COLORADO
Colorado Water Conservation Board
Department of Natural Resources

1313 Sherman Street, Room 718
Denver, CO 80203

P (303) 866-3441
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Jared Polis, Governor

Dan Gibbs, DNR Executive Director

Lauren Ris, CWCB Director

TO: Colorado Water Conservation Board Members

FROM: Robert Viehl, Chief
Brandy Logan, Water Resource Specialist
Stream and Lake Protection Section

DATE: January 27, 2025

AGENDA ITEM: 6. Request to Form Intent to Appropriate Instream Flow Water Rights in Water Divisions 4, 5, and 6.

Staff Recommendation:

Staff recommends that, pursuant to ISF Rule 5d., the Board declare its intent to appropriate an instream flow (ISF) water right on each stream segment listed in Table 1, and direct staff to publicly notice the Board's declaration of its intent to appropriate.

Table 1. Instream Flow Recommendations

Water Div	Stream	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus	Flow Rate (CFS)
4	Beaver Dams Creek	Uncompahgre	Ouray	3.29	headwaters	confluence East Fork Dry Creek	0.3 (09/01 - 02/29) 0.5 (03/01 - 03/31) 2.6 (04/01 - 04/30) 2.8 (05/01 - 06/30) 1.7 (07/01 - 07/31) 0.6 (08/01 - 08/31)
4	Cabin Creek	Tomichi	Gunnison	7.92	headwaters	Van Tuyl State Wildlife Boundary	1 (04/01 - 06/30)
4	Canyon Creek	Tomichi	Gunnison	8.64	headwaters	confluence Tomichi Creek	1.5 (09/01 - 03/31) 4.5 (04/01 - 08/31)
4	East Fork Dry Creek	Uncompahgre	Montrose Ouray	3.11	headwaters	confluence Beaver Dams Creek	0.6 (11/01 - 02/29) 1.5 (03/01 - 03/31) 2.5 (04/01 - 07/31) 1.2 (08/01 - 10/31)
4	Goat Creek	San Miguel	San Miguel	2.01	confluence Galloway Creek	confluence Beaver Creek	0.35 (11/01 - 03/31) 0.95 (04/01 - 06/15) 0.6 (06/16 - 10/31)
4	Main Hubbard Creek	North Fork Gunnison	Delta	2.50	headwaters	Overland Ditch	0.2 (12/01 - 03/31) 0.6 (04/01 - 04/30) 2.9 (05/01 - 06/30) 2.6 (07/01 - 07/31) 0.8 (08/01 - 08/31) 0.3 (09/01 - 11/30)

Water Div	Stream	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus	Flow Rate (CFS)
4	Middle Hubbard Creek	North Fork Gunnison	Delta	2.37	headwaters	Overland Ditch	0.25 (08/16 - 03/31) 0.6 (04/01 - 04/30) 4.9 (05/01 - 06/30) 2.9 (07/01 - 07/31) 1 (08/01 - 08/31) 0.5 (09/01 - 10/31)
4	Red Creek *(Increase)*	Upper Gunnison	Gunnison	6.73	confluence West Fork Red Creek	confluence Blue Mesa Reservoir	1 (08/01 - 09/30) 2.5 (05/01 - 07/31)
4	Unnamed Tributary to East Fork Dry Creek	Uncompahgre	Montrose Ouray	2.75	headwaters	confluence East Fork Dry Creek	0.25 (11/01 - 02/29) 0.5 (03/01 - 03/31) 1.6 (04/01 - 04/30) 3.2 (05/01 - 06/30) 1.6 (07/01 - 07/31) 0.5 (08/01 - 10/31)
4	West Hubbard Creek	North Fork Gunnison	Delta	2.32	headwaters	Overland Ditch	0.4 (10/01 - 04/30) 4 (05/01 - 05/14) 6.5 (05/15 - 07/15) 3.2 (07/16 - 07/31) 1.3 (08/01 - 09/30)
5	Coon Creek	Colorado Headwaters-Plateau	Mesa	3.18	confluence West Branch Coon Creek	100' Upstream of South Side Canal headgate	0.64 (10/01 - 04/15) 3.3 (04/16 - 06/30) 1.1 (07/01 - 09/30)
5	Derby Creek *(Increase)*	Colorado Headwaters	Eagle	8.40	confluence South Derby Creek	confluence Colorado River	3.1 (04/01 - 06/30)
6	Clear Creek	Lower Yampa	Rio Blanco	8.32	headwaters	confluence Milk Creek	1.3 (07/01 - 03/31) 4.8 (04/01 - 06/30)

Introduction

This memo provides an overview of the technical analyses performed by the recommending entities and CWCB staff on ISF recommendations in Water Divisions 4, 5, and 6. This work was conducted to provide the Board with sufficient information to declare its intent to appropriate ISF water rights in accordance with the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program (ISF Rules). The executive summaries and links to the appendices containing supporting scientific data are provided in the attached Table of Contents.

In addition, the scientific data and technical analyses performed by the recommending entity are accessible on the Board's website at:
https://cwcb.colorado.gov/2025-isf-recommendations

Natural Environment Studies

The Bureau of Land Management, Colorado Parks and Wildlife, High Country Conservation Advocates, Western Resource Advocates, and the National Park Service documented the natural environment on their respective recommendations and found natural environments that can be preserved. To evaluate instream flow requirements, the recommending entities collected hydraulic data and performed R2Cross modeling on all segments. Staff reviewed each proposed ISF segment to ensure that the dataset is complete, and proper methods and procedures were followed. Staff also conducted site visits to each recommendation. CWCB

staff worked with the recommending entities to develop final recommendations for the flow rates of water necessary to preserve the natural environment to a reasonable degree.

Water Availability Studies

To determine the amount of water physically available for the recommended streams, staff analyzed available streamflow gage records, available streamflow models, and/or utilized appropriate standard methods to develop a hydrograph showing median daily or mean monthly flows for each stream flow recommendation. In addition, staff analyzed the water rights tabulation for each stream to identify any potential water availability problems. In some cases, the flow rates were modified due to water availability limitations. The recommending entities confirmed that the proposed flow rates would preserve the natural environment to a reasonable degree on each stream segment. Based on these analyses, staff determined that water is available for appropriation on each stream segment listed in Table 1 to preserve the natural environment to a reasonable degree.

Stakeholder Outreach

Staff provided public notice of the recommendations to the ISF subscription mailing list, posted public notices in local newspapers, gave presentations to County Commissioners, and contacted landowners adjacent to the proposed ISF reaches. In addition, staff contacted water commissioners, water right holders, and others when possible, to further discuss the recommendations. Detailed information on stakeholder outreach is contained in the attached executive summary for each recommendation.

Instream Flow Rule 5d.

Rule 5d. provides that the Board may declare its intent to appropriate ISF water rights after reviewing staff's recommendations for the proposed appropriations. Rule 5d. also sets forth actions that staff must take after the Board declares its intent that initiate the public notice and comment procedure for the ISF appropriations. Specifically:

5d. Board's Intent to Appropriate. Notice of the Board's potential action to declare its intent to appropriate shall be given in the January Board meeting agenda and the Board will take public comment regarding its intent to appropriate at the January meeting.

(1) After reviewing Staff's ISF recommendations for proposed ISF appropriations, the Board may declare its intent to appropriate specific ISF water rights. At that time, the Board shall direct the Staff to publicly notice the Board's declaration of its intent to appropriate.

(2) After the Board declares its intent to appropriate, notice shall be published in a mailing to the ISF Subscription Mailing Lists for the relevant water divisions and shall include:

(a) A description of the appropriation (e.g. stream reach, flow amounts, etc.);

(b) Availability (time and place) for review of Summary Reports and Investigations Files for each recommendation; and,

(c) Summary identification of any data, exhibits, testimony or other information in addition to the Summary Reports and Investigations Files supporting the appropriation.

(3) Published notice shall also contain the following information:

(a) The Board may change flow amounts of contested ISF appropriations based on information received during the public notice and comment period.

(b) Staff will maintain, pursuant to Rule 5e.(3), an ISF Subscription Mailing List for each water division composed of the names of all persons who have sent notice to the Board Office that they wish to be included on such list for a particular water division. Any person desiring to be on the ISF Subscription Mailing List(s) must send notice to the Board Office.

(c) Any meetings held between Staff and members of the public will be open to the public. Staff may provide Proper Notice prior to any such meetings and may provide notice to persons on the ISF Subscription Mailing List(s).

(d) Any Notice to Contest must be received at the Board office no later than March 31st, or the first business day thereafter. All Notices of Party status and Contested Hearing Participant status must be received at the Board office no later than April 30th, or the first business day thereafter.

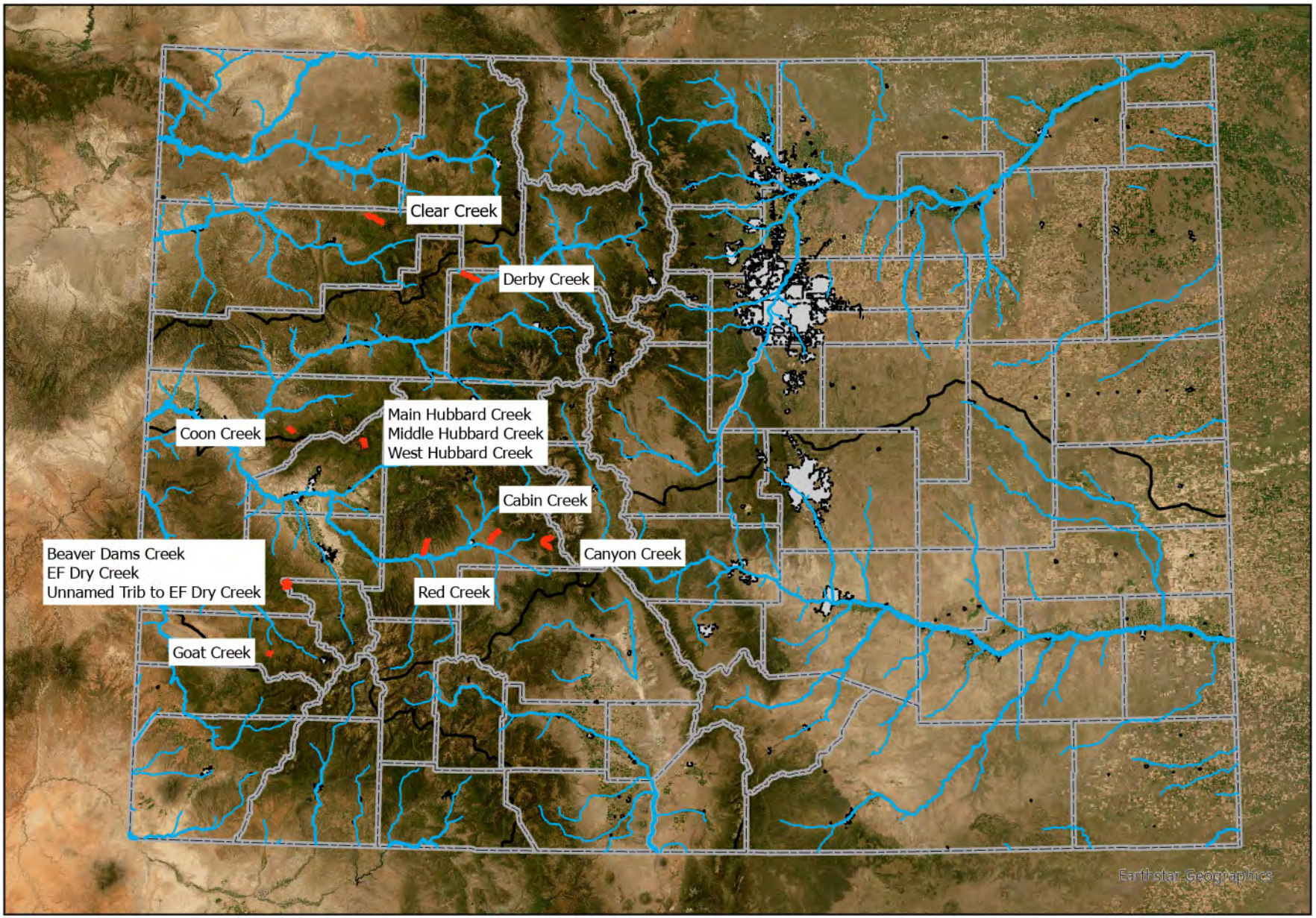
(e) Staff will announce its Final Staff ISF Recommendation concerning contested appropriations at the September Board meeting and will send notice of the Final Staff Recommendation to all persons on the Contested Hearing Mailing List.

(f) The Board may take final action on any uncontested ISF appropriations at the May Board meeting.

(4) After the Board declares its intent to appropriate, notice of the Board's action shall be mailed within five working days to the County Commissioners of the county(ies) in which the proposed reach is located.

(5) Final action by the Board on ISF appropriations will occur no earlier than the May Board Meeting.

Attachments: Overview Map
Public Comment Letters
Table of Contents for ISF Recommendation Executive Summaries
ISF Executive Summaries



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Colorado Water Conservation Board

Department of Natural Resources

January 2025
ISF Recommendations

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BOARD OF COMMISSIONERS

Anne Brown Kris Holstrom Lance Waring

November 15, 2024

Colorado Water Conservation Board
Stream and Lake Protection Section
1313 Sherman Street, 7th Floor
Denver, CO 80203

RE: Instream flow right designation in San Miguel County

To Whom It May Concern:

We are pleased to submit this letter in support of the Bureau of Land Management's proposed instream flow rights on Goat Creek in San Miguel County. We strive to protect and promote valuable wildlife habitat, healthy riparian areas, and ecological values and to balance these with other beneficial uses of water. The proposed instream flow designations will help further those efforts.

Goat Creek supports the Colorado River Cutthroat Trout and a robust riparian community. The proposed increases in instream flow rates will continue the diverse environments and help maintain the native fishery and essential biodiversity.

San Miguel County fully supports the proposed instream flows rights and sincerely hopes they are approved. Thank you for considering this important proposal.

Sincerely,

Lance Waring, Chair

Kris Holstrom, Vice Chair

Anne Brown, Commissioner

November 12, 2024
127 East Lynwood Ave
San Antonio Tx

Dear Colorado Water Conservation Board,

First, I am the longtime owner of land which constitutes much of Goat Creek's drainage there south of Norwood, Colorado. This stream has flowed and supported trout, beaver, deer elk and bear, plus neotropical migrants and waterfowl all the years of my experience. Though short and small this stream is vital to all these species because other sources of water are in short supply here abouts. Goat Creek flow must be protected, noting that Beaver Creek into which it flows has been deprived of natural flow (and actually gone dry) several summers over the past ten years. This is unconscionable, recognizing that trout, mostly brook, have reliable been plentiful in Beaver Creek for decades. I understand that cutthroat were the dominate species originally but I've not seen them here myself. Beaver ponds, along Goat Creek's path through my deeded acreage have held trout all my years of ownership. Both Goat and Beaver Creek's water sources must be protected! Please work to support these critical streams and count on my help. You may contact me to discuss both the Beaver and Goat Creeks. Respectfully,

N Russell Scott

Plse share with BLM's Roy Smith 830 285 0486

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January 2025 Instream Flow Recommendations

Clicking on the Executive Summary links below will jump to the correct bookmark in this pdf document. Clicking on the Appendices links below will open a web page linked to the supporting data.

<u>Water Division 4</u>

1. Beaver Dams Creek (Ouray County)
    a. Executive Summary
    b. Appendices

2. Cabin Creek (Gunnison County)
    a. Executive Summary
    b. Appendices

3. Canyon Creek (Gunnison County)
    a. Executive Summary
    b. Appendices

4. East Fork Dry Creek (Montrose and Ouray Counties)
    a. Executive Summary
    b. Appendices

5. Goat Creek (San Miguel County)
    a. Executive Summary
    b. Appendices

6. Main Hubbard Creek (Delta County)
    a. Executive Summary
    b. Appendices

7. Middle Hubbard Creek (Delta County)
    a. Executive Summary
    b. Appendices

8. Red Creek *(Increase)* (Gunnison County)
    a. Executive Summary
    b. Appendices

9. Unnamed tributary to East Fork Dry Creek (Gunnison County)
    a. Executive Summary
    b. Appendices

10. West Hubbard Creek (Delta County)
    a. Executive Summary
    b. Appendices

Water Division 5

11. Coon Creek (Mesa County)
    a. Executive Summary
    b. Appendices

12. Derby Creek *(Increase)* (Eagle County)
    a. Executive Summary
    b. Appendices

Water Division 6

13. Clear Creek (Rio Blanco County)
    a. Executive Summary
    b. Appendices

Beaver Dams Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4241940.00 UTM East: 229120.87
LOWER TERMINUS:	confluence with East Fork Dry Creek at UTM North: 4246758.01 UTM East: 229778.94
WATER DIVISION/DISTRICT:	4/68
COUNTY:	Ouray
WATERSHED:	Uncompahgre
CWCB ID:	21/4/A-001
RECOMMENDER:	Colorado Parks and Wildlife (CPW)
LENGTH:	3.29 miles
FLOW RECOMMENDATION:	0.3 cfs (09/01 - 02/29) 0.5 cfs (03/01 - 03/31) 2.6 cfs (04/01 - 04/30) 2.8 cfs (05/01 - 06/30) 1.7 cfs (07/01 - 07/31) 0.6 cfs (08/01 - 08/31)

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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

CPW recommended that the CWCB appropriate an ISF water right on a reach of Beaver Dams Creek at the ISF Workshop in January 2020. Beaver Dams Creek is located within Ouray County and is approximately thirteen miles southwest of the City of Montrose (See Vicinity Map). The stream originates on the Uncompahgre Plateau and flows north until it reaches the confluence with East Fork Dry Creek. Beaver Dams Creek is a tributary to East Fork Dry Creek, a tributary to Dry Creek which is a tributary to the Uncompahgre River.

The proposed ISF reach extends from headwaters downstream to the confluence with East Fork Dry Creek for a total of 3.29 miles. The proposed reach is mainly on public lands managed under the Uncompahgre National Forest with approximately 15% of the bottom of the reach on private land (See Land Ownership Map). CPW is interested in protecting this stream to preserve the natural environment which includes native 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 Beaver Dams Creek was sent to the mailing list in November 2024, March 2024, March 2023, March 2022, March 2021, and March 2020. Staff sent letters to identified landowners adjacent to Beaver Dams Creek based on information from the county assessor's website. A public notice about this recommendation was also published in the Ouray County Plaindealer on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Ouray County Board of County Commissioners on October 8, 2024. In addition, staff spoke with Eric Weig, District 68 Water Commissioner, on June 26, 2024 regarding water availability, which confirmed staff's understanding of hydrology and adminstative practices on the unnamed tributary to East Fork Dry 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.

Beaver Dams Creek is a first order headwater stream and a tributary to East Fork Dry Creek. It flows northerly off the Uncompahgre Plateau towards the City of Montrose through dense forest of coniferous pine. Beaver Dams Creek has a high-gradient, confined channel with substrate that ranges from large cobble to gravel and sand. Fish habitat is complex with wood and cover in the channel, as well as some side channel features. Cover habitat includes undercut banks, large woody debris, and step-pools. The creek supports a healthy riparian environment with ample overhead shading supporting suitable stream temperatures. The creek supports a diverse macroinvertebrate community with multiple species of mayfly, diptera, and caddisfly observed in the field.

Beaver Dams Creek supports a self-sustaining population of Colorado River cutthroat trout (CRCT) of the Gunnison Basin lineage (Table 1). The population is considered a core conservation population indicating high genetic purity of the cutthroat trout and limited introgression with non-native trout species. CRCT are a state species of special concern and considered a federally sensitive species (CPW, 2015). Length-frequency data indicates multiple age classes which reinforces that the cutthroat trout in Beaver Dams Creek are a self-sustaining population. CPW staff observed fish during 2022 field work.

Table 1. List of species identified in Beaver Dams Creek.

Species Name	Scientific Name	Status
Colorado River Cutthroat Trout- Gunnison Basin Lineage	*Oncorhynchus clarkii pleuriticus*	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

CPW 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 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

CPW 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 0.49 cfs and a summer flow of 2.8 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 Beaver Dams Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
05/25/2022, 1	7.9	1.9	0.39	2.1
05/25/2022, 2	10.1	1.9	0.59	3.5
			0.49	2.8

ISF Recommendation

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

0.3 cfs is recommended from September 1 to February 29; this flow rate has been reduced due to water availability limitations. This flow rate supports baseflow conditions and will maintain adequate wetted perimeter in the channel to provide sufficient holding habitats in pools and glides. This will support fish during the fall when they are transitioning to resting habitat in preparation for overwintering conditions.

0.5 cfs is recommended from March 1 to March 31 and meets two of three hydraulic criteria. This flow rate will support adequate depth and wetted perimeter to support fish as they begin to transition from overwintering resting habitat into more metabolic activity.

2.6 cfs is recommended from April 1 to April 30; this flow rate has been reduced due to water availability limitations. This flow rate follows the rising limb of the streams hydrograph and

maintains adequate wetted perimeter and depth, as well as higher velocities. It will support fish as they transition into more metabolic activity as ice cover decreases.

2.8 cfs is recommended from May 1 to June 30 and meets all three hydraulic criteria for summer flows during spring runoff through its recession. This flow rate will allow oxygenation and productivity of macroinvertebrates in riffles. This rate will support cutthroat trout as they are actively feeding and spawning.

1.7 cfs is recommended from July 1 to July 31; this flow rate has been reduced due to water availability limitations. This flow rate follows the falling limb of the streams hydrograph and maintains adequate depth and wetted perimeter that supports rearing and refuge habitats enabling feeding and growth of cutthroat trout.

0.6 cfs is recommended from August 1 to August 31; this flow rate has been reduced due to water availability limitations. This flow rate follows the falling limb of the streams hydrograph and will maintain adequate depth and wetted perimeter to provide sufficient habitat in riffles, runs, and pools, allowing fish movement between habitat types.

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 Beaver Dams Creek is 2.9 square miles, with an average elevation of 9,305 feet and average annual precipitation of 24.9 inches (See the Site Map). Beaver Dams Creek is a high elevation, steep gradient, snowmelt driven hydrologic system with a strong late summer monsoonal signal. The basin has natural streamflow conditions and is anthropogenically unaltered.

Water Rights Assessment

There are no diversions within the reach of Beaver Dams Creek recommended for an ISF. Three decreed spring water rights exist within the reach totaling less than 0.25 cfs in absolute rights. There is one USFS Federal Reserve reservoir right high in the reach appropriated in 1905 (WDID 6807021) though photographic review shows that no reservoir has been constructed. The lower terminus of the recommended reach is located at the upper terminus of an existing IFS on East Fork Dry Creek decreed in 05CW0151.

Data Collection and Analysis

Representative Gage Analysis

There are no current or historic gages on Beaver Dams Creek. Staff investigated nearby gages for similarities in basin characteristics and hydrology and found no gages were sufficiently similar to be used to estimate streamflow on Beaver Dams Creek.

Multiple Regression Model

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

Site Visit Data

CWCB staff joined CPW on a site visit during data collection for R2Cross modeling on 5/25/2022.

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 Beaver Dams Creek.

MATERIAL INJURY

If decreed, the proposed ISF on Beaver Dams 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 Parks and Wildlife, 2015, State Wildlife Action Plan: A strategy for conserving wildlife in Colorado. https://cpw.widencollective.com/assets/share/asset/nbenjdfemj

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

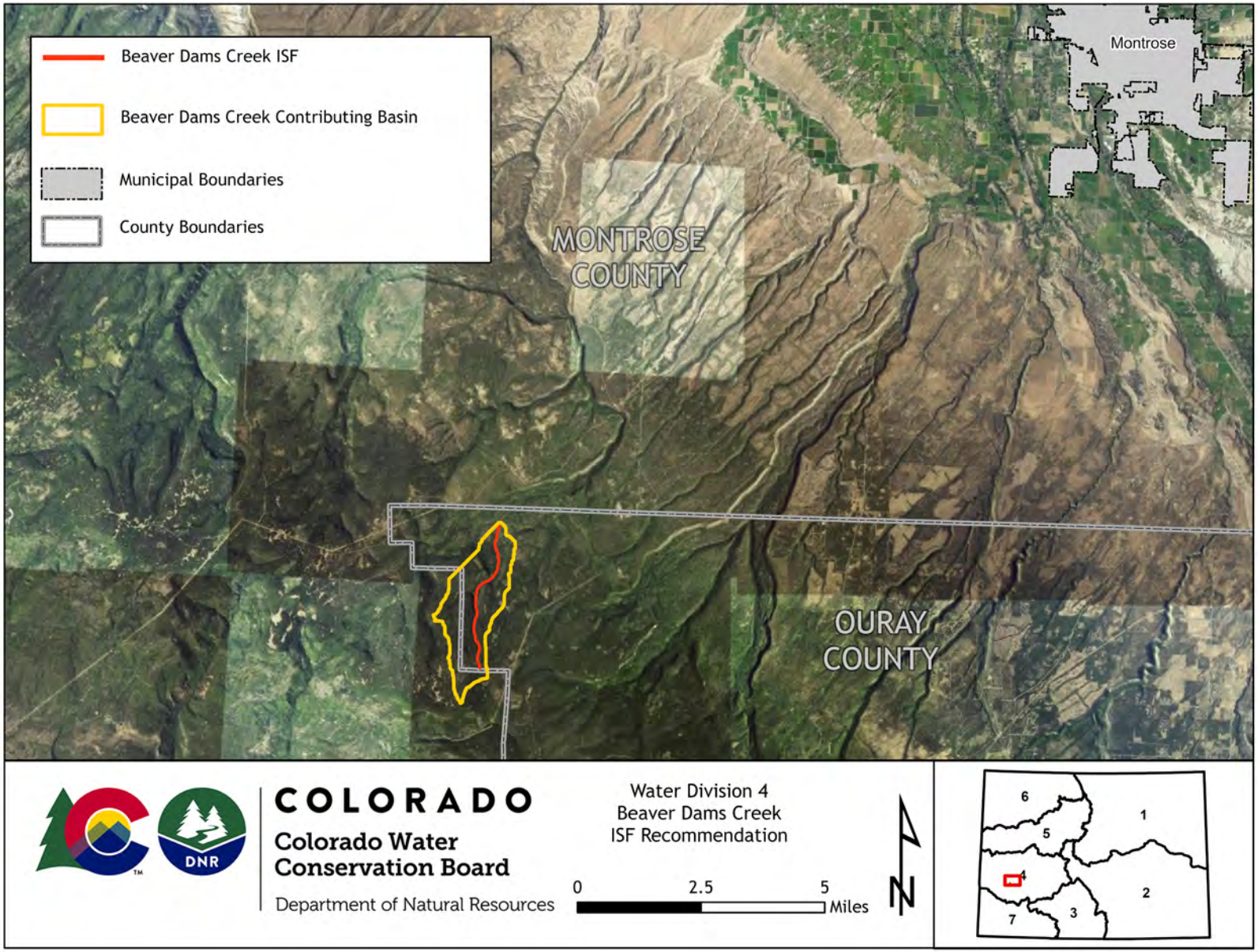
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

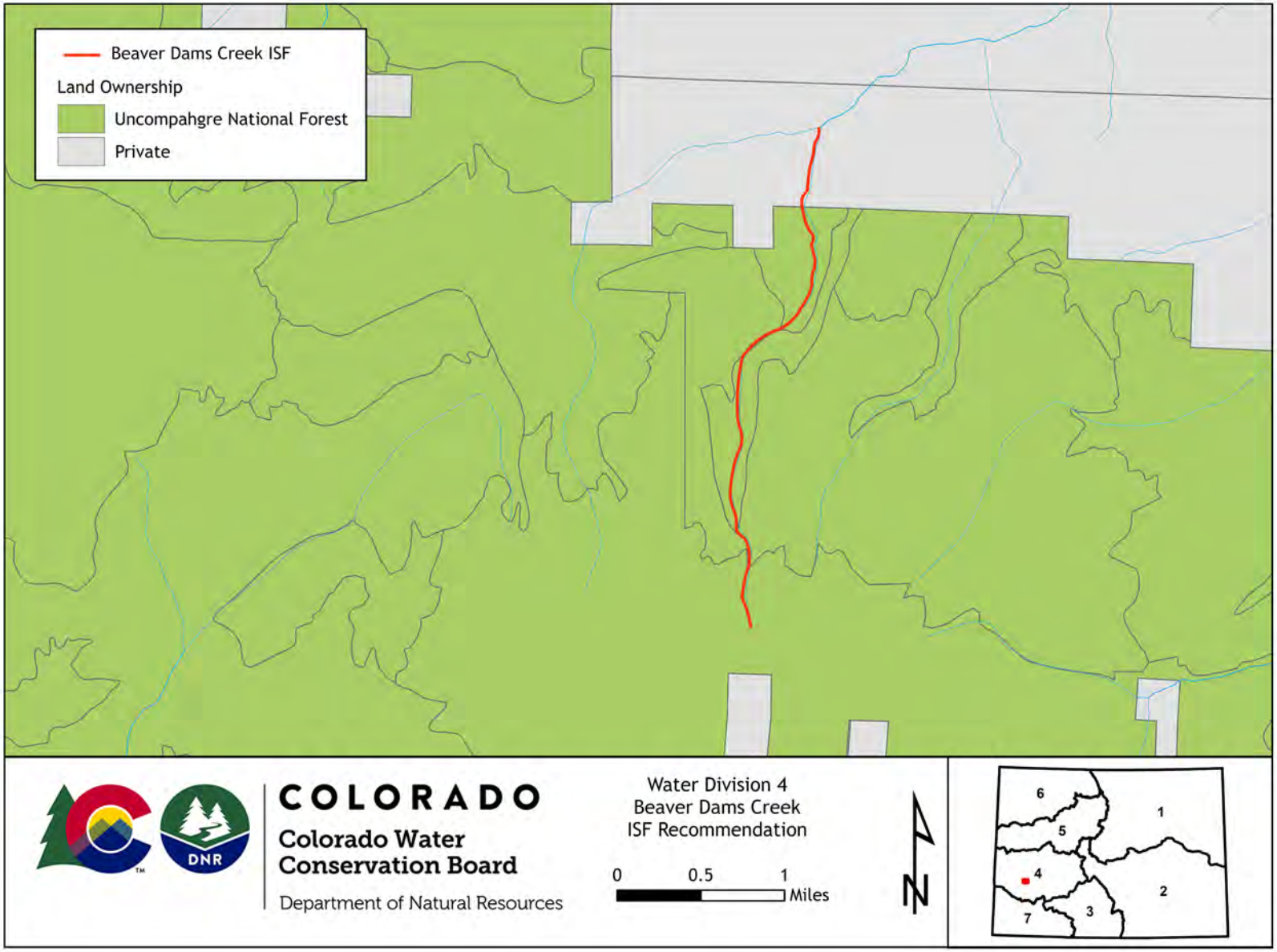
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

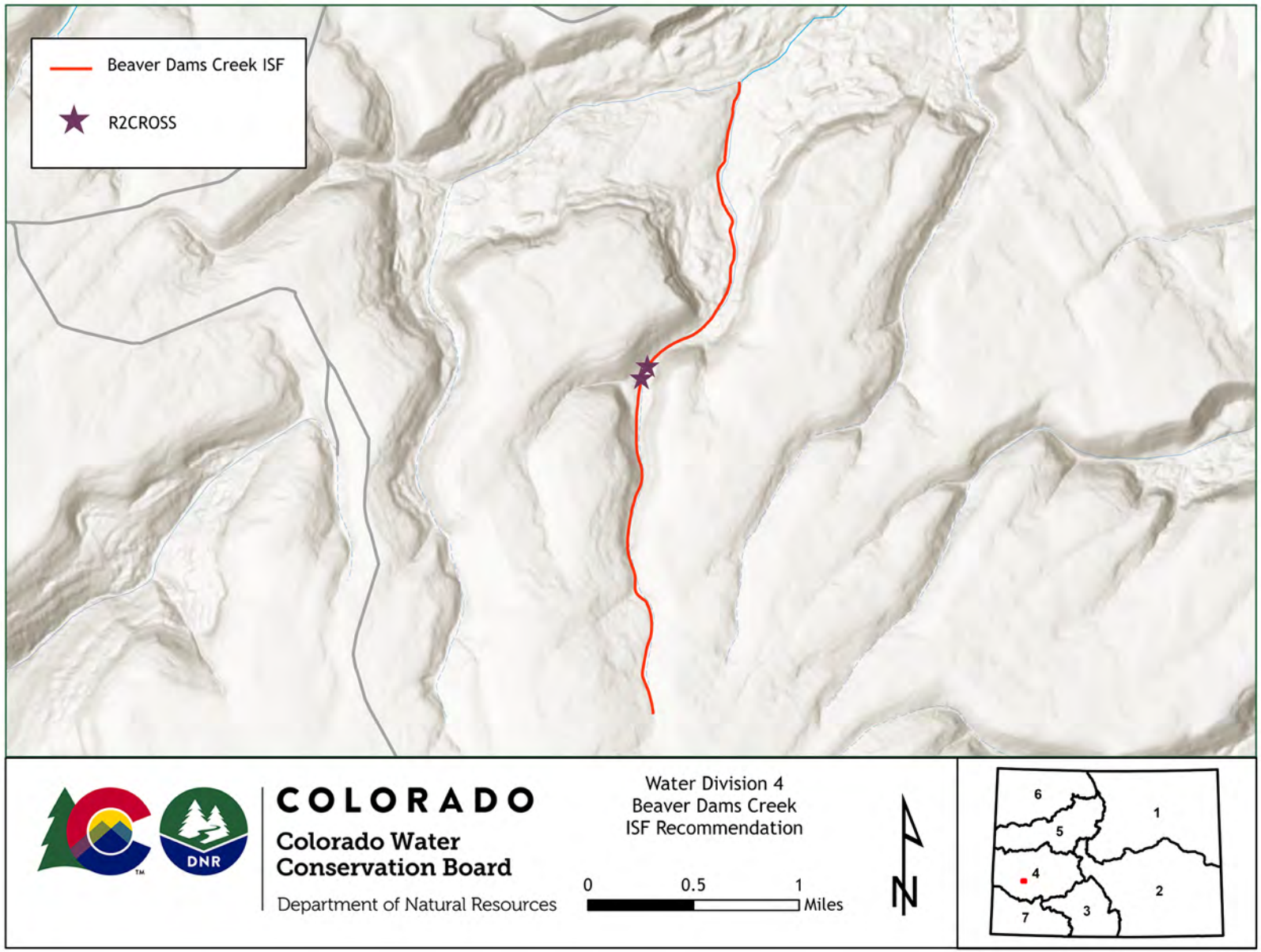
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


Beaver Dams Creek ISF
R2CROSS
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
Beaver Dams Creek
ISF Recommendation
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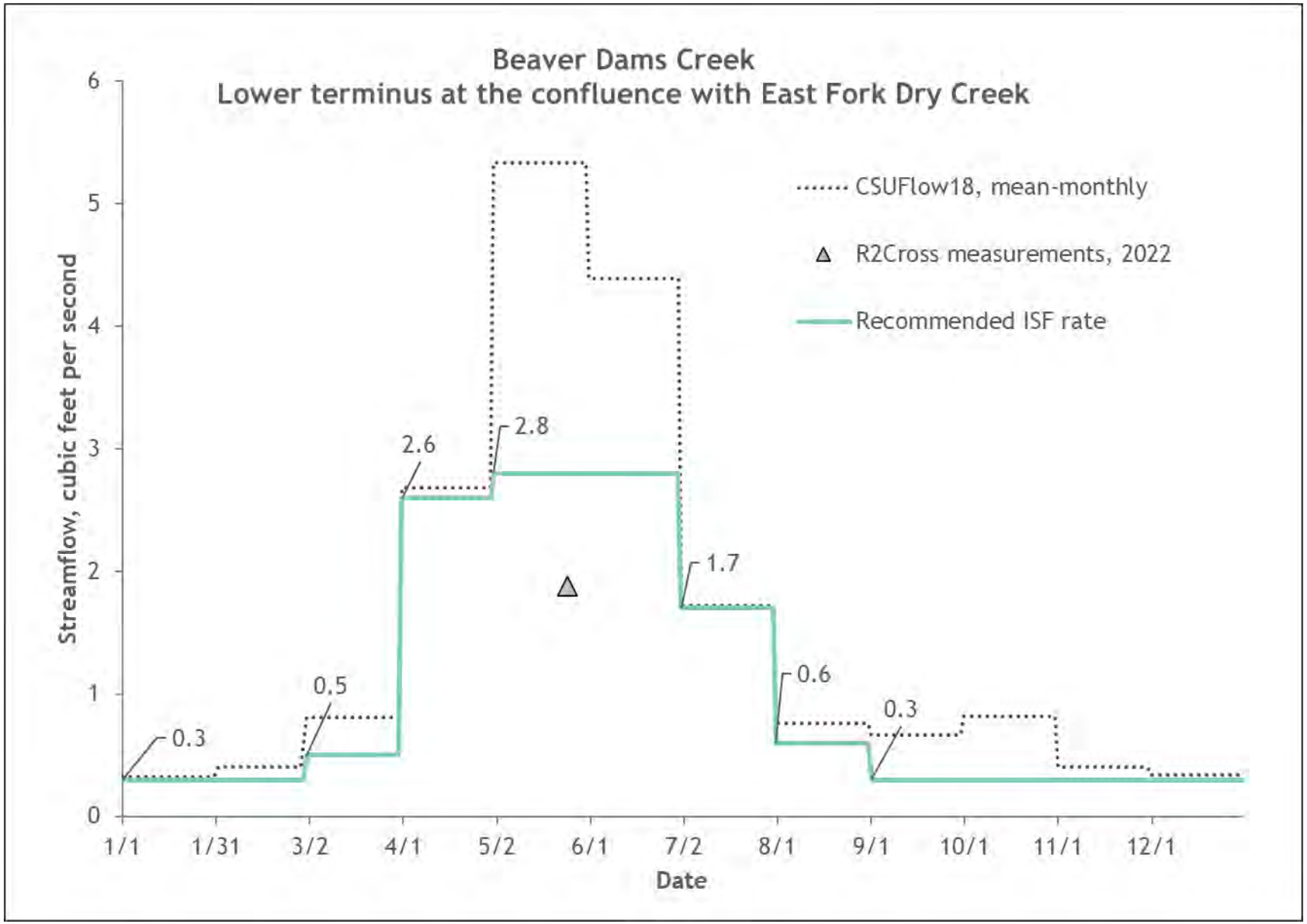
COMPLETE HYDROGRAPH



Cabin Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4275441.22 UTM East: 348233.39
LOWER TERMINUS:	Van Tuyl State Wildlife Boundary at UTM North: 4267761.80 UTM East: 342571.46
WATER DIVISION/DISTRICT:	4/28
COUNTY:	Gunnison
WATERSHED:	Tomichi
CWCB ID:	25/4/A-001
RECOMMENDER:	High Country Conservation Advocates, Western Resource Advocates (HCCA, WRA)
LENGTH:	7.92 miles
FLOW RECOMMENDATION:	1 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

HCCA and WRA recommended that the CWCB appropriate an ISF water right on a reach of Cabin Creek at the ISF Workshop in February 2024. Cabin Creek is located within Gunnison County and is approximately six miles east of the City of Gunnison (See Vicinity Map). The stream originates near an unnamed peak in the Gunnison National Forest and flows south until it reaches the confluence with Tomichi Creek. Cabin Creek is a tributary to Tomichi Creek which is a tributary to the Gunnison River.

The proposed ISF reach extends from the headwaters downstream to the Van Tuyl State Wildlife Boundary for a total of 7.92 miles. The entirety of the proposed reach is on public land (See Land Ownership Map). HCCA and WRA are interested in protecting this stream to preserve the natural environment. The recommended reach supports a robust riparian area and is the primary water source in the Cabin Creek State Wildlife Area.

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 Cabin Creek was sent to the mailing list in November 2024 and March 2024. A public notice about this recommendation was also 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. Staff also spoke with Jack Brazinsky, District 28 Water Commissioner, on August 26, 2024, regarding water availability on Cabin Creek. According to conversations with Commissioner Brazinsky, Cabin Creek reliably flows in spring and early summer and has flowed year-round occasionally during the last 10 years.

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.

Cabin Creek is a seasonal, snowmelt driven stream that flows off the Sawatch Range through a sage brush valley at a moderate gradient. The riparian community is visually striking against the sage meadows. The diverse riparian community includes thick stands of willows and cottonwood galleries interspersed with alders, sedges and reeds. The channel is incised and Colorado Parks and Wildlife is working on their lands to restore the channel. A variety of gravel, cobbles, and sand makeup the streambed, scattered with woody debris. HCCA found evidence of historic beaver ponds and an abundance of macroinvertebrates including caddisflies and diptera. The stream also supports wildlife populations including deer, elk and dusky or blue grouse.

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 and WRA 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). HCCA, WRA 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 and WRA collected R2Cross data at two transects for this proposed ISF reach (Table 1 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 1.0 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 1. Summary of R2Cross cross-section measurements and results for Cabin Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/21/2023, 1	5.16	0.31	NA	1.10
06/21/2023, 2	4.57	0.31	NA	0.95
			NA	1.03

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

1.0 cfs is recommended for April 1 to June 30. This rate meets three of three hydraulic criteria to support high flows during the peak flows of the snowmelt runoff period.

HCCA and WRA do not recommend a year-round ISF flow rate due to water availability constraints.

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 Cabin Creek is 15 square miles, with an average elevation of 9,253 feet and average annual precipitation of 17.1 inches. Cabin Creek is a high elevation, steep gradient, and snowmelt driven system. This system now appears to be an intermittent stream corridor.

Water Rights Assessment

There are no diversions within or above the Cabin Creek reach recommended for an ISF. There are ten decreed spring water rights within the reach and two stock water rights on a tributary to the reach, totaling less than 0.2 cfs in absolute rights.

Data Collection and Analysis

Representative Gage Analysis

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

Multiple Regression Model

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

Site Visit Data

CWCB staff made one site visit to the proposed reach of Cabin Creek on August 29, 2024 and found evidence of seasonal flow and a healthy riparian community.

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 seasonal appropriation on Cabin Creek.

MATERIAL INJURY

If decreed, the proposed ISF on Cabin 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

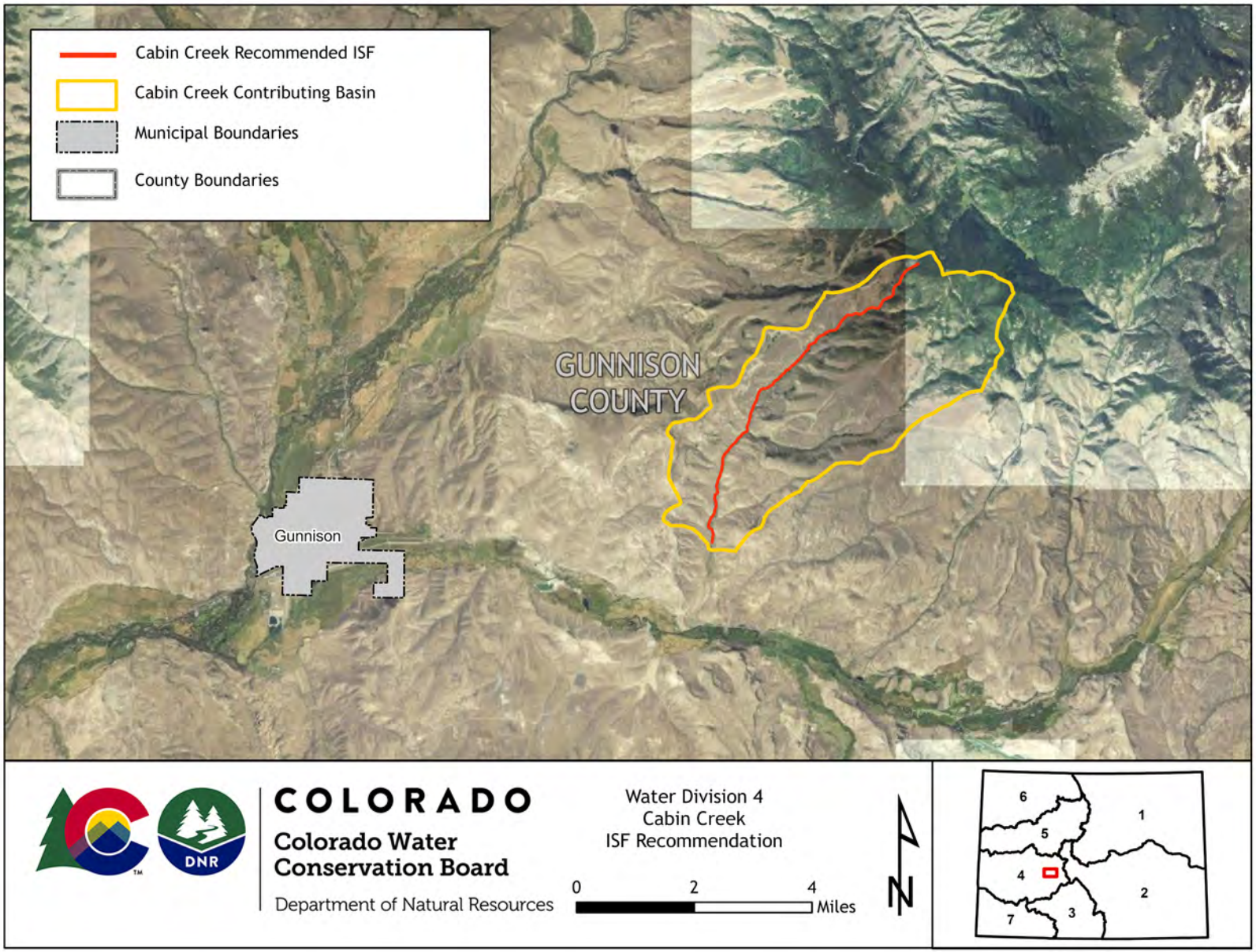
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

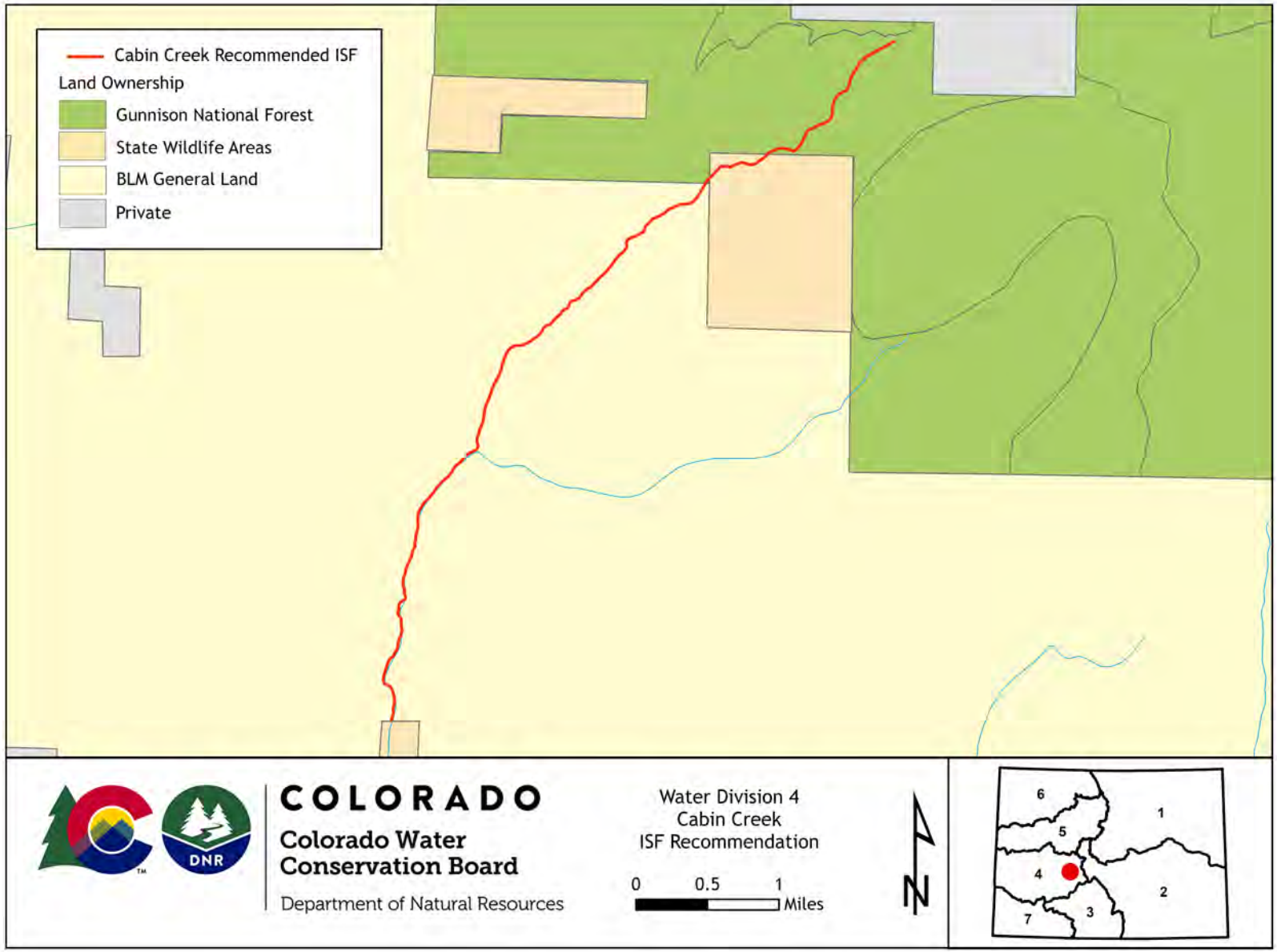
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

VICINITY MAP



LAND OWNERSHIP MAP



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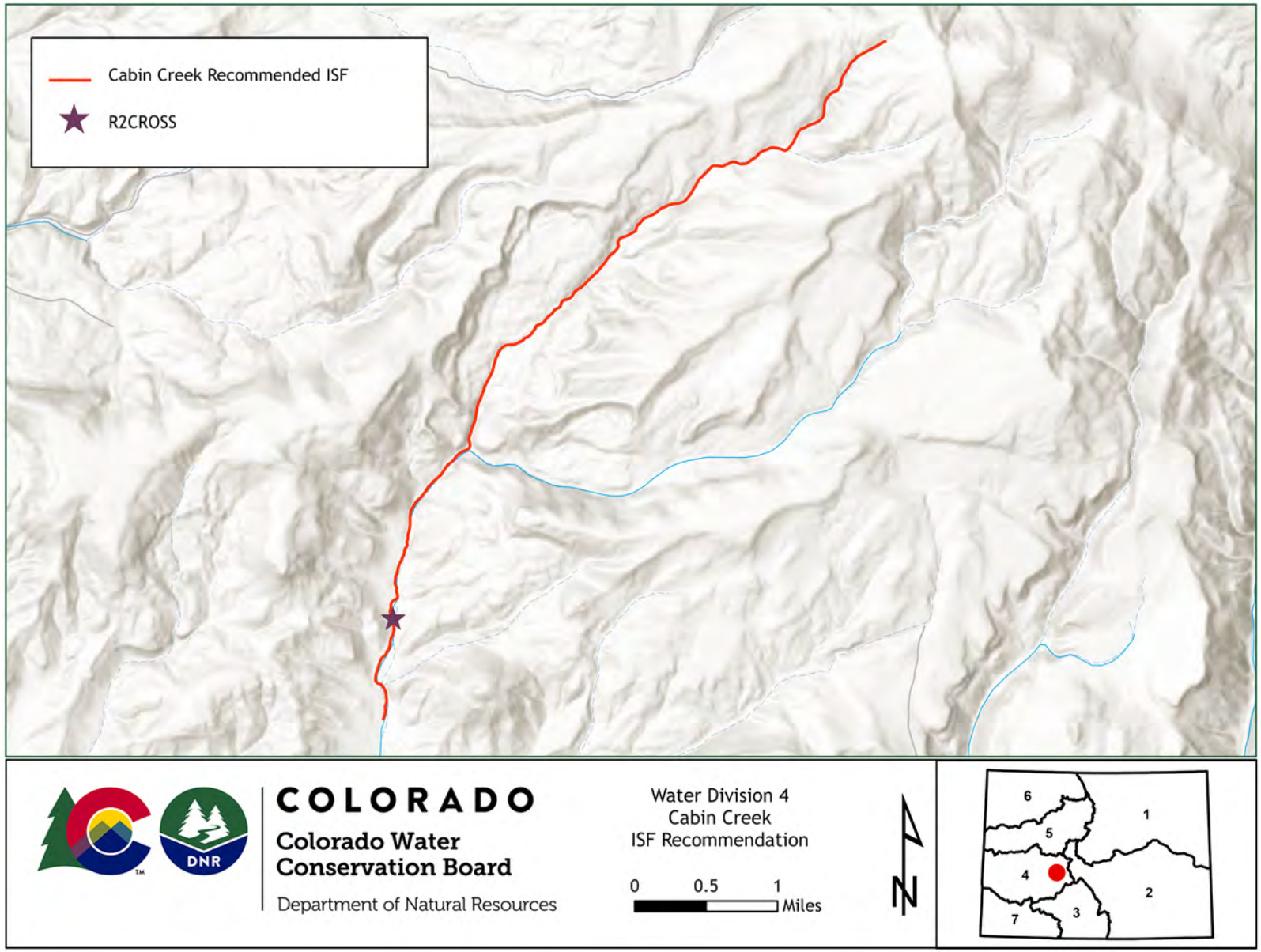
Cabin Creek Recommended ISF
R2CROSS
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
Cabin Creek
ISF Recommendation
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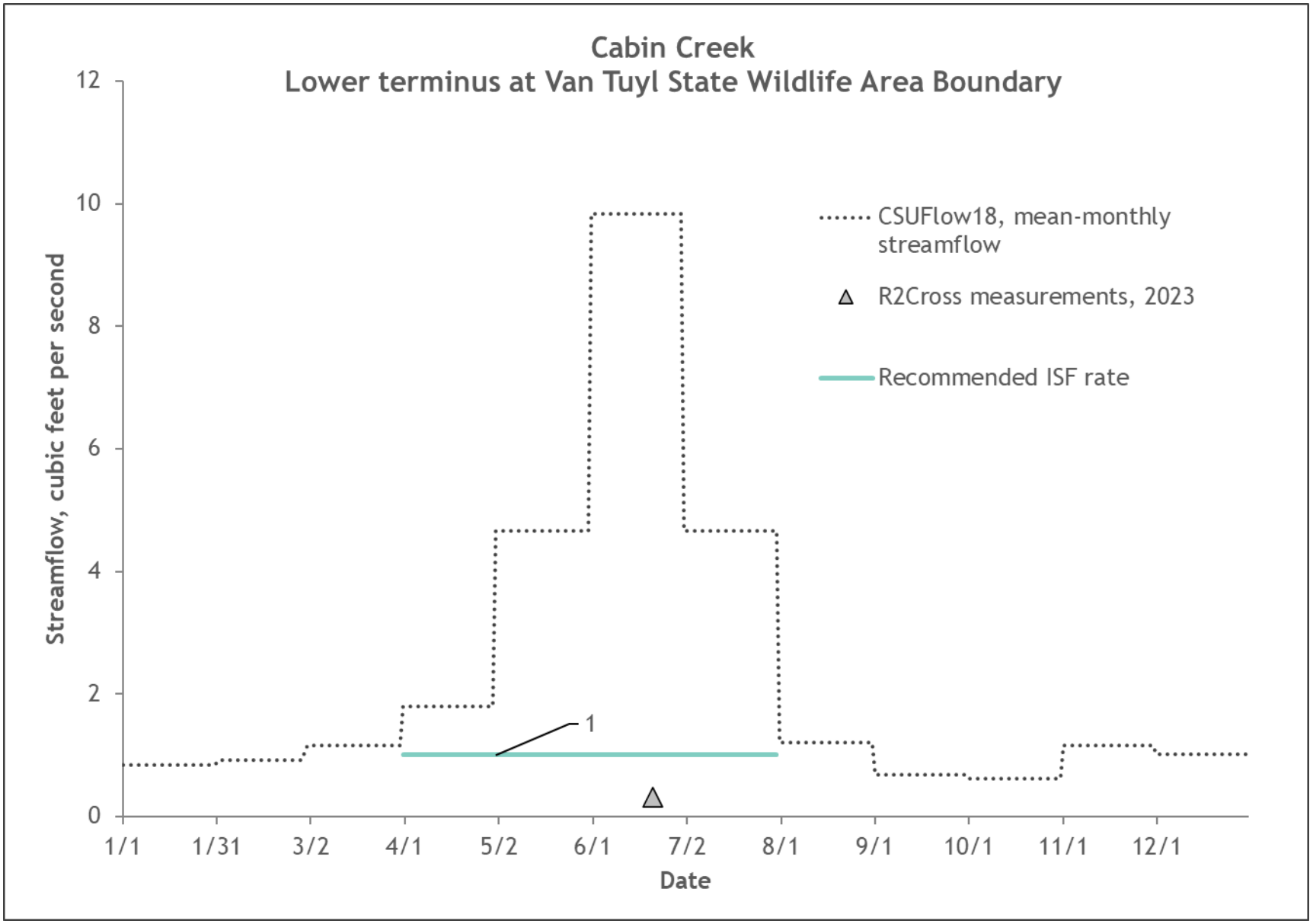
COMPLETE HYDROGRAPH



Canyon Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4271923.34 UTM East: 377118.23
LOWER TERMINUS:	confluence with Tomichi Creek at UTM North: 4264096.23 UTM East: 375818.37
WATER DIVISION/DISTRICT:	4/28
COUNTY:	Gunnison
WATERSHED:	Tomichi
CWCB ID:	25/4/A-002
RECOMMENDER:	High Country Conservation Advocates (HCCA)
LENGTH:	8.64 miles
FLOW RECOMMENDATION:	1.5 cfs (09/01 - 03/31) 4.5 cfs (04/01 - 08/31)

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 (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 recommended that the CWCB appropriate an ISF water right on a reach of Canyon Creek at the ISF Workshop in February 2024. Canyon Creek is located within Gunnison County and is approximately 30 miles east of the City of Gunnison (See Vicinity Map). The stream originates near Granite Mountain and flows generally south until it reaches the confluence with Tomichi Creek. Canyon Creek is a tributary to Tomichi Creek which is a tributary to the Gunnison River.

The proposed ISF reach extends from the headwaters downstream to the confluence with Tomichi Creek for a total of 8.6 miles. Nearly the entire length of the reach, close to 98%, is on public land, only the lower 0.15 miles is on private land (See Land Ownership Map). HCCA is interested in protecting this stream with an ISF water right 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 Canyon Creek was sent to the mailing list in March 2024 and November 2024. Staff sent letters to identified landowners adjacent to Canyon Creek based on information from the county assessor's website. A public notice about this recommendation was also 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. Staff also spoke with Jack Brazinsky, District 28 Water Commissioner, on August 26, 2024, regarding water availability on Canyon Creek. Staff's understanding of the basin was confirmed and the reach has never required administrative action.

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.

Canyon Creek is a headwater mountain stream driven by snowmelt. The headwaters originate above treeline between Little Baldy Peak, Monumental Peak, and Bald Mountain and flows at a steep gradient through an alpine valley densely forested with pine. Near the lower end of the reach, the channel transitions to a wetland, beaver dam complex before flowing into Tomichi Creek (see Figure 1). HCCA noted a large overflow channel and evidence of past high flows. CWCB staff observed evidence of widespread beaver activity including active and breached dams. The channel sequences between riffles, runs, pools, drop pools, and beaver dam complexes. The streambed has ample woody debris and detritus for aquatic species and the substrate consists of sand, coble, and gravel. The verdant riparian community is diverse and includes a mix of pine, wolf and plane leaf willow.

Figure 1. Image of beaver dam complex near confluence with Tomichi Creek

The lower portion of the Canyon Creek riparian corridor has been recognized by the Colorado Natural Heritage Program (CNHP) as possessing high biodiversity significance and as hosting a globally vulnerable thinleaf alder/mesic forb (Alnus incana ssp. tenuifolia/mosic forb) riparian shrubland. The CNHP has identified the Canyon Creek riparian area as a Level 4 Potential Conservation Area in recognition of the unique riparian vegetation. Notably, while this plant association was once common, it is now declining. The CNHP site analysis notes that these stands can be threatened by stream flow alterations; thus, this unique community is dependent on the hydrology of Canyon Creek.

In addition to supporting this unique riparian community, Canyon Creek also supports brook and brown trout populations (Table 1). CWCB staff observed caddisfly beetle larvae, and mayfly in the field.

Table 1. List of species identified in Canyon Creek.

Species Name	Scientific Name	Status
brook trout	Salvelinus fontinalis	
brown trout	Salmo trutta	

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 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). 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 three transects for this proposed ISF reach (Table 2). 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 1.5 cfs and a summer flow of 4.5 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 Canyon Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/22/2023, 1	17.0	29.20	1.44	4.47
09/14/2023, 1	13.3	3.39	0.59	4.88
09/14/2023, 2	16.4	3.26	2.39	4.18
			1.47	4.54

ISF Recommendation

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

1.5 cfs is recommended from September 1 to March 31. This rate meets two of three hydraulic criteria and will support baseflows during overwintering period.

4.5 cfs is recommended from April 1 to August 31. This rate meets three of three hydraulic criteria and provides protection for high flows during the snowmelt runoff period thought the falling limb in summer.

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 Canyon Creek is 12 square miles, with an average elevation of 10,718 feet and average annual precipitation of 26.1 inches. Canyon Creek is a high elevation, steep gradient snowmelt driven hydrologic system that supports ample fish habitat. The reach experiences variable timing and magnitude of snowmelt, often peaking in mid-summer and supports baseflows throughout the late season.

Water Rights Assessment

There are no water rights within or above the reach recommended for an ISF.

Data Collection and Analysis

Representative Gage Analysis

There are no current or historic gages on Canyon Creek. Staff investigated nearby gages for similarities in basin characteristics and hydrology and found no gages were sufficiently similar to be used to estimate streamflow on Cabin Creek.

Multiple Regression Model

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

Site Visit Data

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

Table 3. Summary of streamflow measurements for Canyon Creek.

Visit Date	Flow (cfs)	Collector
08/28/2024	2.9	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 Canyon Creek.

MATERIAL INJURY

If decreed, the proposed ISF on Canyon 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

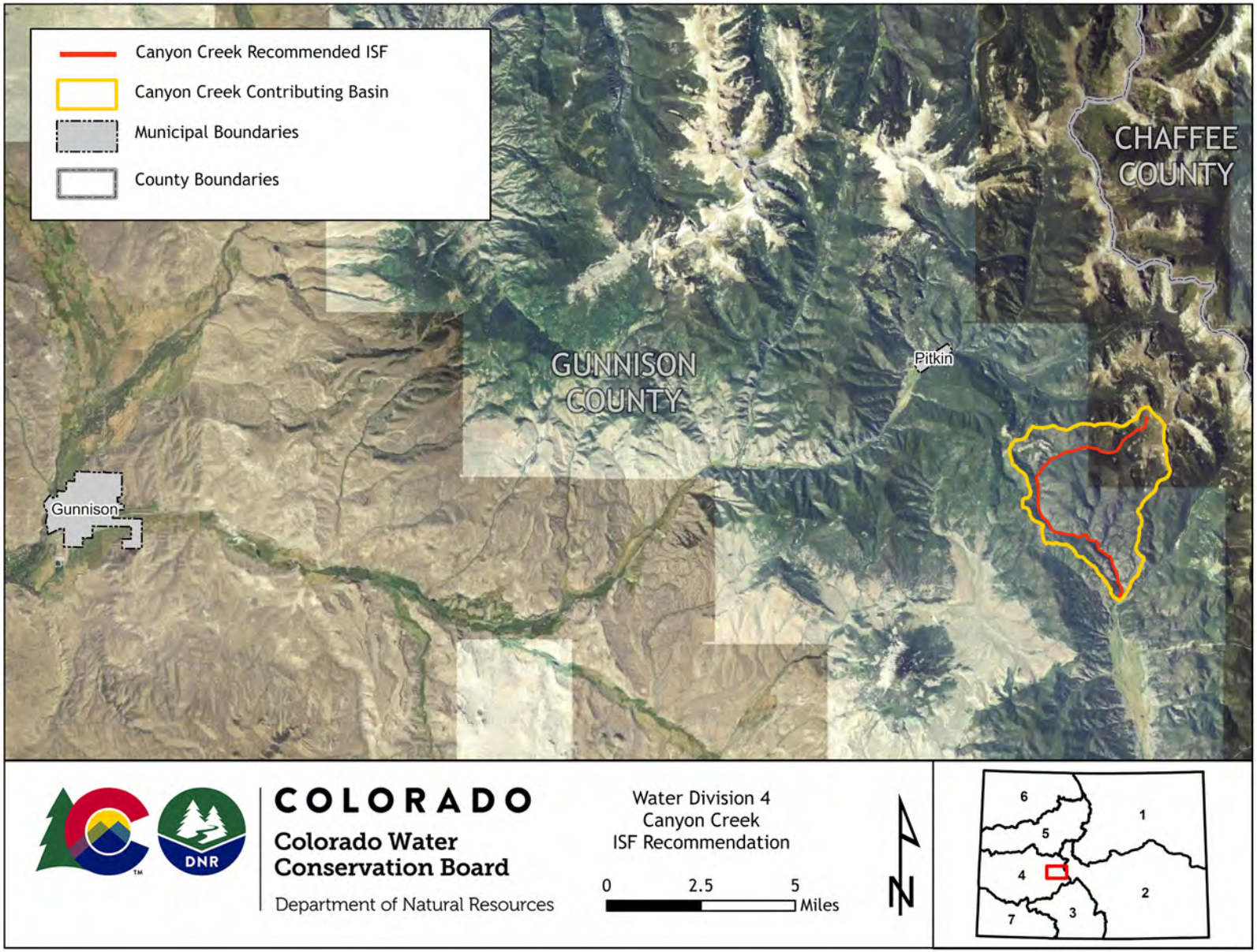
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

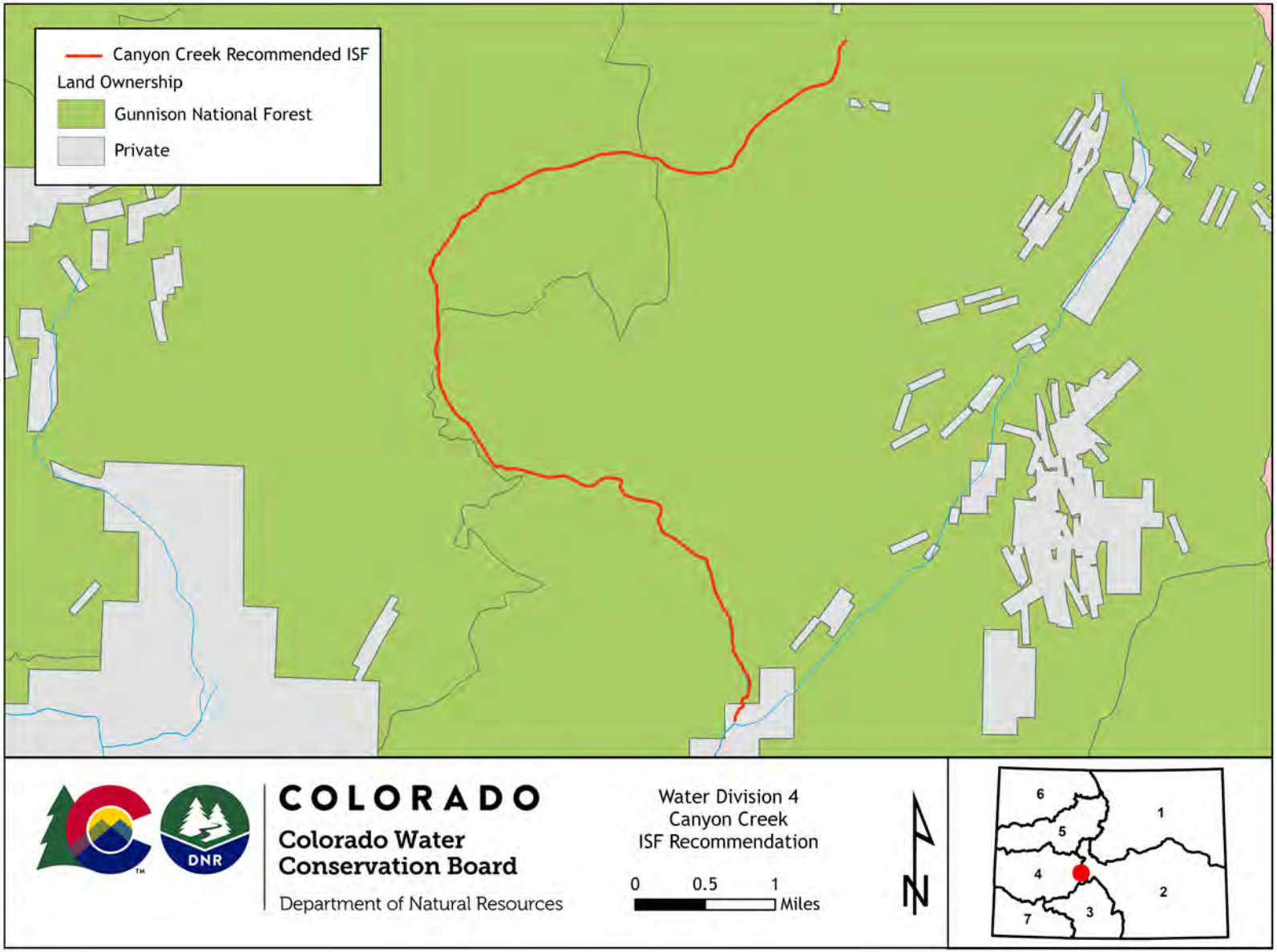
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

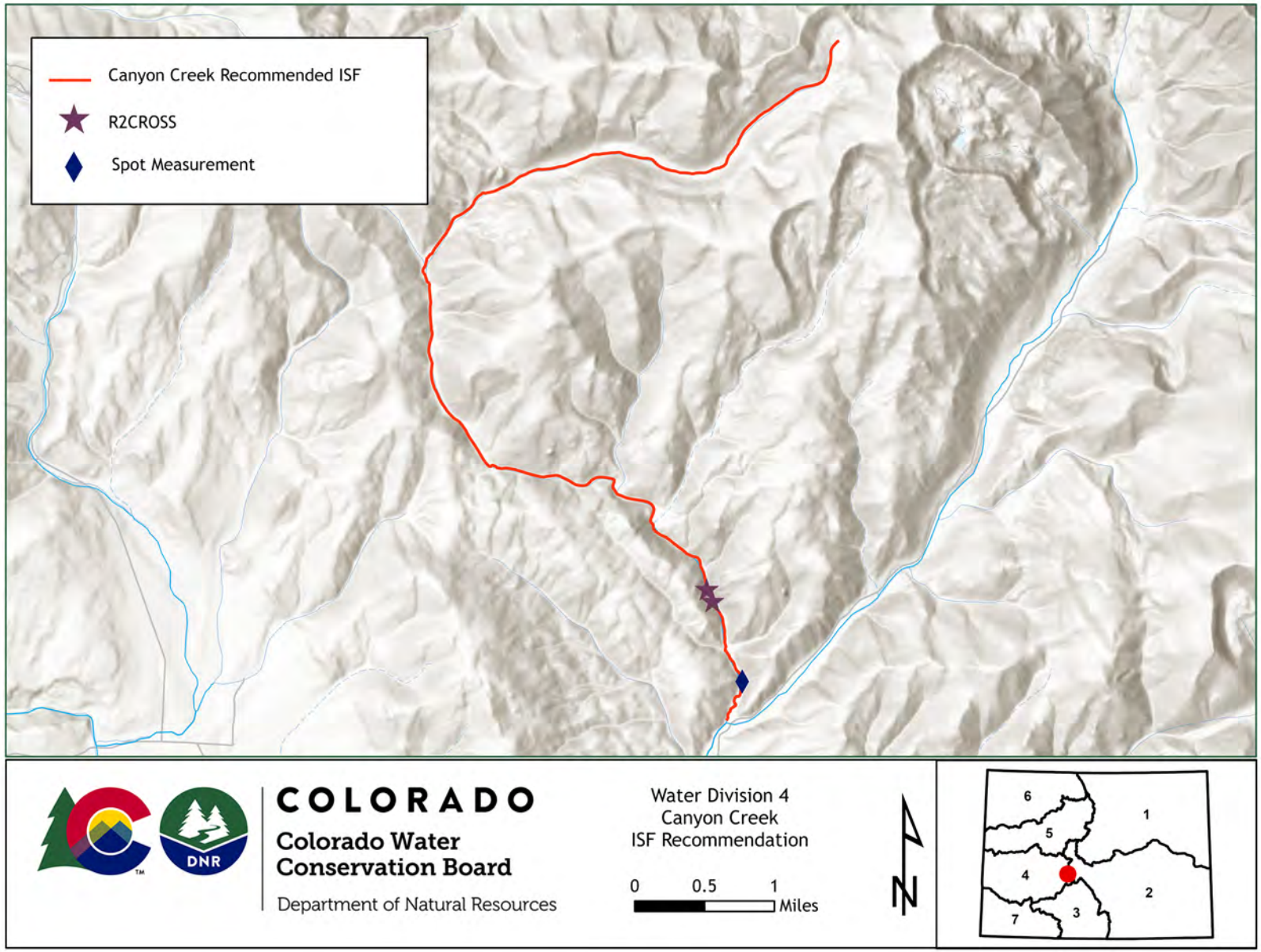
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


