from wet years to dry years and supplement late irrigation season water availability.

Lack of natural and manmade storage in the basin is further evidenced by comparing wet and dry year late season streamflow in the basin (August through September). For example, Figure 1 compares 2018 (dry year) and 2019 (wet year) stream gage data reported from the Cow Creek Gage between the months of August and September. Near the end of August 2019, streamflow in Cow Creek drops to a flowrate near that observed in 2018 and continues this trend through September. This shows the lack of natural and manmade storage and the importance of precipitation, even during wet years, in the UUB. It is important to note that Cow Creek has a large amount of irrigation diversions for land outside of the Cow Creek drainage with return flows that do not accrue back to Cow Creek (see Map 6). In addition, administration in 2018 from downstream senior calls may have pulled more water through lower Cow Creek, because of the curtailment of upstream junior diversions (TU Comment 06/05/2020).

4.2 Water Quality and Aquatic Habitat

The Uncompahgre Watershed Partnership *Uncompahgre River Water Quality Report 2012* (Woodling, 2012) provides an assessment of water quality in the Uncompahgre River and its tributaries to serve as a foundation document for watershed planning in the Uncompahgre River Basin. The Woodling Report indicates water quality in Uncompahgre River upstream of Ridgway Reservoir is contaminated, to a varying degree, due to acidic water which increases metal solubility. Some Uncompahgre River segments upstream of Ridgway Reservoir contain metals concentration and pH levels which may be toxic to aquatic life, while other segments report metals concentrations which are lower than the chronic toxicity level. Segments of the Uncompahgre River and its tributaries include designations for irrigation water and water supply uses, and it is important that water quality for these uses also be considered.

Map 10 provides a summary of the aquatic life classification[1] and known water quality impairments for stream segments in the UUB listed in Colorado's 2018 Integrated Water Quality Monitoring and Assessment Report (CDPHE, 2018). Table 5 provides a description of each CDPHE (2018) stream segment in the UUB, their aquatic life classification, and known impairments. The following sections provide a brief summary of the water quality conditions for stream segments in the UUB.

To develop a better understanding of recreational sport fishing, WWE spoke with local fishing outfitters and guides in the UUB to develop a better understanding of recreational needs for fisheries in the UUB (see Appendix B). The results of the interviews are summarized in the following sections along with information gathered from review of the UWP (2012) Report. WWE also had teleconference calls with CPW, requested and obtained studies from CPW that are included in this report. WWE confirmed by email that applicable fishery studies were provided by CPW. WWE did not conduct independent fishery studies as a part of this report and relied on information developed by others.

4.2.1 *Headwaters of Uncompahgre River and Red Mountain Creek*

The Uncompahgre River from its source to the confluence with Red Mountain Creek is classified as aquatic life use cold class 1 (CW1). CPW records indicate that brook trout are present in the Uncompahgre River upstream of Red Mountain Creek and macroinvertebrate data from the reach attained the aquatic life use standard. (WQCD, 2017).

Tributaries to Red Mountain Creek are classified aquatic life cold water class 2 (CW2). Red Mountain Creek lacks an aquatic life use classification due to CERCLA actions at the Idarado Mine Site. Additional progress is needed to improve water quality in Red Mountain Creek to meet the goals established in the CERCLA settlement. The Hazardous Materials and Waste Management Division at CDPHE is responsible for oversight of the settlement (UWP Comments 4/28/2020).

As noted in Woodling (2012), both historical mining activity and naturally occurring metals loading in Red Mountain Creek and its tributaries have and continue to cause dissolved aluminum, cadmium, copper, iron, and zinc concentrations at levels which are potentially lethal to aquatic life. However, water quality issues are not the only factor to limit the potential for aquatic life in these streams (UWP Comments 4/28/2020). In the uppermost headwaters of Red Mountain Creek,

[1]**Aquatic Life Cold Water Class 1 (CW1)**: These are waters that (1) currently are capable of sustaining a wide variety of cold water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.

Aquatic Life Cold Water Class 2 (CW2): These are waters that are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.

WQCD field assessments indicate that instream habitat is also limited by high stream gradients, excessively cold-water temperatures, and impacts from Highway 550 (WQCD, 2017).

As a result of CERCLA Litigation and 1992 Consent Decree, Idarado Mining Company has undertaken remediation of mining sites both within Idarado historical mining area and outside of Idarado's mining area. Surveys completed in Red Mountain Creek at the Idarado Mining Company's compliance point located in Ironton indicate that instream habitat is severely limited due to high stream gradient, channelization, precipitates on channel substrate, and fluctuating stream flows. Macroinvertebrates were not identified in this portion of Red Mountain Creek and a fish survey was not completed (WQCD, 2017, UWP Comments 4/28/2020).

4.2.2 *Canyon Creek and Oak Creek*

Canyon Creek and Oak Creek enter the Uncompahgre River near the City of Ouray. Oak Creek and Canyon Creek and its tributaries are classified as aquatic life CW2. Canyon Creek is listed in CDHPE (2018) as impaired for dissolved zinc. In 2017, the dissolved zinc concentration in Canyon Creek exceeded the chronic aquatic life standard during high flow but attained the chronic zinc standard during the remainder of the year (UWP, 2018). CPW has identified brook and brown trout in Canyon Creek. The health and diversity of the macroinvertebrate community in Canyon Creek attains the aquatic life use criteria (WQCD, 2017). Like Canyon Creek, streamflow from Oak Creek dilutes the mainstem of the Uncompahgre River and improves its water quality (Woodling, 2012, UWP Comments 4/28/2020).

4.2.3 *Uncompahgre River From its Confluence with Red Mountain Creek to the USGS Gaging Station Near Ouray (Segments COGUUNO3a and COGUUNO3b)*

The mainstem of the Uncompahgre River from its confluence with Red Mountain Creek to the Uncompahgre River near Ouray Gage (see Map 2 and Map 10) is classified CW1. Numerous TMDL's exist within this segment of the river including dissolved copper, zinc, cadmium, and total iron; an updated TMDL analysis is expected within the next two years (UWP Comments 4/28/2020).

The Uncompahgre River from Red Mountain Creek to Canyon Creek in Ouray, Woodling (2012) states:

> Water quality was extremely poor in this section. Aluminum, copper, and iron concentrations were acutely toxic to brook trout and brown trout and pH was low enough to eliminate trout reproduction. The periodic flushing of sediment from the in-channel Ouray Hydropower dam seems to result in instantaneous, acutely toxic concentrations of copper and lead. The Uncompahgre River from Red Mountain Creek to Canyon Creek could be considered for inclusion on the WQCC 303d list for a wide variety of constituents including pH, aluminum, cadmium, copper, iron, lead and zinc.

For the Uncompahgre River from Canyon Creek to the Ouray USGS gage station Woodling 2012 states:

> The Uncompahgre River is not likely to support metals-sensitive aquatic life in Ouray. Copper, iron and aluminum concentrations have likely reduced both numbers and kinds of aquatic species present in the river through Ouray. There was a measurable difference in water quality in the Uncompahgre River above and below Ouray. Metal concentrations were often higher at the USGS station below Ouray compared to upstream at the site near Oak and Canyon Creeks. The low metal concentrations above Ouray were attributed to the location of the outlet works of the Ouray Hydropower Station.

The Water Quality Control Divisions Regulation 35 Rationales for Water Quality Standards state for COGUUNO3a:

> Colorado Division of Parks and Wildlife records indicate the following fish species are present in this segment: brook trout, brown trout, cutthroat trout, rainbow trout, and mottled sculpin are expected based on their presence in adjacent tributaries and species distributions in the mainstem of the Uncompahgre River upstream and downstream of segment 3a.

However, the rationale does not include the existence of the fish barrier at on the Uncompahgre River at the confluence of Red Mountain Creek and at the barrier at the Ouray Hydro Dam. In addition, a portion of this reach is dewatered by the Ouray Hydro facility penstock, subject to sluicing from the Ouray Hydro Dam, and the reach has numerous hot springs discharges.

This segment of the Uncompahgre River is currently designated with water supply use. There are two permitted potable water wells near the Uncompahgre River downstream of Ouray. These two wells are located within the Tri-County water service area (see Map 7). WWE contacted Tri-County and received written confirmation that the properties on which these wells are located have Tri-County water service accounts. The Water Quality Control Divisions Regulation 35 Rationales for Water Quality Standards references the KOA Campground located downstream of these Segments in Segment COGUUNO3c. The KOA Campground is not located in segments COGUUNO3a or 3b and also receives potable water from Tri-County Water Conservation District.

Given the poor water quality and segmentation of the reach, it is recommended that segments within this reach of the Uncompahgre River be considered for additional study and evaluation of current use classifications.

4.2.4 *Uncompahgre River from the USGS Gaging Station to Ridgway Reservoir (Segments COGUUNO3c and COGUUNO3d)*

Woodling (2012) indicates metal concentrations from most water quality samples in this stream segment generally decrease as one moves downstream through the segment. However, iron precipitates may tend to smother the stream substrate in this segment and may be indirectly toxic to aquatic life. Except for aluminum, metals concentrations tend to decrease during spring snow melt. Aluminum concentrations tend to increase during this same time period, as it appears increased flows tend to resuspend aluminum and carry it downstream and into Ridgway Reservoir (Woodling, 2012).

Woodling (2012) also reports the existence of fine black sediments in low velocity areas in this segment. Woodling asserts that these sediments fill the interstitial spaces of the streambed gravel

and eliminate the habitat needed for aquatic invertebrates and trout egg incubation. Woodling called for additional research to identify the source of the sediment and its overall effect on aquatic life within the reach (UWP Comment 4/28/2020).

Results of the guide survey indicate the Uncompahgre River above Ridgway Reservoir is not a good sport fishery, generally poor visibility, and bad water quality. The best time to fish above the Reservoir is reported to be during the springtime when trout swim upstream to spawn; however, there is a limited window of good fishing before snowmelt making this section difficult for fishing.

Comments to the report suggest the toxicity of the sluicing from the Ouray Hydropower Dam has potential impacts on the environment in the reach of the Uncompahgre located downstream of the Ouray Hydro Dam. Ouray Hydropower Dam is in the Uncompahgre River Gorge, upstream of the City of Ouray. Sediment that accumulates behind the dam is periodically discharged downstream (sluiced). The comments to the report referred to the potential of metals in the sediments and potential impacts to the environment and requested additional study and action (Public Comment 4/28/2020).

Further analysis of macroinvertebrates and fishery including reproduction on the Uncompahgre River upstream of Ridgway Reservoir is recommended.

A comment to the report identified the diversion of flows in lower Cottonwood Creek by the Dallas Ditch and the need to bypass flows by the Dallas Ditch downstream for the riparian habitat. Cottonwood Creek is a tributary to the Uncompahgre River with the confluence upstream of Ridgway Reservoir. The comment also noted that the Dallas Ditch was working on a solution (Public Comment 4/48/2020).

4.2.5 *Dallas Creek*

The mainstem of Dallas Creek is currently listed in CHDPE (2018) for agriculture, recreation as a potential and aquatic life CW1, but is currently listed in CHDPE (2018) as impaired for arsenic. The total recoverable arsenic samples that indicate impairment were collected from Cow Creek upstream of Nate Creek (WQCD, 2018). Both Dallas Creek and Cow Creek are part of the same segment, and thus the arsenic impairment applies to all portions of the segment. Dallas Creek is also currently listed on the 303(d) list for monitoring and evaluation for temperature (UWP Comment 4/28/2020).

The Dallas Creek Water Company has an infiltration gallery on Dallas Creek (WQCD, 2017) and several residences rely upon domestic wells in the Dallas Creek watershed. Annual state compliance monitoring does not require Dallas Creek Water Company to sample for total recoverable arsenic in their drinking water system. Total recoverable arsenic was recently measured in selected domestic water wells in the Dallas Creek watershed. Total recoverable arsenic concentrations were less than the maximum contaminant level for public drinking water supplies (UWP Comment 4/28/2020, WCPH, 2019).

Dallas Creek is potentially impaired for the temperature standards used to protect aquatic life. Limited instantaneous water temperature data has been collected by USGS from Dallas Creek near Ridgway (USGS # 09147000). Instantaneous temperature data collected from October 2010 to

September 2013 indicate that the acute temperature standard applied to protect aquatic life during the winter (effective October 1 to May 31) may be exceeded in May. This issue is common in many lower elevation CW1 waters and is commonly called a "shoulder season issue." More critically, the temperature standard was evaluated using instantaneous measurements rather than continuous measurements (i.e. hand-held probe vs. permanently deployed sensor that measures temperature many times per day). Typically, the temperature standard is assessed using continuous temperature data. Due to the potential impairments identified from the instantaneous temperature data, it is recommended that continuous temperature monitoring occur to fully assess temperature standard attainment (UWP Comment 4/28/2020).

Dallas Creek is dewatered during the summer due to irrigation demands in the Dallas Creek watershed. Low late summer flows lead to an increase in water temperature during the summer, which limits its ability to support a cold-water fishery. Figure 2 depicts the low summer flows which occur in Dallas Creek, particularly during a dry year.

Results of the guide survey indicate there are fish in Dallas Creek from the confluence of the East and West Fork Dallas Creek to Ridgway Reservoir. Private land within this reach may limit opportunities for guided fishing.

CPW surveys indicate naturally reproducing brown trout, rainbow trout, and mottled sculpin in this reach of Dallas Creek. Streamflows in Dallas Creek periodically drop below the minimum ISF water right (20 cfs May 1 through October 14 and 9 cfs October 14 through April 30), which creates challenging aquatic conditions for the fish during these sub-optimal flow periods (CPW Comments 4/17/2020). In addition, return flows from a few ditches return to the Uncompahgre River and not back to Dallas Creek, which further impacts Dallas Creek (TU Comment 6/5/2020)

4.2.6 *Uncompahgre River Below Ridgway Reservoir to Ouray County Line*

Ridgway Reservoir regulates the flow in the Uncompahgre River downstream of the reservoir. When the reservoir is not releasing water for downstream agricultural, municipal, and industrial uses, minimum releases are required for the aquatic habitat located downstream of the reservoir. The minimum release directly downstream between the reservoir and the confluence with Cow Creek is 30 cfs. Downstream of the confluence of the Uncompahgre River and Cow Creek (reservoir releases plus inflow from Cow Creek), the minimum release from the reservoir targets 45 cfs from November 1st to May 15th and 75 cfs from May 16 to October 31st (USBR, 2011). These flows would be maintained at all times except during extremely dry years where outflow would be limited to inflow to the reservoir (USBR, 1976).

Woodling (2012), describes the Uncompahgre River downstream of Ridgway Reservoir as a "gem" of a fishery that supports a naturally reproducing brown trout population to a point downstream of the City of Montrose. As noted by CPW and others, the current minimum bypass requirements for releases from Ridgway Reservoir are not optimal for the downstream fishery, especially during the winter (CPW, 2005). Increased wintertime flows generally would benefit the tailwater fishery by increasing the habitat availability. When flows are less than 50 cfs between the dam and Cow Creek's confluence, habitat availability is severely limited, and the trout population experiences stressful conditions. A previous study identified 50 cfs as an operational target for minimum winter flows to maintain the biological integrity of the tailwater fishery. This

target was based on a number of factors, including an R2Cross analysis that was part of an attempted instream flow appropriation below the dam and physical water availability based on gage records.

Before the current hydropower turbines were installed on Ridgway Reservoir, outlet releases contained supersaturated levels of oxygen and nitrogen that caused trout mortality in the winter due to gas bubble disease, particularly when flows were less than 70 cfs. The hydropower turbines have removed this issue by agitating the water to bring the gasses out of solution. Since this is no longer an issue, CPW recommends meeting the 50 cfs minimum flow target in the winter to maintain habitat availability in this valuable section of river. CPW may conduct further analysis in the future to determine whether the 50 cfs minimum flow recommendation is still sufficient to protect the fishery. (CPW Comments 4/17/2020)

Table 6 provides a summary of the additional volume of water that would need to be released from Ridgway Reservoir between November and March to meet a minimum winter release between 50 cfs and 70 cfs. CPW reports suggest that low flow conditions below Ridgway Reservoir can be avoided with changes to reservoir operations (TU 4/28/2020).

Results of the guide survey indicate the best fishing in the area is below Ridgway Reservoir. The most fishable locations include the Uncompahgre River through Pa-Co-Chu-Puk Campground in Ridgway State Park, and the Billy Creek Wildlife Area, which is approximately 5 miles downstream of the reservoir below the confluences of the Cow Creek and Billy Creek tributaries (see Map 8). UWP (2012) notes that higher levels of macroinvertebrate diversity surveyed on the Billy Creek State Wildlife Area – Billy Creek Tract suggests that the aquatic community is healthier than the community in the Uncompahgre River upstream at Pa-Co-Chu-Pak due to the tributary inflows from Cow Creek (CPW Comments 4/17/2020).

4.2.7 *Cow Creek*

Cow Creek generally meets applicable water quality standards for its use designations. After high flow events, the total aluminum concentration in Cow Creek has exceeded the chronic stream standard (Woodling, 2012).

The mainstem of Cow Creek, from the wilderness boundary to the Uncompahgre River, is listed in CPDHE (2018) as impaired for water supply use due to arsenic. The total recoverable arsenic samples that indicate impairment of the water supply standard were collected from Cow Creek upstream of Nate Creek (WQCD, 2018).

Several residences rely upon domestic wells in the Cow Creek watershed. Total recoverable arsenic was recently measured in two domestic water wells in the Cow Creek watershed. Total recoverable arsenic concentrations were less than the maximum contaminant level for public drinking water supplies (WCPH, 2019).

Reaches of Cow Creek, especially the lower reaches, are susceptible to lower summer flows. Based on Cow Creek Gage data reported between October 2008 and October 2019, streamflow in Cow Creek between September 1st and October 31st averages 18 cfs.

In the summer of 2019, CPW and CWCB staff performed a fishery study and supplemental stream temperature evaluation in Cow Creek (see Appendix C). These findings suggest a healthy population of aquatic species including brown and rainbow trout, along with native mottled sculpin, speckled dace, and most notably bluehead sucker. The bluehead sucker are a Tier 1 species of greatest conservation need in the state (CWP Comment 4/17/2020).

An evaluation of Cow Creek Gage as a fish barrier is recommend including an assessment at varying flow conditions. The Cow Creek Gage is in need repair (TU 4/28/2008). There may be other barriers in Cow Creek including culverts and diversion structures that restrict fish passage. Working with water rights owners and landowners to improve diversion structures that restrict fish movement is recommended. If efforts are undertaken to fix the Cow Creek Gage the installation of a pit tag array to record the presence of tagged fish in Cow Creek and a permanent temperature logger is recommended.

As part of the fishery study, CPW installed temperature loggers in Cow Creek near the Cow Creek Gage. This temperature study was meant to evaluate the potential impacts of additional depletions from Cow Creek and references Colorado's chronic and acute stream temperatures for trout as a benchmark for potential impact. The evaluation was not meant to formally define impairment via a 7-day average temperature analysis as would be relevant to 303d evaluations, but rather used the thermal standards as points of comparison to evaluate future water use. Findings from the temperature data collected between August 2019 and January 2020 indicate the chronic stream temperature standard for trout (65°F) is periodically exceeded during daily thermal fluctuations under late summer low flow conditions (see Appendix C). During low flow periods in the summer, the peak of the diurnal flow fluctuation consistently results in daily periods where the temperature drops below the chronic standard. These daily drops in temperature are likely responsible for maintaining the fishery in Cow Creek as they provide trout a reprieve from the chronic warm temperatures that can result in trout mortality when high temperatures persist over an extended duration (CPW Comments 4/17/2020).

In February of 2020, CPW provided WWE with a preliminary summary of Cow Creek and Uncompahgre River environmental flow needs (see Appendix C). CPW's preliminary assessment indicates minimum environmental flows of approximately 53 cfs between April and mid-July 15, and 15 cfs between mid-July to March (See Appendix C). It is important to note these preliminary biological recommendations and have not been refined based on physical water availability in Cow Creek. As indicated in Figure 1, the late season flows in Cow Creek frequently drop below the minimum environmental flow of 15 cfs during the late irrigation season. Figure 14 also shows periods in April and May of 2018 when streamflows fall below the recommended environmental flow of 53 cfs. It is important that water strategies further evaluated as part of this Plan consider these environmental flow targets in future analysis.

Based on the guide survey, the fishery in Cow Creek from the USFS Boundary to its confluence with the Uncompahgre is generally unknown because it runs through mostly private land between the USFS Boundary and the Ridgway State Park Boundary. Trout Unlimited reports that Cow Creek is a good fishery, dynamic in terms or fish movement and health of insect population (TU Comments 2/28/2020). There is public angling access on the Billy Creek State Wildlife Area – Beckett Tract.

Upper Cow Creek has a recreational population of Colorado River cutthroat trout (CWP Teleconference 5/14/2020, TU Comments 4/28/2020). Colorado River cutthroat trout only inhabit about 8 percent of their native habitat in the Gunnison Basin and great efforts have been made to restore the population and habitats (TU Comments 2/28/2020).

It is important that water strategies evaluated as part of this plan consider impacts to the Cow Creek fishery.

4.2.8 *Selenium and Salinity*

Both selenium and salinity are well-known issues in surface waters located on the western slope of Colorado. Naturally occurring marine shales in certain parts of Colorado contain high selenium and salt concentrations. When groundwater comes in contact with these selenium and salt-bearing shale formations, selenium and salts are mobilized causing elevated selenium and salt concentrations in surface waters. This problem is exacerbated by irrigated agricultural lands overlying these marine shales. This phenomenon has been well documented by both the U.S. Geological Survey (USGS) and the U.S. Bureau of Reclamation (USBR) (Henneberg, 2018 and USBR, 2017).

The USBR and the U.S. Department of Agriculture (USDA) have spent $180 million on salinity control projects in the Colorado and Gunnison River Basins. (Kanzer, 2018) and an additional $14 million of selenium and salinity source control projects are planned over the next few years (USBR, 2017). These projects typically involve lining and piping irrigation canals and lateral and improving irrigation application efficiencies. The projects are popular with the agricultural water users and assist in addressing water shortages (TU Comments 2/28/2020).

Map 9 provides a summary of irrigated lands in the UUB which overlay Mancos shale. The ditches that serve these irrigated areas should be prioritized for irrigation efficiency projects. As a result, potential irrigation efficiency projects in the UUB may be eligible to receive grant funding through the USBR's Salinity Control Program[1]. A listing of these ditches is provided in Table 4.

4.3 Recreational Boating Flow Water Gaps

In 2013, American Whitewater (AW) published a report assessing streamflow needs for whitewater boating recreation in the Gunnison River Basin (AW, 2013). AW (2013) provides a summary of minimum and optimum recreational boating flow targets for three stream segments in the UUB. Table 7 provides a summary of each UUB stream segment listed in AW (2013) and their corresponding minimum and optimal flow ranges. Figure 3 through Figure 5 provide a comparison of available streamflow data since year 2000 with minimum and maximum optimum flow ranges for each UUB recreational boating flow segment. These figures indicate that minimum optimum recreational boating flow targets were present in all years except 2002, 2012, 2013, and 2018. Based on a telephone interview with a local whitewater guide shop, which operates in UUB, the peak season for whitewater tours is between May and August (approximately

[1]Colorado River Basin Salinity Control Program: https://www.usbr.gov/uc/progact/salinity/

122 days per season), and their peak guided tour period typically occurs during the first two weeks in July.

Table 8 provides a summary of the average daily flow needed to meet the target minimum optimum recreational whitewater boating flow for each stream segment in the UUB during years in which the minimum optimum flow target was not met. The stream segment below Ridgway Reservoir has the highest potential for meeting the minimum optimum recreational flow target since it is downstream of the Ridgway Reservoir. Over the dry years of 2002, 2012, 2013 and 2018, the average daily flow volume needed to meet the minimum optimum flow for two weekends a year (four days total) downstream of the reservoir is approximately 600 AF per day for a total of 2,400 AF (see Table 8). This corresponds to an average daily additional flow release of approximately 300 cfs each day from Ridgway Reservoir. Additional water may be needed for ramping criteria to protect the tailwater fishery (CPW Comment 4/17/2020).

There are also recreational fishing gaps that were identified in comments to the report. A gap was identified by Trout Unlimited on the Uncompahgre River downstream of Ridgway Reservoir regarding high flows during summer months and low flows in the winter months.

5.0 WATER SUPPLY PROTECTION AND ENHANCEMENT

At the onset of the Steering Committee meetings, the group discussed potential water supply strategies to further protect and enhance water supplies in the UUB. Potential strategies discussed included the following:

- Strategy No. 1 – Investigating potential strategies and management activities to provide water users more access to Ridgway Reservoir water supplies.

- Strategy No. 2 – Connect Cow Creek with Ridgway Reservoir to provide an additional water supply source to Ridgway Reservoir to provide Upper Uncompahgre Water users more access to Ridgway Reservoir water supplies and provide an opportunity for increased hydropower production.

- Strategy No. 3 – Further investigate potential water storage projects in the UUB focusing on Ram's Horn Reservoir.

- Strategy No 4 – Improvements to water use efficiency to reduce current and future water demands.

Please note that there are a number of other potential water supply sources in the UBB, including Tri-County's proposed Dallas Divide Reservoir and Sneva Reservoir, the Double RL Ranch's Carroll Brown Reservoir and proposed Lodge Reservoir, and the Town of Ridgway's Otonawanda Reservoir, all in the Dallas Creek basin, and Lake Lenore, Crystal Reservoir, Ptarmigan Lake and Ptarmigan Pond in the Uncompahgre Basin. Additionally, there are numerous natural high-altitude lakes and ponds including Blue Lakes and Lake Como. Potential new reservoir sites were identified including sites in the Canyon Creek drainage below the confluence of Sneffels and Imogene Creeks, and the Uncompahgre River near Ironton. However, given their storage capacity

and uses, in addition to time and budget constraints, only Ridgway Reservoir and Ram's Horn Reservoir were targeted for further evaluation in this Plan.

5.1 Model Development to Support Identified Strategies

A daily time-step spreadsheet model for Ridgway Reservoir (Reservoir Model) was developed for the purposes of better understanding how changes in water use upstream of the reservoir could impact reservoir operations and reservoir pool volumes. Historical reservoir data including elevation, storage, evaporation, inflow, and release rates reported by the United States Bureau of Reclamation (UBSR) were used for model development. Figure 6 provides a comparison of modeled reservoir storage versus reported historical daily storage between water years 2002 and 2018. As shown in Figure 6, there is good agreement between modeled and USBR historical reservoir storage volumes.

A daily time-step spreadsheet model for Ridgway Reservoir hydropower production was developed for the purpose of understanding how potential stream management projects could affect hydropower production. To help calibrate the hydropower model, Tri County provided WWE with historical hydropower production data from Ridgway Reservoir between 2015 and 2018. Table 9 provides a comparison of this historical hydropower production data and output from the hydropower model during this same time period. As shown in Table 9 there is generally good agreement between the historical data reported by Tri County and the hydropower model. Please note that the hydropower model assumes continuous operations of the turbines and does not consider time periods when the hydropower turbines were turned off for maintenance or other system management purposes.

An hourly time-step spreadsheet model for Cow Creek and the Uncompahgre River to the M&D Canal (Cow Creek to M&D Model) was developed for the purpose of better understanding potential impacts to downstream water users from connecting Cow Creek with Ridgway Reservoir. This spreadsheet model also allows for quantification of potential additional water supplies to Ridgway Reservoir from Cow Creek under various management and diversion amount scenarios.

5.2 Strategy 1: Evaluating Ridgway Reservoir to Provide Additional Water Supply for Ouray County Water Uses

As discussed in the 2016 UUB Report, irrigation, municipal and industrial users in the UUB could on average benefit from an additional 2,100 AF of water depletion from releases and exchanges to meet existing UUB shortages from Ridgway Reservoir. The Reservoir Model is utilized to estimate impacts to storage volumes because of an additional 2,100 AF of water depletions to Ridgway Reservoir during the irrigation season. The Reservoir model is also used to evaluate if the reservoir could fill while maintaining required releases for downstream water users and minimum flows with changes to reservoir releases.

Figure 7 and Figure 9 provide a summary of model results for this management strategy for water years 2002 to 2004 and 2008 to 2010, respectively. The analysis shows that Ridgway Reservoir can be depleted by an additional 2,100 AF per year during the irrigation season and fill in the following spring to the same or nearly the same storage volume reported by the USBR. This is typically achieved by reducing reservoir releases to the minimum required downstream release

during the April to March time frame. This analysis also shows there could also be available flow for increasing winter season flows downstream of Ridgway Reservoir for the fishery (CPW Comments 5/14/2020).

This analysis is based on historical reservoir operations and there may be less water available for filling the reservoir in the future due to climate change (TU Comments 4/28/2020).

The potential benefits of Strategy 1 include the following:

- Utilizes existing infrastructure and has the lowest infrastructure improvement costs of all the strategies evaluated.

- Has potential for quickest implementation of all the strategies evaluated. Agreements and contracts may need to be executed to allow for upstream users to exchange out of Ridgway Reservoir.

The potential negatives of Strategy 1 include the following:

- Upstream depletions (1,430 AF out of 2,100 AF) for irrigation, municipal and industrial water uses will result in impacts to reaches with minimum instream flow water rights on Dallas Creek and the Uncompahgre River upstream of Ridgway Reservoir, especially during dry years.

- Hydropower revenue will be reduced due to decreases in the Reservoirs water surface elevation and reduced release rates during some portions of the year. Under this strategy, average annual hydropower revenue loss is estimated at approximately $40,000 per year (see Table 10).

- While the Reservoir Model results do consider minimum releases below the reservoir, there is a reduced potential for increasing wintertime flow releases below the reservoir for fishery benefits.

5.3 Strategy 2: Additional Water Supply from Cow Creek

Cow Creek is headwater stream located in the San Juan Mountains and is tributary to the Uncompahgre River. Cow Creek generally flows in a northwesterly direction until its confluence with the Uncompahgre River, which is located approximately 1 mile downstream of Ridgway Reservoir (see Map 1). The streambed is highly active, consisting primarily of alluvial gravels and cobbles and in the downstream reaches within a Mancos Shale geological formation, which makes the stream highly susceptible to braiding and lateral migration. Land use practices also contribute to the unstable channel (CPW Comments 4/27/2020, TU Comments 6/5/2020). Another factor contributing to the highly active streambed is the variable diurnal streamflow that occurs in Cow Creek during the spring runoff season. Cow Creek can experience fluctuations in streamflow of more than 100 cfs within a 24-hour period. Figure 12 provides 2018 (a dry year) streamflow data from the Cow Creek Gage during the month of May to highlight the highly variable diurnal streamflow pattern during spring runoff. This gage is located on Cow Creek approximately 1 mile upstream of its confluence with the Uncompahgre River.

This highly variable diurnal streamflow pattern causes the following operational issues for both Cow Creek water users, Tri-County, and the UVWUA:

- Constant maintenance is required in and around the headgates on Cow Creek. The highly active streambed can make it difficult to maintain a constant diversion into the headgate and ditches and requires regular instream maintenance to maintain the diversion structures. During high flow events, diversion structures can experience full or partial blowouts.

- The UVWUA indicates the variable streamflow contribution from Cow Creek to the Uncompahgre River makes it operationally difficult to maintain a constant diversion from the Uncompahgre River to the major UVWUA diversion structures, including the M&D Canal, Loutzenheiser, and Selig Diversion Structures (UVWUA Diversion Structures). Excess water, which could be used for irrigation, bypass this diversion due to the influence of variable streamflow from Cow Creek. The M&D Canal diversion is located on the Uncompahgre River, approximately 11 miles downstream of the Cow Creek confluence. Figure 13 provides gaged 2018 streamflow data from the Upstream of South Canal Gage (this gage is also located upstream of the M&D Canal) and the Olathe Gage located downstream of UVWUA Diversion Structures. The Olathe Gage generally represents water bypassing the UVWUA Diversion Structures due to streamflow fluctuations in Cow Creek.

- Reservoir releases at Ridgway Reservoir are more difficult to operate to coordinate with streamflow contributions from Cow Creek to optimize deliveries to the UVWUA Diversion Structures.

5.3.1 *Strategy 2: Cow Creek - Ridgway Reservoir Pipeline and Stabilization Reservoir Potential Yield and Potential Benefits*

Given the operational issues discussed in Section 5.3, the Steering Committee discussed strategies for a potential project to dampen the diurnal streamflow in Cow Creek by diverting the diurnal peaks off of the daily flow during the peak runoff period via a Cow Creek – Ridgway Reservoir Pipeline. The benefits of this concept include providing additional water yield to Ridgway Reservoir, reducing the operational issues experienced by Cow Creek water users, Tri-County, and the UVWUA. However, diverting the diurnal peak of the hydrograph during late summer low flow conditions is likely to be detrimental to the fishery. During late summer low flow conditions, daily peaks in flow are correlated with temperature drops where temperatures fall below the chronic temperature standard. This has likely allowed the fishery in Cow Creek to persist (CPW Comments 4/27/2020, TU Comments 4/28/2020).

To achieve these benefits the Steering Committee reviewed a project consisting of a flow dampening reservoir on Cow Creek combined with a surface water diversion to deliver excess diurnal water to Ridgway Reservoir. The flow regulating reservoir can be sized to attenuate diurnal streamflow in Cow Creek and make daily releases consistent with the previous three days rolling average streamflow. The intent of the project is to reduce the diurnal flow during peak runoff while maintaining the seasonal natural hydrograph with less daily variability. Diversions from Cow Creek to Ridgway Reservoir should not be conducted during low flow periods during the late

summer season to avoid fisheries impacts resulting from elevated water temperatures downstream of the diversion. Figure 14 shows the calculated Cow Creek Gage hydrograph during the spring runoff season after dampening and diverting 20 cfs to Ridgway Reservoir. The analysis is based on the Cow Creek Gage, which is located downstream of the water rights diversions on Cow Creek. Thus, minimum bypass scenarios include the impacts of Cow Creek diversions located upstream of the Gage.

Table 11 provides a calculated estimate of the amount of water which could be delivered to Ridgway Reservoir from Cow Creek by water year based on a physical diversion limit of 20 cfs and a minimum bypass flow of 6 cfs. Table 11 also provides the calculated minimum size of the flow dampening reservoir needed for each year. This analysis is based on Cow Creek Gage, which is downstream of all the existing diversions on Cow Creek. Under this scenario, the Cow Creek to M&D Model estimates that approximately 8,000 AF of water could be delivered to Ridgway Reservoir in water year 2018 utilizing an approximately 700 AF of active storage from a flow dampening reservoir. With a minimum bypass flow of 15 cfs, the average yield from the pipeline is 6,900 AF.

Figure 15 compares 2018 the Cow Creek Gage streamflow data with an altered streamflow hydrograph from the Cow Creek to M&D Model for the same time period to represent the streamflow in Cow Creek with a flow dampening reservoir and a diversion to Ridgway Reservoir. The altered streamflow hydrograph in Figure 15 assumes the flow dampening reservoir is releasing the previous three days rolling average streamflow, the diversion is delivering a maximum of 20 cfs to Ridgway Reservoir, and the diversion is bypassing a minimum of 6 cfs.

A comment was made to the report requesting an increase of the minimum diversion to greater than 20 cfs. WWE had evaluated increased diversions and found a diminishing return when evaluating larger pipe and flow stability reservoir sizing. However, further evaluation is recommended.

As discussed in Section 4.2.7, during the summer of 2019, CPW completed a status assessment of the Cow Creek fishery, a supplemental stream temperature evaluation, and refined minimum instream flow recommendations in Cow Creek on the Billy Creek SWA (see Appendix C). The 2019 fishery evaluation revealed a healthy population of aquatic species, including Bluehead Sucker, which are a Tier 1 species of greatest conservation need in the state (CPW comments 4/27/2020).

Findings from the temperature data collected between August 2019 and January 2020 indicate the chronic stream temperature standard for trout (65°F) is periodically exceeded under late summer low flow conditions and diurnal peaks during these low flow conditions correspond to periods of thermal respite where the temperature standard is met (CPW Comment 4/27/2020, see Appendix C). It is unclear if the protocol used by CPW meets CDPHE's Water Quality Control Divisions protocol for evaluating temperature versus the stream standard. Further, the assumptions used to develop the flow dampening reservoir on Cow Creek (Figure 14) reduces the available water supply recommended by CPW to protect the natural environment to a reasonable degree. (CPW Comment 4/27/2020). However, the pre-project stream flows in Figure 14 also did not meet the water supply recommended by CPW. It is important that any water strategies evaluated as part of

this plan consider impacts to the Cow Creek fishery from reductions in stream flows including the diurnal fluctuations during low flows conditions.

Considerations for historical UVWUA[1] diversions and minimum releases from Ridgway Reservoir were evaluated and preliminarily quantified. As a result of this strategy, the Cow Creek to M&D Model estimates 400 AF out of the 8,000 AF delivered to Ridgway Reservoir would need to be released from storage through Ridgway Reservoir to maintain historical UVWUA diversions in water year 2018 (see Table 13). The 400 AF of additional delivery is calculated by subtracting the additional 1,900 AF of water delivered to the UVWUA canal system from the diurnal flow dampening from 2,300 AF of less water delivered to the UVWUA canal system during the diurnal flow dampening.

The minimum release from Ridgway Reservoir is defined at the confluence of the Uncompahgre River and Cow Creek. Since this strategy will dampen Cow Creek streamflow, potential impacts to minimum releases from Ridgway Reservoir were evaluated. Table 13 provides a summary of the volume of additional water that would need to be released from Ridgway Reservoir to meet the minimum flow at the Uncompahgre River and Cow Creek confluence by water year for the 20 cfs diversion scenario. In water year 2018, approximately 540 AF of additional water would need to be released from Ridgway Reservoir to meet minimum flows at the confluence of the Uncompahgre River and Cow Creek. Figure 16 provides a summary of the total water delivered to Ridgway Reservoir with Strategy 2 considering the additional releases need for the UVWUA and minimum releases below Ridgway Reservoir.

For a 15 cfs bypass flow, an average annual yield of 6,900 AF, a 1,000 AF average volume requirement for rerelease to meet the minimum streamflow, and meeting the net shortage to UVWUA, gives a calculated net yield of 5,900 AF.

The preferred location for the flow dampening reservoir is Ram's Horn Reservoir site, a potential reservoir site identified in the USBR's Dallas Creek Project (see Map 11). This reservoir site would help dampen diurnal flow fluctuation above Cow Creek diversion structures. The diversion structure to convey water from Cow Creek to Ridgway Reservoir would be located downstream of the dampening reservoir and designed to maintain a minimum amount of flow in Cow Creek past the diversion structure. Potential locations for the diversion structure include the following:

1. Locate the diversion structure on Cow Creek near where it is in close proximity to the Reservoir and install a pipeline underneath the highway to Ridgway Reservoir (see Map 12).

[1] Includes the following diversion amounts reported by the CDWR Accounting Sheet:

- **M&D Canal:** (1) Stark Volkman / Logan Ditch Bypass (2) Diversions from Uncompahgre Flow Above South Canal (3) Diversions from Ridgway Storage Release
- **Loutsenhizer Canal:** (1) Diversions from Uncompahgre Flow Above South Canal (2) Diversions from Ridgway Storage Release
- **Selig Canal:** (1) Diversions from Uncompahgre Flow Above South Canal (2) Diversions from Ridgway Storage Release

2. Utilize existing diversion structures to deliver water to Ridgway Reservoir including the Alkali No 1, Alkali No. 2 and the Sneva Ditch either when there is existing capacity or if enlarged (see Map 6).

The potential benefits of Strategy 2 include the following:

- Additional water will be delivered to Ridgway Reservoir during dry years and could be used for a variety of benefits, including but not limited to: (1) relaxing the administrative call from the M&D Canal to benefit Ouray County Water Users, (2) increasing winter fishery flows downstream of Ridgway Reservoir, (3) meeting optimum boater recreation flows downstream of Ridgway Reservoir for limited time periods during the peak boating season, (4) providing a new source of water for a potential Ouray County Water Users pool in Ridgway Reservoir, without impacts to existing water users and minimum streamflow releases.

- Less potential for large diurnal streamflow fluctuations at the UVWUA Diversion Structures, which will allow the UVWUA to make use of water that historically bypassed the diversions.

- Additional hydropower generation by Tri County at Ridgway Reservoir. Table 13 provides an estimate of the additional hydropower revenue generated by implementing Strategy 2. The assumptions for this analysis are provided in Table 13. It is important to note that this is a secondary benefit and hydropower would be produced from water released for other purposes.

The potential negatives of Strategy 2 include the following:

- Potential to reduce streamflows below the minimum environmental flow recommendations made by CPW to maintain the fishery in lower Cow Creek at the Billy Creek SWA. CPW is currently in the process of developing and proposing an instream flow recommendation to the CWCB on lower Cow Creek to protect the ecological values of the Billy Creek SWA (CPW 4/27/2020).

- Potential loss of stream water quality buffering and potential degradation to existing water quality use designation on lower Cow Creek, particularly to the aquatic life cold 1 temperature standard (CPW Comment 4/27/2020).

- This Strategy will be more expensive to implement than Strategy 1. Coordination with private landowners and additional infrastructure construction is required. Planning level cost estimates for Strategy 2 are provided in the following section.

- Although this strategy may yield an additional 7,500 AF, based on projections from 2018, the strategy would not totally alleviate the dry-year shortages in Dallas Creek, Cow Creek, and Uncompahgre River upstream of Ridgway Reservoir. It could meet the shortage for the Ouray County water users located on the Uncompahgre River downstream of Ridgway Reservoir.

5.3.2 *Strategy 2: Planning Level Cost Estimates*

Strategy 2 consists of two primary new infrastructure components: 1) construction of a diversion tunnel or enhancement of an existing ditch to convey excess water from Cow Creek to Ridgway Reservoir, and 2) construction of an 800 AF flow dampening reservoir, to allow 100 AF for sedimentation, at the Ram's Horn Reservoir site.

Given the existing capacity constraints of the Alkali No 1, Alkali No. 2 and Sneva Ditch, a planning level cost estimate was prepared for the construction of the Cow Creek – Ridgway Reservoir Pipeline as shown on Map 12. The planning level construction cost estimate for this project component is expected to range between $5 and $6.2 million (see Table 14).

Table 15 provides a summary survey of Colorado reservoir storage project construction costs or cost estimates. Based on this survey information, WWE used an expected reservoir cost range between $5,000 and $10,000 per AF of reservoir storage for project planning purposes. For an 800 AF reservoir, this equates to a planning level cost range of $4 to $8 million.

The total planning level construction cost estimate for Strategy 2 is $9 to $14 million or $1,000 $/AF to 1,600 $/AF (based on 8,800 AF of net average yield equals 9,800 AF minus 1,000 AF for minimum stream flows and UVWUA net shortage, see Table 11, rounded up).

For a 15 cfs bypass below the pipeline and a net average annual yield of 5,900 AF (6,900 AF minus 1,000 AF, the cost per AF of yield increases to a range of 1,500 $/AF to 2,400 $/AF.

5.3.3 *Strategy 2: Additional Considerations*

Planning level estimate of Strategy 2 yields range from 5,900 AF to 8,800 AF. Additional work on how to allocate the yield is recommended. For instance, between 2,100 AF and 4,500 AF could potentially be used for existing water user shortages in UUB through a combination of exchange and direct releases. An average 1,000 AF of yield could increase minimum winter flows below Ridgway Reservoir from 45 cfs to between 50 cfs to up to 70 cfs in some years (See Table 6). Additional evaluation of optimizing releases and bypass to minimize fishery impacts, while maximizing reservoir yields and distributing potential yields among project beneficiaries is recommended. Additional environmental permitting and project feasibility engineering is also needed.

