Watson Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 24-25, 2022

UPPER TERMINUS:	confluence Moody Creek at: UTM North: 4442915.57 UTM East: 331641.39
LOWER TERMINUS:	Hardscrabble Ditch headgate at: UTM North: 4447907.65 UTM East: 335946.66
WATER DIVISION:	6
WATER DISTRICT:	58
COUNTY:	Routt
WATERSHED:	Upper Yampa
CWCB ID:	19/6/A-008
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	5.86 miles
FLOW RECOMMENDATION:	1.1 cfs (08/16 - 03/31) 1.9 cfs (04/01 - 06/21)

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 Watson Creek. Watson Creek is located within Routt County and is approximately 1.5 miles east of the Town of Yampa (See Vicinity Map). The stream originates in the Routt National Forest and flows northeast for 11 miles until it reaches the confluence with the Yampa River.

The proposed reach extends from the confluence with Moody Creek downstream to Hardscrabble Ditch headgate for a total of 5.86 miles. Ninety-three percent of the land on the proposed reach is privately owned and 7% of the land is owned and managed by the BLM (See Land Ownership Map). 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 Watson Creek was sent to the mailing list in November 2021, March 2021, November 2020, March 2020, March 2019, November 2018, and March 2018. Staff also sent notice letters to identified landowners adjacent to Watson Creek based on information available in the county assessors website. Public notice of 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 and October 9, 2018. In addition, CWCB and BLM staff met with a number of interested landowners and Water Commissioner Scott Hummer on July 9, 2021 to discuss the ISF recommendation and answer questions about the ISF program.

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.

Watson Creek is a cool-water stream that runs through high elevation, shrubby grasslands with a low to moderate gradient. The recommended reach flows through a shallow valley, which ranges from a quarter mile to a half mile in width. The land in the reach is primarily agricultural pastures used for grazing livestock. There are healthy riparian communities of willow, sedges, and rush species, which are more abundant in areas fenced off from grazing. BLM and CWCB noted some areas with bank erosion and lower abundance of riparian species in locations with higher livestock usage. There is evidence of some nutrient and sediment loading with some algal growth. BLM staff identified the water quality as being acceptable for supporting cool-water fish species. The substrate consists mostly of sand with some small to medium gravel and cobble. The largest cobbles noted by staff were four inches in diameter.

BLM fish surveys documented self-supporting populations of longnose suckers, whitehead suckers, and creek chub. Fish were also frequently noted by CWCB staff during site visits, as well as a mink. Populations of macroinvertebrate species that are tolerant of cool to warm water were found in the reach, including mayfly nymphs, caddisfly nymphs, and water boatmen. Three distinct species of aquatic plants were also found growing near the CWCB's streamflow measurement location.

Table 1. List of species identified in Watson Creek.

Species Name	Scientific Name	Protection Status
White Sucker	*Catostomus commersonii*	None
Longnose Sucker	*Catostomus catostomus*	None
Creek Chub	*Semotilus atromaculatus*	None
water boatmen	*Corixidae*	None
caddisfly	*Tricoptera*	None
mayfly	*Ephemeroptera*	None
American mink	*Neovison vison*	None
willow	*Salix spp.*	None
sedge	*Carex spp.*	None
rush	*Juncus spp.*	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 1.10 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 1.91 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 Watson Creek.

Date, XSec #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
08/02/2017, 1	12.77	2.52	1.01 - 6.30	1.10	2.27
08/02/2017, 2	10.19	2.57	1.03 - 6.43	Out of range	1.54
			Mean	1.10	1.91

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

1.90 cfs is recommended from April 1 to June 21. This recommendation is driven by the average depth criteria and wetted perimeter criteria. During the early irrigation season, which typically begins in May, maintaining this flow rate in the creek would provide adequate habitat for maintaining fish species while irrigation diversions occur. This flow rate will maintain sufficient physical habitat in the creek for the fish population to complete important parts of their life cycle while physical habitat is abundant due to higher flows.

An instream flow water right is not recommended for the peak irrigation season, from June 22 through August 15, due to insufficient information about potential water availability limitations.

1.10 cfs is recommended from August 16 through March 31. This recommendation is driven by the average velocity criteria. This flow rate should provide adequate habitat during late summer and fall for the fish populations to complete important parts of their life cycle after habitat is restricted during the annual period of high irrigation diversions. This flow rate should also prevent complete icing of the numerous pools in this reach, allowing the fish populations to 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 Watson Creek is 16.40 square miles, with an average elevation of 8,867 feet and average annual precipitation of 28.06 inches (See the Hydrologic Features Map). Hydrology in the region is primarily driven by snowmelt runoff with relatively high flows during spring and early summer and lower flows in mid to late summer due to irrigation uses.

There are a number of water uses in the basin tributary to the proposed Watson Creek ISF, including 47.2 cfs in absolute surface water diversions and 510.5 AF in storage water rights. In addition, the Coal Creek Ditch (WDID 5800589, 8 cfs, appropriation date 1945) imports water from Bear Creek into Watson Creek. Four ditches are located within the proposed ISF reach (Table 3). Of these, all but the Ferguson Ditch are known to dry up the stream, primarily after snowmelt runoff in later summer. Due to surface water diversions and transbasin imports both upstream and within the ISF reach, hydrology in this drainage basin does not represent natural flow conditions.

Table 3. Structures located within the proposed ISF reach on Watson Creek.

WDID	Structure Name	Total Decreed Flow Rate, cfs	Appropriation Dates
5800634	Ferguson Ditch	15	1886, 1930
5800827	Powell Ditch 1	1	1889, 1919
5800725	Laramore Ditch	5	1885, 1888, 1919
5800828	Powell Ditch 2	2	1892, 1919, 1962

Data Analysis

Gage Data

There are no current or historic streamflow gages on Watson Creek. No representative gages on nearby streams were identified in part due to the high level of water use in Watson Creek and the nearest streams with gages. However, a number of gages in the region were evaluated to assess the typical timing of snowmelt runoff (Table 4). These gages consistently show that runoff starts between mid-March and early April, with a peak occurring mid-April to mid-May.

Table 4. Nearby gages evaluated to determine typical timing of snowmelt runoff. Reported location is described relative to the proposed lower terminus on Watson Creek.

ID	Gage Name	Period of Record	Location
09238000	Oak Creek near Oak Creek	1952-1957	7.1 miles northwest
09243900	Foidel Creek at Mouth	1975-2001	15.6 miles north
09060700	Egeria Creek near Toponas	1965-1973	8.7 miles southeast

CWCB Gage and Staff Measurements

CWCB Staff installed a temporary gage near the lower terminus and made 14 streamflow measurements on the proposed reach of Watson Creek as summarized in Table 5. This gage location records the impact from consumptive uses in the basin (in other words the impacts of upstream consumptive water uses is reflected in the gage data), but it does not capture potential dry up points at upstream locations. This gage was operated from late July of 2019 to October of 2020. Site conditions such as aquatic vegetation and ice presented a number of challenges in developing a stage-discharge relationship. These issues were addressed using a variety of techniques that result in conservative estimates (meaning that the estimated flow is likely less than the actual flow). Median hydrology was not calculated due to the short period of record. All of the direct streamflow measurements were higher than the proposed ISF flow rates.

Table 5. Summary of streamflow measurements for Watson Creek.

Visit Date	Flow (cfs)	Collector
05/07/2018	6.24	CWCB*
06/04/2019	12.28	CWCB
06/28/2019	11.54	CWCB
07/29/2019	10.25	CWCB
07/29/2019	4.62	CWCB*
05/06/2019	12.86	CWCB
11/07/2019	3.60	CWCB
12/06/2019	2.94	CWCB
07/08/2020	3.59	CWCB
09/18/2020	2.58	CWCB
07/23/2020	6.16	CWCB
10/11/2020	2.53	CWCB
04/04/2021	9.63	CWCB
07/09/2021	1.30	BLM & CWCB

*Indicates measurements made on BLM property midway through the proposed reach, these measurements are not included in the hydrograph.

Staff evaluated the Yampa River at Steamboat gage (USGS 09239500, period of record 1904 to 2020 with three missing years), to assess how 2018, 2019, and 2020 compared hydrologically to a longer record. This gage is located approximately 22 miles north from the proposed lower terminus on Watson Creek. Based on this analysis, water year 2018 was less than the 25th percentile for total annual streamflow, 2019 was near the 75th percentile, and 2020 was just less than the 50th percentile. However, both 2019 and 2020 experienced little to no summer precipitation resulting in unusually low streamflow late summer through fall. Therefore, the

available streamflow data from 2018 represents very low flows, 2019 represents high runoff, and 2020 represents below median flows. All three years show dry late summer and fall conditions.

Diversion Records
In some cases, diversion records can be used to provide an indication of water availability in a stream reach. The Hardscrabble Ditch, which is located at the proposed lower terminus, is decreed for 2.0 cfs (0.5 cfs with an 1885 appropriation date and 1.5 cfs with a 1919 appropriate date). The diversion structure historically was used fairly consistently starting in the 1930s, but has seen no or limited use since about 1990 (there is recorded use in 1909, 2000, 2010, and 2014). Due to the large number of years without use, median diversions were calculated without including zeros. The records generally show that median diversions (in years with diversions) exceed the proposed ISF rate between June and mid-September. The median diversions in early spring and late fall are somewhat less; these time periods have very limited data which likely reflects reduced irrigation demand rather than water availability limitations. Measuring structures have only recently been installed in this area and some structures are under orders to install them; therefore, the historic diversion records are based on the professional judgment of the water commissioner or estimated values submitted by the ditch owners.

StreamStats
The USGS StreamsStats tools was used to estimate streamflow during late fall, winter, and spring when stock and irrigation uses are minimal or non-existent. StreamStats results are not relied on during the main irrigation season.

Water Commissioner Comments
In addition to the CWCB streamflow measurements, staff contacted Scott Hummer, who is the current water commissioner. Mr. Hummer has been the water commissioner for Watson Creek since 2017. Between 2017 and 2020, the Yampa River basin has experienced a large range in hydrologic conditions. Based on the Yampa River at Steamboat gage (USGS 09239500, period of record 1904 to 2020 with 3 missing years), the total flow volume in water years 2017 and 2018 were ranked less than the 25th percentile, 2019 was near the 75th percentile, and 2020 was just less than the 50th percentile. 2018 and 2020 were also the first years that the Yampa River was placed under administration.

Based on these conditions, Mr. Hummer has observed that the Powell Ditch 1 & 2 and the Laramore Ditch can and do sweep the stream, typically from about June 22 to August 15. Other than those time-frames, water users appear to have sufficient water and no local calls have been placed on Watson Creek. In Mr. Hummer's experience, the proposed ISF flow rates are available for appropriation.

Water Availability Summary
The hydrograph (See Complete Hydrograph) shows the streamflow gage data, the median diversions and the 95% confidence interval for median diversions for the Hardscrabble ditch, StreamStats mean-monthly streamflow, and the proposed ISF. This ISF reach presents challenging conditions to evaluate water availability and there is insufficient information to evaluate if water is available from June 22 to August 15 due to the potential for dry up points within the stream reach. The CWCB streamflow measurements and StreamStats indicate that water is available for appropriation from late September to late May. The availability of water

from late May to June 21 and August 16 to late September is based on streamflow measurements, diversion records, and expertise of the water commissioner. Taken together, these data and the observations from the water commissioner support the finding that water is available during the proposed time-frames.

MATERIAL INJURY

Because the proposed ISF on Watson 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.

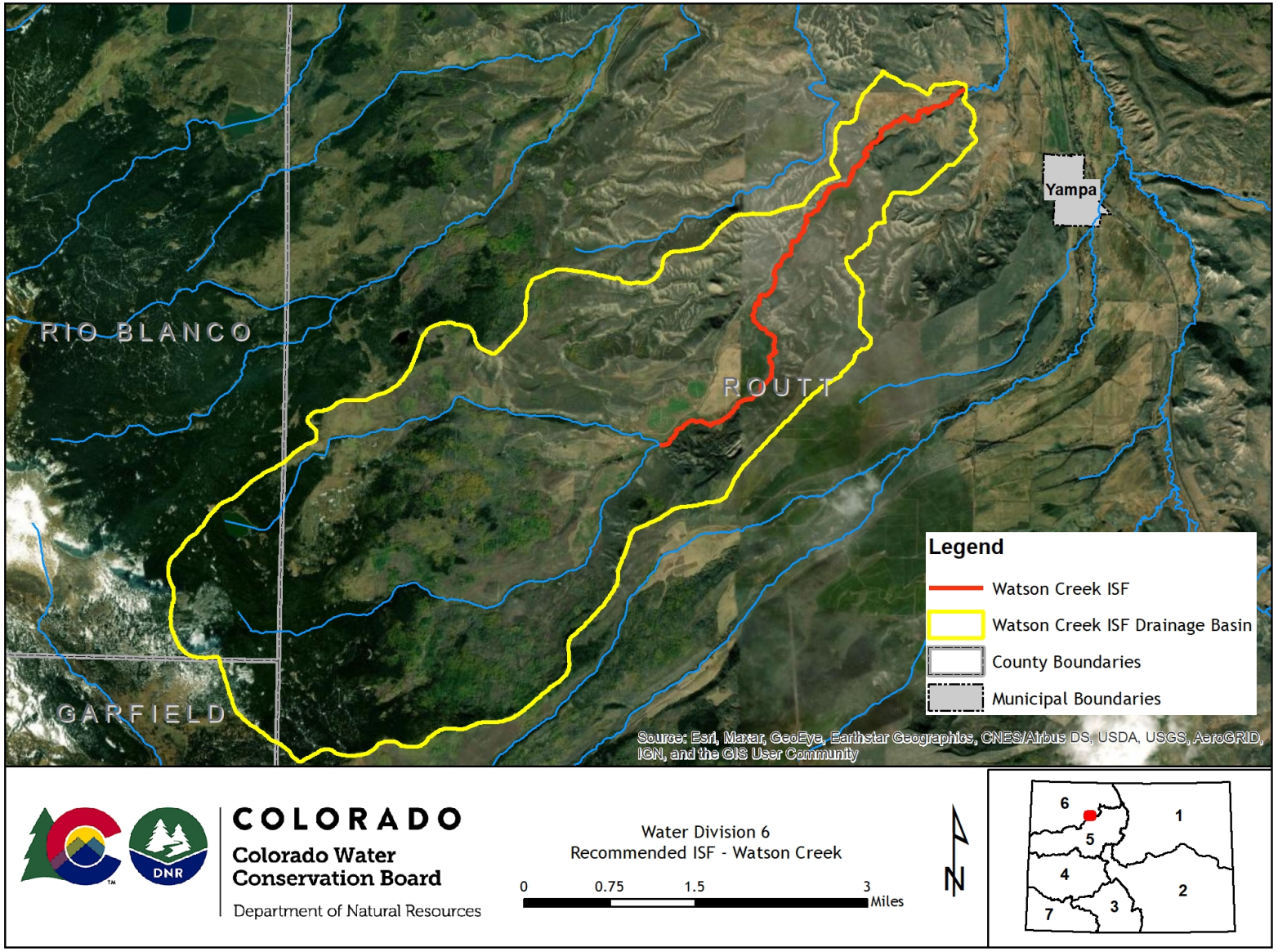
Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

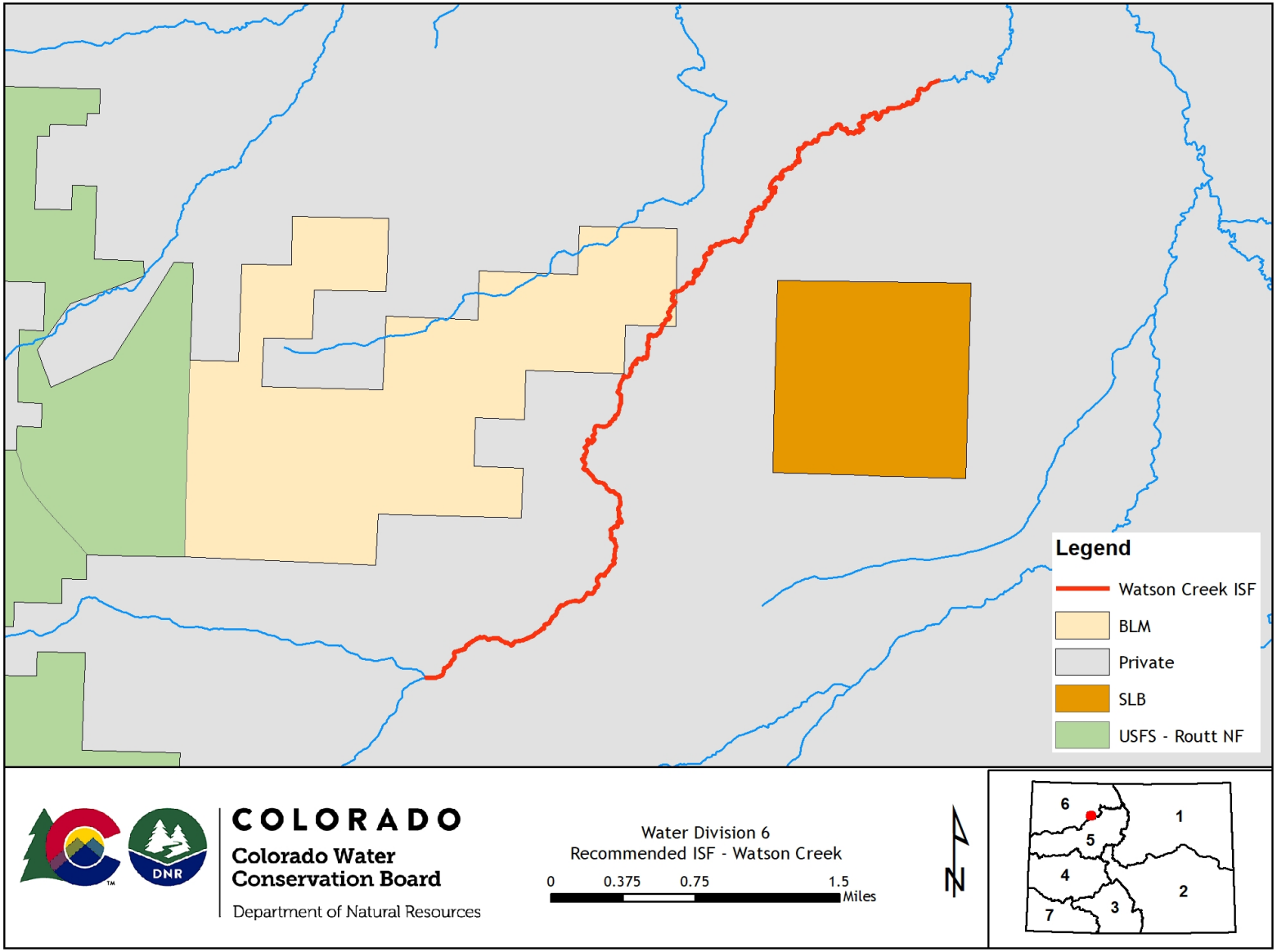
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

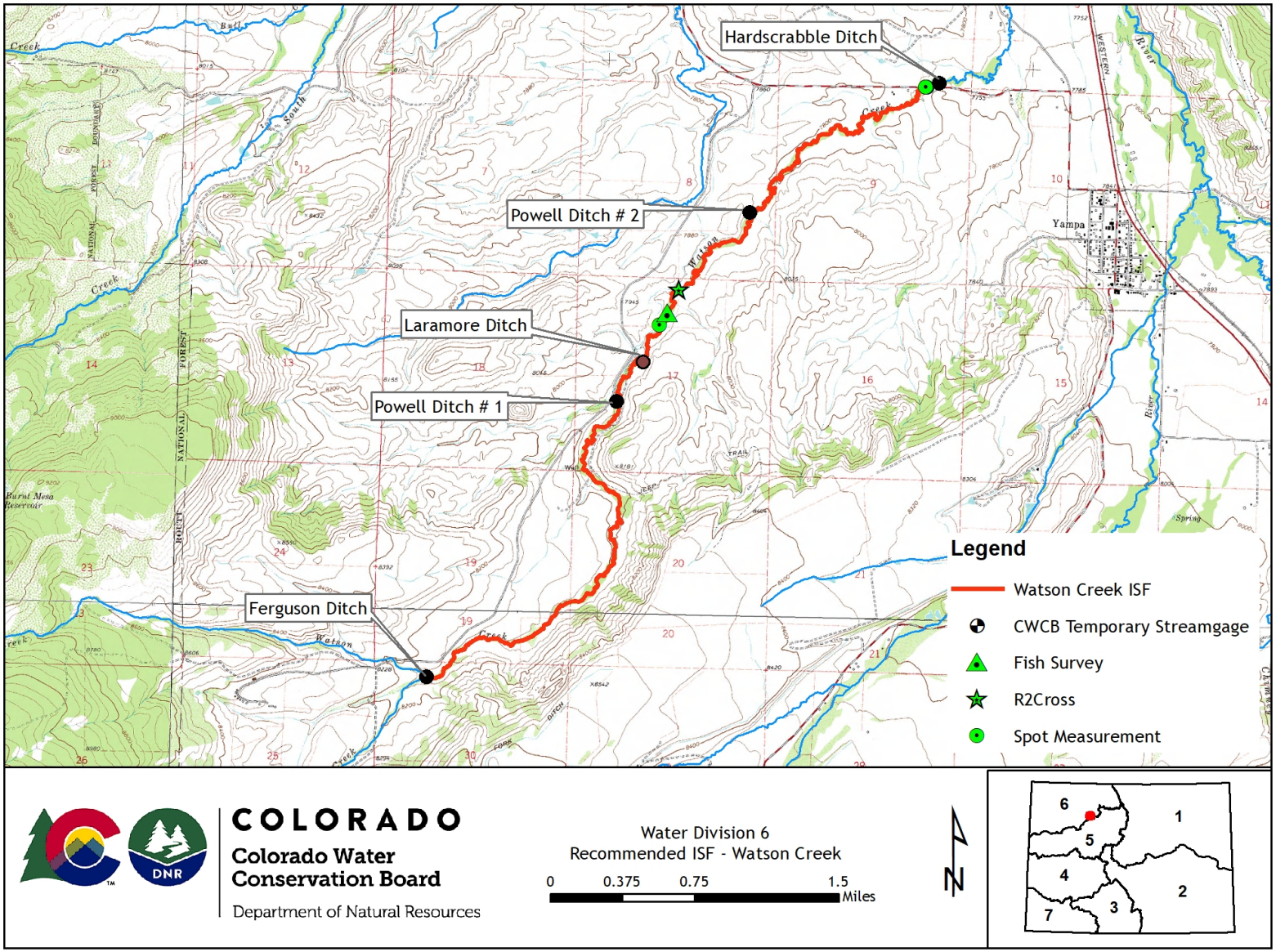
VICINITY MAP



LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH