COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Disappointment Creek (Upper)

EXECUTIVE SUMMARY

CWCB STAFF INSTREAM FLOW RECOMMENDATION

UPPER TERMINUS:	confluence with Morrison Creek UTM North: 4194988.94 UTM East: 202844.92
LOWER TERMINUS:	historic USGS gage (Disappointment Creek near Dove Creek, CO) UTM North: 4198182.88 UTM East: 184833.22
WATER DIVISION:	7
WATER DISTRICT:	69
COUNTY:	Dolores
WATERSHED:	Upper Dolores
CWCB ID:	18/7/A-001
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	21.71 miles
FLOW RECOMMENDATION:	1.8 cfs (01/01 - 01/31) 2.6 cfs (02/01 - 03/15) 14 cfs (03/16 - 06/30) 8.0 cfs (07/01 - 07/15) 5.8 cfs (07/16 - 07/31) 2.2 cfs (08/01 - 12/31)

Disappointment Creek (Upper)

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 10,800 ft. Disappointment Creek flows 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 confluence with Morrison Creek downstream to the historic USGS gage, Disappointment Creek near Dove Creek, CO (USGS 09168100). Twenty percent of the land on the 21.71 mile proposed reach is public land managed by the Bureau of Land Management or U.S. Forest Service (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.

This upper reach of Disappointment Creek is a low to moderate gradient stream that flows through a broad canyon and is confined by bedrock in numerous locations. The riparian community is comprised of narrowleaf cottonwood, river hawthorn, willows, sedges, rushes, and common reed. Substrate size ranges from gravel to small boulders with a good mix of riffle, run, and pool habitat to support fish populations. Water temperatures and food sources are suitable for native species. While no fish surveys have been conducted in this proposed ISF reach, numerous fish species have been documented by the BLM and CPW upstream and downstream. The lower reach of Disappointment Creek (below the USGS gage and subject of a separate ISF recommendation) provides important habitat for flannelmouth sucker and roundtail chub that migrate seasonally from the Dolores River. Above the confluence with Morrison Creek and upstream from this proposed ISF reach, CPW documented Colorado River cutthroat trout and speckled dace in 2016. CPW surveys also discovered a pure population of green lineage Colorado River cutthroat trout in the headwaters. Based on this information, there is a high probability

that both cold and warmwater fish species use portions of this proposed reach either seasonally or as resident. CWCB staff also observed macroinvertebrates in this reach in 2017.

Table 1. List of species identified upstream and downstream from the subject reach of Disappointment Creek.

Species Name	Scientific Name	Status
Colorado River cutthroat trout	*Oncorhynchus clarkii pleuriticus*	State – Species of Special Concern Federal – Sensitive Species
speckled dace	*Rhinichthys osculus*	None
flannelmouth sucker	*Catostomus latipinnis*	None
roundtail chub	*Gila robusta*	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 two transects for this proposed ISF reach in 2016 (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 8.00 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 13.73 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 upper Disappointment Creek.

Entity	Date	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
BLM	06/29/2016 #3	7.73	3.09 - 19.33	8.39	9.08
BLM	06/29/2016 #4	8.02	3.21 - 20.05	7.61	18.37
			Mean	8.00	13.73

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

14.0 cubic feet per second is recommended from March 16 through June 30. In the cross-sections measured, this recommendation is driven by the average depth and wetted perimeter criteria. This flow rate should also serve to recharge the alluvial aquifer that supports the riparian community.

8.0 cubic feet per second is recommended from July I through July 15, which meets two of the three instream flow criteria, and should provide sufficient mobility and physical habitat for fish during a high temperature period of the year.

5.8 cubic feet per second is recommended from July 16 through July 31, which protects as much flow as possible during this high temperature period and will provide mobility to assist fish in moving toward cooler pool habitats. This flow rate also assists in providing groundwater supplies to the riparian zone when evapotranspiration rates are the highest of the year.

2.2 cubic feet per second is recommended from August I through December 31. This a base flow rate that will provide pool habitat and maintain adequate groundwater levels in alluvial aquifers through the end of the growing season.

1.8 cubic feet per second is recommended from January I to January 31. This flow rate should prevent icing in pools, maintain wet rooting zones for the riparian community, and support macroinvertebrate communities in the hyporheic zone below the channel bed.

2.6 cubic feet per second is recommended from February 1 to March 15. As initial snowmelt runoff begins, this flow rate will start increasing groundwater levels in alluvial aquifers as the riparian community starts to become active.

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 Disappointment Creek is 147 square miles, with an average elevation of 7,390 ft and average annual precipitation of 21.45 inches (See the Hydrologic Features Map). The Disappointment Creek basin supports agriculture, among other uses. Hydrology is altered by water use within the basin. A number of diversion structures are located within the proposed reach, including the Knight-Embling Ditch (WDID 690512, appropriation dates 1885,1895, 1901, 1906, 1932, 1935, 7.365 cfs), the Henry M Knight Ditch (WDID 900508, appropriation date 1883, 1 cfs), and the Southside Ditch (WDID 6900523, appropriation dates 1902 and 1930, 0.26 cfs).

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 –9/29/1956) 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.

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	63.81	CWCB

Data Analysis
Staff's analysis focused on the upper gage, Disappointment Creek near Dove Creek, CO (USGS 09168100), which has a longer period of record than the lower gage and was located at the lower terminus. Because this gage is below all diversion structures, the analysis includes the impact from water uses upstream and within the proposed ISF reach. Median streamflow and 95% confidence intervals for median streamflow were calculated for the adjusted Disappointment Creek near Dove Creek, CO gage record.

Water Availability Summary
The hydrographs (See Complete Hydrograph and Detailed Hydrograph) show median streamflow based on the Disappointment Creek gage record. The proposed ISF rate is below the median streamflow for the majority of the time. 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. (2019), 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.

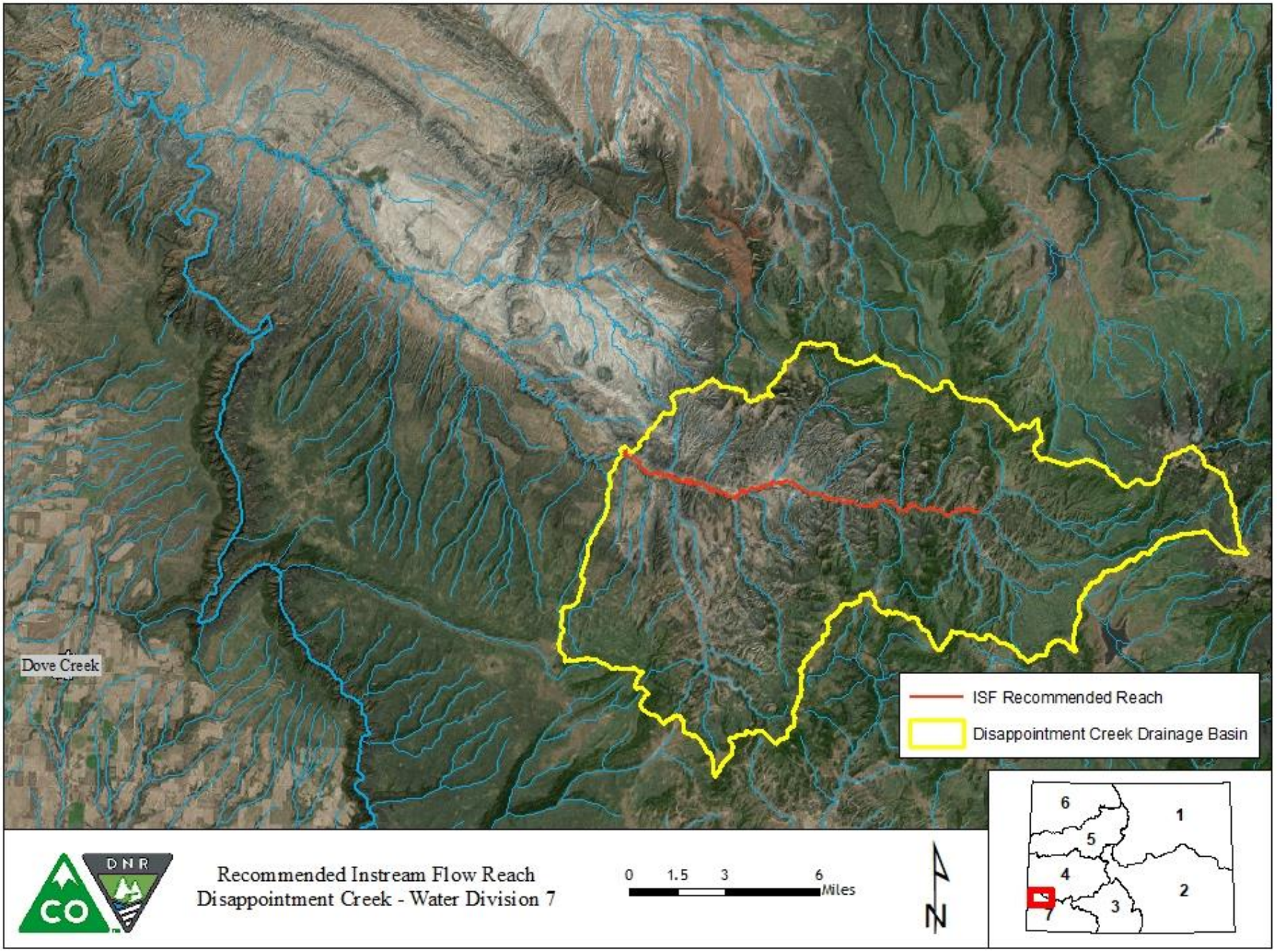
Espegren, G.D., 1996, Development of Instream Flow Recommendations in Colorado Using R2CROSS, Colorado Water Conservation Board.

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.

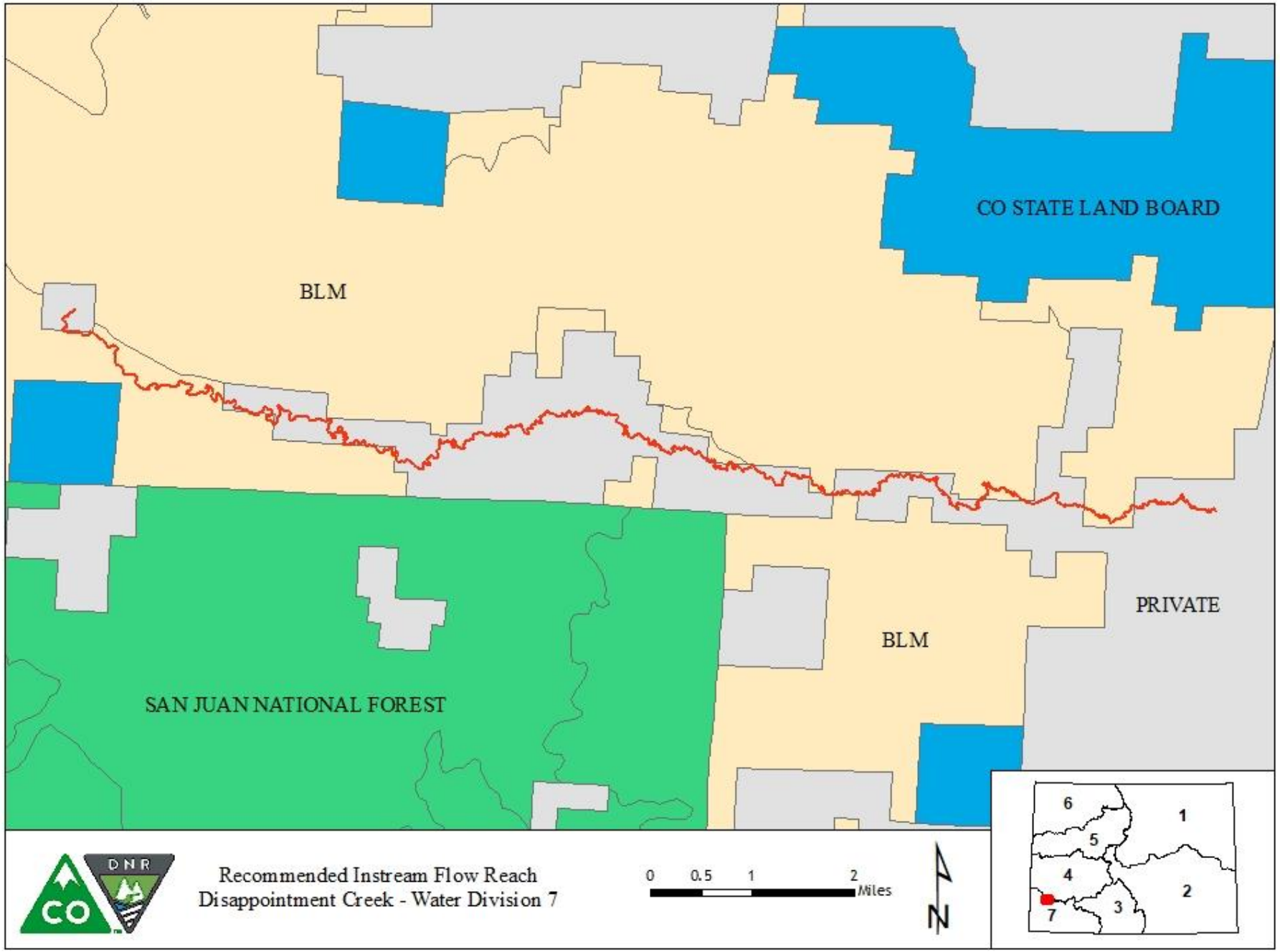
Metadata Descriptions
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

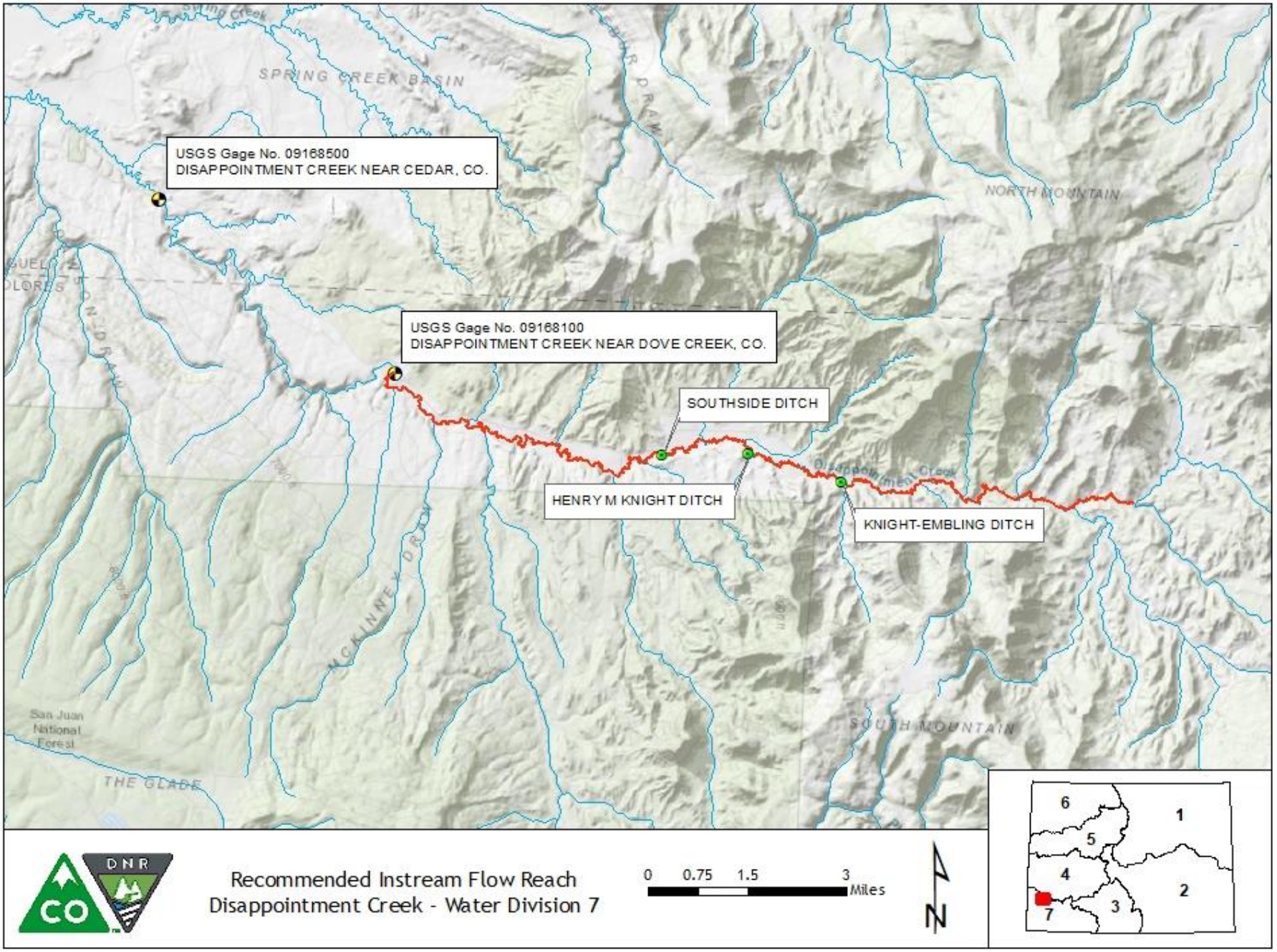
VICINITY MAP



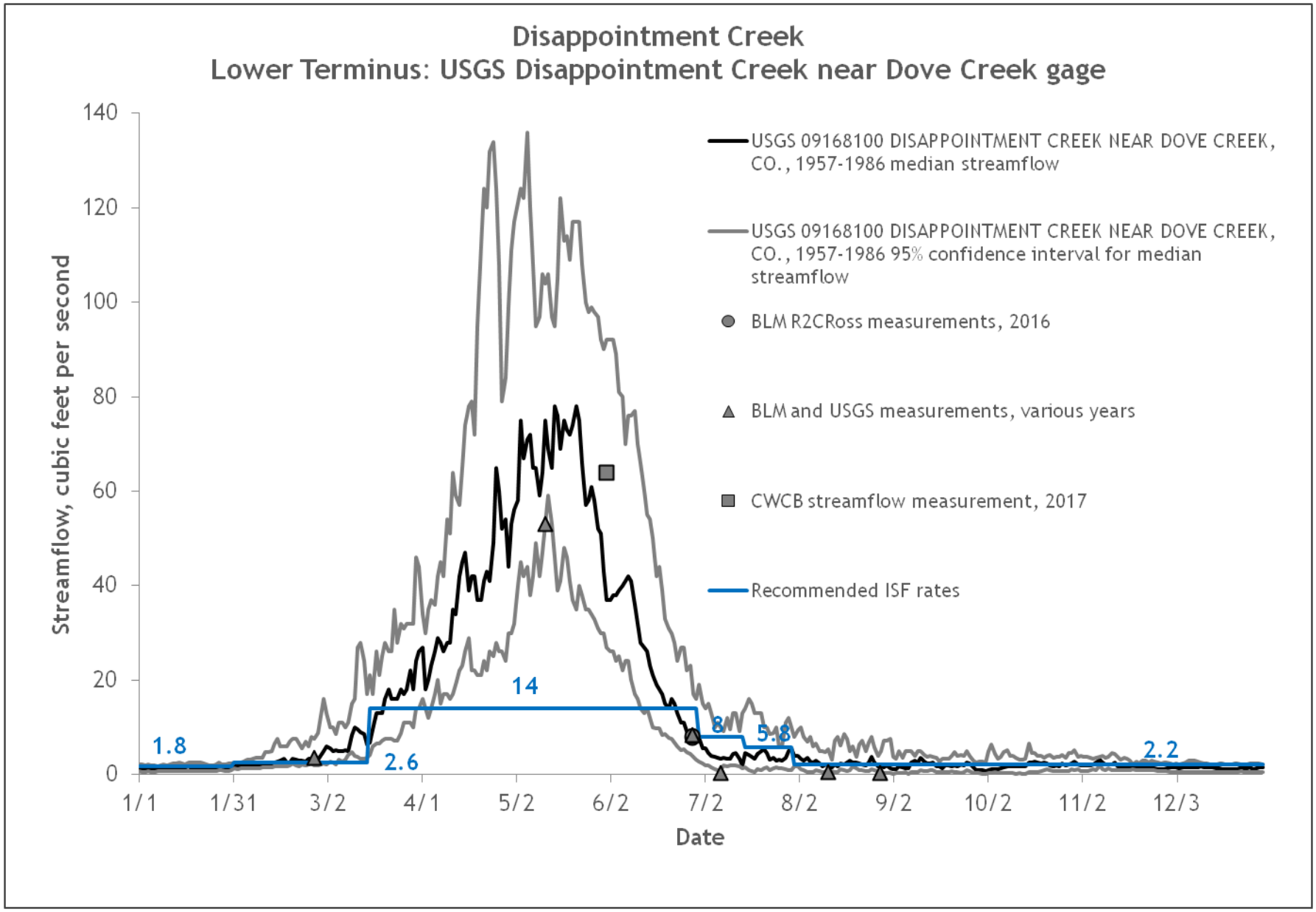
LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH



DETAILED HYDROGRAPH