

Williams Gulch Executive Summary



CWCB STAFF INSTREAM FLOW RECOMMENDATION January 29-30, 2024

UPPER TERMINUS: headwaters in the vicinity of
UTM North: 4509289.75 UTM East: 431929.17

LOWER TERMINUS: confluence with the Cache la Poudre River at
UTM North: 4506563.58 UTM East: 436481.69

WATER DIVISION/DISTRICT: 1/3

COUNTY: Larimer

WATERSHED: Cache La Poudre

CWCB ID: 24/1/A-001

RECOMMENDER: Colorado Parks and Wildlife (CPW)

LENGTH: 4.63 miles

FLOW RECOMMENDATION: 0.4 cfs (11/01 - 03/31)
2.0 cfs (04/01 - 07/31)
1.1 cfs (08/01 - 08/31)
0.7 cfs (09/01 - 10/31)



COLORADO

**Colorado Water
Conservation Board**

Department of Natural Resources

BACKGROUND

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 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/2024-isf-recommendations>.

RECOMMENDED ISF REACH

CPW recommended that the CWCB appropriate an ISF water right on a reach of Williams Gulch at the January 2023 ISF workshop. Williams Gulch is located within Larimer County (See Vicinity Map), and is approximately 36 miles northwest of Fort Collins, CO. The stream originates on the east side of Green Ridge and flows southeasterly until it reaches the confluence with the Cache la Poudre River.

The proposed ISF reach extends from the headwaters downstream to the confluence with the Cache la Poudre River for a total of 4.63 miles. Approximately 86% of the land on the proposed reach is on public lands managed under the United States Forest Service as Roosevelt National Forest and 14% is on Colorado Parks and Wildlife's Bliss Creek State Wildlife Area (See Land Ownership Map). CPW reclaimed Williams Gulch and stocked greenback cutthroat trout in 2022 as part of conservation efforts to protect the threatened native fish species. CPW believes that ISF protection on Williams Gulch is an important step in the overall conservation of greenback cutthroat trout.

OUTREACH

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently, more than 1,100 people subscribe to the ISF mailing list. Notice of the potential appropriation of an ISF water right on Williams Gulch was sent to the mailing list in March 2023, and November 2023. Staff sent letters to identified landowners adjacent to Williams Gulch based on information from the county assessor's website. A public notice about this recommendation was also published in the Fort Collins Coloradoan on December 6, 2023.

Staff presented information about the ISF program and this recommendation to the Larimer County Board of County Commissioners on December 11, 2023. In addition, staff spoke with Mark Simpson, District 3 Water Commissioner, on April 11, 2023 regarding water availability on Williams Gulch.

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 provides the Board with a basis for determining that a natural environment exists.

Williams Gulch is a high-elevation headwaters creek located east of the Rawah Wilderness. The creek flows southeasterly and directly into the Poudre River near Kinikinik off Cameron Pass. The contributing drainage basin is approximately 3.9 square miles. The basin is forested and mountainous with a mean elevation of 9,800 feet. The stream's hydrology is snowmelt-driven into the late summer, and the basin receives approximately 24 inches of precipitation a year.

Williams Gulch is a high-gradient headwaters stream. At the Poudre River valley floor, the channel begins anastomosing and transitions to a wetland, beaver dam complex. It then merges into a main channel and crosses under Highway 14 to its confluence with the Poudre River. Substrate observed in this reach ranges from sand to large cobbles. Williams Gulch supports ideal cutthroat trout habitat including the following: large pools, ample large woody debris, long runs, undercut banks, gravel spawning beds, and aquatic macrophyte and diatom communities throughout the channel.

For decades, Williams Gulch supported a self-sustaining population of Colorado River cutthroat trout. This suitable cutthroat habitat made it a prime candidate stream for greenback cutthroat trout recovery. In September 2021, CPW biologists lead a successful reclamation project to remove the Colorado River cutthroat trout from Williams Gulch with the end goal of establishing native greenback cutthroat trout. Following the reclamation, fish electroshocking efforts confirmed all non-native cutthroat had been removed from the creek. In September 2022, CPW biologists and volunteers stocked young-of-the-year greenback cutthroat trout in the stream (Table 1, See photos below).

Table 1. List of species identified in Williams Gulch.

Species Name	Scientific Name	Status
greenback cutthroat trout	<i>Oncorhynchus clarkii stomias</i>	Federal - Threatened Species State - Species of Greatest Conservation Need State - Threatened Species



Williams Gulch greenback cutthroat trout stocking, September 2022

Williams Gulch also supports an abundant macroinvertebrate community which includes multiple types of cased caddisfly, multiple types of stoneflies, mayflies, and diptera. Additionally, Colorado Natural Heritage Program notes a rare, globally imperiled, plant assemblage within the watershed. The association is Wyoming Big Sagebrush and Rocky Mountain Wildrye Shrubland which occurs on steep south-facing slopes in the Poudre River watershed. In 2020, the lower part of the watershed burned in the Cameron Peak wildfire. Fire impacts are evident and have resulted in a major reconfiguration of the channel. The wet meadow complex supported by Williams Gulch remains intact and healthy despite the recent fire activity and the burned mature pine stands in lower portions of the watershed.



Williams Gulch fire recovery, 2023

ISF QUANTIFICATION

CWCB staff relies on 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 method 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; CWCB, 2022). Riffles are the stream habitat type that are most vulnerable to dry if streamflow ceases. The data collected consists of a streamflow measurement, a survey of channel geometry and features at a cross-section, and a survey of the longitudinal slope of the water surface.

The R2Cross model uses Ferguson's Variable-Power Equation (VPE) to estimate roughness and hydraulic conditions at different water stages at the measured cross-section (Ferguson, 2007; Ferguson, 2021). This approach is based on calibrating the model as described in Ferguson (2021). The model is used to evaluate three hydraulic criteria: 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 use the model results to develop an initial recommendation for summer and winter flows. The summer flow recommendation is based on the flow that meets all three hydraulic criteria. The winter flow recommendation is based on the flow that meets two of the three hydraulic criteria.

The R2Cross method estimates 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 Collection and 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 stream reach. The R2Cross model results in a winter flow of 1.20 cfs and a summer flow of 2.04 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 2. Summary of R2Cross transect measurements and results for Williams Gulch.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
07/11/2023, 1	8.54	2.43	1.00	2.30
07/11/2023, 2	11.58	2.43	1.39	1.78
			1.20	2.04

ISF Recommendation

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

2.0 cfs is recommended from April 1 through July 31. This flow rate meets three of three hydraulic criteria, maintaining depth, velocity, and wetted perimeter during the spring and summer when fish have more metabolic activity during their periods of increased activity. This higher flow rate will support beneficial feeding and spawning conditions as greenback cutthroat trout mature and grow.

1.1 cfs is recommended from August 1 to August 31; this flow rate is reduced due to water availability limitations. This rate will maintain sufficient depth and velocity while water temperatures may be high in the late summer, supporting resting habitat for trout.

0.7 cfs is recommended from September 1 to October 31; this flow rate is reduced due to water availability limitations. This rate will maintain wetted perimeter and depth in runs and pools to support cutthroat trout. This flow rate will also allow fish to move to more stable habitat for the overwintering period.

0.4 cfs is recommended from November 1 to March 31; this flow rate is reduced due to water availability limitations. This rate will maintain available habitat in runs and pools to support fish during the overwintering period.

WATER AVAILABILITY

CWCB staff conducts hydrologic analyses for each recommended ISF appropriation to provide the Board with a basis for determining that water is available.

Water Availability 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.). This approach focuses on streamflow 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) are used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and regression-based models are used when long-term gage data is not available. CSUFlow18 is a multiple regression model developed by Colorado State University researchers using streamflow gage data collected between 2001 and 2018 (Eurich et al., 2021). This model estimates mean-monthly streamflow based on drainage basin area, basin terrain variables, and average basin precipitation and snow persistence. Diversion records are 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 from gage records; 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 Williams Gulch is 3.87 square miles, with an average elevation of 9,773 feet and average annual precipitation of 28.24 inches (See the Hydrologic Features Map). Williams Gulch is a high-elevation, snowmelt driven hydrologic system with variable timing and magnitude of snowmelt, often lasting late into the streamflow generation season. The reach is a steep gradient, confined channel with an abrupt transition to a meandering reach above the confluence with the Cache la Poudre River. Williams Gulch is in the fire affected area of the Cameron Peak Fire of 2020; field visits in 2023 show evidence of effective fire recovery within the reach extent.

Water Rights Assessment

There are no diversions within the reach of Williams Gulch recommended for an ISF appropriation.

Data Collection and Analysis

Representative Gage Analysis

There are no current or historic gages on Williams Gulch. Staff investigated nearby gages for similarities in basin characteristics and hydrology. No gages were sufficiently similar to be used to estimate streamflow on Williams Gulch.

Multiple Regression Model

The CSUFlow18 regression model predicts mean-monthly flow in Williams Gulch and provides the best estimate for streamflow conditions.

CWCB staff accompanied CPW staff for fieldwork related to R2Cross analysis; no additional flow measurements were made on the proposed reach of Williams Gulch.

Water Availability Summary

The hydrograph shows CSUFlow18 results for mean-monthly streamflow and includes the proposed ISF rate (See Complete Hydrograph). The proposed ISF flow rate is below the mean-monthly streamflow. Staff has concluded that water is available for appropriation on Williams Gulch.

MATERIAL INJURY

Because the proposed ISF on Williams 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.,

the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

Citations

Colorado Water Conservation Board, 2022, R2Cross model- user's manual and technical guide. Retrieve from URL: <https://r2cross.erams.com/>

Eurich, A., Kampf, S.K., Hammond, J.C., Ross, M., Willi, K., Vorster, A.G. and Pulver, B., 2021, Predicting mean annual and mean monthly streamflow in Colorado ungauged basins, River Research and Applications, 37(4), 569-578.

Espegren, G.D., 1996, Development of instream flow recommendations in Colorado using R2CROSS, Colorado Water Conservation Board.

Ferguson, R.I., 2007. Flow resistance equations for gravel- and boulder-bed streams. Water Resources Research 43. <https://doi.org/10.1029/2006WR005422>

Ferguson, R.I., 2021. Roughness calibration to improve flow predictions in coarse-bed streams. Water Res 57. <https://doi.org/10.1029/2021WR029979>

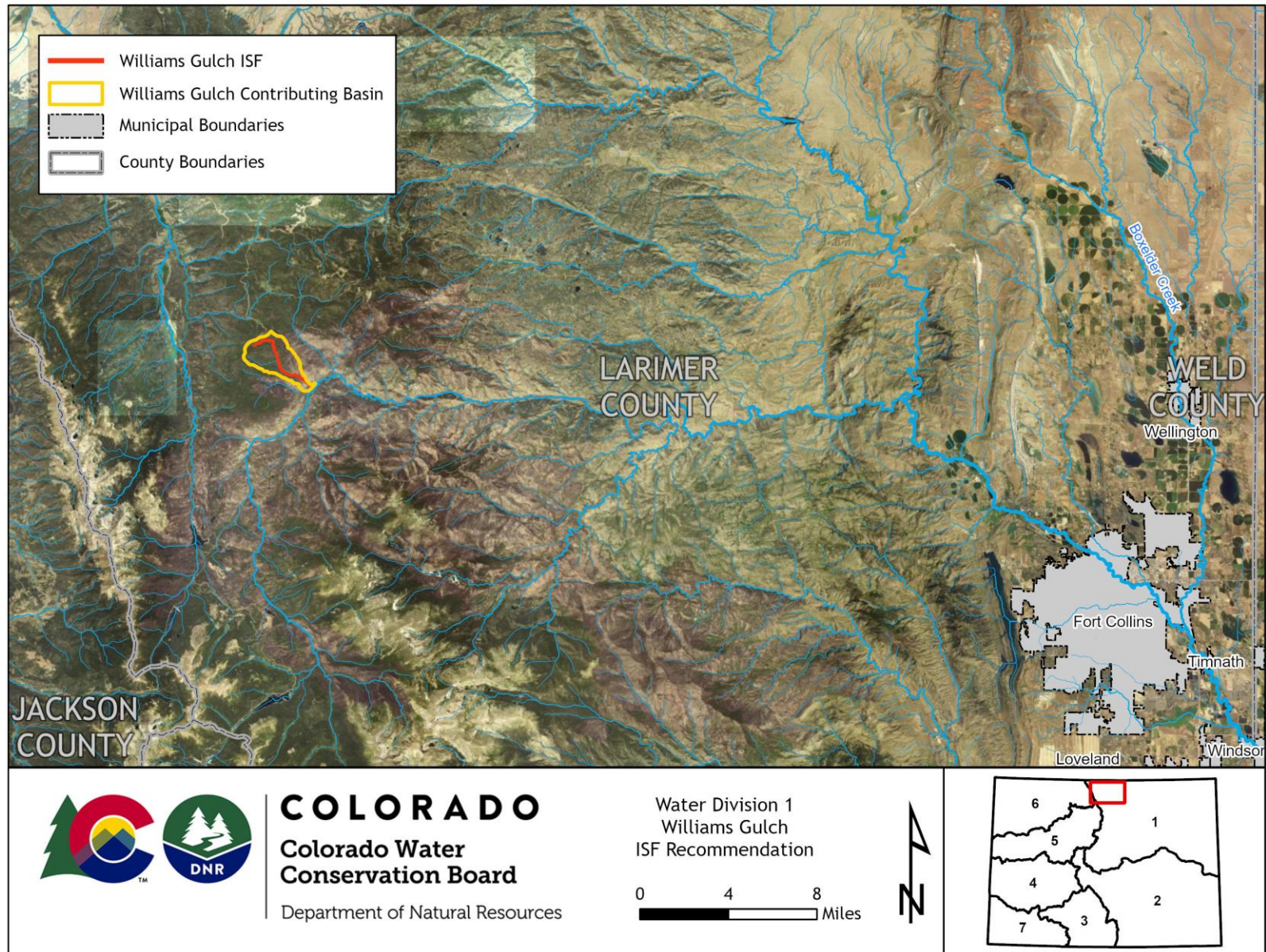
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

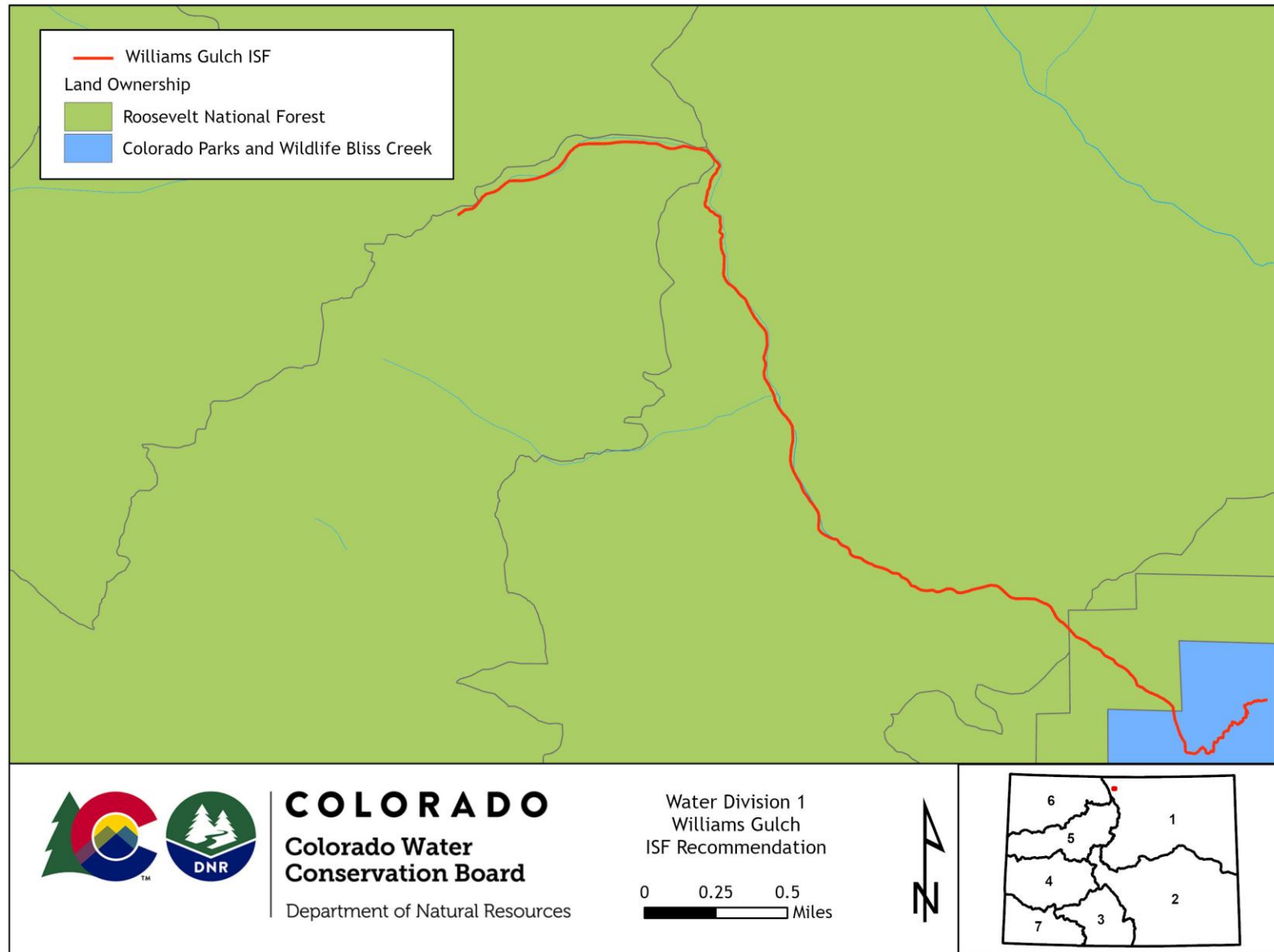
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

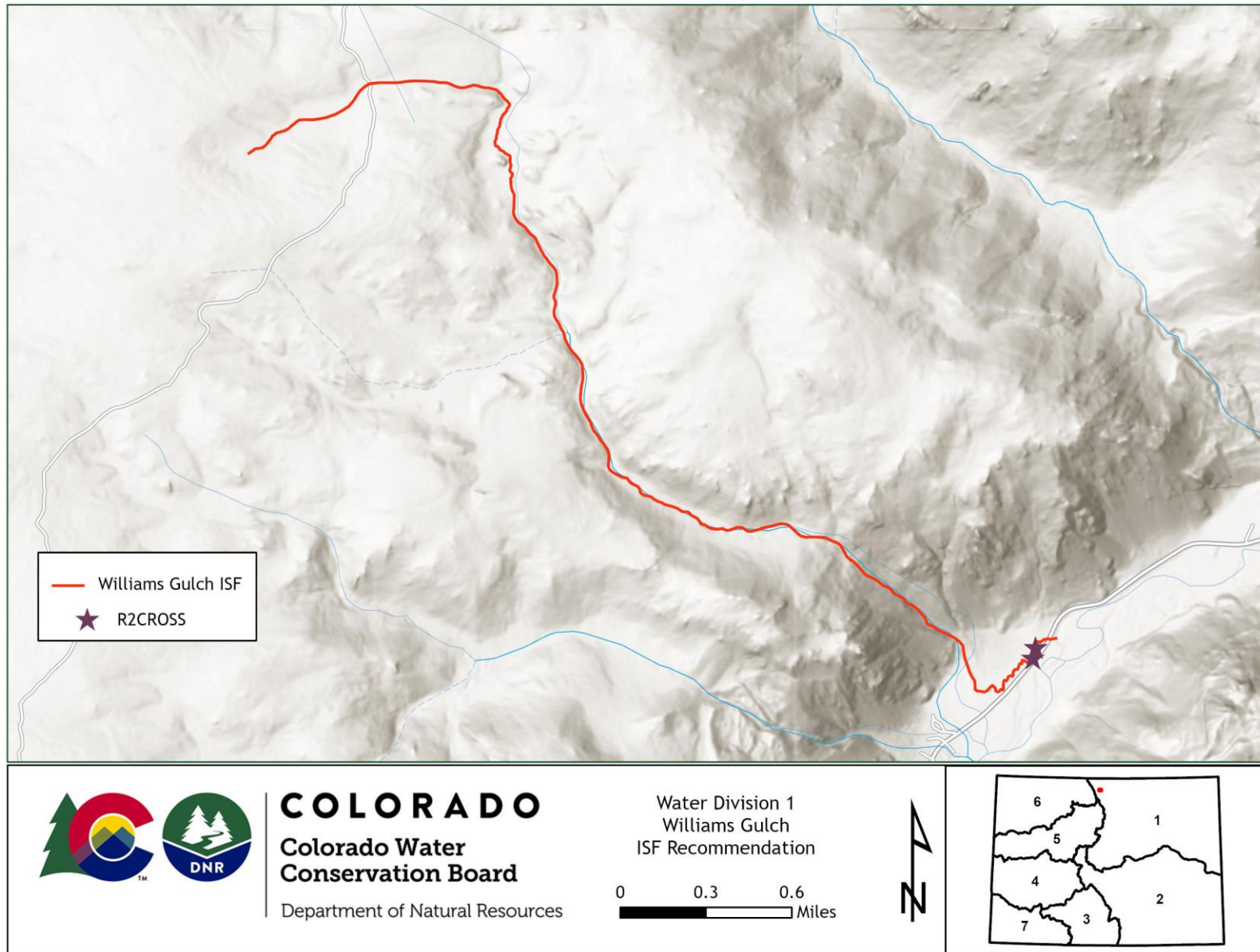
VICINITY MAP



LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH

