Deer Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 29-30, 2024

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4312001.82 UTM East: 334621.80
LOWER TERMINUS:	Beitler No. 1 headgate at UTM North: 4307665.89 UTM East: 334685.81
WATER DIVISION/DISTRICT:	4/59
COUNTY:	Gunnison
WATERSHED:	East-Taylor
CWCB ID:	24/4/A-006
RECOMMENDER:	High Country Conservation Advocates (HCCA)
LENGTH:	3.38 miles
FLOW RECOMMENDATION:	0.35 cfs (11/01 - 03/31) 0.9 cfs (04/01 - 04/30) 1 cfs (05/01 - 08/31) 0.6 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 water rights (NLL). Before initiating a water right filing, the Board must determine that: 1) there is a natural environment that can be preserved to a reasonable degree with the Board's water right if granted, 2) the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made, and 3) such environment can exist without material injury to water rights.

The information contained in this Executive Summary and the associated supporting data and analyses form the basis for staff's ISF recommendation to be considered by the Board. This Executive Summary provides sufficient information to support the CWCB findings required by ISF Rule 5i on natural environment, water availability, and material injury. Additional supporting information is located at: https://cwcb.colorado.gov/2024-isf-recommendations.

RECOMMENDED ISF REACH

HCCA recommended that the CWCB appropriate an ISF water right on a reach of Deer Creek at the January 2023 ISF workshop. Deer Creek is located within Gunnison County (See Vicinity Map) and is approximately four miles east of the Town of Crested Butte. The stream originates near White Rock Mountain and flows south until it reaches the confluence with the East River, which is a tributary to the Gunnison River.

The proposed ISF reach extends from the headwaters downstream to the Beitler No. 1 headgate for a total of 3.38 miles. The entire reach is located on public land managed by the United States Forest Service (See Land Ownership Map). HCCA is interested in protecting this stream to continue their mission to protect the health and natural beauty of the land, rivers, and wildlife in and around Gunnison County.

OUTREACH

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently, more than 1,100 people subscribe to the ISF mailing list. Notice of the potential appropriation of an ISF water right on Deer Creek was sent to the mailing list in March 2023 and November 2023. Staff sent letters to identified landowners adjacent to Deer 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 January 5, 2024.

Staff presented information about the ISF program and this recommendation to the Gunnison County Board of County Commissioners on October 24, 2023. In addition, staff spoke with Tom Rozman, District 59 Water Commissioner, on July 18, 2023 regarding water availability on Deer Creek.

NATURAL ENVIRONMENT

CWCB staff relies on the recommending entity to provide information about the natural environment. In addition, staff reviews information and conducts site visits for each

recommended ISF appropriation. This information provides the Board with a basis for determining that a natural environment exists.

The headwaters of Deer Creek form as a cold-water, high gradient stream to the west of a prominent ridge on the south face of White Rock Mountain. Near the headwaters there is a mix of aspen and evergreen trees. As the stream loses elevation there is an increase in willows and alders immediately adjacent to the creek. The stream channel has multiple pool and drop sequences with a mix of gravel and cobble-sized substrate and moderate amounts of woody debris. Flows from Deer Creek support a robust riparian area that provides shade and cover for the extant aquatic community. There are signs of grazing in the riparian area; but little evidence to indicate meaningful impacts to the natural environment. Colorado Parks and Wildlife (CPW) conducted a biological survey on Deer Creek on July 27, 2023, and found brook trout that ranged in size from 3 to 8 inches with an estimated density of 230 fish per mile (Table 1).

Table 1. List of species identified in Deer Creek.

Species Name	Scientific Name	Status
brook trout	*Salvelinus fontinalis*	None

ISF QUANTIFICATION

CWCB staff relies on the biological expertise of the recommending entity to quantify the amount of water required to preserve the natural environment to a reasonable degree. CWCB staff performs a thorough review of the quantification analyses completed by the recommending entity to ensure consistency with accepted standards.

Quantification Methodology

HCCA staff used the R2Cross method to develop the initial ISF recommendation. The R2Cross method is based on a hydraulic model and uses field data collected in a stream riffle (Espegren, 1996; CWCB, 2022). Riffles are the stream habitat type that are most vulnerable to dry if streamflow ceases. The data collected consists of a streamflow measurement, 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 one transect for this proposed ISF reach (Table 2). The R2Cross model results in a winter flow of 0.61 cfs and a summer flow of 1.01 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 2. Summary of R2Cross transect measurements and results for Deer Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
07/08/2022, 1	4.50	0.33	0.61	1.01
			0.61	1.01

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

0.90 cfs is recommended from April 1 to April 30 and mimics flow initiation. This flow rate is reduced due to water availability limitations.

1.0 cfs is recommended from May 1 to August 31. This rate meets three of three hydraulic criteria.

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

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

WATER AVAILABILITY
CWCB staff conducts hydrologic analyses for each recommended ISF appropriation to provide the Board with a basis for 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 drainage basin of the proposed ISF on Deer Creek is 2.13 square miles, with an average elevation of 10,345 feet and average annual precipitation of 29.26 inches (See the Hydrologic Features Map). Deer Creek is a snowmelt driven hydrologic system, with variable timing and magnitude in snowmelt runoff.

Water Rights Assessment
There are no diversions within the reach of Deer Creek recommended for an ISF. The lower terminus is at the headgate of the Beitler Ditch No. 1.

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

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

CWCB staff made one site visit to the proposed reach of Deer Creek on 10/24/2023.

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 has concluded that water is available for appropriation on Deer Creek.

MATERIAL INJURY
Because the proposed ISF on Deer Creek is a new junior water right, the ISF can exist without material injury to other water rights. Under the provisions of section 37-92-102(3)(b), C.R.S., the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

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

Eurich, A., Kampf, S.K., Hammond, J.C., Ross, M., Willi, K., Vorster, A.G. and Pulver, B., 2021, Predicting mean annual and mean monthly streamflow in Colorado ungauged basins, River Research and Applications, 37(4), 569-578.

Espegren, G.D., 1996, Development of instream flow recommendations in Colorado using R2CROSS, Colorado Water Conservation Board.

Ferguson, R.I., 2007. Flow resistance equations for gravel- and boulder-bed streams. Water Resources Research 43. https://doi.org/10.1029/2006WR005422

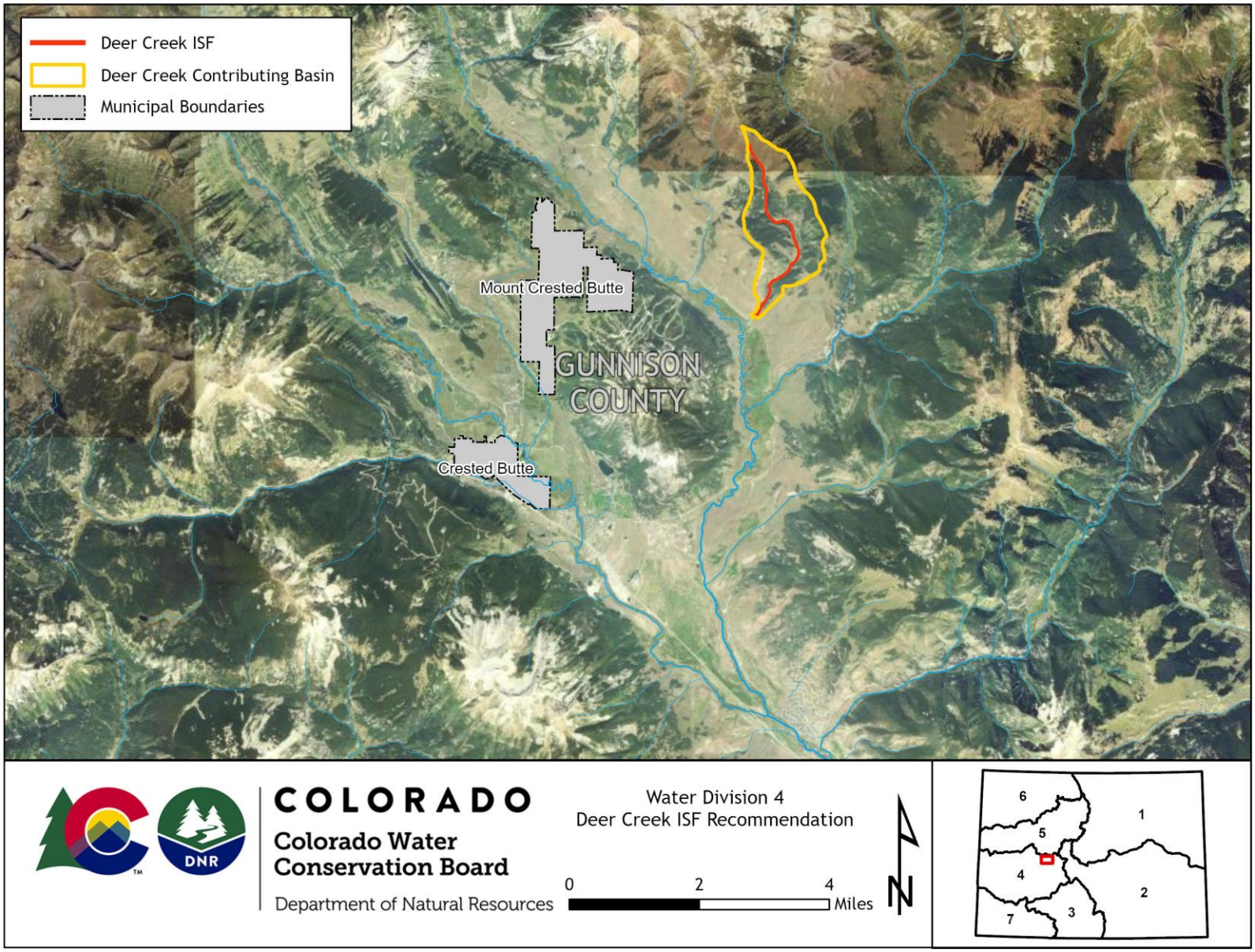
Ferguson, R.I., 2021. Roughness calibration to improve flow predictions in coarse-bed streams. Water Res 57. https://doi.org/10.1029/2021WR029979

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

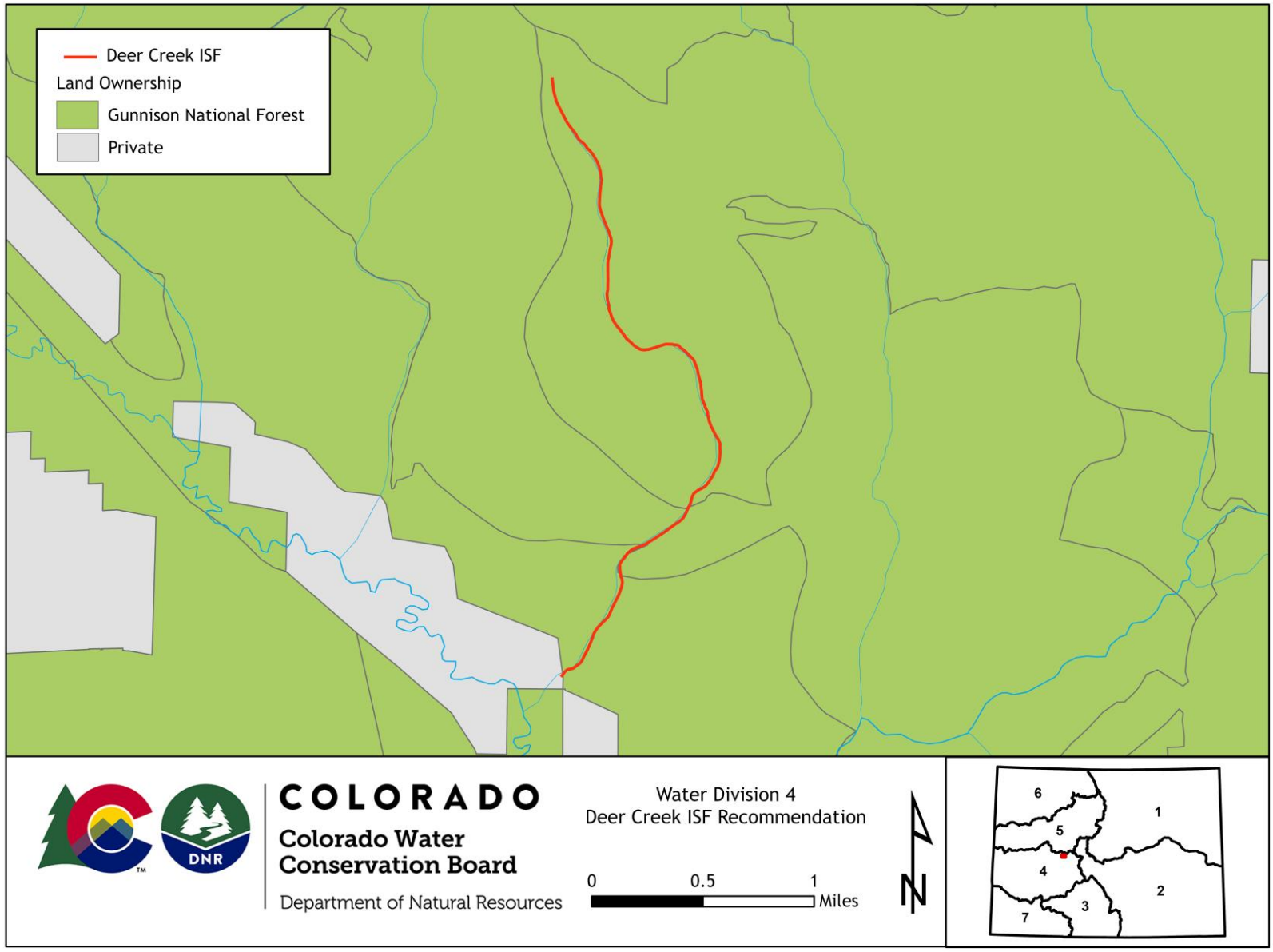
Metadata Descriptions
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

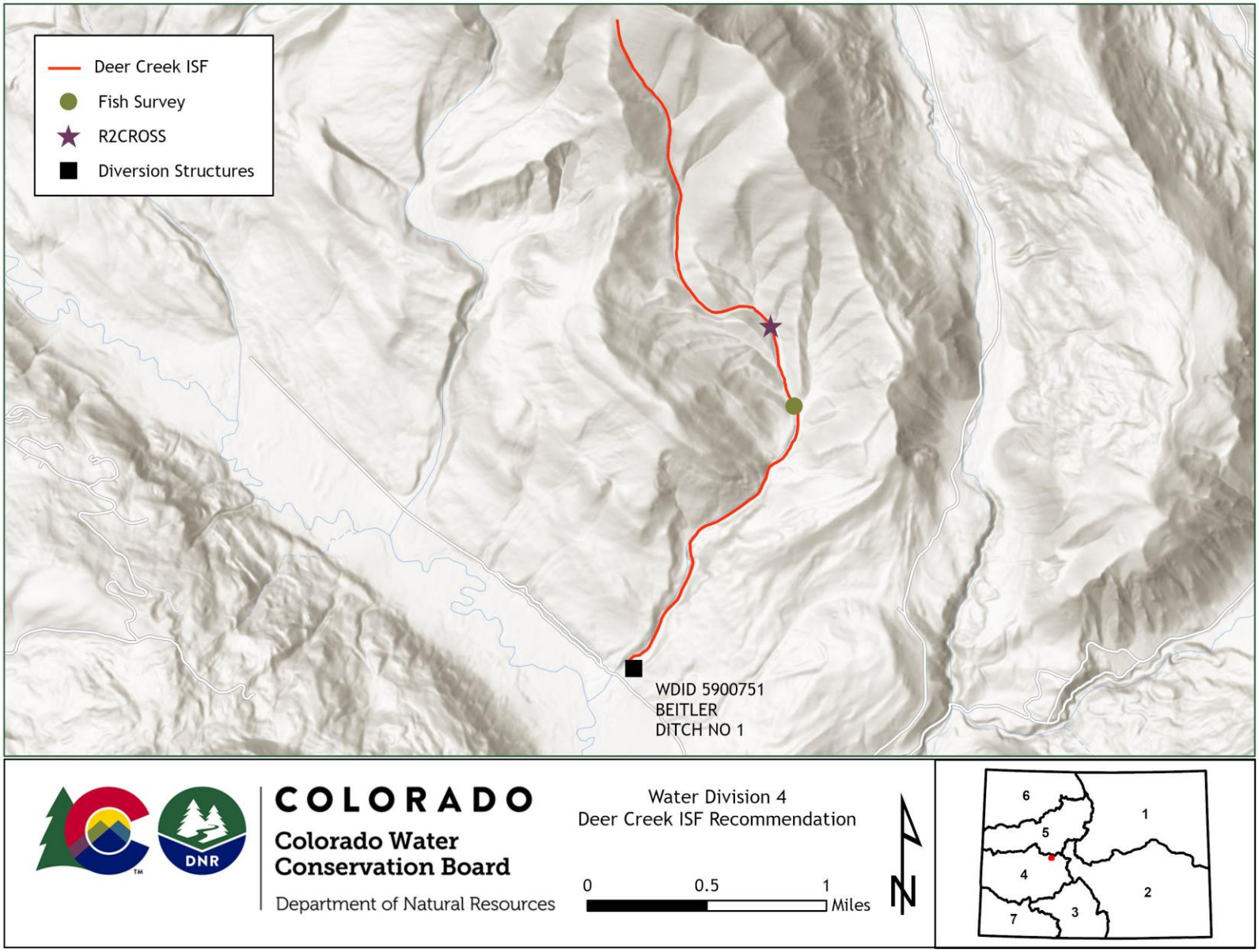
VICINITY MAP



LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH