Deep Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 24-25, 2022

UPPER TERMINUS:	headwaters in the vicinity of: UTM North: 4522646.30 UTM East: 336333.41
LOWER TERMINUS:	confluence with Steamboat Lake at: UTM North: 4519435.84 UTM East: 334767.17
WATER DIVISION:	6
WATER DISTRICT:	58
COUNTY:	Routt
WATERSHED:	Upper Yampa
CWCB ID:	22/6/A-001
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	2.45 miles
FLOW RECOMMENDATION:	0.3 cfs (10/01 - 04/30) 2.5 cfs (05/01 - 07/31) 0.95 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 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/2022-isf-recommendations.

RECOMMENDED ISF REACH

The BLM recommended that the CWCB appropriate an ISF water right on a reach of Deep Creek. Deep Creek is located within Routt County approximately 22 miles northwest of Steamboat Springs (See Vicinity Map). The stream originates near Hahns Peak and flows southwest until it reaches Steamboat Lake.

The proposed reach extends from the headwaters downstream to the confluence with Steamboat Lake for a total of 2.45 miles. Ninety percent of the land on the proposed reach is publically owned; 60% by the United Stated Forest Service (USFS), 12% by Colorado Parks and Wildlife, 14% by Colorado State Land Board, 4% by the BLM. Ten percent is privately owned (See Land Ownership Map). The BLM is interested in protecting this stream to meet management goals aimed at maintaining and enhancing habitat that supports fish species, maintaining and improving the function of riparian areas, and protecting 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 are subscribed to the ISF mailing list. Notice of the potential appropriation of an ISF water right on Deep Creek was sent to the mailing list in March and November of 2021. Staff sent notice letters to identified landowners adjacent to Deep Creek based on information from the county assessors website. A public notice about this recommendation was also published in the Steamboat Pilot on October 28, 2021.

Staff presented information about the ISF program and this recommendation to the Routt County Board of County Commissioners on November 1, 2021. Staff spoke with Luke Fitzgerald, Water Comissioner on October 13, 2021 regarding water availability on Deep Creek. Staff also spoke with attorney Claire Sollars, a representative of water users on Deep Creek, on January 4, 2022.

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 is used to provide the Board with a basis for determining that a natural environment exists.

Deep Creek is a cold-water stream that runs through dense forest at a high gradient before entering a wide meadow surrounding Steamboat Lake. The substrate of Deep Creek ranges from gravel to six-inch cobbles.

According to the BLM, Deep Creek has excellent water quality. The riparian community consists of spruce and thick stands of willow and alder which provide ample shade for the aquatic ecosystem. While there are a limited number of pools along the creek, deeper stream habitat exists around tree root wads and in beaver ponds.

BLM and Trout Unlimited identified a self-sustaining population of Rainbow-Cutthroat Trout hybrids. BLM found abundant populations of stonefly, caddisfly, and mayfly. CWCB staff also found the creek to have an abundant and diverse macroinvertebrate community while visiting the site.

Table 1. List of species identified in Deep Creek.

Species Name	Scientific Name	Protection Status
Rainbow-Cutthroat hybrid	*Oncorhynchus mykiss*	None
alder	*Alnus Spp.*	None
willow	*Salix spp.*	None
stonefly	*Plecoptera*	None
mayfly	*Ephemeroptera*	None
caddisfly	*Trichoptera*	None
water strider	*Gerridae*	None
water boatmen	*Corixidae*	None
water beetle	*Coleoptera*	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

BLM staff used the R2Cross methodology 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). Riffles are a stream habitat type that are most easily visualized as sections of the stream that would dry up first should streamflow cease. The data collected consists of a streamflow measurement, survey of channel geometry and features at a single transect, and survey of the longitudinal slope of the water surface.

The field data is used to model three hydraulic parameters: 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 macro-invertebrates (Nehring, 1979). BLM staff interprets the model results to develop an initial recommendation for summer and winter flows. The summer flow recommendation is based on meeting 3 of 3 hydraulic criteria. The winter flow recommendation is based on meeting 2 of 3 hydraulic criteria. The model's suggested accuracy range is 40% to 250% of the streamflow measured in the field. Recommendations that fall outside of the accuracy range may not give an accurate estimate of the hydraulic parameters necessary to determine an ISF rate.

The R2Cross methodology provides 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 Analysis

R2Cross data was collected at two transects for this proposed ISF reach by BLM (Table 2). Results obtained at more than one transect are averaged to determine the R2Cross flow rate for the reach of stream. The R2Cross model results in a winter flow of 1.43 cfs, which meets 2 of 3 criteria and is within the accuracy range of the R2Cross model. The R2Cross model results in a summer flow of 2.45 cfs, which meets 3 of 3 criteria and is within the accuracy range of the R2Cross model. 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 Deep Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/09/2020, 1	14.70	2.90	1.16 - 7.25	1.35	3.36
06/09/2020, 2	9.44	2.29	0.92 - 5.73	1.53	1.55
			Mean	1.44	2.46

ISF Recommendation

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

2.50 cfs is recommended from May 1 through July 31 during the snowmelt runoff period and summer. This recommendation is driven by the average depth criteria. This flow rate will ensure that the riffle habitat can be fully utilized during the late spring, when fish are completing their spawning cycle and early summer, when fish are actively moving between pools.

0.95 cfs is recommended from August 1 through September 30 during late summer and fall. This flow rate is limited by water availability but should provide adequate physical habitat for the fish population to complete important parts of its life cycle before cold temperatures arrive.

0.3 cfs is recommended from October 1 through April 30 during the cold weather period. This recommendation is driven by naturally limited water availability. This flow rate should maintain full and sufficiently cool pools during fall, and it should prevent pools from completely icing during winter, allowing the fish population to successfully overwinter.

WATER AVAILABILITY

CWCB staff conducts hydrologic analyses for each recommended ISF appropriation to provide the Board with a basis for making the determination that water is available.

Water Availability Methodology

Each recommended ISF reach has a unique flow regime that depends on variables such as the timing, magnitude, and location of water inputs (such as rain, snow, and snowmelt) and water losses (such as diversions, reservoirs, evaporation and transpiration, groundwater recharge, etc.). Although extensive and time-consuming investigations of all variables may be possible, staff takes a pragmatic and cost-effective approach to analyzing water availability. 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) will be used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and StreamStats will be used when long-term gage data is not available. StreamStats, a statistical hydrologic program, uses regression equations developed by the USGS (Capesius and Stephens, 2009) to estimate mean flows for each month based on drainage basin area and average drainage basin precipitation. Diversion records will also be 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; 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 Deep Creek is 1.70 square miles, with an average elevation of 8,833 feet and average annual precipitation of 30.11 inches (See the Hydrologic Features Map). There is one surface water diversion on the proposed reach, Button Ditch No.

1, and three springs used for water supply in the community of Hahns Peak Village. Due to the small amount of diversions, hydrology in the basin represents near natural conditions.

Water Right Assessment
According to records kept on CDSS, Button Ditch No. 1 has not been used since 2003. Water commissioner comments indicate that since 2003, the structure has suffered from maintenance issues, including the headgate being washed out and silting in the diversion structure and ditch. In total, the structure has been used during three of the last 26 years for an average of 17 days at a time, during the month of June. The structure was considered for abandonment in 2020. Staff spoke with District 58 water commissioner, Luke Fitzgerald (communication on August 13, 2021), who indicated that the structure was not listed for abandonment and repairs to the structure were in progress.

Hahns Peak village has water rights on three springs near the middle of the proposed ISF. Each spring is currently decreed for an amount of 0.011 cfs. Judith Spring #2 (WDID 5802140) and Abigale Spring #3 (WDID 5802141) have been made absolute, while Shay Spring #1 (WDID 5802139) remains conditional. In 2021, the Village filed for an additional 0.011 cfs conditional rights at each spring.

Data Analysis
There are no historic or current streamflow gages on Deep Creek and no nearby representative gages were identified. StreamStats provides the best available estimate of streamflow on Deep Creek.

Since the Button Ditch No. 1 structure has been used so infrequently, staff examined four nearby irrigation ditches (Oligarchy Ditch – WDID 5800811, Frye System of Ditches No. 1 – WDID 5800653, Centennial Placer Ditch HG 2 – WDID 5801703, Wheeler Bros Ditch – WDID 5800928) in District 58 to get a better understanding of the likely timing of irrigation in the area. From this analysis, diversions in the area occur roughly 50% of the time on days between June 9 and August 1. Diversions occurred roughly 25% of the time on days between June 1 and August 18.

Staff reduced the StreamStats mean monthly streamflow estimates by the full decreed amount of Button Ditch No. 1 (1 cfs) to account for potential future diversions after repairs are completed. This was done between June 1 and August 18 to align with the timing of the majority diversions in the area as described above. No adjustments were made for the Hahns Peak Village springs due to the relatively small diversion amounts and off channel location.

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

Table 3. Summary of streamflow measurements for Deep Creek.

Visit Date	Flow (cfs)	Collector
10/20/2021	0.08	CWCB

Water Availability Summary
The hydrograph (See Complete Hydrograph) shows StreamStats results for mean-monthly streamflow and StreamStats minus the full decreed amount of the Button Ditch No. 1 during typical irrigation season. This provides the best available estimate of the available water if the Button Ditch No. 1 begins to use their right again in the future. Staff has concluded that water is available for appropriation.

MATERIAL INJURY
Because the proposed ISF on Deep 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. (2021), the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

Citations
Capesius, J.P. and V.C. Stephens, 2009, Regional regression equations for estimation of natural streamflow statistics in Colorado, Scientific Investigations Report 2009-5136.

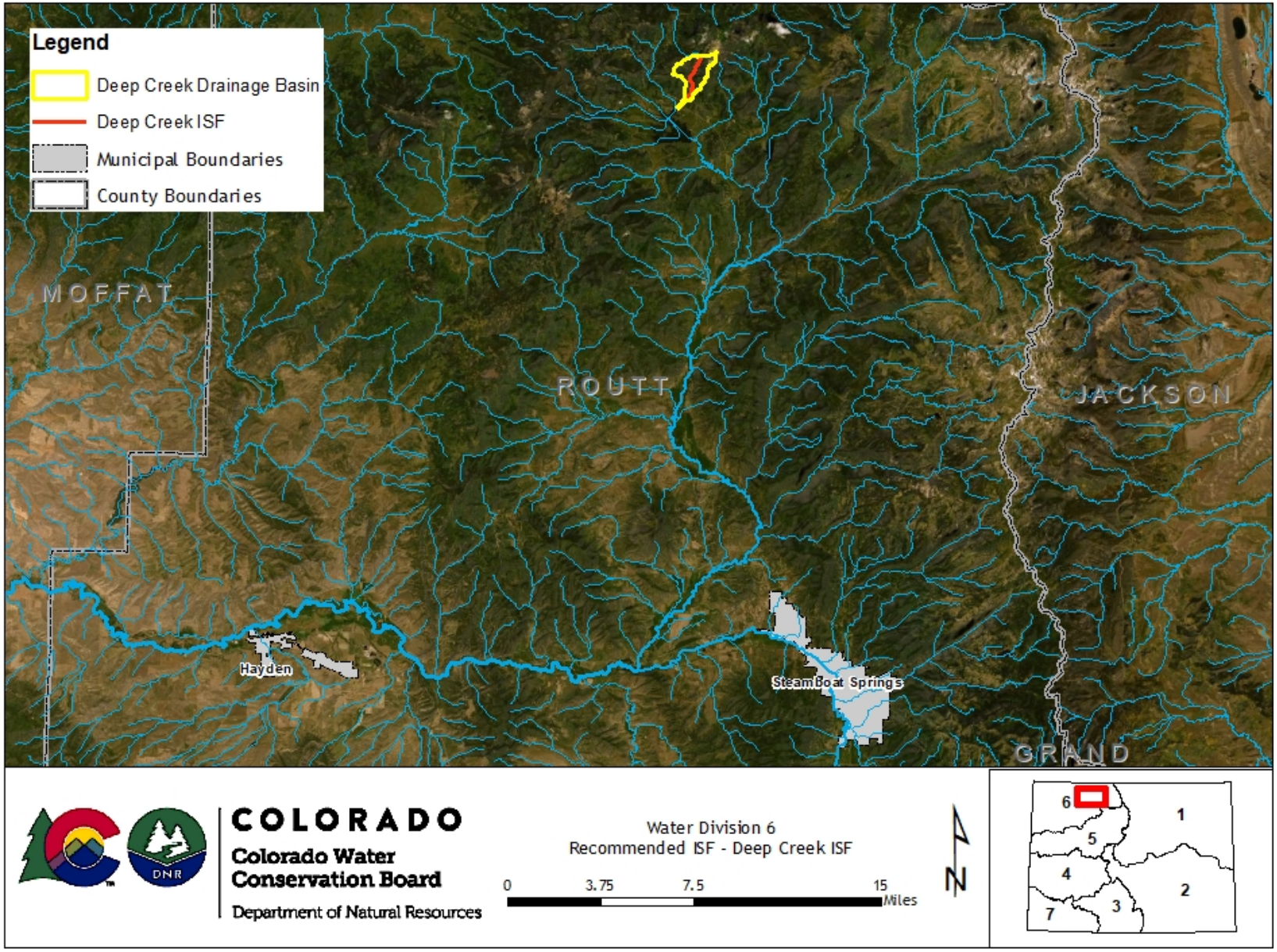
Espegren, G.D., 1996, Development of Instream Flow Recommendations in Colorado Using R2CROSS, Colorado Water Conservation Board.

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.

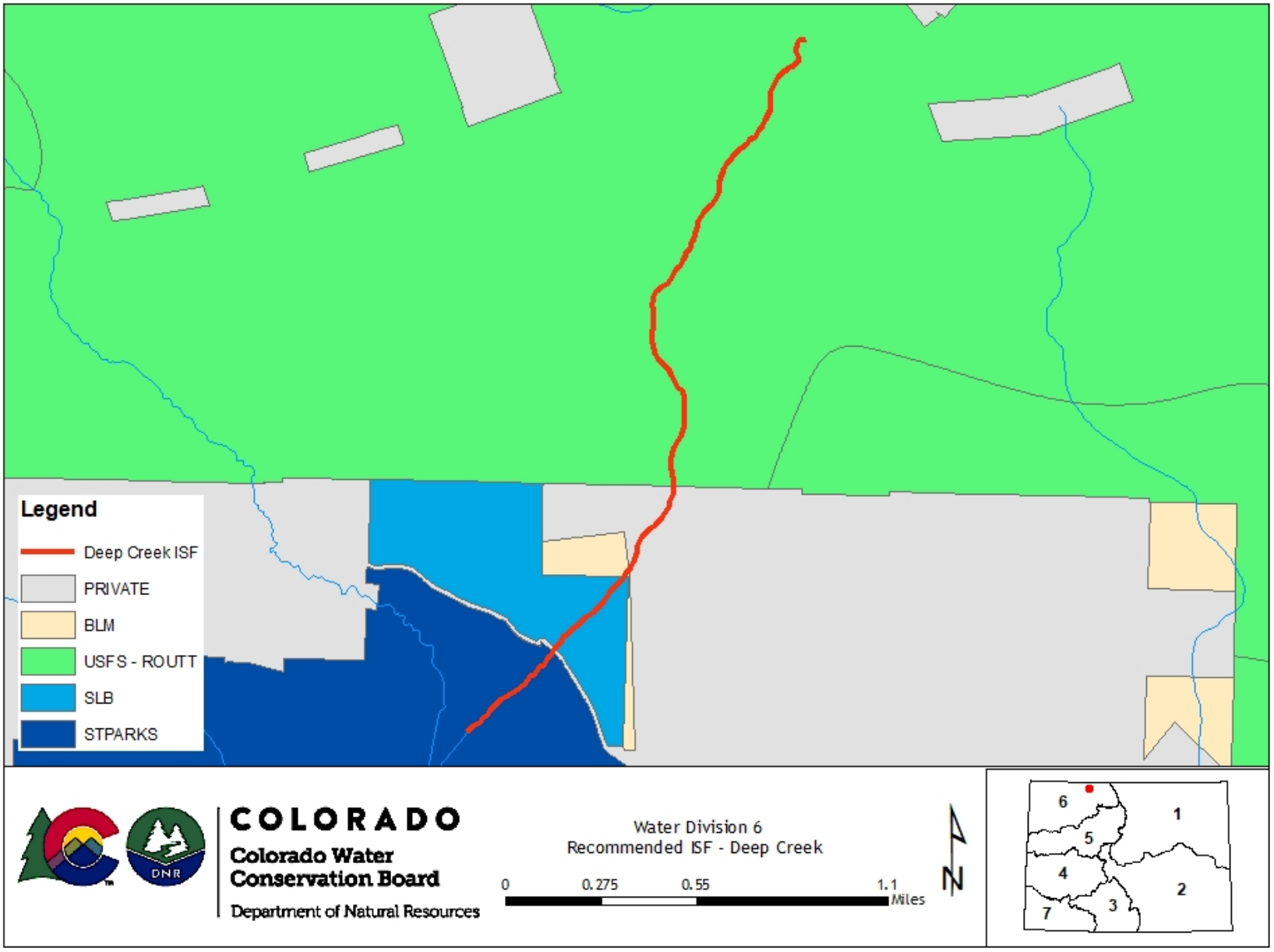
Metadata Descriptions
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

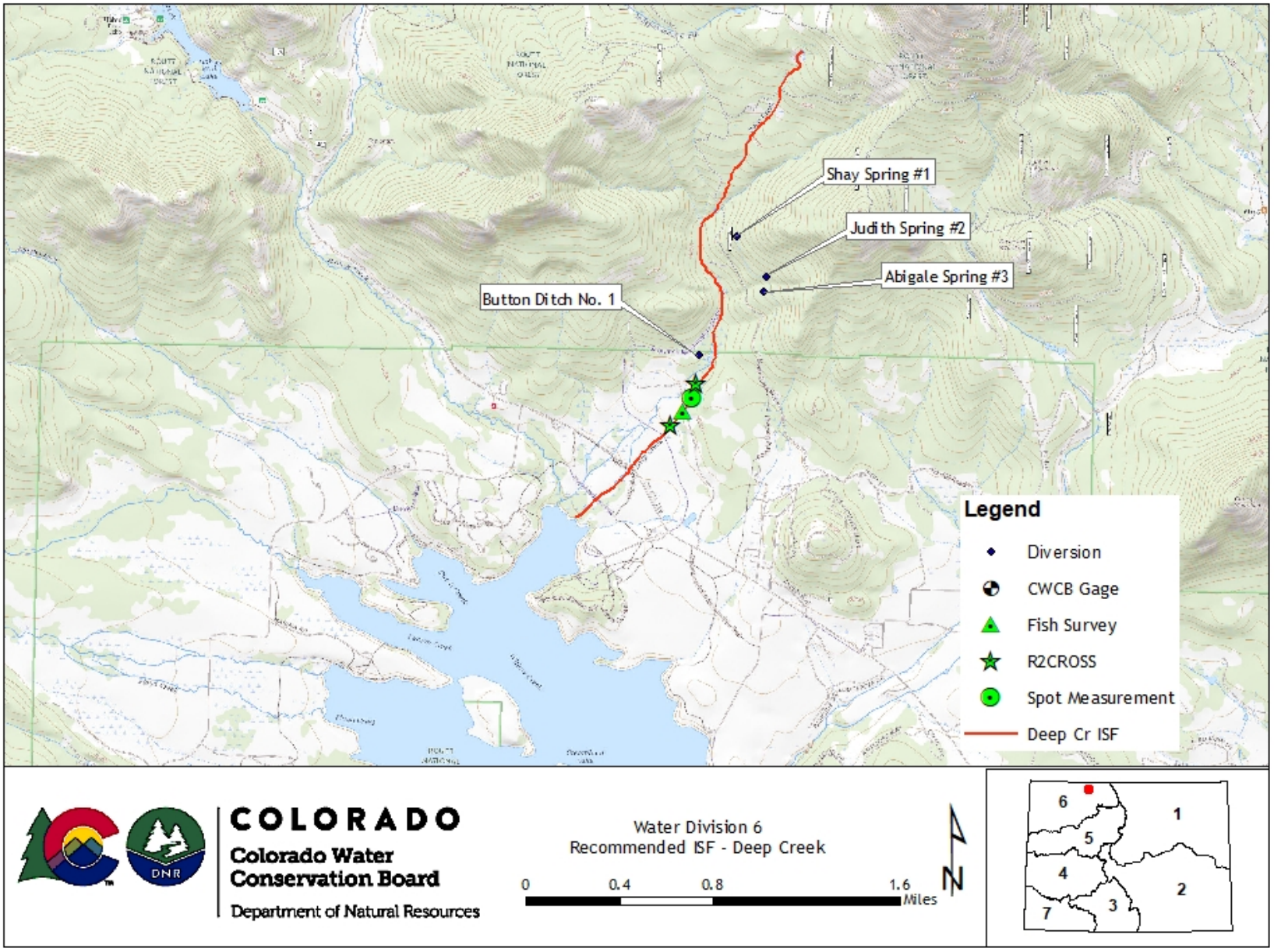
VICINITY MAP



LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH