

Red Canyon Creek Executive Summary



CWCB STAFF INSTREAM FLOW RECOMMENDATION January 24-25, 2023

UPPER TERMINUS: headwaters in the vicinity of
UTM North: 4245322.94 UTM East: 221751.70

LOWER TERMINUS: confluence with Big A Creek at
UTM North: 4240822.17 UTM East: 219603.08

WATER DIVISION: 4

WATER DISTRICT: 60

COUNTY: Montrose

WATERSHED: San Miguel

CWCB ID: 21/4/A-010

RECOMMENDER: Colorado Parks and Wildlife (CPW)

LENGTH: 3.2 miles

FLOW RECOMMENDATION: 5 cfs (04/01 - 04/30)
6.2 cfs (05/01 - 07/31)
3 cfs (08/01 - 09/30)
2.3 cfs (10/01 - 10/31)
1 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

CPW recommended that the CWCB appropriate an ISF water right on a reach of Red Canyon Creek. Red Canyon Creek is located within Montrose County and is approximately 18 miles north of the town of Nulca (See Vicinity Map). The stream originates on the Uncompaghre Plateau at the top of Red Canyon and flows south until it reaches the confluence with Horsefly Creek which is a tributary to the San Miguel River.

The proposed reach extends from the headwaters downstream to confluence with Big A Creek for a total of 3.2 miles. The entire proposed reach is on United States Forest Service (USFS) land in the Uncompaghre National Forest (See Land Ownership Map). CPW is interested in protecting this stream in order to protect the natural environment which includes a core conservation population of Colorado River Cutthroat Trout.

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 Red Canyon Creek was sent to the mailing list in March 2020, March 2021, March 2022, and November 2022. Staff sent letters to identified landowners adjacent to Red Canyon Creek based on information from the county assessors website. A public notice about this recommendation was also published in the Montrose Daily Press on December 21, 2022.

Staff presented information about the ISF program and this recommendation to the Montrose County Board of County Commissioners on November 22, 2022. In addition, staff communicated with Bob Hurford, Division Four Engineer on October 11, 2022 regarding water availability on Red Canyon 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.

Red Canyon Creek is a snowmelt driven, cold-water stream. It flows in a mainly single channel at a high gradient through Red Canyon. Red Canyon Creek basin is forested with stands of aspen, blue spruce, ponderosa, and oak scrub. The understory consists of shrubs and wildflowers, including native red columbines, wild iris, and purple beardtongue. Along the streambank, the riparian community is comprised of healthy willow and alder dotted with common horsetail. Large beaver dam complexes were observed in the field.

The Red Canyon Creek morphology is complex with undercut banks, coarse substrate riffles, pools, and glides. The bed substrate ranges from medium cobbles to large boulders. The riparian community shades the cold-water stream. Ample woody debris and detritus provide habitat and food sources for stream macroinvertebrates. The macroinvertebrate community observed in the field was diverse and included orders, caddisfly and mayfly, that are known to be sensitive to water quality (Hilsenhoff, 1987). A few species of caddisfly, mayfly, aquatic beetle, and diptera were observed in addition to both broad shouldered and giant water striders.

CPW identified a self-sustaining population of Colorado River Cutthroat trout (CRCT) of the Gunnison Basin lineage in Red Canyon Creek. CRCT are native to the Colorado River and its tributaries and are designated by CPW as a species of special concern and species of greatest conservation need in Colorado. This population is a core conservation population of CRCT, meaning that the population is 99% pure. CPW works to secure and enhance watershed conditions in CRCT conservation populations as part of a multi-state and multi-agency conservation agreement aimed at preventing the listing of these subspecies under the Endangered Species Act

Table 1. List of species identified in Red Canyon Creek.

Species Name	Scientific Name	Status
Colorado River cutthroat trout	<i>Oncorhynchus clarkii pleuriticus</i>	State - Species of Greatest Conservation Need State - Species of Special Concern
aquatic beetle	<i>Coleoptera</i>	None
aquatic fly larvae	<i>Diptera</i>	None
caddisfly	<i>Trichoptera</i>	None
mayfly	<i>Ephemeroptera</i>	None
water strider	<i>Gerridae</i>	None
beaver	<i>Castor canadensis</i>	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

CPW 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). CPW 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

CPW collected R2Cross data at one transect for this proposed ISF reach (Table 2). The R2Cross model results in a winter flow of 1.45 cfs and a summer flow of 6.15 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 Red Canyon Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
05/19/2022, 1	20.97	6.89	1.45	6.15

ISF Recommendation

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

5 cfs is recommended from April 1 to April 30; this flow rate is reduced due to water availability limitations. This early season flow recommendation will support beneficial spawning conditions for cutthroat trout.

6.2 cfs is recommended from May 1 to July 31. This rate maintains adequate depth, velocity, and wetted perimeter during the summer period when fish are most active and stream

temperatures are high. This higher flow rate will support ideal spawning conditions for cutthroat trout, a species who spawn in the spring.

3.0 cfs is recommended from August 1 to September 30; this flow rate is reduced due to water availability limitations. This rate maintains available habitat, depth, and wetted perimeter, and allows fish movement as flows recede and temperatures may still be high during the late-summer.

2.3 cfs is recommended from October 1 to October 31. This flow rate is reduced due to water availability limitations. This rate maintains available habitat and allows fish movement as flows recede to baseflow conditions.

1.0 cfs from November 1 to March 31; this flow rate is reduced due to water availability limitations. This rate will provide sufficient habitat availability in pools and deep glides during the overwintering period.

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 Red Canyon Creek is 6.00 square miles, with an average elevation of 9,186 feet and average annual precipitation of 29.12 inches (See the Hydrologic Features Map). Red Canyon Creek is a high-gradient, single channel, snowmelt driven hydrologic system, with variable timing and magnitude in snowmelt runoff.

Water Rights Assessment

There are current water rights within the contributing basin of Red Canyon Creek. Staff is aware of a historical structure that no longer exists within the reach, Red Canyon Ditch (WDID 6001303).

Data Collection and Analysis

Representative Gage Analysis

There are no current or historic gages on Red Canyon 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 Red Canyon Creek.

Multiple Regression Models

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

Data Collection and Analysis

CWCB staff assisted CPW in R2Cross data collection and performed both site visit and stream measurement alongside CPW staff (Table 2).

Water Availability Summary

The hydrograph (See Complete Hydrograph) shows CSUFlow18 results for mean-monthly streamflow and the proposed ISF flow rate. Staff has concluded that water is available for appropriation.

MATERIAL INJURY

As a new junior water right, the proposed ISF on Red Canyon 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>

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.

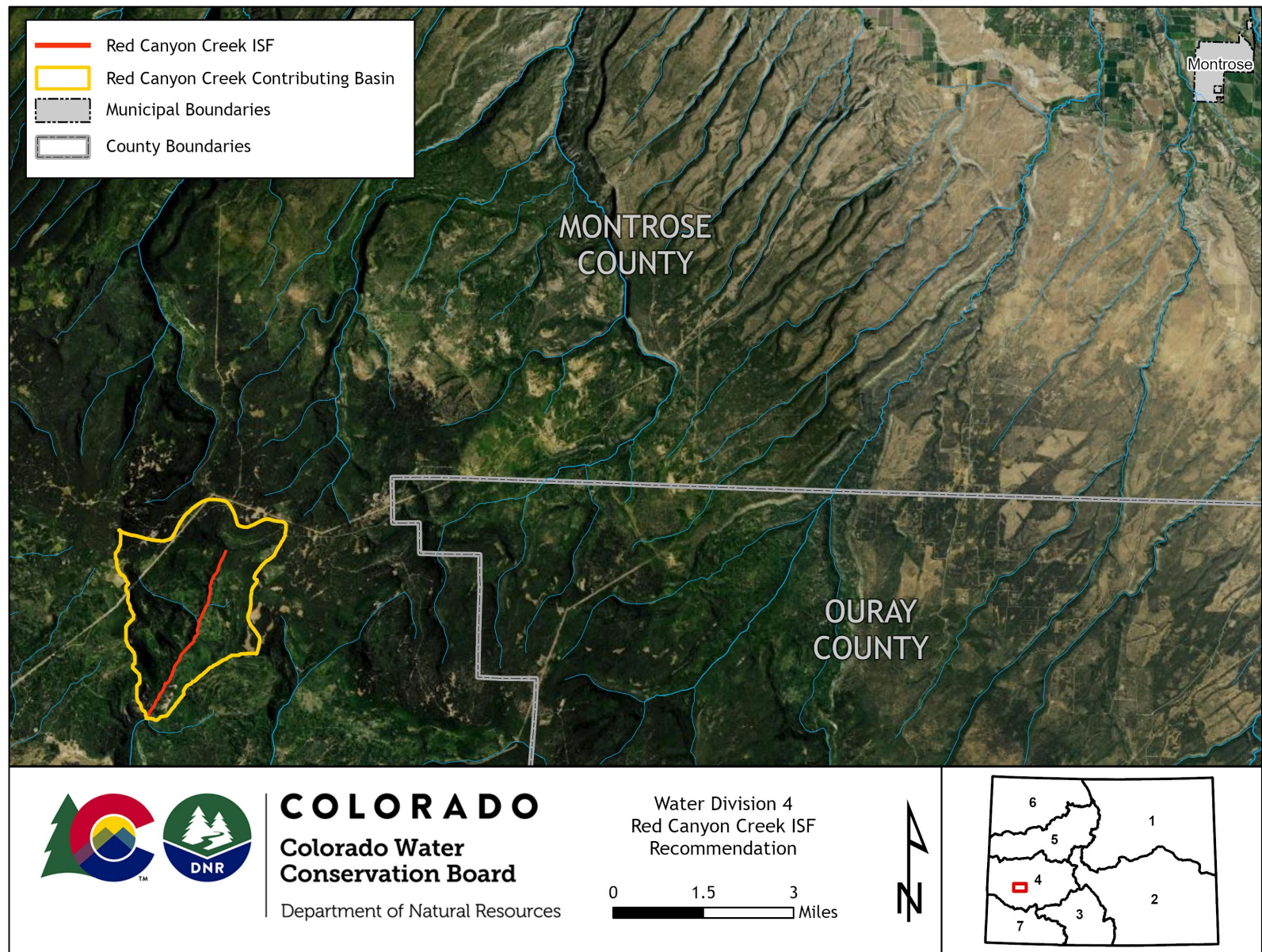
Hilsenhoff, W.L. 1987. An improved biotic index of organic stream pollution. Michigan Entomology Society. 20(11):9-13

Metadata Descriptions

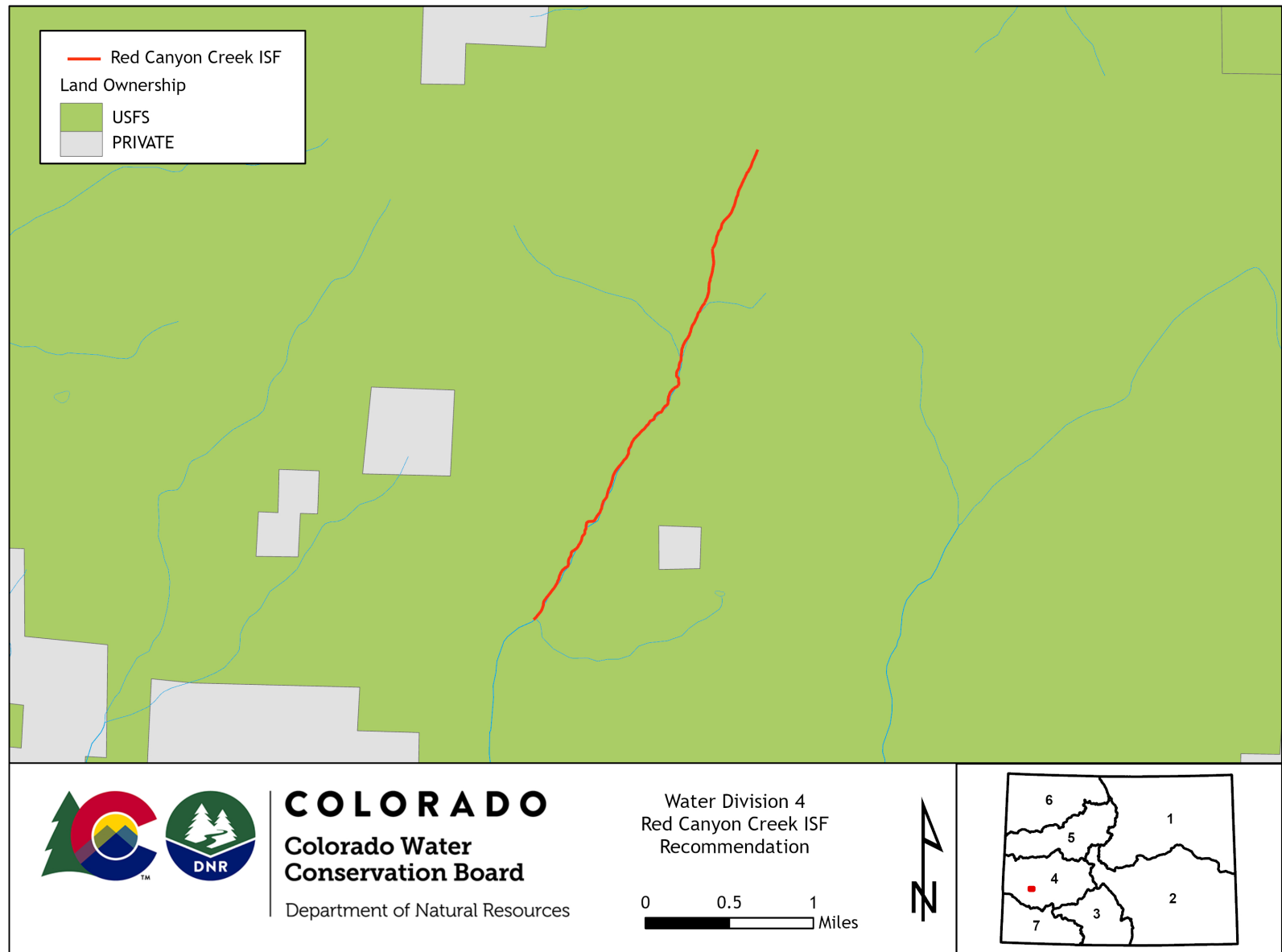
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

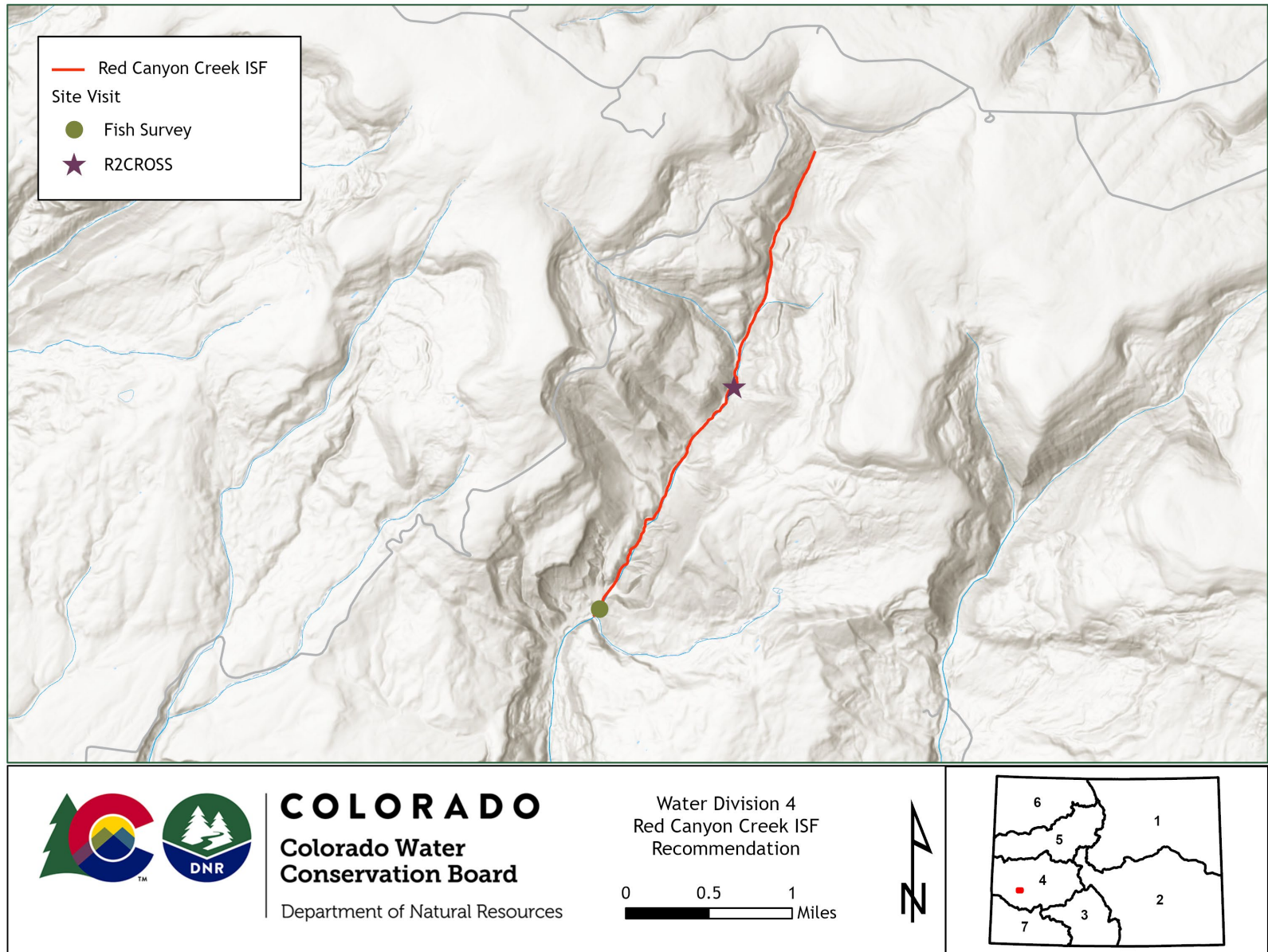
VICINITY MAP



LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH

Red Canyon Creek Lower terminus at the confluence with Big A Creek