5.4 Strategy 3: Ram's Horn Reservoir and Cow Creek – Ridgway Reservoir Pipeline

Strategy 3 builds upon the approach described in Strategy 2 and considers construction of Ram's Horn Reservoir in combination with the Cow Creek surface water diversion to deliver water to Ridgway Reservoir. Appendix D provides a summary of the desktop level evaluation performed by Yeh and Associates, Inc. (Yeh) to further evaluate the feasibility of Ram's Horn Reservoir. Yeh's evaluation resulted in the following primary findings:

- Available small-scale geologic maps indicate that the Ram's Horn ridgeline was created by a Cretaceous intrusion of igneous rock. This crystalline rock is more resistant to

weathering than the surrounding bedrock and formed a higher landform as the surrounding rock eroded. This ridgeline would likely serve as the foundation for the dam abutments to create the reservoir, however a site-specific subsurface investigation is needed to better determine the engineering properties of the igneous rock.

- A seismic fault study of the area may be required. The USBR has completed extensive studies of faults and seismic risk in the Ridgway Reservoir area, and the USBR reportedly discovered many new Quaternary to Late Cenozoic faults and recorded micro seismicity in the vicinity.

- High resolution LiDAR data of the Cow Creek watershed made available by the Colorado Water Conservation Board (QSI, 2018) was utilized to develop a more accurate stage-area-volume relationship for the Ram's Horn Reservoir.

Ram's Horn Reservoir was decreed on April 14, 1961 in Civil Action No. 2440 for a conditional water right with an appropriation date of November 16, 1956 for irrigation, domestic, municipal and industrial, and flood control uses. The decreed volume of Ram's Horn Reservoir is 25,349.15 AF. Ram's Horn Reservoir is part of a Colorado River Storage Act project, the Dallas Divide Project, which included Ridgway Reservoir, Dallas Divide Reservoir and Willow Swamp Reservoir (see map 11). Diligence on Ram's Horn Reservoir has been maintained by Tri-County Water Conservancy District, the owner of the water right.

WWE recommends adding additional uses to Ram's Horn Reservoir to allow for uses more clearly in Ouray County. In addition to the Ram's Horn Reservoir's currently decreed conditional uses, the following additional uses are recommended to help alleviate water gaps in the UUB: flow stabilization, augmentation, exchange, aquifer recharge, reuse, streamflow enhancement and augmentation (for aquatic life including improving water quality for aquatic habitat predicated upon approval from the Colorado Water Conservation Board) and piscatorial use in the reservoir.

Initial evaporation calculations for the Ram's Horn reservoir site based on precipitation and evaporation contours result in 1.89 feet per year without adjusting for icing. During the month of June, assuming a full pool of 25,349 AF (228 acres), average daily net evaporation is roughly 3 AF per day when full.

The proposal is to work from an existing decreed reservoir site with limited decreed uses and to add uses to the reservoir site that would allow the reservoir storage to be used for a much wider variety of uses, including downstream releases for aquatic life, exchange and augmentation to increase the use capability for Ouray County water users, and other water uses in Ouray County

5.4.1 *Strategy 3: Ram's Horn Reservoir and Cow Creek - Ridgway Reservoir Pipeline Potential Yield and Potential Benefits*

Table 16 provides a summary of potential Ram's Horn Reservoir storage pool volumes for potential uses within the UUB.

The potential benefits of Strategy 3 include the following:

- As discussed in the 2016 UUB Report there are water shortages to water users on Cow Creek and the Uncompahgre River below Ridgway Reservoir. Ram's Horn Reservoir would provide these users with an additional water supply during both average and dry years and allow for irrigation further into the irrigation season.

- Attenuating and stabilizing flows in Cow Creek will reduce the potential for diversion structure blowouts on Cow Creek.

- Adding streamflow enhancement and augmentation use to the Ram's Horn Reservoir would provide supplemental flow for the fishery especially in late summer months when additional flow is most needed in Cow Creek, but will have to be operated in a manner that maintains a functional flow regime (peak flows, recession flows, baseflows and interannual variability) to preserve natural spawning behavior and the natural environment below the Cow Creek – Ridgway Reservoir pipeline (CPW Comments 4/17/2020).

- With the implementation of the Cow Creek – Ridgway Reservoir Pipeline, Ram's Horn Reservoir and Ridgway would become interconnected, significantly benefiting water supply management strategies in the UUB.

The potential negatives of Strategy 3 include the following:

- This Strategy is the most expensive of the three strategies evaluated.

- This Strategy requires extensive lead time and coordination with multiple local, state, and federal agencies.

- This Strategy does not provide water directly to water users in Dallas Creek, which is the most water short region of the UUB or the Uncompahgre River Upstream of Ridgway Reservoir.

- Currently, the Ram's Horn Reservoir Due Diligence Decree appears to limit public access to the reservoir site.

- Ecological impacts: An on-channel reservoir permanently modifies the natural flow regime of Cow Creek. This strategy significantly alters the historical sediment-transport regime in Cow Creek and the hydrogeomorphic processes that contribute to the biodiversity of Cow Creek and the Uncompahgre River below Ridgway Reservoir. Cow Creek may be solely responsible for supporting a healthy benthic macroinvertebrate community below the confluence on the Uncompahgre River. Flow dampening on Cow Creek and the proposed Cow Creek - Ridgway Reservoir Pipeline reduces streamflow to the fishery in Cow Creek on CPW's Billy Creek State Wildlife Area and water available to meet the biological flow recommendations. Increased temperatures on Cow Creek may lead to water quality degradation for the aquatic life use classification (CPW Comments 4/27/2020).

5.4.2 *Strategy 3: Planning Level Cost Estimate*

As discussed in Section 5.3.2, WWE recommends using an expected reservoir cost range between $5,000 and $10,000 per AF of reservoir storage for project planning purposes. For an approximately 25,000 AF reservoir, this equated to a planning level cost range of $125 million to $250 million. The estimated average year water yield of the Ram's Horn Reservoir is 21,000 AF. This equates to a cost of approximately $6,000 to $12,000 per AF of water yield.

Planning level costs for the construction of the Cow Creek – Ridgway Reservoir Pipeline are discussed in Section 5.3.2.

5.5 Strategy 4: Irrigation Water Efficiency projects

Improvements to irrigation efficiency is a cost-effective method to reduce shortages to water demands. However, care should be taken when implementing ditch efficiency projects because downstream water users can rely on return flow patterns and return flow patterns can be altered by ditch efficiency projects. Education such as demonstration projects and case studies that present other benefits, like reduced labor and maintenance projects, may help local water users appreciate the benefits of various efficiency projects.

WWE attended several meetings with local irrigators to discuss their irrigation water practices and potential irrigation water efficiency projects. Efficiency projects including canal and ditch lining and piping, consolidating ditches, sprinkler and drip systems and the installation of automated headgates with tailwater monitoring, and providing additional climate information were discussed. Comments to the draft report pointed out the importance of increasing water efficiency and irrigators provided examples of ditch efficiency improvement projects.

5.5.1 *Inter-Basin Diversions*

Inter-basin diversions (not trans-basin diversion) divert water from a tributary and deliver it to a place of use in another tributary to the same river basin. A trans-basin diversion diverts water from one river basin (determined by CDWR division boundaries) and delivers it to a place of use which is tributary to a different river basin. Table 4 lists the inter-basin diversions in the UUB. For example, the Sneva Ditch, Alkali Ditch No. 1, and Alkali Ditch No. 2 (see Map 6) divert water from Cow Creek and convey the water southwest out of the Cow Creek Region where it is used to irrigate lands tributary to the Uncompahgre River above Ridgway Reservoir. As a result, the irrigation return flows from these diversions do not return to Cow Creek.

Additionally, much of the lands irrigated by these inter-basin diversions overlie the Mancos shale (see Map 9 and Table 4). As discussed in Section 4.2.8, these lands have the potential to contribute selenium and salinity to the groundwater tributary to the Uncompahgre River. The potential benefits of inter-basin diversion irrigation efficiency projects include; 1) additional water remains in its native basin, and 2) potential reductions in selenium and salinity loading to the Uncompahgre River.

5.5.2 *Automated Gates and Remote Sensing – Dallas Creek and Cow Creek*

Automated gates on irrigation diversions can allow for better management of water within the delivery system. Installation of automated gates on Cow Creek and Dallas Creek inter-basin diversions are recommended as a priority.

The headgate structures of the Dallas Ditch, Sneva Ditch, and Alkali Ditches No. 1 and 2 are difficult to access, which limits the ability of ditch operators to quickly respond to changes in water demand and fluctuating water levels. The automated gate system should operate based on continuous water level measurement at the flume with remote sensing at the diversion structure so the operator can remotely monitor the flow in the ditch and remotely adjust the gate. It is also helpful to have remote water level depth sensing on the tailwater end of the ditch to help inform the operator how much the ditch is spilling. In the event the tailwater in the ditch reaches a critical spill point, the headgate is remotely adjusted by the operator to help balance the diversion rate at the headgate and reduce the tailwater spill of the ditch. It is difficult to operate a ditch system without some spillage at the tail end. This can also be used in conjunction with soil moisture monitors. This measure is geared toward minimizing tailwater spills and increasing irrigation efficiencies including flood irrigation efficiencies (TU Comment, 4/28/2020).

The benefits of this project include:

- By reducing excess diversions and water spilled off the end of the ditch, water is being used more efficiently in the Dallas Creek and Cow Creek regions.

- More water will remain in Dallas Creek and Cow Creek. This can benefit the ISF on Dallas Creek above Ridgway Reservoir and maintain higher flows in Cow Creek.

- Reduced selenium and salinity loading to the Uncompahgre River above Ridgway Reservoir.

5.5.3 *COAGMET Station*

The Colorado Agricultural Meteorological Network (COAGMET) is a network of local climatological monitoring stations located throughout Colorado, typically in irrigated agricultural areas. Each COAGMET station collects the following data: 1) air temperature and relative humidity, 2) wind speed, 3) solar radiation, 4) precipitation, and 5) soil temperature. With this information, daily reference evapotranspiration rates can be generated and used by irrigators to better manage crop water demands, increasing irrigation water use efficiency. Currently, there is not a COAGMET station located in the UUB. It the COAGMET station is too costly, on farm ET meters could be used.

The benefits of this project include:

- Potential for more efficient water use by agricultural water users in the UUB.

- More efficient irrigation timing can help maximize crop ET and reduce contributions to alluvial groundwater overlying the Mancos shale, reducing salinity and selenium loads to the Uncompahgre River.

- Development of a dataset to support a better understanding of agricultural consumptive use demands in the UUB.

- A COAGMET station would also provide supplemental data to evaluate attainment with stream temperature standards (UWP Comment 4/28/2020).

The Colorado State University (CSU) COAGMET office estimates the total equipment and installation cost for a station in the UUB to be approximately $10,500. There is an annual fee of approximately $2,500 for CSU staff to operate and maintain the station, including maintaining communications, web link hosting, sensor calibration, etc. The next step for this project includes identifying a funding source and preferred location for the COAGMET station. For more information the CSU COAGMET Office can be contacted (https://coagmet.colostate.edu/).

5.5.4 *Dallas Ditch Lining*

In 2015 the USBR estimated that piping the Dallas Ditch (see Map 4) would reduce the salinity load to the Colorado River. In 2017 the Shavano Conservation District and J-U-B Engineers, Inc. conducted a preliminary study to evaluate the feasibility of piping portions of the Dallas Ditch (Dallas Ditch Study). Two alternatives were evaluated with estimated total costs of $3.4 million (at a cost of $160 per ton of salt removed) and $500K (at a cost of $205 per ton of salt removed), respectively. The Dallas Ditch Study indicates a "competitive" range for projects to be funded by the USBR is $55 to $60 per ton of salt removed. The amount of water savings was not included in the report, and WWE is following up with the USBR on this information. It is recommended that this project consider finding matching funds from other potential funding sources summarized in Section 9.0.

5.5.5 *Hayes-Teague and Chaffee Ditch*

The Hayes-Teague and Chaffee Ditch both divert water for irrigation purposes out of Cow Creek with return flows accruing to the Uncompahgre River downstream of Ridgway Reservoir (see Map 6). Multiple users of the Hayes-Teague ditch proposed piping portions of the Chaffee Ditch and using the Chaffee Ditch to convey water historically carried by the Hayes-Teague Ditch. The Hayes-Teague diversion is located approximately 0.4 miles upstream of the Chaffee Ditch diversion and irrigates approximately 15 acres of land directly above the Chaffee Ditch. Users of the Hayes-Teague Ditch proposes to pump water from the proposed Chaffee Ditch pipeline or deliver water directly to the lands historically irrigated by the Hayes-Teague Ditch.

The benefits of this project include:

- Piping the Chaffee ditch will help minimize ditch loss, potentially leaving more water in Cow Creek.

- The reach of Cow Creek between the Hayes-Teague and Chaffee Ditch will carry more water during the irrigation season protecting the fishery (TU Comment 6/5/2020).

- Annual maintenance needs for the Hayes-Teague diversion structure can be reduced or eliminated. This provides both a financial benefit to water users and an environmental benefit to Cow Creek.

Both of these ditches have been mapped and the next steps for this project include working with water users on both ditches to seek consensus on the project.

5.5.6 *Double RL Ranch*

The Double RL Ranch has and continues to maintain and make improvements to its irrigation systems. The Double RL Ranch recently piped approximately 1,200 feet of the Burkhart-Eddy Ditch near its headgate on the West Fork of Dallas Creek. The Double RL Ranch is also planning to pipe portions of the Switzerland Ditch and Brown Ditch 271 in 2020. Finally, the Double RL Ranch is planning to pipe approximately 4,500 feet of the Swyhart Ditch where it traverses a steep hillside overlying Mancos Shale. This project is currently scheduled to start construction in 2021 or 2022.

5.5.7 *Municipal Water Projects including Efficiency Projects*

5.5.7.1 City of Ouray Water Metering and Non-Potable Water Supply Project

The City of Ouray has prepared a Water Efficiency Plan and as part of the Plan has begun installing water meters on potable water system taps. In addition, the City is currently exploring the feasibility of developing a non-potable water supply source. Primary project components include construction of a new potable water pipeline between the City's Weehawken Spring and their water storage tanks. The old existing potable line would be repurposed as a non-potable water supply line to carry water from Weehawken Creek to be used for non-potable purposes, including existing hydropower generation, irrigation, and the City's hot springs pools.

Potential benefits of this project include reducing the water demands on the treated potable water system, a new micro-hydropower source, and reducing hot springs discharge into the Uncompahgre River, thus helping improve water quality in the Uncompahgre River between the City's hot springs and Ridgway Reservoir.

5.5.7.2 Town of Ridgway

The Town of Ridgway has identified general goals to be incorporate into this plan for its municipal water supply system, including the following:

- Support existing and potential future water supply and efficiency projects to firm up or increase Town of Ridgway's municipal water supplies as necessary.

- Support recommended water quality improvement projects identified in the Town's forthcoming Stormwater Masterplan.

- Support Source Water Protection planning projects, including Ridgway Ditch.

6.0 ENVIRONMENTAL AND RECREATIONAL

6.1 Evaluate the Classification of Uncompahgre River Stream Segment through City of Ouray

Currently, the segments of the Uncompahgre River through the City of Ouray are classified as CW1. As discussed in Section 4.2.3, recommend further study and the potential for reclassification to better reflect actual conditions on these segments.

6.2 Stream Management Plan for Cow Creek, Uncompahgre River Below Ridgway, and Dallas Creek

Ouray County places a high value on the environment and recreation and the next phase in the development of the water supply Strategies 1, 2, and 3 considered in this Plan should be further assessed to optimize impacts to water uses in the UUB, including environmental uses. CPW provided new data on the Cow Creek fishery and initial environmental flow needs that will inform the UUB Phase II Plan (see Appendix C). Additional analyses are recommended to better understand the relationship between streamflow and the local fisheries, including Cow Creek, the Uncompahgre River Below Ridgway, and lower Dallas Creek. Potential impacts of the strategies outlined in this plan to aquatic habitat should be further explored through development of a Stream Management Plan that involves all stakeholders, including CPW. At a minimum, this plan should consider the following:

- Geomorphology and stream assessment of Cow Creek, the Uncompahgre River above and below Ridgway Reservoir and lower Dallas Creek.

- Macroinvertebrate studies and stream temperature studies on of Cow Creek, the Uncompahgre River above and below Ridgway Reservoir, and lower Dallas Creek.

- Detailed assessment of the Cow Creek Gage station to determine if and under what conditions it is acting as a fish barrier. Development of preliminary concepts to remove and replace or improve the gaging station to provide adequate fish passage under a range of flows.

- Further evaluation of water supply Strategies 1, 2 and 3 in relationship to optimizing flows for aquatic species in Cow Creek, the Uncompahgre River below Ridgway Reservoir, and potential impacts lower Dallas Creek and the Uncompahgre River upstream of Ridgway Reservoir, while maintaining or enhancing historical water uses.

- An evaluation of water quality impacts to all streams impacted by existing and new water withdrawal strategies.

- An evaluation of the functional interaction between the streams and their floodplains, riparian health, and sediment transport inputs.

- An assessment of stream restoration projects.

7.0 POTENTIAL FUNDING SOURCES

7.1 USBR Salinity Control Program

The USBR provides grant funding assistance for projects which can help reduce salinity loads to the Colorado River Basin. An outline of the USBR's Colorado Basin Salinity Control Area within the UUB is provided in Map 9. To be eligible for grant funds, applicants must estimate the project's potential salinity load reduction. Projects with a unit cost of approximately $55 to $60 per ton of salt removed are generally considered most fundable by the USBR. Projects with a higher unit cost are still eligible for grant funding, however costs above this unit cost range typically must be matched by the applicant using in-kind funds or funding from another source. Annual funding opportunities and application deadlines can be found at the USBR website[1].

7.2 WSRF Funding

The CWCB's Water Supply Reserve Fund (WSRF) provides a source of grant and loan funding to assist Colorado water users in addressing their critical water supply issues and interests. There are two accounts from which applicants can request funding:

- **Basin Account:** Requests for funding from a basin roundtable account are made to the Basin Roundtable. Projects within the UUB would request funding from the Gunnison Basin Roundtable. The applicant must demonstrate at least a 25% match when applying to the Basin Account. The match may be provided by the applicant or a third party and may consist of any combination of cash, in-kind services, or in-kind materials.

- **Statewide Account:** Requests for funding from the statewide account are made to the CWCB. The applicant must demonstrate at least a 50% match of the Statewide Account grant request. At least of 10% of the required match shall be cash from Basin Account funds; and at least 10% of the required match shall be provided by the applicant or a third party in any combination of cash, in-kind services or in-kind materials. The remaining 30% of the required match may be provided from any other source, including cash from the Basin Account, or any combination of cash, in-kind services, or in-kind materials.

Multi-purpose projects have a higher probability of funding with WSRF funds. More information on WSRF funding and threshold requirements can be found at the CWCB website[2].

7.3 State Water Plan

The purpose of the Water Plan Grant funding is to make progress on the critical actions identified in the Colorado's Water Plan (CWP) and its Measurable Objectives. The Water Plan Grant funding

[1]Colorado River Basin Salinity Control Program: https://www.usbr.gov/uc/progact/salinity/

[2]CWCB Water Supply Reserve Fund Grants: https://cwcb.colorado.gov/water-supply-reserve-fund-grants

includes technical assistance, project, or program funding for the following project types: water storage & supply projects, conservation and land use planning, engagement & innovation activities, agricultural projects, and environmental & recreation projects. Water Plan Grant requests require matching funds. CWCB funds for Colorado Water Plan Grants cannot exceed 50% of the total cost of the project or activity. Other CWCB funds (such as WSRA funds) may be used for plans and studies, but the total CWCB funding cannot exceed 75% of the total cost. More information on Water Plan Grant funding and threshold requirements can be found at the CWCB website[1].

8.0 IDENTIFIED PROJECTS AND PROCESSES

The Gunnison Basin Implementation Plan (Gunnison BIP) identifies projects and methods to meet basin-specific municipal, industrial, agricultural, environmental, and recreational needs, and is intended to inform and help drive Colorado's Water Plan (GBR, 2015). The Gunnison BIP includes a list of implementation plan goals which are used to evaluate identified projects or processes (IPP) within the basin. IPPs which meet these goals can be approved by the Gunnison Basin Roundtable and incorporated into the roundtable's IPP list, which are then eligible to receive funding from the WSRA basin account.

The Gunnison BIP Goals are as follows:

1. Protect existing water uses in the Gunnison Basin.
2. Discourage the conversion of productive agricultural land to all other uses within the context of private property rights.
3. Improve agricultural water supplies to reduce shortages.
4. Identify and address municipal and industrial water shortages.
5. Quantify and protect environmental and recreational water uses.
6. Maintain or, where necessary, improve water quality throughout the Gunnison Basin.
7. Describe and encourage the beneficial relationship between agricultural, environmental and recreational water uses.
8. Restore, maintain, and modernize critical water infrastructure, including hydropower.
9. Create and maintain active, relevant, and comprehensive public education, outreach and stewardship processes involving water resources in the six sectors of the Gunnison Basin.

Key Projects Identified to Further Water Supply Protection and Enhancement

[1]CWCB Colorado's Water Plan Grants: https://cwcb.colorado.gov/colorados-water-plan-grants

The following provides a summary of key projects identified in this UUB Phase II Plan to further water supply protection and enhancement in the UUB:

- The Gunnison Basin IPP list already has an IPP for development of additional Upper Uncompahgre Water Supplies. Recommend the continuance of this IPP. Additional water supply development is key to solving many of the issues identified in this Plan and more work is necessary to further develop the strategies identified in this Plan. Recommend adding further development of Ridgway Reservoir, Cow Creek – Ridgway Reservoir Pipeline and Ram's Horn Reservoir to the development of additional Upper Uncompahgre Water Supplies IPP notes.

- Recommend keeping the IPP for the development of a Basin Wide Augmentation Plan for the UUB. The water supply strategies provided in this Plan include the development of water supplies for augmentation.

- Recommend keeping the IPP for Inventory of Irrigation Infrastructure Improvement Needs – District 68. Recommend adding automated gates, measurement of ditch tailwater, and remote sensing to this IPP's notes section. Also recommend continued mapping of ditches and calculating salt loads for ditch located on or near Mancos Shale.

- There is an IPP for Gunnison Basin Selenium Management Plan and Gunnison Basin Task Force. Recommend coordinating this planning effort with area identified in the UUB that overlay Mancos Shale and may contribute to both salinity and selenium.

- Include an IPP for the UUB that would support the installation of a COAMET station.

- Include an IPP for the City of Ouray's non-potable water pipeline project and its potential benefits to reduce hot springs discharge into the Uncompahgre River.

- Recommend keeping the improvements to Red Mountain Ditch on the IPP List and adding acquisition and development of additional storage to UUB to IPP List.

- Recommend an IPP for the development of a Stream Management Plan which focuses on Cow Creek, the Uncompahgre River above and below Ridgway Reservoir, and lower Dallas Creek. Minimum elements of this plan should include, macroinvertebrate studies, continuous stream temperature monitoring, geomorphology, quantifying and modeling return flow patterns, depletions and streamflow under various scenarios, stream assessments, and assessment of plan project strategies to improve or minimize impacts to aquatic species.

- Recommend an IPP for fish barrier evaluation and possible improvement for fish passage at the Cow Creek Gage. If improvements are made to the Gage, installation of a pit tag array in Cow Creek to help monitor and track fish movement is recommended.

- Recommend an IPP to assess reclassification of the Uncompahgre River segments to better reflect actual conditions in preparation for the October 2020 WQCD Issues Scoping Hearing for Regulation #35 (Gunnison and Lower Dolores River Basins).

- Recommend an IPP for the development of source water protection plans for the City of Ouray and Town of Ridgway.

- Recommend an IPP for support of existing and potential future water supply and efficiency projects to firm up or increase Town of Ridgway's municipal water supplies as necessary.

- Recommend an IPP to support recommended water quality improvement projects identified in the Town of Ridgway's forthcoming Stormwater Masterplan.

- Recommend an IPP to support additional water quality improvement projects identified by UWP, Trout Unlimited, the Colorado Division of Reclamation, Mining and Safety, or other parties working to reduce the impact of historic abandoned mines within the UUB.

- Recommend and IPP on rehabilitation, maintenance, and construction of stream restoration projects in the UUB and identified current needs downstream of Ridgway Reservoir.

9.0 REFERENCES

AW, 2013. Assessing Streamflow Needs for Whitewater Recreation in the Gunnison River Basin. American Whitewater. P.O. Box 1540 Cullowhee, NC 28723. Available here: https://www.americanwhitewater.org/content/Article/view/articleid/31794/display/full/

CDPHE, 2018. Integrated Water Quality Monitoring and Assessment Report 2018. Colorado Water Quality Control Division Department of Public Health and Environment.

CPW, Cow Creek Fishery Report 2019. (Attached in Appendix C.1)

CPW, Cow Creek Thermal and Flow Supplemental Report 2019. (Attached in Appendix C.2)

CPW, Cow Creek and Uncompahgre River Environmental Flow Needs, Katie Birch CPW 4/15/2020. (Attached in Appendix C.3)

CPW, 2005. Letter from Dan Kowalski, Colorado Parks and Wildlife Department to Tri-County Water Conservancy District date July 11, 2005.

GBR, 2015. Gunnison Basin Implementation Plan. Prepared for Gunnison Basin Roundtable for submittal to the Colorado Water Conservation Board. Issue Date: April 17, 2015. Available here: http://gunnisonriverbasin.org/water-plans-management/gunnison-basin-implementation-plan/

Henneberg, M., 2018. Assessment of dissolved-selenium concentrations and loads in the lower Gunnison River Basin, Colorado, as part of the Selenium Management Program, from 2011 to 2016: U.S. Geological Survey Scientific Investigations Report 2018–XXXX, XX p., Available here: https://doi.org/10.3133/ofr2018xxxx.

Kanzer, D., 2018. Personal Communication with Dave Kanzer, Deputy Chief Engineer for the Colorado River District. Email correspondence January 11, 2018.

QSI, 2018. CWCB NASA Re-Process Colorado Priority Sites LiDAR, Technical Data Report. Prepared for Colorado Water Conservation Board. Prepared by Quantum Spatial – QSI Corvallis. 517 SW 2nd Street, Suite 400. Corvallis, OR 97333.

USBR 2011. Final Environmental Assessment – Tri-County Water Hydropower Project. Western Colorado Area Office, Upper Colorado Region. Available here: https://www.usbr.gov/uc/envdocs/ea/Ridgway/finalEA.pdf

USBR, 2015. Formulating Guidelines for Reservoir Sustainability. United States Bureau of Reclamation (USBR). Technical Services Center – Denver Federal Center. Denver CO, 80225. Available here: https://www.usbr.gov/research/projects/download_product.cfm?id=1372

USBR, 2017. Selenium Management Program Gunnison River Basin, Colorado Annual Progress Report 2016. Prepared by the United States Bureau of Reclamation in Cooperation with the Selenium Management Program Workgroup. USBR Upper Colorado Region, Wester Colorado Area Office. Grand Junction, CO 81501.

Woodling, 2012. Uncompahgre River Water Quality Report 2012. Uncompahgre Watershed Partnership. Written by John.

P:\151-032 Ouray County - UUB\REPORT UUB Water Supply Protection and Enhancement Project Phase 2\20200608 - Upper Uncompahgre Basin Water Supply Enhancement Plan Phase II Report final.docx

TABLES

Table 1

Steering Committee Meetings Summary

Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan Phase II

Steering Committee (Ouray County Resolution No. 2017-041)	
Ouray County Citizen and Water Attorney	Log Hill / Fairway Pines / Divide Ranch Representative
Wright Water Engineers, Inc - Consultant	Dallas Water Company
Trout Unlimited	Double RL Ranch
Ouray County Water Users Association	Telluray Ranch
Tri-County Water	Sleeping Indian Ranch
Shavano Soil Conservation District	J Bar M Ranch
Town of Ridgway	Wolf Cattle Company
City of Ouray	Sawtooth Ranch
Ouray County	Chimney Peak Ranch
Uncompahgre Watershed Partnership	Hydro-Electric Operators or Facilities
Colorado River Water Conservation District	Other Participants

Steering Committee Meeting Summary

Meeting Date	Meeting Subject
August 16, 2018	Kickoff Meeting - Present purpose of project and review of previous work.
October 19, 2018	Review of Ridgway Reservoir operations and Cow Creek diurnal flow pattern. Review potential water supply projects and efficiency
November 1, 2018	Ridgway Reservoir model development and calibration. Ridgway hydropower model development and calibration. Review of potential additional water supply projects in the Upper Uncompahgre Basin. Ridgway Reservoir operations scenario to provide 2,100 ac-ft of additional depletions upstream of Reservoir.
April 24, 2019	Cow Creek diurnal flow study. Review of conceptual project location to bring some water from Cow Creek into Ridgway Reservoir. Review of potential irrigation efficiency projects. Selection of preferred potential reservoir site.
July 10, 2019	CWCB presentation on instream flow program. Initial findings of water quality investigation and discussions with Colorado Parks and Wildlife. Present findings of Cow Creek flow dampening reservoir analysis and water available to be diverted to Ridgway Reservoir. Review of potential irrigation efficiency projects.

Meeting Attendees

Representing	Name(s)
Ouray County	Ben Tisdel
Telluray / Broken Arrow Ranches	Bob Thomas
Dallas Creek Water Company	Bobbi Rouse
Trout Unlimited and local Ouray County water user	Cary Denison
Ouray County	Connie Hunt
Ouray County Water Users Association	Daris Jutten
Ouray County	Don Batchelder
Colorado River District	Eric Kuhn
Ouray Hydro Power Facility	Eric Jacobson
Ouray County Water Users Association	Jack Flowers
Uncompahgre Watershed Partnership	Jay Montgomery
	Jeff Lee
Town of Ridgway	Jen Coates
Uncompahgre Valley Water Users Association	Steve Anderson
	Russ Meyer
Town of Ridgway	Chase Jones
City of Ouray	Joe Coleman
	John Osterberg
Ouray County	John Peters
Tri-County Water Conservancy District	Kathleen Margetts
Tri-County Water Conservancy District	Mike Berry
	Richard Wojciechowaki
Colorado Parks and Wildlife	Katie Birch
Shavano Ditch	Ken Lipton
Fisher Ranch	Linda Ingo
	Mark Hartman
Ouray County	Marti Whitmore
Ouray County	Carol Viner
Trout Unlimited	Cary Dennison
Double R L Ranch	Oakley Kelly
	Paul Stashick
J Bar M Ranch	Porter McConnell
Colorado Water Conservation Board	Rob Viehl
Sleeping Indian Ranch and Local Ouray County water user	Scott Hill
Uncompahgre Watershed Partnership	Scott Williams

Table 2
Average Annual Discharge at Various Stream Gages in the UUB
Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan Phase II

Water Year	CDWR Cow Creek Near Ridgway Reservoir (COWCRKCO)		USGS 09147000 Dallas Creek Near Ridgway, CO		USGS 09146020 Uncompahgre River Near Ouray, CO		USGS 09147500 Uncompahgre River at Colona, CO	
	Average Annual Flow (cfs)	Annual Volume (AF)	Average Annual Flow (cfs)	Annual Volume (AF)	Average Annual Flow (cfs)	Annual Volume (AF)	Average Annual Flow (cfs)	Annual Volume (AF)
2002	Time period before gage was installed		14.6	10,349	59.1	42,757	116.1	84,079
2003			27.1	18,977	109.0	78,875	162.9	117,967
2004			25.0	16,231	119.3	83,574	217.3	157,731
2005			38.6	25,824	147.1	106,498	281.5	203,817
2006			25.8	19,056	119.9	86,817	202.9	146,862
2007			43.4	28,909	158.1	114,477	283.0	204,863
2008			57.8	38,230	165.4	120,161	353.0	256,233
2009	76.5	57,567	39.2	26,902	131.2	94,614	271.7	196,699
2010	52.5	38,069	42.9	27,103	132.9	96,236	247.1	178,892
2011	72.2	52,272	38.5	25,313	157.5	114,002	313.7	227,077
2012	25.5	18,495	20.9	14,890	79.4	57,598	146.0	105,979
2013	36.9	26,726	21.5	14,580	88.3	65,700	125.8	91,076
2014	45.9	33,167	40.5	25,718	148.5	107,482	255.7	185,098
2015	67.3	48,657	37.5	23,631	130.6	94,430	270.0	195,505
2016	59.0	42,986	46.1	29,530	134.1	97,174	271.2	196,858
2017	73.2	52,861	46.0	29,213	154.7	111,970	281.2	203,600
2018	33.0	23,770	9.8	7,771	69.2	50,105	114.9	83,165
Average	54.2	39,457	33.8	22,484	123.8	89,557	230.2	166,794
2002 (Dry Year) Percent of Average	N/A	N/A	43%	46%	48%	48%	50%	50%
2012 (Dry Year) Percent of Average	47%	47%	62%	66%	64%	64%	63%	64%
2018 (Dry Year) Percent of Average	61%	60%	29%	35%	56%	56%	50%	50%

Notes:

1) The CDWR Cow Creek Stream Gage was installed in Spring of 2008.
2) Annual Flow Volume is calculated from incremental stream gage flow data. COWCRKCO is hourly gage data. The USGS Dallas Creek and Uncompahgre River Near Ouray are fifteen-minute gage data. The USGS Uncompahgre River at Colona is average daily data.

Table 3
Average Annual Discharge at USGS Stream Gage 09146200
Uncompahgre River near Ridgway, CO Sorted Wettest to Driest
Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan Phase II

Water Year	Average Annual Discharge (CFS)	Estimated Average Annual Discharge Volume (AF)
1984	270.0	195,472
1983	244.3	176,866
1997	236.4	171,146
1995	235.9	170,784
1985	225.4	163,183
2008	213.2	154,350
1986	209.8	151,889
1965	205.8	148,993
2011	202.1	146,314
1975	201.5	145,880
1973	199.1	144,142
1979	197.3	142,839
1982	197.2	142,767
1970	196.7	142,405
2019	195.4	141,464
2007	189.9	137,482
1978	189.7	137,337
1987	188.7	136,613
2005	187.9	136,034
1993	187.0	135,382
2017	183.3	132,703
1999	182.9	132,414
2009	180.4	130,604
1968	175.0	126,695
2016	172.6	124,957
1962	172.4	124,812
1971	168.4	121,916
2014	168.3	121,844
2010	168.2	121,772
1991	164.6	119,165
2015	163.3	118,224
1992	163.0	118,007
1960	162.0	117,283
1998	161.7	117,066
2004	157.9	114,315
1964	157.8	114,242
1969	157.2	113,808
2006	152.8	110,622
2001	149.7	108,378
1996	149.6	108,306
1961	148.6	107,582
1966	144.3	104,469
1994	140.7	101,862
1974	140.1	101,428
1980	138.4	100,197
2003	135.0	97,736
1988	134.9	97,663
1959	131.7	95,347
1967	127.5	92,306
2000	126.7	91,727
1976	122.6	88,759
1963	121.1	87,673
1990	118.9	86,080
1972	116.8	84,560
1989	113.0	81,808
2013	112.7	81,591
1981	111.2	80,505
2012	103.9	75,220
2018	86.0	62,261
2002	75.2	54,442
1977	72.6	52,560
Average	**164.0**	**118,758**

Table 4

Ouray County Structures With Decreed Amounts

Upper Uncompahgre Basin Water Supply Protection and Enhancement Project Phase II

Structure Name	Decreed Diversion Rate (cfs)	Interbasin Ditch?	Irrigated Land On Mancos Shale?
Alkali Ditch D No 80	39.50	Yes	Yes
Alkali No 2 Ditch	36.71	Yes	Yes
Burkhart Eddy Ditch	15.00	Yes	Yes
Carroll Ditch	4.00	Yes	Yes
Chaffee Ditch	4.93	Yes	No
Dallas Ditch	41.25	Yes	Yes
Hayes Teague	3.66	Yes	No
Hockley Lateral Ditch	4.50	Yes	Yes
Hosner Rowell Ditch	18.10	Yes	Yes
Leopard Ditch	21.00	Yes (trans-basin)	Yes
Sneva Ditch	36.00	Yes	Yes
Switzerland Ditch	4.00	Yes	No
Swyhart Ditch	2.00	Yes	No
Von Hagen Dallas Ditch	13.00	Yes	Yes
Von Hagen Lateral Ditch	13.50	Yes	Yes
Brown Ditch	12.13	No	Yes
Charley Logan Ditch	15.00	No	No
Cronenberg Ditch	12.25	No	Yes
Doc Wade Ditch	20.50	No	Yes
Gibson Ditch	11.50	No	Yes
Heath Ditch	10.50	No	No
Henry Trenchard Ditch	12.00	No	Yes
Homestretch Ditch	14.00	No	Yes
Hosner Brownyard Ditch	13.10	No	No
Hyde Sneva Ditch	15.08	No	Yes
Mayol Lateral Ditch	15.00	No	No
Mayol Sisson Ditch	13.25	No	No
Moody No1 Ditch	26.14	No	No
Old Agency Ditch	12.75	No	Yes
Owl Creek Ditch	12.00	No	Yes
Park Ditch	21.00	No	No
Pinion Ditch	22.73	No	Yes
Reed Overman Ditch	27.25	No	Yes
Ridgway Ditch	27.00	No	No
Roswell Hotchkiss Ditch	11.58	No	No
Ruffe Wade Ditch	10.00	No	Yes
Shortline D Cow Creek	14.00	No	Yes
Thomas Cow Trail Ditch	16.00	No	No
Tierra Colo Ditch	30.02	No	No
Trenchard Ditch	16.25	No	Yes
Upper Uncompahgre Ditch	13.00	No	No
Vance Ditch	17.13	No	No
Betty Ditch	14.00	No	Yes

Non-interbasin ditches below 10 cfs are not included

Table 5
Selected Waterbody Segments in the Upper Uncompahgre Basin with Impairments Aquatic Life Class 1, TMDL's or an Aquatic Life Class 2 Use Designation

Upper Uncompahgre Basin Water Supply Protection and Enhancement Project Phase II

Waterbody Segment Description	Waterbody Segment ID	Use Designations	Known Impairments	Category / List
Mainstem of Red Mountain Creek from the source to immediately above the confluence with the East Fork of Red Mountain Creek	COGUUN06a_A	Agriculture Aquatic Life Class 2 - Cold Water Recreation - Not Assessed	Zinc (Dissolved) Silver (Dissolved) Copper (Dissolved)	4a. - TMDL 5. - 303(d) 5. - 303(d)
Mainstem of Red Mountain Creek from immediately above the confluence with the East Fork of Red Mountain Creek to the confluence with the Uncompahgre River. All tributaries to Red Mountain Creek within Corkscrew and Champion basins.	COGUUN06b_A	Agriculture Aquatic Life Class 2 - Cold Water Recreation - Exisitng	No listed impairments for - Aquatic Life Class 2	
Mainstem of the Uncompahgre River from the source (Poughkeepsie Gulch) to a point immediately above the confluence with Red Mountain Creek.	COGUUN02_A	Agriculture Aquatic Life Class 1 - Cold Water Recreation - Potential Water Supply	Lead (Dissolved) Copper (Dissolved) Zinc (Dissolved) Cadmium (Dissolved) pH	3b. - M&E List 4a. - TMDL 4a. - TMDL 4a. - TMDL 5. - 303(d)
Mainstem of the Uncompahgre River from a point immediately above the confluence with Red Mountain Creek to a point immediately above the confluence with Cascade Creek.	COGUUN03a	Agriculture Aquatic Life Class 1 - Cold Water Recreation - Existing Water Supply	Cadmium (Dissolved) Copper (Dissolved) Iron (Total) Zinc (Dissolved) pH	4a. - TMDL 4a. - TMDL 4a. - TMDL 5. - 303(d) 5. - 303(d)
Mainstem of the Uncompahgre River from a point immediately above the confluence with Cascade Creek to a point immediately above the confluence with Dexter Creek.	COGUUN03b	Agriculture Aquatic Life Class 1 - Cold Water Recreation - Existing Water Supply	Cadmium (Dissolved) Copper (Dissolved) Iron (Total)	4a. - TMDL 4a. - TMDL 4a. - TMDL
Mainstem of the Uncompahgre River from a point immediately above the confluence with Dexter Creek to a point immediately below the confluence with Dallas Creek.	COGUUN03c	Agriculture Aquatic Life Class 1 - Cold Water Recreation - Existing Water Supply	Cadmium (Dissolved) Copper (Dissolved) Iron (Total)	4a. - TMDL 4a. - TMDL 4a. - TMDL
Commodore Gulch and its tributaries	COGUUN05_B	Agriculture Aquatic Life Class 2 - Cold Water Recreation - Existing Water Supply	Cadmium (Dissolved) Copper (Dissolved) Lead (Dissolved) Zinc (Dissolved)	3b. - M&E list 3b. - M&E list 3b. - M&E list 5. - 303(d)
Governor Basin	COGUUN05_C	Agriculture Aquatic Life Class 2 - Cold Water Recreation - Existing Water Supply	Cadmium (Dissolved) Copper (Dissolved) Zinc (Dissolved) Lead (Dissolved)	5. - 303(d) 5. - 303(d) 5. - 303(d) 5. - 303(d)
Silver Creek	COGUUN05_D	Agriculture Aquatic Life Class 2 - Cold Water Recreation - Existing Water Supply	Lead (Dissolved)	3b. - M&E list
Sneffels Creek below Governor Basin	COGUUN05_E	Agriculture Aquatic Life Class 2 - Cold Water Recreation - Existing Water Supply	Zinc (Dissolved) Cadmium (Dissolved) Macroinvertebrates Lead (Dissolved)	5. - 303(d) 5. - 303(d) 5. - 303(d) 5. - 303(d)
Mainstem of Mineral Creek from the source to the confluence with the Uncompahgre River.	COGUUN08_A	Agriculture Aquatic Life Class 2 - Cold Water Recreation - Potential Water Supply	Copper (Dissolved) Zinc (Dissolved) Cadmium (Dissolved)	5. - 303(d) 5. - 303(d) 5. - 303(d)
Mainstem and all tributaries of Sneffels Creek from a point 1.5 miles above its confluence with Imogene Creek at 37.974979, -107.753960 (WGS84) to its confluence with Imogene Creek.	COGUUN09_B	Agriculture Aquatic Life Class 2 - Cold Water Recreation - Potential	Macroinvertebrates Cadmium (Dissolved) Zinc (Dissolved) Lead (Dissolved)	3b. - M&E list 5. - 303(d) 5. - 303(d) 5. - 303(d)
Mainstem of Canyon Creek from its inception at the confluence of Imogene Creek and Sneffels Creek to the confluence with the Uncompahgre River.	COGUUN09_C	Agriculture Aquatic Life Class 2 - Cold Water Recreation - Potential	Zinc (Dissolved)	5. - 303(d)
Mainstem of Dallas Creek	COGUUN11_G	Agriculture Aquatic Life Class 1 - Cold Water Recreation - Potential Water Supply	Temperature	3b. - M&E List
Mainstem of Cow Creek from the confluence of Nate Creek to the Uncompahgre River.	COGUUN10a_C	Agriculture Aquatic Life Class 1 - Cold Water Recreation - Potential Water Supply	Arsenic (Total)	5. - 303(d)

Aquatic Life Class I Cold Water: These are waters that (1) currently are capable of sustaining a wide variety of cold water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.

Aquatic Life Class I Warm Water: These are waters that (1) currently are capable of sustaining a wide variety of warm water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.

Aquatic Life Class 2 Cold and Warm Water: These are waters that are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.

Water Supply Use: These surface waters are suitable or intended to become suitable for potable water supplies.

Use Reporting Category Definitions

Category 1: Attaining water quality standards for all classified uses.
Category 2: Attaining water quality standards for some classified
Category 3a: Lacking data to determine whether or not classified uses are being attained.
Category 3b: Segment placed on the Monitoring and Evaluation List.
Category 4: Not supporting a standard for one or more classified uses, but a TMDL is not needed.
Category 4a: TMDL has been completed.
Category 4b: Plan for attainment of water quality standards.
Category 4c: Impairment not caused by a pollutant.
Category 5: Not meeting applicable water quality standards for one or more classified uses by one or more pollutants (303(d) waterbodies).

https://www.colorado.gov/pacific/cdphe/tmdl-gunnison-and-lower-dolores-river-basins
http://www.uncompahgrewatershed.org/wp-content/uploads/2019/02/UncompahgreRiverWaterQualityReport-2012.pdf
https://www.colorado.gov/pacific/cdphe/water-quality-control-commission-regulations

Table 6

Calculated Additional Winter Season Release From Ridgway Reservoir to Meet Minimum Flow Targets for Aquatic Species

Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan Phase II

Winter	Additional Winter Season Release From Ridgway Reservoir to Meet Minimum Flow Targets (AF)		
	Minimum Flow Target Below Reservoir		
	50 CFS	60 CFS	70 CFS
2014 - 2015	111	268	805
2015 - 2016	22	165	754
2016 - 2017	155	420	998
2017 - 2018	617	1702	3705
2018 - 2019	368	1660	3717
Average	254	843	1996
Maximum	617	1702	3717
Minimum	22	165	754

Notes:

1) Winter is defined as November through March.

Table 7

Target Recreational Flow Summary for Whitewater Attributes in the Upper Uncompahgre Basin

Upper Uncompahgre Basin Water Supply and Protection Plan Phase II

Whitewater Attribute	Segment Description	USGS Gage Used for Assessing Whitewater Attribute	Minimum Flow (cfs)	Optimum Flow Range (cfs)		Acceptable Flow (cfs)	
				Min	Max	Min	Max
Uncompahgre River above Ridgway Reservoir	Ouray to KOA Camp Ground Rollans Park to Ridgway Reservoir	USGS Gaged Streamflow - 09146020 Uncompahgre River Near Ouray	500	600	1800	500	2000
Uncompahgre River	Ridgway Whitewater Park	USGS Gaged Streamflow - 09146200 Uncompahgre River Near Ridgway	500	600	900	500	2000
Uncompahgre River below Ridgway Reservoir	Billy Creek to Trout Road	USGS Gaged Streamflow - 09147500 Uncompahgre River at Colona	400	500	1400	400	2000

Source: American Whitewater Association Report - Assessing Streamflow Needs for Whitewater Recreation in the Gunnison River Basin.

Table 8
Average Daily Flow Volume Needed to Meet Target Minimum Optimum Recreational Flow

Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan Phase II

Year	Uncompahgre River below Ridgway Reservoir	
	Average Daily Volume Needed to Meet Target Minimum Optimum Flow (AF)	
	Peak Season	Peak Two Weeks
2002	676	723
2012	519	594
2013	596	574
2018	557	510
Average (AF)	587	600
Average (CFS)	296	303

Notes:

1) Table is limited to years 2002, 2012, 2013, and 2018 because these are year when the minimum optimum flow did not occur.
2) **Peak Season:** May 1st to August 31st
3) **Peak Two Weeks:** July 1st to July 14th

Table 9

Comparison of Actual Hydropower Produced by Ridgway Reservoir and Modeled Hydropower Produced (2015 to 2018)

Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan Phase II

Year	2015		2016		2017		2018	
	Historical Hydropower Produced (MWH)	Modeled Hydropower Produced (MWH)	Historical Hydropower Produced (MWH)	Modeled Hydropower Produced (MWH)	Historical Hydropower Produced (MWH)	Modeled Hydropower Produced (MWH)	Historical Hydropower Produced (MWH)	Modeled Hydropower Produced (MWH)
January	482	497	415	381	403	354	453	355
February	486	449	446	354	429	420	361	291
March	984	908	952	866	602	945	380	324
April	2,037	1,867	848	833	2,054	2,278	309	284
May	1,979	2,035	4,532	4,363	3,416	3,011	2,112	1,885
June	5,384	5,921	4,859	5,654	4,882	5,258	2,138	1,886
July	4,548	4,689	4,002	4,865	5,040	4,828	2,390	2,104
August	3,978	3,905	4,238	4,291	4,479	4,226	920	726
September	2,250	2,158	1,717	1,632	2,379	2,253	271	225
October	1,161	173	949	976	782	711	136	358
November	85	405	239	363	441	422		
December	441	412	352	326	431	415		
Total	**23,815**	**23,420**	**23,551**	**24,902**	**25,338**	**25,122**	**9,470**	**8,438**
Percent Error		**-2%**		**6%**		**-1%**		**-11%**

Notes:

1) Based on the hydropower production data from Tri County, at times, the hydropower turbines were turned off for maintenance or other system management purposes. The hydropower model assumes continuous operation of the turbines and does not consider these periods.

2) The hydropower production data from Tri County is reported from a totalizing meter. There are period of missing days within the data which, at times, do not have end of month readings. Therefore, the specific reported total for each month should be considered a calculated estimate.

Table 10

Estimate of Annual Hydropower Revenue Lost Due to Additional 2,100 AF Depletion in Ridgway Reservoir (2015 to 2018)

Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan Phase II

Month	2015		2016		2017		2018	
	Modeled Hydropower Produced (MWH)	Modeled Hydropower Produced With 2,100 AF Depletion (MWH)	Modeled Hydropower Produced (MWH)	Modeled Hydropower Produced With 2,100 AF Depletion (MWH)	Modeled Hydropower Produced (MWH)	Modeled Hydropower Produced With 2,100 AF Depletion (MWH)	Modeled Hydropower Produced (MWH)	Modeled Hydropower Produced With 2,100 AF Depletion (MWH)
January	497	492	381	377	354	350	355	303
February	449	445	354	351	420	416	291	249
March	908	900	866	857	945	932	324	291
April	1,867	1,847	833	823	2,278	2,232	284	284
May	2,035	1,682	4,363	4,248	3,011	2,558	1,885	1,858
June	5,921	5,752	5,654	5,256	5,258	5,252	1,886	1,879
July	4,689	4,664	4,865	4,839	4,828	4,807	2,104	2,086
August	3,905	3,873	4,291	4,253	4,226	4,192	726	718
September	2,158	2,136	1,632	1,615	2,253	2,227	225	225
October	173	170	976	965	711	703	358	357
November	405	401	363	359	422	290		
December	412	408	326	322	415	352		
Total (MWH)	**23,420**	**22,771**	**24,902**	**24,263**	**25,122**	**24,310**	**8,438**	**8,250**
Annual Revenue Estimate ($)	**$1,619,265**	**$1,574,402**	**$1,721,751**	**$1,677,559**	**$1,736,902**	**$1,680,809**	**$583,407**	**$570,384**
Estimated Revenue Lost ($)		**$44,863**		**$44,192**		**$56,093**		**$13,023**
Estimated Revenue Lost ($/AF)		**$21**		**$21**		**$27**		**$6**

Average Annual Revenue Lost ($) =	**$39,543**
Average Annual Revenue Lost ($/AF) =	**$19**

Notes:

1) Revenue generated per MWH = $69.14 per MWH

Table 11

Total Estimated Annual Volume (AF) Diverted to Ridgway Reservoir from Cow Creek by Water Year for 20 cfs Physical Diversion Limit with Flow Dampening Reservoir

Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan Phase II

Water Year	Volume Diverted (AF)	Flow Dampening Reservoir Size (AF)
2009	10,813	2,192
2010	8,773	1,578
2011	11,603	1,359
2012	8,403	490
2013	8,801	836
2014	7,578	1,321
2015	11,762	1,717
2016	10,038	1,533
2017	12,817	1,280
2018	8,056	708
Average (AF)	9,864	1,302
Minimum (AF)	7,578	490
Maximum (AF)	12,817	2,192
Dry Year (2018)	8,056	708
Dry Year (2012)	8,403	490

Notes:

1) Assumes 6 cfs minimum bypass flow in Cow Creek.

Table 12

Additional Hydropower Produced with Cow Creek Flow Dampening Reservoir and Maximum 20 cfs Diversion to Ridgway Reservoir

Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan Phase II

Year	Total Additional Yield to Reservoir	Additional Yield Through Hydropower Model (AF)	Without Cow Creek Diversion and Flow Dampening Reservoir		With Cow Creek Diversion and Flow Dampening Reservoir		Additional Calculated Hydropower Revenue	
			Calculated Annual Hydropower Generated (MWH)	Calculated Hydropower Revenue ($)	Calculated Annual Hydropower Generated (MWH)	Calculated Hydropower Revenue ($)	$/AF	From Total Additional Yield to Reservoir
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2009	9,694	9,654	25,199	$1,742,283	25,964	$1,795,153	$5	$53,087
2010	10,282	9,296	23,345	$1,614,076	24,764	$1,712,165	$11	$108,490
2011	11,383	7,911	25,105	$1,735,773	26,088	$1,803,707	$9	$97,744
2012	7,035	5,485	13,552	$936,990	14,328	$990,651	$10	$68,825
2013	9,123	7,433	12,313	$851,306	13,608	$940,830	$12	$109,882
2014	9,024	8,589	24,744	$1,710,774	26,289	$1,817,628	$12	$112,274
2015	10,479	10,438	23,420	$1,619,265	25,339	$1,751,912	$13	$133,163
2016	11,566	11,530	24,902	$1,721,751	26,363	$1,822,712	$9	$101,271
2017	11,574	11,513	25,122	$1,736,902	26,593	$1,838,612	$9	$102,254
2018	6,008	5,633	8,438	$583,407	9,270	$640,929	$10	$61,354
						Average	$10	$94,834
						Maximum	$13	$133,163
						Minimum	$5	$53,087

Column Notes:

(1) Total calculated volume of water delivered to Ridgway Reservoir from Cow Creek

(2) Total modeled volume of water delivered through turbines. At times, the additional water delivered from Cow Creek increases the release rate through a turbine within the turbines "flow gap." Under this condition the Cow Creek Diversion is not added to the release. Note that changes in storage as a result of the additional water diverted form Cow Creek are not considered (conservative assumption).

(3) Calculated Annual Hydropower Generated without Cow Creek Diversion.

(4) Column (3) x $69.14 per MWH

(5) Calculated Annual Hydropower Generated with Cow Creek Diversion yield summarized in Column (2).

(6) Column (5) x $69.14 per MWH

(7) (Column (6) - Column (4)) / Column (2)

(8) This calculates the estimated total revenue generated if all of the water form the Cow Creek Diversion Project were able to be utilized by the turbines. Column (1) x Column (7)

Table 13

Estimate of Additional Releases Needed From Ridgway Reservoir Resulting From Cow Creek - Ridgway Reservoir Pipeline Project

Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan Phase II

Water Year	Additional Release Needed to Meet Historical UVWUA Diversion Amount (AF)	Additional Release Needed to Meet Minimum Flow Downstream of Reservoir (AF)
	(1)	(2)
2009	Not Available	1,572
2010		696
2011		202
2012		50
2013		726
2014		113
2015		0
2016		56
2017		83
2018	400	536

Column Notes:

(1) Strategy Two: Cow Creek - Ridgway Reservoir Pipeline and Stabilization Reservoir with following assumptions:

a. Cow Creek Dampening Reservoir target release is the previous 3-day rolling average streamflow.

b. Minimum bypass in Cow Creek is 6 cfs.

c. Maximum physical diversion amount from Cow Creek to Ridgway Reservoir is 20 cfs.

d. Based on the Cow Creek to M&D Model, UVWUA is underdelivered approximately 2,300 AF as a result of Strategy 2. However, the UVWUA may be able to make use of an additional 1,900 AF as a result of flow stabilization. Therefore, the net additional needed release to meet the historical UVWUA diversions is approximately 400 AF.

e. Additional release estimates needed to meet historical UVWUA diversions could not be performed for water years prior to 2018 due to limitations of CDWR's Uncompahgre River accounting sheets prior to 2018.

Table 14
Budget Level Planning Capital Construction Cost Estimate
Cow Creek - Ridgway Reservoir Pipeline Project
Upper Uncompahgre Basin Water Supply and Enhancement Plan Phase II

Description	Cost per Unit	Unit	Reference	Quantity (±)	Cost
Mobilization / Demobilization					
15% of all other work items	$475,000	L.S.	1	1	$475,000
Permit Compliance					
404 Permitting Compliance	$5,000	L.S.	1	1	$5,000
Dewatering	$10,000	L.S.	1	1	$10,000
Stormwater Permit Compliance	$2,000	L.S.	1	1	$2,000
Earthwork					
Earthwork for Diversion Structure	$15	C.Y.	1	500	$8,000
Earthwork for Outlet Structure	$12	C.Y.	1	430	$5,000
Tunnel Boring Machine / Pipeline					
36 inch diameter pipe with max capacity of 20 cfs	$2,300	L.F.	3	1350	$3,105,000
Diversion Structure					
Concrete diversion structure	$10,000	L.S.	1	1	$10,000
Outlet Structure					
Concrete outlet structure	$10,000	Each	1	2	$20,000
Riprap	$190	C.Y.	1	100	$19,000
				Construction Cost Subtotal =	$3,660,000
				Budget Level Estimate Contingency (30% of Construction Cost Subtotal) =	$1,100,000
				Construction Cost Estimate Total =	$4,760,000
				High Range Budget Level Planning Construction Cost (+30%) =	$6,190,000

Exclusions and Assumptions:

Does not include professional engineering fees for geotechnical engineering investigation or other engineering design services.

References:

Based on WWE experience and comparative project bid tabs.

Estimate from Brierley Associates and comparative project unit costs for tunneling.

Table 15
Survey of Reservoir Storage Project Costs
Upper Uncompahgre Basin Water Supply and Protection Enhancement Plan Phase II

Project	Water Division / District	Structure ID	Approximate Elevation (ft)	Location	Storage Volume AF	Construction / Cost Estimate Date	Construction Cost $	Unit Cost $ per AF $/AF	2019 Unit Cost $ per AF $/AF	Owner	New	Expansion	Notes / Comments
Pine Brook Dam	1/6	3367	6250	Boulder County	113	2006	$4,000,000	$35,398	$48,662	Pine Brook Water District	X		ASI Project; RCC, 80' dam height, 4 acre surface area
Genesee Dam	1/9	4330	6800	Idledale, Jefferson Co.	101	2007	$6,100,000	$60,396	$80,930	Genesee Water and Sanitation District	X		ASI Project; 34,500 cy RCC, 40,000 cy excavation, 5,000 cy conc
Dry Creek Dam	1/3	3749	5270	Larimer Co.	331	2006	$3,022,000	$9,130	$12,551	Little Thompson Water District	X		ASI Project; Embankment dam with 60'height, with RCC spillway, 11,000 cy RCC, 1,500 cy conc.
Lake Otonowanda	4/68	3578	8540	Ridgway	500	2015	$2,000,000	$4,000	$4,381	City of Ridgway		X	
Chase Gulch Dam	1/7	3312	8700	Central City, North Clear Creek	602	1996	$3,254,000	$5,405	$9,967	Central, City of	X		ASI Project; 100' dam height, dam embankment 142,000 cy, excavation 105,000 cy, 4,000 cy conc. Faced rock fill; surface area 34.9 acres
Jackson Gulch Dam	7/34	3589	7825	North of Mancos, Montezuma Co.	1,000	2008	$4,400,000 to $8,500,000	$4,400 to $8,500	$5,600 to $10,818	Bureau of Reclamation Mancos Project		X	Existing storage 10,000 AF. Cost Estimate.
Long Hollow Reservoir (Bobby K Taylor)	7/33	3530	6300	La Plata County	5,309	2014	$22,500,000	$4,238	$4,721	La Plata Water Conservancy District	X		
McPhee Reservoir (Dolores Project)	7/71	3614	6940	San Juan, Dolores Basins	8,700	1986	$26,000,000	$2,989	$7,348	Dolores Water Conservancy District	X		
Fortune Reservoir (Welton Dam)	1/2	3083	5790	Jefferson County	10,000	2002	$15,000,000	$1,500	$2,516	Consolidated Mutual Water Company	X		
Elkhead Reservoir	6/44	3902	6390	Craig, Yampa River	13,800	2006	$31,000,000	$2,246	$3,088	Colo River District		X	
Rueter Hess Reservoir	1/8	3347	6160	South Platte, Douglas County	17,000	2007	$120,000,000	$7,059	$9,459	Parker Water and San District	X		
Galeton	1/1	3393	4850	Weld County	45,624	2010	$54,140,000	$1,187	$1,458	Northern Integrated Supply Projects	X		Cost estimate.
Rueter Hess Reservoir	1/8	3347	6160	South Platte, Douglas County	58,000	2012	$170,000,000	$2,931	$3,435	Parker Water and San District		X	
Gross Reservoir	1/6	4199	7300	South Platte, Moffat Project	72,000	2015	$360,000,000	$5,000	$5,476	Denver Water		X	On-stream reservoir. Cost estimate.
Chimney Hollow	1/4	3316	5700	NE of Longmont	90,000	2005	$223,000,000	$2,478	$3,494	Northern Water, Windy Gap Firming Project	X		Cost estimate.
Lake Nighthorse (Ridges Basin Dam)	7/30	3623	6900	La Plata Co.	120,000	2011	$500,000,000	$4,167	$4,973	Animas-La Plata Project	X		
Glade Reservoir	1/3	3900	5300	Larimer Co., NW of Ft. Collins	170,000	2010	$933,000,000	$5,488	$6,742	Northern Integrated Supply Projects	X		Cost estimate.
								Average ($/AF)	$12,534				
								Median ($/AF)	$5,538				
								Maximum ($/AF)	$80,930				
								Minimum ($/AF)	$1,458				

Table 16
Conceptual Summary of Potential Ram's Horn Reservoir Allocation Amounts
Upper Uncompahgre Basin Water Supply and Enhancement Plan Phase II

Conceptual Reservoir Allocation Description	Storage Volume (AF)		Notes and Comments
	Average Year	Dry Year	
1) All Dallas Creek and Upper Uncompahgre River Water Users 2) All Non-Mainstem Cow Creek and Lower Uncompahgre Water Users (in Ouray County)	1,500	4,000	Use Enlargement: estimated storage for 1 years worth of average year or dry year exchange water supply for non-mainstem Region 1 water users, all Region 2 and Region 3 water users, and non-mainstem Region 4 water users. Note, Region 1 and Region 4 mainstem users can be provided with additional physical water supply from the water supply allocation for those Regions.
Water Supply Storage For Lower Uncompahgre River Water Users (in Ouray County)	200	900	Confirming: direct supplemental irrigation water to meet Irrigation Water Requirement for mainstem Region 1 water users.
Water Supply Storage for Mainstem Cow Creek Water Users	1,600	6,100	Confirming: direct supplemental irrigation water to meet Irrigation Water Requirement for mainstem Region 4 water users.
1) Cow Creek and Uncompahgre River instream flow enhancement 2) Carry over storage for dry year firming 3) Supplemental irrigation water for lower Uncompahgre River (Delta and Montrose Counties) 4) Compact Water 5) Dead storage / sediment	22,049	14,349	Amount available for original supplemental irrigation purposes, reservoir firming, and supplemental flow for Aquatic Habitat. Recommend performing a study on Cow Creek and Uncompahgre River below Ridgway Reservoir to determine pool volume needed for Aquatic Habitat.
Total Volume (AF)	**25,349.15**	**25,349.15**	Ramshorn Reservoir was conditionally decreed for 25,349.15 AF of storage in Decree of April 14, 1961, Civil Action No. 2440.

Table 17

Proposed UUB Projects for Gunnison Basin Roundtable IPP List

Upper Uncompahgre Basin Water Supply Protection and Enhancement Project Phase II

IPP Reference No.	Identified Project or Process	Basin Goals Met								
		1	2	3	4	5	6	7	8	9
Currently Identified IPPs										
37	City of Ouray Water Efficiency and Conservation Plan	x			x				x	
38	Ouray County Upper Uncompahgre Basin Wide Augmentation Plan	x	x		x				x	
39	Inventory of Irrigation Infrastructure Improvement Needs - District 68	x		x		x		x	x	
40	Environmental Recreational Project Identification and Inventory - Upper Uncompahgre Region	x				x	x	x		
43	Gunnison Basin Selenium Management Plan and Gunnison Basin Selenium Task Force	x		x			x		x	
45	Development if Upper Uncompahgre Water Supplies	x		x	x				x	
46	Improvements to Red Mountain Ditch	x		x	x				x	
Proposed IPPs Developed from UUB Water Supply Protection and Enhancement Project Phase II										
	Provide Upper Basin Water Users Access to Ridgway Reservoir									
	Cow Creek Flow Dampening Reservoir and Ridgway Reservoir Diversion Project									
	Agricultural Efficiency Projects									
	City of Ouray – Non-potable water supply and water quality proejcts									
	Town Of Ridgway – Water supply and water quality projects									

FIGURES

Figure 1. Gaged Cow Creek Streamflow
Late Season 2018 and 2019

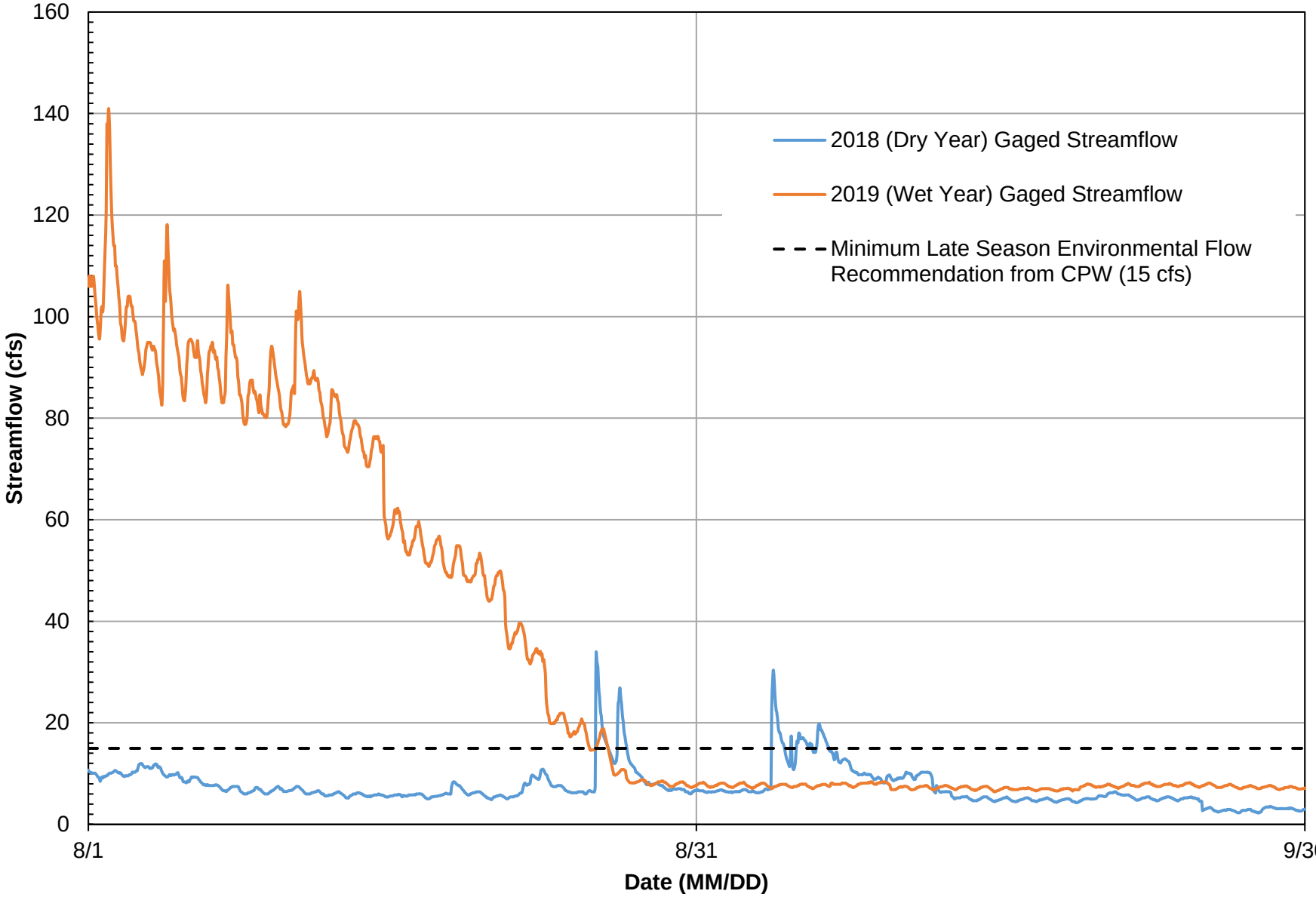


Figure 2. Gaged Dallas Creek Streamflow
Late Season 2018 and 2019

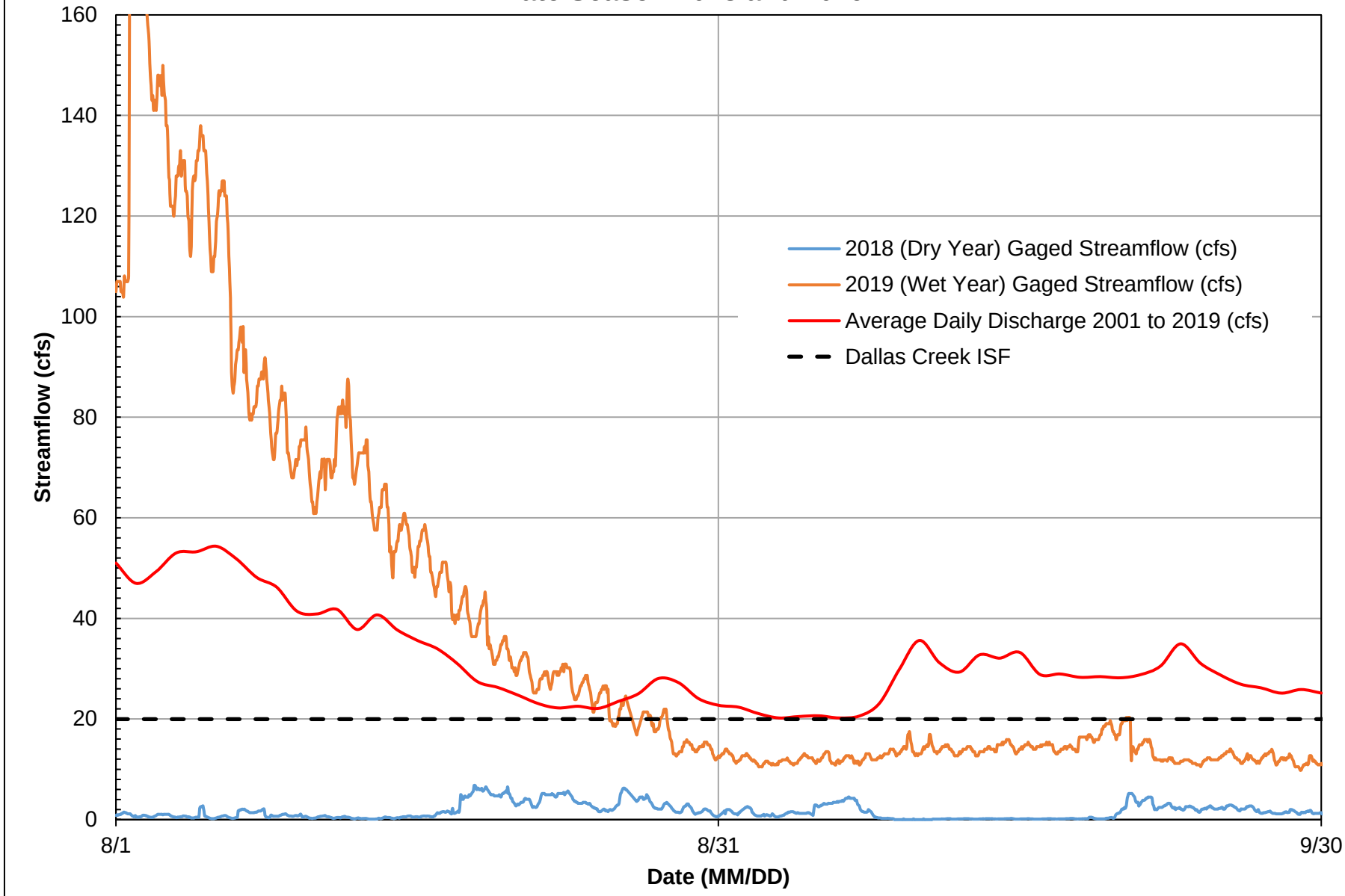


Figure 3. Recreational Flow Summary - Uncompahgre River above Ridgway Reservoir
Ouray to KOA Camp Ground

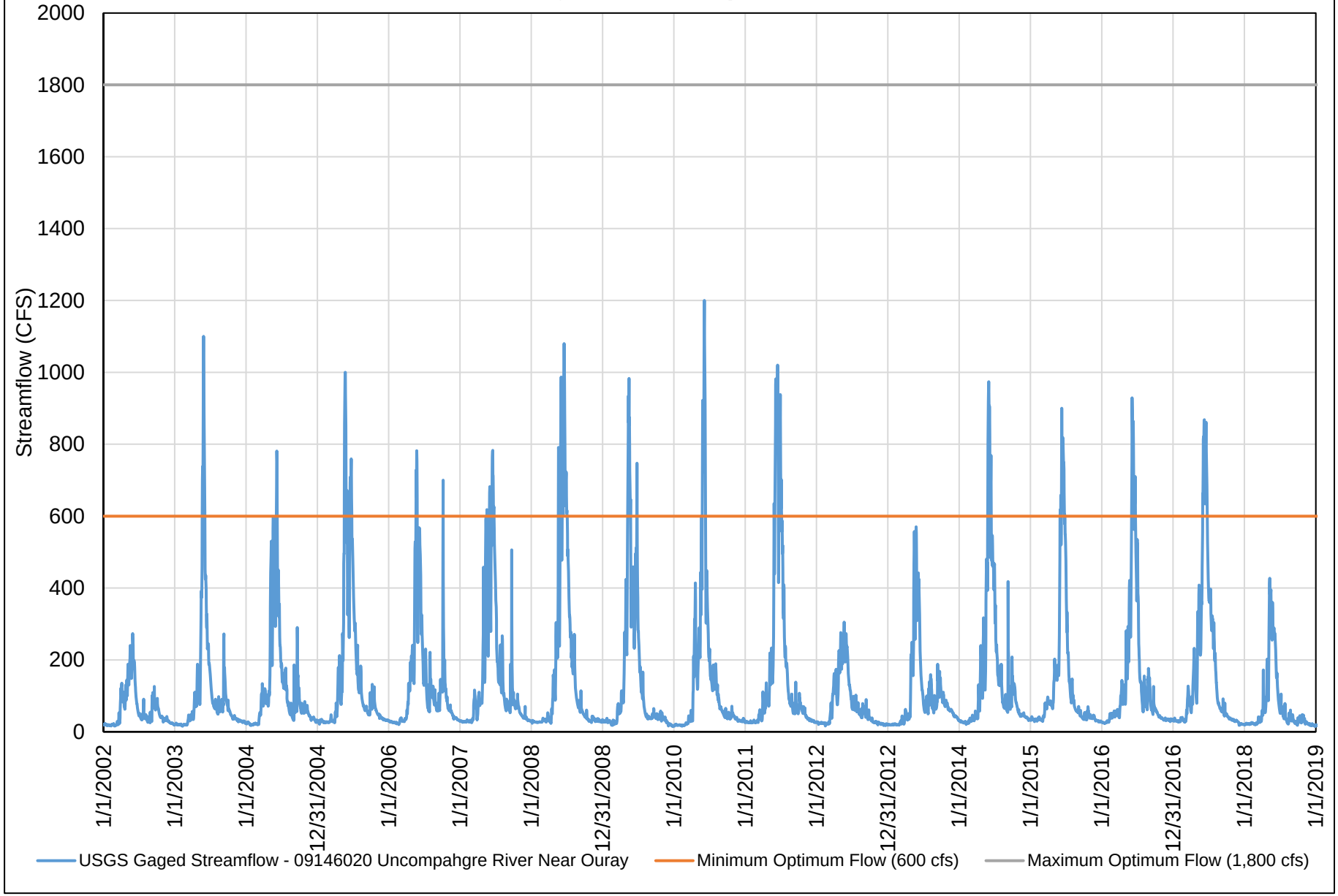


Figure 4. Recreational Flow Summary - Uncompahgre River
Ridgway Whitewater Park and Rollans Park to Ridgway Reservoir

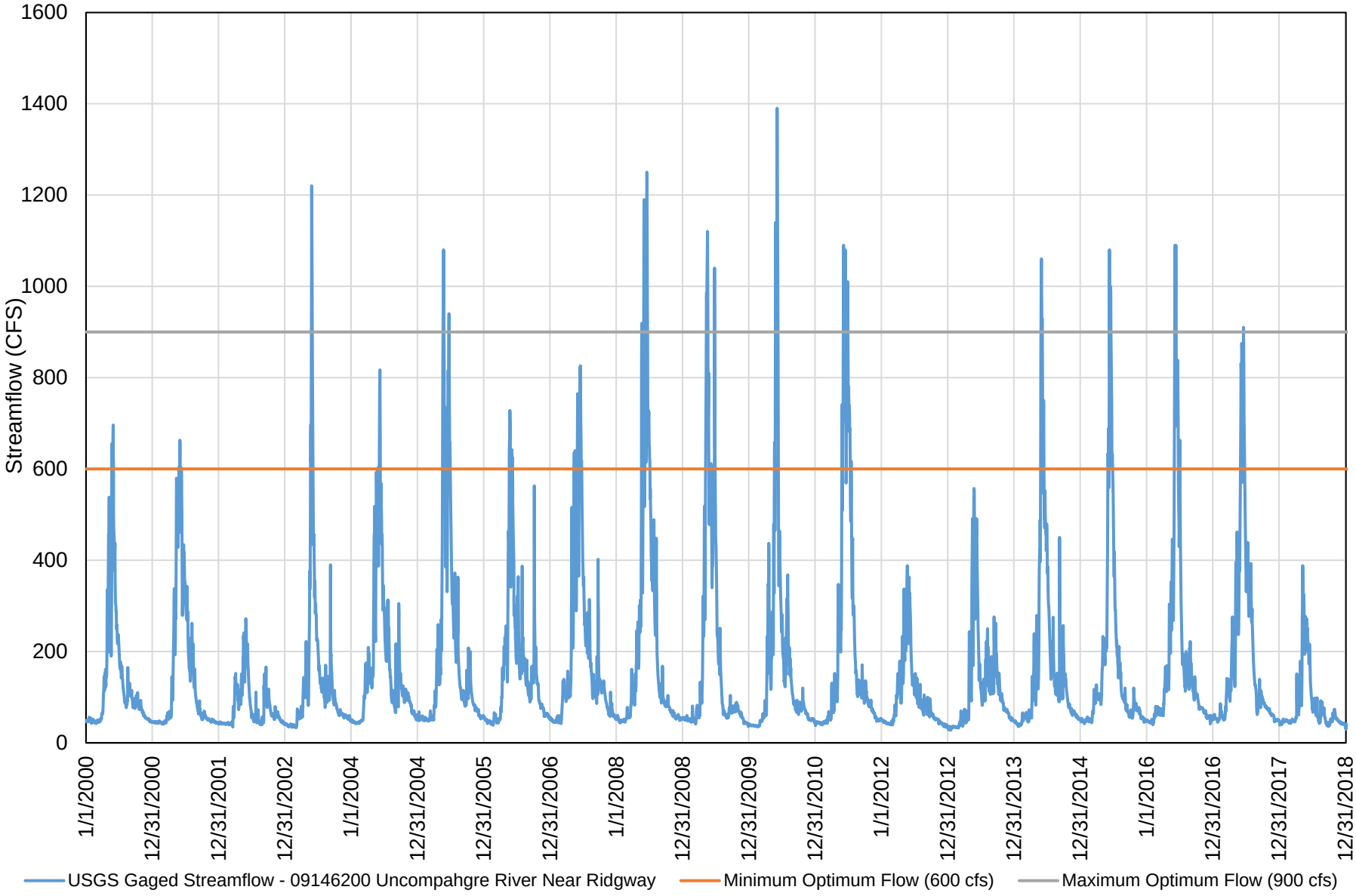


Figure 5. Recreational Flow Summary - Uncompahgre River below Ridgway Reservoir
Billy Creek to Trout Creek

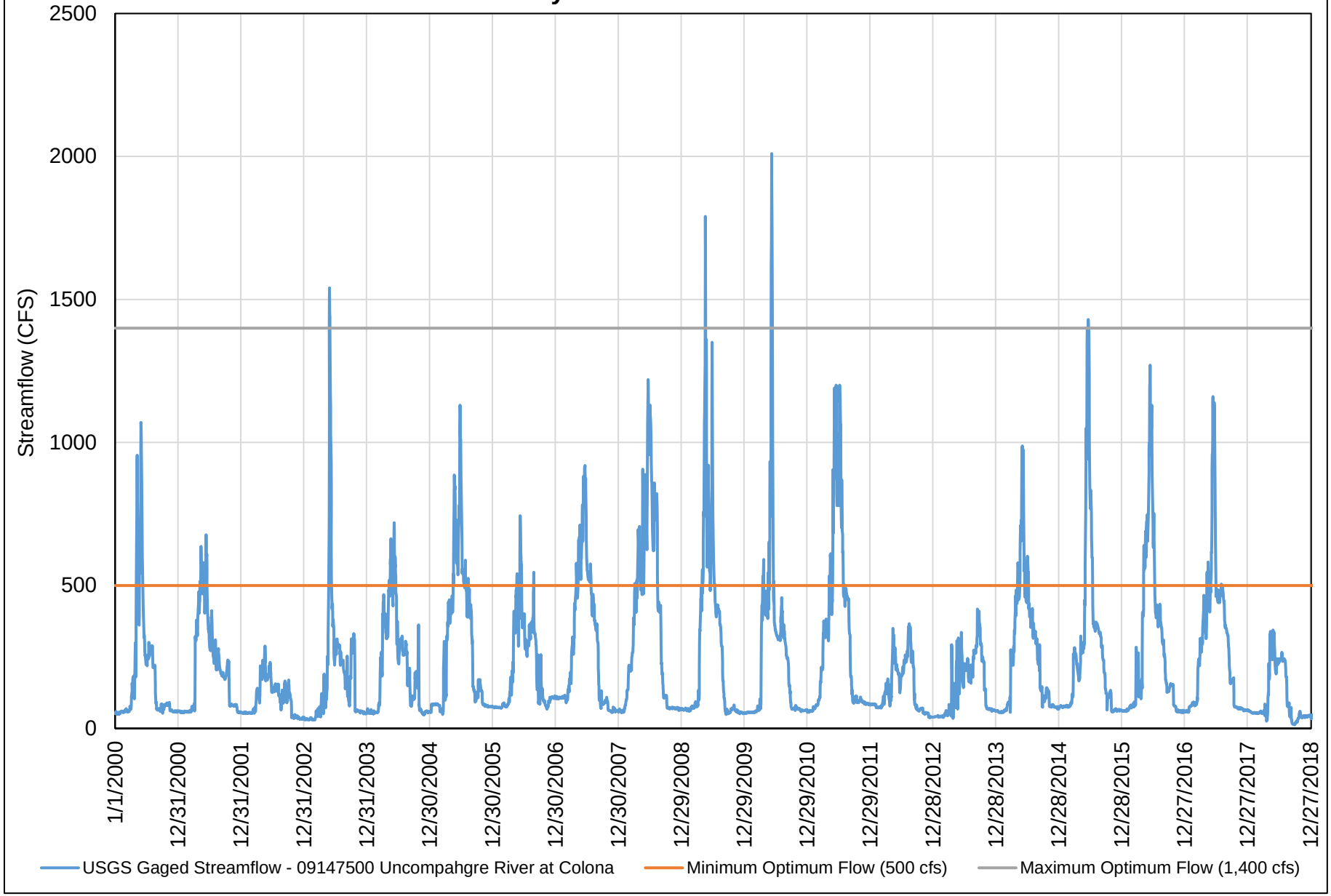


Figure 6. Modeled Ridgway Reservoir Daily Storage Volume Comparison with USBR Historical Data Water Years 2002 to 2018

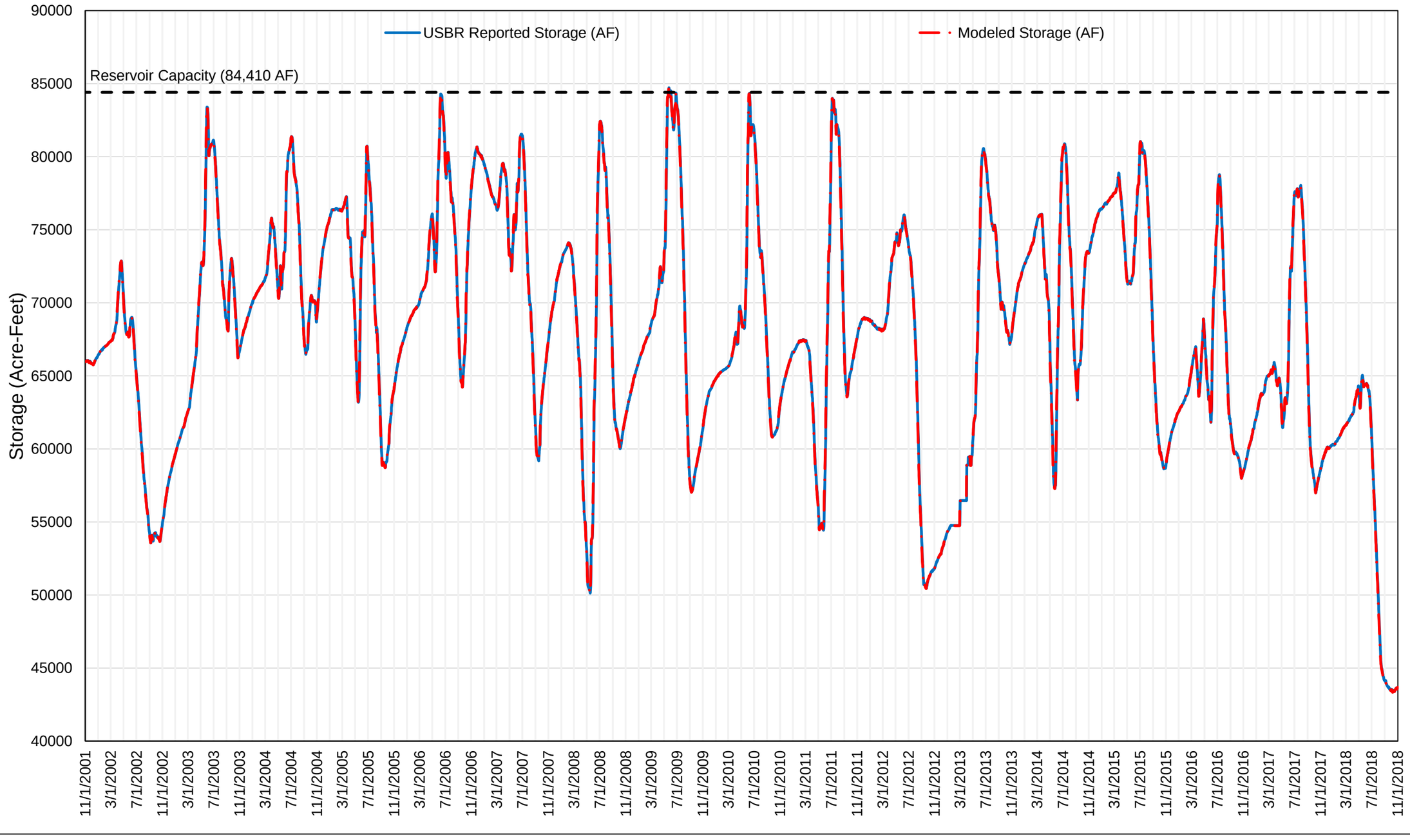


Figure 7. Modeled Ridgway Reservoir Daily Storage Volume with Additional 2,100 AF Depletion
Comparison with Historical USBR Data
Water Years 2002 to 2004

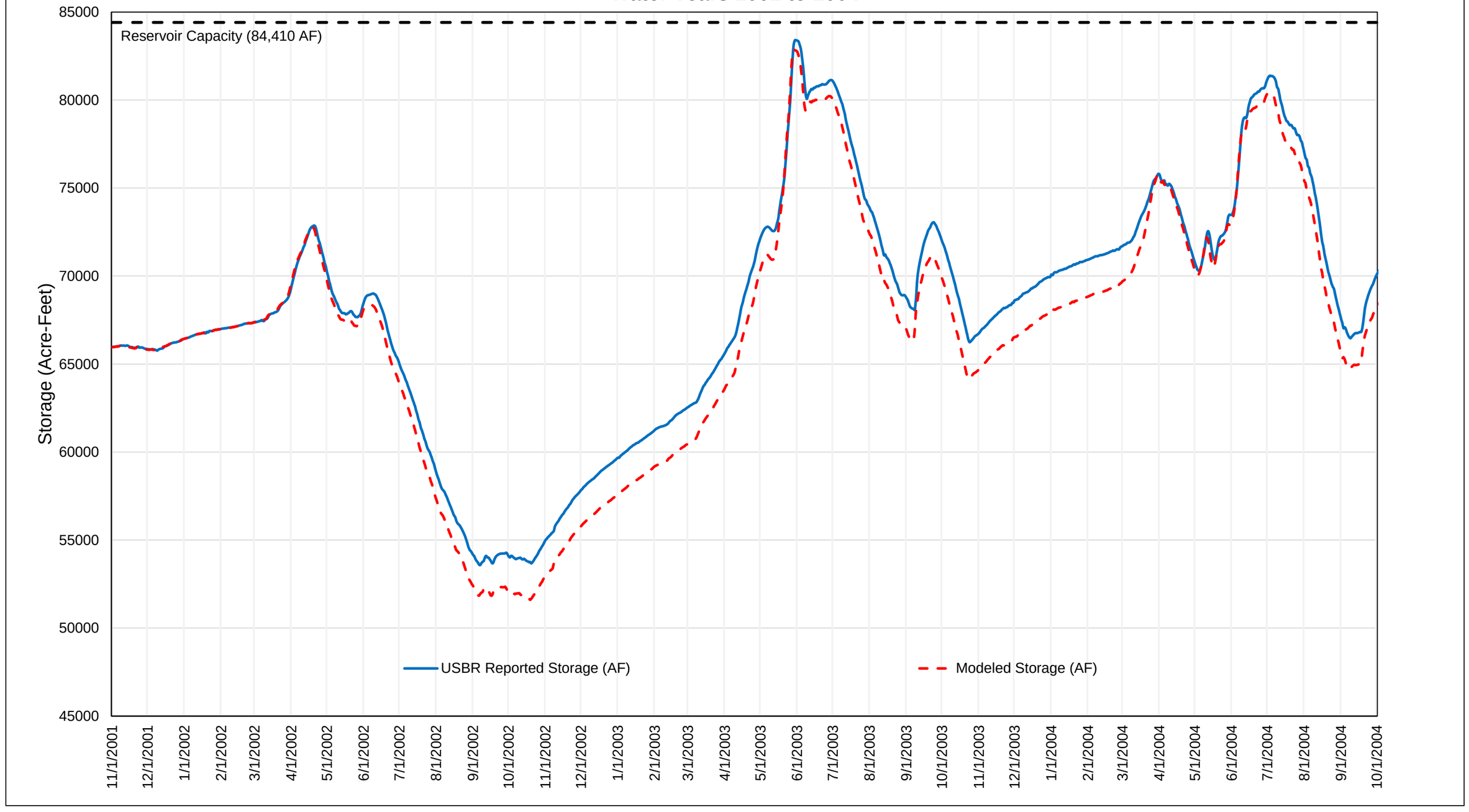


Figure 8. Modeled Monthly Ridgway Reservoir Releases with Additional 2,100 AF Depletion
Comparison with Historical USBR Data
Water Years 2002 to 2004

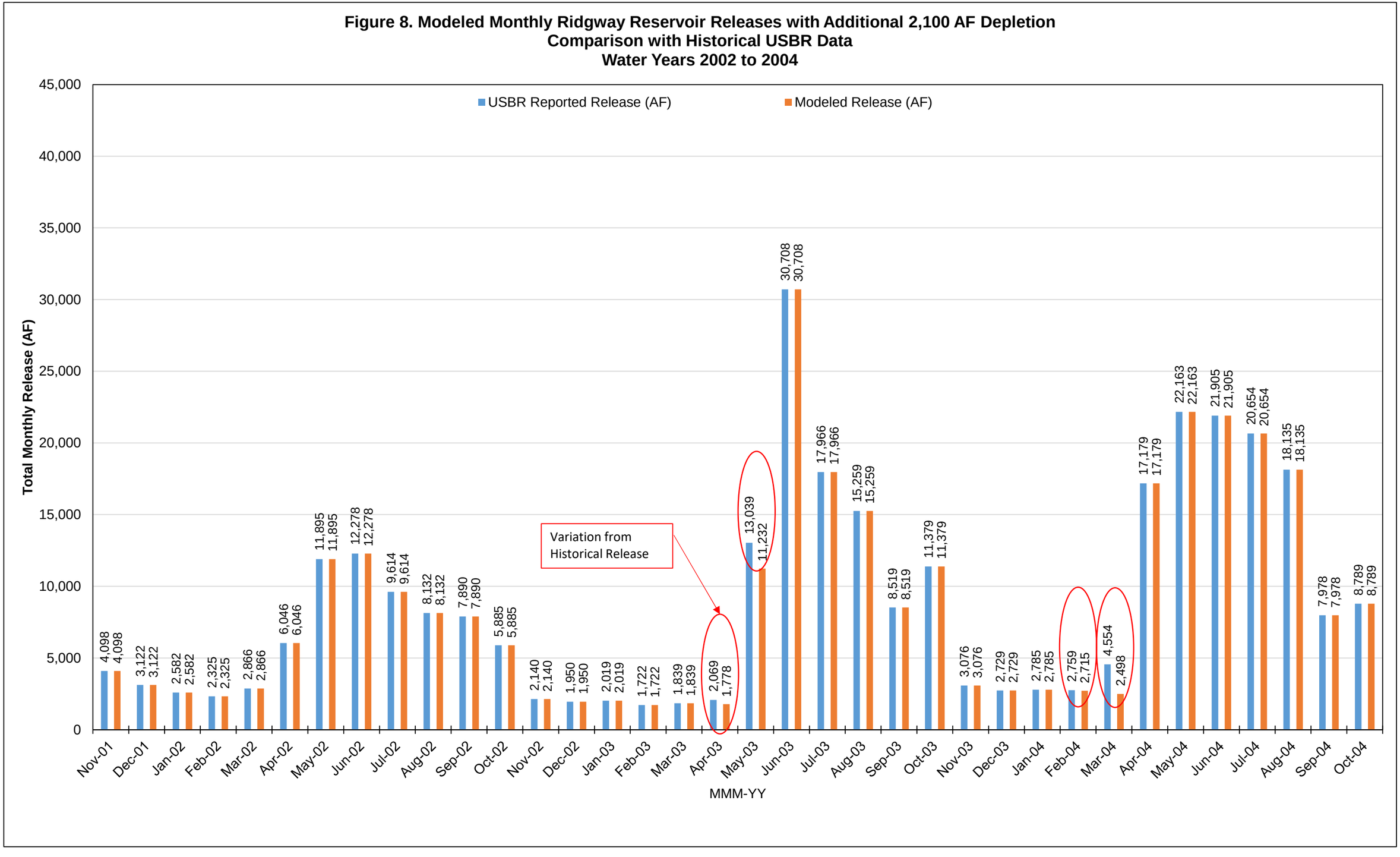


Figure 9. Modeled Ridgway Reservoir Daily Storage Volume with Additional 2,100 AF Depletion
Comparison with Historical USBR Data
Water Years 2008 to 2010

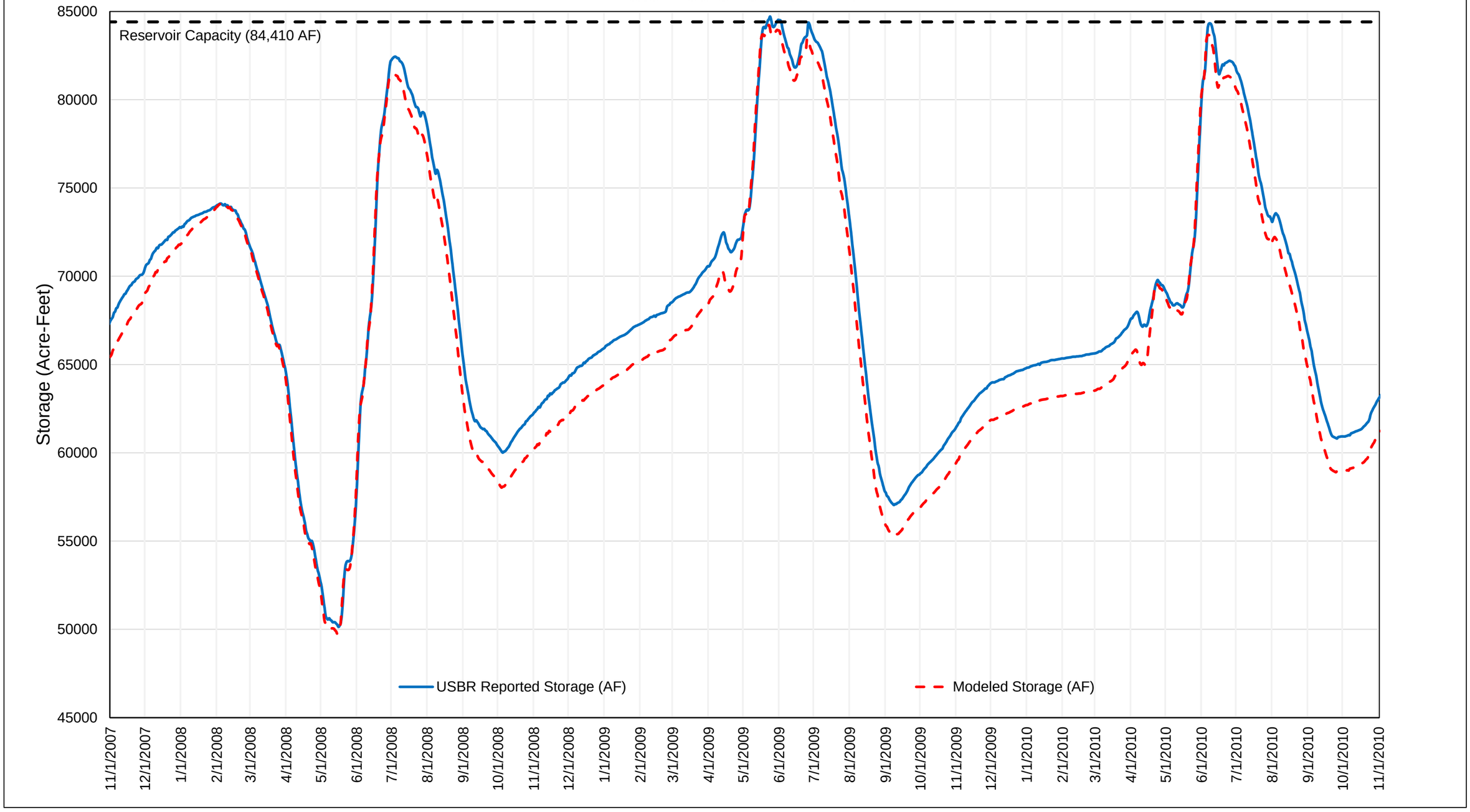


Figure 10. Modeled Monthly Ridgway Reservoir Releases with Additional 2,100 AF Depletion
Comparison with Historical USBR Data
Water Years 2008 to 2010

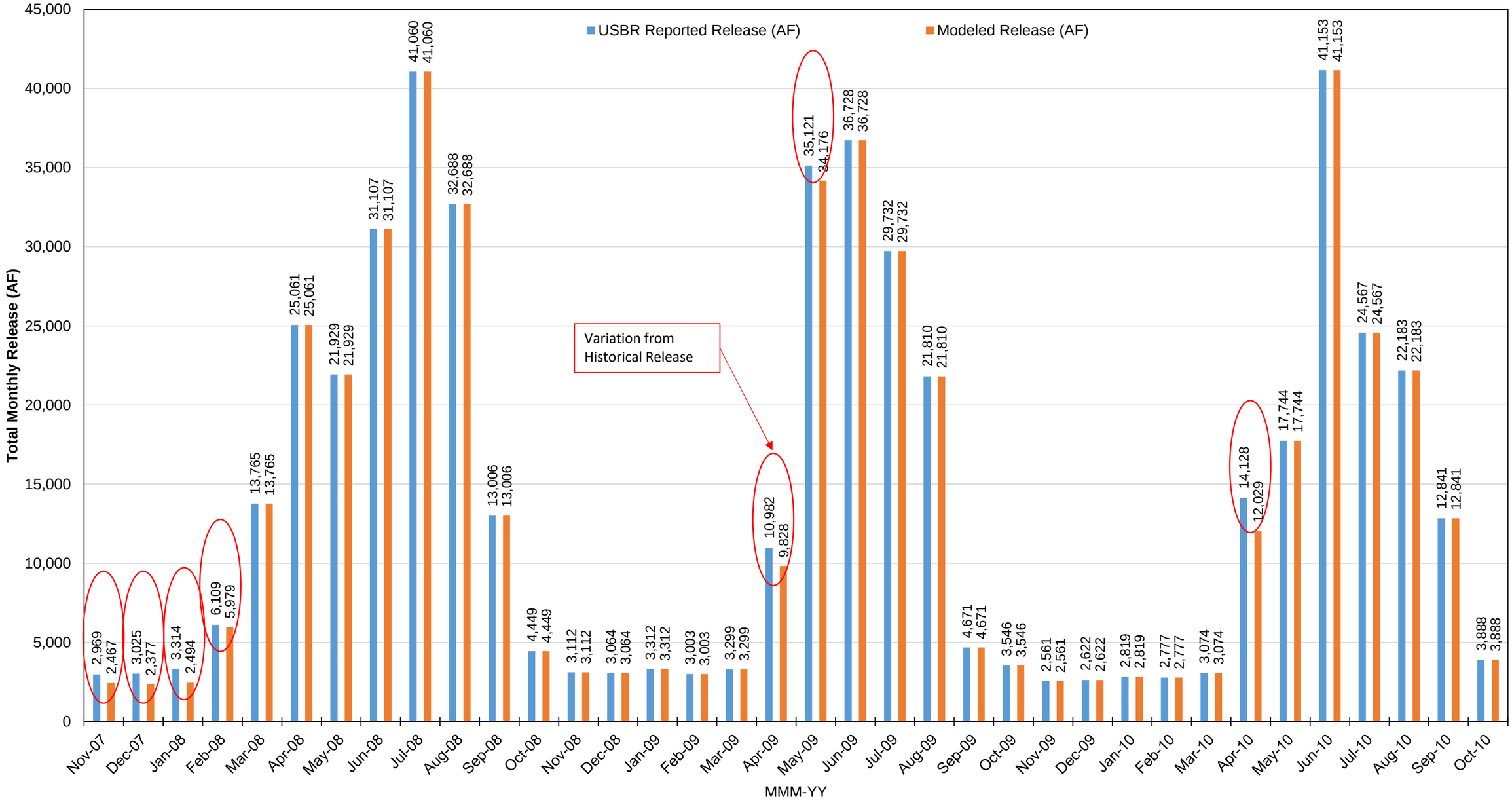


Figure 11. Modeled Inflow Into Ridgway Reservoir
Comparison with Historical USBR Reported Data
Summer Irrigation Season 2002

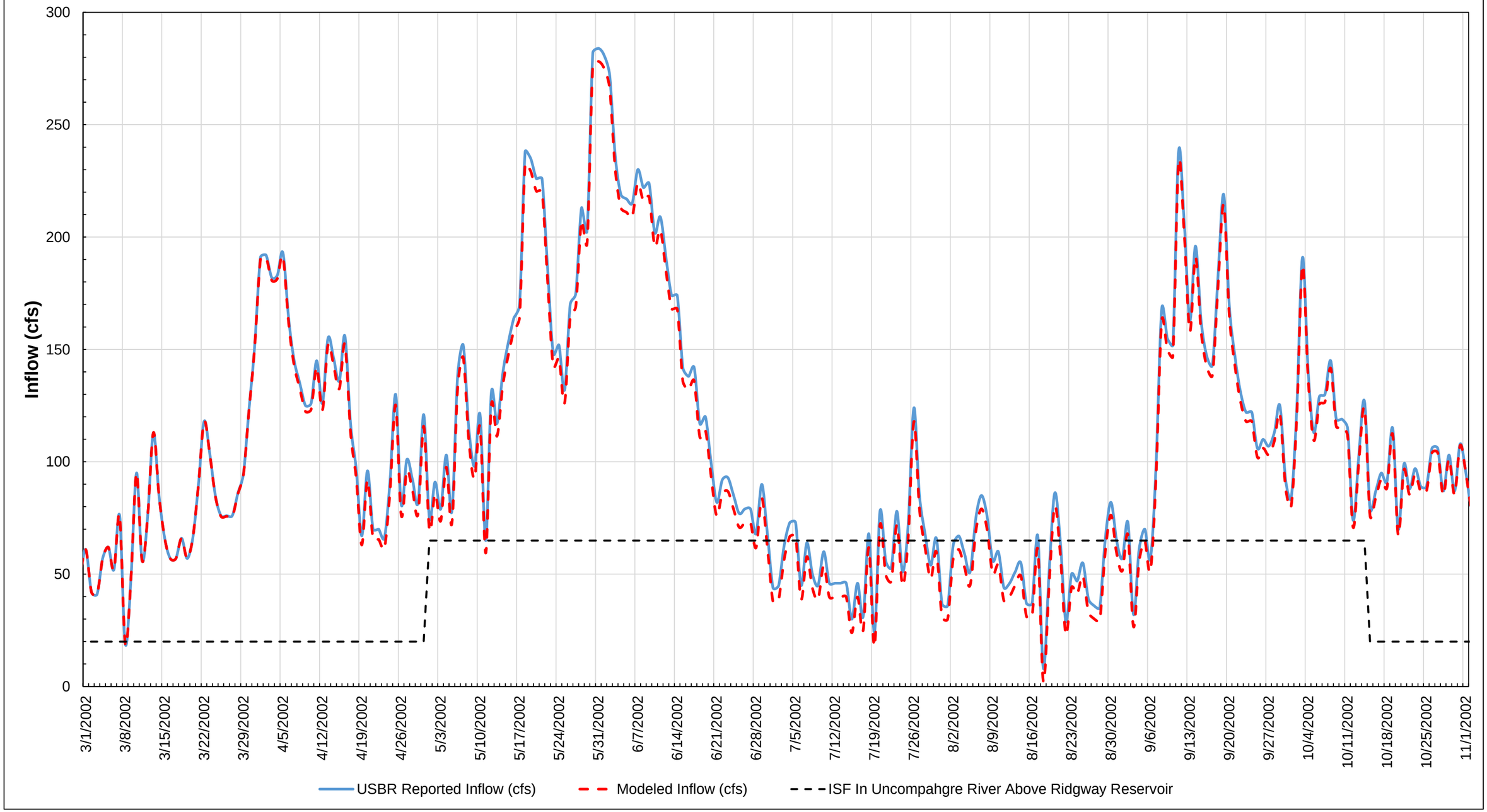


Figure 12. May 2018 Gaged Cow Creek Streamflow

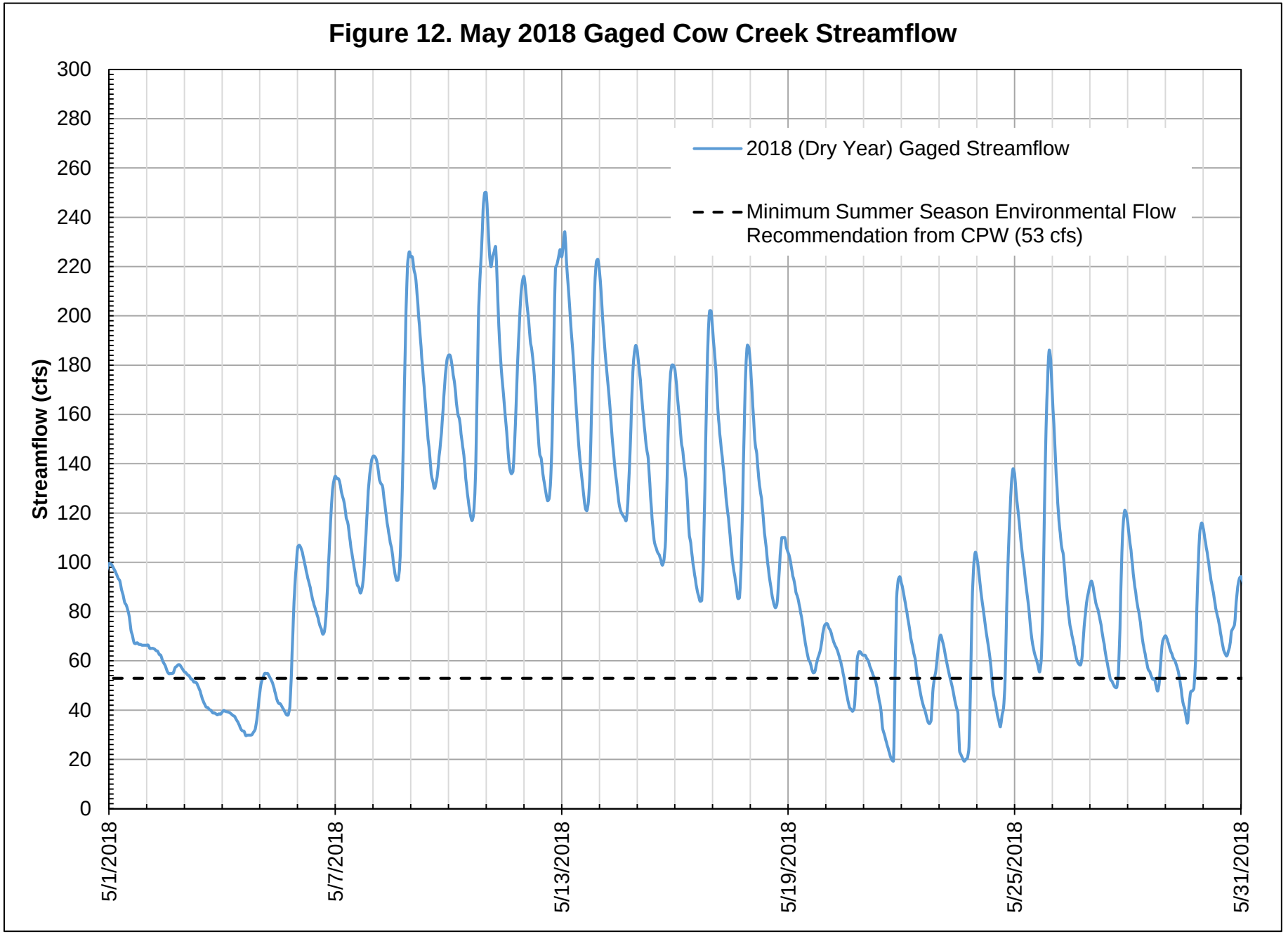


Figure 13. Gaged Streamflow at Upstream of South Canal Gage and Olathe Gage
April to September 2018

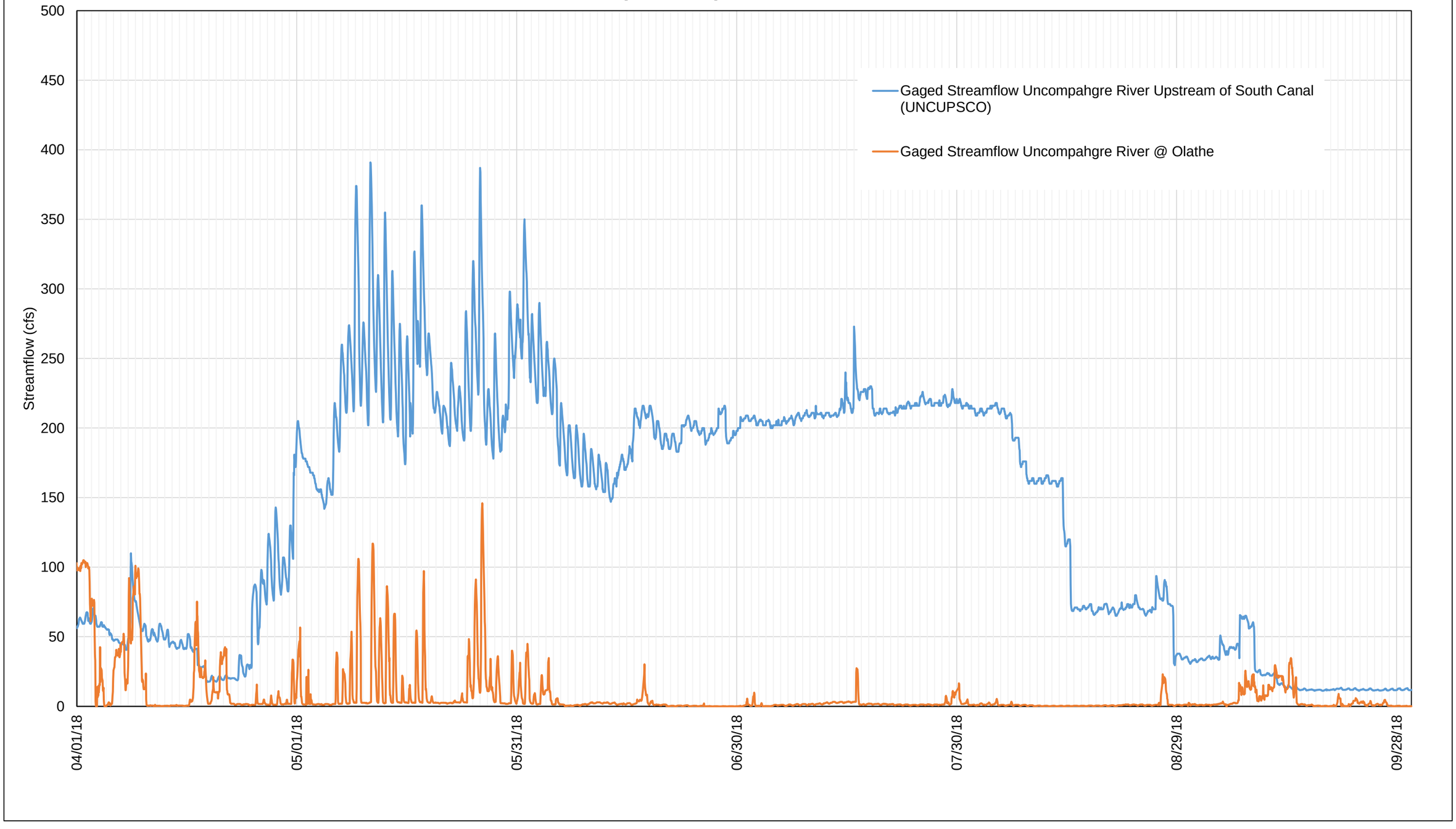


Figure 14. Calculated Cow Creek Streamflow with Dampening Reservoir and Cow Creek - Ridgway Reservoir Pipeline
Comparison with Historical Gaged Cow Creek Streamflow
Spring Runoff Season Water Year 2018

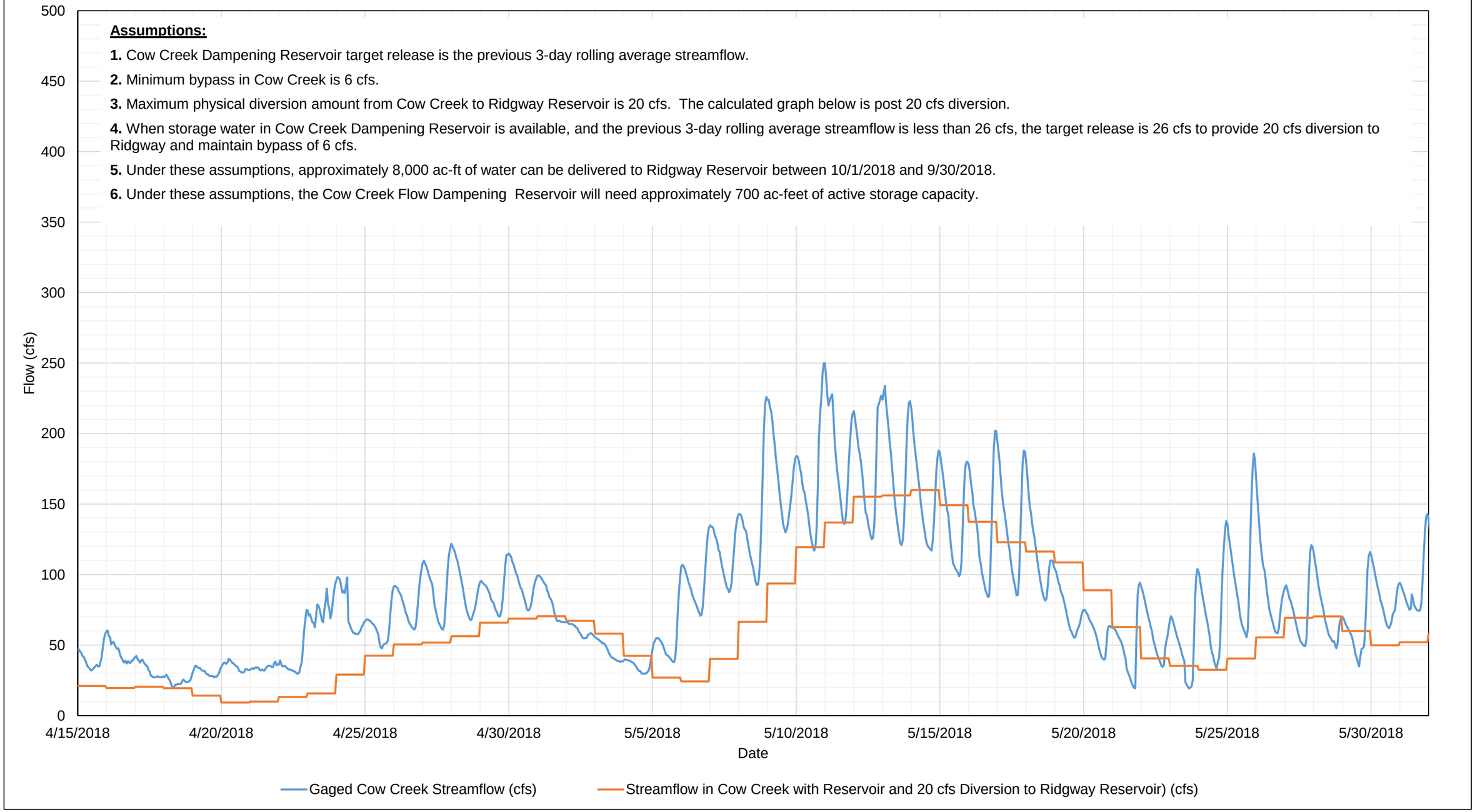


Figure 15. Calculated Streamflow at Upstream of South Canal Gage
With Flow Dampening Reservoir on Cow Creek and Diversion from Cow Creek to Ridgway Reservoir
Comparison with Historical Upstream of South Canal Gage Data Between April and September 2018

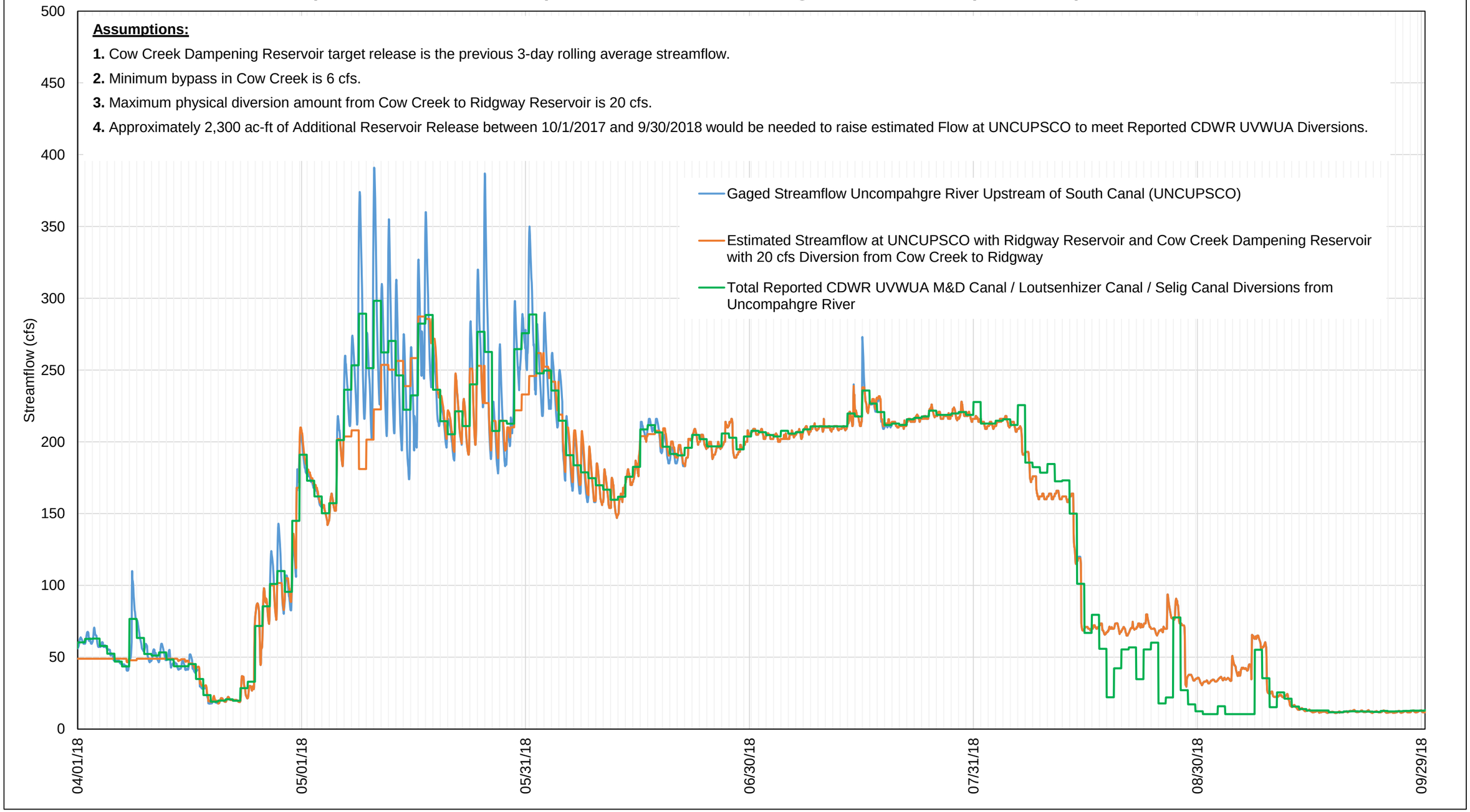
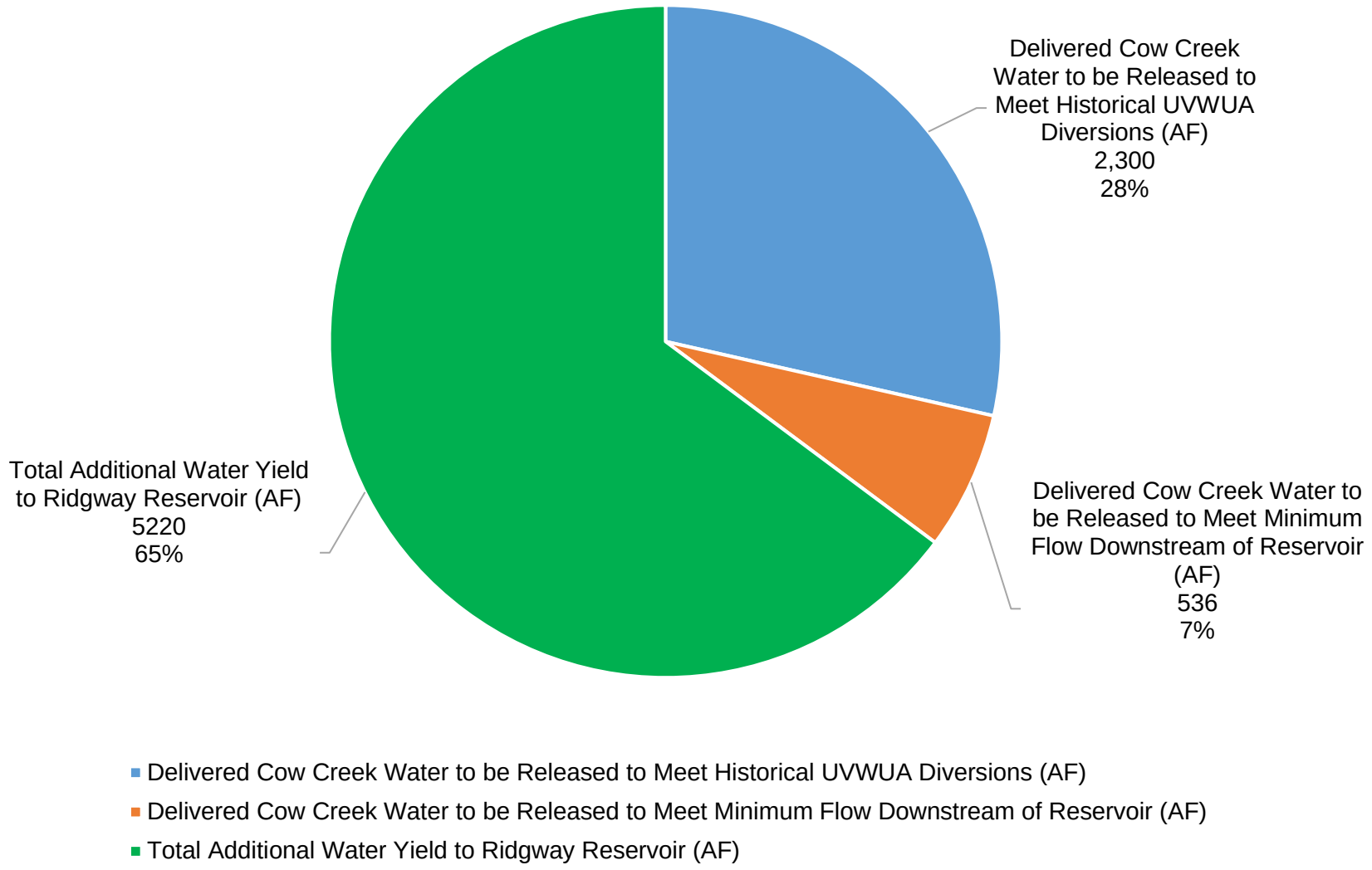
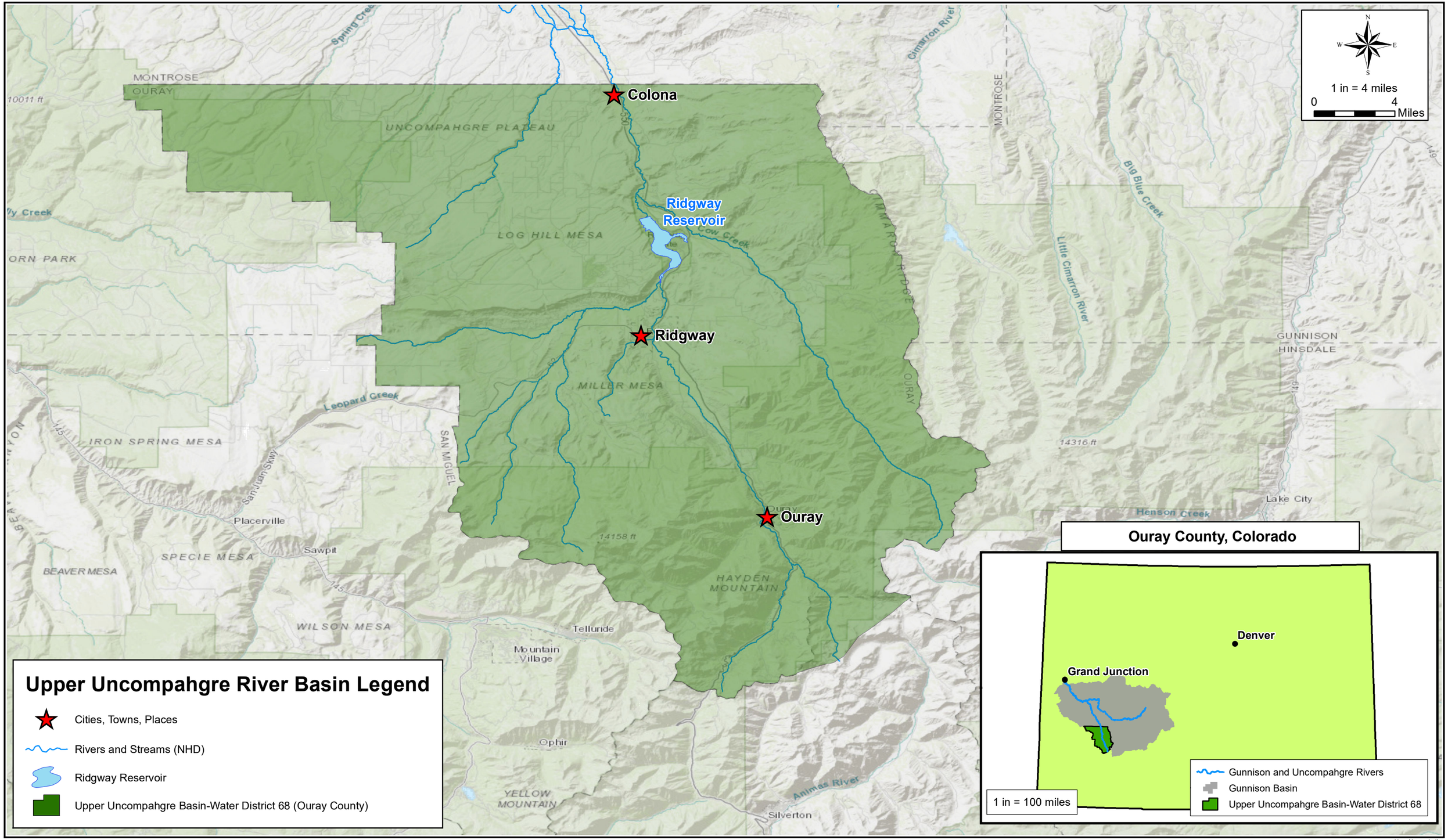


Figure 16. Calculated Additional Water Delivered from Cow Creek to Ridgway Reservoir
Water Year 2018



MAPS



Upper Uncompahgre River Basin Legend

- Cities, Towns, Places
- Rivers and Streams (NHD)
- Ridgway Reservoir
- Upper Uncompahgre Basin-Water District 68 (Ouray County)

Date: 2/14/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Stream Management Plan Maps\Map 1-UUB Location Map.mxd

User Name: boliver

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

OURAY COUNTY, COLORADO

UPPER UNCOMPAHGRE BASIN-WATER DISTRICT 68

UPPER UNCOMPAHGRE BASIN (OURAY COUNTY)

PROJECT NO.
151-032.021

MAP
1

Number	Structure Name	Type
1	Hieland Ditch	Selected Structure
2	Ouray Ditch	Selected Structure
3	Hyde Sneva Ditch	Selected Structure
4	Log Hill Pumping Plant	Selected Structure
5	Happy Hollow Ditch	Selected Structure
6	Ridgway Ditch	Selected Structure
7	Wehawken Spring	Selected Structure
8	Sneva Ditch	Selected Structure
9	Mike Cuddigan Ditch	Selected Structure
10	West Canal	Selected Structure
11	South Canal	Selected Structure
12	Montrose and Delta Canal	Calling Structure
13	Albush DItch	Calling Structure
14	Tierra Colo Ditch	Calling Structure
15	Hosner Rowell Ditch	Calling Structure
16	Mayol Sisson Ditch	Calling Structure
17	Reed Overman Ditch	Calling Structure
18	Tidwell Ditch	Calling Structure
19	Coal Creek Ditch	Calling Structure
20	Moody Ditch	Calling Structure
21	Morrison Ditch	Calling Structure
22	Charley Logan Ditch	Calling Structure
23	Uncompahgre River at Colona, CO	USGS Active Gage Station
24	Uncompahgre River below Ridgway Reservoir, CO	USGS Active Gage Station
25	Uncompahgre River near Ridgway, CO	USGS Active Gage Station
26	Dallas Creek near Ridgway, CO	USGS Active Gage Station
27	Uncompahgre River near Ouray, CO	USGS Active Gage Station
28	Olathe Stream Gage	USGS Active Gage Station
29	Beaver Creek near Ridgway, CO	USGS Inactive Gage Station
30	East Fork Dallas Creek near Ridgway, CO	USGS Inactive Gage Station
31	West Fork Dallas Creek near Ridgway, CO	USGS Inactive Gage Station
32	Red Mountain Creek near Ironton, CO	USGS Inactive Gage Station
33	Uncompahgre River below Ouray, CO	USGS Inactive Gage Station
34	Canyon Creek at Ouray, CO	USGS Inactive Gage Station
35	Uncompahgre River at Ouray, CO	USGS Inactive Gage Station
36	Cow Creek near Ridgway, CO	USGS Inactive Gage Station
37	Pleasant valley Creek near Noel, CO	USGS Inactive Gage Station
38	Cow Creek Gage Station	DWR Gage Station
39	Uncompahgre River Upstream of South Canal Gage	DWR Gage Station
40	Leopard Creek Ditch	Transbasin Diversion Structure
41	Red Mountain Ditch	Transbasin Diversion Structure
42	Cimarron Feeder Garnet Ditch	Transbasin Diversion Structure

1 in = 3 miles

0 3 Miles

Legend

- Cities, Towns, Places
- Calling Structure
- DWR Gage Station
- Selected Structure
- USGS Active Gage Station
- USGS Inactive Gage Station
- Transbasin Diversion Structure
- Rivers and Streams (NHD)
- Reservoir Location
- Upper Uncompahgre Basin

Date: 2/14/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Stream Management Plan Maps\Map 2 - Important Structures in UUB, with table.mxd

User Name: boliver

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

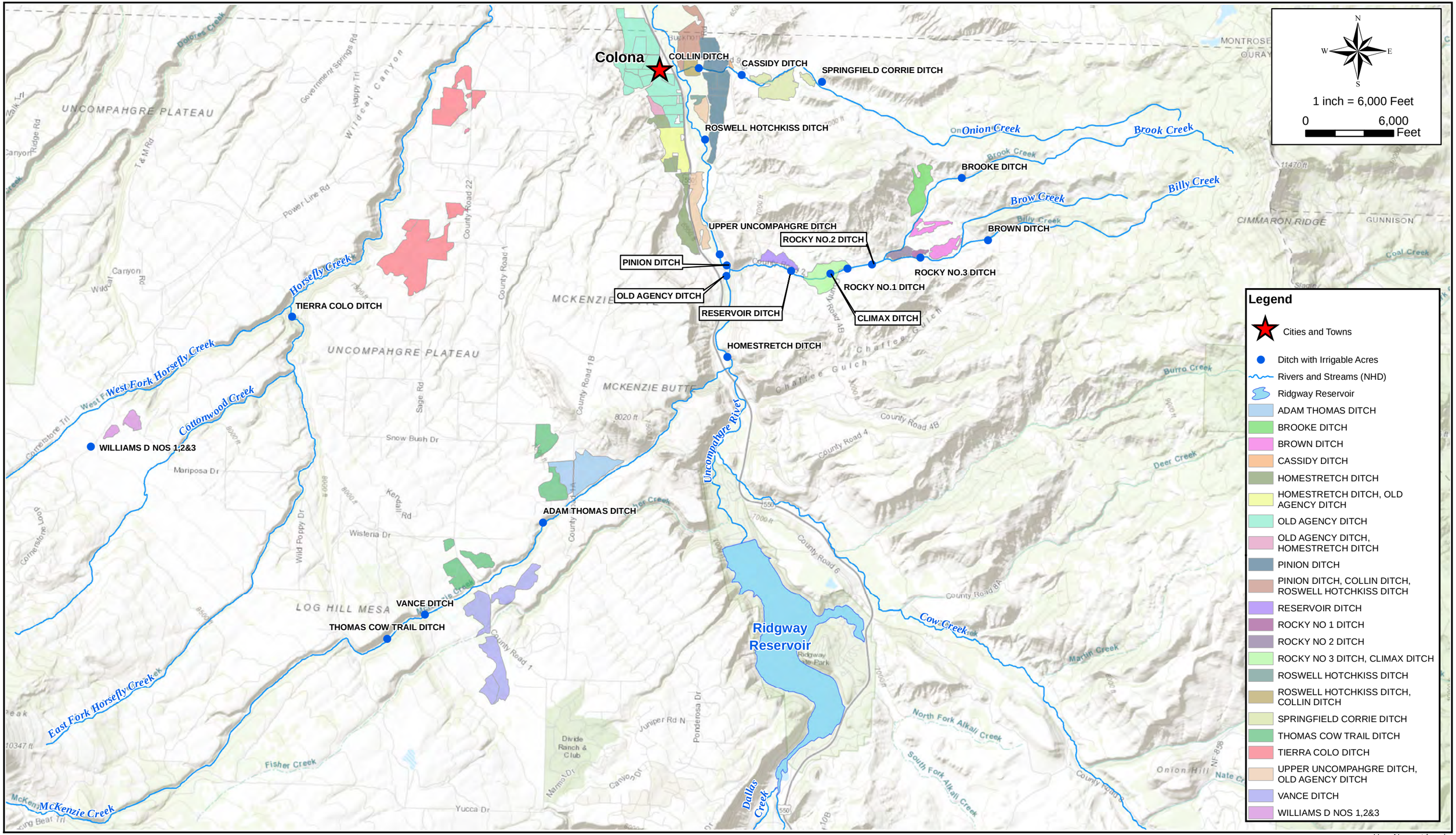
OURAY COUNTY, COLORADO

SELECTED STRUCTURES IN THE UUB NEAR COLONA

UPPER UNCOMPAHGRE BASIN (OURAY COUNTY)

PROJECT NO. 151-032.021

Map 2



Date: 2/25/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Stream Management Plan Maps\Map 3 - Region1_AgricultureMap.mxd

User Name: tdowning

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

OURAY COUNTY, COLORADO

REGION 1- UNCOMPAHGRE RIVER DOWNSTREAM OF RIDGWAY RESEVOIR

UPPER UNCOMPAHGRE BASIN (OURAY COUNTY)

PROJECT NO.
151-032.021

MAP
3

Legend

- Cities,Towns, Places
- Ridgway Resevoir
- Rivers and Streams (NHD)
- Ditch with Irrigable Acres
- BARKER DITCH
- BURGER DITCH
- BURKHART EDDY DITCH, LEOPARD CREEK DITCH
- CRONENBERG DITCH
- DALLAS DITCH
- DALLAS PLACER DITCH
- DOC WADE DITCH, RUFFE WADE DITCH
- EVANS DITCH
- HARRISON NO 1 DITCH
- HENRY TRENCHARD DITCH
- HORN DITCH, LEOPARD CREEK DITCH
- HOSNER ROWELL DITCH
- HYDE SNEVA DITCH
- JAMES STEWART DITCH, P J NASH DITCH
- LISCHKE NO. 2 DITCH
- LOWER PLEASANT VALLEY
- LOWER PLEASANT VALLEY, LEOPARD CREEK DITCH
- MAYOL LATERAL DITCH
- MAYOL LATERAL DITCH, MAYOL SISSON DITCH
- MAYOL SISSON DITCH
- MIKE CUDDIGAN DITCH
- OAKES JEROME DITCH
- OAKES WOODRUFF EGGLESTON
- REED OVERMAN DITCH
- REYNOLDS DITCH
- RIDGWAY DITCH
- SCOTT MCNEIL DITCH
- SHERBINO DITCH
- SIBERT DITCH
- SWITZERLAND DITCH
- TRENCHARD DITCH
- VON HAGEN LATERAL DITCH, LEOPARD CREEK DITCH, VON HAGEN DALLAS DITCH
- WOOD PERRY DITCH

1 inch = 5,000 Feet

0 5,000 Feet

Ridgway Reservoir

JAMES STEWART DITCH
WOOD PERRY DITCH
P J NASH DITCH
OAKES WOODRUFF EGGLESTON
HYDE SNEVA DITCH
OAKES JEROME DITCH
MIKE CUDDIGAN DITCH
DALLAS PLACER DITCH
LOWER PLEASANT VALLEY
HOSNER ROWELL DITCH
HORN DITCH
EVANS DITCH
HENRY TRENCHARD DITCH
Ridgway
SHERBINO DITCH
DALLAS DITCH
MAYOL LATERAL DITCH
MAYOL SISSON DITCH
SCOTT MCNEIL DITCH
VON HAGEN LATERAL DITCH
REED OVERMAN DITCH
BARKER DITCH
LISCHE NO. 2 DITCH
BURKHART EDDY DITCH
TRENCHARD DITCH
RUFFE WADE DITCH
DOC WADE DITCH
VON HAGEN DALLAS DITCH
BURGER DITCH
HARRISON NO 1 DITCH
SIBERT DITCH
REYNOLDS DITCH
RIDGWAY DITCH
CRONENBERG DITCH
SWITZERLAND DITCH
Lake Otonowanda
Dallas Creek
Uncompahgre River
Pleasant Valley Creek
Cottonwood Creek
West Fork Dallas Creek
West Fork West Dallas Creek
Vance Creek
East Fork Dallas Creek
Wilson Creek
Beaver Creek
Coal Creek
Dry Creek
Whitehouse Creek
PLEASANT VALLEY
MILLER MESA
South Baldy
Dallas Divide
Round Top
Yucca Dr
Pine Dr
Relay Rd
Old Relay Rd
McClure Rd
County Road 24
San Juan Skyway
Terrace Dr
JQ Slanton Rd
High Noon Dr
County Road 3
County Road 10B
Highland Dr
Scenic Dr
Coal Creek Rd
Elk Ridge Trl
SAN MIGUEL
OURAY
8955 ft
12000 ft

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Date: 2/14/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Stream Management Plan Maps\Map 4 - Region2_AgricultureMap.mxd

User Name: tdowning

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

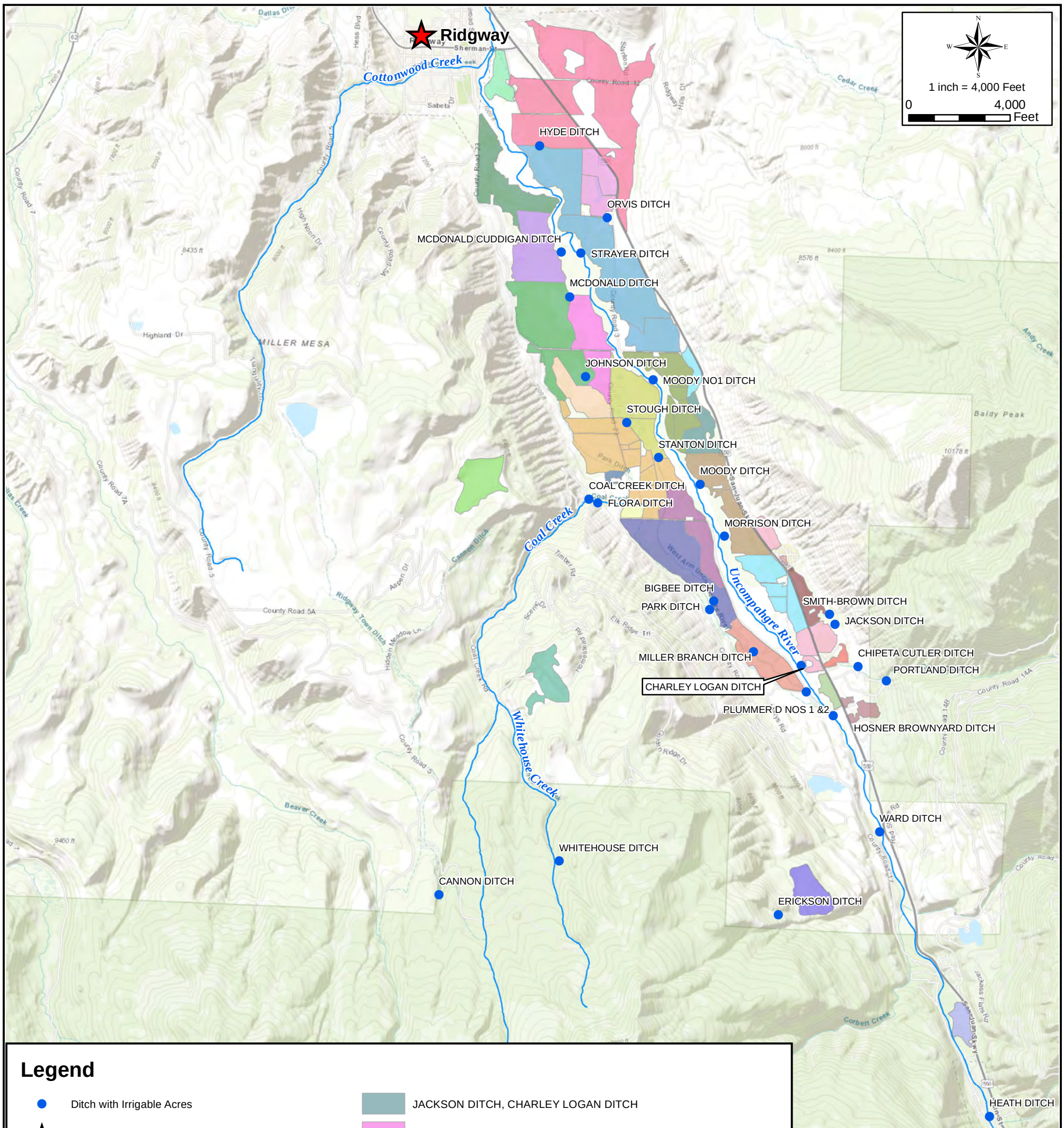
OURAY COUNTY, COLORADO

REGION 2-DALLAS CREEK

UPPER UNCOMPAHGRE BASIN (OURAY COUNTY)

PROJECT NO. 151-032.021

Map 4



Legend

- Ditch with Irrigable Acres
- Cities, Towns, Places
- Rivers and Streams (NHD)
- BIGBEE DITCH
- CANNON DITCH
- CHARLEY LOGAN DITCH
- CHARLEY LOGAN DITCH, MORRISON DITCH
- CHIPETA CUTLER DITCH
- COAL CREEK DITCH
- DALLAS DITCH, MCDONALD CUDDIGAN DITCH
- ERICKSON DITCH
- FLORA DITCH
- HEATH DITCH
- HOSNER BROWNYARD DITCH
- HOSNER BROWNYARD DITCH, SMITH-BROWN DITCH
- HYDE DITCH
- JACKSON DITCH, CHARLEY LOGAN DITCH
- JOHNSON DITCH
- MCDONALD DITCH, JOHNSON DITCH, MCDONALD CUDDIGAN DITCH
- MILLER BRANCH DITCH
- MOODY DITCH
- MOODY NO1 DITCH
- ORVIS DITCH
- PARK DITCH
- PARK DITCH, COAL CREEK DITCH, JOHNSON DITCH
- PARK DITCH, STOUGH DITCH
- PLUMMER D NOS 1 & 2
- PORTLAND DITCH
- STANTON DITCH
- STRAYER DITCH
- WARD DITCH
- WHITEHOUSE DITCH

Date: 2/14/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Stream Management Plan Maps\Map 5 - Region3_AgricultureMap.mxd

User Name: tdowning

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

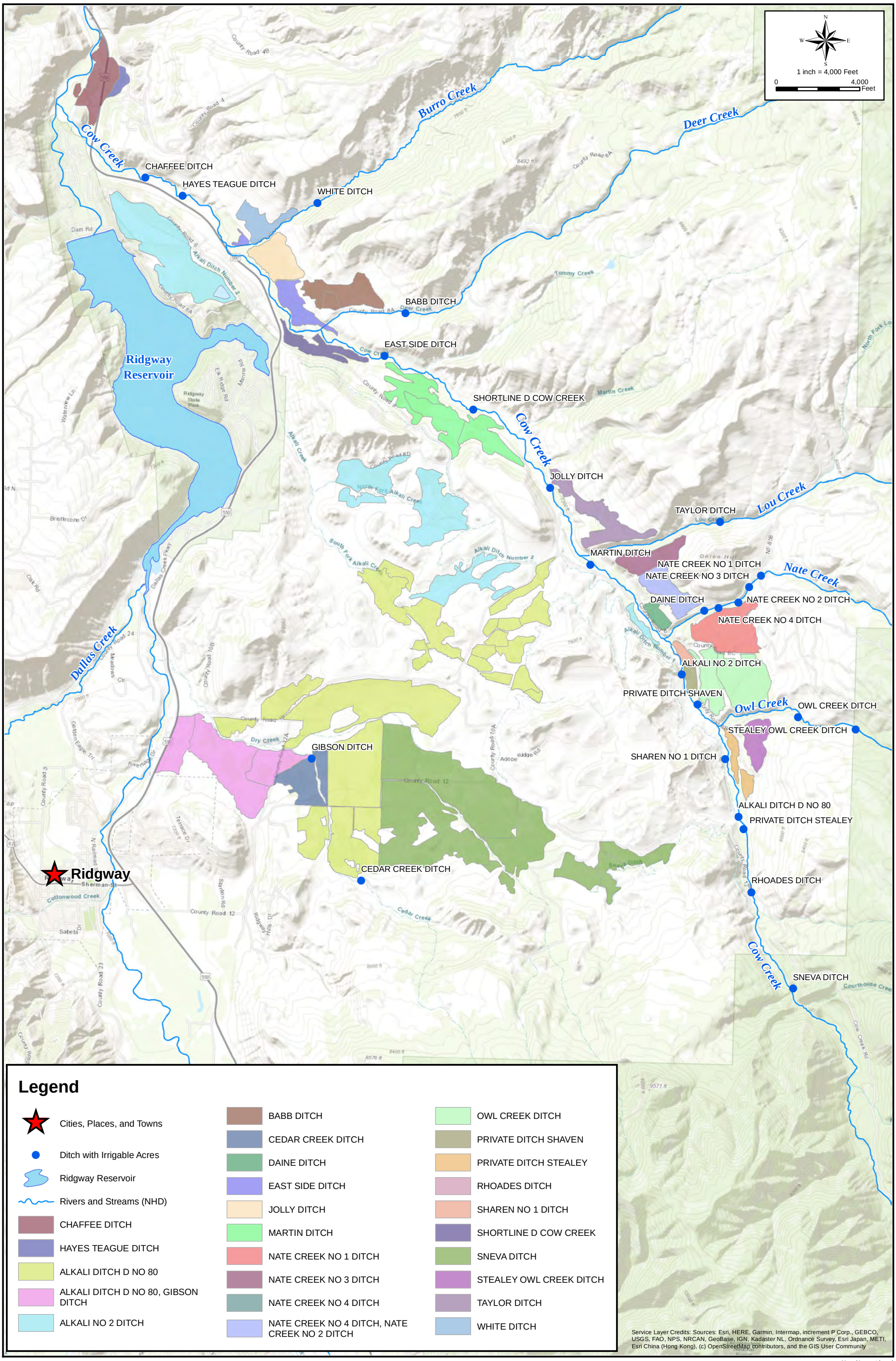
OURAY COUNTY, COLORADO

REGION 3-UNCOMPAHGRE RIVER UPSTREAM OF RIDGWAY RESERVOIR

UPPER UNCOMPAHGRE BASIN (OURAY COUNTY)

PROJECT NO. 151-032.000

MAP 5



Legend

- Cities, Places, and Towns
- Ditch with Irrigable Acres
- Ridgway Reservoir
- Rivers and Streams (NHD)
- CHAFFEE DITCH
- HAYES TEAGUE DITCH
- ALKALI DITCH D NO 80
- ALKALI DITCH D NO 80, GIBSON DITCH
- ALKALI NO 2 DITCH
- BABB DITCH
- CEDAR CREEK DITCH
- DAINE DITCH
- EAST SIDE DITCH
- JOLLY DITCH
- MARTIN DITCH
- NATE CREEK NO 1 DITCH
- NATE CREEK NO 3 DITCH
- NATE CREEK NO 4 DITCH
- NATE CREEK NO 4 DITCH, NATE CREEK NO 2 DITCH
- OWL CREEK DITCH
- PRIVATE DITCH SHAVEN
- PRIVATE DITCH STEALEY
- RHOADES DITCH
- SHAREN NO 1 DITCH
- SHORTLINE D COW CREEK
- SNEVA DITCH
- STEALEY OWL CREEK DITCH
- TAYLOR DITCH
- WHITE DITCH

Date: 2/14/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Stream Management Plan Maps\Map 6 - Region4_AgricultureMap.mxd

User Name: tdowning

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

OURAY COUNTY, COLORADO

REGION 4-COW CREEK

UPPER UNCOMPAHGRE BASIN (OURAY COUNTY)

PROJECT NO. 151-032.000

MAP 6

1 inch = 10,000 feet
0 10,000 Feet

Legend

- Domestic Water Well
- ISF Reach
- Ridgway Reservoir
- Rivers

Water System Service Area

- City of Ouray
- Dallas Creek Water Company
- Dallas Meadows
- Elk Meadows Estates
- South Mesa Zone
- Town of Ridgway
- Tri County Water Conservancy District Service Area Boundary

Montrose County
Ouray County

Dallas Creek Water Company

Ridgway Reservoir

South Mesa Zone

Dallas Meadows

Town of Ridgway

Elk Meadows Estates

City of Ouray

A

Detail Area A

19 County Road 23
Ridgway, CO
Permit # 65008

138 Red Stone Road
Ridgway, CO
Permit# 68154

1 inch = 2,000 feet
0 2,000 Feet

Date: 4/29/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Stream Management Plan Maps\Map 7 Selected Municipal Water Supplies and Drinking Water Wells.mxd

User Name: tdowning

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

OURAY COUNTY, COLORADO

SELECTED MUNICIPAL WATER SUPPLIERS AND DOMESTIC WATER WELLS

UPPER UNCOMPAHGRE BASIN (OURAY COUNTY)

PROJECT NO. 151-032.000

Map 7

Legend

- Cities, Towns Places
- Non-Interbasin Ditch Headgate
- Interbasin Ditch Headgate
- ISF Stream Reach
- Proposed ISF Reach
- Rivers and Streams
- Interbasin Irrigation Ditch
- Ridgway Reservoir

1 inch = 10,000 Feet

0 10,000 Feet

Colona

Roswell Hotchkiss Ditch

Onion Creek

Brook Creek

Brow Creek

Billy Creek Wildlife Area

Billy Creek

Upper Uncompahgre Ditch

Old Agency Ditch

Pinion Ditch

Brown Ditch

Tierra Colo Ditch

Chaffee Ditch

Homestretch Ditch

Hayes Teague Ditch

Burro Creek

Pa-Co-Chu-Puk Campground

Chaffee Ditch

Hayes Teague Ditch

Deer Creek

Cow Creek

Martin Creek

Shortline D Cow Creek

Alkali Ditch No. 2

North Fork Lou Creek

Lou Creek

Ridgway Reservoir

Alkali Creek

North Fork Alkali Creek

South Fork Alkali Creek

Vance Ditch

Thomas Cow Trail Ditch

Cottonwood Creek

Horsefly Creek

East East Fork Horsefly Creek

Fisher Creek

Mc Kenzie Creek

Divide Ranch & Club

Nate Creek

Alkali No 2 Ditch

Owl Creek

Owl Creek Ditch

Alkali Ditch D No 80

Dallas Creek

Hyde Sneva Ditch

Dry Creek

Gibson Ditch

Alkali Ditch No. 1

Pleasant Valley Creek

Hosner Rowell Ditch

Ridgway

Henry Trenchard Ditch

Leopard Ditch

Von Hagan Lateral

Dallas Ditch

Mayol Sisson Ditch

Mayol Lateral Ditch

Sneva Ditch

Courthouse Creek

Red Creek

Von Hagen Lateral Ditch

Reed Overman Ditch

Von Hagen Dallas Ditch

Burkhart Eddy Ditch

Trenchard Ditch

Moody No1 Ditch

Andy Creek

Uncompahgre River

Coal Creek

Ruffe Wade Ditch

Doc Wade Ditch

Park Ditch

Charley Logan Ditch

Cutler Creek

Hosner Brownyard Ditch

Oben Creek

Swyhart Ditch

Vance Creek

East Fork Dallas Creek

Beaver Creek

Whitehouse Creek

Cronenberg Ditch

Ridgway Ditch

West Fork West Dallas Creek

West Fork Dallas Creek

Wilson Creek

Dexter Creek

Corbett Creek

Bridalveil Creek

Heath Ditch

Difficulty Creek

Cascade Creek

Ouray

Oak Creek

Uncompahgre National Forest

Portland Creek

Wildhorse Creek

Weehawken Creek

Bear Creek

Lewis Creek

Fall Creek

Canyon Creek

Mill Creek

Deep Creek

Richmond Creek

Imogene Creek

Red Mountain Creek

Mineral Creek

Uncompahgre River

PAHGRE PLATEAU

MCKENZIE BUTTE

LOG HILL MESA

DEEP CREEK MESA

IRON MOUNTAIN

HAYDEN MOUNTAIN

MILLER MESA

PLEASANT VALLEY

SAN MIGUEL FLATS

OURAY

SAN JUAN

Telluride Regional Airport

Telluride Golf Club

Telluride

Only Headgates that deliver at least 10 cfs are shown.

Date: 2/14/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Stream Management Plan Maps\Map 8-Environmental and Recreation.mxd

User Name: tdowning

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

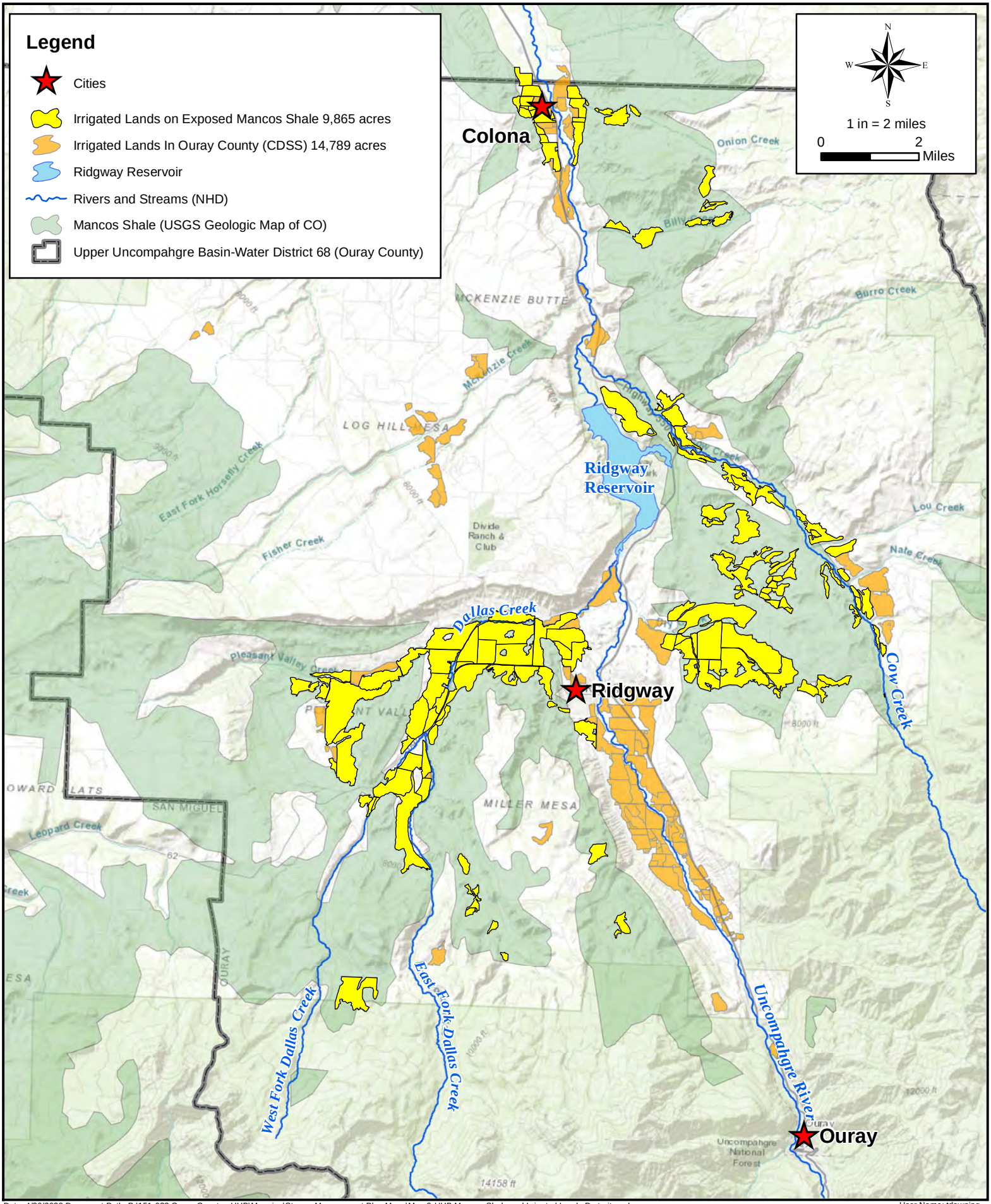
OURAY COUNTY, COLORADO

ENVIRONMENTAL AND RECREATIONAL WATER USES

UPPER UNCOMPAHGRE BASIN (OURAY COUNTY)

PROJECT NO. 151-032.000

MAP 8



Date: 4/30/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Stream Management Plan Maps\Map 9-UUB Mancos Shale and Irrigated Lands Portrait.mxd

User Name: tdowning

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

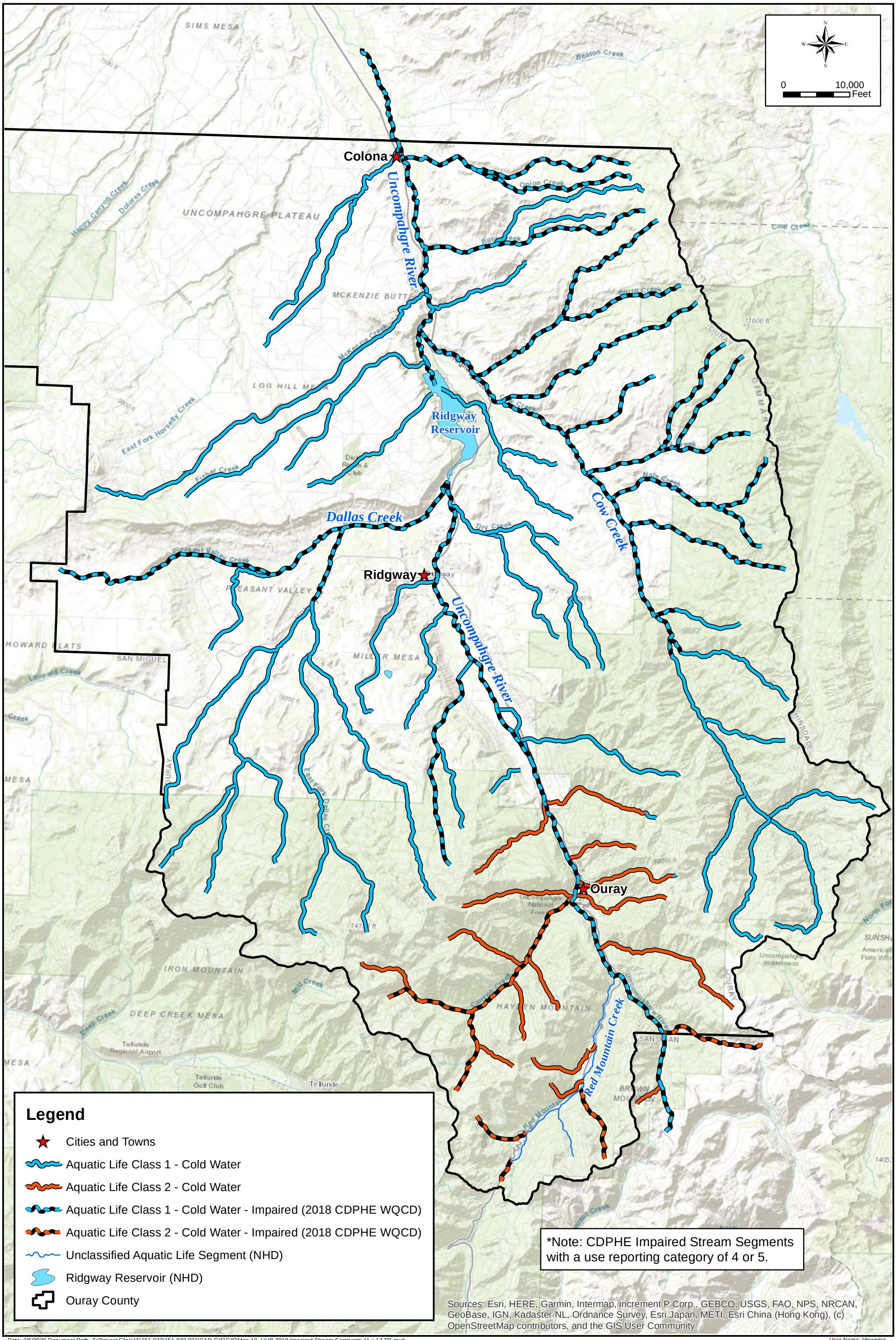
OURAY COUNTY, COLORADO

IRRIGATED LANDS ON MAPPED MANCOS SHALE IN THE UPPER UNCOMPAHGRE BASIN

UPPER UNCOMPAHGRE BASIN

PROJECT NO. 151-032.000

MAP 9



Legend

- Cities and Towns
- Aquatic Life Class 1 - Cold Water
- Aquatic Life Class 2 - Cold Water
- Aquatic Life Class 1 - Cold Water - Impaired (2018 CDPHE WQCD)
- Aquatic Life Class 2 - Cold Water - Impaired (2018 CDPHE WQCD)
- Unclassified Aquatic Life Segment (NHD)
- Ridgway Reservoir (NHD)
- Ouray County

*Note: CDPHE Impaired Stream Segments with a use reporting category of 4 or 5.

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Date: 3/6/2020 Document Path: Z:\Project Files\15\151-032\151-032.021\CAD-GIS\GIS\Map 10- UUB 2018 Impaired Stream Segments 11 x 17 TD.mxd

User Name: tdowning

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

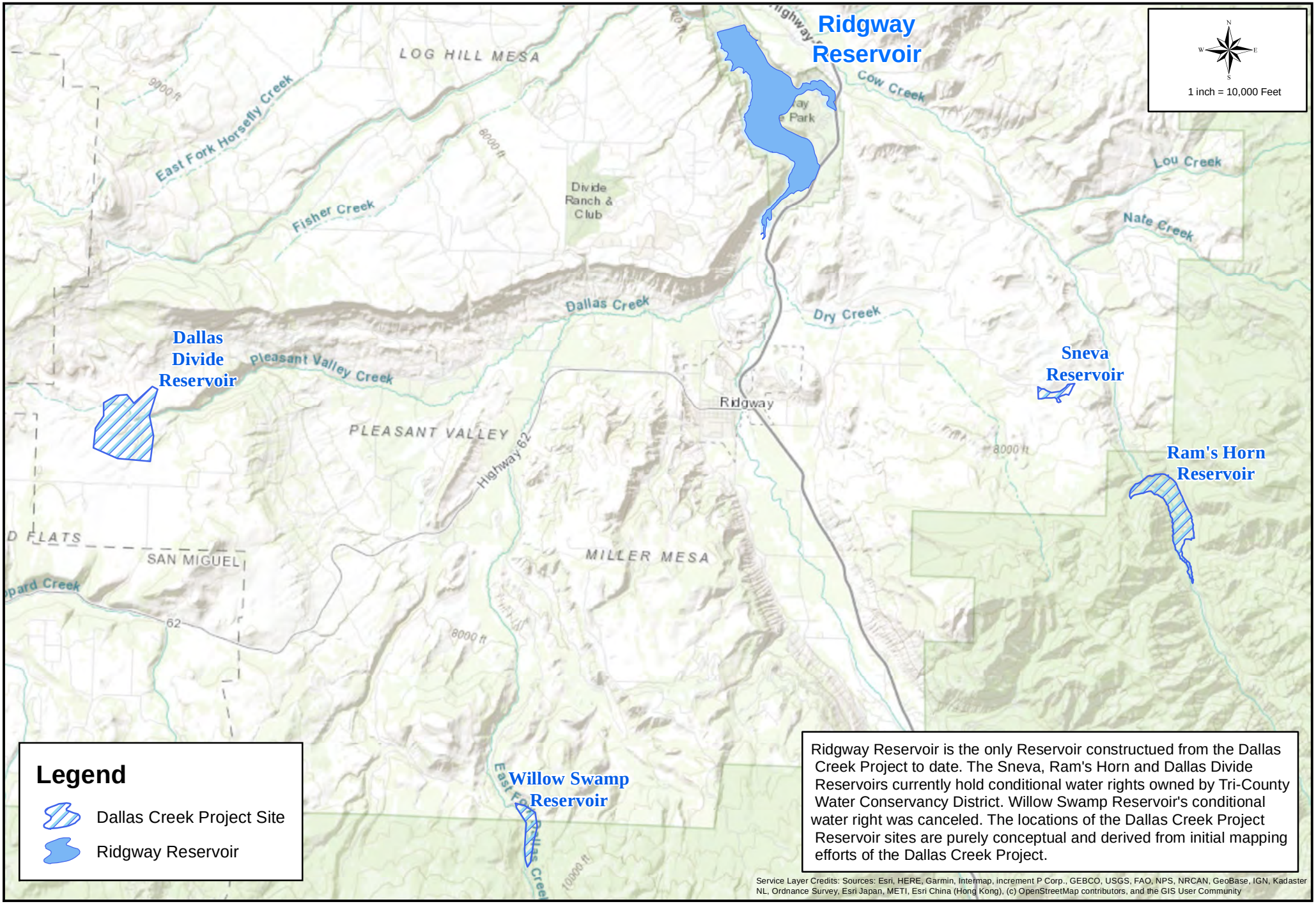
OURAY COUNTY, COLORADO

AQUATIC LIFE CLASSIFICATION AND KNOWN WATER QUALITY IMPAIRMENTS FOR STREAM SEGMENTS IN THE UPPER UNCOMPAHGRE BASIN

UPPER UNCOMPAHGRE BASIN (OURAY COUNTY)

PROJECT NO. 151-032.021

MAP 10



Date: 1/31/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Map 11- Dallas Project Reservoirs .mxd

User Name: tdowning

WWE
Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

OURAY COUNTY, COLORADO

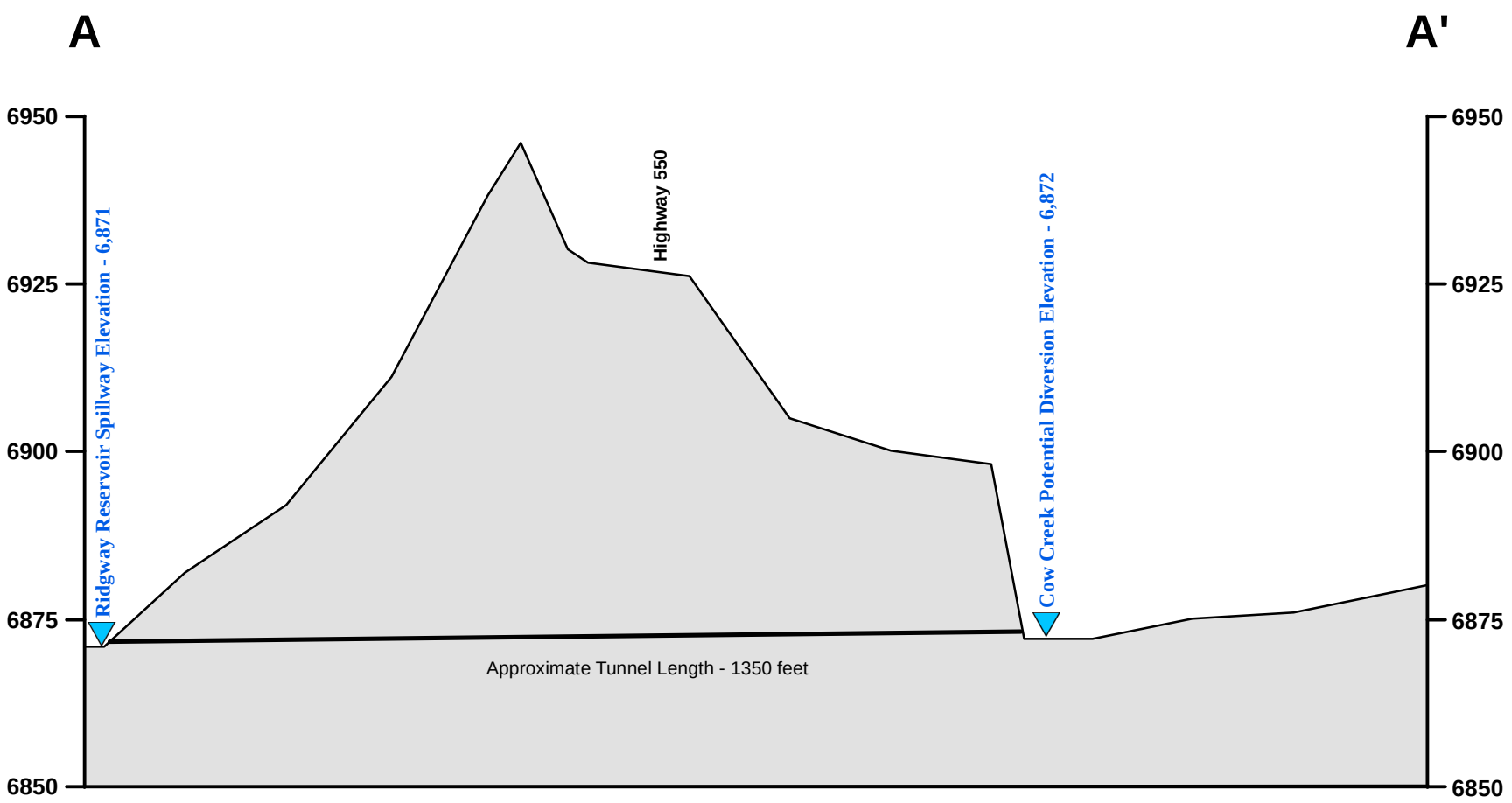
DALLAS CREEK PROJECT RESERVOIR SITES

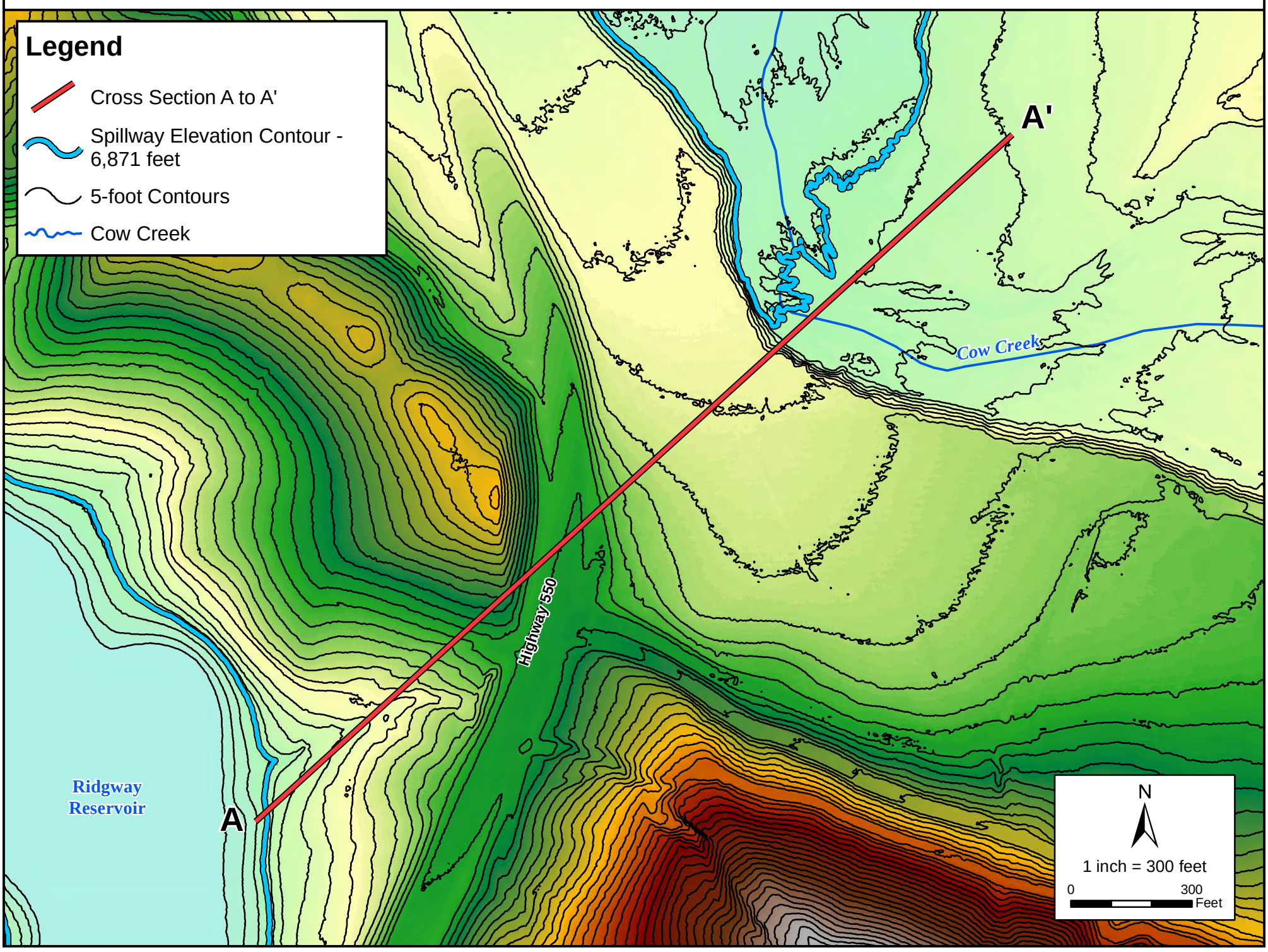
OURAY COUNTY

PROJECT NO. 151-032.000

MAP 11

Horizonal Scale: 1 inch = 250 feet
Vertical Scale: 1 inch = 25 feet





Date: 1/31/2020 Document Path: P:\151-032 Ouray County - UUB\Mapping\Map 12 - Cross Section CC to RR for Pipeline.mxd

User Name: tdowning

Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

OURAY COUNTY, COLORADO

COW CREEK TO RIDGWAY RESERVOIR POTENTIAL PIPELINE

UPPER UNCOMPAHGRE BASIN (OURAY COUNTY)

PROJECT NO. 151-032.021

MAP 12

APPENDICES

Appendix A

Ouray County Resolution No. 2017-041– Establishing a Steering Committee for Stream Management Planning

RESOLUTION No. 2017-041

219246
Page 1 of 1
Michelle Nauer, Clerk & Recorder
Ouray County, CO RP $0.00
08-23-2017 08:26 AM Recording Fee $0.00

A RESOLUTION OF THE
BOARD OF COUNTY COMMISSIONERS OF OURAY COUNTY, COLORADO
ESTABLISHING A STEERING COMMITTEE FOR STREAM MANAGEMENT PLANNING

WHEREAS, the importance of ensuring that adequate water supplies are available to Ouray County residents, citizens, property owners and visitors is essential; and

WHEREAS, the Board of County Commissioners ("Board") is supportive of applying for a Water Grant to continue work on the next phase of water planning, analysis and research for Ouray County and its citizenry; and

WHEREAS, the Board believes that it would be beneficial to establish a Steering Committee to move efforts forward on the second phase of water planning to include the development of augmentation water, new sources of water and storage availability for both current and future growth; and

WHEREAS, the composition of a Steering Committee for Stream Management Planning would consist of representatives from the following entities and organizations and others as deemed appropriate by the Board:

- Ouray County Citizen and Water Attorney
- Wright Water Engineer - Consultant
- Trout Unlimited
- Ouray County Water Users Association
- Tri-County Water
- Shavano Soil Conservation District
- Town of Ridgway
- City of Ouray
- Ouray County
- Uncompahgre Watershed Partnership
- Colorado River Water Conservation District
- Log Hill/Fairway Pines/Divide Ranch Representative
- Dallas Water Company
- Double RL Ranch
- Telluray Ranch
- Sleeping Indian Ranch
- J Bar M Ranch
- Wolf Cattle Company
- Sawtooth Ranch
- Chimney Peak Ranch
- Hydro-Electric Operators or Facilities
- Other

NOW, THEREFORE, be it resolved by the Board of County Commissioners of the County of Ouray, that:

1. The Board of County Commissioners of Ouray County hereby establishes the **Steering Committee for Stream Management and Planning,** appointing representatives from the entities and organizations listed above and others as deemed appropriate by the Board.
2. The Board is supportive of applying for a Water Grant to continue work on the next phase of water planning, analysis and research.

APPROVED AND ADOPTED THIS 22nd DAY OF AUGUST, 2017.

Voting for: Commissioners Tisdel, Batchelder + Peters
Voting against: None

BOARD OF COUNTY COMMISSIONERS
OF OURAY COUNTY, COLORADO

Attest:

Ben Tisdel, Chair

Don Batchelder, Vice-Chair

John Peters, Commissioner

OURAY COUNTY SEAL

Michelle Nauer, Clerk and Recorder
By: Hannah Hollenbeck, Deputy Clerk of the Board

Appendix B

Interview Summaries with Local Fishing and Whitewater Recreation Guides

Questions for Fishing Outfitters – RIGS Fly Shop and Guide Service: 7/11/2019

We are working on a stream management plan for the Uncompahgre River Basin and are trying to incorporate water needs for multiple uses including aquatic wildlife. We have been reviewing some reports and talking with CPW, but wanted to get some on hand information from the fishing guides.

1) Contact Info
    a. Name: **Tim Patterson (owner)**
    b. How long have you been a guide: **24 years**
    c. How long has your company been conducting guide services in the Uncompahgre River Basin: **Since 2002**
    d. Approximately how many visitors do you take fishing each year: **On Uncompahgre – 500 (as a company)**

2) What is the peak season for you?
    June- September

3) Where do you typically take clients fishing?
    a. Paco and Billy Creek
        i. Town of Ridgway to reservoir only upper part with fish
            1. Late fall – reasonable aquatic life but not good water clarity
        ii. Water quality in upper river not as good

4) How do you rate the fishing on the following sections of river?
    Anything above the reservoir is not good fishing.
    a. Uncompahgre River Near Ouray. Specifically, Confluence of Uncompahgre River and Canyon Creek to Dexter Creek.
        i. **Has potential but currently very little to no fishing**

    b. Uncompahgre river from Dexter Creek to the Town of Ridgway
        i. **Has potential but very little fishing**

    c. Town of Ridgway to Ridgway Reservoir
        i. **Begin to see fishable areas here – water quality still not as good as below reservoir and low fish reproduction.**

    d. Dallas Creek from the confluence of East and West Fork of Dallas Creek to Ridgway Reservoir.
        i. **Some fish but low reproduction. Better fishing still below Reservoir**

    e. Cow Creek from USFS Boundary to Confluence with Uncompahgre River
    f. Uncompahgre River between Ridgway Reservoir outlet to Colona.
        i. Paco most visited
        ii. Billy Creek Wildlife area – not allowing guided fishing at the moment, but still a good area for fish

g. Ridgway Reservoir
    i. **Further away (north), the better**

5) Has the fishing improved over the last several years, stayed the same or gotten worse?
    a. **In the upper part, fish/aquatic life has decreased over the last 5 years. About the same below.**

6) What would you recommend for areas that need additional water to improve the fishery?
    a. **Water quality in the upper part – need clearer water. Gravel production also occurring – worsens water quality.**

Questions for Fishing Outfitters – Montrose Anglers: 8/6/2019

We are working on a stream management plan for the Uncompahgre River Basin and are trying to incorporate water needs for multiple uses including aquatic wildlife. We have been reviewing some reports and talking with CPW, but wanted to get some on hand information from the fishing guides.

1) Contact Info
    a. Name: **Tadd Fore**
    b. How long have you been a guide: **2 years**
    c. How long has your company been conducting guide services in the Uncompahgre River Basin: **2 years**
    d. Approximately how many visitors do you take fishing each year: **100**

2) What is the peak season for you?
    Late July – August for fishing

3) Where do you typically take clients fishing?
    a. State parks - Paco

4) How do you rate the fishing on the following sections of river?
    a. **Above Ridgway Reservoir past 1 mile is private**
    b. Water quality and fishing better below Ridgway Reservoir
        i. Not managed above
        ii. Fish stocked below
        iii. Best time above Reservoir is springtime when Rainbow trout swim above Reservoir to spawn. Small window because runoff starts soon after.
        iv. 1st mile above reservoir definitely has fish – not as good further up

    c. Uncompahgre River between Ridgway Reservoir outlet to Colona.
        i. **Paco is the best place. Was remodeled with boulders to allow for great habitat**

5) Has the fishing improved over the last several years, stayed the same or gotten worse?
    1. Fishing at Paco declining in last 4 years
    2. Doesn't spend a lot of time above reservoir

6) What would you recommend for areas that need additional water to improve the fishery?
    a. Above – more habitat for trout (i.e. boulders)
        i. Need better water quality/clarity
    b. Below – rock dams for fish

Questions for Whitewater Outfitters – RIGS Fly Shop and Guide Service: 7/30/2019

We are working on a stream management plan for the Uncompahgre River Basin and are trying to incorporate water needs for multiple uses including boater recreation. We have been reviewing some reports and talking with American Whitewater, but wanted to get some on hand information from the local whitewater guides.

1) Contact Info
    a. Name?
        i. **Tim Patterson**
    b. How long have you been a guide?
        i. **24**
    c. How long has your company been conducting guide services in the Uncompahgre River Basin?
        i. **Since 2002**
    d. Approximately how many visitors do you take whitewater rafting each year.
        i. Approx. 3000

2) What is the typical season for you (month to month)?
    a. **May – August. Variable in September**

3) What is the peak month, and **weekend for you**?
    a. **Months for best rapids: May and June. Calmer in July/August**
    b. **Months for most rafters: mid June-Aug. Peak first two weeks in July. Weekdays most popular.**

4) Where do you typically take clients whitewater rafting?
    a. **Two trips:**
        i. **Town of Ouray (10 miles)**
        ii. **Ridgway to Ridgway Reservoir**

5) How do you rate the whitewater rafting on the following sections of river?
    a. Uncompahgre River above Ridgway Reservoir. Specifically, Ouray to KOA Camp Ground, and Rollans Park to Ridgway Reservoir.
        i. **Ouray to KOA: Good and technical**
    b. Uncompahgre River – Ridgway Whitewater Park.
        i. **Whitewater park: Less technical than around Ouray, but popular trip. Rest of way to Ridgway relatively calm and good for little kids.**
    c. Uncompahgre River below Ridgway Reservoir. Specifically, Billy Creek to Trout Road.
        i. **Primary resource for both fishing and rafting is below Ridgway reservoir because of consistent releases and improved water quality.**

6) Have boating flows improved over the last several years, stayed the same or gotten worse?
    a. **Diminished over last few years for sure**

7) What would you recommend for areas that need additional water to improve boater recreation?
    a. **Seems to be reasonable water levels for rafting most of the year, but drastic release rates cause safety concerns and are often announced. Limited access is biggest issue for recreationalists, as put-ins and take-outs are undefined.**

Appendix C

Appendix C1

Cow Creek Fishery Report 2019

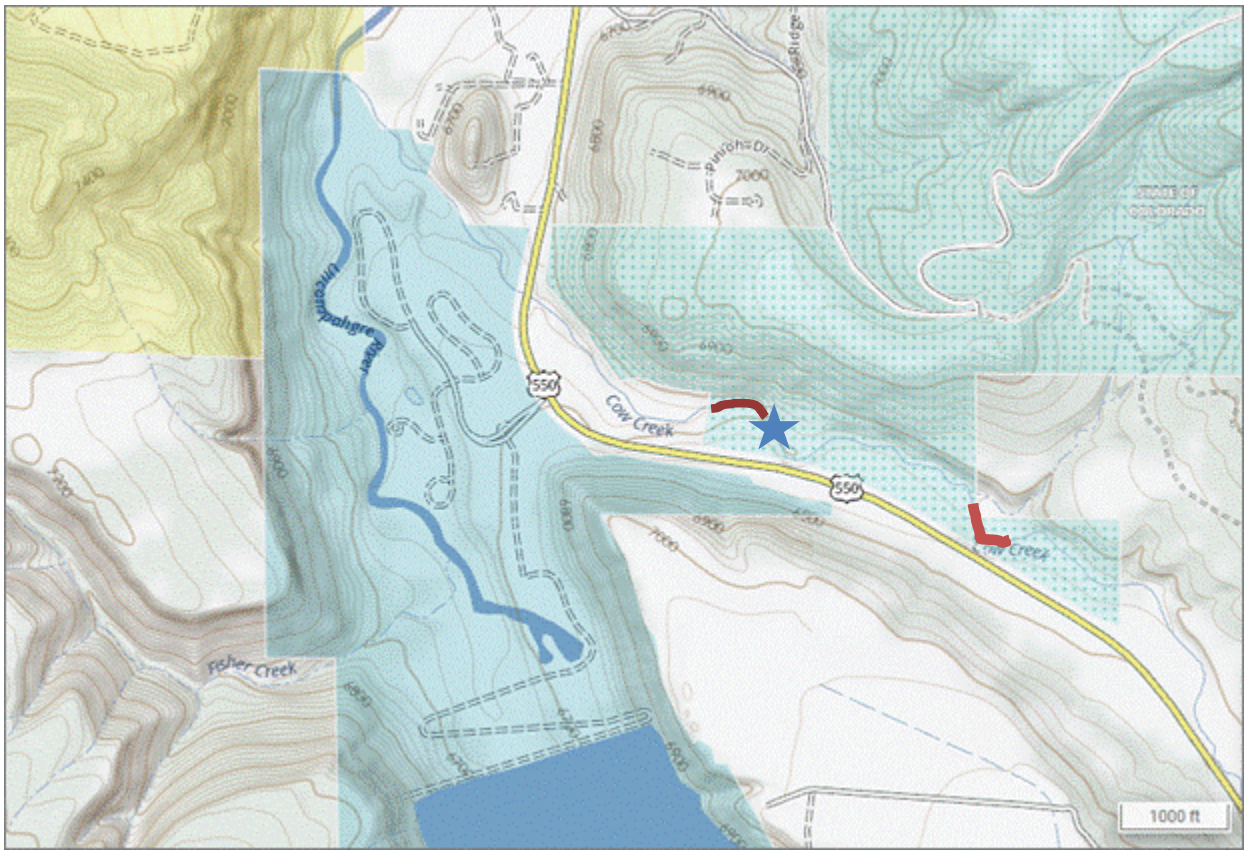
Cow Creek

Eric Gardunio
Aquatic Biologist
Southwest Region

Water: Cow Creek
Location: GU4205 and GU4206
Sampling Date: 8/5/2019 and 9/11/2019
Gear: 3x LR-24 backpack electrofisher
Drainage: Gunnison
Water Code: 39380

OBJECTIVE

Cow Creek was sampled on the Billy Creek State Wildlife Area (SWA) in 2019 to determine the status of the fishery pertaining to a water use study that may further impact water availability in the drainage. Additionally, sampling was done upstream and downstream of a gauging station on the SWA to evaluate the fishery on either side of this potential fish barrier.



Map 1: Map of 2019 Cow Creek sampling locations (red) and gauging station (blue star).

HISTORY

Cow Creek is a heavily diverted, flashy stream that flows north out of the San Juan Mountains east of the town of Ridgway, eventually joining the Uncompahgre River approximately 1.1 miles downstream of Ridgway Reservoir on Ridgway State Park. A USGS gauging station is located on the SWA approximately one mile upstream of the Uncompahgre River confluence. It is currently managed as a Category 302 Salmonid Recreation Stream, with limited recruitment potential, particularly in the upstream section of the stream located on Forest Service land. This section is supplemented with fingerling cutthroat trout plants to maintain a sport fishery. Near the Forest boundary, diversions begin to take water for irrigation purposes, limiting the potential for the fishery. On the downstream end where there is public access on the Billy Creek SWA, the stream is heavily impacted by water diversions, however, there is reportedly a seasonal fishery where fish potentially move in and out of the stream from the Uncompahgre River. These movements may be important, given the tumultuous nature of the system. In summer, when the water is most highly diverted, and much of the stream flow is comprised of return flows, the water may reach temperatures that are too warm, conversely, the system drains a large steep drainage, and often "flashes" causing high flows and often highly turbid water. These changing conditions may necessitate movement from the fish in the stream, and the gauging station could be limiting their ability to reestablish following downstream movements. The 2019 sampling was meant to evaluate the status of the fishery, and to determine if the USGS gauging station on the SWA is limiting these movements by comparing fish populations from a site upstream and downstream of the gauging station. An initial sampling effort was conducted at both sites on August 5, 2019, but high flows limited sampling efficiency, precluding obtaining a population estimate at the upstream site. The two sites were repeated on September 11, 2019 when flows subsided, and population estimates were obtained at both sites. Catch rates were low for some species during individual sampling events, precluding formal population estimates. These estimates are noted below, and represent a minimum population size, given the number of fish sampled.

RESULTS

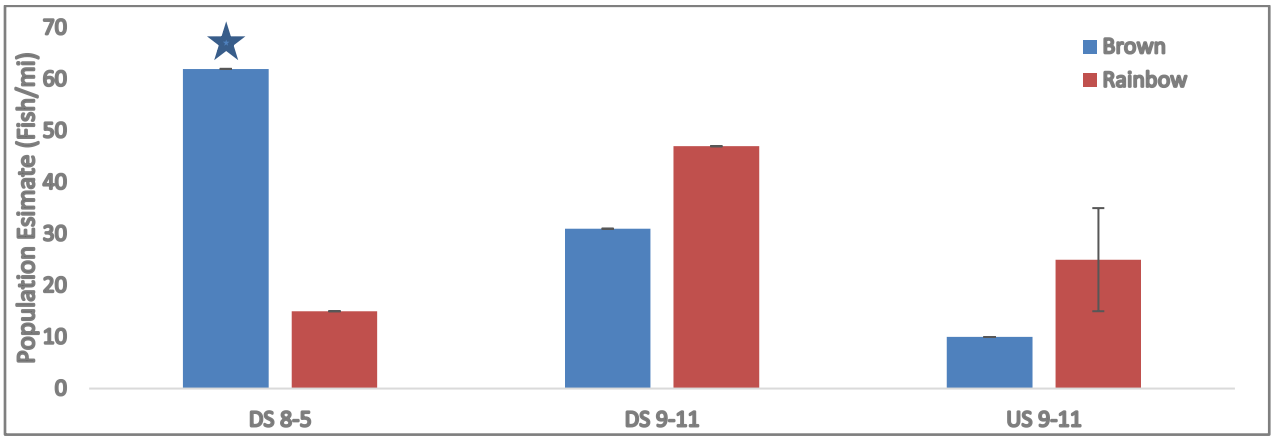


Figure 1: Population estimate (fish/mile) for rainbow (red) and brown (blue) trout including 95% confidence interval for trout captured at either the upstream (US) or downstream (DS) sites on Cow Creek on 8-5-2019 and 9-11-2019. Star indicates minimum population based on true total catch rather than formal population estimates due to insufficient capture rate or depletion.

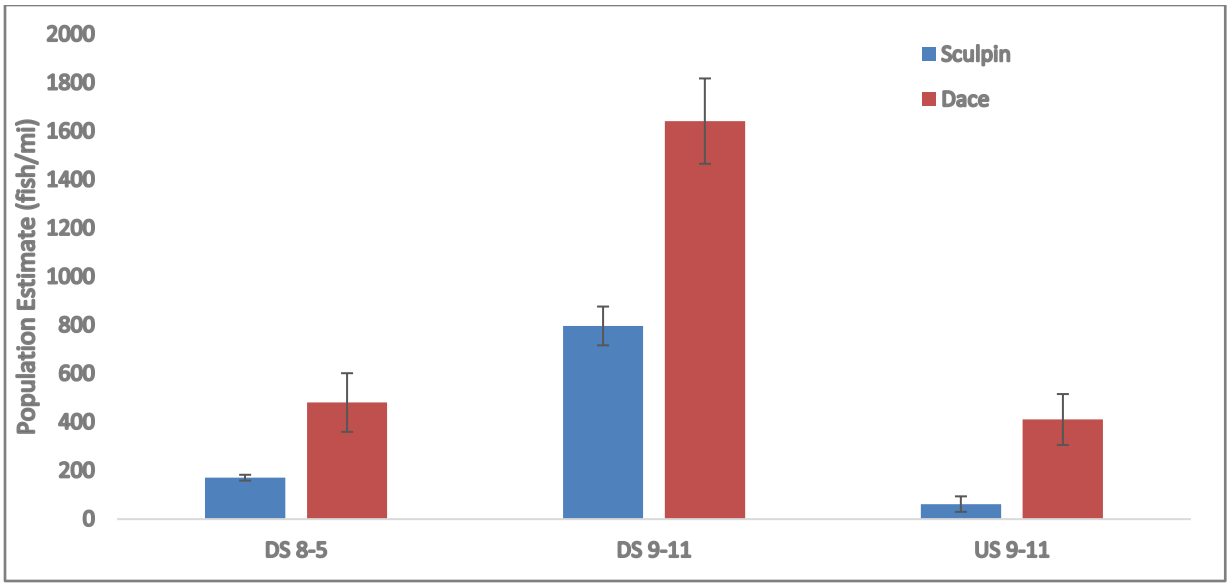


Figure 2: Population estimate (fish/mile) for speckled dace (red) and mottled sculpin (blue) including 95% confidence interval for fish captured at either the upstream (US) or downstream (DS) sites on Cow Creek on 8-5-2019 and 9-11-2019.

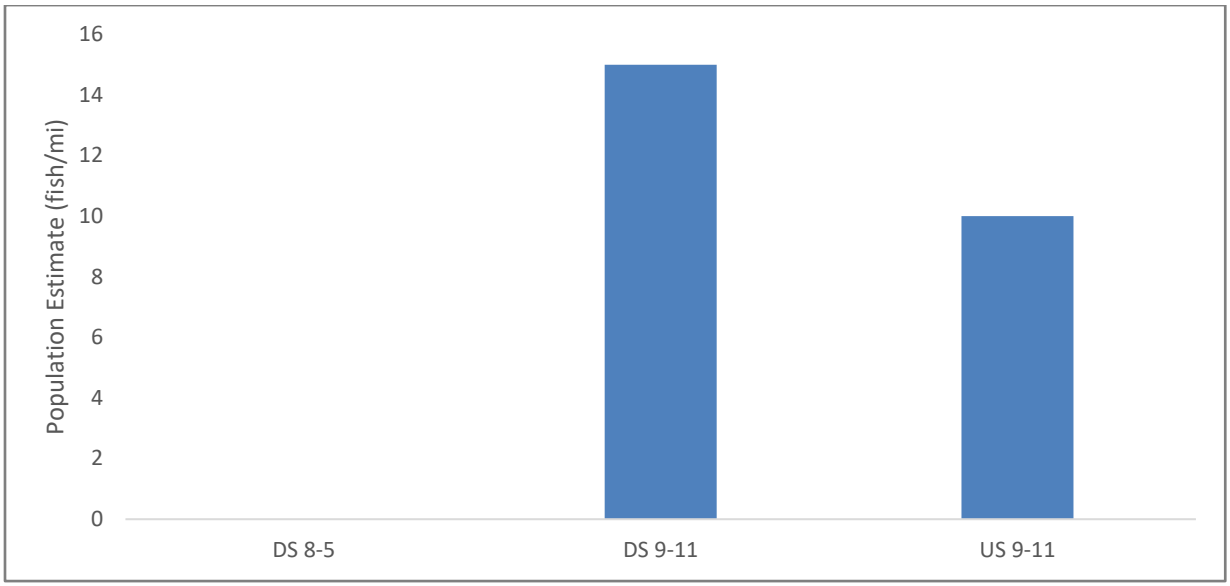


Figure 3: Minimum population estimated by true catch rate (fish/mile) for bluehead sucker captured at either the upstream (US) or downstream (DS) sites on Cow Creek on 8-5-2019 and 9-11-2019.

CONCLUSIONS

The 2019 sampling captured brown and rainbow trout, along with native mottled sculpin, speckled dace and most notably bluehead sucker. Rainbow trout numbers increased at the site downstream of the gauging station from 8-5 until 9-11 (Figure 1), while brown trout numbers decreased. The 9-11 sampling was the only chance to compare upstream to downstream estimates, and the estimates were lower at the upstream site for both rainbow and brown trout. Sculpin and dace numbers were robust in all

sampling events (Figure 2), but were somewhat depressed in the 8-5 sampling due to the higher flows. Similar to the trout numbers, on 9-11 the dace and sculpin numbers were higher at the downstream site (Figure 2). The 9-11 sampling resulted in the capture of three bluehead suckers (Figure 3), which was surprising. These fish are probably representative of a remnant population of the native suckers that have subsisted in Cow Creek following the implementation of diversion structures that prevent movement of the species throughout the Uncompahgre River. The inundation of Ridgway Reservoir in 1977 likely further isolated this population to Cow Creek, due to lower water temperatures in the tailwater section of the Uncompahgre River downstream of Ridgway Reservoir.

The fishery on Cow Creek is an interesting one. It appears that the gauging station is a likely barrier, and could be limiting the quality of the fishery on the SWA. The structure is degrading, and fish passage should be a criteria for any new design. Temperature loggers were placed in Cow Creek on the SWA and the Forest Service section in addition to a logger on the Uncompahgre River just upstream of the Cow Creek confluence to evaluate thermal conditions that may facilitate movement into or out of Cow Creek. Utilizing mobile Pit tag reader arrays could be useful to determine fish movement and the impact of the gauging station on that movement in Cow Creek. This data, paired with thermal data could prove valuable for informing the proposed water project in the drainage, and should be pursued. The fishery on the SWA is average, but the access is great. Supplemental stocking could greatly improve the fishery and should be considered. Stocking sub-catchables in Cow Creek may also provide a rearing opportunity for the fishery in the Uncompahgre.

MANAGEMENT RECOMMENDATION SUMMARY

1. *Management:* Continue to manage a category 302 Salmonid Stream.
2. *Stocking*: Consider stocking either catchable or sub-catchable trout to supplement the fishery.
3. *Regulations:* Given the light angling pressure, general regulations are suitable.
4. *Habitat Improvement*: Evaluate gauging station, and try to replace with passable structure.
5. *Access/Facilities:* Public access is great.
6. *Information/Education:* None necessary.

Large brown trout with Cow Creek gauging station in background

Population Estimates

Water 39380 Cow Creek

Station GU4205 On Billy Creek SWA downstream of gauging station

Date 8/5/2019

Species	Total Catch	Min.Cut inch	Max.Cut inch	Total Used	Pass 1	Pass 2	Population Biomass Lb	No./Mile Lb/Mile	No./Acre Lb/Acre
BROWN TROUT	4	4.72		4	2	2			
						95% CI (+/-)			
						Low 95%CL			
						High 95% CL			
MOTTLED SCULPIN	11	0.00		11	10	1	11.00	170.82	56.37
						95% CI (+/-)	0.80	12.46	4.11
						Low 95%CL			
						High 95% CL			
RAINBOW TROUT	2	7.87		1	1	0	1.00	15.53	5.12
						95% CI (+/-)	0.00		
							0.95	14.69	4.85
						Low 95%CL			
						High 95% CL			
SPECKLED DACE	28	0.00		28	21	7	31.00	481.41	158.87
						95% CI (+/-)	7.78	120.80	39.86
						Low 95%CL			
						High 95% CL			
						Overall totals	43	667.76	220.36
							0.95	14.69	4.85

Notes: Water was high ~100 CFS

Population Estimates

Water 39380 Cow Creek

Station GU4205 On Billy Creek SWA downstream of gauging station

Date 8/5/2019

Species	Total Catch	Min.Cut inch	Max.Cut inch	Total Used	Pass 1	Pass 2	Population Biomass Lb	No./Mile Lb/Mile	No./Acre Lb/Acre
BROWN TROUT	4	4.72		4	2	2			
						95% CI (+/-)			
						Low 95%CL			
						High 95% CL			
MOTTLED SCULPIN	11	0.00		11	10	1	11.00	170.82	56.37
						95% CI (+/-)	0.80	12.46	4.11
						Low 95%CL			
						High 95% CL			
RAINBOW TROUT	2	7.87		1	1	0	1.00	15.53	5.12
						95% CI (+/-)	0.00		
							0.95	14.69	4.85
						Low 95%CL			
						High 95% CL			
SPECKLED DACE	28	0.00		28	21	7	31.00	481.41	158.87
						95% CI (+/-)	7.78	120.80	39.86
						Low 95%CL			
						High 95% CL			
						Overall totals	43	667.76	220.36
							0.95	14.69	4.85

Notes: Water was high ~100 CFS

Combined Summaries

Water **39380** Cow Creek

Station **GU4206** Upstream end of Billy Creek SWA accessed via S. gate

Date **8/5/2019**

Drainage **Gunnison River**

UtmX **259623** UtmY **4236460** Elevation **6726 ft**

Length **1040 ft** Width **25.00 ft** Area **0.60 acre**

Surveyors **Gardunio, Birch, Untreiner, Anderson, Kimber**

Gear **3x BPEF** Effort Metric Protocol **PRESENCE/ABSENCE**

Proportional Stocking Density and Catch/Unit Effort

Species	Total Catch	Min Cut inch	Max Cut inch	Total used	Proportional Stock Density (%)	Percent Stock Size	Percent Quality Size	Percent Preferred Size	Percent Memorable Size	Percent Trophy Size	Max Length inches
MOTTLED SCULPIN	1	0.00		1							3.62
RAINBOW TROUT	1	7.87		1	0.00	100.00					10.28
SPECKLED DACE	6	0.00		6							2.99

Mean, Minimum and Maximum Length and Weight

Species	Total Catch	Min cut inch	Max cut inch	Total Used	Length (inches) Mean	Length (inches) Minimum	Length (inches) Maximum	Weight (lb) Mean	Weight (lb) Minimum	Weight (lb) Maximum
MOTTLED SCULPIN	1	0.00		1	3.62	3.62	3.62		0.00	0.00
RAINBOW TROUT	1	7.87		1	10.28	10.28	10.28	0.47	0.47	0.47
SPECKLED DACE	6	0.00		6	2.43	1.73	2.99		0.00	0.00

Relative Abundance and Catch/Unit Effort

Species	Total Catch	Min.Cut inch	Max.Cut inch	Total used	Weight Lbs	Percent Number	Percent Weight	Catch per Unit Effort Number/Effort	Catch per Unit Effort Lbs/Effort
MOTTLED SCULPIN	1	0.00		1	0.00	12.50	0.00		
RAINBOW TROUT	1	7.87		1	0.47	12.50	100.00		
SPECKLED DACE	6	0.00		6	0.00	75.00	0.00		

Abundance and Biomass

Species	Total Catch	Min.Cut inch	Max.Cut inch	Total Used	Population estimate	Biomass Lbs	Percent Number	Percent Weight	Density estimates Lb/Acre	Density estimates Fish/Acre	Density estimates Fish/Mile
MOTTLED SCULPIN	1	0.00		1		0.00	12.50	0.00	0.00	1.68	5.08
RAINBOW TROUT	1	7.87		1		0.47	12.50	100.00	0.78	1.68	5.08
SPECKLED DACE	6	0.00		6		0.00	75.00	0.00	0.00	10.05	30.46

Notes: Water was high ~100 CFS

Population Estimates

Water **39380** **Cow Creek** Date **9/11/2019**

Station **GU4205** **On Billy Creek SWA downstream of gauging station**

Drainage **Gunnison River** UtmX **259046** UtmY **4236636** Elevation **6690 ft**

Length **340 ft** Width **25.00 ft** Area **0.20 acre**

Surveyors **Gardunio, Birch, Untreiner, Anderson, Kimber**

Gear **2x BPEF** Effort Metric **PASS** Protocol **TWO-PASS REMOVAL**

Species	Total Catch	Min.Cut inch	Max.Cut inch	Total Used	Pass 1	Pass 2	Population Biomass Lb	No./Mile Lb/Mile	No./Acre Lb/Acre
BLUEHEAD SUCKER	1	5.91		0	0	0			
						95% CI (+/-)			
						Low 95%CL			
						High 95% CL			
BROWN TROUT	4	4.72		2	2	0	2.00	31.06	10.25
						95% CI (+/-)	0.00		
						Low 95%CL			
						High 95% CL			
MOTTLED SCULPIN	49	0.00		49	40	9	51.32	797.01	263.01
						95% CI (+/-)	5.14	79.82	26.34
						Low 95%CL			
						High 95% CL			
RAINBOW TROUT	5	7.87		3	3	0	3.00	46.59	15.37
						95% CI (+/-)	0.00		
						Low 95%CL			
						High 95% CL			
SPECKLED DACE	97	0.00		97	75	22	105.72	1,641.72	541.77
						95% CI (+/-)	11.34	176.09	58.11
						Low 95%CL			
						High 95% CL			
						Overall totals	162	2,516.38	830.41
							0.00	0.00	0.00

Notes: Observed YOY SPD.

Population Estimates

Water **39380** **Cow Creek** Date **9/11/2019**

Station **GU4206** **Upstream end of Billy Creek SWA accessed via S. gate**

Drainage **Gunnison River** UtmX **259623** UtmY **4236460** Elevation **6726 ft**

Length **1040 ft** Width **25.00 ft** Area **0.60 acre**

Surveyors **Gardunio, Birch, Untreiner, Anderson, Kimber**

Gear **2x BPEF** Effort Metric **PASS** Protocol **TWO-PASS REMOVAL**

Species	Total Catch	Min.Cut inch	Max.Cut inch	Total Used	Pass 1	Pass 2	Population Biomass Lb	No./Mile Lb/Mile	No./Acre Lb/Acre
BLUEHEAD SUCKER	2	5.91		2	1	1			
						95% CI (+/-)			
						Low 95%CL			
						High 95% CL			
BROWN TROUT	3	4.72		2	2	0	2.00	10.15	3.35
						95% CI (+/-)	0.00		
						Low 95%CL			
						High 95% CL			
MOTTLED SCULPIN	11	0.00		11	8	3	12.20	61.94	20.44
						95% CI (+/-)	6.24	31.68	10.46
						Low 95%CL			
						High 95% CL			
RAINBOW TROUT	5	7.87		5	4	1	5.00	25.38	8.38
						95% CI (+/-)	1.95	9.89	3.26
						Low 95%CL			
						High 95% CL			
SPECKLED DACE	67	0.00		67	47	20	81.07	411.61	135.83
						95% CI (+/-)	20.69	105.03	34.66
						Low 95%CL			
						High 95% CL			
						Overall totals	100	509.08	168.00
							0.00	0.00	0.00

Notes: Observed YOY SPD

Appendix C2

Cow Creek Thermal and Flow Supplemental Report 2019

COW CREEK 2019

Supplemental Flow and Temperature Data Analysis

Eric Gardunio

Aquatic Biologist

Colorado Parks and Wildlife

This evaluation is meant to supplement the fisheries data presented in the 2019 Cow Creek Annual Report. The thermal logger from which this data set originates was not pulled from Cow Creek until January 2020, precluding its inclusion in the Annual Report. This may be relevant to water rights filings that have been recently applied for on Cow Creek.

Sampling in 2019 indicated that Cow Creek contains populations of cutthroat, brown and rainbow trout, along with native populations of bluehead suckers, mottled sculpin and speckled dace. The bluehead sucker population is of particular note, as it represents a remnant native population of what was in the Uncompahgre River prior to dam construction. Bluehead suckers are listed in the Colorado State Wildlife Action Plan as Tier I Species of Greatest Conservation Need defined as: "…species which are truly of highest conservation priority in the state."

CPW owns 0.9 miles of Cow Creek access on the Billy Creek State Wildlife Area (SWA) that contains all of the above listed species, save cutthroat trout, and offers a public angling opportunity. The proposed 20 cfs conditional water right and the 30 CFS exchange has the potential to damage or eliminate this fishery via channel drying and/or increased water temperatures. In both 2018 and 2019 (representing low and high water years, respectively), flows at the Cow Creek gauge on the CPW SWA approximately 1 mile upstream of the Uncompahgre River confluence were recorded at less than 20 cfs for 5-6 months annually (Figures 1-2). The conditional water right application has the potential to eliminate flows and damage this fishery, depending on the timing of water diversions. The proposed diversions may allow fisheries persistence if they are conducted during the high flow portion of the hydrograph (May through mid-June), however this potential cannot be confirmed at this time

To assess the water temperature regime within Cow Creek, a temperature logger was deployed approximately 100 feet downstream of the gauging station on the Billy Creek SWA from August 14, 2019 through January 27, 2020. Between August 14 and September 20, 2019, water temperatures exceeded Colorado's chronic standard for trout during daily fluctuations, and reached temperatures near the acute standard on multiple occasions (Figure 3). The chronic standard represents a water temperature that could result in mortality for trout if it persists for long periods of time, while the acute standard represents temperatures that would cause rapid mortality. The proposed water depletions would likely result in increased water temperatures to above the acute standard, causing trout mortality in Cow Creek. Although the conditional water right filing has no details related to the timing or implementation of the diversion, conversations with Wright Water Engineers outlined the potential to divert the daily peaks of the hydrograph, which result from evapotranspiration of riparian vegetation in the Cow Creek drainage. Examination of daily flow and temperature data demonstrate that during low flow periods, daily increases in flow correlate to water temperatures that are below the chronic standard (Figures 4

and 5), and are likely responsible for maintaining the fishery in Cow Creek by allowing daily drops in temperature that provide fish a reprieve from the chronic temperatures. By diverting the daily peaks, fish in Cow Creek would lose these daily periods of thermal respite, and may experience mortality due to chronic exposure to high temperatures.

The flow and temperature analysis for Cow Creek indicates that the water rights application has the likelihood to damage or eliminate the native bluehead sucker population as well as the rest of the fishery in the downstream end of Cow Creek through the degradation of water quantity and quality. The 30 CFS exchange appears to have the ability to dry the channel, and even with lower volumes of diversion, the thermal regime from July through September is likely to increase to levels that would cause mortality to the fish of Cow Creek. If water is diverted during high flow periods (mid-April through mid-June) these impacts may be avoided. Opportunities to work collaboratively toward a solution that would prevent undue impacts to the fishery should be pursued.

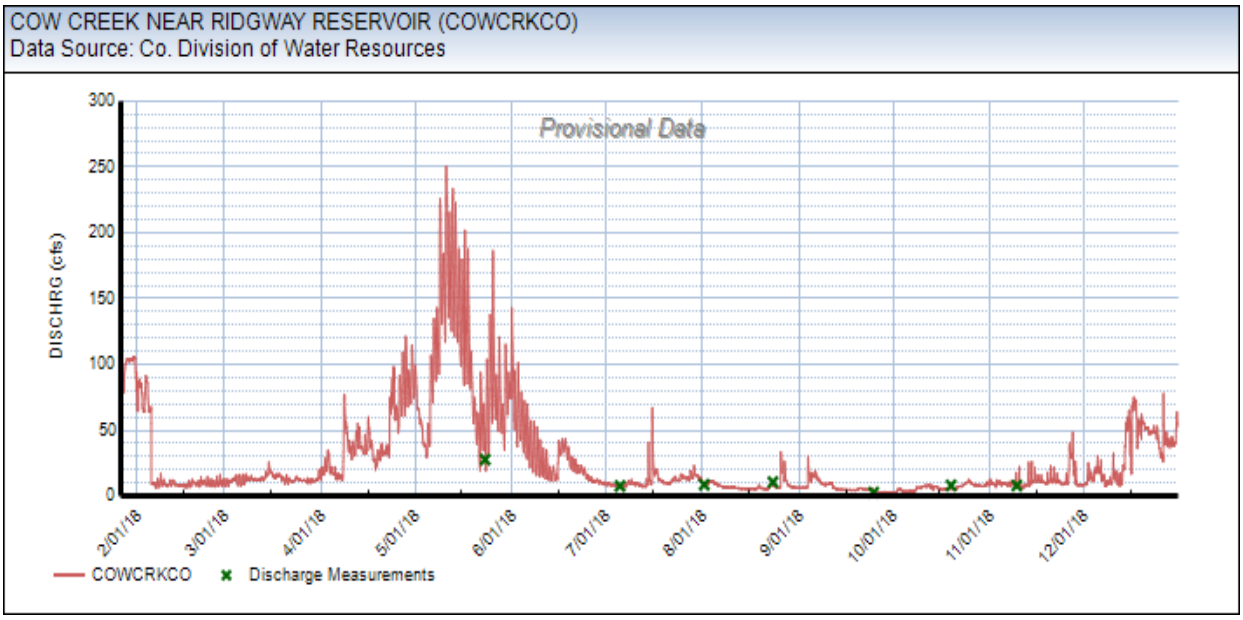


Figure 1: Cow Creek flows in CFS from 2018 at Cow Creek gauge on Billy Creek State Wildlife Area.

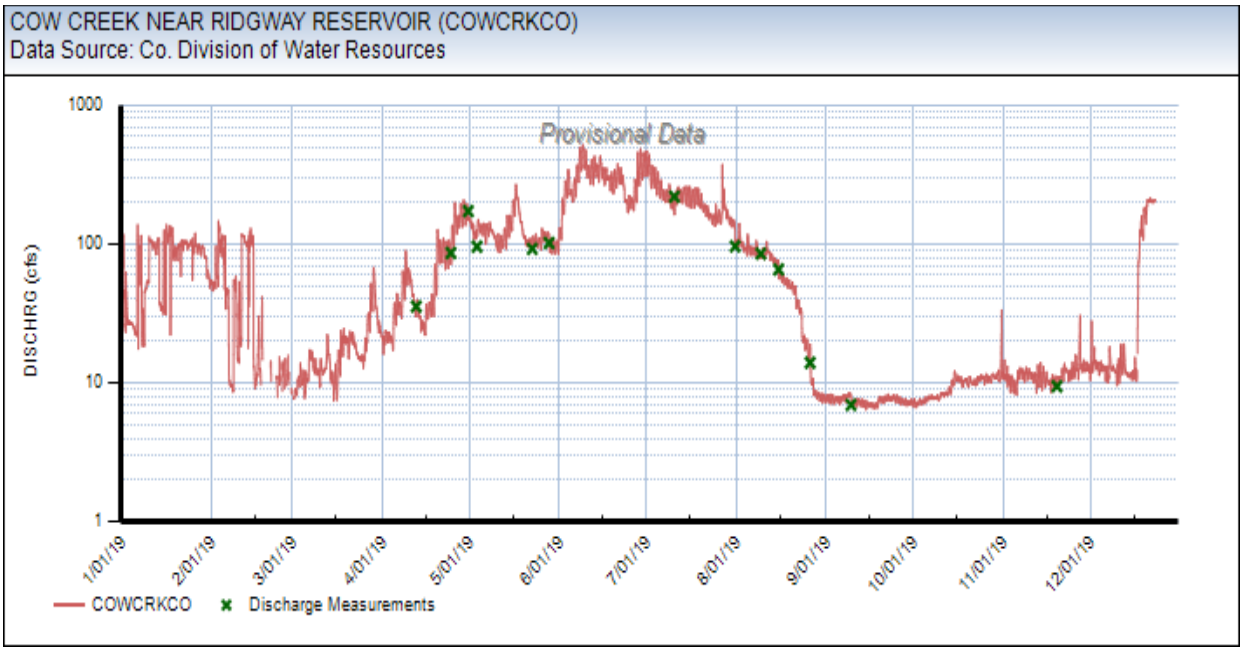


Figure 2: Cow Creek flows in CFS from 2019 at Cow Creek gauge on Billy Creek State Wildlife Area represented in log scale.

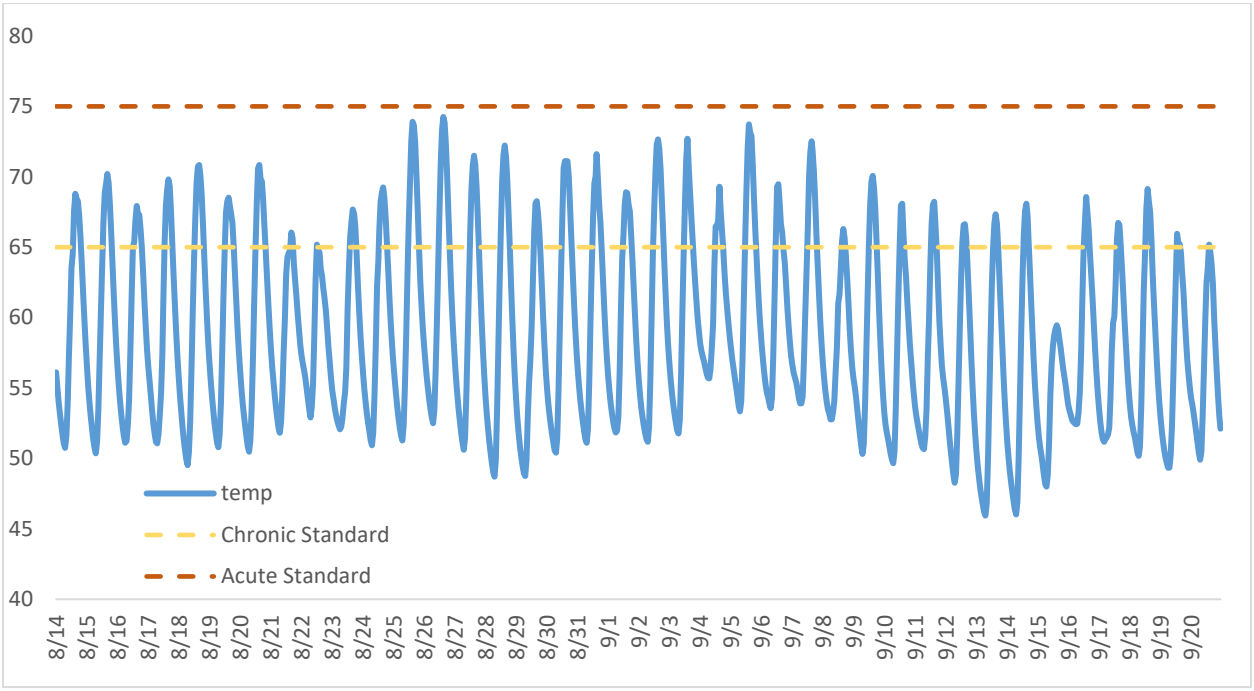


Figure 3: Water temperatures (Fahrenheit) recorded on the Billy Creek SWA in August 14 - September 20 of 2019 with the chronic and acute temperature standards.

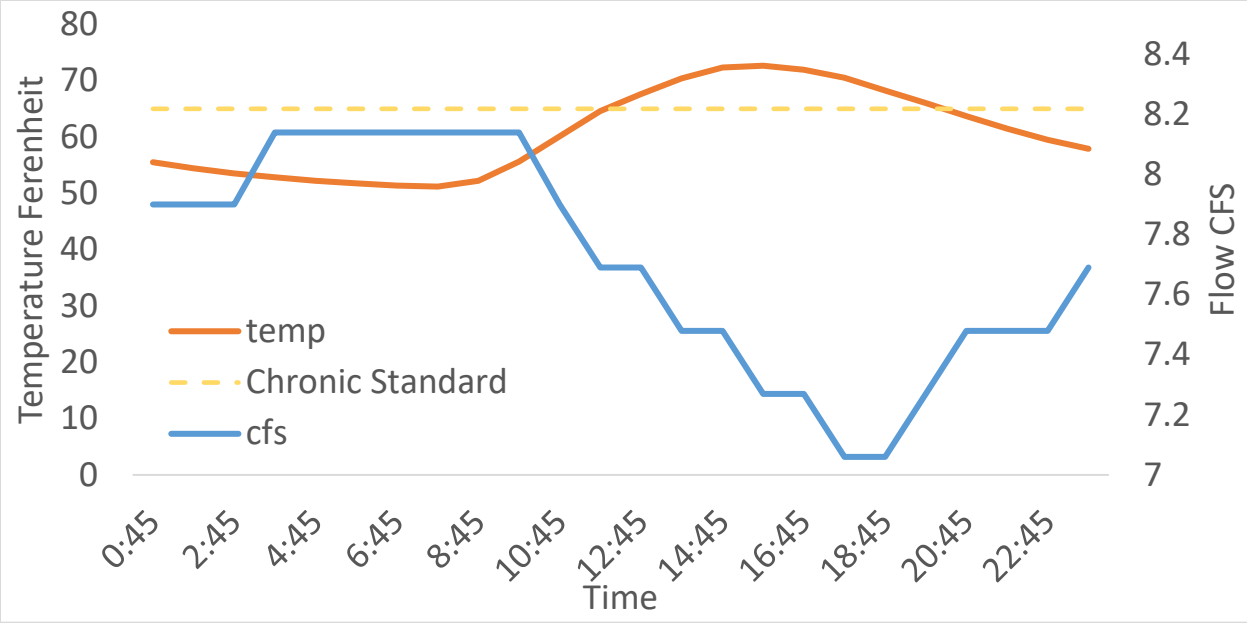


Figure 4: Hourly water temperature (with chronic standard) and flow data taken at the Billy Creek SWA gauging station on 9-2-2019; these data are representative of relationships observed over the course of data collection in 2019.

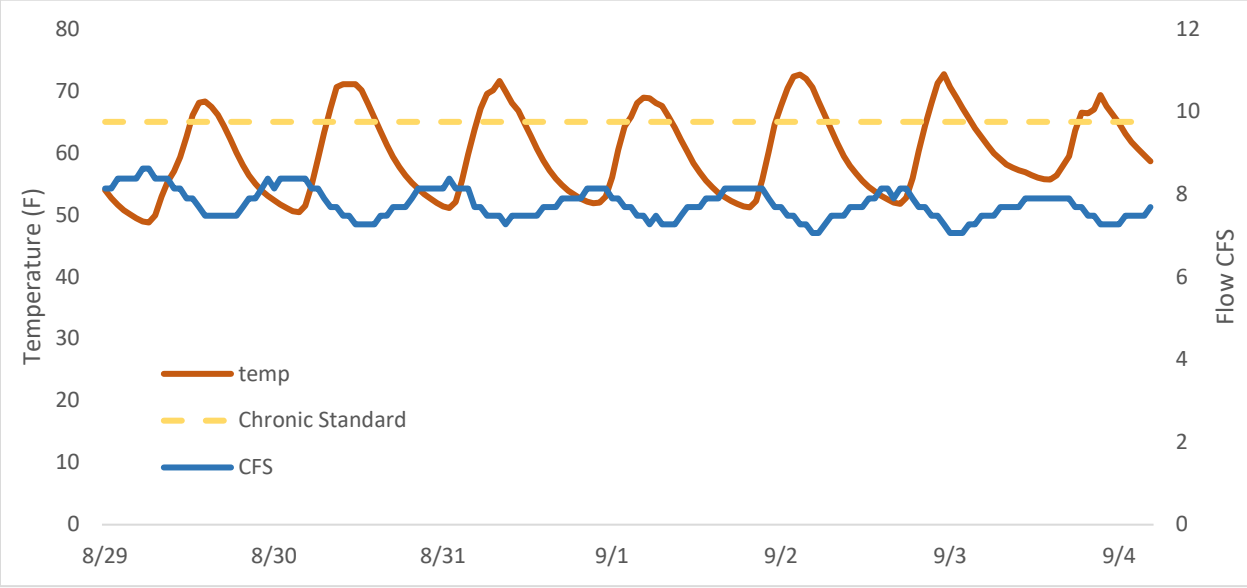


Figure 5: Hourly flow (blue) and temperature data from Cow Creek collected at the gauging station on Billy Creek SWA during 2019 displayed along with the chronic temperature standard for trout.

Appendix C3

Cow Creek and Uncompahgre River Environmental Flow Needs, Katie Birch, CPW 4/15/2020

Cow Creek and Uncompahgre River Environmental Flow Needs

Katie Birch, Instream Flow Program Specialist, CPW
04/15/2020

History of CPW's ISF Effort on Cow Creek

Colorado Parks and Wildlife has been developing an instream flow (ISF) recommendation on lower Cow Creek since 2015. At that time, the reach under consideration was approximately 12 miles from the Sneva Ditch headgate (near the USFS boundary) to the confluence with the Uncompahgre River. Data collection on Cow Creek occurred in 2014 on CPW's Billy Creek State Wildlife Area (SWA) approximately 1.5 miles from the lower terminus of the proposed ISF reach. For a number of reasons, the ISF recommendation was postponed until 2020. The geomorphological setting of the stream made R2Cross analyses difficult. The hydrology of the creek is flashy; the stream exhibits very high peaks during spring runoff and a very depleted baseflow during the irrigation season because of a number of agricultural diversions above Billy Creek SWA. Many of the 2014 cross sections were outside of the accuracy range for use of Manning's equation in the R2Cross model. Another part of the reason for delaying the instream flow recommendation was to attempt to work with landowners above the SWA to understand the series of depletions, and potentially secure access for additional R2Cross cross sections to better understand the flow needs. This was unsuccessful, and ultimately additional cross sections were collected in 2019 on the SWA.

Cow Creek is a dynamic river that transports significant sediment. Considerable sections of the channel are braided, particularly near the creek's confluence with the Uncompahgre River on Billy Creek SWA. Cow Creek's flow regime is important to the Uncompahgre River tailwaters below Ridgway Reservoir. Below the reservoir, there is low diversity and high biomass of macroinvertebrates. Cow Creek improves the sediment and temperature regime of the tailwaters. Below Cow Creek's confluence, there are fresh gravels and cobbles, which provide interstitial space for spawning and macroinvertebrate production, and substrate is generally less embedded than above the confluence. This correlates to a higher number of taxa below Cow Creek's confluence – including multiple species of stonefly, mayfly, and generally more pollutant-sensitive taxa. The higher levels of macroinvertebrate diversity downstream of the confluence of Billy Creek and Cow Creek suggests that the aquatic community is healthier than the community in the Uncompahgre River upstream at Pa-Co-Chu-Pak due to these tributary inflows (UWP Water Quality Report, 2012).

Cow Creek supports populations of cutthroat, brown, and rainbow trout, along with native populations of bluehead sucker, mottled sculpin, and speckled dace. The stream supports complex fish habitat including riffles, runs, pools, and slow-velocity side channel habitat. Cow Creek exhibits a notable diurnal fluctuation, which provides important temperature refuge for the resident fish. The daily peaks in the diurnal fluctuation correlate with water temperatures that are below the state chronic standard, as evidenced by CPW's temperature loggers deployed in 2019 (Gardunio, 2019).

In 2019, CPW refined our flow recommendation on Cow Creek. We limited the proposed reach to the segment of Cow Creek flowing through Billy Creek SWA, in order to better protect the ecological values on our state wildlife area. In 2019, we surveyed suitable, representative, single-thread riffles for R2Cross analyses. Based on these field investigations, we developed a flow recommendation with the intention

of bringing the recommendation to the CWCB in 2020. The CWCB wanted to work collaboratively with the Ouray County Phase 2 Needs Study and asked CPW to postpone the recommendation for an appropriation date of 2021. Below is a summary of the current draft biological flow recommendation.

	Bankfull Channel Width	**Date Measured**	**Flow Measured**	**Model Accuracy Range**	**Flow Meeting Two Criteria**	**Flow Meeting Three Criteria**
XS-1	57 ft	8/7/2019	90 cfs	36 – 227 cfs	Out of Range[1]	53 cfs
XS-2	45 ft	9/11/2019	6.85 cfs	2.7 – 17 cfs	15	Out of Range[1]
				Mean	**15 cfs**	**53 cfs**

[1]Results are outside of recommended accuracy range for use of Manning's equation (40 to 250% of flow measured during site visit) and as such, were omitted.

Given these results, it is CPW's opinion that the following flows are needed to protect the natural environment to a reasonable degree. These recommendations may be reduced due to water availability considerations. CPW's initial biological recommendations are as follows:

- Summer Flow Recommendation: 53 cfs (April through mid-July)
- Baseflow Recommendation 15 cfs (late-July through March)

History of CPW's ISF Effort on the Uncompahgre below Ridgway Reservoir

In 1996, flow recommendations were developed for the Uncompahgre River below Ridgway Reservoir. Cross sectional work done in 1996 resulted in a biological recommendation of 100 cfs in the summer and 65 cfs in the winter. The USGS gage "Uncompahgre River below Ridgway Reservoir" (09147025) was used to refine this recommendation based on water physically available for appropriation. Water availability analysis indicated median hydrology of 90 cfs from May 1 through October 14 and 50 cfs from October 15 through April 30. The water availability-refined flow rates were recommended to the CWCB. It was also noted at this time that approximately 70 cfs was correlated with minimizing low flow conditions in the winter that caused trout mortality related to gas bubble disease from supersaturated levels of oxygen and nitrogen from the outlet releases, resulting in more severe impacts to the fishery during the winter. Ultimately, this ISF recommendation was not appropriated by the CWCB for unknown reasons.

Since this time period, new hydropower turbines installed on the dam have resulted in the gas supersaturation issue no longer being relevant. However, the current minimum bypass requirements released from Ridgway Reservoir are not optimal for the downstream fishery. When flows are less than 50 cfs between the dam and Cow Creek's confluence, habitat is restricted and the trout population experience stressful overwintering conditions. Water temperatures in the summer are too cold, and water temperatures in the winter are too warm, resulting in increased metabolism with no additional aquatic food availability. Cow Creek's contribution to the Uncompahgre tailwater fishery contributes a more natural looking hydrograph, improving the temperature and sediment regime, as well as the aquatic insect community. This contribution has minimized the "tailwater effect" below the dam.

For the Uncompahgre River below Ridgway Reservoir, there is a good amount data that can be utilized in assessing the flow needs, including PHABSIM data. Flow recommendations made by the Division of Wildlife in 1995 using R2Cross indicate a need for 65 cfs in the wintertime (or 50 cfs if water availability-limited). This quantification should serve as a starting point for determining the minimum flows necessary to preserve the tailwaters fishery above Cow Creek's confluence. Past habitat modeling indicates optimum

habitat availability can be reached with flows greater than 50 cfs, and incremental gains in weighted usable habitat for brown and rainbow trout are realized approaching 200 cfs. Given what we know about the aquatic resources in Cow Creek and Dallas Creek and as a matter of practice, Colorado Parks and Wildlife does not condone damaging or sacrificing those fisheries to in an effort to enhance the fishery below the reservoir.

Appendix D

Ram's Horn Reservoir Evaluation by Yeh and Associates, Inc.

Yeh and Associates, Inc.
Geotechnical • Geological • Construction Services

2000 Clay Street, Ste 200
Denver, CO 80211
303-781-9590 • www.yeh-eng.com

Project No. 219-208

TECHNICAL MEMORANDUM

DATE: August 22, 2019

TO: Hayes Lenhart/Peter Foster – Wright Water Engineers, Inc.

FROM: Jonathan L. White, P.G.

SUBJECT: Office review, stage-storage capacity, and recommendations for future geotechnical investigation at the proposed reservoir at Ramshorn Ridge, Ouray County, Colorado

Yeh and Associates, Inc. (YA) is providing this technical memo to complete the scope-of-work (SOW) modification that was submitted July 31, 2019 to Wright Water Engineers, Inc. (WWE). This work was approved by WWE, via e-mail, on August 1, 2019. Spatial data will be provided by a dropbox upload.

WWE is requesting preliminary water-storage data and recommendations for a future feasibility/preliminary geotechnical investigation at a reservoir location that is tentatively proposed on the Cow Creek tributary of the Uncompahgre River about 6.5 miles east of Ridgway, with the dam located at the narrow water gap that is formed in the Ramshorn ridgeline (38°08'19"N, 107°38'17"W). Ramshorn Ridge is a named topographic feature labeled on USGS topographic basemaps of the area. A comprehensive collection of spatial data was completed for this location as an ArcGIS relational geodatabase that was delivered in an ArcGIS Map Package that was uploaded to the WWE dropbox site on July 12, 2019. Supplemental data for this scope-of-work modification includes a 5ft-interval contour map created from the light detection and ranging (lidar) data set and derived reservoir-elevation surface polygons to generate volumetric calculations at various reservoir water levels. The latter part of this memo includes the recommendations for a future feasibility/preliminary geotechnical investigation.

Site Geological and Surficial Conditions

The site conditions expressed below are based solely on office reconnaissance of lidar imagery and published geologic data that has been included in the original geodatabase map package submission. As per the SOW, neither a site inspection nor field mapping has been conducted by YA. Available small-scale geologic maps in the geodatabase indicate that the Ramshorn ridgeline was created by a Cretaceous intrusion of igneous rock. This crystalline rock is more resistant to weathering than the surrounding bedrock and formed a higher landform as the surrounding rock eroded. The engineering properties of the igneous rock mass is unknown at the time this memo report was written. Incision and downcutting of Cow Creek through this intrusive rock mass formed a narrow water gap. Published geologic maps indicate the surrounding steeply dipping sedimentary bedrock includes the top-to-bottom stratigraphic interval from the Cretaceous Mancos Shale to the Permian Cutler

Formation red beds. Faults have been mapped in the near vicinity. San Juan volcanic and volcaniclastic rocks form the upper hills above Cow Creek valley. Surficial unconsolidated deposits (soils) are variable and include the alluvium of Cow Creek, older alluvial terraces and alluvial fans, and extensive colluvial and landslides deposits in the area. Talus (scree) slopes appear to be present below outcropping igneous rock.

GIS Analyses at the Preliminary Ramshorn Reservoir Location

YA completed the GIS tasks and created reservoir polygons at varying elevations (Plate 1). Reservoir volume calculations were performed by utilizing existing lidar and National Elevation Dataset (NED) digital elevation models (DEM). These DEM's represent "bare earth" surficial topography that removes existing vegetation or structures. Volumes can be estimated by defining the reservoir elevation and computing precise volumes based on the DEM's topography in ArcGIS. It should be noted that the larger reservoirs (8,100 ft, 8,050 ft and 8,040 ft) are outside of the LiDAR DEM extent and therefore the NED DEM was summated with the LiDAR DEM to complete the final volume calculation.

An embankment backslope was not modeled because of site-location uncertainty with the original reservoir outline provided by WWE, high variability dependent on reservoir depth, and unknown dam type. Such precise analyses should be done during design-level investigations when CAD grading contours of a preliminary dam design become available. For the purpose of this feasibility study, a vertical face was modeled at a dam location where the ridgelines are at their highest (See Plate 1). The preliminary stage-storage capacity graph in shown in Figure 1. The data is shown electronically in an Excel spreadsheet and as georeferenced feature classes in the relational geodatabase.

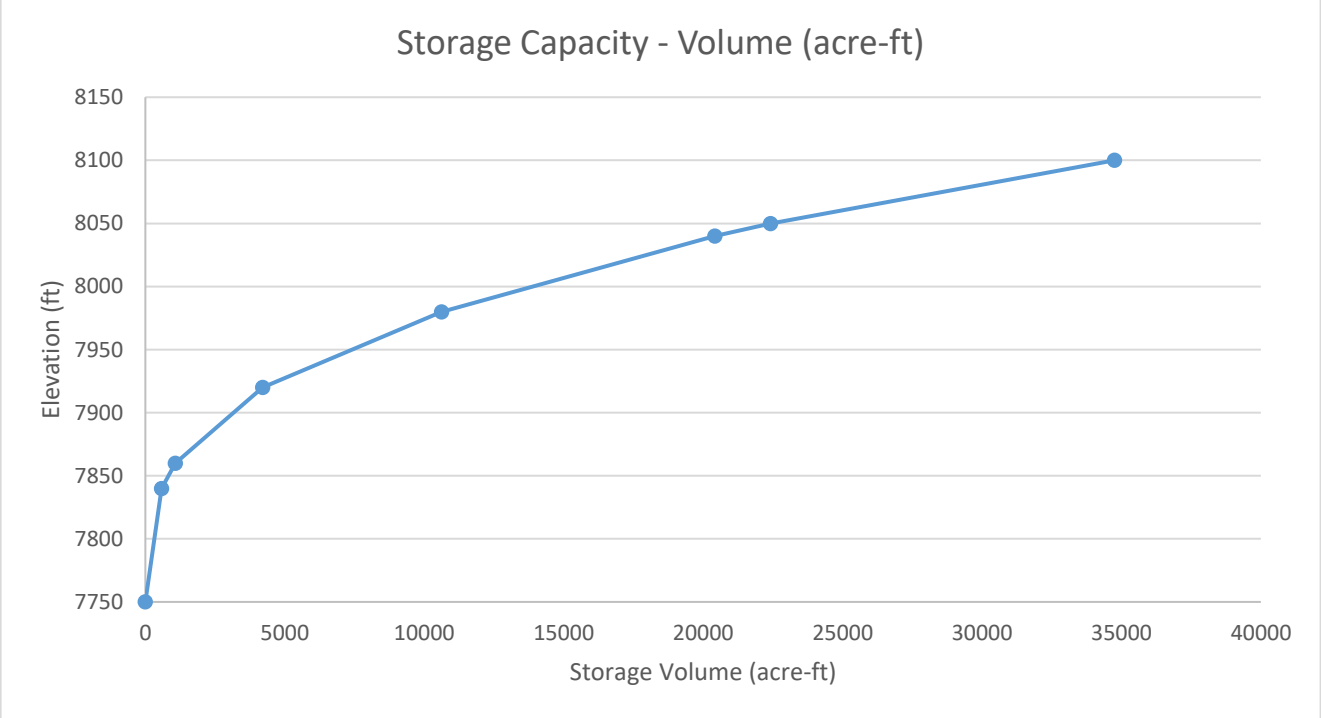


Figure 1. Stage-storage capacity graph. The elevations of the reservoir stages are shown in Plate 1 at the points shown

Recommendations for future feasibility/preliminary geotechnical investigation

1. Surface mapping program
   Detailed geologic mapping should be completed of the site within an area of interest that includes adjacent slopes within the Cow Creek basin that fall within the hydrologic catchment of the proposed reservoir. This mapping should be at a suitable scale that mapped bedrock and unconsolidated surficial (soil) deposits can be accurately delineated for design purposes. We recommend a scale no less than 1:2,400 (1 inch equals 200 ft). Use of lidar bare-earth imagery and derived contours as a basemap can achieve that scale. Lidar DEM should also be used to prepare a high-resolution slope-classification map to help determine site access and other general preliminary design purposes. Upon completion of mapping, the subsurface investigation program can be defined. Suitability of geophysical surveys can then also be assessed.

2. Subsurface Investigative Program
   A site-specific subsurface investigation is needed to determine the depth and engineering properties of both the unconsolidated soils and bedrock. This program should have sufficient borings, laboratory testing, and supplemental geophysical surveys to satisfy the following requirements.
   a. Determine properties of local unconsolidated deposits (soils) that includes the following:
      i. Determine potential locations and engineering properties for borrow sources for dam embankment fills.
      ii. Thickness and engineering properties of Cow Creek alluvium at creek floor where dam is proposed.
      iii. Engineering properties for alluvium and alluvial fan soils at the shoreline of proposed reservoir. Determine if slope stability may be a concern, especially during rapid drawdown of reservoir levels in seasonal irrigation cycles.
      iv. Collapsible, low density soils are common in alluvial fans formed in semi-arid environments. Soils may also swell where derived from potentially expansive Mancos Shale and mudstone of the Morrison Formation. Swell/consolidation testing will be required.
   b. Determine rock quality of igneous rock intrusion that forms the Ramshorn Ridge and its adequacy as foundation for dam embankment:
      i. Core borings at floor and ridge sides of creek water gap at proposed dam location to determine both the thickness of soils mentioned above and the underlying rock conditions. Horizontal or inclined borings may be considered if access is problematic.
      ii. Rock discontinuity mapping of the igneous rock.
      iii. Rock mass tests to determine strength and permeability.

   Upon preliminary analysis of the subsurface data, future pits and trenches may be needed for design-level investigations.

3. Seismic/fault survey
   A seismic study may be required after a thorough review of available seismotectonic studies and results of the field mapping. The USBR has completed extensive studies of faults and seismic risk at the nearby Ridgway Reservoir area. USBR reportedly discovered many new Quaternary to Late Cenozoic faults and recorded microseismicity in the vicinity. Many of those faults on Log Hill Mesa offset the hard Dakota Sandstone that forms the dip slope of the Uncompahgre Plateau and so can be more easily seen in lidar imagery. Much of Cow Creek basin is covered by landslides deposits or easily weathered shale where similar faults will be easily obscured.

Upon request, Yeh and Associates, Inc. can provide a more detailed scope of work and anticipated costs to conduct site mapping and a preliminary level of subsurface investigation. There will also be related logistical costs for site access of drill rigs. As with the data accompanying this report, YA would include the results of the study into the existing project relational geodatabase. If you have any questions, please contact Ed Archuleta at 970-382-9590 or Jon White at 720-272-9947.

Reviewed by Todd Schlittenhart, P.E.

Cc: Ed Archuleta

Plate 1 attachment

Ramshorn Ridge Water Gap
(38°08'19"N, 107°38'17"W)

Preliminary Ramshorn Reservoir Stages
Ouray County, Colorado

Project 219-208 August 23, 2019

N

0 0.125 0.25 0.5 Miles

Scale 1:7,500

Stage elevations and capacities for proposed reservoir

- 7840-ft level - 577 ac ft
- 7860-ft level - 1,076 ac-ft
- 7920-ft level - 4,208 ac-ft
- 7980-ft level - 10,622 ac-ft
- 8040-ft level - 20,420 ac-ft
- 8050-ft level - 22,419 ac-ft
- 8100-ft level - 34,751 ac-ft
- Original Reservoir Polygon from VWE

Basemap hillshade from Colorado Water Conservation Board lidar provided by Colorado Office of Information Technology.
Extent of available 1m lidar in map area is shown by white arrow where it is then replaced by USGS NED 10m DEM.
This old dataset contains a relict interference pattern.

Disclaimer: Volume calculations are based on lidar and summation of lidar and NED 3D terrain models at the elevation contours shown. The volumes are preliminary to provide feasibility information for reservoir planning. They do not reflect dam construction and embankment grading.

Yeh and Associates, Inc.
Geotechnical • Geological • Construction Services

Plate 1

Appendix E

Assorted Comments

Peter Foster

From: Chase Jones <cjones@town.ridgway.co.us>
Sent: Tuesday, April 28, 2020 2:35 PM
To: Peter Foster
Cc: Trevor Downing; Hayes Lenhart; Shay Coburn
Subject: RE: Please Review and Comment: Draft Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II
Attachments: Ridgway_Boundary_Block180214.zip

Afternoon Pete,
I only have a few comments to add to Shay's below.

- Page 70 – Ridgway's Athletic park is shown as being irrigated by Dallas Ditch water. It is instead watered by our non-potable water line.
- If reclassifying the Ouray Uncompaghre stretch to CW2 is underwent, it may be worth adding on Cottonwood creek too. I have heard the creek has not connected to the river in over 40years and that is the longest local memory I have heard from. It's primarily low to non-existent seasonal flows I think would classify it as being not capable of sustaining a wide variety of life ie CW2.
- There are properties that utilize Ridgway Ditch water when flows are in excess of Town needs. However, their primary use may be for stock ponds not field irrigation. The one property that I know has used Ridgway ditch water for irrigation purposes is adequately displayed on p70 Map 4.

To help address Shay's comments about Map 7 page 73 I have attached a current Town boundary file. I think this is the area we should utilize for defining Ridgway's service area. With some homes in the area shown already utilizing TCW water and our growth being uncertain, it is the better bet.

Best,
Chase

From: Peter Foster <pfoster@wrightwater.com>
Sent: Monday, April 27, 2020 4:02 PM
To: Shay Coburn <scoburn@town.ridgway.co.us>
Cc: Chase Jones <cjones@town.ridgway.co.us>; Trevor Downing <tdowning@wrightwater.com>; Hayes Lenhart <hlenhart@wrightwater.com>
Subject: RE: Please Review and Comment: Draft Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II

Thank you. We would be happy to include the Town Boundary and also show the growth boundary (and label as such). Please let us know. Thanks so much for the comments.

Pete

Peter R. Foster, P.E.
Vice President
Wright Water Engineers, Inc.
Over 50 Years of Service
1666 N. Main Ave., Suite C
Durango, CO 81301

(970) 259-7411
(970) 259-8758 FAX
HTTP://www.wrightwater.com

From: Shay Coburn <scoburn@town.ridgway.co.us>
Sent: Monday, April 27, 2020 4:00 PM
To: Peter Foster <pfoster@wrightwater.com>
Cc: Chase Jones <cjones@town.ridgway.co.us>
Subject: RE: Please Review and Comment: Draft Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II

Hi Pete, here are a few minor edits I came up with after a quick review:

- Page 32 of the PDF – under Ridgway it is Russ Meyer, not Ross.
- Page 73 of PDF – Town of Ridgway boundary looks to be our growth area, not our current town boundary. We can get you a GIS file if needed.

Thanks!

Shay Coburn
Town Planner

RIDGWAY TOWN HALL
PO Box 10 | 201 N. Railroad Street | Ridgway, Colorado 81432
970.626.5308 ext. 222 | scoburn@town.ridgway.co.us

From: Chase Jones <cjones@town.ridgway.co.us>
Sent: Tuesday, April 14, 2020 4:26 PM
To: Preston Neill <pneill@town.ridgway.co.us>; Joanne Fagan <jfagan@town.ridgway.co.us>; Shay Coburn <scoburn@town.ridgway.co.us>
Subject: FW: Please Review and Comment: Draft Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II

FYI – In case you didn't get this from Hannah.

From: Hannah Hollenbeck <hhollenbeck@ouraycountyco.gov>
Sent: Tuesday, April 14, 2020 4:06 PM
To: Hannah Hollenbeck <hhollenbeck@ouraycountyco.gov>
Cc: Connie Hunt <chunt@ouraycountyco.gov>; Carol Viner <cviner@cvinerlaw.com>; Don Batchelder <dbatchelder@ouraycountyco.gov>; Ben Tisdel <btisdel@ouraycountyco.gov>; John Peters <jpeters@ouraycountyco.gov>; 'Peter Foster' <pfoster@wrightwater.com>

Subject: Please Review and Comment: Draft Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II

Good Afternoon:
Please find attached the Draft Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II for review and comment.

Please file comments to Pete Foster, Wright Water Engineers at pfoster@wrightwater.com no later than **Tuesday, April 28, 2020.**

Thank you,
Hannah

Hannah Hollenbeck
Deputy Clerk of the Board
Ouray County

P.O. Box C
Ouray, CO 81427
(970) 325-7320

From:	Cary Denison
To:	Peter Foster
Cc:	"Hannah Hollenbeck (hhollenbeck@ouraycountyco.gov)"
Subject:	UUB Draft Plan comments
Date:	Tuesday, April 28, 2020 4:54:28 PM
Attachments:	image001.png Draft Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II Comments TU.pdf

---

Pete,

Attached are TU's comments on the draft UUB Phase II plan.

Thanks.

Cary Denison | Gunnison Basin Project Manager
Western Water and Habitat Program
Ph. (970) 596-3291
http://www.tu.org

TROUT UNLIMITED

April 28, 2020

Peter Foster, P.E.
Wright Water Engineers, Inc.
1666 N. Main Ave., Suite C
Durango, CO
81301

Delivered via email.

RE: Draft Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II

Mr. Foster;

As you well know Trout Unlimited (TU) has been involved in the water planning processes in Ouray County since the first phase of the process. We believe that multi-stakeholder stream management planning processes can result in projects that truly forward TU's mission of protecting, reconnecting, restoring and sustaining America's coldwater fisheries. For these reasons TU contributed a significant amount of staff time along with $2,000 to the Phase II effort and we hope that the comments we provide to you, Ouray County and other members of the steering committee are accepted with thoughtful consideration.

Our specific comments about individual sections of the draft report can be found in the following section. Generally, TU is concerned about the focus of the Phase II report in that the primary strategies are not directed at the shortages identified in the Phase I assessment. We were hoping the recommendations for water projects would focus more on multi-benefit projects like those mentioned in the Scope-of-Work for the CWCB grant and that are deployed elsewhere in the arid West to address water shortages. Related, we are also concerned that this project has not adhered to the goals and objectives laid out in the Scope-of-Work related to the CWCB funding that TU helped secure.

We are concerned that WWE, who shaped many of the recommendations in the report, was working on components of water supply strategies described in the report prior to the Phase I assessment and during the Phase II process. TU believes that steering committee members should have been made aware of WWE relationships with these projects or steering committee memebers well before Phase I was initiated. We strongly encourage WWE to address this real or apparent conflict of interest in the final report.

TU was hoping that alternatives such as water conservation practices and efficiency projects would be the focus of this report. We realize that some of the water users interviewed in the Phase II process are opposed to efficiency projects for several reasons, but we believe it is important that this report highlight the benefits of efficiency improvements rather than dismiss the opportunity.

We ask that the final Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan report not serve as the final report to the CWCB but that final report to the CWCB on this project include the description of the steering committee process, where the funding was spent, how the work product relates to the initial efforts, hurdles experienced in the process and other information related to the project. We also request that the final project report for the CWCB grant, described above, be provided to all steering committee members.

Thank you for your time and consideration.

Sincerely,

Cary Denison
Gunnison Basin Project Manager
Trout Unlimited

Specific comments and questions related to sections of the draft final report are as follows:

1.0 Introduction

We believe that WRE should point out in the introduction that they provided engineering services for Tri-County Water during or just prior to the initial study for diligence purposes.

Was the project not funded by any of the ranches in Ouray County? Did the CRWCD provide cash to the project.

The following are the objectives of the project as laid out for the WSRA funding request and scope of work:

- Coordinate with Project Stakeholders and Formation of Steering Committee
- Model Objective and Scenarios
- Work with Steering Committee on Developing and Evaluating Various Water Supply and Management Strategies
- Identify Water Supply and Efficiency Projects
- Prepare final Upper Uncompahgre Cooperative Stream Management Plan

These do not match the objectives in the draft.

2.0 Steering Committee

The report lists UVWUA as a steering committee member. TU does not recall UVWUA being involved in steering committee, yet they are listed as a member. We believe this is an oversight that should be corrected.

3.0 Key findings from 2016 study and Phase II Plan Development

In the first bullet below key findings, the report mentions streams in the county experience low flows in dry and even normal years. This section then suggest that the cause is lack of manmade storage. The suggestion is not backed up by facts. Low flow conditions are common on high elevation streams even without diversions. Snowpack, precipitation and water use contribute to flows.

The second bullet mentions that irrigation supply in Ridgway Reservoir is currently contracted for use. It should be noted that UVWUA leases the water annually which suggests other could also lease the water and there is augmentation water in the reservoir that is available for purchase.

The third bullet should expand on the frequency and cause of shortages as well as crop versus structure demand.

The fourth bullet should include discussion about water availability for those structures that could use exchange water from Ridgway. If physical water is not available due to priority or supply and exchange is not possible.

TU strongly supports the idea of projects that improve recreational and environmental attributes such as efficiency projects. We suggest the first sentence be changed from "should be considered" to **are** a top priority.

In the last bullet recharge of aquifers is discussed. The section claims that the recharge "helps to increase late summer flows". That may be true, but the tradeoff should be discussed. Return flow from Cow Creek and Dallas Creek diversions do not help stream flows that are relied upon as a source. Also, of note, 61% of irrigated lands in Ouray county are on Mancos shale or marine shale soils, as is mentioned elsewhere in the document. These soils aren't alluvial in nature and are not susceptible to being "filled". Rather, deliveries in excess of crop demand leads to poor crops, water quality issues, and increased off-farm consumption.

4.1 Basin Hydrology

Again, low flows are not just an indicator of lack of storage, particularly on Cow and Dallas Creeks. For example, low flow conditions on the Uncompahgre below the reservoir exist even on years with normal hydrology.

Streamflow gages reporting less than 50 percent of average is not necessarily an indicator of lack of storage. Gages in the basin, particularly on Dallas and Cow Creek, are heavily impacted by diversions and downstream calls, making them less than useful for making assumptions about effects of drought or storage on the system. The Colona gauge is influenced by releases from Ridgway reservoir which can affect the average flows. Comparing 2019 and 2018 on Cow Creek is misleading because flows in 2019 in summer months were heavily impacted by drought during summer months and 2018 flows were impacted by downstream call which kept water in the stream.

4.2 Water Quality and Aquatic Habitat

We do not believe that interviews with guides and outfitters adequately captures the recreational needs for fisheries in the basin. Information about local fisheries should be gathered from other sources including CPW and local TU chapters.

4.2.3 Uncompahgre River from its Confluence with Red Mountain Creek to the USGS Gaging Station Near Ouray

This section should clarify the benefits that would come from changing the recommended reclassifications. This section should also clarify if these reclassifications and the rationale provided for them are in line with WQCC regulations.

4.2.5 Dallas Creek

Dallas Creek is heavily impacted by irrigation diversions particularly by ditches that divert water from Dallas Creek and return it to Uncompahgre River. Upstream diversions and inefficiency of ag water use increases temperatures on the lower section of Dallas creek impacting the fishery in Dallas Creek,

Uncompahgre river and Ridgway Reservoir. When flows are adequate, and temperatures are not elevated beyond chronic levels for trout, Dallas Creek can be a good recreational fishery.

The lower section of Dallas Creek was referenced in Phase I report for having a water supply gap. Projects and strategies in this report have not identified how those shortages would be addressed.

4.2.6 Uncompahgre River Below Ridgway Reservoir to Ouray County Line

We suggest relying on recent field survey data from CPW about the fish populations and recreation opportunities in this section of river and not UWP report. While the section in the State Park is a "gem" at times, this section of river relies on stocking and suffers from habitat losses due to reservoir operations and low natural recruitment of juvenile trout.

The recommendation of 70cfs was made prior to the hydroelectric project which has reduced nitrogen super saturation concerns however there are still flow deficiencies in the winter months below the reservoir. There are reasons beyond the nitrogen super-saturation for improved winter flows in this section.

Low flows in winter reduce habitat and refuge areas for trout. The recent release patterns of high releases from spring to early fall, that often exceed long-term averages, and low releases in the winter is impacting the fishery not only within the state park but downstream of Cow Creek. The CPW report suggested that low flow conditions could be avoided with slight changes to the reservoir operations.

The Billy Creek Wildlife Area is a popular fishing destination though access can be limited by high flows in the summer months that make it unfishable and low winter and spring flows that reduce habitat for trout.

4.2.7 Cow Creek

What is the source for the total aluminum concentration standard exceedance?

Lower sections of Cow Creek are susceptible to low flows, in part, from irrigation diversions and lack of in-basin return flow. The gage on Cow Creek, along with being a barrier, is falling apart with rebar sticking out of it, which is another reason to repair the structure.

CPW data provided in Appendix C illustrates that chronic temperature levels were reached in cow creek with a drop in flow from 8 to 7cfs. This direct correlation should be noted more clearly in this section. Increased diversion, as suggested in this document, will continue to increase temperatures.

The flow recommendations for the ISF right on lower Cow Creek should be the bypass amount modeled in the strategies that include diversions from the creek.

This report needs to include fish population studies from upper Cow Creek. USFS and CPW have data on the fish population, which is known as a recreation population of Colorado River Cutthroat Trout (CRCT). CRCT only inhabit about 8% of their native range in the Gunnison Basin and great efforts have been made to restore the populations and habitats.

According to fish survey information provided by CPW, Bluehead Suckers are in Cow Creek. This is one of the "three species" of native fish in the Gunnison basin that is considered a Species of Special Concern due to declining populations and is managed under a range-wide conservation agreement. This report needs to include this information

TU supports the recommendation of evaluating the gage and installing a pit tag array. Additionally, we think a permanent temperature gage should be installed on the creek.

Increased irrigation efficiency on Cow creek ditches would decrease temperatures and increase flows. CPW's temperature data shows a direct relationship between low flows and chronically high temperatures.

The flow recommendation of 15cfs was not used as the bypass flow in the modeling.

The report describes average flow in Cow Creek between Sept 1 and Oct 31st why not provide average from July to August?

Relying on guide survey information does not provide an accurate assessment of fisheries health or impact on the recreation. The guides typically only focus on Paco Chu Puk or fisheries where they are allowed to guide. Further, guides are offering opinions on the quality of the fishery not based on science or fish numbers. I've fished Cow Creek as much as anyone and have found it to be a good fishery that is very dynamic in terms of fish movement and health of insect population.

4.2.8 *Selenium and Salinity*

The concern about costs of piping and other improvements and that of return flows needs to be addressed in this section needs to be expanded on in this section. Water users who rely on specific sources of return flows and stream flows that are improved by returns need to be identified. USBR Salinity program is not a cost share program, there are multiple sources of funding for irrigators who wish to improve their irrigation systems including USDA and state funds.

As Dave Kanzer pointed out, the USDA and USBR spent considerable funds on salinity projects elsewhere in the basin. The projects are largely popular with ag water users and assist in addressing water shortages.

The return flows from Dallas Creek and Cow creek sources into the Uncompahgre are generally not a source of supply for other water users nor are they required for environmental uses.

Increasing the efficiency of irrigation ditches would also address late season shortages. Exchange water is only an option if the exchange does not cause injury and if the source water is not water short which, as this report eludes to, can often be the case.

The idea that more late season water availability would reduce early season over-diversion is and assumption that I don't think is defensible. We suggest cutting out the last sentence in this section.

4.3 Recreational Flow Water Gaps

This section needs to have a description of fishing and fishing access gaps. Data from visitor days at the State Park and estimates of use on Billy Creek SWA and elsewhere may help inform this section. Recreations gaps for fishing access exist on the Uncompahgre and its tributaries due to flows. For example, there is a recreational gap on Uncompahgre River below Ridgway Reservoir for fishing created by high summer releases as well as low winter releases from the reservoir.

5.0 Water Supply Protection and Enhancement

We would prefer if this section clarified that the strategies recommended in this section were recommended by WWE and not members of the steering committee. Upgrading irrigation infrastructure was discussed far more by steering committee members than were the three strategies in this section. We understand that a few water users were opposed to efficiency but numerous steering committee members were also opposed to the three strategies presented here and yet they are the focus of the report.

TU was under the impression that Sneva Reservoir was going to be evaluated as a storage source and component of irrigation infrastructure upgrade. As funders of this effort, we would like to have a more robust explanation of why Rams Horn was evaluated but Sneva and Dallas Divide, or other potential structures, were not.

5.1 Model Development to Support Identified Strategies

The first paragraph needs to be rewritten to explain what figure 6 illustrates and why the "agreement" is important to the strategies.

We're unclear of what the point is of Table 9 or the second paragraph in this section. Hydropower production was never identified as a water supply gap. If we are interested in evaluating hydropower revenue development, why not evaluate the previous years releases and opportunity to increase revenue with higher winter flows?

Is the third paragraph supposed to be referencing a figure 11? Providing additional water to Ridgway Reservoir, outside of dry years, isn't needed to meet flow targets on the Uncompahgre, and on those dry years the additional depletions would likely kill Cow Creek. Also, assuming a bypass to Cow Creek of only 6cfs is assuming the function of Cow Creek as a fishery and as an important tributary to the Uncompahgre will go away. There is 4-8 cfs of headgate demand below the lowest diversion point to Ridgway Reservoir.

5.2 Strategy 1

We believe that it is worth pointing out that there could and may likely be increased depletions upstream of Ridgway reservoir in the ag sector from climate change or other reasons which reduce

inflow to the reservoir. Hydropower revenue decreases from these or other future depletions do not have to be mitigated. The reservoir operators are required by the Dallas Creek EIS to meet flow targets below the reservoir regardless of the future upstream depletions. It seems that specific places of use for exchange water should be identified in order determine the drawbacks to this plan.

We'd like to point out that 2,100af of new or junior depletions has not been identified. We believe the potential new depletions in Ouray County above the reservoir identified in the Phase I plan were 24af.

Reducing reservoir releases during April and March to the minimum required would likely cause a call from the M&D canal or other downstream users or cause UVWUA to request releases of irrigation water which could impact other uses in the basin while also damaging the river below the reservoir.

The pros and the cons considered in this strategy assume an increase in depletions of 2,100AF not a gradual increase or specific increases or where those would occur.

5.3 Strategy 2

The first bullet refers to maintenance issues for diversion on Cow Creek. While seasonal high water certainly is an issue that affects diversion maintenance the daily diurnal, particularly outside of high water, is not an issue for most diversions. Poor diversion design, lack of interest in serious modifications, and human impacts to the river have increased need for diversion maintenance and

Reducing maintenance costs for the UVWUA, as is eluded to in the second bullet, was not a goal of this project nor was it an identified gap in phase one of this project.

The last bullet references difficulty timing Ridgway reservoir releases as a result of the flows in Cow Creek. The gage on Cow Creek was installed in part to help with reservoir operations, it is unclear if releases have been altered on account of flows out of Cow Creek. It is also worth pointing out that high flows from Cow Creek allow for peaking flow in the Uncompahgre to be stored in Ridgway Reservoir for later use.

5.3.1 Strategy 2

WWE should refer to potential benefits of strategies described in this report so as to not mislead readers.

The first paragraph lists additional yield to Ridgway Reservoir as a benefit of this strategy even though lack of yield to Ridgway was not identified as a gap or goal of this project. There is no evidence that suggests that diverting diurnal peaks will benefit the fishery on Cow Creek. However, there is evidence that the daily diurnal flow keeps temperatures below the chronic range for trout.

Table 11 is **Modeled Inflow into Ridgway Reservoir Comparison with Historical USBR Reported Data Summer Irrigation Season 2002**, which does not appear related to Cow Creek.

Figure 15's modeled hydrograph an UNCUPSCO shows flows below the 75cfs May 15 through October flow target mandated in the operations EIS for Ridgway Reservoir.

If 20cfs was diverted for 50 days beginning on May 15th and ending on July 5, during the average annual peak, impacts to the water users and fishery may be minimal and nearly 2,000af of extra water would be available to the reservoir. However, 20cfs may not be available from Cow Creek on years like 2018 when the reservoir may need the additional water and on big water years like 2019 it seems clear that the reservoir could not handle the excess water without making high releases or spilling both of which would injure the river below the reservoir.

Again, 6cfs bypass is too little to support the creek and the water users. Cutting off the daily diurnal peak would impact water supply to users on the bottom of Cow Creek who at times rely on the daily peak for irrigation supply and would remove temperature dampening flows that are critical to fish survival.

Increased diversions from Cow Creek, particularly in late summer months, will exacerbate high temperature conditions on lower Cow Creek.

The use of Sneva reservoir to capture higher early season diversions and distribute to lands under the Sneva and Alkali 1 ditch seems like a better more cost-effective option that would address more water supply issues.

Again, 6cfs bypass is too little to support fishery needs and the water users on the bottom of Cow Creek. Cutting off the daily diurnal peak would impact water supply to users on the bottom of Cow Creek who at times rely on the daily peak for irrigation supply and would remove temperature dampening flows that are critical to fish survival.

In this option it seems that at least 2,300 acre-feet of the water diverted from Cow Creek would be released from Ridgway Reservoir. This idea runs contrary to the concept that was discussed during steering committee meetings that water diverted into the reservoir would be used to meet winter flow targets below the reservoir. Also, it seems the primary beneficiary of this strategy is Tri-County who would create hydropower with the additional water.

Because of flow requirements for the Reservoir below Cow Creek, flows through the lower end of Cow Creek allow storage in the Reservoir to occur. It seems that additional inflows to the reservoir and reoperations of the reservoir would require a new NEPA process and a new Lease of Power Privilege agreement.

Diverting additional water to Ridgway Reservoir during dry years, assumes water is available to divert. In order to meet downstream flow requirements, water would essentially be passed through the reservoir. On wet and normal water years, Ridgway reservoir fills quite easily and has had to make extreme releases to avoid spilling.

There is water available in Ridgway Reservoir currently that Ouray County water users can access to offset depletions to downstream calls. This should be acknowledged in the report.

The additional hydropower generation seems to be the primary benefit of this strategy which was not an identified gap in the first phase of the study.

5.3.2 Strategy 2 Planning level cost estimates

For $9-14 million price range estimated for this strategy, large portions of both the Sneva and Alkali 1 ditches could be piped, and an off channel small reservoir(s) could be built. These types of efficiency and infrastructure upgrades could be funded in large part by USBR Salinity reduction funding.

The cost estimates should include a cost per acre-feet of water provided to those shortages identified in the Phase 1 report.

5.4 Strategy 3

This report should note that the conditional water right filing was associated with the investigation into an upper Uncompahgre Reservoir site which included several alternatives and subsequent conditional filings including Dallas Divide, Willow Swamp etc. and resulted in the construction of Ridgway reservoir.

One of the primary shortages identified in the Phase 1 report were instream flows on Cow Creek. Why does the third bullet then only state that Rams Horn Reservoir "could" provide supplemental flow for fishery in late summer months while the other benefits addressed in other bullets are positively confirmed?

5.4.1 Strategy 3...

It is unclear how Rams Horn reservoir would provide aquifer recharge. The lands around and downstream of the proposed reservoir site are mancos of marine soils that are not susceptible to

Again, it seems that the primary beneficiary of connecting Cow Creek the Ridgway Reservoir is hydropower production.

In additions to the cons listed the fact that the reservoir would have significant environmental impacts including disconnecting Cow Creek, impacting a valuable big game corridor, reduced habitat for other native animals, requiring a major road construction process, etc. How this project is paid for, both short term and long term, needs to be addressed by evaluating the cost per acre-foot provided to the water users of Ouray County.

To simply say that this Strategy is the most expensive of those evaluated undersells how incredibly costly this project would be to undertake.

This section states that water shortages below Ridgway Reservoir exist that would be served by Rams Horn Reservoir. The report should identify those shortages and explain why they are not using water stored in Ridgway Reservoir now.

We do not believe that connecting Ridgway Reservoir to Cow Creek would benefit "supply management strategies in UUB". Rather we believe that the connection would add to low flow issues on Cow Creek while providing additional hydropower revenue for Tri-County.

Another con worth that should be listed in the report is the stipulation on the Rams Horn water right- that states if it is built in the decreed location there will be no public access. The impact to trout including Colorado River Cutthroat Trout needs to be addressed along with the fact that Cow Creek in the area of the proposed reservoir has been considered for protections under the Wild and Scenic River Act and is a valuable recreation and big game corridor.

The evaporative losses from the reservoir need to be calculated and described in the final report.

5.4.2 *Strategy 3: Planning Level Cost Estimate*

Do the projected reservoir costs consider the required permitting and NEPA work, or the construction of adequate roads and bridges to access the site? And how is the cost of perpetual maintenance of the downstream headgates as stipulated in the previous due diligence claim going to be considered in the cost estimate.

Please explain if the yield mentioned in the cost analysis is yield that can directly address water supply shortages identified in the Phase 1 report.

The US Bureau of Reclamation provided a cost benefit analysis of Rams Horn and other reservoirs and the initiation of the Dallas Creek project and determined that the Rams Horn Reservoir would provide "Marginal economic benefits" and that they questioned the need for supplemental water- "if improved water management techniques were employed".

6.0 IRRIGATION WATER EFFICIENCY PROJECTS

We understand there is hesitancy amongst some irrigators in Ouray County about exploring irrigation efficiency projects. However, there is also hesitancy amongst water users about the strategies described in previous sections.

Not all over irrigation during spring runoff recharges an alluvial aquifer. And returns from excessive deliveries are not generally accessible by irrigators later in the season. In fact, much of the return flow ends up in Ridgway Reservoir.

I don't believe there is evidence that there is a significant portion of water users in Ouray county that rely on return flows for late season supply. There is some aquifer storage occurring, but the delayed

returns may or may not be supply for other users. Moreover, the returns in the Uncompahgre from Dallas creek and Cow Creek sources is not a supply for water users.

6.1 Inter-Basin Diversions

One of the maps defines irrigated lands and associates those lands by structure. There is considerable overlap of decreed lands and structures, particularly under the Alkali 1 and Sneva ditch areas, presumably from waste-water ditch decrees. This overlap and how it affects water supply gaps in the irrigated sector need to be explained. As this section discusses, return flows from some of the diversions on Cow Creek return to Ridgway Reservoir. These inflows can be considerable yet none of the expected benefits of the previous strategies that consider interconnection have been realized as a result of the additional supplies. Some of the returns from the Alkali 2 ditch do return to Cow Creek though some of them cause damage to infrastructure in the process.

Potential benefits of piping or lining some of these ditches would be improved efficiency that would benefit water users, especially when in cases of limited supply from drought or administrative shortages.

6.2 Automated Gates and Remote Sensing – Dallas Creek and Cow Creek

This section should note that automated gates and remote sensing can be used to improve efficiency of flood irrigation practices.

Along with end of system remote level sensors, the report should mention the use and benefits of soil moisture sensors.

6.3 COAGMET Station

If COAGMET is too costly or difficult to use ET meters on-farm and can be used as a replacement.

6.4 Dallas Ditch Lining

Lining or piping the Dallas Ditch could help water users lower Dallas Creek including CWCB. Often the Dallas Ditch spills water out the end of the ditch into the Uncompahgre in the Town of Ridgway, pressurizing even this lower section would reduce spills into the Uncompahgre. There are no water users relying on the return flows from Dallas Creek to the Uncompahgre.

This section should include and evaluation of saved water from the lining project that would improve the flow shortages on Dallas Creek identified in the Phase I report.

6.5 Hayes-Teague and Chaffee Ditch

There are more owners of the Chaffee Ditch (Mueller & Michels/Briggs) and the two more separate owners/users of the Hayes Teague (May and McNeil) who are interested in the proposed improvements.

Piping portions of the Chaffee would reduce maintenance costs on those ditches and reduce chances of ditch failures. Combining the ditches or piping one of both of the ditches would provide environmental benefits to Cow Creek from reduced diversion maintenance.

7.2 Town of Ridgway

Improvements to the Ridgway ditch could reduce system loss, improve diversion efficiency and improve flow on Beaver Creek. Are there specifics on this project that could be provided in the final report?

8.1 Reclassification of Uncompahgre River Stream Segment through City of Ouray

Again, we question the need for this reclassification and whether such a reclassification is in-line with requirements from CDPHE.

8.2 Stream Management Plan for Cow Creek, Uncompahgre River Below Ridgway, and Dallas Creek

While it is true to say that more analysis is needed to determine the relationship between flow and fisheries, we do know that without healthy flow the fisheries will not survive.

This project was supposed to result in a Stream Management Plan. I understand the project was not funded as a SMP project, but the Scope of Work stated that a stream management plans would be an outcome of this effort.

On the fourth bullet; strategies other than 1,2, and 3 need to be evaluated. There should be other options like off channel storage and piping the irrigation ditches which cause the flow problems identified in the initial assessment. Only a portion of the stakeholder group and water users in the county support the proposed strategies and only a small portion are against piping.

9.2 WSRA Funding

It is worth pointing out that WSRA funds are more likely to be obtained if they are being used for multi-benefit projects that meet existing uses and water supply gaps.

10.0 IDENTIFIED PROJECTS AND PROCESSES

Rather than broad investigations I'd suggest specific projects be listed as IPPs to replace existing project such as inventory assessment of irrigation infrastructure and general basin-wide augmentation supplies.

Some of the ditches in Ouray County have been mapped. It would be beneficial if other ditches were mapped and salt loading numbers collected for those ditches.

We were under the impression that the Red Mountain Ditch was completed. Does it need to remain on the list.

The repair of the gage on Cow Creek should be added to the IPP list.

Carol Johnson

From: Jeff Dean <troutbumjd14@yahoo.com>
Sent: Monday, April 27, 2020 9:54 AM
To: Peter Foster
Subject: Upper Uncompahgre Basin Water Supply Protection and Enhancement Plan

Mr. Foster,

I am reaching out to you today as the President of Gunnison Gorge Anglers, the local Trout Unlimited and Fly Fishers International chapter, and as a fisherman who regularly fishes the Uncompahgre River watershed.

My review of the referenced plan, and discussions with fellow users of the watershed, leads me to contact you and express my belief that this plan deserves careful review to ensure that it not only addresses low water flow and storage issues, but also protects water quality and includes recommendations that are scientifically and environmentally sound.

Of particular concern are the following points:

* Two of the three strategies presented in the study to address water supply gaps would involve further diversions from an already de-watered Cow Creek.
* One of the aforementioned strategies recommends construction of a dam on Cow Creek, which would create a reservoir on USFS land, and have a devastating impact on Colorado River Cutthroat habitat, which is not addressed in the report.
* The fact that flow requirements associated with the operations of Ridgway Reservoir have not been met in recent years is not addressed in the plan; so I have to wonder, if flow requirements are not being met in an existing reservoir on the Uncompahgre River, what is going to happen to flows further downstream in the river if another reservoir is created on a significant tributary like Cow Creek?
* Alternative strategies for addressing water supply gaps, such as incentives for water users to increase irrigation efficiency, non-diversion agreements with users, in-stream flow donations and interruptible water supply agreements do not seem to be addressed in this report.

Thank you for your careful consideration of the long term impact of this plan on the Uncompahgre River watershed and the varied concerns of the myriad stakeholders who will be impacted by this plan.

Very Truly Yours,
Jeff Dean

Carol Johnson

From: Ashley Bembenek <abembenek@yahoo.com>
Sent: Tuesday, April 28, 2020 4:10 PM
To: Peter Foster
Cc: Dennis Murphy; Mike Johnson; Scott and Sheelagh Williams
Subject: UWP Comments on the UUB Water Supply Protection and Enhancement Plan Phase II
Attachments: UWP- Additional Comments Rationale and Questions on Draft Plan.pdf; Cover Letter for UWP Comments on UUB Water Supply Protection and Enhancement Plan Phase II.pdf; 20200324 - Upper Uncompahgre Basin Water Supply Enhancement Plan Phase II Report UWP Comments.docx

Hi Peter,

Thank you for accepting comments and for providing the Word Version of the Draft Plan. The Uncompahgre Watershed Partnership (UWP) is submitting the following documents:

- Cover Letter for UWP Comments on UUB Water Supply Protection and Enhancement Plan Phase II: The cover letter introduces UWP and summarizes our perspective and process for the comments.
- UWP- Additional Comments Rationale and Questions on the Draft Plan: This document provides additional explanation on our "major comments."
- 20200324 - Upper Uncompahgre Basin Water Supply Enhancement Plan Phase II Report UWP Comments: This is the Word version of the draft plan. We used track changes and comments to explain ourselves.
- UUB Reference Materials: This folder includes for additional references for the plan. The reference materials are identified in the "Additional Comments" document. The folder is on Google Drive at:

UUB Reference Materials - Google Drive

UUB Reference Materials - Google Drive

The UWP Board and staff invested many hours preparing these comments. Please confirm that you received all of the documents and do not hesitate to email or call with any questions.

Thank you,

Ashley

Ashley Bembenek
Soil and Water Scientist
Alpine Environmental Consultants LLC
(970) 251-0029

Uncompahgre Watershed Partnership
P.O. Box 392, Ridgway, CO 81432
970-325-3010 • uwpcoordinator@gmail.com

April 28, 2020

Peter R. Foster, P.E.
Wright Water Engineers, Inc.
1666 N. Main Ave., Suite C
Durango, CO
81301

Delivered via email.

RE: UWP Comments on the Draft Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II

Dear Mr. Foster;

The Uncompahgre Watershed Partnership (UWP) was created in 2007 to help protect the economic, natural, and scenic values of the Upper Uncompahgre River Watershed. UWP works to inform and engage all stakeholders and solicits input from diverse interests to ensure collaborative restoration efforts in the watershed.

In August 2017 UWP joined the Ouray County Steering Committee for Stream Management Planning. UWP committed $500 in matching funds and board members and staff provided in-kind contributions during the planning effort. We appreciate the opportunity to provide comments on the Draft Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II ("Draft Plan").

UWP is concerned that collaboration between the Steering Committee Members has deteriorated in the last six months. We are grateful that Ouray County opted to extend the comment period on the Draft Plan and agreed to an additional stakeholder meeting in May 2020. We hope these additional measures will allow all members of the Steering Committee and the general public to have meaningful input to the planning effort and to better understand the Plan through open discussion of the comments received.

As you know, this project was funded through a Water Supply Reserve Fund Grant. The statement of work for the grant contract does not identify tasks specifically related to the water court application for the Rams Horn Reservoir. Thus, UWP soundly rejects the suggestion that any member of the Steering Committee who has filed a statement of opposition in the case has a conflict of interest that should affect the meaningfulness of their comments. Were that so, it would seem that the water court applicants themselves would be equally conflicted. UWP believes that all information generated using the grants funds, including comments on the draft and responses to those comments, should be available to the grant funders, members of the Steering Committee, and the public.

Uncompahgre Watershed Partnership
P.O. Box 392, Ridgway, CO 81432
970-325-3010 • uwpcoordinator@gmail.com

Several members of the UWP board and our technical coordinator, Ashley Bembenek, reviewed the Draft Plan. Our comments are provided in the two enclosed documents. Where possible, we provided comments and proposed changes in the Word version of the Draft Plan. Additional comments, rationale, and questions are provided in the document named "UWP- Additional Comments, Rationale, and Questions on the Draft Plan." If you have questions related to our comments please contact Ashley at abembenek@yahoo.com or (970) 251-0029.

Thank you for your time and consideration. Sincerely,

Dennis Murphy
Chairperson, Board of Directors
Uncompahgre Watershed Partnership

Enclosures:

- 20200324 - Upper Uncompahgre Basin Water Supply Enhancement Plan Phase II Report UWP Comments
- UWP- Additional Comments, Rationale, and Questions on the Draft Plan.
- WQCD_2017_Regulation 35 Rationales for Water Quality Standards
- WQCD_2017_Regulation 35 Temperature UAA Upper Uncompahgre Watershed_UN03c_03e_11
- WQCD_2018_Regulation 93 PPHS
- CPW Gunnison Basin Management Plan 2018 Final
- 2016-2017 Water Quality Report Final 6-1-18

Uncompahgre Watershed Partnership

P.O. Box 392, Ridgway, CO 81432

970-325-3010 • uwpcoordinator@gmail.com

April 27, 2020

RE: UWP- Additional Comments, Rationale, and Questions on the Draft Plan

UWP thanks Wright Water Engineers, Inc for providing a Word version of the Draft Plan. We reviewed the Draft Plan in detail and used track changes and comments to document our suggestions and concerns. This document further outlines our top concerns with the Draft Plan. Where possible, we have identified additional sources of information and drafted proposed text to streamline the review and potential acceptance of our comments. Again, we are happy to discuss these comments further. Thank you.

Section 3.0 Key Findings From 2016 Study and Phase II Plan Development

The language in the second bullet is biased. Instream flow water rights operate the same as other water rights. Thus, when discussing their operation, instream flow water rights should not be called out differently than other water rights. Further, water exchange agreements must "do no harm" and protect all senior water rights, not just instream flows. Multiple water rights, including reservoir fill rights, agricultural water rights, instream flow, and others complicate the ability to establish exchanges for water users upstream of the reservoir. UWP recommends removing "instream flow" from this bullet and referring to existing water rights only.

UWP recommends that additional information regarding the shortages by UUB Region be included here. Tables 11 and 12 from the Phase I report summarized water shortages very effectively and the shortages by basin are critical to understanding water supply needs in the UUB.

Section 4.0 Water Quality and Aquatic Habitat

UWP has submitted additional resources from recent WQCD rulemaking hearings and CPW's most recent management plan for the Gunnison Basin. The relevant material is highlighted yellow and our comments in the Word version of the draft plan identify the document and in some cases the page number. Draft text was provided for your consideration throughout Section 4.0. The file name and document descriptions are presented below:

- WQCD_2017_Regulation 35 Rationales for Water Quality Standards: provides WQCD's rationale for the water quality standards applied to each segment in the UUB. Also summarizes the data used to support the designated use assigned to each segment.
- WQCD_2017_Regulation 35 Temperature UAA Upper Uncompahgre Watershed_UN03c_03e_11: provides the data used to justify the most recent revisions to temperature standards in the UUB.
- WQCD_2018_Regulation 93 PPHS: provides the WQCD's rationale for the 303(d) and M&E List that was finalized in the December 2018 Rulemaking Hearing.

Uncompahgre Watershed Partnership

P.O. Box 392, Ridgway, CO 81432

970-325-3010 • uwpcoordinator@gmail.com

- CPW Gunnison Basin Management Plan 2018 Final: Summarizes CPW's management strategies for rivers and streams in the UUB.

- 2016-2017 Water Quality Report Final 6-1-18: This report was prepared for UWP to summarize data collected in 2016 and 2017. This report was referenced in the Canyon Creek section.

Section 4.2.3 Uncompahgre River from its Confluence with Red Mountain Creek to the USGS Gaging Station Near Ouray.

The 2018 WQCC stream segmentation classified 425 miles of streams and rivers in the UUB. **Seventy-nine percent of the segment length is classified as Aquatic Life Cold Class 1.** Eighteen percent of the segment length is classified as Aquatic Life Cold Class 2. Just over one percent of the stream segments are classified as Aquatic Life Warm Class 1; and nearly two percent of the segments do not have an aquatic life use classification. Figure 1 provides a map of the Aquatic Life Use Classification Tiers.

The rationale to remove the cold water class 1 designation is not supported by WQCC Regulations (i.e. process to assign designated uses) and the proposal lacks merit as previous surveys have identified cold water class 1 species.

The rationale to remove the water supply use is not supported by WQCC Regulations (i.e. the process to assign designated uses and requirement to protect downstream uses) and the proposal lacks merit because at least 12 landowners between Ouray and Ridgway (i.e. WQCC segments COGUUN03a and COGUUN03b) submitted water samples for their domestic wells for analysis in a recently completed study led by the West Central Public Health Partnership. Given the proximity to the Uncompahgre River the wells may be hydrologically connected to the river and are presumably used for domestic drinking water supplies as the landowners submitted water for analysis during the study. Additional domestic drinking wells are located near the Uncompahgre River between Ridgway and Ridgway Reservoir. WQCC Regulations require that downstream uses be protected and recognize that additional development and therefore increased pressure to provide clean drinking water is likely to occur in Colorado and the water supply use is protected whenever feasible. Figure 2 identifies the domestic drinking water wells sampled between 2016 and 2019 as part of the West Central Public Health Partnership study.

Figure 1. Aquatic Life Use Classification Tiers in the Upper Uncompahgre Basin, Ouray County, CO.

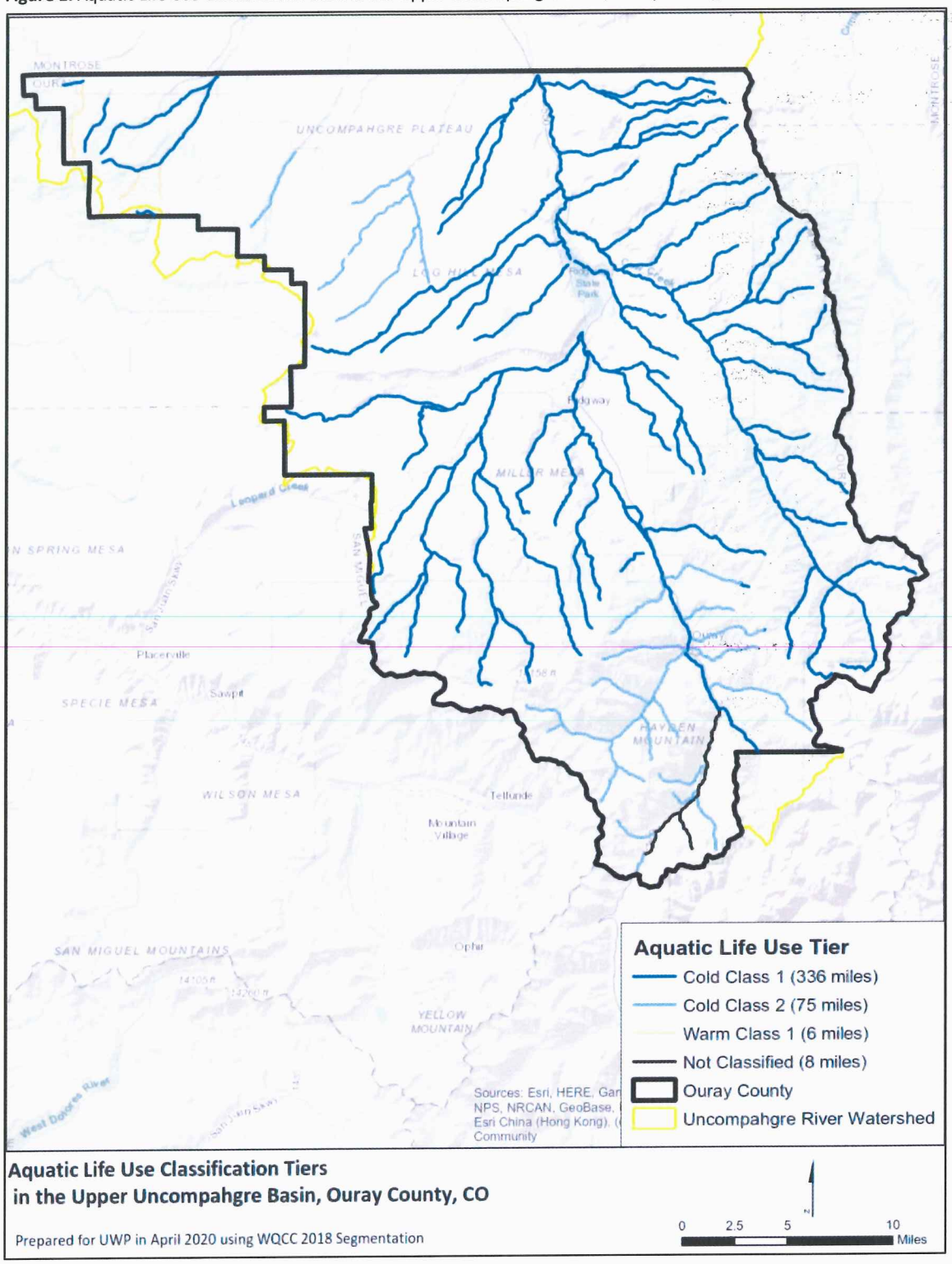
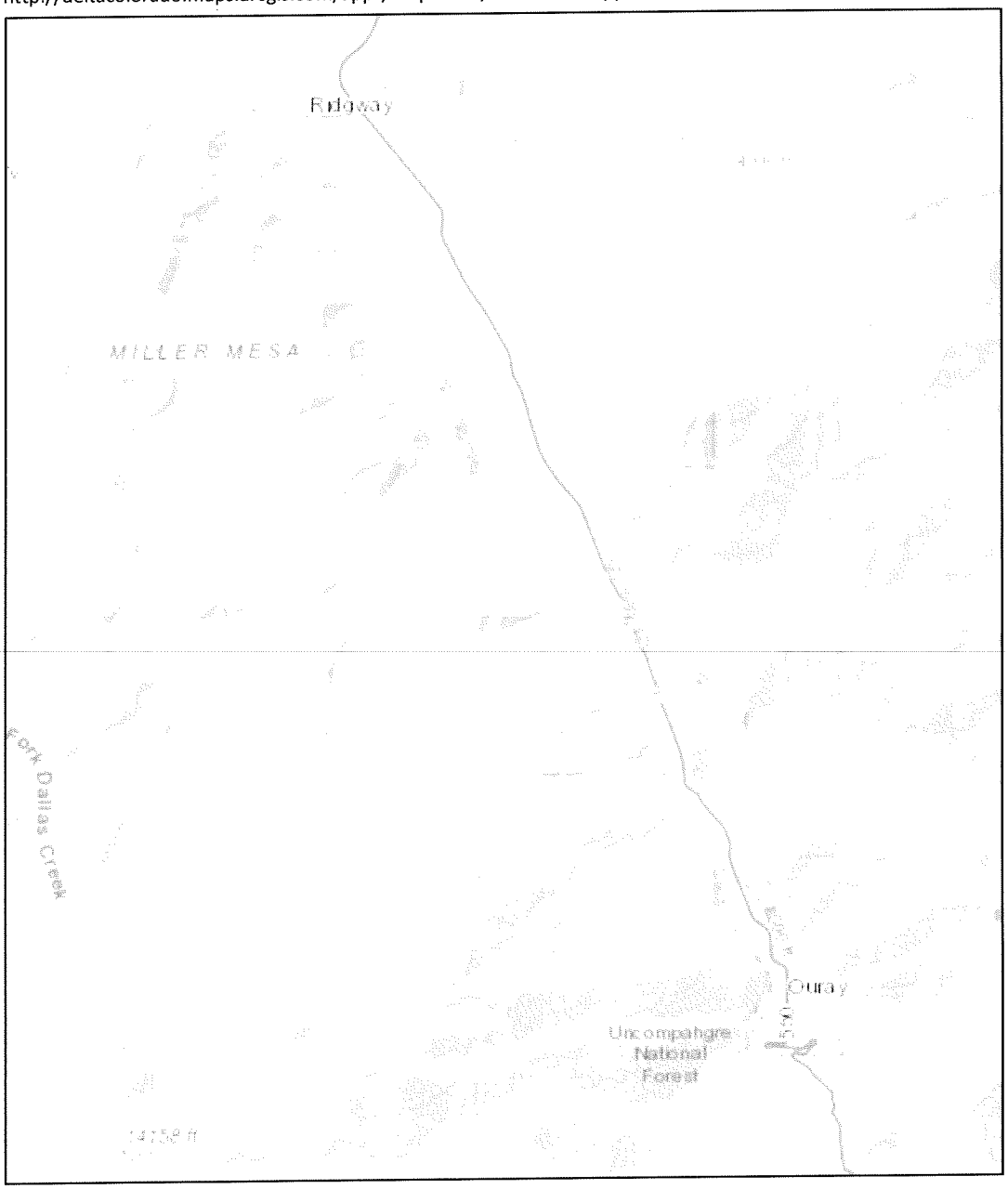


Figure 2. Private drinking water wells near the Uncompahgre River between Ouray and Ridgway. Between 2016 and 2019, 12 homeowners submitted well water samples for analysis through the West Central Public Health Partnership as part of a study to characterize water quality in private drinking water wells. Data source: http://deltacolorado.maps.arcgis.com/apps/MapSeries/index.html?appid=391e306dbe144ca49fdbdd667d52e429



Section 4.2.5 Dallas Creek

UWP frequently communicates with the public about water quality issues. In our experience, it is inappropriate to report that a stream is impaired for the water supply use without further explanation; particularly with respect to arsenic, a known carcinogen. Thus, we strongly recommend that the text below be incorporated into the report:

> "The mainstem of Dallas Creek is currently listed in CHDPE (2018) as impaired for water supply use due to arsenic. The total recoverable arsenic samples that indicate impairment of the water supply standard were collected from Cow Creek upstream of Nate Creek (WQCD, 2018). Because Dallas Creek and Cow Creek are a part of the same segment, the arsenic impairment applies to all portions of the segment.
>
> The Dallas Creek Water Company has an infiltration gallery on Dallas Creek (WQCD, 2017) and several residences rely upon domestic wells in the Dallas Creek watershed. Annual state compliance monitoring does not require Dallas Creek Water Company to sample for total recoverable arsenic in their drinking water system. Total recoverable arsenic was recently measured in selected domestic water wells in the Dallas Creek watershed. Total recoverable arsenic concentrations were less than the maximum contaminant level for public drinking water supplies (WCPH, 2019)."

Dallas Creek (WQCC segment COGUUN11_G) is on the Monitoring and Evaluation List (M&E List) for potential impairment of the acute winter temperature standard. The acute standard was exceeded during May of 2012 and 2013 based on instantaneous temperature measurements collected by USGS in Dallas Creek near Ridgway (USGS 09147000, see page 147 of WQCD_2018_Regulation 93_PPHS).

There are several important nuances related to this M&E listing for temperature. First, there is a lack of data to support a complete conclusion, which is why Dallas Creek was placed on the M&E List rather than classified as impaired. The lack of a complete conclusion is attributed to the use of instantaneous temperature measurements rather than continuous measurements. UWP strongly recommends that a continuous temperature sensor be installed in Dallas Creek near Ridgway. UWP has contacted partners with an interest in Dallas Creek to determine whether continuous temperature data has been collected in recent years; and to assess the interest in data collection in the future.

Second, the potential impairments which occurred in May are considered a "shoulder season issue." Shoulder season issues are common in lower elevation cold water streams throughout the state. The issue is attributed to transition from winter to summer standards on a specific date. In reality streams warm and cool on a slow gradient driven primarily by snowmelt runoff and seasonal transitions in climate.

Further, impairment of the temperature standard is not sufficient evidence to remove the Cold Class 1 temperature classification. WQCC would require a Use-attainability Analysis to justify a change of the temperature standard. In 2017, as part of the Regulation 35 Rulemaking, WQCD staff completed a

thorough review of temperature classifications in the Uncompahgre River Basin and did not recommend a change to the temperature classification applied to Dallas Creek. Additionally, CPW manages Cow Creek as a recreational cold-water fishery (CPW, 2019).

Section 4.2.7 Cow Creek

In our experience, it is inappropriate to report that a stream is impaired for the water supply use without further explanation; particularly with respect to arsenic, a known carcinogen. Thus, we strongly recommend that the text below be incorporated into the report:

> "The mainstem of Cow Creek is currently listed in CHDPE (2018) as impaired water supply use due to arsenic. The total recoverable arsenic samples that indicate impairment of the water supply standard were collected from Cow Creek upstream of Nate Creek (WQCD, 2018).
>
> Several residences rely upon domestic wells in the Cow Creek watershed. Total recoverable arsenic was recently measured in two domestic water wells in the Cow Creek watershed. Total recoverable arsenic concentrations were less than the maximum contaminant level for public drinking water supplies (WCPH, 2019)."

The report text and Appendix C states that the stream temperatures in Cow Creek exceeded the chronic standard. However, based on the material provided in Appendix C it does not appear that a weekly average temperature was calculated in order to evaluate attainment with the chronic temperature standard. It appears that the raw temperature data were compared directly to the chronic temperature standard, instead of the weekly average temperature. **Can you please explain how the temperature data was assessed against the standard? Was that process consistent with the current guidance provided in the current 303(d) Methodology?**

UWP realizes that the time the water temperature is above the chronic standard is critical to understanding the biological effects of a temperature regime. So, we are not suggesting that the existing analysis is incorrect or not useful. But we want to be sure that the standard was evaluated using the correct protocol and that the language around whether the standard was exceeded is technically correct.

Section 4.2.7 does not list the fish identified during CPW's 2019 survey. UWP strongly recommends that the species list be included in the report text, as many readers may not review the appendices. We have provided suggested text that includes the species list. **Additionally, the report fails to note that bluehead sucker are a Tier 1 Species of Greatest Concern.** UWP strongly recommends that this information be added to the report text and has provided suggested text that includes this information.

Section 5.1 Model Development to Support Identified Strategies

We have the following questions related to the use of models in this plan:

Did this analysis rely upon StateMod and/or StateCU? If so, please cite the appropriate model(s).

Was the Gunnison Basin Model, used during Phase I, revised during Phase II? If so, please summarize the revisions.

We assume based on the text in Section 5.4 that the same model was used to evaluate the Ram's Horn Reservoir. Is that correct? Please add text in Section 5.1 to explain how models were used to support the analysis in Section 5.4.

Section 5.2 Strategy 1: Evaluating Ridgway Reservoir to Provide Additional Water Supply for Ouray County Water Users.

The section conflates the water potentially available for exchange from Ridgway Reservoir with the amount of shortage in the Uncompahgre Basin upstream of Ridgway Reservoir. We used data from Table 12 of the Phase I report to identify the average year water shortage upstream of Ridgway Reservoir. This clarification will help readers to evaluate the pros and cons of this potential strategy.

UWP recommends the following item be added as a con in Section 5.2:

> "Although the exchange water right could provide up to 2,100 AF in an average year, the modeled shortage upstream of the reservoir is 24 AF. The costs of adjudicating, maintaining and implementing conditional rights of exchange and subsequent plan(s) for augmentation to utilize such exchanges may be more expensive than other strategies to meet this shortage. For example, it may be more cost effective to increase irrigation efficiency, increase municipal conservation, or develop a new water supply."

Section 5.3 Strategy 2: Cow Creek- Ridgway Reservoir Pipeline and Stabilization Potential Yield and Benefits

The report did not evaluate whether Ridgway Reservoir has the capacity to store water from Cow Creek in average and wet years. In average and wet years, rapid releases are required to prevent the reservoir from spilling and/or prevent dam failure and flooding. Reservoir capacity should be evaluated before this option is explored further.

The pro and con analysis of this strategy does not compare the strategy's potential yield to the projected dry year shortages. UWP recommends the following item be added as a con in Section 5.2:

> "Although this strategy may yield an additional 8,000 AF, based on projections from 2018, the strategy may not distribute water to the areas with the greatest shortage. The Phase I analysis found that in a dry year Dallas Creek had a shortage of 12,786 AF; Cow Creek had a shortage of 4,144 AF, and the Uncompahgre River upstream of Ridgway Reservoir had a shortage of 2,055 AF. Unfortunately, without exchange agreements and other measures this water would not be available to the areas with the largest shortages. This strategy could satisfy the dry year shortage, 1,199 AF, identified in the Uncompahgre River downstream of Ridgway Reservoir."

The planning level cost estimate does not consider the net yield to Ouray County Water Users. As noted in 5.3.1 additional releases from Ridgway Reservoir would be required to satisfy the UVWUA historic diversions and to maintain the minimum flow release during the winter. Because these releases are required to compensate for diversions from Cow Creek they should be omitted when estimating the cost per AF for the project.

Section 5.4 Strategy 3: Ram's Horn Reservoir and Cow-Creek-Ridgway Reservoir Pipeline Yield and Benefits

This section of the report did not identify the releases from Ridgway Reservoir needed to satisfy the UVWUA diversion and did not discuss the potential effect on the minimum flow release. **Please add this**

information as it is important to understand how Ram's Horn Reservoir might affect the operation of Ridgway Reservoir.

The pro and con analysis of this strategy does not address Dallas Creek, the most water short region in the UUB, or bluehead sucker in Cow Creek. UWP recommends the following item be added as a con in Section 5.2:

- "This Strategy does not provide water directly to water users in Dallas Creek which is the most water short region of the UUB.

- Cow Creek supports bluehead sucker, along with other native and sport fish. Because Bluehead Sucker are a Tier 1 Species of Concern the environmental review associated with the project would be more intensive, time-consuming, and expensive. It is possible, and even likely, that the minimum flow releases would be greater than 6 cfs. Such a change would reduce the projected yield estimated in this report."

Section 6.0 Irrigation Water Efficiency Projects

UWP rejects the notion that the status quo will be enough to protect water users and irrigated agriculture in the coming decades. Increased water shortages will occur due to a changing climate and population growth throughout the Colorado River Basin. Given these challenges, UWP urges local water users to identify as many innovative water conservation strategies as possible. We have inserted text that references demonstration studies and case studies.

Section 6.4 Dallas Ditch Lining

Dallas Creek is the most water short region in the UUB. How much additional water would be available if Dallas Ditch were lined? How does this cost compare to the cost estimates for strategies 2 and 3?

Section 8.1 Reclassification of the Uncompahgre River Segment through the City of Ouray

As stated in our comments on Section 4.2.3, UWP strongly opposes this recommendation because it is not consistent with WQCC Regulations or the long-term needs of domestic water users in Ouray County.

Section 8.2 Stream Management Plan for Cow Creek, Uncompahgre River Below Ridgway, and Dallas Creek.

UWP supports additional planning efforts within the UUB, particularly if those efforts characterize stream and riparian conditions, water quality, and fisheries. UWP recommends that continuous temperature monitoring be included in this effort as existing data suggest potential temperature issues in lower Cow Creek and lower Dallas Creek. This report has not identified potential benefits to lower Dallas Creek based on the use of strategies 1, 2, or 3. Can you please clarify?

Carol Johnson

From: Eric Fagrelius <ericwalterf@gmail.com>
Sent: Tuesday, April 21, 2020 12:46 PM
To: Peter Foster
Subject: Response to Unc. River Plan

Greetings
After reading through the 111 page plan, I was surprised and saddened to note that the plan did not address the most significant source of pollution on the Uncompahgre, the Ouray Hydroelectric dam flushing process. The regular flushing of sediment does not add to the total amount of metals that come down, but the toxic levels that are achieved prevent any biotic systems from thriving. The levels of iron and T.S.S. from these flushings easily rival the data from the Gold King mine water disaster. I know this because of past studies that I conducted during my 30 year career as a science teacher at Ouay High School.

I cant believe all these efforts at a plan for the Uncompahgre ignore this effect. Ouray Hydropower, Inc. should be held responsible for mitigating this unchecked polluting activity. The Uncompahgre River in Ouray could arguably be known as " the most polluted river in Colorado."

I propose that legitimate studies be conducted that reveal the true frequency of the flushings along with appropriate water quality data. The study should also look into possible measures to mitigate the sediment build behind the power dam.

Thank you for the opportunity to comment on the plan.

Sincerely,
Eric Fagrelius

From:	Tom McKenney
To:	Peter Foster
Cc:	pneill@town.ridgway.co.us; Shay Coburn; Tom McKenney; Roberts Jerry; Ruth Higdon; Tim J. Manzagol
Subject:	Upper Uncompahgre River Basin Water Supply Protection and Enhancement Plan Phase II
Date:	Monday, April 27, 2020 9:41:39 AM

To Whom This May Concern:

A concern I have that I do not think the steering group or Ridgway reps have addressed is Cottonwood Creek water (I reference Map#4).
The problem, which I have addressed to several different people in the past couple of years, is that there is no longer a device /structure or way for water to complete it's flow from where it enjoins with a ditch that crosses CR#5(at the west end of Alice Billing's property)to it's natural confluence with the Uncompahgre River. Because the structure/"gate" that was in place until a few years ago has been removed, no water can nor does get into this drainage. So what is the big deal ? Specifically, this section of the creek, all of which is in the town of Ridgway, a large portion of which flows parallel with Moffit St and has a very pleasant riparian habitat of "old growth" cottonwoods(a "jewel" to the town) is slowly dying.
At one point some of the ditch users said they would be more than happy to supply some of their "unused water" to follow this course and water this drainage occasionally. Unfortunately, this has never risen to the point of interest that would plan/fund and build the gate/diversion needed to make this possible.
I am truly sorry for the late date of this request/complaint/observation. I am not really sure that this is the proper venue for this discussion but I feel it is an issue that has been constantly shoved to the end of the line as these cottonwoods slowly degrade.
Thanks in advance for considering this observation in your overall plan.

Sincerely
Tom McKenney

Tom Mckenney
545 Hyde Sy
PO Box# 340
Ridgway, Co
891432
(805) 235 7722

DENVER
2490 W. 26th Avenue Suite 100A
Denver, Colorado 80211
Phone: 303.480.1700
Fax: 303.480.1020

GLENWOOD SPRINGS
818 Colorado Avenue
P.O.Box 219
Glenwood Springs, Colorado 81602
Phone: 970.945.7755
Fax: 970.945.9210

DURANGO
1666 N. Main Avenue Suite C
Durango, Colorado 81301
Phone: 970.259.7411
Fax: 970.259.8758

www.wrightwater.com

Wright Water Engineers, Inc.