



## COLORADO

Colorado Water  
Conservation Board

Department of Natural Resources

### Miners Creek EXECUTIVE SUMMARY

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#### CWCB STAFF INSTREAM FLOW RECOMMENDATION

UPPER TERMINUS: Headwaters in the Vicinity of  
UTM North: 4200135.10 UTM East: 361754.34

LOWER TERMINUS: Confluence with Prong Creek  
UTM North: 4201747.81 UTM East: 367461.17

WATER DIVISION: 3

WATER DISTRICT: 27

COUNTY: Saguache

WATERSHED: Saguache

CWCB ID: 18/3/A-001

RECOMMENDER: Colorado Parks and Wildlife (CPW)

LENGTH: 4.35 miles

FLOW RECOMMENDATION: 0.56 cfs (09/01 - 04/30)  
1.0 cfs (05/01 - 08/31)



# Miners 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.

Colorado Parks and Wildlife (CPW) recommended that the CWCB appropriate an ISF water right on a reach of Miners Creek. Miners Creek originates in the La Garita Mountains at an elevation of approximately 11,720 feet. It flows in a northeasterly direction for 4.35 miles until it joins Prong Creek at an elevation of approximately 9,950 feet. The proposed ISF reach extends from its headwaters downstream to the confluence with Prong Creek, and is located within Saguache County (See Vicinity Map). The U.S. Forest Service owns and manages one-hundred percent of the land on which the 4.35 mile proposed reach is located (See Land Ownership Map). CPW recommended this reach of Miners 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/2018ProposedISFRecommendations.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.

Miners Creek has a natural environment consisting of self-sustaining populations of Rio Grande cutthroat trout and brook trout. 2004 electrofishing data shows multiple age classes of both species and a wide range of sizes from 2-inch fish to individuals in excess of 8 inches. Genetic testing of the Rio Grande cutthroats in Miners Creek show approximately 5 -10% introgression with Yellowstone cutthroat trout. Miners Creek's natural environment also contains a diverse macroinvertebrate community and numerous beaver dam complexes.

**Table 1. List of species identified in Miners Creek.**

Species Name	Scientific Name	Status
brook trout	<i>Salvelinus fontinalis</i>	None
Rio Grande cutthroat trout	<i>Oncorhynchus clarkii virginalis</i>	Federal - Sensitive Species State - Species of Greatest Conservation Need

## **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**

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 most easily visualized as the stream habitat types that would dry up first should streamflow cease. The field data collected consists of streamflow measurements, surveys of channel geometry at a transect, and 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). 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 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 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 3 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 0.56 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 1.00 cfs, which is close to meeting 3 of 3 criteria and is within the accuracy range of the R2Cross model.

**Table 2. Summary of R2Cross transect measurements and results for Miners Creek.**

Entity	Date	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
CPW	09/22/1993 # 1	0.39	0.20 - 1.00	Out of range	1.00*
CPW	09/27/2017 # 1	0.99	0.40 - 2.50	Out of range	Out of range
CPW	09/27/2017 # 2	1.25	0.50 - 3.10	0.56	Out of range
			Mean	0.56	1.00

*\* This flow is derived from the upper limit of the R2CROSS modeling accuracy and is used in the computation of the summer flow recommendation. The flow that meets all three instream flow criteria is outside of the confidence interval for this data set. This data set came closest to meeting all three hydraulic criteria within the accuracy range or the R2cross model.*

### ISF Recommendation

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

1.0 cfs is recommended for the period of May 1 to August 31. This recommendation meets two of the three hydraulic criteria (percent wetted perimeter and average depth), and is close (over 90%) to meeting the velocity criteria.

0.56 cfs is recommended for the period of September 1 to April 30.

### 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 Miners Creek is 3.27 square miles, with an average elevation of 11,215 feet and average annual precipitation of 41.48 inches (See the Hydrologic Features Map). No active surface water diversions were identified in the proposed ISF reach; therefore, hydrology in this drainage basin represents natural flow conditions.

### **Available Data**

There is not a current or historic streamflow gage on Miners Creek. The nearest streamflow gage is Carnero Creek near La Garita (USGS and DWR number 08230500), which is located approximately 11.6 miles southeast from the proposed lower terminus. The Carnero Creek gage period of record includes 1919 to present. The drainage basin tributary to the Carnero Creek gage is 106 square miles, with an average elevation of 10,056 feet, and an average precipitation of 26.53 inches. There are a number of diversions in the Carnero Creek drainage basin, resulting in altered hydrology at the gage. Due to the large difference in drainage basin size and the diversions that impact the gage, this data was not used to assess water availability on Miners Creek.

CWCB staff assisted CPW in collecting R2Cross information. No additional site visits were necessary.

### **Data Analysis**

StreamStats provides the best available estimate of streamflow on Miners Creek.

### **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 Miners 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. (2017), 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.

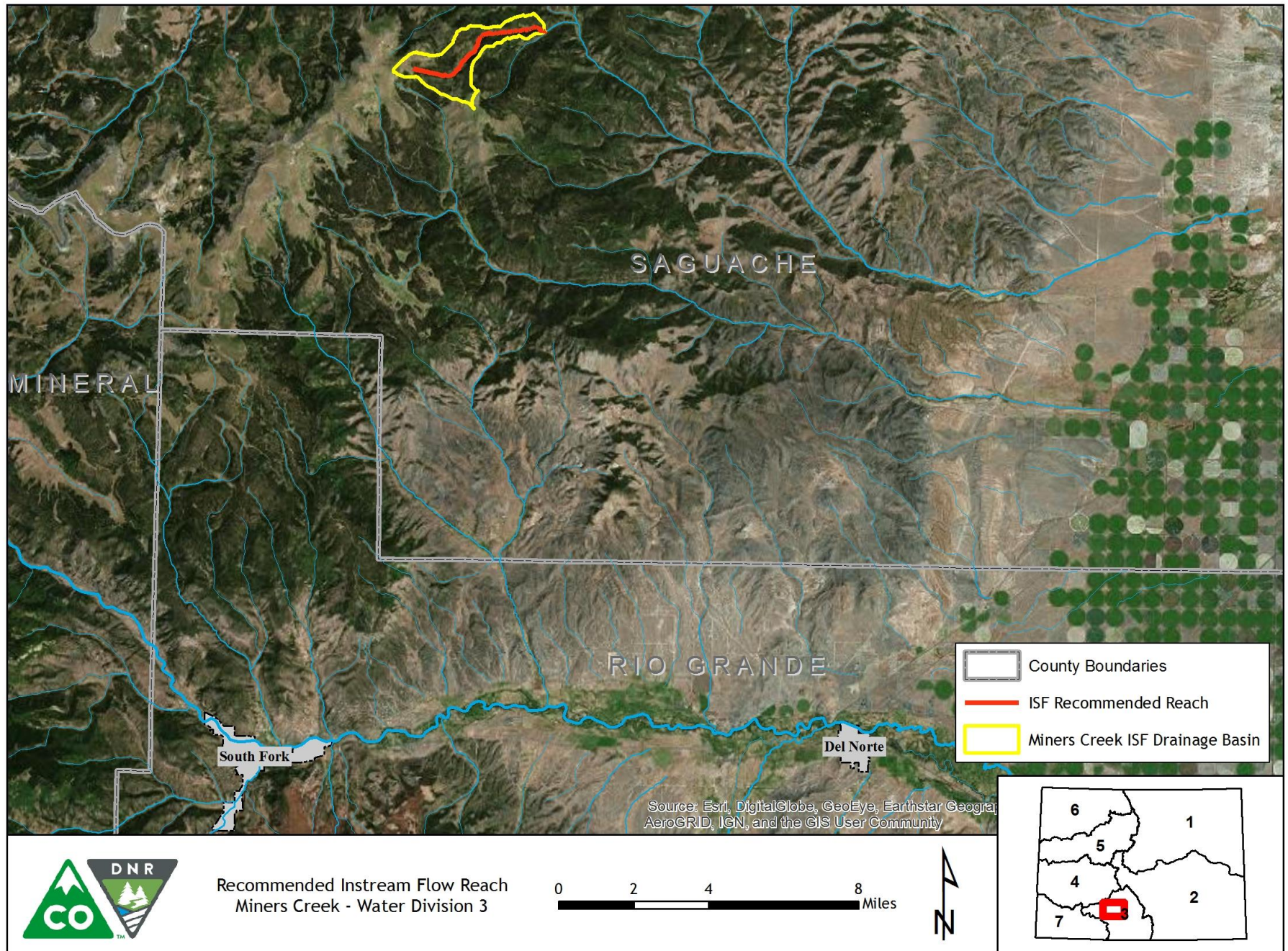
**Metadata Descriptions**

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

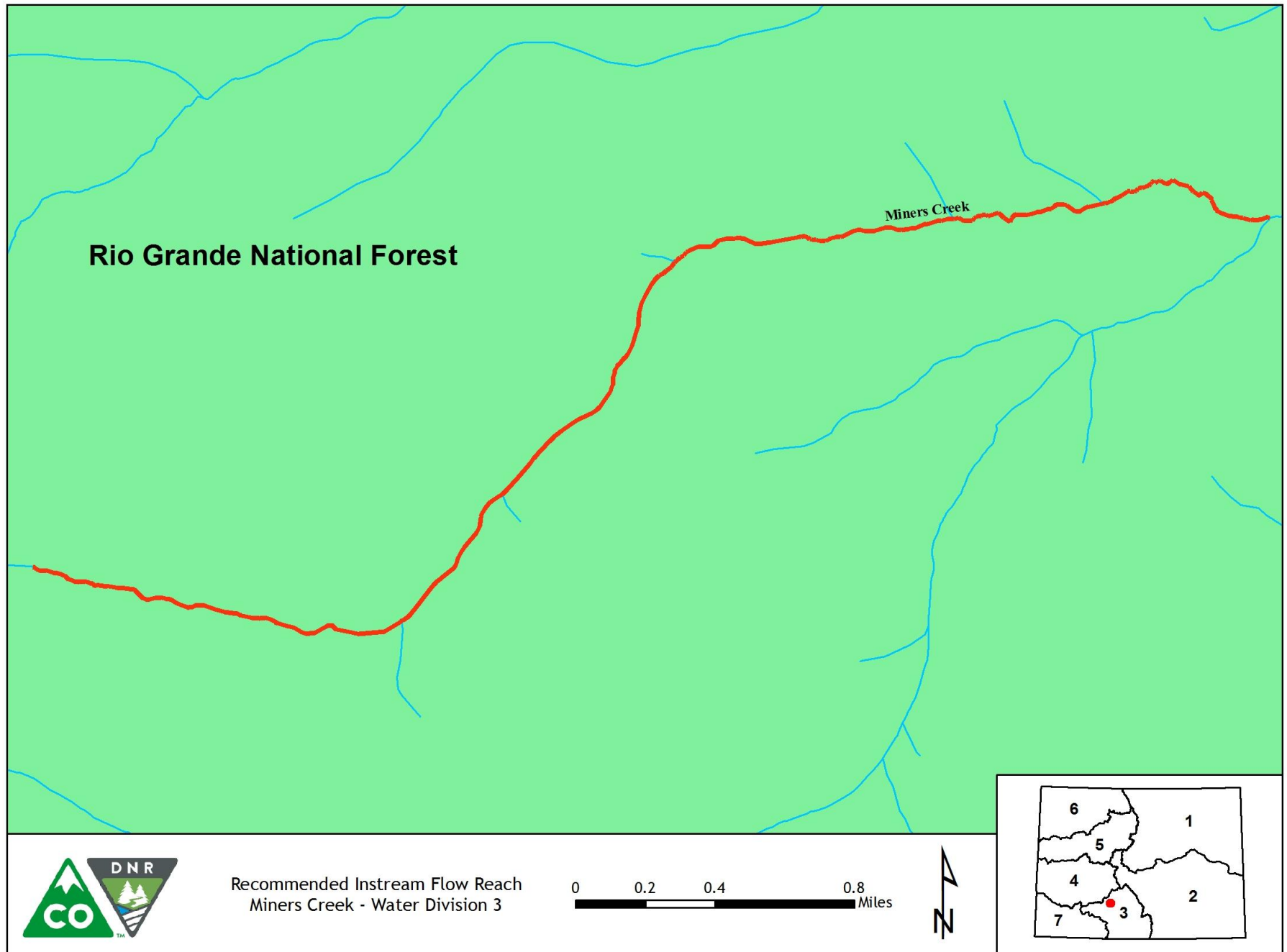
Projected Coordinate System: NAD 1983 UTM Zone 13N.



## VICINITY MAP

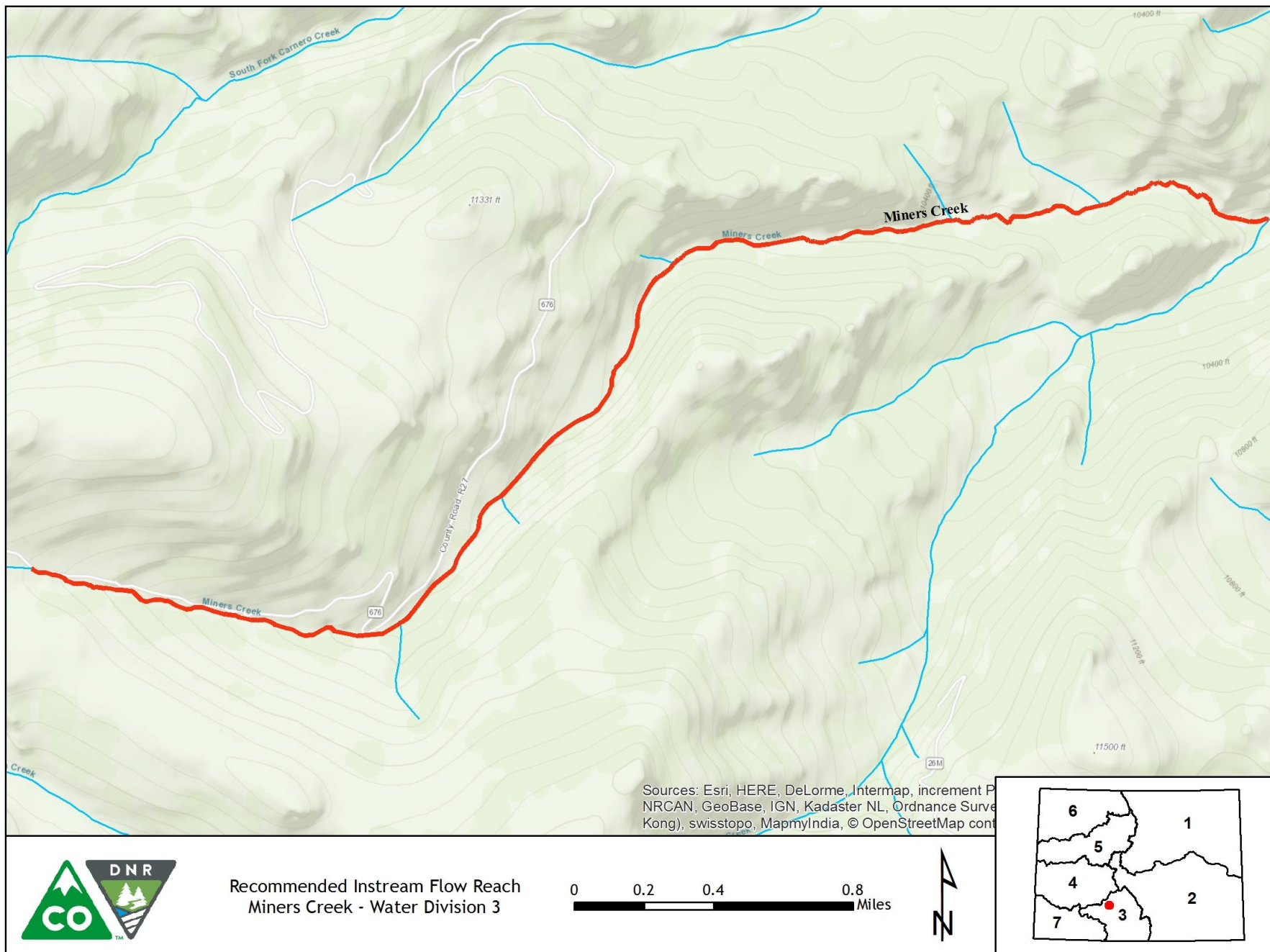


## LAND OWNERSHIP MAP





## HYDROLOGIC FEATURES MAP



## COMPLETE HYDROGRAPH

