Piceance Creek (Upper) Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 24-25, 2023

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4408182.72 UTM East: 253674.05
LOWER TERMINUS:	confluence with unnamed tributary at UTM North: 4402272.35 UTM East: 247589.12
WATER DIVISION:	6
WATER DISTRICT:	43
COUNTY:	Garfield, Rio Blanco
WATERSHED:	Piceance-Yellow
CWCB ID:	17/6/A-001
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	6.93 miles
FLOW RECOMMENDATION:	0.2 cfs (07/01 - 02/29) 0.8 cfs (03/01 - 03/31) 1.5 cfs (04/01 - 04/30) 1.4 cfs (05/01 - 05/31) 0.8 cfs (06/01 - 06/31)

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

BACKGROUND

Colorado's General Assembly created the Instream Flow and Natural Lake Level Program in 1973, recognizing "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3), C.R.S.). The statute vests the Colorado Water Conservation Board (CWCB or Board) with the exclusive authority to appropriate and acquire instream flow (ISF) and natural lake level water rights (NLL). Before initiating a water right filing, the Board must determine that: 1) there is a natural environment that can be preserved to a reasonable degree with the Board's water right if granted, 2) the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made, and 3) such environment can exist without material injury to water rights.

The information contained in this Executive Summary and the associated supporting data and analyses form the basis for staff's ISF recommendation to be considered by the Board. This Executive Summary provides sufficient information to support the CWCB findings required by ISF Rule 5i on natural environment, water availability, and material injury. Additional supporting information is located at: https://cwcb.colorado.gov/2023-isf-recommendations.

RECOMMENDED ISF REACH

The BLM recommended that the CWCB appropriate an ISF water right on a reach of Piceance Creek. The proposed reach on Piceance Creek is located within Garfield and Rio Blanco County and is approximately 16 miles northwest from the town of Riffle (See Vicinity Map). The stream originates on the western edge of Big Mountain at approximately 9,000 feet in elevation and flows west and north until it reaches the confluence with the White River.

The proposed ISF reach extends from the headwaters downstream to the confluence with an unnamed tributary for a total of 6.93 miles. The land on the proposed reach is 16% BLM, 11% United States Forest Service (USFS), and 73% private (See Land Ownership Map). BLM is interested in protecting this stream to meet management goals aimed at maintaining and enhancing habitat that supports fish species, maintaining and improving the function of riparian areas, and protecting riparian and wetland systems.

OUTREACH

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently more than 1,100 people subscribe to the ISF mailing list. Notice of the potential appropriation of an ISF water right on Piceance Creek was sent to the mailing list in March 2022, November 2021, November 2021, October 2021, March 2021, March 2020, November 2019, March 2019, March 2018, March 2017, and November 2016. Staff sent letters to identified landowners adjacent to Piceance Creek based on information from the county assessors website. A public notice about this recommendation was also published in the Rio Blanco Herald Times on December 22, 2022.

Staff presented information about the ISF program and this recommendation to the Garfield County Board of County Commissioners on August 15, 2017, December 17, 2018, and November 14, 2022. Staff also presented information about the ISF program and this recommendation to the Rio Blanco Board of County Commissioners on August 14, 2017, October 8, 2018, and October 8, 2019 and to the White River Integrated Water Initiative Planning Advisory Committee on November 9, 2021. In addition, staff spoke with Brett Waston, Water Commisioner on April

8, 2016 and Shanna Lewis, Water Commissioner on November 19, 2021, reguarding water availability on Piceance Creek.

NATURAL ENVIRONMENT

CWCB staff relies on the recommending entity to provide information about the natural environment. In addition, staff reviews information and conducts site visits for each recommended ISF appropriation. This information provides the Board with a basis for determining that a natural environment exists.

This portion of Piceance Creek is a cold-water, high gradient stream. This reach flows through a broad canyon with a valley floor approximately 1,000 to 3,000 feet in width. The stream cuts through alluvial deposits in the valley and is confined by bedrock in some locations. The stream generally has small-sized substrate, consisting of gravels, small cobbles, and small boulders.

The riparian community is generally comprised of coyote willow, Geyer's willow, sedges and rushes. The riparian community is in good condition and provides shading and cover for fish habitat. The stream has a good mix of pools, small riffles, and runs. While deep pool habitat is absent, the existing pools are sufficient for overwintering fish. CWCB Staff also observed beaver complexes.

Fisheries surveys have revealed a self-sustaining native fish population comprised of speckled dace and mountain suckers. Intensive macroinvertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly. Staff have identified mayfly, stonefly, and caddisfly in the field, which are all taxa know to be sensitive to water quality. Their presence indicates good water quality (Hilsenhoff, 1987).

Table 1. List of species identified in Piceance Creek.

Species Name	Scientific Name	Status
Mountain sucker	*Catostomus platyrhynchus*	State - Species of Greatest Conservation Need State - Species of Special Concern
Speckled Dace	*Rhinichthys osculus*	None
caddisfly	*Trichoptera*	None
mayfly	*Ephemeroptera*	None
stonefly	*Plecoptera*	None

ISF QUANTIFICATION

CWCB staff relies on the biological expertise of the recommending entity to quantify the amount of water required to preserve the natural environment to a reasonable degree. CWCB staff performs a thorough review of the quantification analyses completed by the recommending entity to ensure consistency with accepted standards.

Quantification Methodology

BLM staff used the R2Cross method to develop the ISF recommendation. The R2Cross method is based on a hydraulic model and uses field data collected in a stream riffle (Espegren, 1996; CWCB, 2022). Riffles are the stream habitat type that are most vulnerable to dry if streamflow

ceases. The data collected consists of a streamflow measurement, survey of channel geometry and features at a cross-section, and survey of the longitudinal slope of the water surface.

The R2Cross model uses Ferguson's Variable-Power Equation (VPE) to estimate roughness and hydraulic conditions at different water stages at the measured cross-section (Ferguson 2007, 2001). This approach is based on calibrating the model as described in Ferguson (2021). The model is used to evaluate three hydraulic criteria: average depth, average velocity, and percent wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types also will maintain aquatic habitat in pools and runs for most life stages of fish and aquatic macro-invertebrates (Nehring, 1979). BLM staff use the model results to develop an initial recommendation for summer and winter flows. The summer flow recommendation is based on the flow that meets all three a hydraulic criteria. The winter flow recommendation is based on the flow that meets two of the three hydraulic criteria.

The R2Cross method estimates the biological amount of water needed for summer and winter periods. The recommending entity uses the R2Cross results and its biological expertise to develop an initial ISF recommendation. CWCB staff then evaluates water availability for the reach typically based on median hydrology (see the Water Availability section below for more details). The water availability analysis may indicate less water is available than the initial recommendation. In that case, the recommending entity either modifies the magnitude and/or duration of the recommended ISF rates if the available flows will preserve the natural environment to a reasonable degree or withdraws the recommendation.

Data Collection and Analysis

BLM collected R2Cross data at five transects for this proposed ISF reach (Table 2). Results obtained at more than one transects are averaged to determine the R2Cross flow rate for the reach of stream. The R2Cross model results in a winter flow of 0.52 cfs and a summer flow of 1.46 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 2. Summary of R2Cross transect measurements and results for Piceance Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/15/2015, 2	6.70	3.91	0.52	1.78
06/15/2015, 3	6.96	3.73	0.47	2.22
07/07/2015, 2	7.36	1.98	0.84	1.35
07/20/2022, 2	3.96	0.11	0.31	1.03
07/20/2022, 1	4.05	0.07	0.47	0.90
			0.52	1.46

ISF Recommendation

BLM recommends the following flows based on R2Cross modeling analyses, biological expertise, and staff's water availability analysis.

1.5 cubic feet per second is recommended period from April 1 through April 30 during the beginning of the snowmelt runoff period. This recommendation is variously driven by the mean depth criteria, mean velocity criteria, or wetted perimeter criteria, depending on the cross section surveyed. This portion of the creek is small and habitat availability is very susceptible to even small changes in flow from diversions. It is important to protect a flow rate that makes most of this habitat available to the fish population while they are completing critical life history functions during the warm weather months.

1.4 cubic feet per second is recommended from May 1 to May 31. The rationale for this flow rate is the same as the rationale for the April 1 to April 30 recommendation, except that the flow rate has been slightly reduced because of more limited water availability.

0.8 cubic feet per second is recommended from June 1 through June 30 during the conclusion of the snowmelt runoff period. This flow rate does not meet all three instream flow criteria, but it exceeds two of three instream flow criteria and provides a transitional flow rate between maximum habitat availability during snowmelt runoff and limited habitat availability during the base flow period.

0.2 cubic feet per second is recommended from July 1 through February 29 during the base flow period. This recommendation is driven by very limited water availability. This flow rate should maintain pool habitat during the late summer and fall and prevent pools from freezing during the extended cold weather period, allowing the fish population to successfully overwinter. Even though the base flow in this creek is small, it can persist during drought conditions, allowing the fishery to continue.

0.8 cubic feet per second is recommended from March 1 through March 31 during the low elevation snowmelt period. This flow rate does not meet all three instream flow criteria, but it exceeds two of three instream flow criteria and provides a transitional flow rate between limited habitat availability during the winter and maximum habitat availability during peak snowmelt runoff.

WATER AVAILABILITY

CWCB staff conducts hydrologic analyses for each recommended ISF appropriation to provide the Board with a basis for making the determination that water is available.

Water Availability Methodology

Each recommended ISF reach has a unique flow regime that depends on variables such as the timing, magnitude, and location of water inputs (such as rain, snow, and snowmelt) and water losses (such as diversions, reservoirs, evaporation and transpiration, groundwater recharge, etc.). This approach focuses on streamflow and the influence of flow alterations, such as diversions, to understand how much water is physically available in the recommended reach.

Staff's hydrologic analysis is data-driven, meaning that staff gathers and evaluates the best available data and uses the best available analysis method for that data. Whenever possible, long-term stream gage data (period of record 20 or more years) are used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and regression-based models are used when long-term gage data is not available. CSUFlow18 is a multiple regression model developed by

Colorado State University researchers using streamflow gage data collected between 2001 and 2018 (Eurich et al. 2021). This model estimates mean-monthly streamflow based on drainage basin area, basin terrain variables, and average basin precipitation and snow persistence. Diversion records are used to evaluate the effect of surface water diversions when necessary. Interviews with water commissioners, landowners, and ditch or reservoir operators can provide additional information. A range of analytical techniques may be employed to extend gage records, estimate streamflow in ungaged locations, and estimate the effects of diversions. The goal is to obtain the most detailed and reliable estimate of hydrology using the most efficient analysis technique.

The final product of the hydrologic analysis used to determine water availability is a hydrograph, which shows streamflow and the proposed ISF rate over the course of one year. The hydrograph will show median daily values when daily data is available from gage records; otherwise, it will present mean-monthly streamflow values. Staff will calculate 95% confidence intervals for the median streamflow if there is sufficient data. Statistically, there is 95% confidence that the true value of the median streamflow is located within the confidence interval.

Basin Characteristics

The drainage basin of this proposed ISF on Piceance Creek is 9.4 square miles, with an average elevation of 8,200 feet and average annual precipitation of 23.0 inches (See the Hydrologic Features Map). Streamflow in the Piceance basin can be highly variable in terms of both the magnitude and timing of runoff. Piceance Creek is primarily a snowmelt runoff system, but runoff may start early compared to other locations in the state.

Water Right Assessment

There are a number of water rights and water practices in the basin tributary to the proposed reach that alter hydrology. Four water rights appear to divert directly from the Piceance Creek (Table 3). There is a total of 4.72 cfs in absolute and active surface water diversions and 5.5 acre feet in absolute storage based on HydroBase. There are also a number of absolute small springs and wells that total less than 0.25 cfs. Staff also identified conditional water rights that appear to be in use. This includes at least 5.2 cfs in conditional surface water rights (ditches and springs) that have diversion records and multiple storage rights that appear to exist based on the location of ponds in aerial images. These conditional water rights are generally located higher in the basin and are junior to water rights near the proposed lower terminus.

Table 3. Absolute diversion located within the proposed ISF reach on Piceance Creek.

WDID	Structure Name	Decreed Flow rate, cfs	Appropriation Date
4302563	Ryan's Pond Feeder Ditch*	1	2001
4300754	Larson Ditch**	2.5	1886
4300831	Morgan Ditch 2	0.4	1886
4300832	Morgan Ditch 1	1, 0.4	1883,1886
	Total	**5.3**	

** Listed as conditional but included because of the existence of diversion records*

***Larson Ditch is listed as a structure that can be used to fill the Larson Reservoir Enlargement, at a flow rate of 10 cfs in 88CW240, this right is currently conditional.*

The administrative call record was reviewed for Piceance Creek to better understand current administration. According to the previous water commissioner, (Shanna Lewis, personal communication 11/19/2021) Piceance Creek can have a dry reach below both of the proposed ISFs reaches but above the confluence with the White River. This creates a situation where downstream calls may be futile. Because of this, the basin can have two different calls that cover lower and upper portions of the basin. The upper basin calls extend to the headwaters and go through both proposed ISF reaches. Calls related to the upper basin occurred in 2022, 2021, 2020, 2018, 2012, 2007, 2004, and 2003. These calls are often senior to all water rights in Table 3 with the exception of the 1883 Morgan Ditch #1 right. In short, when the basin is under administration by downstream senior water rights, most available water will remain in the proposed ISF reach.

Data Collection and Analysis

Historic Gage Data

There was a historic streamflow gage on Piceance Creek near the proposed lower terminus, Piceance Creek at Rio Blanco, CO (USGS 09305500). This gage was located upstream from the lower terminus between the Larson and the Morgan 1 and 2 Ditches. It operated during the water year from 1952 through 1957, for a total of five years of record. This gage record does not reflect a number of more recent water rights and changes to water rights that have occurred in the basin since the 1950s. Many more recent water rights are located higher in the basin and are primarily for household use and ponds. In addition, a number of water rights were changed in the 1980s to allow additional uses including commercial, industrial, and augmentation. Because this gage record does not adequately reflect current water use practices, this data was not used as the primary basis for determining water availably. This gage data does indicate that historically April and May had the highest mean-monthly streamflow at rates, which were typically in excess of 1.5 cfs.

BLM Temporary Gage

Given the lack of recent streamflow data, the BLM installed and operated a temporary gage on Piceance Creek approximately 2.6 miles downstream from the lower terminus of this proposed reach. The gage was installed on 6/16/2016 and records include information through 7/27/2020. The drainage basin of the BLM gage was 21.6 square miles, with an average elevation of 7,920 feet and average annual precipitation of 21.71 inches. There are no active intervening water rights between the lower terminus of the proposed reach and the downstream BLM gage location. CWCB staff assisted in making measurements at the BLM gage and developed all rating curves and final flow data used in this analysis. BLM and CWCB staff made additional measurements near the lower terminus of the proposed reach as shown in Table 3.

Table 3. Summary of streamflow measurements for Piceance Creek (Upper).

Visit Date	Flow (cfs)	Collector
08/09/2016	0.06	CWCB
08/22/2018	0.34	CWCB
05/07/2019	7.7	CWCB
12/04/2019	1.37	CWCB
11/02/2022	0.45	CWCB
11/03/2022	0.55	BLM
11/16/2022	0.26	BLM
11/28/2022	0.36	BLM

The BLM gage record was compared to a nearby gage to evaluate how the temporary gage time period compares to a longer record. The Piceance Creek below Ryan Gulch, near Rio Blanco gage (USGS09306200) is the closest gage with a long-term record (1964-2020). This gage is located roughly 24 miles downstream and is affected by substantial water right uses. This assessment looked at the total flow volume at the gage for a calendar year based on the most recent contemporary 30 years (1991 to 2020, omitting 1998 and 1999 which did not have complete records). This showed that 2016 was the only year that the BLM gage operated during nearly average annual streamflow. Streamflow in 2019 was slightly above the 25th percentile. Streamflow in 2017 was less than the 25th percentile. Streamflow in 2018 and 2020 were less than the 10th percentile. In general, the data recorded by the BLM gage includes multiple years that were exceptionally dry compared to the last 30 years in the area.

The BLM temporary gage recorded variable, but generally modest streamflow between 2016 and 2020. The highest peak occurred in 2019 and runoff extended further into summer that year due to delayed snowmelt. Runoff in 2018 and 2020 was relatively short duration, lasting about two months in April and May. Streamflow after runoff was generally low with some periods of zero or near zero flow recorded at the gage.

In order to estimate streamflow in this reach of Piceance Creek (Upper), the BLM temporary gage record was prorated to the proposed lower terminus based to the weighted area-precipitation method (proration factor = 46.1%). Staff believes that this method may under-estimate the amount of water available at the proposed lower terminus because most of the tributaries below the upper reach are intermittent and are unlikely to contribute water year-round. No other adjustments were made for diversions in the proposed reach. The primary water rights in the reach show little to no use in recent years or use primarily for augmentation which left water in the stream, all uses are reflected in the gage record. Due to the short period of record at the gage, mean-monthly streamflow was calculated using the available record rather than median daily streamflow.

Water Availability Summary

The hydrograph (See Complete Hydrograph) shows mean-monthly streamflow prorated from the BLM temporary gage and streamflow measurements made in the proposed ISF reach.

This water availability assessment was challenging due to exceptionally dry hydrologic conditions and changing water use patterns through time. The BLM temporary gage records include multiple years with exceptionally dry conditions compared to the last 30 years. In addition, the BLM temporary gage includes new and changed water rights uses but operated during a period of very little water use by the most senior water rights.

Staff's water availability assessment primarily relies on the BLM gage record, which reflects more recent conditions and is generally a more conservative (lower) estimate of available streamflow. The proposed ISF rates are below the prorated BLM gage mean-monthly streamflow estimates in all months except November and December. Flow rates in winter months are typically fairly consistent. The low value in November is likely due in part to limited gage data in November and the rate in December is just 0.01 cfs less than the mean-monthly streamflow based on the BLM gage. Based on the available information, staff believes the proposed ISF flow rates are available.

MATERIAL INJURY

As a new junior water right, the proposed ISF on Piceance Creek can exist without material injury to other water rights. Under the provisions of section 37-92-102(3)(b), C.R.S., the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

Citations

Colorado Water Conservation Board, 2022, R2Cross model-user's manual and technical guide. Retrieve from URL: https://r2cross.erams.com/

Eurich, A., Kampf, S.K., Hammond, J.C., Ross, M., Willi, K., Vorster, A.G. and Pulver, B., 2021, Predicting mean annual and mean monthly streamflow in Colorado ungauged basins, River Research and Applications, 37(4), 569-578.

Espegren, G.D., 1996, Development of instream flow recommendations in Colorado using R2CROSS, Colorado Water Conservation Board.

Ferguson, R.I., 2007. Flow resistance equations for gravel- and boulder-bed streams. Water Resources Research 43. https://doi.org/10.1029/2006WR005422

Ferguson, R.I., 2021. Roughness calibration to improve flow predictions in coarse-bed streams. Water Res 57. https://doi.org/10.1029/2021WR029979

Hilsenhoff, W.L. 1987. An improved biotic index of organic stream pollution. Michigan Entomology Society. 20(11):9-13

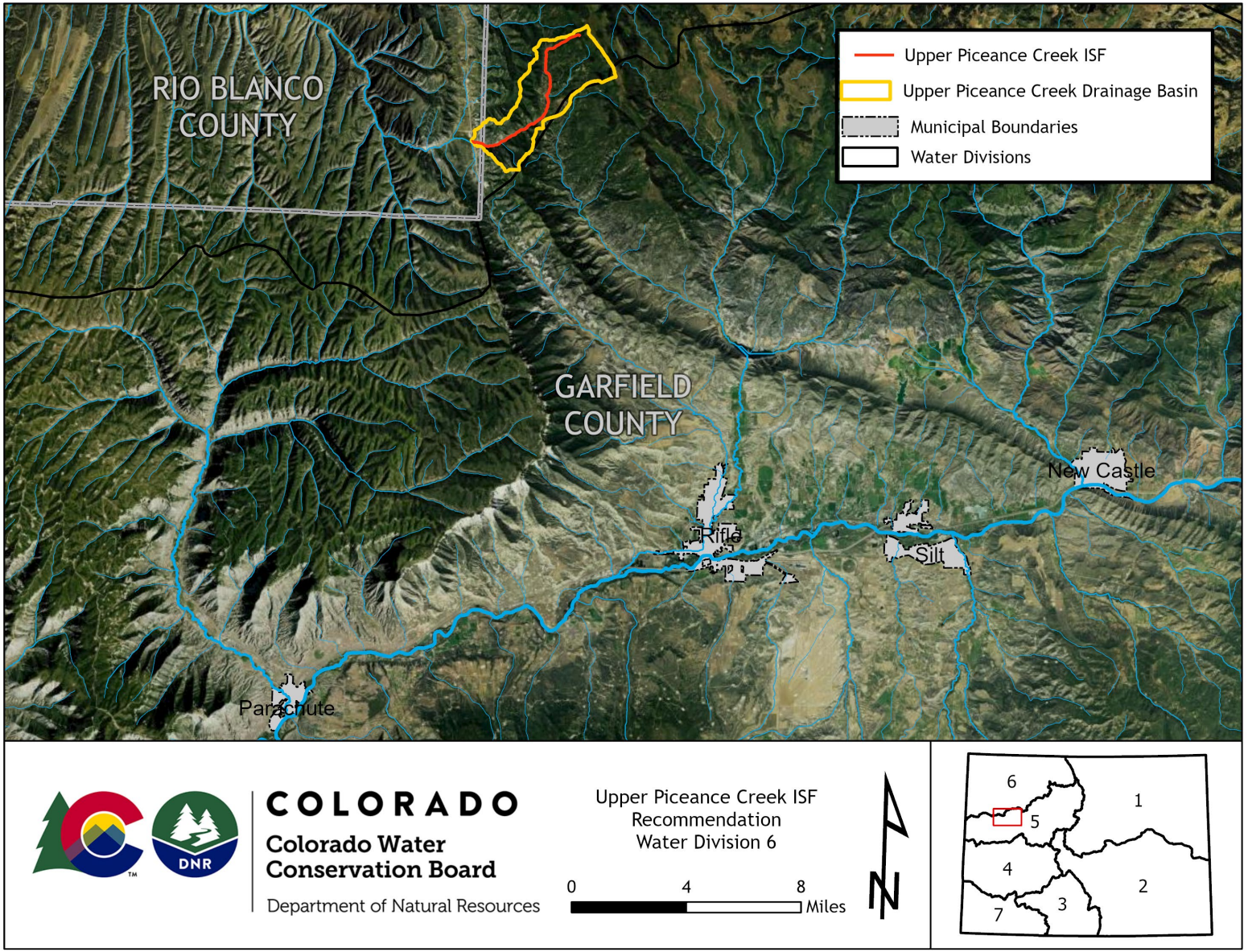
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the State of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

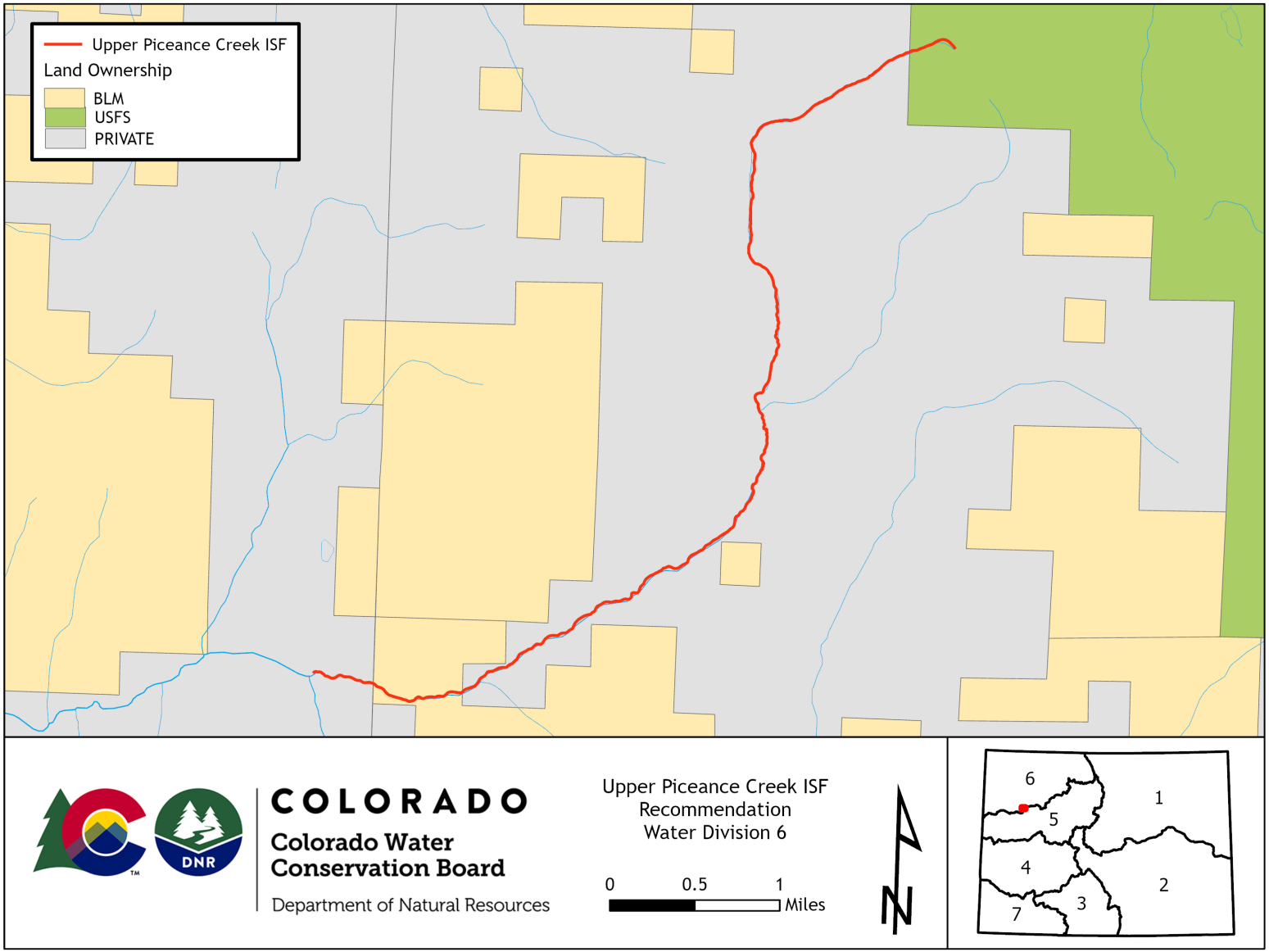
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

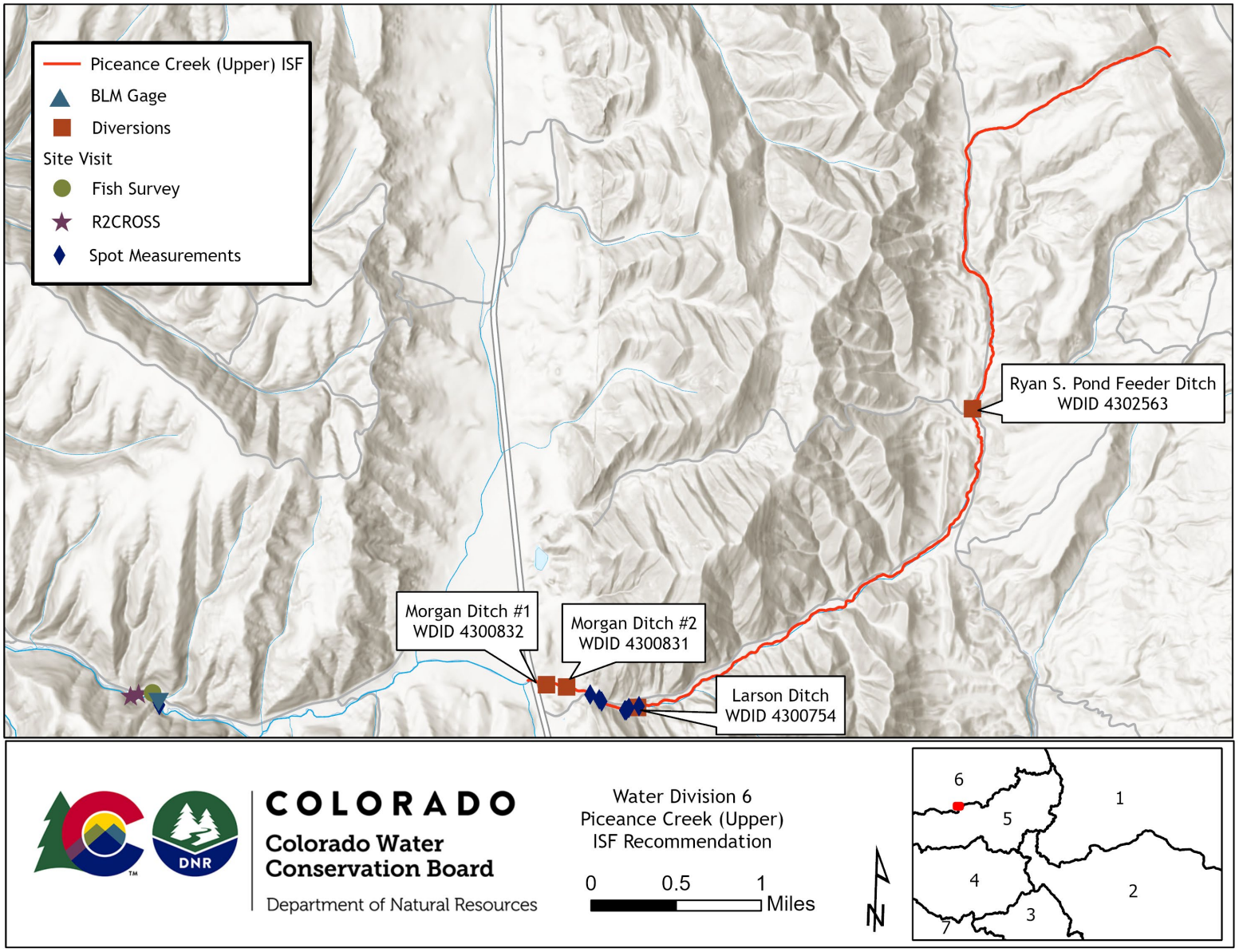
VICINITY MAP



LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH