



COLORADO

Colorado Water
Conservation Board

Department of Natural Resources

Abrams Creek EXECUTIVE SUMMARY



CWCB STAFF INSTREAM FLOW RECOMMENDATION

UPPER TERMINUS: Headwaters in the Vicinity of
UTM North: 4383025.55 UTM East: 339836.18

LOWER TERMINUS: Mrs. Paye Ditch Headgate
UTM North: 4387351.32 UTM East: 343811.41

WATER DIVISION: 5

WATER DISTRICT: 37

COUNTY: Eagle

WATERSHED: Eagle

CWCB ID: 16/5/A-001

RECOMMENDER: Bureau of Land Management (BLM)

LENGTH: 3.95 miles

Existing ISF: 80CW0118, 0.5 cfs (1/1 - 12/31)

FLOW RECOMMENDATION: 0.75 cfs (05/01 - 09/30)



Abrams Creek

Introduction

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 Bureau of Land Management (BLM) recommended that the CWCB appropriate an increase to the existing ISF water right on a reach of Abrams Creek. The CWCB currently holds an instream flow water right on Abrams Creek for 0.5 cfs (1/1-12/31), decreed in Case No. 80CW0118. This increased instream flow water right will help preserve the improved flow regime on Abrams Creek that will result from the implementation of the Abrams Creek project. The Abrams Creek project is an irrigation delivery efficiency project that has been facilitated by Trout Unlimited (TU) and partially funded by the CWCB.

Abrams Creek originates on the northeastern flank of Hardscrabble Mountain at an elevation of approximately 10,000 feet. It flows in a northeasterly direction for 5.5 miles as it drops to an elevation of approximately 6,670 feet where it joins Brush Creek. The proposed ISF reach extends from its headwaters downstream to the Mrs. Paye Ditch headgate, and is located within Eagle County (See Vicinity Map). The BLM owns and manages eighty-six percent of the land on which the 3.95 mile proposed reach is located, with the remaining fourteen percent privately owned (See Land Ownership Map). The BLM recommended this reach of Abrams Creek because it has a natural environment that can be preserved to a reasonable degree with an ISF water right.

The information contained in this report and the associated supporting data and analyses (located at <http://cwcb.state.co.us/environment/instream-flow-program/Pages/2018ProposedISFRecommendations.aspx>) form the basis for staff's ISF recommendation to be considered by the Board. This report provides sufficient information to support the CWCB findings required by ISF Rule 5i on natural environment, water availability, and material injury.

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.

Abrams Creek is a cold-water, high gradient stream. It flows through a narrow valley with a valley floor of up to one-fourth mile in width. The stream is often confined by bedrock, and the horizontal extent of alluvium along the stream is typically less than 100 feet. The stream generally has large substrate, typically consisting of cobbles and small boulder mixed with gravels. The stream also exhibits a large amount of woody debris in the stream channel, which adds to stream stability and habitat complexity. While riffle habitat is sufficient, Abrams Creek generally lacks extensive pool habitat, which could be a limiting factor for the fish population.

Fisheries surveys have revealed a self-sustaining population of native cutthroat trout. The Abrams Creek population is considered a Core Conservation population of pure Green-Lineage Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*). This is the only known aboriginal cutthroat population in the Eagle River watershed and is important with respect to future watershed planning and overall conservation efforts for the species. The population is small and limited in part by reduced water flow - primarily during irrigation season. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The riparian community is generally comprised of blue spruce and aspen in the higher elevation parts of the creek and is comprised of narrowleaf cottonwood and willow species in the lower elevation part of the creek. The riparian community is in very good condition, and provides adequate shading and cover for the fish habitat.

Table 1. List of species identified in Abrams Creek.

Species Name	Scientific Name	Status
Colorado River cutthroat trout	<i>Oncorhynchus clarkii pleuriticus</i>	Federal - Sensitive Species State - Species of Greatest Conservation Need

ISF Quantification

CWCB staff relies upon 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.

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 most easily visualized as the stream habitat types that would dry up first should streamflow cease. The field data collected consists of streamflow measurements, surveys of channel geometry at a transect, and 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 quantification of the amount of water needed for summer and winter periods based on empirical studies of fish species preferences. The recommending entity uses the R2Cross results and 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 7 transects for this proposed ISF reach (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 0.7 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 1.25 cfs, which meets 3 of 3 criteria and is within the accuracy range of the R2Cross model.

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

Entity	Date	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
BLM	07/01/2013 # 1	0.87	0.35 - 2.18	0.75	1.71
BLM	07/01/2013 # 2	0.93	0.37 - 2.33	0.75	Out of range
BLM	07/01/2013 # 3	0.56	0.22 - 1.40	0.56	Out of range
BLM	07/01/2013 # 4	0.59	0.24 - 1.48	0.59	1.22
BLM	06/26/2014 # 1	1.56	0.62 - 3.90	Out of range	Out of range
BLM	06/26/2014 # 2	1.36	0.54 - 3.40	0.86	Out of range
BLM	06/26/2014 # 3	1.74	0.70 - 4.35	Out of range	0.83
Mean				0.70	1.25

ISF Recommendation

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

An increase of 0.75 cfs to the existing 0.5 cfs ISF water right is recommended from May 1 to September 30. The combined total of the two water rights would be 1.25 cfs. This recommendation is driven by the average velocity criteria. According to wetted perimeter criteria, this flow rate also makes a very high percentage of the physical habitat available for fish usage, such as spawning during the spring.

No recommendation is being requested at this time for the period October 1 to April 30 because insufficient water is available to support an increase.

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.

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 streamflows 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 Abrams Creek is 5.68 square miles, with an average elevation of 8,720 feet and average annual precipitation of 30.5 inches (See the Hydrologic Features Map). There is one surface water diversion near the top of the proposed ISF reach (JPO No 2 Ditch, 3 cfs, appropriation dates 1908 and 1916) which exports water out of the basin into Alkali Creek. The lower terminus is the Mrs Paye Ditch (3 cfs, appropriation dates 1899 and 1923). 0.8 cfs of the Mrs. Paye Ditch water right is senior to the JPO No 2 Ditch water right on Abrams Creek. The Mrs. Paye Ditch water right effectively brings 0.8 cfs through the proposed ISF reach. The JPO No 2 Ditch has the next priority water rights and can take the fully decreed 3 cfs before other Mrs Paye Ditch water rights are in priority again. No other active water rights are located within the proposed ISF reach.

Trout Unlimited has partnered with the owner of the JPO No 2 Ditch (Buckhorn Valley Metropolitan District #1) in an effort to increase streamflow in Abrams Creek to support the Colorado River cutthroat trout population. The Buckhorn Valley Metropolitan District #1 has agreed to leave 40% of all streamflow available at the JPO No 2 Ditch in the stream, and no less than 1.25 cfs in the stream. In exchange, Trout Unlimited will secure funding to build a pipeline that will increase the diversion efficiency of the JPO No 2 Ditch. The CWCB has funded portions of the pipeline through a Water

Supply Reserve Account Grant for the Abrams Creek Cutthroat Trout Project, of \$45,000 from the Colorado Basin Account and \$319,711 from the Statewide Account, and a Fish and Wildlife Resources Fund grant for \$550,000. Mely Whiting, Trout Unlimited representative, indicated that all necessary funding has been secured and construction is expected to be completed in 2018 (personal communication, 12/8/2017).

Available Data

There are no current or historic streamflow gages on Abrams Creek or any nearby creeks that are representative of hydrology in Abrams Creek.

In some cases, diversion records can be used to provide an indication of water availability in a stream reach. Although the Mrs. Paye Ditch is located at the lower terminus, the diversion record has a large number of comments of “water taken but no data available” and “water available, but not taken.” Data gaps and inconsistent use of a water right limit the usefulness of the diversion records to evaluate typical water availability.

According to Bill McEwen, Water Commissioner, an 18 inch Parshall flume was installed on Abrams Creek upstream from the JPO No 2 Ditch (personal communication 8/1/2017) and monitored by the Buckhorn Valley Metropolitan District #1. A pressure transducer was mounted in the flume and records are available from 2011 to present (David Graf, personal communication). The flume records are seasonal, typically starting in May and ending in late September or early October. This data was reviewed, but not used in the water availability analysis because the flume is not located near the lower terminus.

Due to limited available data near the lower terminus, CWCB staff installed a pressure transducer in a flume associated with the Mrs. Paye Ditch. This flume measured all of the flow in Abrams Creek near the lower terminus. The pressure transducer was installed on 6/13/2017 and was removed on 11/8/2017 for analysis. The pressure transducer recorded water depth every 15 minutes, which was converted to streamflow based on the standard equations for a 9 inch Parshall flume. It should be noted that the JPO No 2 Ditch is believed to have been operated in 2017, which would reduce the amount of water available recorded by this device. The data collected in the Mrs Paye Ditch flume was not relied upon for the water availability analysis due to the short period of data collection.

CWCB staff made 5 streamflow measurements on the proposed reach of Abrams Creek. These measurements are included in the water availability analysis and are summarized in Table 3.

Table 3. Summary of Streamflow Measurement Visits and Results for Abrams Creek.

Visit Date	Flow (cfs)	Collector
08/10/2016	0.90	CWCB
09/21/2016	0.65	CWCB
07/12/2017	1.23	CWCB
09/14/2017	1.06	CWCB
11/08/2017	1.26	CWCB

Data Analysis

StreamStats provides the best available estimate of streamflow on Abrams Creek.

Water Availability Summary

The hydrograph (See Complete and Detailed Hydrographs) show StreamStats results for mean-monthly streamflow. Changing irrigation practices based on the TU and Buckhorn Valley Metropolitan District #1 agreement would further support water availability on Abrams Creek. Staff has concluded that water is available for appropriation.

Material Injury

Because the proposed ISF on Abrams 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. (2017), the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

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.

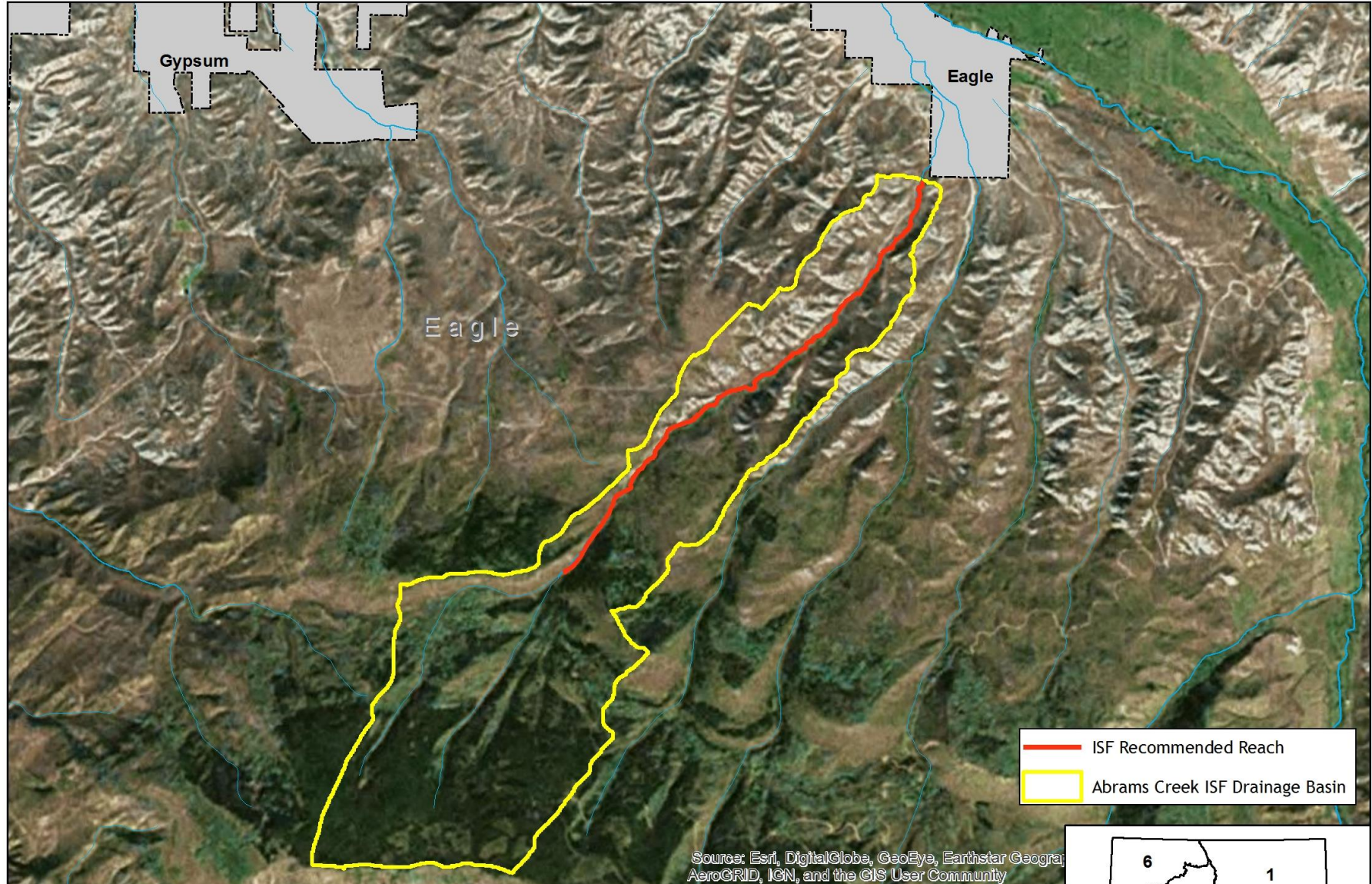
Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

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

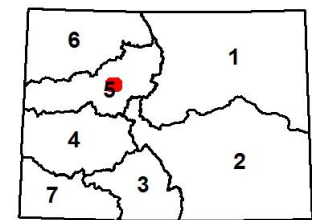
Projected Coordinate System: NAD 1983 UTM Zone 13N.

VICINITY MAP

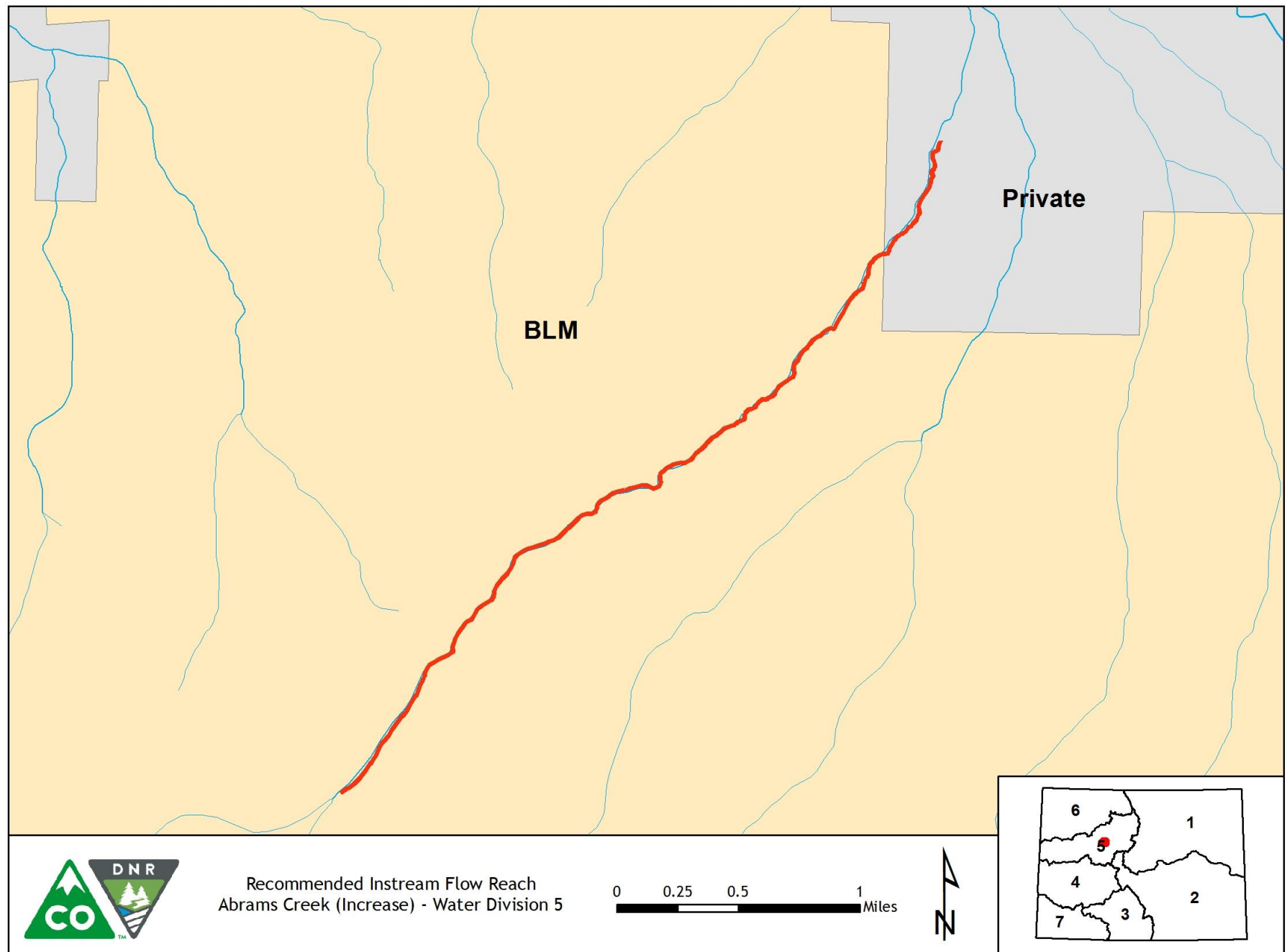


Recommended Instream Flow Reach
Abrams Creek (Increase) - Water Division 5

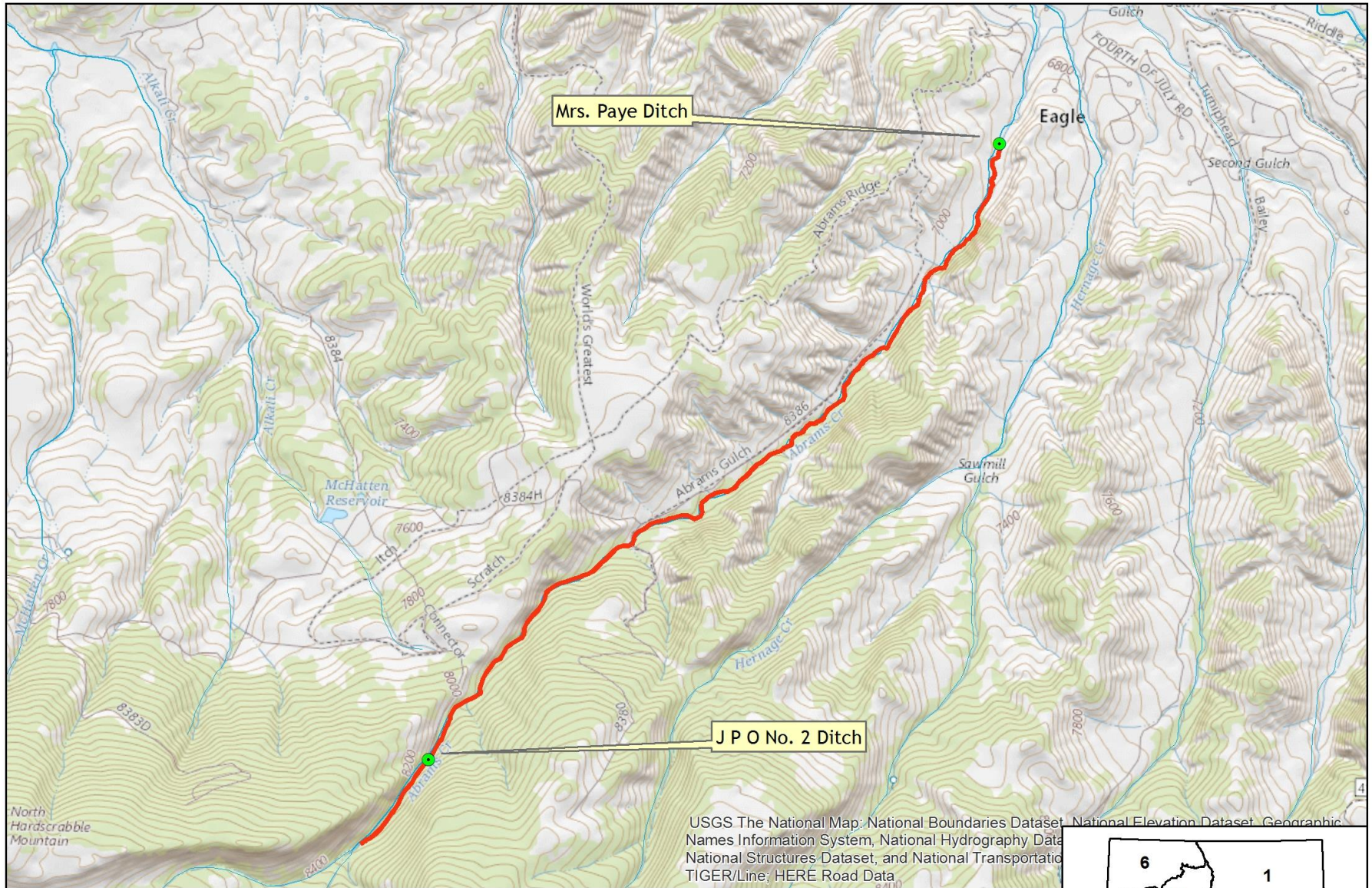
0 0.5 1 2 Miles



LAND OWNERSHIP MAP

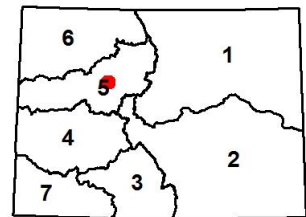


HYDROLOGIC FEATURES MAP

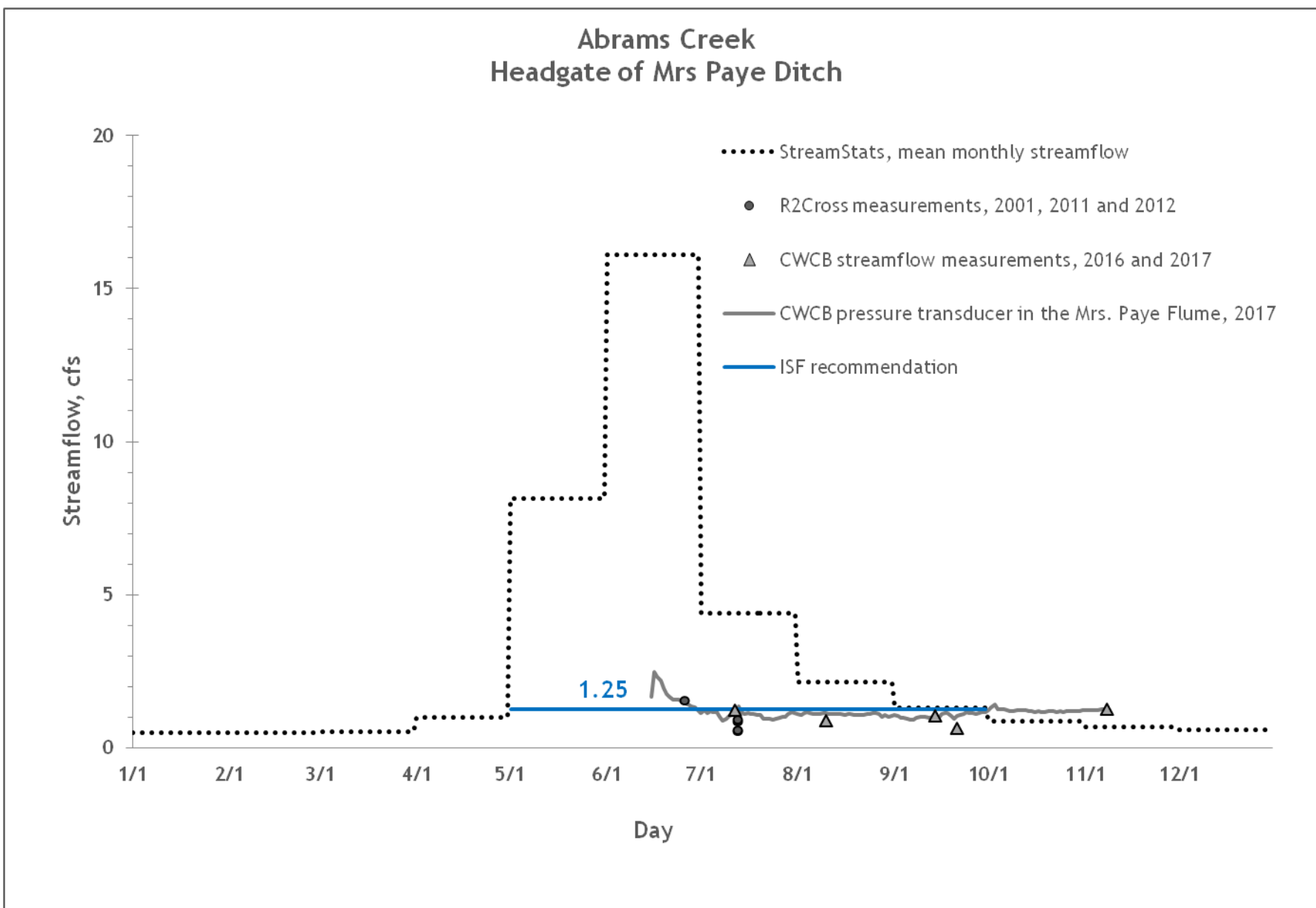


Recommended Instream Flow Reach
Abrams Creek (Increase) - Water Division 5

0 0.25 0.5 1 Miles



COMPLETE HYDROGRAPH



DETAILED HYDROGRAPH

