Clear Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4447253.82 UTM East: 282675.34
LOWER TERMINUS:	confluence with Milk Creek at UTM North: 4453485.17 UTM East: 273474.97
WATER DIVISION/DISTRICT:	6/44
COUNTY:	Rio Blanco
WATERSHED:	Lower Yampa
CWCB ID:	24/6/A-008
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	8.32 miles
FLOW RECOMMENDATION:	1.3 cfs (07/01 - 03/31) 4.8 cfs (04/01 - 06/30)

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

BLM recommended that the CWCB appropriate an ISF water right on a reach of Clear Creek at the ISF Workshop in January 2023. Clear Creek is located within Rio Blanco County and is approximately 22 miles south from the City of Craig (See Vicinity Map). The stream originates near Horse Ridge and flows west until it reaches the confluence with Milk Creek. Clear Creek is a tributary to Milk Creek, which is a tributary to the Yampa River.

The proposed ISF reach extends from the headwaters downstream to the confluence with Milk Creek for a total of 8.32 miles. Approximately 69% of the land of the proposed reach is publicly managed by the BLM and the US Forest Service (9% and 59% respectively) the remaining 31% is under private ownership (See Land Ownership Map). BLM is interested in protecting this stream to preserve the natural environment. Establishing an ISF water right will assist in meeting the BLM's objectives to maintain and enhance habitat that supports fish species and protection for 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 Clear Creek was sent to the mailing list in November 2024, March 2024, and March 2023. Staff sent letters to identified landowners adjacent to Clear Creek based on information from the county assessor's website. A public notice about this recommendation was also published in the Rio Blando Herald Times on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Rio Blanco County Board of County Commissioners on September 10, 2024. In addition, staff contacted Jeff Goble, District 44 water commissioner, on October 11, 2024 to confirm the water rights and reviw the proposed ISF on Clear 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.

Clear Creek is a cold water, moderate gradient stream. It begins in a rolling, forested valley on the north side of Horse Ridge, descends through alternating open meadows and forested reaches, then merges with Milk Creek on a broad valley floor. Substrate ranges from silt to 2-foot boulders, and it appears that the creek carries a substantial sediment load. Bank stability appears to be good, but there are locations where livestock use is evident.

The creek appears to have adequate pools and riffles for natural reproduction of native species, but population sizes appear to be limited by low flows and high stream temperatures in late summer. Other than the limiting factor of water temperatures, water quality appears to be sufficient for supporting native species.

Fish surveys have documented an entirely native fishery, with self-supporting populations of speckled dace and mountain suckers (Figure 1 and Table 1). Colorado Parks and Wildlife reports that Colorado River Cutthroat Trout seasonally use the lower portion of the creek, based on fish fitted with radio transmitters that were detected during a previous fish movement study on Milk Creek. Spot surveys have revealed populations of caddisfly and mayfly. The creek supports a healthy riparian community comprised of narrow leaf cottonwood, willow, and alder.

Figure 1. Mountain sucker in Clear Creek, BLM photograph

Table 1. List of species identified in Clear Creek.

Species Name	Scientific Name	Status
speckled dace	*Rhinichthys osculus*	None
mountain sucker	*Catostomus platyrhynchus*	State - Species of Greatest Conservation Need State - Species of Special Concern
Colorado River cutthroat trout	*Oncorhynchus clarkii pleuriticus*	State - Species of Greatest Conservation Need State - Species of Special Concern

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 (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). 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 two transects for this proposed ISF reach (Table 2 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 winter flow of 2.39 cfs and a summer flow of 4.8 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 2. Summary of R2Cross cross-section measurements and results for Clear Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
05/24/2022, 1	21.85	8.74	1.77	2.92
05/24/2022, 2	19.85	7.94	3.00	6.66
			2.39	4.80

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

1.3 cfs is recommended from July 1 through March 31 during the late summer and winter baseflow period. This recommendation is limited by water availability. This flow rate comes very close to meeting both the wetted perimeter and average depth criteria. It should also maintain full and sufficiently cool pools during the summer when stream temperatures can still be high and provide sufficient water for passage between pools. During the winter, this flow rate should prevent icing of pools, allowing the fish population to overwinter.

4.8 cfs is recommended from April 1 through June 30 during the snowmelt runoff period. This recommendation is driven by the average velocity criteria. This flow rate will ensure that pool and riffle habitat can be fully utilized during this high growth period.

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 Clear Creek is 8.9 square miles, with an average elevation of 8,166 feet and average annual precipitation of 24.8 inches. The proposed reach of Clear Creek is relatively undeveloped, and the hydrology is snowmelt driven.

Water Rights Assessment

There are 12 small springs that total less than 0.05 cfs in absolute water rights and one reservoir that has been breached (Konopik Reservoir, WDID 4403693, 13.3 acre-foot). Due to the small number of water uses, hydrology in this drainage basin represents essentially natural flow conditions.

Data Collection and Analysis

Gage Data

There is not a current or historic streamflow gage on Clear Creek. There are very few streamflow gages in the area, and none appeared to be representative of Clear Creek due to differences in drainage basin characteristics or water use practices.

Site Visit Data

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

Table 3. Summary of streamflow measurements for Clear Creek.

Visit Date	Flow (cfs)	Collector
5/16/2024	26	CWCB staff

Multiple Regression Model

The CSUFlow18 method provides the best available estimate of streamflow for Clear Creek. The historic Milk Creek near Thornburgh stream gage (USGS 09250000) and downstream diversion records were reviewed to refine the timing of the high flow period.

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 Clear Creek.

MATERIAL INJURY
If decreed, the proposed ISF on Clear 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

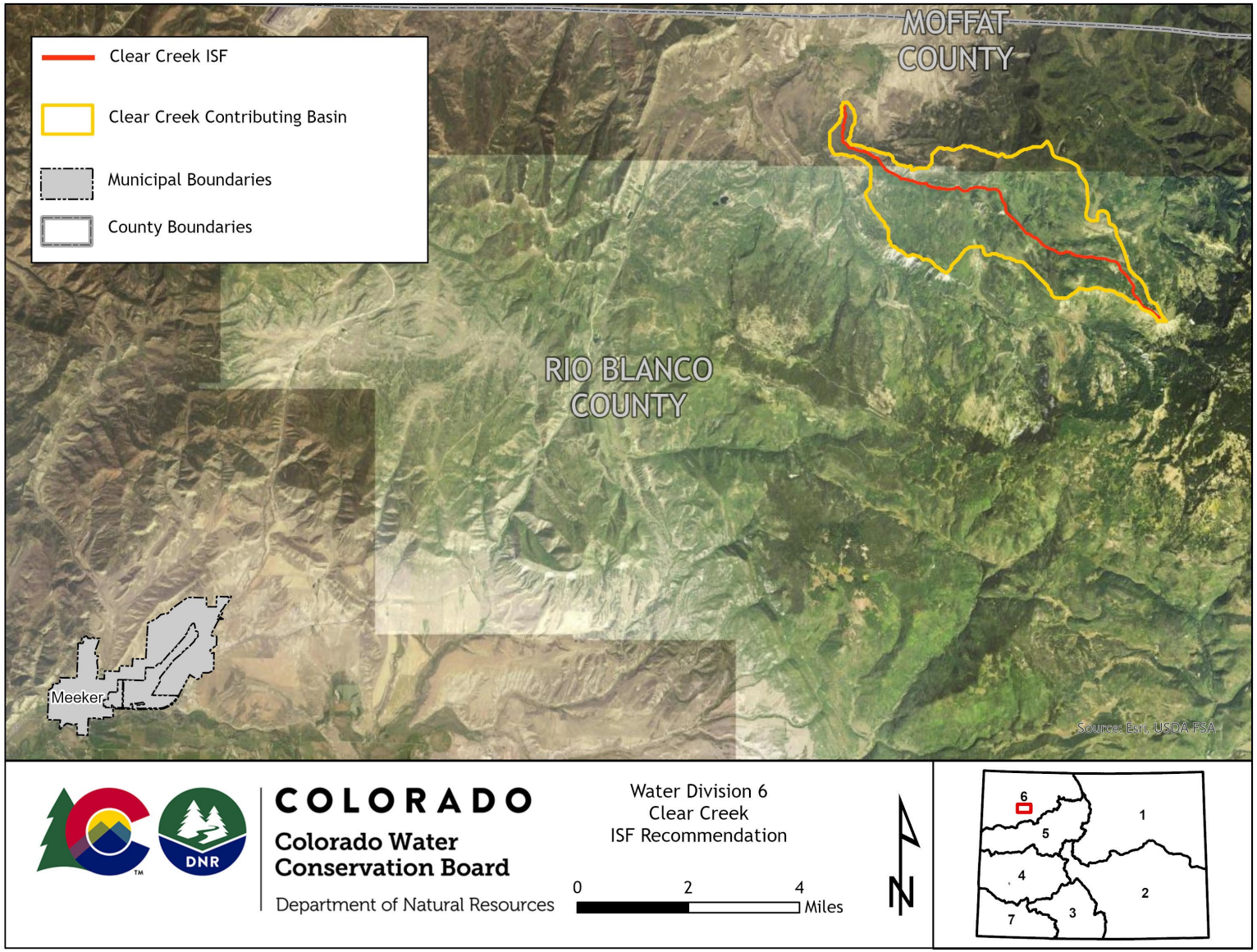
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

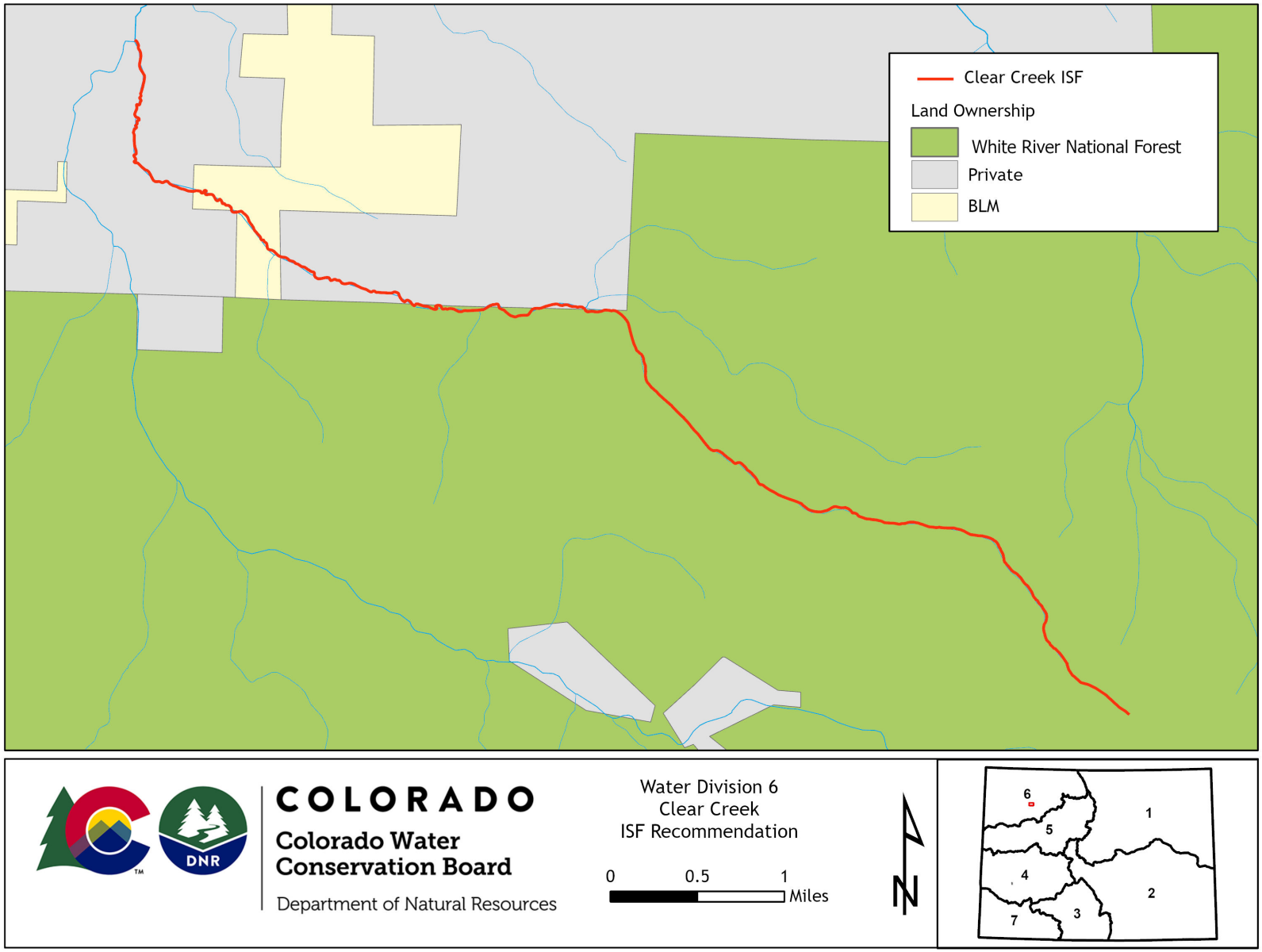
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

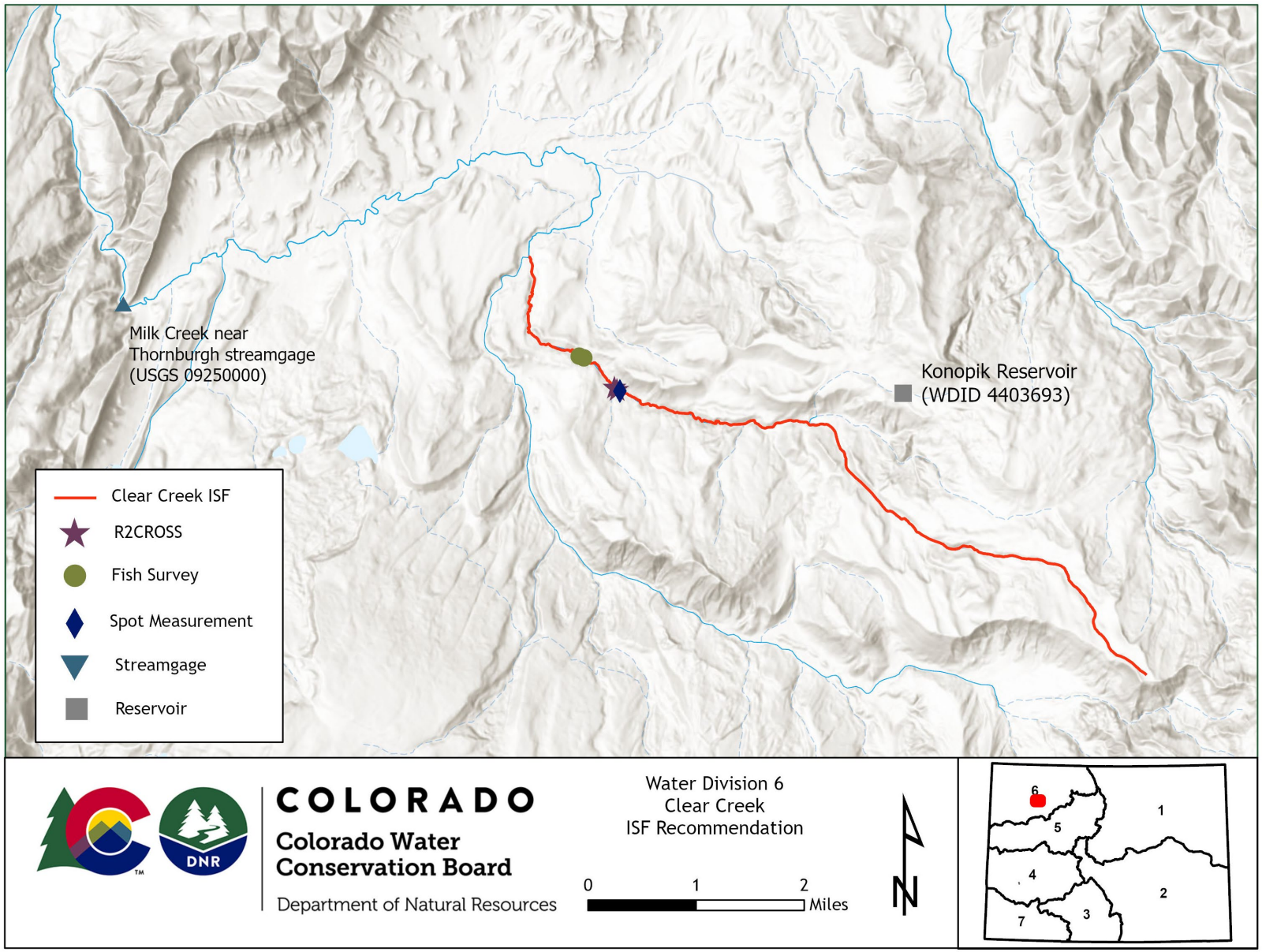
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


Milk Creek near
Thornburgh streamgage
(USGS 09250000)
Konopik Reservoir
(WDID 4403693)
Clear Creek ISF
R2CROSS
Fish Survey
Spot Measurement
Streamgage
Reservoir
COLORADO
Colorado Water
Conservation Board
Department of Natural Resources
Water Division 6
Clear Creek
ISF Recommendation
0
1
2
Miles
N
6
1
5
4
2
7
3

COMPLETE HYDROGRAPH