Cameron Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 24-25, 2023

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4284643.53 UTM East: 362920.79
LOWER TERMINUS:	confluence with Lottis Creek at UTM North: 4289426.62 UTM East: 365596.60
WATER DIVISION:	4
WATER DISTRICT:	59
COUNTY:	Gunnison
WATERSHED:	East-Taylor
CWCB ID:	23/4/A-003
RECOMMENDER:	High Country Conservation Advocates (HCCA)
LENGTH:	3.69 miles
FLOW RECOMMENDATION:	1.1 cfs (04/01 - 09/30) 0.64 cfs (10/01 - 10/31) 0.5 cfs (11/01 - 03/31)

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

HCCA recommended that the CWCB appropriate an ISF water right on a reach of Cameron Creek. Cameron Creek is located within Gunnison County and is approximately 15 miles northeast from the city of Almont (See Vicinity Map). The stream originates on steep slopes between Cross Mountain and Cameron Mountain at 11,600 feet elevation and flows northeast until it reaches the confluence with Lottis Creek.

The proposed reach extends from the headwaters downstream to confluence with Lottis Creek for a total of 3.69 miles. Approximately 96% of the land on the proposed reach is United States Forest Service (USFS) land within the Gunnison National Forest and approximately 4% is private land (See Land Ownership Map). HCCA is interested in protecting this stream to continue their mission to protect the health and natural beauty of the land, rivers, and wildlife in and around Gunnison County.

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 Cameron Creek was sent to the mailing list in March 2022 and Novemnber 2022. Staff sent letters to identified landowners adjacent to Cameron Creek based on information from the county assessors website. A public notice about this recommendation was also published in the Crested Butte News on December 30, 2022.

Staff presented information about the ISF program and this recommendation to the Gunnison County Board of County Commissioners on September 13, 2022. In addition, staff spoke with Bob Hurford, Division Four Engineer on October 11, 2022 regarding water availability on Cameron 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.

The headwaters start above treeline before flowing through the valley between Cross Mountain and Cameron Mountain and then joining Lottis Creek. Cameron Creek flows from alpine slopes into a valley consisting of alternating sections of evergreen forest and meadow. The stream curves sinuously, forming diverse habitats including large riparian wetlands, oxbow lakes and ponds. There are side channels and wet meadows, indicating good floodplain connectivity.

The stream system begins as a high gradient stream, decreasing through the valley terrain. It is a cold-water, high-elevation system. The streambed consists largely of gravel and cobble substrate with ample woody debris below treeline. Cameron Creek supports Brown Trout, and a macroinvertebrate population. CWCB staff identified caddisfly in the field. Taxa in this order are considered evidence of generally good water quality (Hilsenhoff, 1987). CWCB observed evidence of active beaver complexes.

Table 1. List of species identified in Cameron Creek.

Species Name	Scientific Name	Status
Brown Trout	*Salmo trutta*	None
caddisfly	*Trichoptera*	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

HCCA 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 macroinvertebrates (Nehring, 1979). HCCA 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
HCCA collected R2Cross data at two 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 reach of stream. The R2Cross model results in a winter flow of 0.64 cfs and a summer flow of 1.1 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 Cameron Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
07/05/2021, 1	5.70	1.96	0.75	0.87
09/17/2021, 2	5.70	0.52	0.52	1.42
			0.64	1.1

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

1.1 cfs is recommended from April 1 to September 30. This rate meets three of three hydraulic criteria.

0.64 cfs is recommended from October 1 to October 31. This rate meets two of three hydraulic criteria.

0.5 cfs is recommended from November 1 to March 31 for baseflow conditions; this flow rate is reduced due to water availability limitations.

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 the proposed ISF on Cameron Creek is 2.96 square miles, with an average elevation of 11,194 feet and average annual precipitation of 24.24 inches (See the Hydrologic Features Map). Cameron Creek is a snowmelt driven hydrologic system, with variable timing and magnitude in snowmelt runoff. There are no water diversions on-channel or within the basin.

Water Rights Assessment

There are no diversions on Cameron Creek. There is one privately held ISF right on Cameron Creek for 12.5 cfs from the headwaters to the confluence with Lottis Creek (case number W-1987). This privately held right is part of a larger water right for Lottis Creek and its tributaries for a net amount of 60 cfs. These water rights have an appropriation date of 1910 and beneficial uses include stock water, recreation, fish culture, wildlife procreation, and heritage preservation. Although these private ISF rights are extensive, CWCB does not monitor, enforce, or legally protect them.

Data Collection and Analysis

Representative Gage Analysis

There are no current or historic gages on Cameron Creek. Staff investigated nearby gages for similarities in basin characteristics and hydrology and for data collection histories. No gages were sufficiently similar to be used to estimate streamflow on Cameron Creek.

Multiple Regression Model

The CSUFlow18 regression model predicts mean-monthly flow in Cameron Creek and provides the best estimate for streamflow conditions.

CWCB staff made one streamflow measurement on the proposed reach of Cameron Creek as summarized in Table 3.

Table 3. Summary of streamflow measurements for Cameron Creek.

Visit Date	Flow (cfs)	Collector
09/12/2022	0.74	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 concludes that water is available for a new appropriation on Cameron Creek.

MATERIAL INJURY
As a new junior water right, the proposed ISF on Cameron Creek can exist without material injury to other existing 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

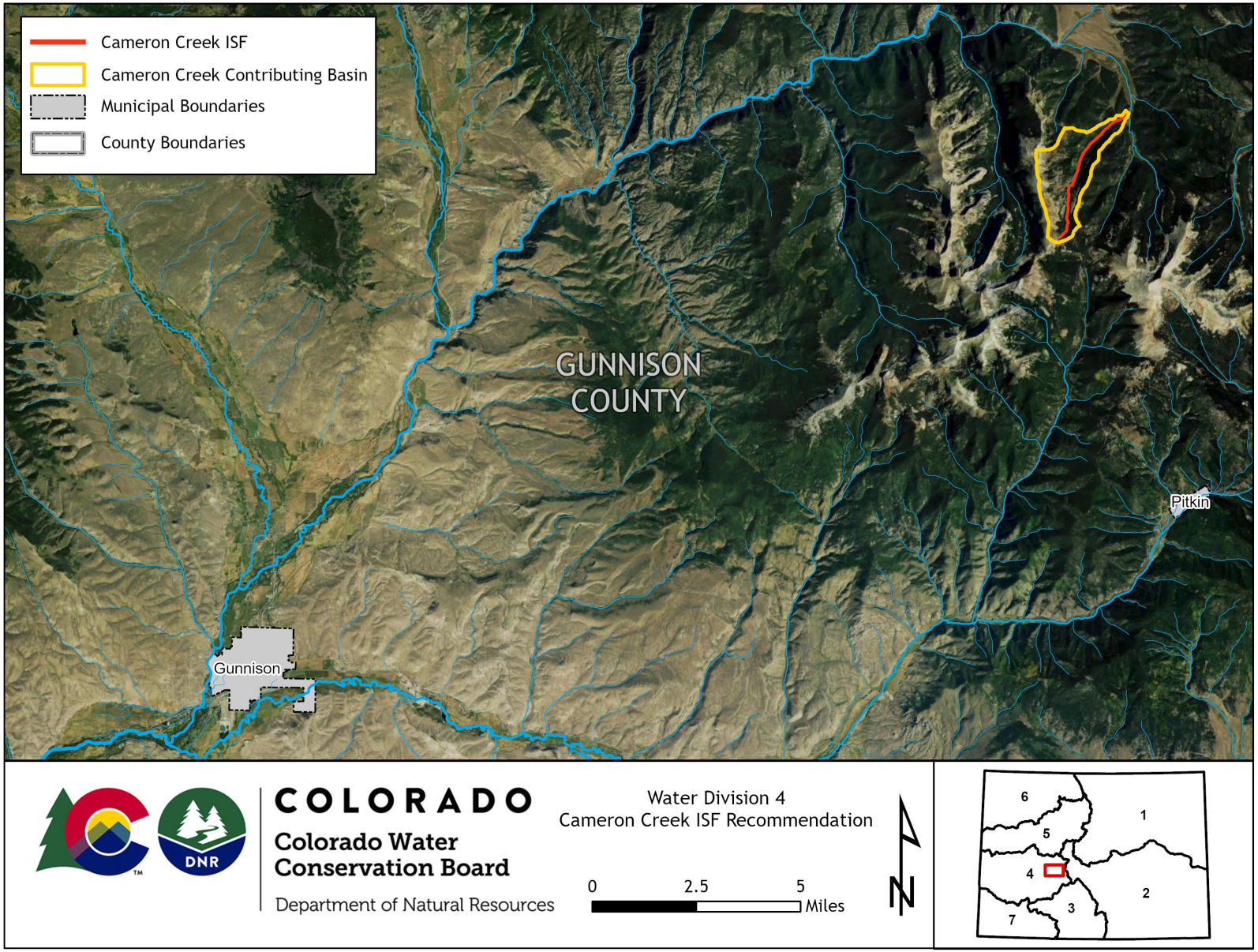
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the State of Colorado, Colorado Division of Wildlife.

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

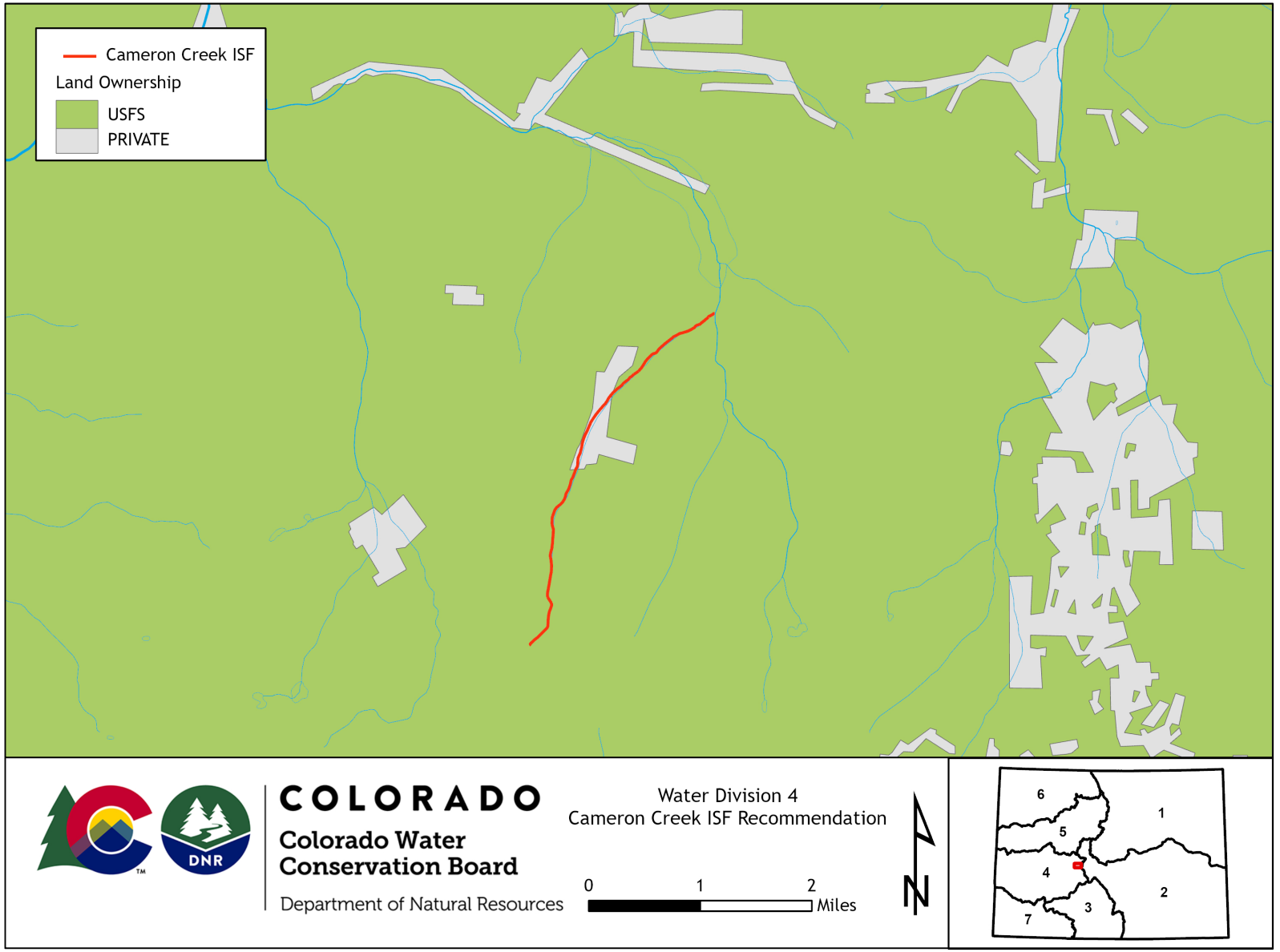
Metadata Descriptions
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

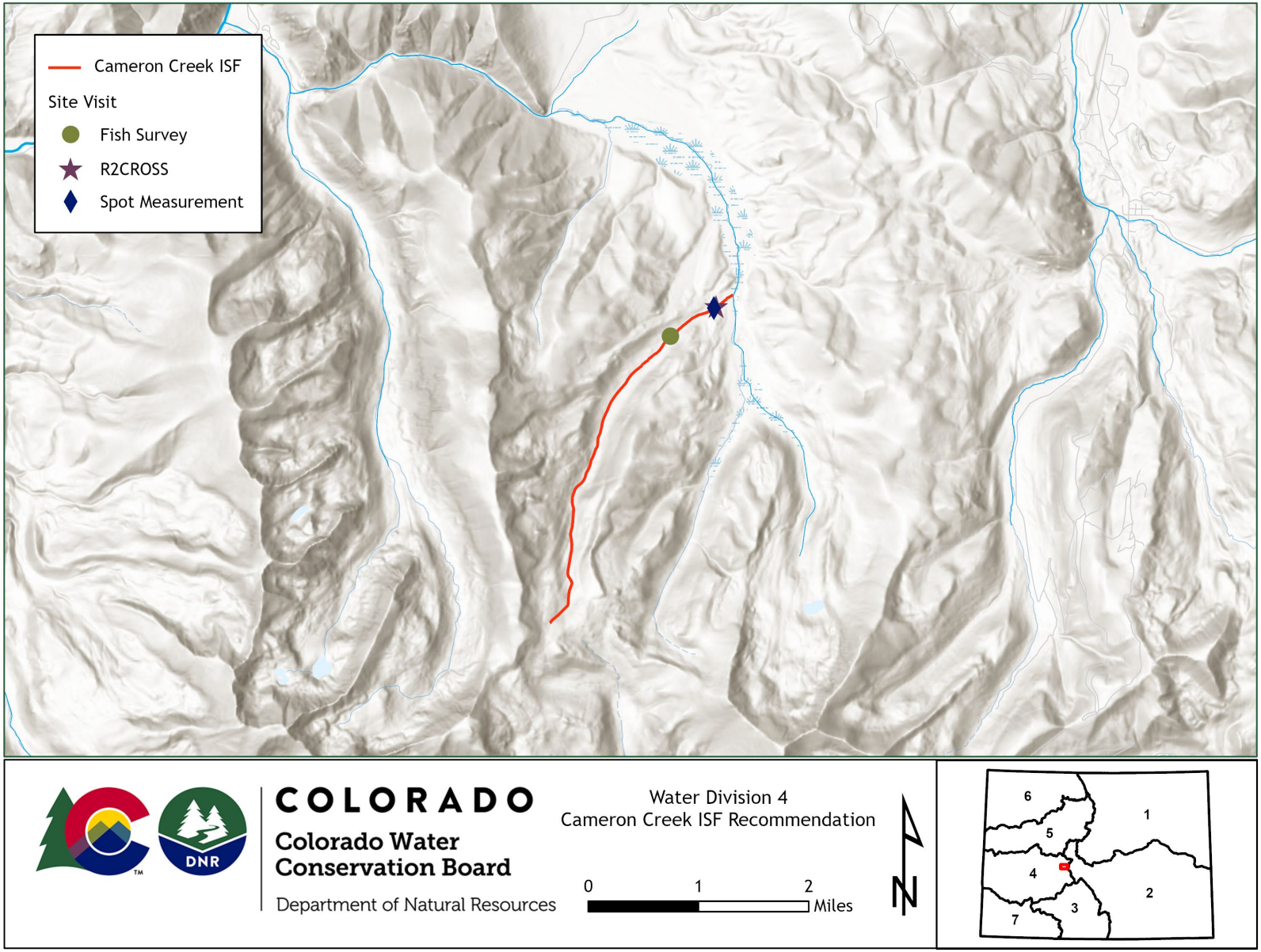
VICINITY MAP



LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH