COLORADO
Colorado Water Conservation Board
Department of Natural Resources

1313 Sherman Street, Room 718
Denver, CO 80203

P (303) 866-3441
F (303) 866-4474

Jared Polis, Governor

Dan Gibbs, DNR Executive Director

Rebecca Mitchell, CWCB Director

TO: Colorado Water Conservation Board Members

FROM: Robert Viehl, Chief
Brandy Logan, Water Resource Specialist
Stream and Lake Protection Section

DATE: January 24, 2022

AGENDA ITEM: 19. 2022 Instream Flow Appropriations in Water Divisions 4, 5, and 6

Staff Recommendation

Staff recommends that, pursuant to ISF Rule 5d., the Board declare its intent to appropriate an instream flow (ISF) water right on each stream segment listed in Table 1, and direct staff to publicly notice the Board's declaration of its intent to appropriate.

Table 1.

Div	Stream	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus	Flow Rate cfs/ Timing
4	Italian Creek *(Increase)*	East-Taylor	Gunnison	2.42	Confluence South Italian Creek	confluence Taylor River	0.7 (04/01 - 10/31)
4	Lottis Creek *(Increase)*	East-Taylor	Gunnison	10.33	headwaters	confluence Taylor River	2.1 (04/01 - 10/31)
4	Spring Creek	San Miguel	Montrose	7.47	headwaters	Crabtree Ditch headgate	1.1 (03/15 - 05/31)
5	Kinney Creek *(Increase)*	Colorado headwaters	Grand	6.31	headwaters	confluence McQueary Creek	0.7 (05/01 - 07/15)
5	Spruce Creek *(Increase)*	Blue	Grand Summit	3.54	headwaters	Hoagland Canal headgate	0.4 (04/15 - 06/30)
6	Deep Creek	Upper Yampa	Routt	2.45	headwaters	confluence Steamboat Lake	0.3 (10/01 - 04/30) 2.5 (05/01 - 07/31) 0.95 (08/01 - 09/30)
6	Watson Creek	Upper Yampa	Routt	5.86	confluence Moody Creek	Hardscrabble Ditch headgate	1.1 (08/16 - 03/31) 1.9 (04/01 - 06/21)

Introduction

This memo provides an overview of the technical analyses performed by the recommending entities and CWCB staff on ISF recommendations in Water Divisions 4, 5, and 6. This work was conducted to provide the Board with sufficient information to declare its intent to appropriate ISF water rights in accordance with the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program (ISF Rules). The Board was also provided with an executive summary for each recommended stream segment. The executive summaries contain the technical basis for each appropriation along with appendices of the supporting scientific data.

In addition, the scientific data and technical analyses performed by the recommending entity are accessible on the Board's website at:
https://cwcb.colorado.gov/2022-isf-recommendations

Natural Environment Studies
The Bureau of Land Management and High Country Conservation Advocates documented the natural environment resources on their respective recommendations and found natural environments that can be preserved. To to evaluate instream flow requirements, the recommending entities collected hydraulic data and performed R2CROSS modeling on all segments. Staff reviewed each proposed ISF segment to ensure that the dataset is complete, and proper methods and procedures were followed. Staff also conducted site visits to each recommended segment. CWCB staff worked with the recommending entities to develop final recommendations for the flow rates of water necessary to preserve the natural environment to a reasonable degree.

Water Availability Studies
To determine the amount of water physically available for the recommended ISF appropriations, staff analyzed available streamflow gage records, available streamflow models, and/or utilized appropriate standard methods to develop a hydrograph of daily, mean daily, median daily and/or mean monthly flows for each stream flow recommendation. In addition, staff analyzed the water rights tabulation for each stream to identify any potential water availability problems. Based on these analyses, staff determined that water is available for appropriation on each stream segment listed in Table 1 to preserve the natural environment to a reasonable degree.

On some of these streams, CWCB staff suggested modifications to the R2Cross biological flow recommendation due to water availability limitations. For these streams, staff met with the recommending entities to review the water availability analyses and discuss whether the modified recommendation would preserve the natural environment to a reasonable degree. After reviewing staff's hydrology and the original R2Cross results, and evaluating flow needs of the natural environment, the recommending entities concluded that the proposed modified recommendations would preserve the natural environment to a reasonable degree on each stream segment.

Stakeholder Outreach
Staff provided public notice of the recommendations in both March and November of 2021 to the ISF subscription mailing list, posted public notices in local newspapers, gave presentations to County Commissioners, and contacted landowners adjacent to the proposed ISF reaches via phone or mail. In addition, staff contacted water commissioners, water right holders, and others when possible to further discuss the recommendations. Detailed information on stakeholder outreach is contained in the attached executive summary for each ISF recommendation.

Instream Flow Rule 5d.

Rule 5d. provides that the Board may declare its intent to appropriate ISF water rights after reviewing staff's recommendations for the proposed appropriations. Rule 5d. also sets forth actions that staff must take after the Board declares its intent that initiate the public notice and comment procedure for the ISF appropriations. Specifically:

5d. Board's Intent to Appropriate. Notice of the Board's potential action to declare its intent to appropriate shall be given in the January Board meeting agenda and the Board will take public comment regarding its intent to appropriate at the January meeting.

(1) After reviewing Staff's ISF recommendations for proposed ISF appropriations, the Board may declare its intent to appropriate specific ISF water rights. At that time, the Board shall direct the Staff to publicly notice the Board's declaration of its intent to appropriate.

(2) After the Board declares its intent to appropriate, notice shall be published in a mailing to the ISF Subscription Mailing Lists for the relevant water divisions and shall include:

(a) A description of the appropriation (e.g. stream reach, flow amounts, etc.);

(b) Availability (time and place) for review of Summary Reports and Investigations Files for each recommendation; and,

(c) Summary identification of any data, exhibits, testimony or other information in addition to the Summary Reports and Investigations Files supporting the appropriation.

(3) Published notice shall also contain the following information:

(a) The Board may change flow amounts of contested ISF appropriations based on information received during the public notice and comment period.

(b) Staff will maintain, pursuant to Rule 5e.(3), an ISF Subscription Mailing List for each water division composed of the names of all persons who have sent notice to the Board Office that they wish to be included on such list for a particular water division. Any person desiring to be on the ISF Subscription Mailing List(s) must send notice to the Board Office.

(c) Any meetings held between Staff and members of the public will be open to the public. Staff may provide Proper Notice prior to any such meetings and may provide notice to persons on the ISF Subscription Mailing List(s).

(d) Any Notice to Contest must be received at the Board office no later than March 31st, or the first business day thereafter. All Notices of Party status and Contested Hearing Participant status must be received at the Board office no later than April 30th, or the first business day thereafter.

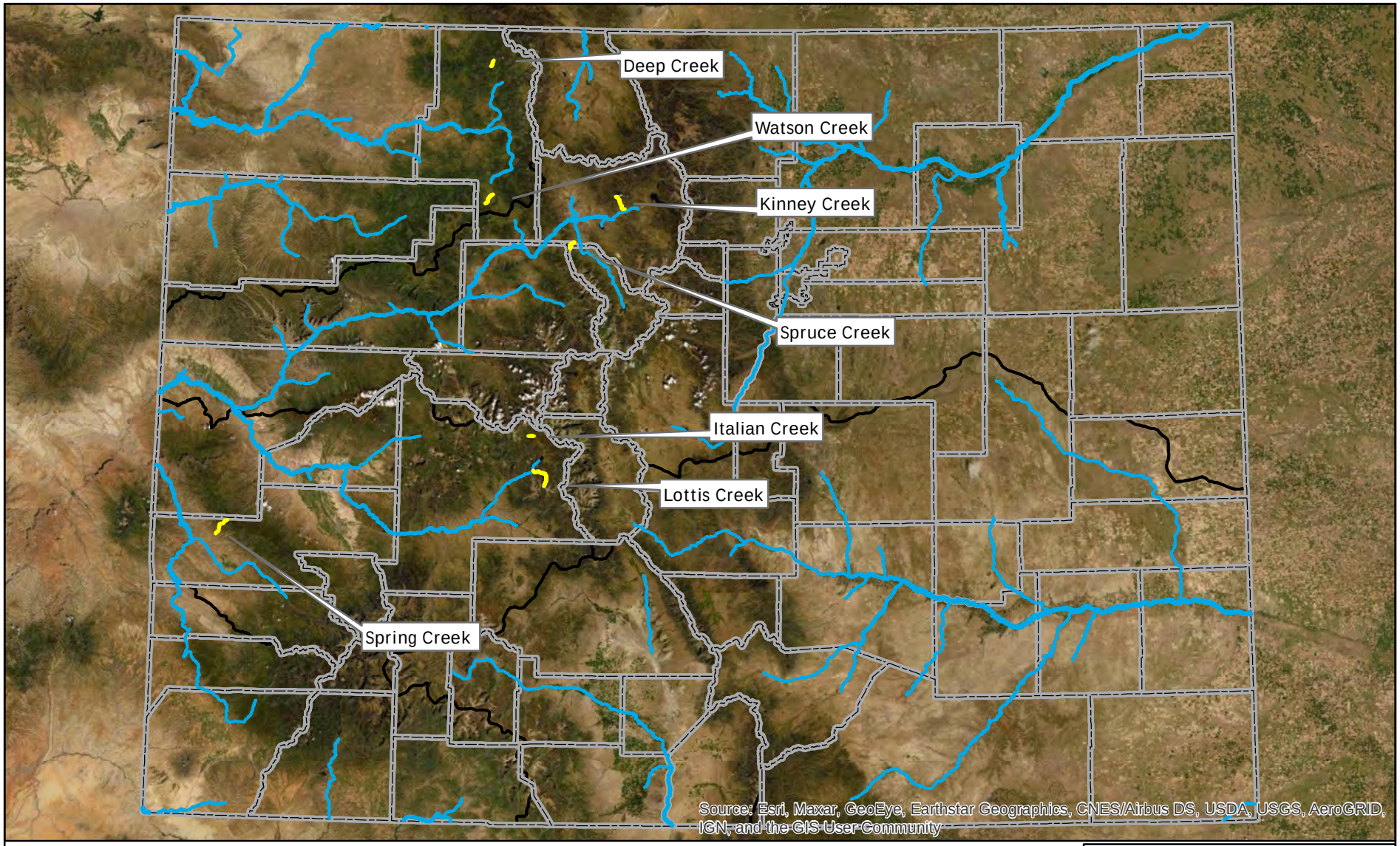
(e) Staff will announce its Final Staff ISF Recommendation concerning contested appropriations at the September Board meeting and will send notice of the Final Staff Recommendation to all persons on the Contested Hearing Mailing List.

(f) The Board may take final action on any uncontested ISF appropriations at the May Board meeting.

(4) After the Board declares its intent to appropriate, notice of the Board's action shall be mailed within five working days to the County Commissioners of the county(ies) in which the proposed reach is located.

(5) Final action by the Board on ISF appropriations will occur no earlier than the May Board Meeting.

Attachments: Overview Map
Grand County BOCC Letter of Support (Kinney Creek & Spruce Creek)
ISF Recommendation Executive Summaries



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Colorado Water Conservation Board
Department of Natural Resources

January 24, 2022
ISF Recommendations in Water Divisions 4,5, and 6

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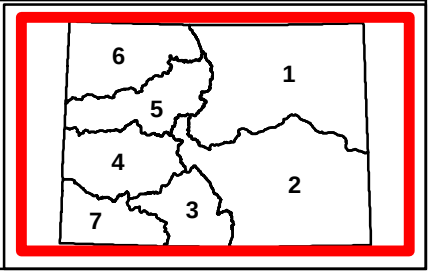

GRAND COUNTY BOARD OF COMMISSIONERS

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EDWARD MOYER
County Manager
CHRISTOPHER LEAHY
County Attorney

December 7, 2021

Rob Viehl
Colorado Water Conservation Board
Stream and Lake Protection Section
1313 Sherman Street, 7th Floor
Denver, CO 80203

Delivered via electronic mail

RE: Instream flow right designations in Grand County

Dear Mr. Viehl,

We are pleased to submit this letter in support of the Bureau of Land Management's proposed instream flow rights on Kinney Creek, Spruce Creek, and Rock Creek in Grand County. We strive to protect and promote valuable wildlife habitat, healthy riparian areas, and ecological values, and to balance these with other beneficial uses of water. The proposed instream flow designations will help further those efforts.

Kinney Creek and Spruce Creek support native Colorado Cutthroat trout and a robust riparian community. The proposed increases in instream flow rates on both streams will help us maintain the native fishery as well as important biodiversity. The new proposed instream flow rates on Rock Creek will ensure preservation of the natural environment and achieve a balance with other beneficial uses of water in the county.

Grand County appreciates the Colorado Water Conservation Board staff presenting information on the above proposed instream flow rights, explaining how the proposed flows are carefully selected to cover multiple seasons and to balance beneficial uses, and explaining what the instream flow program accomplishes. This outreach is important so that our community understands the basis for the proposed flows and how they protect our precious resources at the headwaters of the Colorado River.

Grand County fully supports the proposed instream flows rights and sincerely hopes they are approved. Thank you for your consideration of this important proposal.

Sincerely,

Merrit Linke
Commissioner Chair

Richard Cimino
Commissioner

Kristen Manguso
Commissioner

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January 2022 Instream Flow Recommendations

Water Division 4

1. Italian Creek *(Increase)* (Gunnison County)
    a. Executive Summary
    b. Appendices

2. Lottis Creek *(Increase)* (Gunnison County)
    a. Executive Summary
    b. Appendices

3. Spring Creek (Montrose County)
    a. Executive Summary
    b. Appendices

Water Division 5

4. Kinney Creek *(Increase)* (Grand County)
    a. Executive Summary
    b. Appendices

5. Spruce Creek *(Increase)* (Grand County)
    a. Executive Summary
    b. Appendices

Water Division 6

6. Deep Creek (Routt County)
    a. Executive Summary
    b. Appendices

6. Watson Creek (Routt County)
    a. Executive Summary
    b. Appendices

Italian Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 24-25, 2022

UPPER TERMINUS:	confluence South Italian Creek at: UTM North: 4312733.91 UTM East: 355602.65
LOWER TERMINUS:	confluence Taylor River at: UTM North: 4312702.92 UTM East: 358831.67
WATER DIVISION:	4
WATER DISTRICT:	59
COUNTY:	Gunnison
WATERSHED:	East-Taylor
CWCB ID:	22/4/A-003
RECOMMENDER:	High Country Conservation Advocates (HCCA)
LENGTH:	2.42 miles
EXISTING INSTREAM FLOW:	84CW355, 2.5 cfs (1/1 – 12/31)
FLOW RECOMMENDATION:	0.7 cfs (04/01 - 10/31) - increase

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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

HCCA recommended that the CWCB appropriate an increase to the existing ISF water right on a reach of Italian Creek. Italian Creek is located within Gunnison County approximately eight miles north from Taylor Park Reservoir (See Vicinity Map). Italian Creek originates on the north side of Italian Mountain and flows east until it reaches the confluence with the Taylor River. The existing ISF water right on Italian Creek was appropriated in 1984 for 2.5 cfs.

The proposed reach extends from the confluence with South Italian Creek downstream to the confluence with the Taylor River for a total of 2.42 miles. Ninety-nine percent of the land on the proposed reach is public land managed by the United States Forest Service (USFS) and 1% is privately owned (See Land Ownership Map). HCCA is interested in protecting this stream because it has a self-sustaining population of Colorado River Cutthroat Trout, a species of greatest conservation need and special concern. HCCA's mission is to protect the health and natural beauty of the land, rivers, and willife in and around Gunnison County.

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 Italian Creek was sent to the mailing list in March and November of 2021. Staff sent notice letters to identified landowners adjacent to Italian Creek based on information available in the county assessors website. A public notice about this recommendation was also published in the Crested Butte News on October 28, 2021.

Staff presented information about the ISF program and this recommendation to the Gunnison County Board of County Commissioners on October 25, 2021. In addition, staff spoke with Bob Hurford, Division 4 Engineer, on November 3, 2021 regarding water availability on Italian 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.

Italian Creek is a cold-water, high-gradient stream with a slope that decreases near the confluence with the Taylor River. The channel is composed of mostly cobble-sized substrate with some boulders and ample woody debris.

The stream flows from alpine headwaters through robust riparian environments composed primarily of willow communities. There are both active and abandoned beaver ponds on and off-channel, including a complex forming a large wetland area near the confluence with the Taylor River.

Colorado Parks and Wildlife (CPW) identified four trout species, including a species of greatest conservation need and special concern. These populations are believed to be self-sustaining because Italian Creek is not stocked. HCCA staff observed several small trout and macroinvertebrates while completing R2Cross assessments in 2020.

Table 1. List of species identified in Italian Creek.

Species Name	Scientific Name	Protection Status
Colorado River Cutthroat Trout	*Oncorhynchus clarkii pleuriticus*	State - Species of Greatest Conservation Need State - Species of Special Concern
Brook Trout	*Salvelinus fontinalis*	None
Brown Trout	*Salmo trutta*	None
Rainbow Trout	*Oncorhynchus mykiss*	None
macroinvertebrates	various	None
beaver	*Castor canadensis*	None
willow	*Salix spp.*	None

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

HCCA 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). HCCA 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 HCCA (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 3.18 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 2. Summary of R2Cross transect measurements and results for Italian Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/25/2020, 1	15.00	5.53	2.21 - 13.83	N/A	2.58
07/06/2020, 2	17.10	6.38	2.55 - 15.95	N/A	3.77
09/25/2020, 3	18.40	2.45	0.98 - 6.13	N/A	Out of range
			Mean		3.18

ISF Recommendation

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

An increase of 0.7 cfs is recommended from April 1 through October 31 to bring the total ISF protection to 3.2 cfs. This increase is warranted because R2Cross modeling shows that the existing 2.5 cfs ISF water right does not fully protect habitat in the variety of riffle habitats on Italian Creek. Depending on the geomorphology of individual riffles, the existing ISF flow rate of 2.5 cfs does not fully meet the average velocity criteria.

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 Italian Creek is 16.80 square miles, with an average elevation of 11,108 feet and average annual precipitation of 28.40 inches (See the Hydrologic Features Map). There are no active surface water diversions in the proposed reach. There is one pipeline near the headwaters of Italian Creek. Due to the lack of surface water diversions, hydrology in the basin represents natural flow conditions.

Data Analysis

There are no current or historic streamflow gages on Italian Creek and no nearby representative gages were identified. StreamStats provides the best available estimate of streamflow on Italian Creek. CWCB staff visited Italian Creek but was unable to measure the flow due to inclement weather.

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 Italian 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.

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

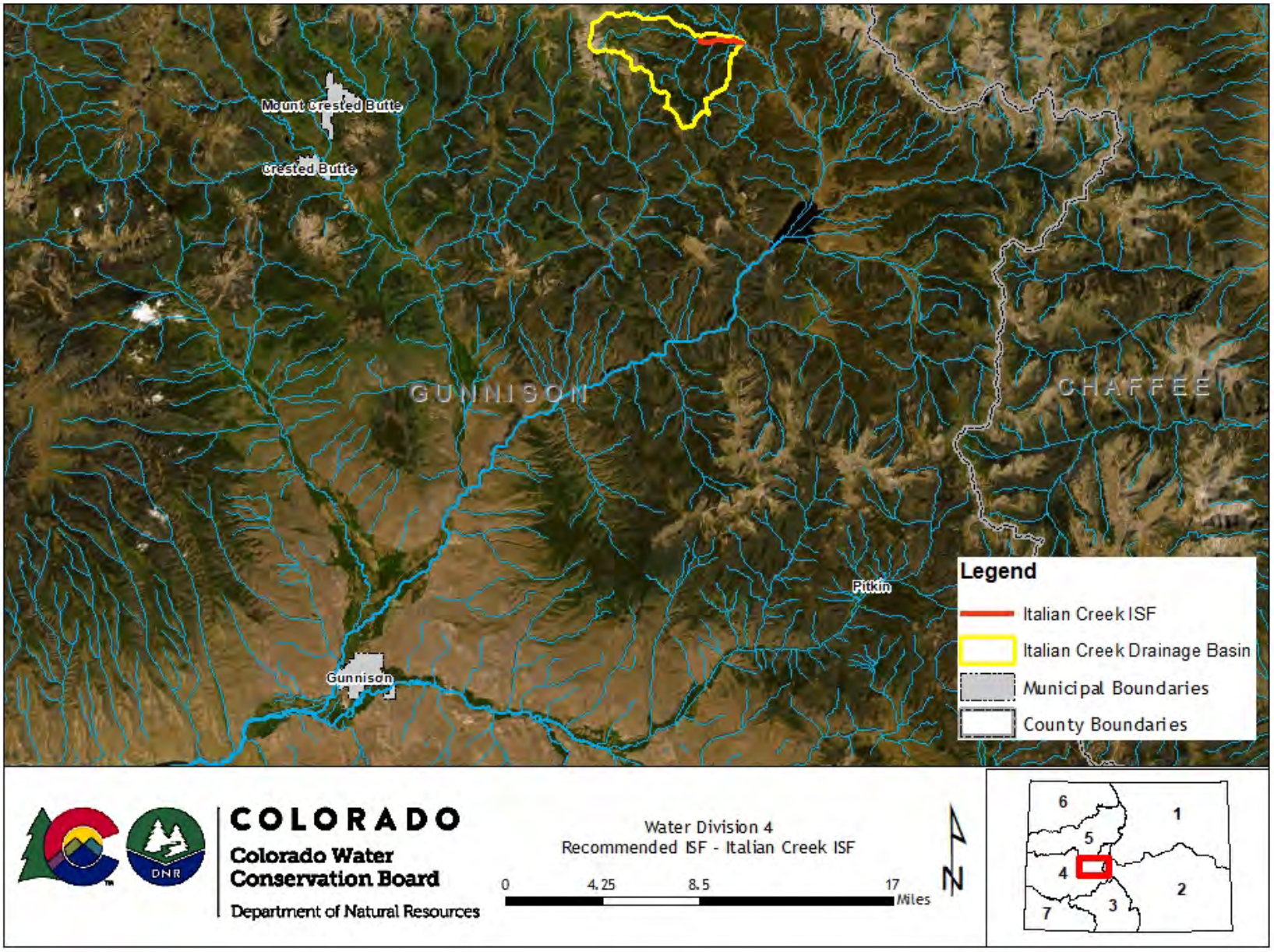
Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

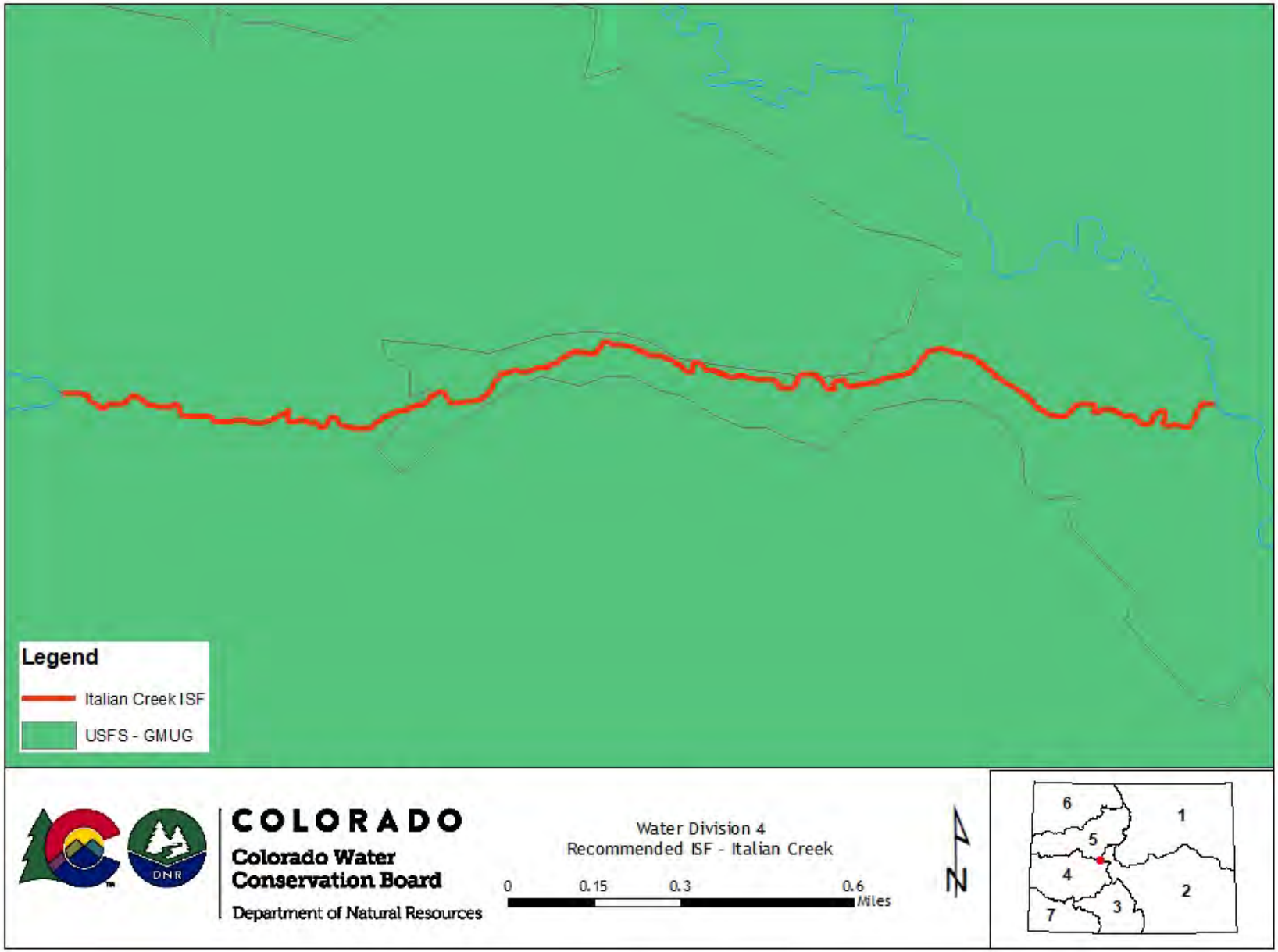
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

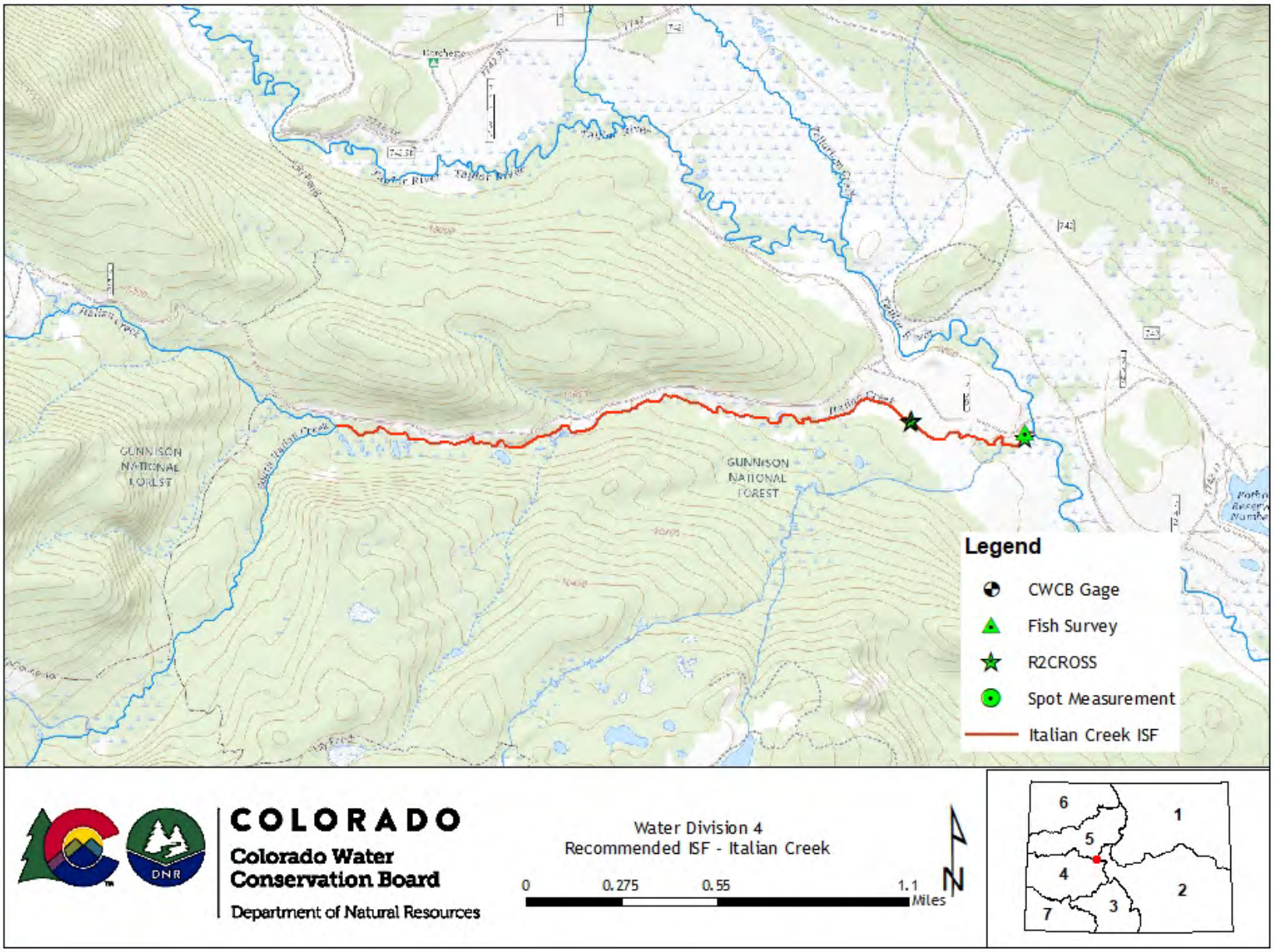
VICINITY MAP



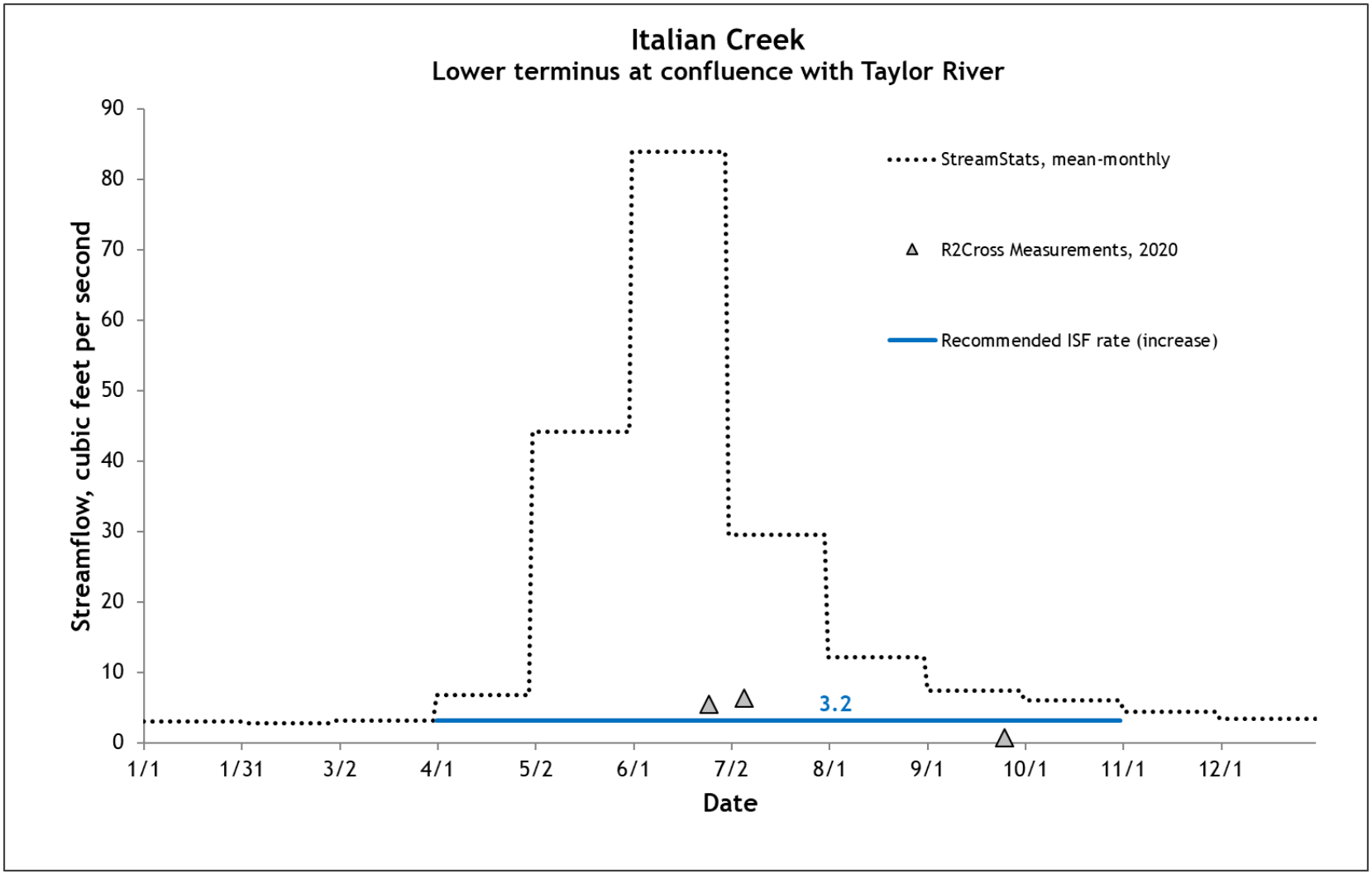
LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH



Lottis Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 24-25, 2022

UPPER TERMINUS:	headwaters in the vicinity of: UTM North: 4284763.01 UTM East: 364436.07
LOWER TERMINUS:	confluence with the Taylor River at: UTM North: 4293390.18 UTM East: 358183.27
WATER DIVISION:	4
WATER DISTRICT:	59
COUNTY:	Gunnison
WATERSHED:	East-Taylor
CWCB ID:	22/4/A-002
RECOMMENDER:	High Country Conservation Advocates (HCCA)
LENGTH:	10.33 miles
EXISTING INSTREAM FLOW:	83CW227, 5 cfs (1/1 – 12/31)
FLOW RECOMMENDATION:	2.1 cfs (04/01 - 10/31) - increase

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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

HCCA recommended that the CWCB appropriate an increase to the existing ISF water right on a reach of Lottis Creek. Lottis Creek is located within Gunnison County and is approximately 3.2 miles southwest of Taylor Park Reservoir (See Vicinity Map). The stream originates in the Fossil Ridge Wilderness and flows north-northwest until it reaches the confluence with the Taylor River, downstream of Taylor Park Reservoir. The existing ISF water right on Lottis Creek was appropriated in 1983 for 5 cfs year round.

The proposed reach extends from the headwaters downstream to the confluence with the Taylor River for a total of 10.33 miles. Eighty-four percent of the land on the proposed reach is managed by the United States Forest Service (USFS) and 16% is privately owned (See Land Ownership Map). HCCA is interested in protecting this stream to continue their mission to protect the health and natural beauty of the land, rivers, and wildlife in and around Gunnison County.

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 Lottis Creek was sent to the mailing list in March and November of 2021. Staff sent notice letters to identified landowners adjacent to Lottis Creek based on information available in the county assessors website. A public notice was also published in the Crested Butte News on October 28, 2021.

Staff presented information about the ISF program and this recommendation to the Gunnison County Board of County Commissioners on October 26, 2021. In addition, staff spoke with Bob Hurford, Division 4 Engineer, on November 3, 2021 regarding water availability on Lottis 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.

Lottis Creek is a high elevation stream that runs through riparian habitat with mixed pine and spruce forest, described by HCCA as diverse and high quality. The headwaters are located in the Fossil Ridge Wilderness, and the creek winds through a wide range of aquatic habitats including beaver pond complexes. Colorado Parks and Wildlife identified a robust recreational fishery including Colorado River Cutthroat Trout, Brook Trout, Brown Trout, and Rainbow Trout. In 2020, HCCA also observed a large variety of macroinvertebrates including caddisfly.

Table 1. List of species identified in Lottis Creek.

Species Name	Scientific Name	Protection Status
Colorado River Cutthroat Trout*	*Oncorhynchus clarkii pleuriticus*	State - Species of Greatest Conservation Need State - Species of Special Concern
Brook Trout	*Salvelinus fontinalis*	None
Brown Trout	*Salmo trutta*	None
Rainbow Trout	*Oncorhynchus mykiss*	None
caddisfly	*Tricoptera*	None
macroinvertebrates	various	None
beaver	*Castor canadensis*	None
willow	*Salix spp.*	None

*indicates fish species native to Colorado

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

HCCA 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). HCCA 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 two transects for this proposed ISF reach by HCCA (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 7.10 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 2. Summary of R2Cross transect measurements and results for Lottis Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
07/21/2020, 1	22.34	13.85	5.54 - 34.63	N/A	5.69
09/13/2020, 1	22.10	9.66	3.86 - 24.15	N/A	8.50
			Mean		7.10

ISF Recommendation

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

An increase of 2.1 cfs is recommended from April 1 to October 31 to bring the total instream flow protection to 7.1 cfs. An increase is warranted because R2Cross modeling shows that the existing 5 cfs ISF water right does not fully protect habitat in the variety of riffle habitats on Lottis Creek. Depending on the geomorphology of individual riffles, 5.0 cfs does not fully meet average velocity criteria.

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 Lottis Creek is 42.10 square miles, with an average elevation of 10,791 feet and average annual precipitation of 23.11 inches (See the Hydrologic Features Map). Hydrology of Lottis Creek is primarily driven by snowmelt runoff. There are no surface water diversions on the proposed reach, so hydrologic conditions are natural. There are several privately held instream flows on Lottis Creek and tributaries (court case W-1991 decreed in 1973).

Data Analysis

Representative Gage Analysis

There is no current or historic streamflow gage on Lottis Creek. The closest identified gage is the Texas Creek at Taylor Park gage (USGS 09107500). The gage is located approximately 6.4 miles northeast from the proposed lower terminus. The gage has a record from 1929 – 1934, 1987 – 1992, and recently begun recording again in 2021. The drainage basin of the Texas Creek gage is 40.5 square miles, with an average elevation of 11,210 feet and average annual precipitation of 23.92 inches. Average precipitation and drainage area of the Texas Creek gage are so similar to the proposed instream flow reach on Lottis Creek that the gage was not scaled. There are no known diversions within the Texas Creek gage drainage basin.

Staff evaluated the NOAA Climate station, USC00051959 Crested Butte, period of record 1909 – present, to assess how 1929 - 1934 and 1987 – 1992 compared hydrologically to the most recent 30 years. At the time of this analysis, the 2021 precipitation data was not available. The climate station is located 19.8 miles northwest from the proposed lower terminus on Lottis Creek. Average precipitation in the last 30 years at the climate station was 23.69 inches. Based on this analysis, 9 of the 10 years were below average precipitation years, and 5 of those years were among the 10% driest years on record. Overall the record from the Texas Creek gage likely represents dry conditions.

Water Rights Analysis

The private instream flow rights on Lottis Creek are for 10 cfs above the confluence with Cameron Creek, 22.5 cfs between Cameron Creek and Cross Creek, 27.5 cfs between Cross Creek and Union Creek, 40 cfs between Union Creek and South Lottis Creek, and 60 cfs between South Lottis Creek and the Taylor River. The priority date for these flows is 1910 and the beneficial use is for stock water, recreation, fish culture, wildlife procreation, and heritage preservation. Although these private instream flow rights are extensive, they are not monitored, enforced, or legally protected by the CWCB.

CWCB staff made one streamflow measurement on the proposed reach of Lottis Creek as summarized in Table 3.

Table 3. Summary of streamflow measurement for Lottis Creek.

Visit Date	Flow (cfs)	Collector
10/26/2021	10.50	CWCB

Water Availability Summary

The hydrograph (See Complete Hydrograph) shows the median streamflow data at the representative gage on Texas Creek and the proposed ISF. Even though the flow data at the representative gage likely represents dry conditions, the median flow is well above the proposed increased amount. Staff has determined that water is available for an increase from April 1 to October 31.

MATERIAL INJURY

Because the proposed ISF on Lottis 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.

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

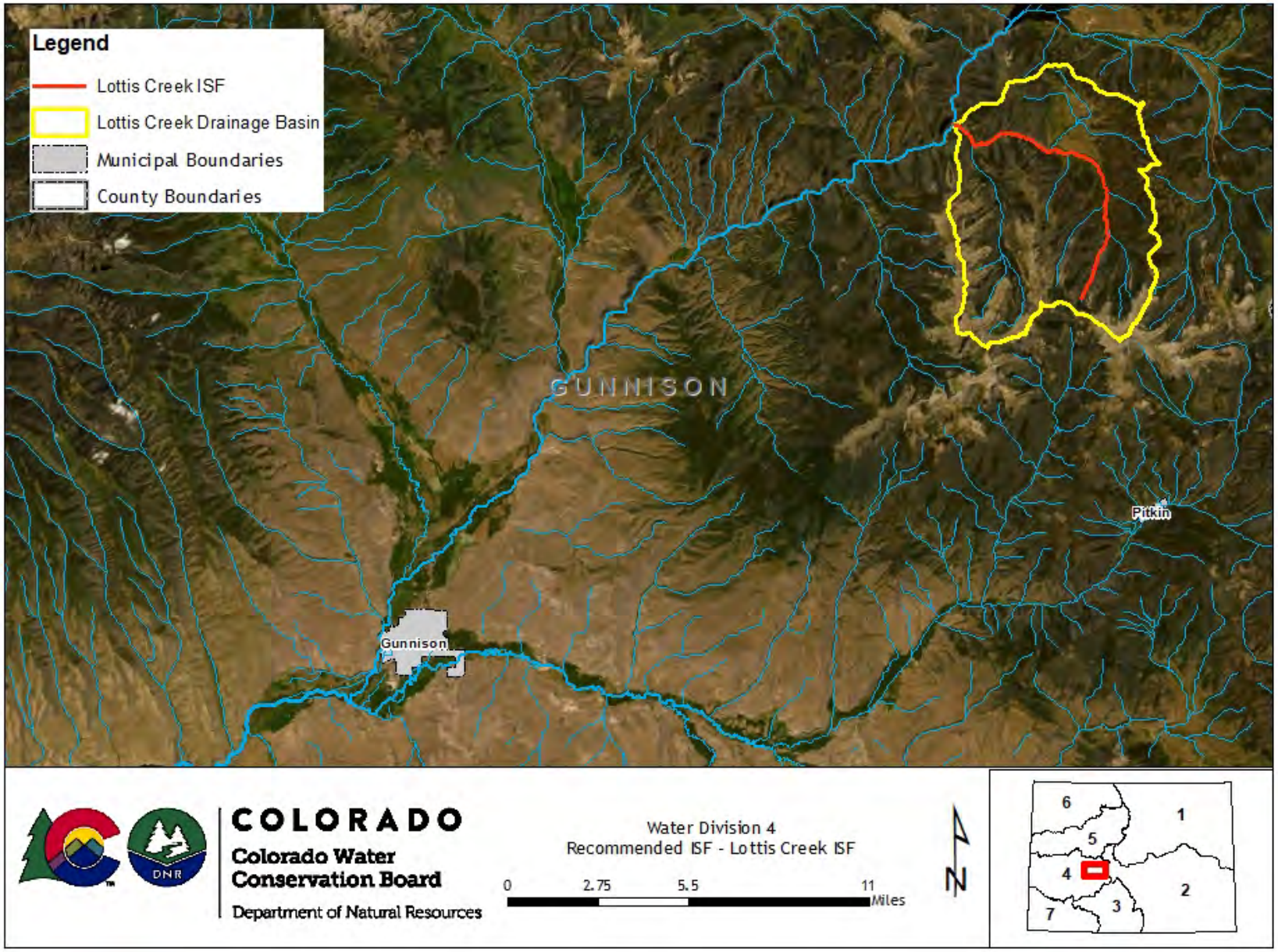
Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

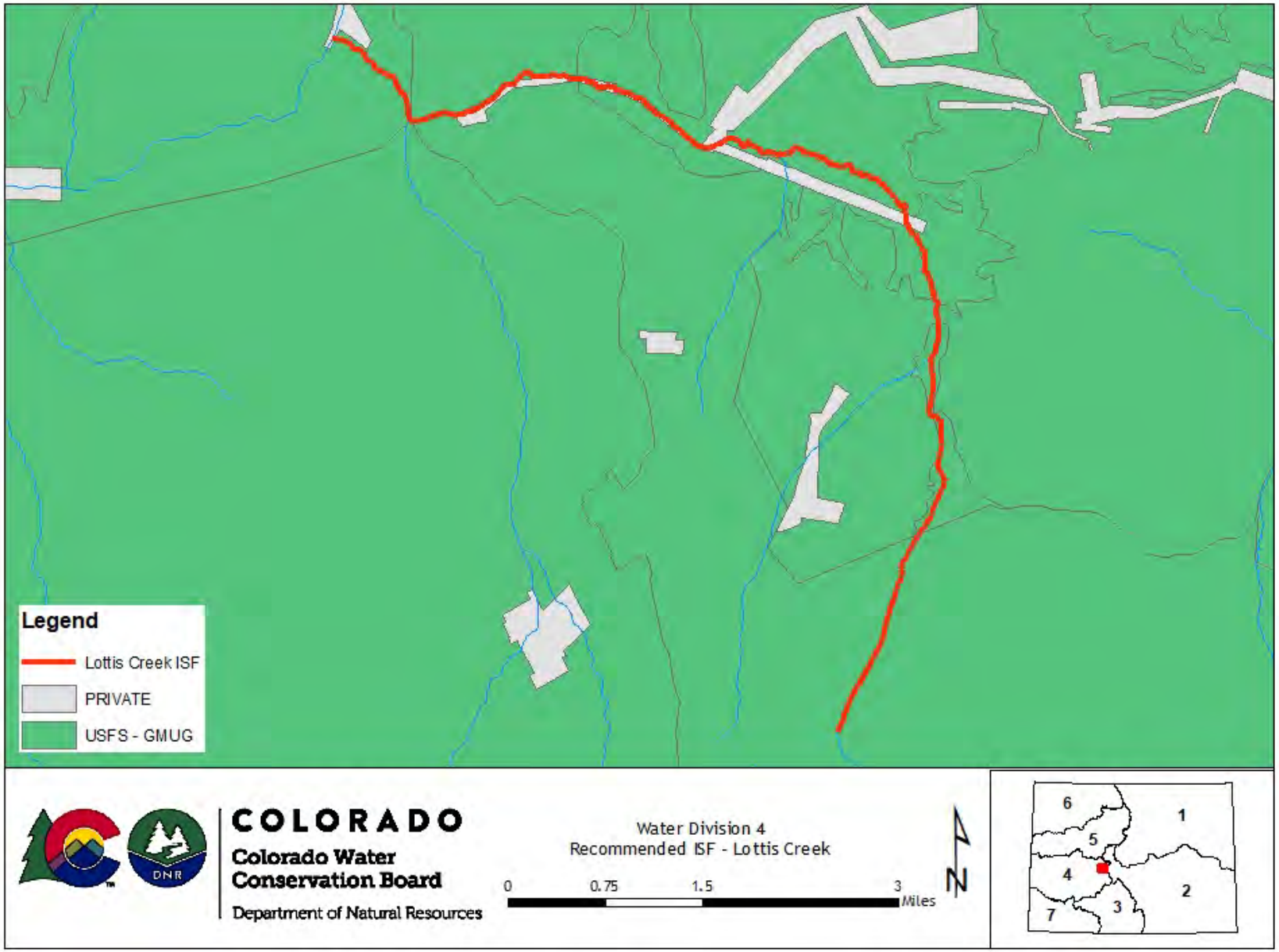
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

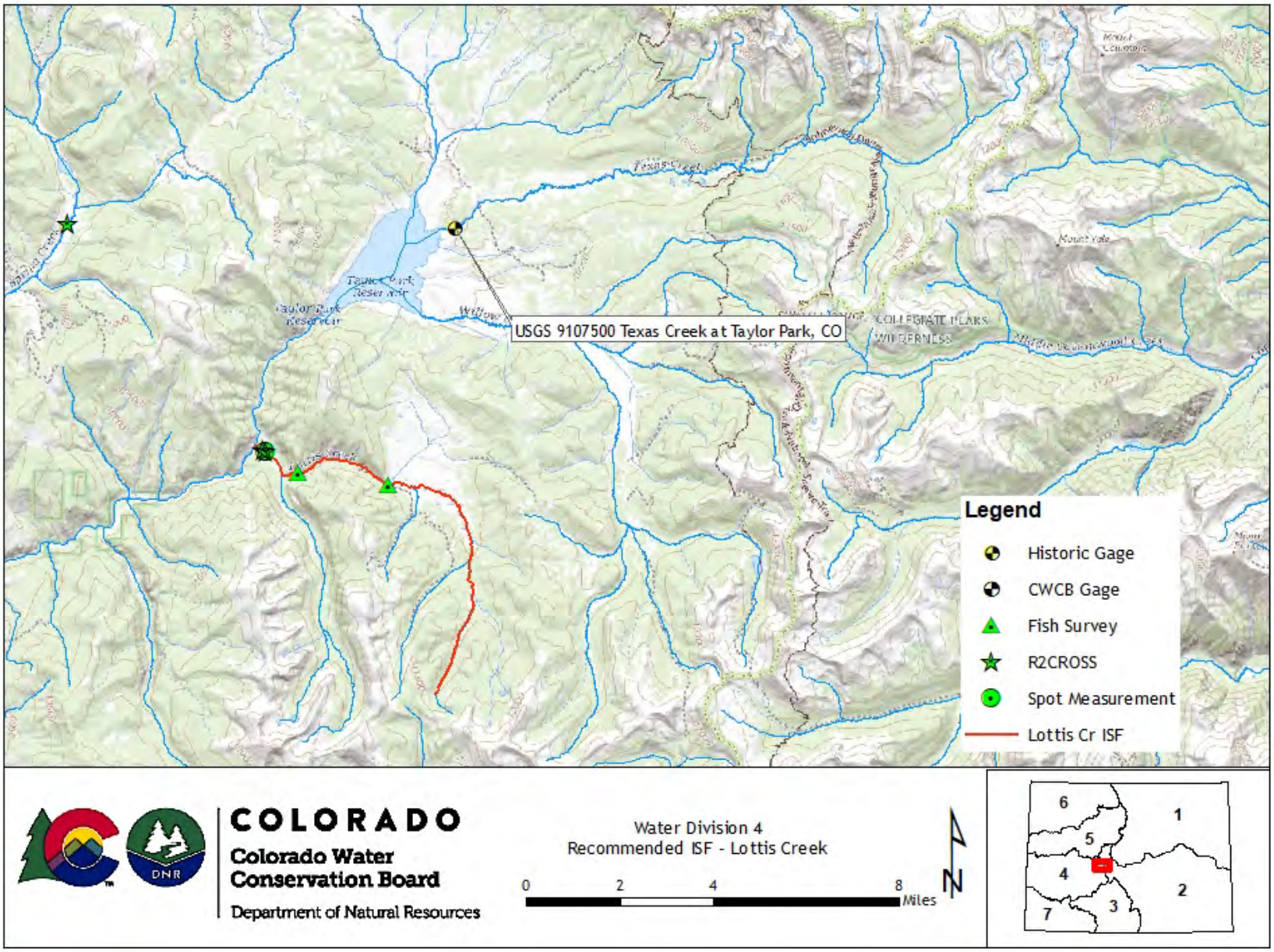
VICINITY MAP



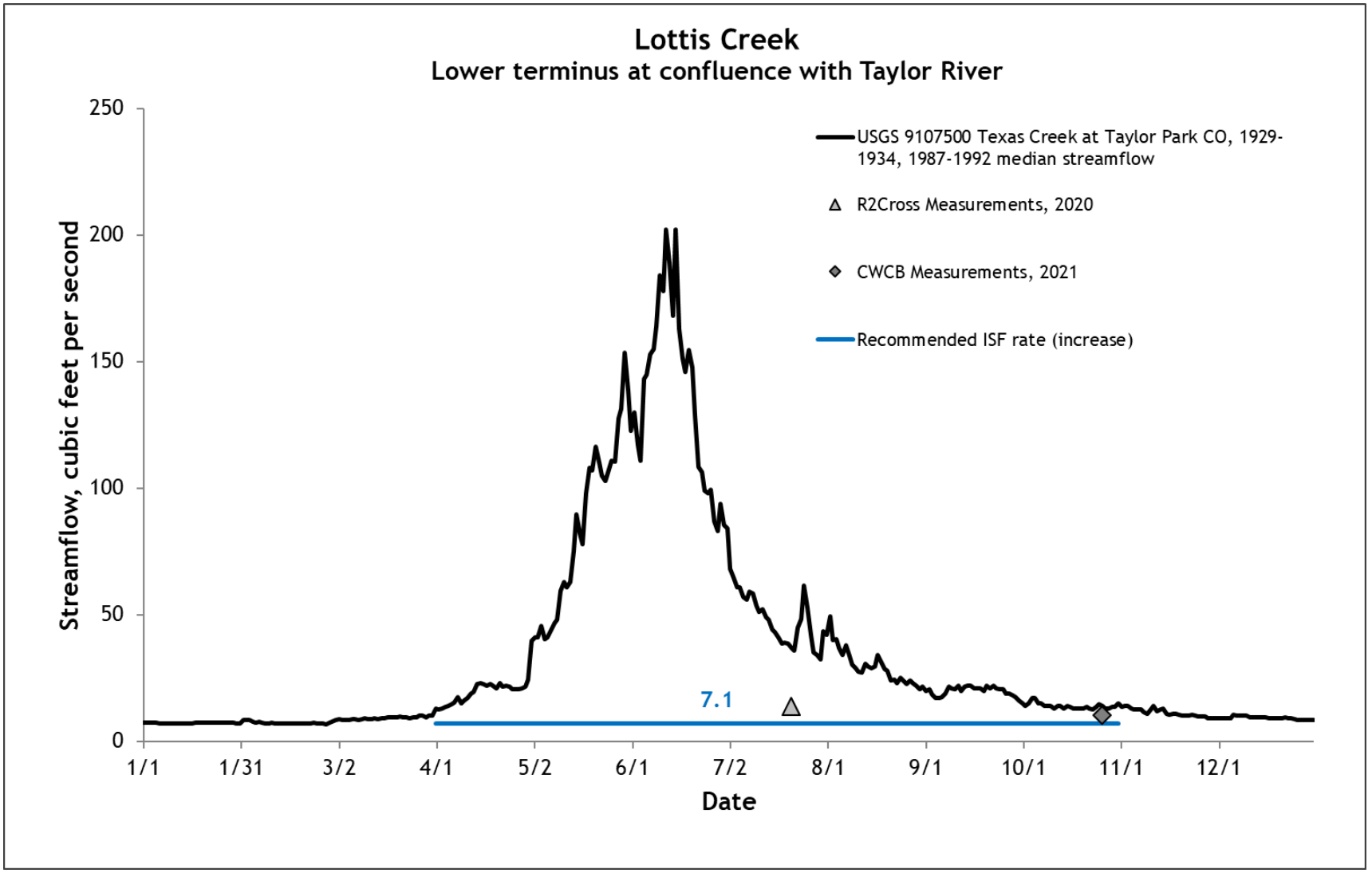
LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH



Spring Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 24-25, 2022

UPPER TERMINUS:	headwaters in the vicinity of: UTM North: 4266062.60 UTM East: 187539.34
LOWER TERMINUS:	Crabtree Ditch headgate at: UTM North: 4258155.00 UTM East: 180820.03
WATER DIVISION:	4
WATER DISTRICT:	60
COUNTY:	Montrose
WATERSHED:	San Miguel
CWCB ID:	18/4/A-002
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	7.47 miles
FLOW RECOMMENDATION:	1.1 cfs (03/15 - 05/31)

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/2022-isf-recommendations.

RECOMMENDED ISF REACH

The BLM recommended that the CWCB appropriate an ISF water right on a reach of Spring Creek. Spring Creek is located within Montrose County and is approximately 14 miles northwest from the town of Nucla (See Vicinity Map). The stream originates on the west slope of the Uncompahgre Plateau and flows southwest for 12 miles until it reaches the confluence with Tabeguache Creek.

The proposed reach extends from the headwaters downstream to the Crabtree Ditch headgate for a total of 7.47 miles. Eighty-five percent of the land on the proposed reach is managed by the United States Forest Service (USFS) and BLM, and 15% is privately owned (See Land Ownership Map). BLM is interested in protecting the riparian community and aquatic habit for macroinvertebrates on Spring Creek.

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 Spring Creek was sent to the mailing list in November 2021, March 2021, November 2020, March 2020, November 2019, March 2019, March 2018, November 2017, and March 2017. Staff sent notice letters to identified landowners adjacent to Spring Creek based on information in the county assessors website. A public notice regarding this recommendation was also published in the Montrose Daily Press on January 5, 2022.

Staff presented information about the ISF program and this recommendation to the Montrose County Board of County Commissioners on December 9, 2019 and October 3, 2017. Staff presented information at a meeting of the San Miguel Watershed Forum on October 21, 2019. Staff spoke with Water Commissioner Mark Ragsdale on June 5, 2017 regarding water availability on Spring Creek. Staff spoke with Kevin Thompson, an Aquatic Research Scientist for Colorado Parks and Wildlife on June 19, 2018 about his knowledge of Spring Creek. In

addition, CWCB and BLM staff met with landowners, and the Water Comissioner to discuss the proposed reach on May 12, 2021.

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.

Spring Creek is a cool-water stream with a high gradient that runs through a canyon along the southern side of the Uncompaghre Plateau. The stream valley is generally less than a quarter mile wide and contains a well-developed floodplain. Abundant wood within the channel forms frequent large pools separated by riffles and runs. Substrate in this reach is a mix of sand and cobble with the occasional outcropping of bedrock forming pools. Bank stability is excellent and is supported by numerous bedrock controls, a vigorous riparian community, and abundant woody debris.

The Colorado Natural Heritage Program (CNHP) conducted an assessment of this area in 1997 and identified Spring Creek as a potential conservation area based on the good condition of the riparian zone and upland communities (Lyon and Sovell, 2000). The riparian community is diverse and includes narrow-leaf cottonwood, three-leafed sumac, red-osier dogwood, and thin-leaf alder. CNHP noted that the vegetation was in excellent condition and unusually lush for the area. They also reported only traces on non-native species such as New Mexico privet and tamarisk. The forest on the canyon rim surrounding the stream is characterized as pinyon-juniper forest type, while the uplands lining the canyon walls are primarily oak woodland.

Spring Creek does not support a fish population, but a community of macroinvertebrates has been documented including stoneflies, mayflies, and caddisflies. Elk, black bear, mule deer, grouse and wild turkey were also observed in camera footage at the CWCB temporary gage.

The Spring Creek watershed was impacted by the Bull Draw Fire in 2018. CWCB staff observed turbid water and debris from the fire, including charred wood deposited several feet up on the banks near the temporary gage.

Table 1. List of species identified in Spring Creek.

Species Name	Scientific Name	Protection Status
mayfly	*Ephemeroptera*	None
stonefly	*Plecoptera*	None
caddisfly	*Trichoptera*	None
water strider	*Gerridae*	None
red-osier dogwood	*Cornus sericea*	None
thin-leaf alder	*Alnus incana*	None
narrow-leaf cottonwood	*Populus angustifolia*	None
three-leafed sumac	*Rhus trilobata*	None

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 two transects for this proposed ISF reach by BLM (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 0.88 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 1.13 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 2. Summary of R2Cross transect measurements and results for Spring Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/16/2016, 3	8.50	1.79	0.72 - 4.48	0.96	1.34
06/16/2016, 4	7.80	1.98	0.79 - 4.95	0.82	0.87
			Mean	0.89	1.10

ISF Recommendation

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

1.1 cfs is recommended from March 15 to May 31. The BLM concludes that meeting all three criteria will maintain a wetted root zone in the alluvial aquifer during the key part of the growing season for the riparian community. Meeting all three instream flow criteria will also provide suitable conditions in the stream substrate for the aquatic macroinvertebrate community.

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 Spring Creek is 10.7 square miles, with an average elevation of 7,779 feet and average annual precipitation of 21.45 inches (See the Hydrologic Features Map). There are a number of known surface water diversions in the drainage basin tributary to the proposed ISF on Spring Creek (Table 3). These surface water diversions divert approximately 4.7 cfs, and there is approximately 9.6 AF in storage in the basin. Hydrology on Spring Creek is driven largely by snowfall on the west side of the Uncompahgre Plateau as well as rain events, particularly during monsoon season. Because of the relatively low elevation and the southwest aspect of the basin, runoff can start relatively early. This basin also experienced the Bull Draw Fire in 2018 which burned approximately 67% of the basin tributary to the proposed ISF.

Table 3. Primary surface water diversions in the vicinity of the proposed Spring Creek ISF. Diversions are listed roughly in order from upstream to downstream and the location relative to the CWCB gage is noted.

Structure Name	WDID	Decreed rate, cfs	Appropriation Date	Relative Location
Spring Creek Ditch No 3	6001693	1	1905	Above gage
Spring Creek Ditch No 2	6001692	1.74	1916	Above gage
Burrow Creek Ditch	6000541	0.87	1916	Above gage
Tilton Ditch	6000779	1	1915	Below gage
Thormalean Spring	6005058	0.0569	1919 & 1915	Below gage
Crabtree Ditch	600568	6	1932 & 1993	Below gage *

**The Crabtree Ditch is the proposed lower terminus.*

Data Analysis

Gage Analysis

There are no current or historic daily streamflow gages on Spring Creek. The nearest gage is the historic Tabeguache Creek near Nucla, CO gage (USGS 09176500), which operated from 1946 to 1953. This gage data was not used to assess water availability on Spring Creek because prorating the Tabeguache gage would not adequately reflect water use practices on Spring Creek.

Due to the lack of streamflow information, CWCB staff installed a temporary gage on Spring Creek 1.4 miles upstream from the proposed lower terminus. The drainage basin of this gage is 9.96 square miles, with an average elevation of 7,877 feet and average annual precipitation of 21.91 inches. This gage was installed on October 24, 2016 and maintained by CWCB staff with assistance from the BLM field office through fall of 2020. A number of data gaps exist due to various equipment issues. CWCB and BLM staff made 12 streamflow measurements on the proposed reach of Spring Creek as summarized in Table 4.

Table 4. Summary of streamflow measurement for Spring Creek.

Visit Date	Flow (cfs)	Collector
10/24/2016	0.22	CWCB
04/28/2017	3.33	BLM
05/29/2017	2.10	CWCB
05/29/2017	1.82	CWCB*
07/26/2017	0.47	BLM
04/09/2019	4.46	CWCB*
04/09/2019	5.64	CWCB
04/26/2019	7.40	BLM
05/08/2019	10.58	CWCB
08/01/2019	0.64	CWCB
10/22/2019	0.04	CWCB
03/05/2020	0.44	CWCB

*measurement located near the confluence with Tabeguache Creek and not included on the hydrographs.
The streamflow was very low and not measureable on 11/17/2017, 12/18/2017, and 4/3/2018.
The stream was observed to be dry on 8/23/2017, 7/3/2018, and 9/2/2020.

Staff used a longer term climate station record to evaluate the hydrologic conditions during the five years the CWCB gage operated. The Columbine Pass climate station was the closest climate station identified with a relatively long period of record (USS0008L02S). This station is located roughly 13 miles east from the proposed lower terminus on Spring Creek. The Columbine climate station recorded precipitation data from 1987 – 2020. The average annual precipitation during this time frame was 32.5 inches. The average annual precipitation in 2016 was 24.5 inches, in 2017 was 24.6 inches, in 2018 was 19.9 inches, in 2019 was 40.2 inches, and in 2020 was 16.2 inches. In four of the five years in which the gage collected data, the precipitation at the climate station was less than the 25th percentile. Therefore in most years the streamflow at the gage is likely to represent well below average conditions with the exception of 2019.

The CWCB streamgage was installed in the fall of 2016 and measured moderate base flows until spring runoff in 2017. Runoff in 2017 started in late February or early March and peaked in mid-May, receding to near zero flow by September. 2018 was particularly dry across the State and in the southwest. 2019 had relatively high snowpack and runoff started in March and showed significantly higher streamflow than in previous years. It should be noted that the data from 2019 was impacted both by high precipitation and the wildfire upstream from the gage. These factors result in flashier high flow events as well sudden drops in streamflow that may be caused by ash and other debris temporarily blocking the channel. The BLM estimates that it will take three to five years for the vegetation in the basin to recover (Jedd Sondergard, BLM personal communication). Issues with the gage resulted in missing data in early winter of 2018, July of 2019, and much of the 2019/2020 winter.

The CWCB streamgage data was adjusted by subtracting the diversion record for the Tilton Ditch. The Tilton Ditch is the only intervening surface diversion between the CWCB gage and the lower terminus. This structure is decreed for 1 cfs and typically diverts water from mid-April to late July or August. In some cases, the reported diversion rates were considerably above the gaged streamflow, in those instances the gage values were set to zero. This results in some sudden changes to zero flow, particularly in mid-May of 2017, which may not be accurate.

The CWCB streamgage data was not adjusted to account for the small (approximately 5%) difference in additional contributing drainage basin below the gage. No other adjustments were made to the CWCB streamgage data. Due to the short period of record, median streamflow and 95% confidence intervals for median streamflow were not calculated. Assessing water availability based on this gage data is challenging because most years of data represent below average precipitation and fire impacts resulted in unusual runoff patterns in 2019. Nevertheless, 2017 and 2020 (below average years) and 2019 (an above average year) show that runoff started in early March and flows were elevated at the gage until at least mid-May. Both of those years show significant periods during the proposed ISF when streamflow is above 1.1 cfs.

Diversion Record Analysis

In some cases, diversion records can be used to provide an indication of water availability in a stream reach. The Crabtree Ditch is the proposed lower terminus and has diversion records from 1974 to 2020 that show use in most years. The decreed flow rate for this structure is 6.0 cfs; however, the Crabtree water right is the most junior water right in the basin and typically diverts less due to water limitations. This diversion is usually used from mid-April to late July or August. It is not typically used during the early period of runoff. Based on the available Crabtree Ditch records, median diversions and 95% confidence intervals for median diversions were calculated and are displayed on the hydrograph. The upper confidence interval for median diversions indicates that 1.1 cfs is available from May 20 to June 13.

Water Commissioner

Staff contacted the Water Commissioner Mark Ragsdale (various personal communications) and Division Engineer Bob Hurford (November 5, 2019) to discuss hydrology on Spring Creek. According to Mr. Ragsdale, who has been the Water Commissioner for the last 15 years, spring runoff starts around mid-March and tapers off to near zero or zero flow during mid to late summer. Mr. Ragsdale confirmed that the recommended ISF flow rates were realistic although not available in all years such as 2018. He also stated that the Bull Draw Fire altered hydrology in 2019 and impacted water users' ability to divert.

Water Availability Summary

The hydrographs (See Complete and Detailed Hydrographs) show the available data from the adjusted CWCB temporary gage as well as the median and upper confidence intervals for the Crabtree Ditch diversion records. With the exception of 2018, the temporary gage data demonstrates that runoff typically starts in late February to early March, and that flows can be in excess of 1.1 cfs through May and typically peak between March and May. The upper 95% confidence interval for median Crabtree diversion records indicate that flows of 1.1 cfs are available in late May until early June. Based on the combination of the CWCB gage data, the Crabtree diversion records, and discussions with the Water Commissioner, staff concludes that water is available for the seasonal ISF flow rates recommended for Spring Creek.

MATERIAL INJURY

Because the proposed ISF on Spring 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.

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

Lyon, P. and J. Sovell, 2000, A Natural Heritage Assessment; Sand Miguel and Western Montrose Counties, Colorado, prepared for San Miguel County through the Colorado Natural Heritage Program.

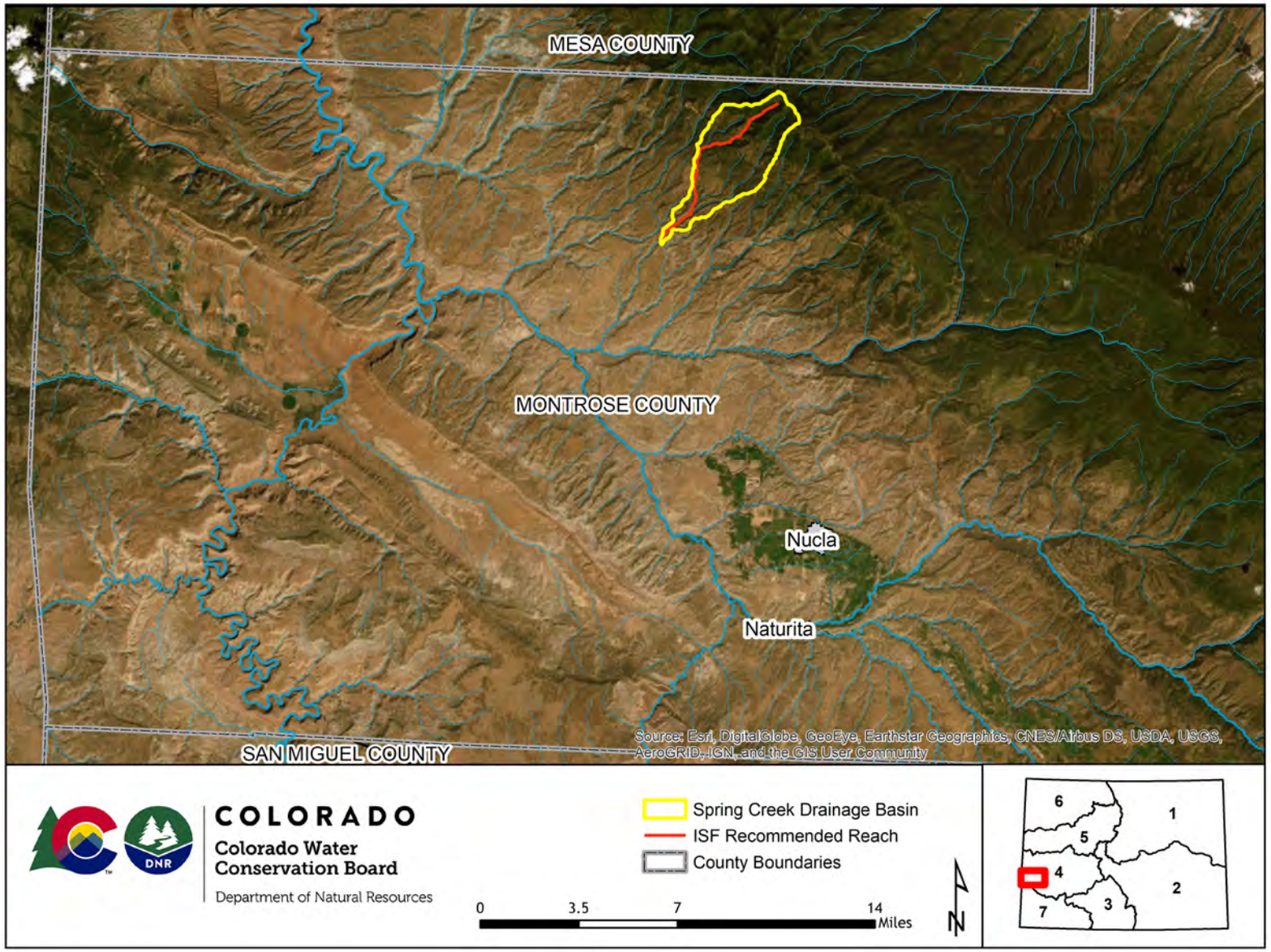
Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

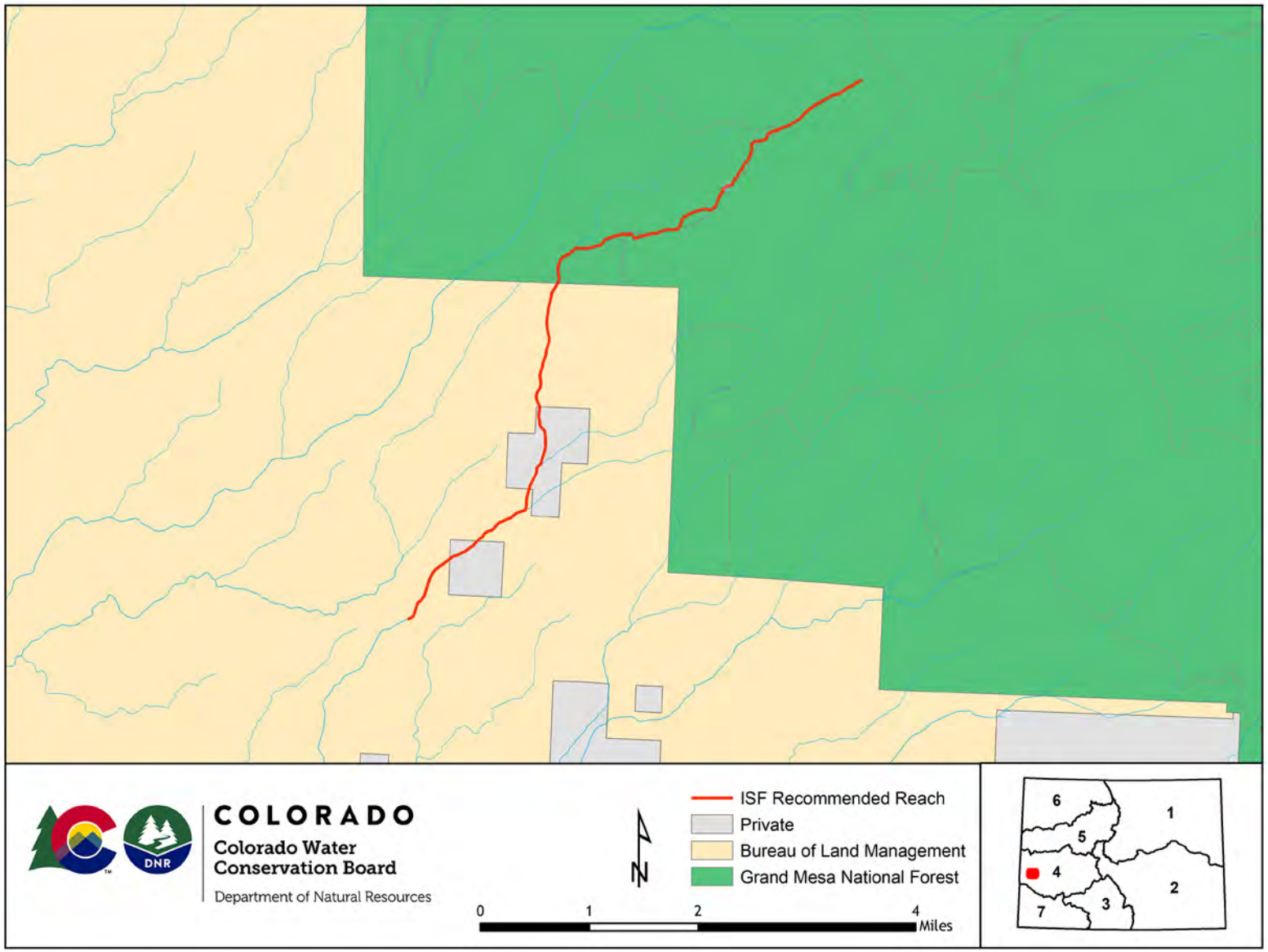
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

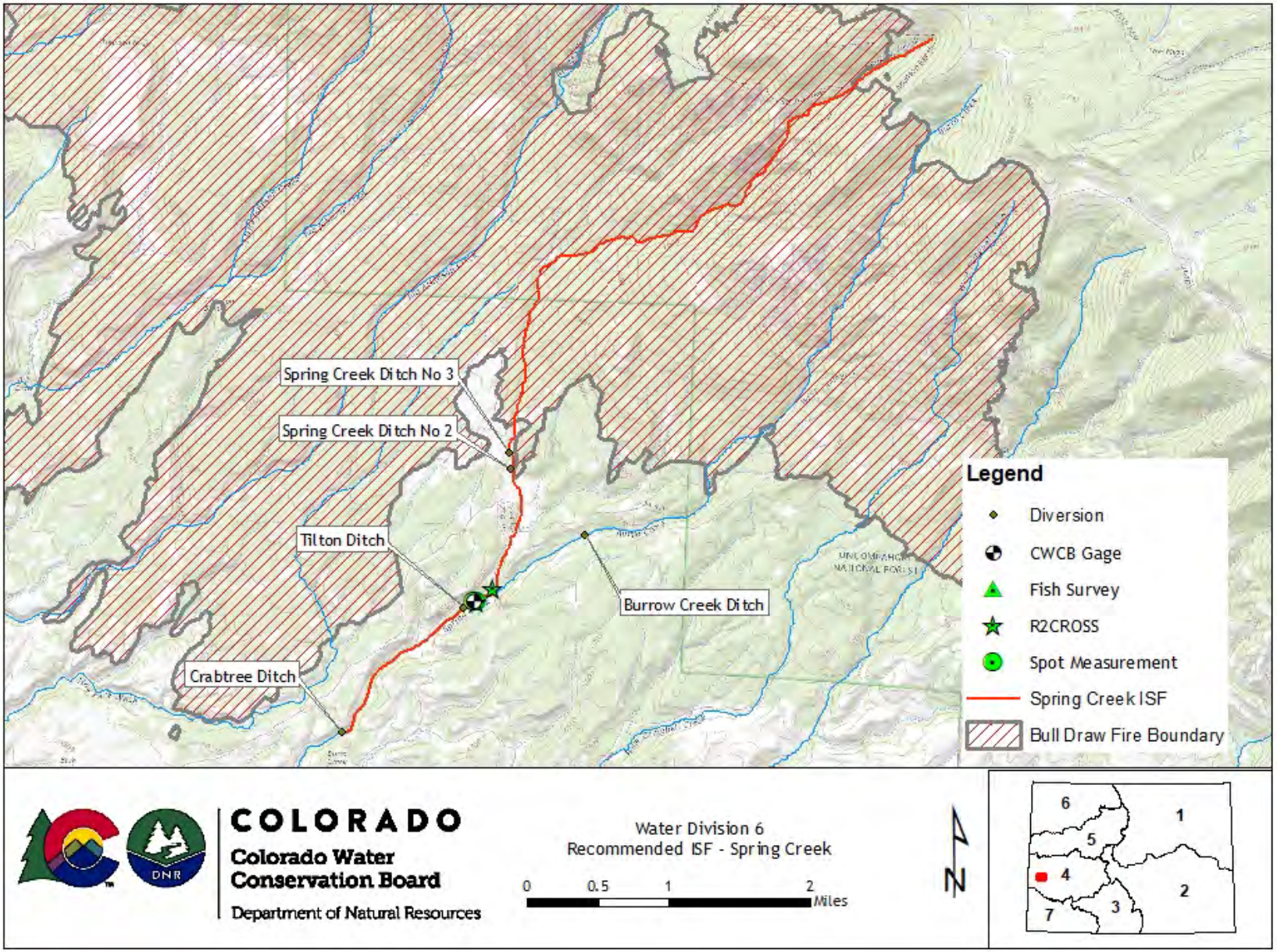
VICINITY MAP



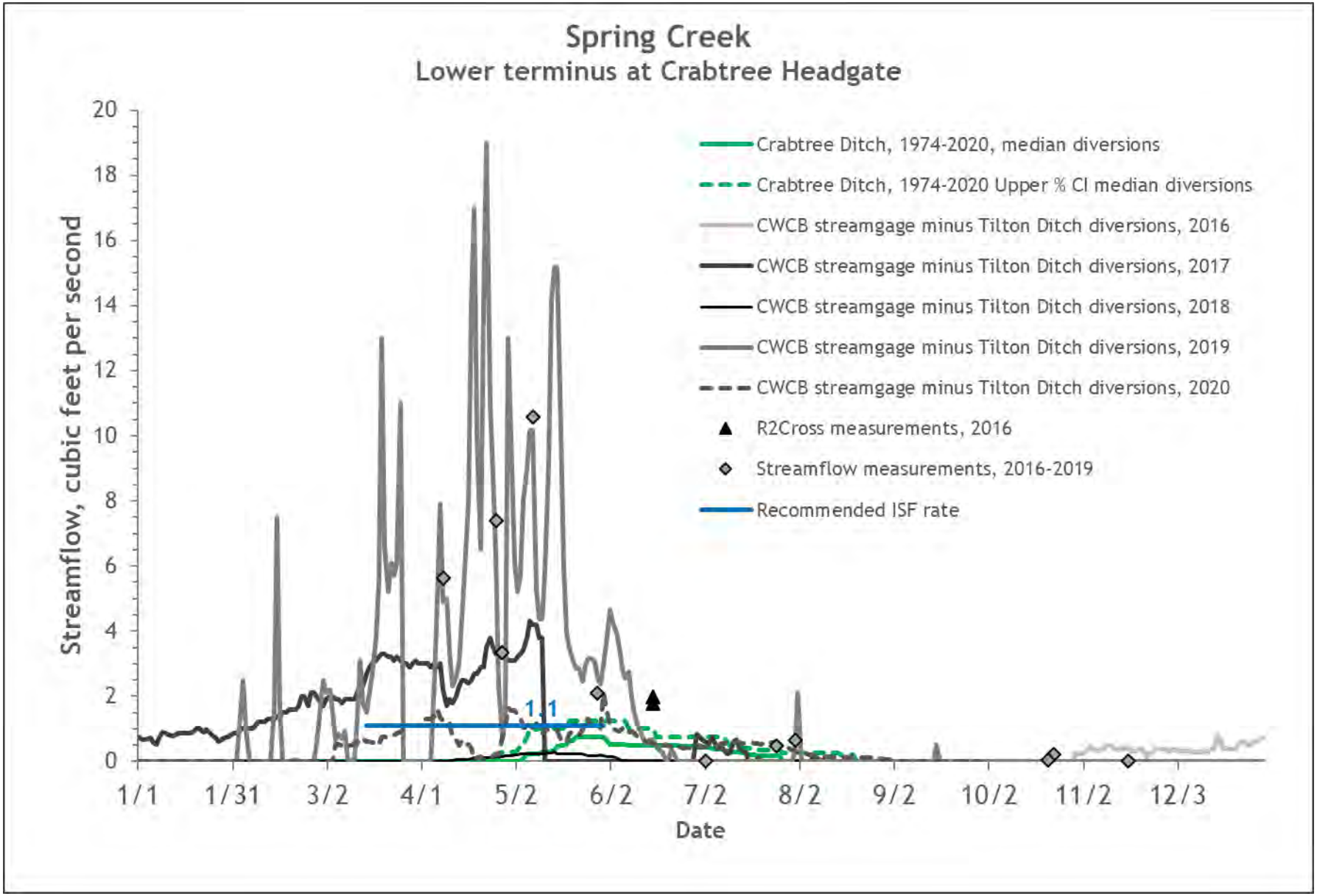
LAND OWNERSHIP MAP



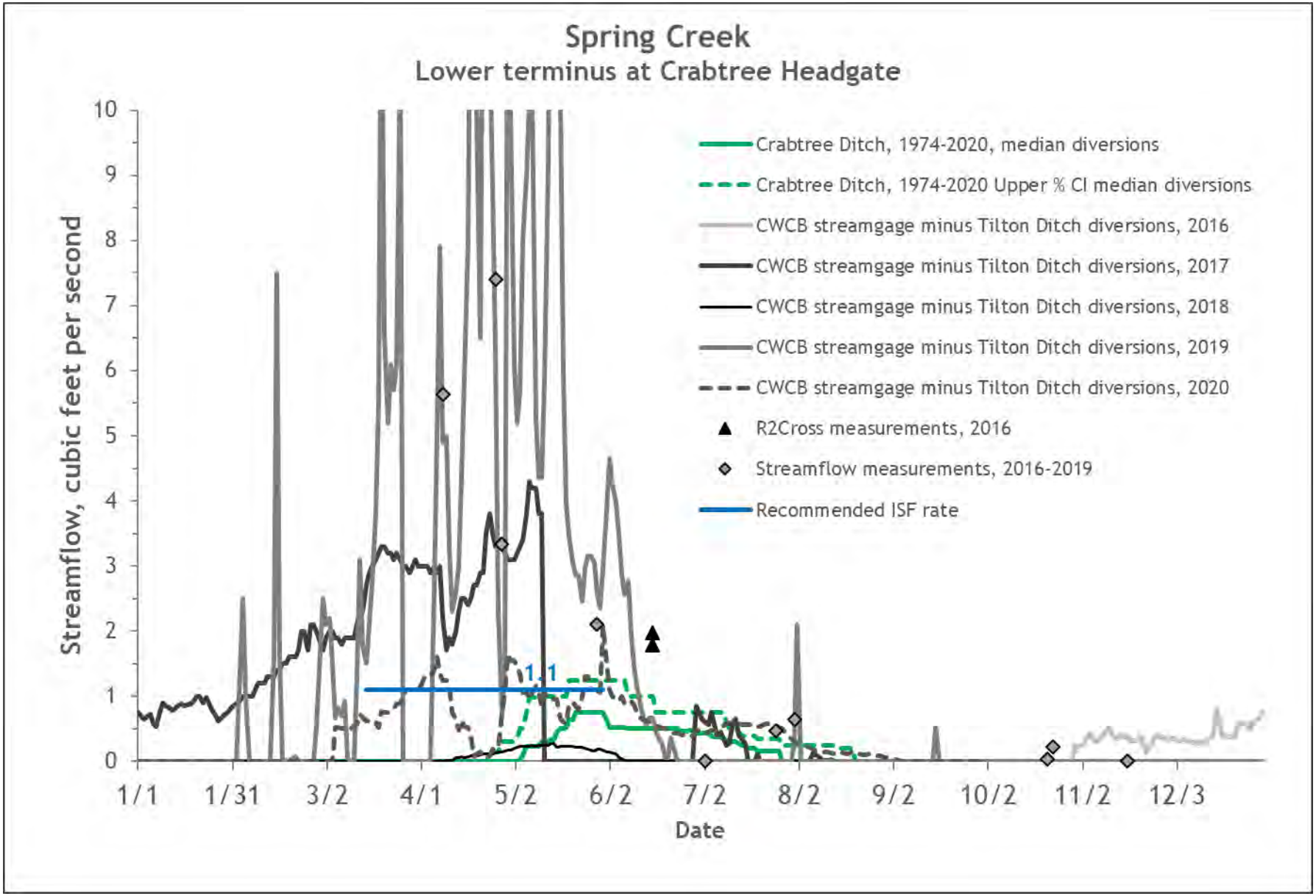
HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH



DETAILED HYDROGRAPH



Kinney Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 24-25, 2022

UPPER TERMINUS:	headwaters in the vicinity of: UTM North: 4446549.34 UTM East: 404504.51
LOWER TERMINUS:	confluence with McQueary Creek at: UTM North: 4439523.21 UTM East: 409496.30
WATER DIVISION:	5
WATER DISTRICT:	51
COUNTY:	Grand
WATERSHED:	Colorado Headwaters
CWCB ID:	22/5/A-002
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	6.31 miles
EXISTING INSTREAM FLOW:	86CW0207, 1.0 cfs (1/1 – 12/31)
FLOW RECOMMENDATION:	0.7 cfs (05/01 - 07/15) - 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 Kinney Creek. Kinney Creek is located within Grand County and is approximately four miles northeast of Hot Sulphur Springs (See Vicinity Map). The stream originates near Elk Mountain and flows south-southeast until it reaches the Colorado River. The existing ISF water right on Kinney Creek was appropriated in 1986 for 1 cfs year round.

The proposed reach extends from the headwaters downstream to the confluence with McQueary Creek for a total of 6.31 miles. Forty-eight percent of the land on the proposed reach is managed by the BLM, 34% is managed by the United States Forest Service (USFS), and 18% 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). In addtion, the upper portions of the stream reach have been designated as an Area of Critical Environmental Concern (ACEC) in BLM's land use planning process. According to BLM, "increasing the instream flow water right would assist in meeting the objectives of the conservation agreement and strategy and the ACEC."

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 Kinney Creek was sent to the mailing list in November and March of 2021. Staff sent notice letters to identified landowners adjacent to Kinney Creek based on information available through the county assessors website. A public notice about this recommendation was also published in the Middle Park Times on October 26, 2021.

Staff presented information about the ISF program and this recommendation to the Grand County Board of County Commissioners on November 9, 2021. In addition, staff emailed and

spoke with Neal Misbach, Lead Water Commisioner of the Upper Colorado River, on various dates in 2021 regarding water use practices and water availability on Kinney 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.

Kinney Creek is a cold-water stream that runs through forest then meadow at a high gradient. The stream runs through a valley that ranges from a quarter mile to a half mile in width. The forested portion was densely populated with trees until the 2020 East Troublesome Fire burned much of the watershed. The substrate of Kinney Creek is generally moderate in size, ranging from gravel to eight-inch cobbles. The channel contains many pool and undercut bank features, with a smaller quantity of riffle habitat due to the steep gradient. The BLM determined that the water quality was excellent for cold water species prior to the fire. Monitoring will be a priority of the BLM in the coming years to determine fire impacts on the ecosystem.

Many portions of the riparian community survived the East Troublesome Fire and CWCB staff saw evidence of regrowth. The riparian community is composed of willow, alder, brushes, sedges, and grasses. The BLM reintroduced beavers to the creek to create additional pool habitat and settle out some of the high sediment load from Elk Mountain. CWCB staff observed many beaver pools along the reach and landowners described frequent beaver activity.

BLM and Colorado Parks and Wildlife (CPW) identified a self-sustaining population of Blue Lineage Colorado River Cutthroat Trout, which is managed by the BLM and its partners as a core conservation population. The BLM also identified a diverse and robust community of macroinvertebrate species in 2019, supported by CWCB spot surveys in 2021. Local landowners have observed moose, elk, and mule deer along Kinney Creek.

Table 1. List of species identified in Kinney Creek.

Species Name	Scientific Name	Protection Status
Colorado River Cutthroat Trout Blue Lineage*	*Oncorhynchus clarki pleuriticus*	State - Species of Greatest Conservation Need State – Species of Special Concern
caddisfly	*Tricoptera*	None
damselfly	*Odonata*	None
mayfly	*Ephemeroptera*	None
stonefly	*Plecoptera*	None
aquatic beetle	*Coleoptera*	None
aquatic fly larve	*Diptera*	None
sedge	*Carex spp.*	None
rush	*Juncaceae*	None
water horsetail	*Equisetum fluviatile*	None
willow	*Salix spp.*	None
cottonwood	*Populus spp.*	None
alder	*Alnus Spp.*	None

*indicates fish species native to Colorado

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 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 1.66 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 2. Summary of R2Cross transect measurements and results for Kinney Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
07/31/2020, 1	6.29	1.00	0.40 - 2.50	N/A	1.67
07/31/2020, 2	7.38	0.93	0.37 - 2.33	N/A	1.45
06/23/2021, 1	7.78	1.78	0.71 - 4.45	N/A	1.85
			Mean		1.66

ISF Recommendation

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

An increase of 0.7 cfs is recommended from April 1 through October 31 to bring the total instream flow protection to 1.7 cfs. This recommendation is driven by the average depth criteria. Kinney Creek has limited riffle habitat, so protecting this flow rate will ensure that the limited habitat can be fully utilized during the snowmelt and summer period. During May and June, the cutthroat trout population is completing spawning, and during July the trout are actively moving between pools. Protecting flows during this period will allow the fish population to complete important parts of its life cycle before cold temperatures arrive.

This increase in ISF protection is warranted because R2Cross modeling shows that the existing 1.0 cfs ISF water right does not fully protect habitat in the variety of riffle habitats on Kinney Creek. Depending on the geomorphology of individual riffles, 1.0 cfs does not fully meet either the average depth or average velocity criteria.

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 Kinney Creek is 5.96 square miles, with an average elevation of 9,311 feet and average annual precipitation of 22.2 inches (See the Hydrologic Features Map). The 2020 East Troublesome Creek Fire burned portions of the drainage basin, primarily on the BLM and USFS lands.

There is limited use of water in the Kinney Creek drainage basin associated with the proposed ISF reach. The Dennis Ditch (see Table 3) and a 5 acre foot reservoir are the only decreed water rights. There is also an undecreed diversion that diverts water at a point approximately 2,000 feet upstream from the lower terminus. This diversion does not have a measuring device and no diversion records are kept (personal communication with Neal Misbach, 2021). There are additional diversions downstream from the proposed reach, including the Kinney No. 2 Ditch (3.5 cfs, appropriation date 1934) and the Kinney Ditch (1.75 cfs, appropriation date 1884). The Kinney Ditch is senior to the Dennis Ditch and has placed calls in 2012 and 2018.

Table 3. Decreed diversion structure located within the proposed ISF reach on Kinney Creek.

WDID	Structure Name	Decreed Flow rate, cfs	Appropriation Date	Location
5100603	Dennis Ditch	2.75	1915	Midway through the ISF reach.

Data Analysis

Gage Data and CWCB Measurements

There is not a current or historic streamflow gage on Kinney Creek. A number of nearby gages were evaluated, but none appeared to be representative of Kinney Creek due to differences in water use patterns. Due to the small number of diversions in the proposed reach and the recent fire that will likely alter hydrology for a number of years, staff determined that installing a temporary gage would not be effective in this case. CWCB staff made two streamflow measurements at different locations in the proposed reach of Kinney Creek as summarized in Table 4.

Table 4. Summary of streamflow measurements for Kinney Creek.

Visit Date	Flow (cfs)	Location
06/14/2021	2.51	Above Dennis Ditch
06/14/2021	0.77	Below the Dennis Ditch

Diversion Records

In some cases, diversion records can be used to provide an indication of water availability in a stream reach. In this situation, there are diversion records for most of the water uses in Kinney Creek; however, in some years the diversion rates are estimated or corrected due to no measuring device or submerged measuring devices. Despite this, an effort was made to evaluate water availability by adding the Kinney No 2 Ditch and the Kinney Ditch records together for the available years of record from 1977 to 2020. The summed records were then prorated to account for the contributions from Kinney Creek at the lower terminus based on the relative drainage basin size and precipitation (proration factor is 0.62). This provides a rough estimate of the portion of the water for the diversions that may be coming through the proposed ISF reach. This method does not explicitly account for impacts from the Dennis Ditch, diversions on McQueary Creek, the undecreed diversion structure (that does not have records that can be evaluated), or return flows. Diversion records are also rarely a perfect proxy for streamflow due to water user decisions on when to start or stop irrigation which do not always perfectly correspond to water availability. Nevertheless, the median and the 95% confidence interval for the median of the summed and prorated diversion records were calculated to provide additional insight.

StreamStats

StreamStats was also used to evaluate water availability at the proposed lower terminus. As the Dennis Ditch is located midway through the reach, staff reduced the StreamStats based estimates of mean-monthly streamflow by the mean-monthly diversion record for the Dennis Ditch (based on the available diversion records from 1981 to 2020). In addition, the Dennis Ditch is not operated in a manner that sweeps Kinney Creek (personal communication June 2021).

Water Availability Summary

The hydrograph (See Complete Hydrograph) shows StreamStats results for mean-monthly streamflow reduced by the mean-monthly diversion record for the Dennis Ditch as well as the upper 95% confidence interval for the summed and prorated diversion records from Kinney No 2 Ditch and Kinney Ditch. The StreamStats based results indicate that significant water is available, while the diversion records suggest that substantially less water is available. Staff elected to rely primarily on the modified StreamStats flow results for runoff and the diversion record analysis which shows more limited water availability in mid to late summer. Based on this analysis, Staff concluded that water is available for appropriation.

MATERIAL INJURY

Because the proposed ISF on Kinney 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.

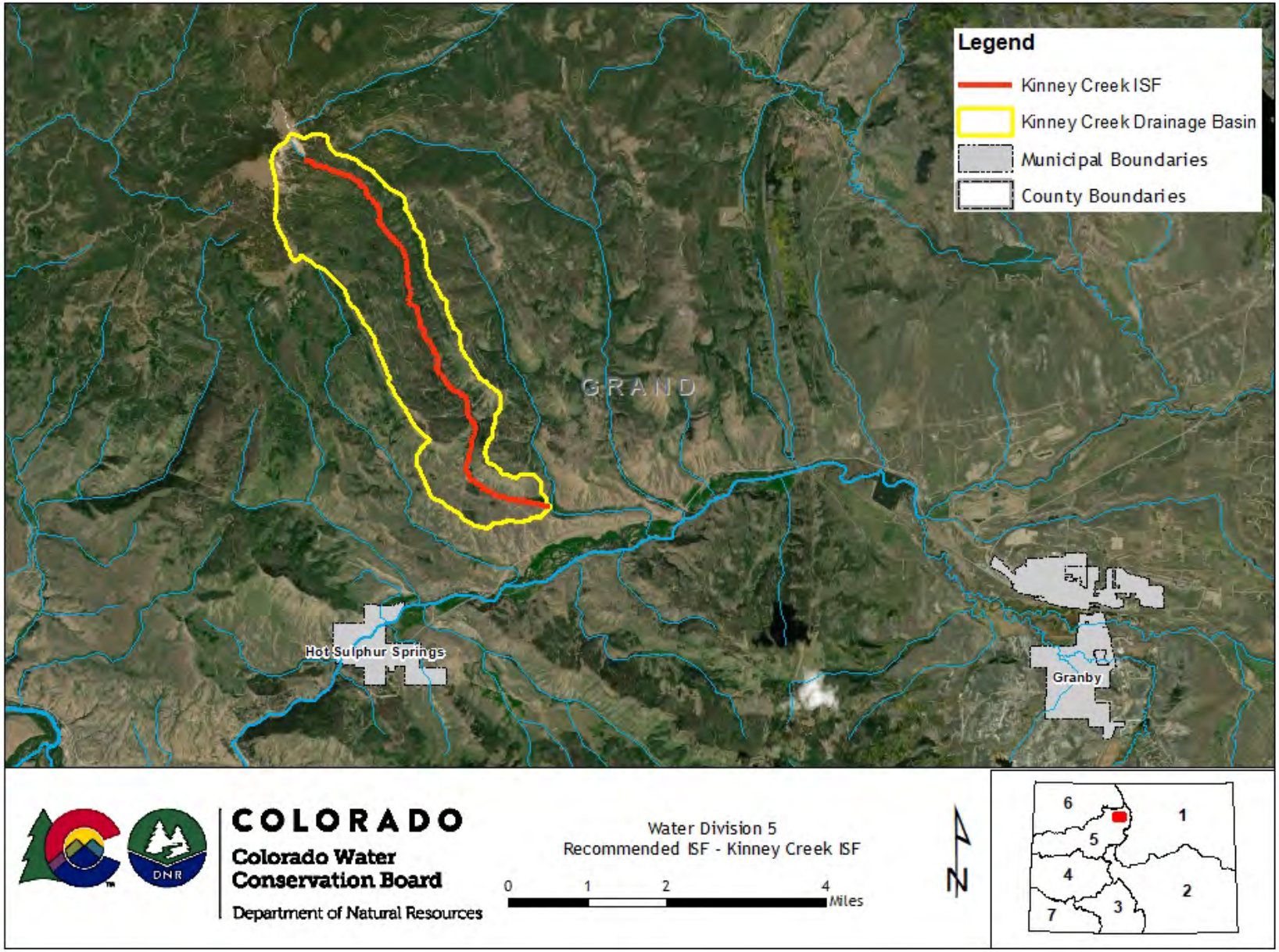
Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

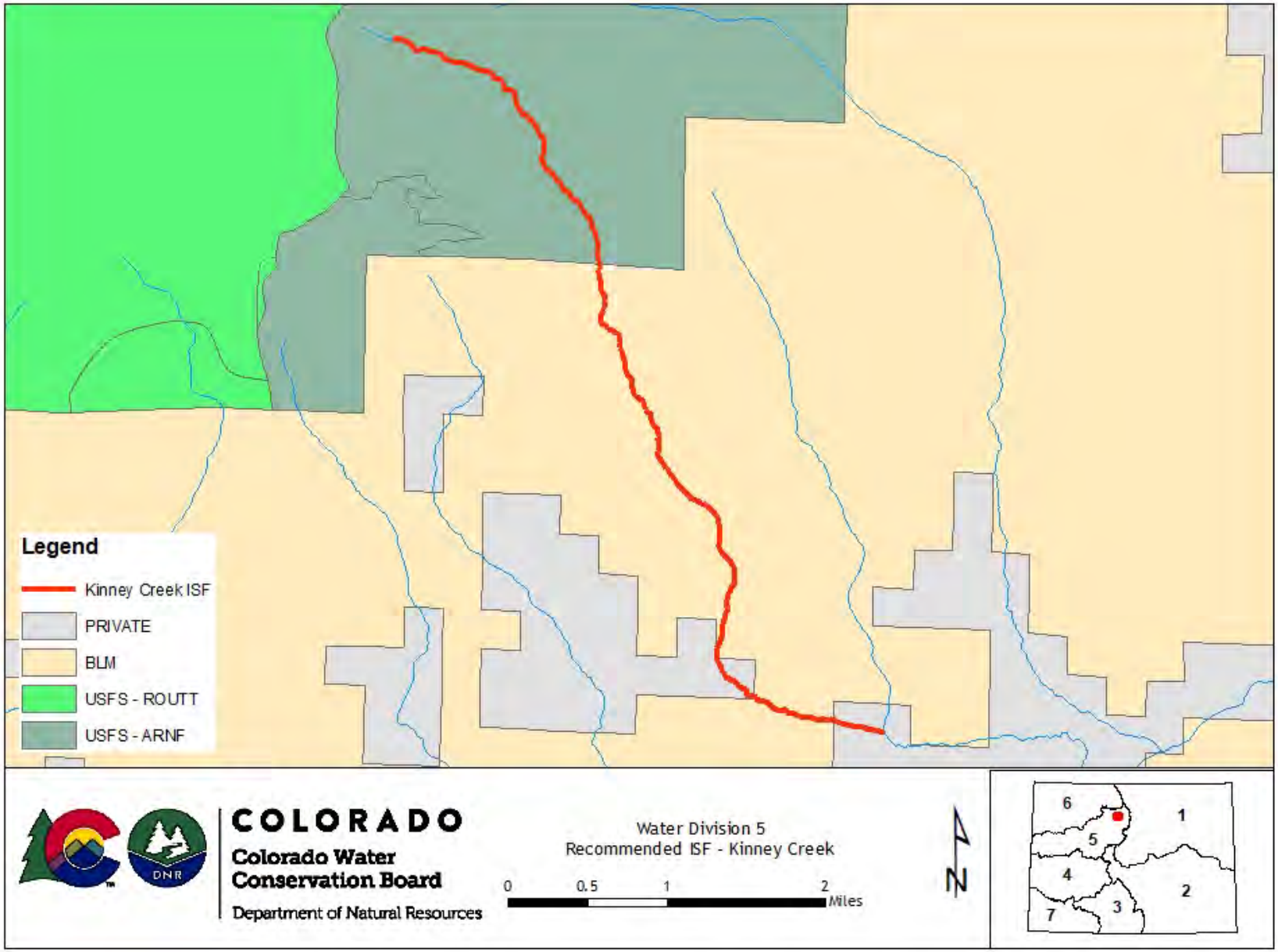
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

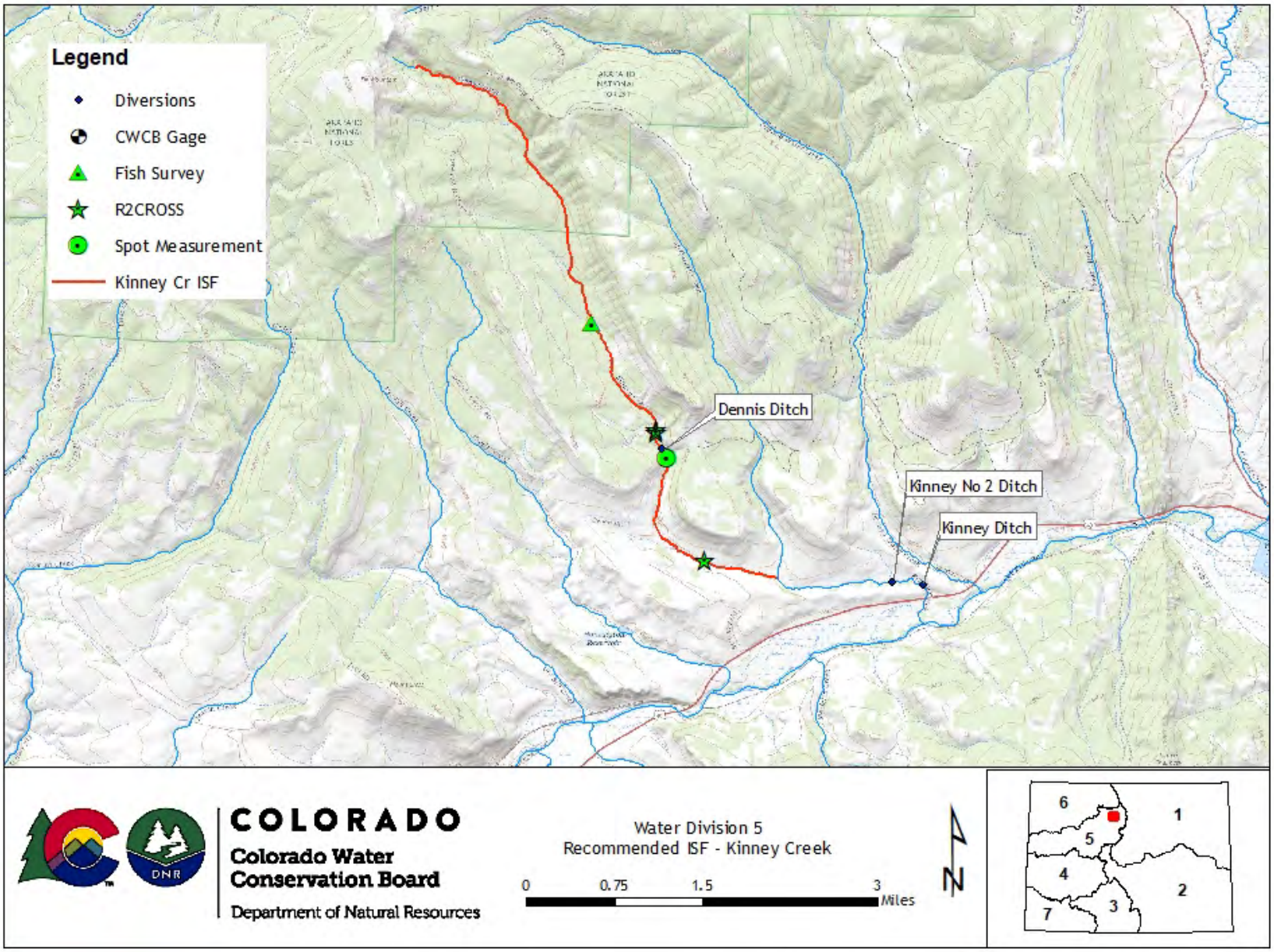
VICINITY MAP



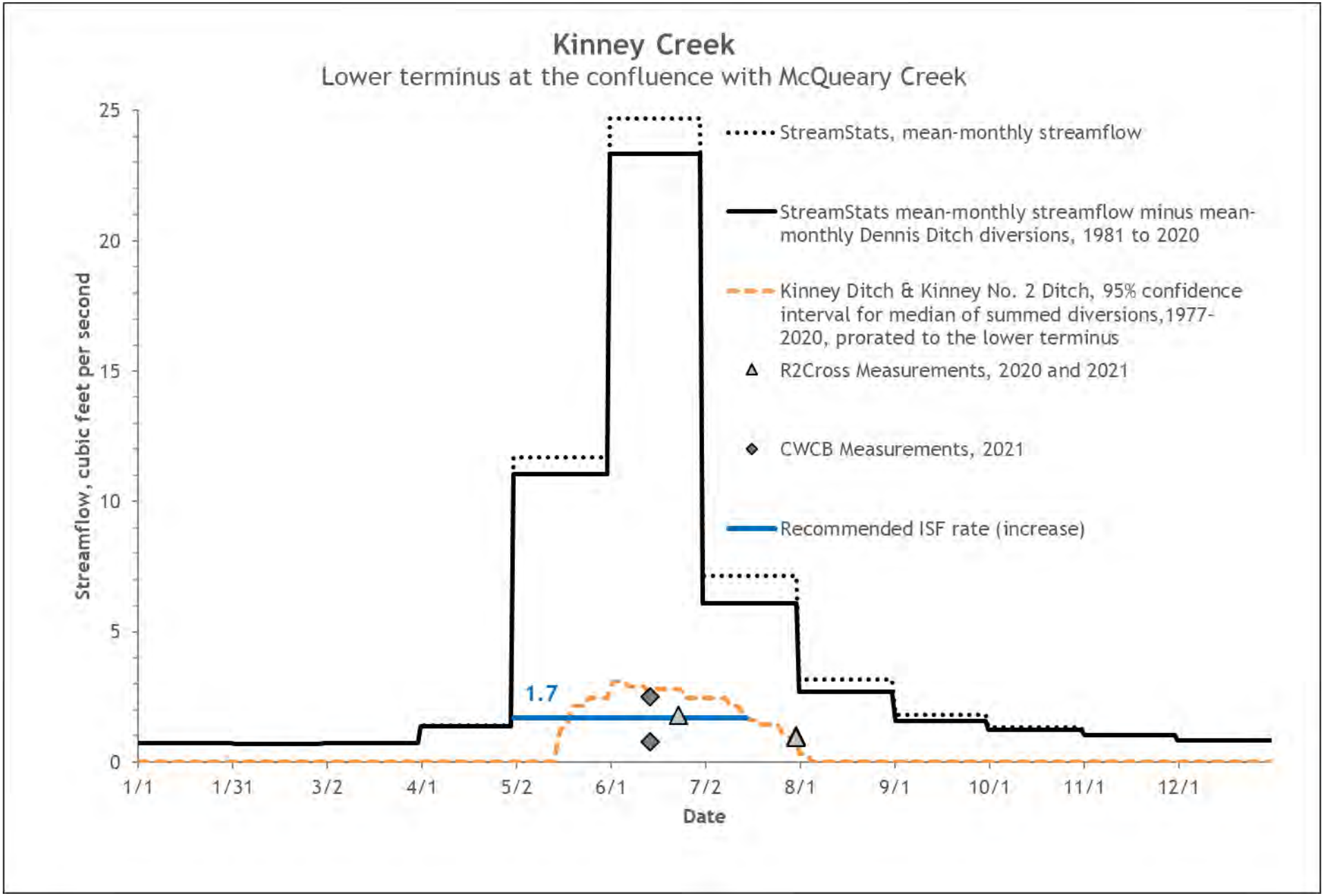
LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH



Spruce Creek Executive Summary

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 Commisioner-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	*Oncorhynchus clarkii pleuriticus*	State- Species of Special Concern
Fingernail clam	*Pisidium spp*	None
Scud	*Hyalella spp*	None
Macroinvertebrates*		None
Sedge	*Carex spp*	None
Spruce	*Picea spp*	None
Water Horsetail	*Equisetum fluviatile*	None
Willow	*Salix spp*	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	*Ameletidae, Baetidae, Ephemerellidae, Heptageniidae, Letophlebiidae*
Stonefly - Plecoptera	12	*Chloroperlidae, Nemouridae, Perlidae, Perlodidae*
Caddisfly - Trichoptera	10	*Glossosomatidae, Hydropsychidae, Lepidostomatidae, Limnephilidae, Philopotamidae, Rhyacophilidae, Uenoidae*
Beetles - Coleoptera	10	*Dytiscidae, Elmidae, Helophoridae, Hydrophilidae*
Fly - Diptera	25	*Ceratopogonidae, Chironomidae, Dixidae, Empididae, Psychodidae, Ptychopteridae, Simuliidae, Tipulidae*
Aquatic Mites - Tombidiformes	3	*Lebertiidae, Sperchonidae*

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.

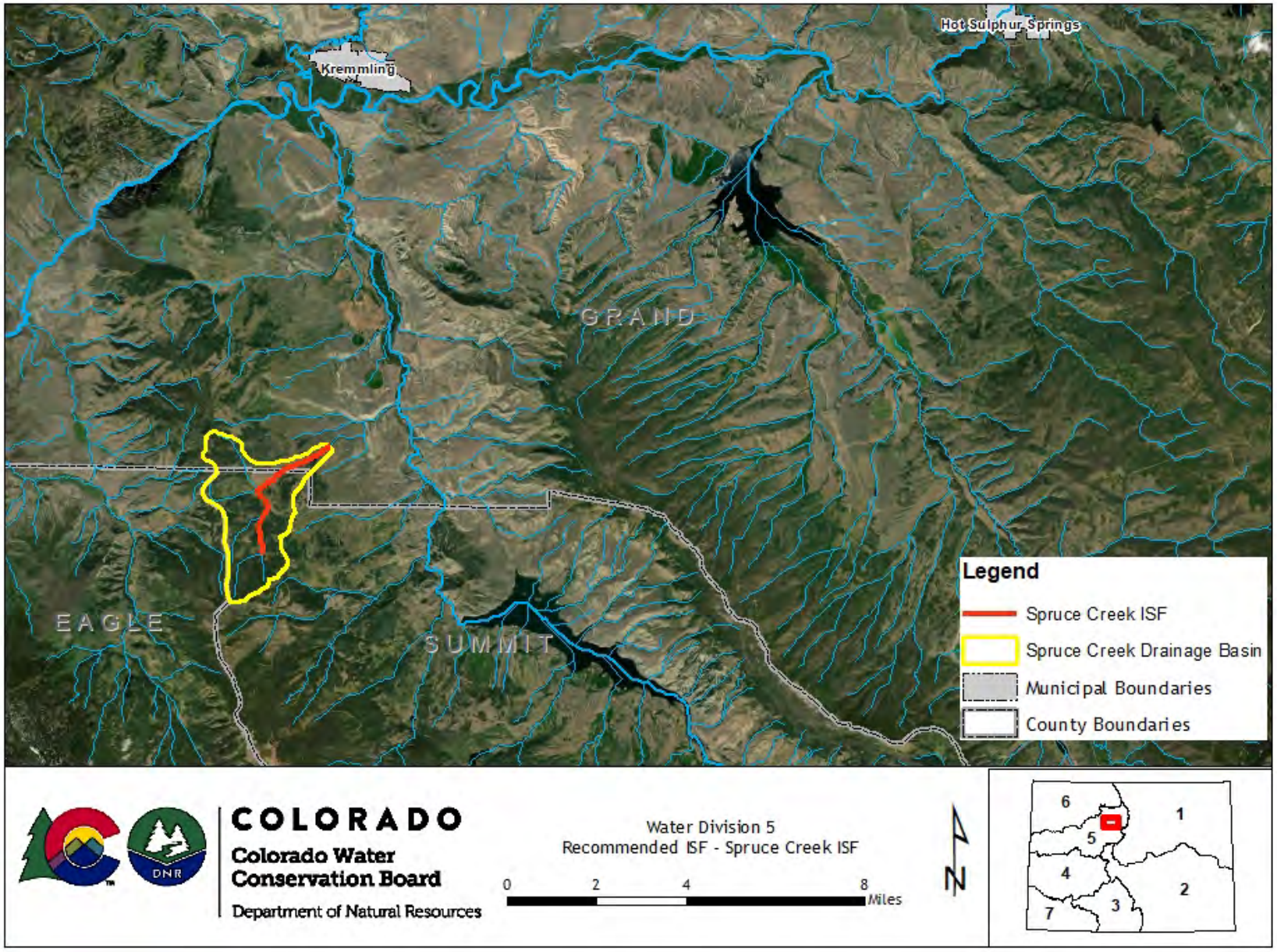
Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

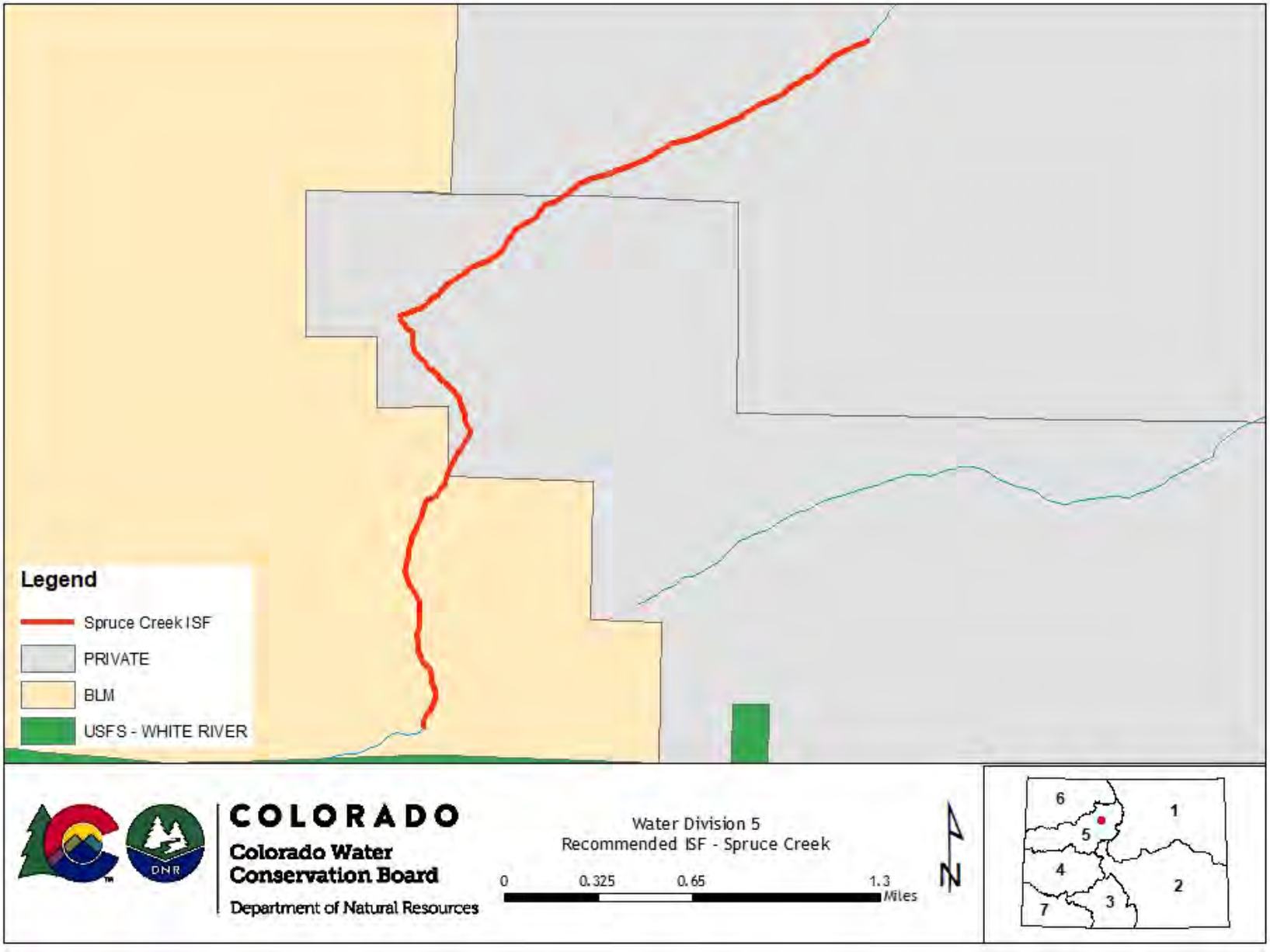
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

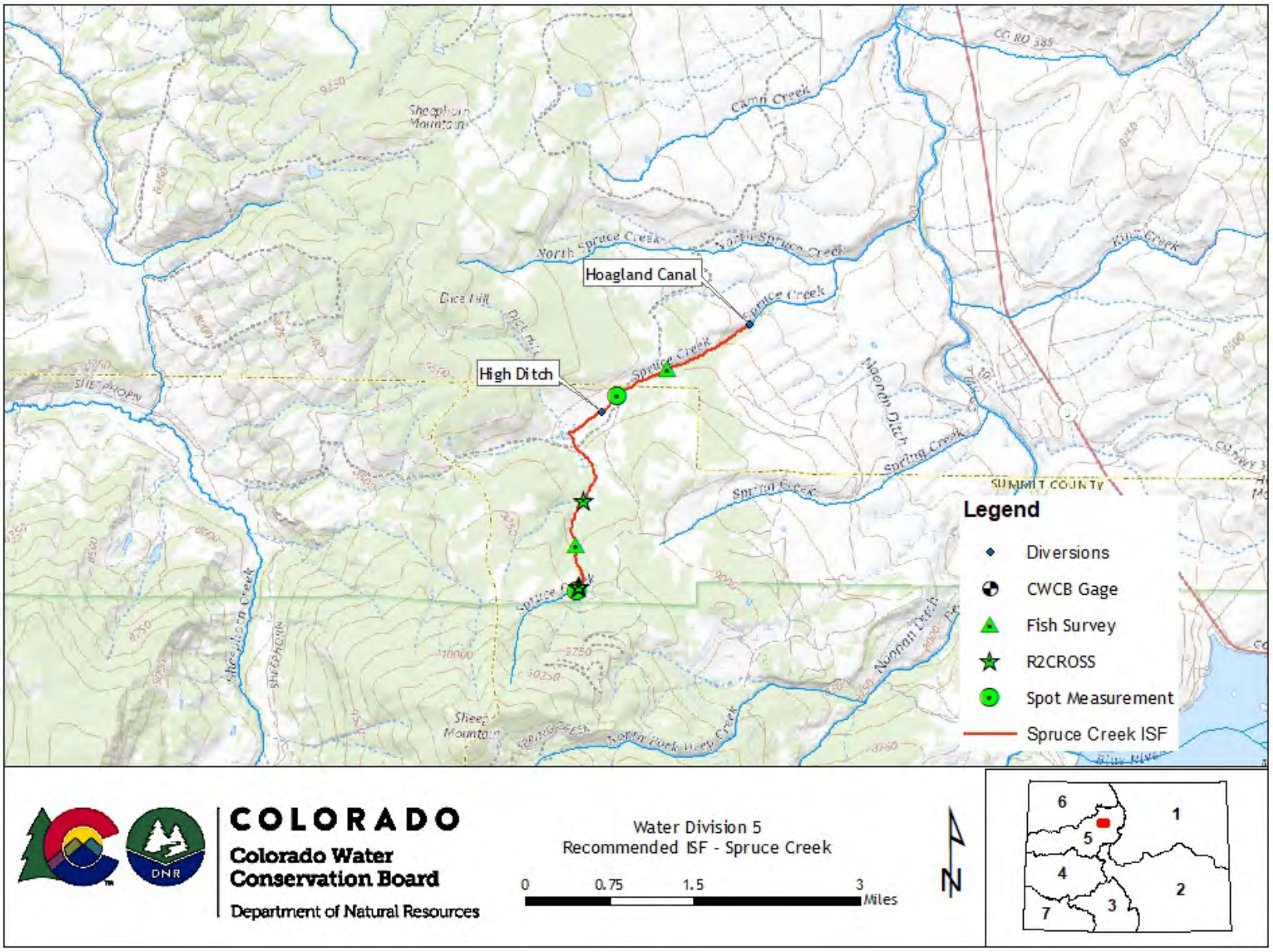
VICINITY MAP



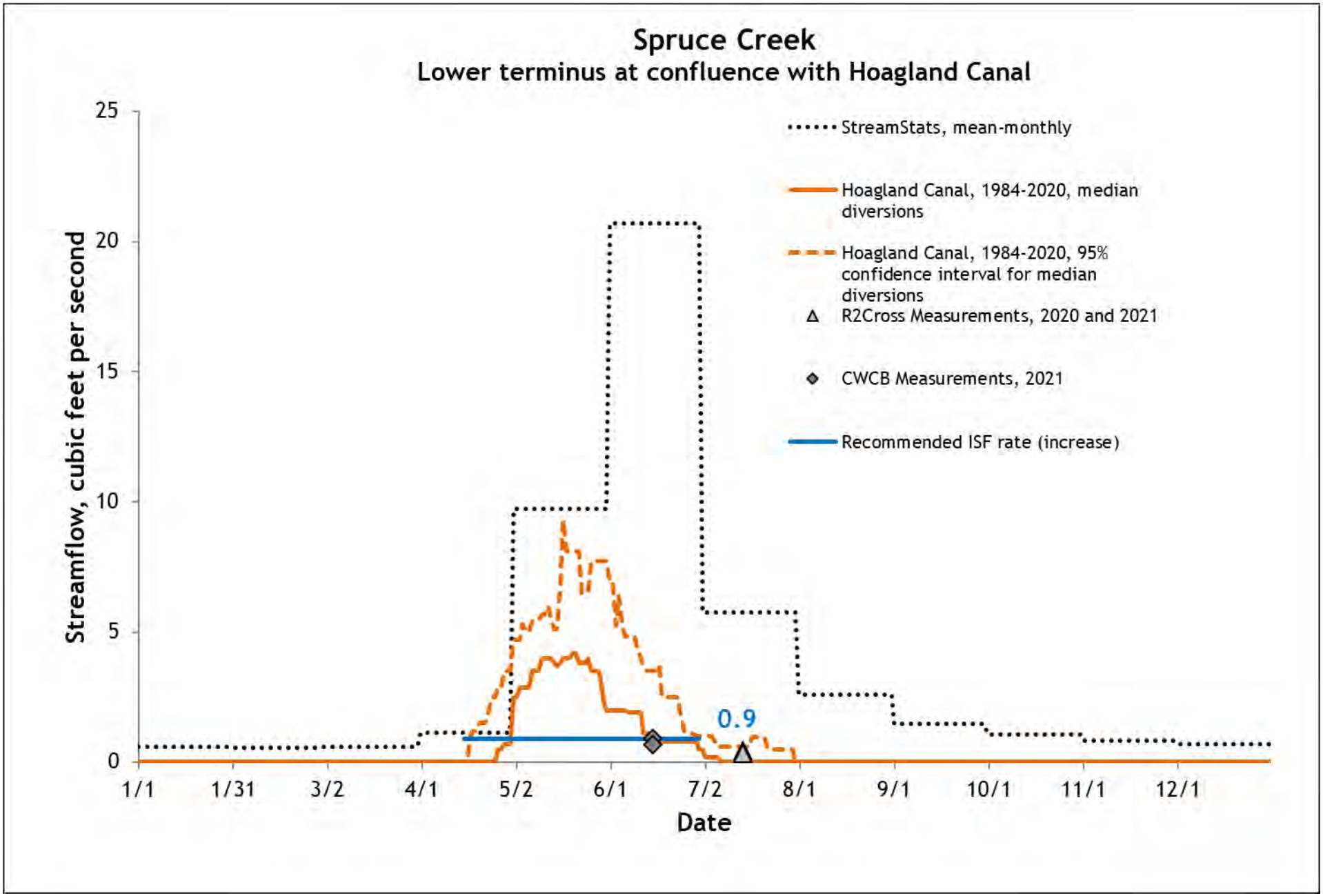
LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH



Deep Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 24-25, 2022

UPPER TERMINUS:	headwaters in the vicinity of: UTM North: 4522646.30 UTM East: 336333.41
LOWER TERMINUS:	confluence with Steamboat Lake at: UTM North: 4519435.84 UTM East: 334767.17
WATER DIVISION:	6
WATER DISTRICT:	58
COUNTY:	Routt
WATERSHED:	Upper Yampa
CWCB ID:	22/6/A-001
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	2.45 miles
FLOW RECOMMENDATION:	0.3 cfs (10/01 - 04/30) 2.5 cfs (05/01 - 07/31) 0.95 cfs (08/01 - 09/30)

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 ISF water right on a reach of Deep Creek. Deep Creek is located within Routt County approximately 22 miles northwest of Steamboat Springs (See Vicinity Map). The stream originates near Hahns Peak and flows southwest until it reaches Steamboat Lake.

The proposed reach extends from the headwaters downstream to the confluence with Steamboat Lake for a total of 2.45 miles. Ninety percent of the land on the proposed reach is publically owned; 60% by the United Stated Forest Service (USFS), 12% by Colorado Parks and Wildlife, 14% by Colorado State Land Board, 4% by the BLM. Ten percent is privately owned (See Land Ownership Map). The BLM is interested in protecting this stream to meet management goals aimed at maintaining and enhancing habitat that supports fish species, maintaining 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 Deep Creek was sent to the mailing list in March and November of 2021. Staff sent notice letters to identified landowners adjacent to Deep Creek based on information from the county assessors website. A public notice about this recommendation was also published in the Steamboat Pilot on October 28, 2021.

Staff presented information about the ISF program and this recommendation to the Routt County Board of County Commissioners on November 1, 2021. Staff spoke with Luke Fitzgerald, Water Comissioner on October 13, 2021 regarding water availability on Deep Creek. Staff also spoke with attorney Claire Sollars, a representative of water users on Deep Creek, on January 4, 2022.

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.

Deep Creek is a cold-water stream that runs through dense forest at a high gradient before entering a wide meadow surrounding Steamboat Lake. The substrate of Deep Creek ranges from gravel to six-inch cobbles.

According to the BLM, Deep Creek has excellent water quality. The riparian community consists of spruce and thick stands of willow and alder which provide ample shade for the aquatic ecosystem. While there are a limited number of pools along the creek, deeper stream habitat exists around tree root wads and in beaver ponds.

BLM and Trout Unlimited identified a self-sustaining population of Rainbow-Cutthroat Trout hybrids. BLM found abundant populations of stonefly, caddisfly, and mayfly. CWCB staff also found the creek to have an abundant and diverse macroinvertebrate community while visiting the site.

Table 1. List of species identified in Deep Creek.

Species Name	Scientific Name	Protection Status
Rainbow-Cutthroat hybrid	*Oncorhynchus mykiss*	None
alder	*Alnus Spp.*	None
willow	*Salix spp.*	None
stonefly	*Plecoptera*	None
mayfly	*Ephemeroptera*	None
caddisfly	*Trichoptera*	None
water strider	*Gerridae*	None
water boatmen	*Corixidae*	None
water beetle	*Coleoptera*	None

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 two transects for this proposed ISF reach by BLM (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 1.43 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 2.45 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 2. Summary of R2Cross transect measurements and results for Deep Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/09/2020, 1	14.70	2.90	1.16 - 7.25	1.35	3.36
06/09/2020, 2	9.44	2.29	0.92 - 5.73	1.53	1.55
			Mean	1.44	2.46

ISF Recommendation

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

2.50 cfs is recommended from May 1 through July 31 during the snowmelt runoff period and summer. This recommendation is driven by the average depth criteria. This flow rate will ensure that the riffle habitat can be fully utilized during the late spring, when fish are completing their spawning cycle and early summer, when fish are actively moving between pools.

0.95 cfs is recommended from August 1 through September 30 during late summer and fall. This flow rate is limited by water availability but should provide adequate physical habitat for the fish population to complete important parts of its life cycle before cold temperatures arrive.

0.3 cfs is recommended from October 1 through April 30 during the cold weather period. This recommendation is driven by naturally limited water availability. This flow rate should maintain full and sufficiently cool pools during fall, and it should prevent pools from completely icing during winter, 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.

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 Deep Creek is 1.70 square miles, with an average elevation of 8,833 feet and average annual precipitation of 30.11 inches (See the Hydrologic Features Map). There is one surface water diversion on the proposed reach, Button Ditch No.

1, and three springs used for water supply in the community of Hahns Peak Village. Due to the small amount of diversions, hydrology in the basin represents near natural conditions.

Water Right Assessment
According to records kept on CDSS, Button Ditch No. 1 has not been used since 2003. Water commissioner comments indicate that since 2003, the structure has suffered from maintenance issues, including the headgate being washed out and silting in the diversion structure and ditch. In total, the structure has been used during three of the last 26 years for an average of 17 days at a time, during the month of June. The structure was considered for abandonment in 2020. Staff spoke with District 58 water commissioner, Luke Fitzgerald (communication on August 13, 2021), who indicated that the structure was not listed for abandonment and repairs to the structure were in progress.

Hahns Peak village has water rights on three springs near the middle of the proposed ISF. Each spring is currently decreed for an amount of 0.011 cfs. Judith Spring #2 (WDID 5802140) and Abigale Spring #3 (WDID 5802141) have been made absolute, while Shay Spring #1 (WDID 5802139) remains conditional. In 2021, the Village filed for an additional 0.011 cfs conditional rights at each spring.

Data Analysis
There are no historic or current streamflow gages on Deep Creek and no nearby representative gages were identified. StreamStats provides the best available estimate of streamflow on Deep Creek.

Since the Button Ditch No. 1 structure has been used so infrequently, staff examined four nearby irrigation ditches (Oligarchy Ditch – WDID 5800811, Frye System of Ditches No. 1 – WDID 5800653, Centennial Placer Ditch HG 2 – WDID 5801703, Wheeler Bros Ditch – WDID 5800928) in District 58 to get a better understanding of the likely timing of irrigation in the area. From this analysis, diversions in the area occur roughly 50% of the time on days between June 9 and August 1. Diversions occurred roughly 25% of the time on days between June 1 and August 18.

Staff reduced the StreamStats mean monthly streamflow estimates by the full decreed amount of Button Ditch No. 1 (1 cfs) to account for potential future diversions after repairs are completed. This was done between June 1 and August 18 to align with the timing of the majority diversions in the area as described above. No adjustments were made for the Hahns Peak Village springs due to the relatively small diversion amounts and off channel location.

CWCB staff made one streamflow measurement on the proposed reach of Deep Creek as summarized in Table 3.

Table 3. Summary of streamflow measurements for Deep Creek.

Visit Date	Flow (cfs)	Collector
10/20/2021	0.08	CWCB

Water Availability Summary
The hydrograph (See Complete Hydrograph) shows StreamStats results for mean-monthly streamflow and StreamStats minus the full decreed amount of the Button Ditch No. 1 during typical irrigation season. This provides the best available estimate of the available water if the Button Ditch No. 1 begins to use their right again in the future. Staff has concluded that water is available for appropriation.

MATERIAL INJURY
Because the proposed ISF on Deep 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.

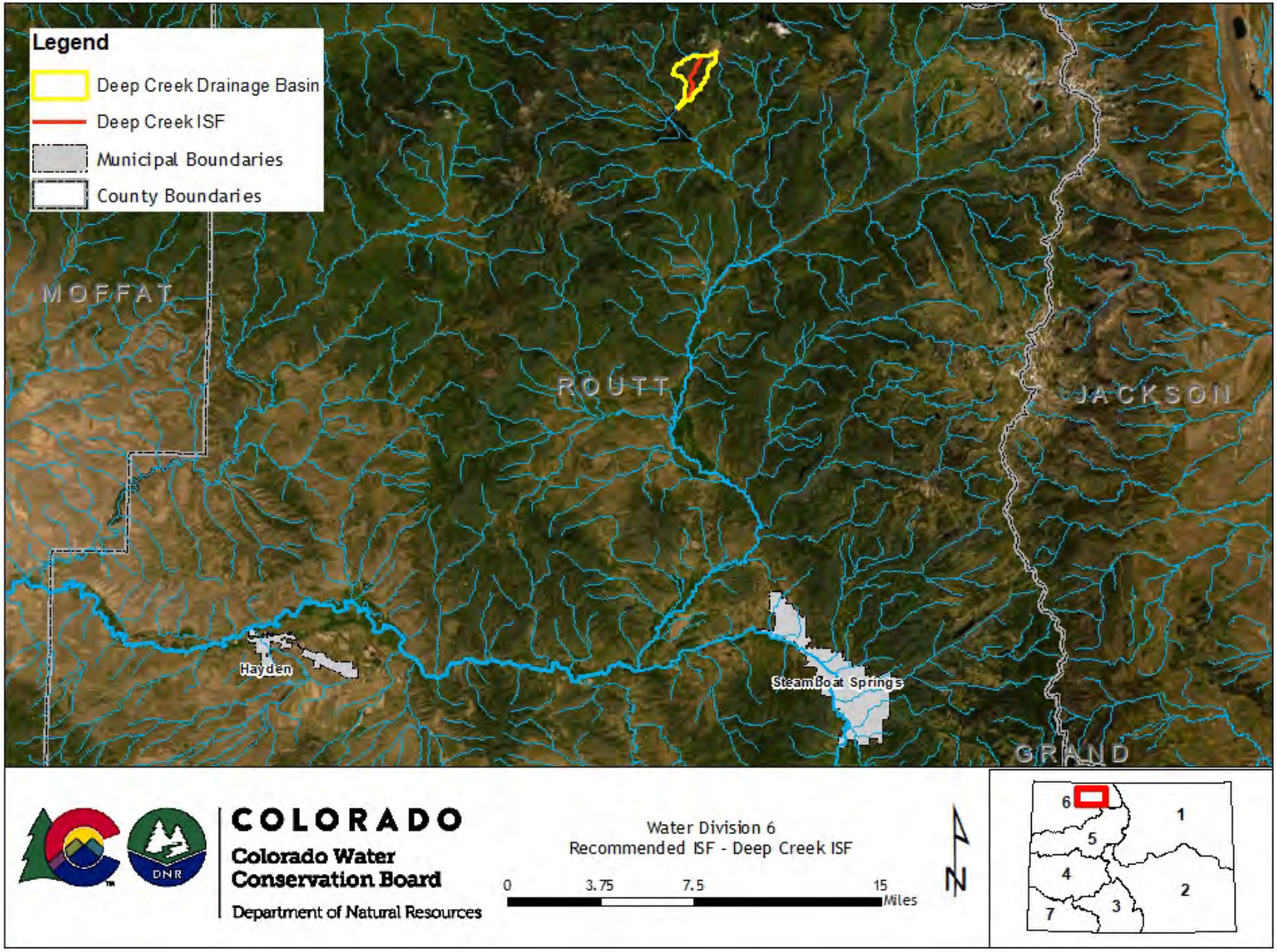
Espegren, G.D., 1996, Development of Instream Flow Recommendations in Colorado Using R2CROSS, Colorado Water Conservation Board.

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.

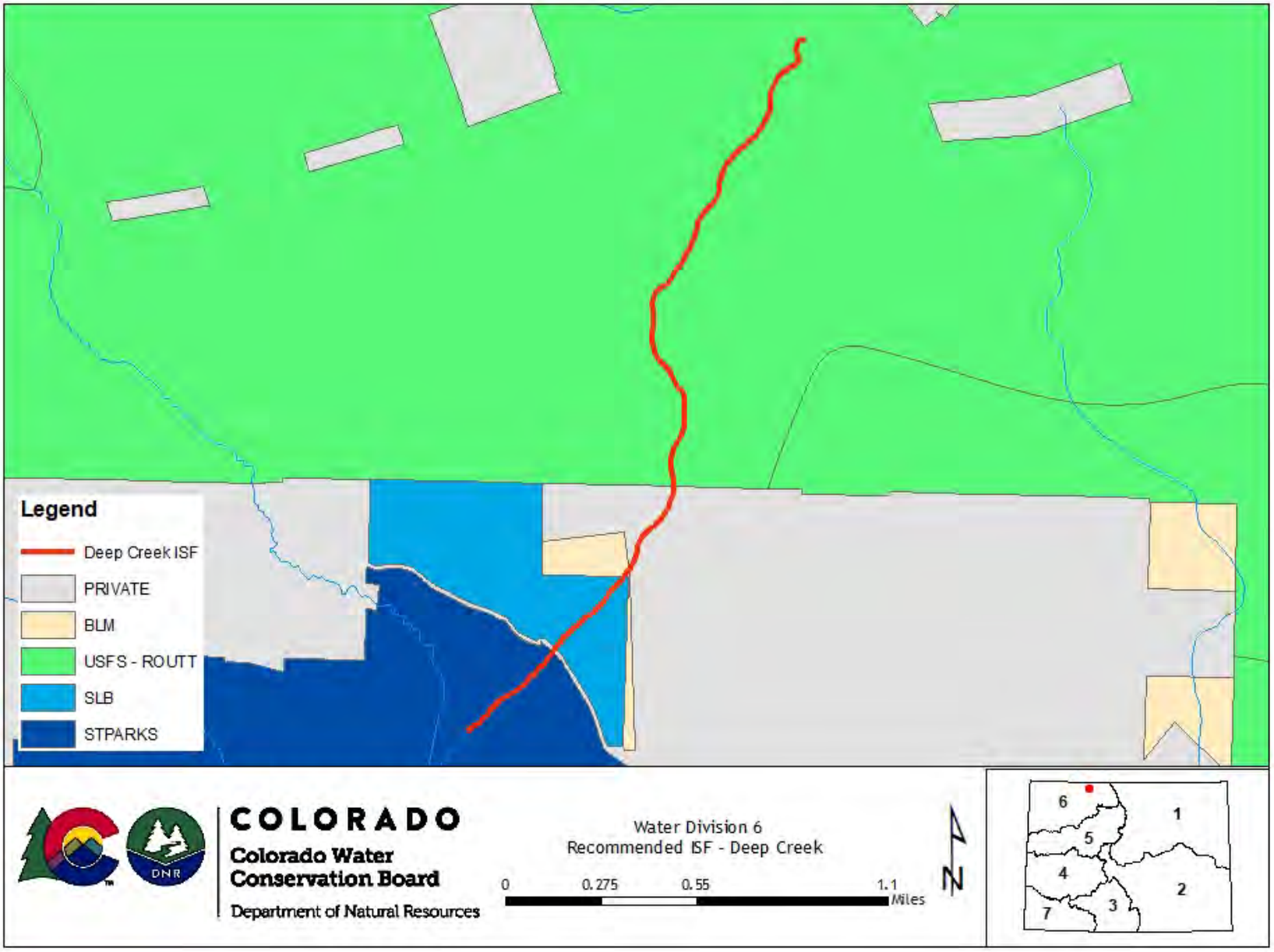
Metadata Descriptions
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

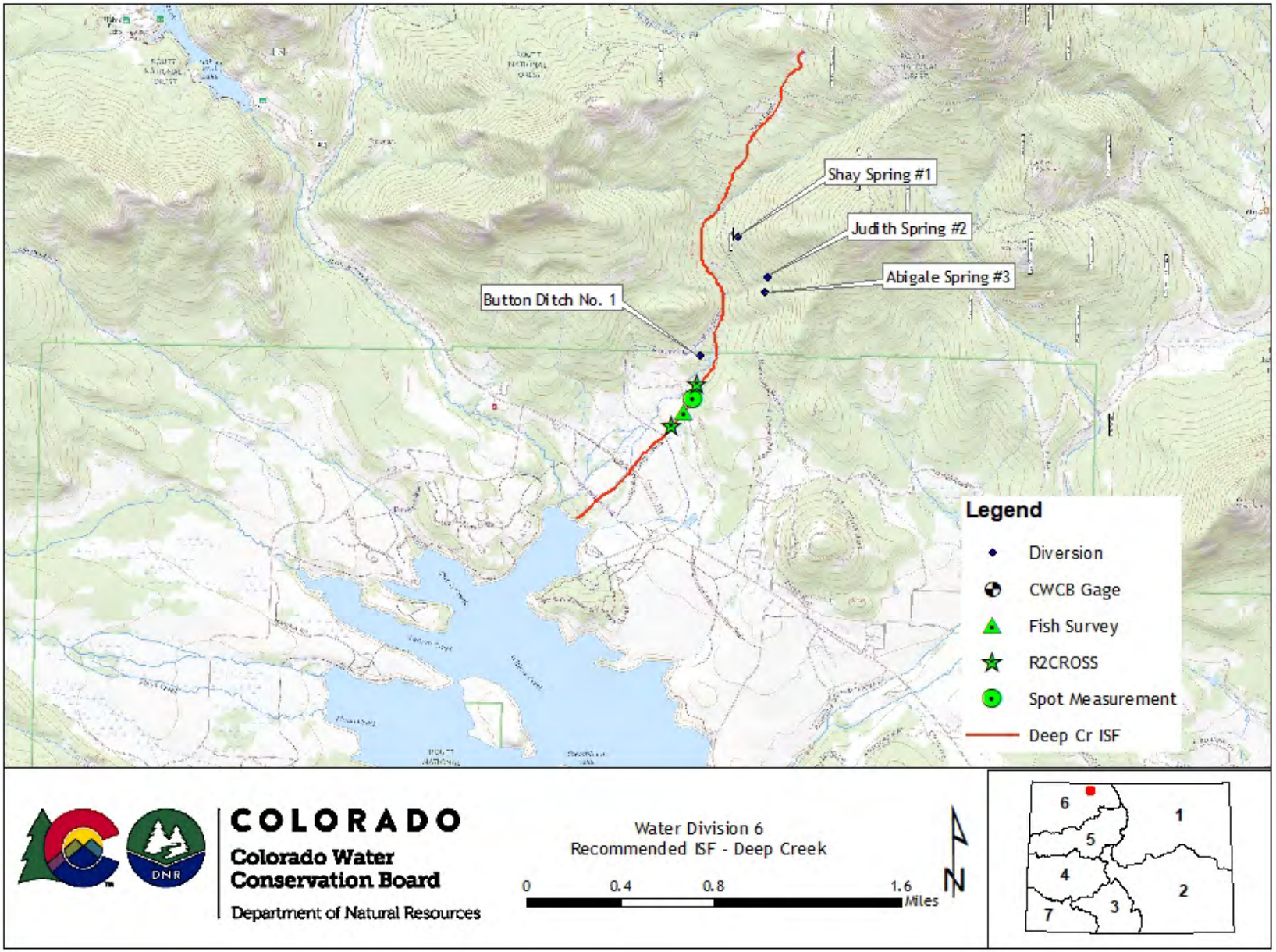
VICINITY MAP



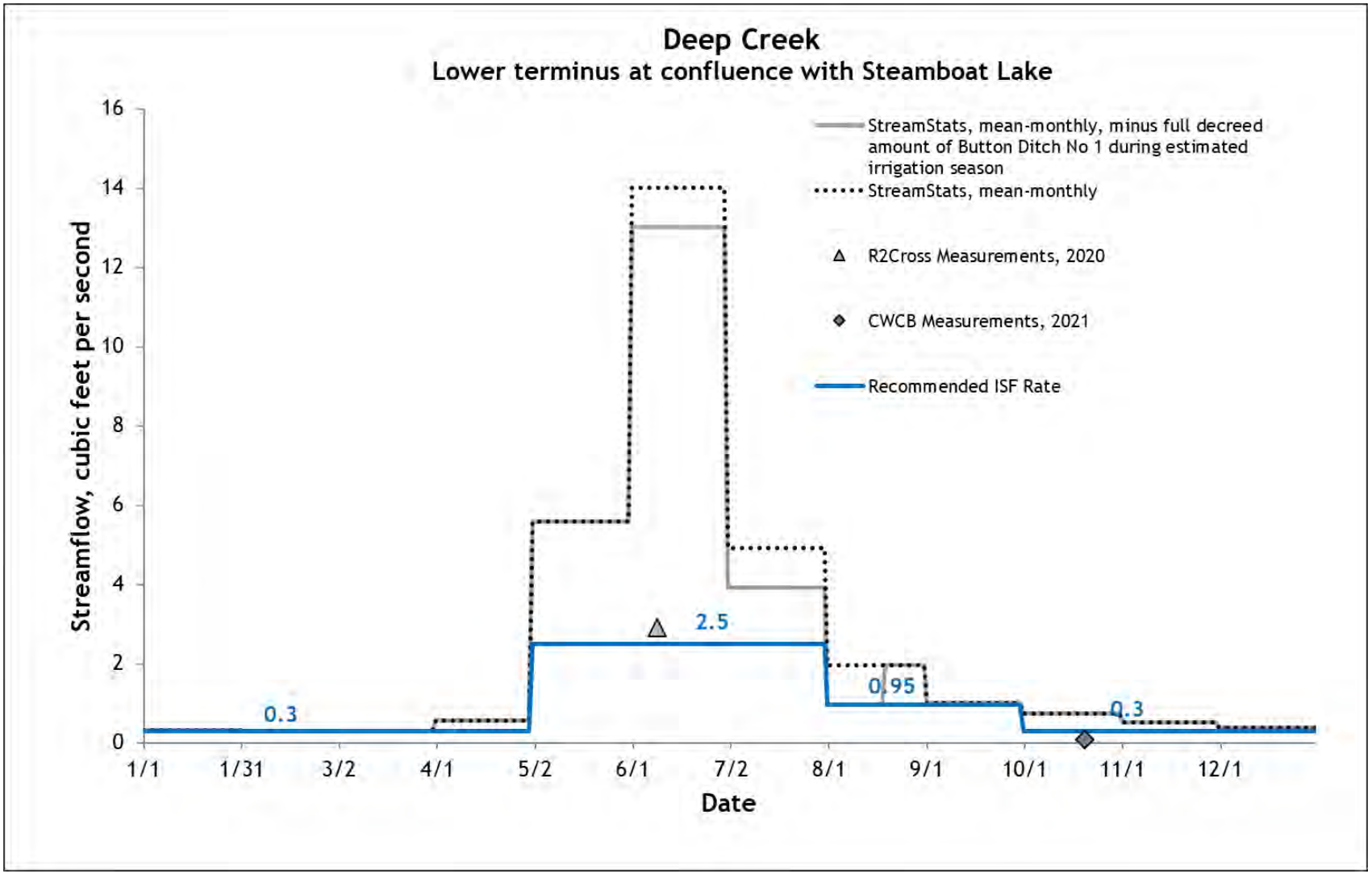
LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH



Watson Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
January 24-25, 2022

UPPER TERMINUS:	confluence Moody Creek at: UTM North: 4442915.57 UTM East: 331641.39
LOWER TERMINUS:	Hardscrabble Ditch headgate at: UTM North: 4447907.65 UTM East: 335946.66
WATER DIVISION:	6
WATER DISTRICT:	58
COUNTY:	Routt
WATERSHED:	Upper Yampa
CWCB ID:	19/6/A-008
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	5.86 miles
FLOW RECOMMENDATION:	1.1 cfs (08/16 - 03/31) 1.9 cfs (04/01 - 06/21)

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 ISF water right on a reach of Watson Creek. Watson Creek is located within Routt County and is approximately 1.5 miles east of the Town of Yampa (See Vicinity Map). The stream originates in the Routt National Forest and flows northeast for 11 miles until it reaches the confluence with the Yampa River.

The proposed reach extends from the confluence with Moody Creek downstream to Hardscrabble Ditch headgate for a total of 5.86 miles. Ninety-three percent of the land on the proposed reach is privately owned and 7% of the land is owned and managed by the BLM (See Land Ownership Map). BLM is interested in protecting this stream to meet management goals aimed at maintaining and enhancing habitat that supports fish species, maintaining 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 Watson Creek was sent to the mailing list in November 2021, March 2021, November 2020, March 2020, March 2019, November 2018, and March 2018. Staff also sent notice letters to identified landowners adjacent to Watson Creek based on information available in the county assessors website. Public notice of this recommendation was also published in the Steamboat Pilot on October 28, 2021.

Staff presented information about the ISF program and this recommendation to the Routt County Board of County Commissioners on November 1, 2021 and October 9, 2018. In addition, CWCB and BLM staff met with a number of interested landowners and Water Commissioner Scott Hummer on July 9, 2021 to discuss the ISF recommendation and answer questions about the ISF program.

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.

Watson Creek is a cool-water stream that runs through high elevation, shrubby grasslands with a low to moderate gradient. The recommended reach flows through a shallow valley, which ranges from a quarter mile to a half mile in width. The land in the reach is primarily agricultural pastures used for grazing livestock. There are healthy riparian communities of willow, sedges, and rush species, which are more abundant in areas fenced off from grazing. BLM and CWCB noted some areas with bank erosion and lower abundance of riparian species in locations with higher livestock usage. There is evidence of some nutrient and sediment loading with some algal growth. BLM staff identified the water quality as being acceptable for supporting cool-water fish species. The substrate consists mostly of sand with some small to medium gravel and cobble. The largest cobbles noted by staff were four inches in diameter.

BLM fish surveys documented self-supporting populations of longnose suckers, whitehead suckers, and creek chub. Fish were also frequently noted by CWCB staff during site visits, as well as a mink. Populations of macroinvertebrate species that are tolerant of cool to warm water were found in the reach, including mayfly nymphs, caddisfly nymphs, and water boatmen. Three distinct species of aquatic plants were also found growing near the CWCB's streamflow measurement location.

Table 1. List of species identified in Watson Creek.

Species Name	Scientific Name	Protection Status
White Sucker	*Catostomus commersonii*	None
Longnose Sucker	*Catostomus catostomus*	None
Creek Chub	*Semotilus atromaculatus*	None
water boatmen	*Corixidae*	None
caddisfly	*Tricoptera*	None
mayfly	*Ephemeroptera*	None
American mink	*Neovison vison*	None
willow	*Salix spp.*	None
sedge	*Carex spp.*	None
rush	*Juncus spp.*	None

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 two transects for this proposed ISF reach by BLM (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 1.10 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 1.91 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 2. Summary of R2Cross transect measurements and results for Watson Creek.

Date, XSec #	Top Width (feet)	Streamflow (cfs)	Accuracy Range (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
08/02/2017, 1	12.77	2.52	1.01 - 6.30	1.10	2.27
08/02/2017, 2	10.19	2.57	1.03 - 6.43	Out of range	1.54
			Mean	1.10	1.91

ISF Recommendation

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

1.90 cfs is recommended from April 1 to June 21. This recommendation is driven by the average depth criteria and wetted perimeter criteria. During the early irrigation season, which typically begins in May, maintaining this flow rate in the creek would provide adequate habitat for maintaining fish species while irrigation diversions occur. This flow rate will maintain sufficient physical habitat in the creek for the fish population to complete important parts of their life cycle while physical habitat is abundant due to higher flows.

An instream flow water right is not recommended for the peak irrigation season, from June 22 through August 15, due to insufficient information about potential water availability limitations.

1.10 cfs is recommended from August 16 through March 31. This recommendation is driven by the average velocity criteria. This flow rate should provide adequate habitat during late summer and fall for the fish populations to complete important parts of their life cycle after habitat is restricted during the annual period of high irrigation diversions. This flow rate should also prevent complete icing of the numerous pools in this reach, allowing the fish populations to 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.

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 Watson Creek is 16.40 square miles, with an average elevation of 8,867 feet and average annual precipitation of 28.06 inches (See the Hydrologic Features Map). Hydrology in the region is primarily driven by snowmelt runoff with relatively high flows during spring and early summer and lower flows in mid to late summer due to irrigation uses.

There are a number of water uses in the basin tributary to the proposed Watson Creek ISF, including 47.2 cfs in absolute surface water diversions and 510.5 AF in storage water rights. In addition, the Coal Creek Ditch (WDID 5800589, 8 cfs, appropriation date 1945) imports water from Bear Creek into Watson Creek. Four ditches are located within the proposed ISF reach (Table 3). Of these, all but the Ferguson Ditch are known to dry up the stream, primarily after snowmelt runoff in later summer. Due to surface water diversions and transbasin imports both upstream and within the ISF reach, hydrology in this drainage basin does not represent natural flow conditions.

Table 3. Structures located within the proposed ISF reach on Watson Creek.

WDID	Structure Name	Total Decreed Flow Rate, cfs	Appropriation Dates
5800634	Ferguson Ditch	15	1886, 1930
5800827	Powell Ditch 1	1	1889, 1919
5800725	Laramore Ditch	5	1885, 1888, 1919
5800828	Powell Ditch 2	2	1892, 1919, 1962

Data Analysis

Gage Data

There are no current or historic streamflow gages on Watson Creek. No representative gages on nearby streams were identified in part due to the high level of water use in Watson Creek and the nearest streams with gages. However, a number of gages in the region were evaluated to assess the typical timing of snowmelt runoff (Table 4). These gages consistently show that runoff starts between mid-March and early April, with a peak occurring mid-April to mid-May.

Table 4. Nearby gages evaluated to determine typical timing of snowmelt runoff. Reported location is described relative to the proposed lower terminus on Watson Creek.

ID	Gage Name	Period of Record	Location
09238000	Oak Creek near Oak Creek	1952-1957	7.1 miles northwest
09243900	Foidel Creek at Mouth	1975-2001	15.6 miles north
09060700	Egeria Creek near Toponas	1965-1973	8.7 miles southeast

CWCB Gage and Staff Measurements

CWCB Staff installed a temporary gage near the lower terminus and made 14 streamflow measurements on the proposed reach of Watson Creek as summarized in Table 5. This gage location records the impact from consumptive uses in the basin (in other words the impacts of upstream consumptive water uses is reflected in the gage data), but it does not capture potential dry up points at upstream locations. This gage was operated from late July of 2019 to October of 2020. Site conditions such as aquatic vegetation and ice presented a number of challenges in developing a stage-discharge relationship. These issues were addressed using a variety of techniques that result in conservative estimates (meaning that the estimated flow is likely less than the actual flow). Median hydrology was not calculated due to the short period of record. All of the direct streamflow measurements were higher than the proposed ISF flow rates.

Table 5. Summary of streamflow measurements for Watson Creek.

Visit Date	Flow (cfs)	Collector
05/07/2018	6.24	CWCB*
06/04/2019	12.28	CWCB
06/28/2019	11.54	CWCB
07/29/2019	10.25	CWCB
07/29/2019	4.62	CWCB*
05/06/2019	12.86	CWCB
11/07/2019	3.60	CWCB
12/06/2019	2.94	CWCB
07/08/2020	3.59	CWCB
09/18/2020	2.58	CWCB
07/23/2020	6.16	CWCB
10/11/2020	2.53	CWCB
04/04/2021	9.63	CWCB
07/09/2021	1.30	BLM & CWCB

*Indicates measurements made on BLM property midway through the proposed reach, these measurements are not included in the hydrograph.

Staff evaluated the Yampa River at Steamboat gage (USGS 09239500, period of record 1904 to 2020 with three missing years), to assess how 2018, 2019, and 2020 compared hydrologically to a longer record. This gage is located approximately 22 miles north from the proposed lower terminus on Watson Creek. Based on this analysis, water year 2018 was less than the 25th percentile for total annual streamflow, 2019 was near the 75th percentile, and 2020 was just less than the 50th percentile. However, both 2019 and 2020 experienced little to no summer precipitation resulting in unusually low streamflow late summer through fall. Therefore, the

available streamflow data from 2018 represents very low flows, 2019 represents high runoff, and 2020 represents below median flows. All three years show dry late summer and fall conditions.

Diversion Records
In some cases, diversion records can be used to provide an indication of water availability in a stream reach. The Hardscrabble Ditch, which is located at the proposed lower terminus, is decreed for 2.0 cfs (0.5 cfs with an 1885 appropriation date and 1.5 cfs with a 1919 appropriate date). The diversion structure historically was used fairly consistently starting in the 1930s, but has seen no or limited use since about 1990 (there is recorded use in 1909, 2000, 2010, and 2014). Due to the large number of years without use, median diversions were calculated without including zeros. The records generally show that median diversions (in years with diversions) exceed the proposed ISF rate between June and mid-September. The median diversions in early spring and late fall are somewhat less; these time periods have very limited data which likely reflects reduced irrigation demand rather than water availability limitations. Measuring structures have only recently been installed in this area and some structures are under orders to install them; therefore, the historic diversion records are based on the professional judgment of the water commissioner or estimated values submitted by the ditch owners.

StreamStats
The USGS StreamsStats tools was used to estimate streamflow during late fall, winter, and spring when stock and irrigation uses are minimal or non-existent. StreamStats results are not relied on during the main irrigation season.

Water Commissioner Comments
In addition to the CWCB streamflow measurements, staff contacted Scott Hummer, who is the current water commissioner. Mr. Hummer has been the water commissioner for Watson Creek since 2017. Between 2017 and 2020, the Yampa River basin has experienced a large range in hydrologic conditions. Based on the Yampa River at Steamboat gage (USGS 09239500, period of record 1904 to 2020 with 3 missing years), the total flow volume in water years 2017 and 2018 were ranked less than the 25th percentile, 2019 was near the 75th percentile, and 2020 was just less than the 50th percentile. 2018 and 2020 were also the first years that the Yampa River was placed under administration.

Based on these conditions, Mr. Hummer has observed that the Powell Ditch 1 & 2 and the Laramore Ditch can and do sweep the stream, typically from about June 22 to August 15. Other than those time-frames, water users appear to have sufficient water and no local calls have been placed on Watson Creek. In Mr. Hummer's experience, the proposed ISF flow rates are available for appropriation.

Water Availability Summary
The hydrograph (See Complete Hydrograph) shows the streamflow gage data, the median diversions and the 95% confidence interval for median diversions for the Hardscrabble ditch, StreamStats mean-monthly streamflow, and the proposed ISF. This ISF reach presents challenging conditions to evaluate water availability and there is insufficient information to evaluate if water is available from June 22 to August 15 due to the potential for dry up points within the stream reach. The CWCB streamflow measurements and StreamStats indicate that water is available for appropriation from late September to late May. The availability of water

from late May to June 21 and August 16 to late September is based on streamflow measurements, diversion records, and expertise of the water commissioner. Taken together, these data and the observations from the water commissioner support the finding that water is available during the proposed time-frames.

MATERIAL INJURY

Because the proposed ISF on Watson 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.

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

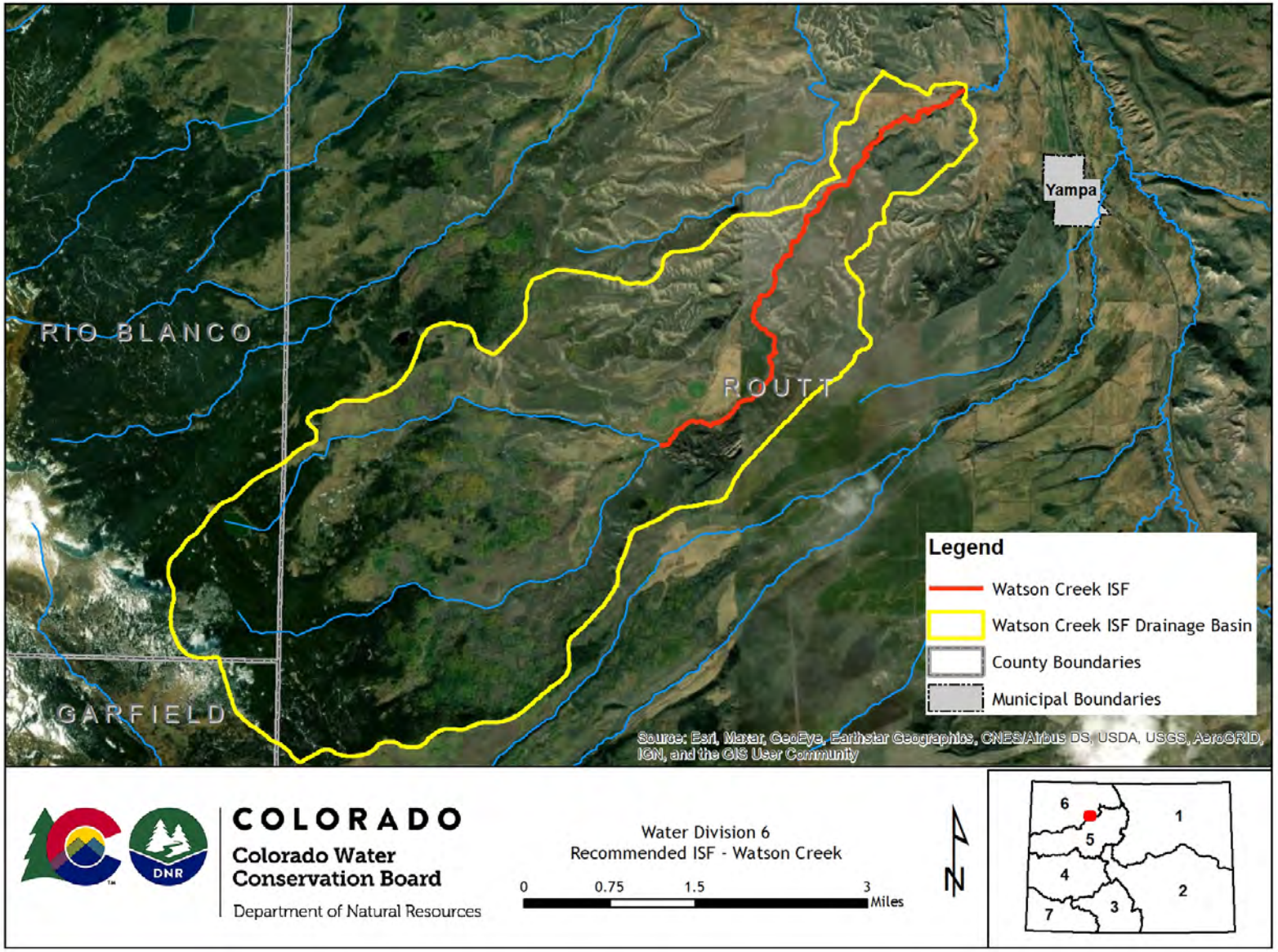
Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

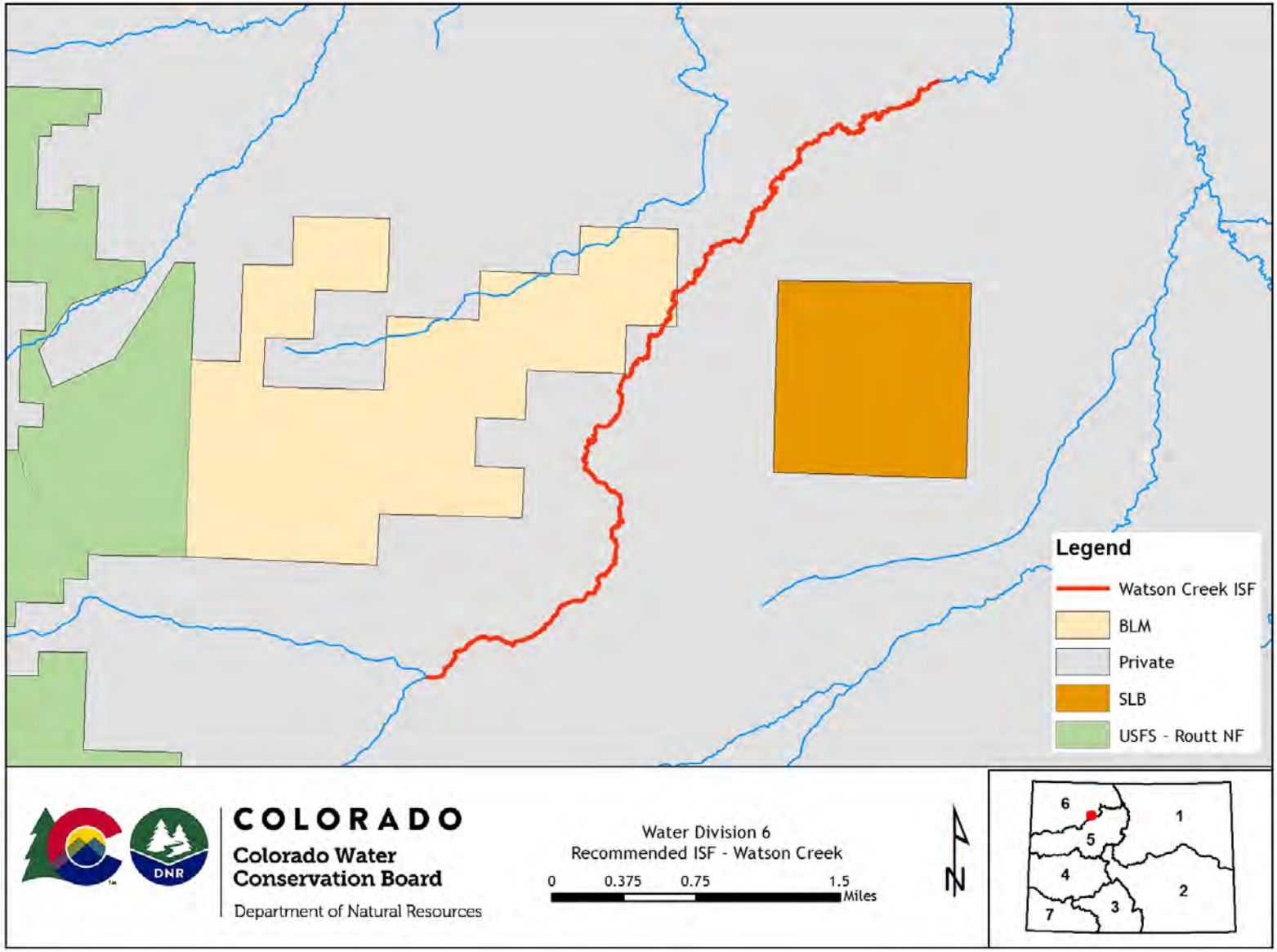
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

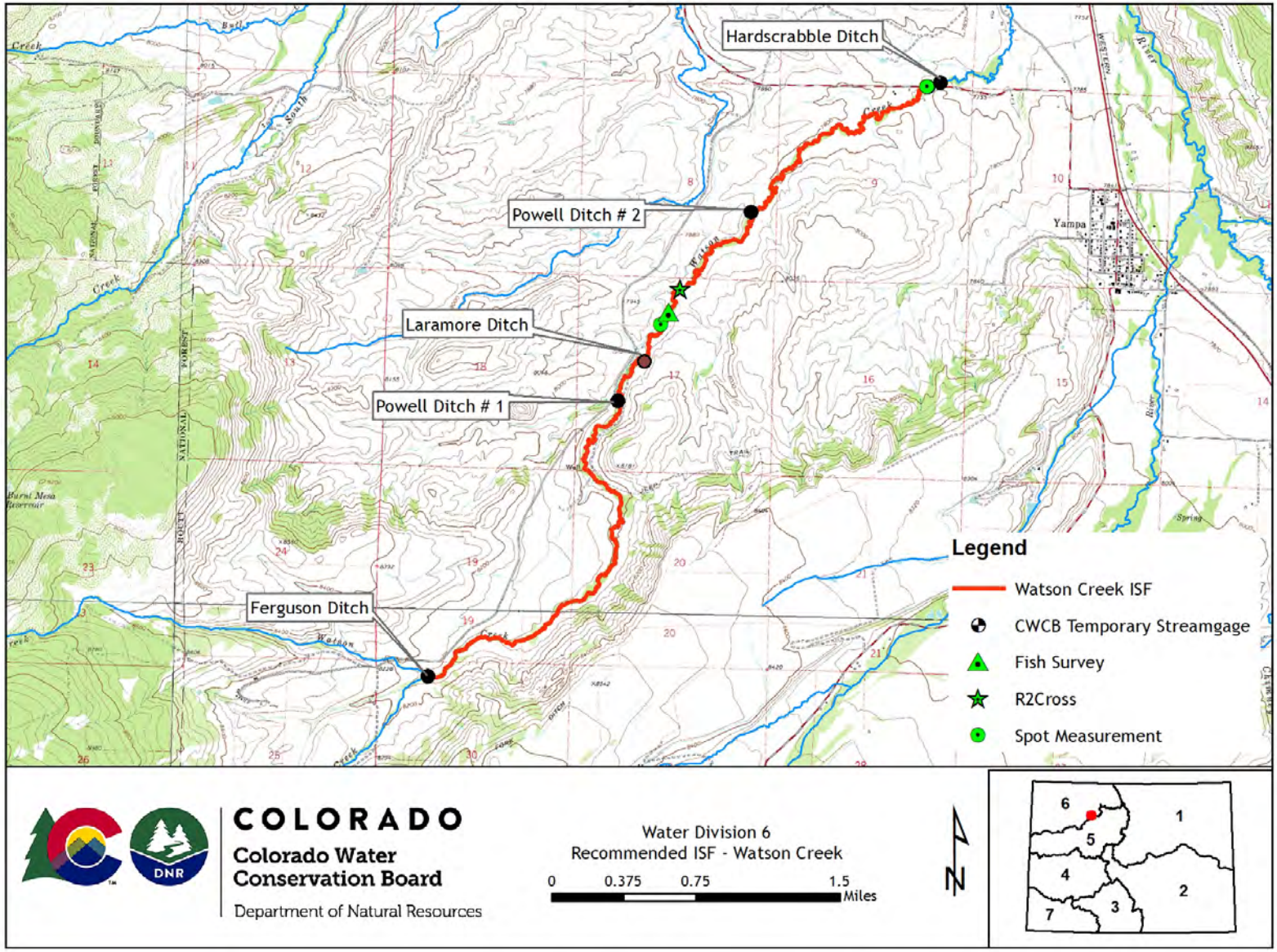
VICINITY MAP



LAND OWNERSHIP MAP



HYDROLOGIC FEATURES MAP



COMPLETE HYDROGRAPH