COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Timber Springs Gulch
Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION

UPPER TERMINUS:	Spring Complex at UTM North: 4392856.91	UTM East: 360417.74
LOWER TERMINUS:	BLM Property Boundary at UTM North: 4392106.56	UTM East: 360360.21
WATER DIVISION:	5	
WATER DISTRICT:	37	
COUNTY:	Eagle	
WATERSHED:	Eagle (HUC#:14010003)	
CWCB ID:	15/5/A-001	
RECOMMENDER	Bureau of Land Management	
LENGTH:	0.47 miles	
FLOW RECOMMENDATION:	1.3 cfs (4/1 – 10/31) 1.0 cfs (11/1 – 3/31)	

TIMBER SPRINGS GULCH

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. 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 Bureau of Land Management (BLM) recommended that the CWCB appropriate an ISF water right on a reach of Timber Springs Gulch. This reach is located within Eagle County about 3.8 miles west of the town of Avon (See Vicinity Map). Timber Springs Gulch originates in the White River National Forest at an elevation of about 8,600 feet. It flows in a southerly direction as it drops to an elevation of 7,200 feet where it flows into Wilmore Lake adjacent to Interstate 70. The proposed reach extends from a springs complex downstream to the BLM property boundary. One-hundred percent of the land on the 0.47 mile proposed reach is publicly owned and managed by the U.S. Forest Service and the BLM (See Land Ownership Map). BLM recommended this reach of Timber Springs Gulch 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/2015ProposedISFAppropriations.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.

Timber Springs Gulch is a cold-water, high gradient stream. It flows through a canyon with a valley floor approximately one-fourth mile in width. The stream cuts through alluvial deposits in the narrow valley and is not confined by bedrock in most locations. The stream generally has small-sized substrate, consisting of gravels and small cobbles, and small boulders. While riffle habitat is abundant, parts of the stream lack extensive pool habitat.

Fisheries surveys have revealed a self-sustaining population of native cutthroat trout. See Table 1 for a list of species identified in this stream. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The riparian community is generally comprised of blue spruce, willow species, and alder. The riparian community is in very good condition, and provides adequate shading and cover for fish habitat.

Table 1. List of species identified in Timber Springs Gulch.

Species Name	Scientific Name	Status
native cutthroat trout	*Oncorhynchus clarkii**	State Species of Special Concern BLM Sensitive Species

**Identification of subspecies / lineage of native cutthroat trout in Colorado is ongoing through genetic testing and research.*

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 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 (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 summer flow of 2.1 cfs, which meets 3 of 3 criteria and is within the accuracy range of the R2Cross model. The R2Cross model results in a winter flow of 1.0 cfs, which meets 2 of 3 criteria and is within the accuracy range of the R2Cross model.

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

Entity	Date Measured	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
BLM	5/17/2013	1.30	0.5 – 3.3	1.34	1.88
BLM	5/17/2013	1.34	0.5 – 3.3	0.69	2.4
			Mean	**1.01**	**2.14**

ISF Recommendation

The BLM recommends flows of 1.3 cfs (4/1 – 10/31) and 1.0 cfs (11/1 – 3/31) based on R2Cross modeling analyses, biological expertise and staff's water availability analysis.

1.3 cfs is recommended from April 1 to October 31. While 2.1 cubic feet per second would be required to meet all three instream flow criteria, it appears that the springs that feed this creek flow steadily year-round at 1.3 cfs. 1.3 cfs meets both the wetted perimeter and the average velocity criteria and provides an average depth 0.15 feet in riffles. The very stable flow rate of the creek allows the fishery to persist, even though depth conditions may not be optimal in all riffle locations.

1.0 cfs is recommended from November 1 to March 31. This recommendation is driven by the average velocity criteria. This flow rate should prevent pools from freezing, allowing the fish population to successfully overwinter.

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 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.

Basin Characteristics

The proposed ISF reach of Timber Springs Gulch Creek has a 0.42 square mile drainage basin. The average elevation of the basin is 8,210 ft and the average annual precipitation is 15.56 inches. The majority of streamflow originates from a springs complex located in the vicinity of the proposed upper terminus. The springs surface at several points along a hillside and water coalesces to form channels. The recommendation is for the primary channel on Timber Springs Gulch. The drainage basin tributary to the lower terminus has no absolute surface water diversions. Hydrology in the proposed ISF reach represents natural flow conditions from a spring complex.

Available Data

There is not a current or historic streamflow gage on Timber Springs Gulch. However, there are two diversion structures with records lower in the basin. In some cases, diversion records can be used to

provide an indication of water availability in a stream reach. The Groff Ditch (appropriation date 1885, 0.3 cfs; and 1889 6.1 cfs) is located approximately 0.6 miles downstream from the proposed lower terminus. This structure has daily diversion records that start in the 1950s, and then a gap until records start back up in 1975 through 2010. The Groff Ditch Cottonwood Enlargement (Groff Ditch AP) is located approximately 200 ft downstream from the proposed lower terminus. This structure is an alternate diversion point for the Groff Ditch and has a more recent 1990 appropriation for 0.93 cfs. This structure has daily diversion records from 1995 to 2010, with some intermittent periods. The Groff Ditch AP structure receives some streamflow directly from an additional spring located lower in the spring complex. However, sandbags also appear to direct streamflow from the primary Timber Springs Gulch channel into the Groff Ditch AP. Flow diverted using the Groff Ditch AP do not return to Timber Springs Gulch.

Spot streamflow measurements have been made at Timber Spring Gulch and the Groff Ditch AP diversion. CWCB staff made measurements on the primary Timbers Springs Gulch and the spring channel directly above the Groff Ditch AP. The Groff Ditch AP owners also periodically check their diversion rate during winter months. Their engineering firm, Bishop Brogden and Associates (BBA) provided 19 flume measurements during winter months from 2010 through 2014.

Data Analysis

There are some questions about the diversion records for the Groff ditches. The Groff Ditch AP has likely been in use much longer than the diversion record suggests given the mature trees along a well-established ditch. Charlie Stanzione of BBA indicated that historical diversions at the Groff Ditch AP may have been recorded at the lower structure. The Water Commissioner, Bill McEwen, also advised using the record starting in 1995 when there are more detailed diversion records for both locations. Therefore, the water availability analysis focuses on daily records from 1995 to 2010 based on data available through HydroBase on 6/16/2014.

The best estimate of streamflow in the reach is based on summing the diversion records for the two diversion structures. The median diversion was then calculated using the summed diversion record. In general, the daily diversion records show that most use has occurred during the irrigation season. The median diversion during the winter is zero due to the large number of years with zero recorded diversions; however, starting in 2006, all years except 2009 show year round diversions in either the daily or monthly records. Therefore, it is assumed that water is available during the winter but was not taken in past years.

The winter measurements of the Groff Ditch AP from BBA indicate that flow entering the flume is quite consistent. The reported measurements range from 1.93 cfs to 2.73 cfs with an average of 2.38 cfs.

CWCB staff measurements of the primary Timber Springs Gulch channel during the summer of 2014 are also consistent; 2.3, 1.8, 2.4, and 2.3 cfs. The lower spring above the Groff Ditch AP was measured on 10/9/2014 and had 1.1 cfs, which represents approximately one third of the total flow measured in the system on that day.

Water Availability Summary

The hydrograph (Figure 1) shows the median of the summed diversions from the Groff and Groff Ditch AP. The winter flume readings provided by BBA, as well as all measurements made by CWCB staff, are included. The proposed ISF is less than the median of the summed diversions during the irrigation season. The proposed ISF is also less than the majority of measurements during winter. Summing the diversion records may overestimate the amount of water available in the main Timber Springs Gulch channel. However, it appears that there is significantly more water available than the ISF recommendation. Staff has concluded that water is available for appropriation.

Material Injury

Because the proposed ISF on Timber Springs 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. (2014), 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.

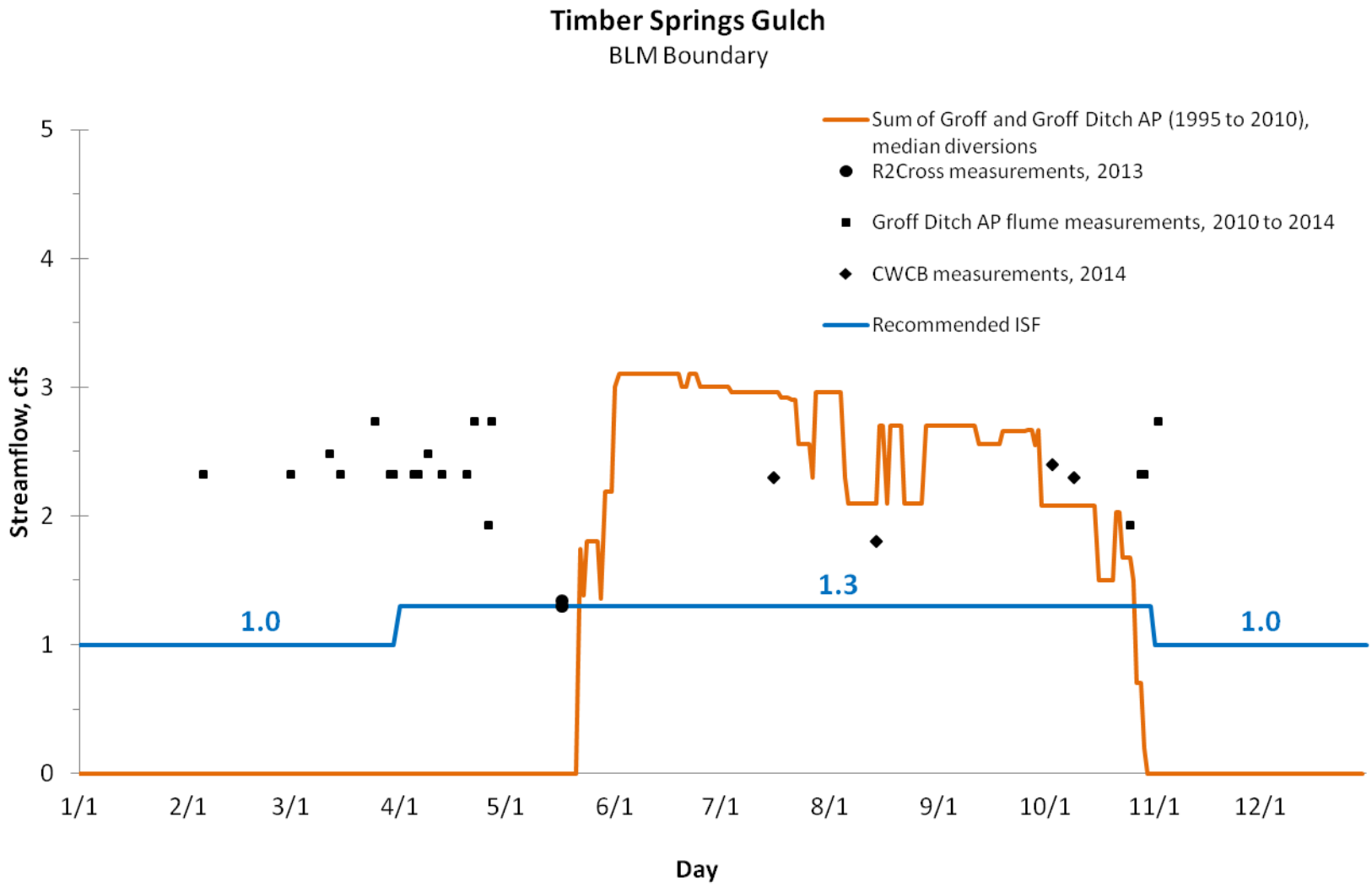
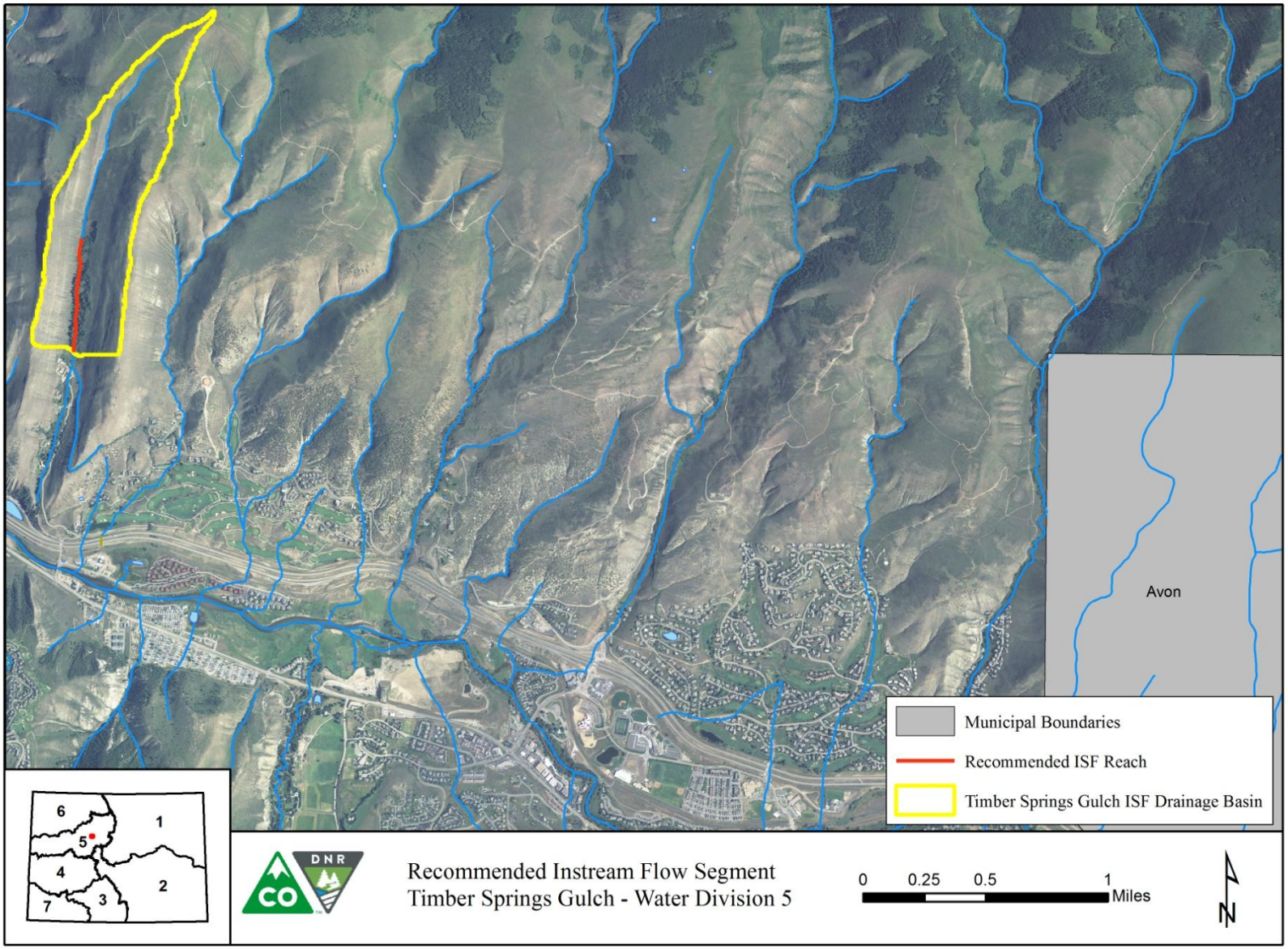
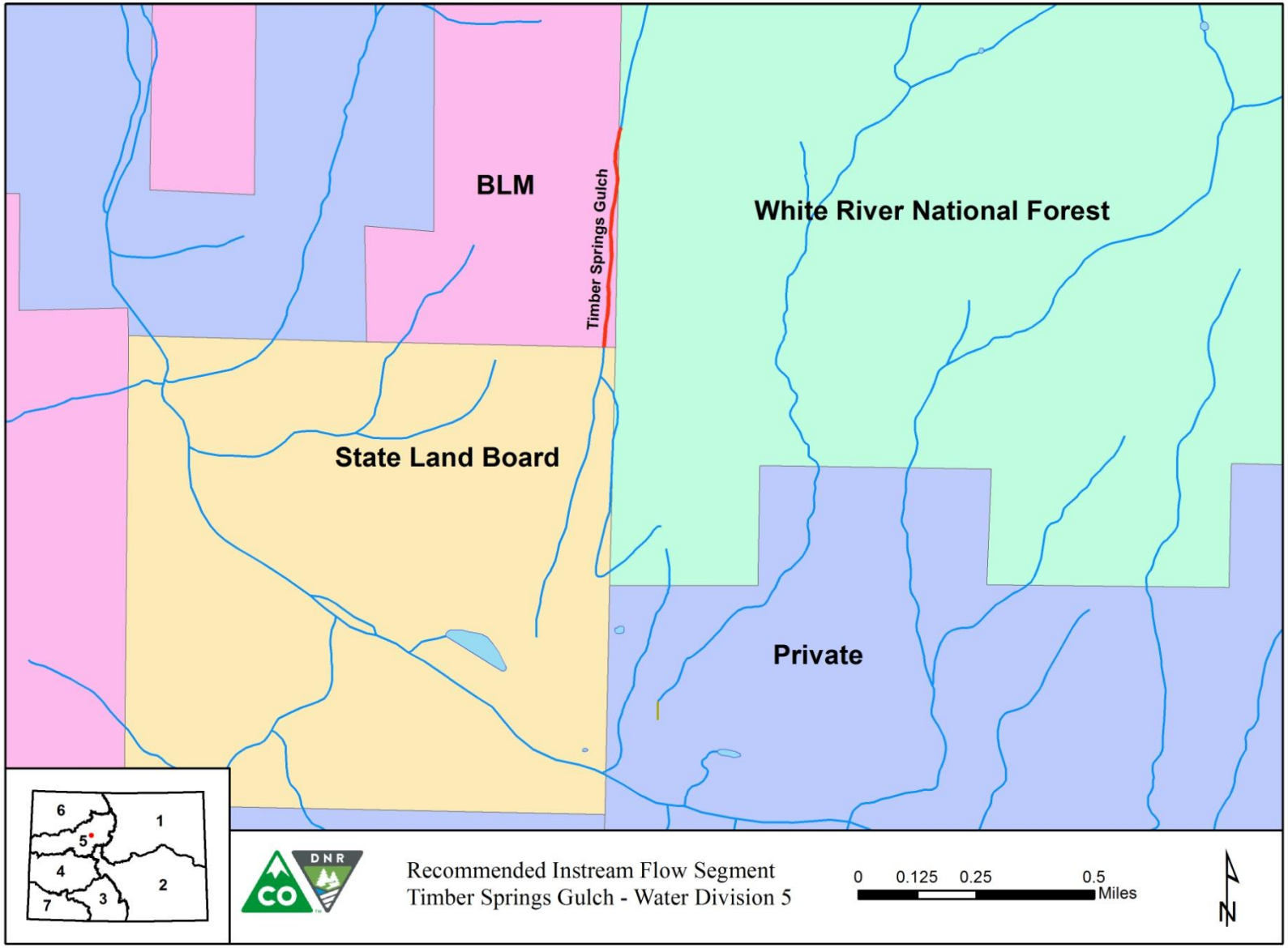


Figure 1. Complete hydrograph showing streamflow data and the proposed ISF rate on Timber Springs Gulch.

Vicinity Map



Land Use Map


BLM
Timber Springs Gulch
White River National Forest
State Land Board
Private
6
1
5
4
2
7
3
DNR
CO
Recommended Instream Flow Segment
Timber Springs Gulch - Water Division 5
0
0.125
0.25
0.5
Miles
N

Water Rights Map