



COLORADO

Colorado Water
Conservation Board

Department of Natural Resources

Disappointment Creek (Lower) EXECUTIVE SUMMARY



CWCB STAFF INSTREAM FLOW RECOMMENDATION

UPPER TERMINUS: historic USGS gage (Disappointment Creek near Dove Creek, CO)
UTM North: 4198182.88 UTM East: 184833.22

LOWER TERMINUS: confluence with the Dolores River
UTM North: 4214275.33 UTM East: 162893.62

WATER DIVISION: 7

WATER DISTRICT: 69

COUNTY: Dolores, San Miguel

WATERSHED: Upper Dolores

CWCB ID: 18/7/A-007

RECOMMENDER: Bureau of Land Management (BLM)

LENGTH: 37.8 miles

FLOW RECOMMENDATION: 5.0 cfs (03/01 - 03/15)
9.8 cfs (03/16 - 06/15)
5.0 cfs (06/16 - 06/30)



Disappointment Creek (Lower)

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 BLM recommended that the CWCB appropriate an ISF water right on this reach of Disappointment Creek because it has a natural environment that can be preserved to a reasonable degree. Disappointment Creek is located within Dolores and San Miguel Counties and originates at an elevation of approximately 10,823 ft, flowing west 68.5 miles to the confluence with the Dolores River at an elevation of approximately 5,528 ft (See Vicinity Map). The proposed reach extends from the historic USGS gage, Disappointment Creek near Dove Creek, CO (USGS 09168100), downstream to the confluence with the Dolores River. Forty-seven percent of the land on the 37.8 mile proposed reach is public land managed by the Bureau of Land Management, U.S. Forest Service, or the State of Colorado (See Land Ownership Map).

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/2019ProposedISFRecommendations.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.

The subject reach of Disappointment Creek is a low to moderate gradient stream located within a wide valley with few bedrock constraints, allowing the stream to cut new channels during high flow events. Substrate size is generally small, ranging from silt to eight-inch cobbles. This lower reach of Disappointment Creek is comprised primarily of pools with significantly fewer riffles compared to the upper reach that is upstream of the USGS gage and the subject of a separate ISF recommendation. Water temperatures and food sources are suitable for native species. Because of the geologic composition of Disappointment Valley and its groundwater flow system, this lower reach has very high conductivity and salinity readings. Poor water quality in this reach restricts fish usage to periods of snowmelt runoff and heavy monsoonal periods, when relatively clean surface waters can dilute the poor quality associated with groundwater inflow to the creek. Despite periods of poor water quality, this reach provides important habitat for flannelmouth sucker and roundtail chub that migrate seasonally from the Dolores River. The riparian community is comprised of narrowleaf cottonwood, river hawthorn, willows, sedges, rushes, and common reed.

Table 1. List of species identified in Disappointment Creek.

Species Name	Scientific Name	Status
flannelmouth sucker	<i>Catostomus latipinnis</i>	None
roundtail chub	<i>Gila robusta</i>	State - Species of Special Concern Federal - Sensitive Species

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 four 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 2.81 cubic feet per second (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 9.80 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 Disappointment Creek.

Entity	Date	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
BLM	06/29/2016, #1	14.68	5.87 - 36.70	Out of range	13.22
BLM	06/29/2016, #2	14.96	5.98 - 37.40	Out of range	6.79
BLM	06/29/2017, #1	1.38	0.55 - 3.45	1.85	Out of range
BLM	06/29/2017, #5	6.10	2.44 - 15.25	3.77	9.40
			Mean	2.81	9.80

ISF Recommendation

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

5.0 cubic feet per second is recommended from March 1 through March 15. This period corresponds to the first portion of snowmelt runoff. During this period, it is important to saturate the alluvial aquifer so that the riparian community can access moisture at the start of the growing season. In addition, this flow rate will prepare the stream channel for access by native fishes. This flow should also maintain macroinvertebrate communities in the hyporheic zone below the channel bed.

9.8 cubic feet per second is recommended from March 16 through June 15, which corresponds to the period when native fishes are spawning in the creek. In most of the cross sections collected, this recommendation is driven by the average depth criteria. Given the wide channel, it is important to maintain sufficient depth to allow native species to pass through riffles to spawning locations.

5.0 cubic feet per second is recommended from June 16 through June 30. This period corresponds to the last portion of snowmelt runoff. During this period, it is important to saturate the alluvial aquifer so that the riparian community has sufficient moisture to make it through the dry period that follows during summer and fall. In addition, this flow rate will assist passage for young of the year fish as they move toward the Dolores River, and will assist in maintaining the macroinvertebrate community.

No flow recommendation is made for the period between July 1 and February 29 because of limited water availability due to natural conditions and irrigation practices.

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 this proposed ISF on Disappointment Creek is 346.00 square miles, with an average elevation of 7,280 ft and average annual precipitation of 18.30 inches (See the Hydrologic Features Map). The Disappointment Creek basin supports agriculture, among other uses. Hydrology is altered by water use within the basin.

Available Data

There is not an active streamflow gage on the proposed reach of Disappointment Creek, but there are two historical gages with available data. The Disappointment Creek near Dove Creek, CO gage (USGS 09168100, period of record 8/1/1957 - 9/29/1986) was located at the proposed lower terminus. The drainage basin of the gage is 147 square miles, with an average elevation of 7,930 ft and average annual precipitation of 21.45 inches. The Disappointment Creek near Cedar, CO gage (USGS 09168500, period of record 3/1/1953 - 09/29/1956) was located approximately 8 miles downstream from the proposed lower terminus. The drainage basin of the gage is 168 square miles, with an average elevation of 7,800 ft and average annual precipitation of 20.8 inches. Both gages are impacted by diversion practices upstream.

A number of on-channel diversions were identified between the upper gage and the lower terminus. These include Disappointment Ditch (WDID 6900503, appropriation dates 1886, 1892, 1913, 19.94 cfs), the Dawson-Hammond Ditch (WDID 6900502, appropriation dates 1885, 1886, 1911, 5.47 cfs), the Northside Ditch (WDID 6900519, appropriation date 1893, 0.2 cfs), Horseshoe Ditch (WDID 690051, appropriation date 1908, 15 cfs), and Pine Arroya Ditch (WDID 6900520, 1883, 1888, 1911,

6.1 cfs). The diversion records typically start in the late 1940s; however, the Northside Ditch does not have records until 1986 and no recorded use until 2002. CWCB staff made one streamflow measurement on the subject reach of Disappointment Creek as summarized in Table 3.

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

Visit Date	Flow (cfs)	Collector
06/01/2017	54.01	CWCB

Data Analysis

The two historic gages did not operate concurrently; therefore, it was not possible to extend the record of the lower gage using regression analysis. Due to this, Staff's analysis focuses on the upper gage (UGS 09168100), which has a longer more recent record, and the available diversion records below this gage. The effects of the diversions below the gage were accounted for by subtracting the diversion records from the gage record for the full gage record. This assumes that no return flows accrue to the stream, which likely underestimates streamflow. The Northside Ditch diversions were not subtracted because none occurred during the gage record; however, the decreed amount is relatively small, 0.2 cfs. The adjusted gage data was not scaled to the lower terminus due to uncertainty in the amount of streamflow that may accrue downstream from the gage. Median streamflow and 95% confidence intervals for median streamflow were calculated for the adjusted Disappointment Creek gage record.

Water Availability Summary

The hydrographs (See Complete Hydrograph and Detailed Hydrograph) show median streamflow and 95% confidence intervals for the median streamflow based on the adjusted Disappointment Creek gage record. The proposed ISF rate is below the median streamflow the majority of the time. The proposed ISF rate is below the 95% confidence interval of the median at all times. Staff has concluded that water is available for appropriation.

Material Injury

Because the proposed ISF on Disappointment 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. (2018), 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.

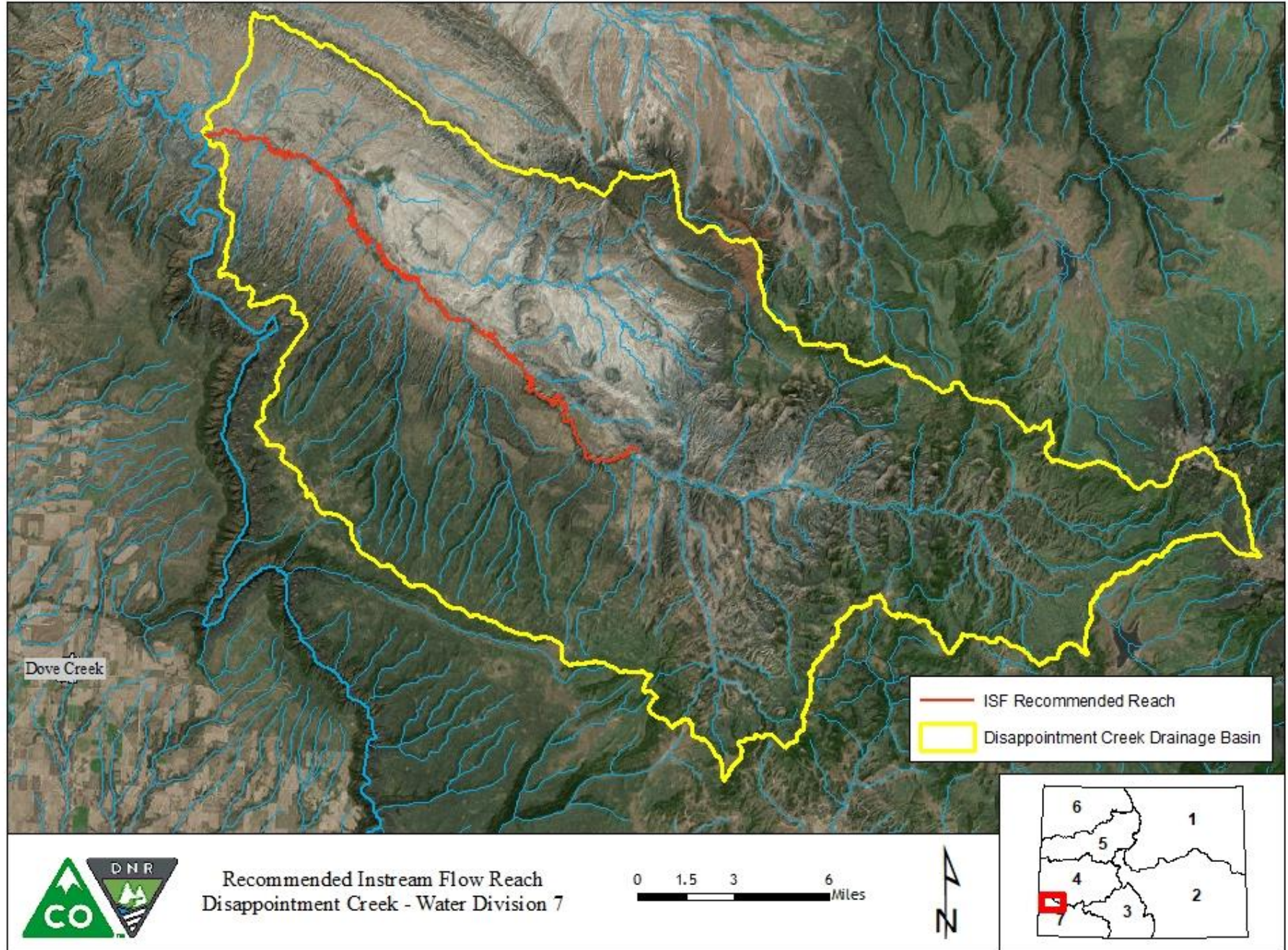
Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

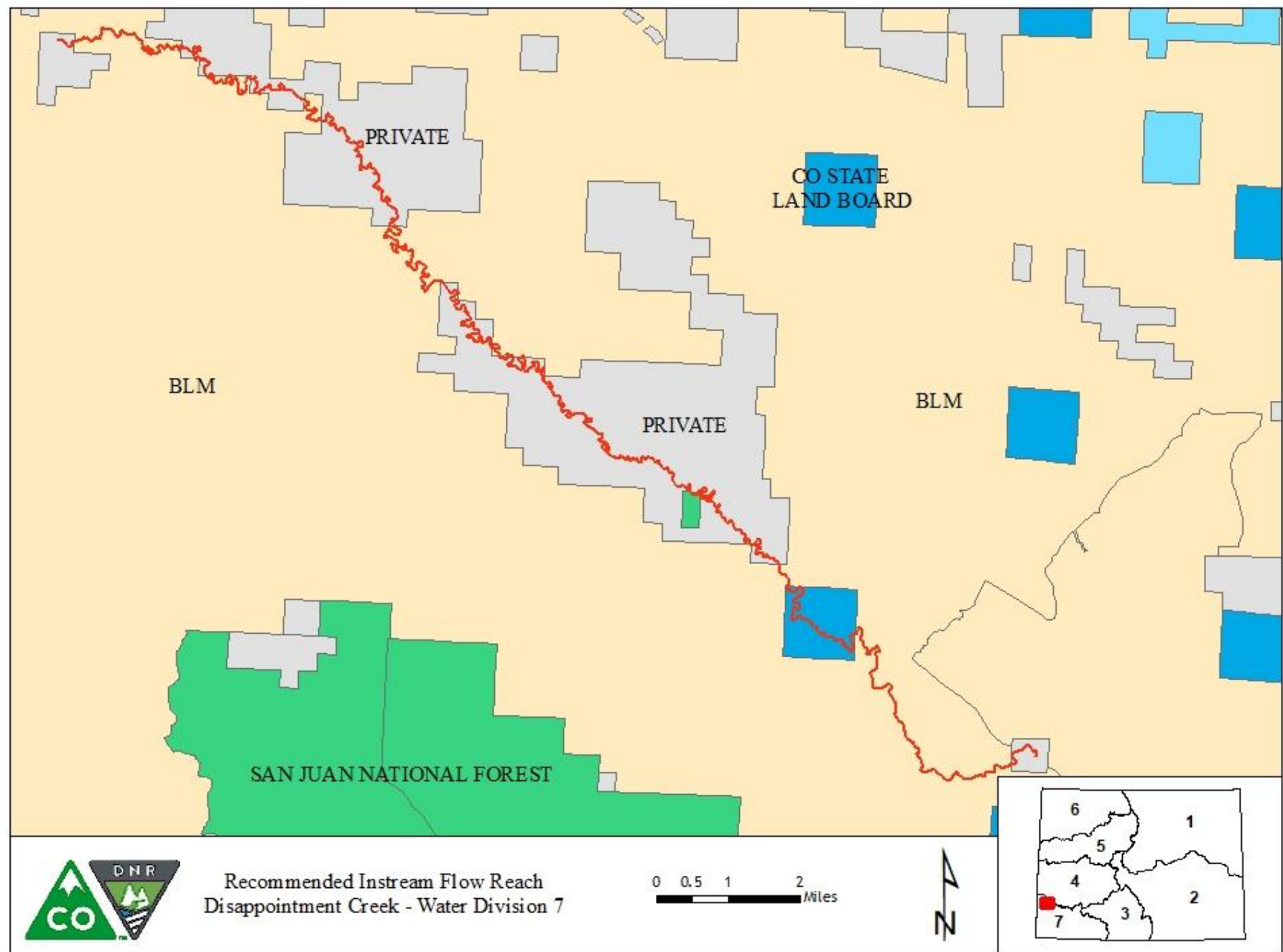
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

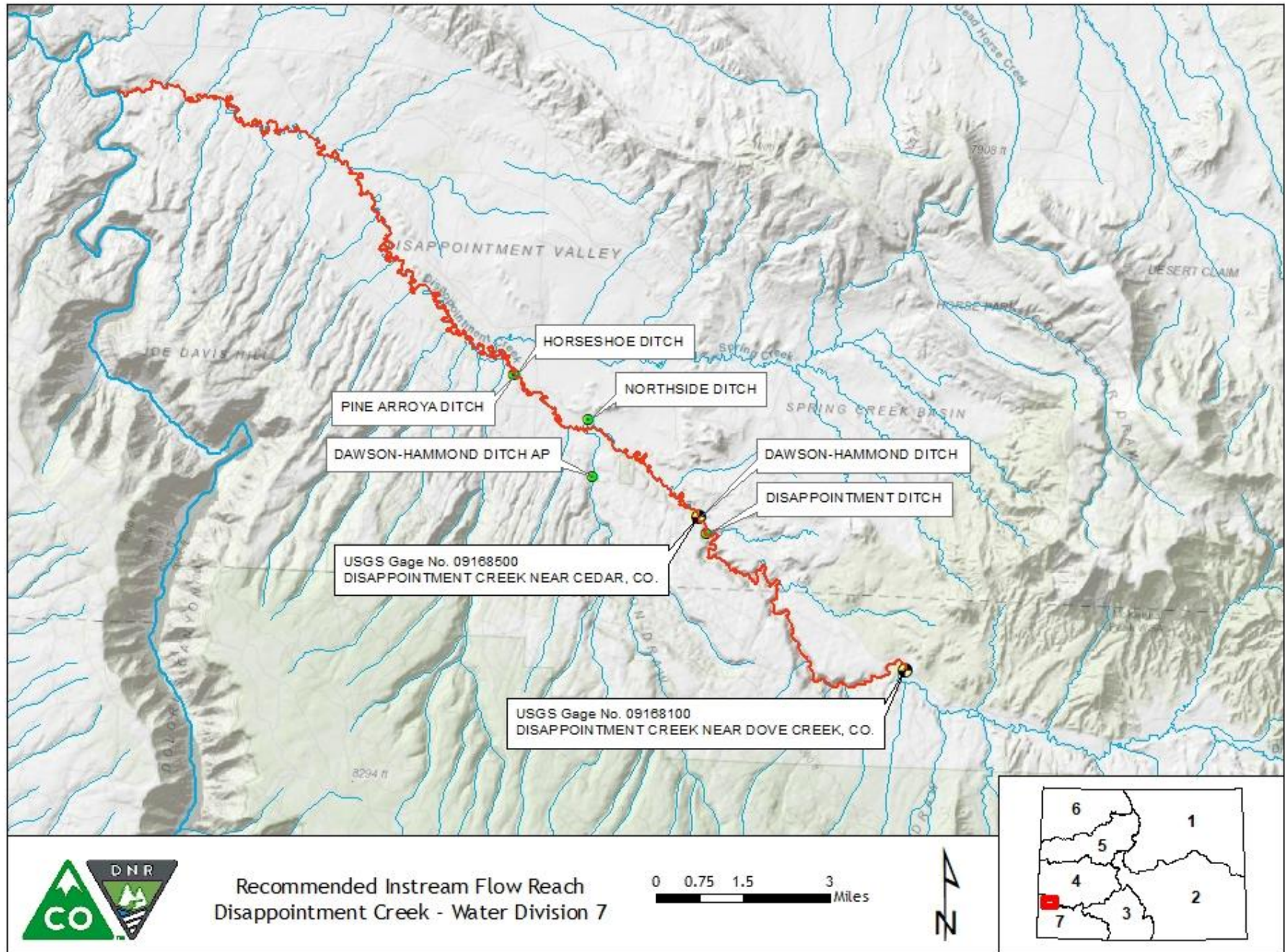
VICINITY MAP



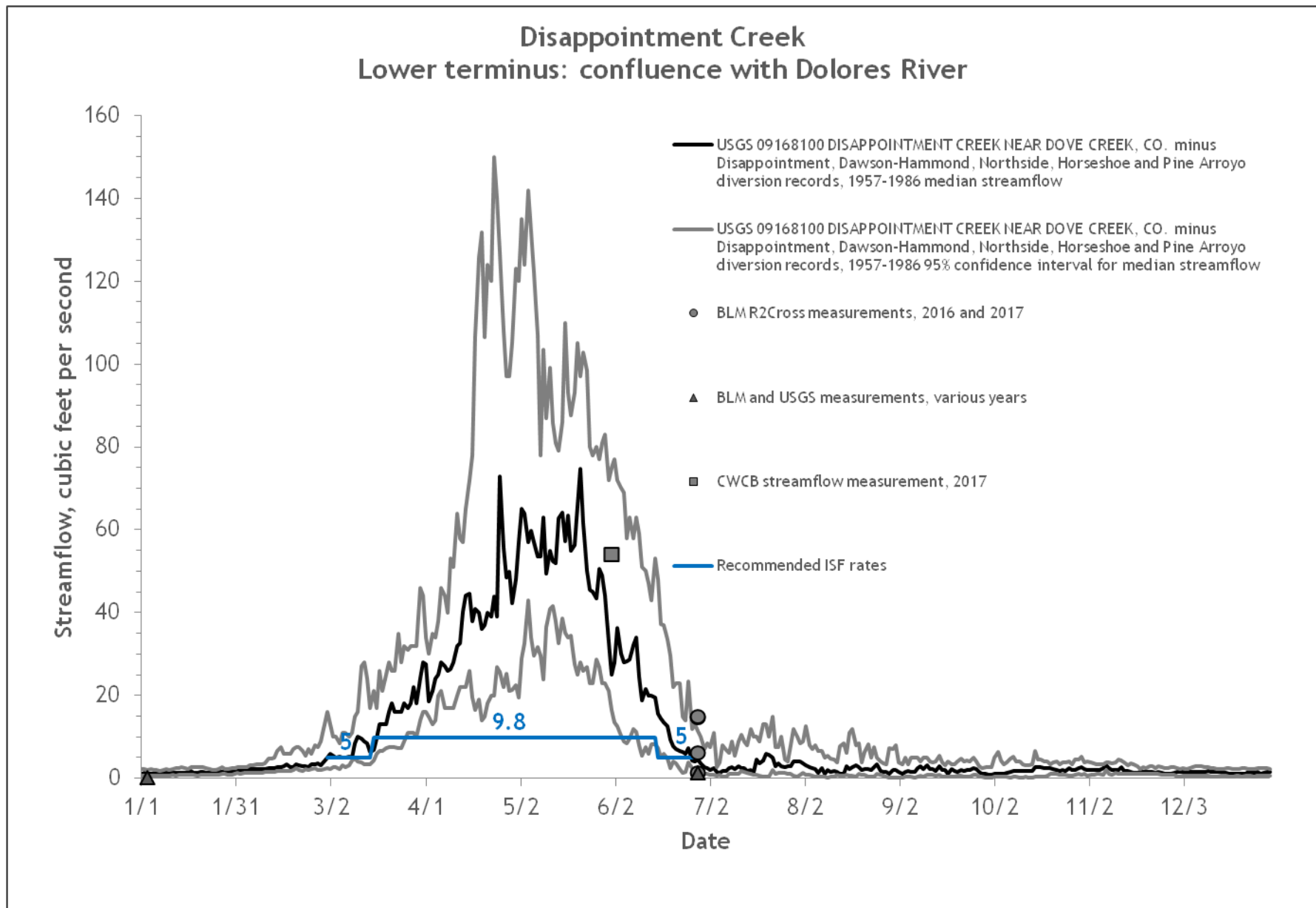
LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH



DETAILED HYDROGRAPH

