Wheeler Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 29-30, 2024

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4533064.48 UTM East: 375794.47
LOWER TERMINUS:	Akers Ditch headgate at UTM North: 4536830.31 UTM East: 372984.74
WATER DIVISION/DISTRICT:	6/47
COUNTY:	Jackson
WATERSHED:	Upper North Platte
CWCB ID:	23/6/A-001
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	3.22 miles
FLOW RECOMMENDATION:	0.65 cfs (11/01 - 02/29) 0.9 cfs (03/01 - 04/30) 1.6 cfs (05/01 - 06/30) 0.9 cfs (07/01 - 10/31)

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/2024-isf-recommendations.

RECOMMENDED ISF REACH

The BLM recommended that the CWCB appropriate an ISF water right on a reach of Wheeler Creek at the February 2022 ISF Workshop. Wheeler Creek is located within Jackson County (See Vicinity Map) and is located approximately 17 miles northwest from the town of Walden in North Park. The stream originates in the Independence Mountains and flows northwest until it reaches the confluence with South Fork Big Creek.

The proposed ISF reach extends from the headwaters downstream to the Akers Ditch headgate for a total of 3.22 miles. Approximately 33% of the land on the proposed reach is private ownership, while 67% is managed by BLM (See Land Ownership Map). BLM is interested in protecting this stream to preserve the natural environment, particularly because it is one of the few fisheries managed by BLM in North Park. The stream was fire affected in 2015 and BLM is managing the watershed for fire recovery and sediment control.

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 Wheeler Creek was sent to the mailing list in March 2022, March 2023, and November 2023. Staff sent letters to identified landowners adjacent to Wheeler Creek based on information from the county assessor's website. A public notice about this recommendation was also published in the Jackson County Star on December 8, 2023.

Staff offered to present information about the ISF program and this recommendation to the Jackson County Board of County Commissioners, which declined the presentation. Staff also contacted Carl Trick, a North Park roundtable representative for the Jackson County Water Conservancy District, on November 7, 2023 to discuss the recommendation. In addition, staff spoke with Ramon Torress, District 47 Lead Water Commissioner, on September 1, 2023 regarding water availability on Wheeler 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.

Wheeler Creek is a moderate gradient stream with small to medium-sized substrate. The upper part of the creek flows through gently sloping forested areas, and the lower portions of the creek flow through meadow habitat. The riparian community is composed of spruce, alder, and multiple species of willow. The stream provides a good mixture of undercut banks, run, and riffles for fish habitat. Fishery surveys indicate that the stream supports a self-sustaining population of brook trout with a variety of age classes (Table 1). A few brown trout were also observed during fish surveys.

Table 1. List of species identified in Wheeler Creek.

Species Name	Scientific Name	Status
brook trout	*Salvelinus fontinalis*	None
brown trout	*Salmo trutta*	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 initial 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, a survey of channel geometry and features at a cross-section, and a 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; Ferguson, 2021). 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 macroinvertebrates (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 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 three transects for this proposed ISF reach (Table 2). Results obtained at more than one transect are averaged to determine the R2Cross flow rate for the stream reach. The R2Cross model results in a winter flow of 0.89 cfs and a summer flow of 1.63 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 Wheeler Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
07/16/2020, 1	6.55	0.44	1.38	3.01
06/16/2021, 1	6.10	0.89	0.69	0.89
06/16/2021, 2	4.29	0.77	0.61	0.98
			0.89	1.63

ISF Recommendation

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

1.6 cfs is recommended from May 1 through June 30 for the snowmelt runoff period. This flow should provide an advantageous amount of physical habitat when the fish population is starting to become very active and feeding.

0.90 cfs is recommended from July 1 through October 31 during the base flow period. This flow rate meets two of the three instream flow criteria, is driven by the average depth criteria and provides sufficient physical habitat when the fish population is gaining weight to survive the long cold weather period in this location. BLM believes that providing this flow will also ensure sufficient physical habitat availability for spawning during October.

0.65 cfs is recommended from November 1 through February 29 during late fall and winter. This recommendation is driven by limited water availability. This flow rate should provide sufficient water circulation to prevent total icing in pools that are critical for overwintering fish.

0.9 cfs is recommended from March 1 through April 30 during late winter and early spring. Flow rates in the creek are beginning to rise during this period due to lower elevation snowmelt runoff. This recommendation meets two of the three instream flow criteria and will provide habitat for fry that have emerged prior to May 1.

WATER AVAILABILITY

CWCB staff conducts hydrologic analyses for each recommended ISF appropriation to provide the Board with a basis for determining 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 the proposed ISF on Wheeler Creek is 6.1 square miles, with an average elevation of 9,054 feet, and average annual precipitation of 26.8 inches (See the Hydrologic Features Map). No water rights were identified in the drainage basin tributary to the proposed ISF. Hydrology is snowmelt driven and essentially natural in the proposed reach.

Data Collection and Analysis

Representative Gage Analysis

There is no current or historic streamflow gage on Wheeler Creek. There are very few streamflow gages in the region, and none appeared to be representative of Wheeler Creek due to differences in drainage basin characteristics.

Multiple Regression Model
The CSUFlow18 method provides the best available estimate of streamflow for Wheeler Creek.

Streamflow Measurements
BLM staff measured streamflow on Wheeler Creek numerous times between 1980 and 2014 at a location downstream from the proposed lower terminus at the crossing with county road 35. These measurements were prorated based on the area-precipitation method to the proposed lower terminus. In addition, CWCB and BLM staff made one streamflow measurement on the proposed reach of Wheeler Creek. All known measurements are summarized in Table 3.

Table 3. Summary of streamflow measurements for Wheeler Creek.

Visit Date	Flow (cfs)	Collector
06/23/1980	1.25	BLM
07/14/1989	0.13	BLM
08/24/1989	0.09	BLM
07/30/1990	0.07	BLM
07/12/1991	0.17	BLM
06/25/1992	0.20	BLM
06/21/1993	1.73	BLM
06/09/2004	0.09	BLM
05/13/2009	19.92	BLM
06/18/2009	3.52	BLM
06/22/2009	5.11	BLM
06/30/2009	3.50	BLM
07/14/2009	2.55	BLM
07/21/2009	1.37	BLM
08/07/2009	1.22	BLM
09/09/2009	0.74	BLM
06/09/2010	7.21	BLM
07/01/2010	1.67	BLM
07/21/2010	1.20	BLM
07/29/2010	1.58	BLM
09/07/2010	0.52	BLM
06/28/2011	8.17	BLM
07/21/2011	3.05	BLM

08/01/2011	1.76	BLM
08/24/2011	0.94	BLM
08/30/2011	1.76	BLM
07/29/2014	0.88	BLM
09/29/2023	0.16	BLM and CWCB

Water Availability Summary
The hydrograph shows CSUFlow18 results for mean-monthly streamflow and includes the proposed ISF rate (See Complete Hydrograph). The proposed ISF flow rate is below the mean-monthly streamflow. Staff has concluded that water is available for appropriation on Wheeler Creek.

MATERIAL INJURY
Because the proposed ISF on Wheeler Creek is a new junior water right, the ISF 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

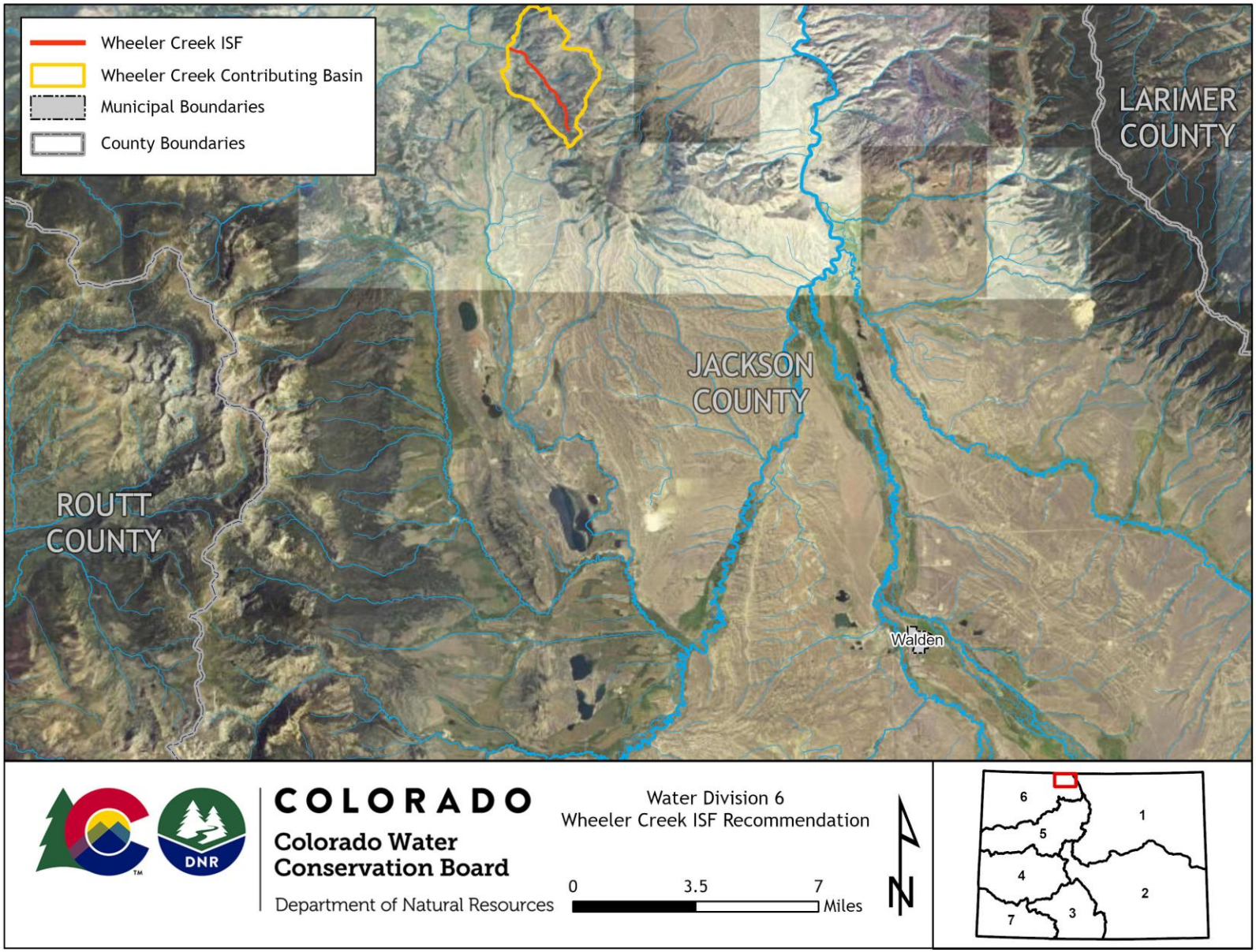
Ferguson, R.I., 2021. Roughness calibration to improve flow predictions in coarse-bed streams. Water Res 57. https://doi.org/10.1029/2021WR029979