Canyon Creek Recommended ISF
R2CROSS
Spot Measurement
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
Canyon Creek
ISF Recommendation
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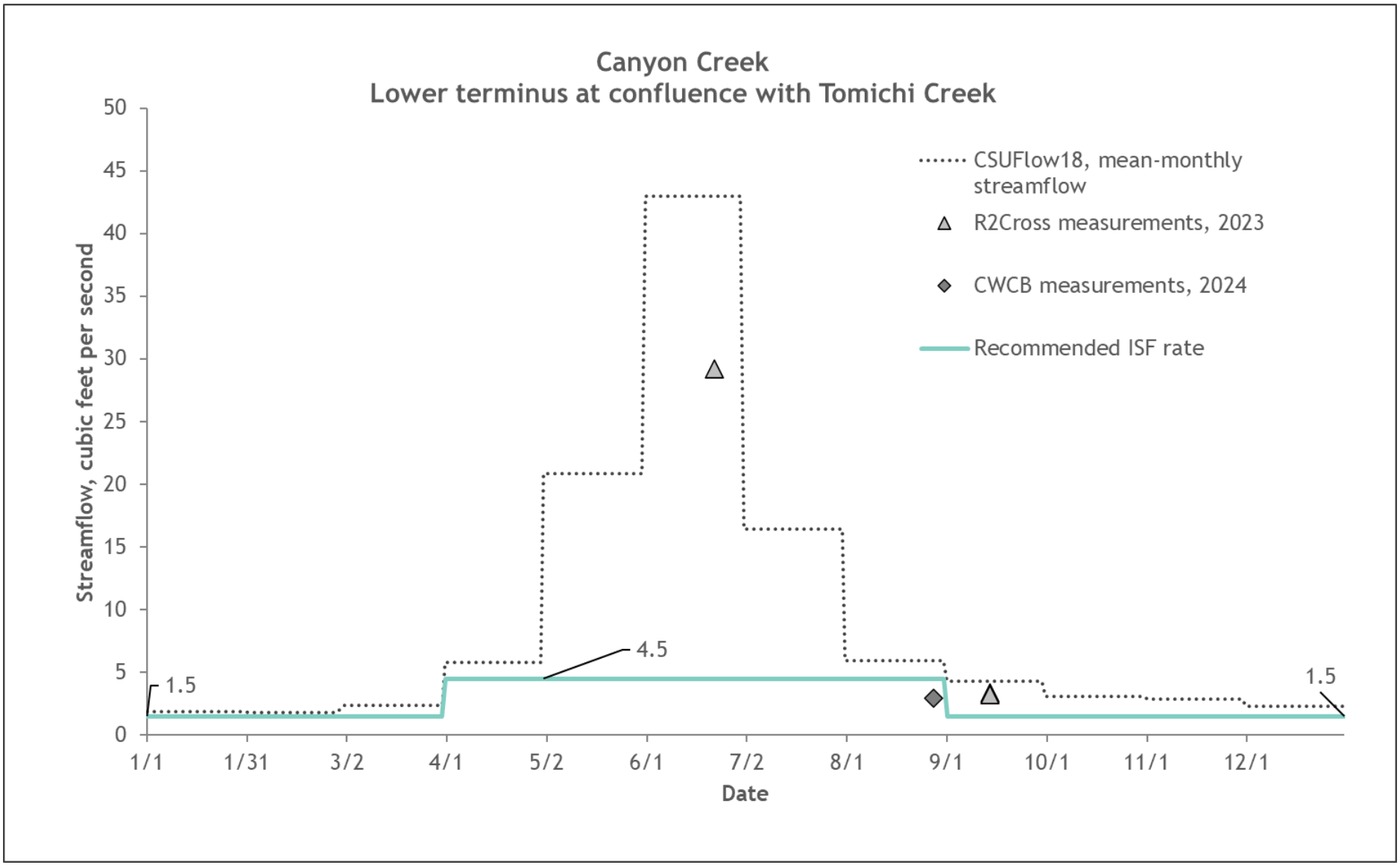
COMPLETE HYDROGRAPH



East Fork Dry Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4245723.89 UTM East: 225416.86
LOWER TERMINUS:	confluence with Beaver Dams Creek at UTM North: 4246758.01 UTM East: 229778.94
WATER DIVISION/DISTRICT:	4/68
COUNTY:	Montrose, Ouray
WATERSHED:	Uncompahgre
CWCB ID:	21/4/A-004
RECOMMENDER:	Colorado Parks and Wildlife (CPW)
LENGTH:	3.11 miles
FLOW RECOMMENDATION:	0.6 cfs (11/01 - 02/29) 1.5 cfs (03/01 - 03/31) 2.5 cfs (04/01 - 07/31) 1.2 cfs (08/01 - 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 (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

CPW recommended that the CWCB appropriate an ISF water right on a reach of East Fork Dry Creek at the ISF Workshop in January 2020. East Fork Dry Creek is located within Montrose and Ouray Counties and is approximately fifteen miles southwest of the City of Montrose (See Vicinity Map). The stream originates on the Uncompahgre Plateau and flows east until it reaches the confluence with Beaver Dams Creek. East Fork Dry Creek is a tributary to Dry Creek. A tributary to the Uncompahgre River, which is a tributary to the Gunnison River.

The proposed ISF reach extends from headwaters downstream to the confluence with Beaver Dams Creek for a total of 3.11 miles. Approximately 45% of the proposed reach is on public lands managed under the Uncompahgre National Forest, the rest is on private land (See Land Ownership Map). CPW is interested in protecting this stream to preserve the natural environment which includes native 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 East Fork Dry Creek was sent to the mailing list in November 2024, March 2024, March 2023, March 2022, March 2021, and March 2020. Staff sent letters to identified landowners adjacent to East Fork Dry Creek based on information from the county assessor's website. Public notices about this recommendation were also published in the Montrose Daily Press on December 7, 2024 and the Ouray County Plaindealer on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Montrose and Ouray Boards of County Commissioners on 11/21/2022 and 10/08/2024, respectively. In addition, staff spoke with Eric Weig, District 68 Water Commissioner, on June 26, 2024 regarding water availability on East Fork Dry Creek. This conversation confirmed hydrologic and adminstatrative understanding of East Fork Dry 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.

East Fork Dry Creek is a first order headwater stream which flows easterly off the Uncompahgre Plateau towards the town of Montrose. East Fork Dry Creek is a relatively high-gradient channel with substrate that ranges from small cobble to gravel and sand. Fish habitat in East Fork Dry Creek is complex and includes significant large woody debris in the channel creating deep pools. Log-jams are plentiful throughout the ISF reach which create both pools and long runs. These refuge habitats support fish when flows are periodically low following runoff. Ample overhead shading provides cover and temperature buffering. The creek also supports a healthy riparian area with willows and skunk cabbage observed in field as well as a diverse macroinvertebrate community including stonefly, case-making caddisfly, midges, and water beetle.

East Fork Dry Creek supports a self-sustaining population of Colorado River cutthroat trout of the Gunnison Basin lineage (Table 1). Colorado River cutthroat trout are a state species of special concern and considered a federally sensitive species (CPW, 2015). Length-frequency data indicates multiple age classes surveyed by CPW in 2017 (see Appendix), which reinforces that the cutthroat trout in East Fork Dry Creek are a self-sustaining population. Multiple cutthroat trout were observed during 2020 and 2022 site visits.

Table 1. List of species identified in East Fork Dry Creek.

Species Name	Scientific Name	Status
Colorado River Cutthroat Trout- Gunnison Basin Lineage	*Oncorhynchus clarkii pleuriticus*	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

CPW 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 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

CPW collected R2Cross data at one transect for this proposed ISF reach (Table 2 and Site Map). The R2Cross model results in a winter flow of 1.8 cfs and a summer flow of 2.5 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 East Fork Dry Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
05/26/2022, 1	14.48	1.49	1.84	2.54
			1.84	2.54

ISF Recommendation

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

0.60 cfs is recommended from November 1 to February 29; this flow rate has been reduced due to water availability limitations. This flow rate supports baseflows in the stream and will provide sufficient wetted perimeter and refuge habitat in deep pools and glides, especially those holding habitats created from large woody debris in the channel.

1.5 cfs is recommended from March 1 to March 31; this flow rate has been reduced due to water availability limitations. This flow rate will support sufficient wetted perimeter and depth as fish transition to more metabolic activity as they come out of overwintering conditions.

2.5 cfs is recommended from April 1 to July 31 and meets all three hydraulic criteria for summer flows. This flow rate will support fish when they are most active and will provide refuge areas when stream temperatures are high following spring runoff. This higher flow rate also supports beneficial spawning conditions for cutthroat trout who spawn in the spring to early summer. It will also allow for streamflow conditions which support feeding and growth.

1.2 cfs is recommended from August 1 to October 31; this flow rate has been reduced due to water availability limitations. This flow rate follows the falling limb of the streams hydrograph will provide sufficient wetted perimeter and habitat availability in pools and glides and may allow fish movement between most riffles.

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 East Fork Dry Creek is 5.7 square miles, with an average elevation of 9,291 feet and average annual precipitation of 23.2 inches. East Fork Dry Creek is a high elevation, steep gradient, snowmelt driven hydrologic system. The basin has natural streamflow conditions and is anthropogenically unaltered.

Water Rights Assessment
There are no diversions within the reach of East Fork Dry Creek recommended for an ISF. The lower terminus of the recommended reach is located at the upper terminus of an existing ISF on East Fork Dry Creek decreed in 05CW0151.

Data Collection and Analysis
Representative Gage Analysis
There are no current or historic gages on East Fork Dry Creek. Staff investigated nearby gages for similarities in basin characteristics and hydrology and found no gages were sufficiently similar to be used to estimate streamflow on East Fork Dry Creek.

Multiple Regression Model
The CSUFlow18 regression model predicts mean-monthly flow in East Fork Dry Creek and provides the best estimate for streamflow conditions.

Site Visit Data
CWCB staff joined CPW on a site visit during data collection for R2Cross modeling on 5/26/2022.

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 East Fork Dry Creek.

MATERIAL INJURY
If decreed, the proposed ISF on East Fork Dry 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 Parks and Wildlife, 2015, State Wildlife Action Plan: A strategy for conserving wildlife in Colorado. https://cpw.widencollective.com/assets/share/asset/nbenjdfemj

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

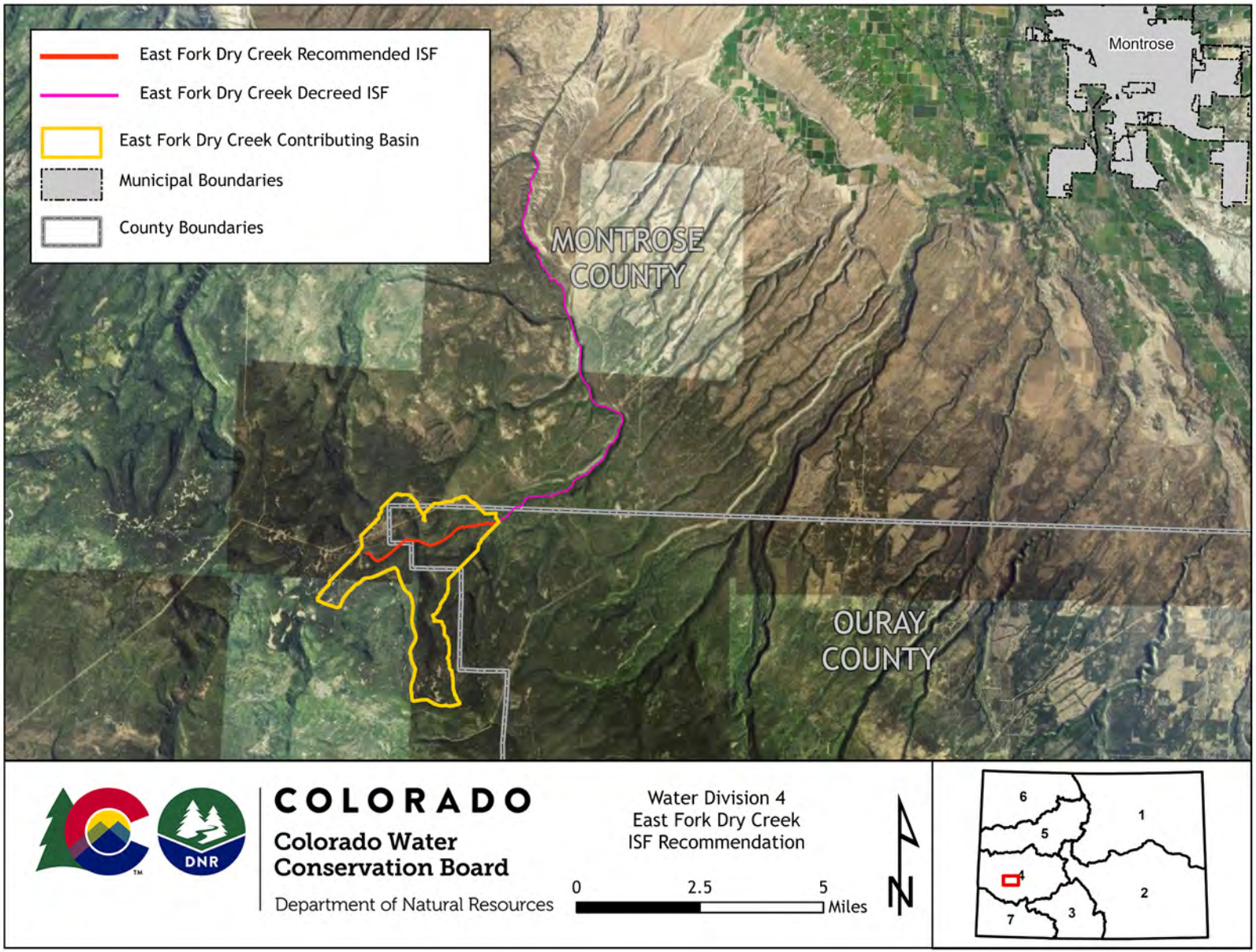
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

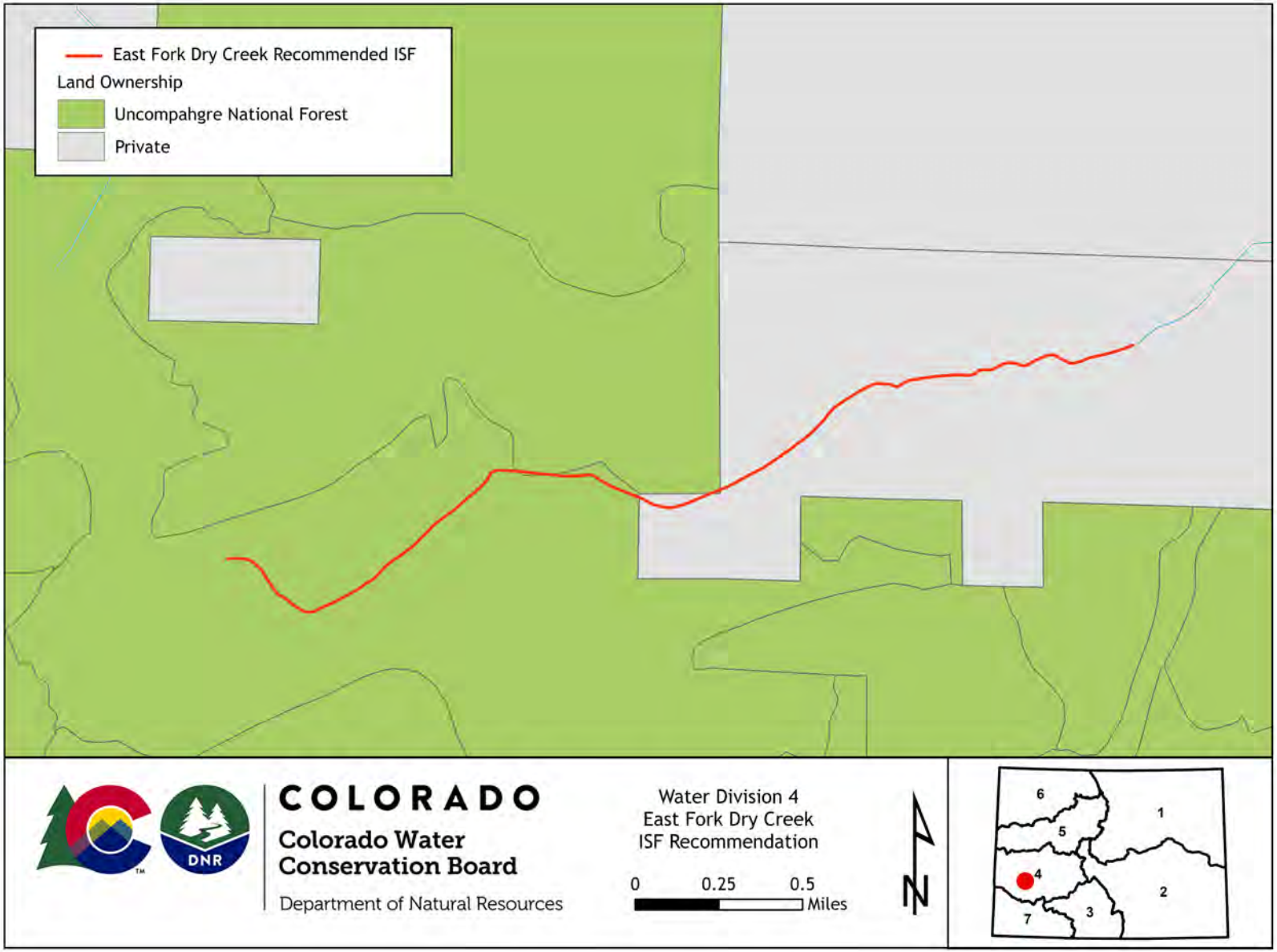
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

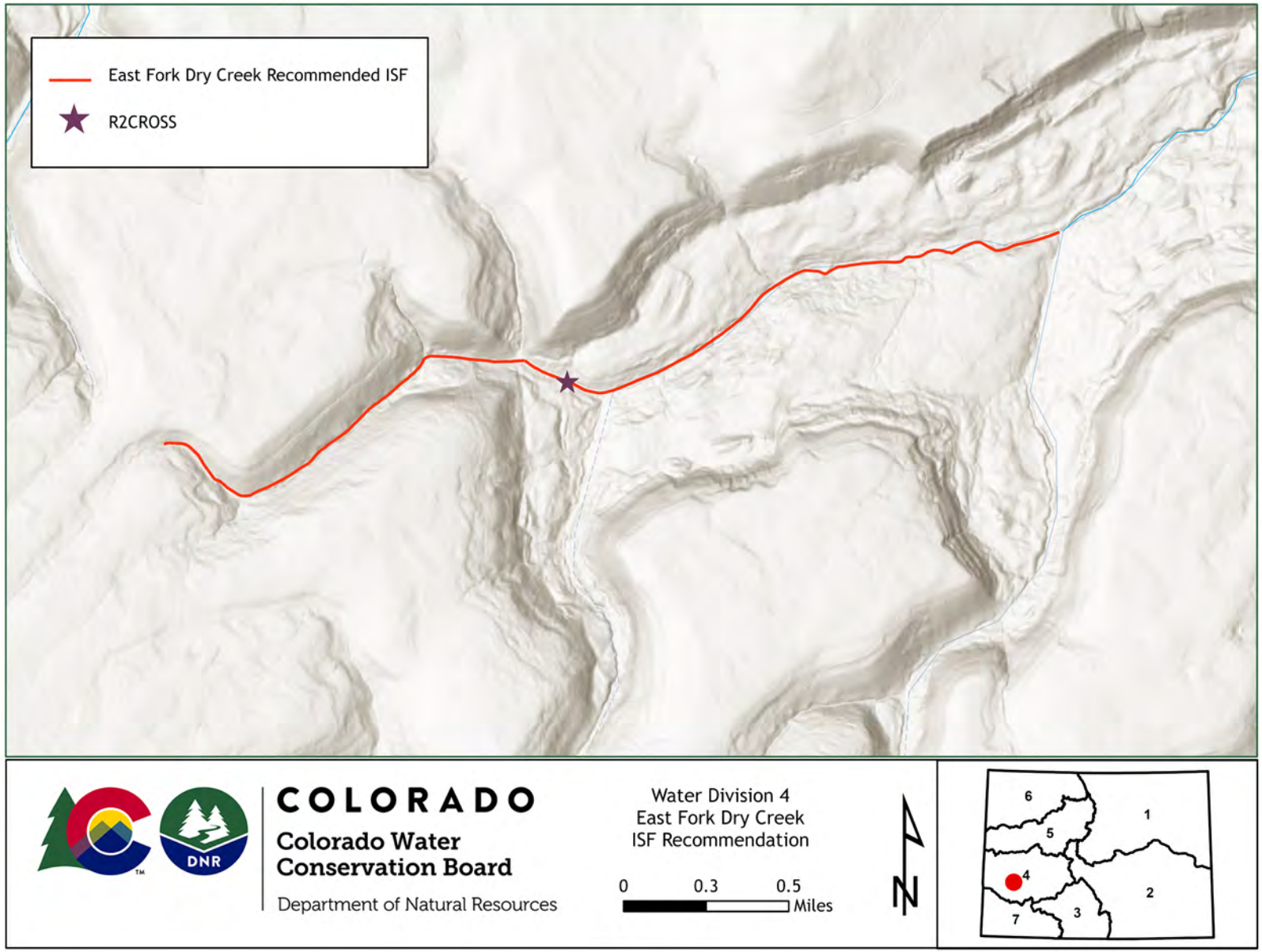
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


East Fork Dry Creek Recommended ISF
R2CROSS
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
East Fork Dry Creek
ISF Recommendation
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0.3
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Miles
N
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1
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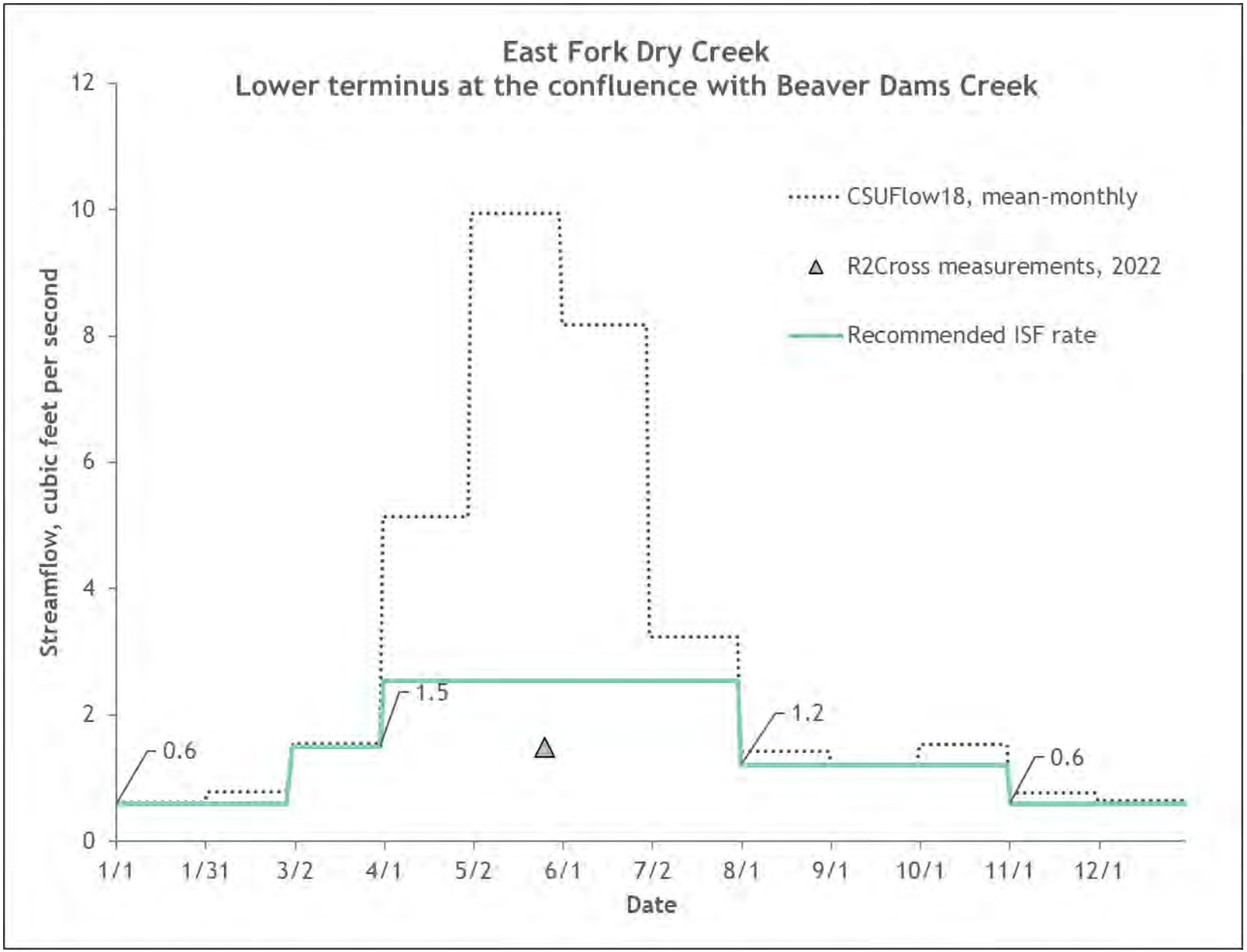
COMPLETE HYDROGRAPH



Goat Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	confluence with Galloway Creek at UTM North: 4204525.69 UTM East: 218205.63
LOWER TERMINUS:	confluence wtih Beaver Creek at UTM North: 4207527.06 UTM East: 219199.36
WATER DIVISION/DISTRICT:	4/60
COUNTY:	San Miguel
WATERSHED:	San Miguel
CWCB ID:	22/4/A-001
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	2.01 miles
FLOW RECOMMENDATION:	0.35 cfs (11/01 - 03/31) 0.95 cfs (04/01 - 06/15) 0.6 cfs (06/16 - 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 (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 Goat Creek at the ISF Workshop in January 2021. Goat Creek is located within San Miguel County and is approximately eight miles east from Miramonte Reservoir (See Vicinity Map). The stream originates in the east flank of Lone Cone and flows north until it reaches the confluence with Beaver Creek. Goat Creek is a tributary to Beaver Creek which is a tributary to the San Miguel River.

The proposed ISF reach extends from the confluence with Galloway Creek downstream to the confluence with Beaver Creek for a total of 2.01 miles. The BLM manages approximately 30% of the reach and the remainder 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 Goat Creek was sent to the mailing list in November 2024, March 2024, March 2023, March 2022, and March 2021. Staff sent letters to identified landowners adjacent to Goat Creek based on information from the county assessor's website. A public notice about this recommendation was also published in the Telluride Daily Planet on December 15, 2024.

Staff presented information about the ISF program and this recommendation to the San Miguel County Board of County Commissioners (BOCC) on September 25, 2024 and a letter of support was recived from the BOCC on Novwember 15, 2024. In addition, staff contacted Bob Hurford Division Engineer on September 25, 2024 regarding water rights on Goat Creek. CWCB and BLM staff also met with representives of the Gurley Ditch, Division Four Water Commisionioners' Sandy Ragsdale and Mark Ragsdale, and a representative of Southwestern Water Conservation

District on May 12, 2021. Russell Scott, contacted CWCB staff after receiving the landowner letter to state his support for an ISF to protect streamflow. He purchased his property, which includes portions of Goat Creek and Beaver Creek, to protect the biodiversity which includes beaver ponds, trout, elk, bear and other wildlife.

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.

Goat Creek is a cold water, high gradient stream. The proposed reach flows through a narrow valley that ranges from 0.25 to 0.5 mile in width. The creek flows mostly through densely forested areas, but occasionally flows through meadows and wetland areas. Substrate is generally from medium to large in size, ranging from gravels to 1-foot boulders. Water quality is good for supporting cold water species. Fish surveys have documented a naturally reproducing population of mottled sculpin, with a small number of speckled dace (Table 1).

Table 1. List of species identified in Goat Creek.

Species Name	Scientific Name	Status
mottled sculpin	*Cottus bairdii*	None
speckled dace	*Rhinichthys osculus*	None

Goat Creek supports a healthy riparian community comprised of spruce, alder, and willow species. Bank stability appears to be good, except in areas of high livestock usage. Stream flow appears to be highly stable and is likely supported by spring discharge and well-developed beaver dam complexes. Flow rates close to bankfull were noted during extreme drought conditions in 2020.

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 four 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 0.61 cfs and a summer flow of 0.96 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 Goat Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
05/12/2012, 2	5.30	0.60	0.35	1.39
06/30/2020, 1	6.20	0.51	0.80	1.05
06/30/2020, 2	5.30	0.43	0.61	0.64
05/12/2021, 1	4.50	0.63	0.68	0.74
		Average	0.61	0.96

ISF Recommendation

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

0.35 cfs is recommended from November 1 through March 31 during the cold weather period. This recommendation is driven by naturally limited water availability. This flow rate should prevent pools from completely icing and will allow the fish population to successfully overwinter.

0.95 cfs is recommended from April 1 to June 15 during the snowmelt runoff period and summer. This recommendation is driven by the average velocity criteria. Goat Creek has limited riffle

habitat, so protecting this flow rate will ensure that the limited habitat can be fully utilized during the snowmelt period, when fish are spawning and moving actively between pools.

0.60 cfs is recommended from June 16 to October 31 during summer and early fall. This recommendation is driven by the average depth criteria. This flow rate should provide adequate physical habitat for the fish population to complete important parts of its life cycle before cold temperatures arrive.

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 Goat Creek is 2.6 square miles, with an average elevation of 8,738 feet and average annual precipitation of 23.4 inches. These values were adjusted to reflect only the area below the Gurley Ditch (discussed below). Due to water uses upstream from the proposed reach, hydrology in the basin is significantly altered.

Water Rights Assessment
The Gurley Ditch (WDID 6001594, 50 cfs, appropriated in 1884) traverses the Goat Creek drainage and a number of other drainages between Cone Reservoir and West Beaver Creek (see Site Map). This ditch captures streamflow for roughly the upper 70% of the total Goat Creek basin. Below this ditch there are two small springs (0.066 cfs in total) and a small stock pond (0.1 acre feet), but no other existing water uses were identified in Goat Creek.

Data Collection and Analysis
Representative Gage Analysis
There is not a current or historic streamflow gage on Goat Creek. There was a historic gage on Beaver Creek, near the confluence with Goat Creek, that operated from 1941 to 1981 (Beaver Creek near Norwood, CO USGS 0917300). This gage was used a reference but was not used to estimate streamflow due to differences in water use patterns between the two basins.

Multiple Regression Model
Because the Gurley Ditch captures water from the upper portion of the Goat Creek basin, the contributing basin for the proposed reach was altered to only include area below the Gurley Ditch (see Vicinity Map). CSUFlow18 used this adjusted basin to estimate mean-monthly streamflow in Goat Creek below the Gurley Ditch.

Site Visit Data
BLM staff made six streamflow measurements on the proposed reach of Goat Creek as summarized in Table 3.

Table 3. Summary of streamflow measurements for Goat Creek.

Visit Date	Flow (cfs)	Collector
06/28/2022	0.43	BLM
06/28/2022	0.42	BLM
08/18/2022	0.64	BLM
08/18/2022	0.74	BLM
10/28/2022	0.58	BLM
10/28/2022	0.66	BLM

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 Goat Creek.

MATERIAL INJURY
If decreed, the proposed ISF on Goat 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

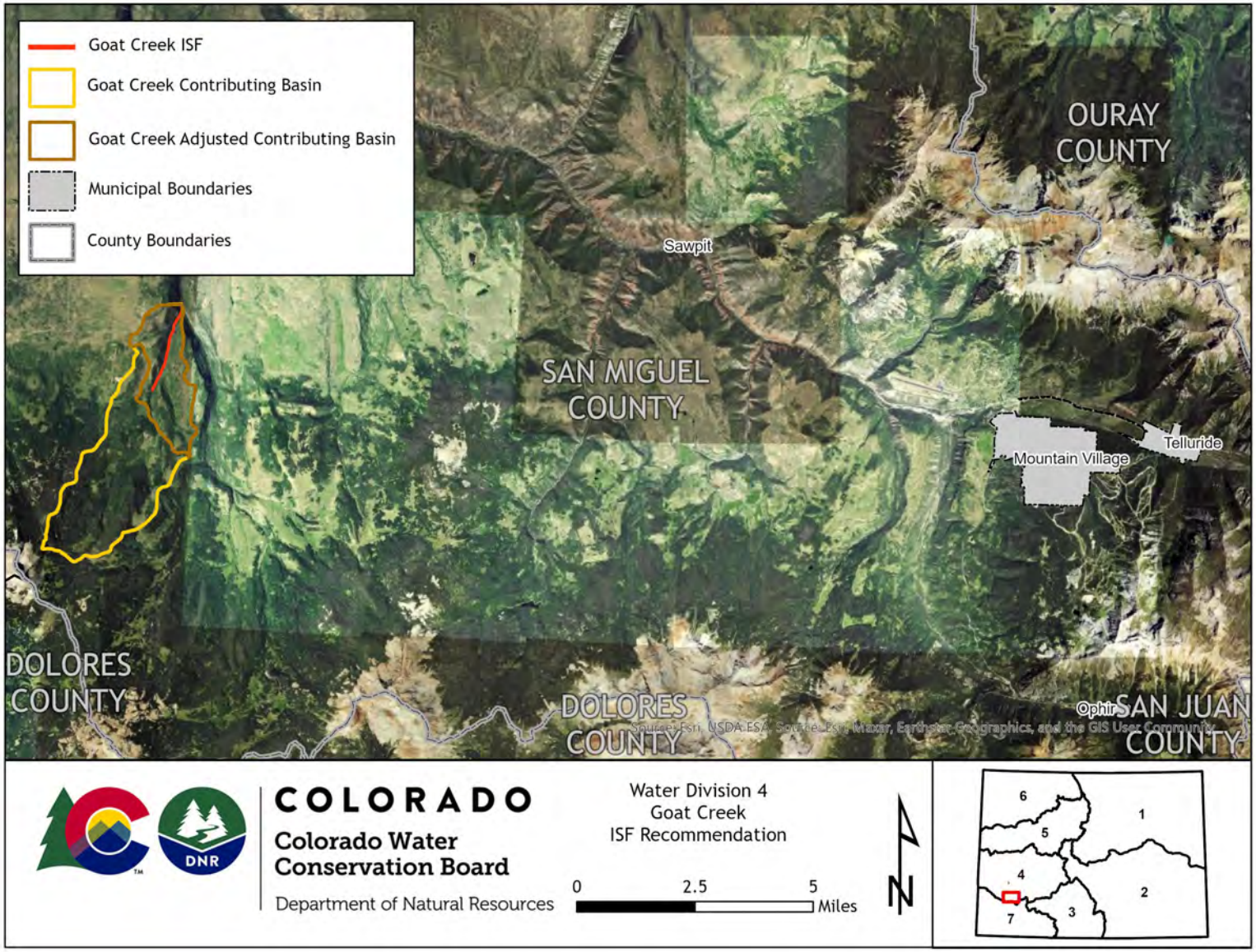
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

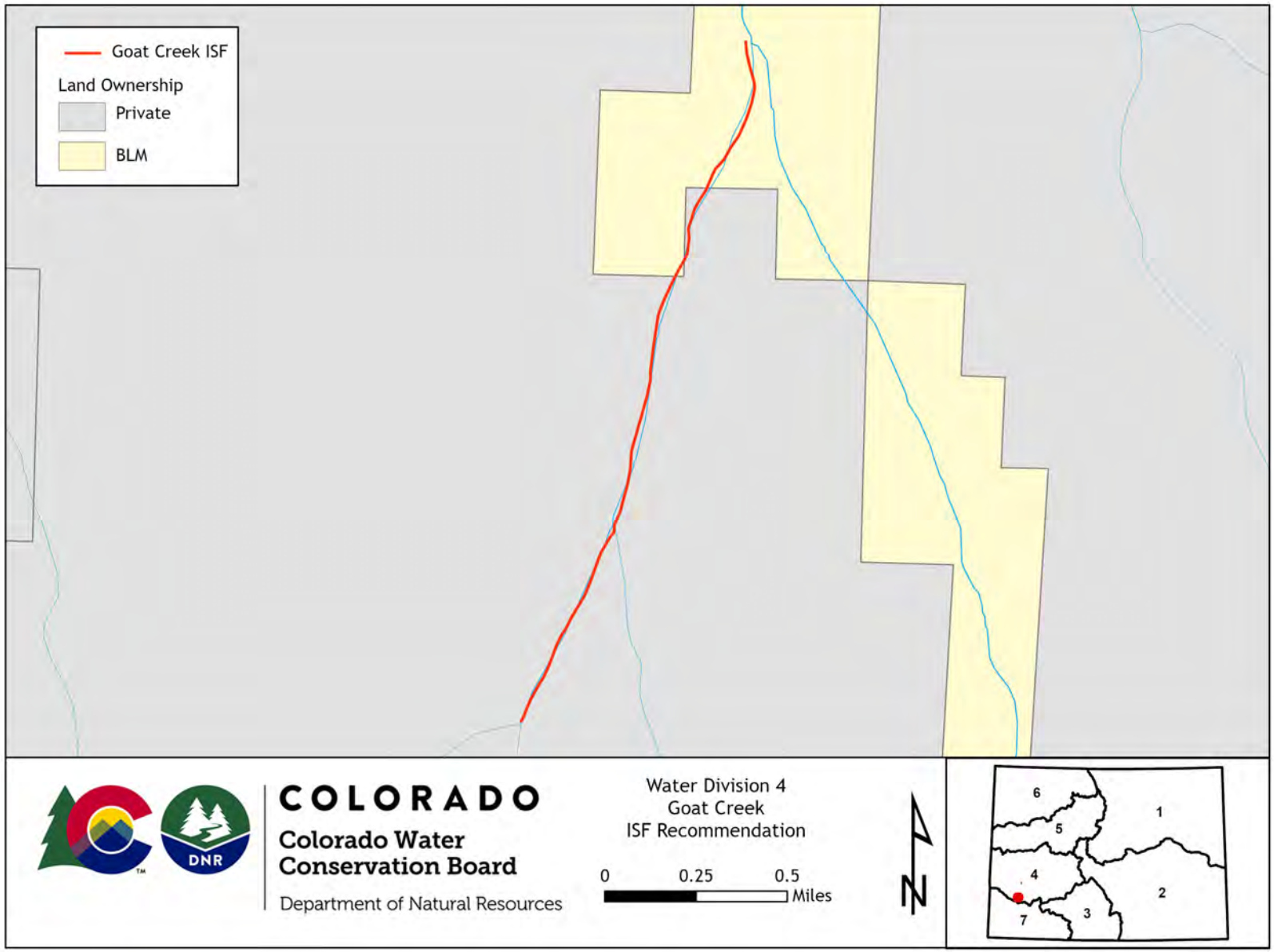
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

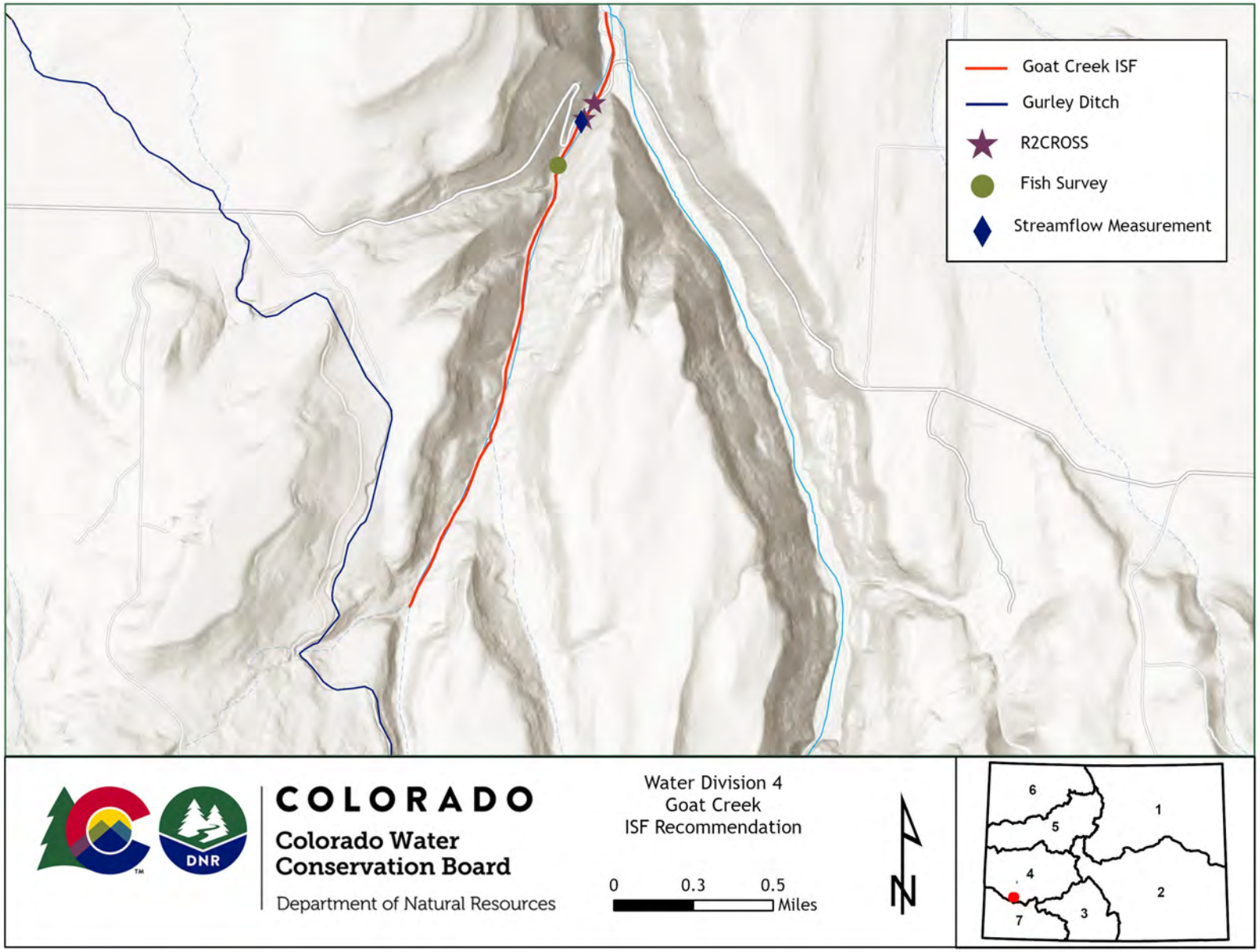
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


Goat Creek ISF
Gurley Ditch
R2CROSS
Fish Survey
Streamflow Measurement
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
Goat Creek
ISF Recommendation
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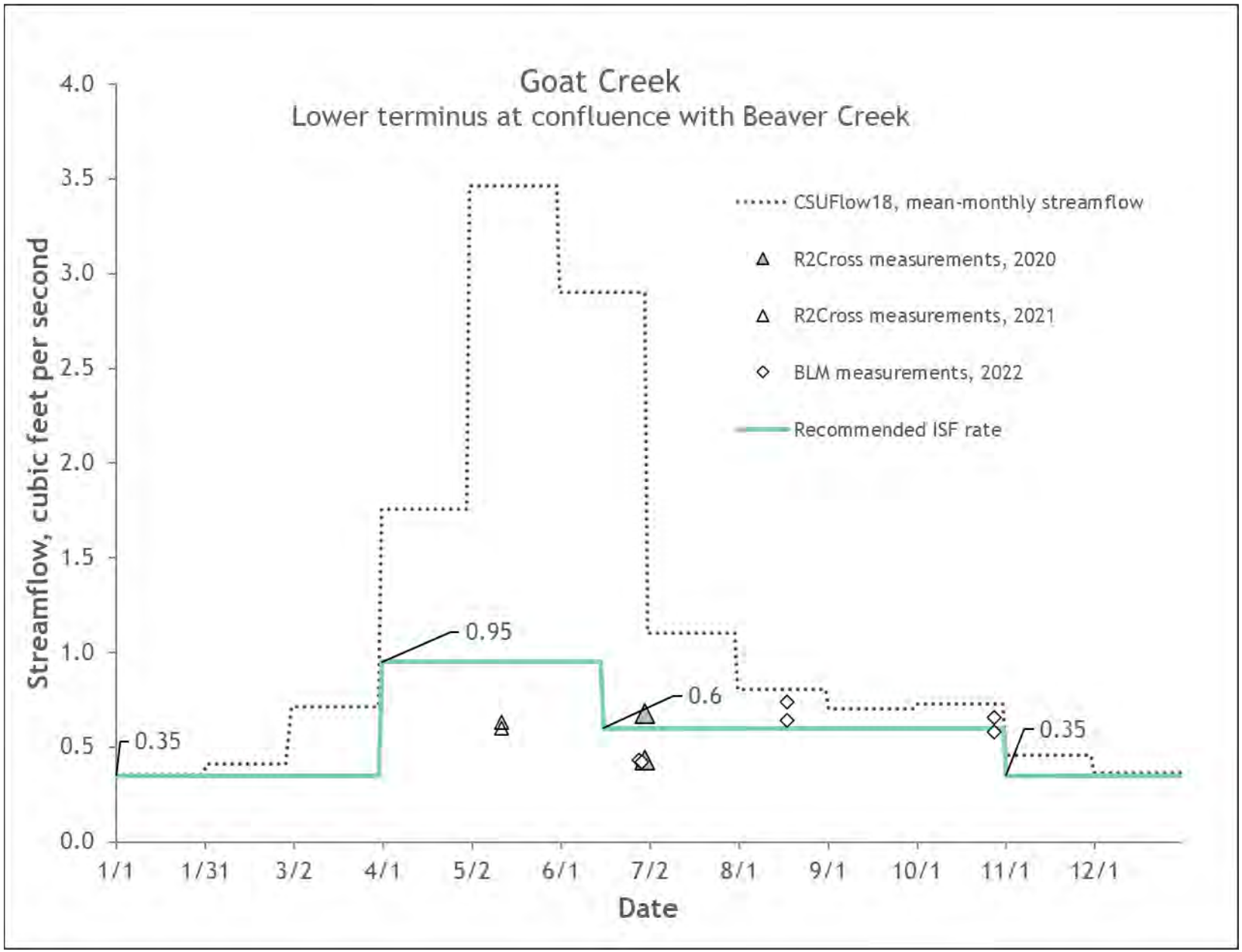
COMPLETE HYDROGRAPH



Main Hubbard Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4324943.67 UTM East: 269584.73
LOWER TERMINUS:	Overland Ditch at UTM North: 4326413.75 UTM East: 272485.73
WATER DIVISION/DISTRICT:	4/40
COUNTY:	Delta
WATERSHED:	North Fork Gunnison
CWCB ID:	21/4/A-008
RECOMMENDER:	Colorado Parks and Wildlife (CPW)
LENGTH:	2.5 miles
FLOW RECOMMENDATION:	0.2 cfs (12/01 - 03/31) 0.6 cfs (04/01 - 04/30) 2.9 cfs (05/01 - 06/30) 2.6 cfs (07/01 - 07/31) 0.8 cfs (08/01 - 08/31) 0.3 cfs (09/01 - 11/30)

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

CPW recommended that the CWCB appropriate an ISF water right on a reach of Main Hubbard Creek at the ISF Workshop in January 2020. Main Hubbard Creek is located within Delta County and is approximately 12.5 miles north of the Town of Paonia (See Vicinity Map). The stream originates near the base of Crater Peak and flows northwest and west until it reaches the confluence with Hubbard Creek. Main Hubbard Creek is a tributary to Hubbard Creek, which is a tributary to the North Fork of the Gunnison River, which is a tributary to the Gunnison River.

The proposed ISF reach extends from the headwaters downstream to the Overland Ditch for a total of 2.5 miles. The proposed reach is entirely on public lands managed under the Grand Mesa National Forest (See Land Ownership Map). CPW is interested in protecting this stream to preserve the natural environment which supports native 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 Main Hubbard Creek was sent to the mailing list in November 2024, March 2024, March 2023, March 2022, March 2021, and March 2020. A public notice about this recommendation was also published in the Delta County Independent on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Delta County Board of County Commissioners on October 1, 2024. CWCB and CPW staff met with members of the North Fork Gunnison Water Users Association and Raquel Flinker from the Colorado River District on November 28, 2023 about the Middle Hubbard Creek, Main Hubbard Creek, and West Hubbard Creek ISF recommendations. CWCB and CPW staff also met with members of the Ragged Mountain Water Users Association and Raquel Flinker to discuss the recommendations on April 13, 2024. In addition, staff met with Luke Reschke, District 40 Lead Water Commissioner, and Doug Christner, District 40 Water Commissioner, about water rights and water availability on all three streams on September 26,2023.

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.

Main Hubbard Creek is a first order, headwater stream and is a tributary of Hubbard Creek. It flows into the North Fork Gunnison near the Town of Somerset. The creek flows through a narrow valley densely forested with stands of pine and aspen. The ISF reach has a high-gradient, confined channel with substrate that ranges from small boulder to small gravels with predominantly large cobble and small boulders. There are some gravels suitable for spawning. Fish habitat is complex and includes undercut banks, deep pools, and excellent cover. There is large woody debris in the channel and step-pools are numerous and mainly created by log jams in the channel. There is ample resting habitat in the pools and beaver dam complexes at the upstream portion of the ISF reach. The creek supports a healthy riparian community and a diverse macroinvertebrate community. Flatheaded mayfly and three species of caddisfly were observed in the field.

Main Hubbard Creek supports a core conservation population of Colorado River cutthroat trout (CRCT) of the Gunnison Basin lineage (Table 1). Core conservation population indicates the species have very high genetic purity and limited hybridization has occurred with non-native trout species. CRCT are a state species of special concern and are considered a federally sensitive species (CPW, 2015). CPW conducted fish surveys in 2007 and found multiple age classes based on length and frequency data. Multiple age classes indicate that the cutthroat trout are a self-sustaining population with natural recruitment occurring.

Table 1. List of species identified in Main Hubbard Creek.

Species Name	Scientific Name	Status
Colorado River cutthroat trout – Gunnison Basin Lineage	*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

CPW 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 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

CPW 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 1.4 cfs and a summer flow of 2.9 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 Main Hubbard Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
08/13/2024, 1	13.08	0.38	1.31	2.75
08/13/2024, 2	16.68	0.38	1.42	2.98
			1.37	2.87

ISF Recommendation

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

0.20 cfs is recommended from December 1 to March 31; this flow recommendation is reduced due to water availability limitations. This rate will maintain holding habitats in pools and will support fish when metabolic activity is limited and they are overwintering in discrete habitat features.

0.60 cfs is recommended from April 1 to April 30; this flow recommendation is reduced due to water availability limitations. This flow rate will maintain adequate wetted perimeter in riffles and glides and will support holding habitat in pools during a period of increasing metabolic activity for trout as the snowmelt period begins.

2.9 cfs is recommended from May 1 to June 30. This flow rate meets all three hydraulic criteria to maintain depth, velocity, and wetter perimeter during spring runoff and high flows. This time period is important to support feeding and spawning for trout as well as the macroinvertebrate community.

2.6 cfs is recommended from July 1 to July 31; this flow recommendation is reduced due to water availability limitations. This flow rate comes close to meeting sufficient depth, velocities, and wetted perimeter criteria and supports rearing and refuge habitats that facilitate growth during longer days and warmer water temperatures.

0.80 cfs is recommended from August 1 to August 31; this flow recommendation is reduced due to water availability limitations. This flow recommendation will maintain adequate wetted perimeter in riffles and sufficient habitat availability in pools and glides providing refuge habitats during the late summer period when fish are active and feeding.

0.30 cfs is recommended from September 1 to November 30; this flow recommendation is reduced due to water availability limitations. This flow rate will provide sufficient habitat availability in deeper habitat features like pools and glides as the temperatures decrease.

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 Main Hubbard Creek is 1.3 square miles, with an average elevation of 10,329 feet and average annual precipitation of 36.5 inches. Main Hubbard Creek is a high elevation, steep gradient, snowmelt driven hydrologic system. The reach experiences variable timing and magnitude of snowmelt, often peaking in mid-summer and supports baseflows throughout the late season.

Water Rights Assessment

There are no water rights within the reach of Main Hubbard Creek recommended for an ISF.

Data Collection and Analysis

Historic Gage Analysis

The USGS operated a streamflow gage on Main Hubbard Creek from 1960 – 1968 (Main Hubbard Creek Near Paonia, CO., USGS ID: 9132700). This gage record was compared to a nearby climate station to evaluate how the historical record compares to a longer record. Montrose No 2 (ID: USC00055722) is approximately 40 miles south of the proposed reach and climate data was analyzed from 1960 to present. When compared to the most recent thirty years of data the eight years of gaged data had slightly above average precipitation with one year above the 75th percentile (1965) and one year below the 25th percentile (1966).

Mean monthly streamflow data was calculated from daily gage data for the entire period of record (POR) and used to analyze water availability (See Complete Hydrograph). Mean monthly flows peak in June before slowly receding to baseflow conditions by September.

Site Visit Data

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

Table 3. Summary of streamflow measurements for Main Hubbard Creek.

Visit Date	Flow (cfs)	Collector
07/16/2020	1.1	CWCB

Water Availability Summary

The hydrograph shows mean-monthly streamflow for the historic gage on Main Hubbard Creek and includes the proposed ISF rate. The proposed ISF flow rate is below the mean-monthly streamflow. Staff concludes that water is available for appropriation on Main Hubbard Creek.

MATERIAL INJURY

If decreed, the proposed ISF on Main Hubbard 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 Parks and Wildlife, 2015, State Wildlife Action Plan: A strategy for conserving wildlife in Colorado. https://cpw.widencollective.com/assets/share/asset/nbenjdfemj

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

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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.

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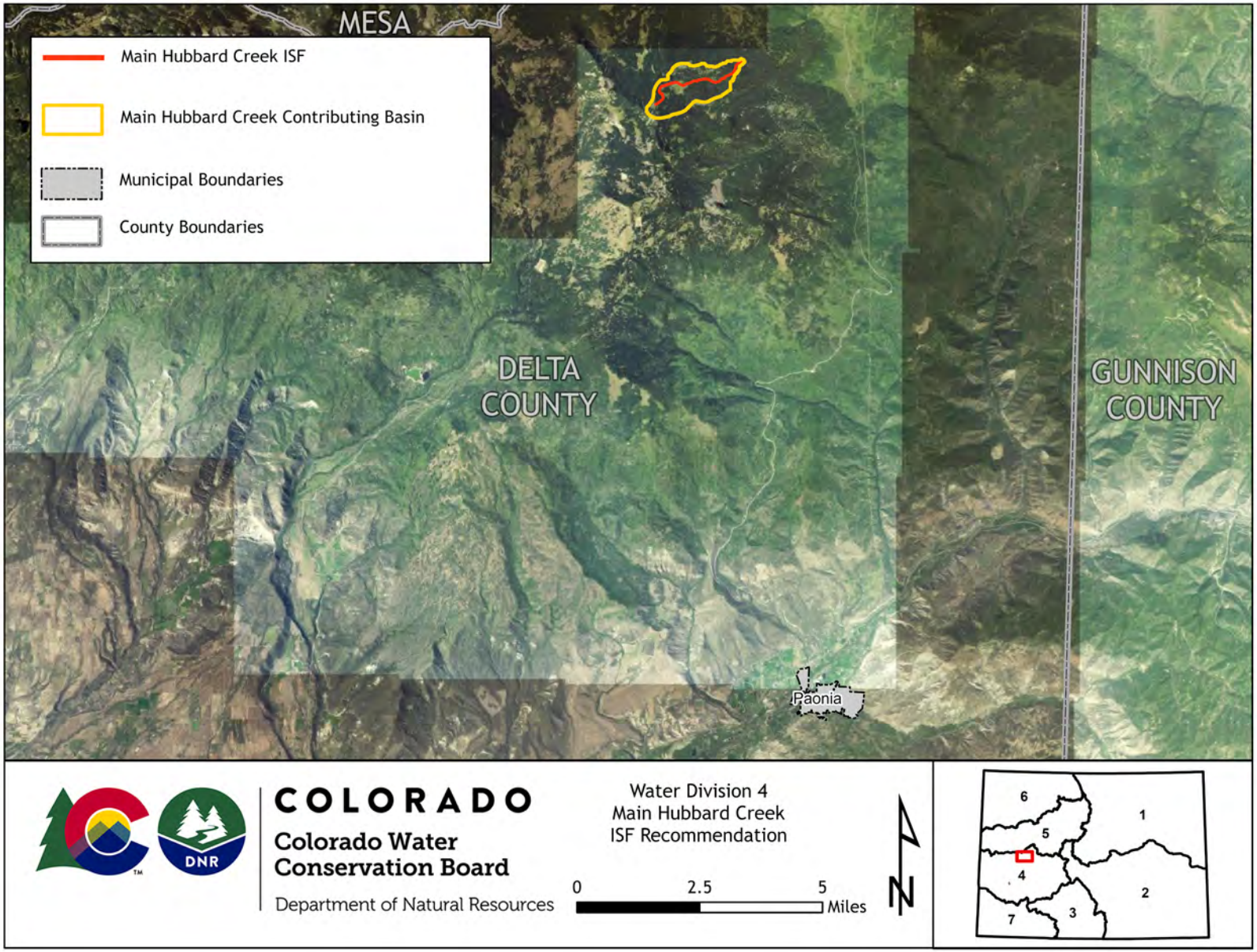
Metadata Descriptions

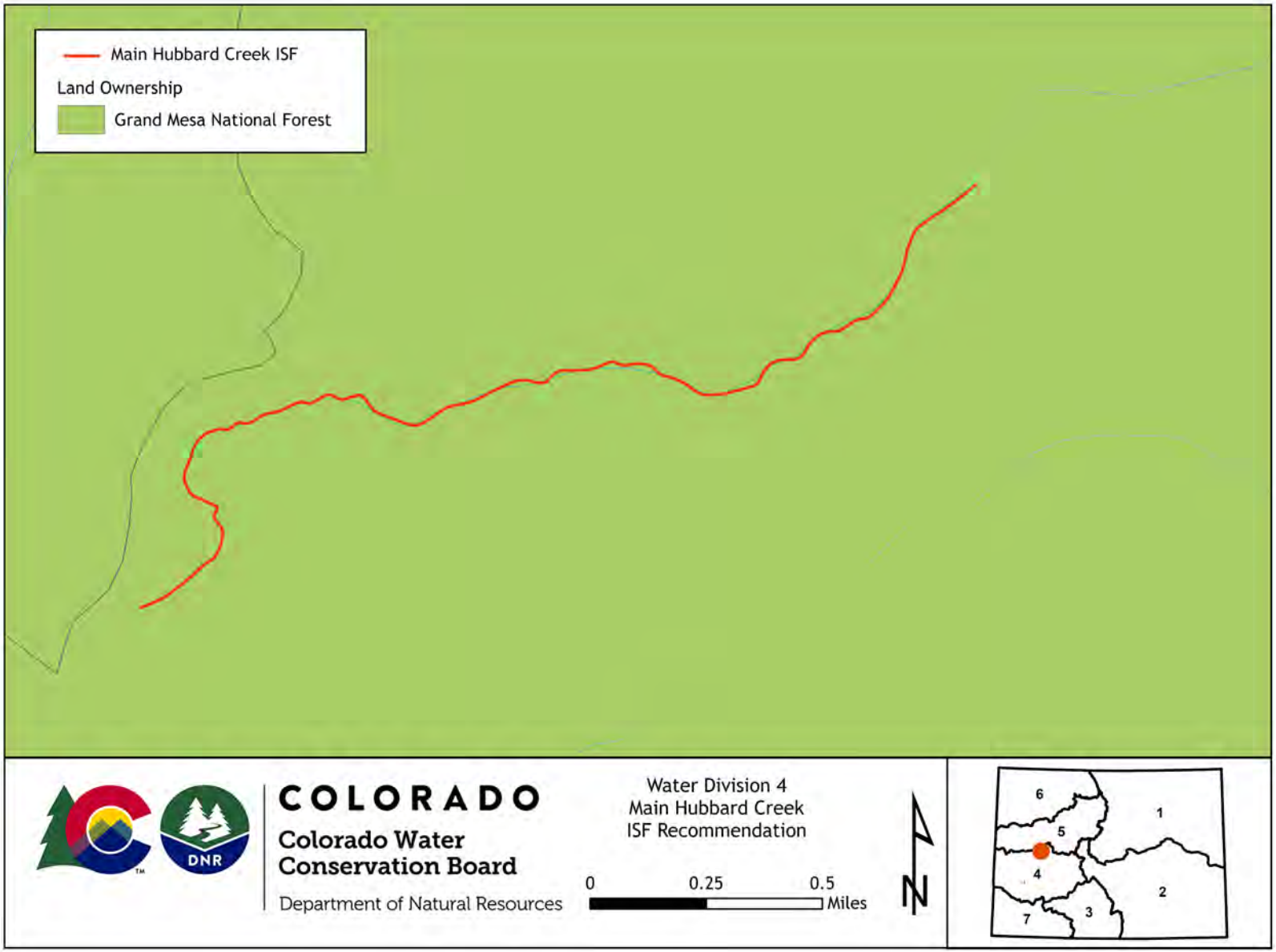
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

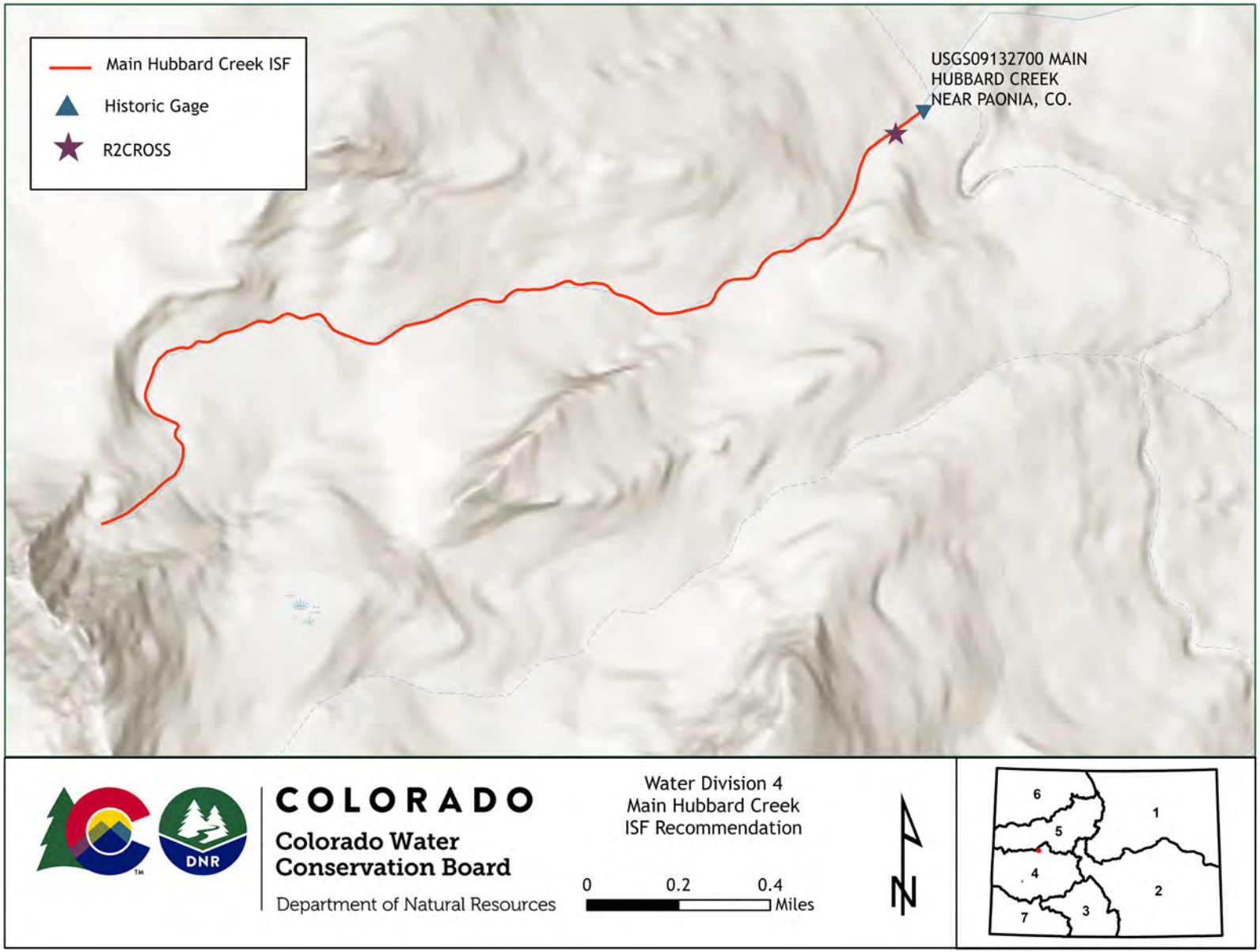
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


Main Hubbard Creek ISF
Historic Gage
R2CROSS
USGS09132700 MAIN
HUBBARD CREEK
NEAR PAONIA, CO.
COLORADO
Colorado Water
Conservation Board
Department of Natural Resources
Water Division 4
Main Hubbard Creek
ISF Recommendation
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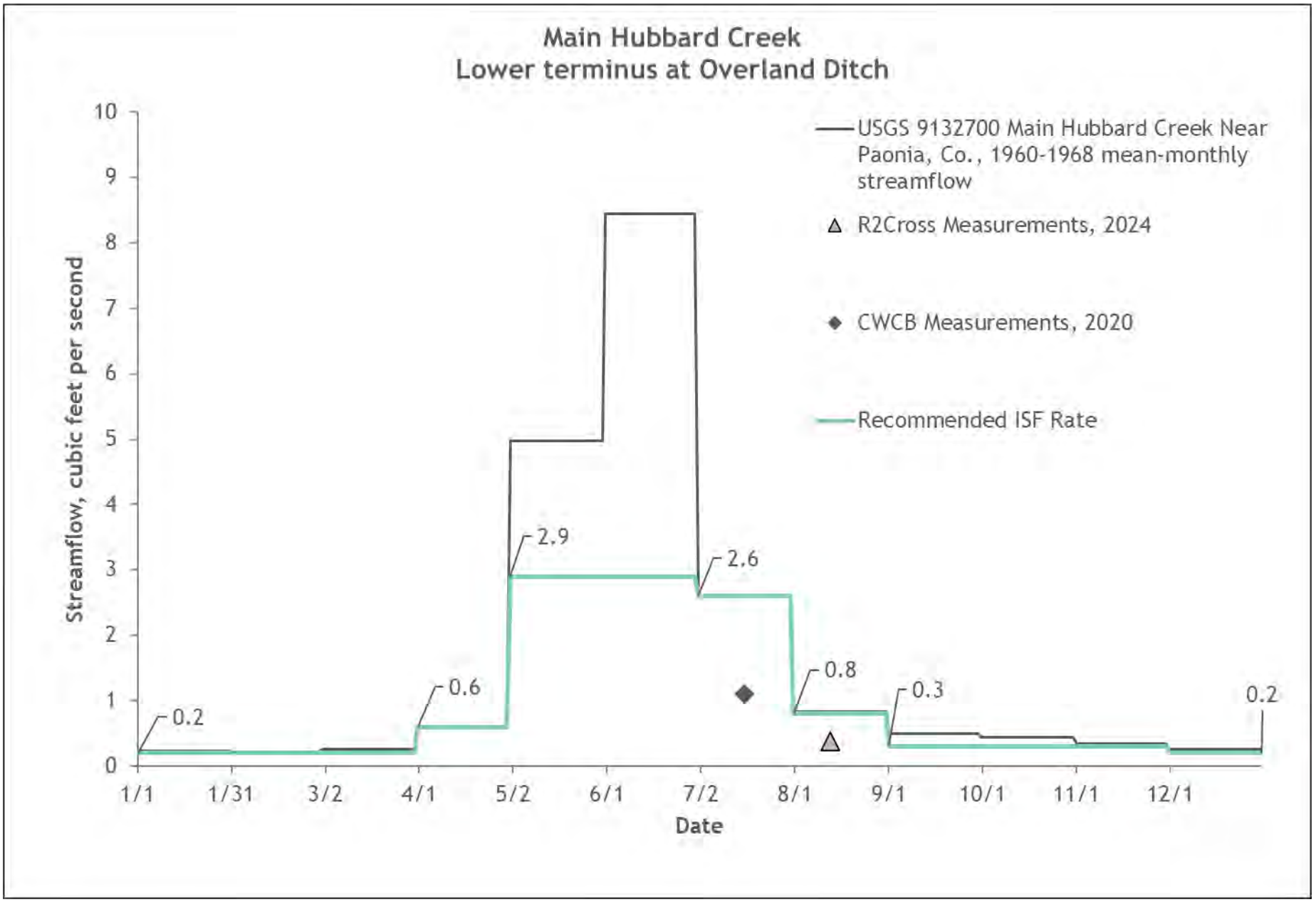
COMPLETE HYDROGRAPH



Middle Hubbard Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4324090.67 UTM East: 270063.72
LOWER TERMINUS:	Overland Ditch at UTM North: 4325516.75 UTM East: 273218.73
WATER DIVISION/DISTRICT:	4/40
COUNTY:	Delta
WATERSHED:	North Fork Gunnison
CWCB ID:	21/4/A-007
RECOMMENDER:	Colorado Parks and Wildlife (CPW)
LENGTH:	2.37 miles
FLOW RECOMMENDATION:	0.25 cfs (08/16 - 03/31) 0.6 cfs (04/01 - 04/30) 4.9 cfs (05/01 - 06/30) 2.9 cfs (07/01 - 07/31) 1.0 cfs (08/01 - 08/31) 0.5 cfs (09/01 - 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 (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

CPW recommended that the CWCB appropriate an ISF water right on a reach of Middle Hubbard Creek at the ISF Workshop in January 2020. Middle Hubbard Creek is located within Delta County and is approximately 11.5 miles north of the Town of Paonia (See Vicinity Map). The stream originates near the base of Crater Peak and flows northwest until it reaches the confluence with Hubbard Creek. Middle Hubbard Creek is a tributary to Hubbard Creek, which is a tributary to the North Fork of the Gunnison River, which is a tributary to the Gunnison River.

The proposed ISF reach extends from headwaters downstream to the Overland Ditch for a total of 2.37 miles. The proposed reach is entirely on public lands managed under the Grand Mesa National Forest (See Land Ownership Map). CPW is interested in protecting this stream to preserve the natural environment which supports native 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 Middle Hubbard Creek was sent to the mailing list in November 2024, March 2024, March 2023, March 2022, March 2021, and March 2020. A public notice about this recommendation was also published in the Delta County Independent on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Delta County Board of County Commissioners on October 1, 2024. CWCB and CPW staff met with members of the North Fork Gunnison Water Users Association and Raquel Flinker from the Colorado River District on November 28, 2023 about the Middle Hubbard Creek, Main Hubbard Creek, and West Hubbard Creek ISF recommendations. CWCB and CPW staff also met with members of the Ragged Mountain Water Users Association and Raquel Flinker to discuss the recommendations on April 13, 2024. In addition, staff met with Luke Reschke, District 40 Lead Water Commissioner, and Doug Christner, District 40 Water Commissioner, about water rights and water availability on all three streams on September 26,2023.

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.

Middle Hubbard Creek is a first order headwaters stream and a tributary to Hubbard Creek. It flows into the North Fork Gunnison River near the town of Somerset. The creek flows through a narrow valley densely forested with stands of pine and aspen. The ISF reach has a confined, high-gradient channel with substrate that ranges from small boulder to large cobbles and gravels with predominantly large substrate. Fish habitat is complex and includes large woody debris in the channel and deep pools providing slower-velocity refuge. High flow events access side channels which create backwater habitats. Large pools are the dominant habitat features used by resident trout. These pools are mainly created from either large boulder step-pool drops or log jams. Deadfall in the basin is significant. There is ample canopy cover providing shading, cover, and thermal refuge for the resident cutthroat trout. The creek supports a healthy riparian community. Macroinvertebrates are diverse and abundant and include three species of caddisfly and mayflies which were observed in the field.

Middle Hubbard Creek supports a self-sustaining population of Colorado River cutthroat trout (CRCT) of the Gunnison Basin lineage (Table 1). The population is considered a "core conservation population" meaning very high genetic purity because of limited hybridization with non-native trout species. CRCT are a state species of special concern and are considered a federally sensitive species (CPW, 2015). Multiple age classes indicate that the cutthroat trout population are self-sustaining with natural recruitment occurring.

Table 1. List of species identified in Middle Hubbard Creek.

Species Name	Scientific Name	Status
Colorado River cutthroat trout – Gunnison Basin Lineage	*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

CPW 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 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

CPW 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 1.0 cfs and a summer flow of 5.3 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 Middle Hubbard Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
08/14/2024, 1	19.45	1.0	0.99	8.02
08/14/2024, 2	15.53	1.0	1.09	2.57
			1.00	5.30

ISF Recommendation

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

0.25 cfs is recommended from November 1 to March 31; this flow recommendation is reduced due to water availability limitations. This flow rate will maintain adequate habitat availability in holding habitats like pools and deep glides to support fish during the overwintering period.

0.60 cfs is recommended from April 1 to April 30; this flow recommendation is reduced due to water availability limitations. This flow rate will maintain adequate wetted perimeter and sufficient depths in riffles to support fish as they transition into higher levels of metabolic activity and may begin to move throughout the channel.

4.9 cfs is recommended from May 1 to June 30; this flow recommendation is slightly reduced due to water availability limitations. This flow rate comes close to meeting sufficient depth, velocities, and wetted perimeter criteria and supports fish when they are actively feeding and spawning. This flow rate supports beneficial spawning conditions during spring runoff and high flow periods.

2.9 cfs is responsible from July 1 to July 31; this flow recommendation is reduced due to water availability limitations. This flow rate will maintain adequate depth and wetted perimeter as well as higher velocities that support rearing and refuge habitats for fish.

1.0 cfs is recommended from August 1 to August 31; this flow recommendation is reduced due to water availability limitations. This flow rate will maintain adequate wetted perimeter and depth in riffles and will provide plenty of habitat availability in deeper habitat features like pools and glides.

0.50 cfs is recommended from September 1 to October 31; this flow recommendation is reduced due to water availability limitations. This low rate will provide sufficient wetted perimeter in riffles and adequate habitat availability in deeper features like pools and glides. It will facilitate longitudinal movement to find overwintering habitats.

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 Middle Hubbard Creek is 1.4 square miles, with an average elevation of 10,444 feet and average annual precipitation of 30.3 inches. Middle Hubbard Creek is a high elevation, steep gradient, snowmelt driven hydrologic system. The reach experiences variable timing and magnitude of snowmelt, often peaking in mid-summer and supports baseflows throughout the late season.

Water Rights Assessment

There are no water rights within the reach of Middle Hubbard Creek recommended for an ISF.

Data Collection and Analysis

Historic Gage Analysis

The USGS operated a streamflow gage on Middle Hubbard Creek from 1960 to 1968 (Middle Hubbard Creek Near Paonia, Co., USGS ID: 9132800). This gage record was compared to a nearby climate station to evaluate how the historical record compares to a longer record. Montrose No 2 (ID: USC00055722) is approximately 40 miles south of the proposed reach and climate data was analyzed from 1960 to present. When compared to the most recent thirty years of data, the thirteen years of gaged data had slightly above average precipitation with one year above the 75th percentile (1965) and one year below the 25th percentile (1966).

Mean monthly streamflow data was calculated from daily gage data for the entire period of record (POR) and used to analyze water availability (See Complete Hydrograph). Mean monthly flows peak in June before slowly receding to baseflow conditions beginning in September.

Site Visit Data

CWCB staff joined CPW staff during R2Cross data collection field work campaign. No additional CWCB site visits occurred.

Water Availability Summary

The hydrograph shows mean-monthly streamflow for the historic gage on Middle Hubbard Creek and includes the proposed ISF rate. The proposed ISF flow rate is below the mean-monthly streamflow. Staff concludes that water is available for appropriation on Middle Hubbard Creek.

MATERIAL INJURY

If decreed, the proposed ISF on Middle Hubbard 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 Parks and Wildlife, 2015, State Wildlife Action Plan: A strategy for conserving wildlife in Colorado. https://cpw.widencollective.com/assets/share/asset/nbenjdfemj

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

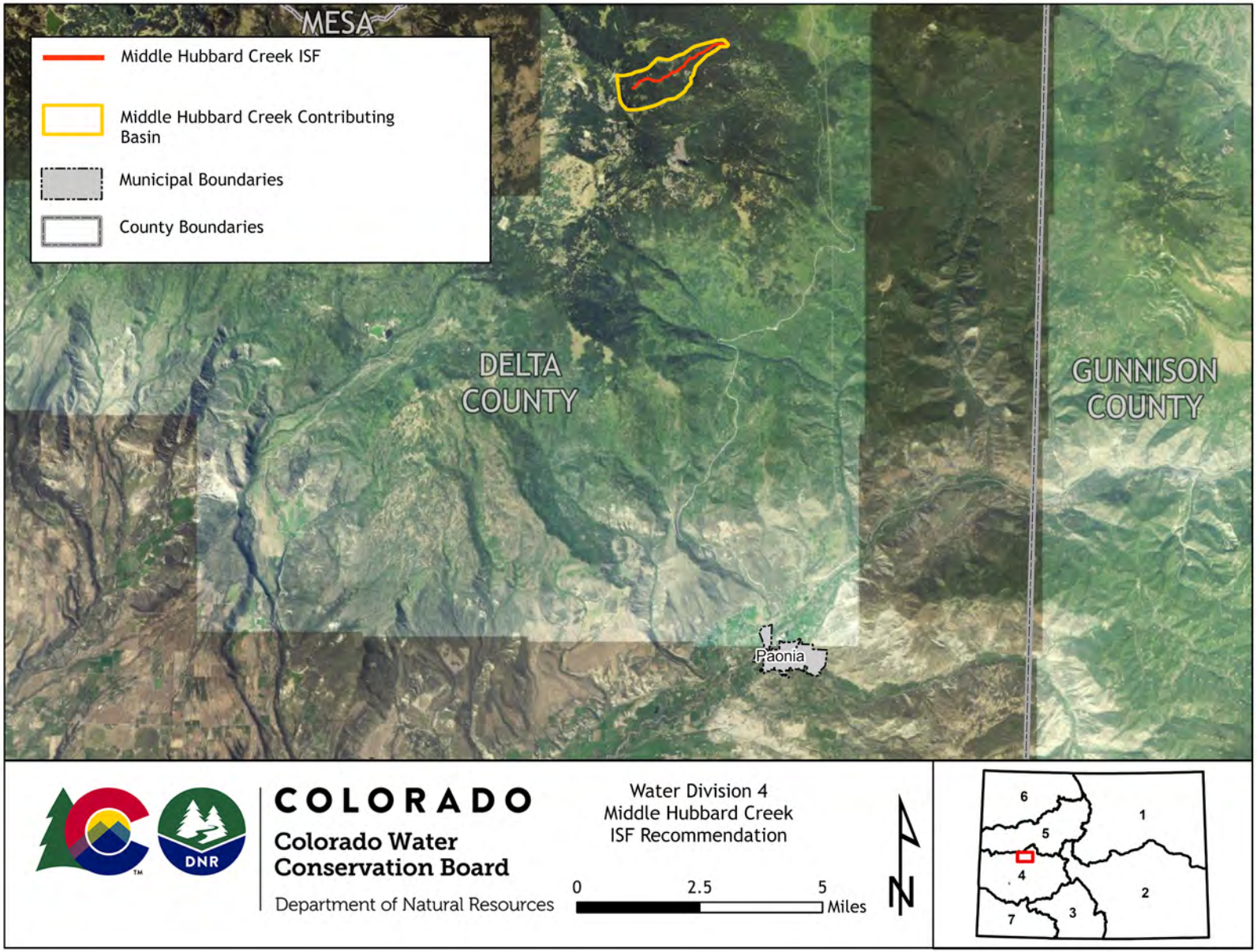
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

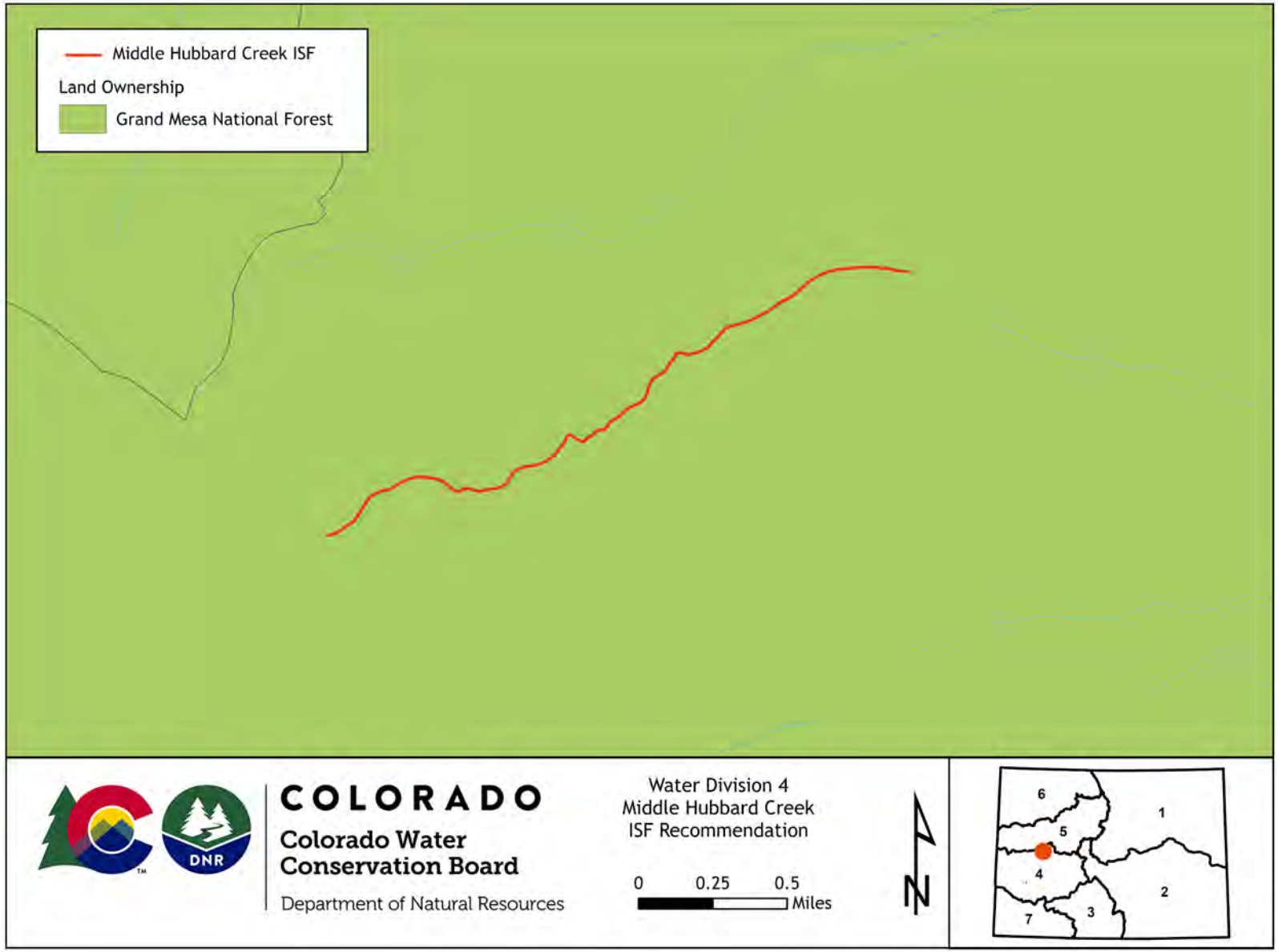
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

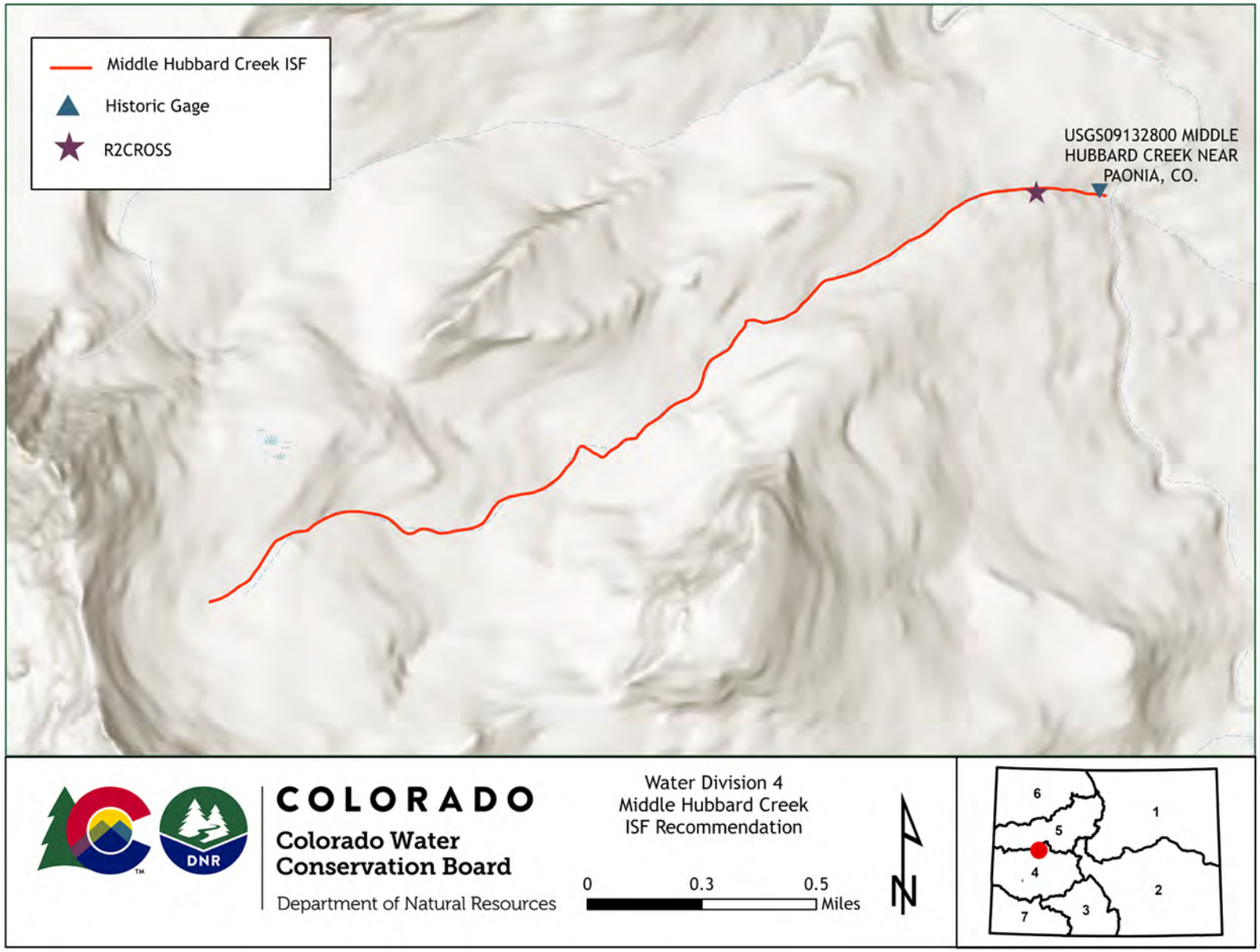
VICINITY MAP



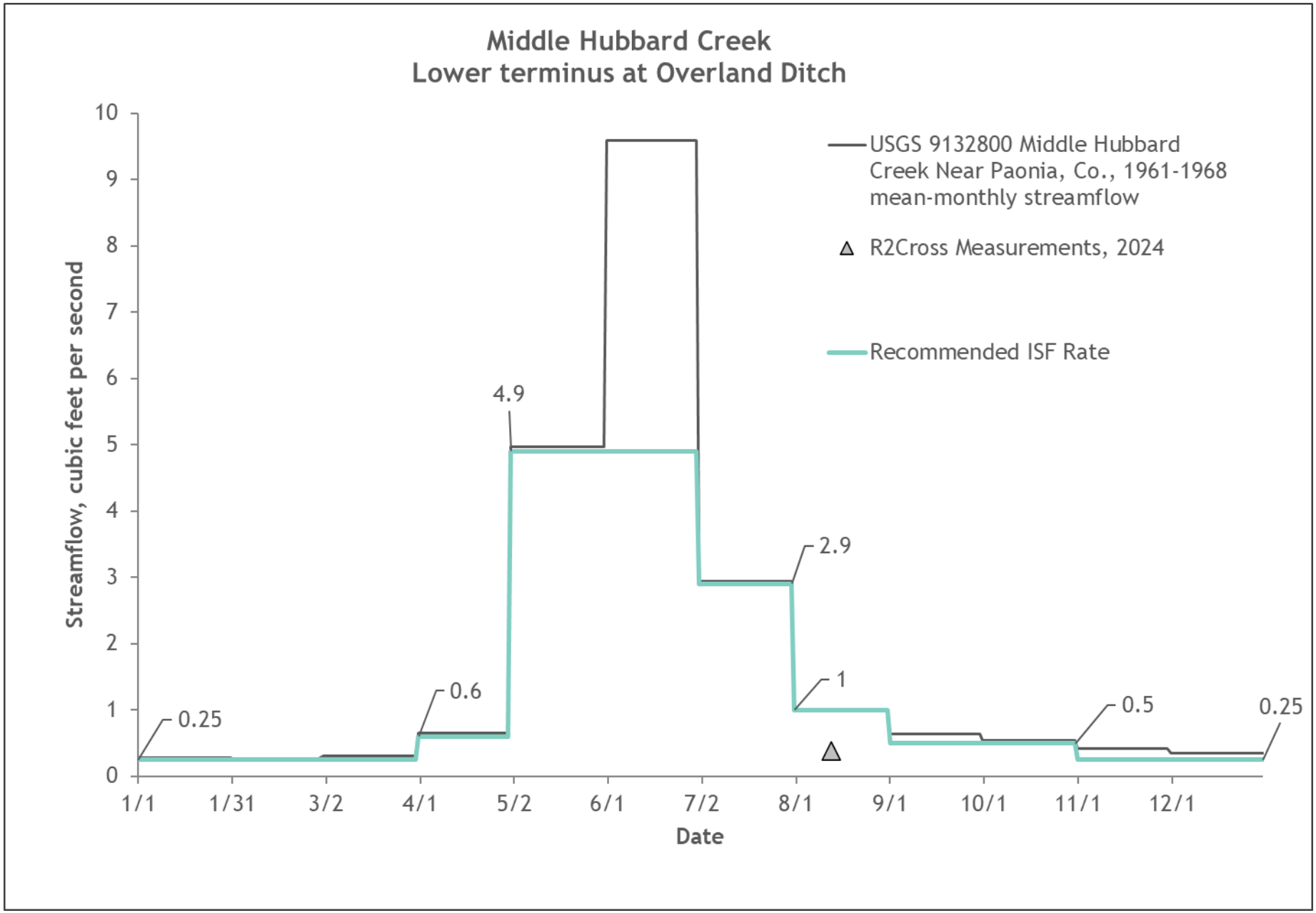
LAND OWNERSHIP MAP



SITE MAP


Middle Hubbard Creek ISF
Historic Gage
R2CROSS
USGS09132800 MIDDLE HUBBARD CREEK NEAR PAONIA, CO.
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
Middle Hubbard Creek
ISF Recommendation
0
0.3
0.5
Miles
N
6
1
5
4
2
7
3

COMPLETE HYDROGRAPH



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:	6.7 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

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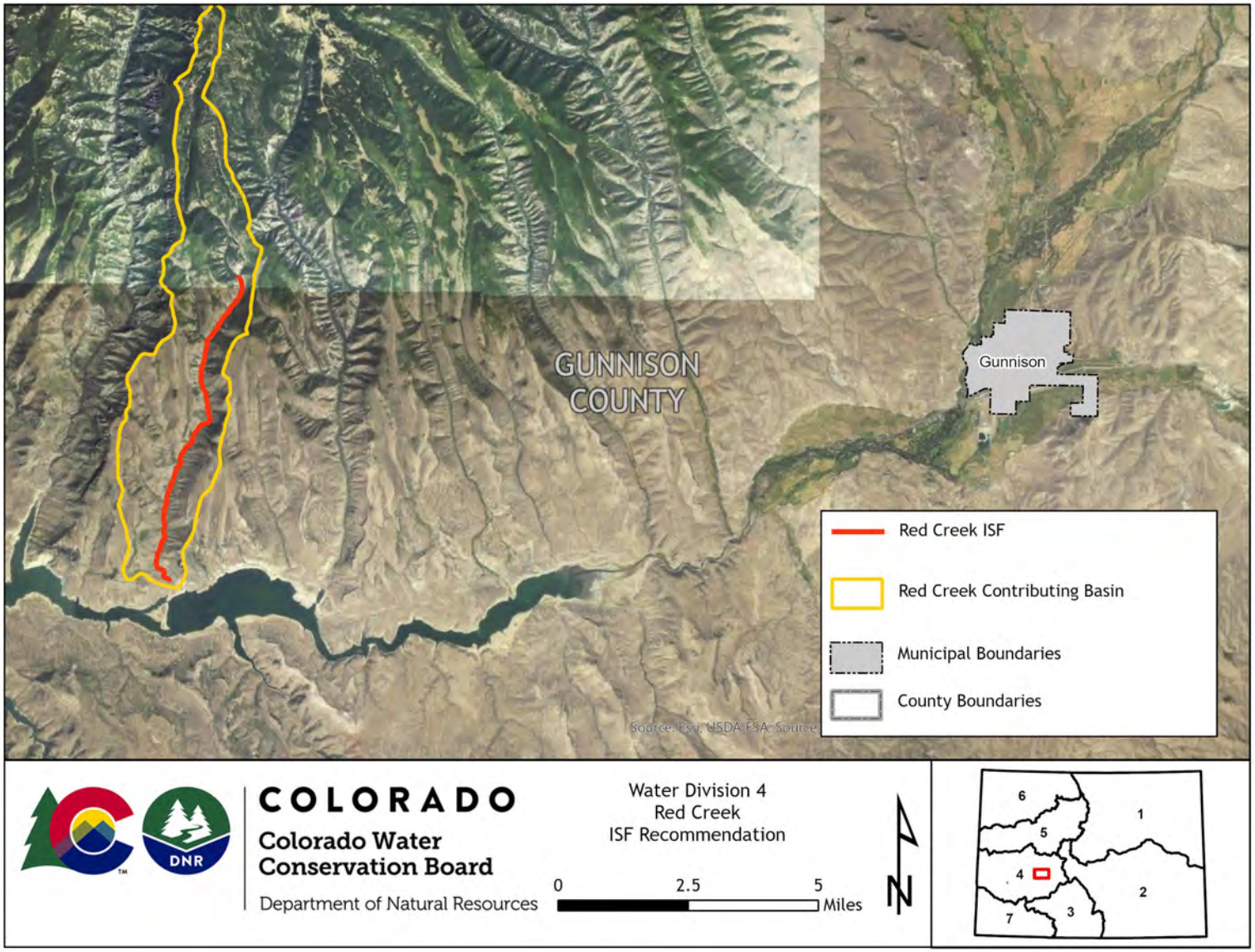
Metadata Descriptions

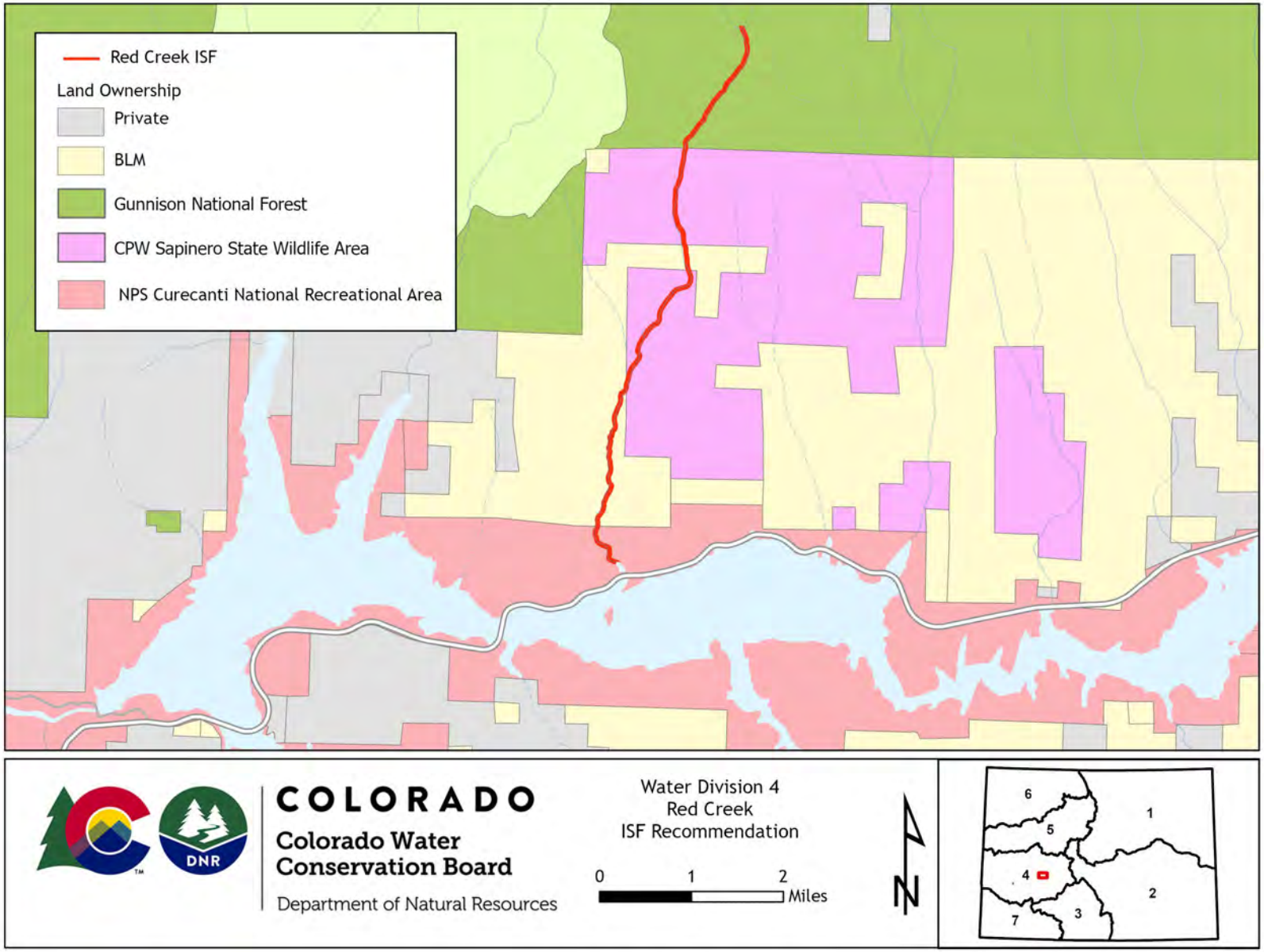
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

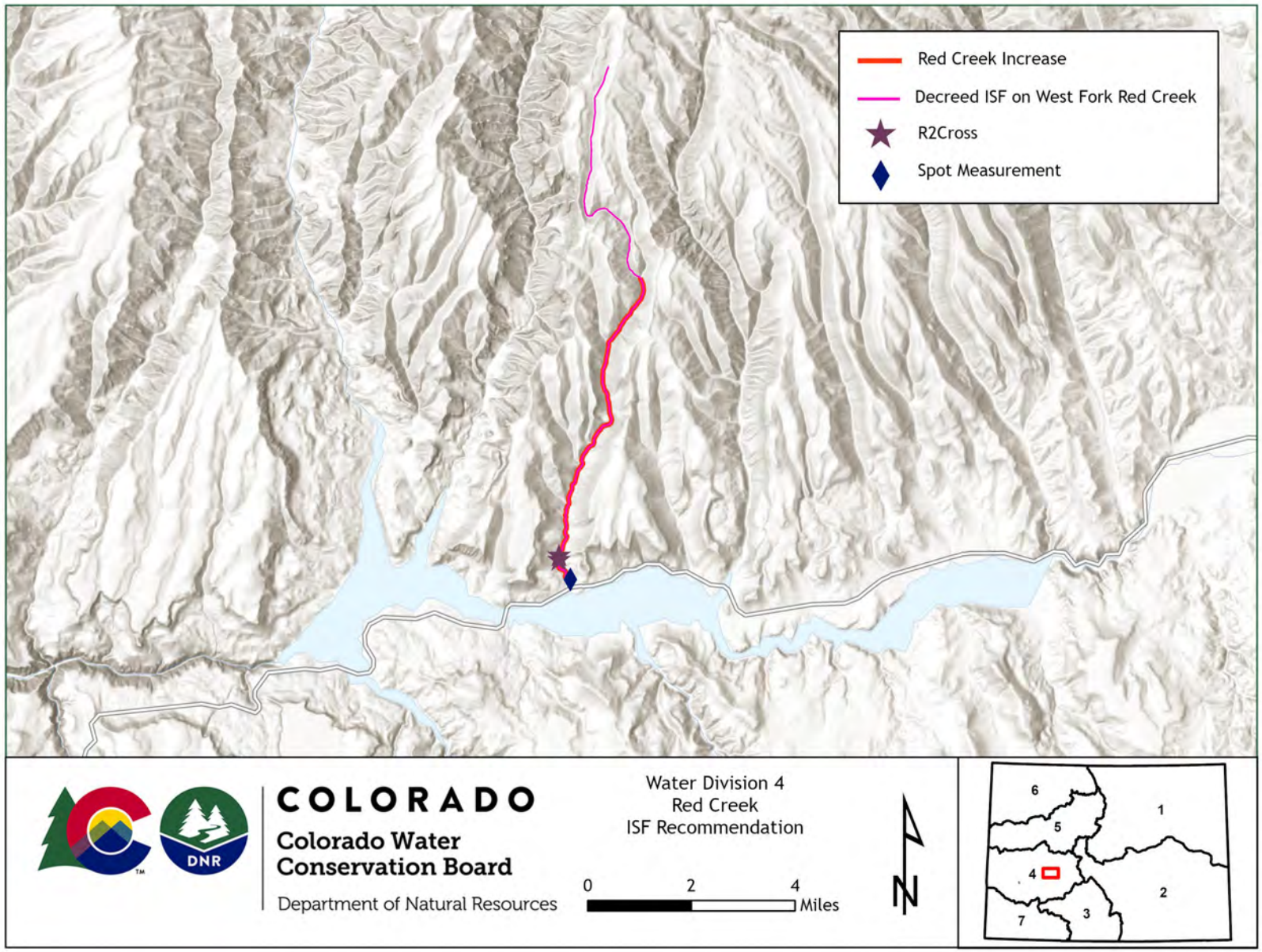
VICINITY MAP



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
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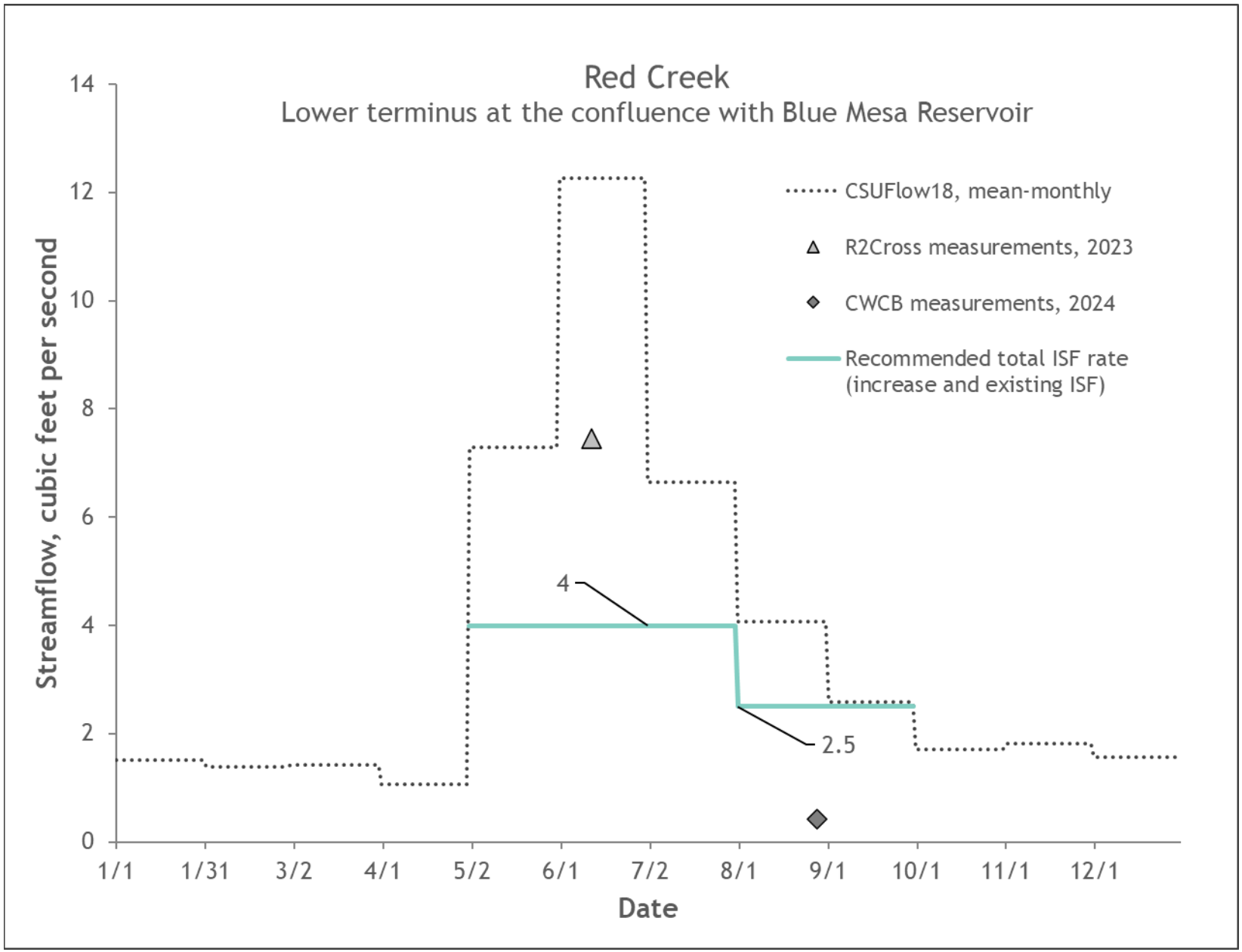
COMPLETE HYDROGRAPH



Unnamed Tributary to East Fork Dry Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4241879.05 UTM East: 227553.33
LOWER TERMINUS:	confluence with East Fork Dry Creek at UTM North: 4245975.82 UTM East: 227567.86
WATER DIVISION/DISTRICT:	4/41,68
COUNTY:	Montrose, Ouray
WATERSHED:	Uncompahgre
CWCB ID:	23/4/A-001
RECOMMENDER:	Colorado Parks and Wildlife (CPW)
LENGTH:	2.75 miles
FLOW RECOMMENDATION:	0.25 cfs (11/01 - 02/29) 0.5 cfs (03/01 - 03/31) 1.6 cfs (04/01 - 04/30) 3.2 cfs (05/01 - 06/30) 1.6 cfs (07/01 - 07/31) 0.5 cfs (08/01 - 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 (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

CPW recommended that the CWCB appropriate an ISF water right on a reach of an unnamed tributary to East Fork Dry Creek at the ISF Workshop in January 2022. The unnamed tributary to East Fork Dry Creek is located within Montrose and Ouray Counties and is approximately 15 miles southwest of the City of Montrose (See Vicinity Map). The stream originates on the Uncompahgre Plateau and flows north until it reaches the confluence with East Fork Dry Creek. Unnamed tributary to East Fork Dry Creek is a tributary to Dry Creek which is a tributary to the Uncompahgre River.

The proposed ISF reach extends from headwaters downstream to the confluence with East Fork Dry Creek for a total of 2.75 miles. Most of the proposed reach is on public lands managed under the Uncompahgre National Forest, approximately 8% of the reach is on private land located near the lower terminus (See Land Ownership Map). CPW is interested in protecting this stream to preserve the natural environment which includes native 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 the unnamed tributary to East Fork Dry Creek was sent to the mailing list in November 2024, March 2024, March 2023, and March 2022. Staff sent letters to identified landowners adjacent to the unnamed tributary to East Fork Dry Creek based on information from the county assessor's website. Public notices about this recommendation were published in the Montrose Daily Press on December 7, 2024 and in the Ouray County Plaindealer on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Montrose and Ouray County Boards of County Commissioners on November 21, 2022 and October 8, 2024, respectively. In addition, staff spoke with Eric Weig, District 68 Water Commissioner, on June 26, 2024 regarding water availability, which confirmed staff's understanding of hydrology and adminstative practices on the unnamed tributary to East Fork Dry 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 unnamed tributary to East Fork Dry Creek is a first order headwater stream and a tributary to East Fork Dry Creek. It flows northerly off the Uncompahgre Plateau into the Uncompahgre River near the City of Montrose. The hydrology of this creek is snowmelt driven and influenced by late-summer monsoonal moisture. The unnamed tributary to East Fork Dry Creek is a relatively high-gradient, confined channel with substrate that ranges from cobble to gravel and sand. Fish habitat is complex with large woody debris in the channel, as well as beaver dam complexes and undercut banks. Large woody debris and undercut banks provide cover for trout. There is ample overhead shading supporting suitable stream temperatures. The creek supports a healthy riparian environment and a diverse macroinvertebrate community with stonefly, caddisfly, midges, and roundworms observed in the field.

The unnamed tributary to East Fork Dry Creek supports a self-sustaining population of Colorado River cutthroat trout (CRCT) of the Gunnison Basin lineage (Table 1). CRCT are a state species of special concern and considered a federally sensitive species (CPW, 2015). Length-frequency data indicates multiple age classes surveyed by CPW in 2017 reinforces that the cutthroat trout in the unnamed tributary to East Fork Dry Creek are a self-sustaining population. Multiple cutthroat trout were observed during the 2020 site visit taking refuge in large pools.

Table 1. List of species identified in Unnamed tributary to East Fork Dry Creek.

Species Name	Scientific Name	Status
Colorado River cutthroat trout- Gunnison Basin Lineage	*Oncorhynchus clarkii pleuriticus*	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

CPW 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 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

CPW 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 1.4 cfs and a summer flow of 3.2 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 unnamed tributary to East Fork Dry Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/01/2021, 1	12.9	1.06	0.93	3.64
05/26/2022, 1	14.5	1.49	1.78	2.81
			1.36	3.23

ISF Recommendation

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

0.25 cfs is recommended from November 1 to February 29; this flow rate has been reduced due to water availability limitations. This flow rate supports baseflow conditions in the stream and will maintain adequate wetted perimeter during the overwintering period. Sufficient resting habitat will be maintained in deep pools and glides created from large woody debris in the channel.

0.5 cfs is recommended from March 1 to March 31; this flow rate has been reduced due to water availability limitations. This rate follows the rising limb of the streams hydrograph and will support sufficient wetted perimeter as fish transition to more metabolic activity coming out of overwintering conditions.

1.6 cfs is recommended from April 1 to April 30; this flow rate has been reduced due to water availability limitations. This rate follows the rising limb of the streams hydrograph and maintains adequate wetted perimeter and velocity criteria. It will support fish as they transition into more metabolic activity as ice cover decreases and flows start to rise during the beginning of snowmelt runoff.

3.2 cfs is recommended from May 1 to June 30 and meets all three hydraulic criteria during spring snowmelt through its recession. This flow rate will support cutthroat trout when they are active feeding and during spawning conditions.

1.6 cfs is recommended from July 1 to July 31; this flow rate has been reduced due to water availability limitations. This flow rate follows the falling limb of the streams hydrograph and will maintain adequate wetted perimeter and velocity that allows of oxygenation supporting production of macroinvertebrates, the cutthroat trout food base, in riffles.

0.5 cfs is recommended from August 1 to October 31; this flow rate has been reduced due to water availability limitations. This rate follows the transition from falling limb to baseflow of the streams hydrograph and will maintain adequate wetted perimeter in the channel providing sufficient areas of holding habitat and refuge in features like pools and glides.

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 the unnamed tributary to East Fork Dry Creek is 2.3 square miles, with an average elevation of 9,509 feet and average annual precipitation of 24.3 inches. The unnamed tributary to East Fork Dry Creek is a high elevation, steep gradient, snowmelt driven hydrologic system. The basin has natural streamflow conditions and is anthropogenically unaltered.

Water Rights Assessment

There are no diversions within the reach of unnamed tributary to East Fork Dry Creek recommended for an ISF. There is one US Forest Service Federal Reserve reservoir water right high in the basin which was appropriated in 1905 (WDID 6807033) though photographic review does not indicate that a reservoir has been constructed.

Data Collection and Analysis

Representative Gage Analysis

There are no current or historic gages on the unnamed tributary to East Fork Dry Creek. Staff investigated nearby gages for similarities in basin characteristics and hydrology and found no gages were sufficiently similar to be used to estimate streamflow on the unnamed tributary to East Fork Dry Creek.

Multiple Regression Model

The CSUFlow18 regression model predicts mean-monthly flow in the unnamed tributary to East Fork Dry Creek and provides the best estimate for streamflow conditions.

Site Visit Data

CWCB staff joined CPW on a site visit during data collection for R2Cross modeling on 5/26/2022.

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 the unnamed tributary to East Fork Dry Creek.

MATERIAL INJURY

If decreed, the proposed ISF on the unnamed tributary to East Fork Dry 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 Parks and Wildlife, 2015, State Wildlife Action Plan: A strategy for conserving wildlife in Colorado. https://cpw.widencollective.com/assets/share/asset/nbenjdfemj

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

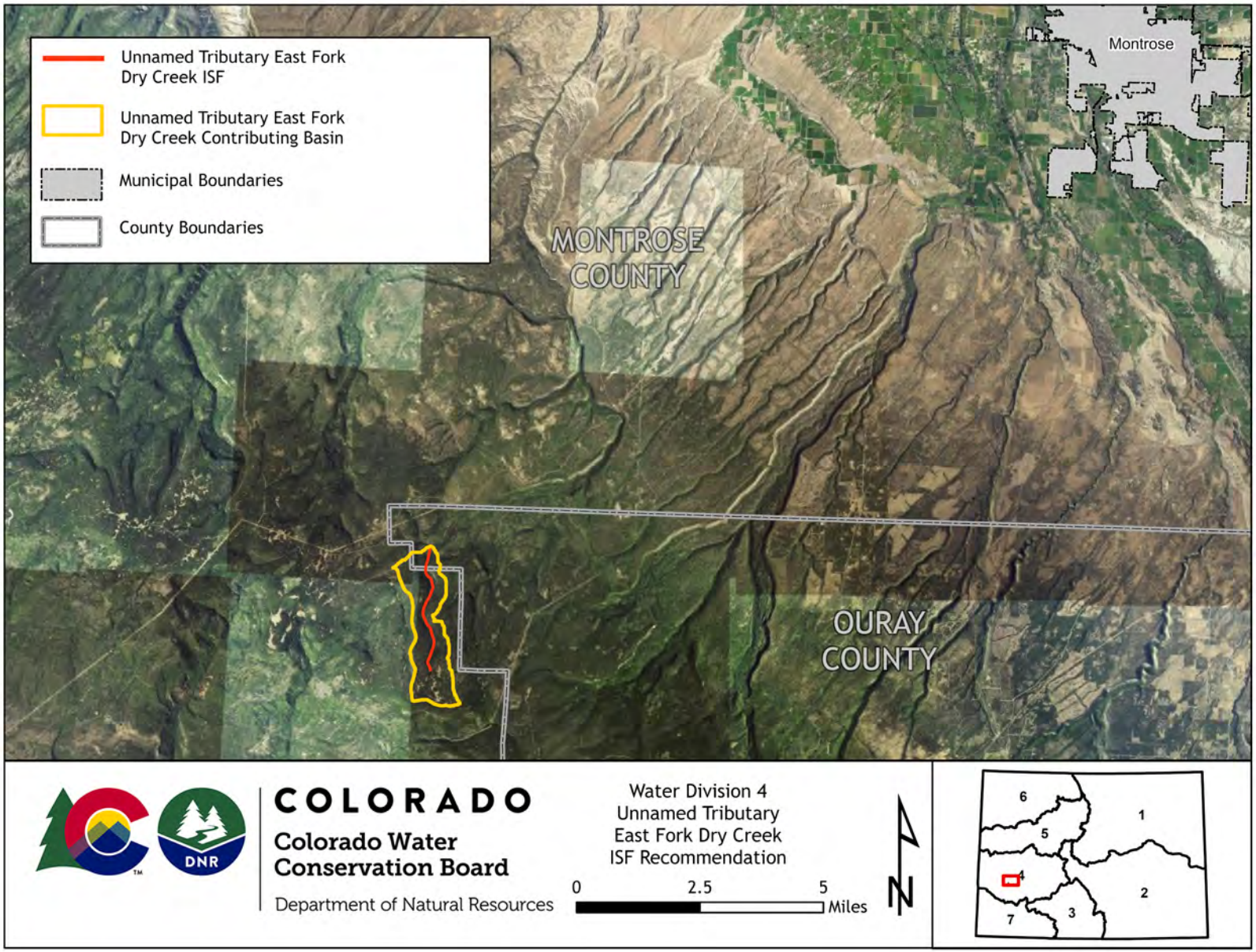
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

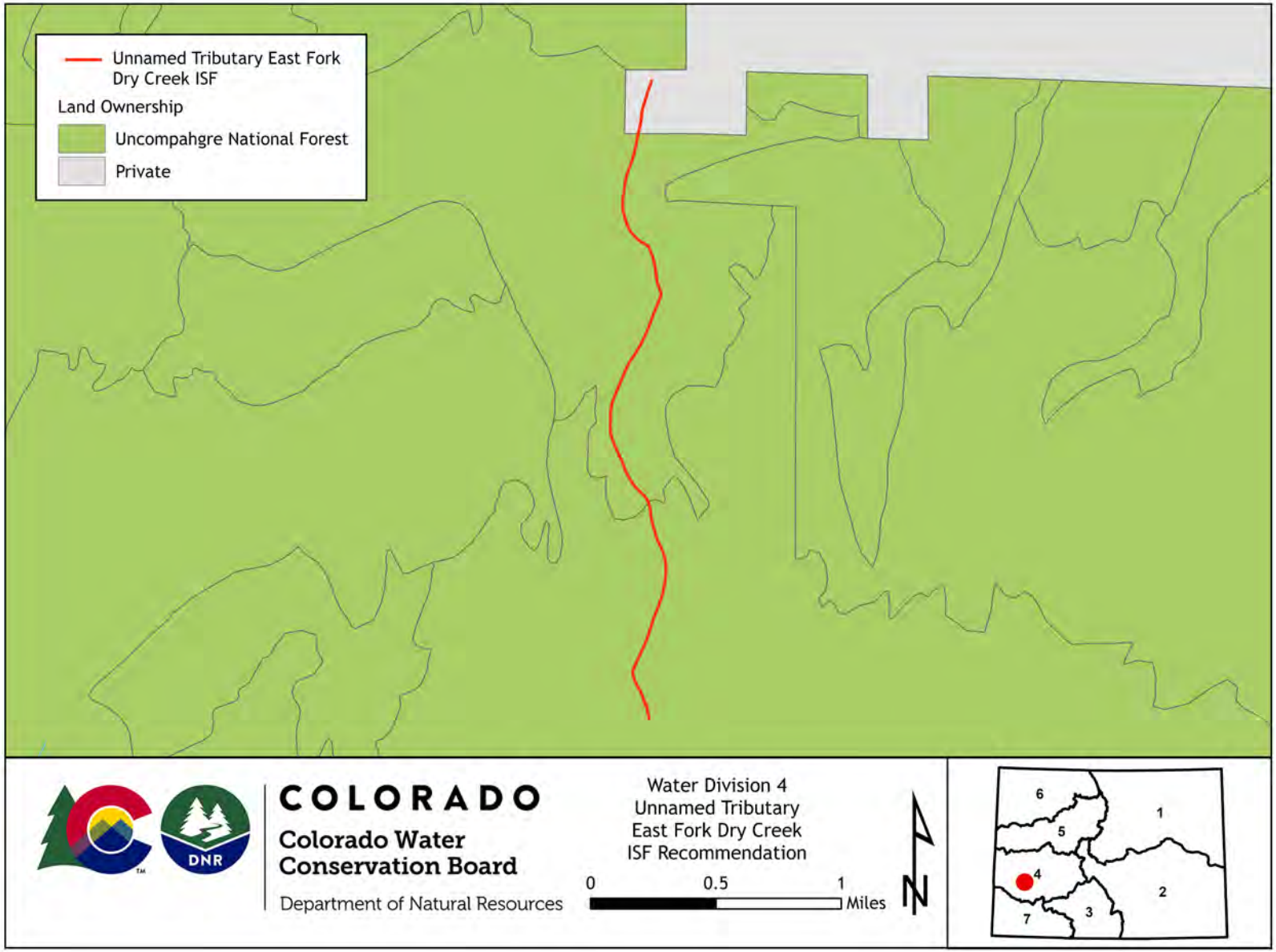
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

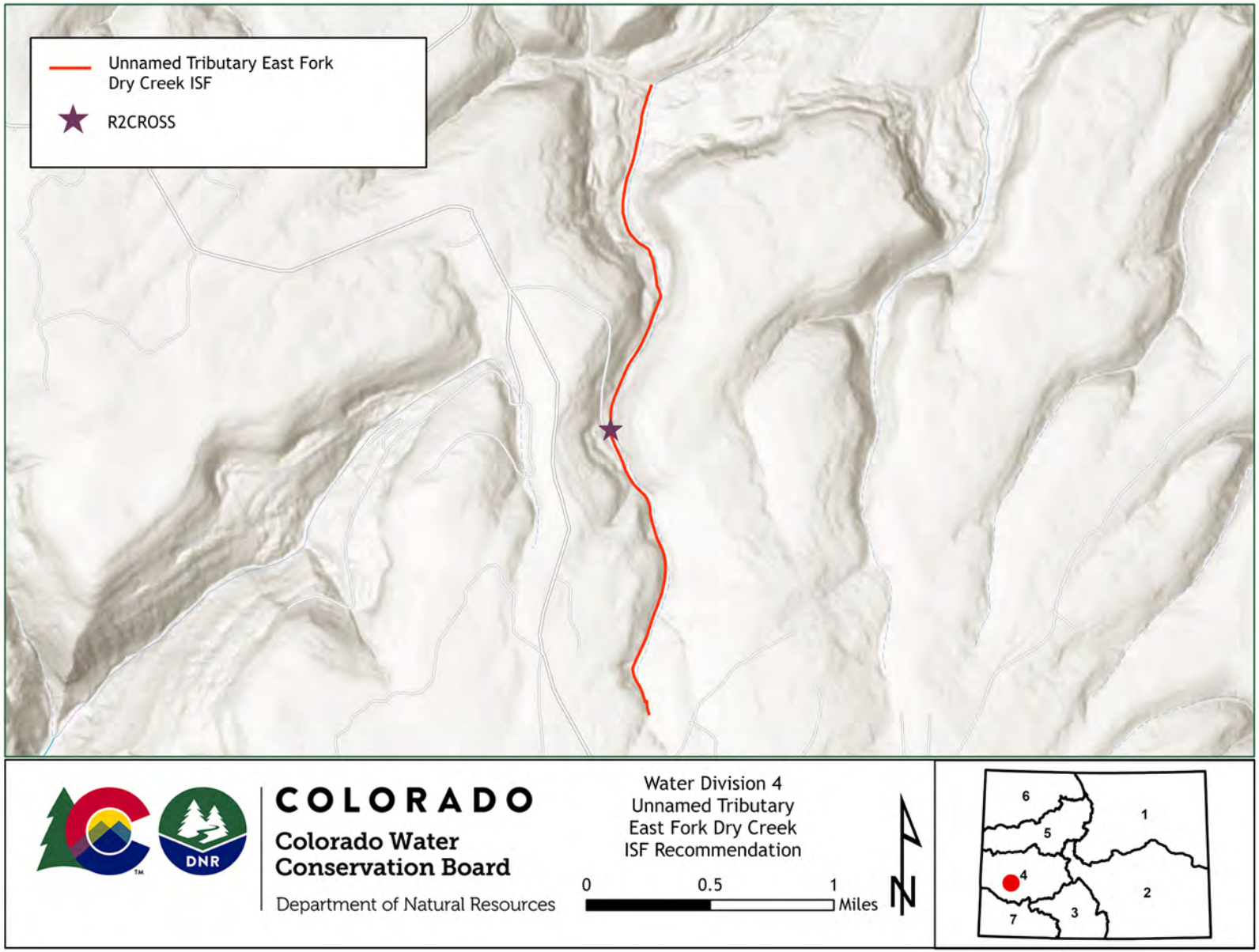
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


Unnamed Tributary East Fork
Dry Creek ISF
R2CROSS
COLORADO
Colorado Water
Conservation Board
Department of Natural Resources
Water Division 4
Unnamed Tributary
East Fork Dry Creek
ISF Recommendation
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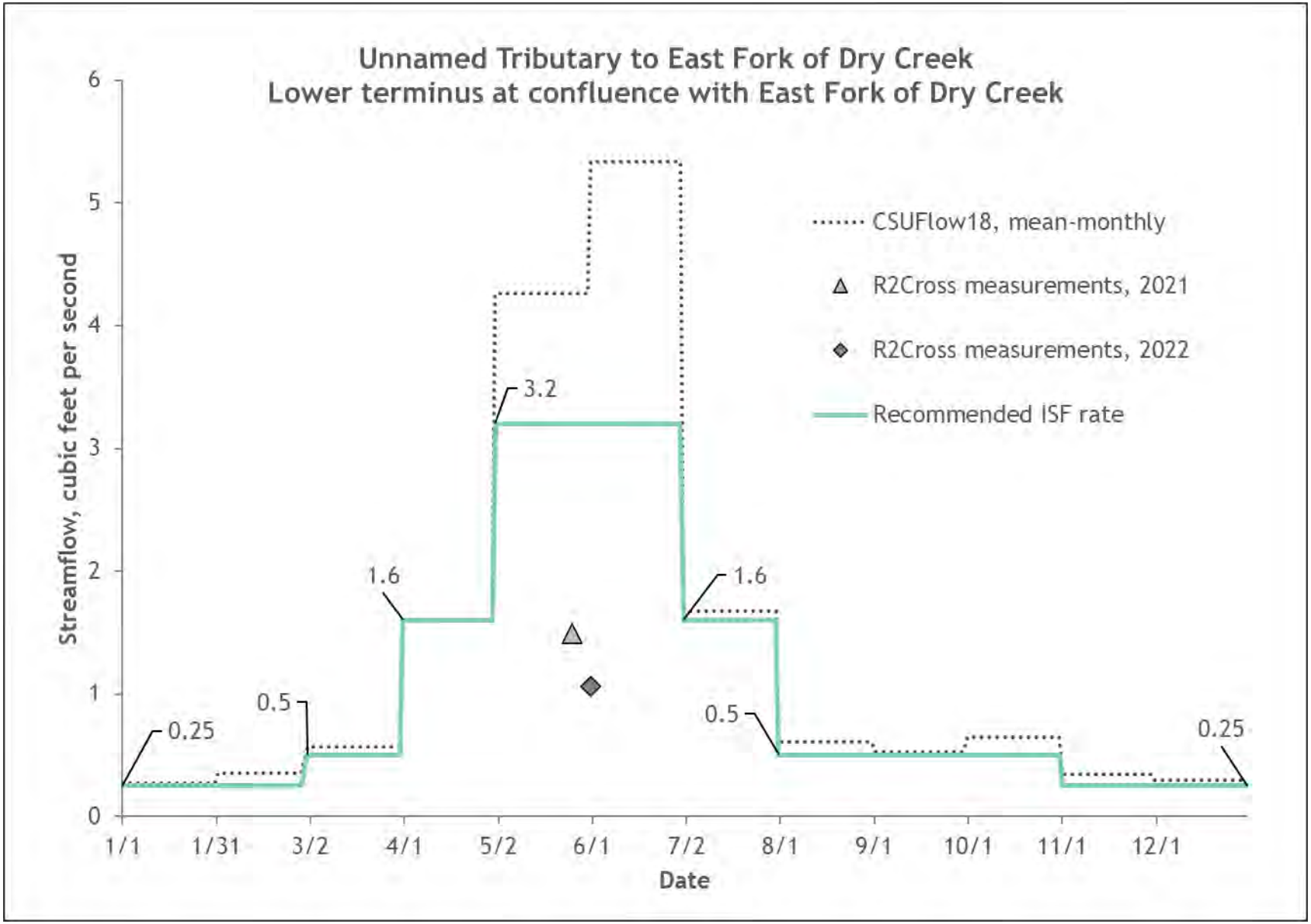
COMPLETE HYDROGRAPH



West Hubbard Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4322507.68 UTM East: 270549.71
LOWER TERMINUS:	Overland Ditch at UTM North: 4323616.26 UTM East: 273785.08
WATER DIVISION/DISTRICT:	4/40
COUNTY:	Delta
WATERSHED:	North Fork Gunnison
CWCB ID:	21/4/A-012
RECOMMENDER:	Colorado Parks and Wildlife (CPW)
LENGTH:	2.32 miles
FLOW RECOMMENDATION:	0.4 cfs (10/01 - 04/30) 4.0 cfs (05/01 - 05/14) 6.5 cfs (05/15 - 07/15) 3.2 cfs (07/16 - 07/31) 1.3 cfs (08/01 - 09/30)

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

CPW recommended that the CWCB appropriate an ISF water right on a reach of West Hubbard Creek at the ISF Workshop in January 2020. West Hubbard Creek is located within Delta County and is approximately 10.5 miles north of the Town of Paonia (See Vicinity Map). The stream originates near the base of Mount Derline and flows west and northwest until it reaches the confluence with Hubbard Creek. West Hubbard Creek is a tributary to Hubbard Creek, which is a tributary to the North Fork of the Gunnison River, which is a tributary to the Gunnison River.

The proposed ISF reach extends from the headwaters downstream to the Overland Ditch for a total of 2.32 miles. The proposed reach is entirely on public lands managed under the Grand Mesa National Forest. CPW is interested in protecting this stream to preserve the natural environment which includes native 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 West Hubbard Creek was sent to the mailing list in November 2024, March 2024, March 2023, March 2022, March 2021, and March 2020. A public notice about this recommendation was also published in the Delta County Independent on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Delta County Board of County Commissioners on October 1, 2024. CWCB and CPW staff met with members of the North Fork Gunnison Water Users Association and Raquel Flinker from the Colorado River District on November 28, 2023 about the Middle Hubbard Creek, Main Hubbard Creek, and West Hubbard Creek ISF recommendations. CWCB and CPW staff also met with members of the Ragged Mountain Water Users Association and Raquel Flinker to discuss the recommendations on April 13, 2024. In addition, staff met with Luke Reschke, District 40 Lead Water Commissioner, and Doug Christner, District 40 Water Commissioner, about water rights and water availability on all three streams on September 26,2023.

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.

West Hubbard Creek is a first order headwaters stream and is a tributary of Hubbard Creek. It flows into the North Fork Gunnison near the town of Somerset. The creek flows through a narrow valley densely forested with stands of pine and aspen. The ISF reach has a high gradient channel with substrate that ranges from boulder to small cobbles to gravels. Fish habitat is complex and includes significant undercut banks, pocket pools, and deep pools created by boulders and large woody debris, both mature and recent, in the channel. There are some riffles in the reach that may be suitable for spawning though most of the riffle features are higher gradient. Step-pools are the dominant habitat features utilized by fish. There is plenty of overhead shading and deep pools which provide temperature refuge. The creek supports a healthy riparian environment with diverse riparian plants and abundant mosses; two species of caddisfly, stonefly larvae, and mayfly were observed during site visits.

West Hubbard Creek supports a self-sustaining population of Colorado River cutthroat trout (CRCT) of the Gunnison Basin lineage (Table 1). CRCT are a state species of special concern and are considered a federally sensitive species (CPW, 2015). CPW conducted fish surveys in 2009 and found multiple ages classes based on length frequency data. Multiple age classes indicate that the cutthroat trout population are a self-sustaining population which have natural recruitment. While brook trout have recently invaded West Hubbard Creek, CPW is working with the Forest Service to design and build a fish barrier. Once that fish barrier construction project is complete, CPW plans to remove brook trout which have invaded the upper portions of the creek and recolonize native cutthroat trout to restore the population.

Table 1. List of species identified in West Hubbard Creek.

Species Name	Scientific Name	Status
Colorado River cutthroat trout – Gunnison Basin Lineage	*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

CPW 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 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

CPW 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 0.40 cfs and a summer flow of 6.5 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 West Hubbard Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
08/21/2023, 1	11.9	0.86	0.28	8.60
08/21/2023, 2	11.9	0.86	0.52	4.45
			0.40	6.53

ISF Recommendation

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

0.40 cfs is recommended from October 1 to April 30. This rate meets two of three criteria for baseflow conditions maintaining adequate depth and wetted perimeter in riffles and providing sufficient holding habitats in pools. This will support fish during overwintering periods when metabolic activity is limited and will allow for movement throughout the channel over critical riffle features.

4.0 cfs is recommended from May 1 to May 14; this flow recommendation is reduced due to water availability limitations. This rate simulates snowmelt runoff initiation and maintains adequate wetted perimeter and depth, as well as swifter velocities as ice cover decreases.

6.5 cfs is recommended from May 15 to July 15. This recommendation meets all three hydraulic criteria for spring runoff through its recession. This flow rate will support fish when they are active feeding and spawning. This higher flow rate will support ideal conditions for cutthroat trout spawning which occurs in the early months of summer, as well as productivity of the macroinvertebrate community.

3.2 cfs is recommended from July 16 to July 31; this flow recommendation is reduced due to water availability limitations. It maintains adequate depth and wetted perimeter, as well as swift velocities, that support foraging, rearing and refuge habitats for fish, as well as a productive macroinvertebrate community.

1.3 cfs is recommended from August 1 to September 30; this flow recommendation is reduced due to water availability limitations. This flow recommendation will maintain adequate depth and wetted perimeter in riffles and supports fish movement throughout the channel. It will also provide good habitat availability in riffles, glides, and pools to facilitate rearing and growth during the later part of summer and fall.

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 West Hubbard Creek is 2.9 square miles, with an average elevation of 10,362 feet and average annual precipitation of 32.4 inches. West Hubbard Creek is a high elevation, steep gradient, snowmelt driven hydrologic system. The reach experiences variable timing and magnitude of snowmelt, often peaking in mid-summer and supports baseflows throughout the late season.

Water Rights Assessment

There are no water rights within the reach of West Hubbard Creek recommended for an ISF water right.

Data Collection and Analysis

Historic Gage Analysis

The USGS operated a streamflow gage on West Hubbard Creek from 1960 to 1973 at a location near the lower terminus of the proposed reach (West Hubbard Creek Near Paonia, Co., USGS ID: 9132900). This gage record was compared to a nearby climate station to evaluate how the historical record compares to a longer record. Montrose No 2 (ID: USC00055722) is approximately 40 miles south of the proposed reach and climate data was analyzed from 1960 to present. When compared to the most recent thirty years of data the thirteen years of gaged data had slightly above average precipitation with one year above the 75th percentile (1965) and one year below the 25th percentile (1966).

Daily gage data was used to calculate median daily streamflow for the entire period of record (POR) and sufficient data exists to calculate a 95% confidence interval for median streamflow (See Complete Hydrograph). Median hydrology with a confidence interval is used to analyze water availability for the recommended reach. Streamflow peak in June before slowly receding to baseflow conditions by September.

Site Visit Data

CWCB staff accompanied CPW staff in a data collection field campaign for West Hubbard Creek on August 21, 2023.

Water Availability Summary

The hydrograph shows median daily streamflow and the upper confidence interval for median daily streamflow based on the historic gage on West Hubbard Creek and includes the proposed ISF rate. The proposed ISF flow rate is below the upper confidence interval of median streamflow. Staff concludes that water is available for appropriation on West Hubbard Creek.

MATERIAL INJURY

If decreed, the proposed ISF on West Hubbard 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 Parks and Wildlife, 2015, State Wildlife Action Plan: A strategy for conserving wildlife in Colorado. https://cpw.widencollective.com/assets/share/asset/nbenjdfemj

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

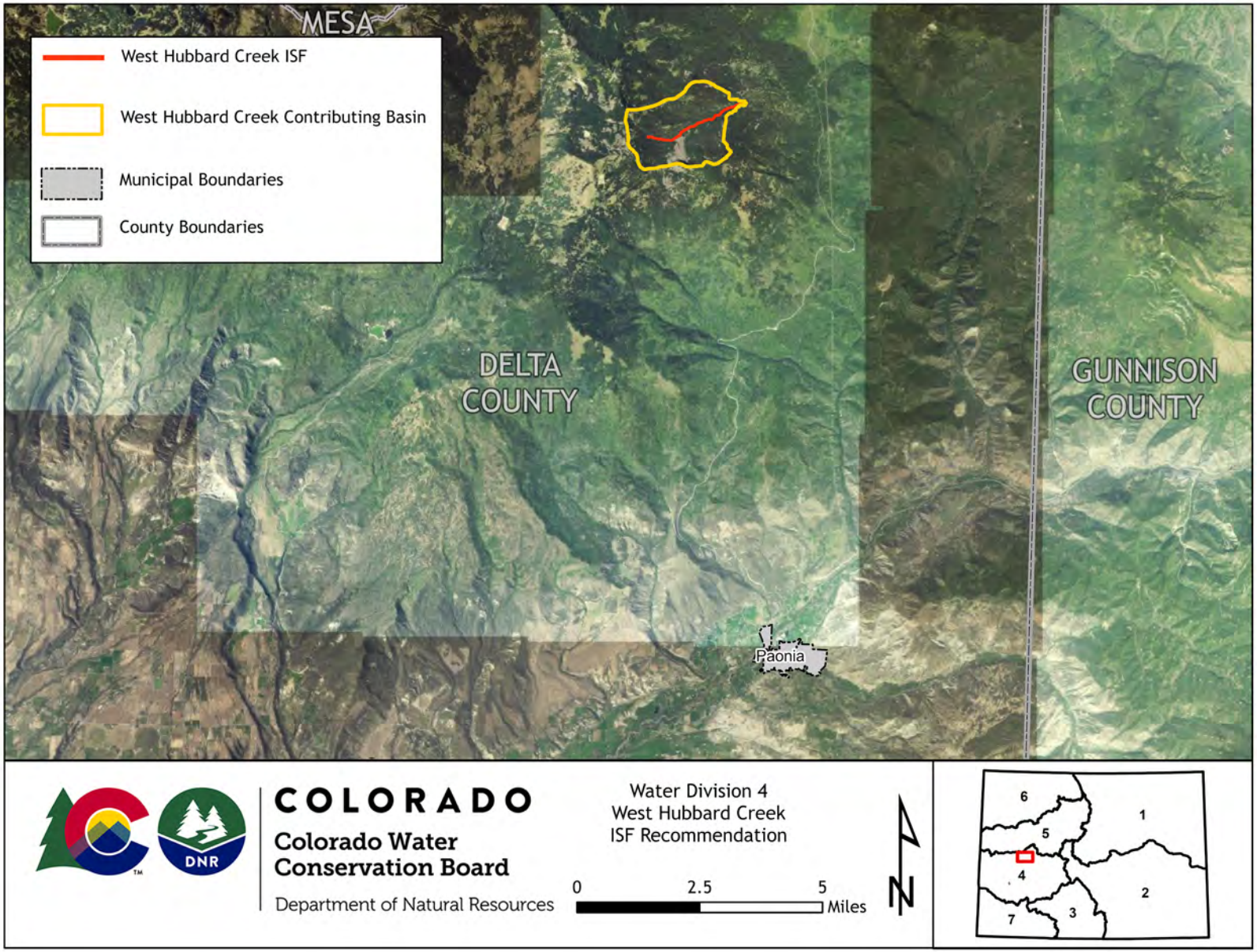
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

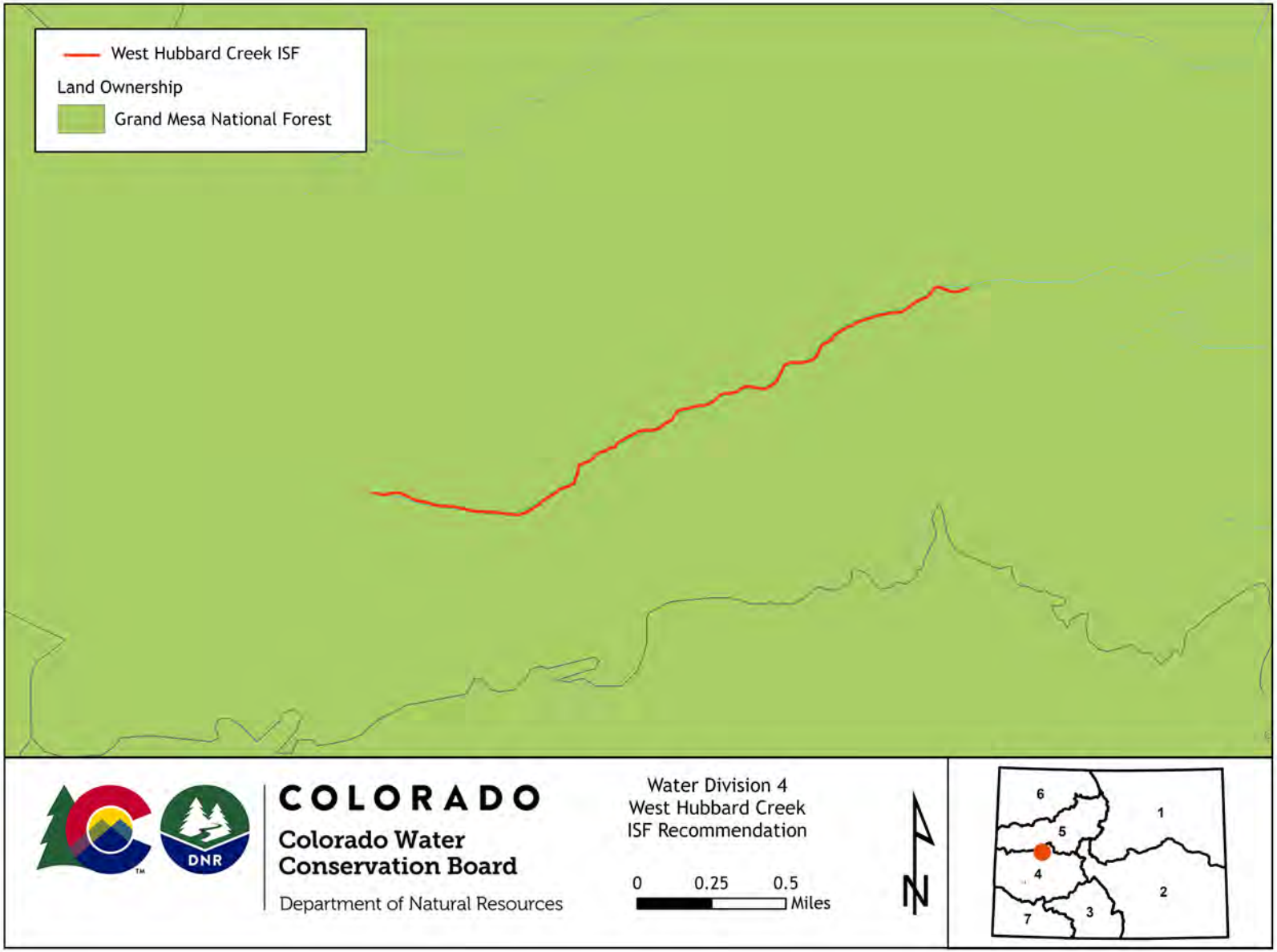
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

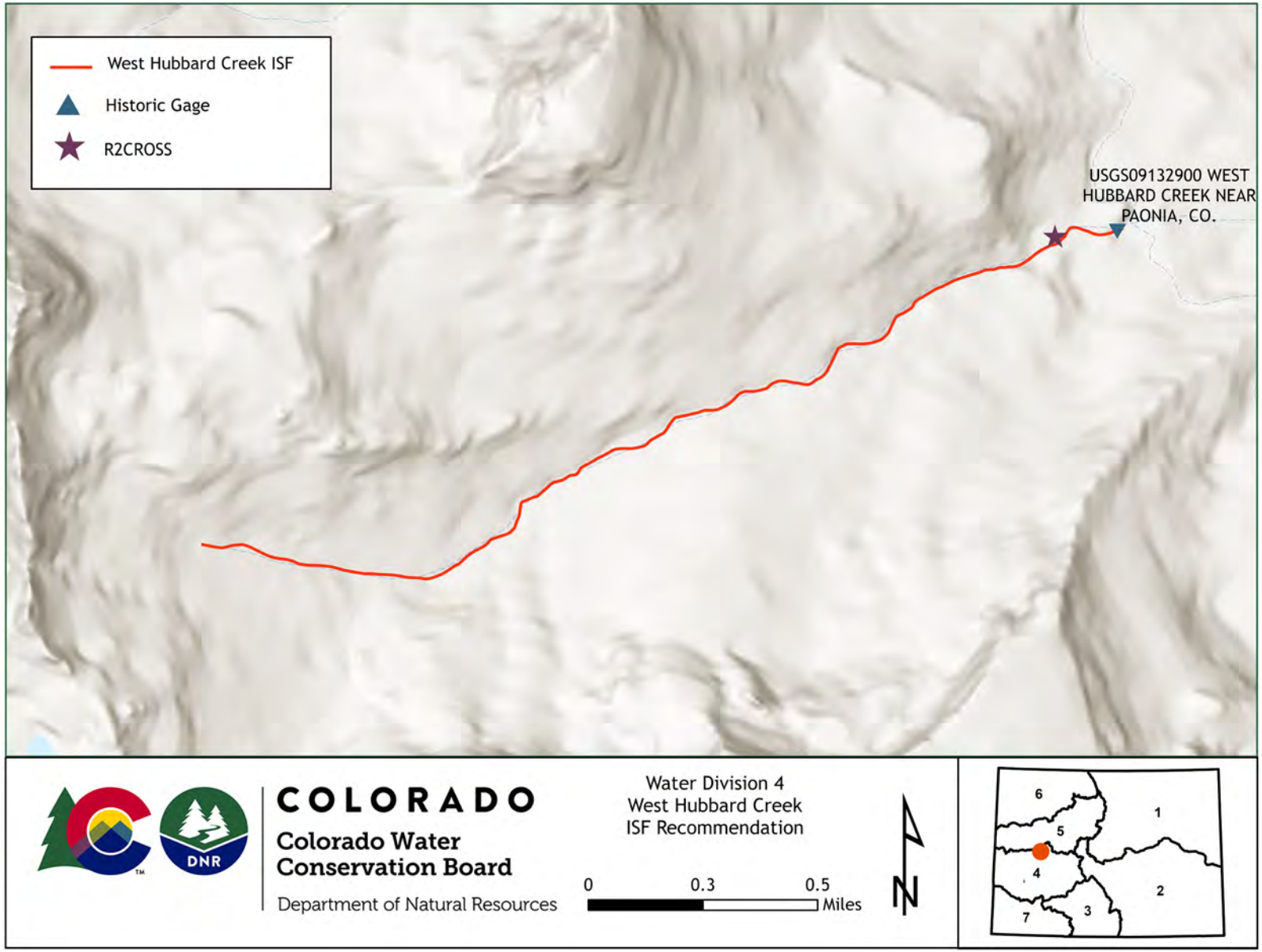
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


West Hubbard Creek ISF
Historic Gage
R2CROSS
USGS09132900 WEST HUBBARD CREEK NEAR PAONIA, CO.
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
West Hubbard Creek
ISF Recommendation
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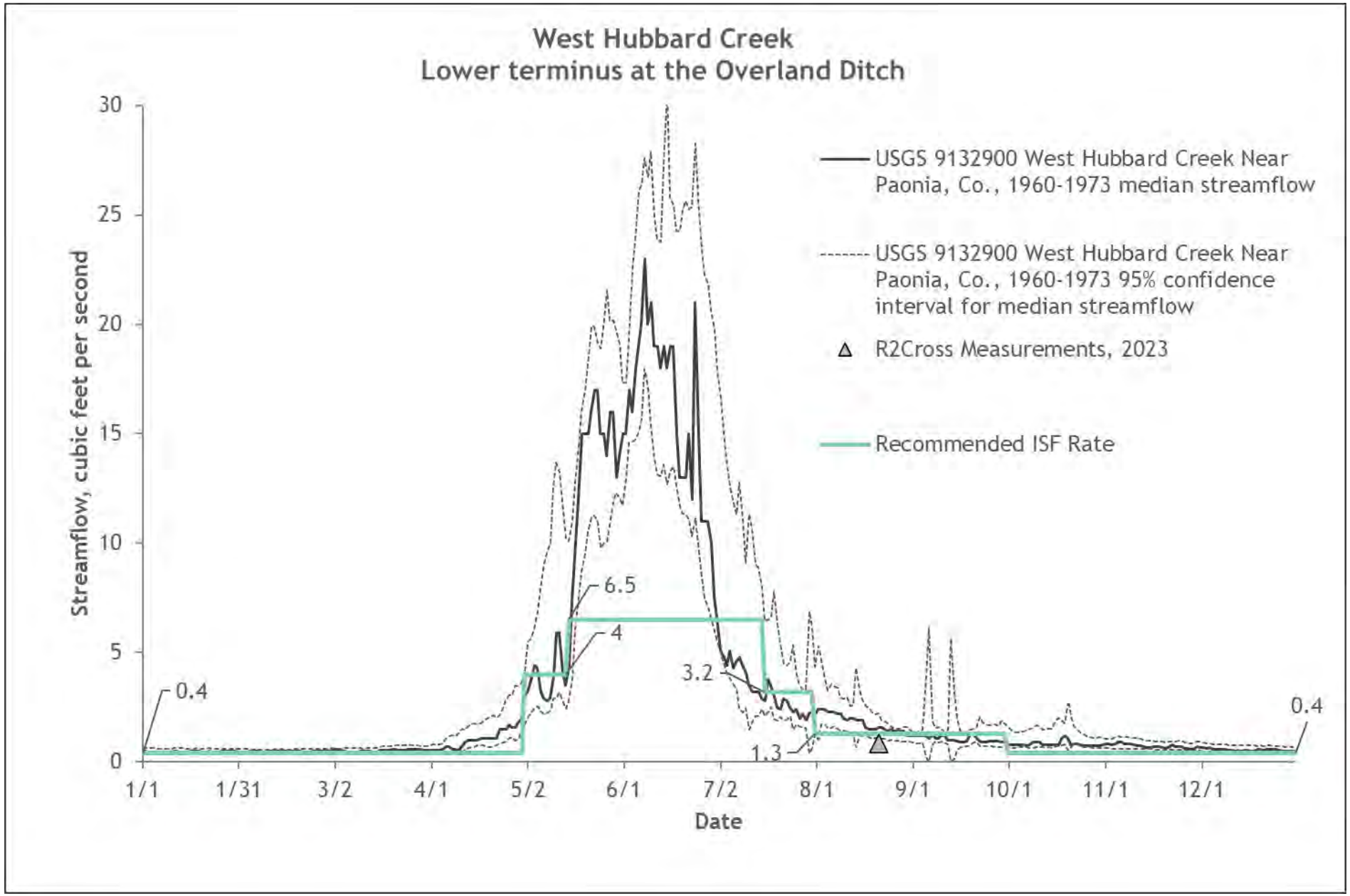
0.5
Miles
N
6
1
5
4
2
7
3

COMPLETE HYDROGRAPH



Coon Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	confluence with West Branch Coon Creek at UTM North: 4329805.62 UTM East: 232298.01
LOWER TERMINUS:	100 ft upstream from the South Side Canal headgate at UTM North: 4333184.17 UTM East: 229006.49
WATER DIVISION/DISTRICT:	5/72
COUNTY:	Mesa
WATERSHED:	Colorado Headwaters-Plateau
CWCB ID:	23/5/A-003
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	3.18 miles
FLOW RECOMMENDATION:	0.64 cfs (10/01 - 04/15) 3.3 cfs (04/16 - 06/30) 1.1 cfs (07/01 - 09/30)

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 Coon Creek at the ISF Workshop in Feburary 2022. Coon Creek is located within Mesa County and is approximately four miles south from Mesa, Colorado (See Vicinity Map). The stream originates near West Griffith Lake (Coon Reservoir No 1) and flows north until it reaches the confluence with Plateau Creek. Coon Creek is a tributary to Plateau Creek, which is a tributary to the Colorado River at Debeque Canyon.

The proposed ISF reach extends from the confluence with the West Branch Coon Creek downstream to a location 100 ft upstream from the South Side Canal headgate for a total of 3.18 miles. Approximately 40% of the proposed reach is public land (BLM and USFS) with the remaining 60% on private land (See Land Ownership Map). BLM is interested in protecting this stream to preserve the natural environment. BLM's land use plan calls for Coon Creek to be managed to maintain, restore, or improve riparian conditions, such that proper functioning conditions are achieved. It also specifies that instream flow appropriations will be pursued on fishery streams to ensure sufficient flows rates for fisheries protection. Appropriation of an instream flow water right would assist BLM in long-term management of riparian and fishery values.

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 Coon Creek was sent to the mailing list in November 2024, March 2024, March 2023, and March 2022. Staff sent letters to identified landowners adjacent to Coon Creek based on information from the county assessor's website. A public notice about this recommendation was also published in the Grand Junction Daily Sentinel on December 21, 2024.

Staff offered to present information about the ISF program and this recommendation to the Mesa County Board of County Commissioners, which was declined. In addition, staff talked with

Brian Sewell, Division 5 River Operations Coordinator and former District 72 Water Commissioner, on July 28, 2023 regarding water rights and hydrology on Coon Creek and corresponded in the fall of 2024 reguarding DWR records. CWCB staff also talked with Brian Sewell as a land and water right owner on Coon Creek to better understand his concerns. BLM and CWCB staff met with land and water right owners Dustin Shiftlet and Greg Williams from the Ute Conservancy District and toured the stream near the South Side Canal and at a new diversion point on September 13, 2024.

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.

Coon Creek is a cold-water, high gradient stream. The stream is confined by bedrock in most locations. The stream generally has medium-sized substrate, ranging from gravels to small boulders. The stream has an abundance of pools and runs but riffle habitat is limited. The existing pools are sufficient for overwintering fish.

Fisheries surveys revealed a self-sustaining population of cutthroat trout and brook trout (Table 1). Intensive macroinvertebrate surveys have not been conducted, but spot samples have revealed abundant stonefly.

Table 1. List of species identified in Coon Creek.

Species Name	Scientific Name	Status
brook trout	*Salvelinus fontinalis*	None
Colorado River cutthroat trout	*Oncorhynchus clarkii pleuriticus*	State - Species of Greatest Conservation Need State - Species of Special Concern

The riparian community is comprised of aspen, alder, and various willow species. The riparian community is in very good condition and provides abundant shading and cover for fish habitat.

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 three 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 0.64 cfs and a summer flow of 3.30 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 Coon Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/09/2021, 1	12.38	1.25	0.51	4.82
06/09/2021, 2	8.65	1.01	0.99	2.34
07/19/2023, 1	6.95	4.39	0.41	2.75
			0.64	3.30

ISF Recommendation

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

0.64 cfs is recommended from October 1 to April 15 during the cold weather period. This recommendation is driven by the average velocity criteria. This flow rate should prevent pools from freezing, allowing the fish population to successfully overwinter.

3.3 cfs is recommended from April 16 to June 30 during the snowmelt runoff period. This flow rate makes a very high percentage of the stream channel available to the fish population so that fishes can seek shelter and rest from the high velocity flows that occur during this period.

1.1 cfs is recommended from July 1 to September 30 during the warm weather portion of the year. This recommendation is driven by the average depth criteria. Coon Creek is very steep and has limited usable habitat, so it is important to protect a flow rate that makes a high percentage of this habitat available to the fish population while they are completing critical life history functions during the warm weather months.

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 Coon Creek is 7.3 square miles, with an average elevation of 9,193 feet and average annual precipitation of 28.1 inches. Coon Creek is largely

a snowmelt runoff dominated system, but upstream reservoirs that make releases for irrigation likely extend higher flows from July through September.

Water Rights Assessment

There are a number of water rights influencing hydrology in the Coon Creek Basin. Several reservoirs are located in the headwaters of Coon Creek and adjacent creeks (Table 3). These reservoirs are generally recognized to lose water into the bed of the reservoirs and some of this water may go to Coon Creek. There are a number of water rights for which it is difficult to determine whether they are on the main stem of Coon Creek or small tributaries based on the mapped location. These include several hydropower rights and small springs that total less than 1 cfs. There are also active water rights within the proposed ISF reach (Table 4).

Table 3. Active reservoir water rights located upstream from the proposed Coon Creek ISF reach.

Water Right Name	WDID	Amount, AF/cfs	Appropriation Date
Coon Reservoir No 1*	7203883	484	1900, 1911
Coon Reservoir No 2	7203884	195	1900
Coon Reservoir No 3	7203885	201	1895
Long Slough Reservoir**	7203901	206.5	1911, 1913

* includes 0.62 AF transferred from Coon Reservoir No 4.
** Also known as Stubb McKinney Clark Reservoir

Table 4. Active water rights within the proposed ISF, ordered from upstream to downstream.

Water Right Name	WDID	Amount, AF/cfs	Appropriation Date
Saddle Ditch	7200862	4.34	1916,1939
Baal Pipeline	7201516	0.1476	1914
Schlenzig Pump and Pond	7201568	0.1	1991
McGeoch Ditch	72000776	2.91	1888, 1914, 1915, 1939

Data Collection and Analysis

Representative Gage Analysis

The USGS monitored streamflow on Coon Creek from 1937-1943 at a location just downstream from the proposed lower terminus (USGS 0901500 Coon Creek near Mesa, CO). This gage record was compared to a nearby gage to evaluate how the historical record compares to a longer record. The Plateau Creek near Cameo gage (USGS 09105000) is the closest gage with a long-term record (1936-2024). This gage is located roughly 16 miles downstream and is affected by substantial water right uses. This assessment looked at the total flow volume at the gage for a calendar year based on the most recent contemporary 30 years (1993 to 2023 which had complete records). Three of the years of record for the Coon Creek gage occurred during years with substantially above average streamflow (1938, 1941, 1942). The other complete years of record were below average streamflow based on the Plateau Creek gage (1937, 1939, 1940, 1943).

Water right transactions were also reviewed to assess potential additional water uses in the basin after the end of the Coon Creek gage record. Four water right transactions have appropriation dates in the early 1900's with adjudication dates in 1941. These water rights, which total approximately 3.86 cfs are assumed to have been operating during the gage time frame. Two water rights that were adjudicated after the gage are both for non-consumptive

power generation. One right from 1988 is for 0.1 cfs to fill a pond. Based on this assessment, staff did not identify significant changes to water right in the basin between when the gage operated and present day. However, based on personal communication with Greg Williams, Ute Conservancy District, 9/9/2024, reservoir operations have changed through time resulting in smaller amounts of water released over longer time frames than historically occurred.

Due to the relatively short time that the Coon Creek gage operated, staff calculated mean-monthly streamflow. No adjustments were made for the small difference in drainage basin size between the historic gage location and the proposed lower terminus, which is about a 0.1% in drainage size. This analysis is used to evaluate water availability during late fall through runoff.

Reservoir Release Records

In addition to the historic Coon Creek gage, staff reviewed DWR records for a structure called the Coon Creek Reservoir System Totalizer (WDID 7204053). This is not a physical structure, but a means for DWR to record the total reservoir releases from several upstream reservoirs. Records from this structure start in 1979, but there are gaps including 1980 to 1986, 1989 to 1998, and 2010. According to the previous water commissioner, Brian Sewell, the geology in this area can result in significant losses between the reservoirs and the South Side Canal. In general, DWR assumes 20% losses, but the actual losses are highly variable. CWCB staff evaluated the records by calculating the mean-monthly releases minus 20%. This analysis shows that most releases occur during July through September. The water availability analysis relies on these results for those months. This approach likely undercounts streamflow because the West Branch of Coon Creek, which is the upper terminus, can contribute a significant percentage of the total flow.

Site Visit Data

In addition to R2Cross measurements, BLM staff made one streamflow measurements on the proposed reach of Coon Creek as summarized in Table 5.

Table 5. Summary of streamflow measurements for Coon Creek.

Visit Date	Flow (cfs)	Collector
11/17/2023	4.6	BLM

Water Availability Summary

The hydrograph shows results for mean-monthly streamflow based on the historic Coon Creek gage as well as the adjusted mean-monthly reservoir releases based on the totalizing structure (See Complete Hydrograph). The proposed ISF flow rate is below the mean-monthly streamflow for October through June and below the reservoir releases from July through September. Staff concludes that water is available for appropriation on Coon Creek.

MATERIAL INJURY

If decreed, the proposed ISF on Coon 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

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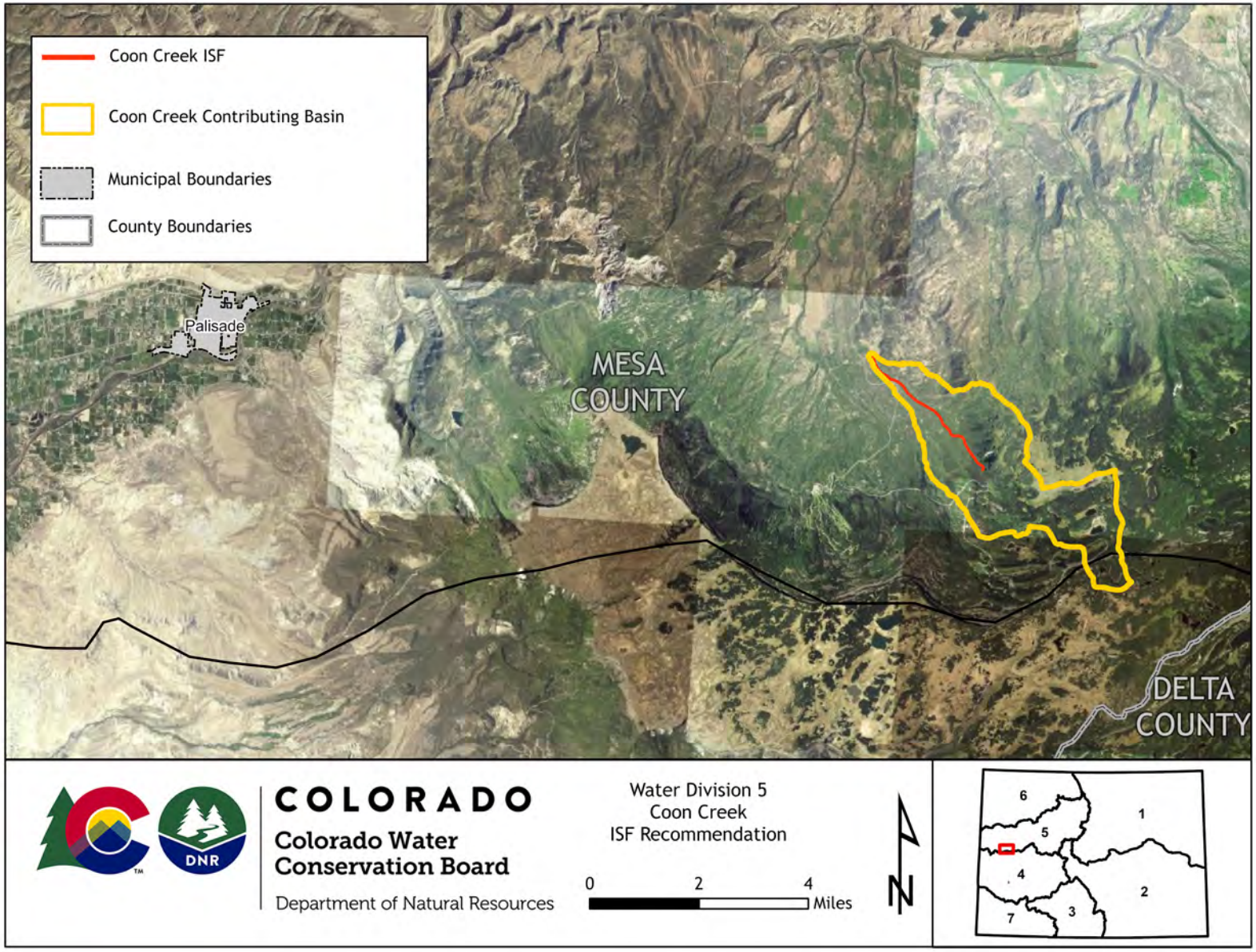
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

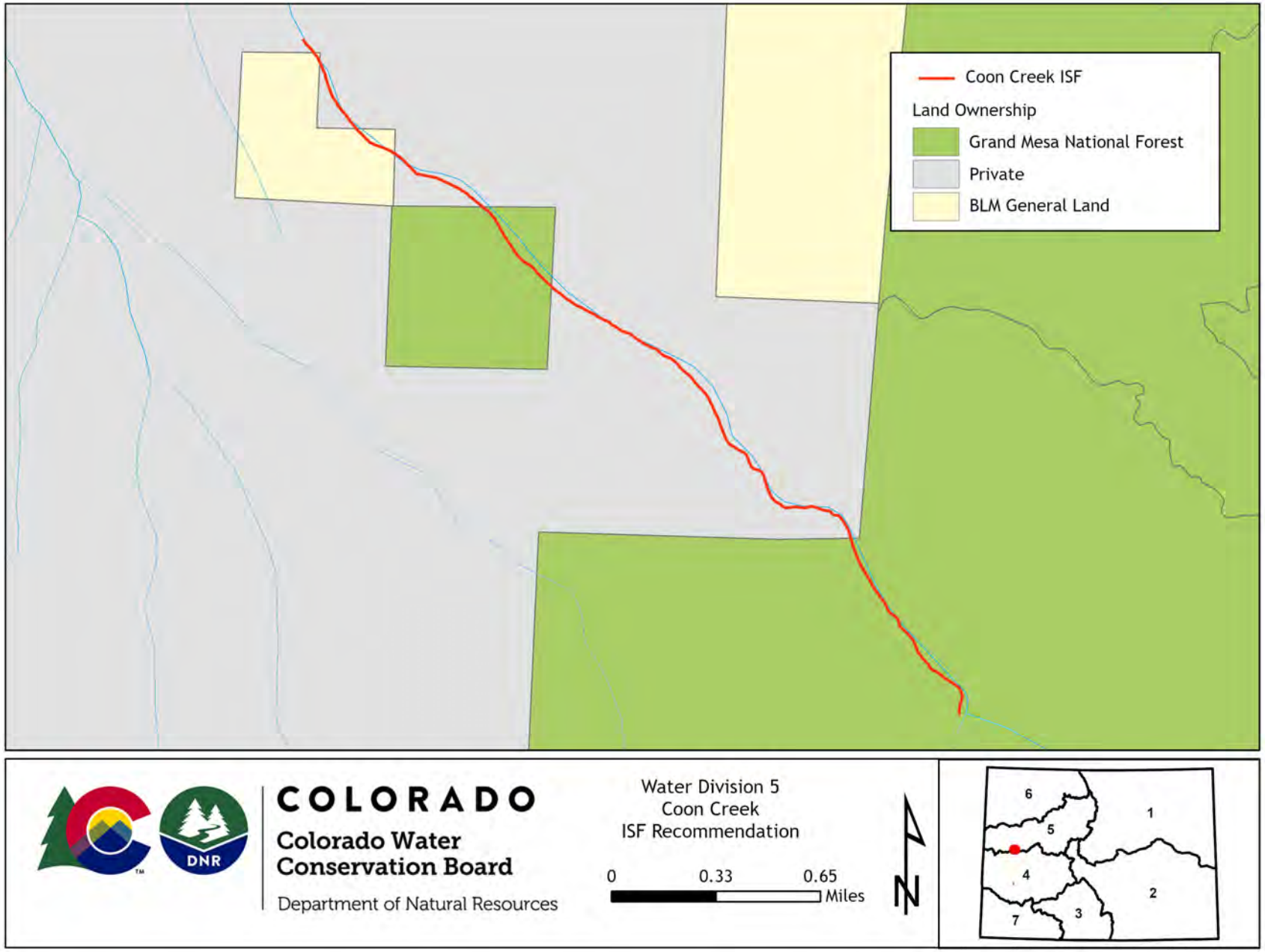
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

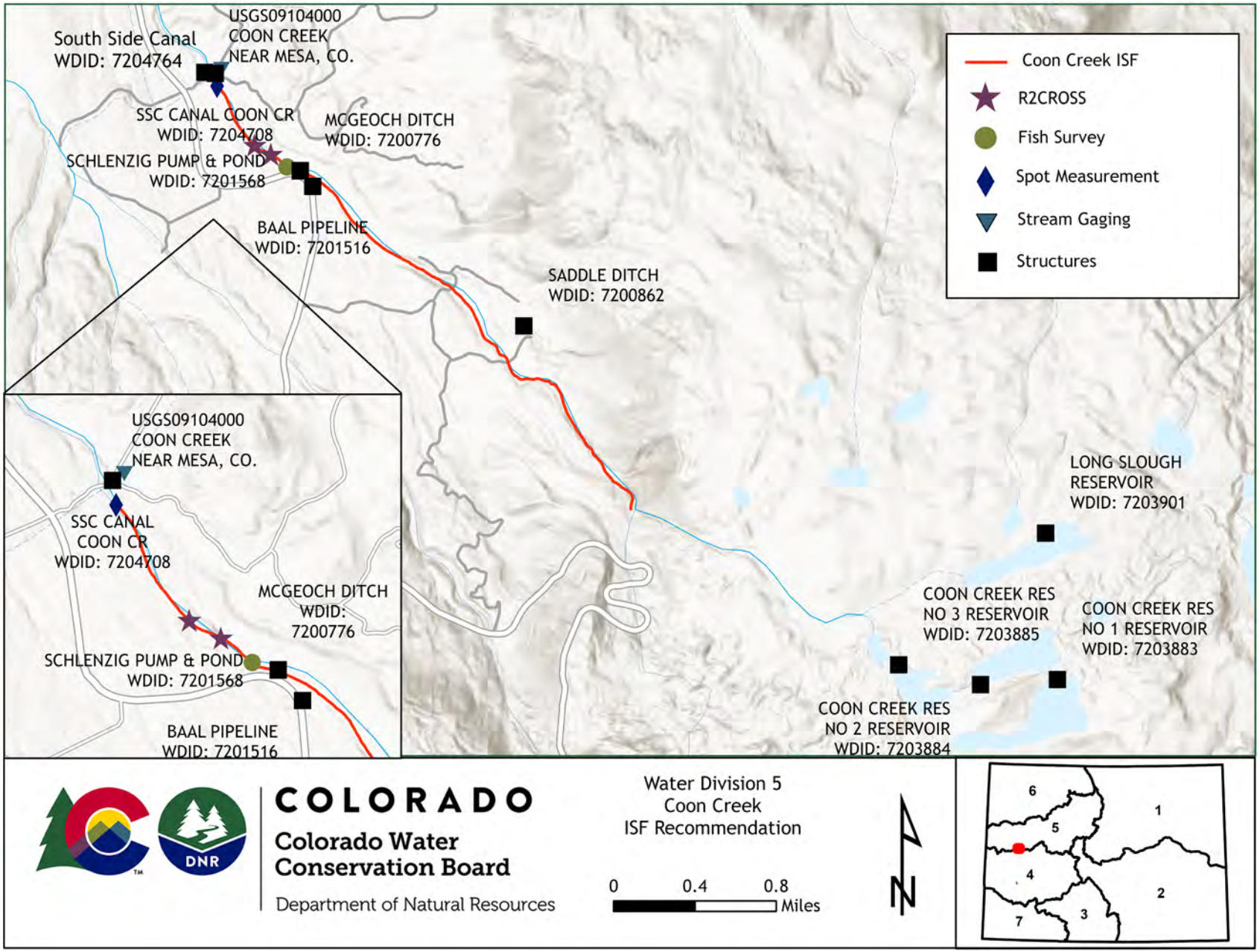
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


South Side Canal
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USGS09104000
COON CREEK
NEAR MESA, CO.
SSC CANAL COON CR
WDID: 7204708
MCGEOCH DITCH
WDID: 7200776
SCHLENZIG PUMP & POND
WDID: 7201568
BAAL PIPELINE
WDID: 7201516
SADDLE DITCH
WDID: 7200862
LONG SLOUGH
RESERVOIR
WDID: 7203901
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WDID: 7203883
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Coon Creek ISF
R2CROSS
Fish Survey
Spot Measurement
Stream Gaging
Structures
COLORADO
Colorado Water
Conservation Board
Department of Natural Resources
Water Division 5
Coon Creek
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Miles
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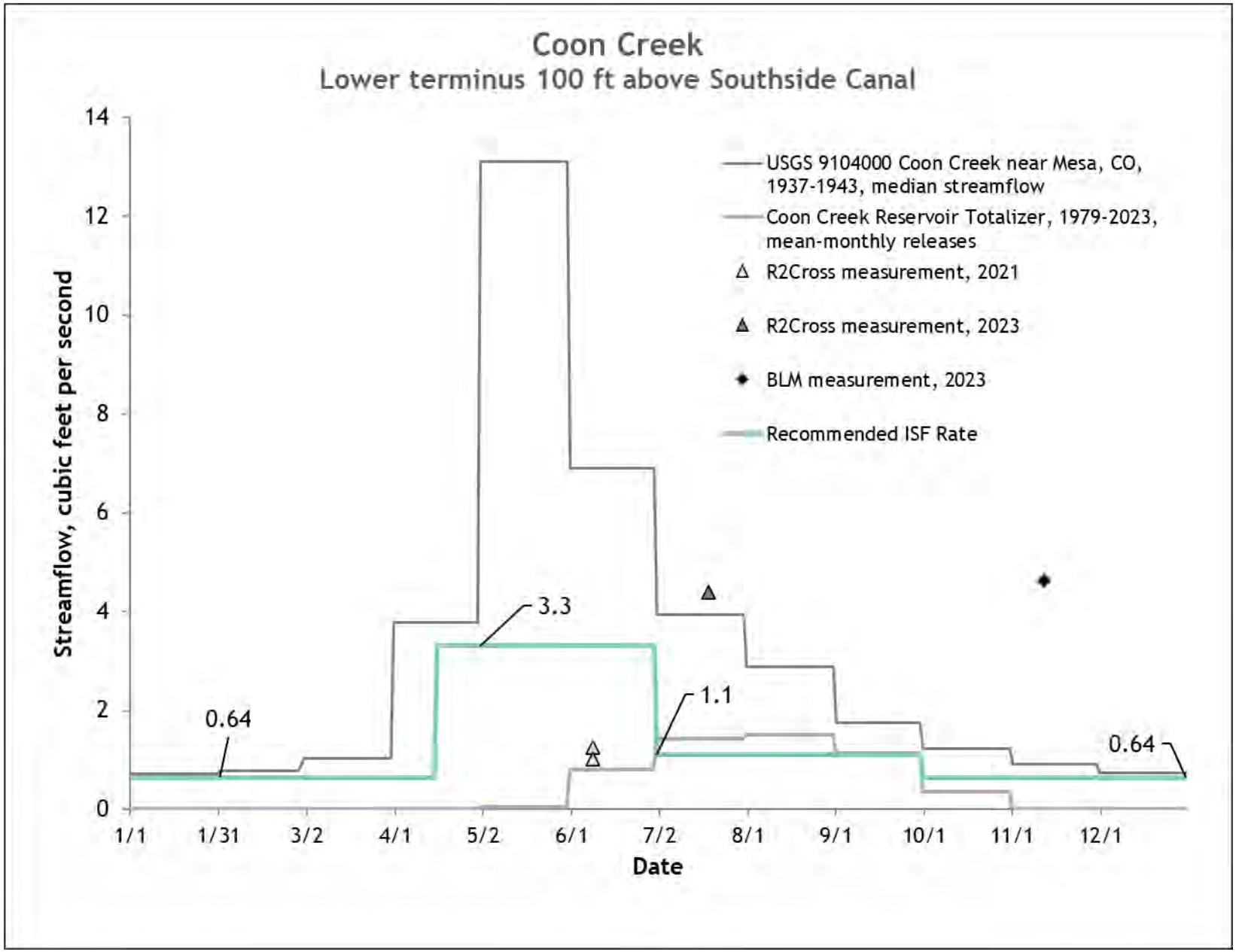
5
4
2
7
3

COMPLETE HYDROGRAPH



Derby Creek Executive Summary

CWCB STAFF INSTREAM INCREASED FLOW RECOMMENDATION
January 27-28, 2025

UPPER TERMINUS:	confluence with South Derby Creek at UTM North: 4419932.41 UTM East: 325757.86
LOWER TERMINUS:	confluence with the Colorado River at UTM North: 4414917.25 UTM East: 337113.78
WATER DIVISION/DISTRICT:	5/53
COUNTY:	Eagle
WATERSHED:	Colorado Headwaters
CWCB ID:	23/5/A-001
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	8.4 miles
EXISTING ISF:	7.5 cfs (1/1 – 12/31), 85CW0261
INCREASED FLOW RECOMMENDATION:	3.1 cfs (04/01 - 06/30) – increase to 10.6 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

BLM recommended that the CWCB appropriate an ISF water right on a reach of Derby Creek at the ISF Workshop in January 2022. Derby Creek is located within Eagle County and is approximately one mile southwest of the community of Burns (See Vicinity Map). The stream originates on the east side of the Flattops Wilderness Area, approximately 16 miles northwest of the community of Burns and flows into the Colorado River at the unincorporated community of Derby Junction.

The proposed ISF reach extends from the confluence with South Derby Creek downstream to the confluence with Colorado River for a total of 8.4 miles. Approximately 42% of the land on the proposed reach is on public land, the BLM manages 0.81 miles and the United States Forest Service manages 2.68 miles of the reach (See Land Ownership Map). BLM is interested in protecting this stream to preserve the natural environment. The ISF reach has an existing ISF water right, decreed in 1985 in case 85CW0261 for 7.5 cfs, year-round. The increased flow recommendation meets three of three hydraulic criteria to support the fishery during summer higher flow period.

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 Derby Creek was sent to the mailing list in November 2024, March 2024, March 2023, and March 2022. Staff sent letters to identified landowners adjacent to Derby Creek based on information from the county assessor's website. A public notice about this recommendation was also published in the Eagle Valley Enteprise and the Vail Daily on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Eagle County Board of County Commissioners on November 19, 2024. In addition, staff spoke with Rick Bumgardner, District 53 water commissioner, on May 10, 2023 regarding water availability

on Derby Creek. CWCB and BLM staff also spoke with interested water users at a stakeholder meeting in Derby Junction on October 9, 2024.

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.

Derby Creek is a cold water, moderate to high gradient stream that flows through a canyon, approximately ½ mile in width at its widest point. The upper part of the reach flows through heavily forested lands, while the lower part of the reach flows through more open vegetation. Substrate is generally from medium to very large size, ranging from 2-inch cobbles to three-foot diameter boulders. Riffles are limited with abundant step-pool habitat. Water quality is good for supporting salmonid fish species, but the presence of didymo algae indicates that the stream may be low in certain nutrients, such as phosphorus.

Fish surveys indicate self-sustaining populations of brown trout and mottled sculpin (Table 1). The creek appears to be a preferred tributary spawning location for brown trout that reside in the Colorado River because surveys have documented abundant young-of-the-year specimens. The brown trout and mottled sculpin populations appear robust, with good densities and a diversity of age classes present. Fish surveys also documented a limited number of rainbow trout.

Table 1. List of species identified in Derby Creek

Species Name	Scientific Name	Status
brown trout	*Salmo trutta*	None
mottled sculpin	*Cottus bairdii*	None
rainbow trout	*Oncorhynchus mykiss*	None

Macroinvertebrate surveys have indicated relatively abundant populations of mayfly, golden stonefly and caddisfly. Derby Creek significantly exceeds aquatic life use thresholds as measured by the Benthic Macroinvertebrate Multimetric Index (MMI), achieving a score of 56.5 versus the attainment threshold score of 45.

The creek supports a vigorous riparian community comprised of alder, dogwood, willow, hawthorn, narrowleaf cottonwood and spruce. When the creek flows through confined canyons, the riparian community provides good cover and shading for the creek and contributes substantially to bank stability.

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 three 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 summer flow rate of 10.6 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 Derby Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
07/15/2021, 1	30.30	10.56	NA	8.74
07/15/2021, 2	30.57	9.87	NA	12.49
09/23/2021, 1	31.50	7.87	NA	10.68
			NA	10.64

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

An increase of 3.1 cfs is recommended from April 1 to June 30 to bring the total ISF protection up to 10.6 cfs. This flow rate is driven by the average velocity criteria which is important for maintaining the limited amount of riffle habitat.

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 Derby Creek is 72 square miles, with an average elevation of 9,970 feet and average annual precipitation of 34.3 inches. Derby Creek is a cold-water, moderate to high gradient snowmelt driven hydrologic system with some mid-season monsoonal influence. Baseflows are often more than 30 cfs. Runoff initiates in late April and typically peaks by mid-June. Streamflow conditions are generally lowest during late summer when hydrology is altered by water use practices.

Water Rights Assessment

The Derby Creek basin has just under 200 cfs of direct flow diversions (Table 3); the proposed reach has approximately 430 acre feet in storage rights within the contributing basin (Table 4). There are 27 spring water rights amounting to just under two cfs of decreed flow. As mentioned above, there is an existing ISF water right decreed on the recommended reach in 1985 for 7.5 cfs of year-round flow (WDID: 5302014) and upstream of the recommended reach there is an ISF water right on the South Fork Derby Creek decreed in 1989 for 4.5 cfs in the summer and 2 cfs in the winter (WDID: 5302018 in case number 89CW182).

Table 3. Active water rights within the proposed ISF contributing basin

Water Right Name	WDID	Amount, cfs	Appropriation Date
Derby Ditch	5300555	28	1884
Grand River L and C Ditch	5300591	18.4	1887
Lion Basin Ditch	5300678	31.76	1893, 1915
Middle Derby Ditch	5300704	40	1890, 1895, 1976
Pipeline Ditch	5300754	15	1951
Rogers Ditch	5300780	21.4	1909, 1912, 1952
Russell Spring No 2 & 3 Ditch	5300789	0.34	1945
Sherwood Ditch	5300794	1.68	1932
South Derby Ditch	5300800	32	1893, 1953
Trail Creek Ditch	5300837	5.2	1889, 1915
Wurtsmith Spring Ditch	5300888	4.5	1932

Table 4. Active reservoir water rights within the proposed ISF contributing basin

Water Right Name	WDID	Amount, af	Appropriation Date
Cresent Lake Reservoir	5303960	237.247	1935
George A Gates Reservoir No 1	5304013	6	1971
George A Gates Reservoir No 2	5304014	18	1967
Keener Lake	5303539	18	1949
Mackinaw Lake Reservoir No 2	5304020	79.028	1935
Mid Is Lake	5303546	15	1949
Mirror Lake	5303549	3	1960
Mud Lake	5303550	6	1959
Muskrat Reservoir	5303551	9	1949
Troutville Pond No 1	5304023	0.5	1967
Troutville Pond No 2	5304024	0.8	1967
Troutville Pond No 3	5304025	1	1967
Troutville Pond No 4	5304026	0.5	1967
Up Is Lake	5303562	40	1949

Data Collection and Analysis

Representative Gage Analysis

No current or long-term gages exist on Derby Creek. Due to the extent of direct uses on the main channel and tributaries, CWCB staff opted to install a temporary gage at the lower terminus of the current recommended ISF reach on Derby Creek.

Temporary Gage Analysis

CWCB staff determined that a stream gaging station near the lower terminus of the recommended reach would assist in determining water availability. CWCB staff installed a temporary gage (Derby Creek gage) on land managed by BLM on September 6, 2023, near the lower terminus at the confluence with the Colorado River. Stream conditions were monitored by HOBO logger through August 5, 2024, at 15 minute intervals (period of record: 9/6/2023 – 8/5/2024).

Daily average Derby Creek streamflow data is calculated as mean monthly streamflow (See Complete Hydrograph). Mean monthly baseflow conditions range from 30 to 44 cfs of flow. Stream conditions peaked in June with a mean monthly flow of 113 cfs. July through September mean monthly flows decrease substantially indicating significant water use for irrigation. All basin diversions are reflected in the Derby Creek gage record during the ISF recommended timeframe and no further adjustments were made to assess the impact on water available for the ISF reach.

Staff Visit Data

CWCB staff made 10 streamflow measurements on the proposed reach of Derby Creek as summarized in Table 5.

Table 5. Summary of streamflow measurements for Derby Creek.

Visit Date	Flow (cfs)	Collector
10/09/2023	27	CWCB
03/27/2024	45	CWCB
06/26/2024	63	CWCB
08/05/2024	13	CWCB
05/22/2024	57	DWR
05/28/2024	54	DWR
06/03/2024	93	DWR
06/14/2024	160	DWR
06/26/2023	92	CWCB
10/07/2024	20	CWCB

Water Availability Summary
The hydrograph shows the CWCB temporary gage results for mean-monthly streamflow and includes the proposed ISF rate. The proposed seasonal ISF flow rate is below the mean-monthly streamflow. Staff concludes that water is available for appropriation on Derby Creek.

MATERIAL INJURY
If decreed, the proposed increased ISF on Derby 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

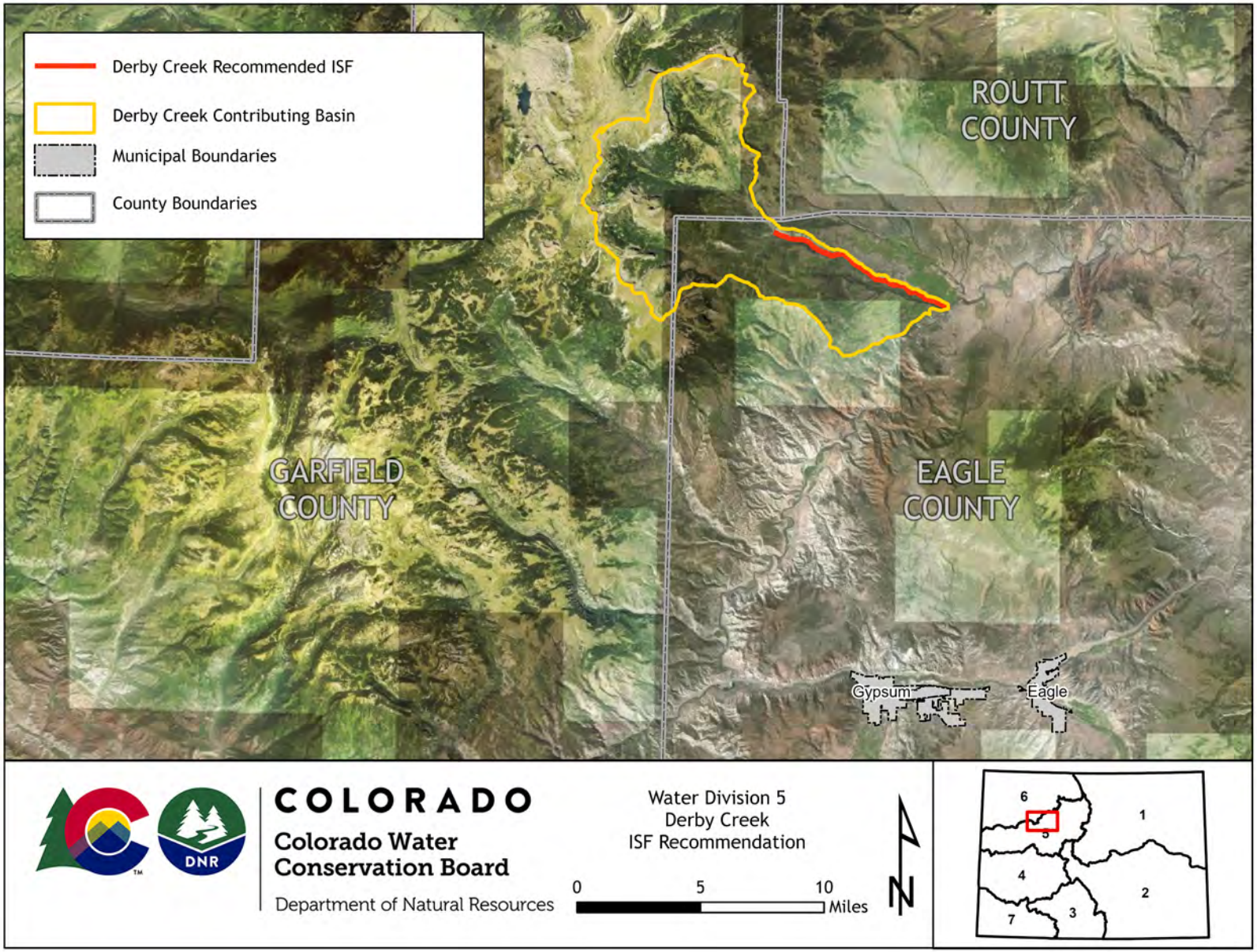
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

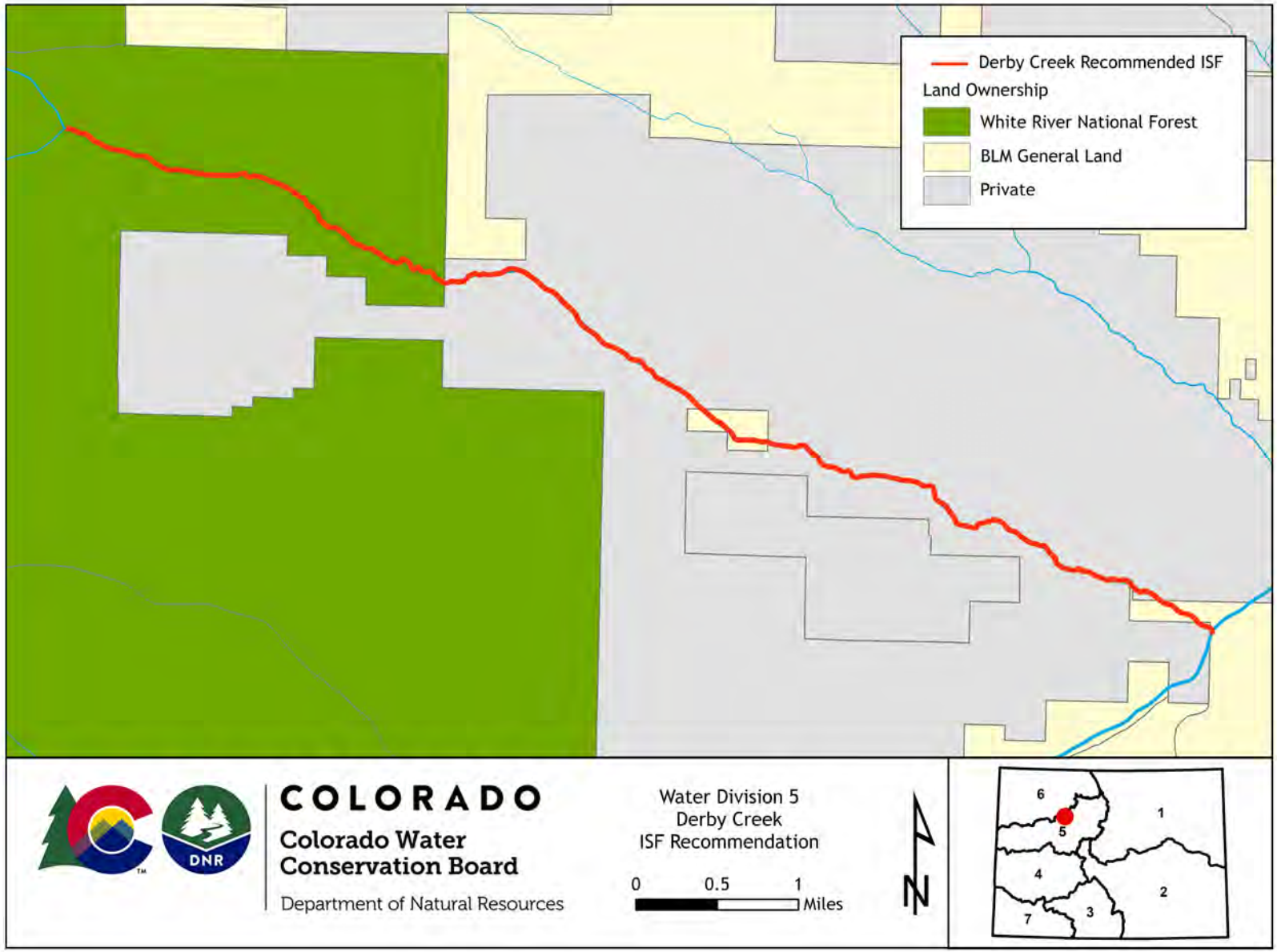
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

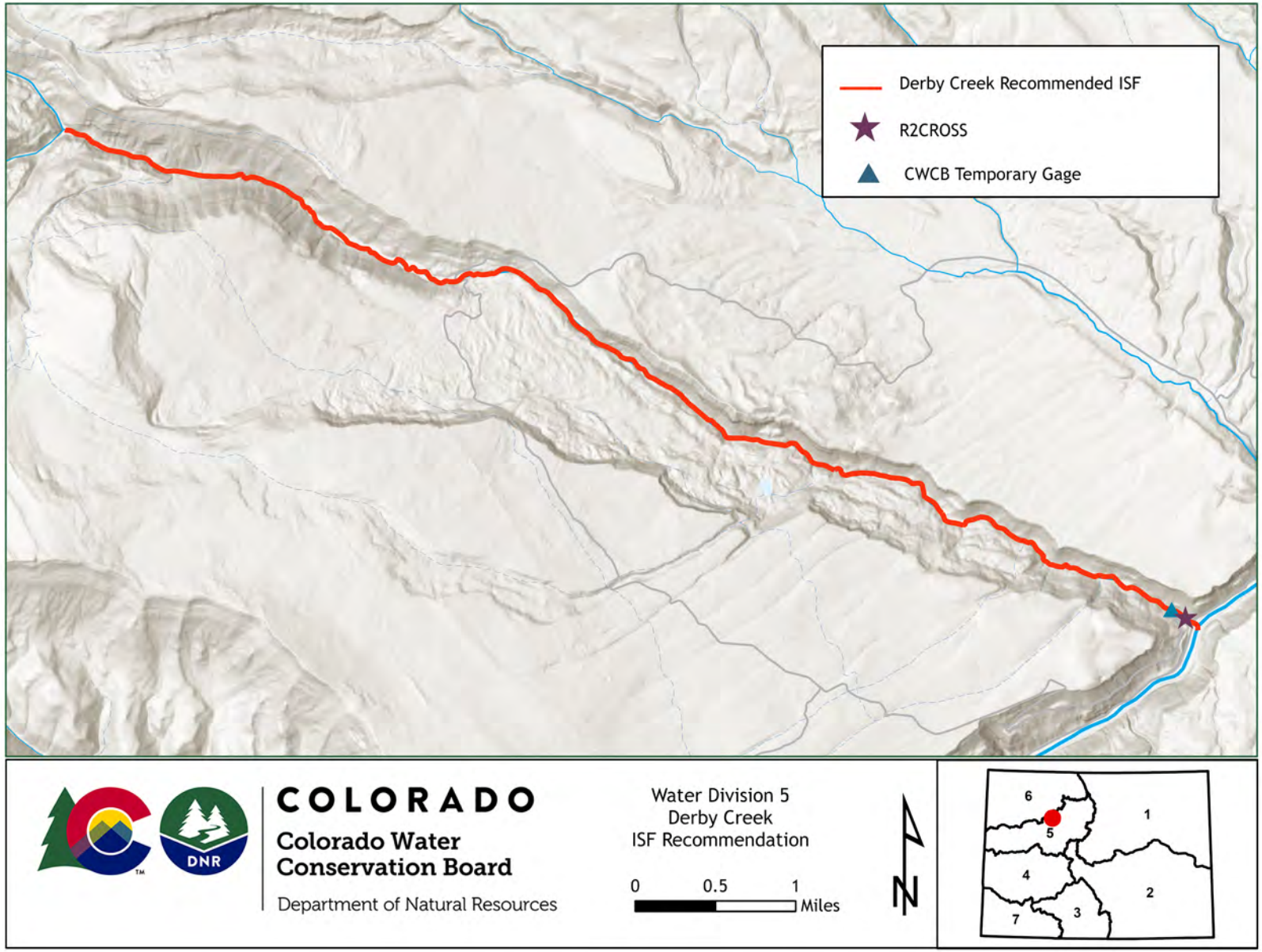
VICINITY MAP



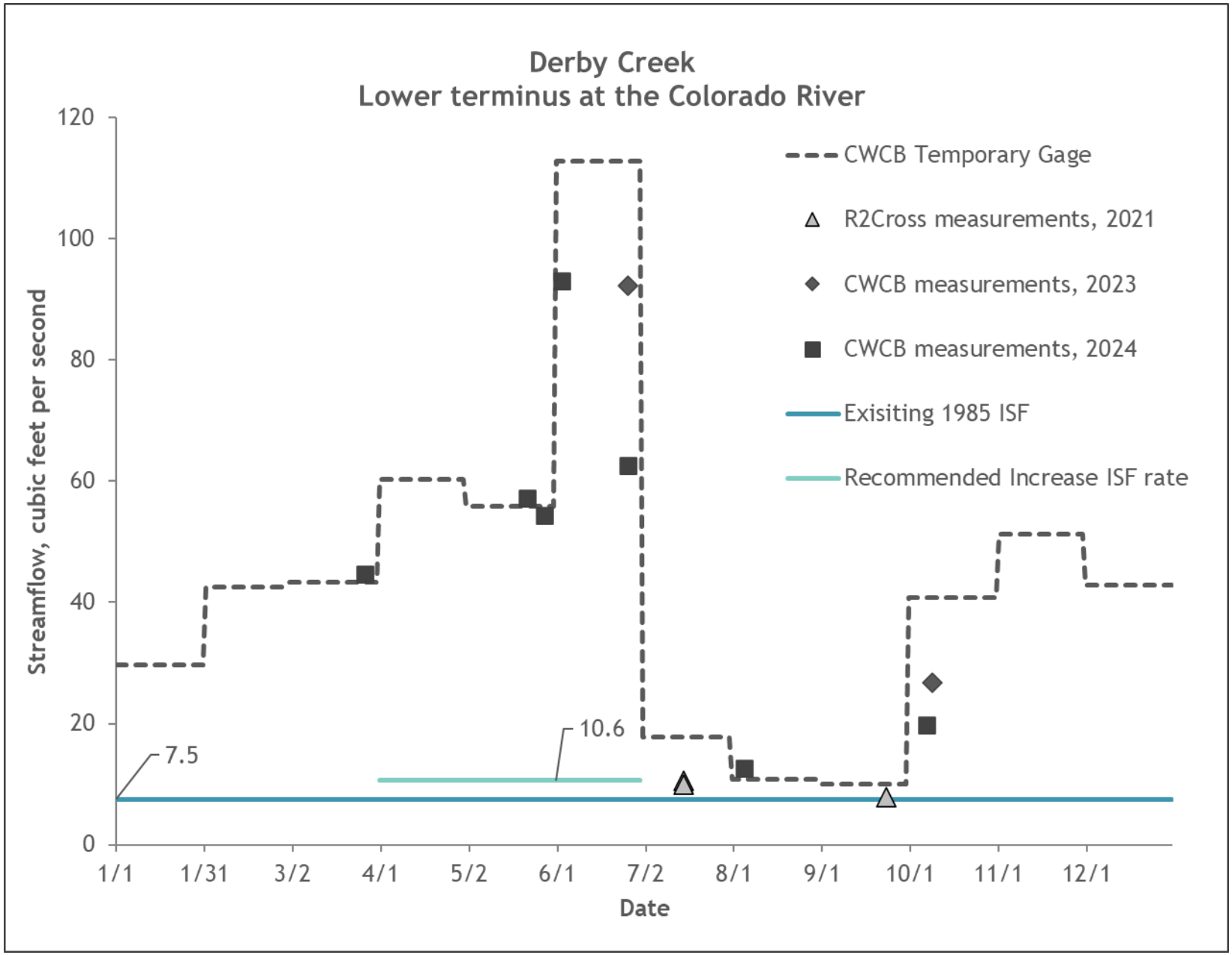
LAND OWNERSHIP MAP

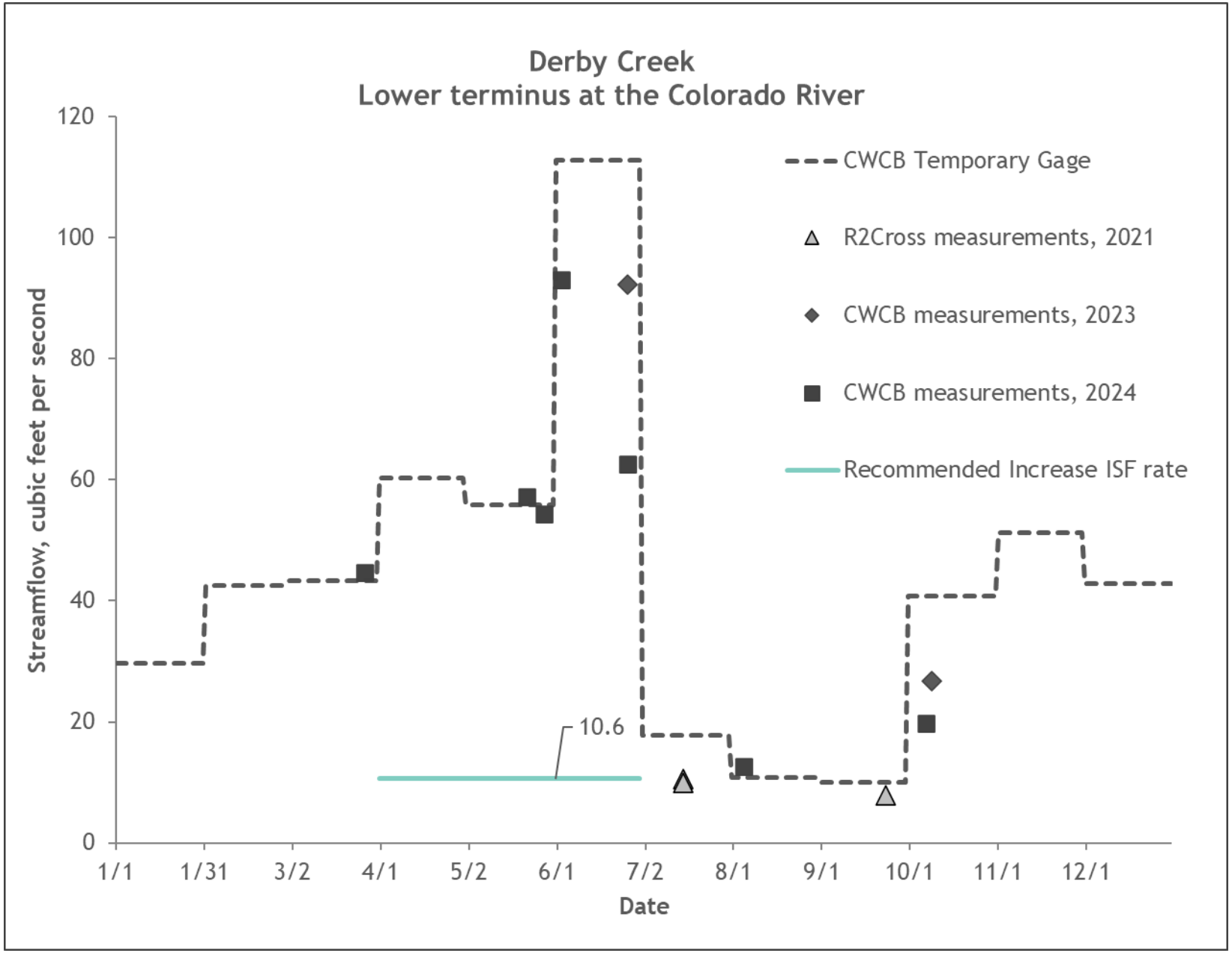


SITE MAP


Derby Creek Recommended ISF
R2CROSS
CWCB Temporary Gage
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 5
Derby Creek
ISF Recommendation
0
0.5
1
Miles
N
6
1
5
4
2
7
3

COMPLETE HYDROGRAPH




Derby Creek
Lower terminus at the Colorado River
Streamflow, cubic feet per second
120
100
80
60
40
20
0
1/1
1/31
3/2
4/1
5/2
6/1
7/2
8/1
9/1
10/1
11/1
12/1
Date
10.6
CWCB Temporary Gage
R2Cross measurements, 2021
CWCB measurements, 2023
CWCB measurements, 2024
Recommended Increase ISF rate

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

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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

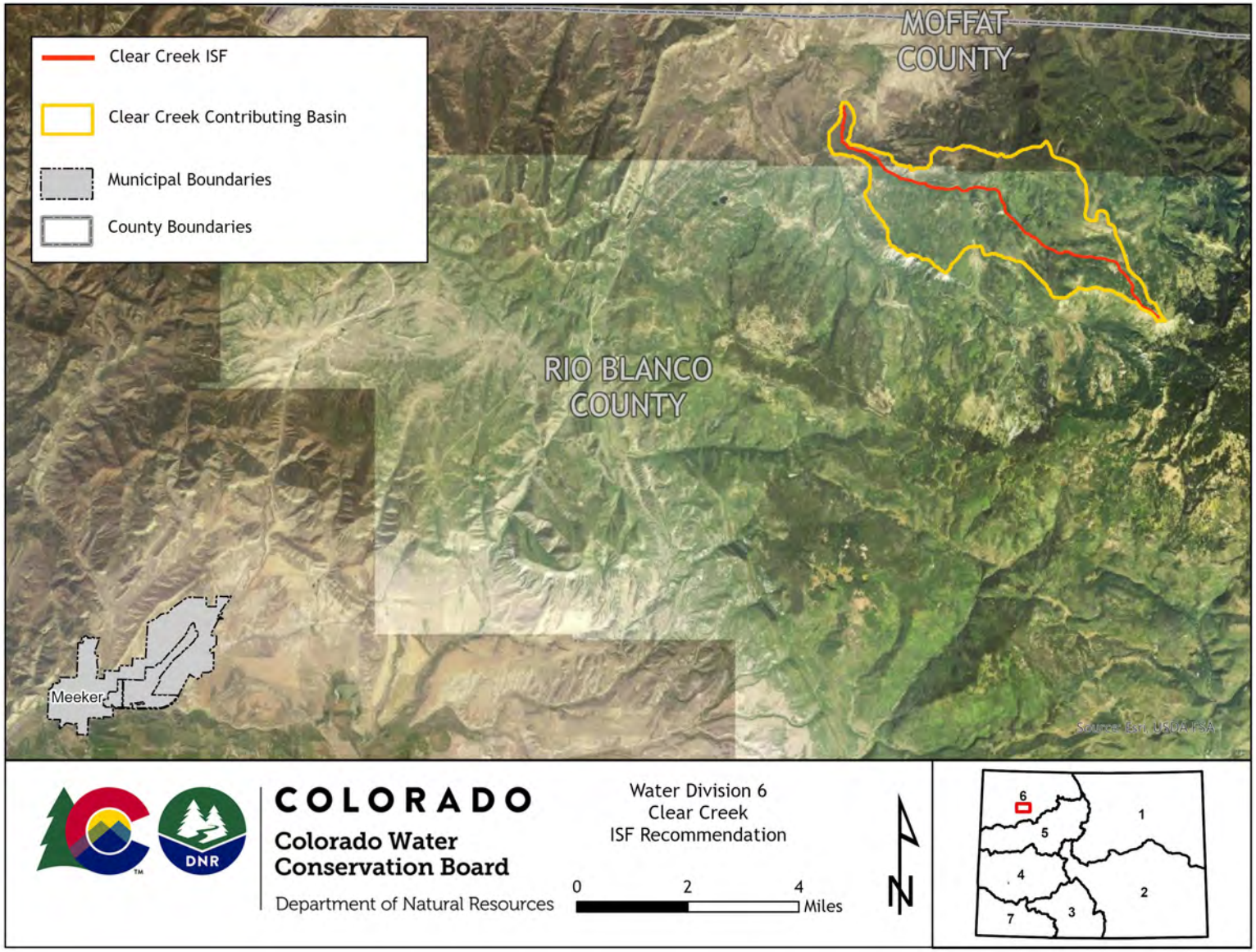
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

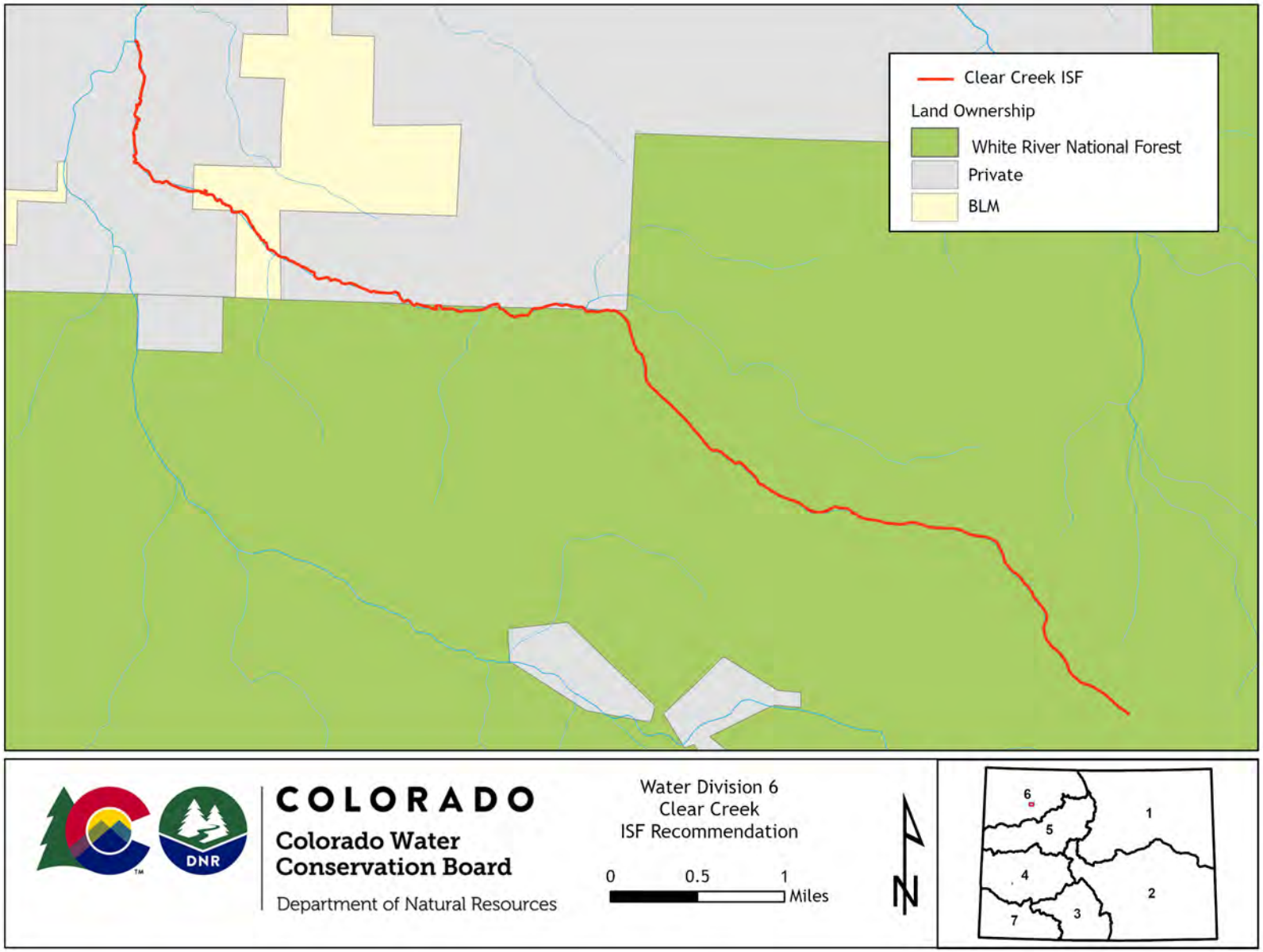
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

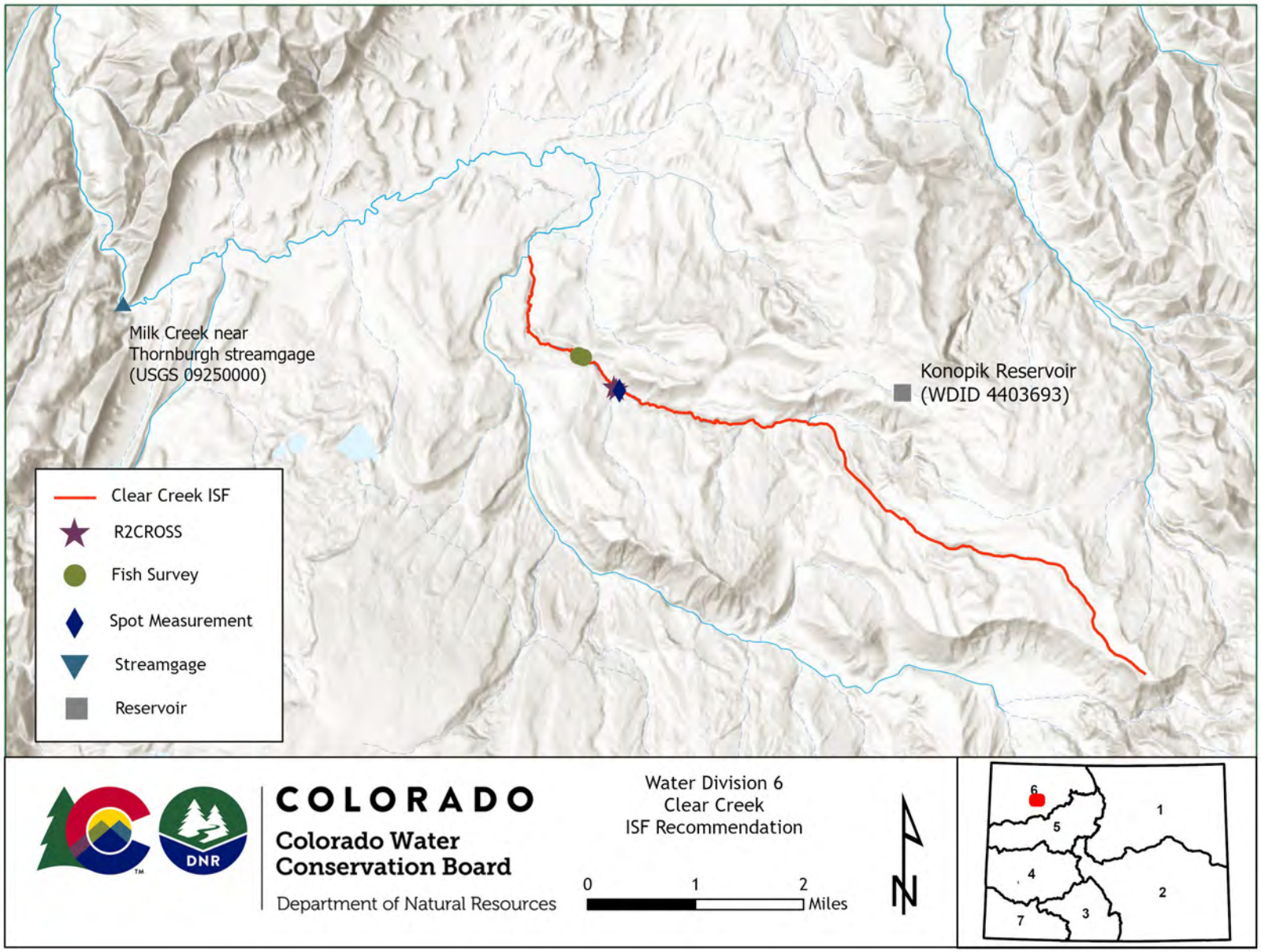
VICINITY MAP



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