# Dry Gulch Executive Summary



# CWCB STAFF INSTREAM FLOW RECOMMENDATION January 25-26, 2021

UPPER TERMINUS:	headwaters		
	UTM North: 4395039.45	UTM East:	421166.28
LOWER TERMINUS:	confluence Clear Creek		
	UTM North: 4394414.43	UTM East:	425249.35
WATER DIVISION:	1		
WATER DISTRICT:	7		
COUNTY:	Clear Creek		
WATERSHED:	Clear Creek		
CWCB ID:	21/1/A-001		
RECOMMENDER:	Colorado Parks and Wild	life (CPW)	
LENGTH:	2.83 miles		
FLOW RECOMMENDATION:	0.67 cfs (01/01 - 04/30) 5.4 cfs (05/01 - 07/31) 2 cfs (08/01 - 09/30) 0.85 cfs (10/01 - 12/31)		



**COLORADO** Colorado Water Conservation Board

Department of Natural Resources

#### 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.

**Colorado Park and Wildlife (**CPW) recommended that the CWCB appropriate an ISF water right on a reach of Dry Gulch because it has a natural environment that can be preserved to a reasonable degree. The proposed reach extends from Dry Gulch's headwaters downstream to the confluence with Clear Creek. Dry Gulch is located within Clear Creek County (See Vicinity Map), and originates about 1.8 miles north of the Eisenhower Tunnel at an elevation of approximately 11,800 feet. Dry Gulch flows in an easterly direction for 2.83 miles before it joins Clear Creek at an elevation of 10,600 feet. One hundred percent of the land on the 2.83 mile proposed reach is owned and managed by the U. S. Forest Service (See Land Ownership Map).

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/2021-isf-recommendations.

#### 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.

Dry Gulch is a cold-water, high gradient mountain stream with a mean basin elevation at almost 12,000 feet. Its contributing basin is high-alpine and forested, with snowmelt driven hydrology fed by high elevation snowpack. This stream is first order and tributary to Clear Creek. A majority of its reach is single thread with some side channel formation, though there is a great deal of braiding and side channels in portions of the reach. Good habitat variety is present with a mixture of coarse substrate riffles and runs, along with pools formed by large boulders and ample woody debris. The substrate mostly consists of medium-sized cobble to boulders. Macroinvertebrate populations were observed in the field to include two types of caddisfly nymphs, mayfly nymphs, stonefly nymphs, and flatworm.

In its recommendation for Dry Gulch, CPW states:

A significant avalanche cycle in 2019 added notable large woody debris to the creek, creating numerous log jam scour pools. Suitable trout habitat is plentiful

including large pools, smaller pocket pools, undercut banks, and abundant riparian cover in the forested, high-gradient reach of the creek. Riparian willows are dense in the lower-gradient transition zone from the alpine to the high-gradient forested cascading reach.

Dry Gulch contains a population of Bear Creek greenback cutthroat trout, which are listed as a threatened species by both the state and federal government. In 2016, CPW and Trout Unlimited conducted a Bear Creek greenback cutthroat trout reintroduction and reclamation project. CPW relocated the existing Colorado River cutthroat fish population. Greenback cutthroat trout were then stocked in Dry Gulch from 2017 through 2019. In 2019, CPW conducted a fish survey showing a fish population of exclusively greenback cutthroat, which was CPW's goal. The agency expects to find evidence of natural recruitment among the population in the coming years.

Species Name	Scientific Name	Protection Status
greenback cutthroat - Bear Creek strain*	Oncorhynchus clarkii stomias	Federal - Threatened Species, State - Threatened Species & Species of Greatest Conservation Need
mayfly	Ephemeroptera	None
caddisfly	Trichoptera	None
stonefly	Plecoptera	None
aquatic fly larve	Diptera	None
flatworm	Platyhelminths	None

\*indicates native fish 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.

#### Quantification Methodology

CPW 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 macroinvertebrates (Nehring, 1979). CPW 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

CPW collected R2Cross data at two 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 1.51 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 5.39 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.

Date, Xsec #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
08/17/2020, 1	12.40	3.05	1.22 - 7.63	1.56	4.33
08/28/2020, 1	16.50	2.97	1.19 - 7.43	1.45	6.45
			Mean	1.51	5.39

Table 2, Sum	mary of R2Cros	s transect r	measurements	and results	for Dry	/ Gulch.
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#### ISF Recommendation

The CPW recommends the following flows based on R2Cross modeling analyses, biological expertise, and staff's water availability analysis. Based on the hydrology from StreamStats, there appear to be water availability limitations during the baseflow period from October through March. Therefore, the ISF flow recommendation has been refined based on water availability to the following:

5.4 cfs is recommended from May 1 through July 31. This flow rate maintains adequate depth, velocity, and wetted perimeter during the summer period when fish are most active.

2.0 cfs is recommended from August 1 through September 31. This flow rate is reduced due to water availability constraints, but will maintain available habitat and allows fish movement as they are headed into the overwintering period.

0.85 cfs is recommended from October 1 through December 31. This flow rate is reduced due to water availability constraints, but will provide sufficient habitat availability in pools and deep glides.

0.67 cfs is recommended from January 1 through April 30. This flow rate is reduced due to water availability constraints, but will provide sufficient habitat availability in pools and deep glides.

#### 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 Dry Gulch is 3.22 square miles, with an average elevation of 11,845 feet and average annual precipitation of 33.62 inches (See the Hydrologic Features Map). The hydrology of Dry Gulch is primarily driven by snowmelt runoff; however, the creek was noted to sustain relatively high streamflow even during August of 2020, which was very dry across the State. There are no known water rights in the entire basin and hydrology is unaltered from natural flow conditions.

#### Available Data and Analysis

There are no historic or current streamflow gages on Dry Gulch and no nearby representative gages were identified. StreamStats provides the best available estimate of streamflow on Dry Gulch. CWCB staff made one streamflow measurement on the proposed reach of Dry Gulch as summarized in Table 3.

Table 5. Summary of Streamfow Measurement Visits and Results for Dry Gulen.			
Visit Date	Flow (cfs)	Collector	
10/13/2020	1.63	CWCB	

#### Table 3. Summary of Streamflow Measurement Visits and Results for Dry Gulch.

#### Water Availability Summary

The hydrograph (See Complete Hydrograph) shows StreamStats results for mean-monthly streamflow. Staff has concluded that water is available for appropriation.

#### Material Injury

Because the proposed ISF on Dry Gulch 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. (2020), 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

