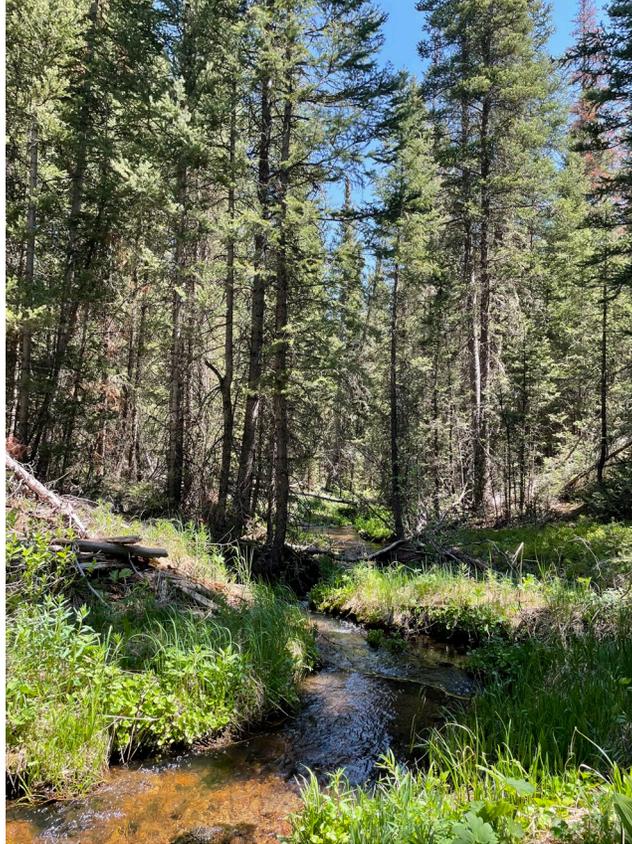


# Spruce Creek Executive Summary

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## CWCB STAFF INSTREAM FLOW RECOMMENDATION January 24-25, 2022

UPPER TERMINUS: headwaters in the vicinity of:  
UTM North: 4417390.06 UTM East: 379009.02

LOWER TERMINUS: Hoagland Canal headgate at:  
UTM North: 4421229.09 UTM East: 381495.21

WATER DIVISION: 5

WATER DISTRICT: 36

COUNTY: Grand, Summit

WATERSHED: Blue

CWCB ID: 22/5/A-003

RECOMMENDER: Bureau of Land Management (BLM)

LENGTH: 3.54 miles

EXISTING ISF: 85CW0645, 0.5 cfs (1/1 to 12/31)

FLOW RECOMMENDATION: 0.4 cfs (04/15 - 06/30) - increase



**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/2022-isf-recommendations>.

## **RECOMMENDED ISF REACH**

The BLM recommended that the CWCB appropriate an increase to the existing ISF water right on a reach of Spruce Creek. Spruce Creek is located within Grand and Summit Counties and is approximately 6 miles west of Green Mountain Reservoir (See Vicinity Map). The stream originates near Sheep Mountain in the Gore Range and flows northeast for 4.7 miles until it reaches the confluence with the Blue River. The existing ISF was appropriated in 1985 for 0.5 cfs year round from the headwaters to the confluence with the Blue River.

The proposed reach extends from the headwaters downstream to the Hoagland Canal headgate for a total of 3.54 miles. Twenty-six percent of the land on the proposed reach is managed by the BLM and 74% is privately owned (See Land Ownership Map). BLM is interested in an additional ISF water right to protect this stream because it contains a population of Colorado River Cutthroat Trout identified as a core conservation population based on the Conservaton Agreement and Strategy for Colorado River Cutthroat Trout in the States of Colorado, Utah, and Wyoming (CRCT Coordination Team, 2006). Protecting Spruce Creek aligns with BLM's management goals of mantaining and enhancing habitat that supports sensitive fish species, as well as maintaing and improving the function of riparian areas, and protecting riparian and wetland systems.

## **OUTREACH**

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently more than 1,100 people are subscribed to the ISF mailing list. Notice of the potential appropriation of an ISF water right on Spruce Creek was sent to the mailing list in November 2021 and March 2021. Staff sent notice letters to identified landowners adjacent to Spruce Creek based on information available through the county assessors website. Public notice of this recommendation was also published in the Middle Park Times on October 26, 2021 and the Summit County Journal on October 29, 2021.

Staff presented information about the ISF program and this recommendation at a meeting of the Grand County Board of County Commissioners on November 9, 2021. In addition, staff spoke with Brett Davidson, a manager at the Blue Valley Ranch on March 22, 2021 regarding water availability on Spruce Creek. Staff communicated with Neal Misbach, Lead Water Commissioner-Upper Colorado River, on various dates in 2021 regarding water use practices and water availability on Spruce Creek.

### **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.

Spruce Creek is a cold-water stream that runs through forests and meadows at a high gradient. The recommended reach flows through a valley that ranges from a quarter mile to half a mile in width. The stream begins on densely forested United States Forest Service (USFS) lands, flows through BLM lands comprised of mixed forests and meadows, and then flows through private lands primarily used for recreation and hunting. The channel appears to have natural sinuosity and the substrate ranges from small gravels to four-inch cobbles. BLM noted that bank stability is good except in limited areas of high livestock usage. According to the BLM, the water quality is excellent for cold-water species.

The BLM identified a self-sustaining population of Green Lineage Colorado River Cutthroat Trout, designated by the State of Colorado as a species of special concern. The BLM works with Colorado Parks and Wildlife (CPW) and the Blue Valley Ranch to manage the fishery in Spruce Creek as a conservation population. In addition, BLM, CPW, and Blue Valley Ranch have completed projects designed to improve habitat conditions, fish passage, habitat connectivity, and increase fish populations lower in the stream reach. These projects include changes in diversion practices and reconstruction of culverts.

The riparian community consists of spruce and willow species, providing ample shade for fish species. Macroinvertebrate surveying found a diverse community with 76 taxa, including robust populations of stonefly, mayfly, and caddisfly (Tables 1 & 2). CWCB staff also observed a wide range and large quantity of macroinvertebrates during site visits.

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

Species Name	Scientific Name	Protection Status
Colorado River Cutthroat Trout - Green Lineage	<i>Oncorhynchus clarkii pleuriticus</i>	State- Species of Special Concern
Fingernail clam	<i>Pisidium spp</i>	None
Scud	<i>Hyalella spp</i>	None
Macroinvertebrates*		None
Sedge	<i>Carex spp</i>	None
Spruce	<i>Picea spp</i>	None
Water Horsetail	<i>Equisetum fluviatile</i>	None
Willow	<i>Salix spp</i>	None

\*Detailed in Table 2.

**Table 2. List of macroinvertebrate species identified in Spruce Creek.**

Macroinvertebrate Order	Species in Order (#)	Classes Identified
Mayfly - Ephemeroptera	13	<i>Ameletidae, Baetidae, Ephemerellidae, Heptageniidae, Letophlebiidae</i>
Stonefly - Plecoptera	12	<i>Chloroperlidae, Nemouridae, Perlidae, Perlodidae</i>
Caddisfly - Trichoptera	10	<i>Glossosomatidae, Hydropsychidae, Lepidostomatidae, Limnephilidae, Philopotamidae, Rhyacophilidae, Uenoidae</i>
Beetles - Coleoptera	10	<i>Dytiscidae, Elmidae, Helophoridae, Hydrophilidae</i>
Fly - Diptera	25	<i>Ceratopogonidae, Chironomidae, Dixidae, Empididae, Psychodidae, Ptychopteridae, Simuliidae, Tipulidae</i>
Aquatic Mites - Tombidiformes	3	<i>Lebertiidae, Sperchonidae</i>

### 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

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 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 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 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**

R2Cross data was collected at three transects for this proposed ISF reach by BLM (Table 3). 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 0.88 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.

**Table 3. Summary of R2Cross transect measurements and results for Spruce Creek.**

Date, XS #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
07/14/2020, 1	5.20	0.44	0.18 - 1.10	N/A	0.93
07/14/2020, 2	7.36	0.32	0.13 - 0.80	N/A	Out of range
06/23/2021, 1	4.60	0.59	0.24 - 1.48	N/A	0.83
			Mean		0.88

**ISF Recommendation**

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

An increase of 0.4 cfs is recommended from April 15 through June 30 to bring the total ISF protection up to 0.9 cfs. This recommendation is driven by the average velocity and average depth criteria. Spruce Creek has limited riffle habitat, so protecting this flow rate will ensure

that the limited habitat can be fully utilized during the spring and summer period. During May and June, the fish population is completing its spawning activities and the fish are moving actively between pools.

## **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.

### **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.). 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 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) 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 Spruce Creek is 5.33 square miles, with an average elevation of 9,175 feet and average annual precipitation of 21.03 inches (See the Hydrologic Features Map). Two diversion structures are located on Spruce Creek (Table 4) and an additional three diversions are on a tributary. Each of these structures is decreed to use the Hoagland Canal as an alternate point of diversion, and based on records and conversations with the water commissioner, that is the primary practice (personal communication, Neal Misbach, 2021). The Hoagland Canal is located at the lower terminus, therefore there is little flow alteration in the proposed ISF reach.

**Table 4. Decreed diversion structures located within the proposed ISF reach on Spruce Creek.**

WDID	Structure name	Decreed flow rate, cfs	Appropriation Date	Location
3600656	High Ditch	5	1883	Midway through the ISF reach.
3600945	Hoagland Canal	5 & 11.5*	1912	Lower terminus

*\*11.5 cfs is the total for all other diversions that use the Hoagland Canal as an alternate point, which is the primary practice. This value also includes 5 cfs from the High Ditch.*

### Data Analysis

There is not a current or historic streamflow gage on Spruce Creek. A number of gages were evaluated, but none appeared to be representative of Spruce Creek due to differences in water use patterns or basin characteristics. StreamStats provides the best available estimate of streamflow in the proposed Spruce Creek reach.

In some cases, diversion records can be used to provide an indication of water availability in a stream reach. Although the Hoagland Canal typically diverts the available water, the diversion record is not a perfect proxy for streamflow because use or non-use of a structure is not always related to the availability of water. For example, maintenance issues or haying operations may result in zero recorded diversions even when water is available. Nevertheless, the diversion records for the Hoagland Canal were evaluated and median diversion records and upper 95% confidence interval for median diversions were calculated to provide additional information.

CWCB staff made two streamflow measurements on the proposed reach of Spruce Creek as summarized in Table 5.

**Table 5. Summary of streamflow measurements for Spruce Creek.**

Visit Date	Flow (cfs)	Location
06/15/2021	0.93	Midway through the reach
06/15/2021	0.68	Near the upper terminus

### Water Availability Summary

The hydrograph (See Complete Hydrograph) shows StreamStats results for mean-monthly streamflow and the median and upper 95% confidence interval for median diversions. Based on both of these sources of information, Staff has concluded that water is available for appropriation.

### MATERIAL INJURY

Because the proposed ISF on Spruce 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. (2021), the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

## **ADDITIONAL INFORMATION**

### **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.

CRCT Coordination Team, 2006, Conservation Strategy for Colorado River Cutthroat Trout (*Oncorhynchus clarkii pleuriticus*) in the States of Colorado, Utah, and Wyoming. Colorado Division of Wildlife, Fort Collins.

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

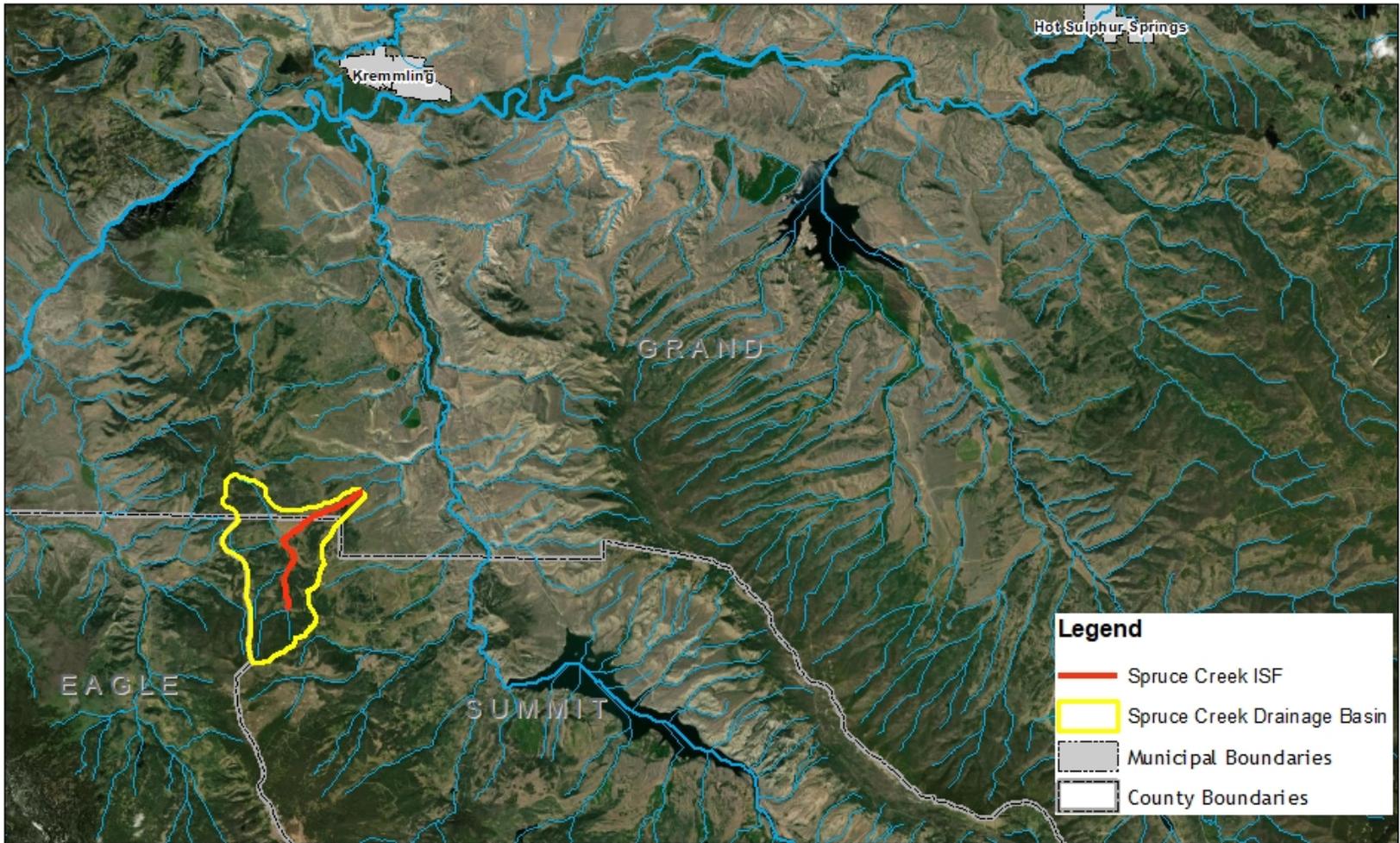
Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

### **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

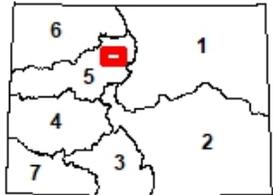


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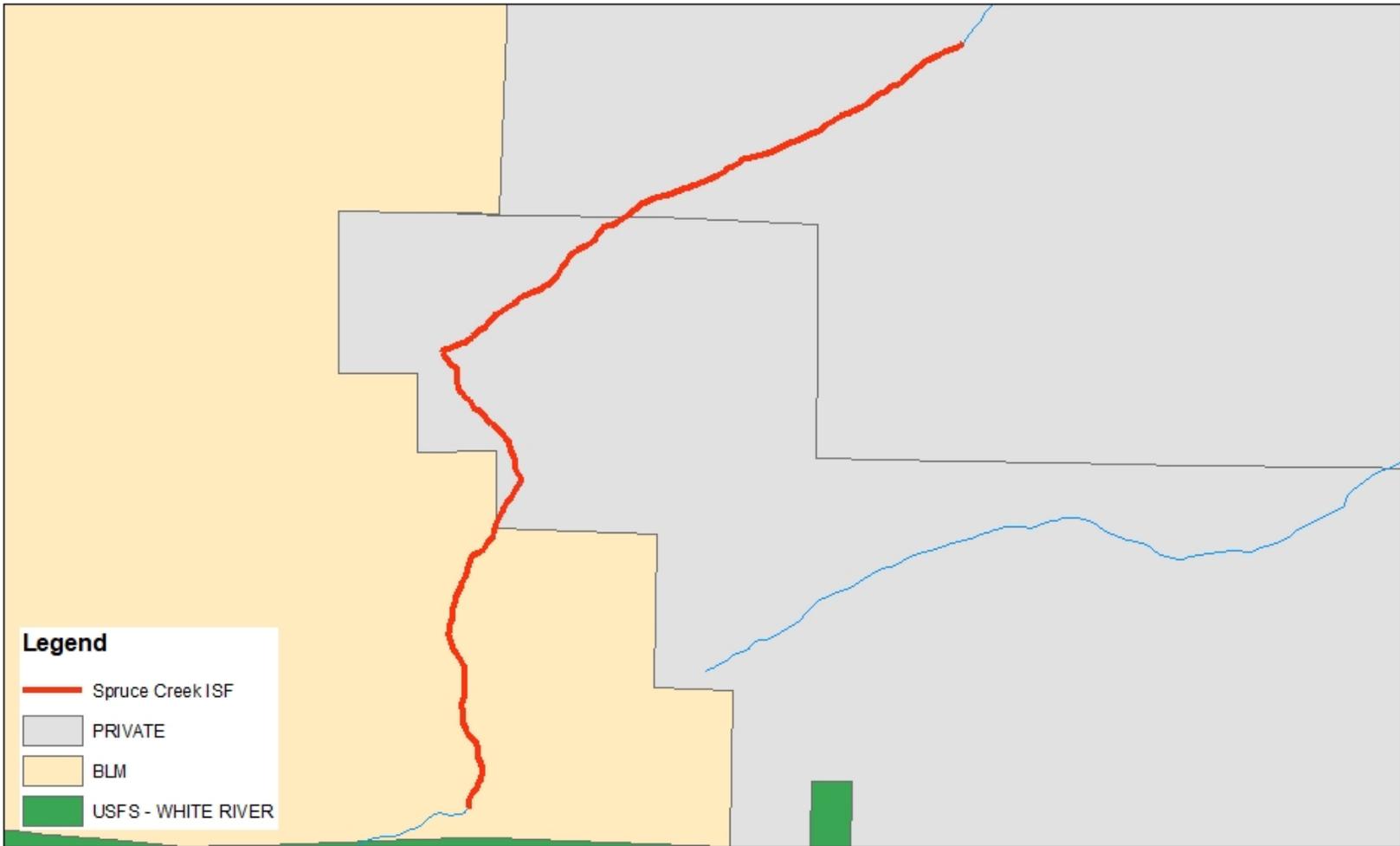
Water Division 5  
Recommended ISF - Spruce Creek ISF

0 2 4 8 Miles





# LAND OWNERSHIP MAP

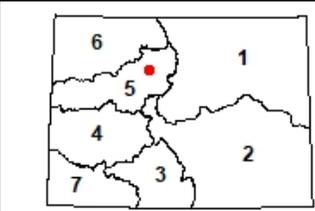
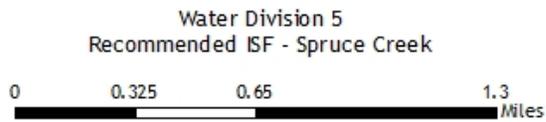


**Legend**

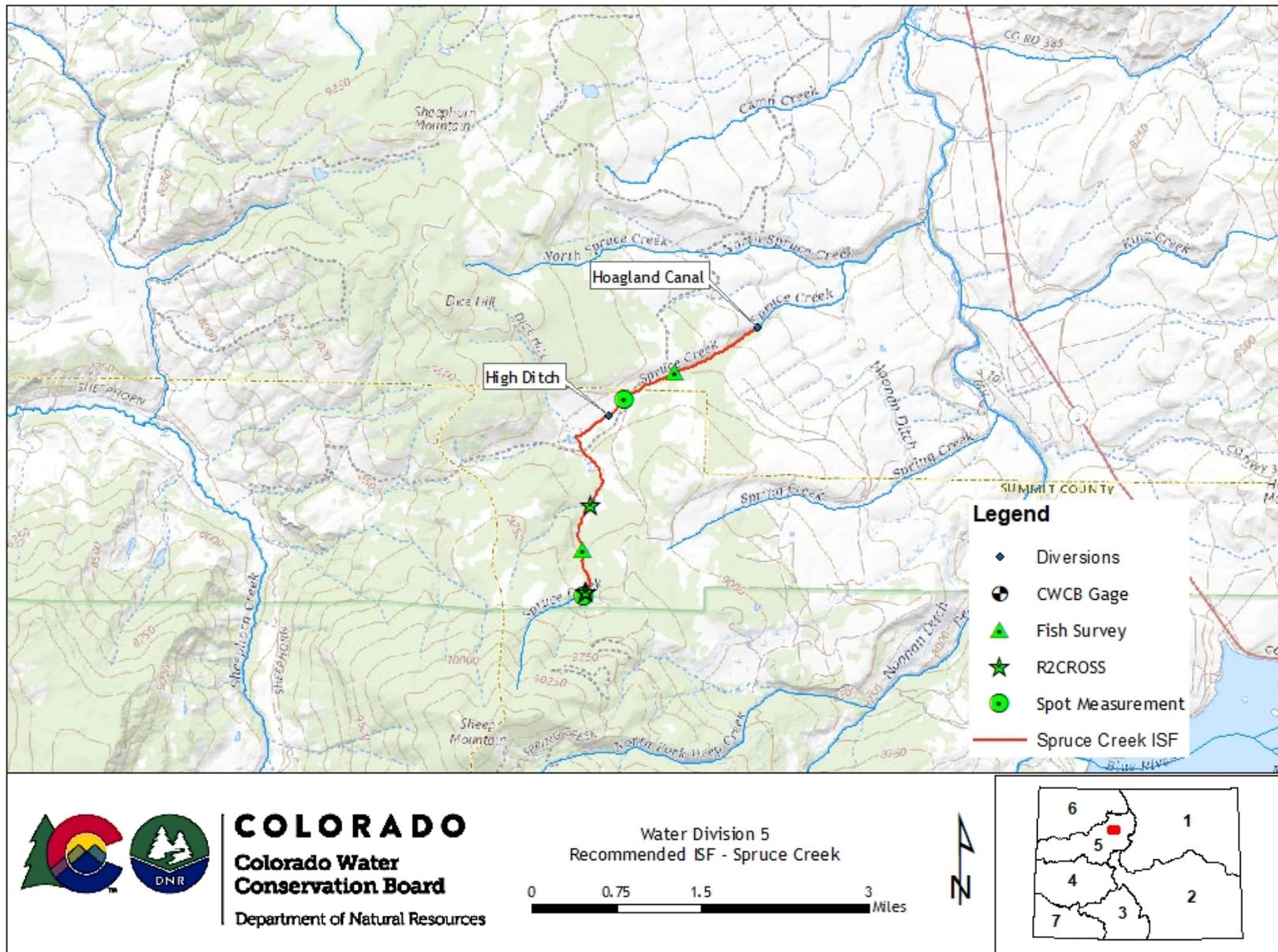
-  Spruce Creek ISF
-  PRIVATE
-  BLM
-  USFS - WHITE RIVER



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# HYDROLOGIC FEATURES MAP



# COMPLETE HYDROGRAPH