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.

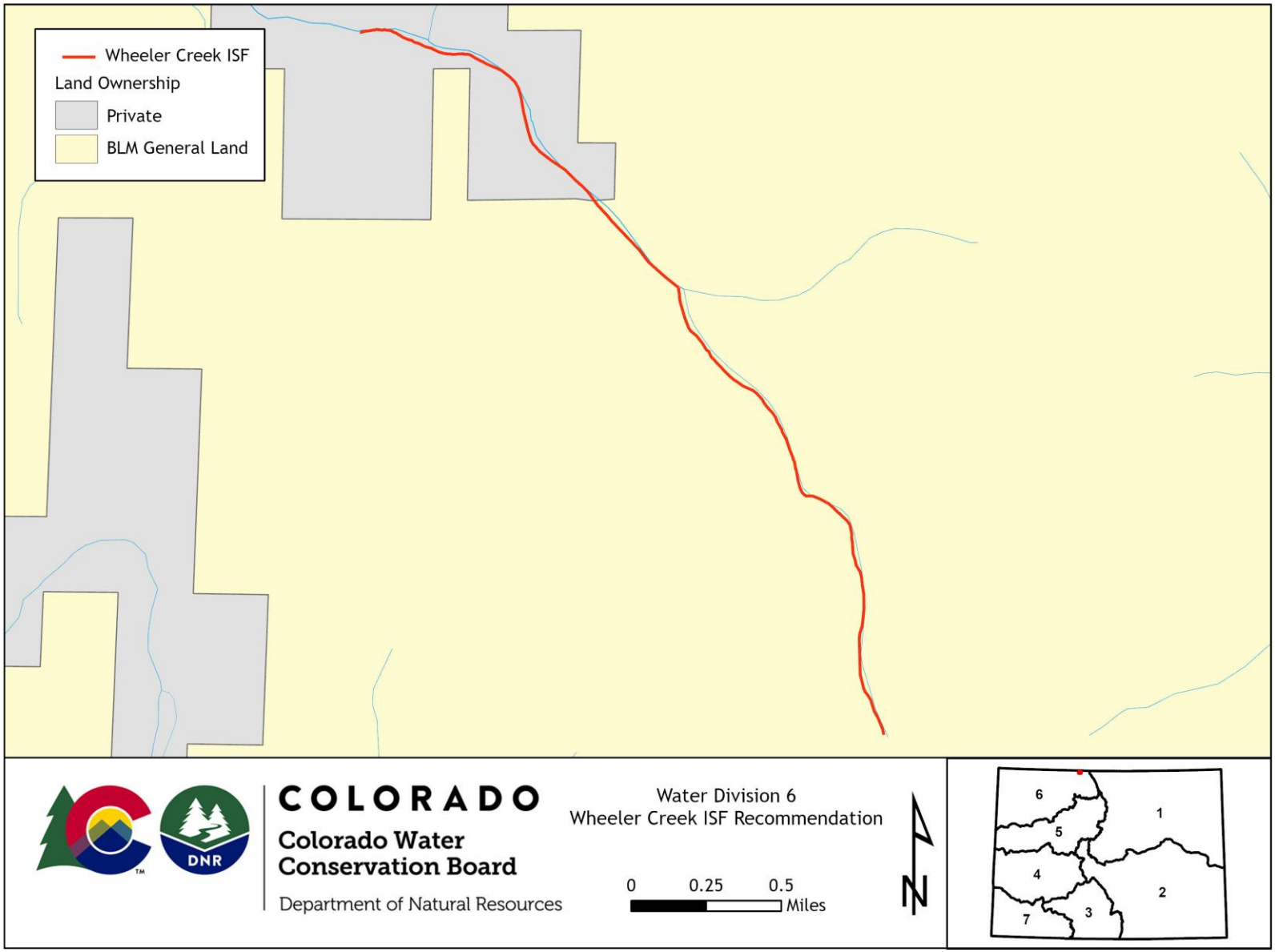
Metadata Descriptions
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

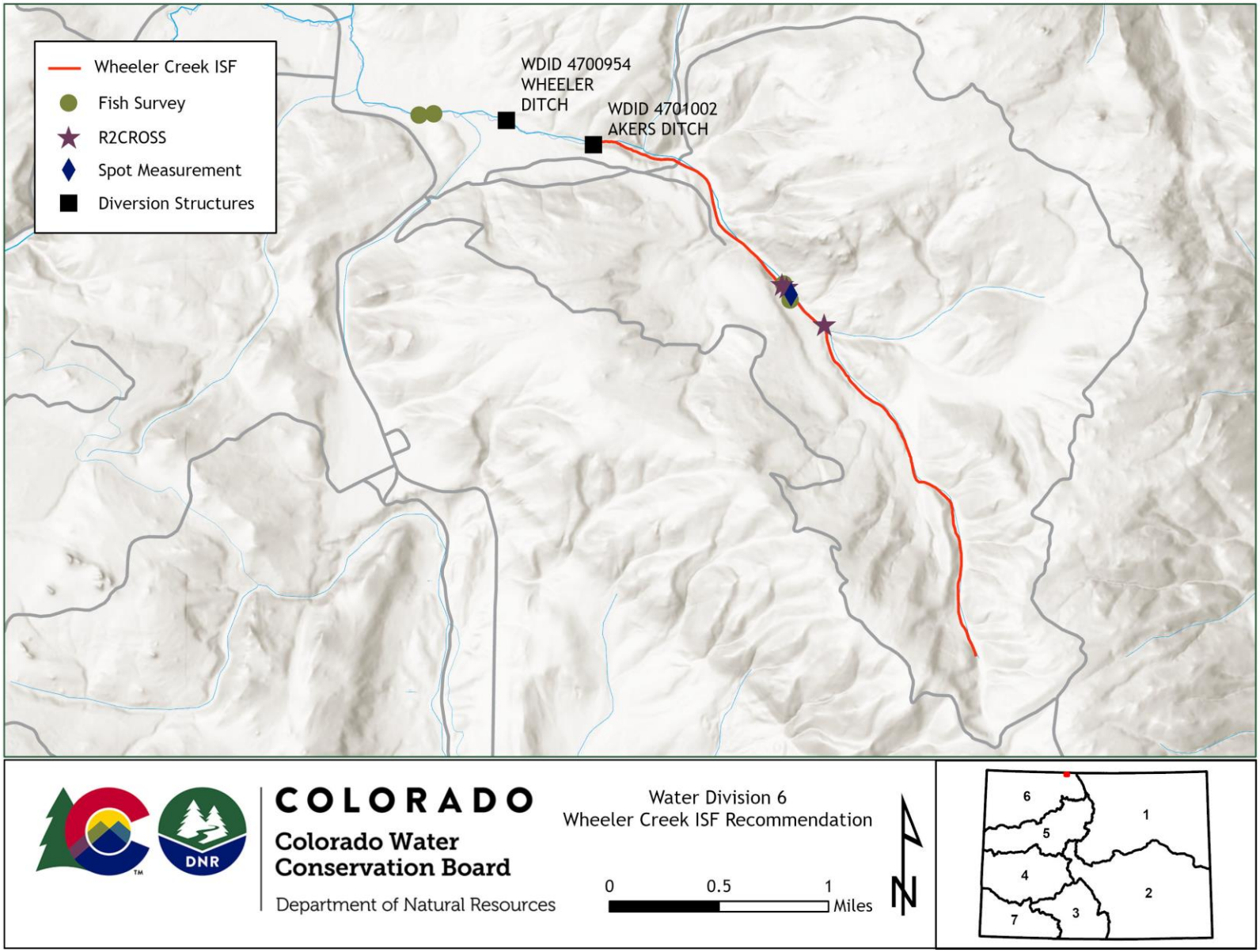
VICINITY MAP



LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH