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Department of Natural Resources

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West Hawxhurst Creek
EXECUTIVE SUMMARY

CWCB STAFF INSTREAM FLOW RECOMMENDATION

UPPER TERMINUS:	Headwaters in the vicinity of UTM North: 4361117.90 UTM East: 250123.61
LOWER TERMINUS:	Confluence with East Hawxhurst Creek UTM North: 4353102.99 UTM East: 248989.35
WATER DIVISION:	5
WATER DISTRICT:	72
COUNTY:	Mesa
WATERSHED:	Colorado Headwaters-Plateau (HUC#: 14010005)
CWCB ID:	16/5/A-003
RECOMMENDER:	Bureau of Land Management
LENGTH:	5.57 miles
FLOW RECOMMENDATION:	1.60 cfs (4/15 – 6/30) 0.56 cfs (7/1 – 4/14)

West Hawxhurst 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 ISF water right on a reach of West Hawxhurst Creek. This reach is located in Mesa County about 4 miles northeast of Collbran (See Vicinity Map). West Hawxhurst Creek originates on the south flank of Battlement Mesa at an elevation of 10,640 ft. The creek flows in a southerly direction as it drops to an elevation of 8,600 feet where it joins East Hawxhurst Creek to form Hawxhurst Creek, a tributary to Plateau Creek. The proposed reach extends from the headwaters downstream to the confluence with East Hawxhurst Creek. Ninety-nine percent of the land on the 5.57 mile proposed reach is publicly owned and managed by a combination of the BLM and the U.S. Forest Service (See Land Ownership Map). The BLM recommended this reach of West Hawxhurst 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/2016ProposedISFRecommendations.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.

West Hawxhurst Creek is a cold-water, high gradient stream. The stream is confined by bedrock in most locations. The stream generally has medium-sized substrate, consisting of gravels and small cobbles, and small boulders. The stream has a good mix of pools, small riffles, and runs. While deep pool habitat is absent, the existing pools are sufficient for overwintering fish.

Fisheries surveys have revealed a self-sustaining population of hybridized native cutthroat trout and rainbow trout. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The riparian community is very diverse and is comprised of box elder, red osier dogwood, birch, willow species, and alder. The riparian community is in very good condition, and provides abundant shading and cover for fish habitat.

Table 1. List of fish species identified in West Hawxhurst Creek.

Species Name	Scientific Name	Status
native cutthroat trout	*Oncorhynchus clarkii*	None
rainbow trout	*Oncorhynchus mykiss*	None

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 and surveys of channel geometry at a transect and 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 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 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 three 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 summer flow of 1.63 cfs, which meets 3 of 3 criteria and is within the accuracy range of the R2Cross model. The R2Cross model results in a winter flow of 1.23 cfs, which meets 2 of 3 criteria and is within the accuracy range of the R2Cross model.

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

Entity	Date	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
BLM	10/1/2011 - 1	1.15	0.46 – 2.88	1.51	2.01
BLM	7/22/2014 - 1	1.22	0.49 – 3.05	0.95	0.97
BLM	7/22/2014 - 2	1.10	0.44 – 2.75	1.24	1.91
			Mean	**1.23**	**1.63**

ISF Recommendation
The BLM recommends flows of 1.6 cfs (4/1 – 7/31), and 0.9 cfs (8/1 – 3/31) based on R2Cross modeling analyses and biological expertise. Staff recommends 1.6 cfs (4/15 – 6/30) and 0.56 cfs (7/1 – to 4/14) due to water availability.

1.60 cubic feet per second is recommended during the snowmelt runoff period and summer, from April 15 to June 30. This recommendation is driven by the wetted perimeter criteria. This 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.

0.56 cubic feet per second is recommended during the cold weather period from July 1 to April 14. This recommendation is driven by limited water availability. This flow rate should prevent pools from freezing, allowing the fish population to successfully overwinter. Even though the base flow in this creek is small, it is extremely consistent, allowing the fishery to persist.

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 West Hawxhurst Creek is 6.57 square miles, with an average elevation of 9,300 ft and average annual precipitation of 30.71 inches. There is one surface water diversion within the basin tributary to the proposed ISF, the Hawxhurst Smalley Ditch (appropriation 1930 and 1950, 4.8 cfs). This diversion transports water out of the West Hawxhurst Creek drainage. There are no known transbasin imports. Hydrology in this drainage basin represents somewhat altered conditions due to the Hawxhurst Smalley Ditch. See the Hydrologic Features Map for more information.

Available Data

There is not a current or historic streamflow gage on West Hawxhurst Creek. The closest gage identified was the historic Brush Creek near Collbran, CO gage (USGS 09097600). The gage was located in a drainage basin approximately 4.3 miles northeast from the proposed lower terminus. The gage has a continuous short period of record from 1955 to 1967. The Brush Creek gage has a 9.29 square mile drainage basin. The average elevation of the basin is 9,590 ft and the average precipitation is 30.96 inches. Brush Creek drains the southern edge of Battlement Mesa and is oriented similar to West Hawxhurst Creek. The Brown No 1 Ditch (appropriation date 1928, 0.78 cfs) has absolute decreed water rights with diversion records in the drainage basin tributary to the historic gage. This structure irrigates land upstream from the Brush Creek gage and return flows may accrue to the stream above the gage.

The Hawxhurst Smalley ditch on West Hawxhurst Creek has daily diversion records starting in 1969 through present. Many intervening years do not have records and some years of records may be questionable based on previous water commission comments in the structure summary report. Based on discussions with Bruce Michaelson, the current water commissioner, water likely leaks through the diversion structure when it is in operation (personal communication, 1/5/2015). In addition, more senior water rights are located on the mainstem of Hawxhurst Creek downstream. These include the more senior rights for the following structures; McCurry Highline Ditch (appropriation dates 1888 to 1991, 5.29 cfs), McCurry Ditch (appropriation dates 1922 to 1991, 4.8 cfs), and Hawxhurst Ditch (appropriation dates 1988 to 1991, 13.99 cfs).

CWCB staff made one streamflow measurement on the proposed reach of West Hawxhurst Creek. This measurement is included in the water availability analysis.

Data Analysis

Due to the short period of record available for the Brush Creek gage, staff took additional steps to evaluate the record. Staff examined other gages in the region in an attempt to find a gage that could be used to extend the record through regression analysis. However, none of the gages evaluated produced a reasonable regression coefficient and none were found suitable for regression extension.

Staff also examined climate stations and found that the Collbran climate station (Collbran, Station USC00051741, downloaded 1/10/2015) had a long, nearly continuous period of record and is located about 4.5 miles southwest from the lower terminus. The average annual precipitation at the Collbran station for the period of record (1893 to 1999, excluding years with incomplete records) was 14.89 inches. During the complete years the Brush Creek gage operated (1956 to 1966), the average precipitation was 13.41 inches, with five years above average precipitation at the Collbran station and six years below average. Therefore, the Brush Creek gage record likely represents average precipitation conditions.

The area-precipitation method was used to scale Brush Creek gage data to the West Hawxhurst Creek basin. The method estimates streamflow based on the ratio of the precipitation weighted drainage area. The scale factor for West Hawxhurst Creek basin at the lower terminus is 0.70, and for this analysis, the basin was subdivided into 0.55 for the contribution above the Hawxhurst Smalley Ditch and 0.15 for the contribution from the Ditch to the confluence with East Hawxhurst Creek. The location selected to represent the Hawxhurst Smalley ditch was slightly downstream from the location of the headgate in HydroBase to reflect tributaries also potentially captured by the ditch.

The Brush Creek gage was analyzed using the period of record available (1955 to 1967). Staff assumed the affects of the Brown No 1 diversion were included in the gage record. The Brush Creek gage data was scaled by 0.55 to the Hawxhurst Smalley ditch, as described above. The scaled data was adjusted for the Hawxhurst Smalley Ditch diversions by subtracting median Hawxhurst Smalley Ditch diversions. Additional flow accruing below the Hawxhurst Smalley Ditch was estimated by scaling the estimate of the Brush Creek gage by 0.15. The streamflow in both portions of the West Hawxhurst basin were then summed to estimate median streamflow at the proposed lower terminus. 95% confidence intervals were not calculated due to the short period of record at the Brush Creek gage.

Water Availability Summary
The hydrographs (See Complete and Detailed Hydrographs) show median streamflow for the Brush Creek gage adjusted for Hawxhurst Smalley Ditch diversions and scaled to the proposed lower terminus on West Hawxhurst Creek. The proposed ISF is below the median streamflow estimate at all times. Staff concludes that water is available for appropriation on West Hawxhurst Creek.

Material Injury
Because the proposed ISF on West Hawxhurst 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. (2015), 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.

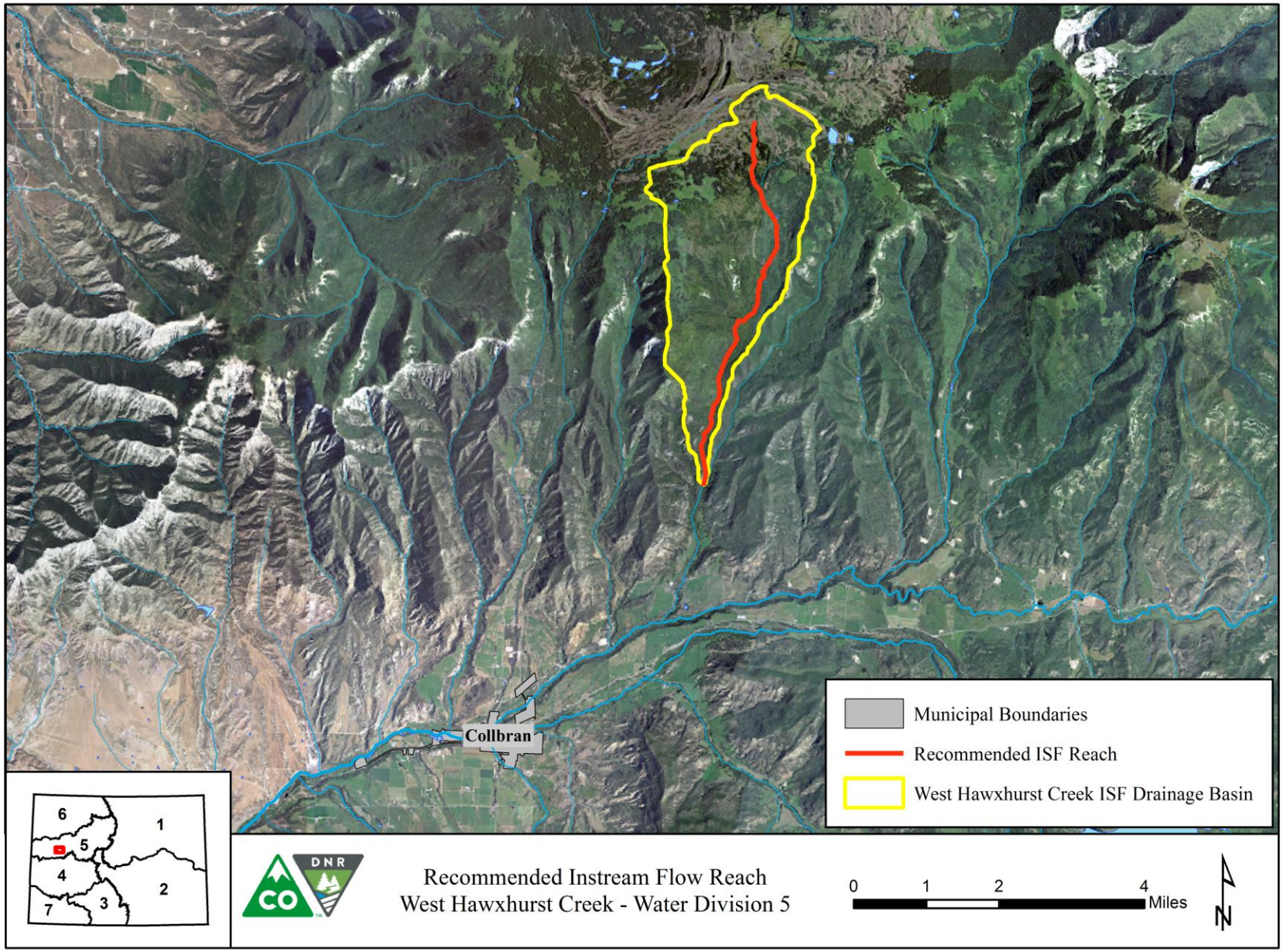
Espegren, G.D., 1996, Development of Instream Flow Recommendations in Colorado Using R2CROSS, Colorado Water Conservation Board.

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.

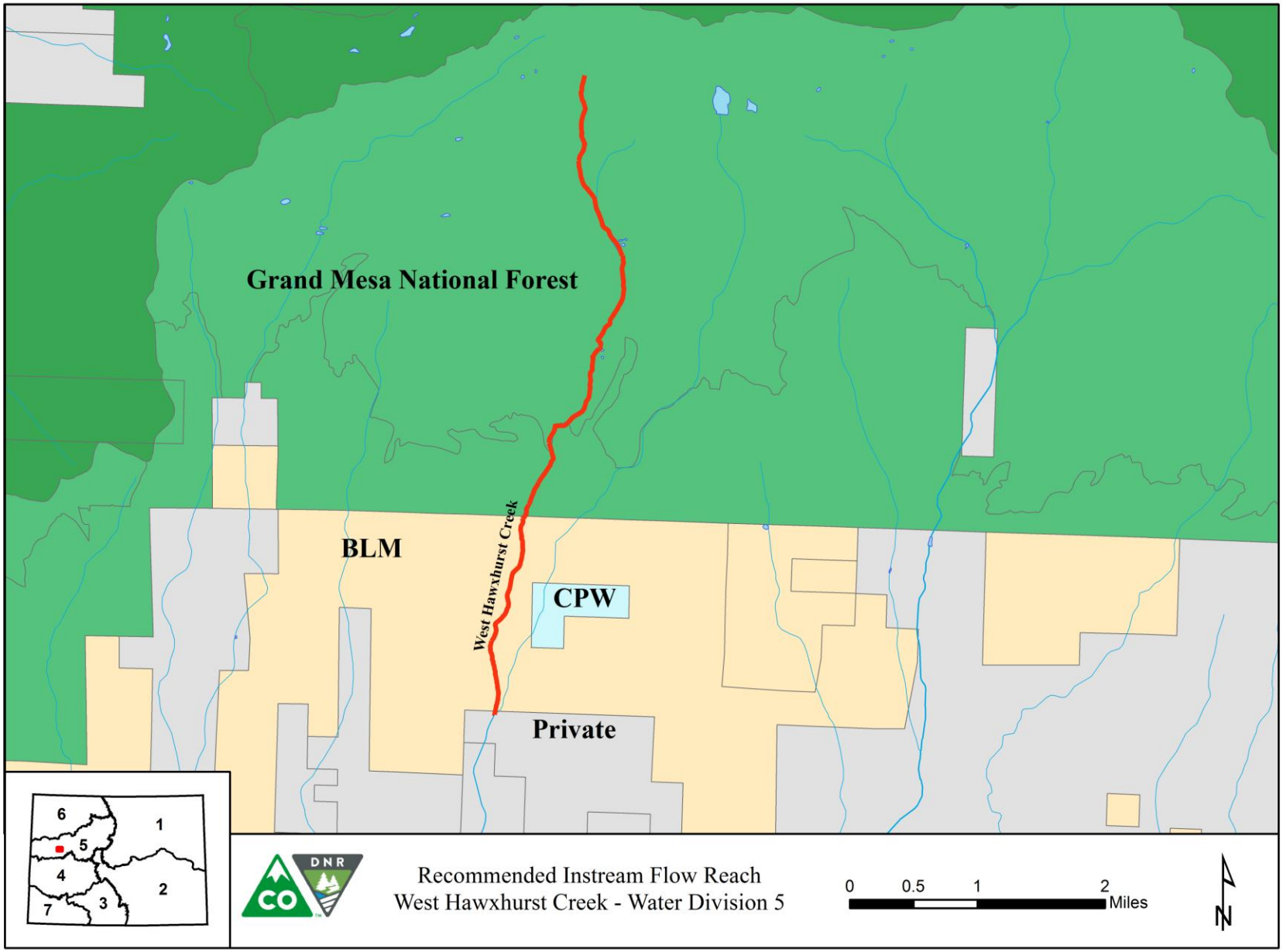
Metadata Descriptions
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

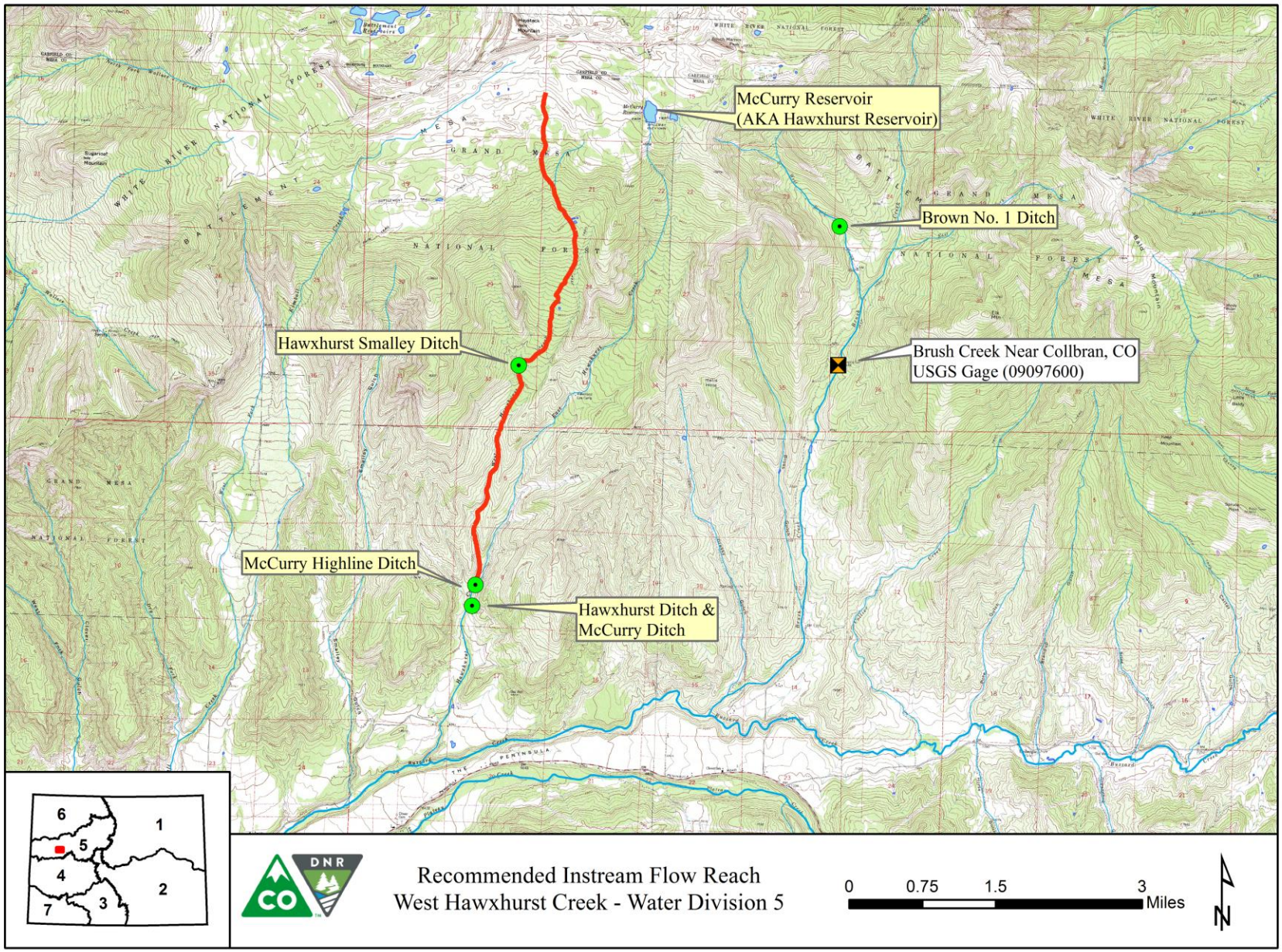
VICINITY MAP



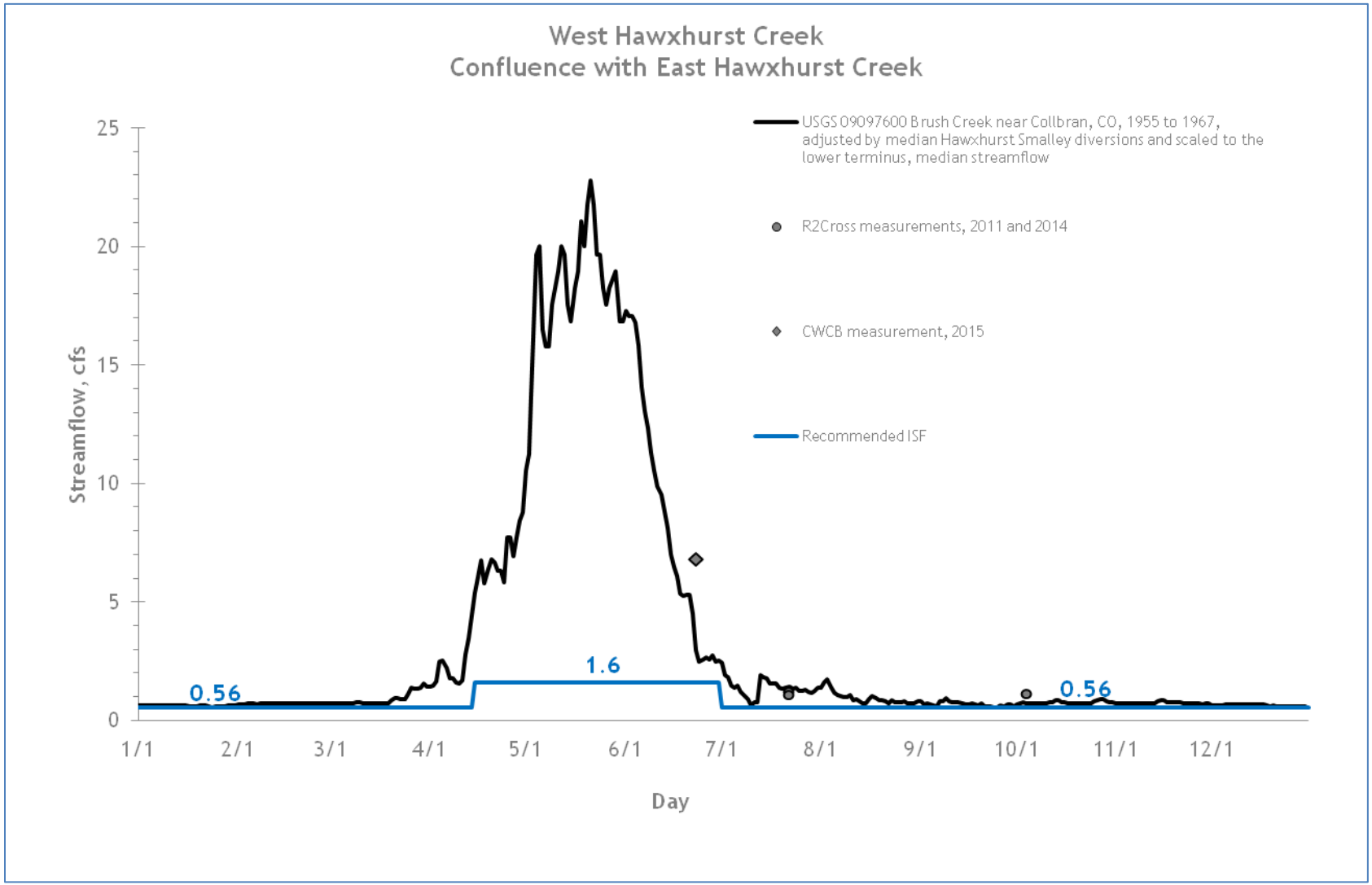
LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH



DETAILED HYDROGRAPH