Red Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	confluence with West Red Creek at UTM North: 4270658.46 UTM East: 307592.84
LOWER TERMINUS:	confluence with Blue Mesa Reservoir at UTM North: 4261023.63 UTM East: 305537.85
WATER DIVISION/DISTRICT:	4/59
COUNTY:	Gunnison
WATERSHED:	Upper Gunnison
CWCB ID:	25/4/A-003
RECOMMENDER:	High Country Conservation Advocates, National Park Service (HCCA, NPS)
LENGTH:	6.9 miles
EXISTING ISF:	1.5 cfs (01/01 – 12/31), 84CW0379
FLOW RECOMMENDATION (INCREASE):	2.5 cfs (05/01 - 07/31) – increase to 4.0 cfs total 1.0 cfs (08/01 - 09/30) - increase to 2.5 cfs total

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 (NLL) water rights. 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/2025-isf-recommendations.

RECOMMENDED ISF REACH

HCCA and NPS recommended that the CWCB appropriate an ISF water right on a reach of Red Creek at the ISF Workshop in February 2024. Red Creek is located within Gunnison County and is approximately 17 miles east from the City of Gunnison (See Vicinity Map). The stream originates at the border with the West Elk Wilderness and flows south until it reaches the confluence with Blue Mesa Reservoir. The existing ISF water right on Red Creek was appropriated in 1984 for 1.5 cfs year-round.

The proposed ISF reach extends over the same reach as the existing ISF, from the confluence with West Red Creek downstream to the confluence with Blue Mesa Reservoir, for a total of 6.9 miles. One hundred percent of the land on the proposed reach is on public lands including USFS, Bureau of Land Management, and Colorado Parks and Wildlife (See Land Ownership Map).

HCCA and NPS are interested in protecting this stream to preserve the natural environment. HCCA protects the health and natural beauty of the land, rivers, and wildlife in and around Gunnison County. HCCA has a long history of protecting waters in the Upper Gunnison Basin and of partnering with federal agencies and other non-profits to support a number of instream flow proposals in their region. Red Creek has been designated an outstanding waters by the State of Colorado, sustains a fishery, and provides important riparian habitat for a broad range of wildlife species.

This is the first recommendation the ISF program has recieved from the National Park Service. Each National Park has a foundation document to provide basic guidance for planning and management decisions. The Curecanti National Recreation Area Foundation Document (2013) identifies both riparian habitats and aquatic resources as core resources for protection both in the park and in the surrounding, connected landscape. The mainstem of Red Creek is partially within the park—where it is directly protected—and upstream of the park—where the NPS seeks to protect water and habitat quality through cooperative conservation.

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 Creek was sent to the mailing list in March 2024. A public notice about this recommendation was published in the Crested Butte News on December 20, 2024.

Staff presented information about the ISF program and this recommendation to the Gunnison County Board of County Commissioners on October 8, 2024. In addition, staff communicated with Bob Hurford, Divsision Engineer, on September 19, 2024 regarding existing water uses on Red 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 upper portion of Red Creek has been designated as an outstanding water by the State of Colorado. In 1979 CPW sampled Red Creek and found brook trout present (Table 1). In 1986 CPW sampled and noted the presence of brown trout and rainbow trout. In 2016 sampling below the confluence of West and East Red Creek demonstrated the presence of brook trout. While conducting R2Cross assessments, HCCA and CPW staff saw numerous macroinvertebrates, a crayfish and a small fish (unknown species).

Table 1. List of species identified in Red Creek.

Species Name	Scientific Name	Status
rainbow trout	*Oncorhynchus mykiss*	None
brown trout	*Salmo trutta*	None
brook trout	*Salvelinus fontinalis*	None

As part of the foundational document for Curecanti NRA, the aquatic resources are identified as Fundamental Resources essential to the purpose of the park and maintaining its significance. The NPS has been monitoring the aquatic macroinvertebrate community in Red Creek going back to 2013. Red Creek has shown consistently high index scores and no impairment, as seen in Table 2.

Table 2. NPS Red Creek Aquatic Macroinvertebrate Sampling Results
Model Method: CO Ecological Data Application System Multimetric Index -Transition

Collection Date	Fixed Count	MMI Score	Condition Result
2013-08-29	96	79.4	Not impaired
2014-09-02	204	72.2	Not impaired
2016-08-11	6	41	Inconclusive
2017-08-15	60	53.9	Not impaired
2018-09-06	51	55	Not impaired
2020-09-10	300	65.1	Not impaired
2022-09-14	300	61.2	Not impaired

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, HCCA, NPS 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 (CWCB, 2022; CWCB, 2024). 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). CPW, HCCA, NPS 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
CPW, HCCA, NPS collected R2Cross data at two transects for this proposed ISF reach (Table 3 and Site Map). Results obtained at more than one cross section are averaged to determine the R2Cross flow rate for the stream reach. The R2Cross model results in a summer flow of 4.0 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 3. Summary of R2Cross cross-section measurements and results for Red Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/12/2023, 2	14.20	7.46	NA	2.86
06/12/2023, 3	15.47	7.46	NA	5.17
			NA	4.00

ISF Recommendation
HCCA and NPS recommends the following flows based on R2Cross modeling analyses, biological expertise, and staff's water availability analysis. HCCA and NPS recommends an increase to the existing ISF to meet all three hydraulic criteria.

An increase of 2.5 cfs is recommended from May 1 to July 31 to bring the total ISF protection up to 4.0 cfs. This flow provides adequate depth, velocity, and wetted perimeter during runoff.

An increase of 1.0 cfs is recommended from August 1 to September 30 to bring the total ISF protection up to 2.5 cfs. This flow recommendation 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 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 contributing basin of the proposed ISF on Red Creek is 14.3 square miles, with an average elevation of 9,319 feet and average annual precipitation of 17.0 inches. Hydrology is snowmelt driven and natural in the proposed reach.

Water Rights Assessment

As stated, the CWCB holds an ISF water right on this proposed reach from 1984 (84CW0379) as well as a water right on West Red Creek (84CW0380) which is an upstream tributary. Other than a small spring right and a historical ditch, no other water rights were identified.

Data Collection and Analysis

Representative Gage Analysis

There are no historic or current streamflow gages on Red Creek and no nearby representative gages were identified.

Multiple Regression Model

CSUFlow18 provides the best available estimate of streamflow on Red Creek and no adjustments were necessary.

Site Visits Data

CWCB staff made one streamflow measurements on the proposed reach of Red Creek as summarized in Table 4.

Table 4. Summary of streamflow measurements for Red Creek.

Visit Date	Flow (cfs)	Collector
08/28/2024	0.42	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 appropriation on Red Creek.

MATERIAL INJURY

If decreed, the proposed ISF on Red Creek would be a new junior water right. This ISF water right can exist without material injury to other senior 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

Common Acronyms and Abbreviations

Term	Definition
af	acre feet
BLM	Bureau of Land Management
cfs	cubic feet per second
CWCB	Colorado Water Conservation Board
CPW	Colorado Parks and Wildlife
DWR	Division of Water Resources
HCCA	High Country Conservation Advocates
ISF	Instream Flow
NLL	Natural Lake Level
USGS	United States Geological Survey
USFS	United States Forest Service
XS	Cross section

Citations

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

Colorado Water Conservation Board, 2024, R2Cross field manual. Retrieve from URL: https://dnrweblink.state.co.us/cwcbsearch/0/edoc/224685/R2Cross%20Field%20Manual%202024.pdf

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.

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

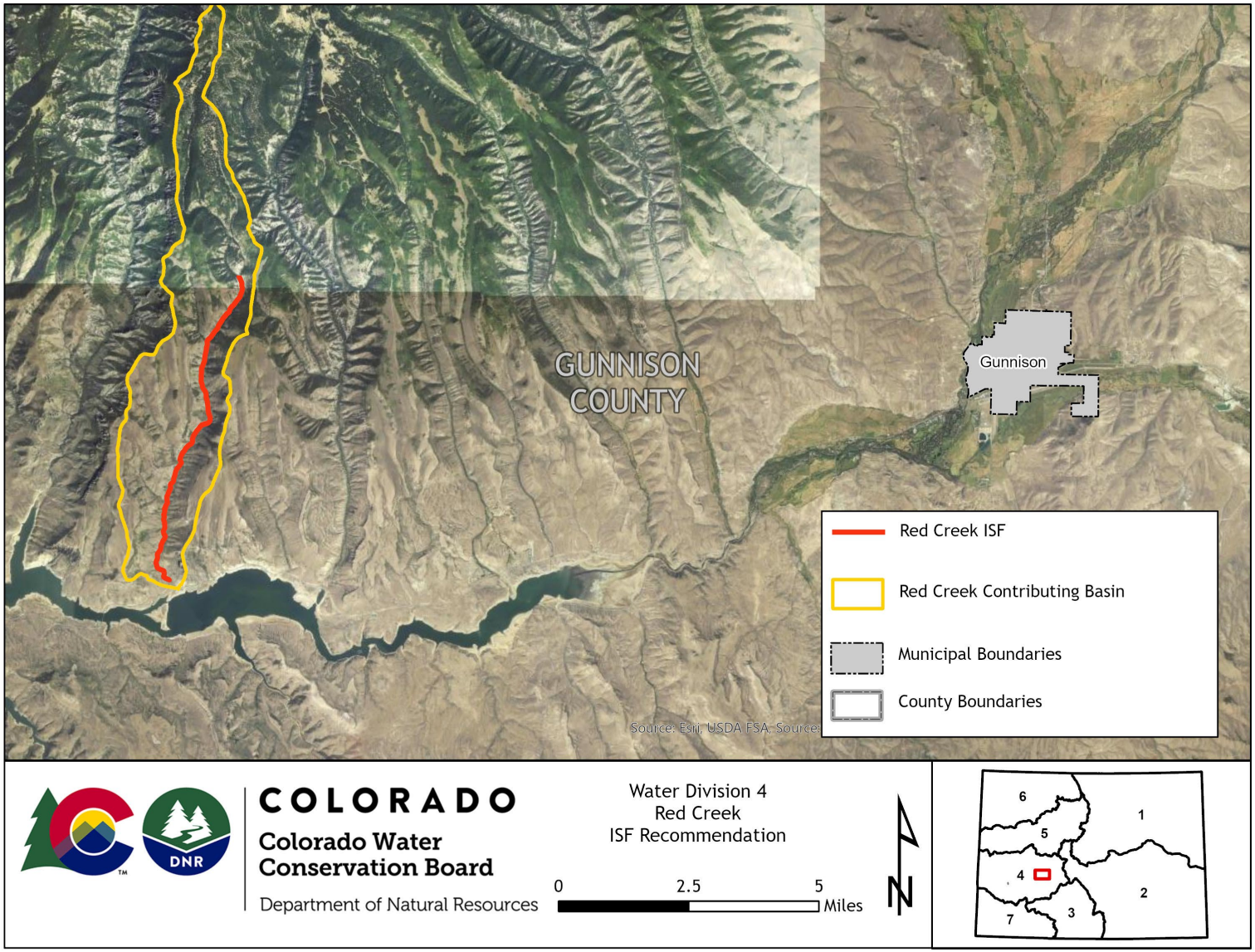
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

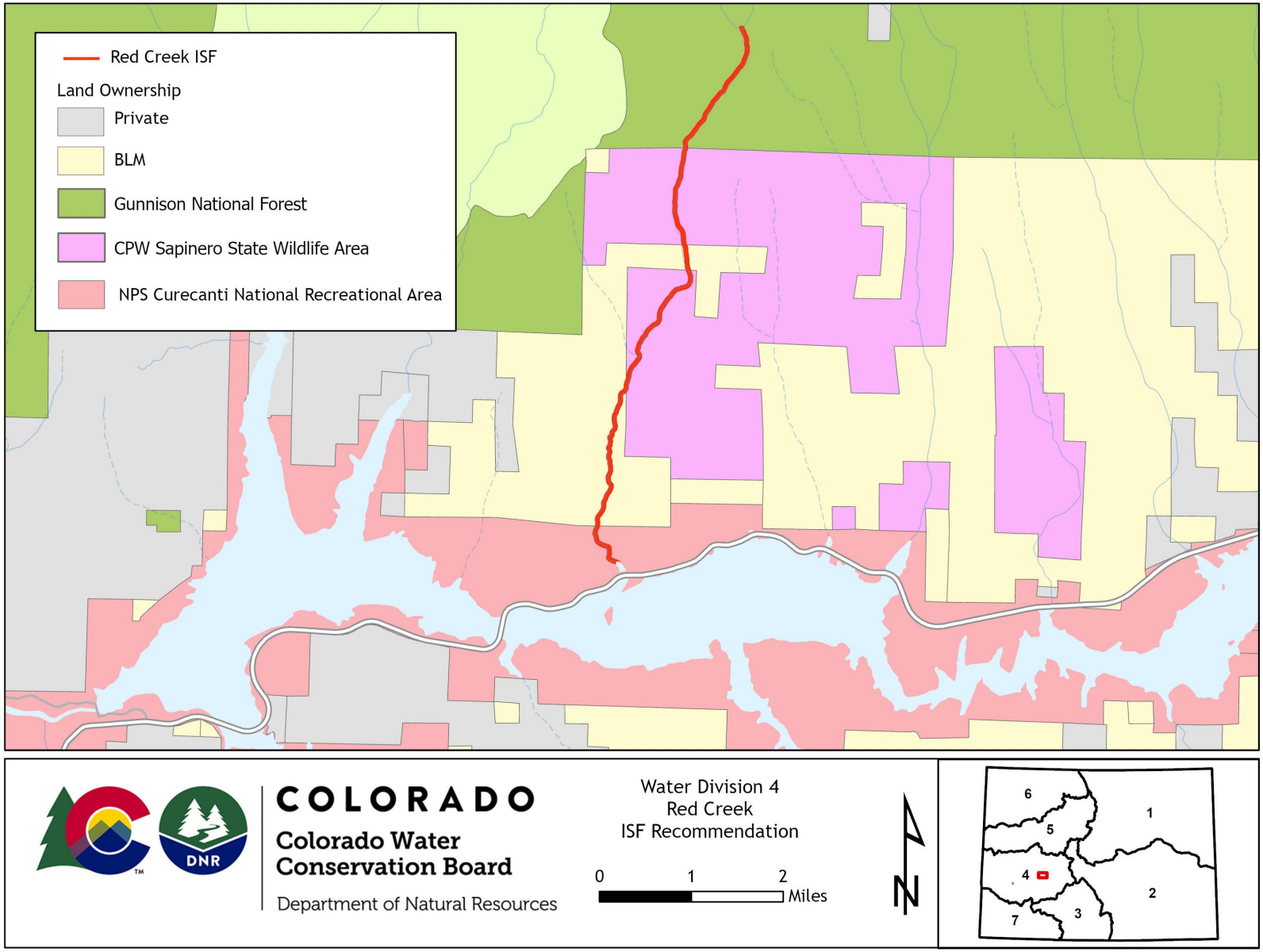
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

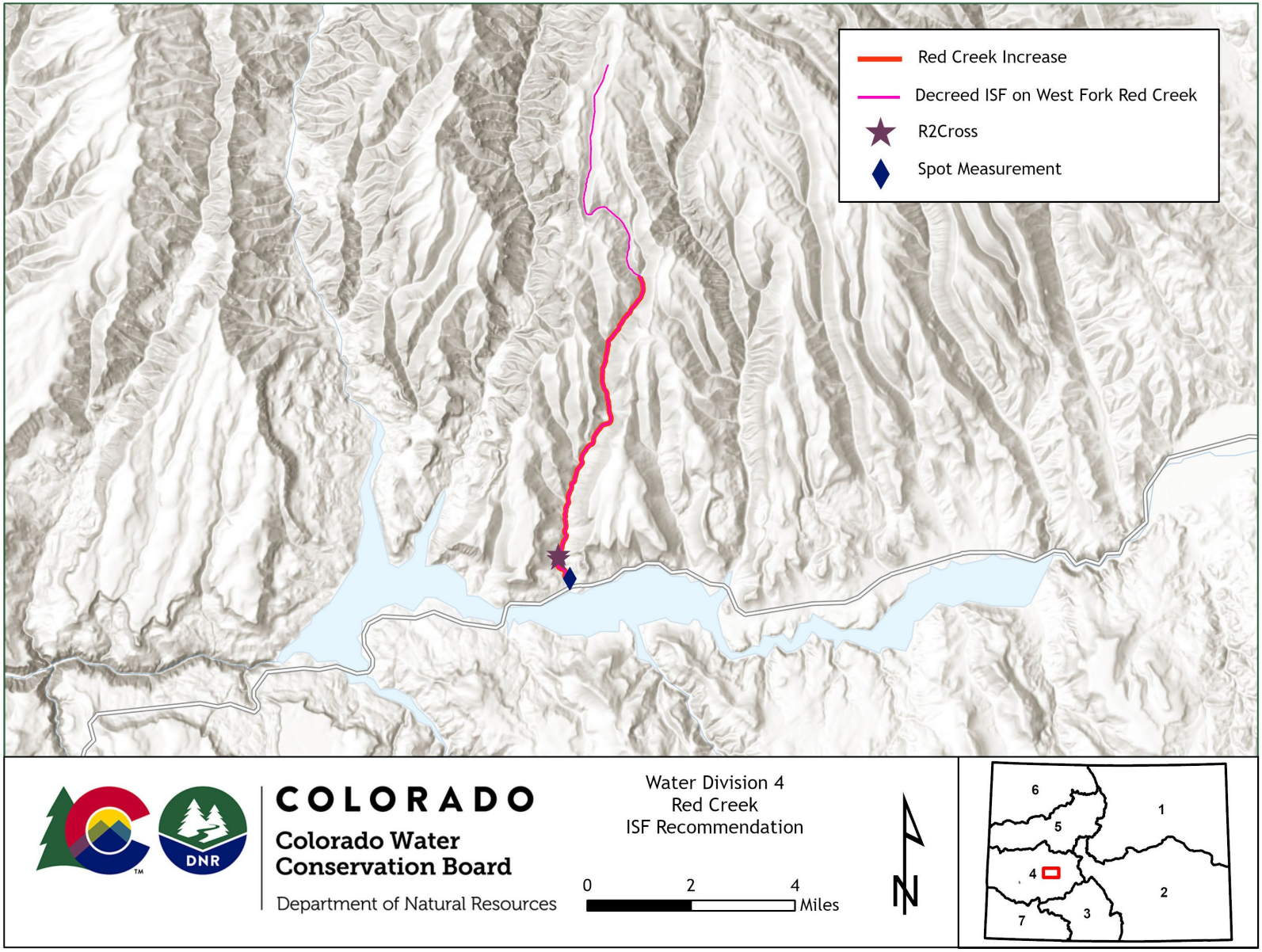
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


Red Creek Increase
Decreed ISF on West Fork Red Creek
R2Cross
Spot Measurement
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
Red Creek
ISF Recommendation
0
2
4
Miles
N
6
1
5
4
2
7
3

COMPLETE HYDROGRAPH