BEFORE THE COLORADO WATER CONSERVATION BOARD
STATE OF COLORADO

IN THE MATTER OF STAFF'S RECOMMENDATIONS FOR AN INSTREAM FLOW APPROPRIATION ON EAST MUDDY CREEK BETWEEN THE CONFLUENCE WITH LEE CREEK AND THE CONFLUENCE WITH MUDDY CREEK, WATER DIVISION 4

PREHEARING STATEMENT OF STAFF OF THE COLORADO WATER CONSERVATION BOARD

Pursuant to the Hearing Officer's August 6, 2025 Notice of Prehearing Conference & Deadlines for Submissions, and pursuant to Rule 5n(2) of the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, 2 CCR 408-2 ("ISF Rules"),[1] the Staff of the Colorado Water Conservation Board ("CWCB Staff") hereby submits its prehearing statement in support of Staff's recommendations for an instream flow ("ISF") appropriation on East Muddy Creek in the subject reach and in the amounts shown in the table below.

Water Division	Stream	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus	Flow (CFS)
4	East Muddy Creek	North Fork Gunnison	Gunnison	6.32	confluence Lee Creek	confluence Muddy Creek	11.2 (11/01 - 02/28) 20 (03/01 - 03/31) 23 (04/01 - 06/30) 14.5 (07/01 - 10/31)

Staff's recommendations for the East Muddy Creek ISF appropriation is described in greater detail within the East Muddy Creek ISF Recommendation Executive Summary Report ("Staff's ISF Executive Summary"), prepared by Staff and provided to the Colorado Water Conservation Board ("Board") for its March 19–20, 2025, regular board meeting. **Exhibit No. CWCBStaff-1**.

I. CWCB STAFF'S POSITION STATEMENT: SPECIFIC STATEMENT OF THE FACTUAL AND LEGAL CLAIMS ASSERTED AND THE LEGAL BASIS THEREOF

The United States Bureau of Land Management ("BLM") recommended the East Muddy Creek ISF appropriation to protect known year-round habitat for self-sustaining populations of speckled dace, mottled sculpin, bluehead sucker, rainbow

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[1] The ISF Rules have been provided as Exhibit No. CWCBStaff-8 for the Board's convenience.

trout, fathead minnow, and white sucker, as well as a riparian community generally comprised of willow species, alder, spruce and narrowleaf cottonwood. At its March 19–20, 2025, regularly scheduled Board meeting, the CWCB Board declared its intent to appropriate an ISF water right on East Muddy Creek. Hummingbird Ranch now contests the Board's declaration of intent to appropriate the East Muddy Creek ISF water right. For the reasons discussed herein, CWCB Staff recommends the Board take the following actions:

1) Determine, pursuant to section 37-92-102(3), C.R.S., that for the East Muddy Creek ISF appropriations identified and described in Staff's ISF Executive Summary:
    a) There is a natural environment that can be preserved to a reasonable degree with the recommended water rights, if granted;
    b) The natural environment will be preserved to a reasonable degree by the water available for the recommended appropriation; and
    c) Such natural environment can exist without material injury to water rights.

2) Pursuant to ISF Rule 5f., establish the appropriation date for the East Muddy Creek ISF appropriation as the date of the filing of the water court application which will occur no sooner than December 1, 2025 and no later than December 31, 2025.

3) Include in the East Muddy Creek appropriation and in future water court application, filings, and decree the terms and conditions agreed upon between the CWCB Board, Ragged Mountain Water Users Association, and the North Fork Water Conservancy District.

4) Request CWCB Staff to work with the Attorney General's office to file applications for these water rights in water court, in accordance with section 37-92-102(3), C.R.S., by the end of the calendar year.

A. Background History

East Muddy Creek originates in the Gunnison National Forest at the confluence of Little Muddy Creek and Clear Fork, approximately 14.5 miles northeast of the town of Paonia. This mountain-valley stream flows south-east until it passes under

Highway 133, then it takes a more southerly direction, following the highway south until it converges with West Muddy Creek to form Muddy Creek above Paonia Reservoir.

In January of 2020, at the Board's annual ISF Workshop, BLM recommended that the Board appropriate an ISF water right on East Muddy Creek. CWCB Staff subsequently mailed notice of the potential East Muddy Creek ISF appropriation in March and November of 2020 to everyone who was signed up for the ISF Subscription Mailing List for Water Division 4. **Exhibit No. CWCBStaff-9 *and* 10**. In September of 2023 CWCB Staff also mailed letters to landowners adjacent to East Muddy Creek within the recommended reach.[2]

This recommendation was postponed for several years to gather additional data. But notice of the potential appropriation of an ISF water right on East Muddy Creek was sent to the ISF Subscription Mailing List for Water Division 4 at least once every year (March 2020, March 2021, March 2022, March 2023, March 2024, and November 2024). **Exhibit No. CWCBStaff-9, 11, 13, 14, 16, *and* 17**. A public notice about this recommendation was also published in the Crested Butte News on January 5, 2024, and December 20, 2024, **Exhibit No. CWCBStaff-15 *and* 18**, and the Delta County Independent on December 12, 2024, **Exhibit No. CWCBStaff-19**.

CWCB Staff presented information about the ISF program and the recommended East Muddy Creek ISF appropriation to the Gunnison County Board of County Commissioners on November 10, 2020, September 13, 2022, October 24, 2023, and October 8, 2024. On September 26, 2023, CWCB Staff also met with Luke Reschke and Doug Christner, who are Water Commissioners for District 40 in Water Division 4, to better understand the water administration on East Muddy Creek and its tributaries. After that CWCB Staff met with members of the North Fork Gunnison Water Users Association and Raquel Flinker, who is the Director of Interstate and Regional Water Resources at Colorado River District, on November 28, 2023, to discuss the East Muddy Creek ISF recommendation. On April 13, 2024, CWCB Staff then met with members of the Ragged Mountain Water Users Association ("RMWUA") and Raquel Flinker again to discuss their concerns about BLM's recommendation.

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[2] Landowners were identified based on information obtained from the county assessor's website.

BLM submitted a final recommendation in writing to the Board on February 27, 2025. **Exhibit No. CWCBStaff-2**. CWCB Staff then evaluated the accuracy of the recommendation and performed detailed hydrological analyses to ensure that the East Muddy Creek recommendations met the statutory requirements for an ISF appropriation. CWCB Staff subsequently prepared the ISF Executive Summary, which contains data, analysis, and other information in support of the East Muddy Creek ISF appropriation. **Exhibit No. CWCBStaff-1**.

More than 60 days before the regularly scheduled March Board Meeting, the Board gave notice to the public that it would consider whether to form its intent to appropriate several ISF water rights in water divisions 4, 6, and 7, including the East Muddy Creek ISF appropriation. **Exhibit No. CWCBStaff-17**. At the meeting, CWCB Staff recommended the East Muddy Creek ISF appropriation to the Board. **Exhibit No. CWCBStaff-20**. The Board subsequently took public comment, deliberated, and then declared its intent to appropriate the East Muddy Creek ISF water right. **Exhibit No. CWCBStaff-28**.

Notice of the Board's declaration to appropriate the East Muddy Creek ISF water right was posted to the Board's website and emailed to the ISF Subscription Mailing List for Water Division 4 on March 25, 2025. **Exhibit No. CWCBStaff-21**. At the May Board Meeting, the CWCB Board took public comment on the East Muddy Creek ISF recommendation. **Exhibit No. CWCBStaff-29**. After the May CWCB Board Meeting, Hummingbird Ranch submitted a timely notice to contest the East Muddy Creek ISF appropriation to the Board on June 2, 2025. **Exhibit No. CWCBStaff-23**.

Notice that the East Muddy Creek ISF appropriation was contested was posted on the Board's website and emailed to the ISF Subscription Mailing List for Water Division 4 on Sunday, June 6, 2025. **Exhibit No. CWCBStaff-24**. This Notice indicated that the Board would schedule a hearing to evaluate the Board's decision to declare its intent to appropriate the contested proposed ISF water rights and included information about how anyone who desires to participate in that hearing can obtain party status. No one filed notice of party status.

At the last CWCB Board Meeting on July 17, 2025, the Board appointed a hearing officer and set a hearing for the contested East Muddy Creek ISF appropriation to commence in conjunction with the November 19–20, 2025 CWCB Board Meeting. **Exhibit No. CWCBStaff-25 *and* 30**.

B. Board Determinations for Appropriating an Instream Flow Water Right

In 1973, the General Assembly created the Colorado Instream Flow and Natural Lake Level Program and charged the Colorado Water Conservation Board ("Board") with implementing and administering that program. Accordingly, section 37-92-102(3) vests the Board with the exclusive authority to appropriate minimum instream flow water rights:

> … [R]ecognizing the need to correlate the activities of mankind with some reasonable preservation of the natural environment, the Colorado water conservation board is hereby vested with the exclusive authority, on behalf of the people of the state of Colorado, to appropriate in a manner consistent with sections 5 and 6 of article XVI of the state constitution, such waters of natural streams and lakes as the board determines may be required for minimum streamflows or for natural surface water levels or volumes for natural lakes to preserve the natural environment to a reasonable degree.

Before the Board takes final action and directs Staff to file a water rights application with the Water Court, the Board must evaluate the recommendation and make three determinations:

(1) Natural Environment. That there is a natural environment that can be preserved to a reasonable degree with the Board's water right, if granted.

(2) Water Availability. That the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made.

(3) Material Injury. That such environment can exist without material injury to water rights.

These determinations are required by section 37-92-102(3)(c), C.R.S., and by Rule 5i of the ISF Rules. The Board must make findings related to each determination. During a hearing on a contested ISF appropriation, a party may raise only those issues relevant to the statutory determinations stated above. ISF Rule 5j(3).

1. A Natural Environment Exists that Can be Preserved to a Reasonable Degree

There is an existing natural environment of native and introduced fishes and riparian communities that can be preserved on East Muddy Creek between the confluence with Lee Creek and the confluence with Muddy Creek in Gunnison County.

The proposed East Muddy Creek ISF appropriation is a cold-water, low to moderate gradient perennial stream that flows through a mountain valley. As shown by BLM's recommendation letter and attached report, the stream consists of various medium-sized substrates, including gravels, cobbles, and small boulders, and has a good mix of pool and riffle habitat for supporting introduced and native fish populations. **Exhibit No. CWCBStaff-1, *and* 2**. Paonia Reservoir, which is located downstream of the proposed ISF reach, prevents fish migration between East Muddy Creek and the Gunnison River. As a result, East Muddy Creek provides important year-round habitat for existing native species found in the stream. *Id.*

A recent fishery survey conducted in the summer of 2025 showed that, despite the extremely dry conditions, there is a self-sustaining population of native species, including Speckled Dace, Sculpin, and Bluehead Suckers, and introduced species, including rainbow trout, fathead minnow, and white sucker. **Exhibit No. CWCBStaff-6**. The BLM lists Bluehead Suckers as sensitive species,[3] which are native species that require special management to avoid future listing under the Endangered Species Act. **Exhibit No. CWCBStaff-5**. Bluehead sucker is also the subject of a multi-party, multi-state conservation agreement, known as the Three Species Agreement, aimed at preventing the listing of bluehead suckers under the Endangered Species Act. **Exhibit No. CWCBStaff-7**. BLM's recommendation letter and attached report also shows that the proposed ISF reach in East Muddy Creek is

[3] Criteria that apply to BLM sensitive species include the following: (1) species under status review by the U.S. Fish and Wildlife Service; or (2) species with numbers declining so rapidly that federal listing may become necessary; or (3) species with typically small and widely dispersed populations; or (4) species inhabiting ecological refugia or other specialized or unique habits. The Three Species meet the first two of the criteria listed above, qualifying them as BLM "sensitive species."

habitat to riparian plants, including willow, alder, spruce, and narrowleaf cottonwoods species. *Id.*

In brief, there is an existing natural environment in and along the East Muddy Creek ISF appropriation that supports a healthy fish and riparian community.

2. Water Available for the East Muddy Creek Appropriation will Preserve the Natural Environment to a Reasonable Degree

The ISF rates recommended for the East Muddy Creek appropriation: (1) are based upon standard scientific methodology and analyses; (2) are required to preserve the natural environment to a reasonable degree; and (3) reflect the amount of water available for appropriation as an ISF water right.

The ISF rates recommended for the subject reaches of East Muddy Creek are based upon standard scientific methodology and accurate analyses. BLM used their professional judgement and past experiences to determine that the R2Cross model was appropriate to quantify the amount of water necessary to preserve the existing natural environment. **Exhibit No. CWCBStaff-1, *and* 2;** *see generally* **Exhibit No. CWCBStaff-3 *and* 4**.

The R2Cross model estimates the biological amount of water needed for summer and winter periods based on a hydraulic model developed using field data collected in stream riffles, which are areas of the channel most likely to dry if streamflow ceases. *Id*. The data collected for the R2Cross model includes streamflow measurement, a survey of channel geometry and features at a cross-section of the stream, and a survey of the longitudinal slope of the water surface. *Id*. The R2Cross model estimates hydraulic conditions at different water stages at the measured cross-section. The results of the model are then used to evaluate three hydraulic criteria: (1) average depth, (2) average velocity, and (3) percent wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types will maintain aquatic habitat in pools and runs for most life stages of fish and aquatic macro-invertebrates. *Id*. The recommending entity used the results of the R2Cross model and its biological expertise to develop the ISF recommendation for the subject reach of East Muddy Creek. *Id*.

CWCB Staff then evaluated water availability for the subject reach based on a hydrologic and water rights analysis. As part of this analysis, CWCB Staff gathered a wide range of technical data, including stream gage data, spot streamflow measurements, diversion records, and regression-based models. After initial conversations with various stakeholders, CWCB Staff selected the most

conservative (lowest available streamflow) analysis method, which was based on recent streamflow gage data. This data was used to create a hydrograph which shows water availability within the proposed ISF reach over a year. **Exhibit No. CWCBStaff-1**. CWCB Staff further adjusted the analysis in response to local stakeholder feedback regarding water availability during high irrigation use periods. Based on their analysis and stakeholder engagement, CWCB Staff determined that there is water available in the flow rates recommended by BLM for the subject reaches of East Muddy Creek.

Ultimately, the Board has the exclusive authority to determine the amount and timing of water necessary to preserve the natural environment to a reasonable degree. And to further the General Assembly's intent, as expressed in section 37-92-103(3), C.R.S., to "correlate the activities of mankind with some reasonable preservation of the natural environment," CWCB Staff recommends an ISF appropriation on the subject reach of East Muddy Creek in the amounts and times listed in their ISF Executive Summary. *Id.* at p. 5.

3. <u>The East Muddy Creek Appropriation will not Materially Injure to Water Rights</u>

The proposed East Muddy Creek ISF appropriation will not materially injure other water rights for several reasons. First, if decreed, the proposed East Muddy Creek ISF water right will be junior to existing water rights, including conditional water rights. Second, under section 37-92-102(3)(b), C.R.S. the East Muddy Creek ISF appropriation "shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." And third, because ISF water rights are non-consumptive, and do not divert water from the stream, the Board may appropriate an ISF water right for water that will be diverted downstream. Because of this the East Muddy Creek ISF appropriation will not materially injure other water rights.

C. Other Legal and Policy Issues Raised by the Hearing Request

The following are some of the issues raised by Hummingbird Ranch's notice to contest, which are not necessarily addressed by the required determination discussed above. CWCB Staff will more fully address these or other issues that may be raised in other parties' Prehearing Statements through CWCB Staff's Rebuttal Statement.

1. Hummingbird Ranch disputes the accuracy and sufficiency of CWCB Staff's water availability analysis.

Hummingbird Ranch disputes the accuracy and sufficiency of CWCB Staff's water availability analysis for several reasons. First, the amount of water available for East Muddy Creek ISF is based on multiple sources of stream gage data including the USGS Gage on East Muddy Creek near Bardine (USGS ID 9130500), which operated from 1930–1953, a CWCB temporary gage installed on West Muddy Creek from 2021–2024, and DWR's MUDAPRCO Gage which is located downstream on Muddy Creek above Paonia Reservoir (DWR WDID 4003152). Hummingbird Ranch contends that these records do not take into account drought years from 2000–2020, unprecedented low runoff in 2025, or Hummingbird Ranch's long-term prediction that there will be less water available in East Muddy Creek going forward because of lower annual runoff from warmer temperatures, lower snowpack, increased evaporation, dry ground absorption, etc. *See* **Exhibit No. CWCBStaff-23**.

Whenever possible, CWCB Staff relies on long-term stream gage data to evaluate streamflow. However, there is not a strict requirement for the Board to rely on such data when appropriating new ISF water rights, so when such data is unavailable or insufficient, CWCB Staff uses other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and regression-based models. Because of data limitations on East Muddy Creek and West Muddy Creek,[4] CWCB Staff decided to install a temporary gage near the lower terminus of the West Muddy ISF reach. **Exhibit No. CWCBStaff-1**. No suitable gage locations were identified for a temporary gage directly on East Muddy Creek.

To calculate streamflow in East Muddy Creek from 2021–2024 using the West Muddy Creek Gage, CWCB Staff subtracted the daily streamflow obtained from the West Muddy Gage from the daily streamflow obtained from the MUDAPRCO Gage. To verify the reliability of these calculations, CWCB Staff

[4] The West Muddy Creek ISF appropriation was recommended concurrently with the East Muddy Creek ISF appropriation. The West Muddy Creek ISF was uncontested and the Board took final action on it during the May 2025 Board Meeting. **Exhibit No. CWCBStaff-29**.

compared these calculated daily streamflows to the daily median streamflow from the East Muddy Creek Gage near Bardine. Because the shape and timing of peak flows were similar, CWCB Staff is confident that the calculated streamflow in the East Muddy Creek for 2021–2024 are accurate. *Id.*

Despite Hummingbird Ranch's contention, in determining the amount of water available for an ISF appropriation, the Board is not limited to the amount of water available during drought years. The flow rates recommended for the East Muddy Creek ISF appropriation are based on the best available data and analysis methods, taking into consideration wet and dry years. CWCB Staff evaluated numerous different ways to analyze water availability. Based on their professional judgement, past experiences, and interviews with various stakeholders and local water users, CWCB Staff selected a method to analyze water availability which resulted in the lowest estimate of available streamflow.

Also, the Board does not need to take into consideration Hummingbird Ranch's long-term predictions that East Muddy Creek will dry-up. To appropriate water in Colorado, a prospective appropriator must divert unappropriated water and intentionally apply that water to a beneficial use. As explained in Section I.B.2 above, CWCB Staff's water analysis shows that there is currently water available for the Board to appropriate. The Board, just like other prospective appropriators in Colorado, is not required to prove will be available in the future. To require proof of future availability would be to speculate on future river conditions, meteorological changes, the actions of other water rights holders, and other complicated factors that cannot be easily quantified. Requiring the Board to limit itself based on questionable and uncertain predictions would foreclose on the Board's ability to appropriate any ISF water rights whatsoever, and its constitutional right to appropriate unappropriated waters of State for beneficial use.

2. <u>The existing habitat is unlikely to exist in the future if East Muddy Creek dries-up.</u>

Hummingbird Ranch asserts that it is inappropriate for the Board to appropriate an ISF water right on East Muddy Creek because it claims the subject is likely to dry up. For the same reason that the Board does not need to consider Hummingbird Ranch's long-term predictions that East Muddy Creek will dry-up, as stated in the previous section above (section I.C.1), the Board does not need to consider conjecture about whether the natural environment will cease to exist. The Board's Instream Flow Program is intended to protect the natural environment to a reasonable decree. This may mean curtailing future junior diversions when there is

not sufficient water for the ISF water right. This also means that at times the ISF water right will not be met and will not be in priority due either to hydrologic conditions or senior water uses or the combination. More importantly, the natural environment and aquatic ecosystem in East Muddy Creek has already weathered significant and known periods of low flow such as in 1995 and in 2002 and despite this the fish persist.

3. Ragged Mountain Water Users Association needs the ability to seek new water storage rights if current sources of exchange augmentation water is reduced or lost due to sedimentation of Paonia Reservoir.

Hummingbird Ranch believes that due to sedimentation in Paonia Reservoir, sources of exchange and augmentation historically available to Ragged Mountain Water Users Association ("RMWUA") will be reduced or lost. Hummingbird Ranch, asserts that RMWUA must be allowed the ability to seek new water storage rights to compensate for those losses. While this concern is not one of the three required determinations under section 37-92-102(3), the Board and RMWUA have already agreed to terms and conditions to be included in any Final Action by the Board on the East and West Muddy Creek ISFs and included in any future water court filings to address these concerns. CWCB Staff believe these terms are sufficient to address Hummingbird Ranch's concerns too. *See* **Exhibit No. CWCBStaff-22** (stating terms and conditions agreed to be included in any Final Action by the Board on the East and West Muddy Creek ISF).

4. Alternatives, including a 0.5 cfs lease of Columbine Ditch water, may be more effective to protect the existing environment from dry-up conditions than the proposed East Muddy Creek ISF appropriation.

In exchange for abandoning the Board's intent to appropriate East Muddy Creek ISF water right, Hummingbird Ranch has offered to lease 0.5 cfs of its Columbine Ditch water right to the Board. While a future acquisition to assist during drought or other low flow conditions may be helpful, temporary leases such as what Hummingbird Ranch appears to be offering requires an underlying ISF water right. If the Board abandons its intent to appropriate the East Muddy Creek ISF water right, as requested, then under ISF Rule 6k, the Board cannot also accept a temporary lease of water for ISF use. Therefore, what Hummingbird appears to be offering cannot be done.

Even if Hummingbird Ranch offered a permanent acquisition, which does not require an underlying ISF, and even if such permanent acquisition was for part of its Columbine Ditch water right, which is a senior water right, an amount of 0.5 cfs would not be enough to preserve the natural environment to a reasonable decree. The lease amount offered by Hummingbird Ranch is far below the minimum flow rate needed to protect the fishery and natural environment in and along the subject reach of East Muddy Creek. *See* **Exhibit No. CWCBStaff-1 *and* 2** (explaining the minimum flow rate necessary to preserve the natural environment).

Hummingbird Ranch also suggests that there are other better alternatives than the proposed ISF to improve fish habitat and populations, including supporting measures to improve water quality and reduce sedimentation of Paonia Reservoir with revegetation along the banks of Muddy Creek's headwaters. CWCB Staff believe that these efforts are not mutually exclusive. Also, the suggested alternatives are speculative at this time. Hummingbird has not provided any evidence or indication that anyone is pursuing these alternatives or that these alternatives would offer the same or similar benefits as the East Muddy Creek ISF appropriation would have on preserving the natural environment. Ultimately, the Board has discretion to exercise its statutory authority to appropriate the East Muddy Creek, if the Board believes that doing so would preserve the natural environment to a reasonable degree without injuring other water rights regardless of other alternatives.

5. <u>The Proposed East Muddy Creek ISF appropriation will negatively affect long-term water and land use options and economic development in the surrounding area.</u>

Hummingbird Ranch contends that the East Muddy ISF appropriation will hamper economic development in the surrounding area. The purpose of the Instream Flow Program is "… to correlate the activities of mankind with some reasonable preservation of the natural environment" by appropriating "waters of natural streams … as the board determines may be required for minimum streamflows … to preserve the natural environment to a reasonable degree." The Board is not required to speculate about the economic impacts of the proposed ISF appropriation. There may also be arguments that the East Muddy Creek ISF appropriation will improve economic development in the area.

D. Desired Time

CWCB Staff requests 90 minutes to present any direct and rebuttal testimony.

E. Conclusion and Staff's Requested Relief/Recommendation

Staff's recommendation for an ISF appropriation on East Muddy Creek between the confluence with Lee Creek and the confluence with Muddy Creek in the amounts set forth in CWCB Staff's ISF Executive Summary, is appropriate and will protect the existing natural environment to a reasonable decree without materially injuring any water rights. As enumerated above in Section I of this prehearing statement, CWCB Staff recommends that the Board: (1) Determine, pursuant to section 37-92-102(3), C.R.S., that for the East Muddy Creek ISF appropriations identified and described in Staff's ISF Executive Summary: (a) There is a natural environment that can be preserved to a reasonable degree with the recommended water rights, if granted; (b)The natural environment will be preserved to a reasonable degree by the water available for the recommended appropriation; and (c) Such natural environment can exist without material injury to water rights. (2) Pursuant to ISF Rule 5f., establish the appropriation date for the East Muddy Creek ISF appropriation as the date of the filing of the water court application which will occur no sooner than December 1, 2025 and no later than December 31, 2025. (3) Include in the East Muddy Creek appropriation and in future water court application, filings, and decree the terms and conditions agreed upon between the CWCB, Ragged Mountain Water Users Association, and the North Fork Water Conservancy District. (4) Request CWCB Staff to work with the Attorney General's office to file applications for these water rights in water court, in accordance with section 37-92-102(3), C.R.S., by the end of the calendar year.

II. Exhibit List

CWCB Staff may introduce the following documents and tangible things as exhibits during the trial of this case:

ENGINEERING DATA, BIOLOGICAL DATA, AND REPORTS

EXHIBIT NO.	DESCRIPTION OF EXHIBIT
CWCBStaff-1	CWCB Staff, East Muddy Creek Executive Summary: CWCB Staff Instream Flow Recommendation (March 18, 2025)
CWCBStaff-2	November 27, 2024, Letter Report from Joel Humphies, on behalf of Alan Bittner, BLM Deputy State Director, to Rob Viehl, Section Chief of the CWCB Stream and Lake Protection Section concerning BLM's Instream Flow Recommendation for East

	Muddy Creek, along with supporting field data, photographs, maps, and analysis.
CWCBStaff-3	CWCB, R2Cross model- User's manual and technical guide (2022), https://r2cross.erams.com/
CWCBStaff-4	CWCB, R2Cross field manual (2024), https://dnrweblink.state.co.us/cwcbsearch/0/edoc/224685/R2Cross%20Field%20Manual%202024.pdf
CWCBStaff-5	Bureau of Land Management, Manual Transmittal Sheet: 6840 – Special *Status Species Management* (Dec. 12, 2008)
CWCBStaff-6	BLM, Uncompahgre Field Office Stream Survey July 2025: East Fork Muddy Creek – Water Code: 41765

CONTRACTS, LEASES, AND OTHER AGREEMENTS

EXHIBIT NO.	DESCRIPTION OF EXHIBIT
CWCBStaff-7	Utah Division of Wildlife Resources, Range-wide conservation agreement and strategy for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker. Publication Number 06-18 (Sept. 2006) (a/k/a Three Species Agreement)

ADMINISTRATIVE RULES AND REGULATIONS

EXHIBIT NO.	DESCRIPTION OF EXHIBIT
CWCBStaff-8	Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, 2 CCR 408-2 (Effective 9/14/2025)

NOTICES AND SUBMISSIONS TO THE BOARD

EXHIBIT NO.	DESCRIPTION OF EXHIBIT
CWCBStaff-9	March 2020 CWCB Notice to the ISF Subscription Mailing List, identifying streams that may be considered for instream flow (ISF) appropriations in 2021
CWCBStaff-10	November 2020 CWCB Notice to the ISF Subscription Mailing List, identifying streams that may be considered for instream flow (ISF) appropriations in 2021

CWCBStaff-11	March 2021 CWCB Notice to the ISF Subscription Mailing List, identifying streams that may be considered for instream flow (ISF) appropriations in 2021
CWCBStaff-12	November 2023 CWCB Notice to the ISF Subscription Mailing List, identifying streams that may be considered for instream flow (ISF) appropriations in 2024
CWCBStaff-13	March 2022 CWCB Notice to the ISF Subscription Mailing List, identifying streams that may be considered for instream flow (ISF) appropriations in 2023
CWCBStaff-14	March 2023 CWCB Notice to the ISF Subscription Mailing List, identifying streams that may be considered for instream flow (ISF) appropriations in 2024
CWCBStaff-15	Public Notice of East Muddy Creek ISF Recommendation Published in the Crested Butte News (Jan. 5, 2024)
CWCBStaff-16	March 2024 CWCB Notice to the ISF Subscription Mailing List, identifying streams that may be considered for instream flow (ISF) appropriations in 2025
CWCBStaff-17	November 2024 CWCB Notice to the ISF Subscription Mailing List, identifying streams that may be considered for instream flow (ISF) appropriations in 2025
CWCBStaff-18	Public Notice of East Muddy Creek ISF Recommendation Published in the Crested Butte News (Dec. 20, 2024)
CWCBStaff-19	Public Notice of East Muddy Creek ISF Recommendation Published in the Delta County Independent (Dec. 12, 2024)
CWCBStaff-20	March 19, 2025, CWCB Board Meeting Agenda Item No. 5c, Request to Form Intent to Appropriate
CWCBStaff-21	March 25, 2025 CWCB Notice of Intent Formed to Appropriate Proposed 2025 Instream Flow Appropriations in Water Divisions 4, 6, & 7
CWCBStaff-22	May 21, 2025, CWCB Board Meeting Agenda Item 9b - Public Comment on 2025 Instream Flow Appropriations in Water Division 4, 6, and 7.
CWCBStaff-23	June 2, 2025 Hummingbird Ranch Notice to Contest East Muddy Creek ISF

CWCBStaff-24	June 6, 2025 CWCB Notice of Contested 2025 ISF Appropriations
CWCBStaff-25	July 17, 2025, CWCB Board Meeting Agenda Item No. 19b, Contested 2025 Instream Flow Appropriations in Water Divisions 4 and 6
CWCBStaff-26	Notice of Prehearing Conference & Deadlines for Submissions, *served on East Muddy Creek Instream Flow Recommendation Hearing Participants* on August 6, 2025

OTHER INFORMATION

EXHIBIT NO.	DESCRIPTION OF EXHIBIT
CWCB Staff-27	CWCB Staff, CWCB Instream Flow Workshop Power Point Presentation (February 8, 2024)
CWCB Staff-28	*March 19, 2025 Board Meeting*, YouTube, https://www.youtube.com/live/rQ01ESuByqE.
CWCB Staff-29	*May 21, 2025 Board Meeting*, YouTube, https://www.youtube.com/watch?v=vKmtB9x9YSg&list=PLtC1SluPUwzI6Q7VeqlvU6d6_gbKDS9g2&index=5
CWCB Staff-30	*July 16, 2025 Board Meeting*, YouTube, https://www.youtube.com/watch?v=qCJjpD0sdcA&list=PLtC1SluPUwzI6Q7VeqlvU6d6_gbKDS9g2&index=3

1) Staff for the Colorado Water Conservation Board may introduce and rely on any exhibits, documents or tangible things introduced or disclosed by any other party to this hearing.

2) Staff for the Colorado Water Conservation Board may also introduce any demonstrative exhibits, rebuttal exhibits, and any other exhibits allowed by the Hearing Officer.

3) Copies of the exhibits listed herein have been made available at the secure file sharing site MOVEit. An email notice has been or will be sent to each individual on the service list providing instructions for accessing the exhibits on MOVEit by entering your email and setting up a password. Please be advised that, in the past, some parties have not received MOVEit-generated emails due to the parties' email firewalls. Please contact Melissa Ciener at melissa.ciener@coag.gov if you do not

receive the email notice described above or are not able to access the exhibits listed herein using MOVEit.

III. Witness List

CWCB Staff witnesses include CWCB Staff and representatives from BLM. The witness list below includes a description of the anticipated testimony for each witness and their respective resumes:

A. Staff for the Colorado Water Conservation Board May Call the Following Witnesses:

ROY SMITH
Water Rights and Instream Flow Coordinator
Bureau of Land Management
Denver Federal Center, Building 40 Lakewood, CO 80215
(303) 239-3940

Mr. Smith may provide a presentation on the information contained in BLM's Recommendation Letter and Report, which has been provided as **Exhibit No. CWCBStaff-2**. Specifically, Mr. Smith may provide a presentation about (1) BLM's basis for its ISF recommendations; and (2) the biological benefits of the potential appropriation, including how the natural environment will be preserved and improved by the potential appropriation; (3) his on the ground observations. Mr. Smith will be available during the hearing to answer questions from the Board. Mr. Smith's resume is available upon request.

KATIE BIRCH
Physical Scientist and Instream Flow Coordinator
Colorado Parks and Wildlife
2300 S. Townsend Ave.
Montrose, CO 81401
(970) 819-1037

Ms. Birch may provide a presentation on the information contained in Staff's ISF Executive Summary, which has been provided as **Exhibit No. CWCBStaff-1**. Specifically, Ms. Birch may provide a presentation about (1) the biological benefits of the potential appropriation, including how the natural environment will be preserved and improved by the potential appropriation; (2) her on the ground observations. Ms. Birch will be available

during the hearing to answer questions from the Board. Mrs. Birch's resume is available upon request.

LAURA CORONA
Hydrographer
Colorado Water Conservation Board
1313 Sherman Street, Room 718
Denver, CO 80203
(303) 945-5246

Ms. Corona may provide information contained in Staff's ISF Executive Summary, which has been provided as **Exhibit No. CWCBStaff-1**. Specifically, Ms. Corona may provide information about (1) measurements and data collection for the proposed ISF appropriation; and (2) her on the ground observations. Ms. Corona will be available during the hearing to answer questions from the Board. Ms. Corona's resume is available upon request.

MARIELLE SIDELL
Hydrologist
Colorado Water Conservation Board
1313 Sherman Street, Room 718
Denver, CO 80203
(303) 607-8102

Ms. Sidell may provide a presentation on the information contained in Staff's ISF Executive Summary, which has been provided as **Exhibit No. CWCBStaff-1**. Ms. Sidell may provide a presentation on how CWCB conducted the water availability analysis for the subject ISF recommendations. Ms. Sidell may offer expert opinion and factual testimony. Ms. Sidell will be available during the hearing to answer questions from the Board. Ms. Sidell's resume is available upon request.

BRANDY LOGAN
Water Resource Specialist
Colorado Water Conservation Board
1313 Sherman Street, Room 718
Denver, CO 80203
(720) 854-3237, ext. 3241

Ms. Logan may provide a presentation on the information contained in Staff's ISF Executive Summary, which has been provided as **Exhibit No. CWCBStaff-1**. Ms. Logan may provide a presentation on how CWCB conducted the water availability analysis for the subject ISF recommendations. Ms. Logan may offer expert opinion and factual testimony. Ms. Logan will be available during the hearing to answer questions from the Board. Ms. Logan's resume is available upon request.

ROB VIEHL
Section Chief of the Stream and Lake Protection Section
Colorado Water Conservation Board
1313 Sherman Street, Room 718
Denver, CO 80203
(720) 854-3237, ext. 3237

Mr. Viehl may provide a presentation on the information contained in Staff's ISF Executive Summary, which has been provided as **Exhibit No. CWCBStaff-1**. Mr. Viehl may provide a presentation on: (1) the general history and background of the East Muddy Creek ISF appropriation; (2) CWCB's involvement in the East Muddy Creek ISF appropriation; (3) and policies and issues related to the Instream Flow Program. Mr. Viehl will be available during the hearing to answer questions from the Board. Mr. Viehl's resume is available upon request.

B. Reservation Of Additional Witnesses:

Staff for the Colorado Water Conservation Board may also call (1) any witness needed to provide information the Board may need to make the necessary determinations required under section 37-92-102(3) in the above captioned matter, (2) any witness needed for rebuttal purposes, (3) any witness disclosed, identified, or offered by any other party to this hearing.

IV. Alternative Proposal

CWCB Staff is not submitting an alternative proposal with its prehearing statement but reserves the right to submit alternative proposal along with its rebuttal statement.

V. Written Testimony

Staff is not submitting written testimony with its prehearing statement, but reserves the right to submit written testimony along with its rebuttal statement.

VI. Legal Memoranda

Staff is not submitting legal memoranda with this prehearing statement, but reserves the right to submit legal memoranda along with its rebuttal statement.

DATED: September 3, 2025

PHILIP J. WEISER
Attorney General

/s/ Christopher J. Davis

CHRISTOPHER J. DAVIS, #58659*
Assistant Attorney General
Natural Resources and Environment Section
Attorneys for the Staff of the Colorado Water Conservation Board
*Counsel of Record

CERTIFICATE OF SERVICE

I hereby certify that I have duly served the copies of the foregoing **Prehearing Statement of the Staff of the Colorado Water Conservation Board** upon all parties herein by email, on September 3, 2025, addressed as follows:

Hearing Officer

Jennifer Mele
First Assistant Attorney General
Water Conservation Unit
Colorado Attorney General's Office
1300 Broadway, 10th Floor
Denver, CO 80203
(720) 508-6282
jen.mele@coag.gov

Party Status

Colorado Water Conservation Board: Robert Viehl Colorado Water Conservation Board 1313 Sherman Street, Room 718 Denver, CO 80203 (720) 854-3237 rob.viehl@state.co.us Christopher Davis Assistant Attorney General Water Resources Unit Colorado Attorney General's Office 1300 Broadway, 10th Floor Denver, CO 80203 (720) 508-6280 christopher.Davis@coag.gov	Bureau of Land Management: Roy Smith Bureau of Land Management Denver Federal Center, Building 40 Lakewood, CO 80215 (303) 239-3940 r20smith@blm.gov
Hummingbird Ranch: Jim Auster and Merrilee Bliss Hummingbird Ranch 26140 Hwy 133 Somerset CO 81434 (970) 618-7692 jimauster@hotmail.com	

A duly signed original is on file with the Office of the Attorney General for the State of Colorado.

/s/ Melissa Ciener

East Muddy Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
March 19-20, 2025

UPPER TERMINUS:	confluence Lee Creek at UTM North: 4327742.52 UTM East: 295050.07
LOWER TERMINUS:	confluence Muddy Creek at UTM North: 4319399.06 UTM East: 295770.58
WATER DIVISION/DISTRICT:	4/40
COUNTY:	Gunnison
WATERSHED:	North Fork Gunnison
CWCB ID:	21/4/A-005
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	6.32 miles
FLOW RECOMMENDATION:	11.2 cfs (11/01 - 02/29) 20 cfs (03/01 - 03/31) 23 cfs (04/01 - 07/31) 14.5 cfs (08/01 - 10/31)

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

BACKGROUND

Colorado's General Assembly created the Instream Flow and Natural Lake Level Program in 1973, recognizing "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3), C.R.S.). The statute vests the Colorado Water Conservation Board (CWCB or Board) with the exclusive authority to appropriate and acquire instream flow (ISF) and natural lake level water rights (NLL). Before initiating a water right filing, the Board must determine that: 1) there is a natural environment that can be preserved to a reasonable degree with the Board's water right if granted, 2) the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made, and 3) such environment can exist without material injury to water rights.

The information contained in this Executive Summary and the associated supporting data and analyses form the basis for staff's ISF recommendation to be considered by the Board. This Executive Summary provides sufficient information to support the CWCB findings required by ISF Rule 5i on natural environment, water availability, and material injury. Additional supporting information is located at: https://cwcb.colorado.gov/2025-isf-recommendations.

RECOMMENDED ISF REACH

The BLM recommended that the CWCB appropriate an ISF water right on a reach of East Muddy Creek. East Muddy Creek is located within Gunnison County and is approximately 14.5 miles northeast of the town of Paonia (See Vicinity Map). The stream originates at the confluence of Little Muddy Creek and Clear Fork and flows south until it reaches the confluence with Muddy Creek above Paonia Reservoir. Muddy creek is a tributary to the North Fork Gunnison River, which is tributary to the Gunnison River.

The proposed ISF reach extends from the confluence with Lee Creek downstream to the confluence with Muddy Creek for a total of 6.32 miles. Approximately 19% of the proposed reach is managed by the BLM, while 81% is managed under private ownership. (See Land Ownership Map). BLM's management goals include maintaining and enhancing habitat that supports fish species and functional riparian and wetland systems. Establishing an ISF water right will assist in meeting these BLM objectives.

OUTREACH

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently, more than 1,100 people subscribe to the ISF mailing list. Notice of the potential appropriation of an ISF water right on East Muddy Creek was sent to the mailing list in November 2024, March 2024, January 2024, November 2023, March 2023, March 2022, March 2021, and March 2020. Staff sent letters to identified landowners adjacent to East Muddy Creek based on information from the county assessor's website. Public notices about this recommendation were published in the Crested Butte News on January 5, 2024 and December 20, 2024 and the Delta County Independent on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Gunnison County Board of County Commissioners on November 10, 2020, September 13, 2022, October 24, 2023 and October 8, 2024. Staff met with Luke Reschke, District 40 Lead Water Commissioner, and Doug Christner, District 40 Water Commissioner, on September 26, 2023 to better understand the administration on West Muddy Creek and its tributaries. CWCB and CPW

staff met with members of the North Fork Gunnison Water Users Association and Raquel Flinker from the Colorado River District on November 28, 2023 about the East Muddy Creek and West Muddy Creek ISF recommendations. CWCB and CPW staff also met with members of the Ragged Mountain Water Users Association and Raquel Flinker to discuss the recommendations on April 13, 2024. These stakeholder meetings included a presentation on the ISF recommendations and included discussions and questions about the purpose of ISF protection, stock uses, water availablity, and other concerns.

NATURAL ENVIRONMENT

CWCB staff relies on the recommending entity to provide information about the natural environment. In addition, staff reviews information and conducts site visits for each recommended ISF appropriation. This information provides the Board with a basis for determining that a natural environment exists.

East Muddy Creek is a cold-water, low to moderate gradient stream. It flows through a mountain valley approximately 0.5 miles in width. The stream cuts through alluvial deposits in some locations and is constrained by bedrock in locations where the stream comes close to valley walls. The stream generally has medium-sized substrate consisting of gravels, cobbles, and small boulders. The stream has a good mix of pool and riffle habitat for supporting introduced trout species as well as native fish species.

Fisheries surveys have revealed self-sustaining populations of speckled dace, sculpin, bluehead sucker, rainbow trout, fathead minnow, and white sucker (Table 1). Speckled dace, sculpin, and bluehead suckers are native species. Bluehead sucker appears on BLM's sensitive species list and BLM is a signatory to a multi-party, multi-state conservation agreement for that species that is designed to prevent a listing of bluehead suckers under the Endangered Species Act. Since Paonia Reservoir prevents migration of fish between East Muddy Creek and the Gunnison River, it is likely that East Muddy Creek provides year-round habitat for bluehead sucker.

Table 1. List of species identified in East Muddy Creek.

Species Name	Scientific Name	Status
brook trout	*Salvelinus fontinalis*	None
white-blue sucker hybrid	*Catostomus commersoni x discobolus*	None
white-flannelmouth hybrid	*Catostomus commersoni x latipinnis*	None
bluehead sucker	*Catostomus discobolus*	State - Species of Greatest Conservation Need
flannelmouth sucker	*Catostomus latipinnis*	State - Species of Greatest Conservation Need
fathead minnow	*Pimephales promelas*	None
sculpin	*Cottus bairdii*	None
speckled dace	*Rhinichthys osculus*	None
white sucker	*Catostomus commersonii*	None

The riparian community in this part of East Muddy Creek is generally comprised of willow species, alder, spruce, and narrowleaf cottonwood. In general, the riparian community is in good condition, provides some shading and cover for fish habitat, and provides stream stability during flood events.

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 method to develop the initial ISF recommendation. The R2Cross method is based on a hydraulic model and uses field data collected in a stream riffle (Espegren, 1996; CWCB, 2022). Riffles are the stream habitat type that are most vulnerable to dry if streamflow ceases. The data collected consists of a streamflow measurement, a survey of channel geometry and features at a cross-section, and a survey of the longitudinal slope of the water surface.

The R2Cross model uses Ferguson's Variable-Power Equation (VPE) to estimate roughness and hydraulic conditions at different water stages at the measured cross-section (Ferguson 2007, 2001). This approach is based on calibrating the model as described in Ferguson (2021). The model is used to evaluate three hydraulic criteria: average depth, average velocity, and percent wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types also will maintain aquatic habitat in pools and runs for most life stages of fish and aquatic macro-invertebrates (Nehring, 1979). BLM staff use the model results to develop an initial recommendation for summer and winter flows. The summer flow recommendation is based on the flow that meets all three hydraulic criteria. The winter flow recommendation is based on the flow that meets two of the three hydraulic criteria.

The R2Cross method estimates the biological amount of water needed for summer and winter periods. The recommending entity uses the R2Cross results and its biological expertise to develop an initial ISF recommendation. CWCB staff then evaluates water availability for the reach typically based on median hydrology (see the Water Availability section below for more details). The water availability analysis may indicate less water is available than the initial recommendation. In that case, the recommending entity either modifies the magnitude and/or duration of the recommended ISF rates if the available flows will preserve the natural environment to a reasonable degree or withdraws the recommendation.

Data Collection and Analysis

BLM collected R2Cross data at four transects for this proposed ISF reach (Table 2 and Site Map). Results obtained at more than one transect are averaged to determine the R2Cross flow rate for the stream reach. The R2Cross model results in a winter flow of 11.2 cfs and a summer flow of 23.3 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 2. Summary of R2Cross transect measurements and results for East Muddy Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/01/2018, 1	49.90	45.34	15.16	32.41
06/01/2018, 2	42.37	43.24	6.80	15.59
09/24/2019, 1	50.54	11.58	13.42	17.19
09/24/2019, 2	44.45	12.17	9.48	27.91
			11.22	23.28

ISF Recommendation

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

11.2 cfs is recommended from November 1 to February 29. This recommended flow rate meets two of three hydraulic criteria during the winter. This flow rate either meets or comes close to meeting the average depth and average velocity criteria in cross sections analyzed and should prevent icing in pools.

20.0 cfs is recommended from March 1 to March 31. This flow rate does not meet three of three criteria; it mimics spring flow initiation of snowmelt runoff.

23.0 cfs is recommended from April 1 to July 31. This flow rate meets three of three hydraulic criteria during the peak flow and snowmelt runoff period. The recommended flow rate is driven by the wetted perimeter criteria in most of the cross-section data collected. Wetting 50 to 60 percent of the channel, as recommended by the R2Cross manual for streams 40 to 60 feet in width, will provide important physical habitat during a time of year when the fish population is completing key life cycle functions.

14.5 cfs is recommended from August 1 to October 31; this flow rate is reduced due to limited water availability. This flow rate will generally meet the average velocity and average depth criteria in the cross-sections analyzed, while providing approximately 50% wetted perimeter in the wider cross sections.

WATER AVAILABILITY

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

Water Availability Methodology

Each recommended ISF reach has a unique flow regime that depends on variables such as the timing, magnitude, and location of water inputs (such as rain, snow, and snowmelt) and water losses (such as diversions, reservoirs, evaporation and transpiration, groundwater recharge, etc.). This approach focuses on streamflow and the influence of flow alterations, such as diversions, to understand how much water is physically available in the recommended reach.

Staff's hydrologic analysis is data-driven, meaning that staff gathers and evaluates the best available data and uses the best available analysis method for that data. Whenever possible, long-term stream gage data (period of record 20 or more years) are used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and regression-based models are used when long-term gage data is not available. CSUFlow18 is a multiple regression model developed by Colorado State University researchers using streamflow gage data collected between 2001 and 2018 (Eurich et al. 2021). This model estimates mean-monthly streamflow based on drainage basin area, basin terrain variables, and average basin precipitation and snow persistence. Diversion records are used to evaluate the effect of surface water diversions when necessary. Interviews with water commissioners, landowners, and ditch or reservoir operators can provide additional information. A range of analytical techniques may be employed to extend gage records, estimate streamflow in ungaged locations, and estimate the effects of diversions. The goal is to obtain the most detailed and reliable estimate of hydrology using the most efficient analysis technique.

The final product of the hydrologic analysis used to determine water availability is a hydrograph, which shows streamflow and the proposed ISF rate over the course of one year. The hydrograph will show median daily values when daily data is available from gage records; otherwise, it will present mean-monthly streamflow values. Staff will calculate 95% confidence intervals for the median streamflow if there is sufficient data. Statistically, there is 95% confidence that the true value of the median streamflow is located within the confidence interval.

Basin Characteristics

The drainage basin of the proposed ISF on East Muddy Creek is 135.4 square miles, with an average elevation of 8,673 feet and average annual precipitation of 27.3 inches. East Muddy Creek is a cold-water, moderate gradient snowmelt driven hydrologic system with influence from mid-season monsoonal periods. Higher flows typically initiate in early April and generally reach peak flow conditions by early to mid-May. Baseflow conditions are generally lowest in August and September when irrigation practices combine with late summer climate conditions. Streamflow increases slightly when upstream irrigation ends each season.

Water Rights Assessment

There are 94 active water rights on East Muddy Creek and its tributaries. These include up to 290 cfs of direct flow ditch diversions, 376 acre-feet of reservoir storage, and four ISF water rights: Clear Fork of East Muddy Creek (case number 09CW0077), Spring Creek (case number 05CW0245A) and two reaches of Little Spring Creek (case numbers 09CW0072 and 09CW0073). There is one transbasin diversion high up in the Clear Fork contributing basin, a tributary to East Muddy Creek, that exports water to West Divide Creek in Division 5. Diversion records are consistently reported from 2004 to present and show high variability in exported water volumes for the Clear Fork Feeder Ditch (station ID CLFOFDCO) from nothing in 2005 to just under 1,624 acre feet in 2023. Within the extent of the recommended reach, there is one direct diversion water right, the Old Placer Ditch (WDID 4001737), which has a 1922 appropriation date for 0.5 cfs. This structure is listed as inactive and no records are maintained, however Luke Reschke indicated that new owners intend to rehabilitate this structure (personal communication, 2/05/2025).

The North Fork Gunnison River is often under administration with calls extending up both West and East Muddy Creek. The priority calling dates are typically in the late 1800s to early 1900's, but the exact priority can shift through the season. Typically, the call is on by late-July, but some calls have occurred as early as June. North Fork Water Conservancy District was decreed multiple points of exchange upstream of Paonia Reservoir in case number 05CW0236, with up to a volumetric limit of 2,000 acre feet. According to Water Commissioner Luke Reschke, in most years this exchange starts towards the end of July and the seasonal limit is reached by early to mid-September (personal communication, 9/26/2023 and 1/03/2024).

Data Collection and Analysis

Representative Gage Analysis

No current or long-term gages exist within the reach for the ISF recommendation on East Muddy Creek. There is one historic gage, East Muddy Creek Near Bardine, CO (BARDINE, USGS ID 9130500) that monitored streamflow conditions from 1934-1953 at a point approximately 1 mile above the confluence of West and East Muddy Creek. Streamflow at the Bardine gage was analyzed at a median daily timestep as well as calculated to mean monthly streamflow. Due to data limitations on West Muddy Creek, CWCB staff opted to install a temporary gage at the lower terminus of the current recommended ISF reach on West Muddy Creek. No suitable gage locations were identified for a temporary gage on East Muddy Creek. Staff used this data in conjunction with a downstream gage on Muddy Creek above Paonia Reservoir CO (MUDAPRCO, DWR WDID: 4003152) to estimate streamflow on East Muddy Creek.

West Muddy Temporary Gage Analysis

CWCB installed a temporary gage (West Muddy gage) near the lower terminus of the West Muddy ISF reach 500 feet above the point where West Muddy and East Muddy combine to create Muddy Creek. West Muddy Creek is monitored by Hobo MX2001 pressure transducer at a 15-minute interval that was installed on May 19, 2021; gaged West Muddy discharge data is analyzed through October 8, 2024 (period of record, POR: 5/19/2021 – 10/8/2024). There are periods when the gage was ice affected each winter, and the pressure transducer failed for two weeks during the rising limb of 2022. Water year 2023 received the most precipitation during the gage record and this is reflected in the hydrographs for each year. 2024 snowmelt peaked at the earliest date in late April and lowest streamflow at 125 cfs. By comparison, streamflow in 2023 reached over 400 cfs 10 days later than 2024 and maintained high flows longer than the other two water years.

Staff analyzed total streamflow from the MUDAPRCO gage during its POR from 1985 to present to contextualize gaged data on West Muddy gage. MUDAPRCO is located approximately 2,300 ft downstream from the confluence of East and West Muddy Creek. Annual streamflow yield during the previous 30-year record (1995-2024) show that the three years monitored represent a year that is slightly above median yield, a wet year and a dry year for 2022 through 2024, respectively. Therefore, the three years monitored during the POR, represent variability in patterns of streamflow generation and timing.

Estimated East Muddy Creek Streamflow

The West Muddy daily gaged streamflow, as described above, was subtracted from MUDAPRCO daily gaged streamflow to calculate streamflow in East Muddy Creek from 2021-2024. The estimated daily data for East Muddy Creek was compared to daily median streamflow from the East Muddy Bardine gage. The shape and timing of peak flows were similar, and the estimated

streamflow based on the West Muddy gage and MUDAPRCO was lower than the Bardine gage during the higher streamflow months. Daily average East Muddy Creek streamflow was calculated as mean monthly streamflow (See Complete Hydrograph). Due to missing data from ice at the MUDAPRCO gage, the final estimated streamflow for East Muddy Creek includes mean-monthly streamflow from the Bardine gage from December through February.

The East Muddy reach is affected by within basin diversions. For a summary, please see existing water rights assessment section above. Given that the impacts of diversions are reflected in gage records at the West Muddy gage and at MUDAPRCO, no further adjustments were made to assess the impact on water available for the ISF reach. Staff also considered streamflow from Dugout Creek, a tributary below the East Muddy Creek and above MUDAPRCO and determined it to be negligible and no further adjustments were necessary

Site Visit Data
CWCB staff made one streamflow measurement on the proposed reach of East Muddy Creek as summarized in Table 3.

Table 3. Summary of streamflow measurements for East Muddy Creek.

Visit Date	Flow (cfs)	Collector
11/06/2023	16.9	CWCB

Water Availability Summary
The hydrograph shows estimated mean-monthly streamflow on East Muddy Creek, as described in the Data Collection and Analysis section above, along with the proposed ISF rate. The proposed ISF flow rate is below the mean-monthly streamflow. Staff has concluded that water is available for appropriation.

MATERIAL INJURY
If decreed, the proposed ISF on East Muddy Creek would be a new junior water right. This ISF water right can exist without material injury to other senior water rights. Under the provisions of section 37-92-102(3)(b), C.R.S., the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

Common Acronyms and Abbreviations

Term	Definition
af	acre feet
BLM	Bureau of land management
cfs	cubic feet per second
CWCB	Colorado Water Conservation Board
CPW	Colorado Parks and Wildlife
DWR	Division of Water Resources
HCCA	High Country Conservation Advocates
ISF	Instream Flow
NLL	Natural Lake Level
USGS	United States Geological Survey
USFS	United States Forest Service
XS	Cross section

Citations

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

Colorado Water Conservation Board, 2024, R2Cross field manual. Retrieve from URL: https://dnrweblink.state.co.us/cwcbsearch/0/edoc/224685/R2Cross%20Field%20Manual%202024.pdf

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

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

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

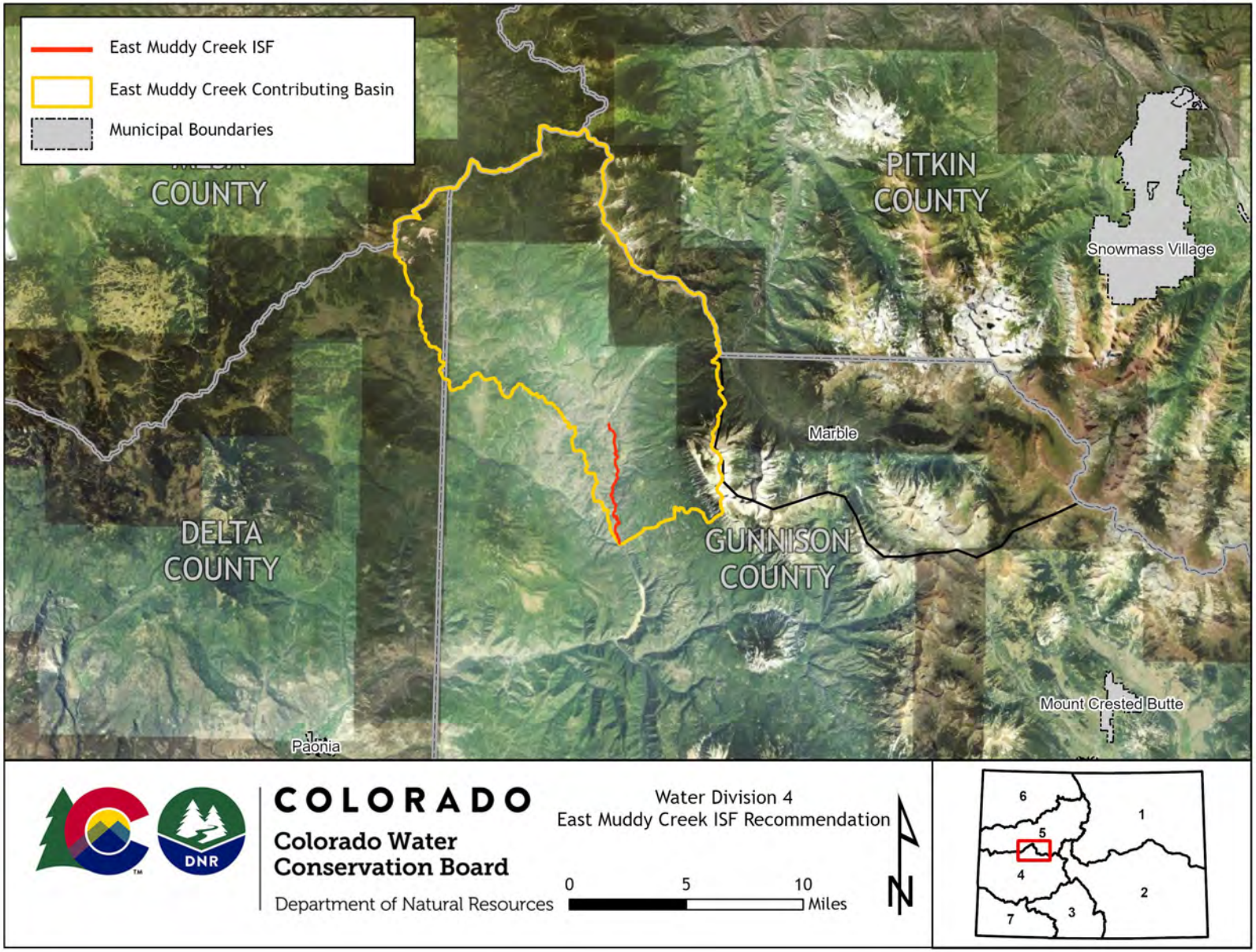
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

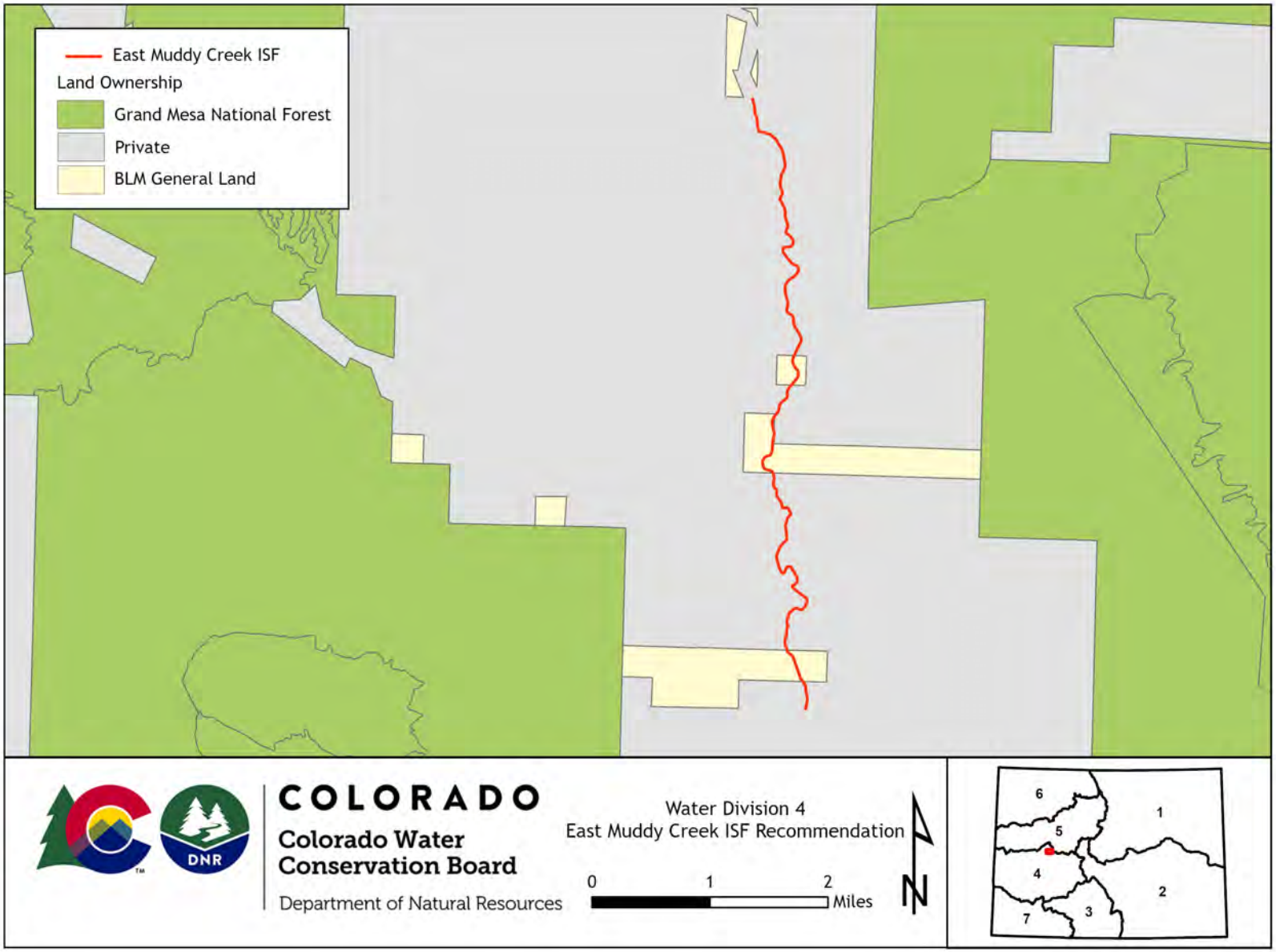
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

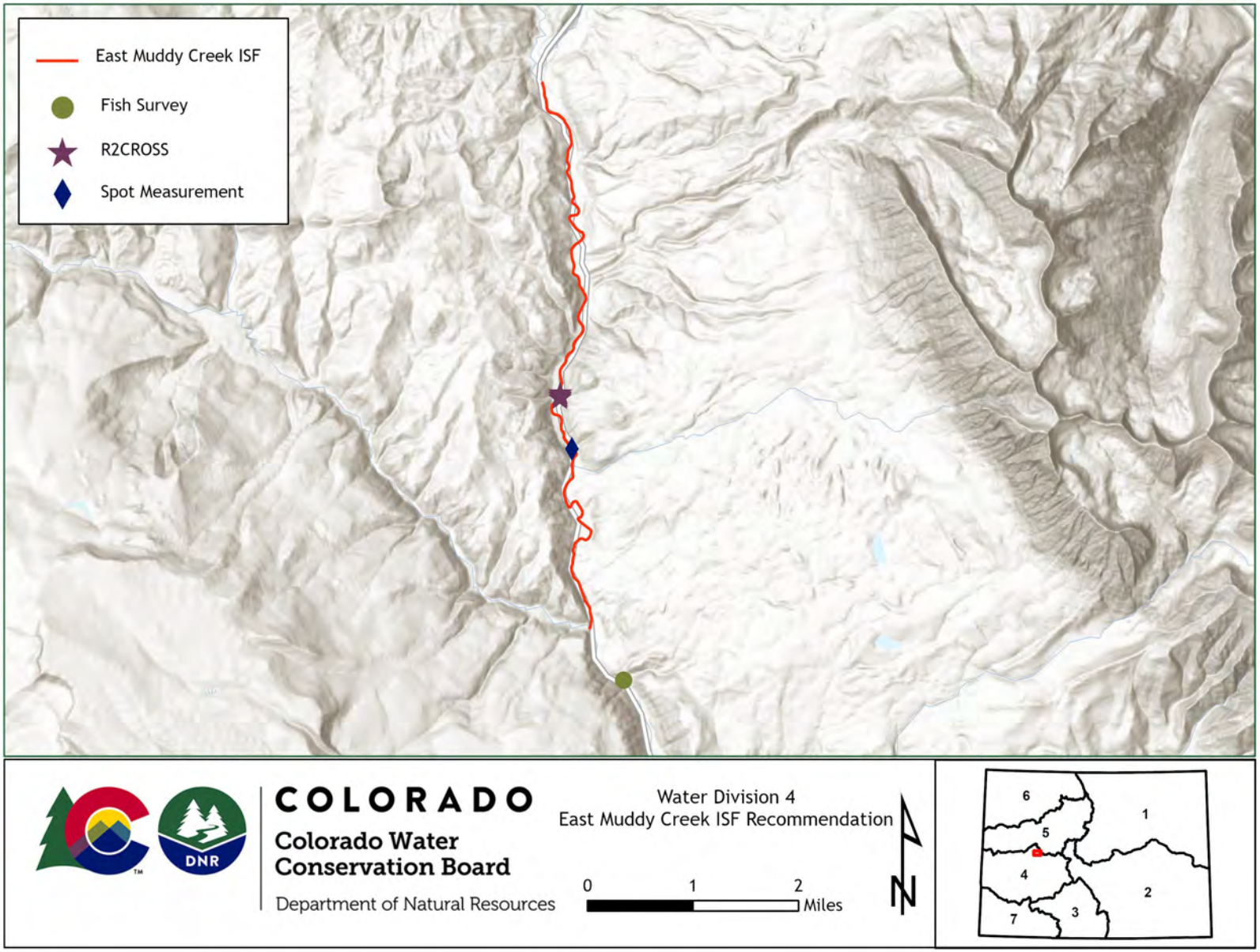
VICINITY MAP



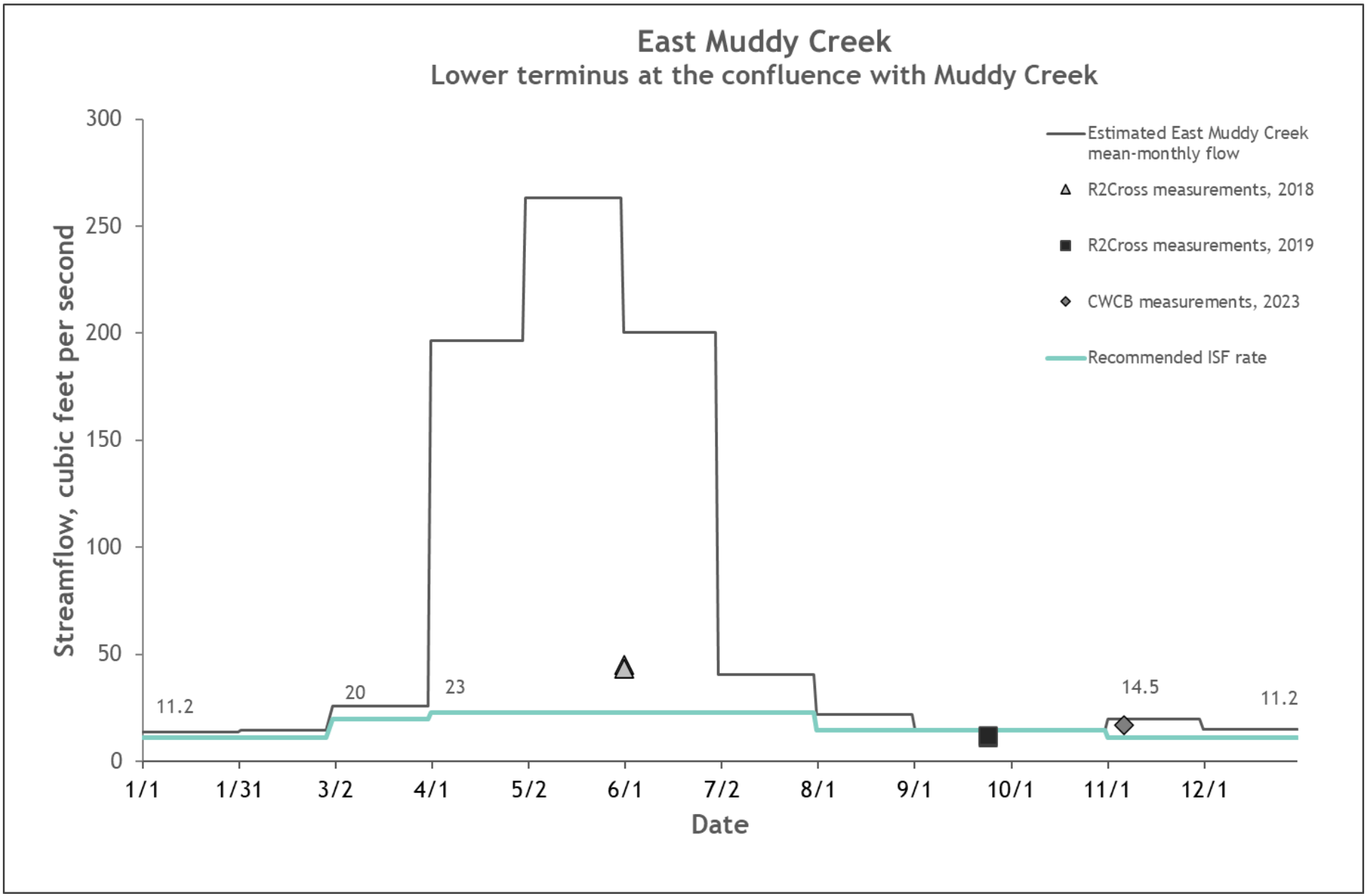
LAND OWNERSHIP MAP



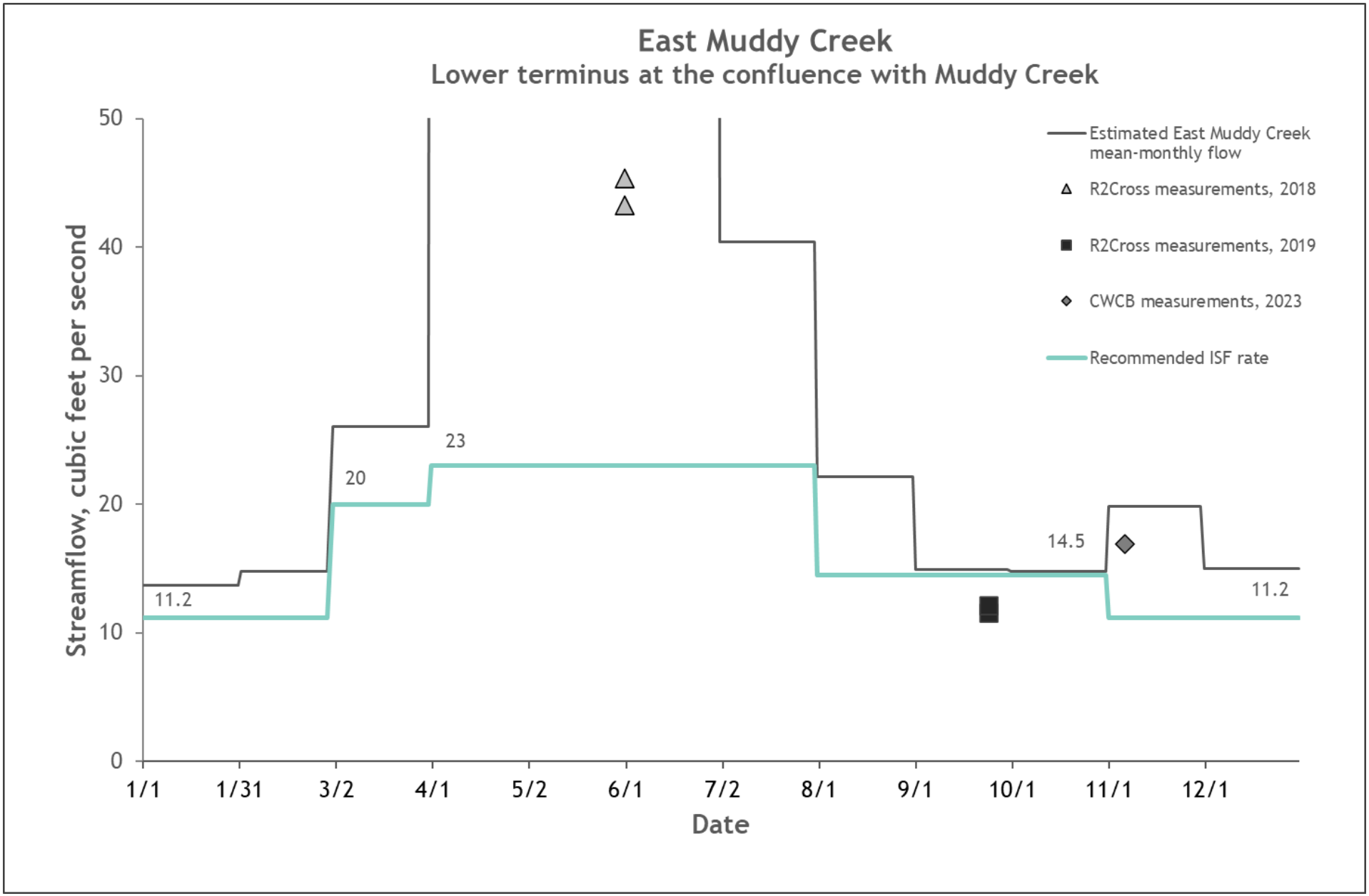
SITE MAP


East Muddy Creek ISF
Fish Survey
R2CROSS
Spot Measurement
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
East Muddy Creek ISF Recommendation
0
1
2
Miles
N
6
1
5
4
2
7
3

COMPLETE HYDROGRAPH



DETAILED HYDROGRAPH



United States Department of the Interior
BUREAU OF LAND MANAGEMENT

Colorado State Office
Denver Federal Center, Building 40
Lakewood, Colorado 80225
www.blm.gov/colorado

In Reply Refer To:
CO-932 (7250)

Mr. Rob Viehl
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80203

Dear Mr. Viehl:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its recommendation for an instream flow water right on East Muddy Creek, located in Water Division 4.

Location and Land Status. East Muddy Creek originates at the confluence of Little Muddy Creek and Clear Fork, approximately 14.5 miles northeast of Paonia. The creek flows into Paonia Reservoir. This recommendation covers a reach that starts at the confluence with Lee Creek and extends to the confluence with West Muddy Creek. This stream reach covers a distance of approximately 6.36 miles. The BLM manages approximately 0.85 miles of this stream reach, while 5.51 miles are in private ownership.

Biological Summary. East Muddy Creek is a cold-water, low to moderate gradient stream. It flows through a mountain valley approximately 0.5 miles in width. The stream cuts through alluvial deposits in some locations and is constrained by bedrock in locations where the stream comes close to valley walls. The stream generally has medium-sized substrate, consisting of gravels, cobbles, and small boulders. The stream has a good mix of pool and riffle habitat for supporting introduced trout species as well as native fish species.

Fisheries surveys have revealed self-sustaining populations of speckled dace, mottled sculpin, bluehead sucker, rainbow trout, fathead minnow and white sucker. Speckled dace, mottled sculpin and bluehead suckers are native species, and the bluehead sucker appears on BLM's sensitive species list. Since Paonia Reservoir prevents migration of fishes between East Muddy Creek and the Gunnison River, it is likely that East Muddy Creek provides year-round habitat for bluehead sucker.

The riparian community in this part of East Muddy Creek is generally comprised of willow species, alder, spruce and narrowleaf cottonwood. In general, the riparian community is in good condition, provides some shading and cover for fish habitat, and provides stream stability during flood events.

R2Cross Analysis. BLM collected the following R2Cross data from East Fork Muddy Creek:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
06/01/2018 #1	45.34 cfs	49.9 feet	15.16 cfs	32.41 cfs
06/01/2018 #2	43.24 cfs	42.4 feet	6.80 cfs	15.59 cfs
09/24/2019 #1	11.58 cfs	50.5 feet	13.42 cfs	17.19 cfs
09/24/2019 #2	12.17 cfs	44.5 feet	9.48 cfs	27.91 cfs
		Averages:	11.22 cfs	23.28 cfs

BLM's analysis of this data indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree.

> 23.00 cubic feet per second is recommended for the snowmelt runoff period from April 1 through July 31. This recommendation is driven by the wetted perimeter criteria in a majority of the cross-section data collected. Wetting 50 to 60 percent of the channel, as recommended by the R2Cross manual for streams 40 to 60 feet in width, will provide important physical habitat during a time of year when the fish population is completing key life cycle functions.
>
> 14.5 cubic feet per second is recommended for the late summer and early fall period between August 1 and October 31. This recommendation is driven by limited water availability during this period. This flow rate will generally meet the average velocity and average depth criteria in the cross sections analyzed, while providing approximately 50% wetted perimeter in the wider cross sections.
>
> 11.20 cubic feet per second is recommended during the winter period between November 1 and February 29. This recommendation is driven by limited water availability during the winter. This flow rate either meets or comes close to meeting the average depth and average velocity criteria in cross sections analyzed and should prevent icing in pools.
>
> 20.0 cubic feet per second is recommending from March 1 to March 31. This period is when lower elevation snowmelt runoff begins. Sufficient water is available to significantly exceed the winter flow recommendation and provide additional habitat before large scale snowmelt runoff occurs.

Water Availability. The BLM recommends relying upon two data sources to confirm water availability. The first information source is USGS Gage 09130500 (East Muddy Creek Near Bardine, CO). This gage was operated between 1934 and 1953, reflecting a 20-year period of record. The gage records will have to be adjusted to account for new diversions below the gage that have commenced since 1953. In addition, the gage data will need be adjusted to reflect the fact that some tributaries enter the creek downstream of the gage. The second data source is comprised of reservoir content records for Paonia Reservoir, located downstream. Daily fill volumes can be converted to incoming flow rates from East Muddy Creek. If this data source is

used, any inflow to the reservoir from West Muddy Creek would have to be subtracted out to accurately reflect water availability in the recommended instream flow reach.

The BLM is aware of only one active surface water right in the proposed reach, the John Medved Ditch 4, which is decreed for 1.5 cfs. Upstream from the proposed instream reach, BLM is aware of at least 25 active surface water rights, totaling just under 100 cfs in decreed diversion rates. BLM is also aware of multiple exchanges between Paonia Reservoir and upstream points of diversion.

Relationship to Land Management Plans. The BLM land use plan for this area calls for actions to maintain and enhance riparian and fisheries habitat. In general, any proposed new land use, such as right-of-way corridors or mineral development, must be implemented with no surface occupancy to avoid impacts to the creek. Any proposed land uses along this creek are also carefully reviewed and mitigated to prevent impacts to sensitive aquatic species which appear on BLM's sensitive species list. Establishing an instream flow water right would assist in meeting these objectives.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2020. BLM thanks both Colorado Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940.

Sincerely,

JOEL HUMPHRIES Digitally signed by JOEL HUMPHRIES Date: 2024.11.27 09:06:37 -07'00' for

Alan Bittner
Deputy State Director
Resources

Cc: Kevin Hyatt, Uncompahgre FO
Dan Ben-Horin, Uncompahgre FO
Stephanie McCormick, Southwest District

Combined Summaries

Water **41741** **Muddy Creek** Date **7/17/2012**

Station **GU0040** **ABV Dugout Creek (EM-1)**

Drainage **Gunnison River** UtmX **296304** UtmY **4318625** Elevation **6478 ft**

Length **722 ft** Width **41.60 ft** Area **0.69 acre**

Surveyors **K. Thompson, S. Sherman, P. Jones, N. Thompson**

Gear **BPEF** Effort **2.00** Metric **PASS** Protocol **FULL HABITAT**

Proportional Stocking Density and Catch/Unit Effort

Species	Total Catch	Min Cut inch	Max Cut inch	Total used	Proportional Stock Density (%)	Percent Stock Size	Percent Quality Size	Percent Preferred Size	Percent Memorable Size	Percent Trophy Size	Max Length inches
BLUEHEAD SUCKER	112	5.91		112							9.49
BROOK TROUT	2	5.12		2	0.00	100.00					8.86
FLANNELMOUTH SUCKER	2	5.91		2							5.28
FATHEAD MINNOW	60			60							2.20
MOTTLED SCULPIN	102			102							4.80
NORTHERN PIKE	5	3.94		5							6.77
SPECKLED DACE	187			187							5.04
SUCKER (S.U.)	5			5							0.00
WHITE SUCKER	60	5.91		60	0.00	100.00					9.57
WHITE-BLUEHEAD SUCKER HYBRID	11			11							11.26
WHITE-FLANNELMOUTH HYBRID	1			1							0.00

Combined Summaries

Water **41741** **Muddy Creek** Date **7/17/2012**

Station **GU0040** **ABV Dugout Creek (EM-1)**

Mean, Minimum and Maximum Length and Weight

Species	Total Catch	Min cut inch	Max cut inch	Total Used	Length (inches) Mean	Length (inches) Minimum	Length (inches) Maximum	Weight (lb) Mean	Weight (lb) Minimum	Weight (lb) Maximum
BLUEHEAD SUCKER	112	5.91		112	3.85	2.44	9.49	0.04	0.00	0.33
BROOK TROUT	2	5.12		2	8.33	7.80	8.86	0.27	0.24	0.31
FLANNELMOUTH SUCKER	2	5.91		2	5.28	5.28	5.28	0.05	0.05	0.05
FATHEAD MINNOW	60			60	1.99	1.73	2.20	0.00	0.00	0.01
MOTTLED SCULPIN	102			102	3.53	2.40	4.80	0.03	0.01	0.07
NORTHERN PIKE	5	3.94		5	6.09	5.59	6.77	0.06	0.03	0.07
SPECKLED DACE	187			187	3.48	1.97	5.04	0.02	0.00	0.07
SUCKER (S.U.)	5			5		0.00	0.00		0.00	0.00
WHITE SUCKER	60	5.91		60	4.77	2.83	9.57	0.06	0.01	0.26
WHITE-BLUEHEAD SUCKER HYBRID	11			11	8.31	3.82	11.26	0.25	0.01	0.46
WHITE-FLANNELMOUTH HYBRID	1			1		0.00	0.00		0.00	0.00

Combined Summaries

Water **41741** **Muddy Creek** Date **7/17/2012**

Station **GU0040** **ABV Dugout Creek (EM-1)**

Relative Abundance and Catch/Unit Effort

Species	Total Catch	Min.Cut inch	Max.Cut inch	Total used	Weight Lbs	Percent Number	Percent Weight	Catch per Unit Effort Number/Effort	Catch per Unit Effort Lbs/Effort
BLUEHEAD SUCKER	112	5.91		112	2.88	20.48	27.13	56.00	1.44
BROOK TROUT	2	5.12		2	0.55	0.37	5.14	1.00	0.27
FLANNELMOUTH SUCKER	2	5.91		2	0.05	0.37	0.46	1.00	0.02
FATHEAD MINNOW	60			60	0.01	10.97	0.14	30.00	0.01
MOTTLED SCULPIN	102			102	1.15	18.65	10.85	51.00	0.58
NORTHERN PIKE	5	3.94		5	0.28	0.91	2.59	2.50	0.14
SPECKLED DACE	187			187	1.67	34.19	15.71	93.50	0.84
SUCKER (S.U.)	5			5	0.00	0.91	0.00	2.50	0.00
WHITE SUCKER	60	5.91		60	1.81	10.97	17.00	30.00	0.90
WHITE-BLUEHEAD SUCKER HYBRID	11			11	2.23	2.01	21.00	5.50	1.12
WHITE-FLANNELMOUTH HYBRID	1			1	0.00	0.18	0.00	0.50	0.00

Combined Summaries

Water **41741** **Muddy Creek** Date **7/17/2012**

Station **GU0040** **ABV Dugout Creek (EM-1)**

Abundance and Biomass

Species	Total Catch	Min.Cut inch	Max.Cut inch	Total Used	Population estimate	Biomass Lbs	Percent Number	Percent Weight	Density estimates Lb/Acre	Density estimates Fish/Acre	Density estimates Fish/Mile
BLUEHEAD SUCKER	112	5.91		112		2.88	20.48	27.13	4.18	162.48	819.29
BROOK TROUT	2	5.12		2		0.55	0.37	5.14	0.79	2.90	14.63
FLANNELMOUTH SUCKER	2	5.91		2		0.05	0.37	0.46	0.07	2.90	14.63
FATHEAD MINNOW	60			60		0.01	10.97	0.14	0.02	87.04	438.90
MOTTLED SCULPIN	102			102		1.15	18.65	10.85	1.67	147.97	746.13
NORTHERN PIKE	5	3.94		5		0.28	0.91	2.59	0.40	7.25	36.58
SPECKLED DACE	187			187		1.67	34.19	15.71	2.42	271.28	1,367.91
SUCKER (S.U.)	5			5		0.00	0.91	0.00	0.00	7.25	36.58
WHITE SUCKER	60	5.91		60		1.81	10.97	17.00	2.62	87.04	438.90
WHITE-BLUEHEAD SUCKER HYBRID	11			11		2.23	2.01	21.00	3.24	15.96	80.47
WHITE-FLANNELMOUTH HYBRID	1			1		0.00	0.18	0.00	0.00	1.45	7.32

Notes: 2x LR-24 BPEF; Primary purpose of survey is three species occupancy. Often no more than 40 specimens of individual species were weighed and measured and the remainder were counted. Therefore population estimates are not completely accurate. Leopard Frog.

COLORADO
Department of Natural Resources

Date	6/1/2018
Observer	R. Smith, J. Sondergard
Cross-section#	1
System	UTM Zone 13
X (easting)	295335
Y (northing)	4322956

R2CROSS CROSS-SECTION NOTES

Stream Name	Stream Location	Slope
East Muddy Creek	Approx 1.0 mile upstream from confluence with Spring Creek	0.0056

Feature	Distance From Initial Point (ft)	Rod Height (ft)	Water Depth (ft)	Velocity (ft/s)
Bankfull	0	3.5		
	4	4.17		
	8	4.65		
Waterline	11.9	4.95	0	0
	13	5.15	0.2	0.33
	14	5.35	0.4	1.19
	15	5.45	0.5	2.19
	16	5.75	0.8	1.68
	17	5.85	0.9	2.3
	18	5.75	0.8	1.92
	19	5.75	0.8	2.43
	20	5.85	0.9	1.89
	21	5.75	0.8	2.48
	22	5.95	1	2.53
	23	5.85	0.9	2.86
	24	5.85	0.9	2.64
	25	5.75	0.8	2.58
	26	5.85	0.9	2.56
	27	5.95	1	2.34
	28	5.95	1	2.42
	29	5.85	0.9	1.65
	30	5.95	1	1.71
	31	5.85	0.9	1.57
	32	6.05	1.1	1.63
	33	6.05	1.1	1.46
	34	5.95	1	1.81
	35	5.95	1	2
	36	5.75	0.8	1.73
	37	5.75	0.8	1.64
	38	5.7	0.75	1.65
	39	5.4	0.45	1.46
	40	5.1	0.2	0.54
Waterline	40.9	4.9	0	0
	44	4.36		
	48	3.9		
Bankfull	50.2	3.55		

COLORADO
Department of Natural Resources

Date	6/1/2018
Observer	R. Smith, J Sondergard
Cross-section#	2
System	UTM Zone 13
X (easting)	295345
Y (northing)	4323005

R2CROSS CROSS-SECTION NOTES

Stream Name	Stream Location	Slope
East Muddy Creek	Approx. 1.0 mile upstream from confluence with Spring Creek	0.0048

Feature	Distance From Initial Point (ft)	Rod Height (ft)	Water Depth (ft)	Velocity (ft/s)
	0	2.94		
Bankfull	4	3.43		
	8	3.86		
Waterline	12	4.15		
	14.5	4.4	0	0
	15	4.5	0.1	0.13
	16	5	0.6	0.81
	17	5.1	0.7	1.56
	18	5.2	0.8	1.7
	19	5.3	0.9	1.99
	20	5.3	0.9	1.09
	21	5.4	1	1.88
	22	5.4	1	2.01
	23	5.3	0.9	1.58
	24	5.4	1	2.03
	25	5.5	1.1	2.86
	26	5.4	1	2.14
	27	5.5	1.1	2.06
	28	5.5	1.1	1.9
	29	5.4	1	1.52
	30	5.5	1.1	2.38
	31	5.6	1.2	1.51
	32	5.5	1.1	1.99
	33	5.6	1.2	2.19
	34	5.6	1.2	1.6
	35	5.3	0.9	2.29
	36	5.6	1.2	1.54
	37	5.5	1.1	1.41
	38	4.8	0.4	0.98
	39	5.4	1	1.06
	40	5.4	1	0.69
	41	5.2	0.8	0.31
	42	4.6	0.2	0
Waterline	42.6	4.4	0	0
	44	3.98		
Bankfull	46.5	3.4		

COLORADO
Department of Natural Resources

Date	9/24/2019
Observer	J. Sondergard
Cross-section#	1
System	UTM Zone 13
X (easting)	295348.2
Y (northing)	4322971.9

R2CROSS CROSS-SECTION NOTES

Stream Name	Stream Location	Slope
East Muddy Creek	Approx 1.57 miles upstream from Paonia Reservoir	0.009

Feature	Distance From Initial Point (ft)	Rod Height (ft)	Water Depth (ft)	Velocity (ft/s)
	2.9	1.79		
Bankfull	5.3	2.74		
	17.25	3.96		
Waterline	20.45	4.64	0	0
	21.4	4.85	0.2	0
	22	5.1	0.45	0.63
	23	5.15	0.5	1.23
	24	5.1	0.45	0.6
	25	5	0.35	1.05
	26	5.15	0.5	1.34
	27	5.05	0.4	1.68
	28	5.15	0.5	1.4
	29	5.15	0.5	0.67
	30	5.05	0.4	1.52
	31	5.15	0.5	2.11
	32	5.05	0.4	1.78
	33	4.95	0.3	2.26
	34	5.05	0.4	1.55
	35	4.95	0.3	1.09
	36	5.05	0.4	0.48
	37	4.9	0.25	0.86
	38	4.85	0.2	0.69
	39	5.15	0.5	0.01
	40	5.15	0.5	0.31
	41	5.25	0.6	0.1
	42	5.05	0.4	0.24
	43	4.95	0.3	1.07
	44	5.05	0.4	1.4
	45	5.2	0.55	0.6
	46	5.15	0.5	0.55
	47	5.35	0.7	0.76
	48	5.5	0.85	0.9
	49	5.15	0.5	0.22
Waterline	49.5	4.65	0	0
	54.2	3.18		
Bankfull	56.25	2.63		
	56.85	2.12		

COLORADO
Department of Natural Resources

Date	9/24/2019
Observer	J. Sondergard
Cross-section#	2
Coordinate	Lat/Long
X (easting)	-107.364728
Y (northing)	39.03145

R2CROSS CROSS-SECTION NOTES

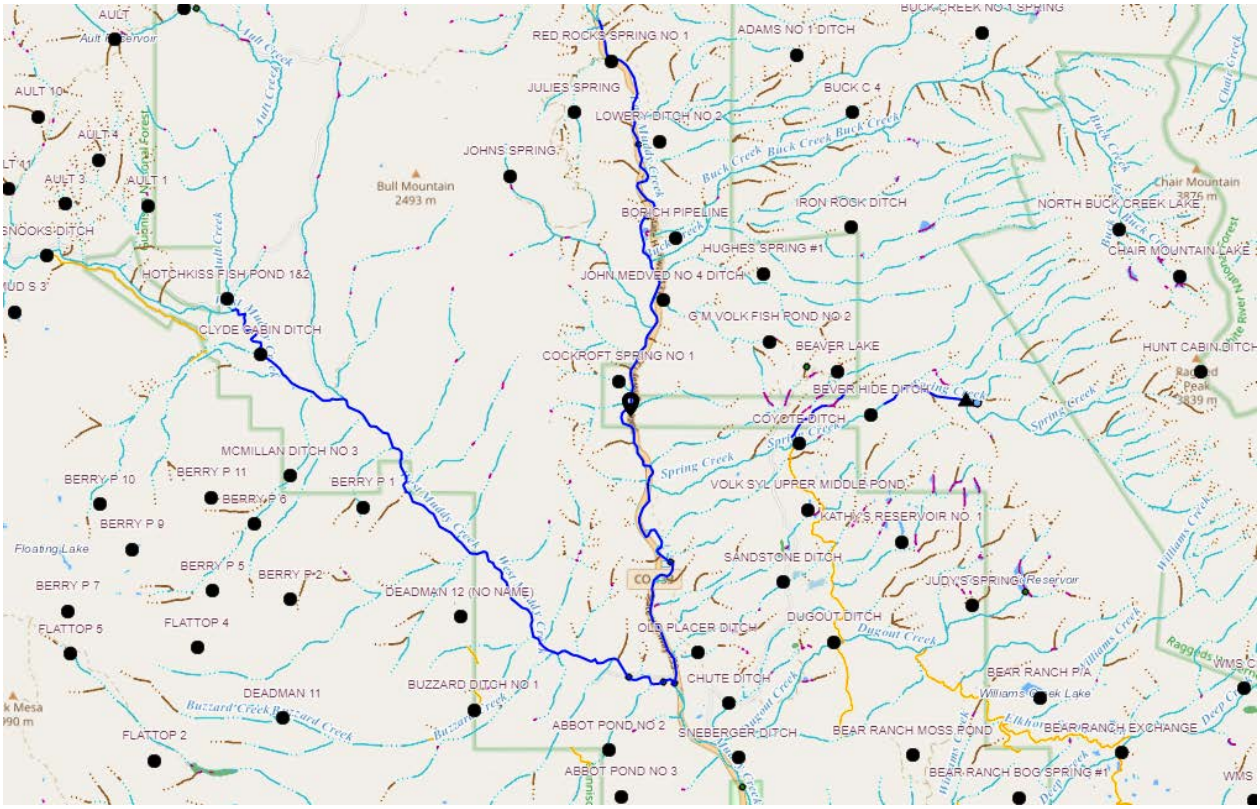
Stream Name	Stream Location	Slope
East Muddy Creek	Approx. 1.75 miles upstream from Paonia Reservoir	0.003

Feature	Distance From Initial Point (ft)	Rod Height (ft)	Water Depth (ft)	Velocity (ft/s)
	1	2.75		
Bankfull	3.65	3.55		
	8.05	4.62		
Waterline	10.1	5.14	0	0
	11	5.45	0.3	0.55
	12	5.55	0.4	0.07
	13	5.7	0.55	1.23
	14	5.75	0.6	1.5
	15	5.75	0.6	1.36
	16	5.65	0.5	1.45
	17	5.75	0.6	0.65
	18	5.95	0.8	1.43
	19	5.95	0.8	1.72
	20	5.85	0.7	1.65
	21	5.95	0.8	1.57
	22	5.95	0.8	1.24
	23	5.5	0.35	1.53
	24	5.55	0.4	1.22
	25	5.65	0.5	1.27
	26	5.6	0.45	1.31
	27	5.4	0.25	0.71
	28	5.35	0.2	0.17
	29	5.45	0.3	0.33
	30	5.15	0	0
Waterline	31.4	5.15	0	0
	33.5	4.42		
Bankfull	58.5	2.93		
	65.6	1.96		

R2Cross RESULTS

Stream Name: East Muddy Creek
Stream Locations: Approx. 1.75 miles upstream from Paonia Reservoir
Fieldwork Date: 09/24/2019
Cross-section: 2
Observers: J. Sondergard
Coordinate System: Lat/Long
X (easting): -107.364728
Y (northing): 39.03145
Date Processed: 05/29/2023
Slope: 0.003
Discharge: R2Cross data file: 12.17 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: East Muddy Creek 9-24-19 #2.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 44.45

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.4	9.48
Percent Wetted Perimeter (%)	52.2	27.91
Mean Velocity (ft/s)	1.0	7.91

STAGING TABLE

Feature	Distance to Water (ft)	Top Width (ft)	Mean Depth (ft)	Maximum Depth (ft)	Area (sq ft)	Wetted Perimeter (ft)	Percent Wetted Perimeter	Hydraulic Radius (ft)	Manning's n	Mean Velocity (ft/s)	Discharge (cfs)
Bankfull	3.55	44.45	1.3	2.4	57.98	45.07	100.0	1.29	0.03	3.0	173.98
	3.6	43.41	1.29	2.35	55.8	44.02	97.68	1.27	0.03	2.96	165.42
	3.65	42.36	1.27	2.3	53.65	42.97	95.34	1.25	0.03	2.93	157.16
	3.7	41.32	1.25	2.25	51.56	41.92	93.01	1.23	0.03	2.89	149.22
	3.75	40.27	1.23	2.2	49.52	40.87	90.67	1.21	0.03	2.86	141.59
	3.8	39.23	1.21	2.15	47.53	39.82	88.34	1.19	0.03	2.82	134.27
	3.85	38.18	1.19	2.1	45.6	38.76	86.0	1.18	0.03	2.79	127.26
	3.9	37.14	1.18	2.05	43.71	37.71	83.67	1.16	0.03	2.76	120.55
	3.95	36.1	1.16	2.0	41.88	36.66	81.34	1.14	0.03	2.73	114.13
	4.0	35.05	1.14	1.95	40.11	35.61	79.0	1.13	0.03	2.69	108.01
	4.05	34.01	1.13	1.9	38.38	34.56	76.67	1.11	0.03	2.66	102.17
	4.1	32.96	1.11	1.85	36.7	33.5	74.33	1.1	0.03	2.63	96.61
	4.15	31.92	1.1	1.8	35.08	32.45	72.0	1.08	0.03	2.6	91.32
	4.2	30.87	1.09	1.75	33.51	31.4	69.67	1.07	0.03	2.58	86.3
	4.25	29.83	1.07	1.7	32.0	30.35	67.33	1.05	0.03	2.55	81.55
	4.3	28.78	1.06	1.65	30.53	29.3	65.0	1.04	0.03	2.52	77.06
	4.35	27.74	1.05	1.6	29.12	28.24	62.66	1.03	0.03	2.5	72.82
	4.4	26.69	1.04	1.55	27.76	27.19	60.33	1.02	0.03	2.48	68.84
	4.45	26.06	1.01	1.5	26.44	26.55	58.91	1.0	0.03	2.43	64.22
	4.5	25.71	0.98	1.45	25.15	26.19	58.1	0.96	0.03	2.35	59.2
	4.55	25.37	0.94	1.4	23.87	25.82	57.29	0.92	0.03	2.28	54.36
	4.6	25.02	0.9	1.35	22.61	25.46	56.48	0.89	0.03	2.2	49.71
	4.65	24.67	0.87	1.3	21.37	25.1	55.69	0.85	0.03	2.12	45.25
	4.7	24.33	0.83	1.25	20.14	24.74	54.9	0.81	0.03	2.03	40.97
	4.75	23.99	0.79	1.2	18.94	24.39	54.11	0.78	0.04	1.95	36.88

	4.8	23.65	0.75	1.15	17.74	24.03	53.32	0.74	0.04	1.86	32.98
	4.85	23.31	0.71	1.1	16.57	23.68	52.53	0.7	0.04	1.77	29.28
	4.9	22.97	0.67	1.05	15.41	23.32	51.74	0.66	0.04	1.67	25.78
	4.95	22.63	0.63	1.0	14.27	22.97	50.95	0.62	0.04	1.57	22.47
	5.0	22.28	0.59	0.95	13.15	22.61	50.17	0.58	0.04	1.47	19.37
	5.05	21.94	0.55	0.9	12.05	22.26	49.38	0.54	0.04	1.37	16.48
	5.1	21.6	0.51	0.85	10.96	21.9	48.59	0.5	0.04	1.26	13.8
Waterline	5.15	19.87	0.5	0.8	9.88	20.15	44.71	0.49	0.04	1.23	12.19
	5.2	19.56	0.45	0.75	8.9	19.83	43.99	0.45	0.04	1.12	9.97
	5.25	19.25	0.41	0.7	7.93	19.5	43.26	0.41	0.04	1.0	7.95
	5.3	18.94	0.37	0.65	6.97	19.17	42.53	0.36	0.05	0.88	6.15
	5.35	18.63	0.32	0.6	6.03	18.85	41.82	0.32	0.05	0.76	4.57
	5.4	16.82	0.31	0.55	5.15	17.02	37.75	0.3	0.05	0.71	3.64
	5.45	15.75	0.28	0.5	4.33	15.93	35.34	0.27	0.06	0.62	2.68
	5.5	15.01	0.24	0.45	3.57	15.18	33.67	0.23	0.06	0.51	1.83
	5.55	13.14	0.22	0.4	2.86	13.29	29.49	0.22	0.06	0.46	1.31
	5.6	11.95	0.19	0.35	2.23	12.08	26.8	0.18	0.07	0.37	0.83
	5.65	10.01	0.17	0.3	1.69	10.11	22.44	0.17	0.08	0.32	0.54
	5.7	8.56	0.14	0.25	1.22	8.65	19.2	0.14	0.09	0.26	0.31
	5.75	5.45	0.16	0.2	0.85	5.52	12.24	0.15	0.08	0.29	0.24
	5.8	5.08	0.11	0.15	0.58	5.14	11.41	0.11	0.1	0.19	0.11
	5.85	4.73	0.07	0.1	0.34	4.77	10.58	0.07	0.15	0.09	0.03
	5.9	3.37	0.04	0.05	0.13	3.39	7.51	0.04	0.23	0.04	0.01
	5.93	2.41	0.01	0.01	0.03	2.41	5.36	0.01	0.57	0.01	0.0

This Manning's roughness coefficient was calculated based on velocity estimates from the Ferguson VPE method

MODEL SUMMARY

Measured Flow (Qm) =	12.17	(cfs)
Calculated Flow (Qc) =	12.19	(cfs)
(Qm-Qc)/Qm * 100 =	-0.09%	
Measured Waterline (WLm) =	5.14	(ft)
Calculated Waterline (WLc) =	5.15	(ft)
(WLm-WLc)/WLm * 100 =	-0.09%	
Max Measured Depth (Dm) =	0.8	(ft)
Max Calculated Depth (Dc) =	0.8	(ft)
(Dm-Dc)/Dm * 100 =	-0.02%	
Mean Velocity =	1.23	(ft/s)
Manning's n =	0.041	
0.4 * Qm =	4.87	(cfs)
2.5 * Qm =	30.43	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	1	2.75		
Bankfull	3.65	3.55		
	8.05	4.62		
Waterline	10.1	5.14	0	0
	11	5.45	0.3	0.55
	12	5.55	0.4	0.07
	13	5.7	0.55	1.23
	14	5.75	0.6	1.5
	15	5.75	0.6	1.36
	16	5.65	0.5	1.45
	17	5.75	0.6	0.65
	18	5.95	0.8	1.43
	19	5.95	0.8	1.72
	20	5.85	0.7	1.65
	21	5.95	0.8	1.57
	22	5.95	0.8	1.24
	23	5.5	0.35	1.53
	24	5.55	0.4	1.22
	25	5.65	0.5	1.27
	26	5.6	0.45	1.31
	27	5.4	0.25	0.71
	28	5.35	0.2	0.17
	29	5.45	0.3	0.33
	30	5.15	0	0
Waterline	31.4	5.15	0	0
	33.5	4.42		
Bankfull	58.5	2.93		
	65.6	1.96		

COMPUTED FROM MEASURED FIELD DATA

Wetted Perimeter (ft)	Water Depth (ft)	Area (ft^2)	Discharge (cfs)	Percent Discharge
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.95	0.3	0.28	0.16	1.29
1	0.4	0.4	0.03	0.23
1.01	0.55	0.55	0.68	5.56
1	0.6	0.6	0.9	7.39
1	0.6	0.6	0.82	6.7
1	0.5	0.5	0.72	5.96
1	0.6	0.6	0.39	3.2
1.02	0.8	0.8	1.14	9.4
1	0.8	0.8	1.38	11.3
1	0.7	0.7	1.16	9.49
1	0.8	0.8	1.26	10.32
1	0.8	0.8	0.99	8.15
1.1	0.35	0.35	0.54	4.4
1	0.4	0.4	0.49	4.01
1	0.5	0.5	0.64	5.22
1	0.45	0.45	0.59	4.84
1.02	0.25	0.25	0.18	1.46
1	0.2	0.2	0.03	0.28
1	0.3	0.3	0.1	0.81
1.04	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

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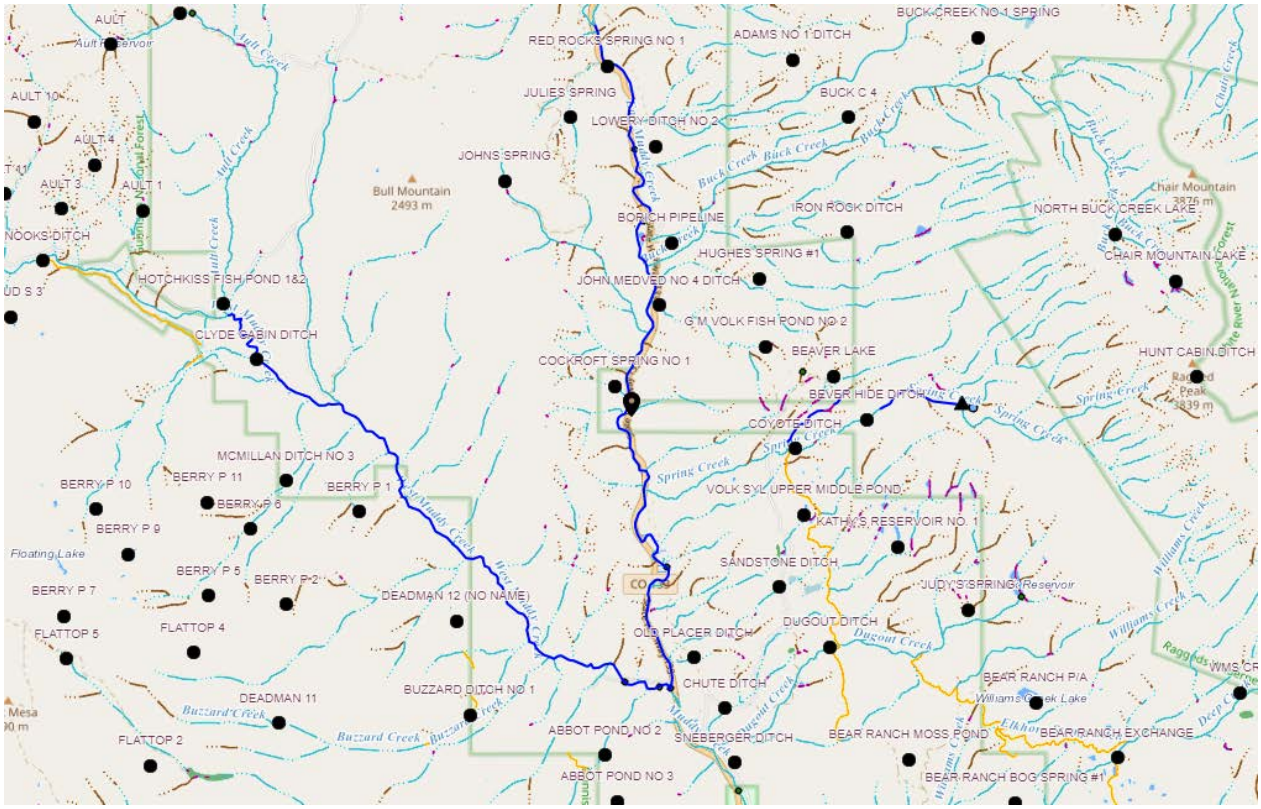
R2Cross RESULTS

Stream Name: East Muddy Creek
Stream Locations: Approx 1.57 miles upstream from Paonia Reservoir
Fieldwork Date: 09/24/2019
Cross-section: 1
Observers: J. Sondergard
Coordinate System: UTM Zone 13
X (easting): 295348.2
Y (northing): 4322971.9
Date Processed: 05/29/2023
Slope: 0.009
Discharge: R2Cross data file: 11.58 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: East Muddy Creek 9-24-19 #1.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 50.54

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.5	17.19
Percent Wetted Perimeter (%)	55.3	3.52
Mean Velocity (ft/s)	1.0	13.42

STAGING TABLE

Feature	Distance to Water (ft)	Top Width (ft)	Mean Depth (ft)	Maximum Depth (ft)	Area (sq ft)	Wetted Perimeter (ft)	Percent Wetted Perimeter	Hydraulic Radius (ft)	Manning's n	Mean Velocity (ft/s)	Discharge (cfs)
Bankfull	2.74	50.54	1.71	2.76	86.19	51.49	100.0	1.67	0.04	4.68	403.78
	2.75	50.41	1.7	2.75	85.69	51.36	99.74	1.67	0.04	4.67	400.23
	2.8	49.73	1.67	2.7	83.19	50.67	98.41	1.64	0.04	4.6	382.51
	2.85	49.05	1.65	2.65	80.72	49.99	97.08	1.61	0.04	4.53	365.26
	2.9	48.38	1.62	2.6	78.28	49.3	95.75	1.59	0.04	4.45	348.48
	2.95	47.7	1.59	2.55	75.88	48.62	94.42	1.56	0.04	4.38	332.15
	3.0	47.03	1.56	2.5	73.51	47.93	93.08	1.53	0.04	4.3	316.28
	3.05	46.35	1.54	2.45	71.18	47.25	91.75	1.51	0.04	4.23	300.86
	3.1	45.67	1.51	2.4	68.87	46.56	90.42	1.48	0.04	4.15	285.88
	3.15	45.0	1.48	2.35	66.61	45.88	89.09	1.45	0.04	4.07	271.35
	3.2	44.33	1.45	2.3	64.37	45.2	87.78	1.42	0.04	4.0	257.2
	3.25	43.68	1.42	2.25	62.17	44.54	86.5	1.4	0.04	3.91	243.39
	3.3	43.03	1.39	2.2	60.01	43.88	85.22	1.37	0.05	3.83	230.01
	3.35	42.38	1.37	2.15	57.87	43.22	83.94	1.34	0.05	3.75	217.06
	3.4	41.73	1.34	2.1	55.77	42.56	82.66	1.31	0.05	3.67	204.53
	3.45	41.08	1.31	2.05	53.7	41.9	81.37	1.28	0.05	3.58	192.42
	3.5	40.43	1.28	2.0	51.66	41.24	80.09	1.25	0.05	3.5	180.72
	3.55	39.79	1.25	1.95	49.65	40.58	78.81	1.22	0.05	3.41	169.43
	3.6	39.14	1.22	1.9	47.68	39.92	77.53	1.19	0.05	3.33	158.55
	3.65	38.49	1.19	1.85	45.74	39.26	76.25	1.16	0.05	3.24	148.07
	3.7	37.84	1.16	1.8	43.83	38.6	74.97	1.14	0.05	3.15	137.99
	3.75	37.19	1.13	1.75	41.96	37.94	73.69	1.11	0.05	3.06	128.31
	3.8	36.54	1.1	1.7	40.11	37.28	72.41	1.08	0.05	2.97	119.02
	3.85	35.89	1.07	1.65	38.3	36.62	71.12	1.05	0.05	2.87	110.11
	3.9	35.24	1.04	1.6	36.53	35.96	69.84	1.02	0.05	2.78	101.59

	3.95	34.59	1.01	1.55	34.78	35.3	68.56	0.99	0.05	2.69	93.45
	4.0	34.14	0.97	1.5	33.06	34.85	67.67	0.95	0.05	2.57	85.09
	4.05	33.75	0.93	1.45	31.37	34.44	66.88	0.91	0.05	2.45	76.99
	4.1	33.35	0.89	1.4	29.69	34.03	66.08	0.87	0.06	2.33	69.28
	4.15	32.96	0.85	1.35	28.03	33.62	65.29	0.83	0.06	2.21	61.98
	4.2	32.56	0.81	1.3	26.39	33.21	64.5	0.79	0.06	2.09	55.08
	4.25	32.17	0.77	1.25	24.77	32.81	63.71	0.76	0.06	1.96	48.59
	4.3	31.77	0.73	1.2	23.18	32.4	62.91	0.72	0.06	1.83	42.52
	4.35	31.38	0.69	1.15	21.6	31.99	62.12	0.68	0.06	1.71	36.85
	4.4	30.98	0.65	1.1	20.04	31.58	61.33	0.63	0.07	1.58	31.6
	4.45	30.58	0.6	1.05	18.5	31.17	60.54	0.59	0.07	1.45	26.77
	4.5	30.19	0.56	1.0	16.98	30.77	59.75	0.55	0.07	1.32	22.35
	4.55	29.79	0.52	0.95	15.48	30.36	58.95	0.51	0.08	1.19	18.36
	4.6	29.4	0.48	0.9	14.0	29.95	58.16	0.47	0.08	1.06	14.77
Waterline	4.65	29.01	0.43	0.85	12.54	29.54	57.37	0.42	0.09	0.93	11.61
	4.7	28.73	0.39	0.8	11.1	29.24	56.78	0.38	0.09	0.79	8.8
	4.75	28.45	0.34	0.75	9.67	28.94	56.2	0.33	0.1	0.66	6.42
	4.8	28.18	0.29	0.7	8.25	28.64	55.61	0.29	0.11	0.54	4.44
	4.85	27.9	0.25	0.65	6.85	28.34	55.03	0.24	0.13	0.42	2.86
	4.9	26.57	0.21	0.6	5.49	26.96	52.35	0.2	0.15	0.33	1.79
	4.95	25.9	0.16	0.55	4.18	26.26	50.99	0.16	0.18	0.23	0.95
	5.0	22.24	0.13	0.5	2.97	22.53	43.76	0.13	0.21	0.17	0.51
	5.05	17.73	0.11	0.45	1.97	17.96	34.89	0.11	0.25	0.13	0.26
	5.1	13.48	0.09	0.4	1.19	13.65	26.51	0.09	0.3	0.09	0.11
	5.15	5.84	0.11	0.35	0.66	5.95	11.56	0.11	0.24	0.13	0.09
	5.2	3.36	0.13	0.3	0.43	3.45	6.69	0.12	0.22	0.16	0.07
	5.25	2.22	0.13	0.25	0.29	2.28	4.43	0.13	0.22	0.16	0.05
	5.3	1.82	0.1	0.2	0.19	1.87	3.64	0.1	0.26	0.12	0.02
	5.35	1.43	0.08	0.15	0.11	1.47	2.85	0.07	0.34	0.07	0.01
	5.4	0.95	0.05	0.1	0.05	0.98	1.9	0.05	0.48	0.04	0.0
	5.45	0.48	0.03	0.05	0.01	0.49	0.95	0.02	0.85	0.01	0.0
	5.49	0.14	0.01	0.01	0.0	0.15	0.28	0.01	2.33	0.0	0.0

This Manning's roughness coefficient was calculated based on velocity estimates from the Ferguson VPE method

MODEL SUMMARY

Measured Flow (Qm) =	11.58	(cfs)
Calculated Flow (Qc) =	11.59	(cfs)
(Qm-Qc)/Qm * 100 =	-0.10%	
Measured Waterline (WLm) =	4.64	(ft)
Calculated Waterline (WLc) =	4.65	(ft)
(WLm-WLc)/WLm * 100 =	-0.10%	
Max Measured Depth (Dm) =	0.85	(ft)
Max Calculated Depth (Dc) =	0.85	(ft)
(Dm-Dc)/Dm * 100 =	-0.02%	
Mean Velocity =	0.92	(ft/s)
Manning's n =	0.086	
0.4 * Qm =	4.63	(cfs)
2.5 * Qm =	28.96	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	2.9	1.79		
Bankfull	5.3	2.74		
	17.25	3.96		
Waterline	20.45	4.64	0	0
	21.4	4.85	0.2	0
	22	5.1	0.45	0.63
	23	5.15	0.5	1.23
	24	5.1	0.45	0.6
	25	5	0.35	1.05
	26	5.15	0.5	1.34
	27	5.05	0.4	1.68
	28	5.15	0.5	1.4
	29	5.15	0.5	0.67
	30	5.05	0.4	1.52
	31	5.15	0.5	2.11
	32	5.05	0.4	1.78
	33	4.95	0.3	2.26
	34	5.05	0.4	1.55
	35	4.95	0.3	1.09
	36	5.05	0.4	0.48
	37	4.9	0.25	0.86
	38	4.85	0.2	0.69
	39	5.15	0.5	0.01
	40	5.15	0.5	0.31
	41	5.25	0.6	0.1
	42	5.05	0.4	0.24
	43	4.95	0.3	1.07
	44	5.05	0.4	1.4
	45	5.2	0.55	0.6
	46	5.15	0.5	0.55

	47	5.35	0.7	0.76
	48	5.5	0.85	0.9
	49	5.15	0.5	0.22
Waterline	49.5	4.65	0	0
	54.2	3.18		
Bankfull	56.25	2.63		
	56.85	2.12		

COMPUTED FROM MEASURED FIELD DATA

Wetted Perimeter (ft)	Water Depth (ft)	Area (ft^2)	Discharge (cfs)	Percent Discharge
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.97	0.2	0.15	0	0
0.65	0.45	0.36	0.23	1.96
1	0.5	0.5	0.61	5.31
1	0.45	0.45	0.27	2.33
1	0.35	0.35	0.37	3.17
1.01	0.5	0.5	0.67	5.78
1	0.4	0.4	0.67	5.8
1	0.5	0.5	0.7	6.04
1	0.5	0.5	0.34	2.89
1	0.4	0.4	0.61	5.25
1	0.5	0.5	1.05	9.11
1	0.4	0.4	0.71	6.15
1	0.3	0.3	0.68	5.85
1	0.4	0.4	0.62	5.35
1	0.3	0.3	0.33	2.82
1	0.4	0.4	0.19	1.66
1.01	0.25	0.25	0.21	1.86
1	0.2	0.2	0.14	1.19
1.04	0.5	0.5	0.01	0.04
1	0.5	0.5	0.15	1.34
1	0.6	0.6	0.06	0.52
1.02	0.4	0.4	0.1	0.83
1	0.3	0.3	0.32	2.77
1	0.4	0.4	0.56	4.83
1.01	0.55	0.55	0.33	2.85
1	0.5	0.5	0.28	2.37

1.02	0.7	0.7	0.53	4.59
1.01	0.85	0.85	0.77	6.61
1.06	0.5	0.38	0.08	0.71
0.71	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

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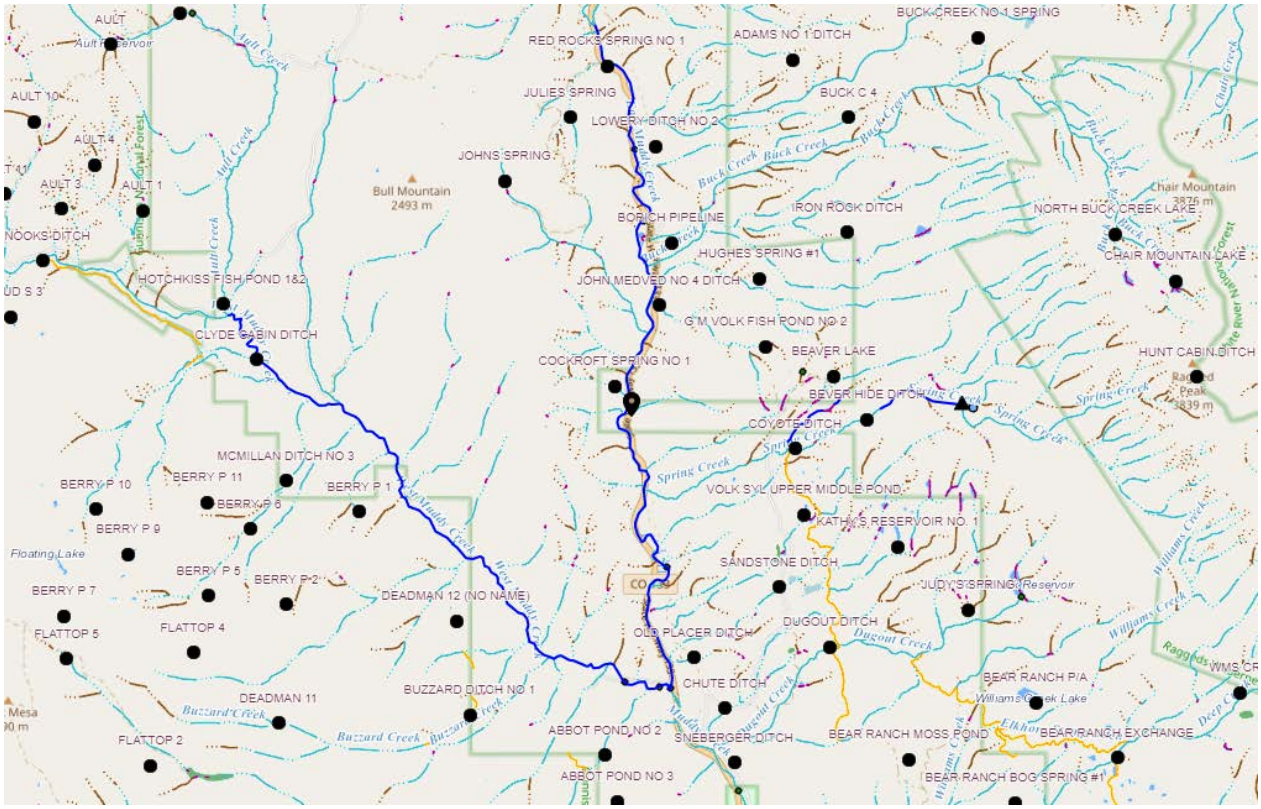
R2Cross RESULTS

Stream Name: East Muddy Creek
Stream Locations: Approx. 1.0 mile upstream from confluence with Spring Creek
Fieldwork Date: 06/01/2018
Cross-section: 2
Observers: R. Smith, J Sondergard
Coordinate System: UTM Zone 13
X (easting): 295345
Y (northing): 4323005
Date Processed: 05/29/2023
Slope: 0.0048
Discharge: R2Cross data file: 43.24 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: East Muddy Creek 6-1-18 #2 New.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 42.37

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.4	6.8
Percent Wetted Perimeter (%)	51.2	1.53
Mean Velocity (ft/s)	1.0	15.59

STAGING TABLE

Feature	Distance to Water (ft)	Top Width (ft)	Mean Depth (ft)	Maximum Depth (ft)	Area (sq ft)	Wetted Perimeter (ft)	Percent Wetted Perimeter	Hydraulic Radius (ft)	Manning's n	Mean Velocity (ft/s)	Discharge (cfs)
Bankfull	3.43	42.37	1.41	2.17	59.78	43.44	100.0	1.38	0.05	2.78	166.19
	3.45	42.1	1.4	2.15	58.93	43.16	99.36	1.37	0.05	2.76	162.5
	3.5	41.42	1.37	2.1	56.85	42.47	97.78	1.34	0.05	2.7	153.53
	3.55	40.74	1.35	2.05	54.79	41.78	96.19	1.31	0.05	2.64	144.85
	3.6	40.06	1.32	2.0	52.77	41.09	94.61	1.28	0.05	2.59	136.47
	3.65	39.38	1.29	1.95	50.79	40.41	93.02	1.26	0.05	2.53	128.38
	3.7	38.69	1.26	1.9	48.84	39.72	91.43	1.23	0.05	2.47	120.58
	3.75	38.01	1.23	1.85	46.92	39.03	89.85	1.2	0.05	2.41	113.06
	3.8	37.33	1.21	1.8	45.03	38.34	88.26	1.17	0.05	2.35	105.83
	3.85	36.65	1.18	1.75	43.18	37.65	86.67	1.15	0.05	2.29	98.88
	3.9	35.79	1.16	1.7	41.37	36.78	84.68	1.12	0.05	2.24	92.72
	3.95	34.89	1.14	1.65	39.61	35.87	82.57	1.1	0.05	2.2	86.96
	4.0	34.0	1.11	1.6	37.88	34.97	80.52	1.08	0.05	2.15	81.42
	4.05	33.15	1.09	1.55	36.2	34.11	78.52	1.06	0.05	2.1	76.06
	4.1	32.29	1.07	1.5	34.57	33.24	76.53	1.04	0.05	2.05	70.97
	4.15	31.43	1.05	1.45	32.98	32.38	74.54	1.02	0.05	2.01	66.12
	4.2	30.77	1.02	1.4	31.42	31.7	72.98	0.99	0.05	1.94	61.07
	4.25	30.1	0.99	1.35	29.9	31.03	71.43	0.96	0.05	1.88	56.27
	4.3	29.43	0.97	1.3	28.41	30.35	69.87	0.94	0.05	1.82	51.7
	4.35	28.77	0.94	1.25	26.96	29.67	68.31	0.91	0.05	1.76	47.35
Waterline	4.4	28.1	0.91	1.2	25.53	29.0	66.75	0.88	0.06	1.69	43.24
	4.45	27.7	0.87	1.15	24.14	28.58	65.8	0.84	0.06	1.61	38.89
	4.5	27.3	0.83	1.1	22.76	28.17	64.85	0.81	0.06	1.53	34.77
	4.55	27.05	0.79	1.05	21.41	27.9	64.23	0.77	0.06	1.43	30.69
	4.6	26.8	0.75	1.0	20.06	27.63	63.61	0.73	0.06	1.34	26.86

4.65	26.62	0.7	0.95	18.72	27.42	63.13	0.68	0.06	1.24	23.21
4.7	26.43	0.66	0.9	17.4	27.21	62.65	0.64	0.07	1.14	19.83
4.75	26.25	0.61	0.85	16.08	27.0	62.17	0.6	0.07	1.04	16.73
4.8	26.07	0.57	0.8	14.77	26.79	61.68	0.55	0.07	0.94	13.89
4.85	25.73	0.52	0.75	13.48	26.4	60.78	0.51	0.08	0.85	11.44
4.9	25.39	0.48	0.7	12.2	26.01	59.87	0.47	0.08	0.76	9.24
4.95	25.05	0.44	0.65	10.94	25.61	58.97	0.43	0.09	0.67	7.29
5.0	24.71	0.39	0.6	9.69	25.22	58.06	0.38	0.09	0.58	5.59
5.05	23.98	0.35	0.55	8.48	24.44	56.26	0.35	0.1	0.5	4.23
5.1	23.24	0.31	0.5	7.3	23.65	54.45	0.31	0.11	0.42	3.09
5.15	22.5	0.27	0.45	6.15	22.87	52.65	0.27	0.12	0.35	2.14
5.2	21.76	0.23	0.4	5.05	22.08	50.84	0.23	0.14	0.27	1.39
5.25	20.86	0.19	0.35	3.98	21.14	48.67	0.19	0.16	0.21	0.83
5.3	18.95	0.16	0.3	2.96	19.2	44.2	0.15	0.19	0.15	0.46
5.35	16.71	0.12	0.25	2.07	16.9	38.92	0.12	0.23	0.11	0.23
5.4	12.47	0.1	0.2	1.29	12.61	29.03	0.1	0.27	0.08	0.11
5.45	9.57	0.08	0.15	0.74	9.66	22.24	0.08	0.34	0.05	0.04
5.5	5.67	0.06	0.1	0.33	5.71	13.16	0.06	0.43	0.04	0.01
5.55	3.33	0.03	0.05	0.11	3.36	7.73	0.03	0.69	0.02	0.0
5.58	1.7	0.01	0.01	0.02	1.71	3.93	0.01	1.6	0.0	0.0

This Manning's roughness coefficient was calculated based on velocity estimates from the Ferguson VPE method

MODEL SUMMARY

Measured Flow (Qm) =	43.24	(cfs)
Calculated Flow (Qc) =	43.24	(cfs)
(Qm-Qc)/Qm * 100 =	0.01%	
Measured Waterline (WLm) =	4.28	(ft)
Calculated Waterline (WLc) =	4.4	(ft)
(WLm-WLc)/WLm * 100 =	-2.92%	
Max Measured Depth (Dm) =	1.2	(ft)
Max Calculated Depth (Dc) =	1.2	(ft)
(Dm-Dc)/Dm * 100 =	0.00%	
Mean Velocity =	1.69	(ft/s)
Manning's n =	0.056	
0.4 * Qm =	17.3	(cfs)
2.5 * Qm =	108.1	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	2.94		
Bankfull	4	3.43		
	8	3.86		
Waterline	12	4.15		
	14.5	4.4	0	0
	15	4.5	0.1	0.13
	16	5	0.6	0.81
	17	5.1	0.7	1.56
	18	5.2	0.8	1.7
	19	5.3	0.9	1.99
	20	5.3	0.9	1.09
	21	5.4	1	1.88
	22	5.4	1	2.01
	23	5.3	0.9	1.58
	24	5.4	1	2.03
	25	5.5	1.1	2.86
	26	5.4	1	2.14
	27	5.5	1.1	2.06
	28	5.5	1.1	1.9
	29	5.4	1	1.52
	30	5.5	1.1	2.38
	31	5.6	1.2	1.51
	32	5.5	1.1	1.99
	33	5.6	1.2	2.19
	34	5.6	1.2	1.6
	35	5.3	0.9	2.29
	36	5.6	1.2	1.54
	37	5.5	1.1	1.41
	38	4.8	0.4	0.98
	39	5.4	1	1.06

	40	5.4	1	0.69
	41	5.2	0.8	0.31
	42	4.6	0.2	0
Waterline	42.6	4.4	0	0
	44	3.98		
Bankfull	46.5	3.4		

COMPUTED FROM MEASURED FIELD DATA

Wetted Perimeter (ft)	Water Depth (ft)	Area (ft^2)	Discharge (cfs)	Percent Discharge
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.51	0.1	0.07	0.01	0.02
1.12	0.6	0.6	0.49	1.12
1	0.7	0.7	1.09	2.52
1	0.8	0.8	1.36	3.15
1	0.9	0.9	1.79	4.14
1	0.9	0.9	0.98	2.27
1	1	1	1.88	4.35
1	1	1	2.01	4.65
1	0.9	0.9	1.42	3.29
1	1	1	2.03	4.7
1	1.1	1.1	3.15	7.28
1	1	1	2.14	4.95
1	1.1	1.1	2.27	5.24
1	1.1	1.1	2.09	4.83
1	1	1	1.52	3.52
1	1.1	1.1	2.62	6.05
1	1.2	1.2	1.81	4.19
1	1.1	1.1	2.19	5.06
1	1.2	1.2	2.63	6.08
1	1.2	1.2	1.92	4.44
1.04	0.9	0.9	2.06	4.77
1.04	1.2	1.2	1.85	4.27
1	1.1	1.1	1.55	3.59
1.22	0.4	0.4	0.39	0.91
1.17	1	1	1.06	2.45

1	1	1	0.69	1.6
1.02	0.8	0.8	0.25	0.57
1.17	0.2	0.16	0	0
0.63	0	0	0	0
0	0	0	0	0
0	0	0	0	0

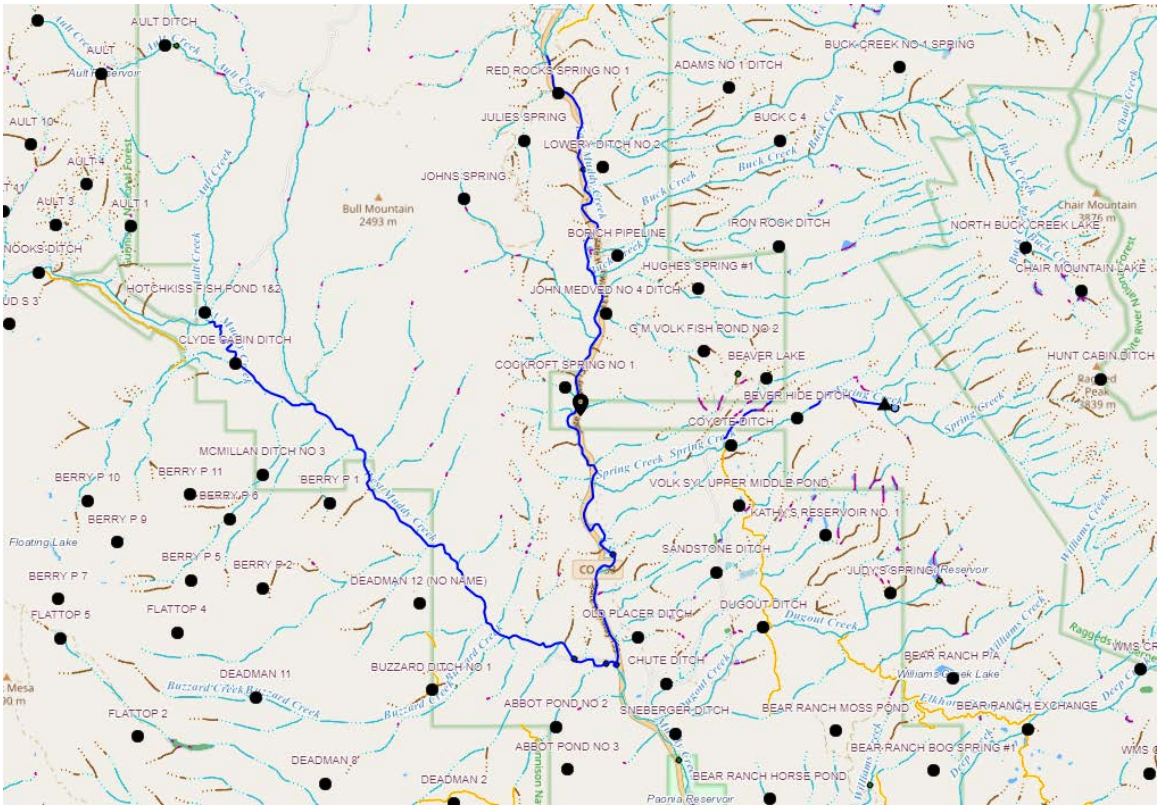
DISCLAIMER

"The Colorado Water Conservation Board makes no representations about the use of the software contained in the R2Cross platform for any purpose besides that for which it was designed. To the maximum extent permitted by applicable law, all information, modeling results, and software are provided “as is” without warranty or condition of any kind, including all implied warranties or conditions of merchantability, or fitness for a particular purpose. The user assumes all responsibility for the accuracy and suitability of this program for a specific application. In no event shall the Colorado Water Conservation Board or any state agency, official or employee be liable for any direct, indirect, punitive, incidental, special, consequential damages or any damages whatsoever including, without limitation, damages for loss of use, data, profits, or savings arising from the implementation, reliance on, or use of or inability to use the R2Cross platform.

R2Cross RESULTS

Stream Name: East Muddy Creek
Stream Locations: Approx 1.0 mile upstream from confluence with Spring Creek
Fieldwork Date: 06/01/2018
Cross-section: 1
Observers: R. Smith, J. Sondergard
Coordinate System: UTM Zone 13
X (easting): 295335
Y (northing): 4322956
Date Processed: 05/29/2023
Slope: 0.0056
Discharge: R2Cross data file: 45.34 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: East Muddy Creek 6-1-18 #1 New.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 49.9

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.5	15.16
Percent Wetted Perimeter (%)	55.0	32.41
Mean Velocity (ft/s)	1.0	10.7

STAGING TABLE

Feature	Distance to Water (ft)	Top Width (ft)	Mean Depth (ft)	Maximum Depth (ft)	Area (sq ft)	Wetted Perimeter (ft)	Percent Wetted Perimeter	Hydraulic Radius (ft)	Manning's n	Mean Velocity (ft/s)	Discharge (cfs)
Bankfull	3.55	49.9	1.58	2.5	78.65	50.41	100.0	1.56	0.04	4.02	315.88
	3.6	49.32	1.55	2.45	76.28	49.82	98.82	1.53	0.04	3.95	301.34
	3.65	48.7	1.52	2.4	73.83	49.2	97.59	1.5	0.04	3.88	286.52
	3.7	48.09	1.48	2.35	71.41	48.58	96.36	1.47	0.04	3.81	272.08
	3.75	47.48	1.45	2.3	69.02	47.96	95.13	1.44	0.04	3.74	258.03
	3.8	46.86	1.42	2.25	66.66	47.33	93.9	1.41	0.04	3.67	244.37
	3.85	46.25	1.39	2.2	64.33	46.71	92.66	1.38	0.04	3.59	231.1
	3.9	45.64	1.36	2.15	62.03	46.09	91.43	1.35	0.04	3.52	218.21
	3.95	44.91	1.33	2.1	59.77	45.36	89.98	1.32	0.04	3.45	206.2
	4.0	44.18	1.3	2.05	57.54	44.62	88.51	1.29	0.04	3.38	194.59
	4.05	43.44	1.27	2.0	55.35	43.88	87.04	1.26	0.04	3.31	183.36
	4.1	42.71	1.25	1.95	53.2	43.14	85.57	1.23	0.04	3.24	172.5
	4.15	41.98	1.22	1.9	51.08	42.4	84.1	1.2	0.04	3.17	162.01
	4.2	41.18	1.19	1.85	49.0	41.59	82.5	1.18	0.04	3.1	152.13
	4.25	40.33	1.16	1.8	46.96	40.73	80.8	1.15	0.04	3.04	142.8
	4.3	39.48	1.14	1.75	44.97	39.88	79.1	1.13	0.04	2.98	133.83
	4.35	38.62	1.11	1.7	43.01	39.02	77.4	1.1	0.04	2.91	125.21
	4.4	37.89	1.08	1.65	41.1	38.27	75.92	1.07	0.04	2.84	116.61
	4.45	37.18	1.05	1.6	39.23	37.56	74.51	1.04	0.04	2.76	108.23
	4.5	36.48	1.02	1.55	37.38	36.85	73.1	1.01	0.04	2.68	100.19
	4.55	35.77	0.99	1.5	35.58	36.14	71.69	0.98	0.04	2.6	92.5
	4.6	35.07	0.96	1.45	33.81	35.43	70.28	0.95	0.04	2.52	85.13
	4.65	34.37	0.93	1.4	32.07	34.72	68.87	0.92	0.04	2.44	78.09
	4.7	33.44	0.91	1.35	30.38	33.78	67.02	0.9	0.04	2.37	71.9
	4.75	32.5	0.88	1.3	28.73	32.84	65.15	0.87	0.04	2.3	66.06

	4.8	31.57	0.86	1.25	27.13	31.9	63.28	0.85	0.04	2.23	60.53
	4.85	30.63	0.83	1.2	25.57	30.95	61.4	0.83	0.05	2.16	55.31
	4.9	29.69	0.81	1.15	24.06	30.01	59.53	0.8	0.05	2.09	50.39
Waterline	4.95	28.81	0.78	1.1	22.6	29.13	57.78	0.78	0.05	2.02	45.66
	5.0	28.3	0.75	1.05	21.17	28.6	56.73	0.74	0.05	1.92	40.61
	5.05	27.8	0.71	1.0	19.77	28.09	55.72	0.7	0.05	1.81	35.82
	5.1	27.3	0.67	0.95	18.39	27.58	54.71	0.67	0.05	1.7	31.33
	5.15	26.85	0.63	0.9	17.04	27.12	53.8	0.63	0.05	1.59	27.08
	5.2	26.44	0.59	0.85	15.71	26.69	52.95	0.59	0.05	1.47	23.1
	5.25	26.02	0.55	0.8	14.4	26.26	52.1	0.55	0.06	1.35	19.44
	5.3	25.6	0.51	0.75	13.1	25.84	51.25	0.51	0.06	1.23	16.09
	5.35	25.19	0.47	0.7	11.84	25.41	50.4	0.47	0.06	1.1	13.06
	5.4	24.53	0.43	0.65	10.59	24.74	49.08	0.43	0.06	0.99	10.5
	5.45	23.86	0.39	0.6	9.38	24.06	47.74	0.39	0.07	0.88	8.23
	5.5	23.51	0.35	0.55	8.2	23.7	47.02	0.35	0.07	0.75	6.14
	5.55	23.18	0.3	0.5	7.03	23.35	46.33	0.3	0.08	0.62	4.36
	5.6	22.85	0.26	0.45	5.88	23.01	45.64	0.26	0.09	0.49	2.91
	5.65	22.51	0.21	0.4	4.75	22.66	44.95	0.21	0.1	0.37	1.77
	5.7	22.18	0.16	0.35	3.63	22.31	44.26	0.16	0.13	0.26	0.94
	5.75	21.05	0.12	0.3	2.55	21.17	42.0	0.12	0.16	0.17	0.43
	5.8	15.66	0.11	0.25	1.67	15.75	31.25	0.11	0.18	0.14	0.23
	5.85	12.16	0.08	0.2	0.98	12.23	24.25	0.08	0.23	0.09	0.09
	5.9	7.89	0.06	0.15	0.5	7.94	15.75	0.06	0.27	0.06	0.03
	5.95	4.64	0.04	0.1	0.19	4.66	9.25	0.04	0.4	0.03	0.01
	6.0	1.78	0.04	0.05	0.07	1.79	3.55	0.04	0.39	0.03	0.0
	6.04	1.23	0.01	0.01	0.02	1.23	2.43	0.01	0.98	0.01	0.0

This Manning's roughness coefficient was calculated based on velocity estimates from the Ferguson VPE method

MODEL SUMMARY

Measured Flow (Qm) =	45.34	(cfs)
Calculated Flow (Qc) =	45.53	(cfs)
(Qm-Qc)/Qm * 100 =	-0.44%	
Measured Waterline (WLm) =	4.92	(ft)
Calculated Waterline (WLc) =	4.95	(ft)
(WLm-WLc)/WLm * 100 =	-0.46%	
Max Measured Depth (Dm) =	1.1	(ft)
Max Calculated Depth (Dc) =	1.1	(ft)
(Dm-Dc)/Dm * 100 =	-0.20%	
Mean Velocity =	2.01	(ft/s)
Manning's n =	0.047	
0.4 * Qm =	18.13	(cfs)
2.5 * Qm =	113.34	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
Bankfull	0	3.5		
	4	4.17		
	8	4.65		
Waterline	11.9	4.95	0	0
	13	5.15	0.2	0.33
	14	5.35	0.4	1.19
	15	5.45	0.5	2.19
	16	5.75	0.8	1.68
	17	5.85	0.9	2.3
	18	5.75	0.8	1.92
	19	5.75	0.8	2.43
	20	5.85	0.9	1.89
	21	5.75	0.8	2.48
	22	5.95	1	2.53
	23	5.85	0.9	2.86
	24	5.85	0.9	2.64
	25	5.75	0.8	2.58
	26	5.85	0.9	2.56
	27	5.95	1	2.34
	28	5.95	1	2.42
	29	5.85	0.9	1.65
	30	5.95	1	1.71
	31	5.85	0.9	1.57
	32	6.05	1.1	1.63
	33	6.05	1.1	1.46
	34	5.95	1	1.81
	35	5.95	1	2
	36	5.75	0.8	1.73
	37	5.75	0.8	1.64
	38	5.7	0.75	1.65

	39	5.4	0.45	1.46
	40	5.1	0.2	0.54
Waterline	40.9	4.9	0	0
	44	4.36		
	48	3.9		
Bankfull	50.2	3.55		

COMPUTED FROM MEASURED FIELD DATA

Wetted Perimeter (ft)	Water Depth (ft)	Area (ft^2)	Discharge (cfs)	Percent Discharge
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1.12	0.2	0.21	0.07	0.15
1.02	0.4	0.4	0.48	1.05
1	0.5	0.5	1.09	2.42
1.04	0.8	0.8	1.34	2.96
1	0.9	0.9	2.07	4.57
1	0.8	0.8	1.54	3.39
1	0.8	0.8	1.94	4.29
1	0.9	0.9	1.7	3.75
1	0.8	0.8	1.98	4.38
1.02	1	1	2.53	5.58
1	0.9	0.9	2.57	5.68
1	0.9	0.9	2.38	5.24
1	0.8	0.8	2.06	4.55
1	0.9	0.9	2.3	5.08
1	1	1	2.34	5.16
1	1	1	2.42	5.34
1	0.9	0.9	1.49	3.27
1	1	1	1.71	3.77
1	0.9	0.9	1.41	3.12
1.02	1.1	1.1	1.79	3.96
1	1.1	1.1	1.61	3.54
1	1	1	1.81	3.99
1	1	1	2	4.41
1.02	0.8	0.8	1.38	3.05
1	0.8	0.8	1.31	2.89
1	0.75	0.75	1.24	2.73

1.04	0.45	0.45	0.66	1.45
1.04	0.2	0.19	0.1	0.23
0.92	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

DISCLAIMER

"The Colorado Water Conservation Board makes no representations about the use of the software contained in the R2Cross platform for any purpose besides that for which it was designed. To the maximum extent permitted by applicable law, all information, modeling results, and software are provided “as is” without warranty or condition of any kind, including all implied warranties or conditions of merchantability, or fitness for a particular purpose. The user assumes all responsibility for the accuracy and suitability of this program for a specific application. In no event shall the Colorado Water Conservation Board or any state agency, official or employee be liable for any direct, indirect, punitive, incidental, special, consequential damages or any damages whatsoever including, without limitation, damages for loss of use, data, profits, or savings arising from the implementation, reliance on, or use of or inability to use the R2Cross platform.

General Site Field Visit Data Report *(Filters: Name begins with East Muddy Creek; Division = 4;)*

CWCBStaff-02

Type		Div	Name	CWCB Case Number	Segment ID	Visit Date	Location Description	Watershed Name
Stream		4	East Muddy Creek		21/4/A-005	4/7/2021	From McClure Pass to Paonia Reservior	North Fork Gunnison
	Remarks	Date	Remark					
		07/04/21 00:00	Site Investigation: potential locations for CWCB temp gage, USGS and DWR gages on Muddy Creek, tributaries above and below confluence with West Muddy, photos.					
	GPS Log	No GPS Log records for this visit.						
	Photo Log	No Photo Log records for this visit.						
		4	East Muddy Creek		21/4/A-005	4/8/2021	At DWR gage and confluence with West Muddy Creek. Collaborated with DWR, Josh Casper, about the segments and potential temporary gage locations.	North Fork Gunnison
	Remarks	Date	Remark					
		08/04/21 00:00	Determined no good gage location on East Muddy Creek with public access between Spring Creek trib and confluence with West Muddy Creek.					
	GPS Log	No GPS Log records for this visit.						
	Photo Log	No Photo Log records for this visit.						

Discharge Measurment Field Visit Data Report *(Filters: Name begins with East Muddy Creek; Division = 4;)*

CWCBStaff-02

Div	Name	CWCB Case Number	Segment ID	Meas. Date	UTM	Location	Flow Amount (cfs)	Meas #	Rating	Station ID
4	East Muddy Creek		21/4/A-005	11/06/2023	UTMx: 295498 UTMy: 4322126	measurment taken near the bridge	16.94			

Discharge Measurement Summary

Site name	EMUDDY Bridge at rv park
Site number	Bridge at rv park
Operator(s)	Lfs
File name	Bridge at rv park_20231106-140228.ft
Comment	

Start time	11/6/2023 12:40 PM
End time	11/6/2023 1:00 PM
Start location latitude	-
Start location longitude	-
Calculations engine	FlowTracker2

Sensor type	Top Setting
Handheld serial number	FT2H2322005
Probe serial number	FT2P2317010
Probe firmware	1.30
Handheld software	1.7

# Stations	Avg interval (s)	Total discharge (ft³/s)
20	40	16.9441

Total width (ft)	Total area (ft²)	Wetted Perimeter (ft)
42.700	38.4120	50.940

Mean SNR (dB)	Mean depth (ft)	Mean velocity (ft/s)
38	0.900	0.4411

Mean temp (°F)	Max depth (ft)	Max velocity (ft/s)
41.525	2.000	0.6266

Discharge Uncertainty		
Category	**ISO**	**IVE**
Accuracy	1.0%	1.0%
Depth	0.2%	3.1%
Velocity	0.5%	2.4%
Width	0.1%	0.1%
Method	1.6%	
# Stations	2.8%	
Overall	**3.4%**	**4.0%**

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Data Collection Settings	
Salinity	0.000 PSS-78
Temperature	-
Sound speed	-
Mounting correction	0.000 %

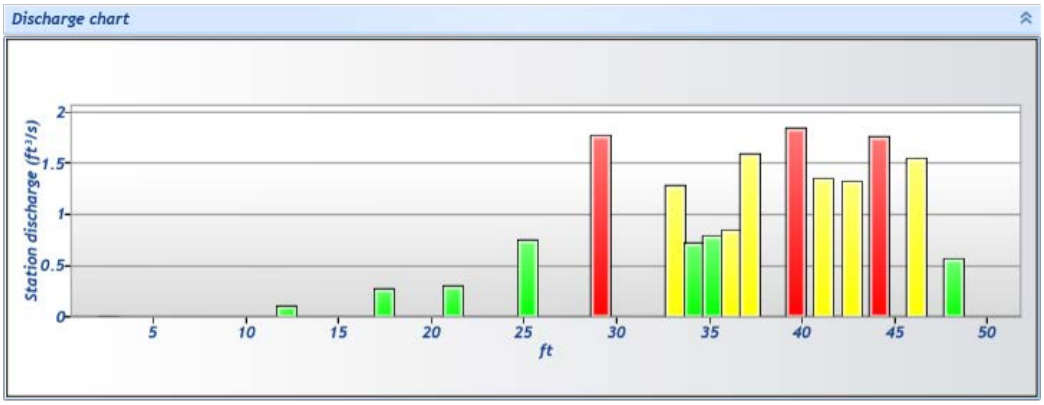
Summary overview

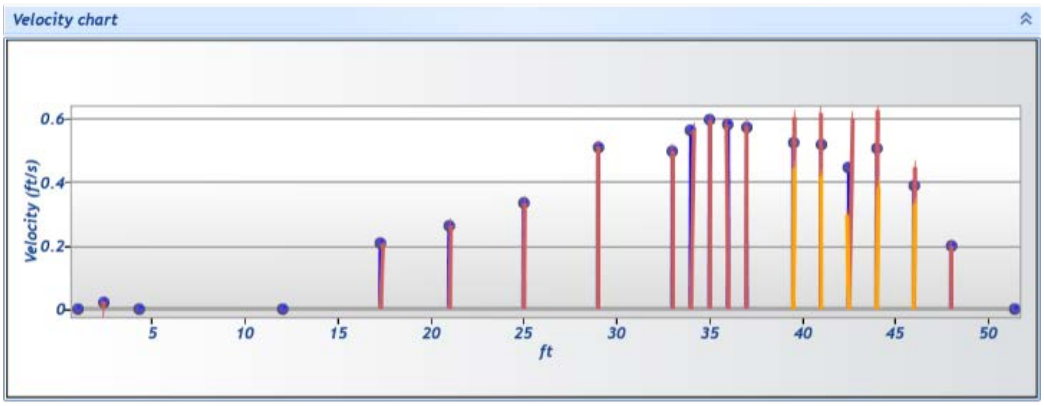
No changes were made to this file
Quality control warnings

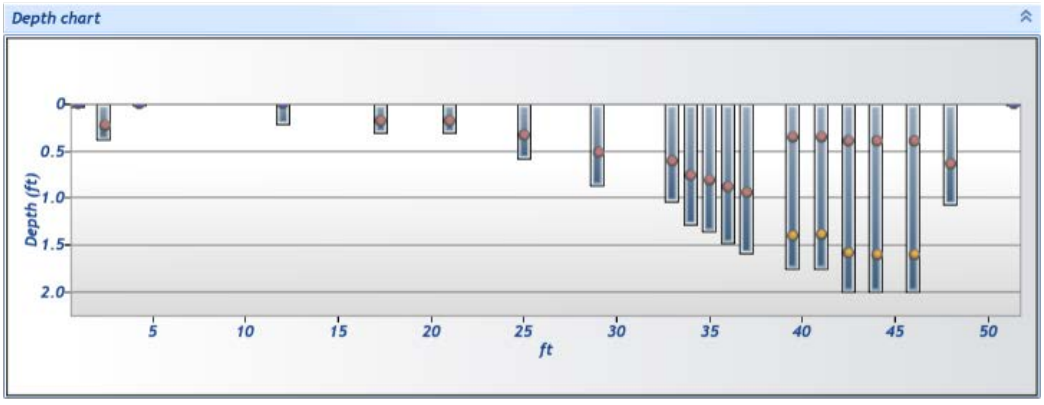
Discharge Measurement Summary

Site name	EMUDDY Bridge at rv park
Site number	Bridge at rv park
Operator(s)	Lfs
File name	Bridge at rv park_20231106-140228.ft
Comment	

Station Warning Settings	
Station discharge OK	Station discharge < 5.00%
Station discharge caution	5.00% >= Station discharge < 10.00%
Station discharge warning	Station discharge >= 10.00%







Discharge Measurement Summary

Site name	EMUDDY Bridge at rv park
Site number	Bridge at rv park
Operator(s)	Lfs
File name	Bridge at rv park_20231106-140228.ft
Comment	

Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correction	Mean Velocity (ft/s)	Area (ft²)	Flow (ft³/s)	%Q	
0	1:40 PM	1.000	None	0.030	0.0000	0.000	0	0.0000	1.0000	0.0240	0.0210	0.0005	0.00	✓
1	1:41 PM	2.400	0.6	0.370	0.6000	0.222	16	0.0240	1.0000	0.0240	0.6105	0.0146	0.09	✓
2	1:41 PM	4.300	None	0.010	0.0000	0.000	0	0.0000	1.0000	0.0240	0.0095	0.0002	0.00	✓
3	1:42 PM	12.000	None	0.200	0.0000	0.000	0	0.0000	1.0000	0.2086	0.5300	0.1106	0.65	✓
4	1:43 PM	17.300	0.6	0.300	0.6000	0.180	25	0.2086	1.0000	0.2086	1.3500	0.2817	1.66	✓
5	1:44 PM	21.000	0.6	0.300	0.6000	0.180	17	0.2637	1.0000	0.2637	1.1550	0.3046	1.80	✓
6	1:45 PM	25.000	0.6	0.570	0.6000	0.342	21	0.3332	1.0000	0.3332	2.2800	0.7597	4.48	✓
7	1:46 PM	29.000	0.6	0.870	0.6000	0.522	28	0.5107	1.0000	0.5107	3.4800	1.7773	10.49	✓
8	1:47 PM	33.000	0.6	1.030	0.6000	0.618	18	0.4980	1.0000	0.4980	2.5750	1.2825	7.57	✓
9	1:47 PM	34.000	0.6	1.280	0.6000	0.768	18	0.5646	1.0000	0.5646	1.2800	0.7227	4.26	✓
10	1:48 PM	35.000	0.6	1.350	0.6000	0.810	20	0.5946	1.0000	0.5946	1.3500	0.8028	4.74	✓
11	1:49 PM	36.000	0.6	1.470	0.6000	0.882	15	0.5816	1.0000	0.5816	1.4700	0.8550	5.05	✓
12	1:50 PM	37.000	0.6	1.580	0.6000	0.948	29	0.5760	1.0000	0.5760	2.7650	1.5926	9.40	✓
13	1:50 PM	39.500	0.2/0.8	1.760	0.2000	0.352	13	0.6046	1.0000	0.5239	3.5200	1.8442	10.88	✓
13	1:50 PM	39.500	0.2/0.8	1.760	0.8000	1.408	17	0.4432	1.0000	0.5239	3.5200	1.8442	10.88	✓
14	1:52 PM	41.000	0.2/0.8	1.750	0.2000	0.350	36	0.6171	1.0000	0.5179	2.6250	1.3595	8.02	✓
14	1:52 PM	41.000	0.2/0.8	1.750	0.8000	1.400	14	0.4187	1.0000	0.5179	2.6250	1.3595	8.02	✓
15	1:53 PM	42.500	0.2/0.8	1.990	0.2000	0.398	14	0.6001	1.0000	0.4478	2.9850	1.3366	7.89	✓
15	1:53 PM	42.500	0.2/0.8	1.990	0.8000	1.592	29	0.2954	1.0000	0.4478	2.9850	1.3366	7.89	✓
16	1:55 PM	44.000	0.2/0.8	2.000	0.2000	0.400	18	0.6266	1.0000	0.5051	3.5000	1.7680	10.43	✓
16	1:55 PM	44.000	0.2/0.8	2.000	0.8000	1.600	25	0.3837	1.0000	0.5051	3.5000	1.7680	10.43	✓
17	1:57 PM	46.000	0.2/0.8	2.000	0.2000	0.400	12	0.4465	1.0000	0.3888	4.0000	1.5550	9.18	✓
17	1:57 PM	46.000	0.2/0.8	2.000	0.8000	1.600	21	0.3311	1.0000	0.3888	4.0000	1.5550	9.18	✓
18	1:59 PM	48.000	0.6	1.070	0.6000	0.642	13	0.1983	1.0000	0.1983	2.8890	0.5728	3.38	✓
19	2:00 PM	51.400	None	0.010	0.0000	0.000	0	0.0000	1.0000	0.1983	0.0170	0.0034	0.02	✓

Discharge Measurement Summary

Site name	EMUDDY Bridge at rv park
Site number	Bridge at rv park
Operator(s)	Lfs
File name	Bridge at rv park_20231106-140228.ft
Comment	

Quality Control Settings	
Maximum depth change	50.00%
Maximum spacing change	100.00%
SNR threshold	10 dB
Standard error threshold	0.0328 ft/s
Spike threshold	10.00%
Maximum velocity angle	20.0 deg
Maximum tilt angle	5.0 deg

Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings
1	1:41 PM	2.400	0.6	0.370	0.6000	0.222	SNR Threshold Variation
4	1:43 PM	17.300	0.6	0.300	0.6000	0.180	Velocity Angle > QC
7	1:46 PM	29.000	0.6	0.870	0.6000	0.522	High Stn % Discharge
10	1:48 PM	35.000	0.6	1.350	0.6000	0.810	Stn Spacing > QC
13	1:50 PM	39.500	0.2/0.8	1.760	0.2000	0.352	High % Spikes,High Stn % Discharge
13	1:50 PM	39.500	0.2/0.8	1.760	0.8000	1.408	High % Spikes,High Stn % Discharge
16	1:55 PM	44.000	0.2/0.8	2.000	0.2000	0.400	High Stn % Discharge
16	1:55 PM	44.000	0.2/0.8	2.000	0.8000	1.600	High Stn % Discharge
19	2:00 PM	51.400	None	0.010	0.0000	0.000	Water Depth > QC

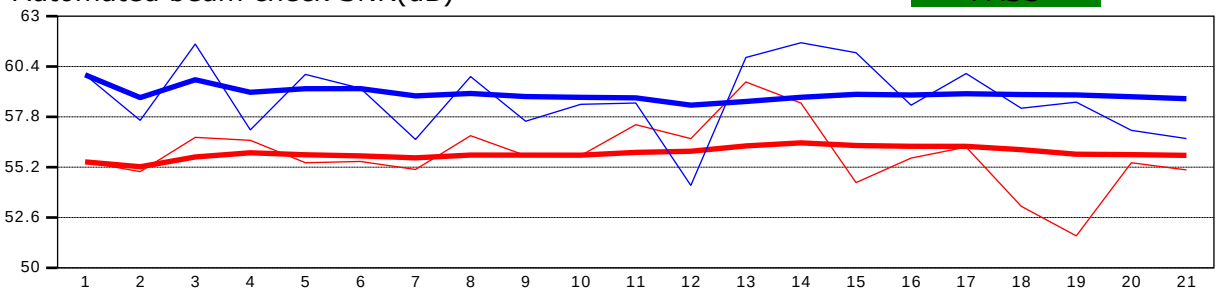
Discharge Measurement Summary

Site name	EMUDDY Bridge at rv park
Site number	Bridge at rv park
Operator(s)	Lfs
File name	Bridge at rv park_20231106-140228.ft
Comment	

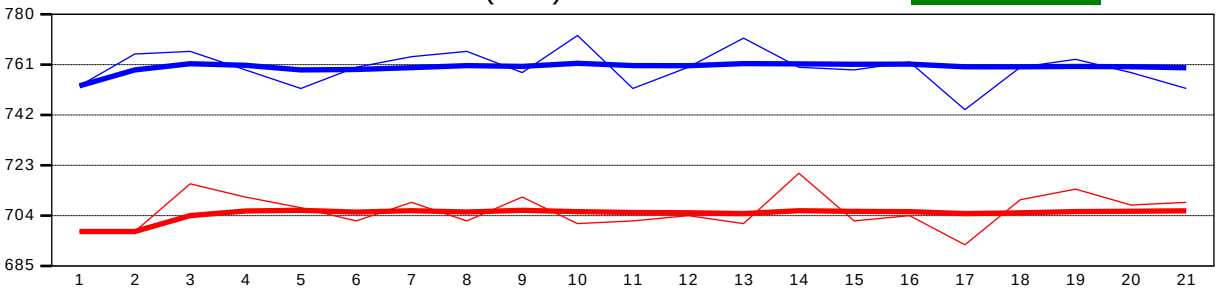
Beam 1	
Beam 2	

Automated beam check Start time 11/6/2023 1:40:25 PM

Automated beam check SNR(dB) PASS



Automated beam check Noise level(cnts) PASS



Automated beam check Quality control warnings

No quality control warnings

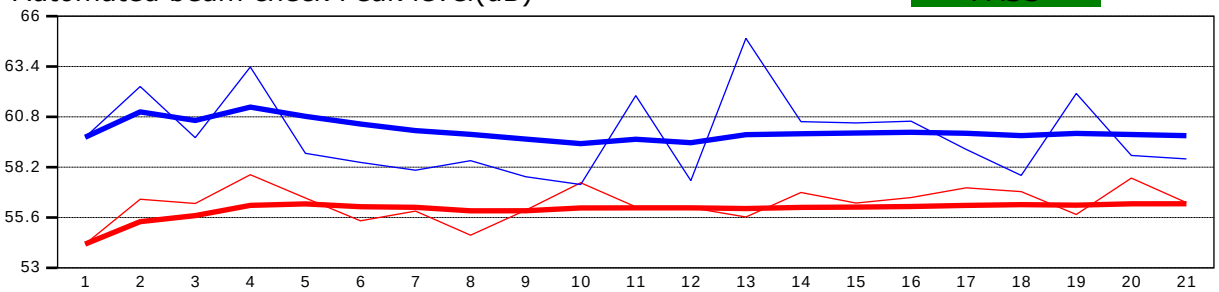
Discharge Measurement Summary

Site name	EMUDDY Bridge at rv park
Site number	Bridge at rv park
Operator(s)	Lfs
File name	Bridge at rv park_20231106-140228.ft
Comment	

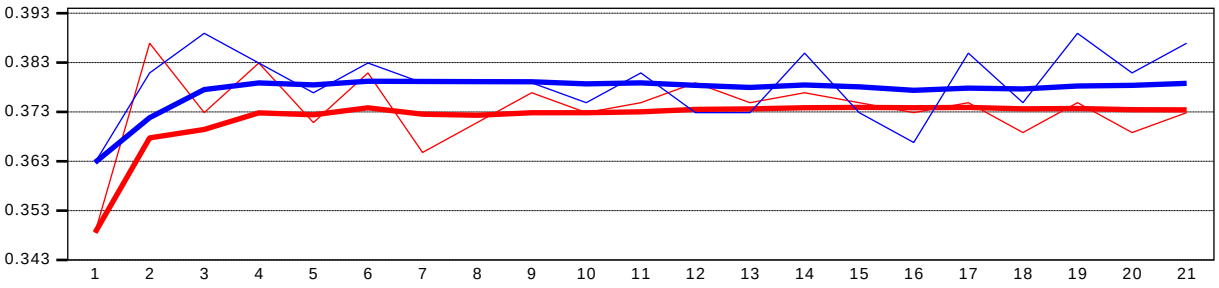
Beam 1	
Beam 2	

Automated beam check Start time 11/6/2023 1:40:25 PM

Automated beam check Peak level(dB) PASS



Automated beam check Peak position(ft) PASS



Automated beam check Quality control warnings

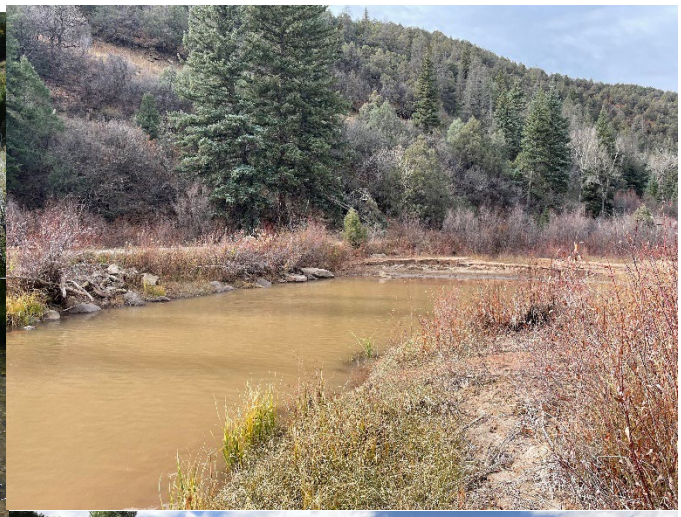
No quality control warnings

CWCBStaff-02

CWCBStaff-02

CWCBStaff-02

CWCBStaff-02



R2Cross Model

User's Manual & Technical Guide

August 2022

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ACKNOWLEDGEMENTS

The Colorado Water Conservation Board (CWCB) would like to thank everyone involved in the development of the R2Cross program on the eRAMS platform, especially the team at Colorado State University, including Dr. Ryan Morrison, Panagiotis D. Oikonomou, Rumpal Sidhu, Tyler Wible, and Matthew Korsa. Additionally, we wish to acknowledge those who reviewed the R2Cross model including Ellen Wohl of Colorado State University, Brian Bledsoe of the University of Georgia, Chris Holmquist-Johnson, and John Pitlick of the University of Colorado. We also thank those who tested the program including Ashley Bembenek and Molly McConnell of Alpine Environmental Consultants LLC, Roy Smith of the Bureau of Land Management, Greg Espegren, Scott Schreiber of Wright Water Engineers, and Danielle Ingrassia of the California Department. of Fish and Wildlife.

TABLE OF CONTENTS

DOCUMENT STRUCTURE

The purpose of this document is to provide a guidance in running the R2Cross model. The first section (User's Guide) describes the components, capabilities, inputs, and outputs of the R2Cross program. This section is intended to help users navigate the eRAMS platform. The second section (Technical Guide) describes the underlying equations used in the R2Cross program, including the hydraulic equation, sediment distribution equations, and other relevant technical details. A companion document, R2Cross Field Manual, provides guidance on how to collect field data necessary for the R2Cross method.

INTRODUCTION

PURPOSE OF R2CROSS

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) with the exclusive authority to appropriate and acquire instream flow (ISF) and natural lake level water rights (NLL). ISF water rights are held by the CWCB on behalf of the people of the State of Colorado to "preserve the natural environment to a reasonable degree". These water rights are non-consumptive, in-channel or in-lake uses of water made exclusively by the CWCB for minimum flows between specific points on a stream or at specific levels in natural lakes. ISF and NLL rights are administered within the state's water right priority system to preserve or improve the natural environment.

Any entity can make a recommendation to the CWCB to appropriate ISF or NLL water rights including State and Federal agencies, local communities, cities, local environmental groups, water users, and other interested parties. Recommending entities document the natural environment, determine the amount of water necessary to protect the natural environment, and support their recommendations through the CWCB process. CWCB staff reviews all data submitted and conducts water availability assessments and outreach. The CWCB makes decisions on all ISF and NLL appropriations following the procedures in the ISF Rules.

R2Cross is one of the techniques used to determine ISF flow rates in order to develop an ISF recommendation. The R2Cross method is based on a hydraulic model and uses field data collected in a representative riffle (Espegren, 1996). Riffles are generally the shallowest locations in a stream and are the stream habitat type most sensitive to changes in hydraulic parameters with variations in discharge. The field data consists of streamflow measurements, surveys of channel geometry at a cross-section, and of the longitudinal slope of the water surface, and optional pebble counts to determine the grainsize distribution (please see the R2Cross Field Manual for more information).

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). The summer flow recommendation is based on meeting three of three hydraulic criteria. The winter flow recommendation is based on meeting two of three hydraulic criteria.

R2CROSS UPDATE

The purpose of this update is to provide a user-friendly, open-access interface for the CWCB, recommending entities, and stakeholders to use the R2Cross program. The updated R2Cross program is hosted in eRAMS, an open platform supporting development of geospatially-enabled web applications for sustainable management of land, water, and energy resources. eRAMS uses open source technologies to provide geospatial data analysis, presentation, processing, and

visualization to build custom analytical tools that incorporate model and data services. The following program features are included in R2Cross on the eRAMS platform:

1) Standard data entry templates to import field data for the R2Cross model, discharge measurements, and pebble counts.

2) Dynamically generated figures and graphs illustrating cross-section information, R2Cross calculations, and habitat criteria selection.

3) A tool for calculating stream discharge using standard cross-section and velocity data.

4) A tool to calculate standard metrics for particle-size analysis using pebble count data.

6) Mapping capabilities to display data collection sites, National Hydrography Dataset streamlines, streamflow gages, water right structures and other relevant coverages.

7) Export tools for pdf reports and Excel files of model output.

USER'S GUIDE

R2CROSS ONLINE PROGRAM

The updated R2Cross program (https://r2cross.erams.com) is hosted in the eRAMS platform. The R2Cross program can be accessed without registering for an eRAMS account. The R2Cross program includes five components:

1. Getting Started - provides an overview of the purpose of R2Cross and brief instructions on each tool that is part of the program. It also provides blank templates and examples templates for each tool.
2. R2Cross Tool - used to compute stream flows that meet habitat criteria based on user-input field measurements.
3. Discharge Calculator - can be used separately to determine the discharge measured at a cross-section.
4. Particle Size Calculator - can be used separately to determine statistical distributions of sediment sizes based on size classifications.
5. Data layers and Mapping Tool - can be used to locate the cross-section and display information related to hydrography, stream gages, water right structures and other coverages.

Figure 1. R2Cross program overview.

The following sections describe the user interface and details of each of these tools.

R2CROSS TOOL

With the R2Cross program interface open, click the R2Cross tool icon (R2Cross tool icon) on the left dashboard (Figure 2). Each step in the R2Cross tool is numbered to guide the user through the tool. The steps include 1) uploading the R2Cross data using a standard Excel file template; 2) running the model; and 3) downloading a report of the results in either a pdf or Excel format.

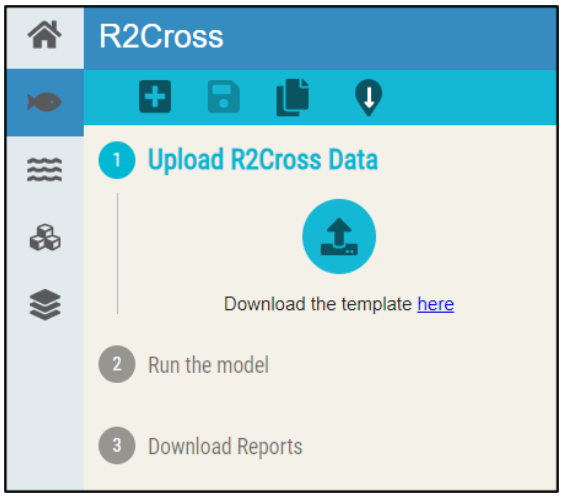


Figure 2. Accessing the R2Cross Tool

The main screen/window, to the right of the steps used to run the model, has two modes. Initially it shows a map centered on Colorado. When R2Cross data is uploaded, the window changes to display the cross-section data in the model view. The user can toggle between the map view and the model view by selecting the button.

R2Cross project files are saved as tokens or URLs on the eRAMS server using the toolbar icons located above the model steps. When R2Cross opens, a New Project is automatically created, the user does not need to create a New Project before uploading data. New Project will create a new project or token and clear any previously data and model runs. Save Project will save the uploaded data, model settings, and results. Copy Project Link can be used to make a copy of the URL in order to reopen the project later.

Upload R2Cross Data

With the R2Cross tool open, the user uploads the R2Cross Data file by clicking the icon (upload icon) on the left dashboard under Step 1 (Figure 2). The upload icon opens a file selection window to select the R2Cross data file for upload. If the data is not formatted correctly, the upload will not work and an error message will display at the top of the screen. A blank R2Cross data file is also available for download below the upload icon. R2Cross field data is entered into the data file using Microsoft Excel. All of the fields are mandatory and the file will not load properly unless they are filled. The blank R2Cross data file provides basic instructions for the user to enter their data in the appropriate format (Figure 3). An example R2Cross data file filled with data that is correctly formatted is included on the Home page under the Getting Started section.

COLORADO
Department of Natural Resources

Observer	JB and JS
Cross-section#	1
Coordinate	UTM Zone 13
X (easting)	501243
Y (northing)	4398584

R2CROSS CROSS-SECTION NOTES

Stream Name	Stream Location			Slope
Example Creek	Approx .5 mi upstream from bridge			0.011
Feature	**Distance From Initial Point (ft)**	**Rod Height (ft)**	**Water Depth (ft)**	**Velocity (ft/s)**
	0	1.68		
Bankfull	5.8	2.02		
	8	3.1		
	11	3.84		
	12.5	4.32		
Waterline	13.7	4.8	0	0
	16	5.05	0.25	0
	18	5.3	0.6	1.56
	20	5.6	0.9	0.85
	22	5.6	0.8	1.16
	24	5.9	1.1	1.04
	26	5.9	1.1	0.42
	28	5.45	0.65	2.42

Figure 3. R2Cross example data.

Once the R2Cross data has been uploaded, the cross-section will be processed and displayed (Figure 5). A new tab will be created at the top of the tool labeled “Cross-Section”, which includes a table of survey data, a graphical representation of the cross-section, and descriptive information about the stream name, location, and other field data.

Mapping Display

After R2Cross data is uploaded, the location of the cross-section is displayed on the map using the icon (position icon). The user can modify the base layer in the R2CROSS interface by clicking the icon (map icon) on the right side of the dashboard and select the arrow buttons to toggle between available base layers (Figure 4). Options include: OpenStreetMap, OpenStreetMap Humanitarian, USGS Imagery, USGS Imagery Topo, USGS Hydro-NHD, USGS Shaded Relief, Bing Aerial, Bing Aerial/Labels, Bing Road, and None. Settings under map icon include changing the opacity, map scale, and aspects of the map toolbar. Additional mapping

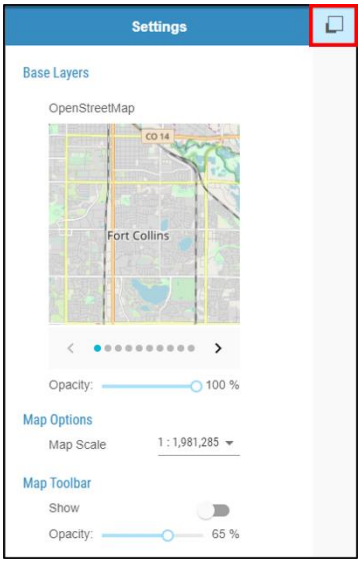


Figure 4. Map layers

features are available using the Data Layers tool (see Data Layers section).

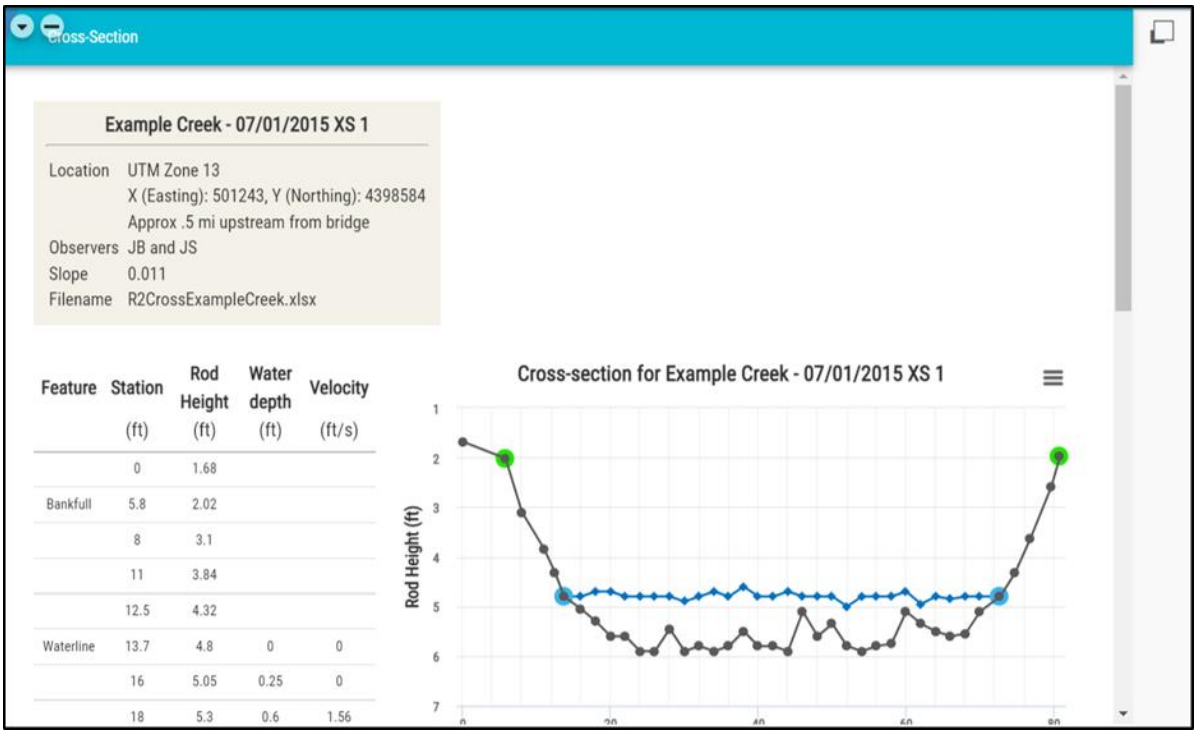


Figure 5. Cross-section tab showing example information.

Cross-section Graph

The graph of the uploaded cross-section is interactive; the user can hover over points on the graph to highlight them and display their X/Y coordinates and feature type. The user can also click and drag on the graph to zoom in on an area of interest. The ☰ icon (menu) in the top right corner of the graph provides options to download the graph as an image (png, jpeg, pdf, and svg formats) or as a spreadsheet of the data (csv and xls formats).

Carefully inspect the graph to make sure the data is reasonable. Once the user has reviewed the cross-section tab, click the NEXT button to move to the second step.

Run the Model

The R2Cross model uses Ferguson's Variable-Power Equation (VPE) to estimate hydraulic conditions (Ferguson 2007, 2021). The VPE is an empirical formula which accounts for the relative difference in channel roughness and water stage to estimate velocity or discharge. This equation is discussed in more detail in the Technical Guide at the end of this document.

Select Discharge Calculation Method

Once the cross-sectional data has been uploaded, the user must select which discharge calculation method should be used in running the model (**Error! Reference source not found.**6). As a default, the model will calculate the discharge based on the velocity and depth data provided in the R2Cross Data file. However, measuring the discharge at a nearby location more suitable for a discharge measurement (such as a cross-section with more uniform velocity) may provide a more accurate measurement (See the R2Cross Field Manual for additional information). In this case, the user can choose to use a different discharge either by uploading a discharge data file measured in a nearby cross-section or by manually entering a discharge value (for example, a discharge value obtained from a nearby gage or FlowTracker). Selecting these options will result in R2Cross calculating an average velocity for the measured cross-section. R2Cross makes all calculations for staging table computations based on the total cross-section area and the total discharge. R2Cross does not use the cell-by-cell water velocity data in any of the staging table computations. A blank discharge data file with basic instructions is available to download when the "Upload a discharge data file" option has been selected. An example discharge file filled with data is included on the Home page under the Getting Started section. This file format is the same as the Discharge Calculator Tool file.

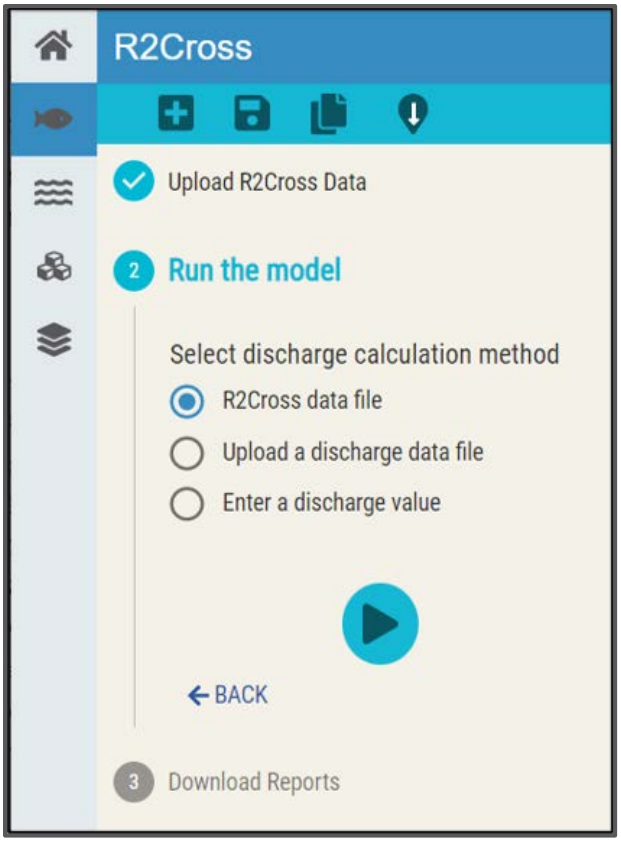


Figure 6. Running the R2Cross model.

Model Output Tabs

Once the model inputs are specified, the model can be run by clicking on the icon (run model icon). When the run is completed, a number of tabs are generated which are described below. Each tab should be carefully reviewed before looking at the final results.

R2Cross Summary Tab

The R2Cross Summary tab compares measured and model calculated values (Figure 7). Measured variables refer to the characteristics measured in the field at the time the cross-section

data was collected. Calculated variables are determined by the model using Ferguson's VPE.

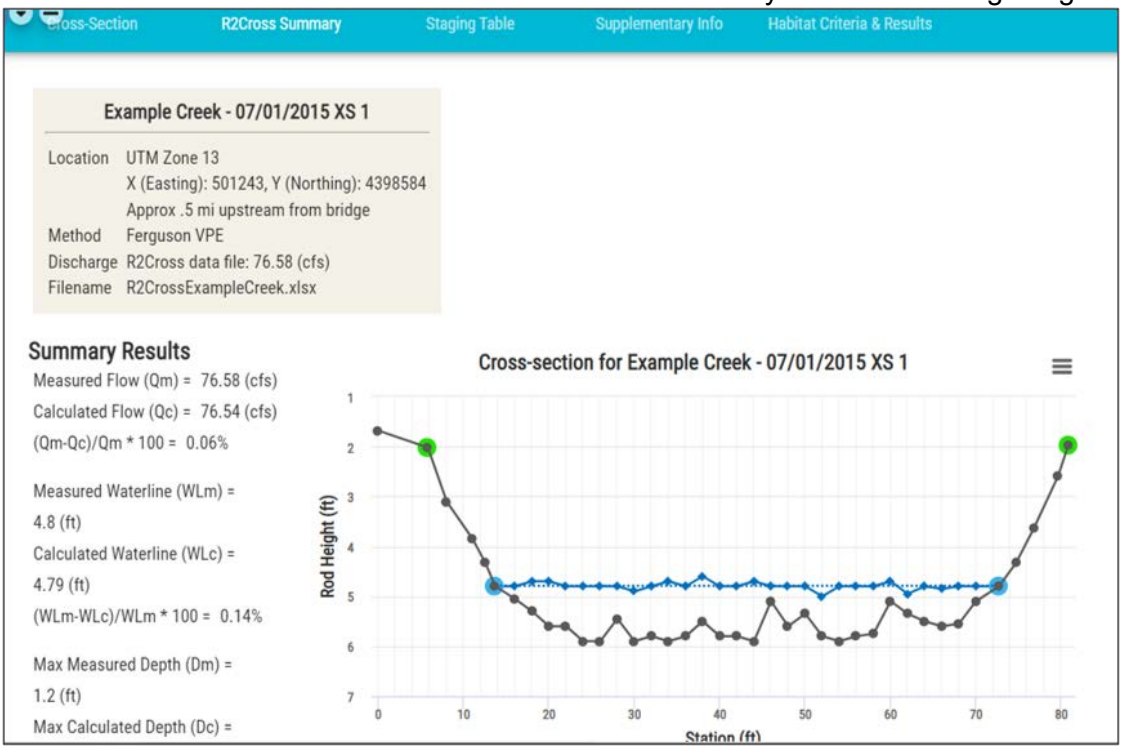


Figure 7. R2Cross Summary tab showing example information.

Table 1 provides an explanation of the variables given on the R2Cross Summary Tab.

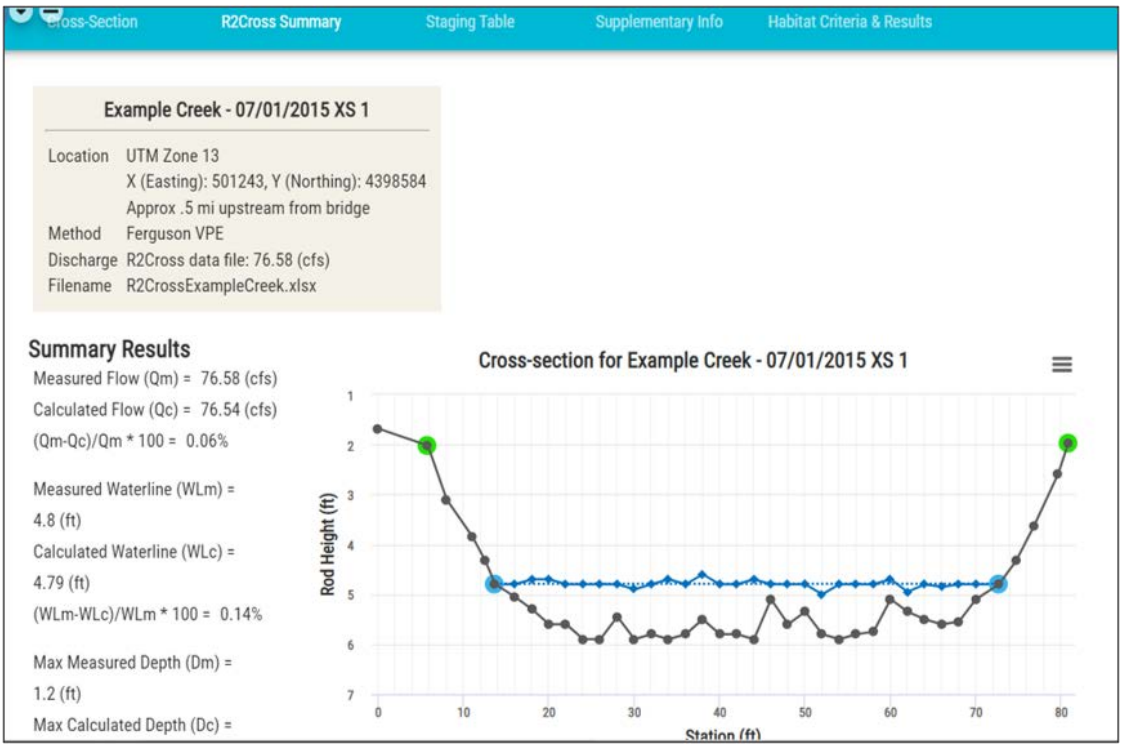


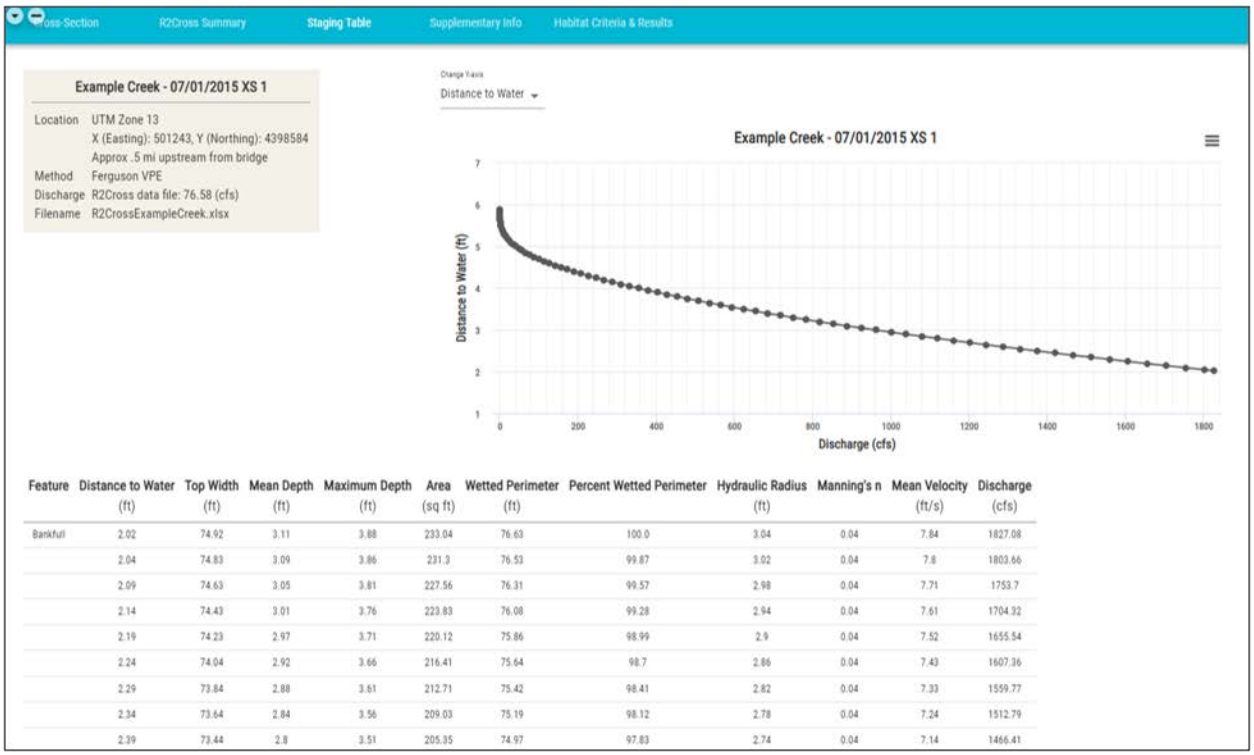
Figure 7. R2Cross Summary tab showing example information.

Table 1. Information presented in the Summary Results Tab

Hydraulic Variable	Description
Measured Flow (Qm)	Flow measured in the field using standard field methods
Calculated Flow (Qc)	Discharge calculated at the optimized waterline using the Ferguson VPE.
Measured Waterline (WLm)	The mean of the two waterline values indicated in the field
Calculated Waterline (WLc)	Model determined waterline based on minimizing the difference in area between the calculated and measured values
Max Measured Depth (Dm)	Maximum depth in the cross-section based on field measurements
Max Calculated Depth (Dc)	Calculated maximum depth based on the calculated waterline
Mean Velocity	Calculated as the total discharge divided by the total flow area using data collected from field measurements
Slope	The field measured slope used by the model

The differences in the measured and calculated flows, waterlines, and depths is provided as a check of the model run. The height of the water surface at each point is determined by adding the bed elevation and the measured depth. This may result in small variations in the measured waterline at each point. These variations could have multiple causes (e.g. surface waves, small differences in the surveyed bed and the measured depth location, etc.). In order to determine a single stage for the calculated waterline, the model determines the waterline elevation that minimizes the difference between the cross-sectional area based on depth measurements and the cross-sectional area based on bed measurements. There may be a slight difference in the discharge and maximum flow depth calculated using the measured and single waterlines, which are shown in the R2Cross Summary Tab. Large differences in the measured and modeled values should be examined closely to determine if there was a survey error or typo in the input file.

Staging Table Tab



Feature	Distance to Water (ft)	Top Width (ft)	Mean Depth (ft)	Maximum Depth (ft)	Area (sq ft)	Wetted Perimeter (ft)	Percent Wetted Perimeter	Hydraulic Radius (ft)	Manning's n	Mean Velocity (ft/s)	Discharge (cfs)
Bankfull	2.02	74.92	3.11	3.88	233.04	76.63	100.0	3.04	0.04	7.84	1827.08
	2.04	74.83	3.09	3.86	231.3	76.53	99.87	3.02	0.04	7.8	1803.66
	2.09	74.63	3.05	3.81	227.56	76.31	99.57	2.98	0.04	7.71	1753.7
	2.14	74.43	3.01	3.76	223.83	76.08	99.28	2.94	0.04	7.61	1704.32
	2.19	74.23	2.97	3.71	220.12	75.86	98.99	2.9	0.04	7.52	1655.54
	2.24	74.04	2.92	3.66	216.41	75.64	98.7	2.86	0.04	7.43	1607.36
	2.29	73.84	2.88	3.61	212.71	75.42	98.41	2.82	0.04	7.33	1559.77
	2.34	73.64	2.84	3.56	209.03	75.19	98.12	2.78	0.04	7.24	1512.79
	2.39	73.44	2.8	3.51	205.35	74.97	97.83	2.74	0.04	7.14	1466.41

Figure 8. R2Cross Staging Table tab showing example information

The Staging Table tab includes a table of hydraulic variables for incremental stream stages (**Error! Reference source not found.**8). The hydraulic variables are calculated based on channel geometry and the roughness equation (Ferguson's VPE) for each stage between zero flow and bankfull. The staging table includes the following columns:

- Feature: Identifies the stage attributed to either the bankfull elevation or waterline elevation
- Distance to Water (ft): the measured or calculated distance from the survey instrument to the water surface. The Distance to Water is displayed in 0.05 foot increments above or below the waterline stage.
- Top Width (ft): calculated top width of flow in the channel based on the surveyed cross-section geometry
- Mean Depth (ft): calculated as the average depth of flow by dividing the total flow area by the top width at each stage
- Maximum Depth (ft): calculated as the maximum depth of flow based on the surveyed cross-section geometry
- Area (sq. ft): calculated as the total flow area based on the surveyed cross-section geometry
- Wetted Perimeter (ft): calculated as the total wetted perimeter of flow based on the surveyed cross-section geometry
- Percent Wetted Perimeter: calculated by dividing the wetted perimeter at that stage by the bankfull wetted perimeter

- Hydraulic Radius (ft): calculated as the area divided by the wetted perimeter
- Mean Velocity (ft/s): calculated based on Ferguson's VPE
- Discharge (cfs): calculated as the product of mean velocity and area

In addition to the staging table, a dynamic graph is also included in the Staging Table tab. The graph allows the user to plot various rating curves by changing the variable represented on the y-axis. The y-axis options include any of the columns shown in the staging table.

NOTE: Any cross-sections that have measured topography below the elevation of the measured waterline, but beyond the surveyed edge of water, may have non-uniform changes in the roughness for stages near the measured water surface. In this situation, the user will need to carefully review the results.

Supplementary Info

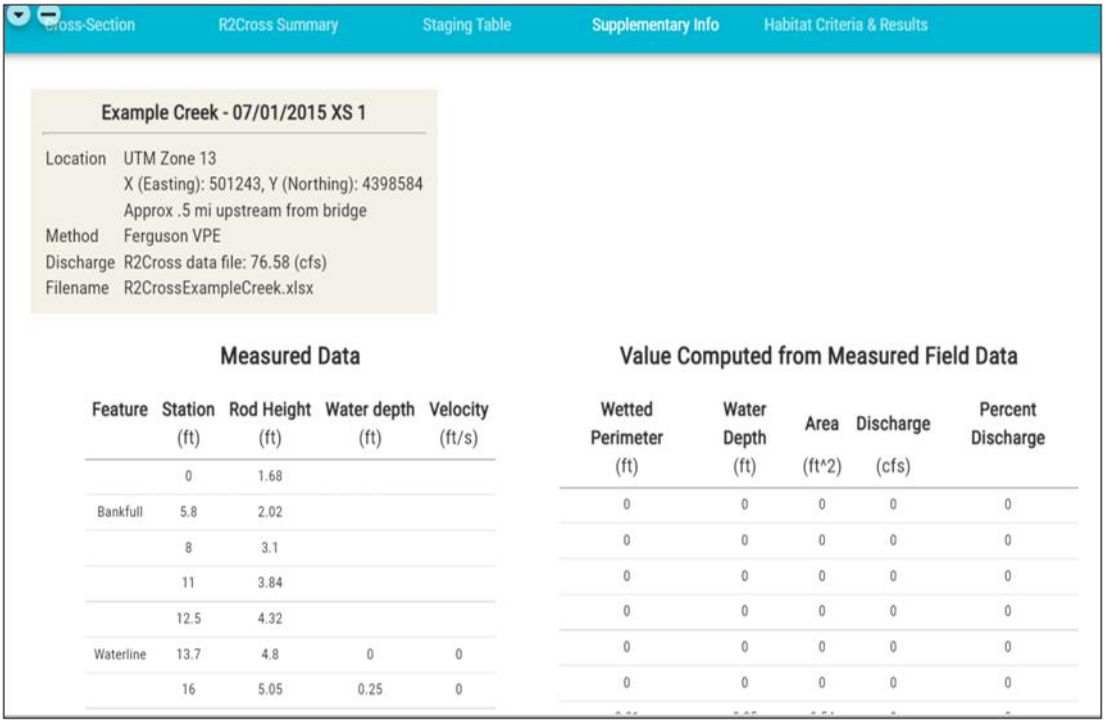


Figure 9. Supplementary Results tab showing example information.

The Supplementary Info tab (**Error! Reference source not found.**9) contains two tables that display: 1) measured data collected in the field; feature, station (called distance from the initial point in the input file), rod height, water depth, and velocity, and 2) accompanying hydraulic variables calculated using the field surveyed data (wetted perimeter, water depth, flow area, discharge, percent of total discharge). Summaries of hydraulic variables are shown at the bottom of the table.

Habitat Criteria & Results Tab

The Habitat Criteria & Results tab contains a summary table of results and three dynamic graphs that show the relationship between hydraulic criteria and discharge (Figure 9).

The R2Cross method is based on maintaining three principle hydraulic criteria related to average depth, average velocity and percent wetted perimeter, as established in Nehring, 1979 (

Table 2). Nehring determined that maintaining these parameters in a riffle cross-section indicates flow-related stream habitat quality that generally supports a cold-water fishery (see the R2Cross Field Manual for additional information).

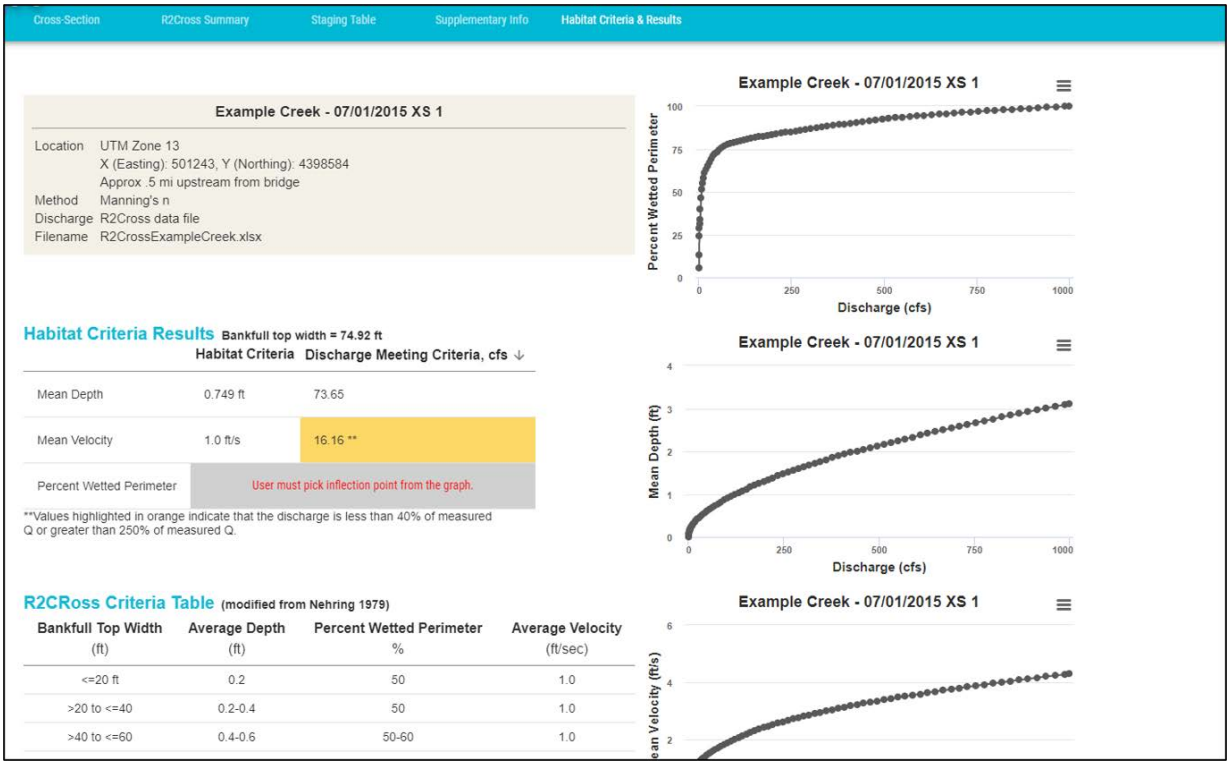


Figure 10. Habitat Criteria & Results tab showing example information.

Table 2: Criteria used to determine minimum flow requirements (modified from Nehring, 1979)

Bankfull Top Width[1] (ft)	Average Depth (ft)	Percent Wetted Perimeter (%)	Average Velocity (ft/sec)
≤20	0.2	50	1.0
>20 to ≤40	0.2-0.4	50	1.0
>40 to ≤60	0.4-0.6	50-60	1.0
>60 to ≤100	0.6-1.0	≥70[2]	1.0

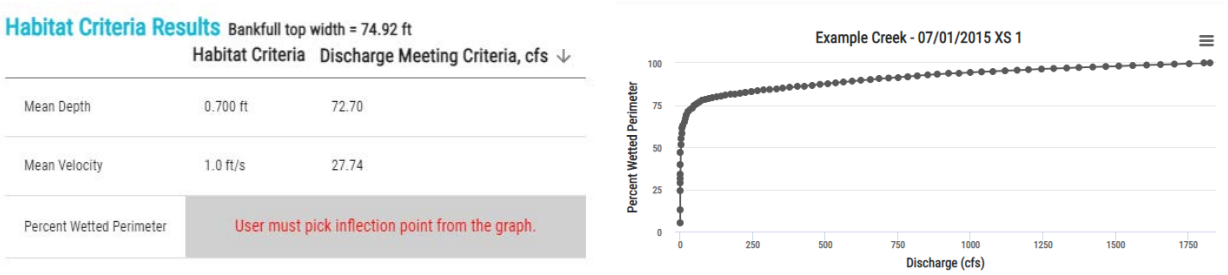
The Habitat Criteria Results table displays the appropriate hydraulic criteria based on the cross-sections' bankfull width. The R2Cross program calculates these criteria by smoothly interpolating between the criteria shown in Table 2. The lowest discharge that meets the hydraulic criteria is displayed and is automatically calculated by linearly interpolating the results shown in the staging table.

When the bankfull top width is greater than 60 feet, the appropriate percent wetted perimeter criteria must be determined by the user. This is done by evaluating the inflection point in the percent wetted perimeter-discharge curve, which typically occurs at or above a 70% wetted perimeter. Generally, wetted perimeter increases rapidly with small increases in discharge until water reaches the sides of the channel at which point only small changes in wetted perimeter occur with large changes in discharge. If more than one inflection point is present, the inflection point that corresponds to the flow that fully wets the bottom of the channel should be selected. In larger streams and rivers, that area of the channel is important for production of macroinvertebrates in the riffle, maintains important riffle habitat used for spawning and rearing of young fish, and corresponds with overhead vegetative cover (Leathe and Nelson, 1986). Selection of the wetted perimeter criteria when bankfull top width is greater than 60 feet should be based on professional judgment relative to the needs of the fish present in the specific stream or river.

If the bankfull top width is greater than 60 feet, the R2Cross program will display a message in the Habitat Criteria Results Tab to notify the user. To select the appropriate percent wetted perimeter for channels wider than 60 feet, the user clicks on the inflection point from the dynamic percent wetted perimeter-discharge graph (

[1] When the bankfull top width is greater than 100 feet, please contact staff at CWCB and CPW for more information.

[2] User should select an inflection point on the wetted perimeter-discharge curve that corresponds with a flow that fully wets the bottom of the riffle. The inflection point can occur at a value greater than 70%. Beyond this inflection point, the water starts to move up the sides of the active channel and the slope of the wetted perimeter-discharge curve begins to decline.



Habitat Criteria Results Bankfull top width = 74.92 ft

	Habitat Criteria	Discharge Meeting Criteria, cfs
Mean Depth	0.700 ft	72.70
Mean Velocity	1.0 ft/s	27.74
Percent Wetted Perimeter	User must pick inflection point from the graph.	

Figure, located at the top right). The user can click and drag on the graph to zoom in to the area of interest, and then select the inflection point on the curve where the rate of change (or slope) between discharge and wetted perimeter decreases noticeably. Once the user selects the inflection point from the graph, that value will automatically be populated into the Habitat Criteria Results table and the discharge meeting that value will be calculated.

The R2Cross program will provide a warning message at the top of the screen if a specific habitat criteria is not met at any point in the stage table. In this situation, the user will need to evaluate the cause and may need to discuss options with CWCB or CPW staff.

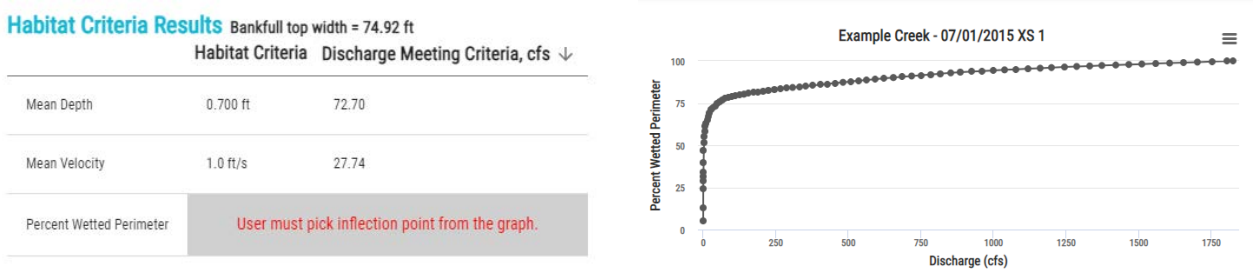


Figure 11. Example showing when bankfull top width is greater than 60 feet, requiring the user to select an appropriate percent wetted perimeter from the figure.

Download Reports

After running the model and reviewing the results, click the next button to move to step 3. The final step of the tool allows users to download information contained in all the result tabs into a pdf report format or as Excel tables (**Error! Reference source not found.**). Please note that all model outputs displayed in the web interface have been rounded to three or less significant digits. However, data contained in the exported Excel tables is not truncated so that the user can verify any of the input data or calculations. It is also advisable to copy the URL which contains a unique token so the model run can easily be reopened.

Use of R2Cross Results

Please see the R2Cross Field Manual for more information about using R2Cross results to determine ISF flow rates. The CWCB website also contains additional information on developing recommendations, guidelines for recommendation letters, and Board processes.

Figure 12. Downloading results in PDF or Excel format.

DISCHARGE CALCULATOR

The Discharge Calculator is a separate tool that allows the user to calculate discharge at a cross-section that is different than the cross-section surveyed for the R2Cross tool. Running the discharge calculator is not a required step in the R2Cross tool, it is provided as a simple means to accurately calculate discharge. The results from the discharge calculator can be used as a substitute discharge in the R2Cross tool in the Select a Discharge Calculation Method step of the R2Cross Tool or can be used completely independent of the R2Cross tool.

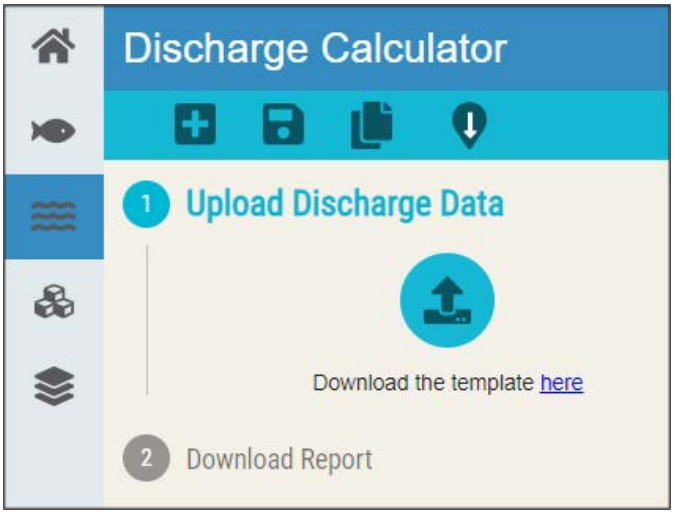


Figure 13. Discharge calculator.

To begin using the Discharge Calculator, click the icon (Discharge Calculator icon) on the left dashboard (**Error! Reference source not found.**).

Upload Discharge Data

With the Discharge Calculator interface open, the user can click the icon (upload icon) on the left dashboard. The upload icon will open a file selection window to select the Discharge Data file for upload. If the data is not formatted correctly, the upload will not work and an error message will display at the top of the screen. The option to download a blank Discharge Data file (Figure) is also provided. This file contains basic instructions for the user to enter data in the appropriate format using Excel. An example discharge file filled with data is included on the Home page under the Getting Started section.

Once discharge data has been uploaded, the cross-section will be processed, and two tables will be displayed to the user. One table contains the field measured data (feature, station, water depth, velocity), and a second table displays the calculated hydraulic variables (flow area, discharge, and percent discharge) at each vertical. The total calculated discharge (Q) is displayed in the yellow box in the top left corner.

COLORADO
Department of Natural Resources

Date	7/1/2015
Observer	JB and JS
Cross Section #	1
Coordinate	UTM Zone 13
X (easting)	501243
Y (northing)	4398584

FIELD MEASUREMENTS FOR DISCHARGE CALCULATOR

Stream Name	Stream Location
Example Creek	~0.5 miles upstream from bridge

Feature	Station (ft)	Water Depth (ft)	Velocity (ft/s)
	0	0	
	2.2	0.32	0
	5.2	0.7	0.94
	8.2	1.2	2.39
	11.2	1.1	3.1
	14.2	0.7	4.07
	17.2	1.05	4.35
	20.2	1.1	4
	23.2	1.15	1.9
	26.2	0.8	3.57
	29.2	0.8	3.04
	32.2	1	2.68
	35.2	0.55	3.77
	38.2	0.8	4.19
	41.2	0.75	2.02
	44.2	0.7	3.44
	47.2	1	3.42
	50.2	1.25	3.11
	53.2	1.1	1.16
	56.2	1.15	1.21
	59.2	1.1	0.42
	62.2	0	

Figure 14. Discharge Calculator example data.

Download Report

Similar to the R2Cross tool, the user can export a report as an Excel file or pdf file showing the results of the Discharge Calculator.

PARTICLE SIZE CALCULATOR

The Particle Size Calculator allows the users to calculate sediment size distributions using pebble count information collected in the field. To begin using the Particle Size Calculator, click the icon (Particle Size Calculator icon) on the left dashboard (**Error! Reference source not found.**).

Upload Sediment Data

With the Particle Size Calculator interface open, the user can click the icon (upload icon) on the left dashboard to open a file selection window and select the Pebble Count Data file for upload. If the data is not formatted correctly, the upload will not work and an error message will display at the top of the screen. The option to download a blank Pebble Count data template (**Error! Reference source not found.**), which includes basic instruction for the user to enter their data in the appropriate format, is also provided. An example particle size file filled with data is included on the Home page under the Getting Started section.

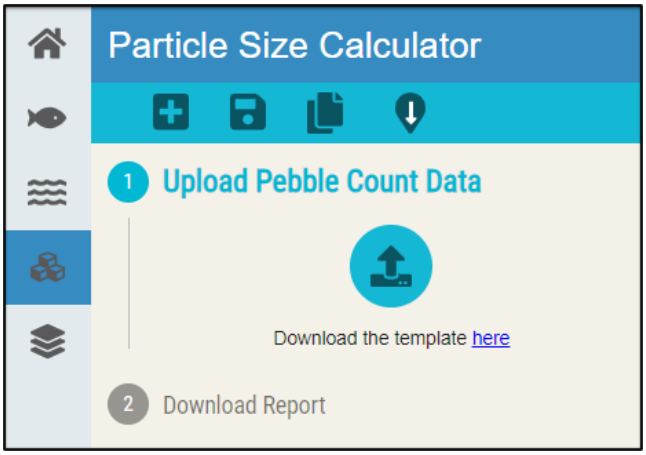


Figure 15. Particle size calculator.

Once particle size data has been uploaded, the information will be processed and displayed to the user (**Error! Reference source not found.**). Results from the particle size calculations include a cumulative yield curve and sediment size histogram as well as summary table by particle size type (i.e. sand and silts, fine gravel, etc.). Summary metrics of the sediment distribution is located at the top of the page, including percent finer sizes (D50, D84), geometric mean, standard deviation, and gradation coefficient.

Download Report

Similar to the R2Cross tool, the user can export a report as an Excel file showing the results of the Particle Size Calculator.

COLORADO
Department of Natural Resources

Date	7/1/2015
Observer	JB and JS
Coordinate	UTM Zone 13
X (easting)	501243
Y (northing)	4398584

PEBBLE COUNT OBSERVATIONS

Stream Name	Stream Location	Cross-Section No.
Example Creek	~0.5 upstream	1

Description of Particle Size	Size (mm)	Count
Sand and Silts	<2	54
Very Fine Gravel	2 - 4	6
Fine Gravel	4 - 5.7	16
Fine Gravel	5.7 - 8	14
Medium Gravel	8 - 11.3	13
Medium Gravel	11.3 - 16	15
Coarse Gravel	16 - 22.6	21
Coarse Gravel	22.6 - 32	50
Very Course Gravel	32 - 45	57
Very Course Gravel	45 - 64	90
Small Cobble	64 - 90	71
Small Cobble	90 - 128	62
Large Cobble	128 - 180	29
Large Cobble	180 - 256	7
Small Boulder	256 - 362	8
Small Boulder	362 - 512	0
Medium Boulder	512 - 1024	0
Large Boulder	1024 - 2048	0
Very Large Boulder	2048 - 4096	0
Bedrock	>4096	0

Figure 16. Particle Size Calculator example data.

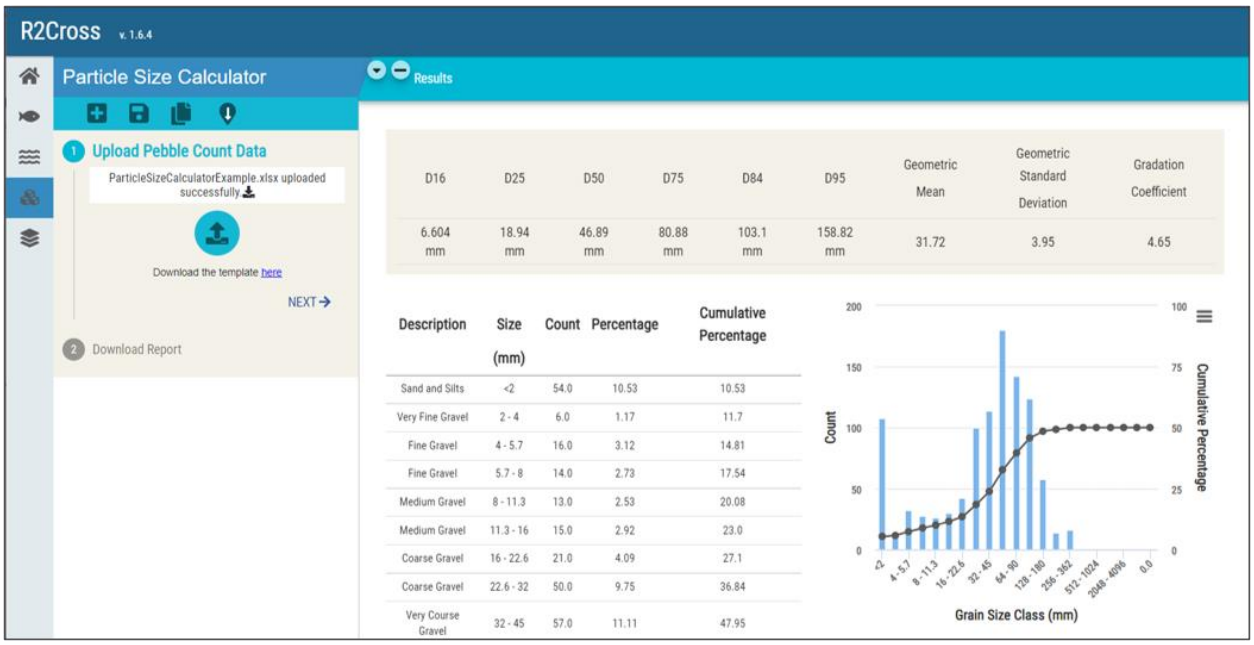


Figure 17. Particle Size Calculator results summary.

DATA LAYERS AND MAPPING

The Data Layers feature allows the users to add additional geospatial information to the map. To access this additional geospatial information, click the icon (Data Layers icon) on the left dashboard. This will open the map and provide the user a list of data sources (Figure). Some of these options are not available at high spatial scales and will be greyed out. To enable these layers, zoom in closer on the map. Multiple data layers can be displayed simultaneously.

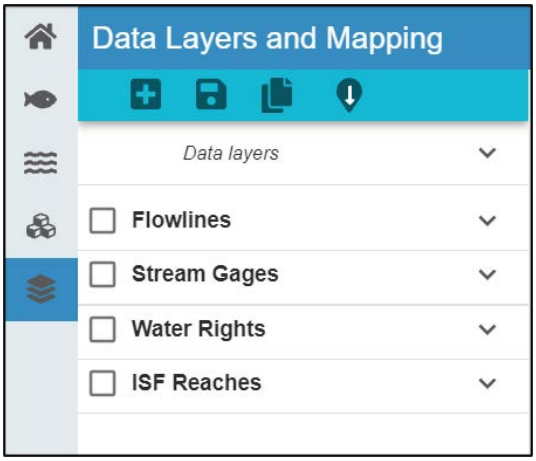


Figure 18. Data layer options

Flowlines

Checking the “Flowlines” option will display NHD+ Flowline data for the current map extent. A legend for this map will be included on the left-hand side of the interface and is collapsible with the arrow icon shown in Figure Figure . Each of the data types in this data set have their own legend as shown in Figure Figure .

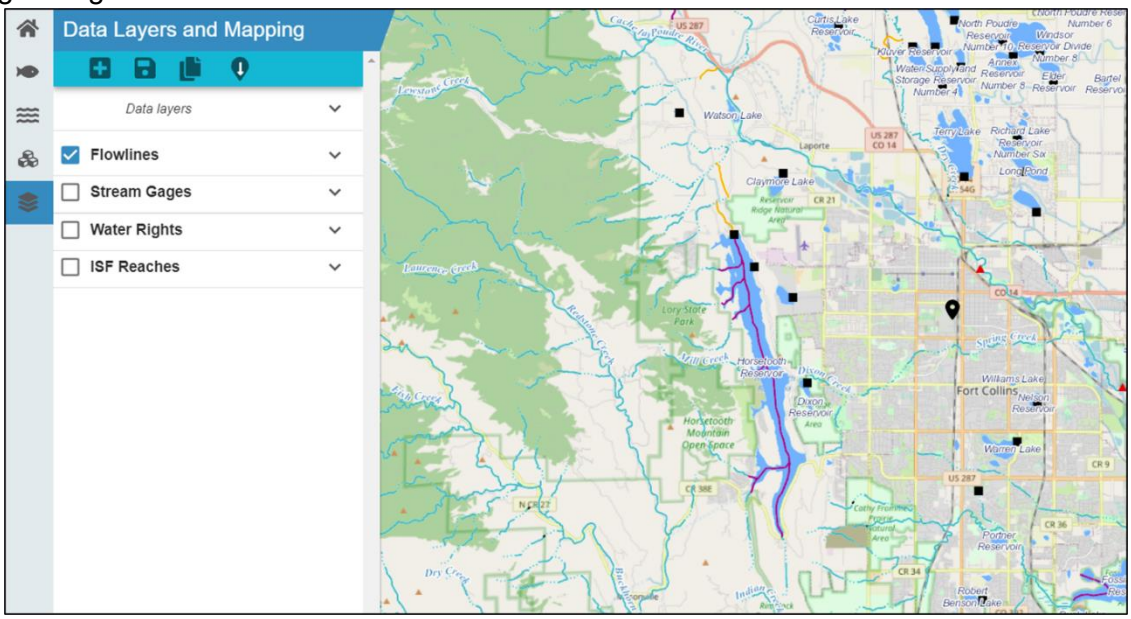


Figure 19. Flowlines Map

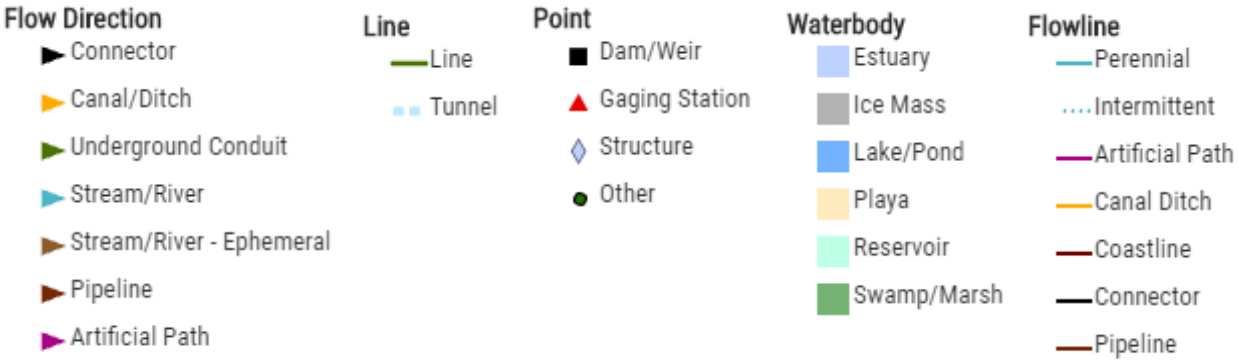


Figure 20. Legend options for NHD+ data

Stream Gages

The Stream Gage option displays stream discharge monitoring locations from USGS National Water Information System (NWIS) and the Colorado Division of Water Resources (CDWR). Checking this data layer will show all of the stream/river and ditch gages locations for the current map extent (Figure 20.). Currently operating gages and discontinued historical gages are shown with differing symbols.

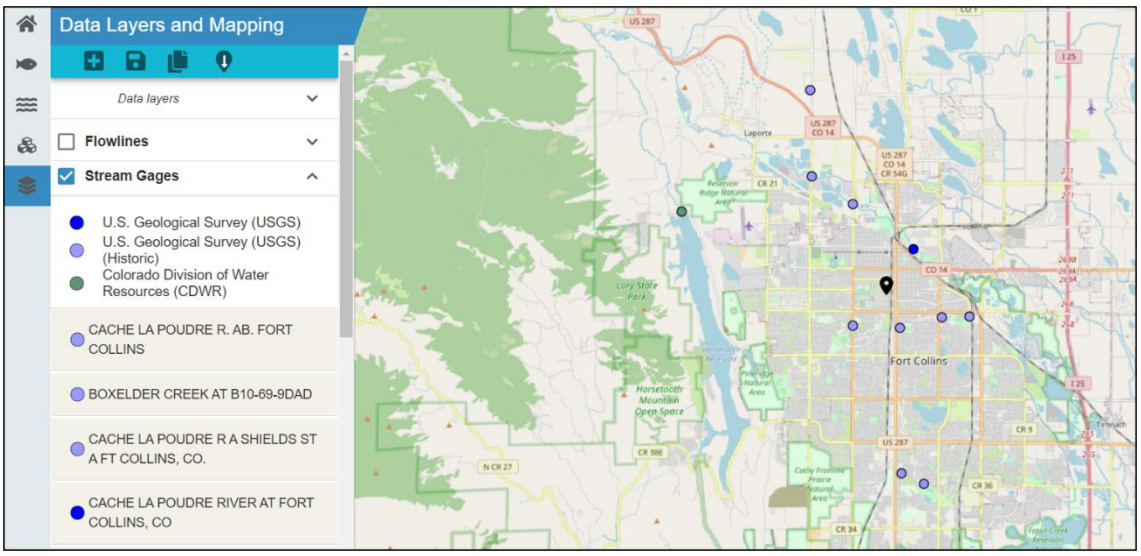


Figure 21. Stream Gage layer

Clicking any of the gaging locations (on the list on the left or on the map) will display a summary of the available streamflow data. A graph of streamflow data is also displayed, and the user can zoom in by selecting a box and zoom out by resetting the extent. A link to the webpage from the data source (USGS/DWR) is also included.

Water Rights

Water Rights data from the Colorado Decision Support System's Hydrobase database is available for summary in the R2CROSS analysis tool. Checking this data layer will show all the diversion structures in the current extent on the map (Figure 21).

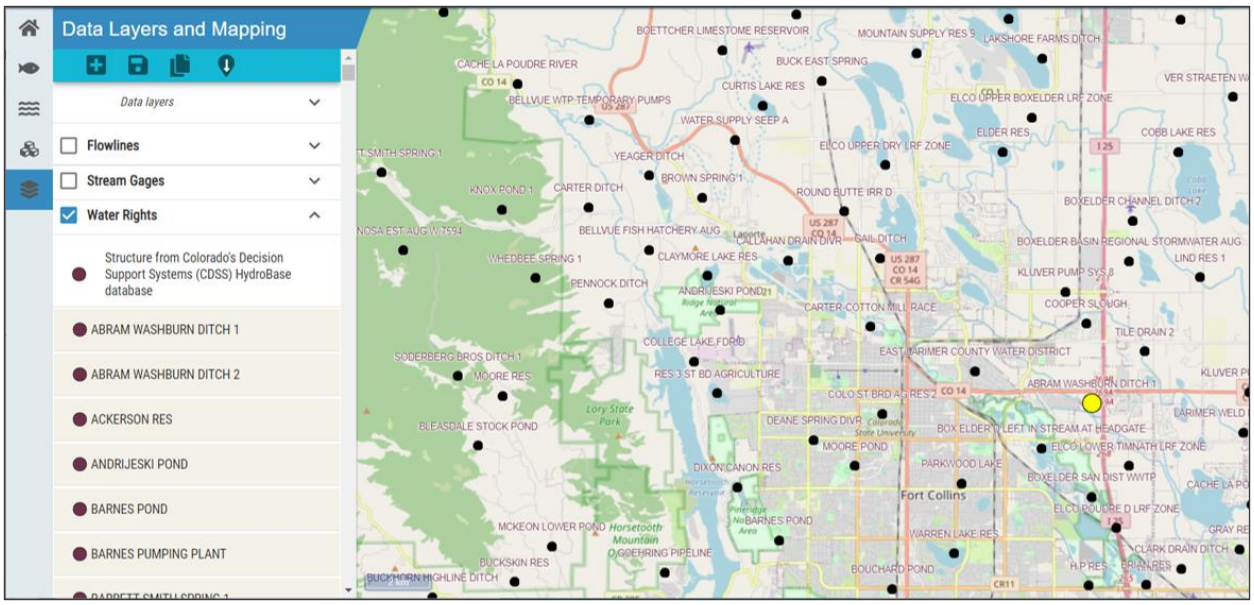


Figure 22. Water rights layer.

Clicking on any of the diversions (on the list on the left or on the map in **Error! Reference source not found.** a summary of the water rights for that location will be displayed, as shown in **Error! Reference source not found.**. This includes information on adjudication and appropriation dates of the water rights associated with these structures as well as their decreed uses, absolute and conditional volumes. A link to the Structure Summary on the Division of Water Resources page is also included for each water right.

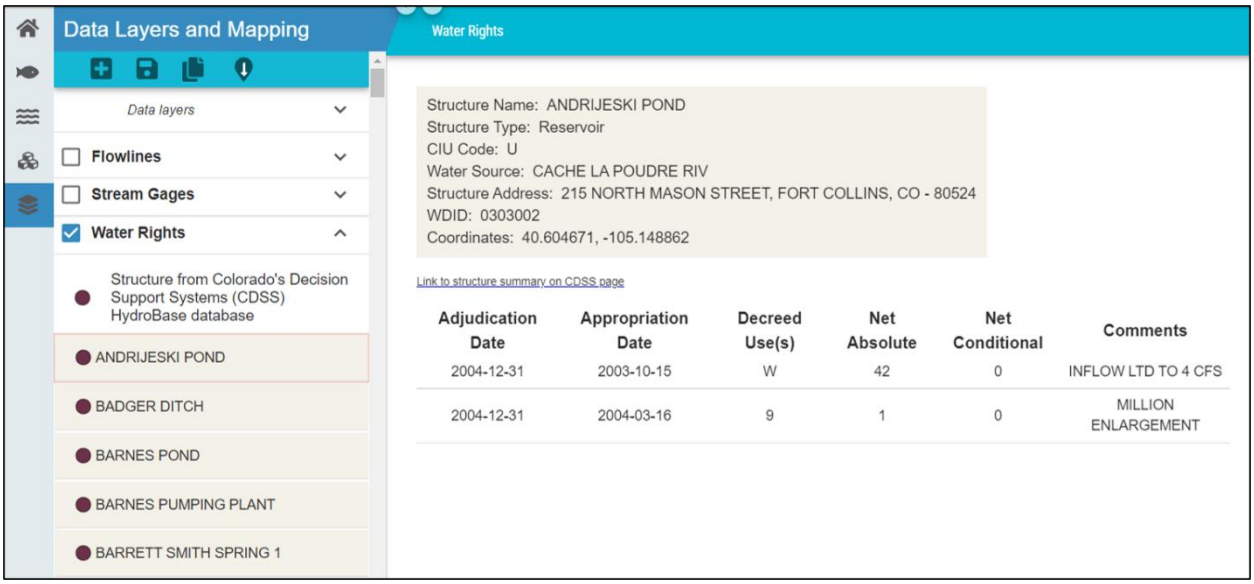


Figure 23. Hydrobase water rights summary.

ISF Reaches

The CWCB maintains a dataset of the instream flow reaches in Colorado. Selecting this data layer will display them on the map, as shown in Figure .

Clicking on any of the ISF water rights on the list in the left panel produces a summary of the water rights for that location (Figure 23). The line segments include information about the type of appropriation, status, case number and segment length. The type of appropriation can be “appropriated” meaning a new appropriation was made or recommended on the segment, “increase” meaning that an increase was recommended or made in addition to an original ISF right on the segment, or “acquired” meaning that the reach was acquired through the ISF acquisition program. The Status field indicates what stage of process the ISF right is in including decreed, recommended (but not decreed), or pending in water court.

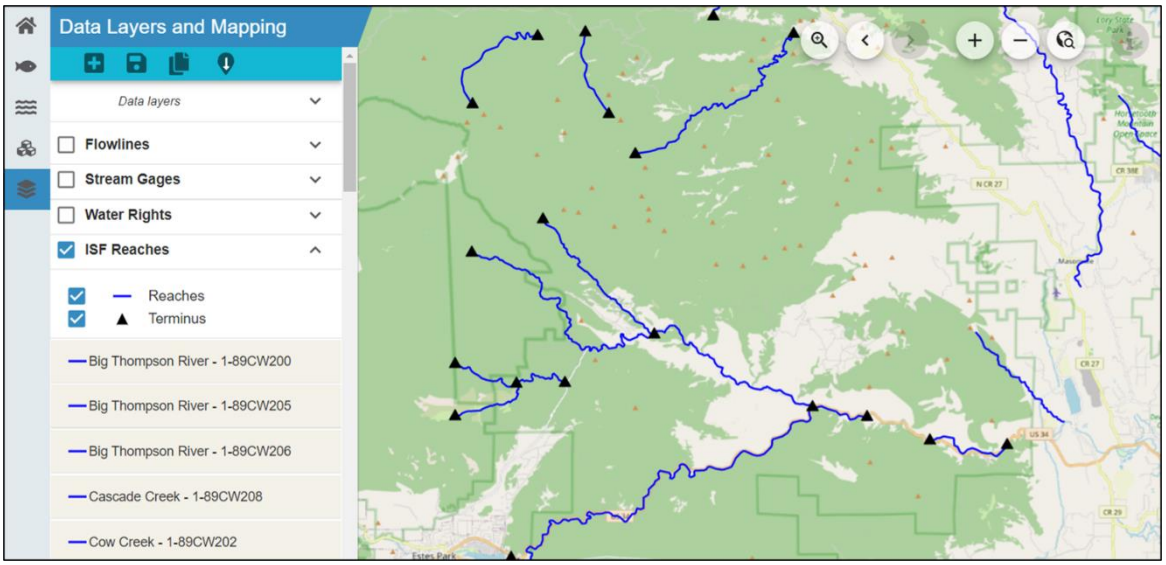


Figure 24. CWCB map of instream flow rights

TECHNICAL GUIDE

INTRODUCTION

The R2Cross program uses stream discharge and channel cross-section information, which is collected in the field, to estimate hydraulic conditions in the channel at different flow depths. The hydraulic conditions, such as depth, velocity, and percent wetted perimeter, are compared to habitat criteria to determine biological instream flow recommendations.

Numerous equations have been developed to predict instream hydraulic conditions based on channel geometry and roughness (e.g., Chow 1959). The most common empirical formula is the Manning equation, which assumes a constant channel roughness and uniform flow conditions. However, additional formulas have been developed to account for changes in overall channel roughness (represented by a flow resistance coefficient) as a function of flow depth, such as Ferguson's Variable-Power Equation (VPE) (Ferguson 2007, 2021). Ferguson's VPE equation relates the flow resistance coefficient to the ratio of flow depth and channel bed sediment size (this ratio is commonly referred to as relative submergence). The R2Cross tool uses the VPE equation, which is described in more detail below, to estimate roughness and hydraulic conditions at a cross-section.

FERGUSON'S VARIABLE-POWER EQUATION (VPE)

Ferguson (2007) proposed a variable-power equation that is asymptotic to the Manning-Strickler equation and the roughness-layer relationship as relative submergence becomes very small or very large, respectively. The main assumption under the variable-power equation suggested by Ferguson is that these two extreme relationships for deep flow and shallow flow are additive for a general coarse-bed stream. Unlike the Manning equation, Ferguson's equation adjusts the hydraulic roughness as the relative submergence changes in the channel. Originally, Ferguson's equation was fitted based on 376 cross-sections with slopes, D_{84}, and relative submergence (R/D_{84}) spanning between 0.00007-0.21, 0.05-0.8, and 0.1-26, respectively (Ferguson 2007). This method is reported to outperform other flow resistance equation based on 2,890 cross-sections (Rickenmann and Recking, 2011). However, as with any hydraulic roughness equation, the Ferguson equation may overestimate or underestimate the channel roughness depending on channel conditions.

Recently, Ferguson demonstrated that at cross-sections where single discharge and stage measurements are collected, a single calibrated effective roughness height (k) can be used to estimate hydraulic conditions at different stages (Ferguson, 2021). This calibrated effective roughness height does not require the user to assume or measure a D_{84} sediment size. Thus, the VPE equation used to calculate channel velocity at a given stage is given by:

$$U = u_* \frac{a_1 a_2 (R/k)}{[a_1^2 + a_2^2 (R/k)^{5/3}]^{1/2}}$$

where, $U =$ is the average channel velocity

u_* = $(gRS)^{1/2}$ is the shear velocity, g is the gravitational acceleration, R is the hydraulic radius, S is the reach-average slope

a_1 , a_2 = Empirical coefficients 6.5 and 2.5 respectively

R = Hydraulic radius (ft)

k = effective roughness height (ft)

An equivalent Manning's *n* is calculated based on results from Ferguson's VPE equation and shown in the R2Cross Staging Table. This is done for all water stages, including the stage associated with the calculated waterline. The Manning's *n* equation is given by:

$$U = \frac{1.486}{n} R^{2/3} S^{1/2}$$

where, U = average velocity in the cross section (ft/s)

n = Manning's roughness coefficient

R = hydraulic radius (ft)

S = channel slope (ft/ft)

PARTICLE SIZE CALCULATOR

The R2Cross program calculates sediment size distributions according to the size classes presented in Table 3. Following the methodology of Bunte and Abt (2001), the *D*84 is calculated using the equation below. A generalized form of this equation can be used to calculate any size percentile, *Dn*, by replacing *D*84 with any percentile *n*.

$$D_{84} = 10\text{^}\left\{[log\ (D_{>84}) - log\ (D_{<84})] * \left(\frac{84 - CPF_{<84}}{CPF_{<84} - CPF_{>84}}\right) + log\ (D_{<84})\right\}$$

where, D_{84} = 84th percentile of a particle-size distribution (mm)

$D_{>84}$ = The particle class that is larger than the 84th percentile (mm)

$D_{<84}$ = The particle class size that is smaller than the 84th percentile (mm)

$CPF_{>84}$ = Cumulative percent finer that is larger than 84

$CPF_{<84}$ = Cumulative percent finer that is smaller than 84

Table 3: Example of sediment classification based on size (mm) and the corresponding number of particles for each size class.

Description of Particle Size	**Size (mm)**	**Count** (Frequency)	**Percent**	**Cumulative Percent Finer**
Sand and Silts	<2	54	10.53	10.53
Very Fine Gravel	2 - 4	6	1.17	11.70
Fine Gravel	4 - 6	16	3.12	14.81
Fine Gravel	6 - 8	14	2.73	17.54
Medium Gravel	8 - 11	13	2.53	20.08
Medium Gravel	11 - 16	15	2.92	23.00
Coarse Gravel	16 - 22	21	4.09	27.10
Coarse Gravel	22 - 32	50	9.75	36.84
Very Course Gravel	32 - 45	57	11.11	47.95
Very Course Gravel	45 - 64	90	17.54	65.50
Small Cobble	64 - 90	71	13.84	79.34
Small Cobble	90 - 128	62	12.09	91.42
Large Cobble	128 - 180	29	5.65	97.08
Large Cobble	180 - 256	7	1.36	98.44
Small Boulder	256 - 362	8	1.56	100.00
Small Boulder	362 - 512	0	0.00	100.00
Medium Boulder	512 - 1024	0	0.00	100.00
Large Boulder	1024 - 2048	0	0.00	100.00
Very Large Boulder	2048 - 4096	0	0.00	100.00
Bedrock	>4096	0	0.00	100.00

Using the example data shown in Table 3, D_{84} is calculated as follows:

$$D_{84} = 10\text{^}\left\{[\log(128) - \log(90)] * \left(\frac{84 - 79.34}{91.42 - 79.34}\right) + \log(90)\right\} = 103.10\, mm$$

DISCHARGE CALCULATOR

The discharge calculator uses the U.S. Geological Survey method described by Buchanan and Somers (1969) to calculate the total discharge at a cross section. The total discharge is calculated using the following equation:

$$Q = \sum(av)$$

where a is the individual partial cross-section area collected in the field and v is the corresponding mean velocity of the flow normal to the partial area.

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R2CROSS FIELD MANUAL

July 2024

COLORADO

Department of Natural Resources

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Acknowledgements

The Colorado Water Conservation Board would like to thank everyone involved in the development of the R2Cross Field Manual. We wish to acknowledge Jay Skinner for his work preparing this document and providing his insight and knowledge about field methods and development of ISF recommendations that come from a career spent working with the ISF program. We also wish to thank Roy Smith of the Bureau of Land Management and Katie Birch of Colorado Parks and Wildlife for their review and suggestions that greatly improved the final document.

Abstract

In 1973, the Colorado State Legislature vested the Colorado Water Conservation Board (CWCB) with the authority to appropriate instream flow (ISF) and Natural Lake Level (NLL) water rights in the State of Colorado. Today, the Board holds over 1,700 instream flow water rights covering approximately 9,700 miles of Colorado streams. R2Cross is one method used by the CWCB to model hydraulic parameters and determine minimum instream flow rates for streams and rivers. This manual describes field procedures to collect the necessary data to run the R2Cross model. This document also includes a discussion on how to develop an instream flow recommendation based on the R2Cross methods. The R2Cross Model User's Manual & Technical Guide describes to how to process the field data using the R2Cross Online Program which performs the calculations and evaluates which flows meet the hydraulic criteria.

Acronyms and Abbreviations

Term	Definition
BLM	Bureau of Land Management
cfs	Cubic feet per second
CWCB	Colorado Water Conservation Board
CPW	Colorado Parks and Wildlife
ft	Feet/foot
ft/s	Feet per second
GPS	Global Positioning System
ISF	Instream Flow
NLL	Natural Lake Level
USFS	United States Forest Service
USGS	United States Geological Survey

Disclaimer

This manual provides guidance on how to collect field data necessary for the R2Cross methodology. User assumes all responsibility and liability for application and use of such guidelines and specifically acknowledges the CWCB is not responsible for any such use by user of this manual. For best results, CWCB recommends that an experienced instream flow practitioner conduct ANY field work and data analysis.

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Introduction

Colorado's Instream Flow Program originated in 1973 with the passage of Senate Bill 97 (SB 97). Under SB 97, the Colorado Water Conservation Board (CWCB) was vested with the authority to appropriate instream flow (ISF) and natural lake level (NLL) water rights in the State of Colorado (§37-92-102(3), C.R.S. (2002). The CWCB holds these water rights are on behalf of the people of the State of Colorado to "preserve the natural environment to a reasonable degree." Today, the CWCB holds over 1,700 ISF water rights covering approximately 9,700 miles of Colorado streams and 506 NLL water rights distributed around the state.

The Instream Flow statute requires the CWCB to make three findings: (1) "determine that the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made; (2) determine that there is a natural environment that can be preserved to a reasonable degree with the CWCB's water right, if granted; and (3) determine that such environment can exist without material injury to water rights" (§37-92-102(3c), C.R.S. (2002)). The CWCB makes these determinations based on the supporting technical data and a final instream flow executive summary prepared by the CWCB staff. The Colorado Instream Flow Program Rules (CWCB 1993) describe the procedure used by the Board to appropriate new ISFs.

The statute directs the CWCB to request instream flow recommendations from other state and federal agencies such as Colorado Parks and Wildlife, United States Department of Agriculture, and United States Department of Interior. However, any entity can make ISF recommendations to the CWCB if they develop the necessary technical data to support the recommendation and participate in the appropriation process. For more information please see the ISF Appropriations website.

Determining the amount of water necessary to preserve the natural environment to a reasonable degree is a key component of ISF recommendations. R2Cross is one method used by the Colorado Water Conservation Board to determine minimum instream flow rates for streams and rivers. The R2Cross method has been used in most, but not all ISF appropriations to date.

This manual provides guidance on how to collect field data necessary for the R2Cross method. Field methods presented in this manual may be modified or adjusted, depending on site specific conditions, using best professional judgement. CWCB recommends that an experienced instream flow practitioner conduct all field work and data analysis. CWCB recommends contacting staff with any questions regarding the methodology. A companion document, R2Cross Model User's Manual & Technical Guide, explains how to process the field data using the R2Cross online tool. This document also describes the underlying equations in the model in more detail.

Use of the R2Cross Method

Before initiating field investigations to determine ISF needs, it is important to carefully consider the natural environment to be protected and the level of protection necessary. The natural environment can include a fish population, aquatic community, riparian community, or other organisms dependent on streamflow. The value and rarity of the natural environment can vary,

from common species such a brook trout, to species found nowhere else. The critical habitat necessary to protect the natural environment may differ depending on the life cycle requirements for the species of interest. The flow needed to protect specific species and habitat may also differ and R2Cross will not be suitable for all applications.

Other methods for ISF quantification should be considered when the natural environment or channel of a given stream is complex or requires special considerations. Streams with high value species or assemblage of species may require additional flow considerations. Multi-thread channels or large river systems may be better modeled with different techniques. When the critical habitat for the fish species of interest is not a riffle or riffles do not occur in the stream type, then other approaches should be assessed. R2Cross may also not be suitable if protection is needed for overbank flows for a critical life stage of plant or animal species. Please contact CWCB and CPW to discuss when it is more appropriate to use other methods to determine ISF flow rates.

In general, the approach in Colorado has been to focus on the most critical low flow habitat type or the most critical life stage of the aquatic organism or water dependent natural resource value. In most cases, the critical low flow habitat for fish is a riffle. Riffles are most easily visualized as locations that would dry up first if streamflow ceased. R2Cross is best suited to streams where riffles are the critical habitat type, the stream is single thread, channel width is generally 100 feet or less, and a base level of protection is appropriate.

R2Cross Overview

R2Cross has come to be the Colorado ISF Program's standard approach for several reasons. R2Cross was recommended as an economical approach to quantifying ISF needs in Colorado (Nehring, 1979). R2Cross was originally developed by the United States Forest Service (Silvey, 1976). The field effort associated with R2Cross is relatively easy to apply, repeatable, and involves real on-the-ground, site-specific measurements. It is superior to desktop methods because it is based on data collected on the stream of interest. Other methods are more data intensive, time consuming, and expensive but these factors do not necessarily mean better information for decision makers. The CWCB and CPW believe that the underlying technical basis for R2Cross remains scientifically sound and this approach is still widely used by the ISF program today.

R2Cross is a standard-setting technique that is based on the retention of hydraulic characteristics in a flowing water environment. The R2Cross method is based on a hydraulic model developed from field data collected during one or more site visits. Field data collection includes surveying stream channel geometry, water surface elevations, water surface slope, bankfull indicators and measuring streamflow. The R2Cross method collects field data in a riffle stream habitat type.

Riffles are biologically significant because they are (1) important for fish passage from pool to pool (Thompson, 1972), (2) they contain the highest diversity and biomass of invertebrates (Heino et al., 2004), the food source for most fish, and (3) they contain the right mixture of substrate size, water velocity, turbulence, depth and dissolved oxygen to make them the preferred habitat for spawning fish, especially salmonids (Espergren, 1996). Riffles, therefore, are a habitat type that is both critical during low flow periods (for passage and connectivity),

critical for completion of a fish's life cycle (reproductive success), and for feeding and growth. Riffles are also the stream habitat type most sensitive to changes in hydraulic parameters with variations in discharge (Nehring, 1979). A small reduction in streamflow may result in a large reduction in water depth and the amount of wetted perimeter available for aquatic habitat. A key assumption in use of the R2Cross method is that maintaining adequate streamflow in riffles will also maintain adequate habitat conditions for most life stages of fish and aquatic invertebrates in other important stream habitat types such as pools and runs (Nehring, 1979).

The data collected in a riffle is uploaded to an online tool that generates a staging table for the measured cross-section. Please refer to the R2Cross Model User's Manual & Technical Guide for an explanation of the procedures used to input the data and run the R2Cross model. The staging table includes calculated channel characteristics and hydraulic variables in increments from the stage of zero flow up to bankfull stage.

The R2Cross method is based on maintaining three hydraulic criteria related to depth, velocity, and wetted perimeter (Table 1). The average depth and percent wetted perimeter directly vary as a function of the bankfull top width (Nehring, 1979). CPW has determined that maintaining these parameters are good indices of flow-related stream habitat quality (Nehring, 1979).

Table 1. Hydraulic criteria used in the R2Cross method. Percent wetted perimeter is measured relative to the bankfull wetted perimeter. Modified from Nehring (1979).

Bankfull Width[1] (feet)	Average Depth (feet)	Percent Wetted Perimeter[2] (percent)	Average Velocity (feet/second)
≤20	0.2	50	1.0
>20 to ≤40	0.2-0.4	50	1.0
>40 to ≤60	0.4-0.6	50-60	1.0
>60 to ≤100	0.6-1.0	>70	1.0

The R2Cross program determines the lowest streamflow that meets the appropriate hydraulic criteria outlined in Table 1. The average depth criteria for streams wider than 20 feet is determined by multiplying the bankfull top width by 0.01. For example, a stream that has a bankfull top width of 44 feet would have an average depth criteria of 0.44 feet.

Streamflow corresponding with these hydraulic criteria are used to recommend seasonal flow rates. CPW recommends meeting all three of the hydraulic criteria during the spring, summer, and fall, and meeting two of the three hydraulic criteria during the winter, when streams are typically at base flows. For additional information about interpreting R2Cross results, please

[1] When the bankfull top width is greater than 100 feet, please contact staff at CWCB and CPW for more information.
[2] User should select an inflection point on the wetted perimeter-discharge curve that corresponds with a flow that fully wets the bottom of the channel. The inflection point usually occurs at a value greater than 70%.

refer to the section on Determine ISF Flow rates and the R2Cross Model User's Manual & Technical Guide.

Pre-Field Work Planning

Defining the Instream Flow Reach

ISF water rights are defined between two points on a stream. These points are referred to as the upper and lower termini and the length of stream in between is referred to as a reach. It is helpful to consider the potential ISF reach prior to going to the field. Factors that can influence the reach boundaries include:

- existing upstream and downstream ISF water rights or existing ISF water rights on tributaries within the reach of interest,
- factors that influence channel geometry or hydrology such as tributary inflows, significant diversions, dry up points, reservoirs, significant spring inflows, or trans-basin inputs,
- physical considerations such as land use like livestock grazing or mining, channelization due to roads, railroads, utility corridors, etc. or water quality changes,
- biological factors or natural environment changes such as a cold water to cool water/warm water fishery transition, angling regulation changes, or other management considerations.

Significant changes to hydrology are particularly important as they may indicate changes in channel geometry or the amount of water that is available for an appropriation. When considering an ISF reach length, it is generally better to err on the side of dividing a stream into smaller reaches and collecting R2Cross field data at more locations. This can refine the flow recommendation and help to avoid the need for additional trips to the field. After data is collected and analyzed with the R2Cross model, reaches with similar R2Cross results can subsequently be combined into one reach following the initial R2Cross analysis.

In general, R2Cross data should be collected in the lower half to the lower third of the intended reach unless access issues (private land, difficult terrain, etc.) prevent it. ISF reaches typically do not go "through" large on-channel lakes or reservoirs unless there are negligible changes to hydrology. If there is an on-channel reservoir, consider having one ISF reach end at the inundation zone and a second reach start at the outlet (Figure 1). If the impoundment is a natural lake, a Natural Lake Level water right should be considered. The pre-planning exercises associated with reach delineation allow the investigator to be efficient and to anticipate a variety of field logistical issues in advance of the initial field visit.

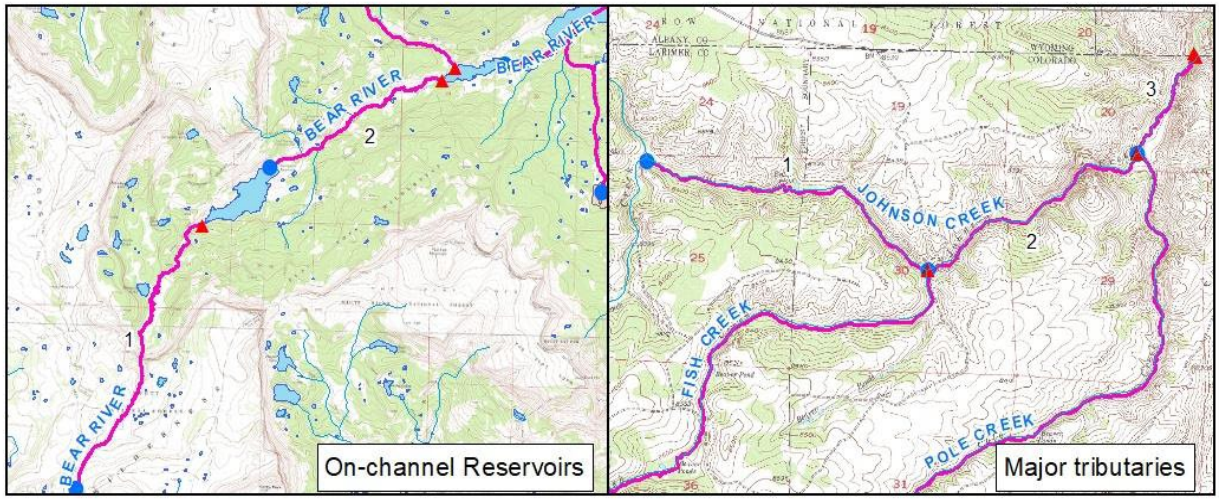


Figure 1. ISF examples that show reach delineation for on-channel reservoirs or lakes and major tributaries. Reaches are shown in pink, upstream termini are blue dots, downstream termini are red triangles.

Timing of Field Work

Planning activities prior to field work should consider the timing of anticipated flows before initiating ISF field investigations. R2Cross data must be collected at flows between low flow and bankfull, but ideally should be collected near the anticipated flow rates for the ISF recommendation. Making measurements at high flows can make it difficult to identify riffles, pose safety issues, and may produce model results that are outside of the suggested accuracy range. The R2Cross model also does not make calculations above the bankfull indicators and will not run if data is collected at flows above that elevation. Measurements taken at very low flows can make it challenging to accurately measure discharge particularly in small streams with coarse substrate. The timing of the ideal range of measurable streamflow is highly dependent upon basin elevation, local precipitation patterns, and winter snowpack.

R2Cross can be used to determine seasonal ISF flow needs in ephemeral or intermittent streams. It may be important to secure ISF protection in these streams which can provide refuge habitat for some species of fish as well as intermittent habitat connectivity to larger stream and river systems. Intermittent and ephemeral streams are also important in supporting other species of plants, insects, and terrestrial wildlife. In these cases, it is necessary to schedule field investigations during times when water is typically flowing.

Natural Environment Investigation

One of the three statutory determinations the CWCB makes is that "a natural environment exists." This is identified by the presence of water dependent natural resource values such as fish, macroinvertebrates, or riparian vegetation. Descriptions of the stream channel and the natural environment as well as fish or macroinvertebrate sampling efforts help to more fully describe the natural environment.

In most cases, ISF appropriations are based on the existence of a fishery or fish population. CPW prefers the use of recent fishery information when available to document the natural environment, rather than conducting new electrofishing efforts which can add unnecessary

stress on the fishery. CPW has an extensive statewide database of fish data; in most cases, no additional aquatic sampling is necessary if there is documentation of the fishery in the CPW database. Another source of frequently used natural environment data is CPW fish stocking records. While extensive aquatic investigations with population estimates or biomass calculations are not required, this type of data should be included if available. Length-frequency data is especially useful as it can provide information about natural reproduction and overall population structure. Both fish sampling and stocking data can be accessed free of charge by writing a request to the CPW Aquatic Research Section: https://cpw.state.co.us/Documents/Research/Aquatic/Aquatic-Data-Request-Form.pdf

If the CPW database does not have fisheries data for the reach, contact local CPW or federal agencies staff to gain a better understanding of what fish may be present in the system. These entities maybe be able to assist in conducting biosurveys. Recommending entities can also complete their own assessments of macroinvertebrates and riparian vegetation or rely on studies or reports by other entities. In addition, the Colorado Natural Heritage Program also conducts detailed surveys of vegetation, ecology, and animals at locations throughout the state. This information is available online at: https://cnhp.colostate.edu/ourdata/

Equipment Checklist

The following list of equipment is recommended to collect all data necessary for the R2Cross method, including cross-section and channel measurements, streamflow measurement, site documentation and description (Table 2). Supplies for conducting fish biosurveys are also listed if needed. A printable equipment list is provided in the Appendix.

Table 2. Field equipment checklist.

	Data forms for cross-section measurement, pebble count, and discharge measurement on either Rite-in-the-Rain paper or bond paper (a cotton/paper blended paper).
	Writing surface and utensils
	Digital camera and GPS unit
	Maps or mapping applications. Maps could include USGS topographic maps, DeLorme Gazetteer, Road Atlas, BLM Planimetric Map, USFS maps (for land survey legal descriptions), or digital applications.
	Optical level or laser level, tripod, and stadia rod. Stadia rod should be at least 15 feet long.
	Water velocity meter Flowtracker, Marsh-McBirney, ADCP, or similar with top-setting wading rod. Mechanical velocity meters with moving parts (Price AA, or Pygmy) can be used but need proper maintenance.
	Two reel-style surveying tapes of adequate length for the bankfull top width of the stream being measured and for water surface slope measurements. Tapes divided into feet and 0.10 feet increments are preferred (tapes in feet and inches can be used but values will have to converted prior to R2Cross processing).
	Anchoring pins to hold the cross-section tape with at least one scissor clamp or similar strong clamp.
	Chaining pins or similar.
	Surveyor's flags or rolls of colorful flagging tape[2] or a can of surveyor's marking paint (optional).
	Gravelometer or millimeter scale (optional).
	Safety equipment as needed such as personal floatation devices, first aid kit, communication equipment, etc.)
	Waders or hip boots dried sufficiently or disinfected
	Extra batteries for velocity meter, radios, GPS unit, camera, and laser level (if used).
	Basic set of tools including a hammer, Phillips and standard screwdrivers, short sections of rebar, etc.
	Vegetation tools including clippers, machete, hedge trimmer, or small hand saw to clear vegetation to improve line of sight for surveying.
	If natural environment data is needed, equipment to collect this information may include electrofishing gear, insulated gloves, nets, buckets, measuring board, scale, water quality sampling equipment (if needed - bottles, filters, meters, thermometer, etc.), and/or macroinvertebrate kick net (or similar). Scientific data collection permit if needed.

[2] Flagging can be useful to mark bankfull or other indicators in photos. Flagging is also helpful to string across the cross-section tape to stabilize the tape and prevent "bounce" on larger rivers in the wind.

Field Work

Field work consists of several steps that are critical to obtain usable data. The first step is to select an appropriate riffle and measurement location. Once a cross-section is established, survey the topography, channel features, and the water-surface slope using an engineering level or other survey equipment. Next, make a discharge measurement using a flow meter and top-setting wading rod. Discharge should be measured in a nearby suitable location or in the cross-section riffle if an accurate measurement is possible. These steps are detailed in the following sections.

Site Selection

As stated above, R2Cross is intended for use in riffle habitats (Figure 2). Riffles are generally the steeper habitat that exists between pools in some stream types or between glide or run habitats in other stream types. Riffles, as the name suggests, are areas in the stream environment where water flow is shallow and somewhat turbulent. The most significant visual feature of a riffle is that they occur at a break in slope where the water surface becomes steeper, velocities increase, and water depths decrease. This break in slope can occur at the tail end of a pool or at the end of a run or glide. Riffles are more easily identified during lower flow conditions. At higher flows, the hydraulics of the riffle may get "washed out" and the riffle feature may not be identifiable.

The riffle's length is highly dependent upon the size of the stream channel and can be a very subtle feature. In larger streams, the riffle can be long (10 or 20 feet or longer) and very easy to see at almost any flow; in small streams, the riffle can be a very short section – sometimes only 2 or 3 feet long. In some stream types, the riffle can be very hard to spot due to the confinement or entrenchment of these stream types. In these cases, look for short sections of stream where there is turbulent flow that is indicative of a rise in the bed profile and perhaps some coarser bed material. In general, in smaller streams with higher gradients, the riffles tend to be short, subtle features.

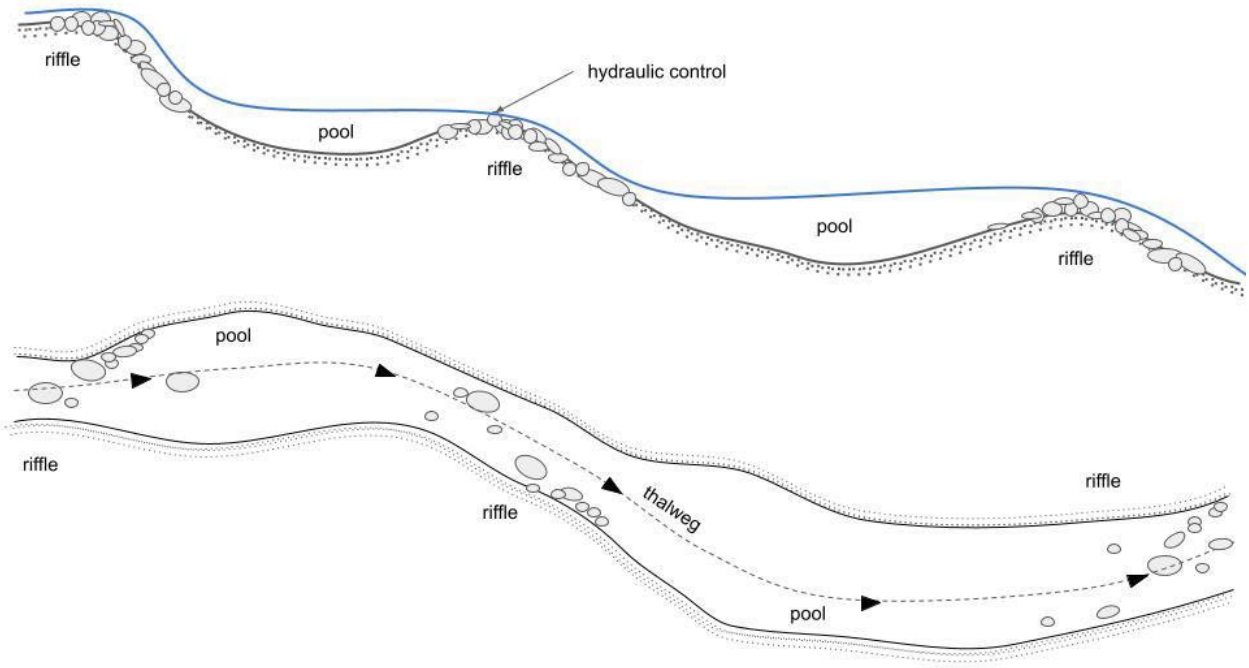


Figure 2. Longitudinal and plan view diagram of a riffle-pool sequence. Note the changes in water surface slope that occur in the pool to riffle transitions (hydraulic control points).

Figure 3. Photo of typical riffle R2Cross cross-section.

Before selecting a riffle to measure, conduct a reconnaissance investigation of a representative reach. An ideal reach should be at least 20-30 channel widths in length, to assess the typical range and variability of riffle habitat and to look for suitable riffles for the cross-section measurements. The riffle needs to be somewhat straight (perpendicular to the banks) and uniform in depth. Sites with undercut or eroding banks should be avoided. Also, avoid sites with mid-channel bars or islands and braided channels or locations that may become braided at lower flows. In streams where there is evidence of beaver activity, reconnaissance needs to include lateral investigation of the riparian zone. Beaver dam complexes often force the stream to cut numerous side channels and spread the flow out laterally into those side channels. Longitudinal reconnaissance will reveal the natural variability in riffles that exists in most streams – some riffles are wide and shallow while others can be relatively deeper and narrower. A thorough ISF investigation will capture the natural variability that exists in riffles by collecting data at two or more riffles in the identified reach. Even if there appears to be little natural variability in stream channel geometry, collecting more than one R2Cross data set in more than one riffle is recommended.

The precise location for the cross-section within the selected riffle should be near the hydraulic control, or the critical limiting transect within the riffle[3]. Avoid very turbulent hydraulics, hydraulic jumps, areas of zero or negative velocities, and undercut banks. Ideally, cross-sections selected will have relatively uniform depths and velocities where the flow is distributed somewhat uniformly across the channel. Make sure that at least one of the banks has a good bankfull indicator. It is always preferable if both banks have good indicators of the bankfull discharge but sometimes this is not possible while attempting to meet all the other conditions of a good R2Cross cross-section.

Bankfull Indicators

Bankfull indictors are signs or marks that show the stage or elevation of bankfull discharge (Harrelson, et al., 1994, Rosgen 1996; Leopold, et al., 1995) Bankfull discharge controls the shape and size of the active channel and is usually the discharge associated with the point of incipient flooding. As stated above, all R2Cross field work should be conducted at a flow less than bankfull, therefore physical indicators of the elevation of bankfull flow will need to be identified in the field. Bankfull indicators are important because the hydraulic criteria used with the R2Cross-method for ISF recommendation are dependent on an accurate measurement of the bankfull elevation[4]. Field observations of bankfull are therefore a critical piece of information that must be collected and documented in the field.

Bankfull indicators can be very subtle features on the streamside landscape. In general, bankfull indicators are a mixture of physical features and vegetative changes that occur on the stream bank (Table 3). Ideally, more than one type of physical feature or vegetation change will be

[3] Often referred to as the riffle crest, or the apex of the riffle. Placing the cross-section at the riffle crest will result in the best estimate of flow needs. The riffle crest is generally the shallowest cross-section in the riffle, and therefore the most important for maintaining connectivity. Cross-sections placed in locations other than the riffle crest may result in flow recommendations that are lower than what is needed for fish passage at the riffle crest.

[4] The term "grassline" has been used as a synonymous term for bankfull in previous R2Cross documentation and elsewhere.

apparent to provide multiple lines of evidence to support selection of the bankfull elevation. When there is uncertainty associated with the determination of bankfull elevations at the selected R2Cross site, the field crew should measure bankfull widths in other nearby riffles to confirm and guide determinations made at the measured R2Cross site or select a new location with clearer indicators.

Table 3. Summary of bankfull indicators.

Category	Description
Slope Break	Breaks in slope between the channel edge and the floodplain or a break in channel bank slope.
Point Bars	Sediment may be deposited on the inside of meander bends to form point bars. The top of a point bar (the highest elevation of the bar typically located near the channel margin) may show the minimum elevation of bankfull.
Vegetation	A transition from herbaceous plants (grasses, sedges, or rushes) to woody plants (willows, alders, cottonwoods, or even sage). The base of alders can provide good indicators if the channel has not migrated into the alders or the alders have not slumped into the channel. Willows are not always reliable indicators because they are more tolerant of long term root submersion.
Soil	The change from river sediments such as gravel and sand to more developed soils with organic matter.
Water lines	In bedrock channels, bankfull indicators can be water mineral stains on rocks or the lower extent of lichens.

Setting up the Field Site

The following section is a step-by-step procedure for setting up the field site in preparation for measurements and filling out site information on the field form. The optimal size of the field crew under most circumstances is three people, but the procedure can be accomplished with two. This procedure assumes that the reach has been identified, that the stream reconnaissance procedure has been done, that the appropriate cross-section locations have been identified, and the equipment has been transported to the streamside. An example of an appropriateR2Cross cross-section site is shown below (Figure 4). .

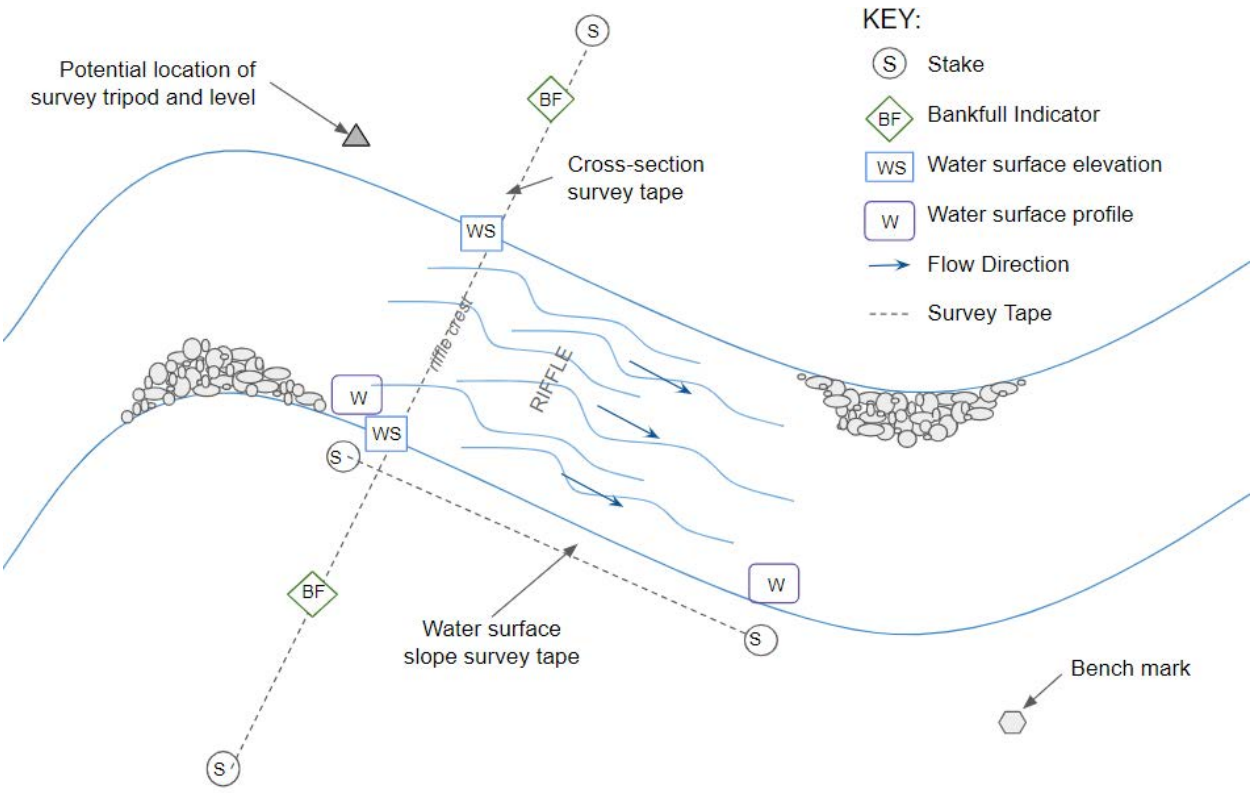


Figure 4. Schematic plan view of a R2Cross cross-section site.

Cross-Section Tape

1. Place the cross-section tape across the stream channel near the top of the riffle at the location of the hydraulic control (the shallowest depths on average or transect most prone to dry up, Figure 5). Take care to look for cross-sections with adequate bankfull indicators. Set the tape so that it is perpendicular to the flow direction at the time of the measurement as well as the presumed flow direction at bankfull discharge. Cross-section should be placed at a location nearest to uniform flow. Avoid locations that have large drops, steps, and hydraulic jumps.
2. Drive anchoring pins (stakes) into the ground on each bank above the elevation of the bankfull indicators. The R2Cross hydraulic model does not calculate any hydraulic information above the bankfull elevation, but it is important to measure some topography above the bankfull indicators.
3. Attach one survey tape to the stakes, making sure that the tape is tight, straight, and fairly level.
4. Remove minor obstructions from the cross-section, such as rocks and sticks, to create more uniform flow conditions. Once the stream cross-section measurements are initiated, all objects or obstructions (even if they are movable) must remain in place. Moving objects or obstructions after measurements are initiated will change the hydraulics of the cross-section.

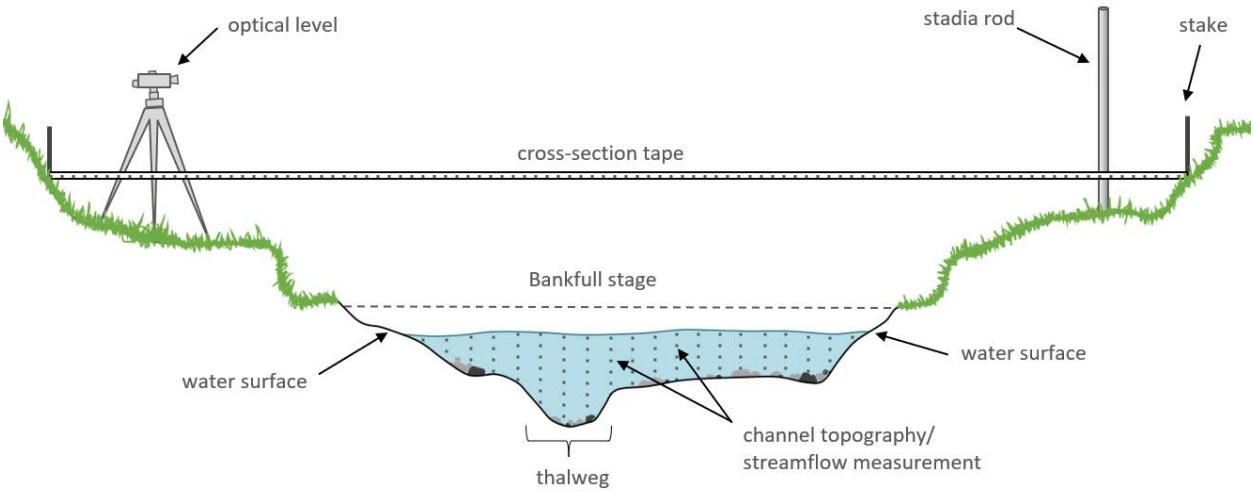


Figure 5. Schematic view of R2Cross cross-section and measurements.

Water Surface Slope (Longitudinal) Tape

5. Secure a second survey tape that extends from the most upstream point of the riffle to the most downstream point of the riffle along one of the banks. This tape is used to measure the local slope of the water surface in the riffle habitat. R2Cross uses the local slope of the water surface along the riffle, not the overall slope of the reach (Figure 4).

Tripod and Level

6. Select a location for the tripod that does not have obstructions between the level and the entire cross-section (bank-to-bank) as well as the points at the top and bottom of the riffle for the measurement of water surface slope. The line of sight should be free from excessive vegetation or other obstructions and should be close enough to allow for communication between the operator of the level and the operator of the stadia rod. Hand-held radios can be used in larger sites or sites with excessive background noise. In some cases, the best location for the level and tripod is in the middle of the stream – this is acceptable provided that the tripod can be made secure in its location and does not affect discharge measurements.
7. Securely set up the tripod and level the instrument using standard techniques for the instrument being used.

Filling out the Field Form

The CWCB and CPW use a standardized field form to record all field data (Figure 6 and Figure 7). Use of this form helps to ensure that the necessary data are collected in a uniform way for ISF recommendations. The front page (Page 1) of the form provides space for documenting the stream and data collection effort, which are discussed below. The back page (Page 2) of the form is for the stream cross-section measurements. A printable R2Cross field form is provided in the Appendix.

Observational documentation of the R2Cross site is important in the analysis phases of the R2Cross process. These notes and photographs often are useful when troubleshooting modeling results.

1. Stream Information
   a. **Stream Name**: can be identified from a USGS map, atlas, local signage, etc. If the name of the stream is not named, it is acceptable, for example, to call it Unnamed Tributary [identifiable creek].
   b. **Cross-Section #**: determine a numbering convention for multiple cross-sections being taken on the same stream on the same date. Each location should have its own number assigned (for example – Cross-Section #1 and Cross-Section #2).

2. Location Information
   a. **Cross-Section Location Description:** This section can be used to provide narrative description of the location of the cross-section and a description of the location relative to features on the ground. For example – upstream of Hwy 9 bridge, near Forest Service boundary, downstream of trailhead parking lot.
   b. **Division**: Water division as defined by the Colorado Division of Water Resources
   c. **Watershed:** major watershed the stream drains to. For example – Upper Colorado, Eagle River, Yampa River, Lower South Platte.
   d. **Coordinate System:** A GPS point should be taken at each cross-section location. This is essential for later data analysis performed by CWCB staff. GPS location can be taken in UTM or Lat/Long Coordinates. It is optional to include the Public Land Survey System (PLSS) coordinates.

3. Supplemental Data:
   a. **Flow Meter Type & Meter Number:** should be recorded so that flow data can be found later if needed. Acceptable Flow Meters are listed above in the Equipment Checklist.
   b. **Flow Measurement Taken at R2Cross Xsec:** record if flow was measured at the cross-section. If no, note the measured discharge and provide a description of the location of the measurement.
   c. **Channel Bed Material Size Range:** record substrate size. Can be qualitative (i.e., pebble, gravel, cobble etc.) or quantitative (i.e., less than ½" in size).
   d. **Pebble Counts:** are not mandatory but they are encouraged. This data can be used to accurately describe substrate and channel roughness.
   e. **Photos:** notes about photos can be documented.

4. Channel Profile Data
   a. **Sketch:** a schematic drawing that includes the location of instrumentation with respect to the cross-section tape, the location of slope measurements, and the number, order, and locations of the photographs of the site.
   b. **Water Surface Measures:** This section of the form also includes space to record the water surface (WS) elevation measurements at left and right bank and the upstream and downstream water surface elevation measurements used to calculate slope.

5. Natural Environment Notes
   The R2Cross field form includes a section on the Natural Environment to document field observations about the presence of fish, aquatic macroinvertebrates, riparian species or other biota. In addition, information about the stream such as valley type, channel

type, bed material, stream condition (for example degraded or pristine) can be noted. Descriptions of habitat such as pools, connectivity, cover, temperature, etc. can be documented.

a. **Aquatic Species Observed:** This section of the field form contains space for observations made about aquatic species (fish and/or aquatic macroinvertebrates). Please note that fish surveys or macro-invertebrate surveys could also be completed during the R2Cross site visit. However, this is not required to be collected at the same time and some information may already be available. Please see the section on the Natural Environment for more information.
b. **Riparian Vegetation Observed:** This section of the field form contains space for observations made about riparian vegetation, as well as upland habitat type.
c. **Other (Valley Type, Geology, Water Diversions, etc):** This section of the field form contains space for observations about other aspects of the natural environment such as water quality samples, water temperature, water diversions, etc. General observations regarding the site and flow conditions such as recent or current weather conditions, water clarity, and precipitation prior to or during the measurement, gage or flume readings, etc., may also be helpful to include.

6. R2Cross Cross-Section Data
   a. Page 2 of the field form is used to record the cross-section measurements including the **start and end times**, **staff gage** readings, **benchmark** measurements, **features**, **distance from initial point** (or horizontal station), **rod height** (stadia level elevations), **water depth**, **velocity (which is optional)**, and other **notes**. These measurements are discussed in depth in the following sections below.

COLORADO
Department of Natural Resources

R2CROSS FIELD FORM

STREAM INFORMATION

STREAM NAME:	DATE:
OBSERVERS:	CROSS SECTION #:

LOCATION INFORMATION

CROSS-SECTION LOCATION DESCRIPTION:					
DIVISION:		COUNTY:	WATERSHED:		
COORDINATE SYSTEM (circle one):		UTM Zone 13	UTM Zone 12	Lat/Long	
X (EASTING):			Y (NORTHING):		
TOWNSHIP:	N/S	RANGE:	E/W	SECTION:	1/4 SECTION:

SUPPLEMENTAL DATA

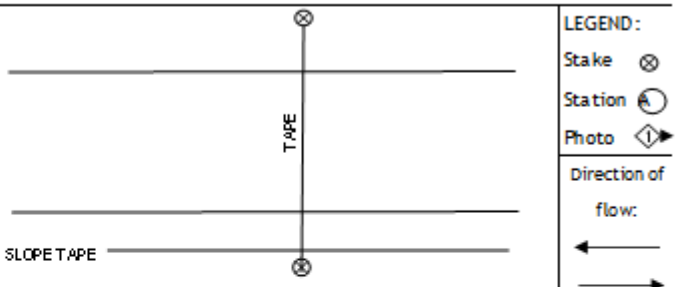
FLOW METER TYPE/METER #:			
FLOW MEASUREMENT TAKEN AT R2CROSS XSEC?	YES / NO	IF NO, MEASURED DISCHARGE:	cfs
IF NO, WHERE?			
CHANNEL BED MATERIAL SIZE RANGE:			
PEBBLE COUNT COLLECTED AT THIS LOCATION?	YES / NO	PHOTOS:	YES / NO

CHANNEL PROFILE DATA

STATION		DIST. FROM TAPE (ft)	ROD HEIGHT[1] (ft)
WS @ Tape LB	LB	0	
WS @ Tape RB	RB	0	
WS UPstream	1		
WS Downstream	2		
Slope:			

[1]Measurement should be taken to the hundredth decimal place

SKETCH



NATURAL ENVIRONMENT NOTES

AQUATIC SPECIES OBSERVED (FISH/MACROINVERTEBRATES/ETC):

RIPARIAN VEGETATION OBSERVED:

OTHER (VALLEY TYPE, GEOLOGY, WATER DIVERIONS, ETC):

Figure 6. Front of the R2Cross field form.

R2CROSS CROSS-SECTION DATA Page ___ of ___

STREAM NAME:

CROSS SECTION #: DATE:

TIME START: TIME END:

STAFF GAGE START (ft): STAFF GAGE END (ft):

BENCHMARK DESCRIPTION:

BENCHMARK START (ft): BENCHMARK END(ft):

FEATURE: Stake (S) Bankfull (BF) Waterline (WL) Rock (R)	DISTANCE FROM INITIAL POINT (ft)	ROD HEIGHT (ft)	WATER DEPTH (ft)	VELOCITY (ft/sec)	NOTES:

Figure 7.Back of the R2Cross field form.

Making Field Measurements

The following section is a step-by-step procedure for cross-section measurements for the R2Cross method. This manual does not provide an overview of general surveying techniques, please review other resources such as Harrelson, et al. (1994) if needed.

Initial QA/QC Checks

1. **Benchmark:** A temporary benchmark should be located or established for the cross-section survey. This benchmark can be a piece of rebar (or similar) driven into the ground or a marked point on a rock or log near the site. The first and last readings from the level should be the elevation of the benchmark; record these elevations on the field form. Both readings should match, confirming that the level did not move during the survey.
2. **Temporary Gage:** A temporary staff gage (a chaining pin or similar) should be placed in the water near the streambank; the water surface elevation on the staff gage and time will be noted on the field form prior to the start of the measurement and when the measurement in complete. This is done to ensure that there was not a drastic increase or decrease in the streamflow while the measurements were taken.
3. **Water Surface Elevations**: To ensure that the cross-section tape is perpendicular to flow, a set of water surface elevation measurements are taken at the water's edge on left and right bank (labeled as WS in Figure 4). These measurements are taken at the left and right extent of the wetted channel at the water surface (Figure 8 for methods for accurately measuring water surface elevation). The water surface elevations on each bank should be made at least to the 0.01 feet level of accuracy and should be nearly identical (within 0.05 feet of one another). If these readings are off by more than 0.05 feet, then either the cross-section has not been placed perpendicular to flow or there is a difference in topography that is forcing water on one bank to be higher. Try adjusting one end of the cross-section tape either upstream or downstream so that these water surface elevations match. If this does not work, the entire tape might have to be moved slightly upstream or downstream. A completely different cross-section may need to be located which does not have stream hydraulics or bank topography issues. Once these readings have been finalized, they can be recorded in the Channel Profile Data section on the first page of the field form.

Survey Water Surface Elevations to Calculate Slope

1. The next two measurements are water surface elevation measurements (labeled WS in Figure 4) taken at the upstream most point and downstream most point of the riffle. Place the stadia rod at the water surface using one of the three methods, bed at water's edge method, the boot method, or substrate support method (Figure 8). Record the rod reading and distance upstream or downstream from the cross-section tape on the field form in the Channel Profile Data section. These measurements are used to calculate the water surface slope along the length of the riffle (slope = rise/run). After recording the information, verify that the elevations reflect water moving in a downhill direction. The locations of these readings as well as the location of the tripod and instrument should be noted on the sketch drawing of the site (Figure 4). These measurements should be made at least to the 0.01 feet level of accuracy.

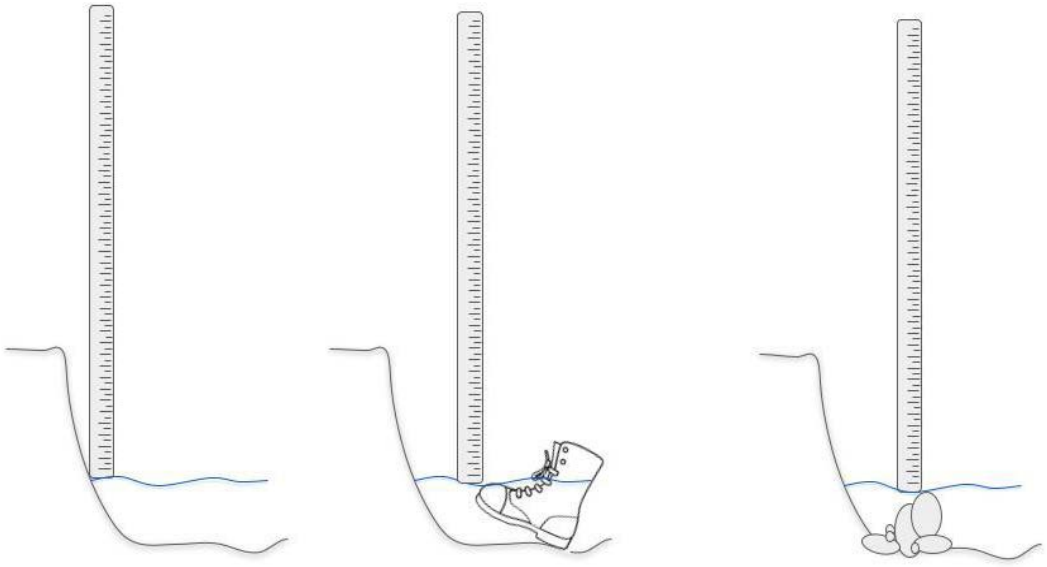


Figure 8. Three options for accurately measuring water surface elevations include using the bed at the water's edge (left), the "boot method" (middle), and using substrate elements (right) to support the rod at the water surface elevation.

Surveying the Channel

1. Note the starting time of the measurement and the staff gage reading on page 2 of the field form.

Overbank Channel Measurements

2. Starting at the 0.00 end of the cross-section tape, record the distance from initial point (station) and stadia rod height (rod level) in sufficient detail (to at least the 0.05 ft level of vertical accuracy) to describe the two-dimensional shape of the cross-section outside of the wetted channel. Distance and elevation coordinates on the bank should be recorded at every break in elevation on the bank, not at regular intervals. This is to accurately describe the topography of the banks to the R2Cross model. On each bank, distance and elevation coordinates need to be recorded at the stake, at the bankfull elevation, and at the water surface at a minimum. These stations need to be specifically noted in the Features column on the field form. Use the Notes field to describe bankfull indicators or any other prominent features of interest.
3. Great care should be taken when measuring the bankfull indicators. The two indicators should be relatively close in elevation but may not be an exact match. R2Cross does not require the two elevations to be an exact match. The R2Cross model selects the lower elevation indicator and projects that elevation across the stream to the opposite bank. The R2Cross model then calculates the top width from this calculated projection. Be sure to record Bankfull in the Feature column of the field form. If only one indicator is reliable, make note of this in the Notes column of the field form, and then measure a point on the other bank that is close in elevation to the reliable indicator and note that point as estimated bankfull ("BF – est"). The R2Cross model requires the user to enter two bankfull points in the features column to run.

Wetted Channel Measurements

4. The water surface elevation measurements collected here should match the ones collected during the initial check that flow is perpendicular to the cross-section tape.
5. When surveying the wetted portion of the channel, try to make at least 20 individual measurements. This is particularly important if the cross-section is being used to measure discharge as well[5]. The increment between measurements can vary in order to best record the shape of the cross-section. Note that it may not be possible to have 20 individual measurements in very small channels[6]. At every station in the wetted portion of the stream, record the horizontal distance off the cross-section tape (Distance from Initial Point), the stadia rod level (Rod Height), and the water depth (Water Depth) in the appropriate columns on the field form. Any large rocks or obstructions can be noted in the features column.
6. The water depth should be read from the side of the stadia rod because water tends to create a small hydraulic head on the upstream side and a cavity the downstream side (Figure 9).

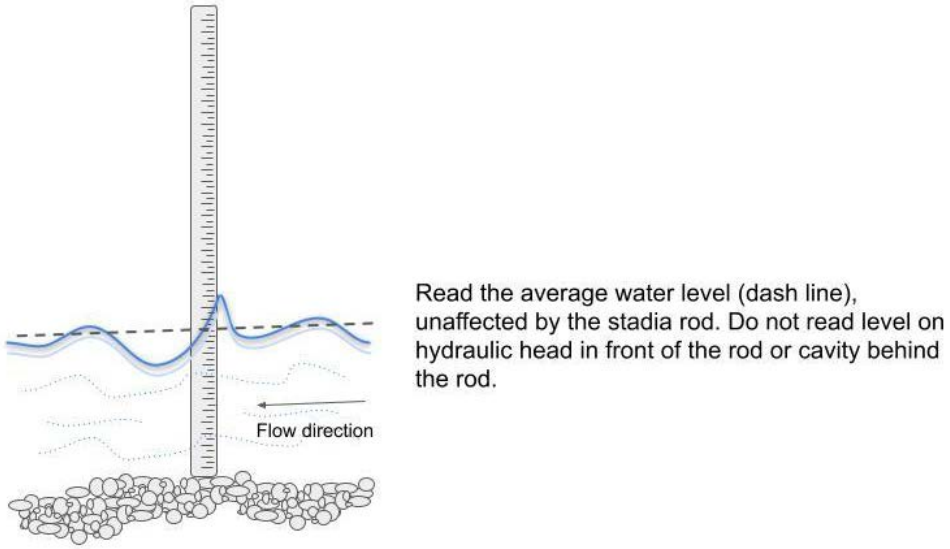


Figure 9. Reading the depth of water off the stadia rod.

Discharge Measurement Options

The R2Cross method requires a measured discharge that corresponds to the flow when the cross-section data was measured. It is preferable to measure discharge at a nearby location that has the same streamflow as the measured riffle cross-section. In most cases, locations other than riffles will result in more accurate discharge measurements. The optimal location for an accurate discharge measurement is within a run feature, where there is straight laminar

[5] 20 data points is a rule-of-thumb that reflects guidance that no more than 5% of the total flow should be measured in a single discharge measurement station.
[6] The minimum distance between stations is 0.3 ft (due to the size of the base of the typical stadia rod, the base of the typical top-setting wading rod, and the size of the typical water velocity meter).

flow and an even streambed. However, if the R2Cross cross-section is suitable for a discharge measurement, then a discharge measurement can be made at that location. Both options are presented in more detail below.

One discharge measurement can be used for multiple R2Cross cross-sections measured in the same reach provided there are no tributaries or diversions between the locations. Discharge data from a nearby stream gage can also be used if the streamflow is representative of the measured R2Cross cross-sections. For detailed instructions and best practices for making discharge measurements, refer to USGS publications (Turnipseed and Sauer 2010) and documentation for the current meter used.

Option 1: Measuring discharge at another location

If discharge is measured at a location different from the R2Cross cross-section, make a note of the location relative to the R2Cross cross-section on the field form. An optional printable form to record information from the discharge measurement is provided in the appendix. The velocity column on page 2 of the R2Cross field form should not be used for this option. The Discharge Calculator within the R2Cross program allows the user to import the data collected in the field and it performs the necessary calculations.

Option 2: Measuring discharge at the R2Cross cross-section

If the R2Cross location is suitable for an accurate discharge measurement, then water velocity can be measured along the R2Cross tape line.

At every station measured in the wetted channel (steps 4-6 above), use a current meter to measure velocity. The person operating the current meter and the note taker should check that the depth measured and recorded in steps 4-6 roughly match the depth that is read off the top-setting wading rod. This practice addresses a potential source of computational error in the calculation of the stream's cross-sectional area that arises when the depths are not similar. Record the average velocity for each location following the directions of the velocity meter being used and the USGS's published standards for discharge measurements.

Depending on the current meter, the 2-point method should be utilized when depths are greater than the published threshold for the current meter. Additional stations can be added to the cross-section measurements during the discharge measurement to address changes in water depths or velocity that may affect the accuracy of the discharge measurement. Adding stations is recommended when flow conditions are affected by large rocks or other upstream obstructions, or if more than 5% of the flow is in one station. If stations are added for any reason, the station and stadia rod elevation will need to be added to the field form before the cross-section tape is removed.

Final Survey Checks

1. Once all the water velocity measurements are completed, the elevation of the temporary benchmark should be measured again to serve as a quality control to ensure the tripod and level have not moved during the measurement.
2. The staff gage should also be re-read to check for flow change during the measurement. Record this information and the time in the spaces for Time End and Staff Gage End. The note taker should review all the recorded data for oversights, erroneous elevations, things to double-check, etc. This should be done before the cross-section tape is removed. The most common error is a mis-read elevation and frequently the error is

exactly 0.50 or 1.00 foot. Another common error is to forget to measure both bankfull indicators.

Photos

1. A picture of the field form can be taken to serve as a reminder that the next 4 photos in the camera are associated with the site described on the field form.
2. Before the cross-section tape is removed, take photos of the site (with the tape in place). It is recommended that at least 4 photos be taken – one from each bank looking straight across the cross-section, one upstream of the tape looking downstream, and a fourth downstream of the tape looking upstream. An overview vantage of the upland ecosystem can also be helpful. Record the location and order of these photos on the schematic drawing of the site. Where possible, place flagging or pin flags at the bankfull indicators so that these points are visible in the photographs.

Pebble Count/Particle Size Distribution Measurements

Pebble counts are optional but provide a quantitative description of the bed material that can be helpful when describing channel characteristics. The Wolman Pebble Count procedure is a widely used and accepted methodology for determining the particle size distribution in coarse bed material streams. One of the benefits of the pebble count procedure is that it can be completed relatively quickly and with very little investment in equipment. The preferred approach is to use a gravelometer, which is a metal template with square cutouts of known sizes. The gravelometer works conceptually the same way as sieve-based analyses. If a gravelometer is not available, the intermediate axis of every sampled particle can be measured by hand to the nearest millimeter using a ruler (Figure 10).

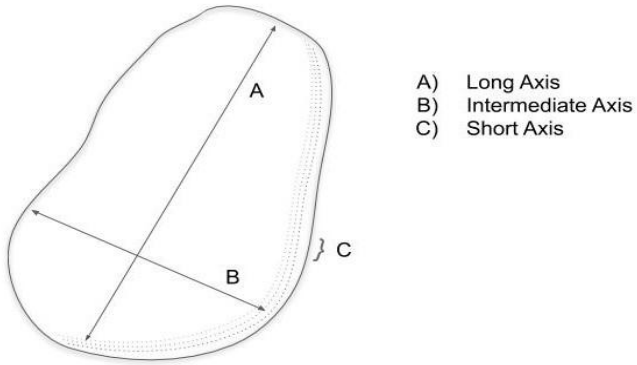


Figure 10. Illustration of the three axes of a substrate particle; in the pebble count procedures, the intermediate axis should be measured with a ruler or gravelometer.

There are several write-ups of the field procedure for a Wolman Pebble Count available in the published literature (USFS, 2016; Harrelson et al.,1994; Bevenger and King, 1995). The procedure as it relates to R2Cross follows the published procedures with only one slight alteration. Many field guides describe the use of a "zig-zag method" for a pebble count in a reference reach; for R2Cross the focus is not on a reference reach but the riffle in isolation. For a pebble count, we are interested in the particle size distribution for a reference riffle habitat type. The "zig-zag method" is still used but is restricted to the particles in the riffle.

All the pebble count procedures call for the measurement of at least 100 randomly selected particles within the bankfull channel. Particles are randomly selected by picking up and measuring the first particle touched at the toe of your boot while zig-zagging across the riffle in a random fashion; when particles are too large or are too embedded to pick up and measure, use the gravelometer or scale to estimate the intermediate axis of the particle touched. If the water is deep, swift, cold or turbid, the smaller particles can be collected in a bucket and measured on the stream's bank.

After the particles are measured and categorized, the particle data is used to construct a cumulative distribution table and curve where "% Finer Than" values can be obtained. The R2Cross Particle Size Calculator within the R2Cross program allows the user to import the grain size information collected in the field and it performs the necessary calculations.

Particle size distribution data is very site-specific. Therefore, it is good field practice to collect a pebble count data set for every riffle analyzed with the R2Cross tool. If the riffle is only a few square feet in size, it may be necessary to collect and measure particles from a few adjacent riffles in order to get the required 100 particle sample. This is a reasonable approach if the substrate is similar in adjacent riffles. It is good practice to document the thought processes behind these decisions on the field forms for future reference if needed.

Observations and notes can be made on the Pebble Count Field Form (Figure 11). A printable pebble count field form is provided in the Appendix. It is important to note that the R2Cross Particle Size Calculator has only one field for particles less than 2 millimeters in diameter (i.e. silts, clays, and sands). This is because fine grain sizes cannot be accurately measured in the field without sieves of varying sizes. The fields of silts, clays, and sands are included on the field form to serve as supplemental information but can be aggregated on the Pebble Count Data Template that is uploaded into the R2Cross Particle Size Calculator.

COLORADO
Department of Natural Resources

PEBBLE COUNT FIELD FORM

STREAM NAME:	DATE:
OBSERVERS:	CROSS SECTION #:
LOCATION DESCRIPTION:	

PARTICLE	SIZE (mm)		PARTICLE COUNT	TOTAL
SILT/CLAY	<.062	S/C		
VERY FINE	.062 - .125	SAND		
FINE	.125 - .25			
MEDIUM	.25 - .5			
COARSE	.5 - 1.0			
VERY COURSE	1.0 - 2.0			
VERY FINE	2.0 - 4.0	GRAVEL		
FINE	4.0 - 5.7			
FINE	5.7 - 8.0			
MEDIUM	8.0 - 11.3			
MEDIUM	11.3 - 16.0			
COARSE	16.0 - 22.6			
COARSE	22.6 - 32.0			
VERY COARSE	32.0 - 45.0			
VERY COARSE	45.0 - 64.0			
SMALL	64.0 - 90.0	COBBLE		
SMALL	90.0 - 128			
LARGE	128 - 180			
LARGE	180 - 256			
SMALL	256 - 362	BOULDER		
SMALL	362 - 512			
MEDIUM	512 - 1024			
LARGE - VERY LARGE	1024 - 2048			
BEDROCK	>2048			

Figure 11. Pebble count field form.

Post Field Work Analysis

Collected R2Cross data is processed using the R2Cross program housed on the eRAMS platform by One Water Solutions Institute at the Colorado State University. The R2Cross program is used to upload data, run the calculations, and review and export the results. In addition to running R2Cross, the program also has tools to calculate discharge from field measurements, process pebble count data, and map the cross-section location and other data layers. Detailed

information about the R2Cross program is provided in the R2Cross Program User's Guide & Technical Manual. The R2Cross tool is available at: https://r2cross.erams.com/

Determining ISF Flow rates

In the early years of the ISF Program, only single year-round flow rates were proposed. These single year-round flow amounts were based on meeting two of the three critical hydraulic criteria identified by Nehring (1979). In the mid 1980's, state biologists began developing seasonal flow recommendations which used all three of the identified critical criteria. Seasonal flow recommendations are an attempt to mimic the natural flow regime on a simplified and smaller scale. When water availability allows, CPW recommends meeting all three of the hydraulic criteria during the spring, summer, and fall, and meeting two of the three hydraulic criteria during the winter, typically during base flows. CPW believes seasonal flow recommendations better addresses the range of hydrologic and hydraulic conditions required for the habitat and its associated aquatic community. Research has shown that single year-round minimum flows, when maintained as a long-term condition, cannot be expected to sustain the same fish populations or aquatic life as a natural flow regime, where low flow conditions occur infrequently and for shorter periods (Stalnaker and Wick, 2000).

Once data has been processed in R2Cross using the eRAMS platform, recommenders can use the R2Cross model results as well as information about hydrology and biological information to develop seasonal flow recommendations. In general, model results for multiple cross-sections located in the same reach are averaged to determine the overall flows that meet the winter and summer rate. In other words, the flows that meet two of three criteria are averaged from multiple cross-sections, to determine the "winter" or base flow recommendation. Flows that meet three of three criteria are averaged together to determine the flows during the rest of the year.

Aquatic biologists may modify flow recommendations based on biological considerations such as stream conditions, species composition, and aquatic habitat quality using best professional judgment. Recommenders can adjust the proposed flow rates in terms of magnitude or timing if the streamflow necessary to meet the hydraulic criteria are not likely to be met based on an initial water availability review. However, recommending entities do not need to complete a detailed analysis of water availability. CWCB staff conducts detailed streamflow assessments in order to determine water availability. If less water is available than the biological need, CWCB and the recommending entity work together to refine flow rates.

Developing ISF Recommendations

Recommending entities are responsible for collecting all required data necessary to document the natural environment and determine the ISF flow rates before submitting a formal recommendation to the CWCB. In addition, staff request recommending agencies to submit a formal recommendation letter that summarizes information about the ISF reach. Guidance for writing a recommendation letter is available on the CWCB website: https://dnrweblink.state.co.us/cwcbsearch/ElectronicFile.aspx?docid=211049&dbid=0

Entities present their recommendations at the annual Instream Flow Workshop, typically held in January of each year. This begins the formal outreach process and staff investigation. For more information on the new appropriation process, visit the CWCB website.

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Appendix A: Field Equipment Checklist

FIELD EQUIPMENT CHECKLIST

	Data forms for cross-section measurement, pebble count, and discharge measurement on either Rite-in-the-Rain paper or bond paper (a cotton/paper blended paper).
	Writing surface and utensils
	Digital camera and GPS unit
	Maps or mapping applications. Maps could include USGS topographic maps, DeLorme Gazetteer, Road Atlas, BLM Planimetric Map, USFS maps (for land survey legal descriptions), or digital applications.
	Optical level or laser level, tripod, and stadia rod. Stadia rod should be at least 15 feet long.
	Water velocity meter Flowtracker, Marsh-McBirney, ADCP, or similar with top-setting wading rod. Mechanical velocity meters with moving parts (Price AA, or Pygmy) can be used but need proper maintenance.
	Two reel-style surveying tapes of adequate length for the bankfull top width of the stream being measured and for water surface slope measurements. Tapes divided into feet and 0.10 feet increments are preferred (tapes in feet and inches can be used but values will have to converted prior to R2Cross processing).
	Anchoring pins to hold the cross-section tape with at least one scissor clamp or similar strong clamp.
	Chaining pins or similar.
	Surveyor's flags or rolls of colorful flagging tape or a can of surveyor's marking paint (optional).
	Gravelometer or millimeter scale (optional).
	Safety equipment as needed such as personal floatation devices, first aid kit, communication equipment, etc.
	Waders or hip boots dried sufficiently or disinfected
	Extra batteries for velocity meter, radios, GPS unit, camera, and laser level (if used).
	Basic set of tools including a hammer, Phillips and standard screwdrivers, short sections of rebar, etc.
	Vegetation tools including clippers, machete, hedge trimmer, or small hand saw to clear vegetation to improve line of sight for surveying.
	If natural environment data is needed, equipment to collect this information may include electrofishing gear, insulated gloves, nets, buckets, measuring board, scale, water quality sampling equipment (if needed - bottles, filters, meters, thermometer, etc.), and/or macroinvertebrate kick net (or similar). Scientific data collection permit if needed.

Appendix B: R2Cross Field Form

CWCBStaff-04

COLORADO
Department of
Natural Resources

R2CROSS FIELD FORM

STREAM INFORMATION

STREAM NAME:	DATE:
OBSERVERS:	CROSS SECTION #:

LOCATION INFORMATION

CROSS-SECTION LOCATION DESCRIPTION:					
DIVISION:		COUNTY:	WATERSHED:		
COORDINATE SYSTEM (circle one):	UTM Zone 13		UTM Zone 12	Lat/Long	
X (EASTING):			Y (NORTHING):		
TOWNSHIP:	N/S	RANGE:	E/W	SECTION:	1/4 SECTION:

SUPPLEMENTAL DATA

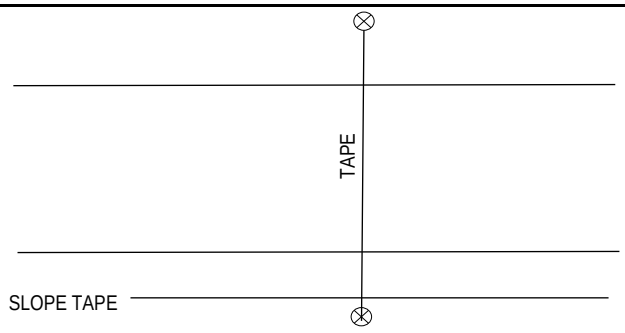
FLOW METER TYPE/METER #:			
FLOW MEASUREMENT TAKEN AT R2CROSS XSEC?	YES / NO	IF NO, MEASURED DISCHARGE:	cfs
IF NO, WHERE?			
CHANNEL BED MATERIAL SIZE RANGE:			
PEBBLE COUNT COLLECTED AT THIS LOCATION?	YES / NO	PHOTOS:	YES / NO

CHANNEL PROFILE DATA

STATION	DIST. FROM TAPE (ft)	ROD HEIGHT[1] (ft)
WS @ Tape LB (LB)	0	
WS @ Tape RB (RB)	0	
WS UPstream (1)		
WS Downstream (2)		
Slope:		

[1]Measurement should be taken to the hundredth decimal place

SKETCH



LEGEND:
Stake ⊗
Station (A)
Photo (1)
Direction of flow:

NATURAL ENVIRONMENT NOTES

AQUATIC SPECIES OBSERVED (FISH/MACROINVERTEBRATES/ETC):

RIPARIAN VEGETATION OBSERVED:

OTHER (VALLEY TYPE, GEOLOGY, WATER DIVERIONS,ETC):

CWCBStaff-04

Page ____ of ____

R2CROSS CROSS-SECTION DATA

STREAM NAME:

CROSS SECTION #: DATE:

TIME START: TIME END:

STAFF GAGE START (ft): STAFF GAGE END (ft):

BENCHMARK DESCRIPTION:

BENCHMARK START (ft): BENCHMARK END(ft):

FEATURE: Stake (S) Bankfull (BF) Waterline (WL) Rock (R)	DISTANCE FROM INITIAL POINT (ft)	ROD HEIGHT (ft)	WATER DEPTH (ft)	VELOCITY (ft/sec)	NOTES:

Appendix C: Discharge Measurement Field Form

CWCBStaff-04

COLORADO
Department of Natural Resources

DISCHARGE MEASUREMENT FIELD FORM

STREAM INFORMATION

STREAM NAME:	DATE:
OBSERVERS:	NAME OF STREAMGAGE (IF APPLICABLE):

SITE VISIT DATA

CROSS-SECTION LOCATION DESCRIPTION:

DIVISION:		COUNTY:	WATERSHED:		
COORDINATE SYSTEM (circle one):		UTM Zone 13	UTM Zone 12	Lat/Long	
X (EASTING):			Y (NORTHING):		
TOWNSHIP:	N/S	RANGE:	E/W	SECTION:	1/4 SECTION:

MEASUREMENT EQUIPMENT TYPE:	METER NUMBER:

WEATHER CONDITIONS (current or recent weather events that may effect discharge measurement):

CROSS-SECTION DESCRIPTION (channel type - pool tail, riffle, run, glide - and substrate type/size):

FLOW CONDITIONS AT THE SITE (circle one):	TURBULENT	SLIGHTLY	TURBULENT	CALM

DISCHARGE MEASUREMENT COMMENTS

NATURAL ENVIRONMENT NOTES

AQUATIC SPECIES OBSERVED (FISH/MACROINVERTEBRATES/ETC):

RIPARIAN VEGETATION OBSERVED:

OTHER (VALLEY TYPE, GEOLOGY, WATER DIVERIONS,ETC):

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DISCHARGE MEASUREMENT DATA

STREAM NAME:

CROSS SECTION NO.: DATE:

STAFF GAGE START (ft): STAFF GAGE START TIME:

DISCHARGE START TIME: DISCHARGE END TIME:

STAFF GAGE START (ft): STAFF GAGE END TIME:

Total A (ft^2):

Total Q (cfs):

FEATURE: Waterline (WL) Rock (R)	STATION (ft)	WATER DEPTH (ft)	VELOCITY (ft/sec)	CALCULATED VALUES WIDTH (ft)	AREA (ft^2)	Q (cfs)	NOTES

Appendix D: Pebble Count Field Form

CWCBStaff-04

COLORADO
Department of
Natural Resources

PEBBLE COUNT FIELD FORM

STREAM NAME:	DATE:
OBSERVERS:	CROSS SECTION #:
LOCATION DESCRIPTION:	

PARTICLE	SIZE (mm)		PARTICLE COUNT	TOTAL
SILT/CLAY	<.062	S/C		
VERY FINE	.062 - .125	SAND		
FINE	.125 - .25			
MEDIUM	.25 - .5			
COARSE	.5 - 1.0			
VERY COURSE	1.0 - 2.0			
VERY FINE	2.0 - 4.0	GRAVEL		
FINE	4.0 - 5.7			
FINE	5.7 - 8.0			
MEDIUM	8.0 - 11.3			
MEDIUM	11.3 - 16.0			
COARSE	16.0 - 22.6			
COARSE	22.6 - 32.0			
VERY COARSE	32.0 - 45.0			
VERY COARSE	45.0 - 64.0			
SMALL	64.0 - 90.0	COBBLE		
SMALL	90.0 - 128			
LARGE	128 - 180			
LARGE	180 - 256			
SMALL	256 - 362	BOULDER		
SMALL	362 - 512			
MEDIUM	512 - 1024			
LARGE - VERY LARGE	1024 - 2048			
BEDROCK	>2048			

Form 1221-2
(June 1969)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

MANUAL TRANSMITTAL SHEET

Release	
6-125	
Date	
12/12/2008	

Subject

6840 – Special Status Species Management

1. **Explanation of Materials Transmitted: This release transmits a complete revision of Manual 6840, the Special Status Species Management Manual for the Bureau of Land Management. This manual establishes policy for management of species listed or proposed for listing pursuant to the Endangered Species Act and Bureau sensitive species which are found on BLM-administered lands.**

2. **Reports Required: None**

3. **Materials Superseded: Manual pages superseded by this release are listed under "REMOVE" below. No other directives are superseded.**

4. **Filing Instructions: File as directed below**

REMOVE	INSERT
All of 6840 (Rels. 6-121)	6840
(Total: 26 Sheets)	(Total: 24 Sheets)

/s/ James Caswell
Director

Table of Contents

.01 Purpose. The purpose of this manual is to provide policy and guidance for the conservation of BLM special status species and the ecosystems upon which they depend on BLM-administered lands. BLM special status species are: (1) species listed or proposed for listing under the Endangered Species Act (ESA), and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as Bureau sensitive by the State Director(s). All Federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as Bureau sensitive species.

.02 Objectives. The objectives of the BLM special status species policy are:

A. To conserve and/or recover ESA-listed species and the ecosystems on which they depend so that ESA protections are no longer needed for these species.

B. To initiate proactive conservation measures that reduce or eliminate threats to Bureau sensitive species to minimize the likelihood of and need for listing of these species under the ESA.

.03 Authority.

A. Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), as amended.

B. Sikes Act, Title II (16 U.S.C. 670g et seq.), as amended.

C. Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.), as amended (FLPMA).

D. Departmental Manual 235.1.1.A, General Program Delegation, Director, Bureau of Land Management.

E. Departmental Manual 632.1.1-1.6, Endangered Species Management.

F. Secretarial Order 3206 (American Indian Tribal Rights, Federal–Tribal Trust Responsibilities, and the Endangered Species Act).

G. Information Quality Act (44 U.S.C 3504(d)(1) and 3516).

H. Oregon and California Lands Act (43 U.S.C. 1181a, et seq.).

.04 Responsibility.

A. The Director is responsible for overseeing implementation of Special Status species policies on BLM-administered lands, coordinating as needed with State Directors on select, multi-State species conservation issues, and making any

applications for project exemptions under Section 7(g) of the ESA to the Secretary of the Interior.

B. The Assistant Director for Renewable Resources and Planning is responsible for the timely development, approval, and implementation of procedures for carrying out the BLM special status species policies.

C. The Chief, Division of Fish Wildlife and Plant Conservation, is responsible for initiating and recommending policies, objectives, general procedures, and priorities relating to Bureau sensitive species, federally proposed and listed species, federally proposed and designated critical habitat, and overall coordination of the special status species policies. The Division Chief is also responsible for designating a National Program Lead whose responsibilities are:

1. Developing and maintaining up-to-date policies pertaining to management of special status species on BLM lands.

2. Developing agency budget documents pertaining to special status species management, and determining funding allocations to States.

3. Coordinating with State program leads in all phases of implementation of the Bureau special status species program.

4. Providing technical assistance and guidance to other BLM Washington Office programs to ensure proper consideration of BLM special status species matters in those programs.

5. Maintaining appropriate interactions with the headquarters of other Federal agencies and bureaus, national conservation organizations, international conservation groups, and individual authorities to advance the objectives of the BLM special status species program.

6. Maintaining a thorough knowledge of the legislation, regulations, court rulings, and litigation actions relative to Bureau sensitive species, federally proposed and listed species, and proposed and designated critical habitat, and communicating the implications of these actions to BLM decision makers and staff.

7. Working with the National Training Center and other agencies to develop training and orientation materials relevant to this policy.

D. The State Directors are responsible for:

1. Developing and implementing procedures for the conservation of special status species on BLM-administered lands within their States.

2. Coordinating the BLM special status species conservation efforts with adjoining BLM State Offices, State and other Federal agencies, various private organizations, and BLM stakeholders.

3. Inventorying BLM lands to determine which BLM special status species occur on public lands, the condition of the populations and their habitats, and how discretionary BLM actions affect those species and their habitats.

4. Designating Bureau sensitive species within their respective jurisdictions and, at least once every 5 years, reviewing and updating the Bureau sensitive species list in coordination with State agencies that are responsible for fisheries, wildlife, and botanical resources.

5. Ensuring that when BLM engages in the planning process, land use plans and subsequent implementation-level plans identify appropriate outcomes, strategies, restoration opportunities, use restrictions, and management actions necessary to conserve and/or recover listed species, as well as provisions for the conservation of Bureau sensitive species. In particular, such plans should address any approved recovery plans and conservation agreements.

6. Ensuring that all actions comply with the ESA, its implementing regulations, and other directives associated with ESA-listed and proposed species, including compliance with Section 7 consultations and conferences with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS).

7. Providing an annual summary of ESA-related expenditures, and other program performance and related information to the Washington Office on an as-needed basis.

8. Designating State Program Leads, whose responsibilities are to:

   a. Initiate and provide technical support to other BLM personnel in the development of conservation strategies for special status species on BLM lands.

   b. Monitor implementation of Bureau sensitive species activities and policies within the state, and develop state level policies as needed to ensure program objectives are met.

   c. Collaborate with other program leads at the state level to ensure objectives of the BLM special status species program are integrated in those programs as appropriate.

   d. Maintain a cooperative working relationship with State and Federal agencies and local conservation groups, especially their respective state agencies with authority for listed species, wildlife, fish, and plants, and the

regional and local offices of the FWS and NMFS.

e. Recommend funding allocations that will best achieve the objectives of this policy and track expenditures to determine if the allocated funds have been appropriately expended.

f. Recommend and develop training material to keep field and district offices current on policies and direction changes.

E. District Managers and Field Managers are responsible for implementing the BLM special status species policies and program within their area of jurisdiction by:

1. Implementing conservation strategies for BLM special status species as contained in approved recovery plans, cooperative agreements, and other instruments the BLM has cooperatively participated in the development of.

2. Conducting and maintaining current inventories of BLM special status species on BLM-administered lands.

3. Ensuring that all actions undertaken comply with the ESA, its implementing regulations, and other directives associated with ESA-listed and proposed species.

4. Ensuring that the results of formal Section 7 consultations, including mandatory terms and conditions in incidental take statements that are consistent with 50 CFR 402 regulations, are implemented and documented in the administrative record.

5. Coordinating field office activities with Federal, State, and local groups to ensure the most effective program for BLM special status species.

6. Ensuring that land use and implementation plans fully address appropriate conservation of BLM special status species.

7. Monitoring populations of Bureau special status species to determine whether management objectives are being met. Records of monitoring activities are to be maintained and used to evaluate progress relative to such objectives. Monitoring shall be conducted consistent with the principles of adaptive management as defined in Department of the Interior policy, as appropriate.

.05 References.

A. 50 CFR Part 17—Endangered and Threatened Wildlife and Plants.

B. 50 CFR Part 17—Subpart H—Experimental Population.

C. 50 CFR Part 226—Designated Critical Habitat.

D. 50 CFR Part 402—Interagency Coordination—Endangered Species Act of 1973, as amended.

E. 50 CFR Part 424—Listing Endangered and Threatened Species and Designating Critical Habitat.

F. 50 CFR Part 451—Application Procedure.

G. 43 CFR 4180—Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration.

H. 68 FR 68255 (December 8, 2003)—Joint Counterpart Endangered Species Act Section7 Consultation Regulations.

I. BLM Manual Section1601—Land Use Planning.

J. BLM Handbook H-1601—Land Use Planning Handbook.

K. BLM Manual 1745—Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants.

L. BLM Manual 1740—Renewable Resource Improvements and Treatments.

M. BLM Handbook H-1740-2—Integrated Vegetation Management Handbook.

N. BLM Handbook H-4180-1—Rangeland Health Standards Handbook.

O. FWS and NMFS Endangered Species Consultation Handbook (March 1998).

P. FWS Director, June 25, 2002, Memorandum on Arizona Cattle Growers Decision and Solicitor's opinion.

Q. Norton v SUWA, 542 US 55 (2004).

R. National Association of Homebuilders v Defenders of Wildlife, 127 S. Ct. 2518 (2007).

S. Forest Guardians v Forsgren, 478 F.3d 1149 (10th Cir 2007).

T. Western Watersheds Project v Bureau of Land Management, 552 F. Supp. 2d 1113 (D. N.V. 2008).

U. Western Watersheds Project v Matejko, 468 F.3d 1099 (9th Cir 2006).

V. Arizona Cattle Growers Association v Fish and Wildlife Service, 273 F.3d 1229 (9th Cir 2004).

W. Gifford Pinchot Task Force v Fish and Wildlife Service, 378 F.3d 1059 (9th Cir 2004).

X. Application of the Endangered Species Act to proposals for access to non-Federal lands across lands administered by the Bureau of Land Management and the U.S. Forest Service, signed January 2003.

.06 Policy. Actions authorized by the BLM shall further the conservation and/or recovery of federally listed species and conservation of Bureau sensitive species. Note that "conservation" has a different meaning depending on whether it is referring to ESA listed species or Bureau sensitive species. See glossary. Bureau sensitive species will be managed consistent with species and habitat management objectives in land use and implementation plans to promote their conservation and to minimize the likelihood and need for listing under the ESA.

The BLM shall retain in Federal ownership those habitats essential for the conservation of any listed species, particularly those that are part of a broader, logical public land ownership management unit. The BLM may dispose of lands providing habitat for listed species, including critical habitat, only following consultation with the FWS or NMFS and upon a determination that such action is consistent with relevant law. This policy does not apply to any lands conveyed pursuant to the Alaska Native Claim Settlement Act.

.1 Administration of the ESA. The administration portion of this manual is divided into three separate parts: (1) species and habitats listed under the ESA, (2) species identified by BLM as Bureau sensitive and (3) general cooperation on BLM special status species management. The BLM shall conserve federally listed species by fulfilling the requirements of the ESA as described in this section. The Bureau sensitive species shall be conserved through the use of management practices as described in Section .2.

Various provisions of the ESA, as amended, apply to plants and animals that have been listed as endangered or threatened, those proposed for being listed, and designated and proposed critical habitat. The BLM shall conserve listed species through administration of the various sections of the ESA that apply to Federal agencies. When administering the ESA, the BLM shall use the best scientific and commercial data available. The BLM shall comply with all applicable sections of the ESA as follows:

A. Section 2 (Findings, purposes, and policy). The BLM shall, consistent with Section 2 of the ESA, seek to conserve endangered and threatened species and shall utilize its authorities in furtherance of the purposes of the ESA. In addition:

1. Federal Agency Cooperation. The BLM will cooperate with other Federal agencies as follows:

a. Seek to improve efficiency by combining efforts with other Federal agencies to foster better working relationships and promote the conservation of listed species.

b. Establish or participate in existing regional interagency working groups that identify geographic areas within which the groups will coordinate agency actions, create opportunities, and overcome barriers to conserve listed species and the ecosystems upon which they depend.

c. Participate in national ESA working groups to coordinate the implementation of the ESA.

2. State and Local Agency Cooperation. As specifically addressed in Section 2 of the ESA, the BLM shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species. The BLM should:

a. Participate on watershed councils.

b. Provide technical assistance to State and local agencies on species, critical habitats, and resources.

c. Actively engage in the Federal Energy Regulatory Commission licensing and relicensing process for hydropower projects affecting ESA-listed and proposed species on BLM-administered lands.

B. Section 4 (Determination of endangered species and threatened species, designation of critical habitat and development of recovery plans). While it is the responsibility of the FWS and/or NMFS to list threatened or endangered species and designate critical habitat, the BLM should provide relevant information to the FWS and/or NMFS on species or habitats proposed for listing and may petition to add a species to, or to remove a species from, the threatened or endangered species list. In addition, the BLM should provide information to the FWS and/or NMFS on proposed critical habitat for BLM-administered lands as per the policy at .1.B.3 of this Manual, and cooperate, as appropriate, with the FWS and/or NMFS in developing recovery plans for listed species that occur on BLM-administered lands. In the development of BLM comments on recovery plans, listing proposals, or critical habitat proposals involving species distributed across more than one state, the BLM will consider designation of a lead State Office or the Washington Office to prepare consolidated agency comments. The decision on preparation of such comments will be jointly agreed to among the affected State Offices and the Washington Office.

1. Determination of endangered or threatened status. Determination of endangered or threatened status of species by the FWS and/or NMFS is provided

for in Section 4 of the Endangered Species Act and the procedures in 50 CFR Part 424. BLM should provide assistance to the FWS and/or NMFS for actions that affect BLM-administered land, including as follows:

a. Responsibilities. The BLM is responsible for preparing and maintaining, on a continuing basis, a current inventory of the public land and its resources (FLPMA, 43 U.S.C. 1701 Sec.201 (a)). This inventory information, along with monitoring data collected under a variety of programs, shall be used to evaluate the current status and trends of plants and animals and their habitats on BLM-administered lands, and to respond to FWS and/or NMFS *Federal Register* Notices of species status review (e.g., 90-day, 12-month, 5-year, and annual candidate reviews).

b. Petitions. When conditions warrant, the BLM Director may petition the FWS and/or NMFS to change the status of any species or revise critical habitat. These petitions shall contain appropriate biological evidence to substantiate any proposed change.

(1) A petition to delist a species or downlist a species from endangered to threatened must demonstrate clearly that the recovery plan objectives have been met or that there is new evidence to show that the conditions on which the initial listing was based no longer exist. Petitions to delist should also include a statement on how the BLM intends to manage the species to ensure that the provisions of the ESA will not be required in the future.

(2) Petitions to list or delist a species must be based solely on substantial scientific information for the species and its habitat, and must address the five factors for listing included in Section 4 of the ESA.

(3) All petitions shall be coordinated with the appropriate State agency having responsibility for the species involved.

2. Recovery plans. Recovery plans are prepared by the FWS and/or NMFS and establish recovery objectives for a species, provide a listing of tasks necessary to achieve those objectives, and recommend assignments to involved agencies to carry out these tasks. A primary function of recovery plans is to combine programs of all agencies involved in managing a species into a coordinated management effort. The BLM will incorporate objectives and actions identified in recovery plans into BLM documents, as appropriate. Examples of such documents include land use plans, implementation level plans, and species conservation plans or agreements.

a. Recovery Teams. The FWS and/or NMFS often request that the BLM provide representatives to serve as members on recovery teams to assist in preparation of recovery plans for species where public land has a significant

role in recovery. These requests usually include a suggestion for a particular employee with special qualifications.

(1) State Directors should make employees with special expertise available and provide support as appropriate to help ensure timely completion of recovery plans.

(2) BLM employees should accept these nominations. The role of the team member is to be a technical expert and advisor, to provide biological input for the species and its habitat, and to inform the recovery team of BLM policies, programs, and procedures.

(3) For species that range across multiple states, the BLM employee on the recovery team shall coordinate with the other affected BLM State Offices.

(4) BLM employee participation in recovery plan preparation does not indicate BLM Director or State Director endorsement of the plan.

b. Technical Review Drafts. The appropriate State Office or selected BLM representative should review technical review drafts of recovery plans to ensure that the information is biologically correct and complete. This review and input represents State Director formal response to the review draft.

c. Agency Review Drafts. All BLM offices that will be involved in implementation of a particular recovery plan should review draft plans. The State Director(s) in the affected State(s) shall designate a BLM lead office to complete the following analysis using field office input:

(1) Determine whether measurable objectives are stated clearly.

(2) Identify any conflicts with other laws, regulations, and policies governing BLM programs and activities.

(3) Identify constraints on other BLM programs, activities, or practices mentioned or implied in the plan.

(4) Evaluate the effects of planned actions carried out by other cooperators on BLM programs.

(5) Identify any inconsistencies with other BLM plans, ongoing programs, or ongoing practices. Initiate efforts to make appropriate adjustments to meet recovery needs.

(6) Check accuracy of cost estimates for BLM tasks, and evaluate economic feasibility of accomplishing the assigned tasks within existing

and prospective staffing and budgetary constraints.

3. Critical Habitat Proposals on BLM-administered Lands. Whenever the FWS and/or NMFS propose to designate critical habitat on BLM-administered lands, the State Director(s) should provide a written response to the *Federal Register* notice that identifies any special management considerations that are in place on BLM lands. Where the State Director determines that adequate conservation measures are in place, and that the benefits, including economic benefits, of excluding BLM lands from critical habitat designation exceed the benefits of inclusion of BLM lands, the State Director shall request exclusion of BLM lands from the critical habitat designation pursuant to Section 4(b)(2) and/or Section 3(5)(A) of the ESA. For proposals across multiple States, the Director will coordinate with the States and submit such information.

4. Delisted Species. The objectives of recovery plans and actions should ultimately be species recovery and removal from the Federal threatened or endangered species list (delisting). Pursuant to the ESA, FWS and/or NMFS are required to monitor delisted species for a minimum of 5 years. The BLM shall work with partners such as the FWS, NMFS, State agencies, and others, as appropriate, to monitor delisted species.

C. Section 5 (Land Acquisition). This section authorizes the Secretary of the Interior to use Land and Water Conservation funds to acquire lands to conserve fish, wildlife, and plants, including those that are listed as endangered species or threatened species. When the BLM engages in the land use planning process, it will identify appropriate opportunities for acquisition by purchase, donation, land exchange, conservation easement, or other means, of land, water, or interests therein for the purpose of conserving fish, wildlife and plants, including listed species.

D. Section 6 (Cooperation with States). This section authorizes the Secretary to cooperate to the maximum extent practicable with States, including entering into management agreements and cooperative agreements for the conservation of threatened and endangered species. The BLM should implement this section through a State level memorandum of understanding by providing technical assistance to, and coordinating with, State agencies responsible for the conservation of endangered and threatened species.

E. Section 7(a)(1) (Conservation Programs). Section 7(a)(1) requires the BLM to use its authorities to further the purposes of the ESA by implementing programs for the conservation of threatened and endangered species and the ecosystems upon which they depend. Ways in which the BLM can carry out these responsibilities include, but are not limited to:

1. Developing and implementing activities that provide for the conservation and recovery of species listed pursuant to the ESA.

2. Undertaking actions designed to maintain the integrity of the primary constituent elements of federally designated critical habitat on BLM-administered lands.

3. Ensuring that BLM actions are not likely to jeopardize the continued existence of any endangered species or threatened species or destroy or adversely modify designated critical habitat.

4. Determining, to the extent practicable, the occurrence, distribution, population, and habitat condition of all ESA-listed species on BLM-administered lands, and evaluating the significance of BLM-administered lands in the conservation of those species.

5. Developing and implementing agency land use plans, implementation plans, and actions in a manner consistent with conservation and/or recovery of listed species.

6. Monitoring and evaluating ongoing management activities to ensure conservation objectives for listed species are being met.

7. Cooperating with the FWS and/or NMFS and other interested parties in species recovery and conservation as provided in species recovery plans. Such actions may include species reintroductions, which shall be carried out in conformance with BLM Manual 1745.

8. Implementing conservation recommendations included in biological opinions if they are consistent with relevant law and policy and are technologically and economically feasible.

F. Section 7(a)(2) (Consultation). The procedures for carrying out Section 7(a)(2) are included in 50 CFR Part 402, Interagency Cooperation and the counterpart regulations developed for National Fire Plan projects (50 CFR Part 402.30-34). Whenever the BLM is considering a discretionary action that may affect a listed or proposed species or designated or proposed critical habitat, the BLM should consider engaging the FWS and/or NMFS early in the project development process and seek recommendations designed to minimize or avoid potential adverse affects to resources protected under the ESA.

1. Discretionary and Nondiscretionary Agency Actions. Section 7(a)(2) applies to affirmative “agency actions” that are authorized, funded, or carried out by the BLM. The BLM must also have discretion to undertake the action. See Part b, below. Illegal and prohibited actions (e.g., trespass grazing) are not Federal actions and therefore do not require consultation.

a. Consultation requirements apply to all discretionary actions that are

authorized, funded, or carried out by the BLM, whether or not:

(1) The species or critical habitat occurs on BLM-managed lands.

(2) The proposed action occurs, either wholly or in part, on BLM-managed lands.

(3) The BLM itself carries out the proposed action.

(4) The species occurs on non-Federal surface lands and the BLM manages the subsurface mineral estate (split-estate lands).

b. Determining if an Action is Discretionary or Nondiscretionary.

(1) Generally, actions that the BLM is statutorily required to perform, with no discretion to take an action to inure to the benefit of, including limiting the impacts of action on, a listed species or designated critical habitat, are not discretionary, and therefore initiation of consultation is not required. Reinitiation of consultation is slightly different and is discussed in section .1.F.5.h. However, if the BLM's discretion is constrained by its own regulation or otherwise, initiation of consultation is generally still required. Examples of statutory nondiscretionary activities include patenting of mining claims and land conveyances pursuant to the Alaska Native Claims Settlement Act. When field managers are uncertain whether particular actions are nondiscretionary for purposes of ESA consultation, they should seek guidance from their respective State Office.

(2) Pre-ESA authorizations to Private Parties. When the BLM has authorized actions by private parties on public lands before the enactment of the ESA, it only has to consult on post-ESA activities conducted by those private parties if it retains discretionary involvement or control over those private actions sufficient to take some action to inure to the benefit of, including limiting the impacts of action on, a listed species or designated critical habitat. If the BLM did not retain such discretionary involvement or control, consultation on further BLM action is not required. For example, the BLM need not consult on activities conducted by private parties on BLM rights-of-way granted before the ESA if the right-of-way does not grant it sufficient discretionary control to take actions that inure to the benefit of, or limit the impacts of action on, a listed species or designated critical habitat.

c. Even if an action is determined to be nondiscretionary on behalf of the BLM, provisions of the ESA may be applicable to the outside entity involved with the activity. In such situations, the BLM's responsibilities are as follows:

(1) If the BLM has reason to believe a nondiscretionary action involving

BLM-administered lands may affect listed species or designated critical habitat, the BLM shall provide written notification to any person or persons involved that ESA-listed species or designated critical habitat are present.

(2) If the outside entity involved with the nondiscretionary action wishes to develop measures that would eliminate effects on listed species or designated critical habitat, the BLM shall arrange for the participation of BLM specialists and, if needed, specialists from the FWS and/or NMFS during the process of developing such measures.

2. Characterizing the Proposed Action, Action Area, Interrelated and Interdependent Actions, Effects of an Action, and the Environmental Baseline. When the BLM is carrying out its consultation and conference responsibilities under Section 7(a)(2) (see Sections 3, 4, and 5), it is critical to properly characterize the proposed action, the action area, the environmental baseline, and effects. Cumulative effects are considered in relation to the requirements of the ESA only during the formal consultation process and are discussed in Section .1.F.2.e.(3).

a. Proposed Action. The proposed action includes any species conservation measures. These actions can include both on-site actions to minimize or avoid effects to listed species or critical habitat and off-site conservation actions for the benefit of listed species. Although off-site compensatory mitigation may not be used as a means of reducing the effects on the listed species at the site, such actions can be used by the BLM as a means of furthering its conservation objectives under Section 7(a)(1) of the ESA and as a means of meeting resource objectives under land use plans.

b. Action Area. The action area includes those areas affected directly or indirectly by the action, not merely the footprint of the action. For example, noise disturbance resulting from the action that may be transmitted beyond the immediate project area must be assessed as part of the proposed action.

c. Interrelated and Interdependent Actions. Interrelated actions are those actions that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. The “but for” test should be used to assess whether an action is interrelated or interdependent to the proposed Federal action. If the activity would not occur “but for” the proposed Federal action, then the activity is interrelated or interdependent and must be considered during consultation on the proposed Federal action. If the Federal action merely facilitates the implementation of a subsequent action that may cause an effect on a listed species, those subsequent effects are not effects of the Federal action and are not subject to consultation. If however, the Federal action is essential for implementing a subsequent action, the effects of both

the Federal action and subsequent action need to be analyzed in the consultation.

(1) Rights-of-Way. If the Federal action is an authorization for a right-of-way to private land, yet there is alternative access for the project proponent, only effects from the Federal right-of-way need to be analyzed. If there is no alternative access, effects from both the Federal action and private action need to be analyzed in the consultation. Unless otherwise requested by an applicant (see section .1F.8.), the consultation process associated with the Federal action can only be used to condition activities on Federal lands.

(2) Split-Estate Federal Minerals. When necessary to comply with the ESA, the BLM or project proponent shall collect information to support an analysis of the effects to listed and proposed species as part of an effect determination for the proposed action in a biological assessment. This may include the need for conducting inventory of either ESA listed or proposed species on private surface lands. The BLM or the Federal mineral lessee has the right to enter the property for this purpose, since it is a necessary prerequisite to development of the dominant mineral estate. When sufficient information already exists, the BLM may proceed through the Section 7 consultation process using the existing information and determine appropriate measures to avoid and minimize effects on listed species and their habitats.

The BLM will take the lead in completing consultation on the proposed action unless the surface estate is administered by another Federal agency that elects to serve as the lead for consultation, or the project proponent is designated as the non-Federal representative by the Federal agency managing the surface or by the BLM (see section .1.F.8).

d. Environmental Baseline. The environmental baseline is the condition of a species or critical habitat at a specified time within the action area. The baseline does not include effects of the action under review for consultation. It does include the Federal, tribal, State, local, and private actions already affecting a species or critical habitat, or those that will occur while the consultation is in progress. Federal actions unrelated to the action under consultation that have affected or are affecting the species or critical habitat and have a completed formal, informal, or early consultation are part of the baseline.

e. Types of Effects. There are three types of effects that are considered under Section 7(a)(2) of the ESA: direct effects, indirect effects, and cumulative effects. Each type of effect is described below. In addition, when considering the effects of a proposed action under Section 7(a)(2), the BLM is required to consider the effects of interrelated or interdependent actions.

(1) Direct Effects. Those effects caused by the action and that occur in the same time and place. Direct effects are immediate, natural causes of taking the proposed action. Effects of future federal actions cannot be direct effects.

(2) Indirect Effects. Those effects caused by the action that are later in time, but reasonably certain to occur.

(a) "Caused by." For a particular effect on a species or critical habitat to be caused by a particular action, there must be a close causal connection between the action and the effect. This means that the particular effect must not be able to occur "but for" the action under consultation. Thus, if the effect may occur without the action under consultation taking place, the "but for" portion of the test is not met and the effect need not be considered.

(b) "Reasonably Certain to Occur." For a particular effect to be an effect subject to consultation, it must be reasonably certain to occur. This determination cannot be based on speculation or the mere possibility of an effect on a listed species or critical habitat. In the context of indirect effects, "reasonably certain to occur" may be evidenced by appropriations, work plans, permits issued, or budgeting; they follow a pattern of activity undertaken in the action area; or they are the logical extensions of the proposed action.

(3) Cumulative Effects. In accordance with Section 7 regulations, the FWS and/or NMFS is required to consider cumulative effects in formal consultation when determining whether or not an action is likely to jeopardize the continued existence of a species. The regulations require the BLM to provide an analysis of cumulative effects for projects entering formal consultation. Cumulative effects, as defined for the purposes of the ESA, involve those effects from future non-Federal actions (tribal, State, local, private and other entities) that are reasonably certain to occur within the action area. See the discussion under indirect effects for an explanation of "reasonably certain to occur." Future Federal actions are not considered as they will be subject to consultation when they are proposed. When making the "reasonably certain to occur" determination in the context of cumulative effects, the BLM must examine the effects of these actions that are likely to occur, bearing in mind the economic, administrative, or legal hurdles that remain to be cleared. Indications of this likelihood include approval of the action by the appropriate government unit(s), evidence of funding having been obtained by project sponsors, or the initiation of contracts. These future non-Federal actions are reasonably certain to occur if approval by all non-Federal agencies or governments granting authority for the action is reasonably certain and

economically viable. Past and ongoing effects are considered part of the environmental baseline and are not considered cumulative effects.

(4) Distinguishing between National Environmental Policy Act (NEPA) effects and ESA effects. NEPA and the ESA have different purposes and impose different analytical standards. While the NEPA and ESA standards for direct effects are very similar, there is an important difference between the acts regarding the standards for indirect and cumulative effects. Under NEPA, indirect or cumulative effects must be reasonably foreseeable. In contrast, the ESA and its regulations require that such effects be reasonably certain to occur. Thus, effects that may be required to be considered under the NEPA analysis standard may not necessarily require consideration under the ESA. In addition, under NEPA, cumulative effects include the effects of both Federal and non-Federal actions, whereas under ESA, cumulative effects do not include Federal actions.

3. "May Affect" Determination. If the BLM is taking a discretionary agency action, it must determine if the action "may affect" a listed species or designated critical habitat. If the BLM determines that ESA-listed species or designated critical habitat may be affected by an action, either positively or negatively, then the BLM must engage in either informal or formal consultation. In addition, the FWS and/or NMFS may request that the BLM enter into consultation if they identify an action for which there has been no consultation that may affect a listed species or designated critical habitat. If the BLM determines, after a review of the project and any interrelated or interdependent actions, that there is no reasonable likelihood that listed species are in the action area, or that there will be no direct or indirect effects to the species in the action area, the action is determined to have "no effect" on listed species or critical habitat. No consultation is required under these circumstances. The administrative record should document these conclusions.

4. Informal Consultation. Informal consultation is a process that includes all discussions and correspondence between the FWS and/or NMFS and the BLM or its designated non-Federal representative. Its purpose is to assist the BLM in determining if formal consultation is required.

If the BLM determines that its particular discretionary agency action "may affect" a listed species or designated critical habitat, it must then determine whether the action is likely to adversely affect (LAA) any listed species or designated critical habitat or not likely to adversely affect (NLAA) such resources.

The consultation regulations at 50 CFR 402.12 only require preparation of a biological assessment (BA) when an action agency proposes a "major construction activity," which is defined as an action requiring preparation of an

environmental impact statement pursuant to the National Environmental Policy Act. However, the BLM will prepare a BA for submittal to FWS and/or NMFS when seeking concurrence on an NLAA determination. The scope and content of a BA prepared by the BLM shall be directly related to the level of potential effect on listed species or designated critical habitat. See Section .1F.5.a.(2) for guidance on the preparation of a BA.

Not likely to adversely affect (NLAA) is the appropriate conclusion when a causal mechanism for creating an effect exists, and the effect is 1) discountable, 2) insignificant, or 3) completely beneficial. These effects have an extremely low probability of occurrence (discountable); cannot be translated into any significant measurable effect on the species even when effects on habitat can be measured (insignificant); or are completely beneficial. For discountable and insignificant, the risk of harm or harassment is so low that a reasonable person would not consider it a factor in making a decision on the proposed action.

Likely to adversely affect (LAA) is the appropriate conclusion if a causal mechanism exists within the action area that creates a direct or indirect effect, or an effect from an interrelated or interdependent activity, that is not discountable, insignificant, or completely beneficial. Adverse effects are those where the likelihood of "take" resulting from the action is not insignificant, and evidence is present in a logical analysis to support this determination to the extent that a reasonable person would agree with the determination.

If the BLM determines that the action is LAA, formal consultation is required. If the BLM determines a proposed action is NLAA a listed species or designated critical habitat, the agency must request that the FWS and/or NMFS concur in that determination. If the FWS and/or NMFS indicate they are unlikely to support an NLAA determination, the BLM should consider further discussion with the Services directed at resolution of outstanding questions and possible development of additional measures to reduce potential effects on listed species or designated critical habitat. If the FWS and/or NMFS refuse to concur in a BLM determination that an action is NLAA, formal consultation is required. Similarly, if the BLM determines that an action is LAA, formal consultation is required.

Informal consultation does not conclude until the BLM has written concurrence of its determination from the FWS and/or NMFS, until the procedures specified under counterpart regulations at 50 CFR 402.34 have been fulfilled, the BLM makes a determination of no effect, or until the BLM enters formal consultation with the FWS and/or NMFS.

5. Formal Consultation. Formal consultation is required on all actions that may affect a listed species, or any designated critical habitat, unless written concurrence that an action is not likely to adversely affect the species is received from FWS and/or NMFS, or the action qualifies for an alternative consultation

under an alternative consultation agreement pursuant to the counterpart regulations for national fire plan projects. When it is determined by the BLM that a proposed action may affect and is likely to adversely affect a listed species or designated critical habitat, the BLM shall initiate formal consultation. Formal consultation is conducted to determine if the proposed action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Formal consultation is initiated with submission of a completed biological assessment and a written request to initiate formal consultation.

a. Providing Information. During formal consultation, the BLM shall provide the FWS and/or NMFS with the best scientific and commercial information available for an adequate review of the effects that a proposed action may have on a listed species or designated critical habitat. If information is lacking, the FWS and/or NMFS can request that the BLM conduct additional surveys or studies to better address listed species issues. Although additional surveys or studies are not required by the ESA, and in many situations may not be practicable, they can be in the BLM's best interest, as the FWS and/or NMFS generally err on the side of conserving listed species when rendering a biological opinion based on limited information. In some situations, it may be necessary to enter consultation with the presently available best scientific and commercial data.

(1) The BLM shall request in writing a list from the FWS and/or NMFS of listed species and designated critical habitat in the action area of a major construction activity. The BLM may request in writing from FWS and/or NMFS a list of species or designated critical habitat for any other agency action. In lieu of requesting such a list, the BLM may determine the presence of listed species or designated critical habitat within the action area and request concurrence from the FWS and/or NMFS.

(2) The BLM shall prepare a biological assessment (BA), as described in 50 CFR 402.12 and 402.14, as the means of providing the best scientific and commercial information available to the FWS and/or NMFS.

(a) When to prepare a BA. A biological assessment shall be prepared for all actions on which formal consultation is necessary. In some instances, the BLM may satisfy the requirement to prepare a BA by incorporating by reference material from a previous biological assessment pertaining to a similar action or through preparation of an environmental assessment or environmental impact statement.

(b) BA contents. By regulation, the contents of a BA are at the discretion of the Federal action agency; however, they shall be based on the best available scientific and commercial data, and shall clearly document the logic used by BLM in reaching its determination of

effects. The consultation regulations (50 CFR 402.12.j) contain recommended contents of a BA. The content of a BA prepared by the BLM for either informal or formal consultation will contain the same information, except that a BA prepared for informal consultation will not include a discussion of cumulative effects. BAs prepared by the BLM will contain the following information:

(i) A clear, thorough description of the action, including any actions to minimize or avoid adverse effects on listed species or designated critical habitat.

(ii) A description of the area that may be directly or indirectly affected by the action.

(iii) Identification of any interrelated or interdependent actions.

(iv) A description of any listed species or designated critical habitat that may be affected, including the results of any on-site inspection(s) of the action area to determine if listed or proposed species are present or occur seasonally.

(v) A review of the literature, and any other pertinent information, including available views of recognized experts on the species at issue.

(vi) An analysis of the direct and indirect effects of the action and any interrelated or interdependent actions on the listed species and critical habitat.

(vii) A determination of effects that is clearly supported by the analysis of effects.

(viii) Identification of any alternate actions considered by the Federal agency for the proposed action.

(ix) For formal consultation only, an analysis of cumulative effects.

While it is important to analyze and document the effects of actions on Bureau sensitive species and “no effect” determinations for listed species in NEPA documents, these analyses will not be included in BAs provided to the FWS and/or NMFS.

b. Irreversible and Irretrievable Commitment of Resources. Under Section 7(d) of the Act, once a request for formal consultation is made or consultation is reinitiated and until the requirements of Section 7(a)(2) are satisfied, the

BLM shall ensure that the agency and any of its applicants do not make any irreversible or irretrievable commitments of resources on agency land with respect to the agency action that have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternatives that could avoid jeopardy to listed species or destruction or adverse modification of designated critical habitat. For ongoing actions subject to formal consultation, the BLM shall conduct and document an analysis pursuant to Section 7(d) of the ESA pertaining to agency actions to determine if there will be any such irreversible or irretrievable commitments of resources. Any BLM discretionary actions with such irreversible or irretrievable commitments of resources shall be immediately suspended until consultation has concluded.

c. Reasonable and Prudent Alternatives. If the FWS and/or NMFS conclude that an action is likely to jeopardize the continued existence of a listed species or is likely to result in the destruction or adverse modification of designated critical habitat, it will prepare a biological opinion that identifies any reasonable and prudent alternatives needed to avoid jeopardy or destruction or adverse modification of critical habitat. Reasonable and prudent alternatives are those that can be implemented in a manner consistent with the intended purpose of the action, can be implemented consistent with the scope of the action agency's legal authority and jurisdiction, are economically and technologically feasible, and would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of designated critical habitat. As the development of reasonable and prudent alternatives is necessitated when the FWS and/or NMFS concludes that an agency action is likely to cause jeopardy or adverse critical habitat modification, the scope of recommended alternatives will be based on the full range of discretion available to the agency.

d. Draft biological opinion. During formal consultation, the BLM should request a draft copy of the biological opinion and incidental take statement (ITS) (if applicable) for review. In any instance involving a potential jeopardy opinion, this review should include an analysis to determine whether any reasonable and prudent alternative is within the scope of the BLM's authority, can be implemented in a manner consistent with the intended purpose of the proposed action, and is economically and technically feasible. The BLM review should also evaluate whether any reasonable and prudent measures, and their implementing terms and conditions, contained in any ITS do not cause more than a minor change to the proposed Federal action. Minor changes cannot alter the basic design, location, scope, duration, or timing of the action. The ITS provided with a draft biological opinion does not constitute a statement of anticipated take under Section 10 of the ESA unless it is confirmed by the FWS and/or NMFS as the final biological opinion.

(1) The BLM should provide expertise to the FWS and/or NMFS in determining the availability and development of reasonable and prudent

alternatives, although the FWS and/or NMFS retains the final decision on which alternatives are included in the biological opinion. The BLM should encourage applicant participation in the development of reasonable and prudent alternatives.

(2) The BLM should forward a copy of the draft biological opinion to applicants upon their request, and inform them that any comments they may have for the FWS and/or NMFS must go through the BLM, although they may provide copies to the FWS and/or NMFS directly.

(3) The BLM should forward applicant comments to the FWS and/or NMFS.

(4) The BLM should ensure that any ITS with reasonable and prudent measures and mandatory terms and conditions provides the agency protection from any and all prohibited takings under Section 9 of the Act that are reasonably certain to occur. Reasonable and prudent measures imposed by the FWS and/or NMFS can include only actions that occur within the action area, and are consistent with a project's basic design, location, scope, duration, and timing. Since the FWS and/or NMFS have determined that any take associated with the agency action will not result in jeopardy, any changes to the project as a result of reasonable and prudent measures imposed by FWS and/or NMFS must be minor and directly related to reduction in the level of take. For example, it would be inappropriate for the FWS and/or NMFS to recommend relocation of a project as a reasonable and prudent measure. Incidental take statements should comport with the Department of the Interior policy, specifically:

(a) If there is no reasonable certainty of take, there should be no ITS and no reasonable and prudent measures with terms and conditions. Terms and conditions must have an articulated, rational connection to the taking of a species.

(b) Terms and conditions must give clear guidance to the holder of the ITS of what is expected of them and how the condition can be met, and must provide a clear standard for determining when the authorized level of take has been exceeded.

(5) By regulation, incidental take statements and associated reasonable and prudent measures with accompanying terms and conditions do not apply to, nor are they issued for, ESA-listed plant species.

e. Termination of the Consultation Procedures. Formal consultation may terminate as follows:

(1) The FWS and/or NMFS issues a biological opinion.

(2) During any stage of consultation, the BLM notifies the FWS and/or NMFS in writing that the proposed action is not likely to occur.

(3) During any stage of consultation, the BLM determines, with the written concurrence of the FWS and/or NMFS, that the proposed action is not likely to adversely affect any listed species or critical habitat.

f. Consultation Timelines. Consultation regulations require that formal consultation be concluded 90 days after it is initiated, unless otherwise agreed to between the FWS and/or NMFS and the BLM. However, the FWS and/or NMFS does not consider the consultation process initiated until it determines that information provided by the BLM represents the best scientific and commercial data available. The regulations provide that the biological opinion is to be transmitted to the Federal agency no later than 45 days after the conclusion of consultation. As consultation deadlines approach, the BLM should contact the FWS and/or NMFS to determine whether consultation deadlines will be met.

g. BLM responsibility after issuance of the biological opinion. After the FWS and/or NMFS issues the biological opinion, the BLM determines how it will proceed.

(1) The BLM shall notify the FWS and/or NMFS in writing of its final decision on any proposed actions that receive a jeopardy or adverse modification of critical habitat determination in the biological opinion. If the BLM determines that it cannot comply with the requirements of Section 7(a)(2) (no jeopardy) of the ESA, it may apply for an exemption, as outlined in .1.F.10.

(2) After acceptance of the biological opinion, the BLM shall implement the proposed action or reasonable and prudent alternative as described, and shall implement all mandatory terms and conditions identified in the ITS. The exemption from listed species take prohibitions, as specified in Section 9 of the ESA, are only valid on the basis of full implementation of these requirements. The BLM shall review conservation recommendations in biological opinions and implement them if they are consistent with BLM land use planning and policy and if they are technologically and economically feasible.

(3) The ITS will specify the effect (i.e., the amount or extent of such incidental take); specify those reasonable and prudent measures that the FWS and/or NMFS considers necessary or appropriate to minimize such effect; set forth implementing terms and conditions (including reporting requirements) that must be complied with by the BLM or any applicant; specify procedures to be used to handle or dispose of any individuals of

a species actually taken; and outline the required monitoring and reporting requirements to be implemented over the life of the action. The responsible BLM line officer will ensure these reporting requirements are documented in the administrative record.

(4) Biological opinions for plants will not have an accompanying ITS, but may contain conservation recommendations. The BLM shall review such conservation recommendations and implement them if they are consistent with BLM land use plans and policy and if they are technologically and economically feasible.

(5) An ITS provided with a conference opinion does not become effective unless the FWS and/or NMFS adopts the conference opinion as the final biological opinion once the species listing is final. The BLM must request in writing that a conference opinion be adopted as a biological opinion once a proposed species has been listed.

h. Reinitiation. Reinitiation of formal consultation is required and shall be requested by the BLM or the FWS and/or NMFS where discretionary control over the action has been retained and (1) the amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals that effects of the action may affect listed species or designated critical habitat in a manner or extent not previously considered, (3) the action is modified in a way that may affect listed species or critical habitat in a way not considered in the biological opinion, and/or (4) a new species is listed or critical habitat is designated that may be affected by the action. The appropriate line officer shall monitor the amount or extent of authorized incidental take and should reinitiate consultation in a timely way if it appears that the level of take will be exceeded over the life of the action. If the amount or extent of incidental take is met or exceeded, the activity must be terminated until additional consultation is concluded. The State Director or Field Manager of the administrative unit that received the biological opinion shall also determine if any other reinitiation condition has occurred and, if so, shall reinitiate the consultation with the appropriate FWS and/or NMFS office.

There is no duty to reinitiate consultation unless there is an ongoing agency action. In the context of a land use plan, the agency action of approving a plan is complete upon approval and a plan is therefore not an ongoing action over the life of the plan. For this reason, reinitiation of consultation is not required if, for example, a new species is listed or critical habitat is designated after a plan is approved.

i. Incremental Step Consultation. The BLM may request that the FWS and/or NMFS conduct consultation in incremental steps when by statute the BLM is allowed to take incremental steps toward completion of the action (e.g.,

issuance of oil and gas or geothermal leases that involve subsequent permitting processes). The biological opinion will include the FWS and/or NMFS views on the entire action (50 CFR Part 402.14(k)).

(1) The initial consultation using the incremental step approach must be formal (see .1.F.5).

(2) The BLM may proceed with the incremental step provided that the FWS and/or NMFS finding for the incremental step is not a jeopardy opinion; the BLM continues consultation with respect to the entire action and obtains biological opinions, as required, for each incremental step; the BLM fulfills its obligation to obtain sufficient data upon which to base the final biological opinion on the entire action; the incremental step does not result in the irreversible or irretrievable commitment of resources; and there is reasonable likelihood that the entire action will not result in jeopardizing the continued existence of a listed species or destruction or adverse modification of designated critical habitat.

6. Conference on Proposed Species and Proposed Critical Habitat. Section 402.10 of 50 CFR provides the procedures necessary for compliance with Section 7(a)(4) of the ESA, which establishes requirements for conferencing on proposed species and proposed critical habitat.

a. The ESA requires BLM to conference with the FWS and/or NMFS on actions that are likely to jeopardize a proposed species or cause destruction or adverse modification to proposed critical habitat. Since the BLM is generally not in a position to determine jeopardy, BLM policy is to confer on all discretionary actions that are determined to be May Affect, Likely to Adversely Affect. Conversely, BLM policy is to not confer on actions determined Not Likely to Adversely Affect.

b. For proposed species, the BLM should request conference in anticipation of future listing. The BLM should request that the conference follow the procedures for formal consultation when deemed advantageous to the agency. The conference opinion issued at the conclusion of a conference may be adopted as the biological opinion if the species or critical habitat is listed or designated, provided the project proposal has not changed and no new pertinent information exists. The FWS and NMFS usually provide advisory recommendations on ways to avoid or minimize adverse effects.

c. The BLM should consider the advisory recommendations for minimizing or avoiding adverse effects to proposed species or proposed critical habitat that are provided by the FWS and/or NMFS in the conference report or conference opinion. Implementation of recommendations is at the discretion of the BLM.

7. Programmatic and Plan Level Consultations. The BLM should invite the FWS and/or NMFS to participate early in the planning process to ensure that effective, agreed on conservation measures are included in the design of any plan to improve the efficiency of the Section 7 consultation process and to assist BLM in meeting its objectives under section 7(a)(1) of the ESA.

The adoption, revision, or amendment of a land use plan is an agency action subject to Section 7(a)(2) of the ESA. Thus, for new land use plans, plan revisions, or plan amendments, the BLM must determine whether the plan "may affect" listed species or designated critical habitat. If the BLM determines that the plan may affect listed species or critical habitat, then the BLM must engage in either informal or formal consultation with the FWS and/or NMFS. When determining whether a plan may affect listed species or critical habitat, the BLM must carefully evaluate whether any effects of the actions, as defined by the ESA, are caused by the adoption, revision, or amendment of the land use plan and are reasonably certain to occur. This analysis should be rigorously documented in the administrative record.

There is no duty to reinitiate consultation unless there is an ongoing agency action. In the context of a land use plan, the agency action of approving a plan is complete upon approval and a plan is therefore not an ongoing action over the life of the plan. For this reason, reinitiation of consultation is not required if, for example, a new species is listed or critical habitat is designated after a plan is approved.

8. Applicants, Designation of non-Federal Representatives, and Early Consultation.

a. Applicant. An applicant is defined as any person who requires formal approval or authorization (such as for permits, licenses, leases, or letters of authorization or approval) from the BLM as a prerequisite to conducting an action. An applicant can be an individual, corporation, partnership, trust, association, or any other private entity; or any officer, employee, agent, department, or instrumentality of the Federal Government, of any State, municipality, or political subdivision of a State, or of any foreign government; any State, municipality, or political subdivision of a State; or any other entity subject to the jurisdiction of the United States. The applicant is involved in the ESA conference or consultation process if the applicant's specific action that requires approval or authorization by the BLM may affect a federally threatened, endangered, or proposed species.

(1) The BLM shall identify and determine who is an applicant for the purposes of ESA consultation. The BLM does not typically identify applicants in association with programmatic consultations, (e.g., land use plan-level consultation) because no specific action that may require authorization or approval is involved. Under programmatic consultations,

the BLM usually retains the discretion to provide formal authorization or approval for more specific actions. If consultation for a more specific action is required, applicants for that specific action will be identified at that time.

(2) The BLM shall promptly inform FWS and/or NMFS if there is an applicant identified for a project that has been or will be submitted for consultation.

(3) The BLM shall notify known applicants promptly of their opportunities for participation in the consultation and/or conference process.

(a) The BLM shall provide any applicant the opportunity to submit information for consideration during the consultation process and should provide the same opportunity during the conference process.

(b) If, after receipt of or concurrence with the species list received from the FWS and/or NMFS, a required BA will not be completed within the 180-day period, the BLM shall provide the applicant with a written statement setting forth the estimated length of the proposed extension and the reasons why such an extension is necessary. An extension is not allowed unless the BLM notifies the applicant before the 180-day deadline.

Once initiated, consultation involving an applicant must be concluded within 90 days, unless the FWS and/or NMFS and the BLM mutually agree to extend the consultation, provided that the FWS and/or NMFS submits to the applicant, before the close of the 90 days, a written statement setting forth: (1) the reasons why a longer period is required, (2) the information that is required to complete the consultation, and (3) the estimated date on which the consultation will be completed. A consultation involving an applicant cannot be extended for more than 60 days without the consent of the applicant.

(c) If requested by the applicant, the BLM should request a copy of the draft biological opinion from the FWS and/or NMFS, provide a copy to the applicant, and forward any applicant comments to the FWS and/or NMFS.

(d) The BLM should encourage the FWS and/or NMFS to discuss the basis for the biological determination in the biological opinion to enhance the applicant's understanding of the outcome. The BLM may also involve the applicant in discussions with the FWS and/or NMFS to develop reasonable and prudent alternatives to the proposed action

in instances where a proposed action is determined to be likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

b. Designation of non-Federal Representative. For each consultation involving an applicant, the appropriate BLM line manager will consider designating the applicant as the non-Federal Representative for purposes of conducting informal consultation and/or preparing a biological assessment under 50 CFR Part 402.08. In making this determination, the line manager should evaluate (1) whether the applicant has sufficient expertise to prepare a biological assessment, or can reasonably secure such expertise, and (2) whether such designation is advantageous to the government.

The BLM can assign the non-Federal representative to prepare the biological assessment, conduct informal consultation, or both. The non-Federal representative may be an applicant, contractor or other party as appropriate. The non-Federal Representative is not permitted to conduct formal consultation beyond preparation of a biological assessment, and shall not subject the BLM to any obligation without specific consent of the agency. The BLM shall furnish available information pertaining to the consultation, guidance, and supervision to the extent required, and must independently review and evaluate the scope and contents of the biological assessment prepared by the non-Federal Representative.

Even with designation of a non-Federal Representative, the ultimate responsibility for compliance with Section 7 of the ESA remains with the BLM. Although there are similarities, a non-Federal representative is not the same as an applicant. Whereas an applicant has the opportunity to participate in consultation alongside the BLM, a non-Federal representative acts in the BLM's place to prepare the BA and/or conduct informal consultation.

(1) The BLM shall provide written notice to the FWS and/or NMFS if it designates a non-Federal representative.

(2) An applicant may be designated as the non-Federal representative. If an applicant is involved and is not the designated non-Federal representative, then the applicant and the BLM must agree on the choice of the designated non-Federal representative.

(3) The BLM shall furnish guidance and supervision and shall independently review and evaluate the scope and contents of the BA prepared by the designated non-Federal representative. If the BLM review finds the BA prepared by a non-Federal representative is inadequate, it should either be returned to the preparer for corrections, or revised by the

BLM before submission to the FWS and/or NMFS.

(4) Written correspondence requesting concurrence or formal consultation shall be prepared by the appropriate BLM official.

c. Early Consultation. Section 7(a)(3) of the ESA and implementing regulations provide the means (referred to as "early consultation") for a prospective applicant for public land use to request an early consultation if the prospective applicant has reason to believe that the prospective action may affect listed species or designated critical habitat (50 CFR Part 402.11). For early consultation, the BLM shall:

(1) Receive in writing the prospective applicant's certification that it has a definitive proposal outlining the action and its effects, and that it intends to implement its proposal, if authorized.

(2) Upon receipt of the prospective applicant's certification, initiate early consultation in writing with the FWS and/or NMFS and provide all of the information required under initiation of formal consultation (50 CFR Part 402.14(c)).

(3) For a major construction activity, include a BA at the time early consultation is initiated.

(4) Provide any prospective applicant with the opportunity to submit information for consideration during early consultation.

(5) If the prospective applicant requests through the BLM a copy of the draft preliminary biological opinion, forward the request and the prospective applicant's comments on the draft preliminary biological opinion to the FWS and/or NMFS.

(6) Not consider the ITS of the preliminary biological opinion as authority to take listed species.

(7) Request in writing to the FWS and/or NMFS confirmation of the preliminary biological opinion as the final biological opinion if the BLM believes that there have been no significant changes in the action as planned or in the information used during the early consultation. If the FWS and/or NMFS do not confirm the preliminary biological opinion, they must request that the BLM initiate formal consultation.

9. Counterpart Regulations. Counterpart regulations provide the BLM an alternative approach for completing informal Section 7 consultation on actions that qualify for use under an ACA and are determined to be NLAA. Presently, such regulations have only been adopted for use on National Fire Plan projects.

Qualifying projects include prescribed fire (including naturally occurring wildland fires managed to benefit resources), mechanical fuels treatments (thinning and removal of fuels to prescribed objectives), emergency stabilization, burned area rehabilitation, road maintenance and operation activities, ecosystem restoration, and culvert replacement actions. State Offices will periodically review the administrative records of proposed actions to ensure conformance with the ACA.

10. Exemption. The ESA allows opportunity to apply for an exemption from the requirements of Section 7(a)(2) if, after consultation, the FWS and/or NMFS determines an agency action would jeopardize the continued existence of a listed species or result in the adverse modification of critical habitat. Procedures for applications for exemption are found in 50 CFR Part 451. Use of the exemption process is rare.

a. The Director has sole authority to make an application for exemption under Section 7(g) of the ESA on behalf of BLM. If any State Director has reason to believe a project deserves consideration for an exemption, a complete briefing package shall be presented to the Director for a final decision.

b. The application for an exemption shall be submitted to the Secretary of the Interior or Secretary of Commerce, as appropriate, within 90 days following the termination of the consultation process.

11. Emergency Consultation. In certain emergency circumstances, special consultation procedures apply. These emergency circumstances are typified by natural disasters, the most common of which on BLM lands is wildfire. When a wildfire occurs on BLM-administered lands, the BLM is responsible for conducting any necessary emergency consultation. In these situations, agency actions must be immediately undertaken to protect life and property, thereby precluding the typical consultation approach in which consultation is concluded in advance of an agency undertaking, which may affect listed species or critical habitats. The first step in emergency consultation is to contact the FWS and/or NMFS by telephone or facsimile to explain the nature of the emergency. The BLM will make every attempt to contact the FWS and/or NMFS within 3 days of onset of an emergency. During this initial contact, the FWS and/or NMFS may suggest conservation recommendations to avoid or reduce potential effects on listed species or critical habitat. The BLM will implement any conservation recommendations that do not substantially interfere with the execution of emergency operations.

As soon as practicable after the emergency is under control, the BLM will initiate consultation with the FWS and/or NMFS if there is reason to believe that a listed species or critical habitat has been adversely affected. In addition to the information normally contained in a biological assessment, the BLM will provide the following information: (1) a description of the emergency, (2) a justification

for the expedited consultation, and (3) an evaluation of the response to and the effects of the emergency on the listed species and critical habitat, including documentation of how the FWS and/or NMFS recommendations were implemented. The ITS prepared by the FWS and/or NMFS will not include reasonable and prudent measures or terms and conditions unless the BLM has an ongoing action related to the emergency.

12. Consultation and Conference Approaches. A number of approaches for improving the efficiency and effectiveness of Section 7 consultation and conference have been taken by various BLM offices. The overall goal is to enhance compliance with Section 7(a)(1) and 7(a)(2). The Director, State Directors, District Managers, and Field Managers, in cooperation with other Federal agencies, should develop and use techniques to further the consultation and conference process. Examples of these approaches are:

a. Contacting and engaging, where possible, the FWS and/or NMFS reviewing office(s) early in the project development process. Experience has shown that, in general, the earlier in the processes the FWS and/or NMFS are engaged, the easier it is to accommodate listed species needs into project design. Similarly, early dialog and exchange of information on project design and components has made it easier to communicate to the FWS and/or NMFS the specific purposes and needs for individual projects, and those areas where flexibility does or does not exist. That is, the earlier project designers become aware of listed species associated needs and issues, the easier it is to address those needs and issues, thereby shortening the consultation process and even potentially avoiding the need for formal consultation.

b. Completing and using national, ecosystem, or regional level programmatic consultations and conferences that address broad-scale programs or wide-ranging species or critical habitats. The BLM should tier to and use the information, analysis, and determinations of the effects of these consultations and conferences to the greatest extent practicable when consulting or conferring at more local or project-specific levels.

c. Consulting and conferring jointly with other Federal agencies on programs or actions affecting the same species or critical habitats in the same project or geographic area.

d. Designating the applicant as the non-Federal representative for preparation of biological assessments, rather than relying on cost recovery to prepare the document in-house, allows limited biological staff time to be directed toward species recovery and other higher priority work.

e. Completing combined consultations and conferences with the FWS and NMFS together when programs or actions include effects on species or critical habitats under both agencies' jurisdictions (e.g., an action affects both listed

plants and anadromous fish).

f. When programmatic consultation results in biological opinions that provide conservation recommendations or design criteria for future agency proposals, considering these recommendations or design criteria in the development of future proposals. If these future proposals are designed to be consistent with these recommendations or criteria, consultation will be facilitated and compliance with Sections 7(a)(1) and 7(a)(2) furthered.

g. Completing batched consultations or conferences on logical groupings of activities or programs of a similar nature. Typically, these batched actions would be in the same geographic area (watershed or administrative unit). Batched consultations can be conducted on a quarterly or annual basis, or longer.

h. Using streamlined processes. Streamlining agreements provide the BLM with alternative ways of meeting their Section 7 consultation obligations. Streamlining may provide expedited consultation times for completing consultation. While streamlining is not intended for use at the project level, other multi-State Memoranda of Understanding (MOUs) have been developed to address streamlining processes at this scale. The use of streamlining processes is designed to make the consultation process more efficient. In instances where the intended benefits of streamlining are not being (or are unlikely to be) realized, the streamlining process should not be used, and the BLM should follow the standard consultation process.

i. For large or complex actions (e.g., energy corridor, promulgation of regulations) use consultation agreements to define agency roles, responsibilities, timeframes, and information requirements needed to complete consultation on the proposed action.

j. It is not necessary to consult or confer on candidate or Bureau sensitive species. However, States or offices may wish to seek technical assistance from the FWS and/or NMFS when it is determined to be advantageous to a species' conservation or BLM management options.

k. When new or novel effective approaches to consultation and conference are developed at the field and State levels, those approaches should be shared with State and national program leads. Similarly, when State and national program leads become aware of new or novel approaches being employed at the Field Office level, they should share those effective approaches with other State and Field Offices.

G. Section 9 (Prohibited Acts). The BLM shall not allow actions that result in take of endangered animals or threatened animals that have take prohibitions established under Section 4(d) of the Act, or the removal or possession of endangered plants,

except as provided for under Section 7(o) or Section 10(a) of the ESA.

Section 9 of the ESA prohibits take of all individuals of listed fish or wildlife. For plants, there is no "take" prohibition, but Section 9 makes it unlawful for anyone to remove and reduce to possession any endangered plant species; maliciously damage or destroy any endangered plant species on Federal lands; remove, cut, dig up, or damage or destroy any such species from any other area in knowing violation of any law or regulation of any State or in the course of any violation of a State criminal trespass law; or violate any regulations pertaining to threatened plants.

H. Section 10 (Exceptions to the ESA). Section 10 of the ESA provides for exceptions to the requirements and prohibited acts of other sections of the ESA.

1. Take of listed species. Section 10 (a)(1)(A) of the ESA provides exceptions for activities otherwise prohibited. The BLM shall obtain Section 10 permits from the FWS and/or NMFS if take of listed fish or wildlife species or the removal or reduction to possession of listed plants is anticipated for scientific purposes or to enhance the propagation or survival of the affected species. Authorization for take can occur in several ways. The exceptions to the requirement of permission for take are as follows and shall be reported to the FWS and/or NMFS as described in 50 CFR Part 17.21(4):

a. Any BLM employee may take endangered wildlife in defense of their own life or the lives of others.

b. Any BLM employee may, when acting in the course of their official duties, take endangered wildlife without a permit if such action is necessary to: (1) aid a sick, injured, or orphaned specimen; or (2) dispose of a dead specimen; or (3) salvage a dead specimen that may be useful for scientific study; or (4) remove specimens that constitute a demonstrable but non-immediate threat to human safety, provided that the taking is done in a humane manner; the taking may involve killing or injuring only if it has not been reasonably possible to eliminate such threat by live-capturing and releasing the specimen unharmed, in a remote area.

c. Any BLM employee may, when acting in the course of their official duties, remove and reduce to possession a federally endangered plant without a permit if such action is necessary to (1) care for a damaged or diseased specimen; (2) dispose of a dead specimen; or (3) salvage a dead specimen that may be useful for scientific study.

2. Experimental Populations.

a. General. The FWS and/or NMFS can designate experimental populations of listed plants and animals. With rare exceptions, these populations can only be released outside the species' current range, but within its probable

historical range if the Secretary determines that such release will further the conservation of the species. The intent is to ensure separation between experimental and natural populations. The Secretary of the Interior or Commerce must determine whether the experimental population is:

(1) "Essential"—Necessary for the continued existence of a listed species in the wild.

(2) "Nonessential"—Not necessary for the continued existence of a listed species.

b. Management. The BLM shall cooperate and assist in establishing experimental populations of listed species on BLM-managed lands when such establishment is consistent with BLM land use plans and policy and is technologically and economically feasible. The BLM shall treat essential experimental populations as threatened species and nonessential experimental populations as proposed species for purposes of Section 7 (other than subsection 7(a)(1)). For nonessential experimental populations, this means:

(1) Incidental take can occur without specific authorization by the FWS and/or NMFS.

(2) Conferencing is required if the action is determined to be Likely to Adversely Affect (LAA).

(3) As required by Section 7(a)(1), the BLM shall use its authorities to conserve these populations.

c. Planning. Planning efforts must reflect those actions necessary for the recovery of species to the extent that BLM management can influence recovery, including the establishment of experimental populations of listed species when appropriate. State Directors and Field Managers shall:

(1) Keep informed on recovery plan development so needs can be addressed during planning.

(2) Ensure participation with the FWS and/or NMFS in developing recovery needs for species that may have experimental population designation.

d. Reintroduction of Listed Species into Congressionally Designated Areas. In some instances, it is appropriate to transplant and reintroduce listed species into their historical ranges within designated wilderness, wilderness study areas, or other congressionally designated areas. The BLM shall use only the minimum actions necessary and the methods most appropriate to protect and enhance the values for which the areas are identified or designated. Further

information on guidelines for fish and wildlife transplantation are contained in BLM Manual 1745 and in the 2006 Association of Fish and Wildlife Agencies, BLM and Forest Service Fish and Wildlife Management Policy in Designated Wilderness MOA, and in the 2005 BLM Interim Management Guidelines for Fish and Wildlife Management in Wilderness Study Areas.

I. Section 11 (Penalties and Enforcement). The BLM shall exercise all of its authorities to ensure compliance with the ESA. Within its authority, BLM shall modify, suspend or revoke the lease, license, permit or other agreement authorizing the use of BLM-managed lands, of any person who is convicted of a criminal violation of the ESA or any regulation, permit, or certificate issued pursuant to the ESA.

J. Section 18 (Annual Cost Analysis by the U.S. Fish and Wildlife Service). Upon request of the FWS, the BLM shall provide to the FWS a species-by-species summary of its expenditures on the conservation of listed species for the FWS annual expenditure report to Congress.

.2 Administration of Bureau Sensitive Species. This section establishes procedures for the management of species designated as BLM sensitive, and their habitat. It is in the interest of the BLM to undertake conservation actions for such species before listing is warranted. It is also in the interest of the public for the BLM to undertake conservation actions that improve the status of such species so that their Bureau sensitive recognition is no longer warranted. By doing so, the BLM will have greater flexibility in managing the public lands to accomplish native species conservation objectives and other legal mandates. When administering the Bureau sensitive species program, all information shall conform to the standards and guidelines established under the Information Quality Act.

In compliance with existing laws, including the BLM multiple use mission as specified in the FLPMA, the BLM shall designate Bureau sensitive species and implement measures to conserve these species and their habitats, including ESA proposed critical habitat, to promote their conservation and reduce the likelihood and need for such species to be listed pursuant to the ESA. Any obligation to conserve proposed critical habitat under this section is terminated at the time the proposal becomes final or the habitat is no longer proposed for listing. All federally designated candidate species, proposed species, and delisted species in the 5 years following their delisting shall be conserved as Bureau sensitive species.

A. Designation of Bureau Sensitive Species. State Directors shall designate species within their respective States as Bureau sensitive by using the following criteria. For species inhabiting multiple States, State Directors shall coordinate with one another in the designation of Bureau sensitive species so that species status is consistent across the species' range on BLM-administered lands, where appropriate. Species designated as Bureau sensitive must be native species found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and either:

1. There is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range, or

2. The species depends on ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk.

B. Planning. When BLM engages in the planning process, it shall address Bureau sensitive species and their habitats in land use plans and associated NEPA documents (as per BLM 1610 Planning Manual and Handbook, Appendix C). When appropriate, land use plans shall be sufficiently detailed to identify and resolve significant land use conflicts with Bureau sensitive species without deferring conflict resolution to implementation-level planning. Implementation-level planning should consider all site-specific methods and procedures needed to bring species and their habitats to the condition under which management under the Bureau sensitive species policies would no longer be necessary.

C. Implementation. On BLM-administered lands, the BLM shall manage Bureau sensitive species and their habitats to minimize or eliminate threats affecting the status of the species or to improve the condition of the species habitat, by:

1. Determining, to the extent practicable, the distribution, abundance, population condition, current threats, and habitat needs for sensitive species, and evaluating the significance of BLM-administered lands and actions undertaken by the BLM in conserving those species.

2. Ensuring that BLM activities affecting Bureau sensitive species are carried out in a way that is consistent with its objectives for managing those species and their habitats at the appropriate spatial scale.

3. Monitoring populations and habitats of Bureau sensitive species to determine whether species management objectives are being met.

4. Working with partners and stakeholders to develop species-specific or ecosystem-based conservation strategies (see .2D Agreements, Assessments and Cooperative Strategies for Conservation).

5. Prioritizing Bureau sensitive species and their habitats for conservation action based on considerations such as human and financial resource availability, immediacy of threats, and relationship to other BLM priority programs and activities.

6. Using Land and Water Conservation Funds, as well as other land tenure

adjustment tools, to acquire habitats for Bureau sensitive species, as appropriate.

7. Considering ecosystem management and the conservation of native biodiversity to reduce the likelihood that any native species will require Bureau sensitive species status.

8. In the absence of conservation strategies, incorporate best management practices, standard operating procedures, conservation measures, and design criteria to mitigate specific threats to Bureau sensitive species during the planning of activities and projects. Land Health Standards should be used for managing Bureau sensitive species habitats until range-wide or site-specific management plans or conservation strategies are developed. Off-site mitigation may be used to reduce potential effects on Bureau sensitive species.

D. Agreements, Assessments, and Cooperative Strategies for Conservation. The BLM should work cooperatively with other agencies, organizations, governments, and interested parties for the conservation of sensitive species and their habitats to meet agreed on species and habitat management goals. Cooperative efforts are important for conservation based on an ecosystem management approach and will improve efficiency by combining efforts and fostering better working relationships. Addressing species' habitat management needs before a species is listed under the ESA will allow more management flexibility, reduce conflicts, and reduce the cost of conservation.

1. The FWS, NMFS, State agencies, universities, or others may have additional information on Bureau sensitive species. To help ensure that the best information is available in the BLM decision-making process, the BLM should request species information from these agencies as needed.

2. State Directors and line managers should make available employees with appropriate skills and expertise to support cooperative efforts for the development and implementation of habitat conservation assessments, strategies, and agreements.

3. State Directors and line managers should initiate the development of these conservation assessments, strategies, and agreements for the purpose of furthering the conservation of the subject species on BLM-administered lands where significant conservation benefits can be achieved through such an effort. Strategies and agreements should identify the role of the BLM and be proportionate to the resource values on BLM-administered lands.

4. The BLM should use habitat conservation assessments based on regional ecosystem assessments, where available, to develop conservation strategies and agreements that outline the program of work necessary to reduce, eliminate, or mitigate specific threats to sensitive species; to develop an ecosystem management approach to conservation on BLM-administered lands; and to

facilitate coordination and cooperation with others, such as States and private entities, to achieve species and habitat conservation across the range of the species.

5. The BLM should be signatory to conservation strategies and agreements if public land or BLM authorization is involved.

6. Habitat and species conservation assessments, strategies, and agreements should be consistent with existing BLM land use plans and describe in sufficient detail management objectives, treatments, and means for assessing accomplishment. Where existing land use plans are not adequate, use plan maintenance, plan conformance reviews, or plan amendments as a means of integrating conservation strategies into existing land use plans.

7. The BLM should consider successful implementation of the program in evaluating line officer performance. Key leaders who contribute to notable successes should be recognized on a continuing basis.

8. The BLM should participate in and coordinate with State natural heritage programs and State comprehensive wildlife management plans as per the Sikes Act (16 U.S.C. 670g et seq.), Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), and 43 CFR parts 24.1-4. Detailed guidance for management of species identified in State comprehensive wildlife management plans, which are not designated by the Bureau as special status species, is contained in BLM Manual 6500.

E. Management of Bureau Sensitive Species with the Oregon and California Lands Act.

In Headwaters v. BLM (1990), the Ninth Circuit held that, under the Oregon and California Sustained Yield Act (O&C Act), former Oregon and California Railroad Company Lands in western Oregon are assigned timber production as a dominant use. The application of the special status species policy to provide specific protection to species that are listed by the BLM as sensitive on lands governed by the O&C Act must be consistent with timber production as the dominant use of those lands. Subsequent litigation on O&C lands regarding timber production and endangered species establishes that timber production actions are still subject to the provisions of the Endangered Species Act, including consultation under Section 7.

.3 General Cooperation for BLM Special Status Species. The BLM shall cooperate with other government and nongovernment agencies to further the conservation of federally proposed and listed species, and will coordinate with the appropriate agencies on conservation of Bureau sensitive species. Specifically:

A. Coordination and Cooperation with Tribes. The relationship between the United States and Indian Tribes is defined by treaties, statutes, executive orders, judicial

decisions, and agreements and differentiates Tribes from other entities that deal with, or are affected by, the Federal government. Tribes are self-governing with fundamental rights to set their own priorities and make decisions affecting their resources and distinctive ways of life. However, as with other entities, coordination on the conservation and management of resources would benefit the tribal resources and public resources as they relate to Bureau sensitive species and federally proposed and listed species.

1. Secretarial Order 3206 on American Indian Tribal Rights, Federal–Tribal Trust Responsibilities, and the ESA. The Secretarial Order, signed on June 5, 1997, by the Secretary of the Interior and Secretary of Commerce clarifies the responsibilities of agencies of the Department of the Interior and Department of Commerce when actions taken under the authority of the ESA and associated implementing regulations affect, or may affect, Indian land, tribal trust resources, or the exercise of American Indian tribal rights. The Secretarial Order does not apply to Alaska. In addition to BLM Policy 8160, the BLM shall administer the conservation provisions of the Secretarial Order as follows:

a. Whenever the BLM is aware that its actions planned under the ESA may affect tribal trust resources, the exercise of tribal rights, or Indian lands, the BLM shall consult (as defined in BLM Handbook H8160-1 and distinct from ESA consultation procedure) with the Tribes that are affected and seek their participation to the maximum extent practicable. This shall include providing affected Tribes adequate opportunities to participate in data collection, consensus seeking, and associated processes.

b. The BLM shall assist Indian Tribes in developing and expanding tribal programs that promote the health of ecosystems upon which Bureau sensitive species and federally proposed and listed species depend. This includes:

(1) Offering and providing such scientific and technical assistance and information as may be available for the development of tribal conservation and management plans to promote the maintenance, restoration, enhancement, and health of the ecosystems upon which Bureau sensitive species and federally proposed and listed species depend.

(2) Cooperatively identifying appropriate management measures to address concerns for such species and their habitats.

c. The BLM shall give deference to tribal conservation and management plans for tribal trust resources that govern activities on Indian lands and that address the conservation needs of listed species.

d. At the earliest indication that it is considering management actions that may be restrictive to Tribes, for the conservation of any species, the BLM shall promptly notify all potentially affected Tribes, and assist Tribes in

identifying and implementing tribal conservation and other measures necessary to protect such species.

e. The BLM should assist the FWS and/or NMFS and other Federal agencies with their required actions under the Secretarial Order regarding the conservation of species.

f. The BLM shall coordinate with the affected Tribes and the Bureau of Indian Affairs on BLM Section 7 consultations of which it is aware that tribal rights or tribal trust resources may be affected.

g. To the extent consistent with the provisions of the Privacy Act, the Freedom of Information Act (FOIA), and the Department's ability to continue to assert FOIA exemptions, the BLM shall make available to a Tribe all information held by the BLM that is related to a Tribe's Indian lands and tribal trust resources.

h. The BLM shall, when appropriate and at the request of a Tribe, pursue intergovernmental agreements to formalize arrangements involving Bureau sensitive species and federally proposed and listed species.

2. BLM 8160 Policy. The BLM should use any opportunity available under its 8160 Policy to seek coordinated conservation activities with Tribes.

B. Other Cooperation and Coordination. Conservation activities in general would benefit from cooperation and coordination with other agencies, organizations, governments, and interested parties.

1. The BLM, in coordination with the FWS and/or NMFS and other interested entities, should develop habitat conservation assessments and conservation agreements for any BLM special status species that the BLM believes would benefit from such an agreement.

2. The BLM should provide technical assistance to, and coordinate with, appropriate state agencies and other agencies, organizations, or private landowners developing and implementing conservation plans.

3. The BLM should seek partnerships and cooperative relationships with other agencies, organizations, governments, and interested parties for the purposes of conservation of sensitive species and compliance with the ESA. The BLM already has MOUs with several agencies and organizations. Partnerships beyond existing MOUs are encouraged. Partnerships and cooperative relationships should be sought with agencies that include the following:

a. Other resource management and regulatory agencies, such as the Natural Resource Conservation Service, State fish and wildlife agencies, State forestry

agencies, State water quality agencies, and municipal parks and recreation agencies.

b. State and local governments, such as governor's offices, County commissioners, and City councils; County extension units, watershed councils, and resource conservation districts; and interested landowners.

c. Federal advisory groups, such as the Sporting Conservation Council, resource advisory councils, and provincial advisory boards.

d. Research entities, such as the Biological Resource Division of the U.S. Geological Survey, U.S. Forest Service, Agricultural Research Service, Cooperative Ecosystem Studies Units, and university researchers.

e. Professional societies, such as The Wildlife Society, the American Fisheries Society, Society for Range Management and the Botanical Society of America.

f. Groups representing private sector interest in resources and resource uses, such as Trout Unlimited, Center for Plant Conservation, National Audubon Society, The Nature Conservancy, National Cattlemen's Beef Association, and American Sports Tackle Manufacturers.

4. The BLM's role in partnerships and cooperative relationships should include developing conservation programs based on ecosystem management, providing expertise for programs affecting lands outside of the public land when benefits to BLM-managed resources are expected to result, and developing grant and cost-shared (e.g., challenge cost-share) projects to support conservation activities.

Glossary of Terms

This glossary is provided for the convenience of the reader and the terms are defined for the purpose of this manual only.

-A-

action: all discretionary activities or programs of any kind authorized, funded, or carried out by the BLM in whole or in part. Examples include (1) projects intended to conserve Bureau sensitive species and federally proposed and listed species or their habitat; (2) the promulgation of regulations; (3) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid; or (4) projects directly or indirectly causing modifications to the land, water, or air.

animals: any member of the animal kingdom, including without limitation any mammal, fish, bird, amphibian, reptile, mollusk, crustacean, arthropod, or other invertebrate, and any part, product, egg, or offspring thereof, or the dead body or parts thereof. As used here, the words "animals," "fish or wildlife," and "wildlife" are interchangeable.

-B-

biological assessment (BA): information prepared by, or under the direction of, a Federal agency concerning listed and proposed species and designated and proposed critical habitat that may be present in the action area and may be affected by the proposed action. A biological assessment presents the BLM's determination of whether any such species or habitat is likely to be adversely affected by the action.

biological opinion (BO): document that includes (1) the opinion of the FWS and/or NMFS as to whether or not a Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of designated critical habitat; (2) a summary of the information on which the opinion is based; and (3) a detailed discussion of the effects of the action on listed species or designated critical habitat. A BO may be accompanied by an incidental take statement.

BLM-administered lands: collectively, BLM-managed lands and split-estate lands.

-C-

candidate species: plant and animal taxa considered for possible addition to the list of endangered and threatened species under the Endangered Species Act. These are taxa for which the FWS or NMFS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposal to list, but issuance of a proposed rule is presently precluded by higher priority listing actions. Separate lists for plants, vertebrate animals, and invertebrate animals are published periodically in the *Federal Register*. Candidate species and their habitats are managed as Bureau sensitive species.

conservation (also conserve and conserving): 1) definition from ESA Section 3(3) and as applied to threatened, endangered, and proposed species in this policy: to use, and the use of, all methods and procedures that are necessary to bring a listed species to the point at which the measures provided pursuant to the ESA are no longer necessary. Methods and procedures of conservation include all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transportation; 2) as applied to Bureau sensitive species, the use of programs, plans, and management practices to reduce or eliminate threats affecting the status of the species, or improve the condition of the species' habitat on BLM-administered lands.

conservation agreement or strategy: formal, written document agreed to by the FWS and/or NMFS or another Federal agency, State agency, local government, or the private sector to achieve the conservation of Bureau sensitive species and federally proposed, listed, and candidate species through voluntary cooperation. It documents the specific actions and responsibilities for which each party agrees to be accountable. The objective of a conservation agreement or strategy is to reduce threats to a Bureau sensitive species and federally proposed and listed species or its habitat. An effective conservation agreement or strategy may lower species' listing priority or eliminate the need for listing.

conservation recommendations: suggestions of the FWS and/or NMFS regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information.

critical habitat (CH): (1) the specific areas within the geographical area currently occupied by a species, at the time it is listed in accordance with the ESA, on which are found those physical or biological features (i) essential to the conservation of the species and (ii) that may require special management considerations or protection, and (2) specific areas outside the geographical area occupied by a species at the time it is listed upon determination by the FWS and/or NMFS that such areas are essential for the conservation of the species. Critical habitats are designated in 50 CFR Parts 17 and 226. The constituent elements of critical habitat are those physical and biological features of designated or proposed critical habitat essential to the conservation of the species, including, but not limited to: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and (5) habitats that are protected from disturbance or are representative of the historical geographic and ecological distributions of a species.

-D-

distinct population segment (DPS): subdivision of a vertebrate species (excluding Pacific salmon stock, see definition of evolutionarily significant unit) that is treated as a species for purposes of listing under the Endangered Species Act. To be so recognized, a potential distinct population segment must satisfy standards specified in a FWS or NMFS policy statement (see the February 7, 1996, *Federal Register*, pages 4722–4725). The standards require it to be separable from the remainder of and significant to the species to which it belongs.

-E-

endangered species: any species that is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta, determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man.

evolutionarily significant unit (ESU): a Pacific salmonid stock that is substantially reproductively isolated from other stocks of the same species and that represents an important part of the evolutionary legacy of the species. Life history, ecological, genetic, and other information can be used to determine whether a stock meets these two criteria. The NMFS uses this designation.

-F-

fish or wildlife: see animals.

formal consultation: a component of the consultation process under Section 7 of the ESA that commences with the BLM's written request for consultation after it has determined that its action may affect and is likely to adversely affect listed species or designated critical habitats and concludes with the issuance of biological opinion.

-H-

habitat conservation assessment: a comprehensive, state-of-knowledge technical document that describes life history, habitat requirements, and management considerations for a species or group of species throughout its occupied range on the lands managed by the cooperating agencies. Habitat conservation assessments are often made as a forerunner to preparation of a conservation strategy or agreement.

-I-

implementation plan: a site-specific plan written to implement decisions made in a land use plan. An implementation plan usually selects and applies best management practices to meet land use plan objectives and is synonymous with an activity plan. Examples of implementation plans include habitat management plans and allotment management plans.

incidental take: see take.

incidental take statement (ITS): under the ESA, a document that accompanies a biological opinion in which some incidental take of listed species is reasonably certain to occur. Such take would not rise to a level that would jeopardize the listed species. An ITS exempts a specific level of take associated with the action from the prohibitions on take under Section 9 of the ESA. An ITS often includes reasonable and prudent measures and their implementing terms and conditions, which are intended to reduce or minimize the take associated with the action or monitor the progress of the action and associated take. A biological opinion will not have an ITS

if no take is reasonably certain to occur.

informal consultation: a component of the consultation process that includes all discussions, correspondence, or other contact between the FWS and/or NMFS and the BLM or the designated non-Federal representative, prior to formal consultation, to determine if a proposed action may affect listed species or critical habitat and to use FWS and/or NMFS expertise, if necessary, to modify the proposed action to avoid potential adverse effects.

-J-

jeopardize the continued existence of (also jeopardize, cause jeopardy to): engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of listed species in the wild by reducing the recruitment, numbers, or distribution of a listed species.

-L-

listed species: species that are designated under the ESA as either threatened or endangered, which may include members of the Plant, Animal or Fungi–Lichen Kingdoms.

-M-

multiple use: a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific, and historical values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment, with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output (FLPMA).

-N-

native species: as per February 3, 1999, Executive Order 13112 (Invasive Species), native species means, with respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or presently occurs in that ecosystem.

-P-

plant: any member of the plant kingdom, including seeds, roots, flowers, and other parts thereof.

-R-

recovery: improvement in the status of listed species to the point at which listing is no longer appropriate under the ESA.

request for technical assistance: communication with the FWS and/or NMFS concerning actions that will potentially have an adverse effect on a BLM special status species or its habitat. The objectives of these requests are to obtain as much biological information as possible about the species involved and its habitat and the FWS and/or NMFS recommendations on how the proposed management action might be carried out without contributing to the further deterioration of the species or its habitat.

-S-

species: any species or subspecies (and regarding plants, any varieties), and any distinct population segment or evolutionarily significant unit of any species of vertebrate, fish, or wildlife that interbreeds when mature.

(A) Federally listed endangered—an animal or plant species in danger of extinction throughout all or a significant portion of its range.

(B) Federally listed threatened—an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

(C) Federally proposed—a species of animal or plant that is proposed in the *Federal Register* to be listed under Section 4 of the Endangered Species Act.

(D) Federal candidate species—a plant or animal species for which FWS or NMFS has on file sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened. All Federal candidates shall be included in the Bureau sensitive species category.

(E) Bureau sensitive species—species that require special management consideration to avoid potential future listing under the ESA and that have been identified in accordance with procedures set forth in this manual

special status species: collectively, federally listed or proposed and Bureau sensitive species, which include both Federal candidate species and delisted species within 5 years of delisting.

split-estate: subsurface mineral resources managed by the BLM where the surface resource is managed by a different public or private entity, as opposed to BLM-managed lands.

status review: process of examination by FWS and/or NMFS to determine if a species situation warrants protection under the ESA. Results of a status review are published in the *Federal Register*.

survival: for determination of jeopardy or adverse modification, the species' persistence as listed or as a subset identified by the FWS and/or NMFS for recovery management purposes, beyond the conditions leading to its endangerment, with sufficient resilience to allow for the potential recovery from endangerment. It is the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a

species with a sufficient population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter.

-T-

take: harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The term applies only to fish and wildlife.

(A) incidental take: take of listed fish or wildlife species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by a Federal agency or applicant. [50 CFR §402.02] Incidental take of listed plant species is neither defined nor prohibited by the Act.

(B) harm: as defined by the FWS, harm includes significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. As defined by the NMFS, harm means an act that actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding, or sheltering.

(C) harass: defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include breeding, feeding, or sheltering Tribes (Indian Tribes): any federally recognized Indian Tribe, band, nation, pueblo, community, or other organized group within the United States that the Secretary of the Interior has identified on the most recent list of federally recognized Tribes maintained by the Bureau of Indian Affairs.

-W-

wildlife: see animals.

Uncompahgre Field Office

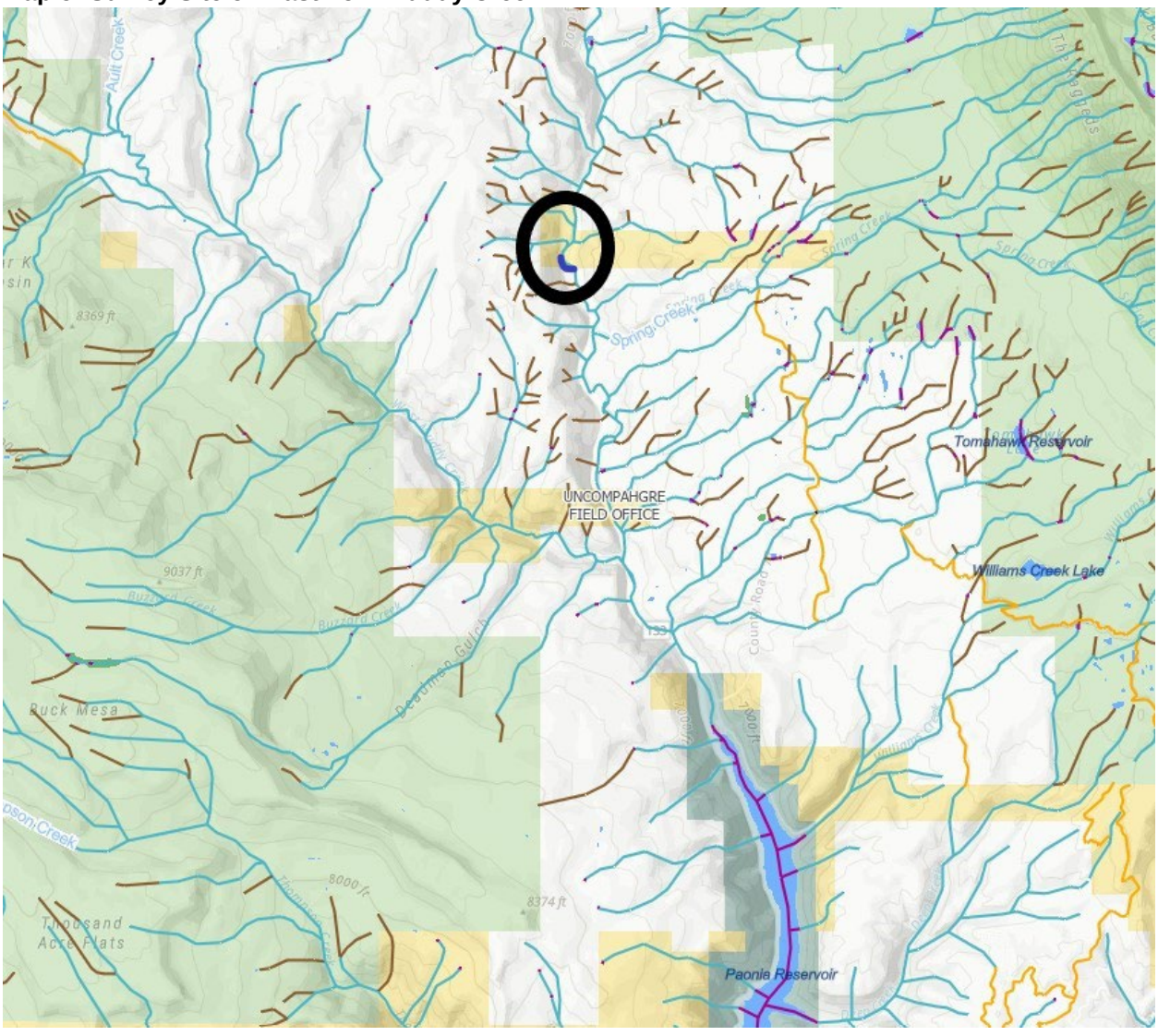
Stream Survey July 2025

East Fork Muddy Creek – Water Code: 41765

Introduction:

A site on East Fork Muddy Creek (see map below), located north of Paonia Reservoir on public lands managed by the Bureau of Land Management's (BLM) Uncompahgre Field Office, was sampled on July 24, 2025. The stream joins with West Muddy Creek to form Muddy Creek just above Paonia Reservoir. The purpose of the sampling was to assess the fishery and determine species composition and obtain population data on select resident fish species.

Map of Survey Site on East Fork Muddy Creek



Methods:
Two electro-fishing backpack units working side by side along with two back-up netters were used to complete a two-pass depletion population estimate in an approximate 500-foot stream reach. Personnel present for the survey included Zachary Hooley-Underwood and crew, Colorado Parks and Wildlife, and Tom Fresques, BLM.

Results:
A total of six species and five hybrid fish were collected during the survey. Native fish species and numbers of individuals collected included: 36 Speckled Dace, 33 Flannelmouth Suckers, 25 Sculpin, and 7 Bluehead Suckers. Nonnative fish and sportfish and numbers of individuals collected included: 4 Brook Trout, 1 Rainbow Trout, 4 White Suckers, 1 White Sucker x Bluehead Sucker hybrid, 3 White Sucker x Flannelmouth Sucker hybrids, and 1 White Sucker x Bluehead Sucker x Flannelmouth Sucker hybrid.

Flannelmouth Sucker

Bluehead Sucker

A population estimate was obtained on Flannelmouth Sucker at the site and is noted here:

East Muddy Creek Flannelmouth Sucker Density

7/24/2025

Flannelmouth Sucker at sample site (500 feet length)	**48 fish + or - 35 fish (95% CI)**
Flannelmouth Sucker per stream mile	**503 fish + or - 370 fish (95% CI)**

Based on the sampling data, East Muddy Creek contains a primarily native fishery including two BLM Sensitive Species (Bluehead Sucker and Flannelmouth Sucker). Nonnative White Sucker (N=4) and White Sucker Hybrids (n=5) were relatively rare. Sculpin and Speckled Dace were common. Brook Trout and Rainbow Trout densities were low.

Discussion:
Flannelmouth Sucker were common in the sample reach, although age class diversity was a bit lacking as no smaller/younger fish were seen or collected. Lengths ranged from 262mm (10.3”) to 441mm (17.4”) total length. Bluehead Sucker were less abundant, and sizes ranged from 125mm (4.9”) to 257mm (10.1”) total length. Given the small amount of habitat sampled, it is likely that additional age classes of both species are present in the system.

Trout densities were low, and this is likely attributed to the site being on the lower end of the elevational and thermal tolerance range for these cold-water species. Sculpin and Speckled Dace were both common. Given the presence of Paonia Reservoir, the Flannelmouth Sucker and Bluehead Sucker populations are resident and complete all life history requirements within the Muddy Creek drainage above the reservoir, which is relatively uncommon, particularly for the Flannelmouth Sucker.

Habitat:
Riparian
Streamside vegetation in the sample reach is comprised primarily of narrowleaf cottonwood, alder, spruce, coyote willow, and some rush, sedge, and riparian grasses. Vegetation is relatively dense and provides good bank stability and some cover. Of note, use by off highway vehicles was noted within the riparian area within the sample reach as evidenced by tire tracks in the willows (see photo). This appears to be coming from the adjacent private land parcel to the west.

Representative Pool

Representative Riffle

Off Highway Vehicle Use in the Riparian Area

Stream

Stream habitats are comprised of a good mix of riffles, short runs/glides, and deep (3'+) pools. As expected, riffle habitats contained the majority of Sculpin and Speckled Dace, while the larger sucker species and trout were found primarily in the deeper pool and undercut bank habitats. Channel substrate consisted of a mix of gravels and small cobbles with some larger rock/boulders and fine sediments in the pools. The stream appears to carry substantial bedload material as noted by the large point bars and steep riffles. Although bed material is abundant, the stream appears to largely be in balance with the landform, hydrology, and sediment load and no substantial impairments were noted.

Recommendations:

- Continue to periodically monitor the resident fish populations and stream and riparian habitats – consider sampling fish at other times of year to document spawning and to document additional age classes
- Monitor off highway vehicle use within the stream/riparian corridor and consider signing or other deterrents

RANGE-WIDE

CONSERVATION AGREEMENT AND STRATEGY FOR

ROUNDTAIL CHUB *Gila robusta*,

BLUEHEAD SUCKER *Catostomus discobolus*,

AND FLANNELMOUTH SUCKER *Catostomus latipinnis*

Prepared for
Colorado River Fish and Wildlife Council

Prepared by
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Publication Number 06-18
September 2006

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RANGEWIDE CONSERVATION AGREEMENT FOR ROUNDTAIL CHUB, BLUEHEAD SUCKER, AND FLANNELMOUTH SUCKER

I. INTRODUCTION

This Conservation Agreement (Agreement) has been developed to expedite implementation of conservation measures for roundtail chub (*Gila robusta*), bluehead sucker (*Catostomus discobolus*), and flannelmouth sucker (*Catostomus latipinnis*), hereinafter referred to as the three species, throughout their respective ranges as a collaborative and cooperative effort among resource agencies. Threats that warrant the three species being listed as sensitive by state and federal agencies and that might lead to listing by the U.S. Fish and Wildlife Service as threatened or endangered under the Endangered Species Act of 1973, as amended (ESA), should be minimized through implementation of this Agreement. Additional state, federal, and tribal partners in this effort are welcomed, and such participation (as signatories or otherwise) is hereby solicited.

II. GOAL

The goal of this agreement is to ensure the persistence of roundtail chub, bluehead sucker, and flannelmouth sucker populations throughout their ranges.

III. OBJECTIVES

The individual state's signatory to this document will develop conservation and management plans for any or all of the three species that occur naturally within their state. Any future signatories may also choose to develop individual conservation and management plans, or to integrate their efforts with existing plans. The individual signatories agree to develop information and conduct actions to support the following objectives:

- Develop and finalize a conservation and management strategy (Strategy) acceptable to all signatories that will provide goals, objectives and conservation actions to serve as consistent guidelines and direction for the development and implementation of individual state wildlfe management plans for these three fish species.

- Establish and/or maintain roundtail chub, flannelmouth sucker and bluehead sucker populations sufficient to ensure persistence of each species within their ranges.

    1) Establish measureable criteria to evaluate the number of populations required to maintain the three species throughout their respective ranges.

    2) Establish measureable criteria to evaluate the number of individuals required within each population to maintain the three species throughout their respective ranges.

- Establish and/or maintain sufficient connectivity between populations so that viable metapopulations are established and/or maintained.

- As feasible, identify, significantly reduce and/or eliminate threats to the persistence of roundtail chub, bluehead sucker, and flannelmouth sucker that: 1) may warrant or maintain their listing as a sensitive species by state and federal agencies, and 2) may warrant their listing as a threatened or endangered species under the ESA.

IV. OTHER SPECIES INVOLVED

This Agreement is primarily designed to ensure the persistence of roundtail chub, bluehead sucker, and flannelmouth sucker within their respective distributions. This will be achieved through conservation actions to protect and enhance these species and their habitats. Although these actions will be designed to benefit the three species, they may also contribute to the conservation of other native species with similar distributions.

Bonytail *(Gila elegans),* Colorado pikeminnow *(Ptychocheilus lucius),* humpback chub *(Gila cypha),* and razorback sucker *(Xyrauchen texanus)* are currently listed as endangered under the ESA. In the Upper Colorado River Basin, recovery of one or more of these species has been undertaken by the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin and the San Juan River Basin Recovery Implementation Program. In the Lower Colorado River Basin, the Grand Canyon Monitoring and Research Center and the Lower Colorado River Multi-Species Conservation Plan have committed to recovery actions for these species. Conservation actions for native fish in the Virgin River Basin are occurring under the direction of the Virgin River Resource Management and Recovery Program in Utah and the Lower Virgin River Recovery Implementation Team in Nevada and Arizona. Fish managed

under these programs include the federally endangered woundfin *(Plagopterus argentissimus)* and Virgin River chub *(Gila seminuda),* as well as the Virgin spinedace *(Lepidomeda mollispinis mollispinis),* desert sucker *(Catostomus clarkii),* and flannelmouth sucker. Virgin spinedace is the subject species of a conservation agreement and is listed as a "conservation species" in Utah; it is also listed as "protected" in Nevada. The programs described above focus primarily on mainstem rivers where, in some cases, the three species spend parts of their life cycles. Although the three species are also found in tributary streams, conservation actions in these habitats have received less emphasis to date. Such actions are, therefore, likely to be the focus of state conservation and management plans developed as part of this Agreement. Any conservation actions implemented through existing recovery programs and/or this Agreement may benefit both the endangered fishes mentioned as well as the three species. The signatories will commit to implement conservation actions under this Agreement and Strategy that neither conflict with nor replicate any conservation actions that have been implemented, are being implemented, or will be implemented under any existing recovery program or conservation agreement.

Additionally, the Agreement may reduce threats to several native species that are not currently listed as threatened or endangered under the ESA, and thereby preclude the need for listing or re-listing in the future. Some of these native species include speckled dace *(Rhinichthys osculus),* Gila chub (*Gila intermedia*), headwater chub *(Gila nigra),* mountain sucker *(Catostomus platyrhynchus),* Zuni bluehead sucker *(Catostomus discobolus yarrowi),* Bonneville cutthroat trout *(Oncorhynchus clarkii utah),* Colorado River cutthroat trout *(Oncorhynchus clarkii pleuriticus),* Yellowstone cutthroat trout *(Oncorhynchus clarkii bouvieri),* mottled sculpin (*Cottus bairdi*), Paiute sculpin (*Cottus beldingi*), northern leopard frog *(Rana pipiens),* relict leopard frog *(Rana onca),* boreal toad *(Bufo boreas boreas),* Great Basin spadefoot *(Spea intermontana),* Great Plains toad *(Bufo cognatus),* New Mexico spadefoot *(Spea multiplicata),* red-spotted toad *(Bufo punctatus),* Woodhouse toad *(Bufo woodhousei),* canyon treefrog *(Hyla arenicolor),* and western chorus frog *(Pseudacris triseriata).*

V. INVOLVED PARTIES

The following state agencies are committed to work cooperatively to conserve the roundtail chub, bluehead sucker, and flannelmouth sucker throughout their respective ranges, and

have further determined that a consistent approach, as described in this Agreement, is most efficient for conserving the three species. The state agencies signatory to this document are:

Arizona Game and Fish Department

Colorado Division of Wildlife

Nevada Department of Wildlife

New Mexico Department of Game and Fish

Utah Division of Wildlife Resources

Wyoming Game and Fish Department

Coordinated participation by state wildlife agencies helps institutionalize range-wide conservation of the three fish species, but federal and tribal partners are being encouraged to participate, as well. The participation of all resource managers in the areas where these species are found is important for the long-term survival of the three species. Some language in this Agreement has been included in anticipation of eventual federal and tribal participation. Any edits proposed by potential conservation partners that will allow them to sign this Agreement and participate in conservation actions will be carefully considered and will only be incorporated with the consensus of the existing signatories. This Agreement may be amended at any time to include additional signatories. An entity requesting inclusion as a signatory shall submit its request to the Council in the form of a document defining its proposed responsibilities pursuant to this Agreement.

VI. AUTHORITY

- The signatory parties hereto enter into this Conservation Agreement and the proposed Conservation Strategy under Federal and State Law, as applicable. Each species' conservation status is designated by state wildlife authorities according to the following table (updated from Bezzerides and Bestgen 2002):

Species	State	Status
Bluehead sucker	Utah	Species of Concern
	Wyoming	Special Concern
Flannelmouth sucker	Colorado, Wyoming	Special Concern
	Utah	Species of Concern
Roundtail chub	New Mexico	Endangered
	Utah	Species of Concern
	Arizona, Colorado, Wyoming	Special Concern

- The signatory parties further note that this Agreement is entered into to establish and maintain an adequate and active program for the conservation of the above listed species.
- The signatory parties recognize that each state has the responsibility and authority to develop a conservation and management plan consistent with the goal and objectives of this Agreement. The purpose of these documents will be to describe specific tasks to be completed toward achieving the goal and objectives of this Agreement.
- All parties to this Agreement recognize that they each have specific statutory responsibilities, particularly with respect to the management and conservation of these fish, their habitat and the management, development and allocation of water resources. Nothing in this Agreement or the proposed companion Strategy to be developed pursuant to this Agreement is intended to abrogate any of the parties' respective responsibilities.

- This Agreement is subject to and is intended to be consistent with all applicable Federal and State laws and interstate compacts (To this end, the State of Arizona has attached appendix 1.)
- The state of Wyoming and the Commission do not waive sovereign immunity by entering into this Agreement, and specifically retain immunity and all defenses available to them as sovereigns pursuant to Wyoming Statute 1-39-104(a) and all other state law.
- This instrument in no way restricts the parties involved from participating in similar activities with other public or private agencies, organizations or individuals.
- Revisions to this Agreement will be made only with approval of all signatories.
- This Agreement may be executed in several parts, each of which shall be an original, and which collectively shall constitute the same Agreement.

VII. CONSERVATION ACTIONS

The signatories will review and document existing and ongoing programmatic actions that benefit the three species. As signatories develop their individual management plans for conservation of the three species, each signatory may include but is not limited by or obligated to incorporate the following conservation actions:

1) Conduct status assessment of roundtail chub, bluehead sucker, and flannelmouth sucker.

2) Establish and maintain a database of past, present, and future information on roundtail chub, bluehead sucker, and flannelmouth sucker.

3) Determine roundtail chub, bluehead sucker, and flannelmouth sucker population demographics, life history, habitat requirements, and conservation needs.

4) Genetically and morphologically characterize populations of roundtail chub, bluehead sucker, and flannelmouth sucker.

5) Increase roundtail chub, bluehead sucker, and flannelmouth sucker populations to accelerate progress toward attaining population objectives for respective species.

6) Enhance and maintain habitat for roundtail chub, bluehead sucker, and flannelmouth sucker.

7) Control (as feasible and where possible) threats posed by nonnative species that compete with, prey upon, or hybridize with roundtail chub, bluehead sucker, and flannelmouth sucker.

8) Expand roundtail chub, bluehead sucker, and flannelmouth sucker population distributions through transplant activities or reintroduction to historic range, if warranted.

9) Establish and implement qualitative and quantitative long-term population and habitat monitoring programs for roundtail chub, bluehead sucker, and flannelmouth sucker.

10) Implement an outreach program (e.g., development of partnerships, information and education activities) regarding conservation and management of roundtail chub, bluehead sucker, and flannelmouth sucker.

Coordinating Conservation Activities

- Administration of the Agreement will be conducted by a range-wide Coordination Team. The team will consist of a designated representative from each signatory to this Agreement and may include technical and legal advisors and other members as deemed necessary by the signatories.
- As a first order of business, the chair of the Coordination Team will be selected from signatory state wildlife agency participants. Leadership will be reconsidered annually, and any member may be selected as Coordination Team Leader with a vote of the majority of the team. The chair will serve no more than two consecutive one-year terms.
- Authority of the Coordination Team will be limited to making recommendations to participating resource management agencies to address status, threats and conservation of roundtail chub, bluehead sucker, and flannelmouth sucker.
- The Coordination Team will meet at least once annually in October or November to develop range-wide priorities, review the annual conservation work plans developed by each agency, review conservation accomplishments resulting from implementation of conservation work plans, coordinate tasks and resources to most effectively implement the work plans, and review and revise the Strategy and states' conservation and management plans as required. They will report on progress and effectiveness of implementing the conservation and management strategies and plans. The Coordination Team will decide the annual meeting date and location.
- Coordination Team meetings will be open to the public. Meeting decision summaries and annual progress reports will be distributed to the Coordination Team and the signatories. Other interested parties may obtain minutes and progress reports upon request.

Implementing Conservation Schedule

- Development of the range-wide Conservation Strategy and states' conservation and management plans will begin no later than March 2004 and be completed no later than December 2004. A 10-year period will be necessary to attain sufficient progress toward

objectives outlined in this Agreement, the range-wide Strategy, and the state plans, but the time required to complete conservation actions may be revised with consensus of the signatories.

- Conservation actions will be scheduled and reviewed on an annual basis by the signatories based on recommendations from the Coordination Team. Activities that will be conducted during the first three to five years of implementation will be identified in annual work plans within the states' conservation and management plans. The Strategy and states' conservation and management plans will be flexible documents and will be revised through adaptive management, incorporating new information as it becomes available.
- The state wildlife agency that has the Coordination Team Leader responsibility will coordinate team review of conservation activities conducted by participants of this Agreement to determine if all actions are in accordance with the Strategy and state conservation and management plans, and the annual schedule.
- Following a 10-year evaluation, the Agreement, Strategy, and associated states' conservation and management plans may be renewed.

Funding Conservation Actions

- Expenditures to implement this Agreement and Strategy will be identified in states' conservation and management strategies and are contingent upon availability of funding.
- Implementation funding will be provided by a variety of sources. Federal, state, and local sources will need to provide or secure funding to initiate procedures of the Agreement and Strategy, although nothing in this Agreement obligates any agency to any funding responsibilities. To date, various federal and state sources have contributed to conservation efforts for the three fish species, including development of the Agreement and Strategy.
- Federal sources may include, but are not limited to, U.S. Forest Service, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, Bureau of Land Management, Land and Water Conservation funds, and the Natural Resource Conservation Service. Nothing in this document commits any of these agencies to funding responsibilities.

- State funding sources may include, but are not limited to, direct appropriation of funds by the legislature, community impact boards, water resources revolving funds, state departments of agriculture, and state resource management agencies. Nothing in this document commits any of these agencies to funding responsibilities.
- Local sources of funding may be provided by water districts, Native American Affiliations, cities and towns, counties, local irrigation companies, and other supporting entities, and may be limited due to factors beyond local control.
- In-kind contributions in the form of personnel, field equipment, supplies, etc., will be provided by participating agencies. In addition, each agency will have specific tasks, responsibilities and proposed actions/commitments related to their in-kind contributions.
- It is understood that all funds expended in accordance with this Agreement are subject to approval by the appropriate local, state or Federal appropriations. This instrument is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between the parties to this instrument will be handled in accordance with applicable laws, regulations, and procedures, including those for government procurement and printing, if applicable. Such endeavors will be outlined in separate agreements (such as memoranda of agreement or collection agreements) that shall be made in writing by representatives of the parties and which shall be independently authorized by appropriate statutory authority. This instrument does not provide such authority. Specifically, this instrument does not establish authority for noncompetitive awards to the cooperator of any contract or other agreement. Any contract or agreement for training or other services must fully comply with all applicable requirements for competition.

Conservation Progress Assessment.

- A range-wide assessment of progress towards implementing actions identified in this Agreement and each state conservation and management plan will be provided to the signatories by the Coordination Team in the first, fifth and tenth years of the Agreement and every fifth year thereafter as dictated by any extension of this instrument beyond ten years. The Coordination Team will compile the annual assessment from submittals

prepared by members of the Coordination Team. Copies of the annual assessment will be provided to the signatories, and to interested parties upon request.

VIII. DURATION OF AGREEMENT

The term of this Agreement shall be for two consecutive five-year periods. The first five-year period will commence on the date all state signatories to this document are completed. Prior to the end of each five-year period, a thorough analysis and review of actions implemented for the three species will be conducted by the Coordination Team. If all signatories agree that sufficient progress has been made toward conservation and management of the roundtail chub, bluehead sucker, and flannelmouth sucker, this Agreement may be extended without additional signatures being required. Any involved party may withdraw from this Agreement on 60 days written notice to the other parties.

IX. POLICY FOR EVALUATION OF CONSERVATION EFFORTS (PECE) COMPLIANCE

Pursuant to the federal Policy for Evaluation of Conservation Efforts (PECE) guidelines, the signatory agencies acknowledge the role of PECE in providing structure and guidance in support of the effective implementation of this conservation program and will address PECE elements within their respective state conservation and management plans. They also acknowledge and support the principle that documented progress toward stable and increased distribution, abundance, and recruitment of populations of the three species constitutes the primary index of effectiveness of this conservation program. Criteria describing population status and trends as well as mitigation of recognized threats comprise the primary basis for evaluation of conservation efforts conducted under this Agreement.

X. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE

The signatories anticipate that any survey, collection, or non-land disturbing research activities conducted through this Agreement will not constitute significant Federal actions under the NEPA, and will be given a categorical exclusion designation, as necessary. However, each signatory agency holds the responsibility to review planned actions for their area of concern to

ensure conformance with existing land use plans, and to conduct any necessary NEPA analysis for those actions within their area.

XI. SIGNATORIES

Arizona Game and Fish Department
2221 W. Greenway Rd.
Phoenix, Arizona 85023-4399

Duane L. Shroufe — Date 02/23/04
Director

Colorado Division of Wildlife
6060 Broadway
Denver, Colorado 80216

for Russell George — Date 3/22/04
Director

Nevada Department of Wildlife
1100 Valley Rd.
Reno, Nevada 89512

For: Terry Crawforth — Date 3/5/04
Director

New Mexico Department of Game and Fish
P.O. Box 25112
Santa Fe, New Mexico 87504

Bruce Thompson — Date 4-15-04
Director

Utah Division of Wildlife Resources
1594 W. North Temple, Suite 2110
P.O. Box 1456301
Salt Lake City, Utah 84114-6301

Kevin K. Conway 2/4/04
Kevin K.Conway Date
Director

Wyoming Game and Fish Department
5400 Bishop Boulevard
Cheyenne, Wyoming 82006

for 3-12-04
Terry Cleveland Date
Director

Ron Arnold 3/11/04
Ron Arnold Date
Chief Fiscal Officer

Approval as to form:

T C Preston 3/11/04
Ted Preston Date
Assistant Attorney General

The following signatories support the goals, objectives, and actions of the Conservation Agreement for Roundtail Chub, Bluehead Sucker and Flannelmouth Sucker, version 10.4.4 and agree to support the conservation efforts described.

Alan L Kesterke

Bureau of Land Management
Wyoming State Office

April 8, 2005

Date

The following signatories support the goals, objectives, and actions of the Conservation Agreement for Roundtail Chub, Bluehead Sucker and Flannelmouth Sucker, version 10.4.4 and agree to support the conservation efforts described.

Jack Wisdy

Bureau of Land Management
Utah State Office

5/16/05

Date

The following signatories support the goals, objectives, and actions of the Conservation Agreement for Roundtail Chub, Bluehead Sucker and Flannelmouth Sucker, version 10.4.4 and agree to support the conservation efforts described.

Linda S.C. Rundell
State Director
Bureau of Land Management
New Mexico State Office

4/7/06
Date

The following signatories support the goals, objectives, and actions of the Conservation Agreement for Roundtail Chub, Bluehead Sucker and Flannelmouth Sucker, version 10.4.4 and agree to support the conservation efforts described.

National Park Service
Intermountain Region
12795 W. Alameda Parkway
P.O. Box 25287
Denver, Colorado 80225-0287

Michael D. Snyder
Acting Director

7/5/05
Date

The U.S. Bureau of Reclamation, Upper Colorado Region (Reclamation), hereby states its support of the goals, objectives, and actions of the Range-Wide Conservation Agreement for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker (Utah Division of Wildlife Resources publication no. 06-18).

Financial support of any activity prescribed to the signatories of the Conservation Agreement is not guaranteed and is contingent upon Reclamation's authority and adequate funds being made available and allocated to Reclamation.

Reclamation recognizes that implementation of certain conservation actions identified in the Conservation Agreement are directed toward the state signatories.

Acting for

Rick L. Gold
Regional Director

4/3/07
Date

CONSERVATION COMMITMENT

The U.S. Fish and Wildlife Service, Mountain-Prairie Region, hereby states its intent and commitment to assist with and participate in the support of the Range-wide Conservation agreement and strategy for roundtail chub *Gila robusta*, bluehead sucker *Catostomus discobolus*, and flannelmouth sucker *Catostomus latipinnis*, as prepared for the Colorado River Fish and Wildlife Council. Specific involvement may include:

1. Providing representation to the Three Species Conservation Team.

2. Consistent with applicable laws and procedures, funding for eligible projects through the State Wildlife Grant program as long as State matching funds are available and projects are consistent with the State Wildlife Plan.

3. Providing comments under existing laws and regulations for any projects federally authorized, funded, or carried out that may impact any of the three species.

4. Using the Service's authority under the Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), as amended, and the Migratory Bird Hunting Stamp Act (16 USC .718), to protect the three species from land and water altering activities, on National Wildlife Refuge System lands.

Performance of all activities listed above is contingent upon the annual receipt of adequate funding. This commitment shall not prohibit the signatory agency from engaging in management actions regarding three species conservation beyond those described in this commitment page and in the associated Plan. Such management actions should be coordinated with the Three Species Conservation Team.

This commitment shall become effective on the date of signature by the participating party and shall remain in effect until the signatory party chooses to terminate the commitment or until the Three Species Conservation Team decides (by consensus) to terminate the Plan. The signatory party will provide 90 days written notification to the other parties upon deciding to terminate involvement.

The U.S. Fish and Wildlife Service has the authority to enter into this commitment through the Endangered Species Act of 1973, as amended; the Fish and Wildlife Act of 1956, as amended; the Fish and Wildlife Coordination Act, as amended; and 43 CFR part 24, U.S. Department of Interior's fish and wildlife policy on State and Federal relationships.

By signing the document below, the Service acknowledges that it is also signing as a party and participant to the whole of the 2006 Three Species Conservation and Management Plan attached hereto.

Mitch King, Regional Director
U.S. Fish & Wildlife Service, Mountain-Prairie Region

12-28-06
Date

-Signature Page-

This signature page is an appendix to the Range-Wide Conservation Agreement for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker dated 27 January2004 ("Agreement").

The Jicarilla Apache Nation enters this Agreement pursuant to its inherent authority and pursuant to the Revised Constitution of the Jicarilla Apache Nation, Article XI, Powers of the Tribal Council. Nothing in this Agreement provides a basis for requiring the Jicarilla Apache Nation to comply with state law. Nothing in this Agreement diminishes the jurisdiction of the Jicarilla Apache Nation, including its legislative, regulatory, and judicial jurisdiction, nor does the Agreement waive the sovereign immunity of the Nation.

Jicarilla Apache Nation
Jicarilla Game and Fish Department
P.O. Box 507
Dulce, NM 87528

President Levi Pesata

5/10/06
Date

The following signatories support the goals, objectives, and actions of the Conservation Agreement for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker, version 10.4.4 and agree to support the conservation efforts described.

Sally Wisely

Sally Wisely
State Director
Bureau of Land Management
Colorado State Office

10/4/07

Date

-Signature Page-

This signature page is an appendix to the Range-Wide Conservation Agreement for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker dated September, 2006 ("Agreement").

The Southern Ute Indian Tribe enters this Agreement subject to the following conditions:

- Nothing in this Agreement provides a basis for requiring the Southern Ute Indian Tribe to comply with state law.
- Nothing in this Agreement diminishes the jurisdiction of the Southern Ute Indian Tribe, including its legislative, regulatory, and judicial jurisdiction.
- Nothing in this Agreement waives the sovereign immunity of the Southern Ute Indian Tribe
- Nothing in this Agreement shall operate as a bar, constitute a waiver of any rights of the Tribe, or in any respect affect the ability of the Tribe to pursue other objectives, besides conservation of native fish species, in connection with the use of its water resources, including economic objectives.

SOUTHERN UTE INDIAN TRIBE

By: Clement J Frost
Clement J. Frost, Chairman
Southern Ute Indian Tribal Council

Sept. 06, 2007
Date

Southern Ute Indian Tribe
P.O. Box 737
Ignacio, CO 81137

CONSERVATION COMMITMENT

The U.S. Fish and Wildlife Service (Service), Region 2, hereby states its intent and commitment to assist with and participate in the implementation of the Range-Wide Conservation Agreement and Strategy for Roundtail Chub (*Gila robusta*), Bluehead Sucker (*Catostomus discobolus*), and Flannelmouth Sucker (*Catostomus latipinnis*). Specific commitments made hereby are as follows:

1. To provide a representative to the Range-Wide Coordination Team, which is comprised of all signatories.

2. Consistent with applicable laws and procedures, provide funding through the State Wildlife Grant Program for State selected projects that are consistent with the applicable State Wildlife Action Plans.

3. To review and provide comments under existing laws and regulations for any projects federally authorized, funded, or carried out that may impact any of the three species.

4. To use the Service's authority under the Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j), as amended, the Migratory Bird Hunting Stamp Act (16 USC .718), and the Fish and Wildlife Coordination Act of 1934, as amended, to protect the three species from land- and water-altering activities, on National Wildlife Refuge System lands.

5. With regard to arbitration in the state of Arizona: If required by law, the Parties agree to engage in alternative dispute resolution procedures authorized by their statutes, regulations, and court rules, including but not limited to 5 U.S.C. § 575 and A.R.S. § 12-1518.

Performance of all activities listed above is contingent upon the annual receipt of adequate funding. This commitment shall not prohibit the signatory agency from engaging in management actions beyond those described in this commitment page and in the associated Plan. Such management actions should be coordinated with the Range-Wide Coordination Team.

This commitment shall become effective on the date of signature by the participating party and shall remain in effect until the signatory party chooses to terminate the commitment or until the Range-Wide Coordination Team decides (by consensus) to terminate the Plan. The signatory party will provide 60 days written notification to the other parties upon deciding to terminate involvement.

The Service has the authority to enter into this commitment through the Endangered Species Act of 1973, as amended; the Fish and Wildlife Act of 1956, as amended; the Fish and Wildlife Coordination Act of 1934, as amended; and 43 CFR part 24, U.S. Department of the Interior's fish and wildlife policy on state and federal relationships.

for Benjamin N. Tuggle, Regional Director
U.S. Fish and Wildlife Service, Region 2

8/13/07
Date

RANGEWIDE CONSERVATION STRATEGY FOR ROUNDTAIL CHUB, BLUEHEAD SUCKER, AND FLANNELMOUTH SUCKER

XII. INTRODUCTION

This conservation strategy (Strategy) has been developed to provide a framework for the long-term conservation of roundtail chub (Cyprinidae: *Gila robusta*), bluehead sucker (Catostomidae: *Catostomus discobolus*), and flannelmouth sucker (Catostomidae: *Catostomus latipinnis*), hereinafter referred to as the three species. Implementation of the Strategy is intended to be a collaborative and cooperative effort among resource agencies to support conservation of the three species throughout their respective ranges. This document provides goals, objectives, and conservation actions to serve as consistent guidelines and direction for the development and implementation of individual state wildlife management plans for the three species. These state conservation and management plans are being developed through an interagency and interested party involvement process. Specific tasks that affect the status of the three species are not reiterated in this document. Rather, we outline the general strategy summarizing the conservation actions to be taken to eliminate or significantly reduce threats and present an overall strategy for the long-term conservation of the three species.

Guidance for specific tasks in state conservation and management plans is summarized in this document. Specific tasks to be completed under the conservation actions set forth in this document will be detailed within respective state conservation and management plans. Likewise, specific tasks that have been completed toward achieving the objectives set forth in this document will also be detailed within the state conservation and management plans. Implementation of these tasks will identify and minimize threats to roundtail chub, bluehead sucker, and flannelmouth sucker that: 1) may warrant or maintain their listing as a sensitive species by state and federal agencies, and 2) may warrant their listing as a threatened or endangered species under the Endangered Species Act of 1973, as amended (ESA).

XIII. BACKGROUND

Geographic Setting

The Colorado River Basin (CRB) is home to 22 fish genera, at least 35 fish species and at least 26 endemic fish species, some of which have persisted for over 10 million years (Evermann and Rutter 1895, Miller 1959, Molles 1980, Minckley et al. 1986, Carlson and Muth 1989, Valdez and Carothers 1998, Bezzerides and Bestgen 2002). Geologic isolation, frequent drought and flood, widely ranging temperatures, and high sediment and solute loads in the CRB created a harsh environment that provided a unique setting for the evolution of a distinct group of endemic fishes (Behnke 1980, Ono et al. 1983, Minckley et al. 1986). The CRB is divided into upper and lower basins at Lee's Ferry in north central Arizona, near the Utah border. The San Juan, Colorado, and Green river basins form the upper CRB. In the lower CRB, the Colorado River flows through Grand Canyon National Park and forms state boundaries between Nevada, California and Arizona. Conjoining the Colorado River in Arizona are the Little Colorado and Gila rivers and the Virgin River joins the Colorado in Nevada. The three species occur in both upper and lower portions of the CRB.

The Bonneville Basin (Utah, Nevada, Wyoming, and Idaho) is an endorheic basin, wherein surface water collects from precipitation and upwelling groundwater, but no streams drain out of the basin (Hubbs et al. 1974). Historically, the Bonneville Basin had aquatic affinities with Hudson Bay, and several species stem from northeastern North American progenitors (Sigler and Sigler 1996 and references therein). During geologic history, the Bear River flowed into the Upper Snake River drainage (Columbia River Basin), but currently flows into the Bonneville Basin (Hubbs and Miller 1948; Sigler and Sigler 1996). The bluehead sucker historically occurred in both the CRB and the Bonneville Basin.

Species Descriptions, Life Histories and Hybrids

The three species share several morphological similarities commonly associated with hydrologically variable environments, including: 1) fusiform bodies, 2) leathery skins with embedded scales, and 3) large, often falcate fins. Such morphologic features, combined with relatively long life spans, may be adaptations to the harsh, unpredictable physical environment of the CRB (Scoppettone 1988, Minckley 1991, Stearns 1993, Bezzerides and Bestgen 2002). Life history characteristics, distribution and abundance have been described for roundtail chub

(Bestgen and Propst 1989, Brouder et al. 2000, Voeltz 2002), bluehead sucker (e.g., McAda 1977, Holden and Minckley 1980, McAda and Wydoski 1983, Cavalli 1999 and Bestgen 2000), and flannelmouth sucker (Chart 1987, Douglas and Marsh 1998, McKinney et al. 1999). Bluehead sucker are also discussed in Valdez (1990), Mueller et al. (1998), Brunson and Christopherson (2001), and Jackson (2001).

Roundtail Chub

Roundtail chub utilize slow moving, deep pools for cover and feeding. These fish are found in the mainstem of major rivers and smaller tributary streams. Roundtail chub utilize a variety of substrate types (silt, sand, gravel and rocks) and prefer murky water to clear (Sigler and Sigler 1996, Brouder et al. 2000). Roundtail chub partition habitat use by life stage [adult, juvenile, young-of-year (YOY)].

Juveniles and YOY are found in quiet water near the shore or backwaters with low velocity and frequent pools rather than glides and riffles. Juveniles avoid depths greater than 100 cm and YOY avoid depths greater than 50 cm. Juveniles use instream boulders for cover, while YOY are found in interstices between and under boulders or the slack-water area behind boulders (Brouder et al. 2000).

Adults generally do not frequent vegetation and avoid shallow water cover types (overhanging and shoreline vegetation) (Sigler and Sigler 1996, Brouder et al. 2000). Adults are found in eddies and pools adjacent to strong current and use instream boulders as cover (Sigler and Sigler 1996, Brouder et al., 2000). Adults occupy depths greater than 20 cm and select for velocities less than 20 cm/s. Adults may range 100 m or less over the course of a year, often in search of pool habitats (Siebert 1980; Brouder et al 2000).

Sigler and Sigler (1996) report that roundtail chub mature at five years of age and/or 254 mm to 305 mm in length and that spawning begins in June to early July when water temperatures reach 18.3 °C. However, Peter Cavalli, (Wyoming Fish and Game Department, 2004 personal communication) has collected data indicating that roundtail chub in Upper Green River drainage lakes may mature at sizes as small as 150 mm in water temperatures of 14.4 °C. Eggs from one female may be fertilized by three to five males over gravel in water up to 9.1 m. A 305 mm

female can produce 10,000 eggs, 0.7 mm in diameter. The eggs are pasty white and adhesive, sticking to rocks and other substrate or falling into crevices (Sigler and Sigler 1996).

Roundtail chub are carnivorous, opportunistic feeders. Documented food items include aquatic and terrestrial insects, fish, snails, crustaceans, algae, and occasionally lizards (Sigler and Sigler 1996, Osmundson 1999, Bestgen 2000, Brouder 2001).

Bluehead Sucker

Bluehead sucker tend to utilize swifter velocity, higher gradient streams than those occupied by either flannelmouth sucker or roundtail chub. These fish are found in warm to cool streams (20 °C) with rocky substrates (Sigler and Sigler 1996, Bestgen 2000). Bluehead sucker do not do well in impoundments (Sigler and Sigler 1996, Bezzerides and Bestgen 2002). Bluehead sucker partition habitat use by life stage [adult, juvenile, young-of-year (YOY)]. Larval fish inhabit near-shore, low velocity habitats (Childs et al. 1998). As they age, they move to deeper habitats further away from shore, and with more cover (Childs et al. 1998).

Larval and early-juvenile bluehead sucker eat mostly invertebrates (Childs et al. 1998). At later life-stages, they are more opportunistic omnivores, consuming algae, detritus, plant debris, and occasionally aquatic invertebrates (Sigler and Sigler 1996, Osmundson 1999, and Bestgen 2000). This species feeds in riffles or deep rocky pools (McAda 1977, Sigler and Sigler 1996).

Bluehead sucker mature at two years of age and/or at 127 to 179 mm in length. Spawning occurs in shallow areas when water temperatures reach 15.6 °C. Time of spawning varies by elevation, i.e., spring and early summer at low elevations and warm water temperatures, and mid- to late summer at higher elevations and cooler temperatures (Sigler and Sigler 1996). Fecundity is related to length, body weight (Holden 1973), and water temperature (McAda 1977). A 38 to 44 cm female may produce over 20,000 eggs (Andreason 1973). Eggs hatch in seven days at water temperatures of 18 to 21 °C (Holden 1973). Bluehead sucker, when disturbed during spawning, will compress to the bottom of the stream and can be captured by hand (Sigler and Sigler 1996). After hatching, larval fish drift downstream and seek out near-shore, slow-velocity habitats (Robinson et al. 1998).

Flannelmouth Sucker

Flannelmouth sucker reside in mainstem and tributary streams. Elements of flannelmouth habitat include 0.9 to 6.1 m deep murky pools with little to no vegetation, and deep runs and riffles (McAda 1977, Sigler and Sigler 1996, Bezzerides and Bestgen 2002). Substrates utilized consist of gravel, rock, sand, or mud (McAda 1977, Sigler and Sigler 1996). Flannelmouth sucker partition habitat use by life stage, with young fish occupying quiet, shallow riffles and near-shore eddies (Childs et al. 1998), and adults occupying deep riffles and runs. Many authors report that flannelmouth sucker do not prosper in impoundments (McAda 1977, Sigler and Sigler 1996, Bezzerides and Bestgen 2002); however, some lakes in the Upper Green River drainage in Wyoming supported large flannelmouth sucker populations historically (Baxter and Stone 1995; P. Cavalli, Wyoming Game and Fish Department, 2004 personal communication). Flannelmouth sucker are opportunistic, benthic omnivores consuming algae, detritus, plant debris, and aquatic invertebrates (McAda 1977, Sigler and Sigler 1996, Osmundson 1999, Bezzerides and Bestgen 2002). Food consumed depends on availability, season, and the individual's age class (McAda 1977, Sigler and Sigler 1996). Larval and early juveniles consume mostly invertebrates (Childs et al. 1998).

Flannelmouth suckers mature at four to five years of age. Males mature earliest (McAda 1977, Sigler and Sigler 1996). Females ripen at water temperatures of 10 °C, whereas males ripen earlier in the spring (6.1 to 6.7 °C) and remain fertile for longer periods than females (McAda 1977, Sigler and Sigler 1996). Seasonal migrations are made in the spring to suitable spawning habitat (Suttkus and Clemmer 1977, Sigler and Sigler 1996). McKinney et al. (1999) (see also Chart 1987, Chart and Bergersen 1987) documented long-range movements (ca. 98-231 km) among adult and sub-adult fish, although the roles these movements play in life history are unclear and need further investigation. Obstructions to movements such as dams may also be an important consideration in the conservation of flannelmouth suckers. Flannelmouth suckers generally spawn for two to five weeks over gravel. A female will produce 9,000 to 23,000 adhesive, demersal eggs. After fertilization, the eggs sink to the bottom of the stream and attach to substrate or drift between crevices (Sigler and Sigler 1996). After hatching, larvae drift downstream and seek out near-shore, low-velocity areas (Robinson et al. 1998).

Hybrids

Potential hybridization among *Gila* species in the CRB has caused management agencies to carefully consider their conservation actions. In Utah, hybridization between humpback chub *(Gila cypha)* and bonytail *(G. elegans)* in Desolation and Gray Canyons of the Green River has been postulated by many observers. The Virgin River chub *(Gila seminuda)* found in the Muddy River has been historically treated as a subspecies of roundtail chub *(G. robusta)* and is thought to be a hybrid between the bonytail *(G. elegans)* and the Colorado roundtail chub *(G. r. robusta;* Maddux et al. 1995, Sigler and Sigler 1996 and references therein). In 1993, taxonomic revisions were accepted, and the Virgin River chub was asserted species status as *G. seminuda* (DeMarais et al. 1992, Maddux et al. 1995). The Virgin River chub is currently listed as endangered under the ESA.

Whether biologists and agencies recognize two species, two species and a hybrid form, three species, or some other combination has implications for how the fish are managed. Because roundtail chub are congeners with humpback chub and bonytail, the potential for hybridization with roundtail exists, although this has not been as well documented as the hybridization between humpback chub and bonytail (e.g., Valdez and Clemmer 1982, Kaeding et al. 1990, Dowling and DeMarais 1993, Douglas and Marsh 1998). Valdez and Clemmer (1982) have suggested that hybridization is a negative result of dramatic environmental changes, while Dowling and DeMarais (1993) and McElroy and Douglas (1995) suggest that hybridization among these species has occurred continually over geologic time, providing offspring with additional genetic variability. Barriers to hybridization among *Gila* species suggest that it is a paraphyletic genus (Coburn and Cavender 1992 and references therein). Putative roundtail chub in the Gila River drainage of New Mexico and Arizona was recently divided into three species, *G. robusta*, *G. intermedia*, and *G. nigra* (Minckley and DeMarais 2000). Additional investigation of these relationships and resulting offspring is required and results may affect future conservation and management actions for roundtail chub and other *Gila* species. Hybridization between bluehead sucker and Rio Grande sucker (*C. plebius*) is thought to have produced the Zuni bluehead sucker (*C.d. yarrowi*), a unique subspecies found mainly in Rio Nutria, NM.

Douglas and Douglas (2003) report that both indigenous bluehead and flannelmouth sucker currently hybridize with invasive white sucker (*Catostomus commersoni*) in the Little

Yampa Canyon region of the Yampa River, Colorado. Two hybrids between flannelmouth and bluehead sucker were also found in their study, which is extremely rare elsewhere in the CRB. Douglas and Douglas (2003) suggest backcrossing of fertile indigenous and invasive sucker hybrids as a mechanism that perpetuates introgressed genes. They also speculate that the species boundary between flannelmouth and bluehead suckers could be compromised as a result.

XIV. CONSERVATION GUIDELINES

This section presents a generalized discussion on conservation topics relevant to the conservation of the three fish species. Intended as a guide for development of state conservation plans, it does not specifically outline minimum requirements for development of such plans. Rather, the signatories recognize that the priority of issues discussed in this section may vary widely from state to state and that the feasibility of resolving management implications discussed herein is situation- and species-specific. Furthermore, it is likely that conservation issues discussed in these sections will frequently be interrelated. For example, genetic concerns will likely be addressed in concert with metapopulation, population viability, and nonnative fish issues. Likewise, nonnative fish control issues may impact habitat management, and in some instances, hybridization issues (e.g., occurrence of white sucker in the upper CRB), and so on. It is therefore desirable that state managers identify interrelationships between conservation issues and formulate their state plans accordingly.

Habitat Maintenance and Protection

Habitat is an important component of metapopulation and species survival. Loss of available habitat may lead to the loss of individuals or populations that in turn may cause loss of metapopulation dynamics. Important physical habitat characteristics may include (but are not limited to) substrate, instream habitat complexity**,** and flow regimes. Chemical characteristics may include (but are not limited to) instream pH, temperature, specific conductance, suspended solids, dissolved oxygen, major ions (e.g., carbonate), nutrients, and trace elements. If needed, the signatories will develop habitat improvement actions to support individual populations and metapopulation dynamics. Rigorous standards for habitat protection can be incorporated into state fishery and land use plans. Current guidelines exist for many agencies that can be incorporated into these efforts, including (but not limited to) Best Management Practices or other state water quality standards, Forest Service Plan Standards and Guidelines, National Park Service Natural Resources Management Guidelines, Bureau of Land Management (BLM) Properly Functioning Condition (PFC) protocols, and recommendations from related broad-scale assessments.

One of the most dramatic anthropogenic changes imposed on the CRB and Bonneville basins is alteration of natural flow regimes. Instream flow and habitat-related programs administered through existing recovery and conservation programs in upper and lower Colorado River basins can provide guidance for development of similar programs for the three species. Studies conducted by the Upper Colorado River Basin Endangered Fish Recovery Program can aid in identifying habitat requirements for main channel three species populations and select tributary populations (e.g., Chart and Lenstch 1999, Trammell et al. 1999, Muth et al. 2000, Osmundson 1999, Tyus and Saunders 2001, McAda 2003). Other examples of habitat management for tributary cypriniform populations have been proposed for the Virgin River (Lentsch et al. 1995; Lentsch et al. 2002).

Habitat availability for flannelmouth and bluehead sucker as a function of stream discharge was recently identified in Anderson and Stewart (2003). The goal of this study was to derive biologically based instream flow recommendations for non-endangered native fish, which makes the study germane as a three species conservation guideline. Habitat quality and quantity were derived by relating output from two-dimensional (2-D) hydraulic models of mesohabitat

availability (as a function of discharge) to patterns of fish abundance over a three-year period among three different systems (Dolores, Yampa, and Colorado rivers). The 2-D approach is advantageous over previous instream flow methods because it is not dependent on microhabitat suitability curves (and their attendant assumptions) for prediction of habitat availability. The higher level of spatial resolution attained by the 2-D allows for greater accuracy in habitat quantification. The 2-D approach as utilized in Anderson and Stewart (2003) is also advantageous because output is interpreted alongside relevant biological information such as non-native fish abundance and native fish size structure in the modeled stream reaches.

Nonnative fish control

Impacts of nonnative fish on native fish fauna of the Southwestern U.S. are dramatic. Of 52 species of fish currently found in the upper CRB, only 13 are native (six of these are endangered; U.S. Fish and Wildlife Service [USFWS] 2003b). Native fish populations in the lower CRB have been similarly impacted by establishment of nonnative fish populations (Minckley et al. 2003). Direct and indirect impacts of nonnative fish on native fish fauna can be measured as changes in the density, distribution, growth characteristics, condition or behavior of both individual native fish and native fish populations (Taylor et al. 1984; Hawkins and Nesler 1991). These changes result from altered trophic relationships (predation, competition for food), spatial interactions (competition for habitat), habitat alteration, hybridization, and/or disease or parasite introductions.

All major recovery plans in the Southwestern U.S., including those of the San Juan River Basin Recovery Implementation Program (SJRIP) (SJRIP, 1995), the Upper Colorado River Endangered Fish Recovery Program (UCREFRP) (USFWS 2003b), the June Sucker Recovery Implementation Program (USFWS 1999), and the Virgin River Resource Management and Recovery Program (USFWS 1995), identify control of nonnative fish species to alleviate competition with and/or predation on rare fishes as a necessary management action. Due to extensive use by the three species of lower-order streams throughout their range, however, states may have to identify HUC-specific control measures for nonnative fish. Guidelines for development of nonnative fish management actions (Hawkins and Nesler 1991; Tyus and Saunders 1996; Lentsch et al. 1996; SWCA Inc. 2002) include:

1) Assessment of impacts of nonnative fish on native fish populations, including problem species and probable impact mechanisms.
2) Identification of spatial extent of impacted populations and potential nonnative source systems; prioritization of areas by severity and cost/benefit ratios.
3) Development of coordinated nonnative fish control strategies; identification of potential sport fishing conflicts.
4) Identification and use of effective nonnative control methods.
5) Development of programs to monitor results of nonnative control measures.
6) Assurance that I & E and outreach programs are in place to communicate intentions and findings to the public.

Tyus and Saunders (1996) identified three basic strategies for nonnative fish control in the upper CRB:

1) Prevention. Nonnative fish are prevented from entering a system by physical barriers or other control structures, removed directly from potential source water bodies, or prevented from being stocked through regulatory mechanisms.
2) Removal. Nonnative fish are removed directly from a system or forced out through creation of unfavorable habitat conditions.
3) Exclusion. Nonnative fish are excluded from preying upon or otherwise interfering with native fish through active management, particularly in nursery areas including, but not limited to, installation of barriers during rearing periods.

Strategies may be applied at the basin-wide level or applied to high priority areas within a specific body of water such as nursery or reproductive habitats where native offspring are most vulnerable to predation. Strategies for control of nonnative fish should be developed at the state level. Evaluations of state nonnative fish stocking policies can be found for Colorado (UCREFRP 2002; Martinez and Nibbelink in review) and Utah (Holden et al. 1996; UCREFRP 2002). Potential conflicts of nonnative fish control actions with sport fishing management may be difficult to resolve, and may require the development of regional coordinated sport and native

fish management strategies. Such strategies often include sufficient monitoring to demonstrate results of nonnative fish control efforts. Outreach programs have been utilized to communicate these results to the public.

Nonnative fish control techniques, specifically applications to southwestern fisheries, have been identified by Lentsch et al. (1996) and SWCA Inc. (2002). Control techniques are categorized as mechanical (angling, commercial fishing, electrofishing, netting), chemical (rotenone, antimycin), biological (introduce predator/competitor, genetically altered individuals, or disease), physical (barriers, screens), physicochemical (habitat modification), or some combination of these. Based on a survey of available literature, SWCA Inc. (2002) identified use of a combination of techniques as the most effective means of controlling nonnative fish abundance. All approaches require a prior knowledge of the target species life history and the physical characteristics of the system they reside in. Documentation of a positive native fish population response to control efforts poses a formidable challenge to managers, but one that ultimately must be addressed.

Population Viability

One of the most fundamental and difficult questions that a wildlife conservation program can address is whether a wild population of animals will persist into the future. Evaluation of the viability of populations may consider available information from the past, the current condition of the species, and the degree of known threats. Population viability analysis also considers what is known about population genetics and demographics, e.g. the probability that very small populations will inbreed and be lost.

This Strategy does not prescribe any one specific method of population viability analysis. Instead, all state signatories agree to develop their own manner of estimating population viability, recognizing the importance of overlapping methods where feasible and applicable. In addition, is it recognized that additional information will be acquired over the course of the Agreement and will thus be adaptive in their approach for estimating population viability. The Strategy identifies the following population viability factors that may be considered, although other appropriate factors may be added to this list in the future:

1. Known and potential threats
2. Available habitat(s)

3. Habitat stability
4. Genetic stability
5. Metapopulation connectivity and stability
6. Reproductive opportunity and potential, including recruitment into the effective population
7. Potential to expand population sizes and distribution

Population viability is a function of population demographics (size and age structure), population redundancy (number and distribution), habitat carrying capacity (resource limitations), and genetic stability (inbreeding and genetic diversity; Franklin 1983; Soulé 1980; Shaffer 1987; Allen et al. 1992). Viable, self-sustaining populations are characterized as having a negligible chance of extinction over century time scales, are large enough to be sustained through historical environmental variation, are large enough to maintain genetic diversity, and maintain positive recruitment near carrying capacity. Establishment of functioning metapopulations (see next section) can fulfill several of these criteria, including stabilization of population dynamics (Wilcox and Murphy 1985, Hanski and Gilpin 1991), increasing range-wide genetic heterogeneity (Simberloff and Abele 1976), and decreasing probability of population losses through environmental and demographic stochasticity (Roff 1974, Wilcox and Murphy 1985).

Metapopulation Dynamics and Function

A metapopulation consists of a series of populations existing in discrete habitat patches linked by migration corridors. Although individual populations should be managed and protected, some degree of interconnectedness among populations (i.e., a metapopulation) is needed to maintain genetic exchange and stabilize population dynamics (Meffe 1986; Wilcox and Murphy 1985, Hanski and Gilpin 1991). Metapopulations stabilize local population dynamics by: 1) allowing genetic exchange among local populations and thereby increasing genetic heterogeneity (Simberloff and Abele 1976); 2) decreasing vulnerability of populations to losses through environmental and demographic stochasticity (Roff 1974, Wilcox and Murphy 1985); and 3) increasing resistance of populations to changes in deterministic variables (birth, survival and death rates; Connell and Sousa 1983; Rieman and McIntyre 1993). Metapopulation dynamics and persistence depend on species life history, connectivity between habitat patches,

and the amount and rate of change in available habitat. A metapopulation may thrive as long as immigration (or recruitment) is greater than extinction (or mortality), the amount of habitat remains the same or increases, and populations remain connected. Metapopulations facilitate exchange of genetic material among populations. If migration is prevented over time, populations that were once connected can follow different evolutionary paths for adaptation to local environments. Migrating breeders within a metapopulation help slow or prevent inbreeding depression by maintaining genetic diversity and contributing genetic material not represented in local populations.

Metapopulations can stabilize populations throughout their range. Stream reaches depopulated following stochastic or anthropogenic events may re-populate from connecting, neighboring populations as long as sufficient migration corridors are maintained. However, diversions, dams, and dewatering within stream systems decrease the amount of connectivity between populations of aquatic species. Corridors require sufficient flows, at least during migration periods, and cannot exceed maximum migration distances. Diversions and dams eliminate connectivity by blocking fish migration routes. Dewatering a stream reach may also temporally reduce the amount of available habitat within a stream and, depending on life history, impact survival of the species in question. Potential management actions may include improving and protecting migration corridors that provide connectivity between historically connected populations, moving fish beyond impassable barriers to simulate historical migration patterns, and improving, protecting, and expanding available flows and habitat. Metapopulation issues (together with conservation genetics) involving interstate waters should be addressed through coordination among the bordering states and with cooperative work between federal land management agencies and state agencies.

Conservation Genetics

Genetic issues vary throughout the range of the three species. Rather than identify issues here for each state, state conservation plans should contain their own prioritization conservation genetics issues among the three species. However, the general goals of range-wide conservation genetics should be to preserve available genetic diversity, including identifying and preserving genetically distinct populations as well as those providing redundancy of specific genetic material across the species' range. Genetically distinct populations should receive special

management consideration. Effective conservation and management of the three fish species requires knowledge of the levels of genetic diversity that exist both within and among populations (Chambers and Bayless 1983; Hamrick 1983; Meffe 1986; Soulé 1986, Hallerman 2003). Small, fragmented populations are at greatest risk of genetic diversity loss due to increased frequency of rare, deleterious alleles *within* the population and consequent decreased ability to respond to environmental changes (Lande 1988). *Among* population variation indicates a historical lack of gene flow and subsequently the opportunity for local adaptation, although rapid outbreeding among such groups can cause reductions in relative fitness of offspring. Aquatic systems in the CRB and the Bonneville Basin have undergone large-scale anthropogenic changes in the last 150 years, including alteration of natural hydrology, temperature regime, sediment loads and community composition through introductions of exotic species. System fragmentation, species range contraction, and local declines in population size resulting from these changes can impact genetic diversity within and among populations. Protection of genetic diversity can be accomplished through protection of existing populations, maintenance or re-establishment of migration corridors, transplants of fish from other areas (augmenting existing populations or re-establishing lost populations), or other means.

A first step toward a conservation and management program is to identify genetically distinct populations or management units within individual state boundaries and among interstate waters. As the signatories to this Strategy assess the status of the three species, genetic diversity of the populations should be evaluated, including review of available data and literature on genetic structuring and identification of necessary morphologic and molecular data needed to make management decisions regarding the species' biological requirements. Genetic (and probably metapopulation-related) issues involving interstate waters should be addressed as such, and coordination among the bordering states is necessary to resolve these issues.

No single approach is best to determine the levels of differentiation within and among populations and it is best to incorporate a variety of different kinds of information for each population. For example, geographic, molecular and morphological or meristic data can all provide important quantitative information on population differences (Chambers 1980; Vrijenhoek et al. 1985; Meffe 1986). Conservation and management actions for divergent populations of the three species may be based on the results of these analyses in conjunction with other fish population assessment tools, such as population estimates, population viability

analysis, life history information, distributions, and habitat analysis. From a genetic perspective, identification and designation of populations may include 1) analysis of nuclear DNA markers, 2) mitochondrial DNA analysis, and 3) meristic and morphologic traits. The signatories will work together as appropriate to ensure that genetic techniques and tools can be used during range-wide assessments.

The signatories will review available peer-reviewed and gray literature sources for data regarding genetic structuring of the three species. In the absence of information to the contrary, populations from neighboring hydrologic units (taken from the U.S.G.S. Hydrologic Unit Code, or HUCs) will be assumed more similar to each other and more distinct from populations of the same species distributed farther away. Populations within the same HUC are presumably more similar to each other than to populations of the same species from neighboring HUCs. These assumptions and any relevant management recommendations will be evaluated as additional data become available. Additional data can be used to help identify the most genetically unique populations as well as those HUCs where the greatest diversity among populations of one or more of the three species is distributed. Unless data to the contrary are developed, populations with greater proportions of heterozygotes will be designated more diverse and resilient to environmental change than those of greater proportions of homozygotes (Reed and Frankham 2003, Hallerman 2003).

Hybrids

Fitness is defined herein as a species' ability to thrive and reproduce in its environment and respond to environmental change. While the ability to respond to environmental change is often impossible to predict, geneticists generally agree that genetically diverse populations exhibit high degrees of fitness. Conversely, populations with less diversity are less fit as they have fewer alleles that may be expressed in response to changing environmental conditions (Reed and Frankham 2003). There are examples of detrimental hybridization whereby fitness of either species does not increase or decline. In fishes, high fecundity and external fertilization increase the probability of hybridization, which may have given rise to some of the species we recognize today. The ability to hybridize does not always lead to the loss of one or more species. Persistent, long-term hybridization among species has been documented between flannelmouth suckers and razorback suckers (Buth et al. 1987). The observation that many of the various *Gila*

species native to the CRB share alleles suggests ongoing hybridization between roundtail chub and other chubs (DeMarais et al. 1992, Dowling and DeMarais 1993). By incorporating additional non-deleterious alleles, hybridization may confer additional fitness or increased ability to respond to environmental stressors. As available habitat has been reduced from historic times, especially due to impoundment and reduced flows, the likelihood of hybridization among closely related species has increased.

There are two documents which could potentially affect the states' conservation and management actions regarding populations comprised partly by hybrids: 1) The Proposed Policy on the Treatment of Intercrosses and Intercross Progeny (Intercross Policy; 61 FR 4709); and 2) The Policy Regarding the Recognition of Distinct Population Segments Under the Endangered Species Act (DPS Policy; 61 FR 4722). Under the non-binding Intercross Policy, the USFWS has responsibility for conserving hybrids under ESA (intercrosses) if 1) offspring share traits that characterize the taxon of the listed parent, and 2) offspring more closely resembles the listed parent's taxon than an entity intermediate between it and the other known or suspected non-listed parental stock. The Intercross Policy proposes the use of the term "intercross" to represent crosses between individuals of varying taxonomic status (species, subspecies, and distinct population segments). Under this proposed policy, populations can contain individuals that represent the protected species and intercrosses between the protected species and another.

While the intercross policy has not been formally adopted, the USFWS has scientifically developed intercross policy concepts in completing their 12-month finding for westslope cutthroat trout (WCT) (USFWS 2003a). They justified inclusion of hybridized fish in their assessment of WCT if such fish conformed morphologically to published taxonomic descriptions. While such fish may have a genetic ancestry derived by up to 20% from other fish species, the USFWS concluded that they also possessed the same behavioral and ecological characteristics of genetically pure fish. They stress, however, that additional criteria should be evaluated, including whether the individual is hybridized with a native or introduced fish and the geographic extent of hybridization. Similar to portions of the USFWS testimony, Peacock and Kirchoff (2004) recommended that hybridization policies be flexible enough to allow for conservation of hybridized fish, if in fact genetically pure populations are rare. These concepts could have significant influence in the interpretation of genetic and biological data on roundtail

chub, which are suspected to hybridize with endangered *Gila* species (*G. elegans*, *G. cypha*) in certain regions of the CRB.

The DPS Policy requires the USFWS to consider three elements in decisions regarding the status of a possible DPS: 1) discreteness of the population segment in relation to the remainder of the species to which it belongs; 2) the significance of the population segment to the species to which it belongs, and 3) the population segment's conservation status in relation to ESA standards for listing. The policy recognizes the importance of unique management units to the conservation of the species and that management priorities can vary across a species' range according to the importance of those population segments. Taken together, the Intercross and DPS policies require that conservation actions for the species be completed by compiling standardized information for each population such that the influence of hybridization and other unique characteristics of the population segments can be identified (Lentsch et al. 2000).

Signatories should review the literature available on hybridization and adequacy of existing data to characterize the degree of hybridization and its impact on fitness among the three species. If additional data are required, additional research on this subject should be conducted. Additional research may characterize genetic structure of the populations, quantify the degree of hybridization, and evaluate whether hybridization appears to be decreasing, maintaining or increasing fitness. If hybridization (whether with nonnative or native species) is decreasing fitness, then management actions to reduce deleterious hybridization may be implemented.

XV. STATUS ASSESSMENT OF ROUNDTAIL CHUB, BLUEHEAD SUCKER, AND FLANNELMOUTH SUCKER

Distribution

The roundtail chub, bluehead sucker, and flannelmouth sucker are three of the least-studied fishes native to the CRB and the Bonneville Basin. Available literature suggests that the three species were common to all parts of the CRB until the 1960s (Sigler and Miller 1963, Jordan and Evermann 1896, Minckley 1973). There have been no range-wide distribution or status assessments for any of these three species preceding the current review of Bezzerides and Bestgen (2002), which concludes that distributions of all three fish species have contracted 50%, on average, from their historic distributions.

Roundtail chubs are found in Wyoming in tributaries to the Green River and in several lakes in the upper portion of the basin. Extant, but declining roundtail chub populations in Utah occur in the Escalante and San Rafael rivers; portions of the middle and upper San Juan River and some tributaries; the Colorado River from Moab to Silt, Colorado; the Fremont River; the Green River from the Colorado River confluence upstream to Sand Wash and from Jensen to Echo Park; the White River from the Green River confluence upstream to near Meeker, Colorado (Bezzerides and Bestgen 2002); and the Duchesne River from the Green River confluence upstream to Myton (Brunson 2001). Roundtail chub presently occur in the lower Colorado River basin in Arizona and New Mexico, in tributaries of the Little Colorado River and Bill Williams River, and in the Gila River and tributaries (Voeltz 2002). Lee et al. (1980) also recorded occurrences in northern Mexico, which was anecdotally confirmed by personal communications in 2001 with S. Contreras-Balderas (Bioconservacíon A.C., Monterrey, Nuevo Leon) and A. Varela-Romero (Universidad de Sonora, Hermosillo). Fishes formerly considered roundtail chub outside the Colorado River basin in Mexico are now considered a different species, *Gila minacae* (S. Norris, California State University Channel Islands, 2004 personal communication).

Although little information exists on distribution of bluehead sucker (but see McAda 1977, Holden and Minckley 1980, and McAda and Wydoski 1983), they historically occurred in large rivers and tributaries in the CRB (including the Colorado, Green, and San Juan river sub-basins), the Bonneville Basin in Utah, the Snake River Basin in Idaho, Nevada, and Utah (Lee et al. 1980; Ryden 2001), and the Little Colorado River Basin in Arizona and New Mexico (Minckley 1973). Bluehead sucker are found in portions of the Bonneville and Snake River Basins in Wyoming (Baxter and Stone 1995) as well mainstem habitats and several tributaries to the Colorado and Green rivers.

Bluehead sucker populations occur in the Escalante, Dirty Devil, and Fremont rivers (Colorado River tributaries) and in the San Rafael, Price, and Duchesne rivers (Green River tributaries); in the Weber and upper Bear River drainages; in the mainstem Green River from the Colorado River confluence upstream to Lodore, Colorado; in the White River from the Green River confluence upstream to near Meeker, Colorado; in the Yampa River from the Green River confluence upstream to Craig, Colorado; in the San Juan River, Utah, New Mexico and Colorado; in the Colorado River from Lake Powell upstream to Kremmling, Colorado; in the

Dirty Devil River in Utah; and in the Dolores River from the Colorado River confluence upstream to McPhee Reservoir, Colorado (Holden and Stalnaker 1974; Sigler and Sigler 1996; Bezzerides and Bestgen 2002). Bluehead sucker also occur in the following tributaries to the Colorado River in Grand Canyon: Bright Angel Creek, Little Colorado River (including headwater tributaries Nutrioso Creek, East, West, and South Fork of the Little Colorado River, East Clear Creek, and Chevelon Creek), Clear Creek, Shinumo Creek, Kanab Creek, and Havasu Creek.

Flannelmouth sucker occur above Flaming Gorge Reservoir in the Green River and its tributaries as well as in some naturally occurring lakes in this drainage. Flannelmouth sucker are currently found in the Escalante and Fremont rivers (Colorado River tributaries), the San Rafael, Price and Duchesne rivers (Green River tributaries); the mainstem San Juan River and tributaries; the Colorado River from Lake Powell upstream to near Glenwood Springs, Colorado; the Gunnison River in Colorado; the Dolores River; the Green River from the Colorado River confluence upstream to Flaming Gorge Reservoir; in the Dirty Devil River in Utah; and the Yampa and White rivers upstream from their confluences with the Green River. Populations of flannelmouth sucker also exist in the main channel Colorado River below Glen Canyon Dam and in the Virgin River. Flannelmouth sucker also occur in the following Grand Canyon tributaries during portions of their life cycle: Paria River, Bright Angel Creek, Kanab Creek, Shinumo Creek, Havasu Creek and the Little Colorado River including Nutrioso Creek and possibly other headwater tributaries (Little Colorado sucker may or may not be genetically distinct from flannelmouth sucker). Flannelmouth sucker are also common below Davis Dam (Mueller and Wydoski 2004) on the lower Colorado River. Although flannelmouth sucker populations usually do not persist in impoundments (Sigler and Sigler 1996; Bezzerides and Bestgen 2002), individuals were recently documented in Lake Havasu and Lake Mead, Lower Colorado River (Mueller and Wydoski 2004, Arizona Game and Fish Department, unpublished).

Status

Available information indicates that roundtail chubs now occupy approximately 45% of their historical range in the CRB. In the upper CRB (New Mexico, Colorado, Utah, and Wyoming), it has been extirpated from approximately 45% of their historical range, including the Price River (Cavalli 1999) and portions of the San Juan River, Gunnison River, and Green

River (Bezzerides and Bestgen 2002). Data on smaller tributary systems are largely unavailable, and population abundance estimates are available only for short, isolated river reaches (Bezzerides and Bestgen 2002). In the lower CRB, current estimates of roundtail chub distribution are as low as 18% of their former range (Voeltz 2002). A petition to list the lower Colorado River Basin roundtail chub under the ESA was filed in April 2003 and the finding from the Fish and Wildlife Service is expected in 2006. Roundtail chub are listed as a species of concern by the states of Arizona, Utah, Wyoming, and Colorado. The state of New Mexico lists roundtail chub as endangered.

Bluehead suckers presently occupy approximately 50% of their historically occupied range in the CRB. In the upper CRB (Utah, Wyoming, Colorado and New Mexico), bluehead suckers currently occupy approximately 45% of their historical habitat. Recent declines of bluehead suckers have occurred in the White River below Taylor Draw Dam (Utah and Colorado) and in the upper Green River (Holden and Stalnaker 1975; Bezzerides and Bestgen 2002). Bluehead sucker have been extirpated in the Gunnison River, Colorado above the Aspinall Unit Reservoirs (Wiltzius 1978). Bluehead sucker were documented in the Escalante River during the mid to late 1970's, but were absent from samples collected in recent years (Mueller et al. 1998). Bluehead sucker are listed as a species of concern by the states of Utah and Wyoming. In Wyoming, hybridization with white sucker appears to be compromising the genetic purity of several populations of bluehead sucker.

Recent investigation of historical accounts, museum specimens, and comparison with recent observations suggests that flannelmouth suckers occupy approximately 50% of their historic range in the upper CRB (Utah, Wyoming, Colorado, and New Mexico [Bezzerides and Bestgen 2002]). Their relative abundance in the Green River tributaries is not well known. Populations have declined since the 1960's due to impoundment in the mainstem Green River in Wyoming (Flaming Gorge, Fontenelle Reservoir) and in the Colorado River in Glen Canyon, Utah (Lake Powell). Flannelmouth sucker are listed as species of concern by the states of Arizona, Utah, Colorado, and Wyoming.

XVI. RANGE-WIDE CONSERVATION OF ROUNDTAIL CHUB, BLUEHEAD SUCKER, AND FLANNELMOUTH SUCKER

Goal

The goal of this strategy is to outline measures that the states can implement and expand upon to ensure the persistence of roundtail chub, bluehead sucker, and flannelmouth sucker populations throughout their ranges as specified in the Conservation Agreement, and to provide guidance in the development of individual state conservation plans. The range-wide strategy will be reviewed by the signatories every five years to ensure the incorporation of new adaptive management strategies or to alter portions of the strategy to better-fit existing conditions.

Objectives

The individual state signatories to the Conservation Agreement for the three species (signatories) will develop conservation and management plans for any or all of the three species that occur naturally within their states. Any future signatories may also choose to develop individual conservation and management plans or to integrate their efforts with existing plans. The individual signatories agree to develop information and conduct actions to support the following objectives:

- Establish and/or maintain roundtail chub, flannelmouth sucker and bluehead sucker populations sufficient to ensure persistence of each species within their ranges.
    1) Establish measureable criteria to evaluate the number of populations necessary to maintain the three species throughout their respective ranges.
    2) Establish measureable criteria to evaluate the number of individuals necessary within each population to maintain the three species throughout their respective ranges.
- Establish and/or maintain sufficient connectivity between populations so that viable metapopulations are established and/or maintained.
- As feasible, identify, significantly reduce and/or eliminate threats to the persistence of roundtail chub, bluehead sucker, and flannelmouth sucker that: 1) may warrant or maintain their listing as a sensitive species by state and federal agencies, and 2) may warrant their listing as a threatened or endangered species under the ESA.

XVII. CONSERVATION ACTIONS AND ADAPTIVE MANAGEMENT

The signatories will review and document existing and ongoing programmatic actions that benefit the three species. Signatories will identify information gaps regarding species distribution, status, and life history requirements, and develop research and analysis programs to fill those gaps. Through coordination with other states, the signatories to the Conservation Agreement will develop and implement conservation and management plans for each state. The signatories agree that the goals and objectives are appropriate across the respective ranges of the three species, though they acknowledge that as more information is gathered, the objectives may

change with a consensus of the signatories to better allow for implementation of the Agreement according to the new information. Signatories also agree to incorporate the preceding conservation actions into their conservation and management plans as applicable, though each management plan should also incorporate the ability to adapt to new information and to incorporate new information where necessary. As signatories develop their individual management plans for conservation of the three species, each signatory may include but is not limited or obligated to incorporate the following conservation actions within their plans:

1) Conduct status assessment of roundtail chub, bluehead sucker, and flannelmouth sucker.

   - Identify concurrent programs that benefit the three fish species. Monitor and summarize activities and progress.
   - Establish current information regarding species distribution, status, and habitat conditions as the baseline from which to measure change.
   - Identify threats to population persistence.
   - Locate populations of the subject species to determine status of each.

2) Establish and maintain a database of past, present, and future information on roundtail chub, bluehead sucker, and flannelmouth sucker.

   - Establish format and maintain compatible databases. Signatories have identified the need to maintain a range-wide database as the primary means to conduct a range-wide assessment.
   - Establish and maintain bibliography of subject species.

3) Determine roundtail chub, bluehead sucker, and flannelmouth sucker population demographics, life history, habitat requirements, and conservation needs.

   - Determine current population sizes of subject species and/or utilize auxiliary catch and effort data to identify trends in relative abundance.

- Identify subject species habitat requirements and current habitat conditions through surveys and studies of hydrological, biological and watershed features.
- Determine if existing flow recommendations and regimes are adequate for all life stages of the subject species. Develop appropriate flow recommendations for areas where existing flow regimes are inadequate.
- Where additional data is needed to determine appropriate management actions, conduct appropriate, focused research and apply results.

4) Genetically and morphologically characterize populations of roundtail chub, bluehead sucker, and flannelmouth sucker.

- Determine if known information is adequate to answer management questions related to conservation genetics and assess need for additional genetic characterization of subject species.
- Apply new information to management strategies.
- Review the literature available on hybridization and adequacy of existing data to characterize the degrees of threats to conservation of the three species posed by hybridization.
- Develop genetic management plans for all three species that outline maintenance of species at the population level and discuss application to reestablishment efforts.

5) Increase roundtail chub, bluehead sucker, and flannelmouth sucker populations to accelerate progress toward attaining population objectives for respective species.

- Assure regulatory protection for three species is adequate within the signatory states.

6) Enhance and maintain habitat for roundtail chub, bluehead sucker, and flannelmouth sucker.

- Enhance and/or restore connectedness and opportunities for migration of the subject species to disjunct populations where possible.
- Restore altered channel and habitat features to conditions suitable for the three species.
- Provide flows needed for all life stages of the subject species.
- Maintain and evaluate fish habitat improvements throughout the range.
- Install regulatory mechanisms for the long-term protection of habitat (e.g., conservation easements, water rights, etc.).

7) Control (as feasible and where possible) threats posed by nonnative species that compete with, prey upon, or hybridize with roundtail chub, bluehead sucker, and flannelmouth sucker.

- Determine where detrimental actions occur between the subject species and sympatric nonnative species.
- Control detrimental nonnative fish where necessary and feasible.
- Evaluate effectiveness of nonnative control efforts.
- Develop multi-state nonnative stocking procedure agreements that protect all three species and potential reestablishment sites.

8) Expand roundtail chub, bluehead sucker, and flannelmouth sucker population distributions through transplant, augmentation (i.e., use of artificially propagated stock), or reintroduction activities as warranted using a genetically based augmentation/reestablishment plan.

9) Establish and implement qualitative and quantitative long-term population and habitat monitoring programs for roundtail chub, bluehead sucker, and flannelmouth sucker.

- Develop and implement monitoring plan for the subject species.
- Evaluate conditions of populations using baseline data.
- Develop and implement habitat monitoring plan for the subject species.

- Evaluate habitat conditions using baseline data.

10) Implement an outreach program (e.g., development of partnerships, information and education activities) regarding conservation and management of roundtail chub, bluehead sucker, and flannelmouth sucker.

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APPENDIX 1: STANDARD LANGUAGE REQUIRED BY THE STATE OF ARIZONA

The Arizona Game and Fish Commission, acting through its administrative agency, the Arizona Game and Fish Department, enters into this Agreement under authority of A.R.S. § 17-231.B.7).

The following stipulations are hereby made part of this Agreement, and where applicable must be adhered to by all signatories to this Agreement.

- **ARBITRATION: To the extent required pursuant to A.R.S. § 12-1518, and any successor statutes, the parties agree to use arbitration, after exhausting all applicable administrative remedies, to resolve any dispute arising out of this agreement, where not in conflict with Federal Law.**

- **CANCELLATION: All parties are hereby put on notice that this agreement is subject to cancellation pursuant to A.R.S. § 38-511.**

- **OPEN RECORDS: Pursuant to A.R.S. § 35-214 and § 35-215, and Section 41.279.04 as amended, all books, accounts, reports, files and other records relating to the contract shall be subject at all reasonable times to inspection and audit by the State for five years after contract completion. Such records shall be reproduced as designated by the State of Arizona.**

DEPARTMENT OF NATURAL RESOURCES

Colorado Water Conservation Board

RULES CONCERNING THE COLORADO INSTREAM FLOW AND NATURAL LAKE LEVEL PROGRAM

2 CCR 408-2

[Editor's Notes follow the text of the rules at the end of this CCR Document.]

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1. TITLE.

Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, hereafter referred to as the Instream Flow ("ISF") Program as established in §37-92-102 (3) C.R.S., shall be hereinafter referred to as the "ISF Rules."

2. PURPOSE OF RULES.

The purpose of the ISF Rules is to set forth the procedures to be followed by the Board and Staff when implementing and administering the ISF Program. By this reference, the Board incorporates the Basis and Purpose statement prepared and adopted at the time of rulemaking. A copy of this document is on file at the Board office.

3. STATUTORY AUTHORITY.

The statutory authority for the ISF Rules is found at §37-60-108, C.R.S. and §37-92-102 (3), C.R.S. Nothing in these rules shall be construed as authorizing the Board to deprive the people of the state of Colorado of the beneficial use of those waters available by law and interstate compact.

4. DEFINITIONS.

4a. Agenda Mailing List.

The agenda mailing list consists of all Persons who have sent a notice to the Board Office that they wish to be included on such list. These Persons will be mailed a Board meeting agenda prior to each scheduled Board meeting.

4b. Board.

Means the Colorado Water Conservation Board as defined in §§37-60-101, 103 and 104, C.R.S.

4c. Board Office.

The Colorado Water Conservation Board's office is located at 1313 Sherman Street, 7th Floor, Denver, CO 80203. The phone number is (303) 866-3441. The facsimile number is (303) 866-4474. The Board's website is https://cwcb.colorado.gov.

4d. Contested Hearing Mailing List.

The Contested Hearing Mailing List shall consist of all Persons who have received Party status or Contested Hearing Participant status pursuant to Rules 5l. or 5m. This mailing list is specific to a contested appropriation.

4e. Contested Hearing Participant.

Any Person who desires to participate in the contested ISF process, but not as a Party, may obtain Contested Hearing Participant status pursuant to Rule 5m. A Person with such status will receive all Party documents. Contested Hearing Participants may comment on their own behalf, but may not submit for the record technical evidence, technical witnesses or legal memoranda.

4f. CWCB Hearing Officer.

The Hearing Officer is appointed by the Board and is responsible for managing and coordinating proceedings related to contested ISF appropriations, acquisitions or modifications, such as setting prehearing conferences and adjusting deadlines and schedules to further the Parties' settlement efforts or for other good cause shown. The Hearing Officer does not have the authority to rule on substantive issues.

4g. Final Action.

For purposes of Rule 5, final action means a Board decision to (1) file a water right application, (2) not file a water right application or (3) table action on an ISF appropriation; however, tabling an action shall not be construed as abandonment of its intent to appropriate.

4h. Final Staff ISF Recommendation.

Staff's ISF recommendation to the Board is based on Staff's data and report, and public comments and data contained in the official record.

4i. ISF.

Means any water, or water rights appropriated by the Board for preservation of the natural environment to a reasonable degree, or any water, water rights or interests in water acquired by the Board for preservation or improvement of the natural environment to a reasonable degree. “ISF” includes both instream flows between specific points on a stream and natural surface water levels or volumes for natural lakes.

4j. ISF Subscription Mailing List(s).

The ISF Subscription Mailing List(s) are specific to each water division. The ISF Subscription Mailing List(s) shall consist of all Persons who have subscribed to the list(s) by sending notice(s) to the Board Office that they wish to be included on such list for a particular water division. The Staff shall, at such times as it deems appropriate, mail to all Persons on the water court resume mailing list in each water division an invitation to be included on the ISF Subscription Mailing List for that water division. Persons on the list are responsible for keeping Staff apprised of address changes. Persons on the ISF Subscription Mailing List(s) shall receive agendas and other notices describing activities related to ISF recommendations, appropriations and acquisitions in the particular water division. Persons may be required to pay a fee in order to be on the ISF Subscription Mailing List(s).

4k. Mail.

For the purposes of the ISF Rules, mail refers to regular or special delivery by the U.S. Postal Service or other such services, electronic delivery (e-mail), or delivery by FAX transmission.

4l. Party.

Any Person may obtain Party status pursuant to Rule 5l. Only a Person who has obtained Party status may submit, for the record, technical evidence, technical witnesses or legal memoranda. Each Party is responsible for mailing copies of all documents to all other Parties and Contested Hearing Participants.

4m. Person.

Means any human being, partnership, association, corporation, special district, water conservancy district, water conservation district, municipal entity, county government, state government or agency thereof, and federal government or agency thereof.

4n. Proper Notice.

Means the customary public notice procedure that is provided each year by the Board in the preamble to the Board's January Board meeting agenda. This customary public notice procedure may include posting of the agenda at the Board office, filing legal notices when required, mailing to Persons on the Board mailing lists and posting notices on the Board's website.

4o. Stacking.

As used in Rule 6, the terms “stack” or “stacking” refer to an instance in which the Board holds more than one water right for the same lake or reach of stream and exercises the rights independently according to their decrees.

4p. Staff.

Means the Director of the Colorado Water Conservation Board (“CWCB Director”) and other personnel employed by the Board.

5. ORIGINAL APPROPRIATION PROCEDURE.

5a. Recommendation of Streams and Lakes for Protection.

All Persons interested in recommending certain stream reaches or natural lakes for inclusion in the ISF Program may make recommendations to the Board or Staff at any time. Staff will provide a preliminary response to any Person making such a recommendation within 30 working days after receipt of the recommendation at the Board Office. Staff will collaborate with State and Federal agencies and other interested Persons to plan and coordinate collection of field data necessary for development of ISF recommendations. The Staff shall advise the Board, at least annually, of all new recommendations received and of streams and lakes being studied for inclusion in the ISF Program.

5b. Method of Making Recommendations.

All recommendations transmitted to the Board or Staff for water to be retained in streams or lakes to preserve the natural environment to a reasonable degree must be made with specificity and in writing.

5c. Board Approval Process.

Periodically, after studying streams and lakes for inclusion in the ISF Program, Staff will recommend that the Board appropriate ISF rights. The Board and Staff will use the following annual schedule for initiating, processing and appropriating ISF water rights:

January

- The January Board meeting agenda will list proposed ISF appropriations to be appropriated that year.
- Staff will provide data, engineering and other information supporting each proposed ISF appropriation to the Board prior to or at the January Board meeting.
- Staff will present its information and recommendation for each proposed ISF appropriation at the January Board meeting.
- The Board will take public comment on the proposed ISF appropriations at the January Board meeting.
- The Board may declare its intent to appropriate for each proposed ISF appropriation at the January Board meeting, provided that the particular ISF appropriation has been listed as being under consideration in a notice, mailed at least 60 days prior to the January Board meeting, to the ISF Subscription Mailing List for the relevant water division(s).
- Notice of the Board having declared its intent to appropriate will be distributed through the ISF Subscription Mailing List for the relevant water division(s).

March

- The Board will take public comment on all ISF appropriations at the March Board meeting.
- Notice to Contest an ISF appropriation, pursuant to Rule 5k, must be submitted to the Board Office by March 31st, or the first business day thereafter.

April

- Staff will notify all Persons on the ISF Subscription Mailing List(s) of contested ISF appropriations by April 10th, or the first business day thereafter.
- Notice of Party status or Contested Hearing Participant status, pursuant to Rules 5l. or 5m., must be submitted to the Board Office by April 30th, or the first business day thereafter.

May

- Staff will report to the Board which ISF appropriations are being contested.
- The Board may set hearing dates for contested ISF appropriations.
- At the May Board meeting, the Board may take final action on all uncontested ISF appropriations.

July

- A prehearing conference will be held prior to the July Board meeting for all contested ISF appropriations (Date specific to be determined by the Hearing Officer).

- Five working days before the prehearing conference, all Parties shall file at the Board office, for the record, any and all legal memoranda, engineering data, biological data and reports or other information upon which the Party will rely.

August

- All Parties must submit written rebuttal statements, including testimony and exhibits, by August 15th, or the first business day thereafter. Except for such rebuttal and testimony provided at the hearing pursuant to Rule 5p.(2), the Board will not accept any statements, related documentation or exhibits submitted by any Party after the prehearing conference, except for good cause shown or as agreed upon by the Parties.

September

- Staff will make its final recommendations to the Board, based upon its original report, all public comments, documents submitted by the Parties and all data contained in the official record, at the September Board meeting.

- Notice of the Final Staff ISF Recommendations will be sent to all Persons on the Contested Hearing Mailing List prior to the September Board meeting.

- Parties may choose to continue or withdraw their Notice to Contest an ISF appropriation at or before the September Board Meeting.

- The Board will hold hearings on all contested ISF appropriations.

November

- The Board shall update the public on the results of any hearings through its agenda and may take final action on contested ISF appropriations.

When necessary, the Board may modify or delay this schedule or any part thereof as it deems appropriate.

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 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, lake location, amounts, etc.);

(b) Availability (time and place) for review of Summary Reports and Investigations Files for each appropriation; 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 ISF Recommendations 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 or lake is located.

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

5e. Public Comment.

(1) The Board will hear comment on the recommended action to declare its intent to appropriate at the January Board Meeting.

(2) ISF appropriations will be noticed in the Board agenda for each regularly scheduled subsequent meeting until the Board takes final action. Prior to March 31st, at each regularly scheduled Board meeting, time will be allocated for public comment. Subsequent to March 31st, the Board will accept public comment on any contested ISF appropriations or lake levels only at the hearings held on those appropriations pursuant to Rule 5j.

(3) Staff will maintain an ISF Subscription Mailing List for each water division. Any Person desiring to receive information concerning proposed ISF appropriations for that water division must contact the Board Office to request inclusion on that ISF Subscription Mailing List.

5f. Date of Appropriation.

The Board may select an appropriation date that may be no earlier than the date the Board declares its intent to appropriate. The Board may declare its intent to appropriate when it concludes that it has received sufficient information that reasonably supports the findings required in Rule 5i.

5g. Notice.

Agenda and ISF Subscription Mailing List(s) notice shall be given pursuant to Rule 5d. and the public shall be afforded an opportunity to comment pursuant to Rule 5e. Notice of the date of final action on uncontested ISF appropriations shall be mailed to Persons on the ISF Subscription Mailing Lists for the relevant water divisions, maintained pursuant to Rule 5e.(3).

5h. Final Board Action on an ISF Appropriation.

The Board may take final action on any uncontested ISF appropriation(s) at the May Board meeting or any Board meeting thereafter. If a Notice to Contest has been filed, the Board shall proceed under Rules 5j. - 5q.

5i. Required Findings.

Before initiating a water right filing to confirm its appropriation, the Board must make the following determinations:

(1) Natural Environment.

That there is a natural environment that can be preserved to a reasonable degree with the Board's water right if granted.

(2) Water Availability.

That the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made.

(3) Material Injury.

That such environment can exist without material injury to water rights.

These determinations shall be subject to judicial review in the water court application and decree proceedings initiated by the Board, based on the Board's administrative record and utilizing the criteria of §§24-4-106(6) and (7), C.R.S.

5j. Procedural Rules for Contested ISF Appropriations.

(1) Whenever an ISF appropriation is contested, the Board shall hold a hearing at which any Party may present evidence, witnesses and arguments for or against the appropriation and any Contested Hearing Participant or member of the public may comment. The hearing shall be a notice and comment hearing as authorized in §37-92-102(4)(a), C.R.S., and shall not be a formal agency adjudication under §24-4-105, C.R.S.

(2) These rules are intended to assure that information is received by the Board in a timely manner. Where these rules do not address a procedure or issue, the Board shall determine the procedures to be followed on a case-by-case basis. The Board may waive the requirements of these rules whenever the Board determines that strict adherence to the rules is not in the best interests of fairness, unless such waiver would violate applicable statutes. For any such waiver, the Board shall provide appropriate justification, in writing, to Persons who have Party or Contested Hearing Participant status.

(3) In a hearing on a contested ISF appropriation, a Party may raise only those issues relevant to the statutory determinations required by §37-92-102(3)(c), C.R.S. and the required findings in Rule 5i.

5k. Notice to Contest.

(1) To contest an ISF appropriation, a Person must comply with the provisions of this section. The Board must receive a Notice to Contest the ISF appropriation by March 31st, or the first business day thereafter.

(2) A Notice to Contest an ISF appropriation shall be made in writing and contain the following information:

(a) Identification of the Person(s) requesting the hearing;

(b) Identification of the ISF appropriation(s) at issue; and,

(c) The contested facts and a general description of the data upon which the Person will rely to the extent known at that time.

(3) After a Party has filed a Notice to Contest an ISF appropriation, any other Person may participate as a Party or a Contested Hearing Participant pursuant to Rules 5l. or 5m.

(4) Staff will notify all Persons on the relevant ISF Subscription Mailing List(s) of contested ISF appropriations by April 10th, or the first business day thereafter.

5l. Party Status.

(1) Party status will be granted to any Person who timely files a Notice of Party Status with the Staff. Any Person filing a Notice to Contest shall be granted Party status and need not also file a Notice of Party Status. A Notice of Party status must be received by April 30th, or the first business day thereafter. A Notice of Party status shall set forth a brief and plain statement of the reasons for obtaining Party status, the contested facts, the matters that the Person claims should be decided and a general description of the data to be presented to the Board. The Board will have discretion to grant or deny Party status to any Person who files a Notice of Party Status after April 30th or the first business day thereafter, for good cause shown.

(2) Only a Party may submit for the record technical evidence, technical witnesses or file legal memoranda. Each Party is responsible for mailing copies of all documents submitted for Board consideration to all other Parties and Contested Hearing Participants.

(3) The Staff shall automatically be a Party in all proceedings concerning contested ISF appropriations.

(4) Where a contested ISF appropriation is based fully or in part on another agency's recommendation pursuant to Rule 5a., that agency shall automatically be a Party in any proceeding.

(5) All Parties, whether they achieved such status by filing a Notice to Contest or a Notice of Party Status, shall be afforded the same rights in the contested ISF appropriation proceedings. Specifically, but without limiting the generality of the foregoing sentence, any Person who filed a Notice of Party Status is entitled to raise issues not raised by any Person who filed a Notice to Contest.

5m. Contested Hearing Participant Status.

(1) Any Person who desires to participate in the process, but not as a Party, may obtain Contested Hearing Participant status by filing a notice thereof at the Board Office prior to April 30th. A Person with such status will receive all Party documents specific to the contested appropriation. Contested Hearing Participants may comment on their own behalf, but may not submit for the record technical evidence, technical witnesses or legal memoranda. The Board will have discretion to grant or deny Contested Hearing Participant status to any Person who filed a Notice of Contested Hearing Participant Status after April 30th or the first business day thereafter, for good cause shown.

(2) The request for Contested Hearing Participant status must be received by April 30th, or the first business day thereafter.

(3) Staff shall notify all Parties and Contested Hearing Participants of the list of Contested Hearing Participants prior to May 31st. Thereafter, Parties shall also mail their prehearing statements and any other documents to Contested Hearing Participants.

5n. Prehearing Conference.

(1) The Board will designate a Hearing Officer, who shall schedule and preside over prehearing conferences and assist the Parties with procedural matters, such as setting prehearing conferences and adjusting deadlines and schedules to further the Parties' settlement efforts or for other good cause shown. All prehearing conferences will be scheduled and held prior to the July Board meeting.

(2) On or before five working days before the prehearing conference, each Party shall file 25 copies of its prehearing statement with the Board, and provide an electronic version when possible. The prehearing statement shall identify all exhibits, engineering data, biological data and reports or other information that the Party will rely upon at the hearing and shall contain:

(a) A specific statement of the factual and legal claims asserted (issues to be resolved) and the legal basis upon which the Party will rely;

(b) Copies of all exhibits to be introduced at the hearing;

(c) A list of witnesses to be called and a brief description of their testimony;

(d) Any alternative proposal to the proposed ISF appropriation;

(e) All written testimony to be offered into evidence at the hearing;

and

(f) Any legal memoranda.

Each Party shall deliver a copy of its prehearing statement to all other Parties, Contested Hearing Participants, the Hearing Officer and directly to the Assistant Attorneys General representing Staff and the Board five working days before the prehearing conference. The Board will not consider information, other than rebuttal statements and testimony provided at the hearing pursuant to Rule 5p.(2), submitted by the Parties after this deadline except for good cause shown or as agreed upon by the Parties.

(3) Any Contested Hearing Participant may also submit written comments 5 working days prior to the prehearing conference. Contested Hearing Participants who submit written comments for the Board's consideration shall provide 25 copies to the Board, and a copy to all other Contested Hearing Participants, Parties, the Hearing Officer and the Assistant Attorneys General representing Staff and Board, and provide an electronic version when possible.

(4) The prehearing conference will afford the Parties the opportunity to address such issues as time available for each Party at the hearing, avoiding presentation of duplicative information, consolidation of concerns, etc. The Parties may formulate stipulations respecting the issues to be raised, witnesses and exhibits to be presented, and/or any other matters which may be agreed to or admitted by the Parties. At the prehearing conference, the Parties shall make known any objections to the procedures or evidence that they may raise at the hearing unless such objections could not have been reasonably determined at that time.

(5) August 15th, or the first business day thereafter, is the last day for submission of written rebuttal statements, including testimony, legal memoranda, and exhibits. Twenty-five copies of such materials must be provided to the Board, and an electronic version also provided, when possible. Except for such rebuttal and testimony provided at the hearing pursuant to Rule 5p.(2), the Board will not accept any statements, related documentation or exhibits submitted by any Party after the deadline set forth in Rules 5n.(2) and 5n.(3), except for good cause shown or as agreed upon by the Parties. The scope of rebuttal is limited to issues and evidence presented in the prehearing statements. Any documentation to be submitted pursuant to this subsection (5) shall be delivered to the Board and mailed to all Parties and Contested Hearing Participants by August 15th, or the first business day thereafter, unless the Parties agree otherwise.

5o. Notice of Hearings on Contested ISF Appropriations.

(1) Staff shall mail notice of prehearing conference(s) on contested ISF appropriations to all Persons on the Contested Hearing Mailing List for the particular ISF appropriation. The notice shall specify the time and place of the prehearing conference and any procedural requirements that the Board deems appropriate.

(2) The Board may postpone a hearing to another date by issuing written notice of the postponement no later than 7 calendar days prior to the original hearing date.

5p. Conduct of Hearings.

(1) In conducting any hearing, the Board shall have authority to: administer oaths and affirmations; regulate the course of the hearing; set the time and place for continued hearing; limit the number of technical witnesses; issue appropriate orders controlling the subsequent course of the proceedings; and take any other action authorized by these Rules.

(2) At the hearing, the Board shall hear arguments, concerns or rebuttals from Parties, Contested Hearing Participants and interested members of the public. The Board may limit testimony at the hearing. Without good cause, the Board will not permit Parties or Contested Hearing Participants to introduce written material at the hearing not previously submitted pursuant to these Rules. The Board, in making its determinations, need not consider any written material not timely presented.

(3) Only the Board may question witnesses at the hearing except where the Board determines that, for good cause shown, allowing the parties to question witnesses may materially aid the Board in reaching its decision, or where such questioning by the Parties relates to the statutory findings required by §37-92-102(3)(c), C.R.S. The Board may terminate questioning where the Board determines that such questioning is irrelevant or redundant or may terminate such questioning for other good cause.

(4) The hearing shall be recorded by a reporter or by an electronic recording device. Any Party requesting a transcription of the hearing shall be responsible for the cost of the transcription.

5q. Final Board Action.

The Board may take final action at the hearing or at a later date.

5r. Statement of Opposition.

In the event that any Person files a Statement of Opposition to an ISF water right application in Water Court, the Staff may agree to terms and conditions that would prevent injury. Where the resolution of the Statement of Opposition does not involve a change regarding the Board's determinations under Rule 5i. (including but not limited to the amount, reach, and season), the Board is not required to review and ratify the resolution. Staff may authorize its counsel to sign any court documents necessary to finalize this type of pretrial resolution without Board ratification.

5s. Withdrawal of Filing.

If the Board elects to withdraw a Water Court filing, notice shall be given in the agenda of the Board meeting at which the action is expected to occur.

6. ACQUISITION OF WATER, WATER RIGHTS OR INTERESTS IN WATER FOR INSTREAM FLOW PURPOSES.

The Board may acquire water, water rights, or interests in water for ISF purposes by the following procedures:

6a. Means of Acquisition.

The Board may acquire, by grant, purchase, donation, bequest, devise, lease, exchange, or other contractual agreement, from or with any Person, including any governmental entity, such water, water rights, or interests in water that are not on the Division Engineer’s abandonment list in such amounts as the Board determines are appropriate for stream flows or for natural surface water levels or volumes for natural lakes to preserve or improve the natural environment to a reasonable degree.

6b. 120 Day Rule.

At the request of any Person, including any governmental entity, the Board shall determine in a timely manner, not to exceed one hundred twenty days, unless further time is granted by the requesting Person, what terms and conditions the Board will accept in a contract or agreement for the acquisition. The 120-day period begins on the day the Board first considers the proposed contract or agreement at a regularly scheduled or special Board meeting.

6c. Stacking Evaluation.

The Board shall evaluate whether to combine or stack the acquired water right with any other ISF appropriation or acquisition, based upon the extent to which the acquired water will provide flows or lake levels to preserve or improve the natural environment to a reasonable degree.

If the Board elects to combine or stack the acquired water right, the details of how the water rights are to be combined or stacked with other existing ISF appropriations or acquisitions must be set forth in the application for a decree to use the acquired right for instream flow purposes.

6d. Enforcement of Acquisition Agreement.

Pursuant to section 37-92-102(3), C.R.S., any contract or agreement executed between the Board and any Person which provides water, water rights, or interests in water to the Board shall be enforceable by either party thereto as a water matter in the water court having jurisdiction over the water right according to the terms of the contract or agreement.

6e. Appropriateness of an Acquisition.

The Board shall evaluate the appropriateness of any acquisition of water, water rights, or interests in water to preserve or improve the natural environment. Such evaluation shall include, but need not be limited to consideration of the following factors:

(1) The reach of stream or lake level for which the use of the acquired water is proposed, which may be based upon any one or a combination of the following: the historical location of return flow; the length of the existing instream flow reach, where applicable; whether an existing instream flow water right relies on return flows from the water right proposed for acquisition; the environment to be preserved or improved by the proposed acquisition; or such other factors the Board may identify;

(2) The natural flow regime;

(3) Any potential material injury to existing decreed water rights;

(4) The historical consumptive use and historical return flows of the water right proposed for acquisition that may be available for instream flow use;

(5) The natural environment that may be preserved or improved by the proposed acquisition, and whether the natural environment will be preserved or improved to a reasonable degree by the water available from the proposed acquisition;

(6) The location of other water rights on the subject stream(s);

(7) The effect of the proposed acquisition on any relevant interstate compact issue, including whether the acquisition would assist in meeting or result in the delivery of more water than required under compact obligations;

(8) The effect of the proposed acquisition on the maximum utilization of the waters of the state;

(9) Whether the water acquired will be available for subsequent use or reuse downstream;

(10) The cost to complete the transaction or any other associated costs; and

(11) The administrability of the acquired water right when used for instream flow purposes.

The Board shall determine how to best utilize the acquired water, water rights or interest in water to preserve or improve the natural environment.

6f. Factors Related to Loans and Leases.

In addition to considering the factors listed above, for loans and leases of water, water rights and interests in water for ISF purposes under section 37-92-102(3),

(1) The Board shall consider the extent to which the leased or loaned water will preserve or improve the natural environment to a reasonable degree, including but not limited to:

(a) Whether the amount of water available for acquisition is needed to provide flows to meet a decreed ISF amount in below average years; and

(b) Whether the amount of water available for acquisition could be used to and would improve the natural environment to a reasonable degree, either alone or in combination with existing decreed ISF water rights.

(2) In considering the extent to which the leased or loaned water will preserve or improve the natural environment to a reasonable degree, the Board will request and review a biological analysis from Colorado Parks and Wildlife (CPW), and will review any other biological or scientific evidence presented to the Board.

(3) If other sources of water are available for acquisition on the subject stream reach(es) by purchase or donation, the Board shall fully consider each proposed acquisition and give preference first to the donation and then to a reasonable acquisition by purchase.

(4) The Board shall obtain confirmation from the Division Engineer that the proposed lease or loan is administrable and is capable of meeting all applicable statutory requirements.

(5) The Board shall determine, through negotiation and discussion with the lessor, the amount of compensation to be paid to the lessor of the water based, in part, upon the anticipated use of the water during and after the term of the lease.

(6) The Board shall consider evidence of water availability based upon the historical record(s) of diversion, the beneficial use of the subject water right, the location and timing of where return flows have historically returned to the stream, and the reason(s) the water is available for lease or loan.

6g. Recording Requirements.

(1) All contracts or agreements for leases or loans of water, water rights or interests in water under section 37-92-102(3) shall require the Board to:

(a) Maintain records of how much water the Board uses under the contract or agreement each year it is in effect; and

(b) Install any measuring device(s) deemed necessary by the Division Engineer (1) to administer the lease or loan of water, (2) to measure and record how much water flows out of the reach after use by the Board under the lease or loan; and (3) to meet any other applicable statutory requirements.

(2) All contracts or agreements for leases or loans of water shall provide for the recording of the actual amount of water legally available and capable of being diverted under the leased or loaned water right during the term of the lease or loan, with such records provided to the Division of Water Resources for review and publication.

6h. Water Reuse.

All contracts or agreements for the acquisition of water, water rights or interests in water under section 37-92-102(3) shall provide that the Board or the seller, lessor, lender or donor of the water may bring about beneficial use of the historical consumptive use of the acquired water right downstream of the ISF reach as fully consumable reusable water, pursuant to the water court decree authorizing the Board to use the acquired water.

(1) The bringing about of beneficial use of the historical consumptive use of the water may be achieved by direct use, sale, lease, loan or other contractual arrangement by the Board or the seller, lessor, lender or donor.

(2) The contract or agreement also shall provide that the Division Engineer must be notified of any agreement for such beneficial use downstream of the ISF reach prior to the use.

(3) Prior to any beneficial use by the Board of the historical consumptive use of the acquired water right downstream of the ISF reach, the Board shall find that such use:

(a) Will be consistent with the Board's statutory authority and with duly adopted Board policies and objectives; and

(b) Will not injure vested water rights or decreed conditional water rights.

6i. Applications for a Decreed Right to Use Water for ISF Purposes.

The Board shall file a change of water right application or other applications as needed or required with the water court to obtain a decreed right to use water for ISF purposes under all contracts or agreements for acquisitions of water, water rights or interests in water under section 37-92-102(3), including leases and loans of water. The Board shall file a joint application with the Person from whom the Board has acquired the water or a Person who has facilitated the acquisition, if requested by such Person. The Water Court shall determine matters that are within the scope of section 37-92-305, C.R.S. In a change of water right proceeding, the Board shall request the Water Court to:

(1) Verify the quantification of the historical consumptive use of the acquired water right;

(2) Verify the identification, quantification and location of return flows to ensure that no injury will result to vested water rights and decreed conditional water rights;

(3) Include terms and conditions providing that:

(a) The Board or the seller, lessor, lender, or donor of the water may bring about the beneficial use of the historical consumptive use of the changed water right downstream of the ISF reach as fully consumable reusable water, subject to such terms and conditions as the water court deems necessary to prevent injury to vested water rights and decreed conditional water rights; and

(b) When the Board has not identified such downstream beneficial use at the time of the change of water right, the Board may amend the subject change decree, if required by the Division Engineer, to add such beneficial use(s) of the historical consumptive use downstream of the ISF reach at the time the Board is able to bring about such use or reuse, without requiring requantification of the original historical consumptive use calculation; and

(4) Decree the method by which the historical consumptive use should be quantified and credited during the term of the agreement for the lease or loan of the water right pursuant to section 37-92-102(3), C.R.S.

6j. Limitation on Acquisitions.

The Board may not accept a donation of water rights that were acquired by condemnation, or that would require the removal of existing infrastructure without approval of the current owner of such infrastructure.

6k. Temporary (Expedited and Renewable) Loans of Water to the Board.

Section 37-83-105, C.R.S., authorizes the Board to accept and exercise two types of temporary loans of water for ISF use: (1) expedited loans; and (2) renewable loans. Expedited loans have a term of up to one year and may be used to preserve the natural environment to a reasonable degree on a decreed instream flow reach. Renewable loans, which can be used to preserve or improve the natural environment on a decreed instream flow reach, may be exercised for up to five years in a ten-year period and for no more than three consecutive years, and may be renewed for up to two additional ten-year periods. The Board may exercise both expedited and renewable temporary loans of water for instream flow use for a period not to exceed 120 days in a single calendar year, in accordance with the procedures and subject to the limitations set forth in section 37-83-105, C.R.S. The owner of a decreed water right who has offered water to the Board for an expedited or renewable loan is referred to herein as an "applicant."

(1) Expedited Loans.

(a) An expedited loan approved to preserve the natural environment to a reasonable degree has a term of up to one year, with instream flow use not to exceed 120 days in a single calendar year. The loan period begins when the State Engineer approves the expedited loan. If an expedited loan is approved, the applicant may not reapply for an additional expedited loan of the subject water right.

(b) Within five working days after receiving an offer of an expedited loan of water to the Board for temporary instream flow use, the Director will provide a response to the applicant. If the proposed loan appears to be appropriate for instream flow use, staff will coordinate with the applicant to:

i. prepare and submit the necessary documentation to the State Engineer required by sections 37-83-105(2)(a)(I) and (2)(b)(I), C.R.S.;

ii. provide the written notice required by section 37-83-105(2)(b)(II), C.R.S., and access to all documentation provided to the State Engineer under Rule 6k.(1)(b)i, to: (1) all parties on the substitute water supply plan notification list established pursuant to section 37-92-308(6), C.R.S., for the water division in which the proposed loan is located; and (2) a registered agent of a ditch company, irrigation district, water users' association, or other water supply or delivery entity within whose system the water rights fall; and

iii. provide notice to all Persons on the ISF Subscription Mailing List for the relevant water division.

(c) Provided that the State Engineer has made a determination of no injury pursuant to section 37-83-105(2)(a)(III), C.R.S., the Board hereby delegates authority to the CWCB Director to accept expedited loans of water for instream flow use in accordance with the procedures and subject to the limitations set forth in section 37-83-105, C.R.S., to execute an agreement for the loan of the water, and to take any administrative action necessary to put the loaned water to instream flow use. The purpose of this delegation is to expedite the Board's exercise of a temporary loan of water for instream flow use under this Rule 6k.(1).

(d) The CWCB's use of loaned water for instream flows shall not exceed the CWCB's decreed instream flow rate(s), time period(s), and reach(es) at any time during the expedited loan term, and shall comply with any terms and conditions imposed by the State Engineer to prevent injury.

(e) At the first regular or special Board meeting after the Director accepts, or rejects over applicant's objection, an offer of an expedited loan of water to the Board for temporary instream flow use under (b) and (c) above, the Board shall vote either to ratify or overturn the Director's decision.

(f) The Board, Director and staff will expedite all actions necessary to implement Rule 6k.(1).

(2) Renewable Loans.

(a) A renewable loan approved to preserve or improve the natural environment must not be exercised for more than five years in a ten-year period and for no more than three consecutive years, for which only a single approval by the State Engineer is required. Instream flow use may not exceed 120 days in a single calendar year. The ten-year period begins when the State Engineer approves the loan. If an applicant for a renewable loan has previously been approved for and has exercised an expedited loan using the same water right(s) that are the subject of the pending application, the one-year loan period of the expedited loan counts as the first year of the five-year allowance for the subsequent renewable loan.

(b) The Board will use a two-Board meeting process to review, consider public comment, and direct Staff whether to move forward with proposed renewable loans of water for instream flow use to preserve or improve the natural environment to a reasonable degree.

(c) Any Person may request the Board to hold a hearing on a proposed renewable loan. Such a request must be submitted to the Board in writing within twenty days after the first Board meeting at which the Board considers the proposed renewable loan, and must include a brief statement, with as much specificity as possible, of why a hearing is being requested. The Board shall conduct all hearings on renewable loans pursuant to Rule 6m.(5).

(d) For renewable loans to improve the natural environment to a reasonable degree, the Board will:

i. request and review a biological analysis from CPW concerning the extent to which the proposed loan will improve the natural environment to a reasonable degree, and review any other biological or scientific evidence presented to the Board;

ii. make findings on flow rates appropriate to improve the natural environment to a reasonable degree with the loaned water; and

iii. give preference to loans of stored water, when made available, over loans of direct flow water.

(e) When evaluating a proposed renewable loan, the Board shall consider any potential injury to decreed water rights, decreed exchanges of water, or other water users' undecreed existing exchanges of water to the extent that the undecreed existing exchanges have been administratively approved before the date of the Board's consideration.

(f) If the Board directs Staff to move forward with a proposed renewable loan, staff will coordinate with the applicant to:

i. prepare and submit the necessary documentation to the State Engineer required by sections 37-83-105(2)(a)(I) and (2)(b)(I), C.R.S.;

ii. provide the written notice required by section 37-83-105(2)(b)(II), C.R.S., and access to all documentation provided to the State Engineer under Rule 6k.(2)(f)i, to: (1) all parties on the substitute water supply plan notification list established pursuant to section 37-92-308(6), C.R.S., for the water division in which the proposed loan is located; and (2) a registered agent of a ditch company, irrigation district, water users' association, or other water supply or delivery entity within whose system the water rights fall;

iii. provide notice to all Persons on the ISF Subscription Mailing List for the relevant water division; and

iv. make best efforts to publish notice of the proposed plan in an appropriate legal newspaper of general circulation in each county in which the loan will be implemented and from which the loaned water has been historically used.

(g) Board direction to Staff to move forward with a proposed renewable loan will include authorizing Staff to execute an agreement for the loan of water and to take any administrative action necessary to put the loaned water to instream flow use, provided that the State Engineer determines that no injury will result from the proposed loan.

(h) The CWCB's instream flow use of loaned water shall not extend beyond the CWCB's decreed instream flow reach(es) at any time during the renewable loan term, and shall comply with any terms and conditions imposed by the State Engineer to prevent injury.

(i) In each year that a renewable loan is exercised, the applicant, coordinating with Staff if necessary, shall provide the written notice described in section 37-83-105(2)(b)(II), C.R.S.

(j) The applicant may reapply for a renewable loan, and the State Engineer may approve such loan for up to two additional ten-year periods. Prior to any such reapplication, at a properly noticed public meeting, Staff will inform the Board about the exercise of the loan during the previous ten-year period and request approval for the loan to continue for the additional ten-year period. The Board shall consider any public comment and objections to the renewal provided at the public meeting. If the Board authorizes renewal of the loan, staff will coordinate with the applicant to: (1) prepare and submit the necessary documentation to the State Engineer required by sections 37-83-105(2)(a)(I) and (2)(b)(I), C.R.S.; and (2) provide the written notice required by section 37-83-105(2)(b)(II), C.R.S.

(3) Water rights loaned to the Board pursuant to expedited or renewable loans are not precluded from concurrent or subsequent inclusion in other programs, such as water conservation, demand management, compact compliance, or water banking programs or plans, as are or may be subsequently defined or described in statute. The applicant will inform the Board of inclusion of the loaned water right in any such program during the loan period.

6l. Funds for Water Right Acquisitions.

The Board may use any funds available to it for costs of the acquisition of water rights and their conversion to ISF use. The Board shall spend available funds for such costs in accordance with section 37-60-123.7, C.R.S. and any other applicable statutory authority, and with applicable Board policies and procedures.

6m. Public Input on Proposed Acquisitions.

The Board shall follow the public review process in Rules 11a. - 11c. when acquiring water, water rights or interests in water, except for expedited and renewable temporary loans or leases as provided in Rule 6k. above and except as provided below.

(1) Prior to Board consideration of any proposed acquisition, Staff shall mail notice of the proposed acquisition to all Persons on the ISF Subscription Mailing List and the State Engineer's Substitute Supply Plan Notification List for the relevant water division, and shall provide Proper Notice. Such notice shall include:

(a) The case number adjudicating the water right proposed to be acquired, and the appropriation date, adjudication date, priority, decreed use(s), and flow amount of the water right proposed to be acquired, and approximately how much of the water right the Board will consider acquiring;

(b) The location of the stream reach or lake that is the subject of the proposal, including, when available, the specific length of stream reach to benefit from the proposed acquisition;

(c) Any available information on the purpose of the acquisition, including the degree of preservation or improvement of the natural environment to be achieved;

(d) Any available scientific data specifically supporting the position that the acquisition will achieve the goal of preserving or improving the natural environment to a reasonable degree; and

(e) In addition to (a) - (d) above, for leases and loans of water, water rights or interests in water under section 37-92-102(3), C.R.S., such notice shall include the proposed term of the lease or loan and the proposed season of use of the water under the lease or loan.

(2) At every regularly scheduled Board meeting subsequent to the mailing of notice, and prior to final Board action, Staff will report on the status of the proposed acquisition and time will be reserved for public comment.

(3) Any Person may address the Board regarding the proposed acquisition prior to final Board action. Staff shall provide any written comments it receives regarding the proposed acquisition directly to the Board.

(4) Any Person may request the Board to hold a hearing on a proposed acquisition. Such a request must be submitted to the Board in writing within twenty days after the first Board meeting at which the Board considers the proposed acquisition, and must include a brief statement, with as much specificity as possible, of why a hearing is being requested.

(5) At its next regularly scheduled meeting after receipt of the request for a hearing, or at a special meeting, the Board will consider the request and may, in its sole discretion, grant or deny such a request. All hearings scheduled by the Board shall be governed by the following procedures:

(a) A hearing on a proposed acquisition, except for renewable loans, must be held within the 120 day period allowed for Board consideration of an acquisition pursuant to Rule 6b., unless the Person requesting the Board to consider the proposed acquisition agrees to an extension of time.

(b) The Board shall appoint a Hearing Officer to establish the procedures by which evidence will be offered.

(c) For hearings on acquisitions other than renewable loans, at least thirty days prior to the hearing date(s), the Board shall provide written notice of the hearing(s) to the Person proposing the acquisition, all interested parties known to the Board, and all Persons on the ISF Subscription Mailing List and the State Engineer's Substitute Supply Plan Notification List for the relevant water division. The Board also shall provide Proper Notice, as defined in ISF Rule 4n.

(d) For hearings on renewable loans, at least thirty days prior to the hearing date, the Board shall provide written notice of the hearing to the owner of the water right to be loaned and to: (1) all parties on the substitute water supply plan notification list established pursuant to section 37-92-308(6), C.R.S., for the water division in which the proposed loan is located; (2) a registered agent of a ditch company, irrigation district, water users' association, or other water supply or delivery entity within whose system the water rights fall; and (3) provide notice to all Persons on the ISF Subscription Mailing List for the relevant water division. Such notice shall include the process and deadlines for participating in the hearing.

(e) Any Person who desires party status shall become a Party upon submission of a written Notice of Party Status to the Board Office. The Notice shall include the name and mailing address of the Person and a brief statement of the reasons the Person desires party status. The Board Office must receive Notice of Party Status within seven days after notice of the hearing is issued.

(f) The Hearing Officer shall set timelines and deadlines for all written submissions. Prehearing statements will be required, and shall include, but not be limited to, the following: 1) a list of all disputed factual and legal issues; 2) the position of the Party regarding the factual and legal issues; 3) a list identifying all of the witnesses that will testify for the Party, and a summary of the testimony that those witnesses will provide; and 4) copies of all exhibits that the Party will introduce at the hearing(s).

(g) Any Party may present testimony or offer evidence identified in its prehearing statement regarding the proposed acquisition.

(h) The Hearing Officer shall determine the order of testimony for the hearing(s), and shall decide other procedural matters related to the hearing(s). The Hearing Officer does not have authority to rule on substantive issues, which authority rests solely with the Board.

(i) The Board will not apply the Colorado Rules of Evidence at hearings on proposed acquisitions.

(j) The Board may permit general comments from any Person who is not a Party; however, the Board may limit these public comments to five minutes per Person.

(k) The Board may take final action at the hearing(s) or continue the hearing and/or deliberations to a date certain.

(l) Board hearings may be recorded by a reporter or by an electronic recording device. Any Party requesting a transcription of the hearing(s) shall be responsible for the cost of the transcription.

(m) When necessary, the Board may modify this hearing procedure schedule or any part thereof as it deems appropriate.

6n. Board Action to Acquire Water, Water Rights or Interests in Water.

The Board shall consider the acquisition during any regular or special meeting of the Board. At the Board meeting, the Board shall consider all presentations or comments of Staff or any other Person. After such consideration, the Board may acquire, acquire with limitations, or reject the proposed acquisition.

7. INUNDATION OF ISF RIGHTS.

Inundation of all or a portion of an ISF stream reach or lake may be an interference with the Board's usufructuary rights that have been acquired by Board action. “Inundation” as used in this section is the artificial impoundment of water within an ISF or natural lake; “inundation” does not refer to the use of a natural stream as a conveyance channel as long as such use does not raise the waters of the stream above the ordinary high watermark as defined in §37-87-102 (1)(e), C.R.S.

7a. Small Inundations.

Staff may file a Statement of Opposition to inundations described in this section if it determines that the ISF right or natural environment will be adversely affected by the inundation. The Staff shall not be required to file a Statement of Opposition to applications proposing small inundations. Small inundations are those in which the impoundment is 100 acre-feet or less, or the surface acreage of the impoundment is 20 acres or less, or the dam height of the structure is 10 feet or less. The dam height shall be measured vertically from the elevation of the lowest point of the natural surface of the ground, where that point occurs along the longitudinal centerline of the dam up to the flowline crest of the spillway of the dam.

(1) All structures proposed by any applicant on a stream reach shall be accumulated for the purpose of determining whether the inundations proposed by the applicant are small inundations. In the event the cumulative surface acreage, volume impounded, or dam height of all impoundments exceed the definition of a small inundation, Staff may file a Statement of Opposition to that application.

(2) In the event that no Statement of Opposition is filed pursuant to the terms of this section, the Board shall be deemed to have approved the inundation proposed without a request by the applicant.

7b. Application of Rule 7.

The provisions of this rule will not be applied to the following water rights:

(1) any absolute or conditional water right that is senior to an ISF right;

(2) any senior conditional water right that seeks a finding of reasonable diligence;

(3) any junior absolute or conditional water right which was decreed prior to July 10, 1990, or had an application for decree pending prior to July 10, 1990, unless the Board had filed a Statement of Opposition to the absolute or conditional water right application prior to July 10, 1990; or

(4) any inundation of an ISF reach by water that does not have an absolute or conditional water right if the inundation occurred prior to July 10, 1990.

7c. Request to Inundate.

Any Person seeking permission to inundate shall timely submit a written request for permission to inundate to the Board Office. No requests for inundation will be considered or approved until the Person seeking permission to inundate files a water court application outlining their storage plans or files plans and specifications with the State Engineer for a jurisdictional dam pursuant to §37-87-105, C.R.S. The Board will consider the request to inundate in a timely manner.

7d. Staff Investigation.

After receiving the request to inundate, the Staff may seek the recommendations from Colorado Parks and Wildlife, Division of Water Resources, United States Department of Agriculture and United States Department of Interior.

7e. Required Information.

In any written request to inundate, the requesting Person shall at a minimum include information on the following factors: the location of the inundation, the size of the inundation, impact of the inundation on the natural environment, any unique or rare characteristics of the ISF water right to be inundated, any regulatory requirements or conditions imposed upon the applicant by federal, state and/or local governments, all terms and conditions included in applicant's water court decree, and any compensation or mitigation offered by the Person proposing the inundation.

7f. Determination of Interference.

In response to the request to inundate, the Board shall determine whether the proposed inundation interferes with an ISF right. When making this determination, the Board shall consider, without limitation, the extent of inundation proposed and the impact of the proposed inundation on the natural environment existing prior to the inundation.

7g. Consideration of Request to Inundate.

If the Board determines that a proposed inundation interferes with an ISF right, the Board may then approve, approve with conditions, defer, or deny the request to inundate. In making this decision, the Board shall consider all relevant factors, including, but not limited to (1) the extent of inundation proposed; (2) the impact of the proposed inundation on the natural environment existing prior to the inundation; (3) the degree to which the beds and banks adjacent to the ISF right subject to the inundation are publicly or privately owned; (4) the economic benefits arising from the inundation; (5) the benefits to recreation and downstream ISF segments arising from the inundation; (6) the degree to which the proposed inundation will allow development of Colorado's allotment of interstate waters as determined by compact or adjudication; and, (7) any mitigation or compensation offered to offset adverse impacts on the ISF right. After considering all relevant factors, the Board shall take one of the actions set forth in Rules 7h. - 7k. below.

7h. Approval.

If the Board approves the request to inundate, any Statement of Opposition filed by the Board shall be withdrawn.

7i. Conditional Approval.

The Board may require certain conditions to be performed prior to approval. Failure to perform any condition will be a reason for denial.

7j. Deferral.

When it appears that other governmental agencies may impose terms and conditions upon the issuance of a permit to construct a facility which will cause an inundation, the Board may defer consideration of the request to inundate until all other governmental bodies have finalized the permit or approval conditions.

7k. Denial of Request to Inundate.

Requests for permission to inundate may be denied if in the discretion of the Board the request is inconsistent with the goals of the ISF Program. The Board may decide to deny a request for permission to inundate if it finds:

(1) No compensation or mitigation would be adequate for the injury caused by the inundation; or

(2) No compensation or mitigation acceptable to the Board has been proposed by applicant; or

(3) The proposed inundation is inconsistent with the goals of the ISF Program.

7l. Remedies.

The Board may seek any administrative, legal or equitable remedy through state courts (including water courts), federal courts, city, county, state or federal administrative proceedings to resolve actual or proposed inundation of its ISF rights.

7m. Board Has Sole Right to Protect ISF Rights from Interference.

Only the Board may seek to prevent interference with an ISF right by inundation and only the Board may seek compensation or mitigation for such interference.

7n. Public Review Process.

The Board shall follow the public review process in Rules 11a. - 11c. prior to any Board decision on a request to inundate an ISF right.

8. PROTECTION OF ISF APPROPRIATIONS.

The Board delegates the day-to-day management and administration of the ISF Program to Staff. Staff shall seek ratification of its decisions as set forth in Rules 8c., 8e.(2), 8i., and 8j.

8a. Resume Review.

Staff shall review the monthly resumes of all water divisions. The Staff shall evaluate each resume entry for the possibility of injury or interference to an ISF right.

8b. Statement of Opposition.

In the event Staff identifies a water right application in the resume that may injure an ISF right, Staff shall file a Statement of Opposition to that application. In the event Staff identifies a water right application in the resume that may interfere with an ISF right as contemplated in Rule 7, Staff may file a Statement of Opposition to that application.

8c. Ratification of Statements of Opposition.

At a Board meeting following the filing of the Statement of Opposition, Staff shall apprise the Board of the filing of a Statement of Opposition and the factual basis for the Staff action. At that time, the Board shall ratify the filing, disapprove the filing, or table the decision to a future meeting if more information is needed prior to making a decision.

8d. Notice.

Prior to ratification of a Statement of Opposition, the Staff shall mail the applicant a copy of the Board memorandum concerning the ratification and a copy of the agenda of the meeting in which the ratification will be considered. Following a Board action considering a Statement of Opposition, the Staff shall notify the applicant and/or its attorney in writing of the Board's action.

8e. De Minimis Rule.

In the event that Staff determines a water court application would result in a 1 percent depletive effect or less on the stream reach or lake subject of the ISF right, and the stream reach or lake has not been excluded from this rule pursuant to Rules 8f. or 8h., Staff shall determine whether to file a Statement of Opposition. Staff's decision not to file a Statement of Opposition does not constitute: (1) acceptance by the Board of injury to any potentially affected ISF water right; or (2) a waiver of the Board's right to place an administrative call for any ISF water right.

(1) If Staff does not file a Statement of Opposition, Staff shall notify the Division Engineer for the relevant water division that it has not filed a Statement of Opposition, but that it may place an administrative call for the potentially affected ISF water right(s). Such a call could be enforced against the water right(s) subject of the application by the Division Engineer in his or her enforcement discretion. Staff also shall mail a letter to the applicant at the address provided on the application notifying the applicant: (a) of Staff's decision not to file a Statement of Opposition pursuant to this Rule; (b) that the CWCB may place a call for its ISF water rights to be administered within the prior appropriation system; and (c) that the Division Engineer's enforcement of the call could result in curtailment or other administration of the subject water right(s).

(2) If Staff files a Statement of Opposition, Staff shall seek Board ratification by identifying and summarizing the Statement of Opposition on the Board meeting consent agenda pursuant to Rule 8c.

8f. Cumulative Impact.

In determining existence of a de minimis impact, Staff shall consider the existence of all previous de minimis impacts on the same stream reach or lake. If the combined total of all such impacts exceeds 1 percent, then Staff will file a Statement of Opposition regardless of the individual depletive effect of an application.

8g. Notification of Staff Action.

At a Board meeting following a Staff determination to apply the De Minimis rule, the Staff shall notify the Board about the factual basis leading to its application of the De Minimis rule.

8h. Exclusion from De Minimis Rule.

The Board may at any time exclude any stream reach or lake, or any portion thereof, from application of the De Minimis rule.

8i. Pretrial Resolution.

Staff may negotiate a pretrial resolution of any injury or interference issue that is the subject of a Statement of Opposition. The Board shall review the pretrial resolution pursuant to the following procedures:

(1) No Injury.

In the event the pretrial resolution includes terms and conditions preventing injury or interference and does not involve a modification, or acceptance of injury or interference with mitigation, the Board is not required to review and ratify the pretrial resolution. Staff may authorize its counsel to sign any court documents necessary to finalize this type of pretrial resolution without Board ratification.

(2) No Injury/Modification.

In the event the pretrial resolution addresses injury or interference through modification of the existing ISF decree, the process set forth in Rule 9 shall be followed prior to any Board decision to ratify the pretrial resolution.

(3) Injury Accepted with Mitigation.

In the event a proposed pretrial resolution will allow injury to or interference with an ISF or natural lake level (NLL) water right, but mitigation offered by the applicant could enable the Board to accept the injury or interference while continuing to preserve or improve the natural environment to a reasonable degree, and if the proposed pretrial resolution does not include a modification under ISF Rule 9, the Board shall:

(a) Conduct a preliminary review of the proposed pretrial resolution during any regular or special meeting to determine whether the natural environment could be preserved or improved to a reasonable degree with the proposed injury or interference if applicant provided mitigation; and

(b) At a later regular or special meeting, take final action to ratify, refuse to ratify or ratify with additional conditions.

(c) No proposed pretrial resolution considered pursuant to this Rule 8i.(3) may receive preliminary review and final ratification at the same Board meeting.

(d) The Board shall not enter into any stipulation or agree to any decretal terms and conditions under this Rule that would result in the Division of Water Resources being unable to administer the affected ISF or NLL water right(s) in accordance with the priority system or with Colorado water law.

(e) To initiate CWCB staff review of an Injury with Mitigation proposal, the proponent must provide the following information in writing:

i. Location of injury to ISF or NLL water right(s) (stream(s) or lake(s) affected, and length of affected reach(es));

ii. Quantification of injury (amount, timing and frequency);

iii. Type of water use that would cause the injury;

iv. Analysis showing why full ISF or NLL protection is not possible;

v. Detailed description of the proposed mitigation, including all measures taken to reduce or minimize the injury;

vi. Detailed description of how the proposed mitigation will enable the Board to continue to preserve or improve the natural environment of the affected stream of lake to a reasonable degree despite the injury;

vii. Identification and feasibility analysis of: (1) all water supply alternatives considered by the proponent in the context of this proposal; (2) all alternatives evaluated by the proponent to fully protect the potentially affected ISF or NLL water right, but rejected as infeasible; and (3) all alternatives evaluated by the proponent and designed to mitigate the injury to or interference with the affected ISF or NLL water right. This information shall address the environmental and economic benefits and consequences of each alternative; and

viii. A discussion of the reasonableness of each alternative considered.

(f) After receipt and review of the required information, staff will consult with CPW and with the entity that originally recommended the affected ISF or NLL water rights(s) (if other than CPW) to determine whether additional field work is necessary and to identify any scheduling concerns. Staff will request a recommendation from CPW as to whether the proposed mitigation will enable the Board to continue to preserve or improve the natural environment of the affected stream or lake to a reasonable degree despite the injury, including a discussion of the reasonableness of the alternatives considered. CWCB staff will use best efforts to consult with affected land owners and managers regarding the proposal.

(g) Prior to bringing the proposal to the Board for preliminary consideration, staff will consult with the Division of Water Resources on whether the proposal would result in the Division of Water Resources being unable to administer the affected ISF or NLL water right(s) in accordance with the priority system or with Colorado water law.

(h) At the first meeting of the two-meeting process required by this Rule, staff will bring the proposal to the Board for preliminary consideration after completing its review of the proposal and its consultation with CPW. Staff will work with the proponent and interested parties to address any preliminary concerns prior to bringing a proposal to the Board. Preliminary consideration by the Board may result in requests for more information or for changes to the proposal. Staff will work with the proponent and interested parties to finalize the proposal and bring it back to the Board for final action at a subsequent Board meeting.

(i) The Board will consider the following factors when evaluating Injury with Mitigation proposals. Because Injury with Mitigation proposals may involve unique factual situations, the Board may consider additional factors in specific cases. Further, evaluation of each Injury with Mitigation proposal will require the exercise of professional judgment regarding the specific facts of the proposal.

i. Extent of the proposed injury:

1. Location of injury – affected stream(s) or lake and length of affected reach(es);

2. Amount, timing and frequency of shortage(s) or impacts to the affected ISF of NLL water right(s); and

3. Potential impact to the natural environment of the affected stream reach(es) or lake from the proposed injury.

ii. Benefits of the mitigation to the natural environment:

1. The nature and extent of the benefits the mitigation will provide to the existing natural environment of the affected stream or lake;

2. The scientific justification for accepting the mitigation; and

3. Whether the mitigation will enable the Board to continue to preserve or improve the natural environment of the subject stream or lake to a reasonable degree.

(j) Evaluation of proposed alternatives. The Board shall evaluate: (1) all water supply alternatives considered by the proponent in the context of this proposal; (2) all alternatives evaluated by the proponent to fully protect the potentially affected ISF or NLL water right, but rejected as infeasible; and (3) all alternatives evaluated by the proponent and designed to mitigate the injury to or interference with the affected ISF or NLL water right. In its evaluation, the Board shall consider the following factors:

i. Availability of on-site mitigation alternatives;

ii. Technical feasibility of each alternative;

iii. Environmental benefits and consequences of each alternative;

iv. Economic benefits and consequences of each alternative;

v. Reasonableness of alternatives;

vi. Administrability of proposed alternatives by the Board and the Division Engineer; and

vi. For mitigation alternatives, whether the mitigation was or will be put in place to satisfy a requirement or need unrelated to the Injury with Mitigation proposal.

(k) The Board will consider mitigation on a different reach of stream or another stream ("off-site mitigation") as a last resort and will only consider mitigation in an area other than the affected stream reach if no reasonable alternative exists for mitigation on the affected stream reach. The Board only will consider off-site mitigation on stream(s) located in the same drainage as the affected stream. Factors that the Board may consider in looking at such a proposal include, but are not limited to, the degree and frequency of impact to the affected stream; the environmental benefits provided to the off-site stream by the mitigation; whether the proposal could, in effect, constitute a modification of the ISF water right on the affected stream; or whether the proposal could result in the Division of Water Resources being unable to administer the affected ISF water right(s) in accordance with the priority system or with Colorado water law.

(l) Stipulations and water court decrees that incorporate Injury with Mitigation shall include, but not be limited to inclusion of, the following terms and conditions:

i. A provision that the proponent will not divert water or take any other action that would reduce flows in the affected stream or levels in the affected lake below the decreed ISF or NLL amount until the agreed-upon mitigation measures are in place and fully operational;

ii. A requirement that the structural components of the mitigation be maintained permanently;

iii. A provision allowing CWCB or CPW staff access to the property on which structural components of the mitigation are located to inspect the structures at certain time intervals, and, if necessary, to perform biological stream or lake monitoring. This provision shall clearly define the reasonable nature, extent and timing of such access (i.e, advance notice, dates, times or season of access, coordination with proponent, and location and routes of access);

iv. A term providing that if the proponent ceases to provide the agreed upon mitigation (such as removing structural components or failing to maintain them to a specified level, or ceasing to implement non-structural components), that the proponent will not divert water or take any other action that would reduce flows in the affected stream or levels in the affected lake below the decreed ISF or NLL amount because the Board will no longer accept the injury based upon the mitigation no longer being in effect -- in such case, if the Board places a call for the affected ISF or NLL water right, the Board will notify the Division Engineer that this provision of the decree now is in effect and that the Board is not accepting the injury;

v. A requirement that the proponent install and pay operation and maintenance costs of (or commit to pay operation and maintenance costs if the CWCB installs) any measuring devices deemed necessary by the Division Engineer to administer the terms of the stipulation and decree implementing the Injury with Mitigation pretrial resolution; and

vi. A term providing that the water court will retain jurisdiction to enforce the terms and conditions set forth above in subsections (i) - (vi), and any other terms and conditions specific to the Injury with Mitigation pretrial resolution, as a water matter.

8j. Authorization to Proceed to Trial.

In the event that a Statement of Opposition filed by the Board is not settled prior to the last regularly scheduled Board meeting prior to the trial date, Staff shall seek Board authorization to proceed to trial. In the event that Staff is authorized to proceed to trial, the Board may adjourn to executive session to discuss settlement parameters with its counsel. Staff is authorized to settle any litigation without Board ratification if the settlement terms are consistent with instructions given by the Board to its counsel.

8k. Public Review Process.

The Board shall follow the public review process in Rules 11a. - 11c. prior to consideration of a request to ratify a pretrial resolution pursuant to Rule 8i.(3).

8l. Notice.

At any time Staff verifies that an ISF water right is not being fulfilled as a result of water use against which the ISF water right is entitled to protection, the Staff shall provide Proper Notice, including a description of what the Board is doing in response to the situation.

9. MODIFICATION OF ISF RIGHTS.

The Board may modify any existing decreed ISF right according to the procedures set forth in this Rule. "Modification" of an ISF right within the meaning of this Rule includes a decrease in the rate of flow described in the existing ISF decree, segmenting an existing ISF reach into shorter reaches with the result of decreasing the rate of flow in any portion of an ISF reach, or subtracting water from an ISF right during any particular time period or season.

9a. Need for Modification.

Modification may be requested by the Staff or by any Person who has filed a water right application on an ISF reach or who has applied for any governmental permit for facilities located in or near an ISF reach and who complies with Rules 9b. and 9c. Any request for modification, except by staff, shall be made in writing, submitted to Staff and such writing shall contain the following information:

(1) name, address and telephone number of the Person seeking modification;

(2) stream or lake subject of request;

(3) modification requested;

(4) reason for modification; and

(5) the scientific data supporting the request.

9b. Need for Water.

Any Person who requests a modification of an ISF right must, as a precondition to the Board's consideration of the request, establish a need for the water made available by the modification. Staff does not have to comply with this rule and any governmental entity seeking to implement the terms of an agreement specified in Rule 9f. does not have to comply with this section.

9c. Grounds for Modification.

No request for modification may be considered until the applicant establishes that one of the following reasons for modification exists:

(1) Mistake.

An ISF right may be considered for modification if the requesting Person establishes that an error was made in the calculations upon which the original or supplemental appropriation or enlargement to an original appropriation was made.

(2) Excessive Flow.

An ISF right may be considered for modification if the requesting Person establishes that the ISF flow rate is in excess of the amount of water necessary to accomplish the purpose of the original, supplemental or enlarged ISF right when that right was appropriated.

9d. Recovery Implementation or Other Intergovernmental Agreement.

An ISF right may be modified if such modification was agreed upon by the Board as part of the Recovery Implementation Program for the Endangered Fishes of the Colorado River Basin or any other agreement between the Board and another governmental entity. Modifications made as a part of the Recovery Implementation Program for the Endangered Fishes of the Colorado River Basin need not be subject to the public review process in Rule 9e. Criteria for modifications made in the ISF rights decreed as part of the Recovery Implementation Program for the Endangered Fishes of the Colorado River Basin will be established in the decrees governing such appropriations.

9e. Public Review Process of Requests for Modification.

The Board shall adhere to the following public review process when considering requests for modification:

(1) Notice.

Notice of the proposed modification and the date of the public meeting at which it will first be considered shall be printed in the resume in the Water Court having jurisdiction over the decree that is the subject of the modification. The first public meeting of the Board at which the modification is to be considered shall occur at least sixty days after the month in which the resume is published. Notice shall also be published in a newspaper of statewide distribution within thirty to forty-five days prior to such first public meeting.

(2) Public Meeting.

If the Board decides at such first public meeting to give further consideration to the proposed modification, the Board shall announce publicly the date of a subsequent public meeting for such purpose. If the Board decides that it will not give further consideration to the proposed modification, it shall state, in writing, the basis for its decision.

(3) Request for Delay.

On the written request of any Person made within thirty days after the date of the first public meeting, the Board shall delay the subsequent public meeting for up to one year to allow such Person the opportunity for the collection of scientific data material to the proposed modification. The Board need not grant the request if it determines that the request is made solely to delay the proceedings.

(4) Procedures.

On the written request of any Person made within thirty days after the date of the first public meeting, the Board shall, within sixty days after such request, establish fair and formal procedures for the subsequent public meeting, including the opportunity for reasonable disclosure, discovery, subpoenas, direct examination, and cross examination. Subject to these rights and requirements, where a meeting will be expedited and the interests of the participants will not be substantially prejudiced thereby, the Board may choose to receive all or part of the evidence in written form.

(5) Final Determination.

The Board shall issue a final written determination regarding the modification that shall state its effective date, be mailed promptly to the Persons who appeared by written or oral comment at the Board's proceeding, and be filed promptly with the water court.

10. ENFORCEMENT AGREEMENTS.

The Board may attach conditions to an appropriation, decreased appropriation, or acquisition, and may enter into any enforcement agreements that it determines will preserve or improve the natural environment to a reasonable degree. The Board may enter into enforcement agreements that limit the Board's discretion in the protection, approval of inundation, modification or disposal of ISF right, and/or may delegate limited authority to act on the Board's behalf.

10a. Ratification of Enforcement Agreements.

No enforcement agreement shall be effective to limit the discretion of the Board until that agreement and all of its terms are reviewed and ratified by the Board. Upon ratification, the Director may execute the agreement and the agreement shall be binding upon the Board for the term set forth in the enforcement agreement.

10b. Public Review Process.

The Board shall follow the public review process set forth in Rules 11a. - 11c. prior to any Board decision to ratify an Enforcement Agreement.

11. PUBLIC REVIEW PROCESS.

Except as otherwise provided in the ISF Rules, the Board shall follow the public review process set forth below prior to any Board decision requiring public review.

11a. Public Notice.

Public notice of all Board actions under these Rules shall be provided through the agenda of each regular or special Board meeting.

11b. Public Comment.

Except as otherwise provided in Rules 5k. and 6m., at a regular or special meeting, the Board shall consider public comment on the recommended ISF action prior to the Board action on the recommendation in any or all of the following manners:

(1) Oral and/or written comments may be directed to Staff. When such comments are made, Staff may summarize these comments to the Board.

(2) Oral and/or written comments, subject to reasonable limitations established by the Board, may be made directly to the Board during the public meeting.

11c. Public Agency Recommendations.

Prior to taking an ISF action pursuant to Rules 5 or 6, the Board shall request recommendations from Colorado Parks and Wildlife. The Board shall also request recommendations from the United States Department of Agriculture and the United States Department of Interior. The Board may also request comments from other interested Persons or agencies as it deems appropriate.

Prior to taking an ISF action pursuant to Rules 7, 8, 9, or 10, the Board may request recommendations from Colorado Parks and Wildlife, the Division of Water Resources, the United States Department of Agriculture, the United States Department of Interior or other Persons as it deems appropriate.

11d. Board Procedures.

At a regular or special Board meeting, the Board may, as necessary, adopt or amend procedures to supplement these rules.

12. SEVERABILITY.

In the event that any section or subsection of these Rules are judged to be invalid by a court of law or are allowed to expire by the General Assembly, the remaining Rules shall remain in full force and effect.

Editor's Notes

History

Entire rule eff. 03/02/2009.

Rules 4c, 6f.(2), 6k, 6m, 7d, 8i(3), 11c eff. 03/17/2021.

COLORADO
Colorado Water Conservation Board
Department of Natural Resources
1313 Sherman Street, Room 718, Denver, Colorado 80203
Phone: (303) 866-3441 * Fax: (303) 866-4474
https://cwcb.colorado.gov/

Pursuant to ISF Rule 5c. of the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, this notice identifies the streams to be considered for instream flow (ISF) appropriations in 2021. At the January 2021 meeting of the Colorado Water Conservation Board (CWCB), staff may request that the Board form its intent to appropriate ISF water rights for the streams listed on the attached ISF recommendation List. The attached list contains a description of the ISF recommendations including water division, stream name, watershed, county, length, upper terminus, and lower terminus.

Copies of the available ISF recommendations and data submitted into the Official CWCB Record can be reviewed by the public during regular business hours (8:00 a.m. - 5:00 p.m.) at the CWCB's office, located at 1313 Sherman Street, Room 718, Denver, Colorado, 80203. The ISF Recommendations are also available online at: https://cwcb.colorado.gov/2021-isf-recommendations

In addition to the ISF recommendations, staff may rely on any additional data, exhibits, testimony, or other information submitted by any party as part of the Official CWCB Record to support its ISF recommendations.

It should also be noted that, pursuant to the ISF Rules:

5d. (3)
(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 31, 2021, 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 30, 2021 or the first business day thereafter.

(e) Staff will announce its Final Staff ISF Recommendation concerning contested appropriations at the September 2021 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 2021 Board meeting.

Note that section 37-92-102 (3) (b), C.R.S. (2019) provides: "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, contact Rob Viehl at the address set forth above or via email to rob.viehl@state.co.us.

The schedule set forth in (d), (e), and (f) above will apply to streams on which the CWCB declares its intent to appropriate water rights in January 2021. Should you wish to comment on the proposed ISF Recommendations or request more information on the applicability of section 37-92-102(3)(b) to present uses of water in or above the proposed ISF segments, you may do so by writing Rob Viehl, of the Board's staff at the address given above or by sending your comments by email to rob.viehl@state.co.us. It should be noted that while your appearance at any meeting is welcome, such an appearance is not necessary for your concerns to be recognized. Staff will take your comments into account and, if you so request, will present them to the Board in your absence. If you are not currently on the Board's ISF Subscription Mailing List and you would like to be, please contact Rob Viehl, or sign up online at: https://dwr.state.co.us/Portal/Login/

ISF Recommendations 2021

Div.	Stream Name	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
1	Dry Gulch*	Clear Creek	Clear Creek	2.83	headwaters	confluence Clear Creek
1	Garber Creek*	Upper South Platte	Douglas	4.75	confluence North & South Garber Creeks	confluence West Plum Creek
1	Herman Gulch* *(Increase)*	Clear Creek	Clear Creek	3.64	headwaters	confluence Clear Creek
1	North Fork Little Thompson River	Big Thompson	Larimer	5.96	confluence unnamed tributary	confluence Little Thompson River
1	Platte Gulch	South Platte Headwaters	Park	1.54	headwaters	confluence MF South Platte River
1	Redstone Creek*	Big Thompson	Larimer	16.3	headwaters	confluence Buckhorn Creek
1	Spring Canyon	Cache La Poudre	Larimer	2.40	headwaters	confluence Horsetooth Reservoir
1	Sulzer Gulch	Big Thompson	Larimer	3.73	headwaters	confluence Big Thompson River
1	Unnamed Tributary to Duck Creek	Upper South Platte	Clear Creek	1.08	outlet of Lower Square Top Lake	inlet of Duck Lake

Div.	Stream Name	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
1	West Plum Creek*	Upper South Platte	Douglas	22.6	headwaters	confluence East Plum Creek
2	Cottonwood Creek*	Arkansas Headwaters	Custer	6.00	headwaters	F. Keuhn Ditch No. 2 headgate
2	Cottonwood Creek*	Arkansas Headwaters	Fremont	9.42	confluence Salt Creek	Giem Ditch headgate
2	East Fork Arkansas River	Arkansas Headwaters	Lake	6.46	headwaters	confluence Chalk Creek
2	East Gulch*	Arkansas Headwaters	Fremont	8.81	confluence Antelope Gulch	confluence Arkansas River
4	Beaver Dams Creek*	Uncompahgre	Ouray	3.29	headwaters	confluence East Fork Dry Creek
4	Big A Creek*	San Miguel	Montrose	1.42	headwaters	confluence Red Canyon Creek
4	Cottonwood Creek *(Increase)*	Lower Gunnison	Delta, Montrose	23.3	Hawkins Ditch headgate	confluence Roubideau Creek
4	Cow Creek	Uncompahgre	Ouray	11.8	USFS Property boundary	confluence Uncompahgre River
4	Curecanti Creek* *(Increase)*	Upper Gunnison	Gunnison	21.4	headwaters	confluence Morrow Point Reservoir
4	East Fork Dry Creek*	Uncompahgre	Montrose, Ouray	3.11	headwaters	confluence Beaver Dams Creek
4	East Muddy Creek*	North Fork Gunnison	Gunnison	6.32	confluence Lee Creek	confluence West Muddy Creek
4	Elk Creek*	East-Taylor	Gunnison	2.66	headwaters	confluence Coak Creek
4	Gold Creek	Tomichi	Gunnison	0.45	Tarkington Ditch headgate	confluence Quartz Creek
4	Kelly Creek*	San Miguel	Montrose	1.59	headwaters	confluence Red Canyon Creek
4	Little Cimarron River *(Increase)*	Upper Gunnison	Gunnison	2.49	confluence Van Boxel Creek	Butte Ditch headgate
4	Little Cimarron River	Upper Gunnison	Gunnison, Montrose	6.56	Butte Ditch headgate	confluence Cimarron River
4	Main Hubbard Creek*	North Fork Gunnison	Delta	2.50	headwaters	Overland Ditch
4	Middle Hubbard Creek*	North Fork Gunnison	Delta	2.37	headwaters	Overland Ditch

Div.	Stream Name	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
4	Monitor Creek	Lower Gunnison	Montrose	9.44	USFS Property Boundary	confluence Potter Creek
4	Naturita Creek *(Increase)*	San Miguel	San Miguel	11.0	headwaters	Norwood Road Crossing
4	Naturita Creek	San Miguel	Montrose, San Miguel	20.2	Norwood Road Crossing	confluence San Miguel River
4	Pine Creek	Upper Gunnison	Gunnison	16.7	headwaters	confluence Morrow Point Reservoir
4	Potter Creek *(Increase)*	Lower Gunnison	Montrose	9.82	USFS Property Boundary	confluence Roubideau Creek
4	Red Canyon*	San Miguel	Montrose	3.25	headwaters	confluence Big A Creek
4	Spring Creek	San Miguel	Montrose	7.47	headwaters	Crabtree Ditch headgate
4	West Hubbard Creek*	North Fork Gunnison	Delta	2.32	headwaters	Overland Ditch
4	West Muddy Creek*	North Fork Gunnison	Gunnison	5.52	confluence Ault Creek	confluence East Muddy Creek
4	Wildcat Creek*	East-Taylor	Gunnison	2.48	Outlet of Green Lake	confluence Coal Creek
6	Bear Creek	Upper White	Garfield	3.09	headwaters	confluence NF White River
6	Big Fish Creek	Upper White	Garfield	4.30	headwaters	confluence NF White River
6	East Marvine Creek	Upper White	Rio Blanco	7.31	headwaters	confluence Marvine Creek
6	Hauskins Creek	Upper White	Garfield	2.11	headwaters	confluence NF White River
6	Hill Creek	Upper White	Rio Blanco	3.84	headwaters	Hill Creek Ditch #2 & #3 headgate
6	Lynx Creek	Upper White	Garfield	1.58	headwaters	confluence NF White River
6	Milk Creek	Lower Yampa	Moffat	4.11	confluence Wilson Creek	confluence Yampa River
6	Mirror Creek	Upper White	Rio Blanco	2.16	headwaters	confluence NF White River
6	Paradise Creek	Upper White	Garfield, Rio Blanco	2.98	headwaters	Paradise Ponds Diversion Headgate

Div.	Stream Name	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
6	Piceance Creek	Piceance-Yellow	Garfield, Rio Blanco	6.93	headwaters	confluence unnamed tributary
6	Piceance Creek	Piceance-Yellow	Rio Blanco	3.83	confluence unnamed tributary	confluence Cow Creek
6	Picket Pin Creek	Upper White	Garfield	2.66	headwaters	confluence NF White River
6	South Fork White River	Upper White	Rio Blanco	8.07	Flat Tops Wilderness Area Boundary	confluence Swede Creek
6	Watson Creek	Upper Yampa	Routt	5.86	confluence Moody Creek	Hardscrabble Ditch headgate
7	Rincon La Vaca Creek	Upper San Juan	Hinsdale	4.47	headwaters	confluence Los Pinos River

*Recommendation received at January 2020 ISF Workshop

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Pursuant to ISF Rule 5c. of the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, this notice identifies the streams to be considered for instream flow (ISF) appropriations in 2021. At the January meeting of the Colorado Water Conservation Board (CWCB), staff may request that the Board form its intent to appropriate ISF water rights for the streams listed on the Instream Flow Recommendation List below.

Information submitted to the CWCB is available for review by the public during regular business hours (8:00 a.m. - 5:00 p.m.) at the Colorado Water Conservation Board's office, located at 1313 Sherman Street, Room 718, Denver, Colorado, 80203. This information is also available online at:

https://cwcb.colorado.gov/2021-isf-recommendations

In addition to the ISF Recommendations and Appendices, staff may rely on any additional data, exhibits, testimony, or other information submitted by any party as part of the Official CWCB Record to support the ISF Recommendations.

It should also be noted that, pursuant to the ISF Rules:

5d. (3)
(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 31, 2021, 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 30, 2021 or the first business day thereafter.

(e) Staff will announce its Final Staff ISF Recommendation concerning contested appropriations at the September 2021 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 2021 Board meeting.

The schedule set forth in (d), (e), and (f) above will apply to streams on which the CWCB declares its intent to appropriate water rights in January 2021.

Note that section 37-92-102 (3) (b), C.R.S. (2020) provides: "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, contact Rob Viehl at the address set forth above or via email to rob.viehl@state.co.us.

Should you wish to comment on the proposed ISF Recommendations, you may do so by writing Rob Viehl of the Board's staff at the address or email given above. Your appearance at any meeting is welcome, but not necessary. If you request, staff will submit your written comments to the Board. If you are not currently on the Board's Instream Flow Subscription Mailing List and you would like to be, please contact the Board's Office at the address given above.

Instream Flow Recommendations 2021

Water Div.	Stream Name *(Segment Upper/Lower Termini)*	Recommending Entity	County	Length (miles)
1	Dry Gulch *(headwaters to the confluence with Clear Creek)*	CPW	Clear Creek	2.83
1	North Fork Little Thompson River *(confluence Beartrap Gulch to the confluence Little Thompson River)*	CPW, Larimer County	Larimer	4.51
1	Redstone Creek *(headwaters to the confluence with Buckhorn Creek)*	CPW, Larimer County	Larimer	16.33
2	East Fork Arkansas River *(headwaters to confluence Chalk Creek)*	BLM	Lake	6.46
4	Cottonwood Creek *(Increase)* *(Hawkins Ditch headgate to confluence Roubideau Creek)*	BLM	Delta, Montrose	23.3
4	Cow Creek *(confluence with Nate Creek to the confluence with the Uncompahgre River)*	CPW	Ouray	8.54
4	Elk Creek *(headwaters to the confluence with Coal Creek)*	HCCA	Gunnison	2.66
4	Gold Creek *(Tarkington Ditch headgate to the confluence with Quartz Creek)*	HCCA	Gunnison	0.45
4	Monitor Creek *(U.S. Forest Service Property Boundary to confluence with Potter Creek)*	BLM	Montrose	9.44

Water Div.	Stream Name *(Segment Upper/Lower Termini)*	Recommending Entity	County	Length (miles)
4	Potter Creek *(Increase)* *(U.S. Forest Service Property Boundary to confluence Monitor Creek)*	BLM	Montrose	8.1
4	Potter Creek *(Increase)* *(confluence with Monitor Creek to confluence with Roubideau Creek)*	BLM	Montrose	1.72
4	Spring Creek *(headwaters to Crabtree Ditch headgate)*	BLM	Montrose	7.47
4	Wildcat Creek *(outlet of Green Lake to the confluence with Coal Creek)*	HCCA	Gunnison	2.48
6	Watson Creek *(confluence with Moody Creek to the Hardscrabble Ditch headgate)*	BLM	Routt`	5.86
7	Rincon La Vaca *(headwaters to the confluence with the Los Pinos River)*	CPW	Hinsdale	4.47

BLM = Bureau of Land Management; CPW = Colorado Parks and Wildlife; HCCA = High Country Conservation Advocates

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NOTICE

To: Instream Flow Subscription Mailing Lists

Subject: Proposed 2021 Instream Flow Appropriations in Water Divisions 2, and 4

Date: March 16, 2021

At its March 10-11, 2021 regular meeting, the Colorado Water Conservation Board (CWCB) declared its intent to appropriate instream flow (ISF) water rights on three stream segments. The attached ISF table provides the water division, stream name, watershed, county, length, upper terminus, lower terminus, and flow rates for all of these stream segments. Copies of the Instream Flow Recommendations and appendices of data submitted into the Official CWCB Record are available online at: https://cwcb.colorado.gov/2021-isf-recommendations. Information can also be reviewed by appointment at the Colorado Water Conservation Board's Office, located at 1313 Sherman Street, Room 718, Denver, Colorado, 80203.

In addition to the above Instream Flow Recommendation Summary Reports and Appendices, staff may rely on any additional data, exhibits, testimony, or other information submitted by any party as part of the Official CWCB Record to support its Instream Flow Recommendations. Pursuant to Rule 5d.(3) of the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program adopted by the Colorado Water Conservation Board, it should also be noted that:

(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 June 1, 2021. All Notices of Party status and Contested Hearing Participant status must be received at the Board office no later than June 30, 2021.

(e) Staff will announce its Final staff Instream Flow Recommendation concerning contested appropriations at the November 2021 Board meeting and, prior to that meeting, 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 July 2021 Board meeting.

A notice to contest an ISF appropriation must be made in writing and contain the following information: (a) identification of the Person(s) requesting the hearing; (b) identification of the ISF at issue; and (c) the contested facts and a general description of the data upon which the Person will rely to the extent known at that time.

Note that section 37-92-102 (3) (b), C.R.S. (2020) provides: "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, contact Rob Viehl at the CWCB address noted above or via email to rob.viehl@state.co.us.

Should you wish to comment on the proposed ISF Recommendations or request more information you may do so by writing Rob Viehl of the Board's staff at the address or email given above. Your appearance at any meeting is welcome, but not necessary. If you request, Staff will present your written comments to the Board. If you are not currently on the Board's ISF Subscription Mailing List and you would like to be, please contact Rob Viehl, or sign up online at: https://dwr.state.co.us/Portal/Login/

Instream Flow Recommendations

Water Div	Stream	Watershed	County	Length (miles)	Upper Terminus (UTM)	Lower Terminus (UTM)	Flow Rate, cfs (Timing)
2	East Fork Arkansas River	Arkansas Headwaters	Lake	6.46	headwaters in the vicinity of: E: 399540.97 N:4353749.78	confl Chalk Creek at E: 394793.07 N: 4356126.94	0.25 (12/16 - 04/30) 7 (05/01 - 07/31) 2.8 (08/01 - 09/20) 0.7 (09/21 - 12/15)
4	Cow Creek	Uncompahgre	Ouray	7.4	confl Lou Creek at E: 265665.02 N: 4231002.60	confl Uncompahgre River at E: 258039.02 N: 4237591.58	7.2 (01/01 - 03/31) 20 (04/01 - 04/30) 53 (05/01 - 06/30) 20 (07/01 - 07/31) 15 (08/01 - 08/15) 7.2 (08/16 - 08/28) 5.9 (08/29 - 09/19) 7.2 (09/20 - 12/31)
4	Wildcat Creek	East-Taylor	Gunnison	2.48	outlet of Green Lake at E: 323800.20 N: 4301420.95	confl Coal Creek at E: 325687.24 N: 4304206.95	0.35 (12/01 - 03/31) 0.65 (04/01 - 04/30) 2.1 (05/01 - 08/31) 0.6 (09/01 - 11/30)

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November 13, 2023

Pursuant to ISF Rule 5c. of the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, this notice identifies the streams and lake to be considered for instream flow (ISF) and natural lake level (NLL) appropriations in 2024. At the January or March meeting of the Colorado Water Conservation Board (CWCB), staff may request that the Board form its intent to appropriate ISF and NLL water rights for the streams listed in Table 1 and the lake listed in Table 2 below.

Information submitted to the CWCB is available online at:
https://cwcb.colorado.gov/2024-ISF-Recommendations

In addition to the ISF & NLL Recommendations and Appendices, staff may rely on any additional data, exhibits, testimony, or other information submitted by any party as part of the Official CWCB Record to support the ISF Recommendations.

It should also be noted that, pursuant to the ISF Rules:

5d. (3)
(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 31, 2024, 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 30, 2024, or the first business day thereafter.

(e) Staff will announce its Final Staff ISF Recommendation concerning contested appropriations at the September 2024 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 2024 Board meeting.

The schedule set forth in (d), (e), and (f) above will apply to streams on which the CWCB declares its intent to appropriate water rights in January 2024. If the CWCB declares its intent to appropriate water rights at its March 2024 meeting a modified schedule will be used.

Note that section 37-92-102 (3) (b), C.R.S. provides: "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, contact Rob Viehl at the address set forth above or via email to rob.viehl@state.co.us.

Should you wish to comment on the proposed ISF or NLL Recommendations, you may do so by writing Rob Viehl of the Board's staff at the address or email given above. Your appearance at any meeting is welcome, but not necessary. If you request, staff will submit your written comments to the Board. If you are not currently on the Board's Instream Flow Subscription Mailing List and you would like to be, please sign up here: https://dwr.state.co.us/Portal/cwcb/NotificationLists

Table 1. Instream Flow Recommendations

Div	Stream	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
1	Square Top Creek	Upper South Platte	Clear Creek	1.08	outlet of Lower Square Top Lake	inlet of Duck Lake
1	Williams Gulch	Cache La Poudre	Larimer	4.47	headwaters	confluence Cache la Poudre River
4	Deer Creek	East-Taylor	Gunnison	3.38	headwaters	Beitler No. 1 headgate
4	East Muddy Creek	North Fork Gunnison	Gunnison	6.32	confluence Lee Creek	confluence West Muddy Creek
4	North Lobe Creek	Lower Dolores	Mesa	7.25	headwaters	Highline Ditch headgate
4	Splains Gulch	East-Taylor	Gunnison	2.48	headwaters	confluence Coal Creek
4	West Muddy Creek	North Fork Gunnison	Gunnison	5.52	confluence Ault Creek	confluence East Muddy Creek
6	Ways Gulch	Upper Yampa	Routt	2.25	headwaters	BLM property boundary

6	Wheeler Creek	Upper North Platte	Jackson	3.22	headwaters	Akers Ditch headgate

Table 2. Natural Lake Level Recommendation

Div	Lake	Watershed	County	Volume (acre-feet)	Location (Center-point) (NAD 1983 Zone 13 North)
2	Titan Lake	Arkansas Headwaters	Lake	2.2	UTM-East: 377505.25 UTM-North: 4356622.28

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March 11, 2022

Pursuant to ISF Rule 5c. of the Rules Concerning the Colorado Instream Flow (ISF) and Natural Lake Level (NLL) Program, this notice identifies the streams and lakes that may be considered for ISF and NLL appropriations in 2023. At the January 2023 meeting of the Colorado Water Conservation Board (CWCB), staff may request that the Board form its intent to appropriate ISF and NLL water rights for the streams and lake listed on the attached recommendation list.

The ISF and NLL Recommendations are available online at: https://cwcb.colorado.gov/2023-isf-recommendations. Information can also be reviewed by appointment at the CWCB's office, located at 1313 Sherman Street, Room 718, Denver, Colorado, 80203.

In addition to the ISF and NLL recommendations, staff may rely on any additional data, exhibits, testimony, or other information submitted by any party as part of the Official CWCB Record.

It should also be noted that, pursuant to the ISF Rules:

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(d) Any Notice to Contest must be received at the Board office no later than March 31, 2023, 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 30, 2023 or the first business day thereafter.

(e) Staff will announce its Final Staff ISF Recommendation concerning contested appropriations at the September 2023 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 2023 Board meeting.

Note that section 37-92-102 (3) (b), C.R.S. provides: "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, contact Rob Viehl at the address set forth above or via email to rob.viehl@state.co.us.

The schedule set forth in (d), (e), and (f) above will apply to streams and lakes on which the CWCB declares its intent to appropriate water rights in January 2023. Should you wish to comment on the proposed ISF and NLL Recommendations or request more information you may do so by writing Rob Viehl of the Board's staff at the address or email given above. Your appearance at any meeting is welcome, but not necessary. If you request, Staff will present your written comments to the Board. If you are not currently on the Board's ISF Subscription Mailing List and you would like to be, sign up online at: https://dwr.state.co.us/Portal/Login/

ISF Recommendations

Div.	Stream Name	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
1	Garber Creek	Upper South Platte	Douglas	4.75	confl North and South Garber Creeks	confl West Plum Creek
1	Herman Gulch *(Increase)*	Clear Creek	Clear Creek	3.64	headwaters	confl Clear Creek
1	Platte Gulch	South Platte Headwaters	Park	1.54	headwaters	confl MF South Platte River
1	Sulzer Gulch	Big Thompson	Larimer	3.73	headwaters	confl Big Thompson River
1	Unnamed Tributary to Duck Creek	Upper South Platte	Clear Creek	1.08	outlet of Lower Square Top Lake	inlet of Duck Lake
1	West Plum Creek	Upper South Platte	Douglas	22.6	headwaters	confl East Plum Creek
2	Cottonwood Creek	Arkansas Headwaters	Custer	6.00	headwaters	F. Keuhn Ditch No. 2 hdgt
2	Cottonwood Creek	Arkansas Headwaters	Fremont	9.42	confl Salt Creek	Giem Ditch hdgt
2	East Gulch	Arkansas Headwaters	Fremont	8.81	confl Antelope Gulch	confl Arkansas River
4	Beaver Dams Creek	Uncompahgre	Ouray	3.29	headwaters	confl East Fork Dry Creek
4	Big A Creek	San Miguel	Montrose	1.42	outlet of unnamed lake	confl Red Canyon Creek
4	Cottonwood Creek *(Increase)*	Lower Gunnison	Delta Montrose	23.3	Hawkins Ditch hdgt	confl Roubideau Creek
4	Cameron Creek*	East-Taylor	Gunnison	3.69	headwaters	confl Lottis Creek
4	Cross Creek*	East-Taylor	Gunnison	2.48	headwaters	confl Lottis Creek
4	Curecanti Creek *(Increase)*	Upper Gunnison	Gunnison	21.4	headwaters	confl Morrow Point Reservoir

Div.	Stream Name	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
4	East Fork Dry Creek	Uncompahgre	Montrose Ouray	3.11	headwaters	confl Beaver Dams Creek
4	East Muddy Creek	North Fork Gunnison	Gunnison	6.32	confl Lee Creek	confl West Muddy Creek
4	Goat Creek	San Miguel	San Miguel	6.25	headwaters	confl Beaver Creek
4	Kelly Creek	San Miguel	Montrose	1.59	headwaters	confl Red Canyon Creek
4	Little Cimarron River *(Increase)*	Upper Gunnison	Gunnison	2.49	confl Van Boxel Creek	Butte Ditch hdgt
4	Little Cimarron River	Upper Gunnison	Gunnison Montrose	6.56	Butte Ditch hdgt	confl Cimarron River
4	Main Hubbard Creek	North Fork Gunnison	Delta	2.50	headwaters	Overland Ditch
4	Middle Hubbard Creek	North Fork Gunnison	Delta	2.37	headwaters	Overland Ditch
4	Monitor Creek	Lower Gunnison	Montrose	9.44	USFS Property Boundary	confl Potter Creek
4	Pine Creek	Upper Gunnison	Gunnison	16.7	headwaters	confl Morrow Point Reservoir
4	Potter Creek *(Increase)*	Lower Gunnison	Montrose	8.10	USFS Property Boundary	confl Monitor Creek
4	Potter Creek *(Increase)*	Lower Gunnison	Montrose	1.72	confl Monitor Creek	confl Roubideau Creek
4	Red Canyon Creek	San Miguel	Montrose	3.25	headwaters	confl Big A Creek
4	Steuben Creek*	Upper Gunnison	Gunnison	9.96	confl West Steuben Creek	confl Blue Mesa Reservoir
4	Unnamed Tributary to EF Dry Creek *	Uncompahgre	Montrose Ouray	2.75	headwaters	confl EF Dry Creek
4	Van Boxel Creek*	Upper Gunnison	Gunnison	7.75	headwaters	confl Little Cimarron River
4	West Hubbard Creek	North Fork Gunnison	Delta	2.32	headwaters	Overland Ditch
4	West Muddy Creek	North Fork Gunnison	Gunnison	5.52	confl Ault Creek	confl East Muddy Creek
4	West Steuben Creek*	Upper Gunnison	Gunnison	5.39	headwaters	confl East Steuben Creek
5	Coon Creek*	Colorado Headwaters-Plateau	Mesa	4.71	Coon Creek Reservoir No. 4	South Side Canal
5	Derby Creek* *(Increase)*	Colorado headwaters	Eagle	8.42	confl South Derby Creek	confl Colorado River

Div.	Stream Name	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
5	Little Elk Creek*	Roaring Fork	Pitkin	1.98	headwaters	Elk Creek No. 1 Ditch hdgt
5	Rock Creek	Colorado headwaters	Grand	4.92	headwaters	confl Colorado River
6	Bear Creek	Upper White	Garfield	3.09	headwaters	confl NF White River
6	Big Fish Creek	Upper White	Garfield	4.30	headwaters	confl NF White River
6	East Marvine Creek	Upper White	Rio Blanco	7.31	headwaters	confl Marvine Creek
6	Hill Creek	Upper White	Rio Blanco	3.84	headwaters	Hill Creek Ditch #2 & #3 hdgt
6	Hauskins Creek	Upper White	Garfield	2.11	headwaters	confl NF White River
6	Lynx Creek	Upper White	Garfield	1.58	headwaters	confl NF White River
6	Milk Creek	Lower Yampa	Moffat	4.11	confl Wilson Creek	confl Yampa River
6	Mirror Creek	Upper White	Rio Blanco	2.16	headwaters	confl NF White River
6	Paradise Creek	Upper White	Garfield Rio Blanco	2.98	headwaters	Paradise Ponds Diversion Hdgt
6	Piceance Creek	Piceance-Yellow	Garfield Rio Blanco	6.93	headwaters	confl unnamed tributary
6	Piceance Creek	Piceance-Yellow	Rio Blanco	3.83	confl unnamed tributary	confl Cow Creek
6	Picket Pin Creek	Upper White	Garfield	2.66	headwaters	confl NF White River
6	South Fork White River	Upper White	Rio Blanco	8.07	Flat Tops Wilderness Area Boundary	confl Swede Creek
6	Vermillion Creek*	Vermilion	Moffat	18.55	confl Talamantes Creek	confl Ink Springs
6	Vermillion Creek*	Vermilion	Moffat	10.12	confl Ink Springs	Vermillion Ditch hdgt
6	Vermillion Creek*	Vermilion	Moffat	7.33	Vermillion Ditch hdgt	confl Green River
6	Ways Gulch*	Upper Yampa	Routt	4.45	headwaters	confl Willow Creek
6	Wheeler Creek*	Upper North Platte	Jackson	3.22	headwaters	Ackers Ditch hdgt

NLL Recommendations

Div.	Lake Name	Watershed	County	Location (NAD 1983 Zone 13 North)
4	Hack Lake*	Colorado headwaters	Garfield	UTM: 4409994.98N UTML 316816.32E

*Recommendation received at February 2022 ISF Workshop

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

1313 Sherman Street, Room 718, Denver, Colorado 80203
Phone: (303) 866-3441 * Fax: (303) 866-4474
https://cwcb.colorado.gov

March 10, 2023

CWCB Public Notice of 2024 Instream Flow & Natural Lake Level Recommendations

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Pursuant to ISF Rule 5c. of the Rules Concerning the Colorado Instream Flow (ISF) and Natural Lake Level (NLL) Program, this notice identifies the streams and lakes that may be considered for ISF and NLL appropriations in 2024. At the January 2024 meeting of the Colorado Water Conservation Board (CWCB), staff may request that the Board form its intent to appropriate ISF and NLL water rights for the streams and lake listed in the recommendation tables below.

The ISF and NLL Recommendations are available online at: https://cwcb.colorado.gov/2024-isf-recommendations. Information can also be reviewed by appointment at the CWCB's office, located at 1313 Sherman Street, Room 718, Denver, Colorado, 80203. In addition to the ISF and NLL recommendations, staff may rely on any additional data, exhibits, testimony, or other information submitted by any party as part of the Official CWCB Record.

It should also be noted that, pursuant to the ISF Rules:

5d. (3)
(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 31, 2024, 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 30, 2024 or the first business day thereafter.

(e) Staff will announce its Final Staff ISF Recommendation concerning contested appropriations at the September 2024 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 2024 Board meeting.

Note that section 37-92-102 (3) (b), C.R.S. provides: "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, contact Rob Viehl at the address above or via email to rob.viehl@state.co.us.

The schedule set forth in (d), (e), and (f) above will apply to streams and lakes on which the CWCB declares its intent to appropriate water rights in January 2024. Should you wish to comment on the proposed ISF and NLL Recommendations or request more information you may do so by writing Rob Viehl of the Board's staff at the address or email given above. Your appearance at any meeting is welcome, but not necessary. If you request, Staff will present your written comments to the Board. If you are not currently on the Board's ISF Subscription Mailing List and you would like to be, sign up online at: https://dwr.state.co.us/Portal/Login/

ISF Recommendations

Div.	Stream Name	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
1	East Roaring Fork Creek*	Cache la Poudre	Larimer	3.49	headwaters	confl Roaring Creek
1	Garber Creek	Upper South Platte	Douglas	4.75	confl North and South Garber Creeks	confl West Plum Creek
1	Platte Gulch	South Platte Headwaters	Park	1.54	headwaters	confl MF South Platte River
1	Square Top Creek	Upper South Platte	Clear Creek	1.08	outlet of Lower Square Top Lake	inlet of Duck Lake
1	Sulzer Gulch	Big Thompson	Larimer	3.73	headwaters	confl Big Thompson River
1	West Plum Creek	Upper South Platte	Douglas	22.6	headwaters	confl East Plum Creek
1	Williams Gulch*	Cache la Poudre	Larimer	4.47	headwaters	confl Cache la Poudre River
2	Cottonwood Creek	Arkansas Headwaters	Custer	6.00	headwaters	F. Keuhn Ditch No. 2 hdgt
2	Cottonwood Creek	Arkansas Headwaters	Fremont	9.42	confl Salt Creek	Giem Ditch hdgt
2	East Gulch	Arkansas Headwaters	Fremont	8.81	confl Antelope Gulch	confl Arkansas River
4	Beaver Dams Creek	Uncompahgre	Ouray	3.29	headwaters	confl East Fork Dry Creek
4	East Fork Dry Creek	Uncompahgre	Montrose Ouray	3.11	headwaters	confl Beaver Dams Creek
4	Deer Creek*	East-Taylor	Gunnison	3.38	headwaters	Beitler No. 2 Diversion Structure

Div.	Stream Name	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
4	East Muddy Creek	North Fork Gunnison	Gunnison	6.32	confl Lee Creek	confl West Muddy Creek
4	Goat Creek	San Miguel	San Miguel	6.25	headwaters	confl Beaver Creek
4	Little Cimarron River *(Increase)*	Upper Gunnison	Gunnison	2.49	confl Van Boxel Creek	Butte Ditch hdgt
4	Little Cimarron River	Upper Gunnison	Gunnison Montrose	6.56	Butte Ditch hdgt	confl Cimarron River
4	Main Hubbard Creek	North Fork Gunnison	Delta	2.50	headwaters	Overland Ditch
4	Middle Hubbard Creek	North Fork Gunnison	Delta	2.37	headwaters	Overland Ditch
4	North Lobe Creek*	Lower Dolores	Mesa	7.25	headwaters	Highline Ditch hdgt
4	Pine Creek	Upper Gunnison	Gunnison	16.7	headwaters	confl Morrow Point Reservoir
4	Splains Gulch*	East-Taylor	Gunnison	2.48	headwaters	confl Coal Creek
4	Unnamed Tributary to EF Dry Creek	Uncompahgre	Montrose Ouray	2.75	headwaters	confl EF Dry Creek
4	West Hubbard Creek	North Fork Gunnison	Delta	2.32	headwaters	Overland Ditch
4	West Muddy Creek	North Fork Gunnison	Gunnison	5.52	confl Ault Creek	confl East Muddy Creek
5	Coon Creek	Colorado Headwaters-Plateau	Mesa	4.71	Coon Creek Reservoir No. 4	South Side Canal
5	Derby Creek	Colorado headwaters	Eagle	2.8	confl South Derby Creek	confl Colorado River
5	Little Elk Creek	Roaring Fork	Pitkin	1.98	headwaters	Elk Creek No. 1 Ditch hdgt
6	Bear Creek	Upper White	Garfield	3.09	headwaters	confl NF White River
6	Big Fish Creek	Upper White	Garfield	4.30	headwaters	confl NF White River
6	Clear Creek*	Lower Yampa	Rio Blanco	8.32	headwaters	confl Milk Creek
6	East Marvine Creek	Upper White	Rio Blanco	7.31	headwaters	confl Marvine Creek
6	Hill Creek	Upper White	Rio Blanco	3.84	headwaters	Hill Creek Ditch #2 & #3 hdgt
6	Hauskins Creek	Upper White	Garfield	2.11	headwaters	confl NF White River
6	Lynx Creek	Upper White	Garfield	1.58	headwaters	confl NF White River
6	Milk Creek	Lower Yampa	Moffat	4.11	confl Wilson Creek	confl Yampa River
6	Mirror Creek	Upper White	Rio Blanco	2.16	headwaters	confl NF White River
6	Pagoda Creek*	Upper Yampa	Rio Blanco	10.32	headwaters	confl South Fork Williams Fork

Div.	Stream Name	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
6	Paradise Creek	Upper White	Garfield Rio Blanco	2.98	headwaters	Paradise Ponds Diversion Hdgt
6	Picket Pin Creek	Upper White	Garfield	2.66	headwaters	confl NF White River
6	South Fork White River	Upper White	Rio Blanco	8.07	Flat Tops Wilderness Area Boundary	confl Swede Creek
6	Vermillion Creek	Vermilion	Moffat	18.55	confl Talamantes Creek	confl Ink Springs
6	Vermillion Creek	Vermilion	Moffat	10.12	confl Ink Springs	Vermillion Ditch hdgt
6	Vermillion Creek	Vermilion	Moffat	7.33	Vermillion Ditch hdgt	confl Green River
6	Ways Gulch	Upper Yampa	Routt	4.45	headwaters	confl Willow Creek
6	Wheeler Creek	Upper North Platte	Jackson	3.22	headwaters	Ackers Ditch hdgt

NLL Recommendations

Div.	Lake Name	Watershed	County	Location (NAD 1983 Zone 13 North)
2	Titan Lake*	Arkansas Headwaters	Lake	UTM_N: 4356622.28 UTM_E: 377505.25

*Recommendation received at January 2023 ISF Workshop

CWCBStaff-15

FOR BILLING DEPARTMENT:

Agency: Colo Water Conservation
Department Viehl
Publication Date: 1.5.24
Ad Description:
water rights notice
Cost: 41.40

PROOF OF PUBLICATION

STATE OF COLORADO)
) ss.
COUNTY OF GUNNISON)

I, Melissa Fenlon, certify that:

I am the publisher of the Crested Butte Chronicle & Pilot/CB News, a newspaper of general circulation published in Crested Butte (printed in Salida) in said State and County:

The attached advertisement, which is a printed copy taken from said newspaper, was published in said newspaper on the 5 day of January, 2024; and

said advertisement was published in said newspaper proper and not in any supplement thereof:

Signature

Subscribed and sworn before me this 11 day of January, 2024
by Melissa Fenlon.

Notary Public

JILL R CLAIR
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20054044048
MY COMMISSION EXPIRES DECEMBER 04, 2025

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

1313 Sherman Street, Room 718, Denver, Colorado 80203
Phone: (303) 866-3441 * Fax: (303) 866-4474
https://cwcb.colorado.gov/

Pursuant to ISF Rule 5c. of the Rules Concerning the Colorado Instream Flow (ISF) and Natural Lake Level (NLL) Program, this notice identifies the streams that may be considered for ISF appropriations in 2025. At the January 2025 meeting of the Colorado Water Conservation Board (CWCB), staff may request that the Board form its intent to appropriate ISF water rights for the streams listed in the recommendation table below.

The ISF Recommendations are available online at:
https://cwcb.colorado.gov/2025-isf-recommendations.

In addition to the ISF recommendations, staff may rely on any additional data, exhibits, testimony, or other information submitted by any party as part of the Official CWCB Record.

It should also be noted that, pursuant to the ISF Rules:

5d. (3)
(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.

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(d) Any Notice to Contest must be received at the Board office no later than March 31, 2025, 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 30, 2025 or the first business day thereafter.

(e) Staff will announce its Final Staff ISF Recommendation concerning contested appropriations at the September 2025 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 2025 Board meeting.

Note that section 37-92-102 (3) (b), C.R.S. provides: “Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court

order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, contact Rob Viehl at the address above or via email to rob.viehl@state.co.us.

The schedule set forth in (d), (e), and (f) above will apply to streams on which the CWCB declares its intent to appropriate water rights in January 2025. Should you wish to comment on the proposed ISF Recommendations or request more information you may do so by writing Rob Viehl of the Board's staff at the address or email given above. Your appearance at any meeting is welcome, but not necessary. If you request, Staff will present your written comments to the Board. If you are not currently on the Board's ISF Subscription Mailing List and you would like to be, sign up online at: https://dwr.state.co.us/Portal/Login/

ISF Recommendations

Div	Stream	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
1	East Fork Roaring Creek	Cache la Poudre	Larimer	3.49	headwaters	confl with Roaring Creek
1	Garber Creek	Upper South Platte	Douglas	4.75	confl North and South Garber Creeks	confl West Plum Creek
1	Platte Gulch	South Platte Headwaters	Park	1.54	headwaters	confl MF South Platte River
1	West Plum Creek	Upper South Platte	Douglas	22.6	headwaters	confl East Plum Creek
2	Cottonwood Creek	Arkansas Headwaters	Fremont	9.42	confl Salt Creek	Giem Ditch hdgt
2	Cottonwood Creek	Arkansas Headwaters	Custer	6.00	headwaters	F. Keuhn Ditch No. 2 hdgt
2	East Gulch	Arkansas Headwaters	Fremont	8.81	confl Antelope Gulch	confl Arkansas River
4	Beaver Dams Creek	Uncompahgre	Ouray	3.29	headwaters	confl East Fork Dry Creek
4	Cabin Creek*	Tomichi	Gunnison	8.22	headwaters	Cabin Creek Ditch hdgt
4	Canyon Creek*	Tomichi	Gunnison	8.64	headwaters	confl Tomichi Creek
4	Goat Creek	San Miguel	San Miguel	2.80	spring complex	confl Beaver Creek
4	East Fork Dry Creek	Uncompahgre	Montrose Ouray	3.11	headwaters	confl Beaver Dams Creek

4	East Muddy Creek	North Fork Gunnison	Gunnison	6.32	confl Lee Creek	confl Muddy Creek
4	Main Hubbard Creek	North Fork Gunnison	Delta	2.50	headwaters	Overland Ditch
4	Middle Hubbard Creek	North Fork Gunnison	Delta	2.37	headwaters	Overland Ditch
4	Pine Creek	Upper Gunnison	Gunnison	16.7	headwaters	confl Morrow Point Reservoir
4	Red Creek*	Upper Gunnison	Gunnison	6.90	confl East Creek and West Red Creek	confl Blue Mesa Reservoir
4	Steuben Creek	Upper Gunnison	Gunnison	9.96	confl West Steuben Creek	confl Blue Mesa Reservoir
4	Unnamed Tributary to East Fork Dry Creek	Uncompahgre	Montrose Ouray	2.75	headwaters in the vicinity	confl EF Dry Creek
4	West Hubbard Creek	North Fork Gunnison	Delta	2.32	headwaters	Overland Ditch
4	West Muddy Creek	North Fork Gunnison	Gunnison	8.78	confl Sheep Creek	confl Muddy Creek
5	Coon Creek	Colorado Headwaters-Plateau	Mesa	4.71	outlet Coon Creek Res No. 4	South Side Canal hdgt
5	Derby Creek	Colorado Headwaters	Eagle	2.80	confl South Derby Creek	confl Colorado River
6	Bear Creek	Upper White	Garfield	3.09	headwaters	confl NF White River
6	Big Fish Creek	Upper White	Garfield	4.30	headwaters	confl NF White River
6	Clear Creek	Lower Yampa	Rio Blanco	8.32	headwaters	confl Milk Creek
6	East Marvine Creek	Upper White	Rio Blanco	7.31	headwaters	confl Marvine Creek

6	Hauskins Creek	Upper White	Garfield	2.11	headwaters	confl NF White River
6	Hill Creek	Upper White	Rio Blanco	3.84	headwaters	Hill Creek Ditch #2 & #3 hdgt
6	Lynx Creek	Upper White	Garfield	1.58	headwaters	confl NF White River
6	Milk Creek	Lower Yampa	Moffat	4.11	confl Wilson Creek	confl Yampa River
6	Mirror Creek	Upper White	Rio Blanco	2.16	headwaters	confl NF White River
6	Paradise Creek	Upper White	Garfield Rio Blanco	2.98	headwaters	Paradise Ponds Diversion hdgt
6	Pagoda Creek	Upper Yampa	Rio Blanco	8.40	headwaters	confl Slide Creek at
6	Pagoda Creek	Upper Yampa	Rio Blanco	1.92	confl Slide Creek	confl SF Williams Fork
6	Picket Pin Creek	Upper White	Garfield	2.66	headwaters	confl NF White River
6	South Fork White River	Upper White	Rio Blanco	8.07	Flat Tops Wilderness Area Boundary	confl Swede Creek
6	Stinking Gulch*	Lower Yampa	Moffat Rio Blanco	20.2	headwaters	confl with Milk Creek
6	Vermillion Creek	Vermilion	Moffat	18.6	confl Talamantes Creek	confl Ink Springs
6	Vermillion Creek	Vermilion	Moffat	10.1	confl Ink Springs	Vermillion Ditch hdgt
6	Vermillion Creek	Vermilion	Moffat	7.33	Vermillion Ditch hdgt	confl Green River
6	West Branch Willow Creek*	Little Snake	Routt	5.26	headwaters	confl Willow Creek
6	Willow Creek*	Little Snake	Routt	4.67	Outlet Boyer Reservoir	confl West Branch Willow Creek

7	Burrows Creek*	Animas	San Juan	1.33	headwaters	confl Animas River

*Recommendation received at the February 2024 ISF Workshop

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

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November 19, 2024

Pursuant to ISF Rule 5c. of the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, this notice identifies the streams that may be considered for instream flow (ISF) appropriations in 2025. At the January or March meeting of the Colorado Water Conservation Board (CWCB), staff may request that the Board form its intent to appropriate ISF water rights for the streams listed in Table 1 below.

Information submitted to the CWCB is available online at:
https://cwcb.colorado.gov/2025-ISF-Recommendations

In addition to the ISF Recommendations and Appendices, staff may rely on any additional data, exhibits, testimony, or other information submitted by any party as part of the Official CWCB Record to support the ISF Recommendations.

It should also be noted that, pursuant to rule 5d.(3) of the ISF Rules:

(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 31, 2025, 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 30, 2025, or the first business day thereafter.

(e) Staff will announce its Final Staff ISF Recommendation concerning contested appropriations at the September 2025 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 2025 Board meeting.

The schedule set forth in (d), (e), and (f) above will apply to streams on which the CWCB declares its intent to appropriate water rights in January 2025. If the CWCB declares its

intent to appropriate water rights at its March 2025 meeting a modified schedule will be used.

Note that section 37-92-102 (3) (b), C.R.S. provides: "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, contact Rob Viehl at the address set forth above or via email to rob.viehl@state.co.us.

Should you wish to comment on the proposed ISF Recommendations, you may do so by writing Rob Viehl of the Board's staff at the address or email given above. Your appearance at any meeting is welcome, but not necessary. If you request, staff will submit your written comments to the Board. If you are not currently on the Board's Instream Flow Subscription Mailing List and you would like to be, please sign up here: https://dwr.state.co.us/Portal/cwcb/NotificationLists

Table 1. Instream Flow Recommendations

Div	Stream	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus
4	Beaver Dams Creek	Uncompahgre	Ouray	3.29	headwaters	confluence East Fork Dry Creek
4	Cabin Creek	Tomichi	Gunnison	7.92	headwaters	Van Tuyl State Wildlife Boundary
4	Canyon Creek	Tomichi	Gunnison	8.64	headwaters	confluence Tomichi Creek
4	East Fork Dry Creek	Uncompahgre	Montrose, Ouray	3.11	headwaters	confluence Beaver Dams Creek
4	East Muddy Creek	North Fork Gunnison	Gunnison	6.32	confluence Lee Creek	confluence Muddy Creek
4	Goat Creek	San Miguel	San Miguel	2.01	confluence Galloway Creek	confluence Beaver Creek
4	Main Hubbard Creek	North Fork Gunnison	Delta	2.50	headwaters	Overland Ditch
4	Middle Hubbard Creek	North Fork Gunnison	Delta	2.37	headwaters	Overland Ditch
4	Red Creek *(Increase)*	Upper Gunnison	Gunnison	6.73	confluence East and West Red Creek	confluence Blue Mesa Reservoir

4	Unnamed Tributary to East Fork Dry Creek	Uncompahgre	Montrose, Ouray	2.75	headwaters	confluence East Fork Dry Creek
4	West Hubbard Creek	North Fork Gunnison	Delta	2.32	headwaters	Overland Ditch
4	West Muddy Creek	North Fork Gunnison	Gunnison	8.78	confluence Sheep Creek	confluence Muddy Creek
5	Coon Creek	Colorado Headwaters-Plateau	Mesa	3.18	confluence West Branch Coon Creek	100' upstream of the South Side Canal headgate
5	Deep Creek *(Increase)*	Colorado Headwaters	Eagle, Garfield	15.3	outlet of Deep Lake	BLM Property Boundary
5	Derby Creek *(Increase)*	Colorado Headwaters	Eagle	8.40	confluence South Derby Creek	confluence Colorado River
6	Clear Creek	Lower Yampa	Rio Blanco	8.32	headwaters	confluence Milk Creek
6	Milk Creek	Lower Yampa	Moffat	4.11	confluence Wilson Creek	confluence Yampa River
6	Vermillion Creek	Vermilion	Moffat	18.6	confluence Talamantes Creek	confluence Ink Springs
6	Vermillion Creek	Vermilion	Moffat	10.1	confluence Ink Springs	Vermillion Ditch headgate
6	Vermillion Creek	Vermilion	Moffat	7.33	Vermillion Ditch headgate	confluence Green River
7	Burrows Creek	Animas	San Juan	1.33	headwaters	confluence Animas River

FOR BILLING DEPARTMENT:

Agency: Column / Richman
Department Colo water cons
Publication Date: 12.20.24
Ad Description:
Vail / Maddy creek
Cost: 45.54

PROOF OF PUBLICATION

STATE OF COLORADO)
) ss.
COUNTY OF GUNNISON)

I, Melissa Fenlon, certify that:

I am the publisher of the Crested Butte Chronicle & Pilot/CB News, a newspaper of general circulation published in Crested Butte (printed in Salida) in said State and County:

The attached advertisement, which is a printed copy taken from said newspaper, was published in said newspaper on the 20 day of December, 2024; and

said advertisement was published in said newspaper proper and not in any supplement thereof:

Signature

Subscribed and sworn before me this 23 day of December, 2024
by Melissa Fenlon.

Notary Public

JILL R CLAIR
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20054044048
MY COMMISSION EXPIRES DECEMBER 04, 2025

Legals

EARLY HOLIDAY DEADLINES: FRIDAY, DECEMBER 20 @ NOON (for the 12/27 paper) | FRIDAY, DECEMBER 27 @ NOON (for the 1/3/25 paper)

legals@crestedbuttenews.com • phone: 970.349.0500 ext. 105 • www.crestedbuttenews.com

—LEGAL—
NOTICE OF GUNNISON COUNTY ELECTRIC ASSOCIATION ANNUAL MEETING & DIRECTOR ELECTION

The Gunnison County Electric Association's 86th Annual Meeting will be held on Tuesday, June 24, 2025 at 6:00 p.m. at 37250 W. US Highway 50, Gunnison, CO 81230.
GCEA's Board of Director positions eligible for election are Districts 2 and 3 currently held by Morgan Weinberg and Darcie Perkins, respectively.
For more information call 970-641-3520 or visit www.gcea.coop.

Published in the *Crested Butte News*. Issue of December 20, 2024 #122001

—LEGAL—

The Town of Mt. Crested Butte (Town) is soliciting proposals from qualified firms to provide maintenance on the Town's Avalanche Fence. The Fence is located along Sunlight Ridge on the southwest part of Town. The purpose of this project is for a Contractor to conduct 2025 maintenance repairs and install approved replacement parts to keep the Fence within manufacturer specifications and tolerances, as per a May, 2024 Geobrugg Fence Inspection Report Letter and the 2006 Geobrugg Product Manual. The Town can foresee this Project evolving into an annualized maintenance repair program. Proposals will be received by the Town of Mt Crested Butte until May 16, 2025 at 3:00 PM (MST), at which time they will be opened and publicly read aloud. The RFP documents and any addendums can be found on the Town's website at https://mtcb.colorado.gov/request-for-proposals.

Published in the *Crested Butte News*. Issue of December 20, 2024 #122003

—LEGAL—

PLEASE TAKE NOTICE that a public hearing of the Crested Butte Town Council will be on the 6th day of January, 2025 at 7PM on Ordinance No. 9, Series 2024 in the Town Council Chambers, located at 507 Maroon Avenue, Crested Butte, CO and on Zoom.
Ordinance No. 9, Series 2024 - An Ordinance of the Crested Butte Town Council Repealing and Replacing Chapter 11 of the Crested Butte Municipal Code.
The public may connect to the meeting via Zoom with the following address:
https://us02web.zoom.us/j/89078029087
Join via audio: +1 719 359 4580 U +1 669 444 9171 US +1 253 205 0468 US +1 646 931 3860 US +1 689 278 1000 US +1 305 224 1968 US +1 309 205 3325 US +1 360 209 5623 US +1 386 347 5053 US +1 507 473 4847 US +1 564 217 2000 US
Webinar ID: 890 7802 9087
TOWN OF CRESTED BUTTE, COLORADO
/s/ Lynelle Stanford, Town Clerk

Published in the *Crested Butte News.* Issue of December 20, 2024 #122006

—LEGAL—
APPLICATION FOR A HOTEL/RESTAURANT LIQUOR LICENSE TOWN OF CRESTED BUTTE, COLORADO

PURSUANT TO THE LAWS OF THE STATE OF COLORADO, Thai Smile LLC has requested the licensing authority of the Town of Crested Butte, Colorado, to approve a new hotel/restaurant liquor license, to sell malt, vinous, and spiritous liquor as provided by law at 16 6th Street, Crested Butte, CO 81224.
Public hearing on this application will be held before the Town Council of the Town of Crested Butte on Monday, January 6, 2025, at 7:00PM.
The public may connect to the meeting using Zoom.
Please use the web address below to join the webinar:
https://us02web.zoom.us/j/89078029087
Join via audio: +1 719 359 4580 U +1 669 444 9171 US +1 253 205 0468 US +1 646 931 3860 US +1 689 278 1000 US +1 305 224 1968 US +1 309 205 3325 US +1 360 209 5623 US +1 386 347 5053 US +1 507 473 4847 US +1 564 217 2000 US
Webinar ID: 890 7802 9087
At said time and place, any interested persons may be heard for or against the issuance of said license. Date of Application: November 26, 2024
TOWN OF CRESTED BUTTE, COLORADO
/s/ Lynelle Stanford, Town Clerk

Published in the *Crested Butte News*. Issue of December 20, 2024 #122008

—LEGAL—

PLEASE TAKE NOTICE that a public hearing of the Crested Butte Town Council will be on the 6th day of January, 2025 at 7PM on Ordinance No. 10, Series 2024 in the Town Council Chambers, located at 507 Maroon Avenue, Crested Butte, CO and on Zoom.
Ordinance No. 10, Series 2024 - An Ordinance of the Crested Butte Town Council Authorizing Signing Stipulation in Case No. 21CW3021 and Storage Water Lease Agreement with Mt. Emmons Mining Company.
The public may connect to the meeting via Zoom with the following address:
https://us02web.zoom.us/j/89078029087
Join via audio: +1 719 359 4580 U +1 669 444 9171 US +1 253 205 0468 US +1 646 931 3860 US +1 689 278 1000 US +1 305 224 1968 US +1 309 205 3325 US +1 360 209 5623 US +1 386 347 5053 US +1 507 473 4847 US +1 564 217 2000 US
Webinar ID: 890 7802 9087
TOWN OF CRESTED BUTTE, COLORADO
/s/ Lynelle Stanford, Town Clerk

Published in the *Crested Butte News.* Issue of December 20, 2024 #122007

—NOTICE OF FINAL PAYMENT—

Notice is hereby given that Lacy Construction Company, Ltd., the Contractor for the construction of the Town of Crested Butte Paving Project 2024, has completed the work specified in the Contract dated July 18, 2024 and that the work has been accepted by the Town of Crested Butte.
Notice is further given that final payment for the work will be made to the Contractor on or after January 6th, 2024, being at least ten (10) days after the second publication of this notice.
Any person having a claim for labor or materials furnished under this Contract shall present the same in writing to the Town of Crested Butte at the following address, prior to the date specified above:
Town of Crested Butte
Department of Public Works
Attn: Shea D Earley
P.O. Box 39
Crested Butte, CO 81224
TOWN OF CRESTED BUTTE

_____
Town Clerk

Published in the *Crested Butte News.* Issue of December 20 and 27, 2024 #122009

—LEGAL—
FIRST PUBLISHED

The Colorado Water Conservation Board ("CWCB"), 1313 Sherman Street, Suite 718, Denver, Colorado 80203. Please direct communications regarding this
notice to Robert Viehl, Chief of the Stream and Lake Protection Section rob.viehl@ state.co.us: RECOMMENDATIONS FOR WATER RIGHTS TO PRESERVE THE NATURAL ENVIRONMENT TO A REASONABLE DEGREE,
IN GUNNISON COUNTY, COLORADO.
The CWCB is the state water planning agency which, among other duties, is tasked with appropriating, acquiring and protecting instream flow (ISF) water rights to preserve and improve the natural environment to a reasonable degree for streams and lakes in the state. The CWCB is the only entity in the state that is authorized to appropriate ISF water rights. These water rights are held on behalf of the people of Colorado for the preservation of the water dependent natural environment. ISF water rights work within Colorado's water law system, and are junior to any existing rights and practices at the time of appropriation of the ISF. According to section 37-92-102 (3) (b), C.R.S. "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree."
For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, or any other questions please contact Rob Viehl. CWCB staff and entities that recommended streams for ISF water rights are in the process of gathering scientific data on the subject streams to finalize the recommendations and specific flow rates. Flow rates will be based on the minimum flow rate necessary to protect the natural environment and typically vary seasonally depending on the needs of the species. If approved by the CWCB, these water rights will have an appropriation date no earlier than 2025. More information regarding the ISF Recommendations is available online at: https://cwcb.colorado.gov/2025-isf-recommendations. There are currently 5 recommended ISF stream segments in Gunnison County that may be appropriated in 2025; Cabin Creek, Canyon Creek, East Muddy Creek, Red Creek, and West Muddy Creek. The Cabin Creek recommendation starts at its headwaters and terminates 7.92 miles downstream at the boundary of the Van Tuyl State Wildlife Area.
The Canyon Creek recommendation starts at its headwaters and terminates 8.64 miles downstream at the confluence with Tomichi Creek. The East Muddy Creek recommendation starts at the confluence with Lee Creek and terminates 6.32 miles downstream at the confluence with Muddy Creek. The Red Creek recommendation starts at the confluence of East Red Creek and West Red Creek and terminates 6.73 miles downstream at the confluence with Blue Mesa Reservoir. The West Muddy Creek recommendation starts at the confluence with Sheep Creek and terminates 8.78 miles downstream at the confluence with Muddy Creek.

Published in the *Crested Butte News.* Issue of December 20, 2024 #122002

—LEGAL—
TOWN OF MT. CRESTED BUTTE, COLORADO
NOTICE OF PUBLIC HEARING BEFORE THE TOWN COUNCIL

Please take notice that, pursuant to Town Code §§ 21-512 and 2-301, the Mt. Crested Butte Town Council will hold a public hearing to hear the Major Alteration Final PUD Plan application for Upper Prospect at Mt. Crested Butte, on Tuesday, January 7th, 2025, at 6:00 p.m., in the Council Chambers at Mt. Crested Butte Town Hall, 911 Gothic Road, Mt. Crested Butte, and via Zoom. Persons wishing to attend the meeting virtually may do so by visiting https://mtcrestedbuttecolorado.civicweb.net/portal/, which contains the associated application materials and Zoom link.
The purpose of the hearing is to receive public comment on the Major Alteration Final PUD Plan – Upper Prospect at Mt. Crested Butte. Application submitted by Aaron J. Huckstep, Huckstep Law LLC, representing Crested Butte Land Holdings LLC and the applicant GCM Squared, Ltd.
All interested persons are encouraged to submit written comments or attend the meeting either in-person or via Zoom. Those who speak at the public hearing shall be allowed a maximum of three (3) minutes to express their comments to the Planning Commission. Written comments are encouraged and should be emailed to Neal Starkebaum, Community Development Director (nstarkebaum@mtcb.colorado.gov) or mailed to the Town Hall, P.O. Box 5800, Mt. Crested Butte, CO 81225-5800. Comments received by Thursday, January 2rd, 2025 at 5:00 P.M., Mountain Time will be included in the Town Council meeting packet.
For a digital copy of the application materials, meeting information, and zoom link, please visit https://mtcrestedbuttecolorado.civicweb.net/portal/. Click on the associated meeting date under 'Upcoming Meetings' to see the materials. Please contact the Town Clerk, or Town Hall at (970)-349-6632 if you need assistance.
Dated this 17th day of December, 2024.
s/ Tiffany O'Connell
Town Clerk

If you require any special accommodation to attend this meeting, either virtually or in person, please call Town Hall at (970)-349-6632 at least 48 hours in advance of the meeting.

Published in the *Crested Butte News.* Issue of December 20, 2024 #122004

—LEGAL—
TOWN OF MT. CRESTED BUTTE, COLORADO
NOTICE OF PUBLIC HEARING BEFORE THE PLANNING COMMISSION

Please take notice that, pursuant to Town Code §§ 21-496 and 2-277, the Mt. Crested Butte Planning Commission will hold a public hearing to hear the Major Alteration Preliminary PUD Plan application for the Nordic Inn, on Wednesday, January 8th, 2025, at 5:00 p.m., in the Council Chambers at Mt. Crested Butte Town Hall, 911 Gothic Road, Mt. Crested Butte, and via Zoom. Persons wishing to attend the meeting virtually may do so by visiting https://mtcrestedbuttecolorado.civicweb.net/portal/, which contains the associated application materials and Zoom link.
The purpose of the hearings is to receive public comment on the Major Alteration Preliminary PUD plan – Nordic Inn development. Application submitted by Aaron J. Huckstep, Huckstep Law LLC, representing the owner/applicant Pearls Management LLC.
All interested persons are encouraged to submit written comments or attend the meeting either in-person or via Zoom. Those who speak at the public hearing shall be allowed a maximum of three (3) minutes to express their comments to the Planning Commission. Written comments are encouraged and should be emailed to Neal Starkebaum, Community Development Director (nstarkebaum@mtcb.colorado.gov) or mailed to the Town Office, P.O. Box 5800, Mt. Crested Butte, CO 81225-5800. Comments received by January 1, 2025, at 5:00 P.M., Mountain Time will be included in the Planning Commission meeting packet.
For a digital copy of the application materials, meeting information, and zoom link, please visit https://mtcrestedbuttecolorado.civicweb.net/portal/. Click on the associated meeting date under 'Upcoming Meetings' to see the materials. Please contact the Town Clerk, or Town Hall at (970)-349-6632 if you need assistance.
Dated this 17th day of December, 2024.
/s/ Tiffany O'Connell
Town Clerk
If you require any special accommodation to attend this meeting, either virtually or in person, please call Town Hall at (970)-349-6632 at least 48 hours in advance of the meeting.

Published in the *Crested Butte News.* Issue of December 20, 2024 #122005

—CB SOUTH P.O.A. BOARD MEETING NOTICE & AGENDA—

Wednesday, January 8, 2025
P.O.A. BOARD MEETING AGENDA
START TIME: 6:00PM
CB South POA, 61 Teocalli Road
Join the meeting:
Zoom: **https://us02web.zoom.us/j/85147198741**
or email staff@cbsouth.net for a Zoom invitation
Questions about this Agenda/Meeting can be directed to 349-1162 or staff@cbsouth.net
This agenda can also be viewed on-line at www.cbsouth.net
6:00 PM Call to Order
6:01 PM Public Comment
6:05 PM Approval of December 10, 2024, BOD Meeting Minutes
6:10 PM Quarterly Financial Report
6:20 PM Discussion and Approval of ComNet Cell Tower
6:35 PM Discussion and Approval of CAMP/SAR from the County
7:00 PM Consideration and approval of clustering Lots 11, 12 & 13, Block 6, AKA 52 Gillaspey Ave, 44 Gillaspey Ave and 28 Gillaspey Ave.
7:10 PM 2024-2025 Board Term Strategic Planning Session
7:35 PM Managers Report
7:55 PM Approve February 2025 Board of Directors Meeting Date
8:00 PM Adjourn Meeting
8:01 PM Executive Session to Discuss Staffing
ADA Accommodations: Anyone needing special accommodations as determined by the *American Disabilities Act* may contact the Association Manager prior to the day of the hearing.
Agenda Items: All times are estimates. Please allow for earlier discussion. Please show up at least 20 minutes prior to the listed times.

Published in the *Crested Butte News*. Issue of December 20, 2024 #122010

DELTA COUNTY INDEPENDENT

See Proof on Next Page

AFFIDAVIT OF PUBLICATION

State of Pennsylvania, County of Lancaster, ss:

Kevin McGillivray, being first duly sworn, deposes and says: That (s)he is a duly authorized signatory of Column Software, PBC, duly authorized agent of Delta County Independent, a newspaper printed and published in the City of Delta, County of Delta, State of Colorado, and that this affidavit is Page 1 of 2 with the full text of the sworn-to notice set forth on the pages that follow, and the hereto attached:

PUBLICATION DATES:
Dec. 12, 2024

NOTICE ID: vg56uAfUHHuD9VSH1ZRa
PUBLISHER ID: DCI000677
NOTICE NAME: Delta ISF 2025
Publication Fee: 71.92

I declare under penalty of perjury under the law of Colorado that the foregoing is true and correct.

(Signed) Kevin McGillivray

VERIFICATION

State of Pennsylvania
County of Lancaster

Commonwealth of Pennsylvania - Notary Seal
Nicole Burkholder, Notary Public
Lancaster County
My commission expires March 30, 2027
Commission Number 1342120

Subscribed in my presence and sworn to before me on this: 12/12/2024

Nicole Burkholder

Notary Public
Notarized remotely online using communication technology via Proof.

The Colorado Water Conservation Board ("CWCB"), 1313 Sherman Street, Suite 718, Denver, Colorado 80203. Please direct communications regarding this notice to Robert Viehl, Chief of the Stream and Lake Protection Section rob.viehl@state.co.us: RECOMMENDATIONS FOR WATER RIGHTS TO PRESERVE THE NATURAL ENVIRONMENT TO A REASONABLE DEGREE, IN DELTA COUNTY, COLORADO. The CWCB is the state water planning agency which, among other duties, is tasked with appropriating, acquiring and protecting instream flow (ISF) water rights to preserve and improve the natural environment to a reasonable degree for streams and lakes in the state. The CWCB is the only entity in the state that is authorized to appropriate ISF water rights. These water rights are held on behalf of the people of Colorado for the preservation of the water dependent natural environment. ISF water rights work within Colorado's water law system, and are junior to any existing rights and practices at the time of appropriation of the ISF. According to section 37-92-102 (3) (b), C.R.S. "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, or any other questions please contact Rob Viehl. CWCB staff and entities that recommended streams for ISF water rights are in the process of gathering scientific data on the subject streams to finalize the recommendations and specific flow rates. Flow rates will be based on the minimum flow rate necessary to protect the natural environment and typically vary seasonally depending on the needs of the species. If approved by the CWCB, these water rights will have an appropriation date no earlier than 2025. More information regarding the ISF Recommendations is available online at: https://cwcb.colorado.gov/2025-isf-recommendations. There are currently three recommended ISF stream segments in Delta County that may be appropriated in 2025; Main Hubbard Creek, Middle Hubbard Creek, and West Hubbard Creek. The Main Hubbard Creek recommendation starts at its headwaters and terminates 2.51 miles downstream at the Overland Canal. The Middle Hubbard Creek recommendation starts at its headwaters and terminates 2.37 miles downstream at the Overland Canal. The West Hubbard Creek recommendation starts at its headwaters and terminates 2.32 miles downstream at the Overland Canal.
Published Thursday, December 12, 2024

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

Lauren Ris, CWCB Director

TO: Colorado Water Conservation Board Members

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

DATE: March 19-20, 2025

AGENDA ITEM: 5c. Request to Form Intent to Appropriate Instream Flow Water Rights in Water Divisions 4, 6, and 7.

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, direct staff to publicly notice the Board's declaration of its intent to appropriate and establish the following initial schedule for the notice and comment procedure pursuant to ISF Rule 5c.:

Date	Action
March 19, 2025	Board declares its intent to appropriate and hears public comment
May 21-22, 2025	Public comment at CWCB Meeting
June 2, 2025	Notice to Contest due
June 6, 2025	Deadline for notification to the ISF Subscription Mailing List of Notices to Contest (no notification if none received)
July 1, 2025	Notices of Party Status and Contested Hearing Participant Status due
July 16-17, 2025	Staff informs Board of Parties and Participants; Board appoints a Hearing Officer and sets hearing date, Alternatively, if no Notices to Contest are filed staff may seek final action at CWCB Meeting
November 2025	ISF Contested Hearing conducted in conjunction with CWCB Meeting

Table 1. Instream Flow Recommendations

Water Div	Stream	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus	Flow Rate (CFS)
4	East Muddy Creek	North Fork Gunnison	Gunnison	6.32	confluence Lee Creek	confluence Muddy Creek	11.2 (11/01 - 02/28) 20 (03/01 - 03/31) 23 (04/01 - 07/31) 14.5 (08/01 - 10/31)
4	West Muddy Creek	North Fork Gunnison	Gunnison	8.78	confluence Sheep Creek	confluence Muddy Creek	5.5 (10/01 - 03/31) 12.9 (04/01 - 07/15) 5.5 (07/16 - 07/31) 2 (08/01 - 09/30)
6	Milk Creek	Lower Yampa	Moffat	4.11	confluence Wilson Creek	confluence Yampa River	7.8 (01/01 - 02/29) 18 (03/01 - 03/31) 40 (04/01 - 06/30) 8 (07/01 - 07/31) 4.5 (08/01 - 09/30) 5.2 (10/01 - 12/31)
6	Vermillion Creek	Vermilion	Moffat	18.6	confluence Talamantes Creek	confluence USGS Vermillion Creek gage at Ink Springs	1 (10/01 - 04/15) 2.6 (04/16 - 09/30)
6	Vermillion Creek	Vermilion	Moffat	10.1	confluence USGS Vermillion Creek gage at Ink Springs	Vermillion Ditch headgate	1.4 (08/01 - 04/30) 2.4 (05/01 - 07/31)
7	Burrows Creek	Animas	San Juan	1.33	headwaters	confluence North Fork Animas River	0.19 (11/01 - 03/31) 1.3 (04/01 - 04/30) 3.75 (05/01 - 06/15) 1.6 (06/16 - 07/15) 0.58 (07/16 - 10/31)

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, 6, and 7. 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 executive summaries and links to the appendices containing supporting scientific data are provided in the attached Table of Contents.

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/2025-isf-recommendations

Natural Environment Studies

The Bureau of Land Management and Colorado Parks and Wildlife documented the natural environment on their respective recommendations and found natural environments that can be preserved. To evaluate instream flow requirements, the recommending entities collected hydraulic data and performed R2Cross or IFIM 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 recommendation. 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 streams, staff analyzed available streamflow gage records, available streamflow models, and/or utilized appropriate standard methods to develop a hydrograph showing median daily 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. In some cases, the flow rates were modified due to water availability limitations. The recommending entities confirmed that the proposed flow rates would preserve the natural environment to a reasonable degree on each stream segment. 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.

Stakeholder Outreach

Staff provided public notice of the recommendations 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. In addition, staff contacted water commissioners, water right holders, and others when possible, to further discuss the recommendations. Staff conducted extensive outreach efforts on several of these recommendations, detailed information on stakeholder outreach is contained in the attached executive summary for each recommendation.

For the Milk Creek ISF recommendation, Western Resource Advocates provided a letter of support and a report by Dr John Woodling, a retired fish biologist with 59 years of experience. This supplemental report reviews the requested flow rates and the supporting information used to develop the final ISF recommendation. In short, this report finds the methods implemented are technically sound and the approach appropriate and protective of the native fish populations in Milk Creek.

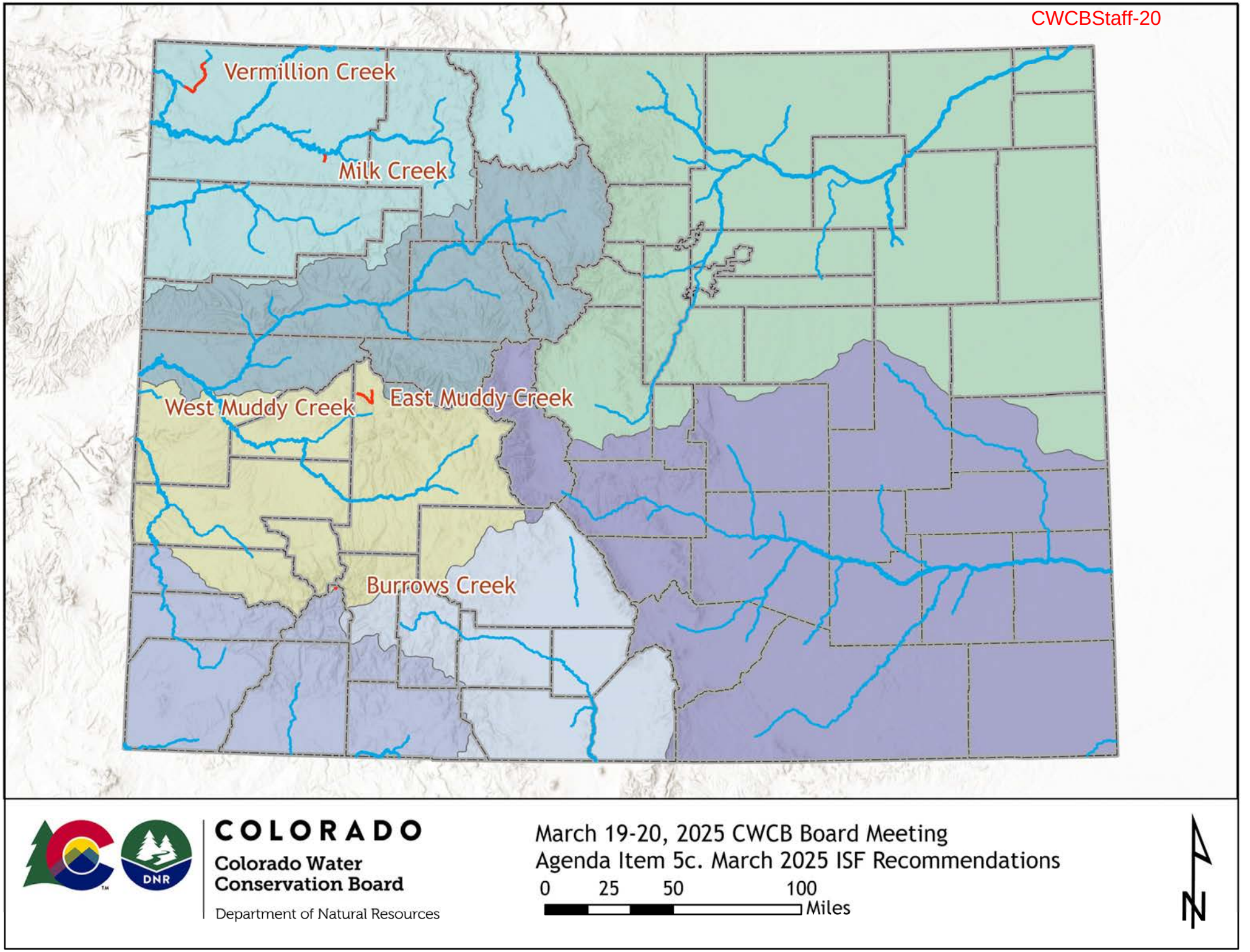
Staff received comment letters on the West Muddy Creek and East Muddy Creek recommendations in 2023. Those appropriations were delayed in 2024 in an effort to address concerns, despite these efforts staff received a new letter in March 2025, indicating that concerns remain.

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.

Attachments:

Overview Map
Public Comment Letters
Table of Contents for ISF Recommendation Executive Summaries
ISF Executive Summaries

CWCBStaff-20



COLORADO
Colorado Water Conservation Board
Department of Natural Resources

March 19-20, 2025 CWCB Board Meeting
Agenda Item 5c. March 2025 ISF Recommendations

0 25 50 100
Miles

N

Western Resource Advocates

CONTACT
303.444.1188
info@westernresources.org
WesternResourceAdvocates.org

CWCBStaff-20

February 24, 2025

Board of Directors, Colorado Water Conservation Board
Colorado Department of Natural Resources
1313 Sherman Street, Room 718
Denver, CO 80203

Support for ISF Recommendation on Milk Creek, Water Division 6

Dear Board Members:

Western Resource Advocates (WRA) strongly supports the U.S. Bureau of Land Management (BLM) and Colorado Parks and Wildlife (CPW) instream flow (ISF) recommendation on Milk Creek in Water Division 6 to protect this important habitat for native fish. Milk Creek is a tributary to the Yampa River and the ISF reach extends approximately four miles up from the Yampa confluence to the confluence with Wilson Creek.

Three native fish species—the Bluehead Sucker, the Flannelmouth Sucker and the Roundtail Chub—collectively referred to as the Three Species, are the object of inter-state efforts to stop the decline in range and numbers of these fishes. Milk Creek provides spawning and other life stage habitat for the native Flannelmouth Sucker and Bluehead Sucker. Milk Creek is also home to the native Speckled Dace. The proposed ISF will provide flow protection for these native fish that rely on Milk Creek and serves a strategic purpose in protecting the Three Species in the entire Yampa River basin.

To help WRA understand biological flow needs, we hired Dr. John Woodling, a fish biologist with more than 59 years of experience, including with CPW and the Colorado Water Quality Control Division. Much of his work has focused on the native fish that are found in Milk Creek. He reviewed the flow rates proposed in the *Final Milk Creek Instream Flow Study Report* prepared for the CWCB by William J. Miller (Sept 30, 2024). Dr. Woodling's detailed report and professional analysis of the importance of Milk Creek and the proposed flow rates to native fish is attached.

The BLM and CPW proposed ISF recommendation would protect key components of the hydrograph throughout the year with seasonal ISF flow rates. The baseflow ISF rates (4.5 cubic feet per second [cfs] from August 1 through September 30, 5.2 cfs from October 1 through December 31, and 7.8 cfs from January 1 through February 29) serve a variety of functions including providing habitat for young-of-the-year fish, any smaller resident adults that may reside in the reach, and Bluehead Suckers stocked by CPW. The March 1 through March 31 flow rate of 18 cfs provides connectivity with the Yampa and protects spawning Bluehead Suckers and Flannelmouth Suckers. The spring flow rate of 40 cfs from April 1 through June 30 is critical for the spawning season. The July 1

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through July 31 rate of 8 cfs provides needed longitudinal connectivity as adults that migrated upstream to spawn move downstream back to the Yampa River as peak flows decline. Together the ISF recommendations will support comprehensive native fish reproduction and survival.

We commend your staff for their work and urge the Board to declare the CWCB's intent to appropriate the ISF proposed by BLM and CPW for Milk Creek. WRA is committed to supporting the ISF throughout the appropriation process and will be available to provide testimony, as will Dr. Woodling.

Sincerely,

Bart Miller, Healthy Rivers Director
Western Resource Advocates

Laura Belanger, Senior Policy Advisor
Western Resource Advocates

Cc: Rob Viehl, Section Chief, CWCB Stream and Lake Protection Section

Attachment:

- John Woodling, Woodling Aquatics. February 20, 2025. An analysis of the relationship of Miller (2024a) Milk Creek proposed instream flows to habitat requirements of native fishes.

TO: Western Resource Advocates
FROM: John Woodling, Ph.D. Woodling Aquatics
DATE: 2/20/2025
RE: An analysis of the relationship of Miller (2024a) Milk Creek proposed instream flows to habitat requirements of native fishes.

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Executive Summary

The US Bureau of Land Management (BLM) and Colorado Parks and Wildlife (CPW) co-recommended an instream flow for Milk Creek to the Colorado Water Conservation Board (CWCB) to protect native fish species. Milk Creek is tributary to the Yampa River in Water Division 6. The recommendation was based in-part on the *Final Milk Creek Instream Study Report* by Miller (2024a) that was prepared for the CWCB. The following is an analysis of the Miller (2024a) report regarding instream flow recommendations for the claimed reach.

I support Miller's (2024a) proposed instream flows as discussed in detail in the following sections:

- 40 cfs for April 1 through June 30
- 8 cfs, or lower, depending on what flow is available for August through February

I differ from the Miller's proposal in that I recommend:

- a higher instream flow (20 cfs) from that proposed by the Miller for the month of March
- an instream flow (8 cfs) for the month of July. Miller (2024a) did not include a specific flow proposal for July.

Figure 1. A smaller Bluehead Sucker, late summer, breeding colors, Roan Creek.

The proposed Milk Creek instream reach (claimed reach) extends upstream from the confluence with the Yampa River to the point where Wilson Creek enters the stream, a distance of about 4.1 miles. Three native fish species, the Bluehead Sucker (*Catostomus discobolus*), the Flannelmouth Sucker (*Catostomus latipinnis*) and the Roundtail Chub (*Gila robusta*) are native

to the Yampa River basin. Multiple state, federal and other entities have implemented programs designed to halt the decline in range and numbers of these fishes. This small group of fish species is collectively referred to as the Three Species by the various management agencies involved in native fish protection in the upper Colorado River basin, which includes the Yampa River basin. Another native species is also found in this stream reach, the Speckled Dace (*Rhinichthys osculus*).

As a fish biologist for 59 years, I was asked by Western Resource Advocates to provide an analysis of the Miller (2024a) report prepared for the CWCB regarding instream flow recommendations for the claimed reach. Adopting an instream flow in the claimed reach is particularly important in that four different subsets of the Three Species are found in the reach. The four subsets are,

1. Resident individuals of the Three Species that inhabit the claimed reach on a year-round basis,
2. Migratory individuals of the Three Species whose home range includes the claimed reach of Milk Creek and the mainstem Yampa River on a seasonal basis. These individuals move into Milk Creek to spawn in the spring and then return to the mainstem Yampa River for the remainder of the year,
3. The Bluehead Sucker that are stocked by CPW into the claimed reach of Milk Creek. The objective of stocking Bluehead Suckers into Milk Creek is to increase the number of Bluehead Suckers in the mainstem Yampa River. CPW stocks two- and three-year old Bluehead Suckers. These older, and relatively larger (five-inch), individuals may avoid predation from the larger non-native piscivorous species that inhabit the mainstem Yampa River by remaining in the claimed reach. These stocked Bluehead Sucker are expected to move out into the Yampa River, mature and return to Milk Creek in a subsequent spawning season,
4. The larvae and age-0 fingerlings of the first three groups that may be found in the claimed reach spring, summer and fall. Longitudinal connectivity must be maintained from the claimed reach to the mainstem Yampa River to allow developing eggs, emerged larvae, fry and fingerlings to migrate to the mainstem Yampa River from nursery areas in the claimed reach.

I believe the analysis and data generated by Miller (2024a) are excellent and were done in a professional manner. Miller (2024a) utilized the System for Environmental Flow Analysis (SEFA) to calculate instream flows for Milk Creek. SEFA is a technically sound method. SEFA allows for additional analyses in comparison to the PHABSIM model used by BLM in prior instream analysis studies. SEFA has the ability to determine longitudinal connectivity in the claimed stream reach as well as the amount of suitable habitat for the Three Species (Miller 2024a). The suitability criteria used by Miller (2024a) in the modeling were updated for the analysis (Miller 2024b). These updates accurately described the relationship of Bluehead suckers and Flannelmouth Sucker to depth and water velocity.

Miller (2024a) adhered to the spirit and word of the instream flow program and proposed flows that minimally protect aquatic resources in Milk Creek. Miller (2024a) recognized that Milk Creek flows in late summer decrease to levels that do not protect the largest, adult members of

the Three Species. Miller (2024a) suggests approving instream flows that result in Milk Creek providing critical spawning habitat for the Bluehead Sucker and Flannelmouth Sucker in the spring and early summer, and lower flows in the rest of the year. These lower flows allow longitudinal connectivity with the Yampa River, and/or flows that protect fry and fingerlings of the Three Species in the claimed reach.

Many tributary streams in the Gunnison River, Dolores River and the mainstem Colorado River portions of the Colorado Plateau are dry or have much reduced flows from late summer to spring, much like Milk Creek. Spring snowmelt in the surrounding mountains creates a seasonal flow regime in these tributaries. Bluehead Sucker and Flannelmouth Sucker, and other big river fish species migrate from main channels of larger rivers, such as Yampa River, to the few tributaries that provides this seasonal spawning habitat. Protecting the spawning flows in spring and early summer in Milk Creek serves a strategic purpose in protecting the Three Species in the entire Yampa River basin.

Milk Creek appears to have surface water flows between pools on a 12-month basis (Roy Smith, BLM, personal communication), and does not go dry in the fall and winter like many streams in the arid portions of western Colorado. The year-round flows in Milk Creek provide habitat for smaller life stages of the Three Species, even at very low flows. Pools, runs and backwaters in Milk Creek provide adequate habitat for fry and fingerling Bluehead Suckers and Flannelmouth Suckers in fall and winter. The fry and fingerling Bluehead Sucker and Flannelmouth Sucker remaining in the claimed reach during low flow are protected from predatory species found in the mainstem Yampa River. Thus, protecting Milk Creek low flows in fall and winter is important to protecting the Three Species in the entire Yampa River basin, not just Milk Creek. The Miller (2024a) proposal protects the majority of the spawning period for the Flannelmouth Sucker and the Bluehead Sucker and provides for longitudinal connectivity to the Yampa River from August through March.

As noted in the first paragraphs of this report, Miller (2024a) suggested two different seasonal instream flows for the claimed reach of Milk Creek based on season: 40 cfs from April through June and 8 cfs from August through March.

Specific flow recommendations for the month of July were not provided by Miller (2024a). Miller (2024a) did point out that

> "Appropriate flows for the ascending and descending limb of the hydrograph would allow more unimpeded movement for migration and for resident fish moving to spawning locations. A streamflow that is intermediate between the recommended base flow and peak flow would be more protective of the species than an abrupt change from baseflow to peak. An intermediate flow for the ascending and descending limb of the hydrograph based on water availability would be protective."

On the basis of my review and analysis. I offer the following recommendations.

Recommendation Regarding the Flow Proposal of 40 cfs from April through June

I recommend the flow of 40 cfs from April 1 through June 30 be approved by the Colorado Water Conservation Board for the claimed reach. The flow of 40 cfs would provide adequate habitat during most of the spawning season (but not all of the spawning season) for Three Species that inhabit the claimed reach of Milk Creek as well as members of the Three Species that migrate from the Yampa River into Milk Creek each spring to spawn. Flannelmouth Sucker spawning season begins in March, not in April. These flows would also provide suitable habitat for Bluehead Suckers stocked by the CPW.

The Bluehead Sucker uses riffle habitats more than the other two members of the Three Species. Water depth in general is deeper in runs and pools than in riffles in a given stream reach. Maintaining a suitable water depth in riffles for Bluehead Suckers would provide protection for not only Bluehead Suckers but also the Flannelmouth Sucker and Roundtail Chub (Anderson and Stewart 2007). The CWCB has agreed in prior instream flow hearings that a water level that reasonably protects Bluehead Suckers in riffles would provide suitable habitat for the Flannelmouth Sucker and the Roundtail Chub.

The Speckled Dace would also be protected at a flow of 40 cfs. The Speckled Dace is still widely distributed in the species' native range on the western slope, but the species has disappeared from some waters on the western slope. Protection of the species is warranted.

Recommendation Regarding the Flow Proposal of 8 cfs from August through March

The flow of 8 cfs from August 1 through March 31 proposed by Miller (2024a) provides water depths and habitat that are minimally protective for,

1. larvae and fry of the Three Species that hatch and grow to fingerling size in the claimed reach,
2. five-inch long Bluehead Suckers stocked by CPW,
3. the Speckled Dace,
4. and perhaps smaller adults of the Three Species that may be resident in the claimed reach

The flow of 8 cfs from August 1 through March 31 (Miller 2024a) importantly provides longitudinal connectivity with the mainstem Yampa River that will allow large adult Bluehead Sucker and Flannelmouth Sucker to move back and forth from the main channel. Such movement allows Milk Creek to serve as a spawning habitat and fry habitat for the Three Species.

The flow of 8 cfs from August 1 through March 31 (Miller 2024a) does not provide suitable habitat for,

1. any large adults of the Three Species that are resident to the claimed reach,
2. large, spawning adults of the Three Species in a pre-spawn condition that may migrate from the mainstem Yampa River into Milk Creek at any time from August through March.

The proposed flow of 8 cfs from August 1 through March 31 (Miller 2024a) would provide a level of protection for the five-inch long Bluehead Suckers CPW stocks in Milk Creek. These stocked fish are much smaller than adults of the species. These smaller fish may find appropriate habitat in Milk Creek at a flow of 8 cfs for a period of time. These stocked fish could feed and grow in Milk Creek at a flow of 8 cfs and at the same time avoid predation by the large bodied piscivorous species that inhabit the mainstem Yampa River. The CPW stocking program is designed to use Milk Creek as a source of young Bluehead Suckers to bolster the species' population in the mainstem of the Yampa River and not just the claimed reach.

A flow of 8 cfs maintains minimal longitudinal connectivity from the claimed reach to the mainstem Yampa River. A continuous pathway at least two feet wide is present through all the cross sections at a flow of 8 cfs (Miller 2024a). Adults, fry and fingerlings of the Three Species would not be stranded and die in the claimed reach in the late summer months, an outcome common in many streams on the arid west slope of Colorado. In contrast, fry and fingerlings of the Three Species stranded in Cottonwood Creek in the Gunnison River basin die as the water disappears each year (Hooley Underwood 2019). With the 8 cfs flow proposed by Miller (2024a), Milk Creek can serve as a source of young Bluehead Suckers and Flannelmouth Suckers to the mainstem Yampa River population for the Three Species.

I recommend that the proposed flow of 8 cfs be approved for the time period of August 1 through February 28, but that a higher flow be approved for the month of March (see following section). Miller (2024a) indicated that "a maximum depth of 0.6 feet was present at some point in all cross sections at an average flow 4.6 cfs except for one of shallowest cross sections," and that movement across these shallows" may be possible for adult Bluehead Sucker and Flannelmouth Sucker. I do not believe that large, adult members of the Three Species would be able to adequately transit the claimed reach at such low flows. However, surface flows less 4.6 feet would allow immature life stages to move throughout the claimed reach to find appropriate habitat, or to migrate to the mainstem Yampa River. Protecting the young fry and fingerlings of the Bluehead Sucker and Flannelmouth Sucker in Milk Creek at flows less than 8 cfs could be a management option for all entities interested in the Three Species program. A flow of 8 cfs provides minimum longitudinal connectivity for larger adults. If, however, flows of 4.6 cfs are all that is available, those flows will provide protection of younger life stages.

Recommendation Regarding the Flow Proposal of 8 cfs in March

I recommend a March instream flow of 20 cfs for Flannelmouth Sucker and Bluehead Sucker. Multiple studies have shown that these two sucker species may spawn in March. For example, Mature Flannelmouth and Bluehead Sucker entered Cottonwood Creek in mid-March of 2017 (Hooley Underwood et al. 2019). Flannelmouth Sucker spawned in March in Paria Creek and Bright Angel Creek, tributaries of the mainstem Colorado River in Arizona (Weiss et al.1998). Flannelmouth Suckers and Bluehead Suckers spawned from the middle of March through early July in San Juan River (Barkalow et al. 2016). I have collected large, mature, pre-spawn, tuberculated, adult Flannelmouth Sucker in Salt Wash, a tributary of the mainstem Colorado River in Mesa County in March. Approved instream flows for Milk Creek in March are needed to protect spawning Bluehead Sucker and Flannelmouth Sucker in March as well as April through June.

The average March flow in Milk Creek is 19.7 cfs, much more than the 8 cfs proposal in Miller (2024a). Bluehead Sucker and Flannelmouth Sucker will likely move into Milk Creek in March and may need appropriate spawning habitat as well as deeper water in pools to provide cover for the mature pre-spawn adults. Such habitat is available at a flow of 20 cfs (Miller 2024a, Figure 5 and Figure 6).

Recommendation Regarding a Flow Proposal for the Month of July

Miller (2024a) did not propose a specific flow rate for the month of July, but does indicate that "intermediate flows" would be "more protective." July flows are critical. Post-spawn adults may be in the claimed reach at this time and would require longitudinal connectivity to the mainstem Yampa River channel. Developing eggs may be drifting downstream as well as recently hatched larvae or developing fry. These life stages must be protected in July.

The average July flow is 8 cfs in the claimed reach (Miller 2024a). At a minimum, a July instream flow of 8 cfs should be approved for the claimed reach. This flow would provide longitudinal connectivity to the mainstem channel for adults as well as habitat for developing eggs, drifting larvae and fry. An instream flow of 8 cfs for July would also provide a level of protection for the five-inch long Bluehead Suckers CPW stocks into Milk Creek as well as Speckled Dace.

1.0 Introduction

Miller (2024a) proposed instream flow rates to protect native fish species in the claimed reach of Milk Creek, tributary to the Yampa River, in CWCB Water Division 6. Milk Creek is a comparatively small tributary to the mainstem Yampa River that drains about 223 square miles in northwestern Colorado. The stream enters the Yampa River about 12 miles southwest of Craig, Colorado. The claimed reach extends upstream from the Yampa confluence to the point where Wilson Creek enters the stream, a distance of about 4.1 miles. The BLM owns 2.49 miles of the claimed reach while 1.62 miles are privately owned. Water depths in Milk Creek vary seasonally and the Miller (2024a) instream flow proposals mirror that seasonal variation.

Three of the native fish species that inhabit the claimed reach are the Bluehead Sucker (*Catostomus discobolus*), the Flannelmouth Sucker (*Catostomus latipinnis*) and the Roundtail Chub (*Gila robusta*). This group of fish species is collectively referred to as the Three Species. The Three Species are the object of interstate efforts designed to halt the decline in range and numbers of the fish. Another native species is also found in this stream reach, the Speckled Dace (*Rhinichthys osculus*).

I was asked by Western Resource Advocates to provide an analysis of the Miller report (2024a) and the instream flow proposals for the claimed reach. I have worked with the Three Species and Speckled Dace since 1974 when I first sampled the Colorado River, the San Miguel River and the Dolores River, working as a researcher for the Colorado Water Quality Control Division.

I periodically sampled and studied the Three Species from 1978 through 2003 as a biologist with CPW. I authored a book about fish species not normally targeted by anglers titled "Colorado's Little Fish" that was published in 1985. This book described more than 40 fish species, including life history information, range description, habitat, etc. Descriptions of the Three Species and the Speckled Dace were part of that book. I am currently working with CPW biologists writing a book titled "Fishes of Colorado," and am also an editor of the publication. I am a co-author of the chapters on Flannelmouth Sucker, Roundtail Chub and Speckled Dace.

The following sections address the status of the Three Species native fish assemblage on the western slope of Colorado, and the status of the Three Species in Milk Creek Basin. Also included are sections on the importance of longitudinal connectivity to the Flannelmouth Sucker and Bluehead Sucker, and the Miller (2024a) proposed instream flow rates. Each of these topics is addressed in the following sections.

2.0 Overview and Status of Native Fish Species

2.1 Native Fish Assemblage on the Western Slope of Colorado

Only 13 fish species are thought to be native to waters on the western slope in Colorado, including the Yampa River basin. The number of native fish species that inhabit west slope waters is very low compared to other major river basins in the Continental United States. Five of these species are currently federally and/or state listed as threatened or endangered, including the Razorback Sucker (*Xyrauchen texanus*), the Colorado Pikeminnow (*Ptychocheilus lucius*), the Humpback Chub (*Gila cypha*), the Bonytail Chub (*Gila elegans*), and lineages of the native Cutthroat Trout (*Oncorhynchus clarkii*). The Mountain Sucker (*Catostomus platyrhynchus*) is also listed as a species of concern by the State of Colorado. The BLM considers the Flannelmouth Sucker (Catostomus latipinnis), Bluehead Sucker (*Catostomus discobolus*) and Roundtail Chub (*Gila robusta*) to be "sensitive" species. The Flannelmouth Sucker, the Bluehead Sucker and the Roundtail Chub are often treated as a single management unit. This species assemblage is referred to as the Three Species (See section 2.2 for a description of the Three Species).

In total, nine of the 13 native fish species (69%) on the western slope of Colorado have declined in numbers and distribution to the point that some form of designation has been applied to the taxa or is warranted. The decline in the fish assemblage on the west slope of Colorado can be compared to a similar nationwide phenomenon. When examined in 2000, A total of 37% of the native fish species in the United States had declined in abundance and distribution to the point that the species had some form of official designation as imperiled (Master et al. 2000). In general, the native fish assemblage of Colorado's western slope has experienced twice as much of a decline as the rest of the United States. Such declines in fish throughout Colorado have resulted in the design and implementation of a variety of recovery endeavors to protect these species. At least five of these declining species are endemic to the Colorado River basin.

2.2 The Three Species

The Three Species are the focus of a multi-state and federal effort. Protection and enhancement of existing populations of the Three Species is a component of many state and federal fish management programs. All three taxa appear to be restricted to less than 50% of the species' historic range in the Upper Colorado River Basin (Bezzerides and Bestgen 2002). The Upper Colorado River Basin is that portion of the Colorado Basin located upstream of Glen Canyon Dam, an expanse that includes the San Juan River basin, the Green River basin and all of the Colorado River basin upstream of the Green River/Colorado River confluence. The Yampa River is tributary to the Green River. The objective of the state and federal efforts is to avoid federal listing of any of the Three Species. Reproducing populations of the Bluehead Sucker, Flannelmouth Sucker and Roundtail Chub inhabit the lower reaches of the several Colorado Rivers including the Yampa River basin. Milk Creek is a tributary to the mainstem Yampa River that supports the Three Species and Speckled Dace.

Any further decline in distribution and abundance of the Three Species is significant. Most western slope rivers in Colorado still support reproducing populations of the Three Species, although the Flannelmouth Sucker and Bluehead Sucker have disappeared from the Gunnison River upstream of Blue Mesa Reservoir (Woodling 1985). The relatively robust Colorado Three Species populations are somewhat of an anomaly compared to the status of the populations throughout the entire native range of this species group. The distribution of the Three Species is also different for the individual fish species. Flannelmouth Sucker are still found in most of the species' historical range in Wyoming and Colorado but the species has disappeared or become less abundant throughout the remainder of the species range: California, Utah, Arizona and Nevada (Rees et al. 2005). Thus, a decrease in abundance or distribution of the Three Species in Colorado has more influence on the status of the taxa than in other states where most populations have disappeared. The failure to protect Colorado populations could lead to the listing of one or more of the Three Species on the national level, an occurrence that could have relatively more implications in Colorado where the taxa are still present.

The Three Species and the four federally listed species are normally associated with larger rivers in the minds of most people who have an interest in this species group. In fact, the Three Species also inhabit smaller rivers and streams on the west slope of Colorado. Flannelmouth Suckers have been collected in all sized stream reaches from the mainstem Colorado River in Mesa County, which is the largest river in western Colorado, to small streams such as Yellowjacket Creek in the southwestern corner of Colorado (John Woodling, personal observation). Yellowjacket Creek was about 8 feet wide where the Flannelmouth Suckers were collected, with pools about 1.5 feet deep. Bluehead Suckers have been found in the mainstem Colorado River at the Utah/Colorado border and in smaller waters at an elevation of 8,500 feet (CPW database). These higher elevation waters support not only Bluehead Suckers but in some cases trout. Roundtail Chub are also found in a wide range of waters from the mainstem Colorado River to much smaller streams such as Yellowjacket Creek and McElmo Creek in the San Juan River (Dan Cammack, CPW, personal communication), and small irrigation return waters in Mesa County (John Woodling, personal observation).

The Three Species not only inhabit various sized streams and rivers, but individuals of the Three Species may be highly mobile. The mobility of individual members of the Three Species means

that these fish often have a rather large home range and these fish may move hundreds of miles in the course of a year. Protecting these mobile species requires providing adequate habitat and connectivity over a large geographic area and in more than one stream or river. Mainstem and tributary reaches are all important.

Flannelmouth Suckers, like the more widely known Colorado Pikeminnow, are very mobile. One Flannelmouth Sucker tagged in the Green River in 2011 was found in the Dolores River in 2014 and 2016, meaning that this fish moved about 260 miles from the point of initial tagging (Zack. Hooley-Underwood CPW, personal communication), while others moved up to 143 miles over time in other waters (Bezzerides and Bestgen 2002).

Individual Roundtail Chub, like Flannelmouth Sucker, can be very mobile. An adult tagged in the Yampa River near Craig, Colorado moved downstream to the Green River in Utah, then downstream to the confluence of the Colorado River and the Green River, and finally upstream in the Colorado River to Grand Junction, Colorado, a distance of more than 200 miles.

The Bluehead Sucker does not appear to move as much as Flannelmouth Sucker or Roundtail Chub (Beyers et al. 2001). One Bluehead Sucker in the San Juan River moved 38 miles in 435 days (Carman 2007). In fact, Bluehead Suckers stocked by CPW in Milk Creek have moved out of the stream and into the Yampa River downstream to Lily Park (Jenn Logan, CPW, personal communication). Others moved upstream in the Yampa River, but for shorter distances than those that moved downstream.

The Three species spawn in the spring, the time of maximum flows in streams and rivers on Colorado's western slope. The high-water levels are created by snow melting at higher elevations in the mountains and/or spring rains at lower elevations. The Three Species are known to spawn in the large mainstem rivers on the western slope of Colorado. However, each of the Three Species are also known to migrate into smaller tributaries from larger rivers to spawn, for example,

1. Flannelmouth in the Grand Canyon move from the mainstem Colorado into Bright Angel Creek and the Paria River (Weiss et al. 1998).
2. Bluehead Sucker, Flannelmouth Suckers and Roundtail Chub move into Cottonwood Creek, an intermittent tributary of Roubideau Creek in the Gunnison River basin (Hooley-Underwood et al. 2019),
3. Bluehead Sucker and Flannelmouth Sucker move into Coal Creek from the White River (Fraser et al. 2017),
4. Flannelmouth Sucker move into McElmo Creek from the San Juan River (Cathcart et al. 2015),
5. Milk Creek was identified by BLM (2009) as a tributary where native fish species spawn.

Large Flannelmouth Sucker have been observed spawning in Parachute Creek in the month of June (John Woodling, personal observation). The large size of these fish indicated that these fish had migrated upstream from the mainstem Colorado River to spawn. Large Flannelmouth Sucker, many with breeding tubercles, were collected in Salt Wash, a tributary to the mainstem Colorado River in Mesa County Colorado, in March. These fish were presumed to be migrants from the Colorado River (John Woodling, personal observation).

The Three Species appear to display spawning site fidelity with many fish returning to the same tributary year after year to reproduce. Seventy one percent of the Flannelmouth Suckers and 61% of Bluehead Suckers tagged in 2016 in Cottonwood Creek returned in 2017 (Hooley Underwood 2019). Return rates for Roundtail Chub were lower. From 18% to 42% of Roundtail Chub returned (Hooley-Underwood et al. 2019). Protecting these declining species in small tributaries during spawning season results in protecting and enhancing the species numbers in the large downstream rivers.

Spawning is cued by increasing temperature. Suckers moved into Coal Creek from the White River beginning in mid-May of 2012 and 2013 to spawn (Fraser et al. 2017). Fraser et al. (2017) determined that the majority of sucker spawning movements occurred when water temperatures in White River exceeded 11–14°C and those in Coal Creek were 2.5–4°C warmer, while flows varied between years. Water levels however can also influence when the Three Species move into a tributary to spawn. The Three Species enter Cottonwood Creek when water levels increase to a level that the adults can access the stream (Zack Hooley Underwood CPW personal communication).

The Three Species have a rather extended spawning season that can begin in early spring. Flannelmouth and Bluehead Sucker entered Cottonwood Creek in mid-March of 2017 while Roundtail Chub were not encountered until the middle of April (Zack Hooley Underwood et al. 2019). Flannelmouth Sucker also spawned in March in Paria Creek and Bright Angel Creek, tributaries of the mainstem Colorado River in Arizona (Weiss et al.1998). Flannelmouth Suckers and Bluehead Suckers spawned from the middle of March through early July in San Juan River (Clark Barkalow et al. 2016). Migrating adult Flannelmouth Suckers were collected in Escalante Creek in mid-March (Roy Smith BLM, personal observation). These multiple observations more than demonstrate that Bluehead Suckers and Flannelmouth Suckers can initiate spawning activities in March. Reasonable protection for the Three Species includes actions designed to provide adequate habitat through the entire spawning season. Such actions include providing reasonable instream flows that allow migrating adults to enter tributaries in the month of March.

2.3 Speckled Dace

The Speckled Dace (*Rhinichthys osculus*) ranges from British Columbia south through California east to Wyoming and down through the Rocky Mountains to Sonora Mexico. This small fish evidently can disperse rapidly and is the only fish species found in all major river basins in the western United States. The species is native to waters on the western slope of the Continental Divide in Colorado.

Various populations of Speckled Dace have been designated as distinct subspecies throughout the native range of this dace species. Some of these subspecies have been listed as federally endangered including the Kendall Springs (*Rhinichthys osculus thermalis*) in Wyoming and the Ash Meadows (*R. osculus nevadensis*) in Nevada, while the Foskett Dace (*R. osculus* spp.) is a federally listed fish in Oregon. No populations in Colorado have been designated as distinct subspecies, nor have any listing actions been proposed. Fishery biologists, including Minckley (1985), have described the Speckled Dace as a "complex" which may actually be several species.

The dace populations on the western slope may be shown to be a distinct subspecies in the future. Thus, protecting Speckled Dave populations in Colorado is a worthwhile proposal.

The Speckled Dace is one of the very few native fish species in Colorado that has not seriously declined in distribution, although some Colorado populations have disappeared. The Longnose Dace, *Rhinichthys cataractae*, is native to the eastern slope of Colorado. However, Longnose Dace replaced Speckled Dace in some waters on Colorado's western slope. For example, the Longnose Dace has replaced the Speckled Dace throughout most of the Gunnison River basin upstream of Blue Mesa Reservoir and in the mainstem Colorado River in the stream reach just downstream of Windy Gap Reservoir. Thus, protection of this native species is warranted.

The Speckled Dace inhabits multiple microhabitats in streams, including riffles. The depth and velocity in riffle areas can be compared to the habitat requirements of Speckled Dace to determine what flows are needed in streams to provide reasonable protection for this species.

2.4 Milk Creek and the Three Species

Milk Creek is a small tributary to the Yampa River. The creek enters the Yampa River about 12 miles southwest of Craig, Colorado. Milk Creek is one of the few permanently flowing tributaries of the Yampa River. The stream in the claimed reach includes fast, shallow riffles and larger deeper pools (BLM 2009).

Four native species, the Flannelmouth Sucker, Bluehead Sucker, Roundtail Chub and Speckled Dace inhabit Milk Creek (BLM 2009, 2017, 2019). These populations are considered to be naturally reproducing. BLM (2009) reported the collection of "Small suckers," which were probably the result of the natural spawning of Flannelmouth Sucker or Bluehead Sucker in Milk Creek. A Roundtail Chub about three inches in length was pictured in BLM (2009, 2017, 2019) reports. This was likely a young of the year fish that may well have been spawned in the claimed reach.

Milk Creek is one of the few permanently flowing streams that enters the mainstem Yampa River in the relatively arid canyonland environment from Hayden, Colorado to the Utah/Colorado border. As such, the Three Species population in this small stream may be more important than in other large river systems where permanently flowing tributaries are more abundant. As previously described, small tributaries are important spawning sites for the Three Species. Large numbers of the Three Species seasonally move into small tributaries to spawn and then return to larger rivers such as the Yampa River. Milk Creek was identified by BLM (2009) as "important" tributary where native fish species spawn.

BLM fish sampling has not reported the presence of large numbers of large piscivorous species in Milk Creek, only the occasional Smallmouth Bass has been collected (BLM 2009, 2017). In contrast, many large piscivorous fish (including Northern Pike and Smallmouth Bass) are abundant in the mainstem Yampa River and are known to prey on other fish in the mainstem river, including the Three Species. The numbers of native fish species in the mainstem Yampa River have been reduced over the last decades.

The absence of large bodied predatory fish species in Milk Creek is an indication that Milk Creek may provide the Three Species with a refuge from predation by these species. BLM has, however, found Creek Chub, a smaller bodied predatory fish, in Milk Creek (BLM 2017). Creek Chub are omnivorous consuming anything, including small fish such as fry and young fingerlings of the Three Species.

BLM and CPW utilize the relatively predator free claimed reach of Milk Creek as part of a program to protect and enhance Bluehead Sucker populations in the mainstem Yampa River. CPW rears Bluehead Sucker for two and three years at a state hatchery. The resulting five-inch-long fish haven been stocked into Milk Creek since 2015 and 2016 (BLM 2015, 2016). These fish are all tagged and are individually identified when recaptured. The five-inch fish are too large to be preyed upon by Creek Chub. Stocking Bluehead Sucker appears to have been successful. Tagged Bluehead Sucker have been reported in Yampa River upstream and downstream of Milk Creek (BLM 2019). The Bluehead Sucker collected in the mainstem Yampa River may well display site fidelity and return to Milk Creek to spawn like the Three Species in Cottonwood Creek (Hooley Underwood et al. 2019). Protecting the stocked five-inch Bluehead Suckers in Milk Creek improves population numbers in the mainstem Yampa River.

Adopting an instream flow for Milk Creek is one important component of maintaining and enhancing the Three Species in the Yampa River basin. Approval of the proposed instream flow would provide not only reasonable levels of spawning habitat but also longitudinal connectivity between Milk Creek and the mainstem Yampa River. Connectivity allows adults, juveniles and fingerlings to migrate in and out of Milk Creek to the Yampa River in relation to changes in season and flow. Maintaining longitudinal connectivity is considered to be a vital component in the conservation of Flannelmouth and Bluehead Suckers (Cathcart et al. 2015).

3.0 Flow Proposals for Milk Creek, and Depth and Velocity Requirements of the Three Species

3.1 Proposed Instream Flow Rates

Miller (2024a) used the System for Environmental Flow Analysis (SEFA) software, to calculate instream flows for Milk Creek. SEFA is a technically sound method that allows for additional analyses in comparison to the PHABSIM model used in prior instream analysis studies. SEFA can be utilized to determine the extent of stream width available for fish passage through a site. The amount of stream width for passage and maximum depth predictions determine the minimum flow that provides longitudinal connectivity in the claimed stream reach (Miller 2024a). The suitability criteria used by Miller (2024a) in the modeling were updated for the analysis (Miller 2024b). These updates accurately described the relationship of Bluehead suckers and Flannelmouth Sucker to depth and water velocity. Connecting the water depth and water velocity needed for adult suckers and adult spawners was critical to producing flow recommendations that protect the Three Species to a reasonable degree.

The goal of the instream flow rates proposed is to protect the Three Species and the natural environment in the claimed reach of Milk Creek to a reasonable degree. The instream flows

proposed by Miller (2024a) are required by statute to be the minimum flow that would protect to a reasonable level, not an optimum level.

Miller's (2024a) flow recommendations for Milk Creek are as follows:

1. A flow of 40 cfs from April through June,

2. A flow of 8 cfs from August through March.

Specific flow recommendations for the month of July were not provided by Miller (2024a). Miller (2024a) did point out that

> "Appropriate flows for the ascending and descending limb of the hydrograph would allow more unimpeded movement for migration and for resident fish moving to spawning locations. A streamflow that is intermediate between the recommended base flow and peak flow would be more protective of the species than an abrupt change from baseflow to peak. An intermediate flow for the ascending and descending limb of the hydrograph based on water availability would be protective."

Water in excess of the Miller (2024a) proposal appears to be present in the claimed reach during the spring snowmelt period, April 1 through July 30. Milk Creek has bank full water levels most years during the spring snowmelt period. These bank full flows are in excess of the proposed 40 cfs instream flow rate to protect native fishes. The existing spring snowmelt flow regime provides adequate depths and velocity to support the Three Species and Speckled Dace in the claimed reach of Milk Creek.

The habitat requirements of the Three Species and the Speckled Dace can be compared to the water depths and velocities provided by the Miller (2024a) flow proposals to determine the level of protection that would be provided at the proposed flows.

3.2 Three Species Depth and Velocity Requirements

The Miller (2024a) flow proposal for Milk Creek is intriguing because four different subsets of the Three Species in Milk Creek may be protected, including

1. Resident individuals of the Three Species that inhabit the claimed reach on a year-round basis,
2. Migratory individuals of the Three Species whose home range includes the claimed reach of Milk Creek and the mainstem Yampa River on a seasonal basis. These individuals move into Milk Creek in the spring to spawn and then return to the mainstem Yampa River for the remainder of the year,
3. The Bluehead Sucker that are stocked by the CPW into the claimed reach of Milk Creek. The objective of stocking Bluehead Suckers into Milk Creek is to increase the number of Bluehead Suckers in the mainstem Yampa River. CPW stocks two- and three-year old Bluehead Suckers. These older, and relatively larger (five-inch), individuals may avoid predation from the larger non-native piscivorous species that inhabit the mainstem Yampa River by remaining in the claimed reach. These stocked Bluehead Sucker may

well move out into the Yampa River to mature and then return to Milk Creek in a subsequent spawning season,

4. The larvae and age-0 fingerlings of all the first three groups that may be found in the claimed reach each spring, summer and fall. Longitudinal connectivity must be maintained from the claimed reach to the mainstem Yampa River to allow fingerlings to migrate to the mainstem Yampa River from nursery areas in lower Milk Creek.

Milk Creek is different in that an instream flow will protect adults of the Three Species that migrate into Milk Creek from the mainstem Yampa River, not just those that are year-round residents of the stream. These adults are large fish moving into a small stream. Most instream flow recommendations have been based on a principle that large fish live in large waters and smaller fish live in smaller waters. In the case of Milk Creek, larger fish are predominately present during part of the year in a small stream and these fish require adequate habitat to successfully spawn.

Water depth and water velocity are two habitat variables that can determine if a fish species can colonize or spawn in a stream reach. Water depth and water velocity are also two variables that Miller (2024a) emphasized in development of his flow proposals.

CPW fishery biologists have long recognized that depth and velocity are important factors when sampling for the Three Species. Adults of the Three Species will be most abundant when water is deepest in the habitat used by each species; deep runs (Miller [2024b] uses the term “glides” for runs) and pools for Flannelmouth Sucker, riffles or runs for Bluehead Sucker and pools, in general, for the Roundtail Chub. Flannelmouth Suckers are often encountered in deep runs when water is from waist to chest deep while Bluehead Suckers are often collected in slightly faster waters that may be a little shallower. The Roundtail Chub seems to use deeper water in the day and shallower water in the nighttime hours. Roundtail Chub are associated with diverse habitat where water is relatively deep, and structure is more prevalent, including areas of undercut banks, large rocks on the substrate or stream bank and in some stream reaches overhanging shrubs and trees.

Published data are similar to the qualitative observations of CPW biologists. The optimum depth for Flannelmouth Suckers in Colorado waters appears to be a depth between 1.3 feet to 6.6 feet (Anderson and Stewart, 2003, page 56, Figure 8). Flannelmouth Suckers in Wyoming selected waters from 1.6 feet to 3.3 feet in depth (Sweet 2007). The optimum depth for Bluehead Suckers in Colorado waters appears to be a depth between 1.6 feet and 5 feet (Anderson and Stewart, 2003, page 55, Figure 7). Bluehead Suckers in Wyoming selected waters from 1.6 feet to 3.3 feet in depth (Sweet 2007). Miller (2024b) calculated that a depth of 0.91 feet to 4.0 feet are the recommended suitability index for Flannelmouth Sucker and Bluehead Sucker in the claimed reach, values similar to the published literature noted in the first portion of this paragraph. Specific information regarding Roundtail Chub and water depth is lacking. However, adults and juveniles are usually taken in comparatively deep water with low water velocity (Rees et al. 2005) and in stream reaches with a complex combination of pool and riffle habitat and cover (Bezzerides and Bestgen 2002).

The Bluehead Sucker uses riffle habitats more than the other two members of the Three Species. Water depth in general is deeper in runs and pools than in riffles in a given stream reach. Maintaining a reasonable water depth in riffles for Bluehead Suckers would provide protection for not only Bluehead Suckers but also the Flannelmouth Sucker and Roundtail Chub (Stewart and Anderson 2007). The CWCB has agreed in prior hearings that a water level that provides Bluehead Suckers with adequate habitat in riffles would provide adequate habitat for the Flannelmouth Sucker and the Roundtail Chub.

An average water depth of 1.0 foot and a flow velocity of 1.3 feet/second provides "marginally suitable" habitat for Bluehead Suckers (Anderson and Stewart 2003). The term "marginally suitable" is a quote from Anderson and Stewart (2003) and is interpreted and used throughout this report as the low end of a range of values that provides "reasonable" protection as used in the instream flow program. Thus, the Miller (2024a) instream flow rates proposed for Milk Creek can be compared to the marginally acceptable water depths and velocities for Bluehead Sucker to determine if the flow recommendation is appropriate to provide the fishery to an adequate habitat.

Lower water depths will not necessarily eliminate the Three Species from Milk Creek. However, at low flows the adult members of the Three Species that are present may well be smaller fish, a situation observed in other Colorado stream reaches. Flannelmouth Suckers, for example, were found in Yellow Jacket Creek in the southwest corner of Colorado. The runs were about 1.5 feet deep and the largest Flannelmouth Suckers were less than 14 inches in length. Yellow Jacket Creek water depth was at the low end of the "optimum" depth as noted by Anderson and Stewart (2003) for Flannelmouth Sucker but a lack of deeper runs and pools resulted in comparatively smaller adult Flannelmouth Sucker. Flows in the Dolores River upstream of the San Miguel River confluence are even lower and Flannelmouth Suckers only reached a maximum length of eight to ten inches (R. Anderson, CPW retired, personal communication). In contrast, Flannelmouth Suckers can be 25-inches in length in streams and rivers with runs and pools in excess of 3.3 feet deep. A decrease in size may well lead to a reduced fecundity in the population as a whole. Water depths may become so low that the fish populations become extirpated. The resident population of the Three Species could likewise be impacted if the current flows are reduced for a period of years.

The water depth in riffles is especially important. Water too shallow in riffles may restrict movement of large adult fish in a stream reach. Adequate depths are needed to provide longitudinal connectivity along a stream reach so that fish can move freely through pool, runs and riffles. In Milk Creek, longitudinal connectivity is needed to allow Bluehead Sucker and Flannelmouth Sucker to move through the claimed reach but also to access the Yampa River at the lower terminus of the claimed reach. Mature adult Bluehead Sucker and Flannelmouth Sucker can move through riffles at a water depth of 0.6 feet (Zach Hooley-Underwood, CPW personal communication). Thus, these two species would be able to move into and through the claimed reach at a flow of 8 cfs in the months of August through March. This represents a minimum flow since only a portion of riffles in the claimed reach (slightly less than two feet in any stream profile: Miller 2024a) have water depths greater than or equal to 0.6 feet.

Water depth is correlated with water velocity. Water velocity and water depth in riffles, runs and pools increase as the flow volume increases during spring snow melt time periods, or during summer thunderstorms. Both Flannelmouth Suckers and Bluehead Suckers may select different areas within the stream as flow levels change. For example, Flannelmouth Sucker may well be in deep water runs at water velocities of 3 feet/second to 4 feet/second but move to areas with slower currents, including pools, when water velocities exceed 4 feet/second at higher stream flows. Miller (2024b) calculated that water velocities from 0.6 feet per second to 2.5 feet/second are the recommended suitability index velocities for Flannelmouth Sucker and Bluehead Sucker in the claimed reach. Bluehead Suckers may move to deep water runs and Flannelmouth Sucker may move to pool areas with slower current. Movement of Bluehead Sucker and Flannelmouth Sucker within rivers like the claimed reach of Milk Creek is a seasonal pattern depending on fluctuations in flow rates that influence both water depth and water velocity and sensitive stages of the fish species' natural history. Water depth and water velocity needs of the Three Species were used by Miller (2024a, 2024b) to create proposed instream flow recommendations for the claimed reach

3.3 Speckled Dace Depth and Velocity Requirements

Protection for the Speckled Dace must also be considered when analyzing the proposed instream flow rates. The Speckled Dace is a small bodied native fish that is not known to migrate long distances. Protection of Speckled Dace involves providing adequate habitat within the stream reach in question. Habitat needs regarding depths and velocities for this species have been determined.

Speckled Dace occupy a wide range of water depths from 2 inches (Moyle and Baltz 1985) to 5.1 feet (Batty 2010), but prefer shallow, low velocity habitats. In a similar manner, Speckled Dace inhabit a wide range of water velocities ranging from 0.3 feet/second (Baltz et el. 1982) to 3.5 feet/second (Batty 2010). This dace species prefers water velocities of 0.95 feet/second to 1.4 feet/second (Moyle and Baltz 1985.

Spawning requirements are also quite broad. Winkowski and Kendall (2018) determined this small minnow prefers a spawning depth of about 2 feet. In extreme contrast, Speckled Dace were observed spawning in a small New Mexico stream in two inches of water over a clean gravel substrate one to two inches in diameter (Mueller 1984). This species has an extended spawning period throughout the spring and summer, where peak activity occurs when water temperatures reach 65˚F (18.3˚C) (Sigler and Sigler 1996).

The Miller (2024a) instream flow rates proposed for Milk Creek result in a water depth in portions of riffles of at least 0.6 feet. A depth of 0.6 feet (7.2 inches) is closer to the two-inch depth reported by Mueller (1984) to be acceptable for spawning compared to the 2 feet depth postulated by Winkowski and Kendall (2018). Speckled Dace spawn in riffles with a cobble substrate. So, riffle depths of 0.6 feet would be appropriate for Speckled Dace spawning and can be considered to be minimal depths for purposes of establishing instream flows for the species. Adults are usually found in pools, slow runs, eddies and along shorelines, not riffles. Water depth in pools and runs would be greater than 0.6 feet if, water depth in portions of Milk Creek

riffles was 0.6 feet. Thus, a flow of 8 cfs results in appropriate habitat for the native Speckled Dace in Milk Creek.

4.0 Comparison of Milk Creek Instream Flow Rates Proposed to Habitat Needs of the Three Species and Speckled Dace

4.1 Background

The instream flow rates proposed by Miller (2024a) provide different water depths and velocities based on season for the claimed reach of Milk Creek. The behavioral patterns of the Three Species vary from season to season and with changing flows. Fish behave differently in breeding season compared to the remainder of the year. A separate analysis for each seasonal flows recommended is presented in the following sections for that reason.

An instream flow should provide a "reasonable" level of protection for the Three Species resident to the claimed reach. However, the term "reasonable" is not defined by the CWCB. There is no specific flow value that represents the minimum instream flow that provides reasonable protection. The flow in a stream or river fluctuates to some degree over the course of each day. Assessing flow recommendations is thus an action that considers a range of flow values. Some flow rates would be on the low side of what is reasonable and some would be on the high side of what is reasonable. This type of assessment includes an aspect of best professional judgement.

As with many Colorado streams, Milk Creek is at base flows through the late summer, fall and winter months, and elevated flows in spring and early summer. Higher spring and early summer flows protect and support reproduction of the Bluehead Sucker and Flannelmouth Sucker. Fertilized eggs, developing larvae and fry would be protected in late summer, fall and winter months, when flows are lower. These recommended flows would protect Bluehead Sucker and Flannelmouth to a reasonable degree. The flow requests are explained in the following sections: 4.2 through 4.5.

4.2 Spring Flows April – June (40 cfs)

Spring flows through the claimed reach of Milk Creek are critical. Spring and early summer are the spawning season for the Three Species and Speckled Dace. These species spawn in riffles and relatively shallow runs, with a cobble, rubble substrate. Any adults of the Three Species that are resident to the lower section of Milk Creek spawn in the claimed reach, as do adults that migrate to Milk Creek from the mainstem Yampa River, as well as adult Bluehead Suckers that were stocked by CPW. Adequate flow is needed in the spring when water temperatures increase in Milk Creek and initiate spawning activities in the Three Species. The CPW plans to enhance Bluehead Sucker populations in the mainstem Yampa River are part of the reason for requesting an instream flow for Milk Creek and demonstrate the importance of maintaining reasonable protection of these fish in Milk Creek.

Bluehead Suckers and Flannelmouth Suckers are broadcast spawners. A single male, or a group of males, move with a gravid female into an appropriate microhabitat (usually a cobble bottomed riffle) to spawn. Usually more than one male swims closely alongside the female. The female releases eggs while the attending males release sperm. A cloud of sperm can be observed drifting downstream from the spawning aggregate. The fertilized eggs then drift downstream, settling to the stream bed to begin embryonic development. The more water in the river at that time the more the eggs disperse, settling into a wider range of microhabitats, perhaps enhancing survival of eggs.

Miller (2024a) analyzed the habitat in the claimed reach of Milk Creek for the spring spawning period from April through June using the System for Environmental Flow Analysis (SEFA), discussed above. Miller (2024a) examined water velocity, depth and substrate type by data collected in different seasons, including the spring and early summer spawning period. Water depth and velocity from multiple cross sections on two stream reaches were included in the analysis. The term applied to the model output is "Average Weighted Suitability" (AWS). AWS is to create the instream flows for the claimed reach (Miller 2024a). This is a combined index for velocity, depth and substrate. AWS is measured as the number of square feet per foot of stream. Adult Bluehead Suckers and Flannelmouth Suckers need both holding habitat and spawning habitat in the claimed reach. Figure 5 from Miller (2024a) is included immediately below to demonstrate both the change at different flows and the differences between adult habitat and spawning requirements.

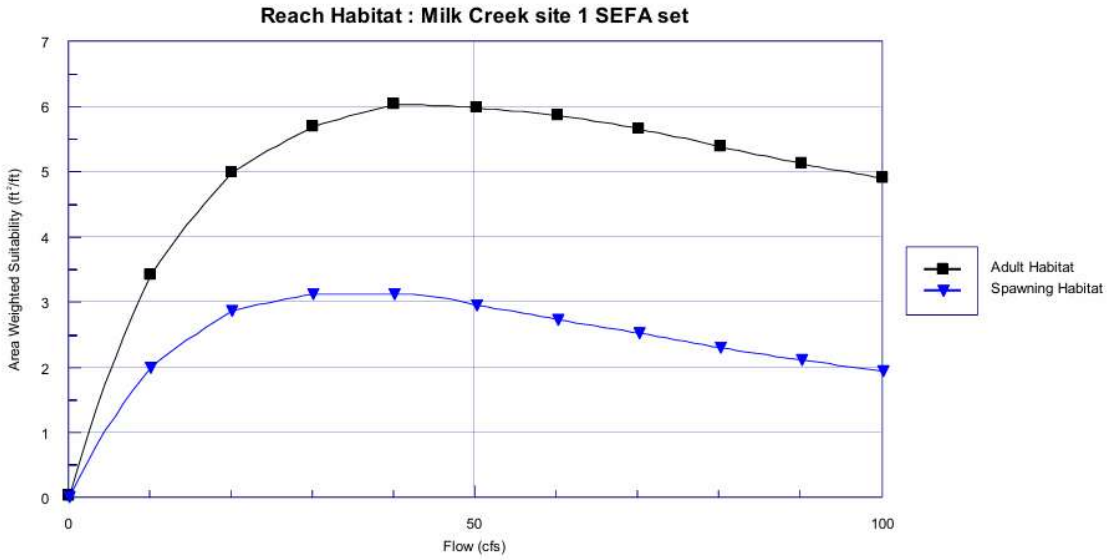

Figure 5. Milk Creek Site 1 predicted average weighted suitability as a function of discharge for adult and spawning Flannelmouth and Bluehead Suckers.

The interaction of these variables is such that the highest AWS index value occurs at a flow of 40 cfs in Milk Creek (Miller 2024a, Figure 5 and Figure 6). The amount of suitable habitat decreases at both lower and higher flows. The amount of appropriate habitat for spawning is lower than the amount of appropriate habitat suitable for adults at all flows. However, the goal of the proposed instream flow regime in Milk Creek is not to just protect large adult suckers, but to protect spawning fish. Protection of spawning adults becomes more important in Milk Creek

where the production of young enhances the population in the mainstem Yampa River as well as Milk Creek. Protection of the young of the Three Species can be assisted by providing appropriate flows through as much of spawning season as possible. Miller (2024) noted that,

> "protecting a minimum flow during snow melt runoff (April June) of 40 cfs would provide unimpeded fish passage for fish migrating into Milk Creek and the most spawning habitat."

Monthly modeled flow data demonstrated that the amount of spawning habitat increases in the spring (April) as snowmelt starts in the surrounding mountains, peaks at a flow of 40 cfs, and then decreases at higher flows. Spawning success would appear to vary across years through wet years and drought years. One way to assure reproductive success for these two sucker species would be to protect a 40 cfs flow through the claimed reach, because the protection of spawning habitat is important for the fishery of the entire Yampa River basin.

Many aspects of a river's ecology are related to maximum spring river flows. Sediments move when flows reach certain levels. Successful fish reproduction is connected to elevated flows. The stream channel is altered based on elevated river levels. The 40 cfs flow recommendation is much less than the peak water levels that often occur in Milk Creek during the spring snowmelt period. Adoption by the CWCB of the Miller (2024a) proposal of 40 cfs is appropriate. The flow of 40 cfs proposed by Miller (2024a) would provide reasonable protection for the Three Species during the spring and early summer spawning period.

4.3 Base Flows August – March (8 cfs)

The base flow period for Colorado streams such as Milk Creek is the time period following the spring snowmelt, extending to the following spring. These August through March flows are critical in the claimed reach. Larvae and fingerlings originating from the spawning of the Three Species may well be present annually during much of the time period of August through March. Bluehead Suckers stocked by CPW may well be present, and there are some Bluehead Sucker and Flannelmouth Sucker that are resident to the claimed reach.

Miller (2024a) recommended an instream flow of 8 cfs for the time period of August through March. A flow of 8 cfs maintains longitudinal connectivity from the claimed reach to the mainstem Yampa River. A continuous pathway at least two feet wide is present through all the cross sections at a flow of 8 cfs (Miller 2024a). Adults, fry and fingerlings of the Three Species would not be stranded and die in the claimed reach in the late summer months, an outcome common in many streams on the arid west slope of Colorado. Fry and fingerlings of the Three Species stranded in Cottonwood Creek in the Gunnison River basin die as the water disappears each year (Hooley Underwood 2019). With the 8 cfs proposed flow, Milk Creek can serve as a source of young Bluehead Suckers and Flannelmouth Suckers to the mainstem Yampa River population for the Three Species.

Available flow data indicate that a flow of 8 cfs is not always present in the claimed reach between August and April (Miller 2024a, Table 4). Instead, monthly flows may be as low as 4.7 cfs. Miller (2024a) addressed this, noting,

> "The maximum depth analysis showed that a maximum depth of 0.6 feet in depth was present at some point in all cross sections at an average flow 4.6 cfs except for one of the seven shallowest cross sections. Fish movement across these shallow stream areas may be possible at flows as low as 4.6 cfs but movement may be slowed or temporarily impeded. Downstream movement may be less impeded for out migrating fish since the movement is in the same direction as the downstream velocity."

Indeed, Miller (2024a, Figure 8 and 9) shows little longitudinal connectivity at flows less than 6 cfs. I would not think that a depth of 0.6 feet "at some point in all cross sections at an average flow 4.6 cfs" would provide long term protection and transit for large, or small, adult Bluehead Suckers or Flannelmouth Suckers. Such shallow depths would provide scant shelter from predators such as Great Blue Herons, racoons and coyotes. However, relatively small, adult Bluehead Suckers can be found in small streams like Milk Creek, including sections of Roan Creek, Naturita Creek, and Mack Wash (John Woodling personal observation), where the depth of riffles can be less than 0.6 feet.

Flows that do not provide adequate habitat for larger Bluehead Suckers and Flannelmouth Suckers may provide adequate habitat for younger fish. Fry and fingerlings resulting from these two species spawning in the claimed reach may well overwinter in Milk Creek. The parents of these larvae and fingerlings could be either migratory adults of the Three Species that spend most of the year in the mainstem Yampa River, year-round residents, or even adult Bluehead Suckers stocked by CPW that matured and returned to spawn. These young fish inhabit areas of the stream with shallower depths (along the shoreline) and lower water velocities (Tyus and Haines 1991; Childs et al. 1998). The presence of continual stream flow during the August to March time period will provide holding habitat and shelter for these small fish that are so vulnerable to predation.

The 5-inch Bluehead Sucker stocked by CPW may well find a reasonable amount of habitat in pools and runs at flows less than 8 cfs. These stocked fish could feed, grow to a larger size, and be protected from the large-bodied predatory species that inhabit the mainstem Yampa River. Protection for younger stocked Bluehead Sucker in the claimed reach during base flow periods would help and enhance the Bluehead Sucker population in the mainstem of the Yampa River, once the stocked fish grow and migrate out into the mainstem river. Protection of Bluehead Suckers would by definition, provide a benefit for the CPW program to enhance the numbers of this sucker species in the mainstem Yampa River.

I recommend that the proposed flow of 8 cfs be approved for the time period of August through February, but that a higher flow be approved for the month of March (see following section). A flow less than 8 cfs may not provide minimum protection for larger adults. If, however, only mean monthly flows from 4.6 cfs to 8 cfs are available in some months, protection of younger life stages should not be ignored.

4.4 July Flow

Miller (2024) did not suggest a specific flow rate for the month of July. Instead, he noted,

> "Appropriate flows for the ascending and descending limb of the hydrograph would allow more unimpeded movement for migration and for resident fish moving to spawning locations. A streamflow that is intermediate between the recommended base flow and peak flow would be more protective of the species than an abrupt change from baseflow to peak. An intermediate flow for the ascending and descending limb of the hydrograph based on water availability would be protective."

The average July flow is 8 cfs in the claimed reach (Miller 2024a). This July flow of 8 cfs would provide longitudinal connectivity to the mainstem channel for adult Bluehead Suckers and Flannelmouth Suckers. Miller (2024a) noted that,

> "A passage criterion of 0.6 foot (7 inches) of depth was chosen based on professional judgement to evaluate fish passage for the native suckers. This depth is approximately double the body depth of adult Flannelmouth Suckers (the larger of the two species), which should allow passage. The SEFA fish passage/connectivity analysis for Milk Creek showed a flow of 8 cfs there is a continuous pathway for fish passage through all cross sections that is at least 2 feet in width and at least 0.6 feet in depth at Milk Creek Site 1 (Figure 9) and Milk Creek Site 2 (Figure 10)."

This connectivity may be especially important in July. Adults that migrated upstream from the mainstem Yampa River upstream into Milk Creek to spawn earlier in the spring will move downstream to the mainstem Yampa River, often as stream flows subside on the descending arm of the hydrograph. Adults resident to the claimed reach can likewise move if appropriate. During this time period developing eggs, larvae and fry that did not settle to the substrate, may still be drifting downstream. An instream flow of 8 cfs for July would also provide a level of protection for the five-inch long Bluehead Suckers CPW stocks into Milk Creek as well as Speckled Dace.

A July instream flow of 8 cfs for the claimed reach would be appropriate. This would help provide a continual flow in the claimed reach on a year-round basis, assuring that the Three Species and Speckled Dace would be a viable, vigorous assemblage in Milk Creek surviving over an extended number of decades.

4.5 March Flow

Miller (2024a) recommended a flow of 8 cfs for the month of March which does not address Bluehead Sucker and Flannelmouth Sucker spawning in March (Barkalow et al. 2016). As described above in section 2.2, Flannelmouth Sucker and Bluehead Sucker spawning in March is well documented.

A flow of 8 cfs is not appropriate for March. Appropriate instream flows for Milk Creek in March are needed to protect spawning Bluehead Sucker and Flannelmouth Sucker in March as

well as April through June. While adult sucker migrating into Milk Creek in March may not actually spawn at that time, adult habitat is needed to protect and shelter these fish.

A mean flow of 19.7 cfs exists in March in Milk Creek (Miller 2024a, Table 4 page 9). The AWS present in March is more than is present in the month of May (Miller 2024a, Figure 7 and Figure 8). Accordingly, I recommend a flow of 20 cfs be adopted for the month of March to provide reasonable protection for the Three Species during the annual spawning period.

4.6 Speckled Dace

The two seasonal instream flows proposed by Miller (2024a) for Milk Creek generally fall within the range of depths and velocities that support Speckled Dace populations. The Speckled Dace seems to be a generalist in regard to water depth and velocity, at least in comparison to the depths and velocities proposed by Miller (2024a) . The Speckled Dace appears to be reasonably protected by instream flows proposed by Miller (2024a).

5.0 Summary and Recommendation

Adopting an instream flow in the claimed reach is particularly important in that four different subsets of the Three Species are found in the claimed reach. The four subsets are,

1. Resident individuals of the Three Species that inhabit the claimed reach on a year-round basis,
2. Migratory individuals of the Three Species whose home range includes the claimed reach of Milk Creek and the mainstem Yampa River on a seasonal basis. These individuals move into Milk Creek in the spring to spawn and then return to the mainstem Yampa River for the remainder of the year,
3. The Bluehead Sucker that are stocked by the CPW into the claimed reach of Milk Creek. The objective of stocking Bluehead Suckers into Milk Creek is to increase the number of Bluehead Suckers in the mainstem Yampa River. CPW stocks two- and three-year old Bluehead Suckers. These older, and relatively larger (five-inch), individuals may avoid predation from the larger non-native piscivorous species that inhabit the mainstem Yampa River by remaining in the claimed reach. These stocked Bluehead Sucker may well move out into the Yampa River to mature and then return to Milk Creek in a subsequent spawning season,
4. The larvae and age-0 fingerlings of the first three groups that may be found in the claimed reach spring, summer and fall. Longitudinal connectivity must be maintained from the claimed reach to the mainstem Yampa River to allow fingerlings to migrate to the mainstem Yampa River from nursery areas in the claimed reach.

Establishing an appropriate instream flow for Milk Creek would also provide protection for the Speckled Dace.

No set of numeric values exists that indicates precisely when a habitat variable (such as depth or velocity) becomes unsuitable for colonization by a fish species or when that variable may reduce growth or numbers. Milk Creek is a much smaller stream than the Yampa River. Members of the Three Species that are year-round residents in Milk Creek may be smaller than the adults that

migrate upstream from the Yampa River to the claimed reach to spawn in the spring and early summer to spawn. The larger, migratory fish coming from the larger Yampa River would select deeper waters than the resident fish of the same species. Determining appropriate flows for all species includes addressing a range of values for a number of parameters and some level of professional judgement.

I believe the analysis and data generated by Miller (2024a) in this matter are excellent and were done in a professional manner. Miller (2024a) has suggested two different seasonal instream flows for the claimed reach of Milk Creek based on season. These two recommendations are,

1. 40 cfs (April through June),

2. 8 cfs (August through March).

5.1 Recommendation Regarding the Flow Proposal of 40 cfs from April through July

I recommend the flow of 40 cfs from April through June be approved by the Colorado Water Conservation Board. The flow of 40 cfs would provide reasonable protection during most of the spawning season for the native fish (the Three Species and the Speckled Dace) that inhabit the claimed reach of Milk Creek as well as members of the Three Species that migrate from the Yampa River to spawn in the spring. Flannelmouth Sucker spawning season begins in March, not in April. These flows would also provide reasonable protection for the Bluehead Suckers stocked by the CPW into Milk Creek.

The Bluehead Sucker is often found in shallower water than either the Flannelmouth Sucker or the Roundtail Chub. In addition, the Bluehead Sucker is often found in riffles. The CWCB has agreed in the past that the adults of the Three Species are assumed to be protected to a reasonable degree when the Bluehead Sucker is provided with appropriate habitat to a reasonable degree.

The Speckled Cub would also be reasonably protected at a flow of 40 cfs. The Speckled Dace is still widely distributed in the species' native range on the western slope, but the species has disappeared from some waters on the western slope. Protection of the species is warranted.

5.2 Recommendation Regarding the Flow Proposal of 8 cfs from August through March

I recommend a flow of 8 cfs from August through February. The proposed flow of 8 cfs from August through February provides reasonable water depths and habitat for,

1. the Speckled Dace,
2. larvae and fry of the Three Species that hatch and grow to fingerling size in the claimed reach,
3. The five-inch long Bluehead Suckers CPW stocks into Milk Creek. These Bluehead Suckers stocked by CPW are much smaller than adults of the species. These smaller fish may find appropriate habitat in Milk Creek at a flow of 8 cfs for an extended period of

time. These stocked fish could feed and grow in Milk Creek at a flow of 8 cfs and at the same time be protected from predation by the large bodied piscivorous species that inhabit the mainstem Yampa River

4. Smaller adults that may use Milk Creek in the claimed reach throughout the entire year and do not migrate to the mainstem Yampa River in low flow months.

The flow of 8 cfs also provides longitudinal connectivity for the Three Species to move throughout the claimed reach and to migrate downstream to the Yampa River. Maintaining connectivity assures that the fry and fingerlings of the Three Species would not be stranded in Milk Creek in the late summer months, an action which could mean the death of these fry and fingerlings. Milk Creek can serve as a source of recruits to the mainstem Yampa River population for the Three Species. The CPW stocking program is designed to use Milk Creek as a source of young Bluehead Suckers to bolster the species' population in the mainstem of the Yampa River and not just the claimed reach.

Available flow data indicate that a flow of 8 cfs is not always present in the claimed reach between August and April (Miller 2024a, Table 4). Instead, monthly flows may be as low as 4.7 cfs. A flow less than 8 cfs does not provide minimum protection for larger adults moving into and out of the claimed reach to the Yampa River. If, however, only mean monthly flows from 4.6 cfs to 8 cfs are available in some months from August through February, protection of younger life stages should not be ignored. A minimum flow equal to the mean flows found in the months.

5.3 Recommendation Regarding March

Miller (2024a) recommended a flow of 8 cfs for the month of March which does not protect Bluehead Sucker and Flannelmouth Sucker spawning in March. A flow of 8 cfs is not appropriate for March as discussed above in section 5.2. Appropriate instream flows for Milk Creek in March are needed to protect spawning Bluehead Sucker and Flannelmouth Sucker in March as well as April through June. While adult sucker migrating into Milk Creek in March may not actually spawn at that time, adult habitat is needed to protect and shelter these fish.

A mean flow of 19.7 cfs exists in March in Milk Creek. Accordingly, a flow of 20 cfs should be adopted for the month of March to provide reasonable protection for the Three Species during the annual spawning period.

5.4 Recommendation Regarding July

Miller (2024a) did not suggest a flow for the month of July. No reason was given by Miller (2024a) for not proposing a July flow. The average July flow is 8 cfs in the claimed reach (Miller 2024a) which would provide longitudinal connectivity to the mainstem channel for adult Bluehead Suckers and Flannelmouth Suckers. I recommend an instream flow rate of 8 cfs for the month of July.

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The North Fork Water Conservancy District (NFWCD) would like to express its concerns about the Instream Flow recommendation for East and West Muddy Creek. The NFWCD thanks the CWCB for the opportunity to comment on this proposal since the creeks largely are within our boundaries and the water users in the area benefit from an exchange program on Muddy Creek run by the district. We have three main issues surrounding the proposal.

First, the proposed instream flow is unnecessary and redundant. Muddy Creek and the whole North Fork drainage is over appropriated already. More importantly, Paonia Reservoir sits at the terminus of Muddy Creek, just above its confluence with Anthracite Creek. As a result, the water rights associated with the reservoir (owned by the NFWCD) pull water through the designated stretches at almost all times of the year. We have an 18,000 acre foot decree and a refill 7,500 af decree which insure that any flows not diverted by senior water rights pass through the proposed Instream Flow reaches; when these rights are called out by downstream users the flows in the creeks are maintained by an exchange program which again insures that flows are continued in the affected ISF area. As a result, the necessary flows are already protected if they are physically present (see below). These existing arrangements would not be affected by the ISF and any future development would have to preserve these senior rights. It seems this ISF appropriation is unnecessary and a waste of staff time and taxpayer money.

Second, the measurements used to quantify the ISF do not reflect an adequate sample size. There is insufficient data for both East and West Muddy flows; there is no gauge on the East Muddy and the West Muddy gauge was a temporary gauge, only used for four years. East Muddy flows were extrapolated from this narrow sample, using a gauge below the terminus of the reach for comparison. None of the years sampled (2021-24) were extreme drought years and the available water is therefore overestimated. By using a gauge well below the affected reach, the projected flows are further overestimated. There are significant return flows within this reach and therefore sections of the proposed ISF flow much less than proposed. Higher up in the reach there is less water available. Even with this sample, the actual water measured is often less than the recommended ISF (see CWCB graphs). We would ask that more measurement be completed to better estimate available flows. This should postpone the Appropriation until after more data is gathered. In addition, the evidence from local water users suggests that the requested amounts are higher than available flows, particularly during the summer and early fall irrigation seasons. We would request that the lowered fall flows begin July 1, not August 1. The winter flows are also likely too high and not adequately measured since the gauge on the Muddy is impacted by ice and not reliable.

Third, it is important to the NFWCD that the ISF agree to the terms and conditions proposed by the Colorado River District and CWCB staff. (attached) In addition to those terms, we would request a specific recognition of the Ragged Mountain exchange program which utilizes 2000 af from Paonia Reservoir storage to allow late season irrigation and stock watering in the affected area. Rather than the single ditches mentioned in the Executive Summary, there are more than 20 ditches that divert water from tributaries to Muddy Creek in these stretches. It is important that any ISF recognize these uses and agrees to not oppose any changes of point of diversion or other modifications of the exchange program. On the East Muddy be advised that RMWUA is aware of 16 member ditches that are located within the stated 6.36 miles reach as follows:

John Medved Ditch No. 3; Can Ditch; Deer Ditch; Elk Ditch; Filmore Ditch; Beaver HideDitch; Crystal No.2 Ditch; No. 2 Buck Creek; Streber Ditch; Coyote Ditch; Coyote No. 1;Coyote No. 2; Downing Ditch; Oak Leaf Ditch; Ridge Ditch; Volk Ditch.

On the West Muddy the following: Martin No.1 Ditch; Snooks Ditch; Snooks No.2 Ditch; Chute Ditch.

The North Fork Water Conservancy District believes the East and West Muddy are well protected by existing water rights and uses and not in need of further ISF protection. If the appropriation must proceed, we would ask for a postponement to allow more representative measurement of water availability. We would further ask for a reduction in recommended flows, particularly in the critical July to October time period, perhaps starting the 11.2 cfs winter flow July 1 on the East Muddy and starting the 2cfs flow on the West on July 1 as well.

Thank you for the opportunity to comment on this proposed Instream Flow appropriation.

Ragged Mountain Water Users Association

PO Box 520

Somerset, CO 81434

December 15, 2023

Colorado Water Conservation Board

Department of Natural Resources

1313 Sherman Street, Room 718

Denver, CO 80203

Members of the Board and Staff:

Ragged Mountain Water User Association (RMWUA) appreciates the meeting held in Hotchkiss for landowners who had received notification from the CWCB.

The majority of attendees were people who had heard of the meeting from other sources—primarily water organizations such as: Overland Ditch, Leroux Creek Water Users, North Fork Conservancy District, and the Gunnison Basin Roundtable. In addition, there were people representing area businesses. The presentation was informative: explaining the enabling Instream Flow legislation and the rationale for the pertinent proposals.

RMWUA objects to the proposed ISF recommendation for the segment of the East Muddy Creek from the confluence with Lee Creek to the confluence with West Muddy Creek. Within this 6.36-mile stretch of creek, the BLM manages approximately 0.85 mile, while the remaining 5.51 miles traverse private property.

First, if the ISF decree were awarded it would be junior and never be able to call. Second, in a 2006 study commissioned by CWCB, Leonard Rice Engineers determined that waters of the North Fork of the Gunnison were already over-appropriated. (That study prompted filings for approximately 5,000 ac. ft. of conditional decrees in our drainage. Many of these filings are upstream of the proposed ISF.) Finally, there was a concern among the attendees that some people who may be affected by these actions are completely unaware of the issue.

At this time, the membership of RMWUA is asking the CWCB to postpone the ISF filings on East Muddy, West Muddy, East Hubbard Creek, Middle Hubbard Creek, and West Hubbard Creek.

We believe it important to expand the notification area to include other property owners who could be affected by the ISF action. A review of the Leonard Rice document and of the current work of the Gunnison Basin Roundtable, which reflects growth and demand for water in the impacted area would be critical in making these decisions moving forward. Finally the Water Availability Data from 1934 – 1953, being used in this effort is clearly outdated and surface water rights named are no longer accurate.

Many members of our association, from multi-generational families on the same land, understand preserving the natural environment. Water usage in our area is recorded and reported by the DNR employees. As an example, in late May of this year the Water Commissioners asked RMWU to support an application for SCADA to provide data at remote locations. The membership agreed to support the request.

Without question, careful consideration is essential to find a balance. Meanwhile, from a broad perspective, RMWUA believes the CWCB should focus on bringing Lower Basin States into compliance with Colorado River Compact usage before suggesting additional restrictions on headwaters of the Gunnison Basin.

With respect,

Dixie Jacobs Luke

On behalf of Board of Directors

Ragged Mountain Water Users Association

VOLK RANCH
O15488 County Rd 77
Somerset, Co 81434

January 3, 2024

RE: Colorado Water Conservation Board
Department of Natural Resources
1313 Serman St Rm 718
Denver, CO 80203

Subject: ISF Recommendation for the
Segment of the East Muddy Creek from the Confluence
With Lee Creek to the confluence with West Muddy Creek

Members of the Board and Staff:

I Gary Volk, owner/partner of Volk Ranch LLLP am the third generation of land homesteaded in 1911 This ranch can be negatively affected if this decree should be granted. I object for the following reasons!

1) Of the 6.36 mile stretch BLM manages approximately only .85 mile with 5.51 miles privately owned
2) There are no areas along the .85 BLM stretch that would meet any historical requirements to grant this decree.
3) If it should be granted it would be so junior it would never be able to be called.
4) In a 2006 study commissioned by CWCB Leonard Rice Engineers determined that waters of the North Fork of the Gunnison were already over appropriated.
5) There presently are approximately 5000 acre feet of approved conditional decrees in this Muddy Creek drainage. Many of these are upstream of the proposed ISF. If this decree would give the BLM the right to object to competing any one of these conditional decrees it would not be right and could be considered a "TAKEING".
6) Water availability data is far outdated (1934-1953) and surface water rights named are not accurate.
7) It is my belief that this kind of decree in any part of Colorado is an end run around and abusive to the traditional water laws and prop0rtion system that has worked very well for decades.
8) CWBC and all departments should focus on bring lower basin states into compliance with Colorado River compact usage before suggesting additional restriction on headwaters of the Gunnison Basin.
9) Coloradians as a whole and my special interest in Western Colorado will face extreme future needs for water. That is already in short supply. Our Western towns are growing and in the near future requirements will need more domestic water to meet this influence of more people desiring to live in our great climate and freedom from large overcrowded city life.

Therefore: I strongly appose this proposed ISF decree

Sincerely,

Gary Volk

Gary Volk

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

Lauren Ris, CWCB Director

March 2025 Instream Flow Recommendations

Clicking on the Executive Summary links below will jump to the correct bookmark in this pdf document. Clicking on the Appendices links below will open a web page linked to the supporting data.

Water Division 4

1. East Muddy Creek (Gunnison County)
    a. Executive Summary
    b. Appendices

2. West Muddy Creek (Gunnison County)
    a. Executive Summary
    b. Appendices

Water Division 6

3. Milk Creek (Moffat County)
    a. Executive Summary
    b. Appendices

4. Vermillion Creek – Reach 1 (Moffat County)
    a. Executive Summary
    b. Appendices

5. Vermillion Creek – Reach 2 (Moffat County)
    a. Executive Summary
    b. Appendices

Water Division 7

6. Burrows Creek (San Juan County)
    a. Executive Summary
    b. Appendices

East Muddy Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
March 19-20, 2025

UPPER TERMINUS:	confluence Lee Creek at UTM North: 4327742.52 UTM East: 295050.07
LOWER TERMINUS:	confluence Muddy Creek at UTM North: 4319399.06 UTM East: 295770.58
WATER DIVISION/DISTRICT:	4/40
COUNTY:	Gunnison
WATERSHED:	North Fork Gunnison
CWCB ID:	21/4/A-005
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	6.32 miles
FLOW RECOMMENDATION:	11.2 cfs (11/01 - 02/29) 20 cfs (03/01 - 03/31) 23 cfs (04/01 - 07/31) 14.5 cfs (08/01 - 10/31)

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

BACKGROUND

Colorado's General Assembly created the Instream Flow and Natural Lake Level Program in 1973, recognizing "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3), C.R.S.). The statute vests the Colorado Water Conservation Board (CWCB or Board) with the exclusive authority to appropriate and acquire instream flow (ISF) and natural lake level water rights (NLL). Before initiating a water right filing, the Board must determine that: 1) there is a natural environment that can be preserved to a reasonable degree with the Board's water right if granted, 2) the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made, and 3) such environment can exist without material injury to water rights.

The information contained in this Executive Summary and the associated supporting data and analyses form the basis for staff's ISF recommendation to be considered by the Board. This Executive Summary provides sufficient information to support the CWCB findings required by ISF Rule 5i on natural environment, water availability, and material injury. Additional supporting information is located at: https://cwcb.colorado.gov/2025-isf-recommendations.

RECOMMENDED ISF REACH

The BLM recommended that the CWCB appropriate an ISF water right on a reach of East Muddy Creek. East Muddy Creek is located within Gunnison County and is approximately 14.5 miles northeast of the town of Paonia (See Vicinity Map). The stream originates at the confluence of Little Muddy Creek and Clear Fork and flows south until it reaches the confluence with Muddy Creek above Paonia Reservoir. Muddy creek is a tributary to the North Fork Gunnison River, which is tributary to the Gunnison River.

The proposed ISF reach extends from the confluence with Lee Creek downstream to the confluence with Muddy Creek for a total of 6.32 miles. Approximately 19% of the proposed reach is managed by the BLM, while 81% is managed under private ownership. (See Land Ownership Map). BLM's management goals include maintaining and enhancing habitat that supports fish species and functional riparian and wetland systems. Establishing an ISF water right will assist in meeting these BLM objectives.

OUTREACH

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently, more than 1,100 people subscribe to the ISF mailing list. Notice of the potential appropriation of an ISF water right on East Muddy Creek was sent to the mailing list in November 2024, March 2024, January 2024, November 2023, March 2023, March 2022, March 2021, and March 2020. Staff sent letters to identified landowners adjacent to East Muddy Creek based on information from the county assessor's website. Public notices about this recommendation were published in the Crested Butte News on January 5, 2024 and December 20, 2024 and the Delta County Independent on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Gunnison County Board of County Commissioners on November 10, 2020, September 13, 2022, October 24, 2023 and October 8, 2024. Staff met with Luke Reschke, District 40 Lead Water Commissioner, and Doug Christner, District 40 Water Commissioner, on September 26, 2023 to better understand the administration on West Muddy Creek and its tributaries. CWCB and CPW

staff met with members of the North Fork Gunnison Water Users Association and Raquel Flinker from the Colorado River District on November 28, 2023 about the East Muddy Creek and West Muddy Creek ISF recommendations. CWCB and CPW staff also met with members of the Ragged Mountain Water Users Association and Raquel Flinker to discuss the recommendations on April 13, 2024. These stakeholder meetings included a presentation on the ISF recommendations and included discussions and questions about the purpose of ISF protection, stock uses, water availablity, and other concerns.

NATURAL ENVIRONMENT

CWCB staff relies on the recommending entity to provide information about the natural environment. In addition, staff reviews information and conducts site visits for each recommended ISF appropriation. This information provides the Board with a basis for determining that a natural environment exists.

East Muddy Creek is a cold-water, low to moderate gradient stream. It flows through a mountain valley approximately 0.5 miles in width. The stream cuts through alluvial deposits in some locations and is constrained by bedrock in locations where the stream comes close to valley walls. The stream generally has medium-sized substrate consisting of gravels, cobbles, and small boulders. The stream has a good mix of pool and riffle habitat for supporting introduced trout species as well as native fish species.

Fisheries surveys have revealed self-sustaining populations of speckled dace, sculpin, bluehead sucker, rainbow trout, fathead minnow, and white sucker (Table 1). Speckled dace, sculpin, and bluehead suckers are native species. Bluehead sucker appears on BLM's sensitive species list and BLM is a signatory to a multi-party, multi-state conservation agreement for that species that is designed to prevent a listing of bluehead suckers under the Endangered Species Act. Since Paonia Reservoir prevents migration of fish between East Muddy Creek and the Gunnison River, it is likely that East Muddy Creek provides year-round habitat for bluehead sucker.

Table 1. List of species identified in East Muddy Creek.

Species Name	Scientific Name	Status
brook trout	*Salvelinus fontinalis*	None
white-blue sucker hybrid	*Catostomus commersoni x discobolus*	None
white-flannelmouth hybrid	*Catostomus commersoni x latipinnis*	None
bluehead sucker	*Catostomus discobolus*	State - Species of Greatest Conservation Need
flannelmouth sucker	*Catostomus latipinnis*	State - Species of Greatest Conservation Need
fathead minnow	*Pimephales promelas*	None
sculpin	*Cottus bairdii*	None
speckled dace	*Rhinichthys osculus*	None
white sucker	*Catostomus commersonii*	None

The riparian community in this part of East Muddy Creek is generally comprised of willow species, alder, spruce, and narrowleaf cottonwood. In general, the riparian community is in good condition, provides some shading and cover for fish habitat, and provides stream stability during flood events.

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 method to develop the initial ISF recommendation. The R2Cross method is based on a hydraulic model and uses field data collected in a stream riffle (Espegren, 1996; CWCB, 2022). Riffles are the stream habitat type that are most vulnerable to dry if streamflow ceases. The data collected consists of a streamflow measurement, a survey of channel geometry and features at a cross-section, and a survey of the longitudinal slope of the water surface.

The R2Cross model uses Ferguson's Variable-Power Equation (VPE) to estimate roughness and hydraulic conditions at different water stages at the measured cross-section (Ferguson 2007, 2001). This approach is based on calibrating the model as described in Ferguson (2021). The model is used to evaluate three hydraulic criteria: average depth, average velocity, and percent wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types also will maintain aquatic habitat in pools and runs for most life stages of fish and aquatic macro-invertebrates (Nehring, 1979). BLM staff use the model results to develop an initial recommendation for summer and winter flows. The summer flow recommendation is based on the flow that meets all three hydraulic criteria. The winter flow recommendation is based on the flow that meets two of the three hydraulic criteria.

The R2Cross method estimates the biological amount of water needed for summer and winter periods. The recommending entity uses the R2Cross results and its biological expertise to develop an initial ISF recommendation. CWCB staff then evaluates water availability for the reach typically based on median hydrology (see the Water Availability section below for more details). The water availability analysis may indicate less water is available than the initial recommendation. In that case, the recommending entity either modifies the magnitude and/or duration of the recommended ISF rates if the available flows will preserve the natural environment to a reasonable degree or withdraws the recommendation.

Data Collection and Analysis

BLM collected R2Cross data at four transects for this proposed ISF reach (Table 2 and Site Map). Results obtained at more than one transect are averaged to determine the R2Cross flow rate for the stream reach. The R2Cross model results in a winter flow of 11.2 cfs and a summer flow of 23.3 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 2. Summary of R2Cross transect measurements and results for East Muddy Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/01/2018, 1	49.90	45.34	15.16	32.41
06/01/2018, 2	42.37	43.24	6.80	15.59
09/24/2019, 1	50.54	11.58	13.42	17.19
09/24/2019, 2	44.45	12.17	9.48	27.91
			11.22	23.28

ISF Recommendation

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

11.2 cfs is recommended from November 1 to February 29. This recommended flow rate meets two of three hydraulic criteria during the winter. This flow rate either meets or comes close to meeting the average depth and average velocity criteria in cross sections analyzed and should prevent icing in pools.

20.0 cfs is recommended from March 1 to March 31. This flow rate does not meet three of three criteria; it mimics spring flow initiation of snowmelt runoff.

23.0 cfs is recommended from April 1 to July 31. This flow rate meets three of three hydraulic criteria during the peak flow and snowmelt runoff period. The recommended flow rate is driven by the wetted perimeter criteria in most of the cross-section data collected. Wetting 50 to 60 percent of the channel, as recommended by the R2Cross manual for streams 40 to 60 feet in width, will provide important physical habitat during a time of year when the fish population is completing key life cycle functions.

14.5 cfs is recommended from August 1 to October 31; this flow rate is reduced due to limited water availability. This flow rate will generally meet the average velocity and average depth criteria in the cross-sections analyzed, while providing approximately 50% wetted perimeter in the wider cross sections.

WATER AVAILABILITY

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

Water Availability Methodology

Each recommended ISF reach has a unique flow regime that depends on variables such as the timing, magnitude, and location of water inputs (such as rain, snow, and snowmelt) and water losses (such as diversions, reservoirs, evaporation and transpiration, groundwater recharge, etc.). This approach focuses on streamflow and the influence of flow alterations, such as diversions, to understand how much water is physically available in the recommended reach.

Staff's hydrologic analysis is data-driven, meaning that staff gathers and evaluates the best available data and uses the best available analysis method for that data. Whenever possible, long-term stream gage data (period of record 20 or more years) are used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and regression-based models are used when long-term gage data is not available. CSUFlow18 is a multiple regression model developed by Colorado State University researchers using streamflow gage data collected between 2001 and 2018 (Eurich et al. 2021). This model estimates mean-monthly streamflow based on drainage basin area, basin terrain variables, and average basin precipitation and snow persistence. Diversion records are used to evaluate the effect of surface water diversions when necessary. Interviews with water commissioners, landowners, and ditch or reservoir operators can provide additional information. A range of analytical techniques may be employed to extend gage records, estimate streamflow in ungaged locations, and estimate the effects of diversions. The goal is to obtain the most detailed and reliable estimate of hydrology using the most efficient analysis technique.

The final product of the hydrologic analysis used to determine water availability is a hydrograph, which shows streamflow and the proposed ISF rate over the course of one year. The hydrograph will show median daily values when daily data is available from gage records; otherwise, it will present mean-monthly streamflow values. Staff will calculate 95% confidence intervals for the median streamflow if there is sufficient data. Statistically, there is 95% confidence that the true value of the median streamflow is located within the confidence interval.

Basin Characteristics

The drainage basin of the proposed ISF on East Muddy Creek is 135.4 square miles, with an average elevation of 8,673 feet and average annual precipitation of 27.3 inches. East Muddy Creek is a cold-water, moderate gradient snowmelt driven hydrologic system with influence from mid-season monsoonal periods. Higher flows typically initiate in early April and generally reach peak flow conditions by early to mid-May. Baseflow conditions are generally lowest in August and September when irrigation practices combine with late summer climate conditions. Streamflow increases slightly when upstream irrigation ends each season.

Water Rights Assessment

There are 94 active water rights on East Muddy Creek and its tributaries. These include up to 290 cfs of direct flow ditch diversions, 376 acre-feet of reservoir storage, and four ISF water rights: Clear Fork of East Muddy Creek (case number 09CW0077), Spring Creek (case number 05CW0245A) and two reaches of Little Spring Creek (case numbers 09CW0072 and 09CW0073). There is one transbasin diversion high up in the Clear Fork contributing basin, a tributary to East Muddy Creek, that exports water to West Divide Creek in Division 5. Diversion records are consistently reported from 2004 to present and show high variability in exported water volumes for the Clear Fork Feeder Ditch (station ID CLFOFDCO) from nothing in 2005 to just under 1,624 acre feet in 2023. Within the extent of the recommended reach, there is one direct diversion water right, the Old Placer Ditch (WDID 4001737), which has a 1922 appropriation date for 0.5 cfs. This structure is listed as inactive and no records are maintained, however Luke Reschke indicated that new owners intend to rehabilitate this structure (personal communication, 2/05/2025).

The North Fork Gunnison River is often under administration with calls extending up both West and East Muddy Creek. The priority calling dates are typically in the late 1800s to early 1900's, but the exact priority can shift through the season. Typically, the call is on by late-July, but some calls have occurred as early as June. North Fork Water Conservancy District was decreed multiple points of exchange upstream of Paonia Reservoir in case number 05CW0236, with up to a volumetric limit of 2,000 acre feet. According to Water Commissioner Luke Reschke, in most years this exchange starts towards the end of July and the seasonal limit is reached by early to mid-September (personal communication, 9/26/2023 and 1/03/2024).

Data Collection and Analysis

Representative Gage Analysis

No current or long-term gages exist within the reach for the ISF recommendation on East Muddy Creek. There is one historic gage, East Muddy Creek Near Bardine, CO (BARDINE, USGS ID 9130500) that monitored streamflow conditions from 1934-1953 at a point approximately 1 mile above the confluence of West and East Muddy Creek. Streamflow at the Bardine gage was analyzed at a median daily timestep as well as calculated to mean monthly streamflow. Due to data limitations on West Muddy Creek, CWCB staff opted to install a temporary gage at the lower terminus of the current recommended ISF reach on West Muddy Creek. No suitable gage locations were identified for a temporary gage on East Muddy Creek. Staff used this data in conjunction with a downstream gage on Muddy Creek above Paonia Reservoir CO (MUDAPRCO, DWR WDID: 4003152) to estimate streamflow on East Muddy Creek.

West Muddy Temporary Gage Analysis

CWCB installed a temporary gage (West Muddy gage) near the lower terminus of the West Muddy ISF reach 500 feet above the point where West Muddy and East Muddy combine to create Muddy Creek. West Muddy Creek is monitored by Hobo MX2001 pressure transducer at a 15-minute interval that was installed on May 19, 2021; gaged West Muddy discharge data is analyzed through October 8, 2024 (period of record, POR: 5/19/2021 – 10/8/2024). There are periods when the gage was ice affected each winter, and the pressure transducer failed for two weeks during the rising limb of 2022. Water year 2023 received the most precipitation during the gage record and this is reflected in the hydrographs for each year. 2024 snowmelt peaked at the earliest date in late April and lowest streamflow at 125 cfs. By comparison, streamflow in 2023 reached over 400 cfs 10 days later than 2024 and maintained high flows longer than the other two water years.

Staff analyzed total streamflow from the MUDAPRCO gage during its POR from 1985 to present to contextualize gaged data on West Muddy gage. MUDAPRCO is located approximately 2,300 ft downstream from the confluence of East and West Muddy Creek. Annual streamflow yield during the previous 30-year record (1995-2024) show that the three years monitored represent a year that is slightly above median yield, a wet year and a dry year for 2022 through 2024, respectively. Therefore, the three years monitored during the POR, represent variability in patterns of streamflow generation and timing.

Estimated East Muddy Creek Streamflow

The West Muddy daily gaged streamflow, as described above, was subtracted from MUDAPRCO daily gaged streamflow to calculate streamflow in East Muddy Creek from 2021-2024. The estimated daily data for East Muddy Creek was compared to daily median streamflow from the East Muddy Bardine gage. The shape and timing of peak flows were similar, and the estimated

streamflow based on the West Muddy gage and MUDAPRCO was lower than the Bardine gage during the higher streamflow months. Daily average East Muddy Creek streamflow was calculated as mean monthly streamflow (See Complete Hydrograph). Due to missing data from ice at the MUDAPRCO gage, the final estimated streamflow for East Muddy Creek includes mean-monthly streamflow from the Bardine gage from December through February.

The East Muddy reach is affected by within basin diversions. For a summary, please see existing water rights assessment section above. Given that the impacts of diversions are reflected in gage records at the West Muddy gage and at MUDAPRCO, no further adjustments were made to assess the impact on water available for the ISF reach. Staff also considered streamflow from Dugout Creek, a tributary below the East Muddy Creek and above MUDAPRCO and determined it to be negligible and no further adjustments were necessary

Site Visit Data
CWCB staff made one streamflow measurement on the proposed reach of East Muddy Creek as summarized in Table 3.

Table 3. Summary of streamflow measurements for East Muddy Creek.

Visit Date	Flow (cfs)	Collector
11/06/2023	16.9	CWCB

Water Availability Summary
The hydrograph shows estimated mean-monthly streamflow on East Muddy Creek, as described in the Data Collection and Analysis section above, along with the proposed ISF rate. The proposed ISF flow rate is below the mean-monthly streamflow. Staff has concluded that water is available for appropriation.

MATERIAL INJURY
If decreed, the proposed ISF on East Muddy Creek would be a new junior water right. This ISF water right can exist without material injury to other senior water rights. Under the provisions of section 37-92-102(3)(b), C.R.S., the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

Common Acronyms and Abbreviations

Term	Definition
af	acre feet
BLM	Bureau of land management
cfs	cubic feet per second
CWCB	Colorado Water Conservation Board
CPW	Colorado Parks and Wildlife
DWR	Division of Water Resources
HCCA	High Country Conservation Advocates
ISF	Instream Flow
NLL	Natural Lake Level
USGS	United States Geological Survey
USFS	United States Forest Service
XS	Cross section

Citations

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

Colorado Water Conservation Board, 2024, R2Cross field manual. Retrieve from URL: https://dnrweblink.state.co.us/cwcbsearch/0/edoc/224685/R2Cross%20Field%20Manual%202024.pdf

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

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

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

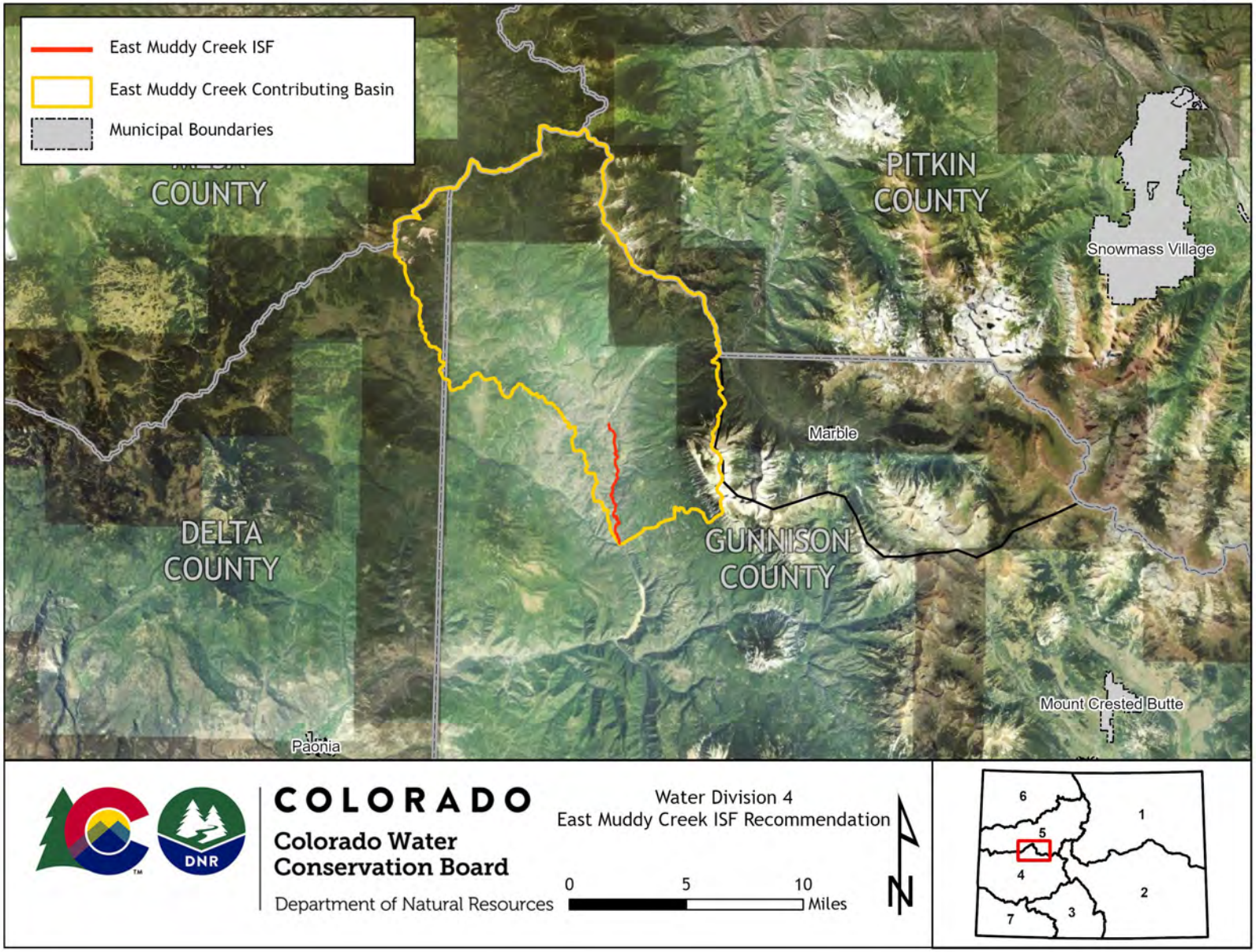
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

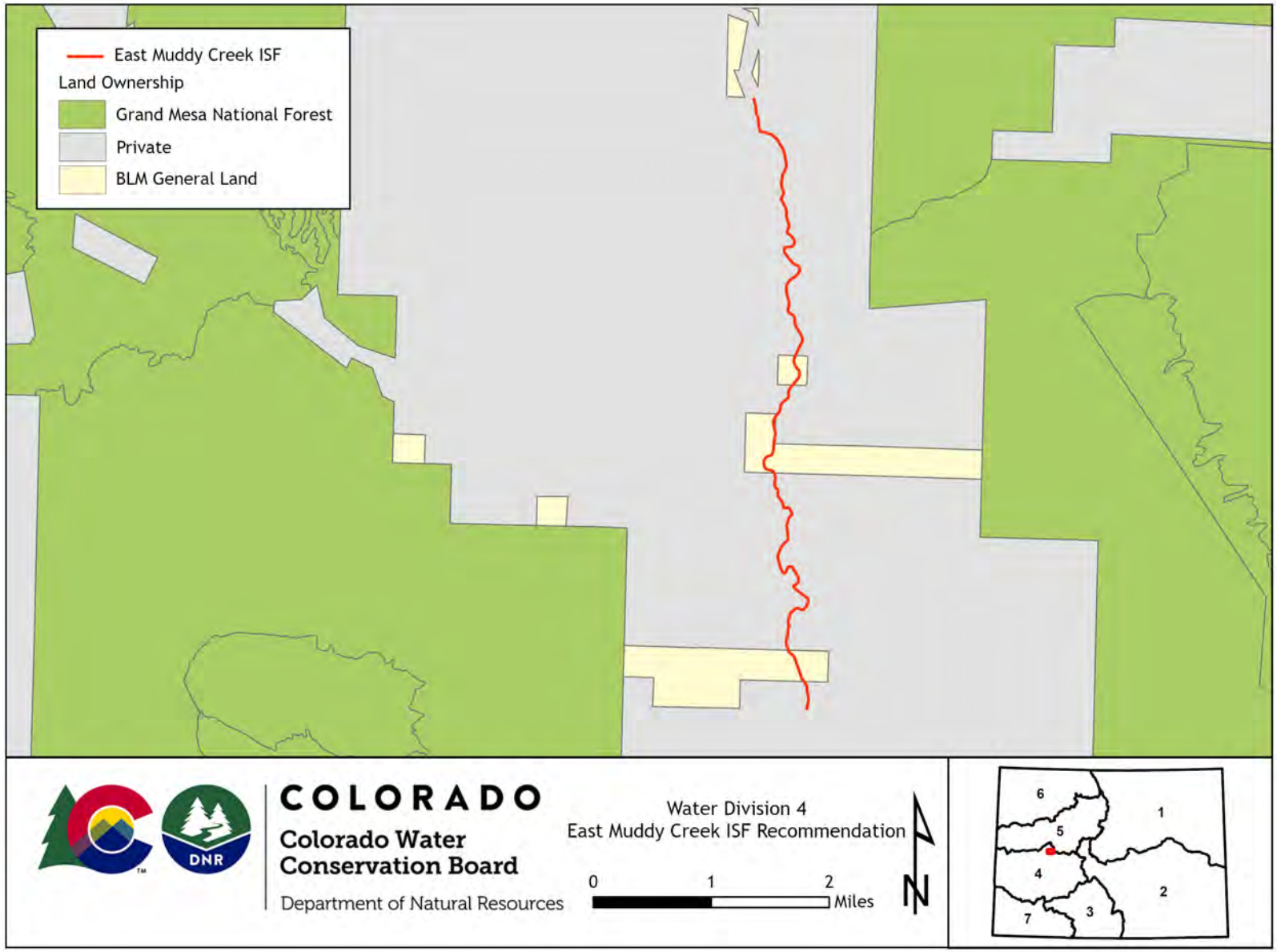
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

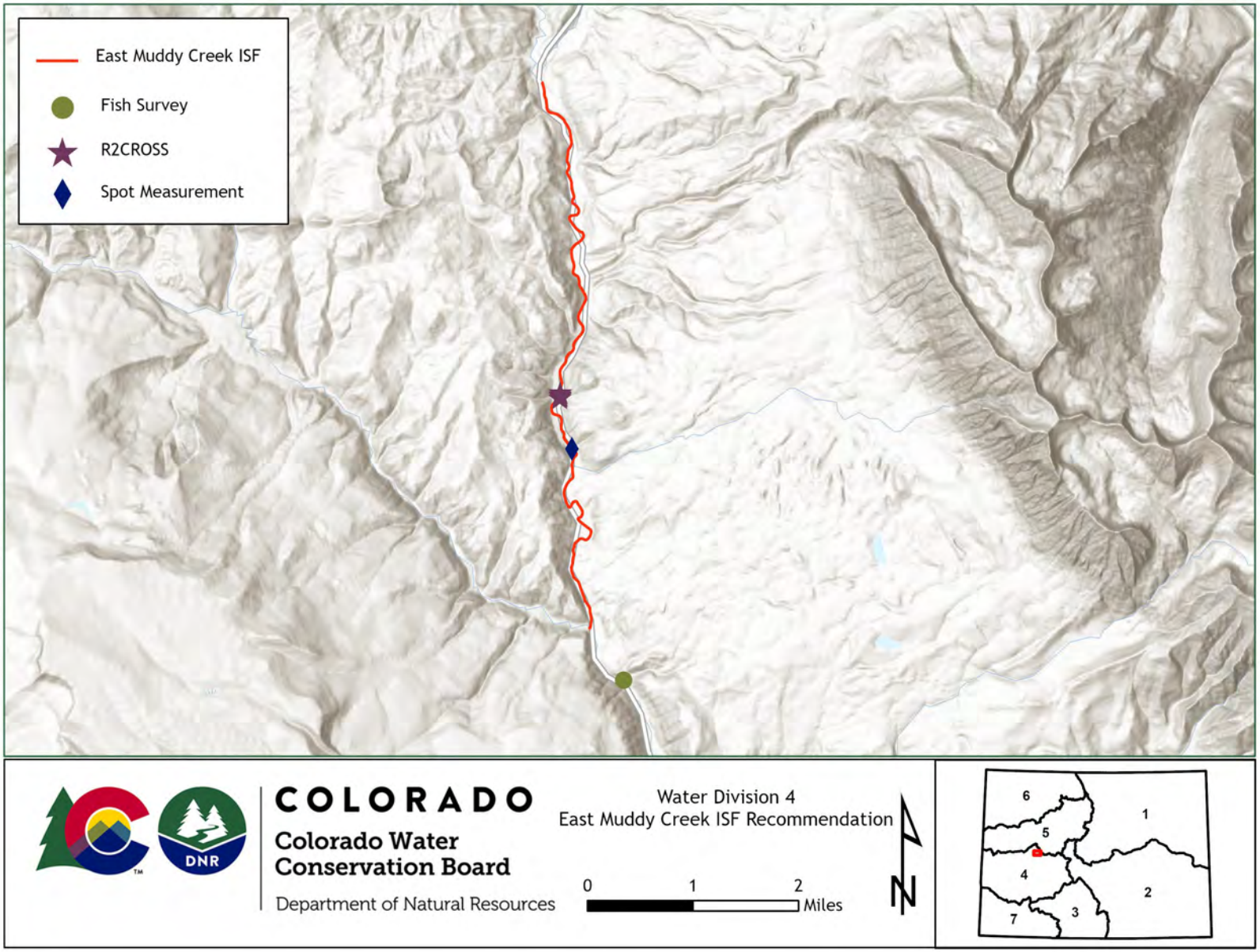
VICINITY MAP



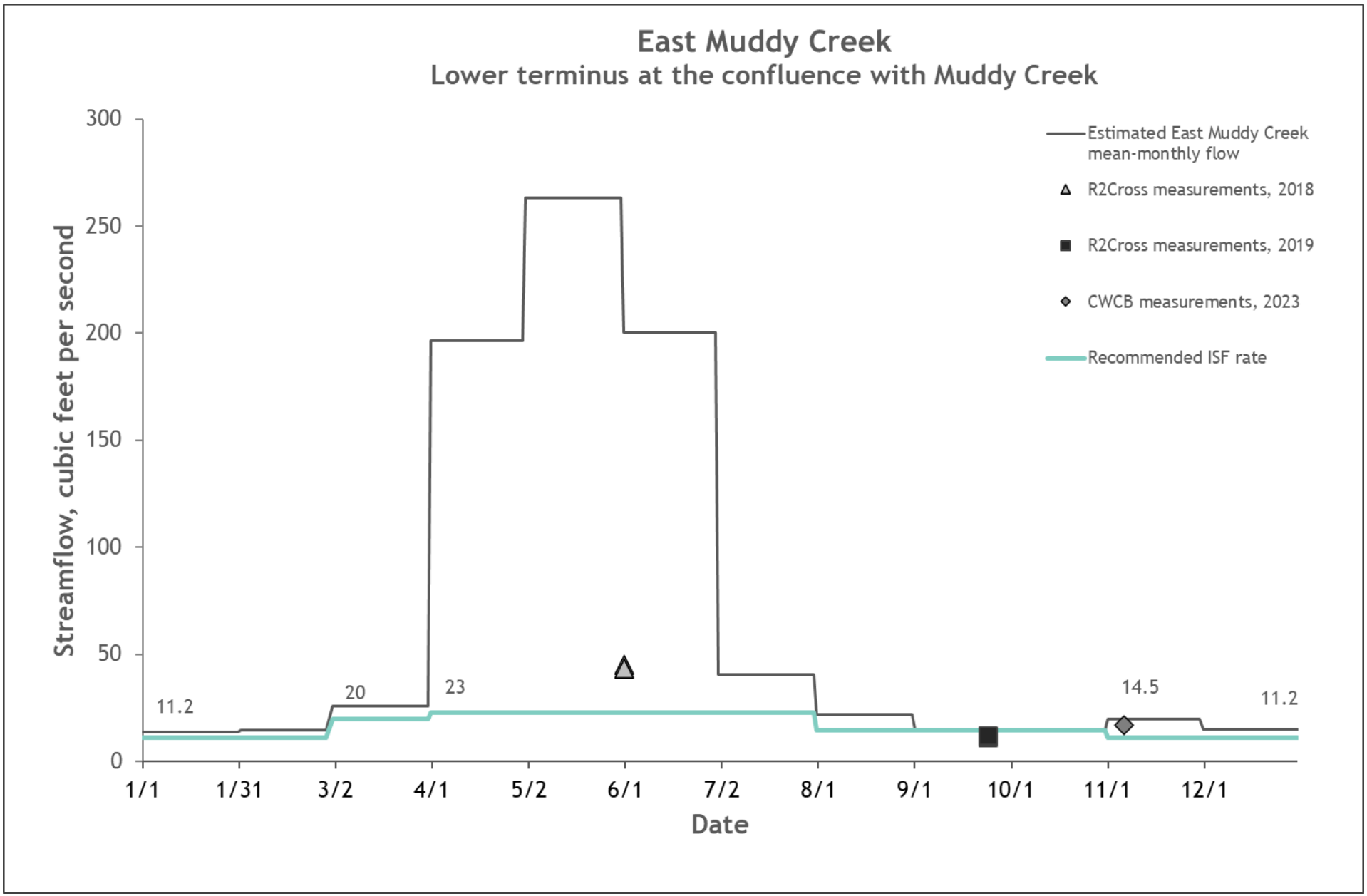
LAND OWNERSHIP MAP



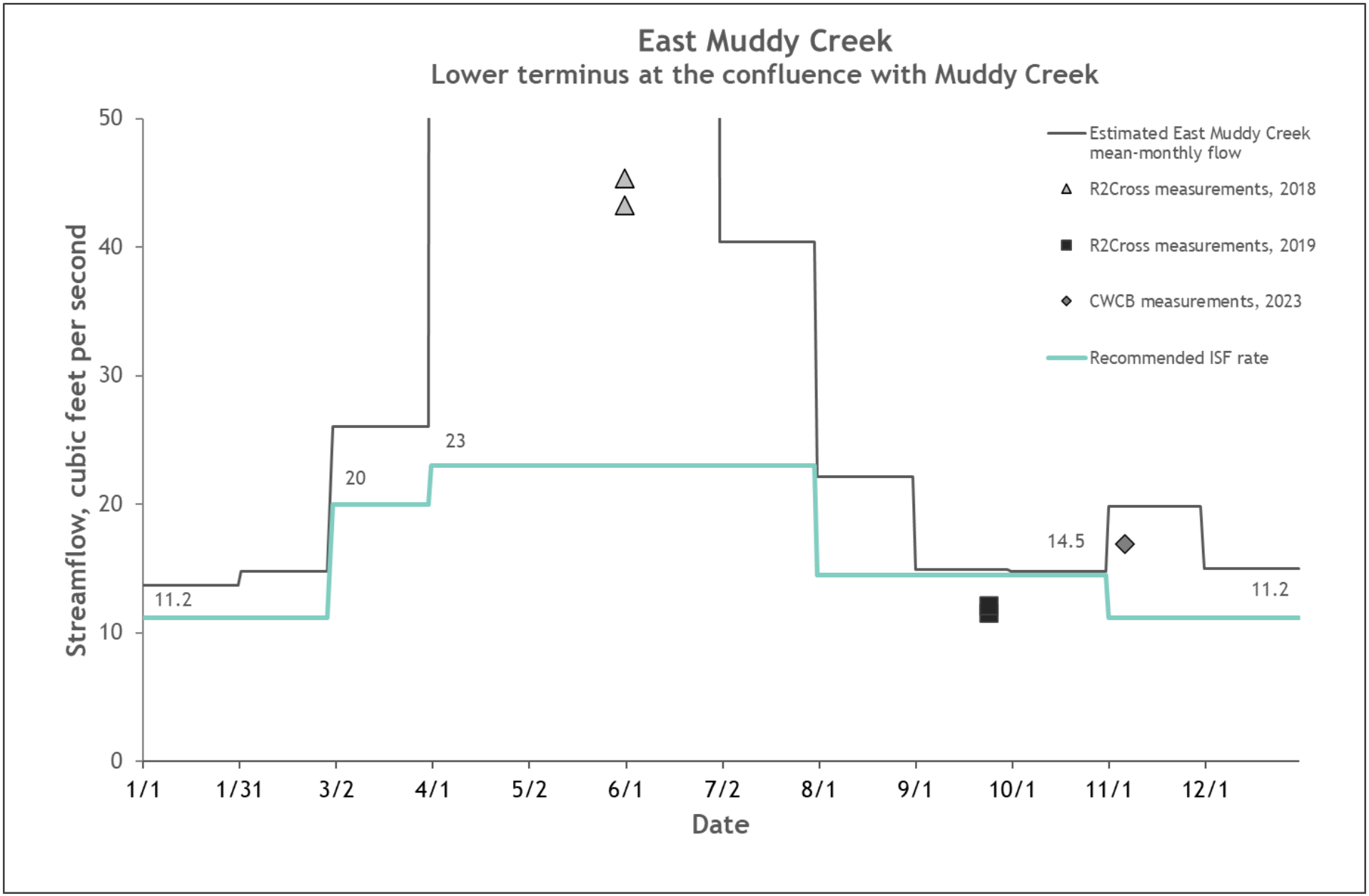
SITE MAP


East Muddy Creek ISF
Fish Survey
R2CROSS
Spot Measurement
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
East Muddy Creek ISF Recommendation
0
1
2
Miles
N
6
1
5
4
2
7
3

COMPLETE HYDROGRAPH



DETAILED HYDROGRAPH



West Muddy Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
March 19-20, 2025

UPPER TERMINUS:	confluence Sheep Creek at UTM North: 4325599.99 UTM East: 286097.65
LOWER TERMINUS:	confluence Muddy Creek at UTM North: 4319399.06 UTM East: 295770.58
WATER DIVISION/DISTRICT:	4/40
COUNTY:	Gunnison
WATERSHED:	North Fork Gunnison
CWCB ID:	21/4/A-011
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	8.78 miles
FLOW RECOMMENDATION:	5.5 cfs (10/01 - 03/31) 12.9 cfs (04/01 - 07/15) 5.5 cfs (07/16 - 07/31) 2 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/2025-isf-recommendations.

RECOMMENDED ISF REACH

The BLM recommended that the CWCB appropriate an ISF water right on a reach of West Muddy Creek at the January 2020 ISF workshop. West Muddy Creek is located within Gunnison County and is approximately 17 miles northeast of Paonia (See Vicinity Map). The stream originates on the eastern slope of Chalk Mountain and flows southeast until it reaches the confluence with Muddy Creek above Paonia Reservoir. Muddy creek is a tributary to the North Fork Gunnison River, which is tributary to the Gunnison River.

The proposed ISF reach extends from the confluence with Sheep Creek downstream to the confluence with Muddy Creek for a total of 8.78 miles. Twelve percent of the land on the proposed reach is BLM, 30% is managed by the United States Forest Service and 58% is privately owned (See Land Ownership Map). BLM's management goals include maintaining and enhancing habitat that supports fish species and functional riparian and wetland systems. Establishing an ISF water rights will assist in meeting these BLM objectives.

OUTREACH

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently, more than 1,100 people subscribe to the ISF mailing list. Notice of the potential appropriation of an ISF water right on West Muddy Creek was sent to the mailing list in November 2024, March 2024, January 2024, November 2023, March 2023, March 2022, and March 2020. Staff sent letters to identified landowners adjacent to West Muddy Creek based on information from the county assessor's website. Public notices about this recommendation were published in the Crested Butte News on January 5, 2024 and December 20, 2024 and the Delta County Independent on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the Gunnison County Board of County Commissioners on November 10, 2020, September 13, 2022, October 24, 2023 and October 8, 2024. Staff spoke with Luke Reschke, District 40 Lead Water Commissioner, and Doug Christner, Disctrict 40 Water Commissioner to better understand the administration on West Muddy Creek and its tributaries. CWCB and CPW staff met with members

of the North Fork Gunnison Water Users Association and Raquel Flinker from the Colorado River District on November 28, 2023 about the East Muddy Creek and West Muddy Creek ISF recommendations. CWCB and CPW staff also met with members of the Ragged Mountain Water Users Association and Raquel Flinker to discuss the recommendations on April 13, 2024. These stakeholder meetings included a presentation on the ISF recommendations and included discussions and questions about the purpose of ISF protection, stock uses, water availablity, and other concerns.

NATURAL ENVIRONMENT

CWCB staff relies on the recommending entity to provide information about the natural environment. In addition, staff reviews information and conducts site visits for each recommended ISF appropriation. This information provides the Board with a basis for determining that a natural environment exists.

West Muddy Creek is a cool-water, moderate gradient stream. The upper four miles of the reach flow through a valley approximately 0.5 miles in width with some meadows and irrigated fields. The lower four miles flow through a narrow mountain valley approximately 0.25 miles in width. The stream cuts through alluvial deposits in some locations and is constrained by bedrock in locations where the stream comes close to valley walls. The upper four miles of the creek generally has medium sized substrate, ranging from silt to one-foot boulders, while the lower four miles of the creek generally have large-sized substrate, ranging from small cobbles to two-foot boulders. The stream has a good mix of pool and riffle habitat for supporting native fish species.

Fisheries surveys have revealed self-sustaining populations of bluehead suckers, speckled dace, and sculpin, all of which are native species (Table 1). Bluehead suckers appear on BLM's sensitive species list, and BLM is a signatory to a multi-party, multi-state conservation agreement for that species to prevent a listing of bluehead suckers under the Endangered Species Act. The stream also supports self-sustaining populations of brook trout, rainbow trout, and white suckers, all of which are introduced species. Northern leopard frogs, which also appear on BLM's sensitive species list, have been documented along the creek (Figure 1).

Table 1. List of species identified in West Muddy Creek.

Species Name	Scientific Name	Status
brook trout	*Salvelinus fontinalis*	None
white-blue sucker hybrid	*Catostomus commersoni x discobolus*	None
bluehead sucker	*Catostomus discobolus*	State - Species of Greatest Conservation Need
sculpin	*Cottus bairdii*	None
speckled dace	*Rhinichthys osculus*	None
rainbow trout	*Oncorhynchus mykiss*	None
northern leopard frog	*Rana pipiens*	State - Species of Greatest Conservation Need State - Species of Special Concern

Figure 1. West Muddy Creek, northern leopard frog

The riparian community in this part of West Muddy Creek is mostly comprised of willow species, alder, narrowleaf cottonwood and spruce. In general, the riparian community is in good condition, provides substantial shading and cover for fish habitat, and provides stream stability during flood events.

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 method to develop the initial ISF recommendation. The R2Cross method is based on a hydraulic model and uses field data collected in a stream riffle (Espegren, 1996; CWCB, 2022). Riffles are the stream habitat type that are most vulnerable to dry if streamflow ceases. The data collected consists of a streamflow measurement, a survey of channel geometry and features at a cross-section, and a survey of the longitudinal slope of the water surface.

The R2Cross model uses Ferguson's Variable-Power Equation (VPE) to estimate roughness and hydraulic conditions at different water stages at the measured cross-section (Ferguson 2007, 2001). This approach is based on calibrating the model as described in Ferguson (2021). The model is used to evaluate three hydraulic criteria: average depth, average velocity, and percent wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types also will maintain aquatic habitat in pools and runs for most life stages of fish and aquatic macro-invertebrates (Nehring, 1979). BLM staff use the model results to develop an initial recommendation for summer and winter flows. The summer flow recommendation is based on the flow that meets all three hydraulic criteria. The winter flow recommendation is based on the flow that meets two of the three hydraulic criteria.

The R2Cross method estimates the biological amount of water needed for summer and winter periods. The recommending entity uses the R2Cross results and its biological expertise to develop an initial ISF recommendation. CWCB staff then evaluates water availability for the reach typically based on median hydrology (see the Water Availability section below for more details). The water availability analysis may indicate less water is available than the initial recommendation. In that case, the recommending entity either modifies the magnitude and/or duration of the recommended ISF rates if the available flows will preserve the natural environment to a reasonable degree or withdraws the recommendation.

Data Collection and Analysis

BLM collected R2Cross data at five transects for this proposed ISF reach (Table 2 and Site Map). Results obtained at more than one transect are averaged to determine the R2Cross flow rate for the stream reach. The R2Cross model results in a winter flow of 5.5 cfs and a summer flow of 12.9 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 2. Summary of R2Cross transect measurements and results for West Muddy Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/01/2018, 1	33.50	4.73	3.28	10.08
06/01/2018, 2	33.49	5.82	4.41	12.34
05/11/2021, 1	47.04	33.34	7.43	19.16
08/06/2021, 1	30.13	4.57	3.39	13.65
08/06/2021, 2	36.16	4.57	8.75	9.30
			5.45	12.91

ISF Recommendation

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

5.5 cfs is recommended from October 1 to March 31. This flow rate meets two of the three hydraulic criteria in the cross-sections analyzed. This flow rate should maintain sufficiently cool temperatures in pools during the late fall and should prevent icing in pools during the winter.

12.9 cfs is recommended from April 1 to July 15 to meet three of three hydraulic criteria. This recommendation is for the snowmelt runoff period and is driven by the average velocity criteria.

5.5 cfs is recommended from July 16 to July 31; this flow rate is reduced due to water availability limitations. This rate provides the maximum amount of physical habitat possible to the fish community during this high growth period.

2.0 cfs is recommended from August 1 to September 30. This flow rate is severely water limited due to existing water use practices and meets just one of three hydraulic criteria. This flow

rate will protect the wetted perimeter or mean depth in most cross-sections and will work to maintain cooler temperatures in summer months.

WATER AVAILABILITY

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

Water Availability Methodology

Each recommended ISF reach has a unique flow regime that depends on variables such as the timing, magnitude, and location of water inputs (such as rain, snow, and snowmelt) and water losses (such as diversions, reservoirs, evaporation and transpiration, groundwater recharge, etc.). This approach focuses on streamflow and the influence of flow alterations, such as diversions, to understand how much water is physically available in the recommended reach.

Staff's hydrologic analysis is data-driven, meaning that staff gathers and evaluates the best available data and uses the best available analysis method for that data. Whenever possible, long-term stream gage data (period of record 20 or more years) are used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and regression-based models are used when long-term gage data is not available. CSUFlow18 is a multiple regression model developed by Colorado State University researchers using streamflow gage data collected between 2001 and 2018 (Eurich et al. 2021). This model estimates mean-monthly streamflow based on drainage basin area, basin terrain variables, and average basin precipitation and snow persistence. Diversion records are used to evaluate the effect of surface water diversions when necessary. Interviews with water commissioners, landowners, and ditch or reservoir operators can provide additional information. A range of analytical techniques may be employed to extend gage records, estimate streamflow in ungaged locations, and estimate the effects of diversions. The goal is to obtain the most detailed and reliable estimate of hydrology using the most efficient analysis technique.

The final product of the hydrologic analysis used to determine water availability is a hydrograph, which shows streamflow and the proposed ISF rate over the course of one year. The hydrograph will show median daily values when daily data is available from gage records; otherwise, it will present mean-monthly streamflow values. Staff will calculate 95% confidence intervals for the median streamflow if there is sufficient data. Statistically, there is 95% confidence that the true value of the median streamflow is located within the confidence interval.

Basin Characteristics

The drainage basin of the proposed ISF on West Muddy Creek is 97.9 square miles, with an average elevation of 8,751 feet and average annual precipitation of 24.9 inches. West Muddy Creek is a cold-water, moderate gradient snowmelt driven hydrologic system with influence from mid-season monsoonal periods. Run off initiates in early April and generally reaches peak flow conditions by early to mid-May. Streamflow conditions are generally lowest in August and September during late summer. Hydrology is altered by both irrigation practices and reservoir storage and releases.

Water Rights Assessment

There are 48 active water rights on West Muddy Creek and its tributaries. These include up to 120 cfs of direct flow ditch diversions, and 6,450 acre-feet of reservoir storage. There are also two ISF water rights within the basin, one on an upper reach of West Muddy Creek from the headwaters to the confluence with Cow Creek (case number 84CW0411) the other on Dyke Creek, a tributary to the upper reach of West Muddy Creek (case number 04CW0157). Within the extent of the recommended reach, there is one direct diversion water right, the Snooks Ditch No 2 (WDID 4001199), which has two appropriation dates for 0.75 cfs each, a 1910 and a 1961.

The Overland Reservoir (WDID 4003399) is located relatively high in the system on Cow Creek, a tributary to West Muddy Creek. The Overland Reservoir is decreed for 6,200 acre feet of the above-mentioned storage rights and stores water from Cow Creek which is exported for irrigation and stock uses outside of the West Muddy basin. Exported water from the Cow Creek basin is recorded in diversion records from the Overland Ditch "Cow Creek" (WDID 4000585). Between 2017 and 2023 diversion records show that between 84.3 (2018) and 4952.01 (2017) acre feet is exported typically from April to October. By late July or early August, the Overland Ditch on Cow Creek is no longer in priority and all natural streamflow from Cow Creek continues downstream to Paonia Reservoir via West Muddy Creek (personal communication, Water Commissioner Luke Reschke, 9/26/2023 and 1/03/2024).

The North Fork Gunnison River is often under administration with calls extending up both West and East Muddy Creek. The priority calling dates are typically in the late 1800s to early 1900's, but the exact priority can shift through the season. Typically, the call is on by late-July, but some calls have occurred as early as June. North Fork Water Conservancy District was decreed multiple points of exchange upstream of Paonia Reservoir in case number 05CW0236, with up to a volumetric limit of 2,000 acre feet. According to Water Commissioner Luke Reschke, in most years this exchange starts towards the end of July and the seasonal limit is reached by early to mid-September (personal communication, 9/26/2023 and 1/03/2024).

Data Collection and Analysis

Representative Gage Analysis

No current or long-term gages exist within the reach for the ISF recommendation on West Muddy Creek. There are three historic gages on West Muddy Creek above the confluence with Cow Creek that monitored stream conditions from the mid-1950's though the mid-1970's. Due to the extent of downstream uses on the main channel and tributaries CWCB staff installed a temporary gage at the lower terminus of the current recommended ISF reach on West Muddy Creek.

Gage Analysis

The CWCB installed a temporary gage (West Muddy gage) at the lower terminus of the reach, 500 feet above the confluence where West Muddy Creek and East Muddy Creek combine to create Muddy Creek. This gage included a Hobo MX2001 pressure transducer recorded at a 15-minute interval that was installed on May 19, 2021, and maintained through present. Gaged West Muddy streamflow data is analyzed through October 8, 2024 (period of record, POR: 5/19/2021 – 10/8/2024). There are periods when the gage was ice affected each winter and the pressure transducer failed for two weeks during the rising limb of 2022. Water year 2023 received the most precipitation during the gage record and this is reflected in the hydrographs

for each year. 2024 snowmelt peaked at the earliest date in late April and lowest streamflow at 125 cfs. By comparison, streamflow in 2023 reached over 400 cfs 10 days later than 2024 and maintained high flows longer than the other two water years.

Staff analyzed total streamflow from the Division of Water Resources Muddy Creek above Paonia Reservoir, CO gage (MUDAPRCO, DWR WDID: 4003152) during its POR from 1985 to present to contextualize gaged data on West Muddy gage. MUDAPRCO is located approximately 2,300 ft downstream from the confluence of East and West Muddy Creek. Annual streamflow yield during the previous 30-year record (1995-2024) show that the three years monitored represent a year that is slightly above median yield, a wet year, and a dry year for 2022 through 2024, respectively. Therefore, the three years monitored during the POR, represent variability in patterns of streamflow and timing.

Daily average West Muddy Creek gaged data was calculated as mean monthly streamflow (See Complete Hydrograph). All basin diversions are reflected in gage records at West Muddy and no further adjustments were made to assess the impact on water available for the ISF reach.

Site Visit Data

CWCB staff made 23 streamflow measurements on the proposed reach of West Muddy Creek in support of rating curve development for the West Muddy gage, as summarized in Table 3.

Table 3. Summary of streamflow measurements for West Muddy Creek.

Visit Date	Flow (cfs)	Collector
5/19/2021	33.00	CWCB
6/17/2021	0.35	CWCB
7/17/2021	0.00	CWCB
8/18/2021	0.62	CWCB
9/14/2021	0.54	CWCB
11/2/2021	2.63	CWCB
2/22/2022	0.50	CWCB
5/5/2022	125.00	CWCB and DWR
5/23/2022	58.00	CWCB
6/23/2022	8.36	CWCB
8/19/2022	3.03	CWCB
9/29/2022	0.93	CWCB
4/20/2023	163.00	CWCB and DWR
6/6/2023	250.00	CWCB
7/27/2023	5.19	CWCB
8/15/2023	0.98	CWCB
11/6/2023	4.48	CWCB
3/28/2024	5.29	CWCB
6/12/2024	11.00	CPW
6/25/2024	7.41	CWCB
8/12/2024	1.56	CWCB
9/12/2024	1.67	CWCB
10/8/2024	1.49	CWCB

Water Availability Summary

The hydrograph shows estimated mean-monthly at the temporary West Muddy gage along with the proposed ISF rate. The proposed ISF flow rate is below the mean-monthly streamflow. Staff has concluded that water is available for appropriation.

MATERIAL INJURY

If decreed, the proposed ISF on West Muddy Creek would be a new junior water right. This ISF water right can exist without material injury to other senior water rights. Under the provisions of section 37-92-102(3)(b), C.R.S., the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

Common Acronyms and Abbreviations

Term	Definition
af	acre feet
BLM	Bureau of land management
cfs	cubic feet per second
CWCB	Colorado Water Conservation Board
CPW	Colorado Parks and Wildlife
DWR	Division of Water Resources
HCCA	High Country Conservation Advocates
ISF	Instream Flow
NLL	Natural Lake Level
USGS	United States Geological Survey
USFS	United States Forest Service
XS	Cross section

Citations

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

Colorado Water Conservation Board, 2024, R2Cross field manual. Retrieve from URL: https://dnrweblink.state.co.us/cwcbsearch/0/edoc/224685/R2Cross%20Field%20Manual%202024.pdf

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

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

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

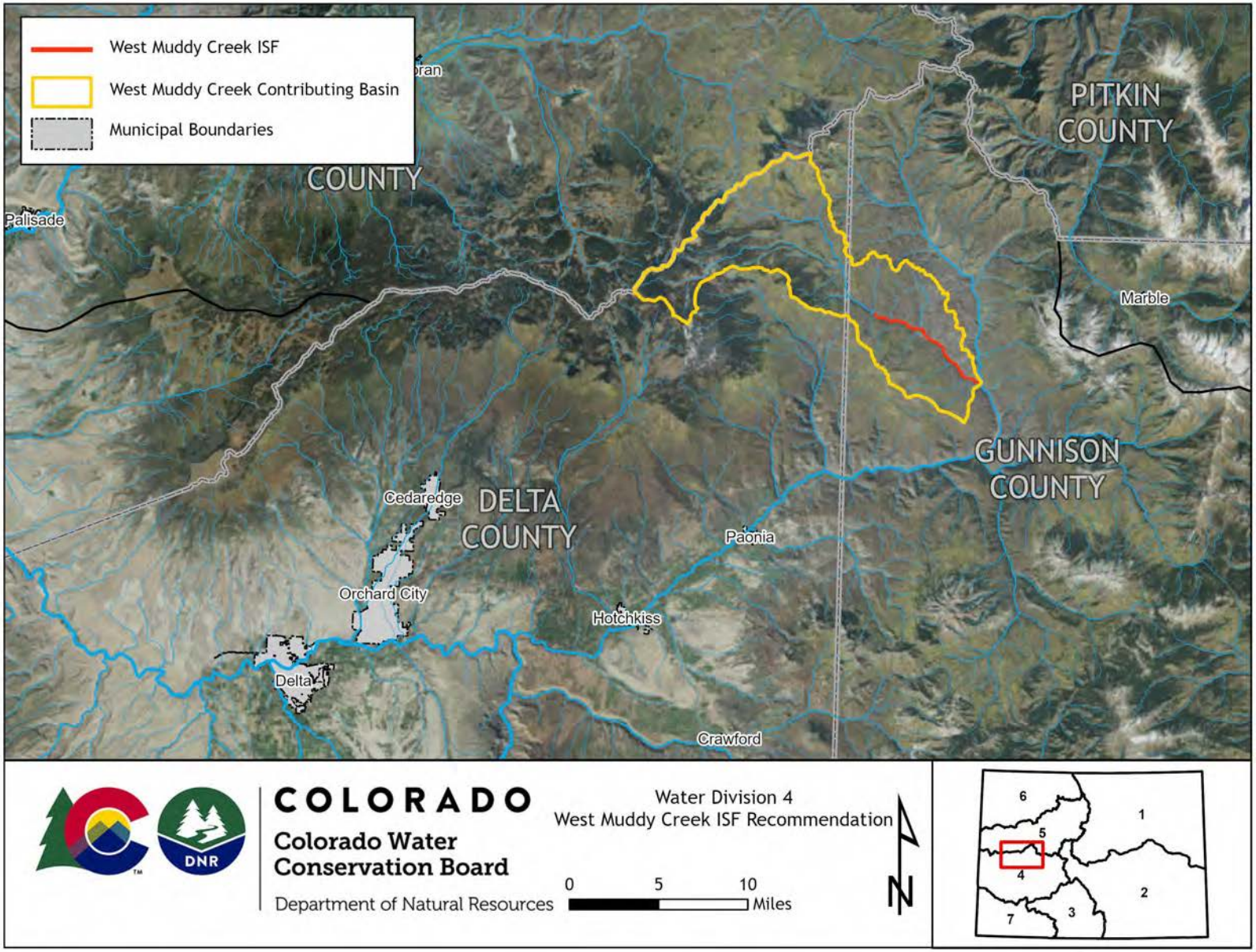
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

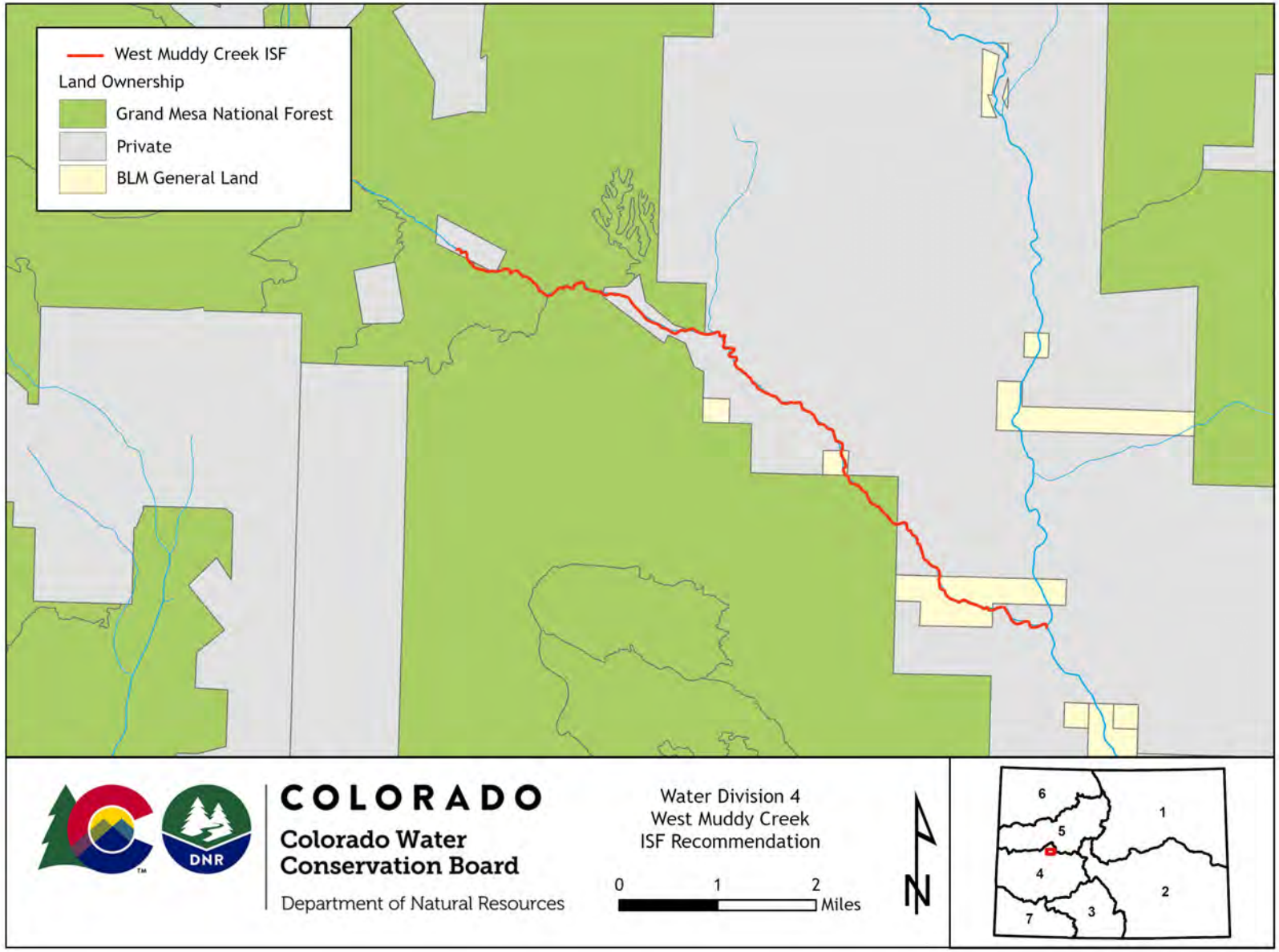
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

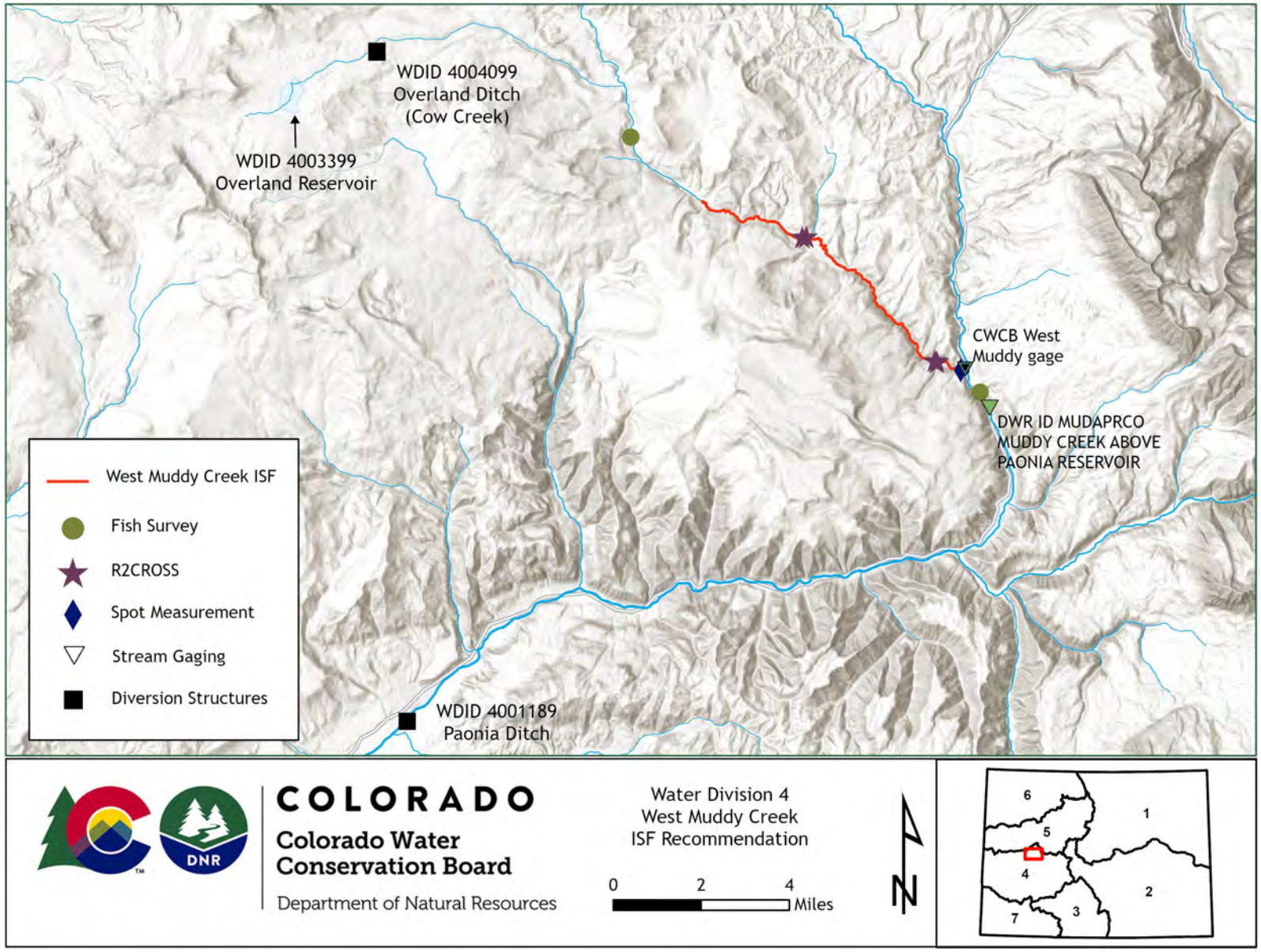
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP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Overland Ditch
(Cow Creek)
WDID 4003399
Overland Reservoir
CWCB West
Muddy gage
DWR ID MUDAPRCO
MUDDY CREEK ABOVE
PAONIA RESERVOIR
West Muddy Creek ISF
Fish Survey
R2CROSS
Spot Measurement
Stream Gaging
Diversion Structures
WDID 4001189
Paonia Ditch
COLORADO
Colorado Water
Conservation Board
Department of Natural Resources
Water Division 4
West Muddy Creek
ISF Recommendation
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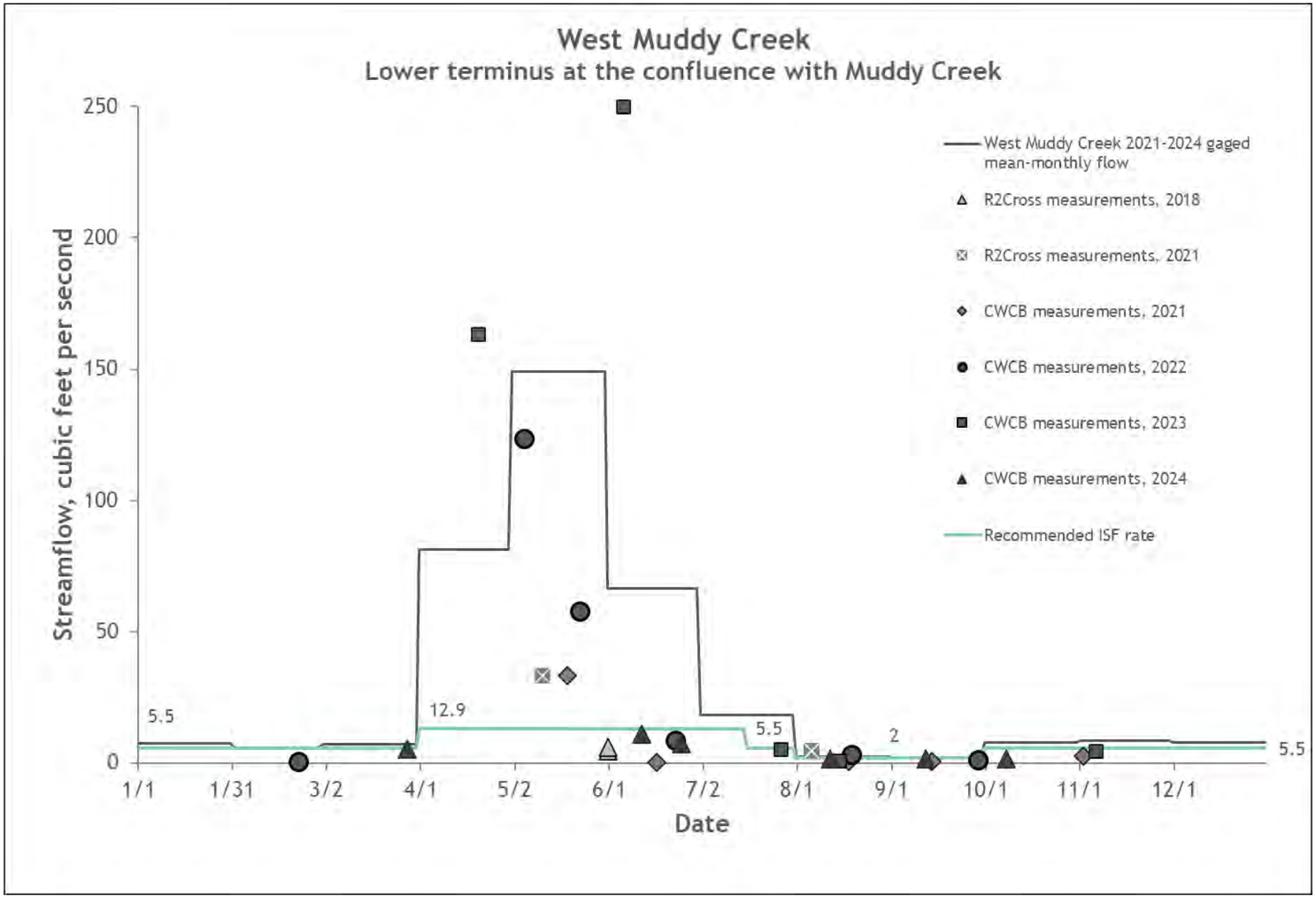
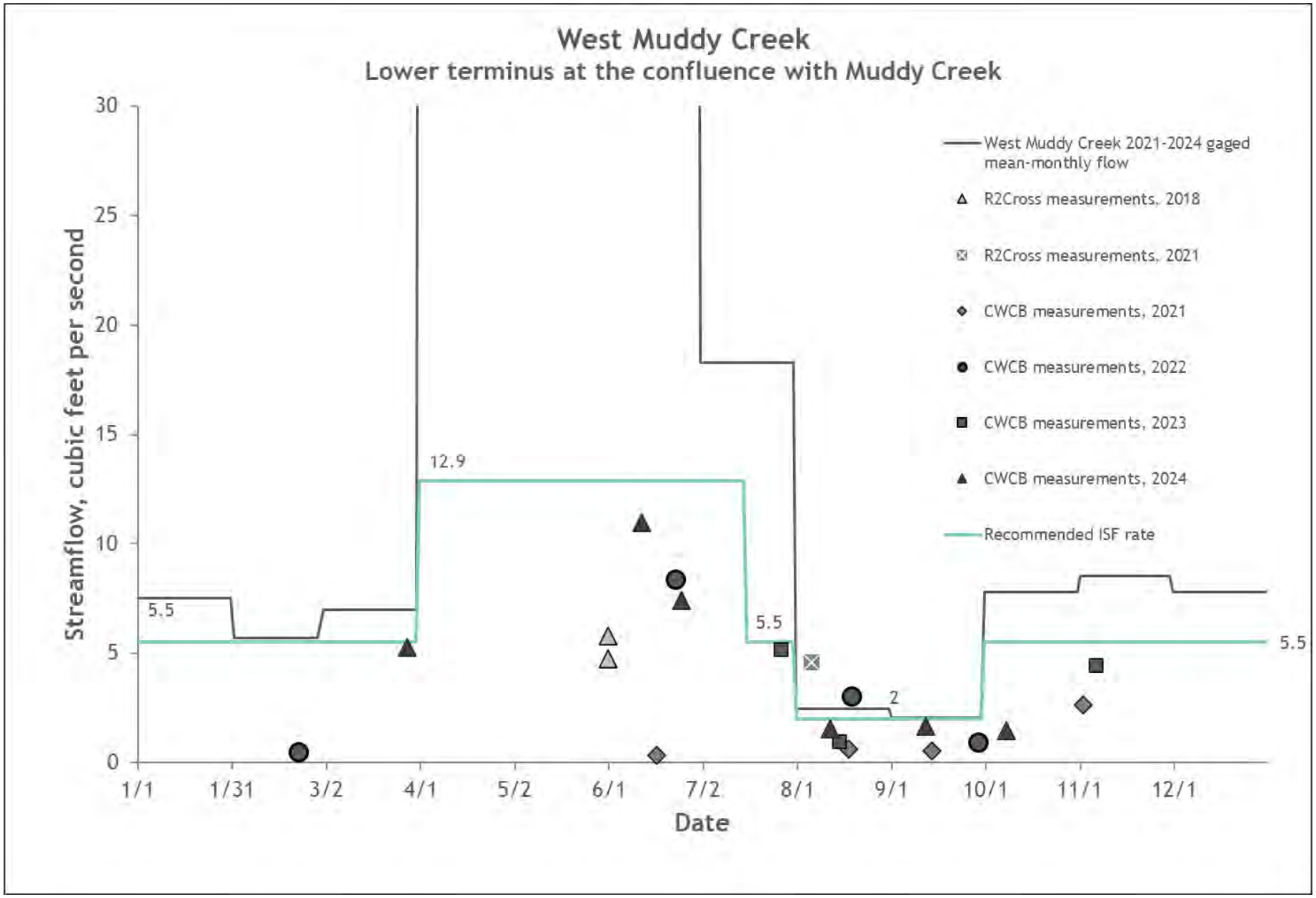
COMPLETE HYDROGRAPH



DETAILED HYDROGRAPH



Milk Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
March 18-19, 2025

UPPER TERMINUS:	confluence with Wilson Creek at UTM North: 4470717.77	UTM East: 265448.43
LOWER TERMINUS:	confluence with Yampa River at UTM North: 4475273.74	UTM East: 265917.99
WATER DIVISION/DISTRICT:	6/44	
COUNTY:	Moffat	
WATERSHED:	Lower Yampa	
CWCB ID:	18/6/A-002	
RECOMMENDER:	Bureau of Land Management (BLM), Colorado Parks & Wildlife (CPW)	
LENGTH:	4.1 miles	
FLOW RECOMMENDATION:	7.8 cfs (01/01 - 02/29) 18 cfs (03/01 - 03/31) 40 cfs (04/01 - 06/30) 8.0 cfs (07/01 - 07/31) 4.5 cfs (08/01 - 09/30) 5.2 cfs (10/01 - 12/31)	

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 (NLL) water rights. Before initiating a water right filing, the Board must determine that: 1) there is a natural environment that can be preserved to a reasonable degree with the Board's water right if granted, 2) the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made, and 3) such environment can exist without material injury to water rights.

The information contained in this Executive Summary and the associated supporting data and analyses form the basis for staff's ISF recommendation to be considered by the Board. This Executive Summary provides sufficient information to support the CWCB findings required by ISF Rule 5i on natural environment, water availability, and material injury. Additional supporting information is located at: https://cwcb.colorado.gov/2024-isf-recommendations.

RECOMMENDED ISF REACH

BLM recommended that the CWCB appropriate an ISF water right on a reach of Milk Creek at the ISF Workshop in January, 2017. CPW became a co-recommender for Milk Creek in 2023. Milk Creek is located within Moffat County and is approximately 14 miles southwest from the City of Craig, CO (See Vicinity Map). The stream originates near the Sleepy Cat Peak and flows northwest and north until it reaches the confluence with the Yampa River. The proposed ISF reach extends from the confluence with Wilson Creek downstream to the confluence with the Yampa River for a total of 4.1 miles. Sixy-one percent of the land on the proposed reach is BLM property and the remaining 39% is privately owned (See Land Ownership Map).

Agency Goals

BLM and CPW are interested in protecting Milk Creek because it provides known spawning and rearing habitat for native Flannelmouth Sucker, Bluehead Sucker, and Roundtail Chub (known as the Three Species). The Three Species are large-bodied native fishes endemic to rivers and streams of western Colorado. The Three Species are exhibiting a downward trend and collectively occupy less than half of their native range in the Colorado River Basin (Bezzerides and Bestgen, 2002). The importance of this reach of Milk Creek for native fishes led to cooperation between the BLM and CPW to document use by native species, implement fish stocking programs, and complete cooperative studies to determine the flow rates needed to support the natural environment.

CPW is a signatory, along with the BLM, other federal agencies, and multiple tribes to the Range-Wide Conservation Agreement and Conservation Strategy for the Three Species (UDWR, 2019). The goal of the Conservation Strategy is to ensure the persistence of populations of the Three Species throughout their respective ranges. CPW and BLM seek to reduce the imperiled status of these species across their historic range in Colorado in order to protect the species and to reduce the risk of a federal listing as threatened or endangered under the Endangered Species Act (ESA). Factors contributing to their decline include hydrologic alteration, lack of connectivity, and predation by and hybridization with non-native species.

CPW and BLM have dedicated significant resources to bolstering these populations through non-native fish control, reservoir screening projects, research on movement patterns and spawning behavior in tributaries like Milk Creek, and supplemental stocking to augment populations. From 2015 to 2024, CPW has proactively stocked over 20,000 Bluehead Sucker and over 3,500 Flannelmouth Sucker in Milk Creek to bolster populations in both Milk Creek and the Yampa River. This effort was the first of its kind to stock small numbers of Bluehead and Flannelmouth Suckers with the goal of augmenting the Milk Creek population and hopefully reestablishing populations of these species throughout the Yampa River basin via dispersal from Milk Creek. By boosting populations in unique tributary environments like Milk Creek, additional populations may also become established in the Yampa River mainstem where non-natives are suppressed by non-native fish control efforts. In addition, CPW tags stocked native fish with Passive Integrated Transponders, also known as PIT tags, to track annual movement patterns throughout the Upper Colorado River Basin, as well as growth rates.

Milk Creek provides unique habitat characteristics such as sporadic high-flow events, appropriate water temperature, suitable geomorphology, and high turbidity that support native fish populations. Protecting flows in a unique tributary environment like Milk Creek is complementary to other agency actions. Both CPW and BLM believe working with the CWCB to secure an ISF water right is an appropriate tool for protecting streamflows that are critically important for the persistence of the Three Species.

OUTREACH

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently, more than 1,100 people subscribe to the ISF mailing list. Notice of the potential appropriation of an ISF water right on Milk Creek was sent to the mailing list in November 2024, March 2024, March 2023, March 2022, March 2021, March 2020, March 2019, March 2018, and March 2017. A public notice about this recommendation was also published in the Craig Press on 12/11/2024. Staff spoke with former District 44 Water Commissioner, Kathy Bower, on 05/17/2017 regarding water availability and water rights on Milk Creek. CWCB staff also talked with Sarah Myer on 4/6/2023 when she was the District 44 Water Commissioner about water rights and water administration.

Staff presented information about the ISF program and this recommendation to the Moffat County Board of County Commissioners and the Moffat County Land Board on 8/14/2017 where members of the public as well as representatives of Tri-State Generation and Transmission Association (Tri-State) were also in attendance. Staff discussed this recommendation with the Moffat County Land Use Board again on 9/10/2024. Staff also worked extensively with representatives of Tri-State to inform them about the proposal, update them on studies, and tour the proposed reach on 04/20/2022 and 06/09/2023. Staff discussed the proposed ISF on Milk Creek with Colorado River Water Conservation District staff on 1/6/2024; their staff followed up with local landowners and no issues were raised.

NATURAL ENVIRONMENT

CWCB staff relies on the recommending entity to provide information about the natural environment. In addition, staff reviews information and conducts site visits for each recommended ISF appropriation. This information provides the Board with a basis for determining that a natural environment exists.

Physical Habitat
Milk Creek is the largest tributary to the Yampa River between the confluence of the Williams Fork and Little Snake Rivers. The proposed reach on Milk Creek is a low to moderate gradient stream in a canyon approximately 0.5 miles in width. In some locations, there is sufficient width in the canyon bottom for the stream to meander over time. In other locations, stream movement is confined by bedrock. The creek has a stable channel but has a highly variable substrate size, including fine sediment, gravels, and large 2-foot diameter boulders. The stream has a good mix of riffle, run, and pool habitat to support native fish populations. Water quality, water temperatures, and food sources are also suitable for native species.

Native Fishery
Fishery surveys indicate that the lowest 4.1 miles of Milk Creek provides habitat for native species, including Flannelmouth Sucker *(Catostomus latipinnis)*, Bluehead Sucker (*Catostomus discobolus*), Roundtail Chub (*Gila robusta*), and Speckled Dace (*Rhinichthys osculus*), see Table 1. The Three Species are considered sensitive species by the BLM. Criteria that apply to BLM sensitive species include the following: 1) species under status review by the U.S. Fish and Wildlife Service; or 2) species with numbers declining so rapidly that federal listing may become necessary; or 3) species with typically small and widely dispersed populations; or 4) species inhabiting ecological refugia or other specialized or unique habits. The Three Species meet the first two of the criteria listed above, qualifying them as BLM "sensitive species" (BLM, 2025). The Three Species are also listed in the Colorado State Wildlife Action Plan (2015) as Tier 1 Species of Greatest Conservation Need, or "species which are truly of highest conservation priority in the state."

Table 1. List of native fish species identified in Milk Creek.

Species Name	Scientific Name	Status
flannelmouth sucker	*Catostomus latipinnis*	State - Species of Greatest Conservation Need BLM – Sensitive Species
bluehead sucker	*Catostomus discobolus*	State - Species of Greatest Conservation Need BLM – Sensitive Species
roundtail chub	*Gila robusta*	State - Species of Greatest Conservation Needn BLM – Sensitive Species
speckled dace	*Rhinichthys osculus*	None

As a significant low elevation perennial tributary to the Yampa River, Milk Creek provides important year-round and seasonal habitat for the Three Species. Very few similar tributaries enter the Yampa River in this area, so it is critical for restoring native fish populations in the Yampa River watershed. Tributary habitats provide unique refugia for juvenile native fish where threats of predation and hybridization with non-native species may be substantially lower than those in the mainstem Yampa River.

Based on CPW data, there is heavy use by adult Three Species during the spring high-flow period and receding limb, specifically Bluehead Sucker and Flannelmouth Sucker. Flannelmouth Suckers and Bluehead Suckers have been known to travel long distances toward habitual spawning areas. During the rising limb of the hydrograph when the water temperature reaches approximately 13°C, Flannelmouth Sucker migrate into tributaries to spawn. Bluehead Suckers follow shortly after, once water temperature reaches 16°C. In Milk Creek this window typically occurs between April to mid-May annually but can vary significantly from year-to-year. Roundtail Chub can be found in Milk Creek and its tributary Stinking Gulch, but their densities are low near the Yampa River confluence. This is likely driven by low densities of Roundtail Chub in the Yampa River. Most of the Roundtail Chub in lower Milk Creek are juveniles. Roundtail Chub of all life stages are present higher in the drainage above Axial Basin. For additional information about fish movement patterns and research in Milk Creek please see CPW's recommendation letter and attached report.

Nonnative Fishery
Non-native fish species that utilize Milk Creek include Black Bullhead (*Ameiurus melas*), Brook Stickleback (*Culaea inconstans*), Brown Trout (*Salmo trutta*), Common Carp (*Cyprinus carpio*), Creek Chub (*Semotilus atromaculatus*), Fathead Minnow (*Pimephales promelas*), Green Sunfish (*Lepomis cyanellus*), Iowa Darter (*Etheostoma exile*), Northern Plains Killifish (*Fundulus kansae*), Red Shiner (*Cyprinella lutrensis*), Sand Shiner (*Miniellus stramineus*), Smallmouth Bass (*Micropterus dolomieu*), White Sucker (*Catostomus commersonii*), White x Bluehead Sucker Hybrid, and White x Flannelmouth Sucker Hybrid.

Macroinvertebrate Community
Aquatic macroinvertebrates are an important component of aquatic food webs and serve as an important food source for fish. In October 2023, CPW staff collected macroinvertebrate samples at two sites within the proposed ISF reach. Analysis of the macroinvertebrate data results show both sites are attaining and meeting the state standards for macroinvertebrate health and biodiversity. Other metrics indicate that Milk Creek has relatively few pollution tolerant species. Both sites also had a high number of unique species demonstrating a community that is species rich with relatively high biodiversity. Additional details on the macroinvertebrate sampling and results are available in CPW's recommendation letter.

Riparian Community
Milk Creek supports a riparian community comprised primarily of willows, sedges, cottonwoods, and rushes. The riparian community has been impacted by historical grazing practices but is now on an upward trend in lower portions of the reach and is static farther upstream. This reach also hosts mature cottonwood trees and substantial cottonwood regeneration has been observed.

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

Instream Flow Incremental Methodology (IFIM) using System for Environmental Flow Analysis (SEFA)

CPW and BLM utilized professional judgement and past experiences to determine the appropriate methodology for the Milk Creek ISF recommendation. The BLM and CPW decided to use a methodology that is species-specific and can be tailored to assessing flow and habitat relationships specific to Flannelmouth Sucker and Bluehead Sucker. BLM and CPW used IFIM, a widely accepted method for quantifying suitable hydraulic habitat as a function of discharge for specific species and life stages of fish. In 2023, CWCB hired Bill Miller to provide field support and technical training necessary to complete a hydraulic habitat model on Milk Creek using SEFA. The SEFA software is a modern version of the Physical Habitat Simulation software (PHABSIM), a program which was historically used for all of Colorado's ISF evaluations using the IFIM framework. As legacy software, PHABSIM was not updated for compatibility to Windows Operating System 11. The SEFA software is the modern equivalent with additional features, one of which is the predicting fish passage across transects. Bill Miller trained BLM, CPW, and CWCB staff in field methods and use of the SEFA software, developed the models, and completed a summary report (Miller, 2024a).

Habitat Suitability Criteria (HSC)

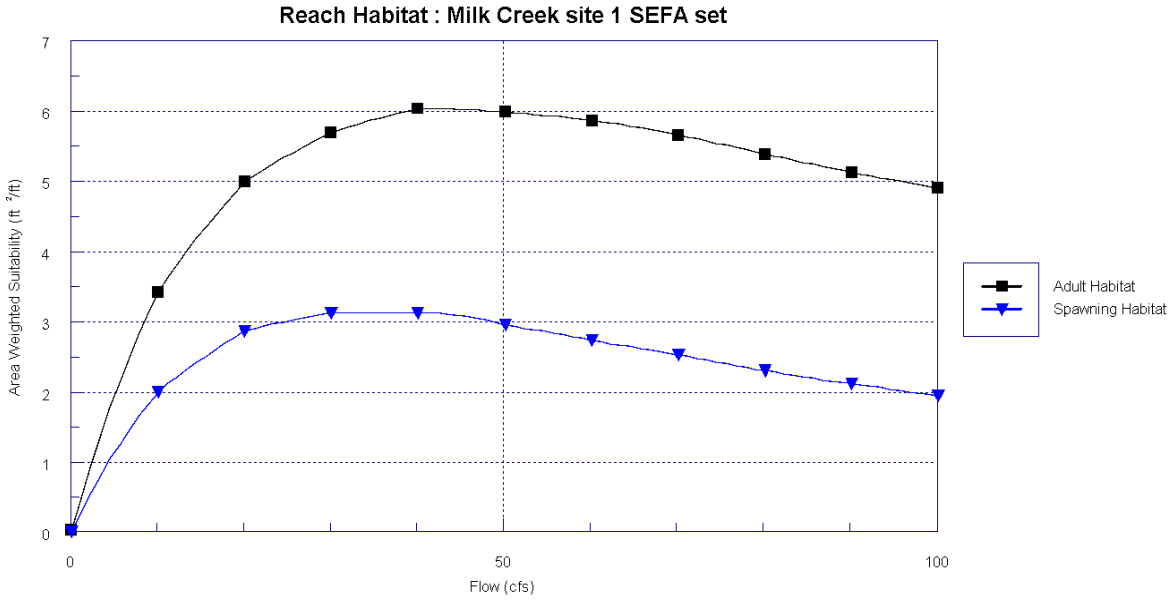
HSC represent a fish species' preference for habitat variables such as depth, velocity, substrate, or cover. For this ISF evaluation, HSC for adult Flannelmouth Sucker and Bluehead Sucker were updated in early 2024 (Miller, 2024b). A combination of data was used including radio telemetry studies on the Colorado River near Grand Junction, existing occupancy data from a range of rivers, and a literature review of habitat and population studies. There is relatively limited habitat suitability data specific to Bluehead Sucker, so HSC for Flannelmouth Sucker were used as a surrogate. Bluehead Sucker have different feeding preferences than Flannelmouth Sucker and are known to feed by scraping algae and periphyton from cobble-sized substrates in faster riffle habitats. Flannelmouth Sucker tend to feed on aquatic invertebrates and detritus found in finer substrates in habitats with relatively low velocities. Given these differences, the habitat response shown for Flannelmouth Sucker approximates habitat response to flow for Bluehead Sucker but will not fully depict all areas suitable for Bluehead Sucker. The suitability indices used in the hydraulic-habitat modeling are a combination of the data from Flannelmouth Sucker and Bluehead Sucker studies on the Colorado River and literature from the U.S. Fish and Wildlife Service (Miller, 2024b).

Flannelmouth Sucker and Bluehead Sucker spawn in riffle habitat over gravel and cobble substrate. Spawning habitat use is generally restricted to shallower depths and higher velocity than the broader habitat types used by adults. The spawning HSC for both species were based on a combination of literature review and existing habitat suitability criteria from the U.S. Fish and Wildlife Service (Miller, 2024b). Suitable spawning substrate material was restricted to gravel and cobble substrate types in the model to accurately reflect the use of these sites during spawning.

Data Collection and Analysis

In fall of 2023, Bill Miller, BLM, CPW, and CWCB staff performed site selection and field data collection to build a hydraulic habitat model for the Milk Creek ISF reach in SEFA. After assessing the four-mile ISF reach, a study area was selected that is representative of the ISF reach. Two study sites were surveyed on BLM lands – Site 1 was approximately 0.5 miles above the confluence with the Yampa River and Site 2 was approximately 0.9 miles above the confluence. The two study sites include a variety of riffle, run and pool habitat types with bed substrate that ranges in size from fine silt to large cobble. Surveys were conducted in October 2023 to establish bed topography. An initial hydraulic habitat-discharge relationship was analyzed under baseflow conditions (approximately 6 cfs). In spring 2024, two additional sets of measurements were made to calibrate the model over a range of flows, these include measurements at a mid-flow (approximately 45-50 cfs in April) and a high flow (approximately 127 cfs in June). Streamflow and habitat were modeled from 5 cfs to 300 cfs.

In SEFA, the amount of suitable habitat computed at various flow rates is referred to as Area Weighted Suitability (AWS). The AWS is the Combined Suitability Index (CSI) for depth, velocity and substrate for each measurement point weighted by the area the point represents. Results for combined AWS for depth, velocity, and substrate are shown below for the two study areas (Figure 1).



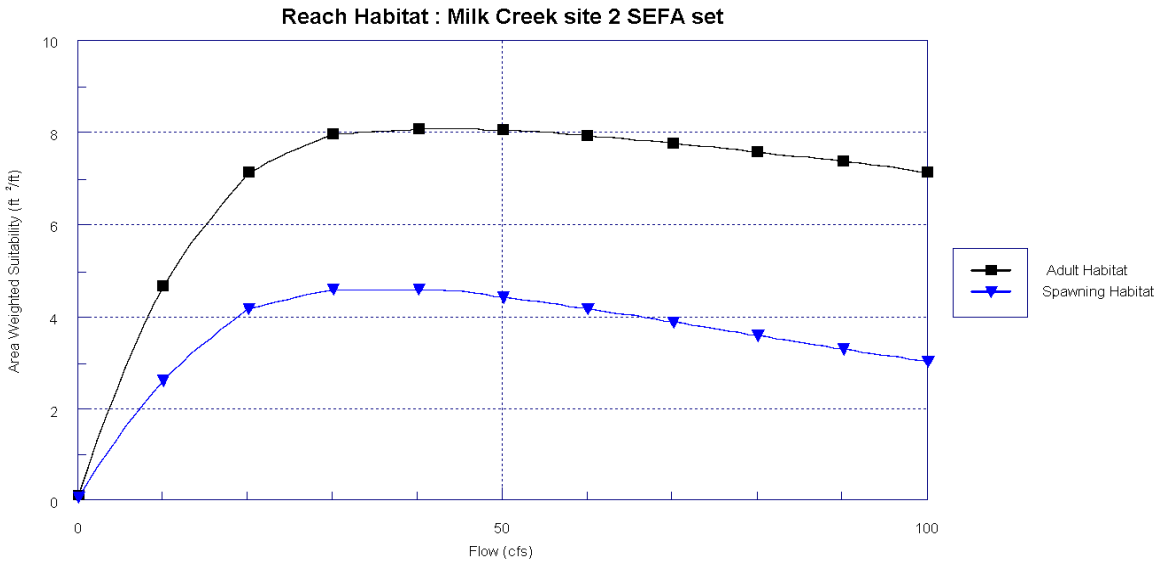


Figure 1. Hydraulic Habitat Modeling Results Graphs for site 1 (top) and site 2 (bottom)

The hydraulic habitat modeling results for both sites were comparable with maximum AWS for occurring at a flow of 40 cfs for adult sucker species. For spawning habitat, the maximum AWS occurs from 30 cfs to 40 cfs for both sites. For both general adult habitat and spawning habitat, AWS decreases rapidly below 40 cfs, indicating that additional increments of discharge provide significant habitat response benefits as flows approach 40 cfs. At flows greater than 40 cfs, additional increments of discharge provide smaller habitat benefits.

Fish Passage

Longitudinal connectivity is important in riverine systems to allow migration and localized movement required by fish and other aquatic biota. Flannelmouth Sucker and Bluehead Sucker migrate from larger rivers into smaller tributary streams such as Milk Creek for spawning, and habitat connectivity is critical for that life stage. Analysis of fish passage is one means to assess connectivity and evaluate the flows needed to allow fish migration.

A fish passage assessment was conducted using a depth criteria of 0.6 feet (7 inches). This was chosen based on professional judgment as this depth is approximately double the body depth of an adult Flannelmouth Sucker. This is protective of Bluehead Sucker because Flannelmouth Sucker is the larger of the two species. The SEFA fish passage connectivity evaluation showed that at a flow of 8.0 cfs, all cross-sections measured show a continuous pathway for fish passage that is at least 2 feet in width and at least 0.6 feet in depth at both study sites.

ISF Recommendation

Using the approach and results summarized above, biological expertise, and staff's water availability analysis, CPW and BLM developed the following instream flow recommendations.

7.8 cfs – January 1 through February 29
This recommended flow rate is based on limited water availability during the baseflow period. This flow rate will provide conditions to enable longitudinal movement of resident fish to find more advantageous habitat.

18.0 cfs - March 1 through March 31
A flow rate of 18 cfs will provide enabling conditions during the beginning of the spawning period for native fish, a critical period for completing their life cycle. As low elevation snowmelt runoff begins in the early part of spring, it is important to preserve flows that begin to cue native fish and allow longitudinal movement between habitat types in order to reach suitable spawning areas.

40.0 cfs – April 1 through June 30
A flow rate of 40 cfs supports preferred habitat for adult Bluehead and Flannelmouth Sucker across both sites. This flow rate also supports preferred spawning habitat for these species. Preserving this flow rate during the spring runoff period (including the rising and receding limb of the hydrograph) will support native fish by providing optimal depth, velocity, and substrate conditions to enable spawning migrations, as well as optimal overall habitat conditions for adult species. The snowmelt runoff peak can occur anytime between April and June on Milk Creek and is critically important in cueing native fish species to spawn, as well as providing geomorphic functions that support life cycle requirements of these fish. The higher flow rate supports sediment mobilization in the stream which supports habitat diversity and healthy spawning beds by flushing fines from interstices to support clean cobble and gravel substrate in the channel (the preferred spawning substrate for these species). Higher flows also support recruitment of woody debris and organic materials that can facilitate healthy stream function as well as a robust macroinvertebrate food base for fish. Protecting this flow rate over this extended spring runoff time period will provide a ramp during and after peak flows that helps with drift, dispersal, and incubation of eggs in the channel.

8.0 cfs - July 1 through July 31
The SEFA fish passage evaluation showed that 8 cfs will preserve a pathway for fish that is at least 2 feet wide and 0.6 feet deep across all modeled cross-sections at both study sites. The recommended flow rate (8 cfs) will maintain longitudinal connectivity of habitat and will enable large-bodied adult fish to move throughout Milk Creek to find suitable habitat or to emigrate into the Yampa River without being stranded. Additionally, this flow rate will support larvae development and emergence by maintaining wetted area in the channel and channel margins. This flow rate will support both fish passage for all life stages of native fish and habitat for larvae development and young-of-the-year fish to grow and mature in channel margins, creating refuge habitat for larvae, young-of-the-year, and juvenile fish.

4.5 cfs – August 1 through September 30
This recommended flow rate is based on limited water availability during the late irrigation season. Despite low flow conditions and limited mobility between habitat types, native species will use available habitat within Milk Creek during this period. Preserving this flow rate is important because it enables rearing of juvenile and young-of-the-year fish. Growth during this late summer period is critical to their survival over the winter period. There is reduced occupancy by non-native species and less competition foraging in Milk Creek than in the mainstem Yampa River.

5.2 cfs – October 1 through December 31
This recommended flow rate is based on limited water availability during the baseflow period. Baseflow during the winter months is necessary to provide enough habitat variety to overwinter resident native fish.

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

Water Availability Methodology
Each recommended ISF reach has a unique flow regime that depends on variables such as the timing, magnitude, and location of water inputs (such as rain, snow, and snowmelt) and water losses (such as diversions, reservoirs, evaporation and transpiration, groundwater recharge, etc.). This approach focuses on streamflow and the influence of flow alterations, such as diversions, to understand how much water is physically available in the recommended reach.

Staff's hydrologic analysis is data-driven, meaning that staff gathers and evaluates the best available data and uses the best available analysis method for that data. Whenever possible, long-term stream gage data (period of record 20 or more years) are used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and regression-based models are used when long-term gage data is not available. CSUFlow18 is a multiple regression model developed by Colorado State University researchers using streamflow gage data collected between 2001 and 2018 (Eurich et al., 2021). This model estimates mean-monthly streamflow based on drainage basin area, basin terrain variables, and average basin precipitation and snow persistence. Diversion records are used to evaluate the effect of surface water diversions when necessary. Interviews with water commissioners, landowners, and ditch or reservoir operators can provide additional information. A range of analytical techniques may be employed to extend gage records, estimate streamflow in ungaged locations, and estimate the effects of diversions. The goal is to obtain the most detailed and reliable estimate of hydrology using the most efficient analysis technique.

The final product of the hydrologic analysis used to determine water availability is a hydrograph, which shows streamflow and the proposed ISF rate over the course of one year. The hydrograph will show median daily values when daily data is available from gage records; otherwise, it will present mean-monthly streamflow values. Staff will calculate 95% confidence intervals for the median streamflow if there is sufficient data. Statistically, there is 95% confidence that the true value of the median streamflow is located within the confidence interval.

Basin Characteristics
The contributing basin of the proposed ISF on Milk Creek is 223 square miles, with an average elevation of 7,336 feet and average annual precipitation of 21.4 inches. The drainage basin is snowmelt driven. Snowmelt runoff can initiate early relative to other basins due to the generally low elevation of the watershed. Baseflow conditions are low, while runoff can be several orders of magnitude higher.

Water Rights Assessment

There are no active water rights within the proposed reach on Milk Creek. There are a large number of water rights influencing hydrology in the drainage basin upstream. This includes 338 cfs in active direct flow diversions, 2,606 acre-feet in storage, 152 springs totaling 5.9 cfs, and a number of wells. A significant portion of the water rights in the lower portion of the basin are owned by Tri-State which then lease the water rights to farms and ranches. Private ranches and water right owners are generally located higher in the basin. There is one transbasin import, the Highline Ditch (WDID 4400814, 3.3 cfs with a 1897 appropriation date, and 3.0 cfs with a 1914 appropriation date) that brings water to Milk Creek from the basin to the east (diversion point is on Deer Creek which is a tributary to Morapas Creek) which is used to irrigate lands along Stinking Gulch, a tributary of Milk Creek just above the proposed upper terminus. There is also a large conditional right on the Yampa River at the mouth of Milk Creek for a potential pipeline (Yampa River Milk Ck PL WDID 4402029, 400 cfs appropriated in 1975)

Data Collection and Analysis

Representative Gage Analysis

There is not a long-term gage within the proposed reach on Milk Creek. There was a historic gage (USGS 0925000, Milk Creek near Thornburg) which was located about 14 miles upstream from the proposed reach and operated from 1952-1986. This gage was determined not to be suitable to evaluate water availability due to the large percentage of the basin area and water rights located downstream from the gage. There were short-term historic gages on several of the tributaries that join Milk Creek within a few miles of the proposed upper terminus (Jubb Creek near Axial, CO (USGS 09250610, 1975-1981; Morgan Gulch near Axial, CO, USGS 09250700, 1980-1981; Wilson Creek near Axial, CO, USGS 09250600, 1974-1980). Staff explored these datasets but determined that there was insufficient data on enough of the system to understand water availability in the proposed reach.

Due to insufficient representative streamflow data, CWCB staff installed a temporary gage on Milk Creek in July of 2017 (See the Site Map). This gage was subsequently moved a short distance upstream in 2018 and remains in operation. The gage consists of a staff plate, HOBO MX2001 pressure transducer which recorded water level in 15 min intervals, and a camera. There are a number of data gaps due to several high streamflow events that disrupted the gage equipment, equipment failures, and ice affected data.

The CWCB gage record was compared to a nearby climate station to evaluate how the historical record compares to a longer record. The closest climate station was located approximately 14 miles to the northeast at the Craig Airport (USC00024046 Craig Moffat CO Airport). Daily precipitation data was available through CDSS from 4/1/1998 to 7/31/2024 with full years of data missing in 2003, 2007, and 2013 and partial years of data missing in 1998 and 2024. Over the CWCB gage record that could be evaluated (2018-2023), three years had below 25th percentile annual precipitation (2020, 2021, and 2023), two years were just under the median (2018 and 2022), and 2019 was above the 75th percentile. Therefore, the CWCB gage data likely includes a range of low flow conditions and higher flow conditions, but most of the data is duirng years when the precipitation in the area was less than median.

Based on the CWCB gage data, streamflow typically begins to increase in March and recede by late June. Most years of data show peak flows above 50 cfs and in 2019 the instantaneous peak was above 500 cfs. The Milk Creek gage data from 7/14/2024 to 12/19/2024 was used to

calculate mean-monthly streamflow. No adjustments were made for the small change in gage location or to extrapolate flow slightly downstream to the lower terminus.

Site Visit Data

CWCB staff made 41 streamflow measurements on the proposed reach of Milk Creek as part of operating the CWCB Milk Creek gage (Table 3).

Table 3. Summary of streamflow measurements for Milk Creek.

Visit Date	Flow (cfs)	Collector
07/13/2017	3.92	CWCB
08/01/2017	4.66	BLM
08/14/2017	2.43	BLM
10/05/2017	14.13	BLM
11/27/2017	9.77	BLM
05/08/2018	170.01	CWCB
06/04/2018	6.63	CWCB
08/15/2018	0.34	BLM
09/13/2018	0.57	CWCB
11/14/2018	3.83	BLM
04/19/2019	105.50	BLM
05/07/2019	263.26	CWCB
07/12/2019	22.08	BLM
07/30/2019	11.33	CWCB
10/08/2019	4.72	BLM
12/05/2019	13.10	CWCB
11/19/2020	6.31	CWCB
04/05/2021	17.13	CWCB
05/13/2021	17.47	CWCB
06/16/2021	1.31	CWCB
07/22/2021	1.24	CWCB
08/19/2021	3.08	CWCB
09/15/2021	1.15	CWCB
11/01/2021	5.11	CWCB

04/20/2022	38.46	BLM, CPW, CWCB
05/24/2022	47.20	CPW, CWCB
08/18/2022	1.82	CWCB
11/01/2022	6.63	CWCB
06/07/2023	146.00	CWCB
07/25/2023	5.73	CWCB
08/16/2023	8.24	CWCB
10/10/2023	4.84	CWCB
10/24/2023	5.72	CPW, CWCB
11/10/2023	4.99	CWCB
03/28/2024	28.21	CWCB
04/12/2024	52.22	CPW
05/29/2024	127.60	CWCB
06/27/2024	13.13	CWCB
08/06/2024	4.37	CWCB
10/09/2024	2.27	CWCB
12/18/2024	5.34	CWCB

Water Availability Summary

The hydrograph shows mean-monthly streamflow for the CWCB Milk Creek gage and the proposed ISF rate (See Complete Hydrograph). The proposed ISF flow rate is below the mean-monthly streamflow. Staff concludes that water is available for appropriation on Milk Creek.

MATERIAL INJURY

If decreed, the proposed ISF on Milk Creek would be a new junior water right. This ISF water right can exist without material injury to other senior water rights. Under the provisions of section 37-92-102(3)(b), C.R.S., the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

Common Acronyms and Abbreviations

Term	Definition
af	acre feet
BLM	Bureau of land management
cfs	cubic feet per second
CWCB	Colorado Water Conservation Board
CPW	Colorado Parks and Wildlife
DWR	Division of Water Resources
HCCA	High Country Conservation Advocates
ISF	Instream Flow
NLL	Natural Lake Level
USGS	United States Geological Survey
USFS	United States Forest Service
XS	Cross section

Citations

Bezzerides, N. and K. Bestgen, 2002, Status review of Roundtail Chub, Flannelmouth Sucker, and Bluehead Sucker in the Colorado River Basin. Larval Fish Laboratory, Colorado State University, Fort Collins.

Bureau of Land Management, 2025, BLM special status species. Retrieve from URL: https://www.blm.gov/programs/wildlife/threatened-and-endangered/blm-special-status-species

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Colorado Water Conservation Board, 2024, R2Cross field manual. Retrieve from URL: https://dnrweblink.state.co.us/cwcbsearch/0/edoc/224685/R2Cross%20Field%20Manual%202024.pdf

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

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

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

Miller, B., 2024a, Final Milk Creek Instream Flow Study Report, September 30, 2024

Miller, B., 2024b, Proposed Habitat Suitability Criteria for Flannelmouth Sucker and Bluehead Sucker for use in Milk Creek Instream Flow Study, January 26, 2024

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.

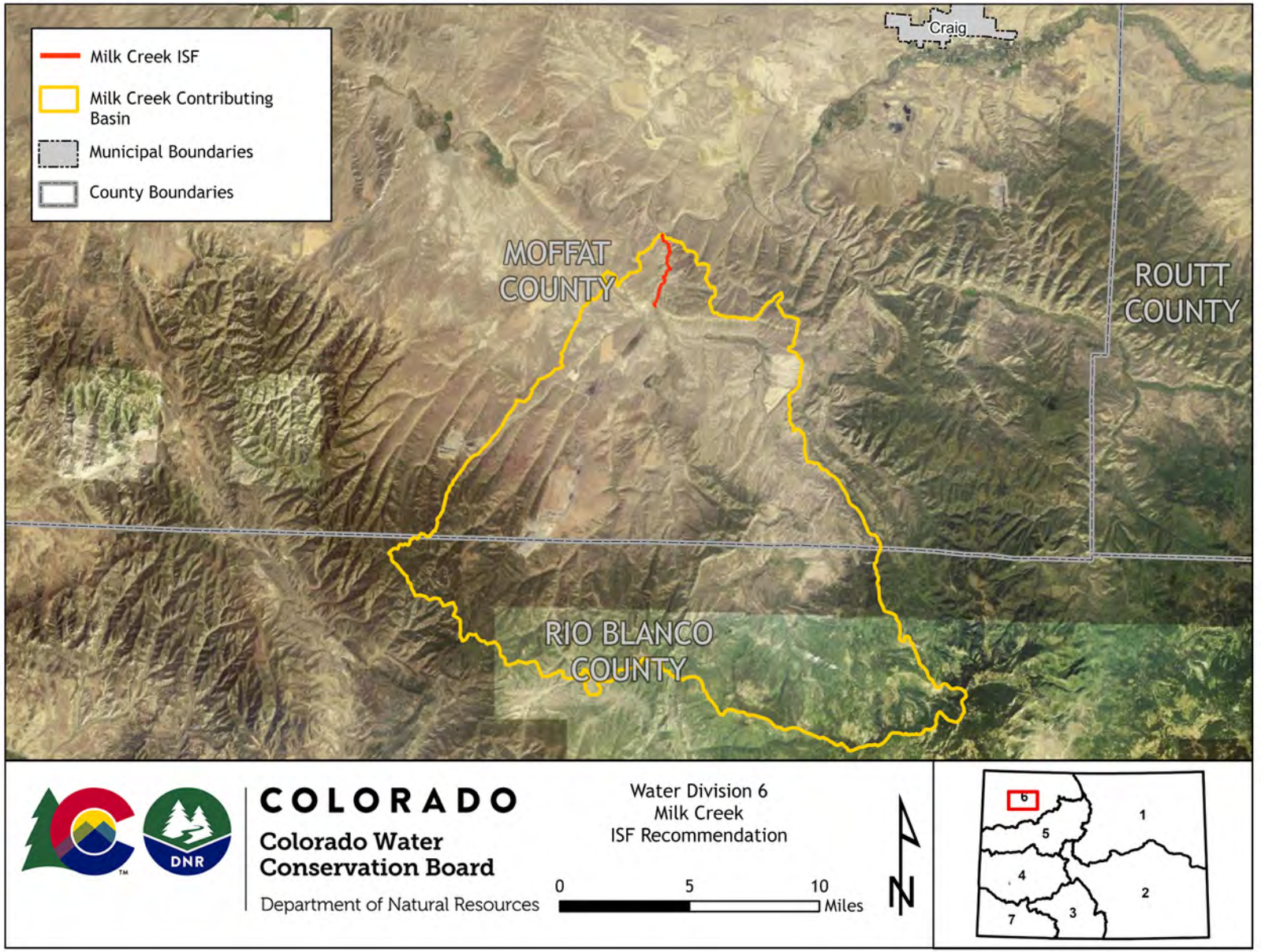
Utah Division of Wildlife Resources (UDWR), 2019, Range-wide conservation agreement and strategy for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker. Publication Number 06-18. Prepared for Colorado River Fish and Wildlife Council. Utah Department of Natural Resources, Division of Wildlife Resources, Salt Lake City, Utah

Metadata Descriptions

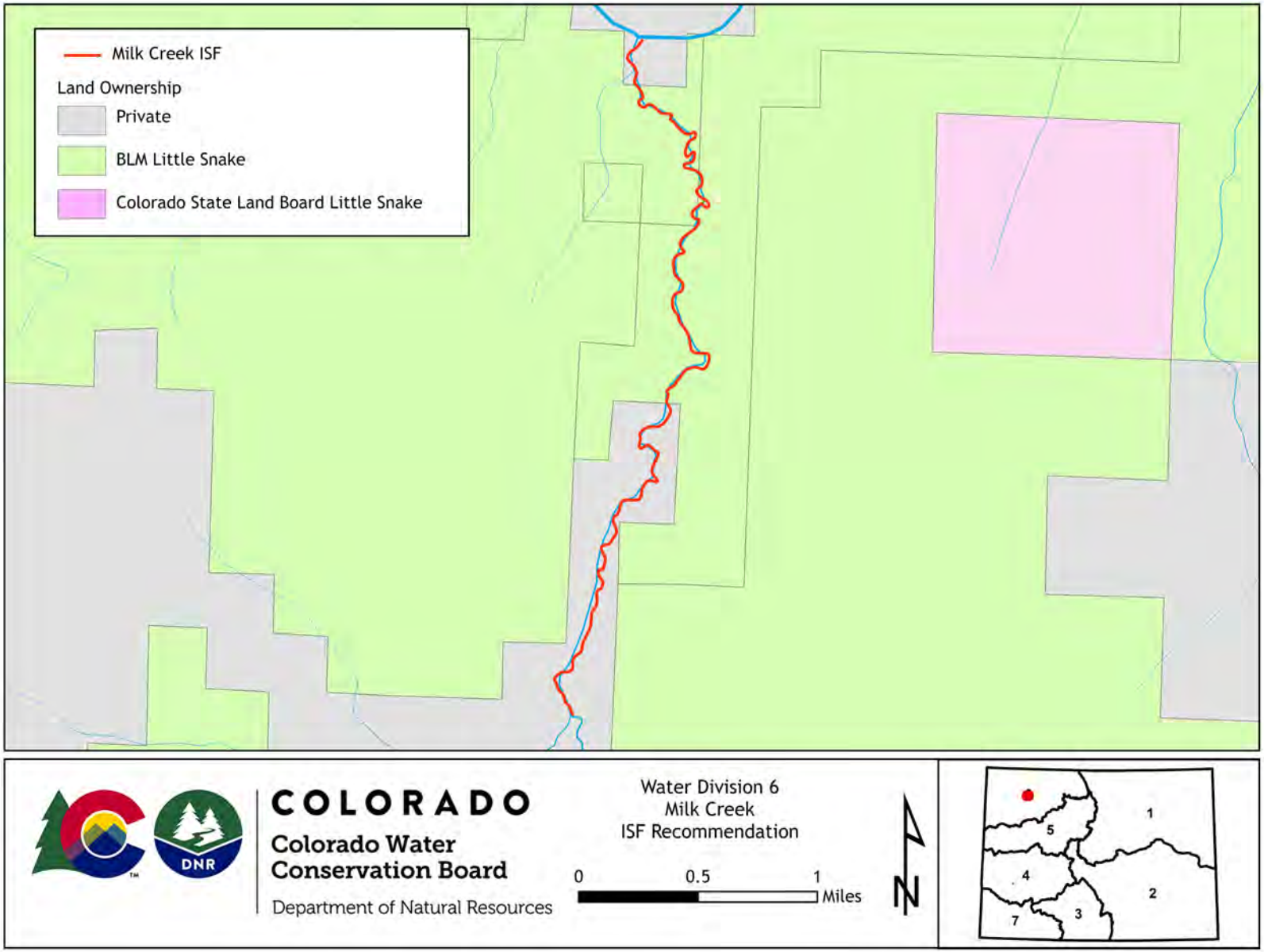
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

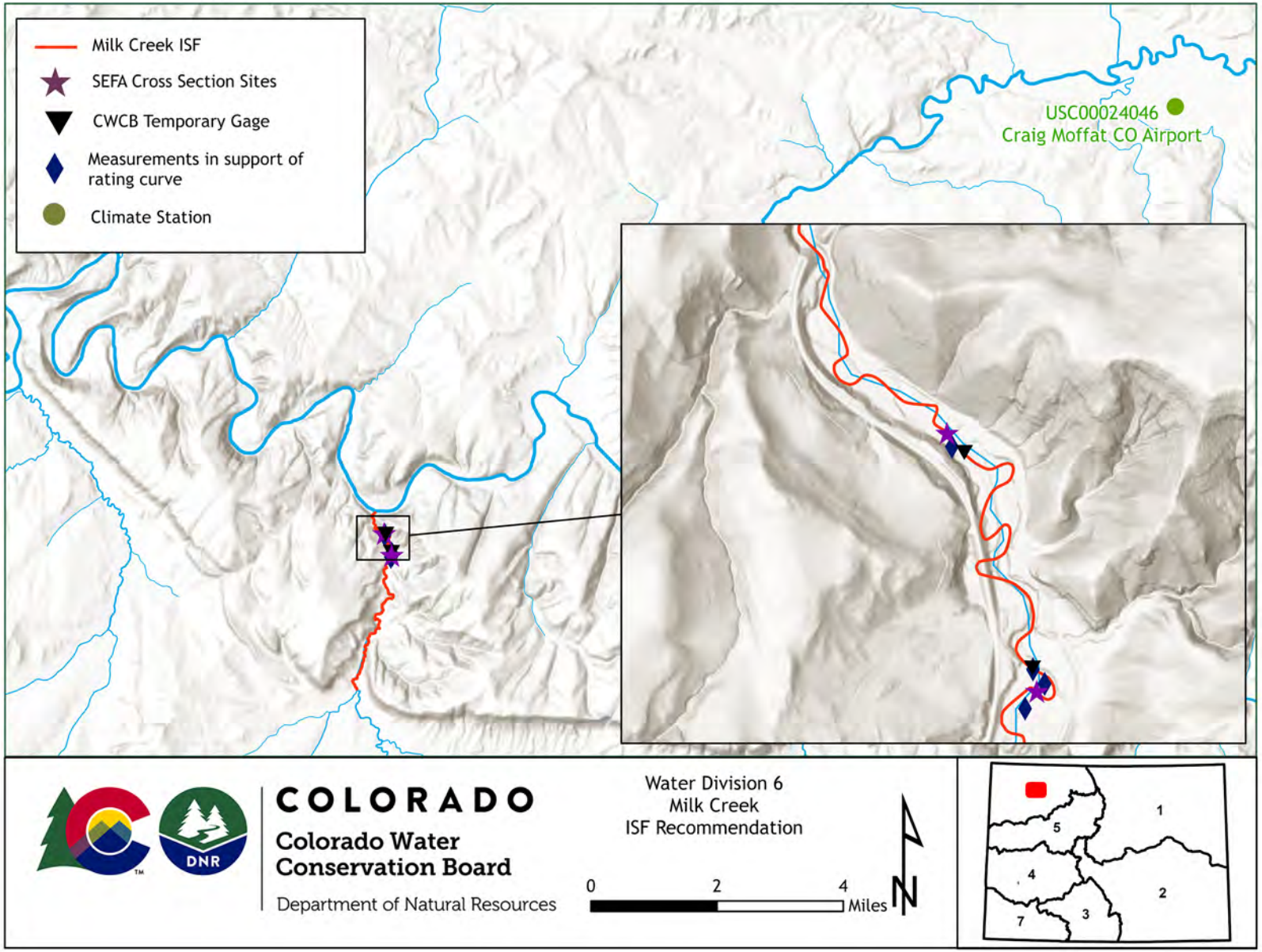
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


Milk Creek ISF
SEFA Cross Section Sites
CWCB Temporary Gage
Measurements in support of rating curve
Climate Station
USC00024046
Craig Moffat CO Airport
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 6
Milk Creek
ISF Recommendation
0
2
4
Miles
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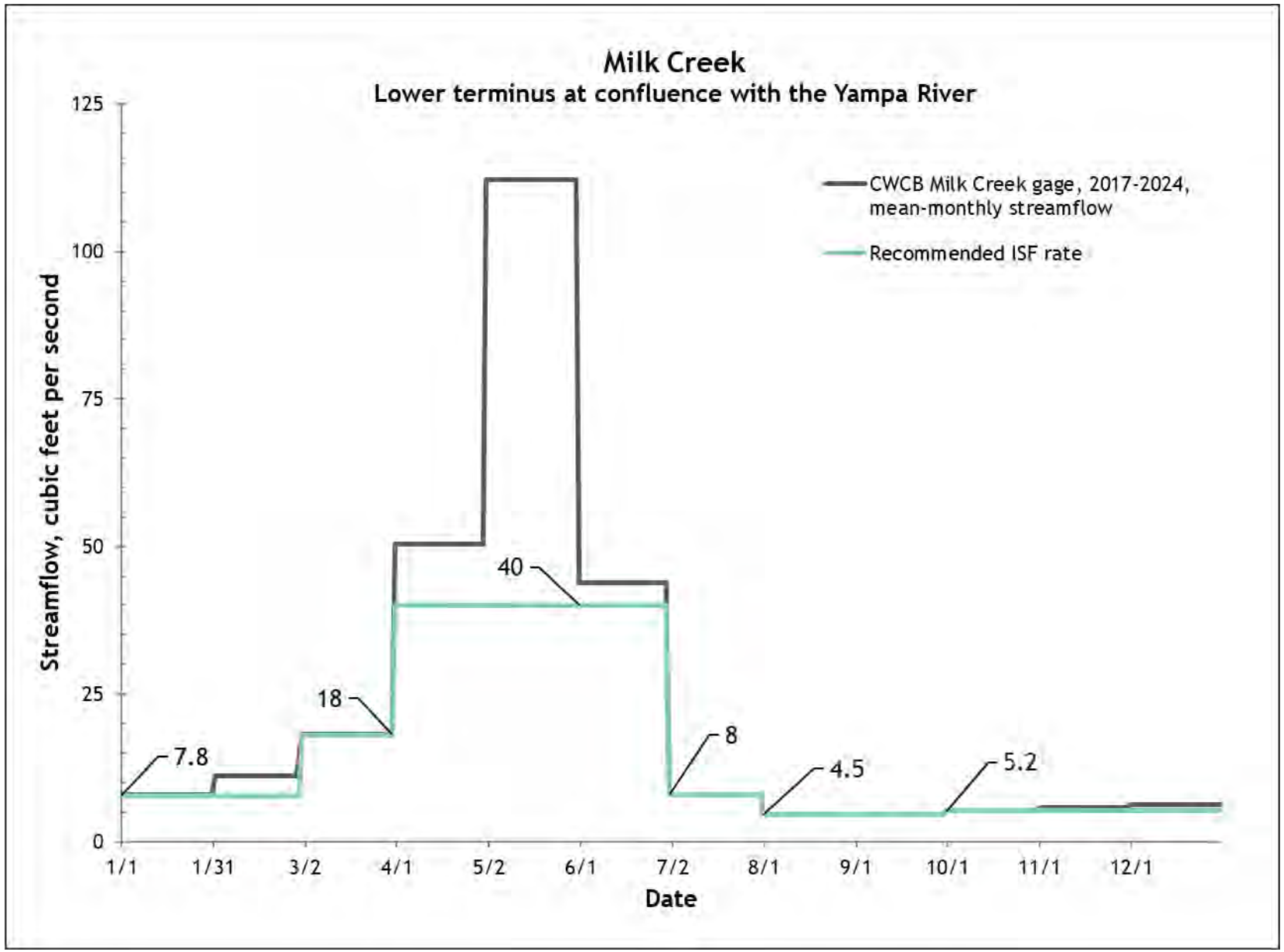
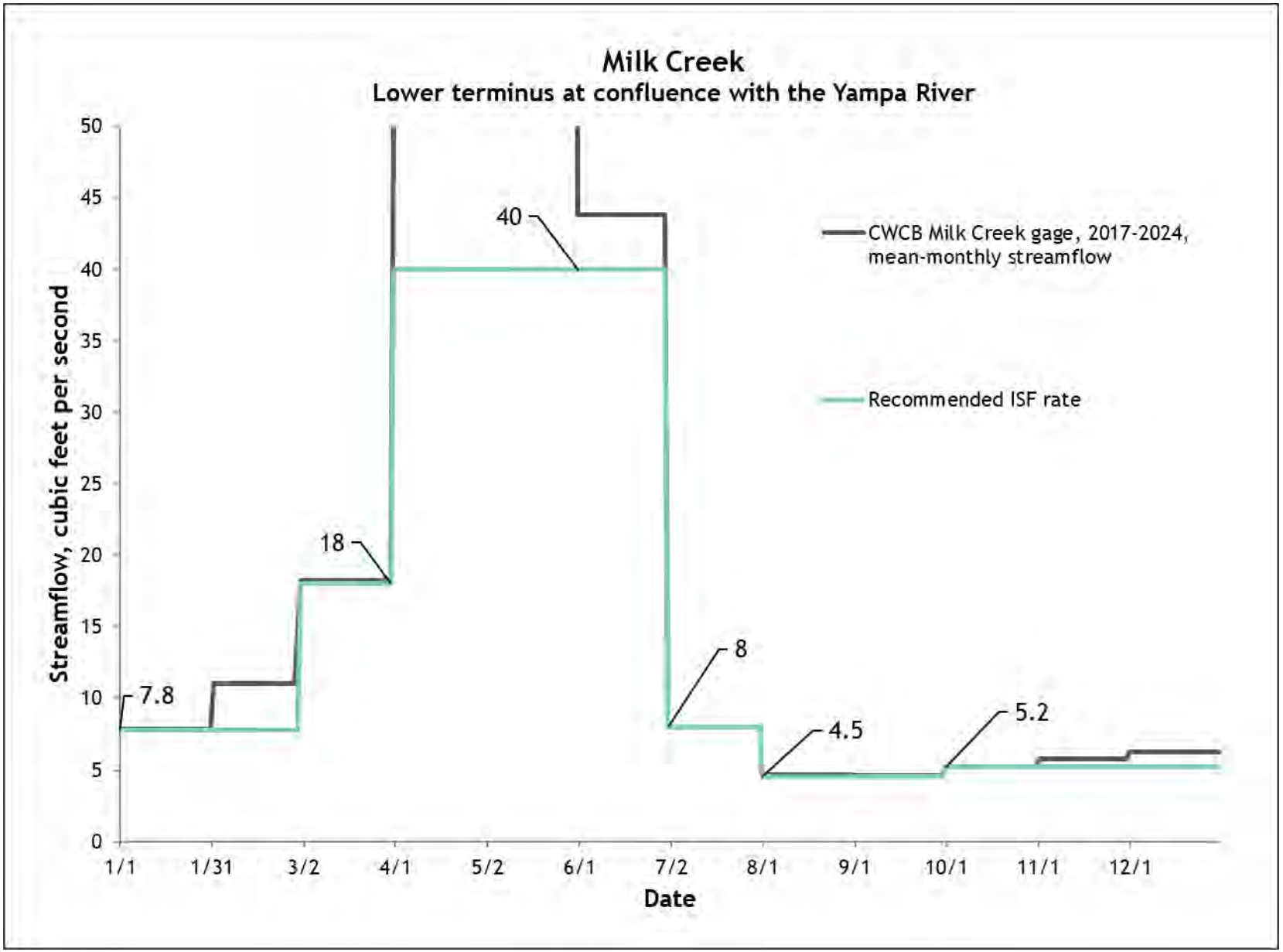
COMPLETE HYDROGRAPH



DETAILED HYDROGRAPH



Vermillion Creek (Reach 1) Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
March 19-20, 2025

UPPER TERMINUS:	confluence with Talamantes Creek at UTM North: 4533493.03 UTM East: 190972.65
LOWER TERMINUS:	historic USGS Vermillion Creek at Ink Spring Ranch gage at UTM North: 4519020.56 UTM East: 185433.71
WATER DIVISION/DISTRICT:	6/56
COUNTY:	Moffat
WATERSHED:	Vermilion
CWCB ID:	23/6/A-003
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	18.55 miles
FLOW RECOMMENDATION:	1 cfs (10/01 - 04/15) 2.6 cfs (04/16 - 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 (NLL) water rights. Before initiating a water right filing, the Board must determine that: 1) there is a natural environment that can be preserved to a reasonable degree with the Board's water right if granted, 2) the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made, and 3) such environment can exist without material injury to water rights.

The 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/2025-isf-recommendations.

RECOMMENDED ISF REACH

BLM recommended that the CWCB appropriate an ISF water right on a reach of Vermillion Creek at the ISF Workshop in February 2022. Vermillion Creek is located within Moffat County and is approximately 62 miles northwest from the City of Craig, CO (See Vicinity Map). The stream originates in Wyoming and flows south and west until it reaches the confluence with the Green River in Browns Park.

The proposed ISF reach extends from the confluence with Talamantes Creek downstream to the the historic Vermillion Creek at Ink Springs Ranch gage (USGS 09235450) for a total of 18.55 miles. Eighty-six percent of the land on the proposed reach is owned by BLM, 12% is owned by the state of Colorado, and two % is privately owned (See Land Ownership Map). BLM is interested in protecting this stream to preserve the natural environment as part of the Little Snake Resource Management Plan which identifies management of streams supporting native fish species as a priority for BLM. The plan specifies that BLM will work to improve aquatic conditions in these streams and will also work to prevent surface disturbances close to them. In addition, the plan specifies that BLM will work with the CWCB to appropriate ISF water rights to protect these fisheries. Vermillion Creek also represents a major riparian habitat resource in an extremely arid area. BLM's plan specifies that BLM will take actions to stabilize and improve riparian habitat. Appropriation of an ISF water right would assist BLM in meeting its aquatic and riparian management objectives.

OUTREACH

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently, more than 1,100 people subscribe to the ISF mailing list. Notice of the potential appropriation of an ISF water right on Vermillion Creek was sent to the mailing list in November 2024, March 2024, March 2023, and March 2022. Staff sent letters to identified landowners adjacent to Vermillion Creek based on information from the county assessor's website. A public notice about this recommendation was also published in the Craig Press on December 11, 2024.

Staff presented information about the ISF program and this recommendation to the Moffat County Land Use Board on September 9, 2024. In addition, staff spoke with Destan Gerhard, the current Water Commissioner for Districts 54, 55, and 56, and Sarah Myers, the former Water Commisioner, on November 5, 2024 to discuss water rights and water availablity on Vermillion 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 provides the Board with a basis for determining that a natural environment exists.

This reach of Vermillion Creek has high sinuosity, low gradient, and generally small substrate size. Riffles are limited and a high percentage of the habitat is comprised of runs. An exception to this character occurs in Vermillion Canyon, where the creek is confined by bedrock, has higher gradient, and more riffle habitat. The riparian community includes cottonwood, willow, Russian olive and Phragmites. Cattle usage of the creek is evident, but the banks and riparian area appear to be stable. Water temperatures and conductivity are close to the upper range of tolerance for native fishes. Fishery surveys indicate a self-sustaining population of native mountain suckers which are identified by CPW as state species of greatest conservation need and state species of special concern (Table 1) (CPW, 2015).

Table 1. List of species identified in Vermillion Creek.

Species Name	Scientific Name	Status
mountain sucker	*Catostomus platyrhynchus*	State - Species of Greatest Conservation Need State - Species of Special Concern

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 method to develop the initial ISF recommendation. The R2Cross method is based on a hydraulic model and uses field data collected in a stream riffle (CWCB, 2022; CWCB, 2024). Riffles are the stream habitat type that are most vulnerable to dry if streamflow ceases. The data collected consists of a streamflow measurement, a survey of channel geometry and features at a cross-section, and a survey of the longitudinal slope of the water surface.

The R2Cross model uses Ferguson's Variable-Power Equation (VPE) to estimate roughness and hydraulic conditions at different water stages at the measured cross-section (Ferguson, 2007; Ferguson, 2021). This approach is based on calibrating the model as described in Ferguson (2021). The model is used to evaluate three hydraulic criteria: average depth, average velocity, and percent wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types also will maintain aquatic habitat in pools and runs for most life

stages of fish and aquatic macroinvertebrates (Nehring, 1979). BLM staff use the model results to develop an initial recommendation for summer and winter flows. The summer flow recommendation is based on the flow that meets all three hydraulic criteria. The winter flow recommendation is based on the flow that meets two of the three hydraulic criteria.

The R2Cross method estimates the biological amount of water needed for summer and winter periods. The recommending entity uses the R2Cross results and its biological expertise to develop an initial ISF recommendation. CWCB staff then evaluates water availability for the reach typically based on median hydrology (see the Water Availability section below for more details). The water availability analysis may indicate less water is available than the initial recommendation. In that case, the recommending entity either modifies the magnitude and/or duration of the recommended ISF rates if the available flows will preserve the natural environment to a reasonable degree or withdraws the recommendation.

Data Collection and Analysis

BLM collected R2Cross data at two transects for this proposed ISF reach (Table 2 and Site Map). Results obtained at more than one cross-section are averaged to determine the R2Cross flow rate for the stream reach. The R2Cross model results in a winter flow of 0.99 cfs and a summer flow of 2.61 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 2. Summary of R2Cross cross-section measurements and results for Vermillion Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
04/01/2021, 2	17.25	0.86	0.99	4.22
05/13/2021, 1	8.70	0.63	0.98	0.99
			0.99	2.61

ISF Recommendation

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

2.6 cfs is recommended from April 16 to September 30 during the warm portion of the year. This period covers spawning activities by native fishes. The recommended flow rate is driven by the average velocity criteria. Protecting average velocity for spawning habitat is important because many portions of this reach have very low velocities. Without suitable velocity, the limited riffles may be unsuitable for spawning.

1.0 cfs is recommended from October 1 to April 15, the base flow period during the cold portion of the year. This recommendation is driven by the average depth criteria and wetted perimeter criteria. During low flow periods, it is important that the fish population be able to move between pools, and during winter, this flow rate should prevent pools from freezing.

WATER AVAILABILITY

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

Water Availability Methodology

Each recommended ISF reach has a unique flow regime that depends on variables such as the timing, magnitude, and location of water inputs (such as rain, snow, and snowmelt) and water losses (such as diversions, reservoirs, evaporation and transpiration, groundwater recharge, etc.). This approach focuses on streamflow and the influence of flow alterations, such as diversions, to understand how much water is physically available in the recommended reach.

Staff's hydrologic analysis is data-driven, meaning that staff gathers and evaluates the best available data and uses the best available analysis method for that data. Whenever possible, long-term stream gage data (period of record 20 or more years) are used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and regression-based models are used when long-term gage data is not available. CSUFlow18 is a multiple regression model developed by Colorado State University researchers using streamflow gage data collected between 2001 and 2018 (Eurich et al., 2021). This model estimates mean-monthly streamflow based on drainage basin area, basin terrain variables, and average basin precipitation and snow persistence. Diversion records are used to evaluate the effect of surface water diversions when necessary. Interviews with water commissioners, landowners, and ditch or reservoir operators can provide additional information. A range of analytical techniques may be employed to extend gage records, estimate streamflow in ungaged locations, and estimate the effects of diversions. The goal is to obtain the most detailed and reliable estimate of hydrology using the most efficient analysis technique.

The final product of the hydrologic analysis used to determine water availability is a hydrograph, which shows streamflow and the proposed ISF rate over the course of one year. The hydrograph will show median daily values when daily data is available from gage records; otherwise, it will present mean-monthly streamflow values. Staff will calculate 95% confidence intervals for the median streamflow if there is sufficient data. Statistically, there is 95% confidence that the true value of the median streamflow is located within the confidence interval.

Basin Characteristics

The contributing basin of the proposed ISF on Vermillion Creek is 823 square miles, with an average elevation of 7,167 feet and average annual precipitation of 12.3 inches. This large drainage basin starts in Wyoming and includes mostly lower elevation terrain that likely melts out earlier than basins with higher elevation snowpacks. It also appears to be influenced by rainstorms in both late winter and during the summer that can result in large changes in streamflow on a periodic basis. Hydrology is altered by water uses within the basin.

Water Rights Assessment

The Upper Buffham Ditch is the only diversion within the proposed reach (WDID 5600528, 3 cfs, appropriated in 1927). This ditch is located about 0.5 miles upstream from the proposed lower terminus and irrigates a parcel just upstream from the lower terminus. Diversion records for this ditch show 2 to 3 cfs in diversions from April to October for most years from the 1970s

through early 2000s, but there are limited records in recent years. The median diversions for the full period of record (1969-2023) are included on the hydrograph for reference (See Complete Hydrograph). Upstream from the Upper Buffham Ditch, BLM has five springs each for 0.03 cfs decreed for wildlife and livestock.

There are a substantial number of water rights within the Vermillion Creek basin tributary to the proposed reach (Table 3). Table 3 summarizes Colorado water rights listed as active and absolute and all Wyoming water rights except those listed as abandoned, cancelled, or expired. Wyoming water rights listed as incomplete, partially adjudicated, or without clear status were included to avoid underestimating the actual amounts.

Table 3. Summary of active water rights in the Vermillion Creek basin in Colorado and Wyoming.

Structure Type, Amount	Colorado	Wyoming	Total
Ditch, cfs	42.5	30.9	73.9
Springs, cfs	2.1	2.3	4.4
Storage, acre-feet	641	880.8	1,521.8

The basin has been under administration three times due to calls placed by the Vermillion Ditch. The Vermillion Ditch is located downstream from this proposed reach and is used for irrigation and storage (WDID 5601180, 10 cfs, appropriated in 1974). This structure placed calls in 2009, 2010, and 2011.

Data Collection and Analysis

Representative Gage Analysis

The USGS operated a streamflow gage on Vermillion Creek at the proposed lower terminus (USGS 09235450 Vermillion Creek at Ink Springs Ranch, CO). This gage operated from July 1977 through September 1981. Staff reviewed streamflow gages and precipitation data in the region but were unable to find suitable data that went back to 1977 to evaluate whether the available gage data is representative of more recent or longer-term conditions. Of the four water years with complete data, the total annual volume of water varied from a low of 4,383 acre-feet to a high of 15,668 acre-feet indicating some degree of variability is included in the record. Due to the short period of record, staff calculated mean-monthly streamflow based on the Vermillion Creek gage. All impacts from the Upper Buffham ditch are assumed to be included in the gage record, no further adjustments were made.

Staff reviewed all water court transactions within Colorado that may have altered streamflow since the period of gage operation. This assessment evaluated new water rights, additional or supplemental water rights, and water rights that were made absolute after 1977. Although many water rights were adjudicated in the 1980's the majority of these were for small reservoirs or ditches that were already in use prior 1977. Approximately 71.5 acre-feet for new reservoirs were decreed after 1977-1981, one of which had a 3 cfs water right. Approximately 1 cfs of springs, 0.3 cfs of well rights, and 0.1 cfs listed as stock diversions were also adjudicated after 1977, but staff did not review these in detail to determine the actual date of beneficial use. In summary, some additional water rights have come into use after the Vermillion gage period of record, but the majority of water rights were already in use. A similar assessment was not conducted for water rights in Wyoming because that data was not readily accessible.

Site Visit Data

CWCB staff made four streamflow measurements on the proposed reach of Vermillion Creek as summarized in Table 4. The Western Region Climate Center maintains a Remote Automatic Weather Stations (RAWS) climate gage approximately six miles southwest from the lower terminus of the proposed reach (Lodore Canyon NWS ID 50104). For context, annual precipitation in 2023 was above the 75th percentile, while 2024 was below median based on the last 30 years of data at the Lodore Canyon climate station (Western Regional Climate Center RAWS, Lodore Canyon NWS ID 50104).

Table 4. Summary of streamflow measurements for Vermillion Creek.

Visit Date	Flow (cfs)	Collector
11/09/2023	2.37	CWCB
03/26/2024	15.38	CWCB
05/15/2024	3.92	CWCB
06/27/2024	0.74	CWCB

Water Availability Summary

The hydrograph shows mean-monthly streamflow for the Vermillion Creek at Ink Springs Ranch gage, median diversions for the Upper Buffham Ditch, and the proposed ISF rate. The proposed ISF flow rate is below the mean-monthly streamflow. Staff concludes that water is available for appropriation on Vermillion Creek.

MATERIAL INJURY

If decreed, the proposed ISF on Vermillion Creek would be a new junior water right. This ISF water right can exist without material injury to other senior water rights. Under the provisions of section 37-92-102(3)(b), C.R.S., the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

Common Acronyms and Abbreviations

Term	Definition
af	acre feet
BLM	Bureau of Land Management
cfs	cubic feet per second
CWCB	Colorado Water Conservation Board
CPW	Colorado Parks and Wildlife
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HCCA	High Country Conservation Advocates
ISF	Instream Flow
NLL	Natural Lake Level
USGS	United States Geological Survey
USFS	United States Forest Service
XS	Cross section

Citations

Colorado Parks and Wildlife, 2015, State Wildlife Action Plan: A strategy for conserving wildlife in Colorado. https://cpw.widencollective.com/assets/share/asset/nbenjdfemj

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

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

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

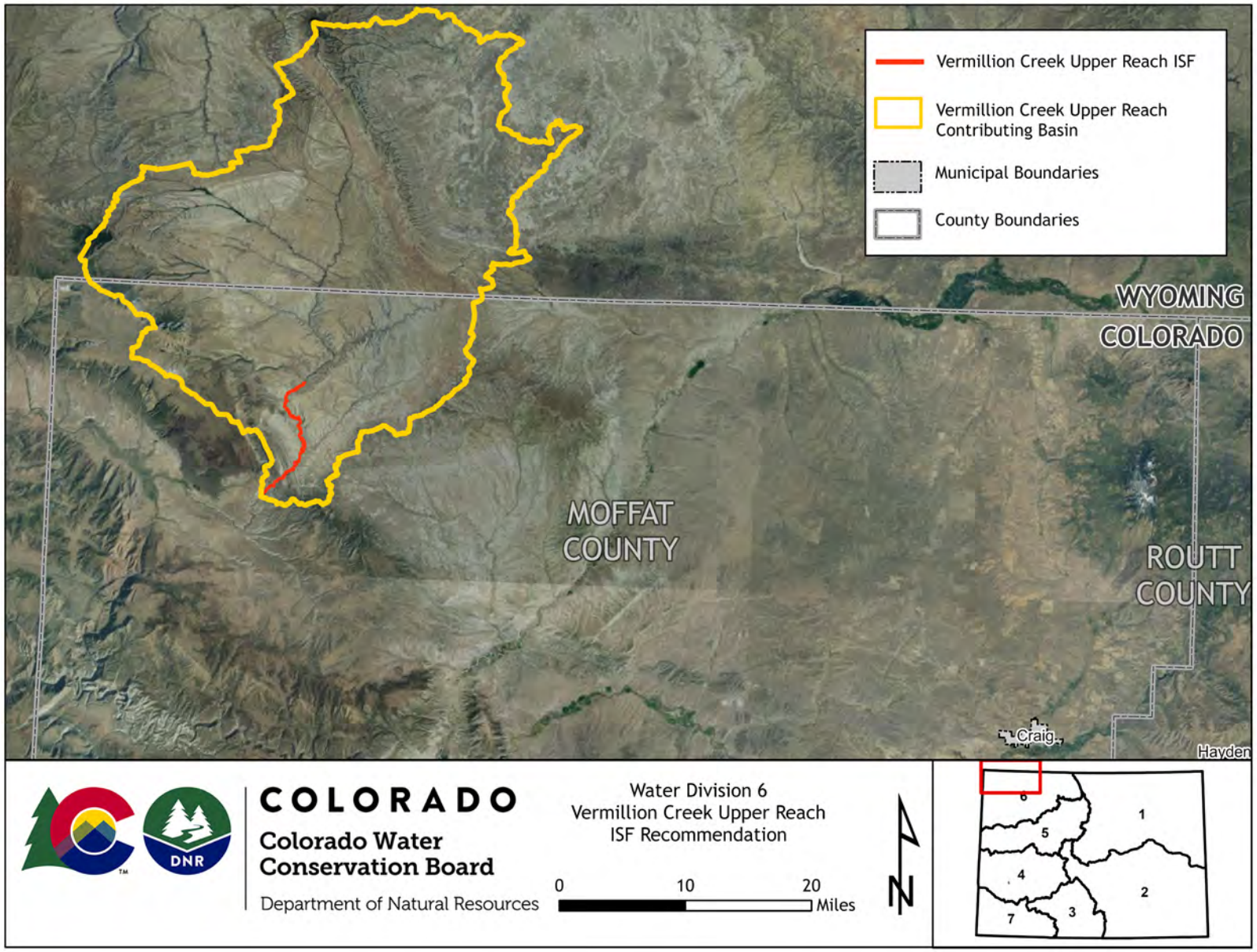
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Metadata Descriptions

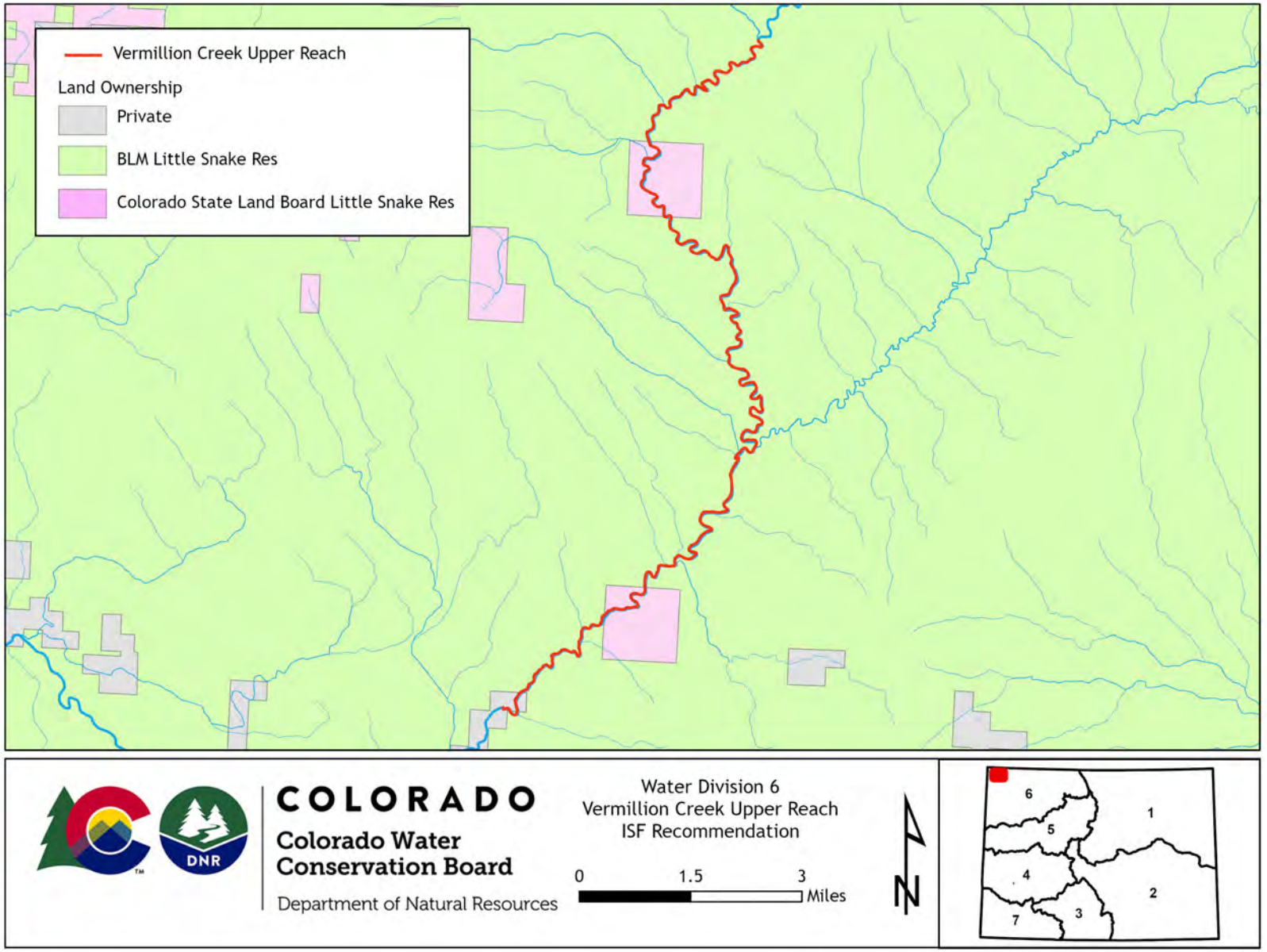
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

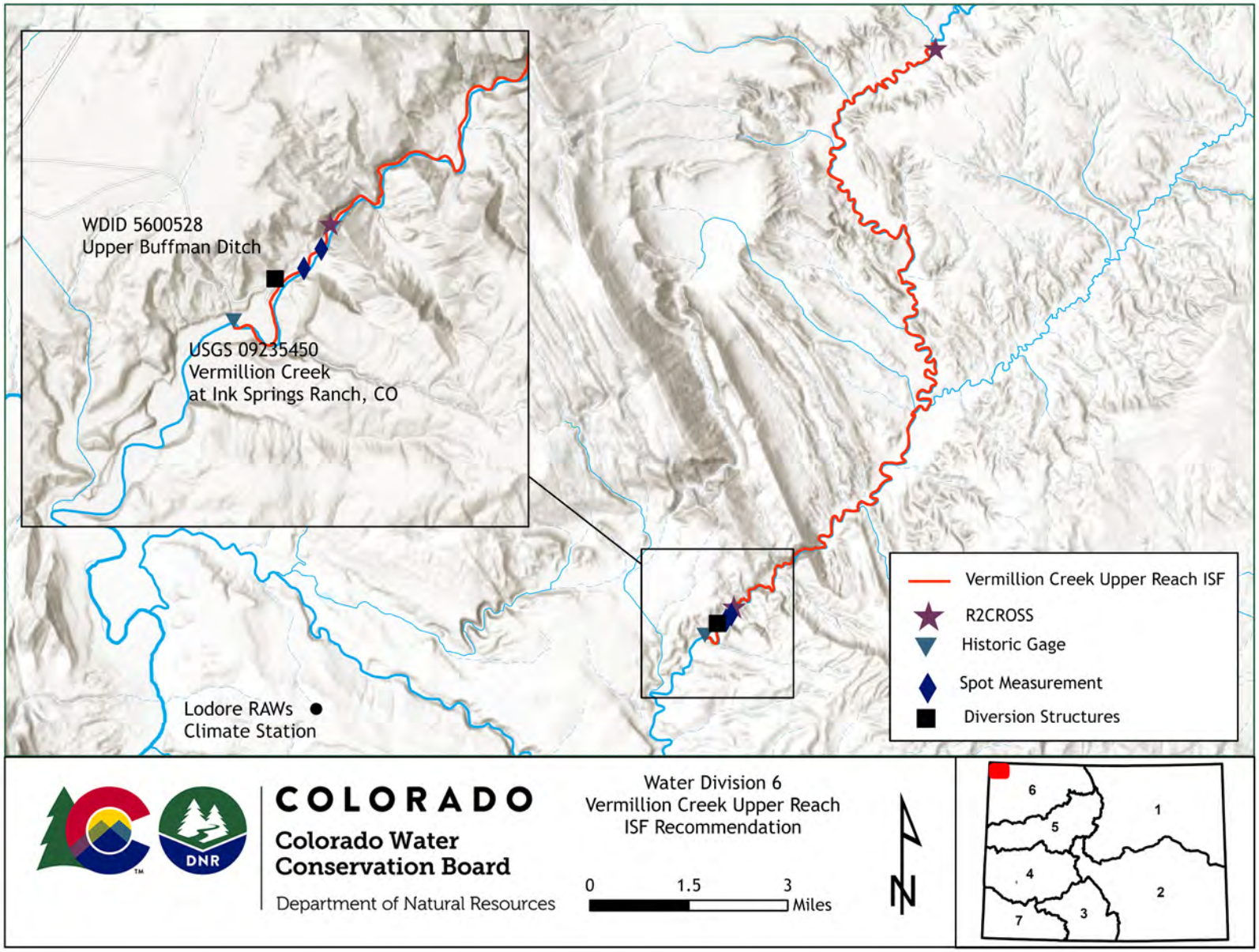
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP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USGS 09235450
Vermillion Creek
at Ink Springs Ranch, CO
Lodore RAWs
Climate Station
Vermillion Creek Upper Reach ISF
R2CROSS
Historic Gage
Spot Measurement
Diversion Structures
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 6
Vermillion Creek Upper Reach
ISF Recommendation
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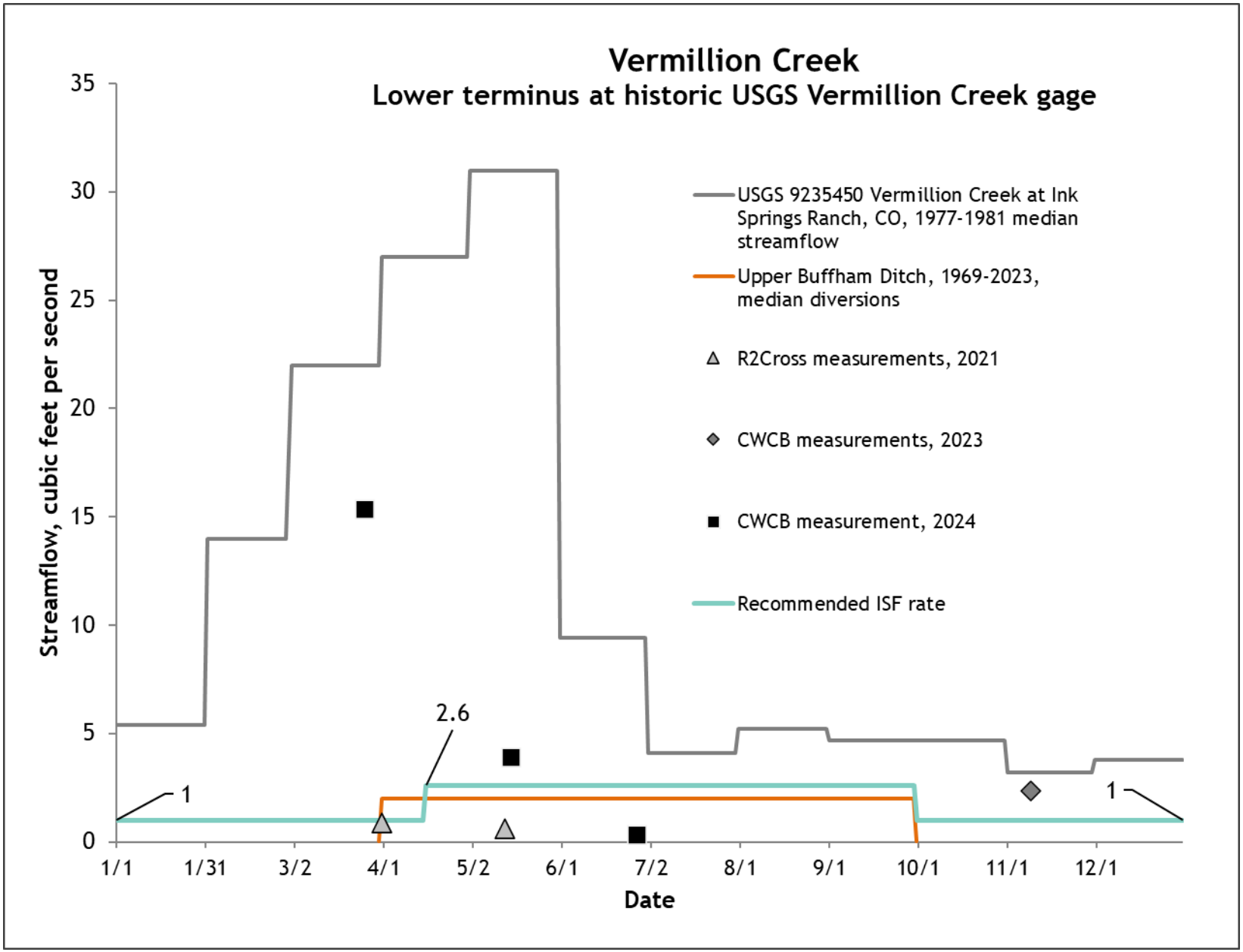
COMPLETE HYDROGRAPH



Vermillion Creek (Reach 2) Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
March 19-20, 2025

UPPER TERMINUS:	historic USGS Vermillion Creek at Ink Springs gage at UTM North: 4519020.56 UTM East: 185433.71
LOWER TERMINUS:	Vermillion Ditch headgate at UTM North: 4518063.06 UTM East: 177768.90
WATER DIVISION/DISTRICT:	6/56
COUNTY:	Moffat
WATERSHED:	Vermilion
CWCB ID:	23/6/A-004
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	10.12 miles
FLOW RECOMMENDATION:	1.4 cfs (08/01 - 04/30) 2.4 cfs (05/01 - 07/31)

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 (NLL) water rights. Before initiating a water right filing, the Board must determine that: 1) there is a natural environment that can be preserved to a reasonable degree with the Board's water right if granted, 2) the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made, and 3) such environment can exist without material injury to water rights.

The 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/2025-isf-recommendations.

RECOMMENDED ISF REACH

BLM recommended that the CWCB appropriate an ISF water right on a reach of Vermillion Creek at the ISF Workshop in February of 2022. Vermillion Creek is located within Moffat County and is approximately 72 miles northwest from the City of Craig, CO (See Vicinity Map). The stream originates in Wyoming and flows south and west into Colorado until it reaches the confluence with the Green River in Browns Park.

The proposed ISF reach extends from the historic Vermillion Creek at Ink Springs Ranch gage (USGS 09235450) downstream to the Vermillion Ditch headgate for a total of 10.12 miles. Seventy-six percent of the land on the proposed reach is owned by BLM, 6% is owned by the state of Colorado, and 18% is privately owned (See Land Ownership Map). BLM is interested in protecting this stream to preserve the natural environment as part of the Little Snake Resource Management Plan which identifies management of streams supporting native fish species as a priority for BLM. The plan specifies that BLM will work to improve aquatic conditions in these streams and will also work to prevent surface disturbances close to them. In addition, the plan specifies that BLM will work with the CWCB to appropriate ISF water rights to protect these fisheries. Vermillion Creek also represents a major riparian habitat resource in an extremely arid area. BLM's plan specifies that BLM will take actions to stabilize and improve riparian habitat. Appropriation of an ISF water right would assist BLM in meeting its aquatic and riparian management objectives.

OUTREACH

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently, more than 1,100 people subscribe to the ISF mailing list. Notice of the potential appropriation of an ISF water right on Vermillion Creek was sent to the mailing list in November 2024, March 2024, March 2023, and March 2022. Staff sent letters to identified landowners adjacent to Vermillion Creek based on information from the county assessor's website. A public notice about this recommendation was also published in the Craig Press on December 11, 2024.

Staff presented information about the ISF program and this recommendation to the Moffat County Land Use Board on September 9, 2024. In addition, staff spoke with Destan Gerhard, the current Water Commissioner for Districts 54, 55, and 56, and Sarah Myers, the former Water Commisioner, on November 5, 2024 to discuss water rights and water availablity on Vermillion 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 provides the Board with a basis for determining that a natural environment exists.

This reach flows through a canyon that ranges from ¼ to ½ mile in width. The stream has low gradient and small to medium substrate size. Riffles are limited and a high percentage of the habitat is comprised of runs. The riparian community includes cottonwood, willow, Russian olive and Phragmites. Cattle usage of the creek is evident, but the banks and riparian area appear to be stable. Water temperatures and conductivity are well within the ranges tolerated by native fishes. Fishery surveys indicate a self-sustaining population of sculpin, speckled dace, and mountain suckers (Table 1). CPW lists mountain sucker as a state species of greatest concern and a species of special concern (CPW, 2015).

Table 1. List of species identified in Vermillion Creek.

Species Name	Scientific Name	Status
sculpin	*Cottus bairdii*	None
mountain sucker	*Catostomus platyrhynchus*	State - Species of Greatest Conservation Need State - Species of Special Concern
speckled dace	*Rhinichthys osculus*	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 method to develop the initial ISF recommendation. The R2Cross method is based on a hydraulic model and uses field data collected in a stream riffle (CWCB, 2022; CWCB, 2024). Riffles are the stream habitat type that are most vulnerable to dry if streamflow ceases. The data collected consists of a streamflow measurement, a survey of channel geometry and features at a cross-section, and a survey of the longitudinal slope of the water surface.

The R2Cross model uses Ferguson's Variable-Power Equation (VPE) to estimate roughness and hydraulic conditions at different water stages at the measured cross-section (Ferguson, 2007; Ferguson, 2021). This approach is based on calibrating the model as described in Ferguson (2021). The model is used to evaluate three hydraulic criteria: average depth, average velocity,

and percent wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types also will maintain aquatic habitat in pools and runs for most life stages of fish and aquatic macroinvertebrates (Nehring, 1979). BLM staff use the model results to develop an initial recommendation for summer and winter flows. The summer flow recommendation is based on the flow that meets all three hydraulic criteria. The winter flow recommendation is based on the flow that meets two of the three hydraulic criteria.

The R2Cross method estimates the biological amount of water needed for summer and winter periods. The recommending entity uses the R2Cross results and its biological expertise to develop an initial ISF recommendation. CWCB staff then evaluates water availability for the reach typically based on median hydrology (see the Water Availability section below for more details). The water availability analysis may indicate less water is available than the initial recommendation. In that case, the recommending entity either modifies the magnitude and/or duration of the recommended ISF rates if the available flows will preserve the natural environment to a reasonable degree or withdraws the recommendation.

Data Collection and Analysis

BLM collected R2Cross data at three transects for this proposed ISF reach (Table 2 and Site Map). Results obtained at more than one cross-section are averaged to determine the R2Cross flow rate for the stream reach. The R2Cross model results in a winter flow of 1.40 cfs and a summer flow of 2.35 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 2. Summary of R2Cross cross-section measurements and results for Vermillion Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
06/14/2018, 1	14.00	0.96	1.53	2.66
06/14/2018, 2	15.06	0.82	1.91	2.21
04/01/2021, 1	9.28	2.76	0.75	2.19
			1.40	2.35

ISF Recommendation

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

2.4 cfs is recommended from May 1 to July 31. This period covers spawning activities by native fishes. The recommended flow rate is driven by the average velocity criteria. Protecting average velocity for spawning habitat is important because many portions of this reach have very low velocities. Without suitable velocity, the limited riffles may be unsuitable for spawning.

1.40 cfs is recommended from August 1 to April 30, the base flow period. This recommendation is driven by the average depth criteria. BLM believes that maintaining this

flow rate will prevent stress on the fish population during high temperature periods during late summer and should keep pools sufficiently free of ice to allow overwintering of fish.

WATER AVAILABILITY

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

Water Availability Methodology

Each recommended ISF reach has a unique flow regime that depends on variables such as the timing, magnitude, and location of water inputs (such as rain, snow, and snowmelt) and water losses (such as diversions, reservoirs, evaporation and transpiration, groundwater recharge, etc.). This approach focuses on streamflow and the influence of flow alterations, such as diversions, to understand how much water is physically available in the recommended reach.

Staff's hydrologic analysis is data-driven, meaning that staff gathers and evaluates the best available data and uses the best available analysis method for that data. Whenever possible, long-term stream gage data (period of record 20 or more years) are used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and regression-based models are used when long-term gage data is not available. CSUFlow18 is a multiple regression model developed by Colorado State University researchers using streamflow gage data collected between 2001 and 2018 (Eurich et al., 2021). This model estimates mean-monthly streamflow based on drainage basin area, basin terrain variables, and average basin precipitation and snow persistence. Diversion records are used to evaluate the effect of surface water diversions when necessary. Interviews with water commissioners, landowners, and ditch or reservoir operators can provide additional information. A range of analytical techniques may be employed to extend gage records, estimate streamflow in ungaged locations, and estimate the effects of diversions. The goal is to obtain the most detailed and reliable estimate of hydrology using the most efficient analysis technique.

The final product of the hydrologic analysis used to determine water availability is a hydrograph, which shows streamflow and the proposed ISF rate over the course of one year. The hydrograph will show median daily values when daily data is available from gage records; otherwise, it will present mean-monthly streamflow values. Staff will calculate 95% confidence intervals for the median streamflow if there is sufficient data. Statistically, there is 95% confidence that the true value of the median streamflow is located within the confidence interval.

Basin Characteristics

The contributing basin of the proposed ISF on Vermillion Creek is 931 square miles, with an average elevation of 7,083 feet and average annual precipitation of 12.2 inches. This large drainage basin starts in Wyoming and includes largely lower elevation terrain that likely melts out earlier than basins with high elevation snowpacks. It also appears to be influenced by rainstorms in late winter and summer that can result in large changes in streamflow on a periodic basis. Hydrology is altered by water uses within the basin.

Water Rights Assessment

Three active water rights were identified in the proposed reach as summarize by Table 3.

Table 3. Active water rights located within the proposed reach on Vermillion Creek.

Structure Name	WDID	Amount	Appropriation Date
Middle Buffham Ditch	5600527	1.0	1943
Vermillion Creek #2	560050	0.04	1930
Moffat CO Pump Div #318*	5601302	2.0 cfs	1971

*for road maintenance

There are a substantial number of water rights within the Vermillion Creek basin tributary to the proposed reach (Table 4). Staff summarized Colorado water rights listed as active and absolute and all Wyoming water rights except those listed as abandoned, cancelled, or expired. Wyoming water rights listed as incomplete, partially adjudicated, or without clear status were included to avoid underestimating the actual amounts.

Table 4. Summary of active water rights in the Vermillion Creek basin in Colorado and Wyoming.

Structure Type, Amount	Colorado	Wyoming	Total
Ditch, cfs	59.8	30.9	90.7
Springs, cfs	2.4	2.3	4.7
Storage, acre-feet	670.5	880.8	1,551.3

Data Collection and Analysis

Representative Gage Analysis

The USGS operated a streamflow gage on Vermillion Creek approximately 4.8 miles upstream from the proposed lower terminus (USGS 09235490 Vermillion Creek below Douglas Draw near Lodore, CO). This short-term gage operated from 9/1/1994 to 12/31/1995. This gage record was compared to a nearby climate station to evaluate how the historical record compares to a longer record. The Western Region Climate Center maintains a Remote Automatic Weather Stations (RAWS) climate gage approximately 1.4 miles southwest from the lower terminus of the proposed reach (Lodore Canyon NWS ID 50104). This climate station includes precipitation data since 1989. Over the last 30 years of record (1993-2023), 1994 had the 3rd highest annual total precipitation while 1995 was at the 25th percentile. Although the stream gage record is short, most of the data is from a year with low annual precipitation. Due to the short period of record, staff calculated mean-monthly streamflow based on the Vermillion Creek below Douglas Creek gage.

Staff reviewed all water court transactions within Colorado that may have altered streamflow since the period of gage operation. This assessment evaluated new water rights, additional or supplemental water rights, and water rights that were made absolute after 1993. Although some water rights were adjudicated after the gage period, the majority of these were already in use prior to 1993. Approximately 40.0 acre-feet for new reservoirs were decreed after 1993, one of which had a 3 cfs water right. Less than 0.1 cfs of spring and 0.13 cfs of well rights were also adjudicated after 1993; staff did not review these in detail to determine the actual date of beneficial use. In summary, some additional water rights have come into use after the

Vermillion gage period of record, but the majority of water rights were already in use. A similar assessment was not conducted for water rights in Wyoming due to limited data availability.

Diversion Records

The Vermillion Ditch is located at the downstream terminus for this proposed reach. This ditch is used for irrigation and storage (WDID 5601180, 10 cfs, appropriated in 1974). This structure has placed three calls in 2009, 2010, and 2011, so at times the basin is under administration. Although diversion records are not a perfect proxy for streamflow, they can provide additional information about potential water availability and timing (See Complete Hydrograph). The median daily diversions from Vermillion Ditch from 1988 to 2020 are generally above the proposed ISF flow rate of 2.4 cfs from May through June and the upper confidence interval for median daily diversions is above 2.4 cfs through July. Median daily diversions or the upper confidence interval for median daily diversions continue to be above the lower proposed ISF flow rate of 1.4 cfs through September ending by mid-October.

Site Visit Data

CWCB staff made four streamflow measurements on the proposed reach of Vermillion Creek as summarized in Table 3. For context, annual precipitation in 2023 was above the 75th percentile, while 2024 was below median based on the last 30 years of data at the Lodore Canyon climate station (Western Regional Climate Center RAWS, Lodore Canyon NWS ID 50104).

Table 3. Summary of streamflow measurements for Vermillion Creek (Middle).

Visit Date	Flow (cfs)	Collector
11/09/2023	4.18	CWCB
03/26/2024	22.44	CWCB
05/15/2024	4.95	CWCB
06/27/2024	0.32	CWCB

Water Availability Summary

The hydrograph shows mean-monthly streamflow at the Vermillion Creek near Douglas Gulch gage, the median daily diversions for Vermillion Ditch, the upper confidence interval for the median daily diversion for Vermillion Ditch, and the proposed ISF rate. The proposed ISF flow rate is below the mean-monthly streamflow or the median or upper confidence interval for median diversions at all times. Staff concludes that water is available for appropriation on Vermillion Creek.

MATERIAL INJURY

If decreed, the proposed ISF on Vermillion Creek would be a new junior water right. This ISF water right can exist without material injury to other senior water rights. Under the provisions of section 37-92-102(3)(b), C.R.S., the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

Common Acronyms and Abbreviations

Term	Definition
af	acre feet
BLM	Bureau of Land Management
cfs	cubic feet per second
CWCB	Colorado Water Conservation Board
CPW	Colorado Parks and Wildlife
DWR	Division of Water Resources
HCCA	High Country Conservation Advocates
ISF	Instream Flow
NLL	Natural Lake Level
USGS	United States Geological Survey
USFS	United States Forest Service
XS	Cross section

Citations

Colorado Parks and Wildlife, 2015, State Wildlife Action Plan: A strategy for conserving wildlife in Colorado. https://cpw.widencollective.com/assets/share/asset/nbenjdfemj

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

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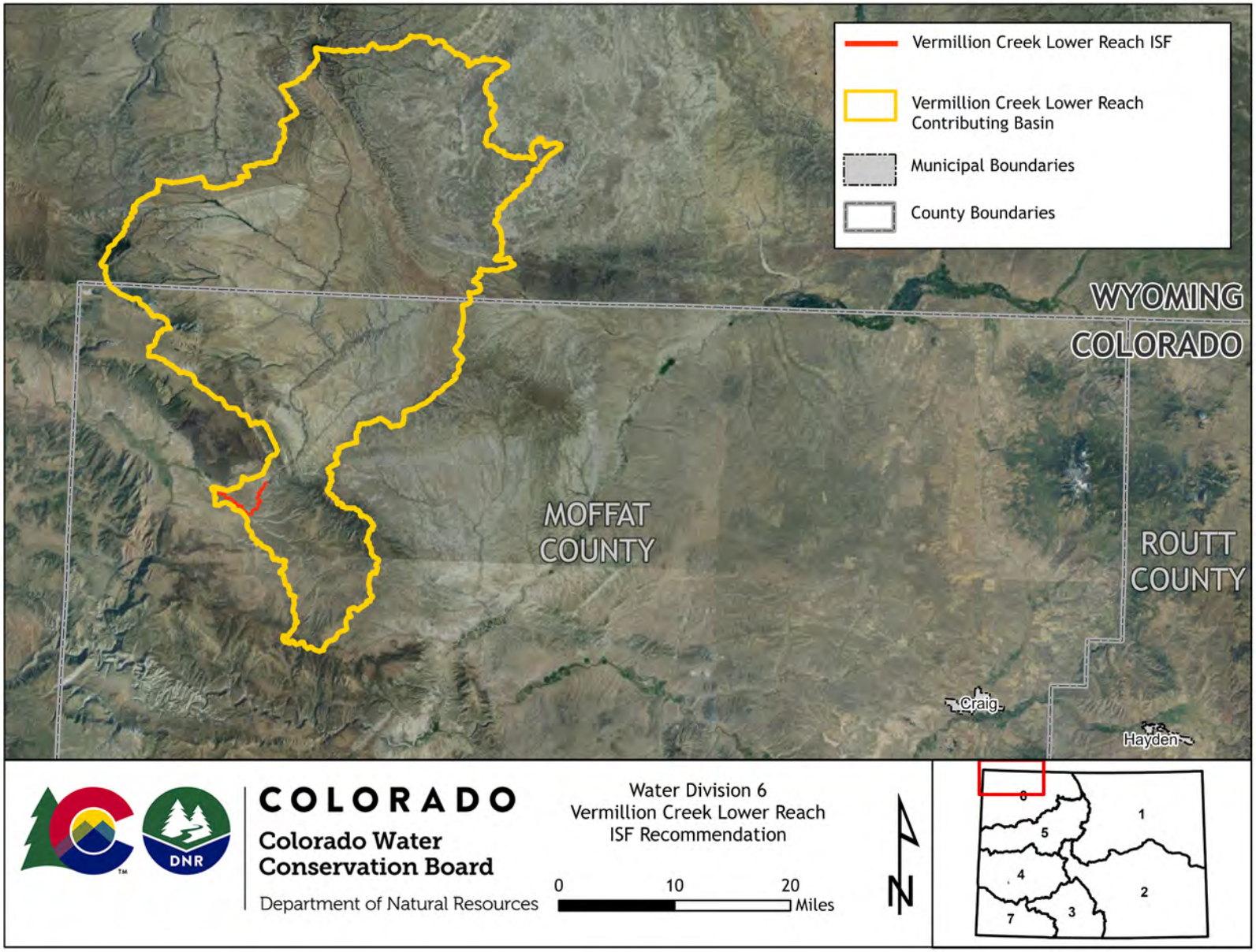
Metadata Descriptions

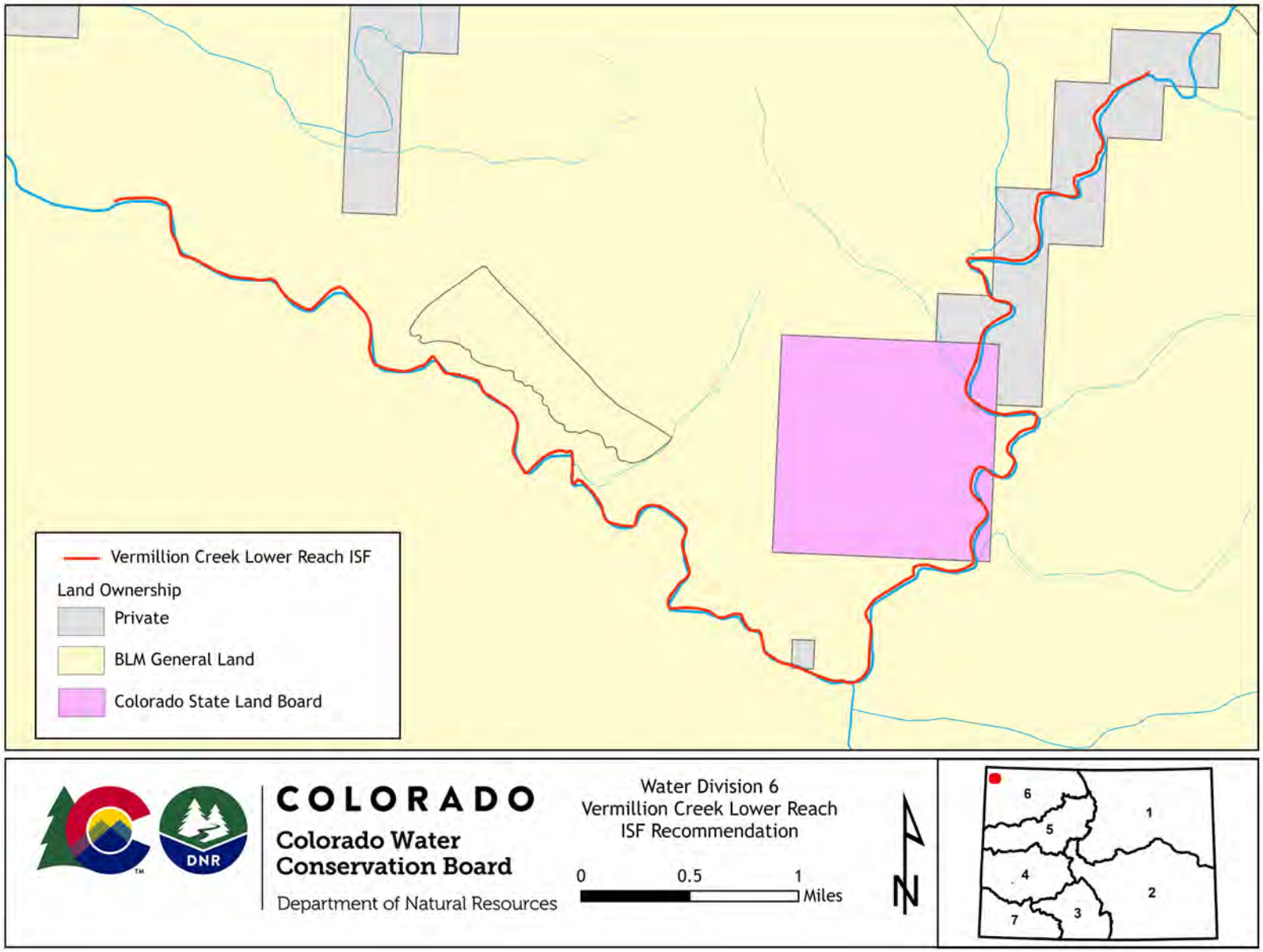
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

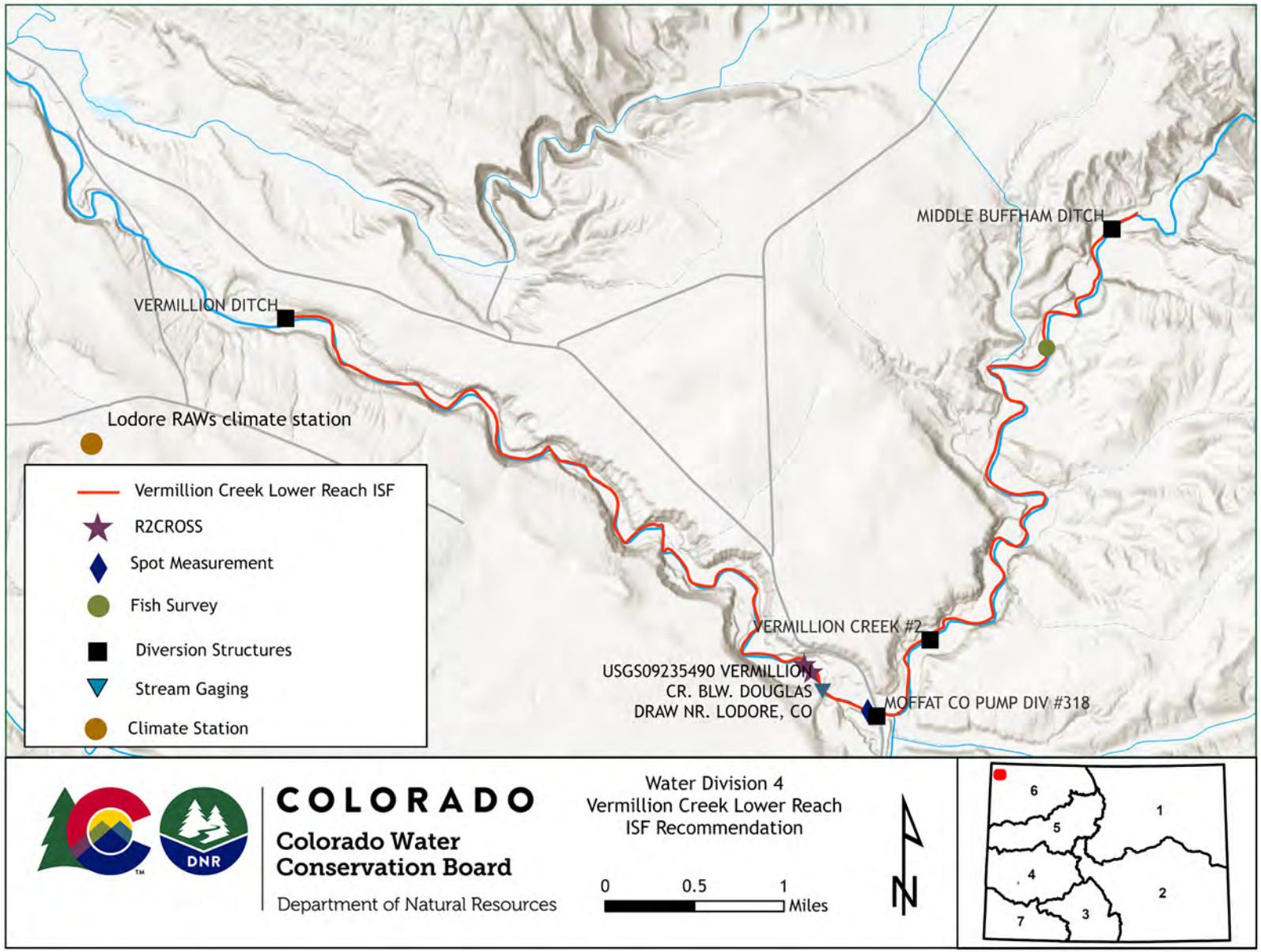
VICINITY MAP



LAND OWNERSHIP MAP



SITE MAP


MIDDLE BUFFHAM DITCH
VERMILLION DITCH
Lodore RAWs climate station
Vermillion Creek Lower Reach ISF
R2CROSS
Spot Measurement
Fish Survey
Diversion Structures
Stream Gaging
Climate Station
VERMILLION CREEK #2
USGS09235490 VERMILLION CR. BLW. DOUGLAS DRAW NR. LODORE, CO
MOFFAT CO PUMP DIV #318
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 4
Vermillion Creek Lower Reach
ISF Recommendation
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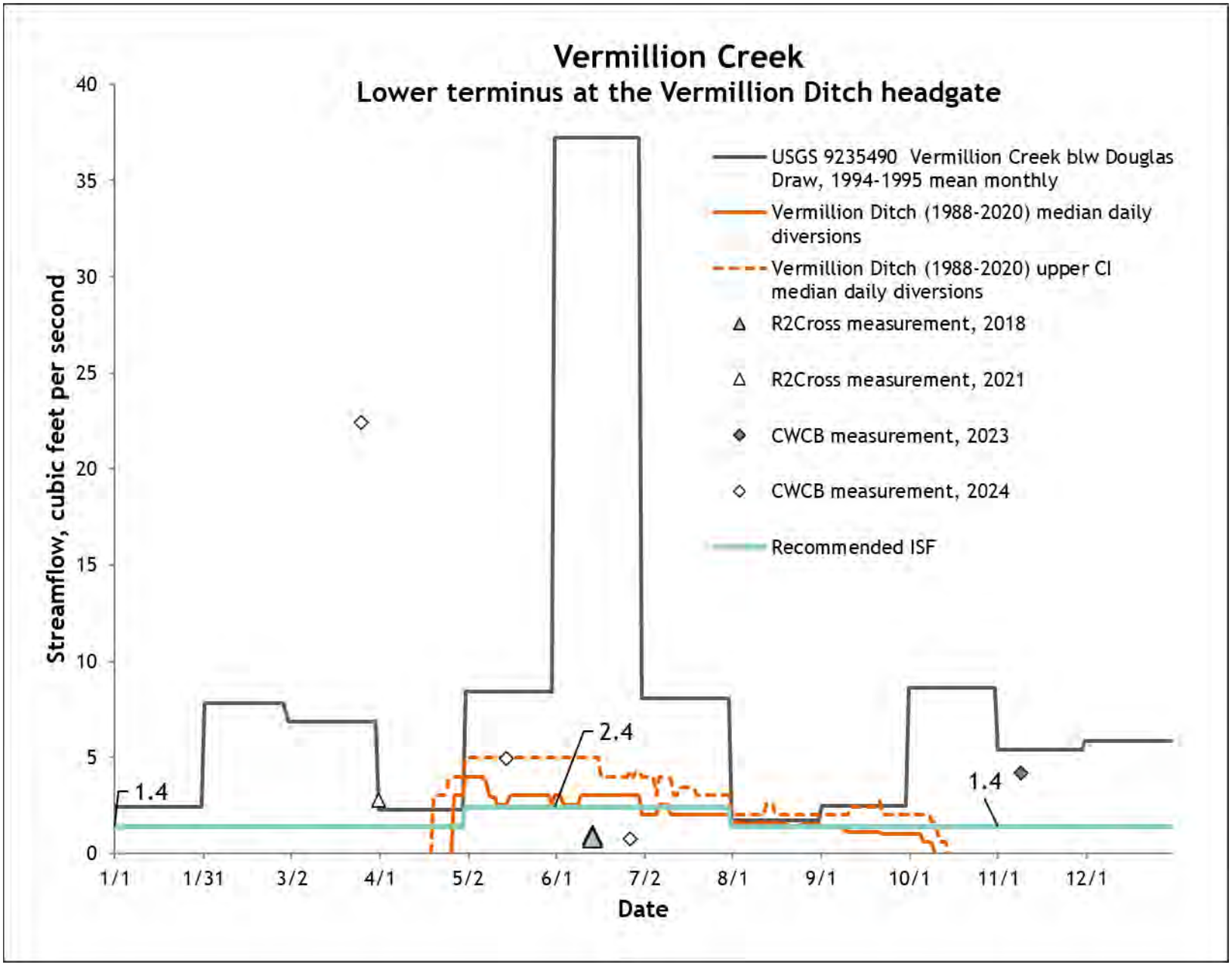
COMPLETE HYDROGRAPH



Burrows Creek Executive Summary

CWCB STAFF INSTREAM FLOW RECOMMENDATION
March 19-20, 2025

UPPER TERMINUS:	headwaters in the vicinity of UTM North: 4202521.48 UTM East: 272039.55
LOWER TERMINUS:	confluence with the North Fork Animas River at UTM North: 4202911.50 UTM East: 273751.78
WATER DIVISION/DISTRICT:	7/30
COUNTY:	San Juan
WATERSHED:	Animas
CWCB ID:	25/7/A-001
RECOMMENDER:	Bureau of Land Management (BLM)
LENGTH:	1.33 miles
FLOW RECOMMENDATION:	0.19 cfs (11/01 - 03/31) 1.3 cfs (04/01 - 04/30) 3.75 cfs (05/01 - 06/15) 1.6 cfs (06/16 - 07/15) 0.58 cfs (07/16 - 10/31)

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

BACKGROUND

Colorado's General Assembly created the Instream Flow and Natural Lake Level Program in 1973, recognizing "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3), C.R.S.). The statute vests the Colorado Water Conservation Board (CWCB or Board) with the exclusive authority to appropriate and acquire instream flow (ISF) and natural lake level (NLL) water rights. Before initiating a water right filing, the Board must determine that: 1) there is a natural environment that can be preserved to a reasonable degree with the Board's water right if granted, 2) the natural environment will be preserved to a reasonable degree by the water available for the appropriation to be made, and 3) such environment can exist without material injury to water rights.

The 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/2025-isf-recommendations.

RECOMMENDED ISF REACH

BLM recommended that the CWCB appropriate an ISF water right on a reach of Burrows Creek at the ISF Workshop in Feburary 2024. Burrows Creek is located within San Juan County and is approximately 13 miles north from the town of Silverton (See Vicinity Map). The stream originates on the northwest flank of Houghton Mountain and flows east until it reaches the confluence with the North Fork Animas River, which is a tributary to the Animas River, which is a tributary to the San Juan River in New Mexico.

The proposed ISF reach extends from the headwaters downstream to the confluence with the North Fork Animas River for a total of 1.33 miles. Thirty-one percent of the land on the proposed reach is owned by BLM and 69% is privately owned (See Land Ownership Map). BLM is recommending this reach to protect the natural environment.

BLM MANAGEMENT ACTIONS

Burrows Creek is located within the Bonita Peak Mining District Superfund Site. This site consists of 48 historic mines or mining-related sources where ongoing releases of metal-laden water and sediments are occurring within the Mineral Creek, Cement Creek, and Upper Animas River watersheds. BLM's Abandoned Mine Lands Program is working closely with the Environmental Protection Agency to remediate the various sources of mining-related contamination at the site. Current investigations and remediation planning in the Burrows Creek watershed include the Redcloud Mine, Dewitt Mine, London Mine, and Boston Mine. Burrows Creek flows through the Boston Mine site.

In October 2023, BLM acquired 10.75 cfs of the 11.0 cfs water right associated with the Mineral Point Ditch (WDID 3004661). In February 2025, BLM acquired the remaining 0.25 cfs ownership interest from another party. Mineral Point Ditch historically diverted water from Burrows Creek at the Boston Mine site and conveyed the water across a low saddle to the headwaters of the Uncompahgre River. The water was historically applied to irrigation use near the City of Ouray. One of BLM's objectives for Burrows Creek is to protect the Mineral Point Ditch flows that have been redirected back to Burrows Creek. BLM is working collaboratively with the CWCB to

develop a lease agreement that would allow the purchased Mineral Point Ditch water rights to be committed to ISF use in Burrows Creek. If CWCB leases the water right, it could function to help satisfy this recommended ISF appropriation.

A second BLM objective for leasing the Mineral Point Ditch water right to the CWCB is to protect water quality benefits for Burrows Creek. Historically, relatively clean water that flowed down Burrows Creek during the snowmelt runoff period was diverted to the Uncompahgre River watershed and could not serve to dilute naturally occurring heavy metals in the Burrows Creek watershed. BLM anticipates that the dilution effects of returning the leased water right to Burrows Creek will help protect and improve water-dependent values on Burrows Creek and the Animas River.

OUTREACH

Stakeholder input is a valued part of the CWCB staff's analysis of ISF recommendations. Currently, more than 1,100 people subscribe to the ISF mailing list. Notice of the potential appropriation of an ISF water right on Burrows Creek was sent to the mailing list in March 2024 and November 2024. Staff sent letters to identified landowners adjacent to Burrows Creek based on information from the county assessor's website. A public notice about this recommendation was also published in the Silverton Standard and Miner on December 12, 2024.

Staff presented information about the ISF program and this recommendation to the San Juan County Board of County Commissioners on February 12, 2025. Staff contacted Jeff Titus, District 30 Lead Water Commisioner, on October 24, 2024 who did not have concerns about the proposed ISF. CWCB, CPW, and BLM staff have also been regularly meeting with representatives from Southwestern Water Conservation District to discuss the proposed ISF and acquistion.

NATURAL ENVIRONMENT

CWCB staff relies on the recommending entity to provide information about the natural environment. In addition, staff reviews information and conducts site visits for each recommended ISF appropriation. This information provides the Board with a basis for determining that a natural environment exists.

Burrows Creek is located within a very high-altitude, U-shaped glaciated valley above tree line, with elevations ranging from 11,600 feet at the confluence with the North Fork Animas River to 12,400 feet at the headwaters. The stream is very high gradient, with slopes typically exceeding five percent and sometimes exceeding 10%. At previously surveyed sites in Burrows Creek, substrate is comprised mostly of gravels (14.29%), pebbles (60.95%), and cobbles (24.76%). The stream is often in contact with bedrock, and the stream channel does not appear to migrate significantly.

Water quality in Burrows Creek is significantly affected by both naturally occurring and anthropogenic sources. Naturally occurring movement of groundwater, surface water, and precipitation through pyritic rocks throughout the Burrows Creek watershed results in dissolution of metals that ultimately make their way into Burrows Creek. This process is commonly referred to as "acid rock drainage." Dissolution of metals by water movement through historic mine tailings and mine infrastructure also affects water quality, which is commonly referred to as "mining influenced water." As a result of these two processes, Burrows

Creek is affected by elevated concentrations of aluminum, cadmium, copper, manganese, lead, and zinc (Roberts, 2017; Herndon Solutions Group, 2021).

Despite the presence of heavy metals, Burrows Creek supports a water-dependent natural environment:

- Previous evaluations of habitat quality conclude that Burrows Creek is similar in habitat quality to other creeks in the upper Animas River watershed that have sufficient water quality to support fish, such as Maggie Gulch. Even if heavy metal concentrations were not a water quality issue for Burrows Creek, BLM does not believe that Burrows Creek could support a fishery. BLM's experience in the Silverton area is that fish populations cannot successfully overwinter in streams above 12,000 feet elevation. In addition, the pools on Burrows Creek are not sufficiently deep to keep them ice free during the winter.

- The natural environment consists of stream-side freshwater emergent wetlands mapped by the National Wetlands Inventory. The common wetland species Carex aquatalis dominates most of the vegetation community, accompanied by Arostis idahoensis, Carex hardina and isolated islands of Sphagnum moss. Calamagrostis canadensis and Agrostis scabra appear closer to Burrows Creek. These wetlands are intermixed with fens, which are an extremely rare wetland type that depend on constant, mineral-rich groundwater discharge. During 2024, BLM started implementing a project to restore the full functionality of these fens, which has been impaired by stream diversions and deposition of erosive materials from adjacent slopes. Together the freshwater and fen wetland complexes remove heavy metals from the hydrologic system by plant uptake and by adsorption on the sediments in the wetland complex.

- In addition to the wetland complexes described above, the creek supports a riparian community comprised of willows, sedges, and rushes. The riparian community has been impacted by historic sheep grazing practices during summer, but the riparian community is stable and vigorous.

- The Burrows Creek macroinvertebrate community is dominated by Chironomidea midges. Trichoptera caddisflies and two stonefly taxa (*Capnia and Zapada*) have been documented at various locations and times on Burrows Creek. The Hilsenoff Biotic Index calculated for Burrows Creek is 7.5, which indicates that the macroinvertebrate community is largely comprised of species tolerant of metals. The calculated Multi-Metric Index (MMI) for Burrows Creek is 15, which indicates that water quality in the creek is impaired. Burrows Creek passes through the historic Boston Mine site, and MMI scores and total taxa richness are lower below the Boston Mine. Remediation efforts to address acid mine drainage from the Boston Mine site have begun, and BLM will be monitoring the effects of the remediation effort on water quality and macroinvertebrates.

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 method to develop the initial ISF recommendation. The R2Cross method is based on a hydraulic model and uses field data collected in a stream riffle (CWCB, 2022; CWCB, 2024). Riffles are the stream habitat type that are most vulnerable to dry if streamflow ceases. The data collected consists of a streamflow measurement, a survey of channel geometry and features at a cross-section, and a survey of the longitudinal slope of the water surface.

The R2Cross model uses Ferguson's Variable-Power Equation (VPE) to estimate roughness and hydraulic conditions at different water stages at the measured cross-section (Ferguson, 2007; Ferguson, 2021). This approach is based on calibrating the model as described in Ferguson (2021). The model is used to evaluate three hydraulic criteria: average depth, average velocity, and percent wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types also will maintain aquatic habitat in pools and runs for most life stages of fish and aquatic macroinvertebrates (Nehring, 1979). BLM staff use the model results to develop an initial recommendation for summer and winter flows. The summer flow recommendation is based on the flow that meets all three hydraulic criteria. The winter flow recommendation is based on the flow that meets two of the three hydraulic criteria.

The R2Cross method estimates the biological amount of water needed for summer and winter periods. The recommending entity uses the R2Cross results and its biological expertise to develop an initial ISF recommendation. CWCB staff then evaluates water availability for the reach typically based on median hydrology (see the Water Availability section below for more details). The water availability analysis may indicate less water is available than the initial recommendation. In that case, the recommending entity either modifies the magnitude and/or duration of the recommended ISF rates if the available flows will preserve the natural environment to a reasonable degree or withdraws the recommendation.

The recommended ISF rates were quantified based on the needs of aquatic macroinvertebrates. Maintenance of stable aquatic macroinvertebrate populations is supported by continuously wetted stream surfaces and adequate stream velocities. R2Cross methodology allows for identification of flows that meet these requirements. In addition, flows that meet CWCB's hydraulic instream flow criteria in riffles also assist in providing stream temperatures and dissolved oxygen that meet macroinvertebrate requirements.

Data Collection and Analysis

BLM collected R2Cross data at two transects for this proposed ISF reach (Table 1 and Site Map). Results obtained at more than one cross-section are averaged to determine the R2Cross flow rate for the stream reach. The R2Cross model results in a winter flow of 1.80 cfs and a summer flow of 4.01 cfs. R2Cross field data and model results can be found in the appendix to this report.

Table 1. Summary of R2Cross cross-section measurements and results for Burrows Creek.

Date, XS #	Top Width (feet)	Streamflow (cfs)	Winter Rate (cfs)	Summer Rate (cfs)
08/26/2024, 1	15.88	2.65	0.97	5.42
08/26/2024, 3	18.25	2.65	2.63	2.60
			1.80	4.01

ISF Recommendation

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

0.19 cfs is recommended from November 1 to March 31. This recommendation is driven by limited water availability. This flow rate will facilitate overwinter survival of macroinvertebrates that embed themselves in the hyporheic zone of the creek and in wetlands immediately adjacent to the creek.

1.30 cfs is recommended from April 1 to April 30. This flow rate will facilitate macroinvertebrate activity in the active stream channel when macroinvertebrates start to emerge from the hyporheic zone of the creek as ice and snow begins to melt.

3.75 cfs is recommended from May 1 to June 15 during the peak of the snowmelt runoff period. This flow rate will provide a substantial extent of wetted surfaces and habitat for macroinvertebrates as they begin the active warm weather period of their life cycles.

1.6 cfs is recommended from June 16 to July 15 during the culmination of the snowmelt runoff period. This period is among the most active periods of the year for macroinvertebrate nymphs, larvae, and pupae, so it is important to provide as much wetted habitat as possible during this brief period.

0.58 cfs is recommended from July 16 to October 31. This recommendation is driven by limited water availability. Protection of flows during this period is important because it typically supports the highest biomass and diversity of aquatic macroinvertebrates during the year.

WATER AVAILABILITY

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

Water Availability Methodology

Each recommended ISF reach has a unique flow regime that depends on variables such as the timing, magnitude, and location of water inputs (such as rain, snow, and snowmelt) and water losses (such as diversions, reservoirs, evaporation and transpiration, groundwater recharge, etc.). This approach focuses on streamflow and the influence of flow alterations, such as diversions, to understand how much water is physically available in the recommended reach.

Staff's hydrologic analysis is data-driven, meaning that staff gathers and evaluates the best available data and uses the best available analysis method for that data. Whenever possible, long-term stream gage data (period of record 20 or more years) are used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and regression-based models are used when long-term gage data is not available. CSUFlow18 is a multiple regression model developed by Colorado State University researchers using streamflow gage data collected between 2001 and 2018 (Eurich et al., 2021). This model estimates mean-monthly streamflow based on drainage basin area, basin terrain variables, and average basin precipitation and snow persistence. Diversion records are used to evaluate the effect of surface water diversions when necessary. Interviews with water commissioners, landowners, and ditch or reservoir operators can provide additional information. A range of analytical techniques may be employed to extend gage records, estimate streamflow in ungaged locations, and estimate the effects of diversions. The goal is to obtain the most detailed and reliable estimate of hydrology using the most efficient analysis technique.

The final product of the hydrologic analysis used to determine water availability is a hydrograph, which shows streamflow and the proposed ISF rate over the course of one year. The hydrograph will show median daily values when daily data is available from gage records; otherwise, it will present mean-monthly streamflow values. Staff will calculate 95% confidence intervals for the median streamflow if there is sufficient data. Statistically, there is 95% confidence that the true value of the median streamflow is located within the confidence interval.

Basin Characteristics

The contributing basin of the proposed ISF on Burrows Creek is 0.7 square miles, with an average elevation of 12,209 feet and average annual precipitation of 41.4 inches. This small high elevation basin receives a significant amount of annual precipitation resulting in snowmelt runoff dominated hydrology.

Water Rights Assessment

There are two water rights located within the Burrows Creek basin. The Mineral Point Ditch was located midway through the reach (WDID 3004661, 11 cfs, appropriated in 1956). Historically this ditch diverted all flow at the diversion point out of the Burrows Creek basin and into the Uncompahgre River system. BLM remediated this ditch in 2024 leaving all stream flow in Burrows Creek. Burrows Creek Diversion (WDID 3000857, 0.9 cfs, appropriated in 2000) was decreed to irrigate wetlands adjacent to the creek due to concerns about the historic dewatering caused by the Mineral Point ditch. This water right shows 2 acre-feet in use each year from 2006 to 2017, but monthly and daily records are not available.

Data Collection and Analysis

Representative Gage Data

There are no current or historical streamflow gages on Burrows Creek. The historic Animas River near Howardsville, CO (USGS 09357500) operated from 1935 to 1982. Staff reviewed this gage data but determined that it was not suitable to estimate water availability due to the large change in drainage basin size and elevation.

Diversion Records
The Mineral Point Ditch is located in the upper reaches of the Burrows Creek basin. Due to the high elevation and remote nature of this diversion, limited records have been kept. There are some recorded diversions between 1986-2006 and in 2019 a telemetered flume was installed that operated until 2022. The more recent record shows a maximum monthly diversion rate of 2.3 cfs in May. These diversion records are helpful for understanding timing but represent a small portion of the total drainage basin and therefore were not used to determine water availability for the proposed reach.

Ungaged Basin Streamflow Estimates
CSUFlow18 provides the best estimate of streamflow in Burrows Creek. No adjustments were made for the Mineral Point Ditch, which BLM has filled in or for the small Burrows Creek ditch because the total diversions appear to be negligible.

Site Visit Data
CWCB staff made no streamflow measurements on the proposed reach of Burrows Creek but did tour the site in September of 2023.

Water Availability Summary
The hydrograph shows CSUFlow18 results for mean-monthly streamflow and includes the proposed ISF rate (See Complete Hydrograph). The proposed ISF flow rate is below the mean-monthly streamflow. Staff concludes that water is available for appropriation on Burrows Creek.

MATERIAL INJURY
If decreed, the proposed ISF on Burrows Creek would be a new junior water right. This ISF water right can exist without material injury to other senior water rights. Under the provisions of section 37-92-102(3)(b), C.R.S., the CWCB will recognize any uses or exchanges of water in existence on the date this ISF water right is appropriated.

ADDITIONAL INFORMATION

Common Acronyms and Abbreviations

Term	Definition
af	acre feet
BLM	Bureau of Land Management
cfs	cubic feet per second
CWCB	Colorado Water Conservation Board
CPW	Colorado Parks and Wildlife
DWR	Division of Water Resources
HCCA	High Country Conservation Advocates
ISF	Instream Flow
NLL	Natural Lake Level
USGS	United States Geological Survey
USFS	United States Forest Service
XS	Cross section

Citations

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

Colorado Water Conservation Board, 2024, R2Cross field manual. Retrieve from URL: https://dnrweblink.state.co.us/cwcbsearch/0/edoc/224685/R2Cross%20Field%20Manual%202024.pdf

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

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

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

Herndon Solutions Group, 2021, *Expanded Site Inspection Report, Burrows Gulch, San Juan County, Colorado*.

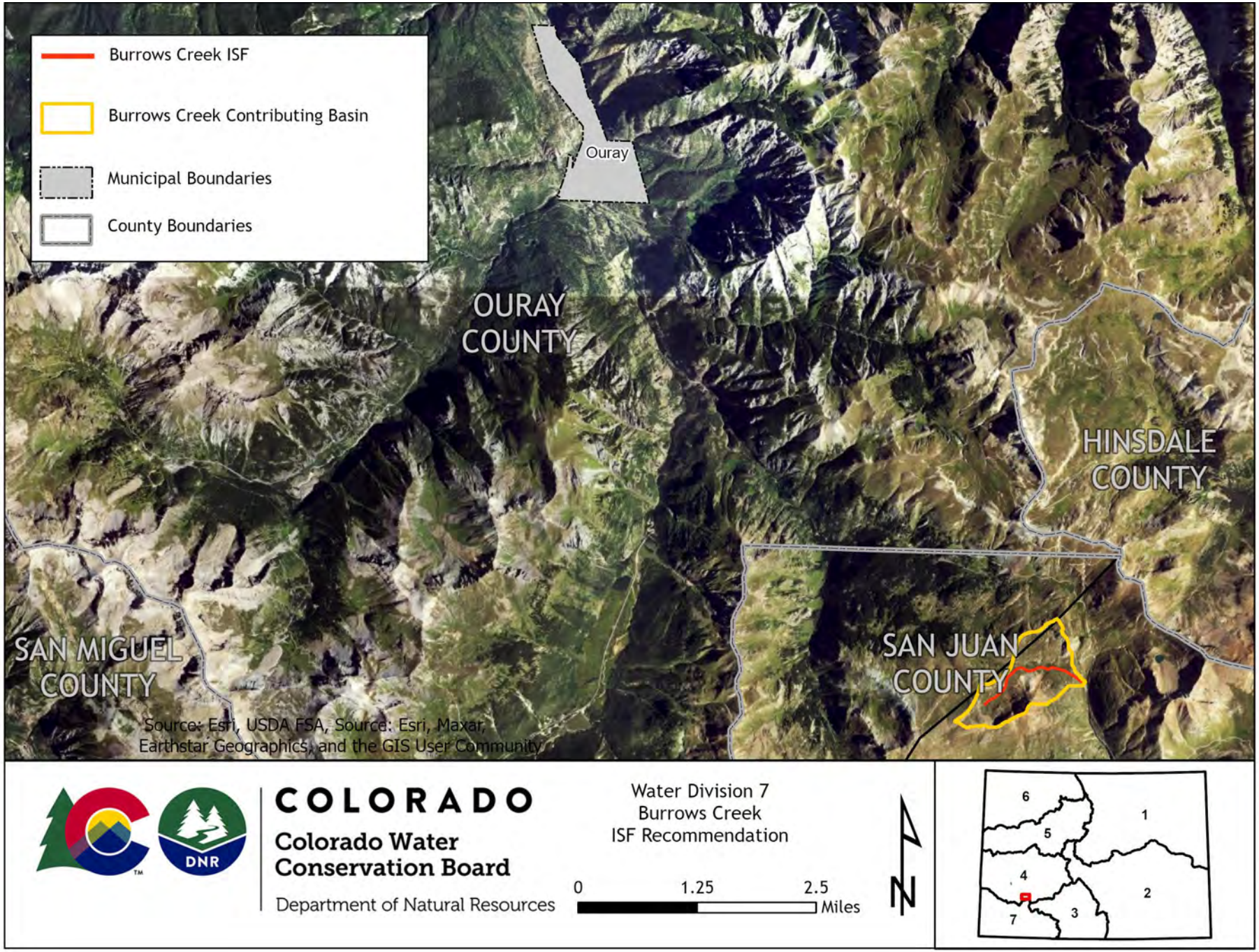
Nehring, B.R., 1979, Evaluation of instream flow methods and determination of water quantity needs for streams in the state of Colorado, Colorado Division of Wildlife.

Roberts, S., 2017, *Bonita Peak Mining District 2016 Benthic Macroinvertebrate Assessment*. Mountain Studies Institute

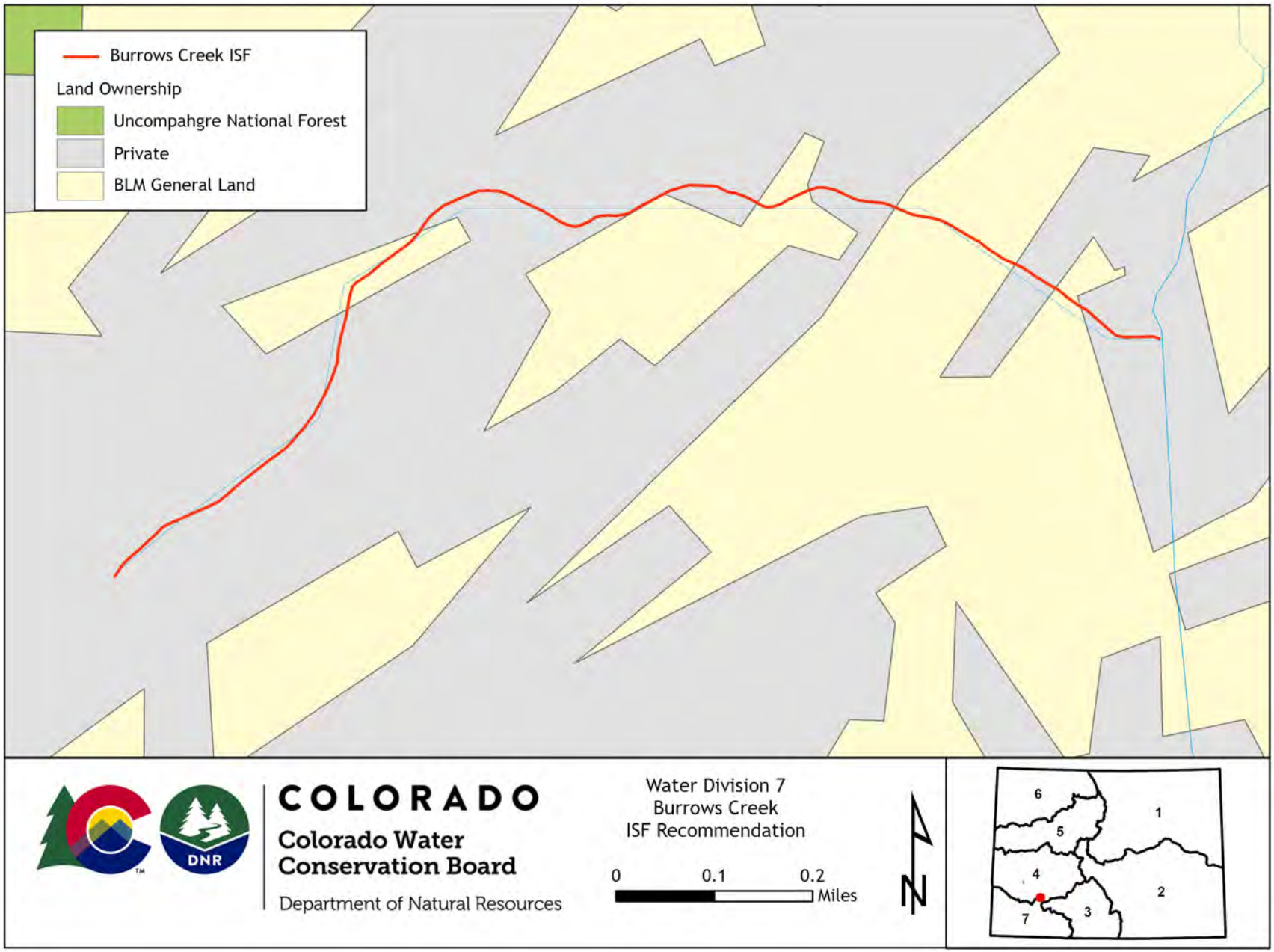
Metadata Descriptions
The UTM locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

Projected Coordinate System: NAD 1983 UTM Zone 13N.

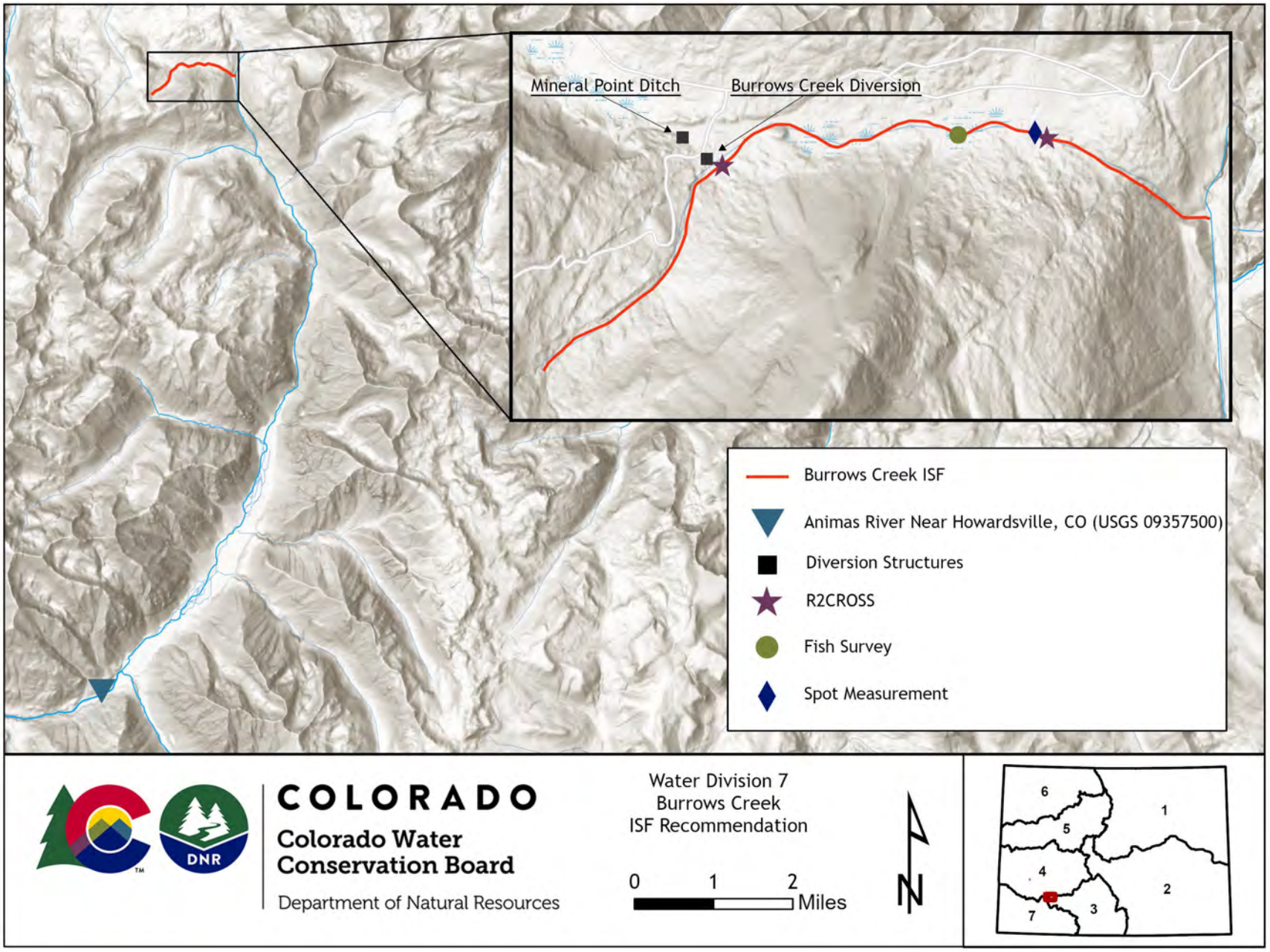
VICINITY MAP



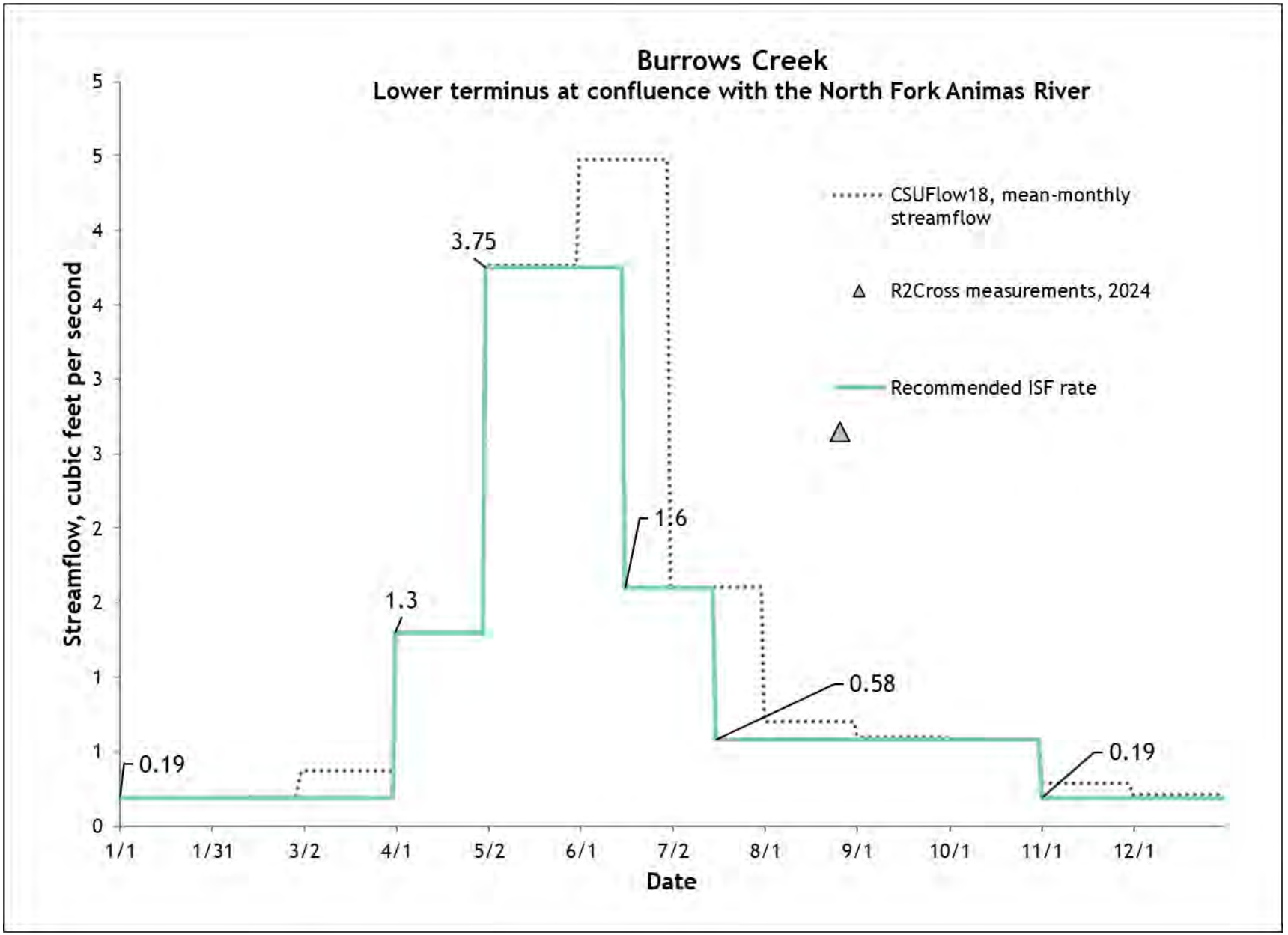
LAND OWNERSHIP MAP



SITE MAP


Mineral Point Ditch
Burrows Creek Diversion
Burrows Creek ISF
Animas River Near Howardsville, CO (USGS 09357500)
Diversion Structures
R2CROSS
Fish Survey
Spot Measurement
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
Water Division 7
Burrows Creek
ISF Recommendation
0 1 2 Miles
N
6
1
5
4
2
7
3

COMPLETE HYDROGRAPH



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Colorado Water Conservation Board
Department of Natural Resources

1313 Sherman Street, Room 718, Denver, Colorado 80203
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www.cwcb.state.co.us

PUBLIC NOTICE

To: Instream Flow Subscription Mailing Lists

Subject: CWCB Proposed 2025 Instream Flow Appropriations in Water Divisions 4, 6, & 7

Date: March 25, 2025

At its March 19-20, 2025, regular meeting, the Colorado Water Conservation Board (CWCB) declared its intent to appropriate instream flow (ISF) water rights on six stream segments. The attached ISF appropriations table provide the water division, stream name, watershed, county, length, upper terminus, lower terminus, and flow rates for these stream segments. Copies of the ISF recommendation executive summary reports and appendices of data submitted into the official CWCB record are available online at: https://cwcb.colorado.gov/2025-isf-recommendations.

In addition to the above ISF recommendation executive summary reports and appendices of data, staff may rely on any additional data, exhibits, testimony, or other information submitted by any party as part of the official CWCB record to support its ISF Recommendations. Pursuant to Rule 5d.(3) of the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program adopted by the Colorado Water Conservation Board, it should also be noted that:

(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 June 2, 2025. All Notices of Party status and Contested Hearing Participant status must be received at the Board office no later than July 1, 2025.

(e) Staff will announce its Final staff ISF Recommendations concerning contested appropriations at the November 2025 Board meeting and, prior to that meeting, 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 July 2025 Board meeting.

A notice to contest an ISF appropriation must be made in writing and contain the following information: (a) identification of the Person(s) requesting the hearing; (b) identification of the ISF at issue; and (c) the contested facts and a general description of the data upon which the Person will rely to the extent known at that time.

Note that section 37-92-102 (3) (b), C.R.S. provides: "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed ISF segments, and potential recognition of such uses in the CWCB's water court decree, contact Rob Viehl at the CWCB address noted above or via email to rob.viehl@state.co.us.

To comment on the proposed ISF Recommendations, you may do so by writing Rob Viehl at the address or email given above. It should be noted that while your appearance at any meeting is welcome, such an appearance is not necessary for your concerns to be recognized. Staff will take your comments into account and present them to the Board in your absence. If you are not currently on the Board's ISF Subscription Mailing List and you would like to be, please sign up at:
https://dwr.state.co.us/Portal/Login/

Instream Flow Appropriations

Div	Stream	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus	Flow (CFS)
4	East Muddy Creek	North Fork Gunnison	Gunnison	6.32	confluence Lee Creek	confluence Muddy Creek	11.2 (11/01 - 02/28) 20 (03/01 - 03/31) 23 (04/01 - 06/30) 14.5 (07/01 - 10/31)
4	West Muddy Creek	North Fork Gunnison	Gunnison	8.78	confluence Sheep Creek	confluence Muddy Creek	5.5 (10/01 - 03/31) 12.9 (04/01 - 06/30) 5.5 (07/01 - 07/15) 2 (07/16 - 09/30)
6	Milk Creek	Lower Yampa	Moffat	4.11	confluence Wilson Creek	confluence Yampa River	7.8 (01/01 - 02/29) 18 (03/01 - 03/31) 40 (04/01 - 06/30) 8 (07/01 - 07/31) 4.5 (08/01 - 09/30) 5.2 (10/01 - 12/31)
6	Vermillion Creek	Vermilion	Moffat	18.6	confluence Talamantes Creek	historic USGS Vermillion Creek at Ink Springs Ranch gage	1 (10/01 - 04/15) 2.6 (04/16 - 09/30)
6	Vermillion Creek	Vermilion	Moffat	10.1	historic USGS Vermillion Creek at Ink Springs Ranch gage	Vermillion Ditch hdgt	1.4 (08/01 - 04/30) 2.4 (05/01 - 07/31)
7	Burrows Creek	Animas	San Juan	1.33	headwaters	confluence North Fork Animas River	0.19 (11/01 - 03/31) 1.3 (04/01 - 04/30) 3.75 (05/01 - 06/15) 1.6 (06/16 - 07/15) 0.58 (07/16 - 10/31)

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Jared Polis, Governor

Dan Gibbs, DNR Executive Director

Lauren Ris, CWCB Director

TO: Colorado Water Conservation Board Members

FROM: Robert Viehl, Chief
Marielle Sidell, Water Resource Specialist
Stream and Lake Protection Section

DATE: May 21, 2025

AGENDA ITEM: 9b. Public Comment on 2025 Instream Flow Appropriations in Water Divisions 4, 6, and 7

Staff Recommendation: This is an informational item with no Board action required.

Background: At its March 19, 2025, meeting, the Board declared its intent to appropriate six instream flow (ISF) water rights. The purpose of this agenda item is to provide notice to the public of these proposed appropriations (see Table 1), and to provide an opportunity for public comment pursuant to Rule 5e. of the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program (ISF Rules). Staff provided notice to the ISF Subscription Mailing List of the proposed appropriations on March 25, 2025. Detailed information regarding these stream segments is available on the CWCB website located at: https://cwcb.colorado.gov/2025-isf-recommendations.

Anyone planning to contest one or more of these ISF appropriations must file a Notice to Contest with the Board, pursuant to ISF Rule 5k., by June 2, 2025. Staff may ask the Board to take final action on all uncontested ISF appropriations at its July 2025 meeting.

Attachments: A) Muddy Creek ISF Recommendation Terms and Conditions
B) Tri-State Generation and Transmission Association, Inc. Milk Creek ISF Memo

Table 1. Instream Flow Recommendations

Water Div	Stream	Watershed	County	Length (miles)	Upper Terminus	Lower Terminus	Flow Rate (CFS)
4	East Muddy Creek	North Fork Gunnison	Gunnison	6.32	confluence Lee Creek	confluence Muddy Creek	11.2 (11/01 - 02/29) 20 (03/01 - 03/31) 23 (04/01 - 07/31) 14.5 (08/01 - 10/31)
4	West Muddy Creek	North Fork Gunnison	Gunnison	8.78	confluence Sheep Creek	confluence Muddy Creek	5.5 (10/01 - 03/31) 12.9 (04/01 - 07/15) 5.5 (07/16 - 07/31) 2.0 (08/01 - 09/30)
6	Milk Creek	Lower Yampa	Moffat	4.11	confluence Wilson Creek	confluence Yampa River	7.8 (01/01 - 02/29) 18 (03/01 - 03/31) 40 (04/01 - 06/30) 8.0 (07/01 - 07/31) 4.5 (08/01 - 09/30) 5.2 (10/01 - 12/31)
6	Vermillion Creek	Vermilion	Moffat	18.6	confluence Talamantes Creek	confluence USGS Vermillion Creek gage at Ink Springs	1.0 (10/01 - 04/15) 2.6 (04/16 - 09/30)
6	Vermillion Creek	Vermilion	Moffat	10.1	confluence USGS Vermillion Creek gage at Ink Springs	Vermillion Ditch headgate	1.4 (08/01 - 04/30) 2.4 (05/01 - 07/31)
7	Burrows Creek	Animas	San Juan	1.33	headwaters	confluence North Fork Animas River	0.19 (11/01 - 03/31) 1.3 (04/01 - 04/30) 3.75 (05/01 - 06/15) 1.6 (06/16 - 07/15) 0.58 (07/16 - 10/31)

Terms and Conditions to be included in final CWCB action on East and West Muddy Creek ISFs and included in future water court filings:

1. Any conditional water rights that were decreed prior to the filing of a water court application for the [West/East] Muddy Creek ISF water right(s) will be administered as senior to the [West/East] Muddy Creek ISF water right(s) if such conditional water rights are decreed absolute.

2. Should any changes to the natural streambed channel of [West/East] Muddy Creek occur due to naturally occurring circumstances outside the control of water rights owners located within the ISF reach, such that it becomes necessary for water rights owner(s) to relocate the decreed point of diversion and related infrastructure to another point of diversion on [West/East] Muddy Creek to receive the proper inflow of water to which the water rights holder(s) may be entitled from [West/East] Muddy Creek, and such relocation is otherwise consistent with section 37-86-111, C.R.S., then the CWCB shall not rely on the instream flow appropriation decreed herein to prohibit or condition any such relocation of the decreed point of diversion and related diversion infrastructure or to require a change of water right associated with any such relocation of the point of diversion and related diversion infrastructure.

3. Paonia Reservoir is experiencing sedimentation and water users may in the future decide to use temporary detention ponds to decrease the amount of sedimentation that flows into the reservoir. The CWCB recognizes that the Colorado Division of Water Resources' General Administration Guidelines for Reservoirs (October 2011, amended February 2016) is a basic guide for reservoir administration.

4. Pursuant to section 37-92-102(3)(b), C.R.S., the [West/East] Muddy Creek ISF water rights shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of this appropriation whether or not previously confirmed by court order or decree.

5. All currently decreed absolute water rights will be administered as senior to the [West/East] Muddy Creek ISF water right.

6. Acknowledge the existence of the 2,000 AF exchange decree w/correction (05CW0236) and its senior position.

7. The CWCB recognizes the Bureau of Reclamation Policy Manual, PEC P05, Page 7, Item G., states the following: Irrigation Use. The use of contract water to irrigate land primarily for the production of commercial agricultural crops or livestock, and domestic and other uses that are incidental thereto.

   CWCB staff agrees to:
   The CWCB will not file a water court application on these two ISF appropriations before December 1, 2025 and will assign an appropriation date to correspond to the date of the application.

CWCB Staff agree to modify the ISF flow recommendations as follows:

East Muddy Creek: from 23 cfs (4/1-7/31) and 14.5 cfs (8/1-10/31) to 23 cfs (4/1-6/30) and 14.5 cfs (7/1-10/31)

West Muddy Creek: from 12.9 cfs (4/1-7/15), 5.5 cfs (7/16-7/31) and 2 cfs (8/1-9/30) to 12.9 cfs (4/1-6/30), 5.5 cfs (7/1-7/15), 2 cfs (7/16-9/30)

TRI-STATE Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

Memorandum

To: Colorado Water Conservation Board
From: Thomas Kennedy, PE
Subject: Initial Comments - Proposed ISF on Milk Creek
Location: ColoWyo
Date: May 5, 2025

Based on a review performed by Bishop Brogden Associates Tri-State has the following comments on the February 2025 draft *BLM Instream Flow Recommendation for Milk Creek* circulated by Bureau of Land Management ("Draft Recommendation") and the associated draft *Recommendation Letter* from Alan Bittner at BLM to Rob Viehl at CWCB ("Draft Letter"). These initial comments follow:

1. The Draft Recommendation references "hydraulic model calibration" and "hydraulic model simulations," among other things. (§ 2 at 5) Colowyo may wish to request copies of data and results associated with these analyses/simulations prepared by BLM in support of the proposed instream flow appropriation ("ISF").

- The Draft Recommendation includes a proposed ISF minimum flow rate of 8.0 cfs in lower Milk Creek during July 1-31; however, BLM does not provide a water availability basis for this proposed rate. (§ 3 at 9-10)

- The Draft Recommendation includes a proposed ISF minimum flow rate of 18.0 cfs in lower Milk Creek during March 1-31; however, BLM does not provide a water availability basis for this proposed rate. (§ 3 at 10)

2. The Draft Recommendation includes proposed ISF minimum flow rates ranging from 4.5 cfs to 7.8 cfs during August through February. BLM refers to these months as the "base flow period." (§ 3 at 10)

- A relatively large proportion of these lower flow rates may at times be contributed by existing or emergent sources within the Colowyo permit boundary. When water from these sources is diverted from the stream, for example to address water quality requirements, flows in Milk Creek are likely to be reduced.

3. The Draft Letter provides that "BLM is willing to meet with water users and stakeholders within the watershed to discuss any concerns they may have about the impact of the proposed appropriation on future water uses and development." Among other things, potential future development of conditional storage rights and/or change of use of the one or more nearby water rights could impact flows in the subject reach and therefore other water rights. Tri-State would request the CWCB consider that though the Tri-State water rights are senior to the proposed ISF, the existence of an ISF on lower Milk Creek would increase the likelihood that CWCB or other entities might engage when Colowyo' s water rights are further developed and/or changed.

CWCBStaff-23

Notification of Opposition to CWCB East Muddy Creek ISF June 2, 2025

Jim Auster and Merrilee Bliss, owners of Hummingbird Ranch on Lee Creek, 26140 Hwy 133, Somerset CO 81434 hereby submit their Notification of Opposition to CWCB proposed ISF for East Muddy Cr.

1. DWR Muddy Creek gauge above Paonia Reservoir is 57 cfs on 6/1/2025, median flow for this date is 450 cfs. The last time Muddy gauge had zero flow was in August 1990, 6/1/1990 was 127 cfs.
2. https://dwr.state.co.us/Tools/Stations/MUDAPRCO?params=DISCHRG
3. Muddy Creek has record low runoff level with a high probability for complete dry-up this summer.
4. Bluehead Sucker population cannot survive dry-up of streamflow and pools.
5. If E Muddy Cr does not have long-term viability to sustain habitat for Bluehead Sucker, ISF may be opposed for no valid beneficial use while precluding all other valid beneficial uses of that water.
6. New water storage rights will be necessary if our share of Ragged Mt Water User Assoc. exchange augmentation water is reduced or lost due to sedimentation of Paonia Reservoir.
7. Storage rights benefit ISF by supplementing late season flow but are not possible unless new storage decrees are exempt from the ISF.
8. Amount of water available for East Muddy Creek ISF is based on 1930 -1953 USGS gauge and from 2020-2024 temporary gauge on West Muddy subtracted from MUDAPRCO gauge of total flow.
9. These records do not include twenty drought years after 2000, unprecedented low runoff this year, and expectations of more reduction in Colorado basin water supply with earlier and lower runoff from warmer temperatures, lower snowpack, increased evaporation, dry ground absorption, etc.
10. ISF that encumbers all available water is premature without more years to measure if 2025 extreme low flow or dry-up with risk to fish population is the new normal long-term trend.
11. If lower flow is the long-term projection, 1930-1953 streamflow records and short-term extrapolation of temporary gauge are obsolete, inaccurate, and irrelevant to calculate the correct amount of available water that can be claimed by the ISF application.
12. CWCB can accomplish much more to improve fish habitat and population than with the proposed ISF by supporting measures to improve water quality with revegetation of eroding steep slopes in Muddy Cr headwaters.100 af/year of sediment material is running like an open sewer down E Muddy Cr. Paonia Reservoir has been filling with an average of one dump truck load every 15 minutes since 1962. CWCB can contribute to finding methods of discharging it downstream.
13. In response to my comments at 5/21/2025 CWCB meeting Board members acknowledged protecting fish from stream dry-up is more important and higher priority than junior ISF that does not prevent dry-up by senior decrees, but there has been no response to our offer of an ISF lease.
14. ISF will not improve Muddy Cr water quality, increase streamflow, or benefit fish population and habitat from conditions that are basically the same since this area was first homesteaded in 1910
15. ISF will negatively affect long-term water and land use options and economic development.

Please consider negotiating an emergency low flow ISF lease from our Columbine Ditch decree. If we have an agreement on terms of a contract for senior ISF lease we will withdraw our opposition to the junior ISF and voluntarily release water to prevent dry-up this summer while an application for change of use to ISF is processed and completed.

Jim Auster
and Merrilee Bliss
PO
Box 716, Carbondale CO 81623, 97061876

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

1313 Sherman Street, Room 718, Denver, Colorado 80203
Phone: (303) 866-3441 * Fax: (303) 866-4474
https://cwcb.colorado.gov/

Public Notice

To: All Interested Parties

Subject: Notice of Contested 2025 ISF Appropriations

Date: June 6, 2025

As required by Rule 5k.(4) of the Rules Concerning the Colorado Instream Flow (ISF) and Natural Lake Level (NLL) Program, the Colorado Water Conservation Board hereby provides the subscribers to the ISF Subscription Mailing List with notice of contested ISF appropriations. The contested ISF appropriations are listed below:

Water Division	Stream Segment	County
4	East Muddy Creek *(Confluence with Lee Creek to confluence with Muddy Creek)*	Gunnison
6	Milk Creek *(Confluence with Wilson Creek to confluence to Yampa River)*	Moffat

For more detailed information regarding these ISF appropriations and a copy of the Notices to Contest, please go to CWCB's website at:

https://cwcb.colorado.gov/2025-contested-isf-appropriations

Please note that these appropriations will use a modified schedule from that listed in the ISF Rules. Dates below have been updated to reflect the modfied timelines (shown in bold). If an hearing is necessary, it will occur at the November CWCB Meeting.

Rules 5i-5m Concerning the Colorado ISF and NLL Program state the following with regard to Contested ISF Appropriations:

Party status will be granted to any person who timely files a Notice of Party Status with the Staff. Any person filing a Notice to Contest shall be granted Party status and need not also file a Notice of Party Status. A Notice of Party status must be received by **July 1st.** Electronic submissions of Notices of Party Status should be sent to rob.viehl@state.co.us. A Notice of Party status shall set forth a brief and plain statement of the reasons for obtaining Party status, the contested facts, the matters that the person claims should be decided and a general description of the data to be presented to the Board. The Board will have discretion to grant or deny Party status to any person who files a Notice of Party Status after **July 1st**, for good cause shown.

Only a Party may submit for the record technical evidence, technical witnesses or file legal memoranda. Each Party is responsible for mailing copies of all documents submitted for Board consideration to all other Parties and Contested Hearing Participants.

Any person who desires to participate in the process, but not as a Party, may obtain Contested Hearing Participant status by filing a notice thereof by **July 1st**. Electronic submissions of Notices of Contested Hearing Participant status should be sent to rob.viehl@state.co.us. A person with such status will receive all Party documents specific to the contested appropriation. Contested Hearing Participants may comment on their own behalf, but may not submit for the record technical evidence, technical witnesses or legal memoranda. The Board will have discretion to grant or deny Contested Hearing Participant status to any person who filed a Notice of Contested Hearing Participant Status after **July 1st**, for good cause shown.

Staff shall notify all Parties and Contested Hearing Participants of the list of Contested Hearing Participants prior to **July 31st**. Thereafter, Parties shall also mail their prehearing statements and any other documents to Contested Hearing Participants.

A copy of the Rules Concerning the Colorado ISF and NLL Program is available on the CWCB website at:

https://dnrweblink.state.co.us/CWCB/0/edoc/214232/2%20CCR%20408-2.pdf

We encourage you to share the information provided in this notice with any groups or individuals whom you feel would have an interest in the State of Colorado's Instream Flow Program.

If you have any additional questions regarding this notice, please contact Rob Viehl (rob.viehl@state.co.us).

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

Lauren Ris, CWCB Director

TO: Colorado Water Conservation Board Members

FROM: Robert Viehl, Section Chief
Marielle Sidell, Hydrologist
Stream and Lake Protection Section

DATE: July 17, 2025

AGENDA ITEM: 19b. Contested 2025 Instream Flow Appropriations in Water Divisions 4 and 6

Staff Recommendation

Staff recommends that the Board designate First Assistant Attorney General Jennifer Mele as the Hearing Officer for the contested instream flow appropriations on East Muddy Creek in Water Division 4 and Milk Creek in Water Division 6 and set the hearing date to be held in conjunction with the Board's November 19-20, 2025 meeting.

Background

The following table describes the Board's March 2025 instream flow appropriations on East Muddy Creek and Milk Creek. Jim Auster and Merrilee Bliss contested the new appropriation on East Muddy Creek and Colowyo Coal Company, L.P. contested the new appropriation on Milk Creek. Jim Auster presented concerns and stated his intent to contest at the May 21, 2025 CWCB board meeting during East Muddy Creek public comment period. Both notices to contest were submitted by the June 2, 2025 deadline. As required by ISF Rule 5k. (4) notice of the consteted ISF appropriations was sent out to the ISF Subscription Mailing List on June 6, 2025. The deadline to request Party status and Contested Hearing Participant status was on July 1, 2025. No additional entities filed for Party status in the East Muddy Creek appropriation. Western Resource Advocates filed for Party Status, and Carroll Davidson Partnership and Milk Creek Ranch LLC filed for Contested Hearing Particiapant status for the Milk Creek appropriation. Staff is in contact with the Colowyo's representatives to explore whether any mutually acceptable terms and conditions can be reached to avoid the need for a hearing on Milk Creek. Information submitted during the contested hearing process will be available on CWCB's website at: https://cwcb.colorado.gov/2025-contested-instream-flow-appropriations

Colorado Water Conservation Board's March 2025 Contested Instream Flow Appropriations

Stream	County	Length (mi)	Flow Rate (cfs)	Hearing Parties	Hearing Participants
East Muddy Creek (Confluence Lee Creek to Confluence Muddy Creek)	Gunnison	6.32	11.2 (11/01 - 02/28) 20 (03/01 - 03/31) 23 (04/01 - 07/31) 14.5 (08/01 - 10/31)	*Notice to Contest* • Jim Auster and Merrilee Bliss	• *None*
Milk Creek *(Confluence Wilson Creek to Confluence with the Yampa River)*	Moffat	4.11	7.8 (01/01 - 02/29) 18 (03/01 - 03/31) 40 (04/01 - 06/30) 8 (07/01 - 07/31) 4.5 (08/01 - 09/30) 5.2 (10/01 - 12/31)	*Notice to Contest* • Colowyo Coal Company, L.P. *Notice of Party Status* • Western Resource Advocates	• *Carroll Davidson Partnership* • *Milk Creek Ranch LLC*

BEFORE THE COLORADO WATER CONSERVATION BOARD

IN THE MATTER OF PROPOSED INSTREAM FLOW APPROPRIATION DIVISION 4: EAST MUDDY CREEK

NOTICE OF PREHEARING CONFERENCE & DEADLINES FOR SUBMISSIONS

The Colorado Water Conservation Board (CWCB) has designated First Assistant Attorney General Jennifer Mele as Hearing Officer for the contested proposed instream flow (ISF) appropriation on East Muddy Creek. The hearing on this matter will be held in conjunction with the CWCB's meeting November 19-20, 2025, in the Denver Metro Area. Parties and Contested Hearing Participants will be notified of the precise time and location of the hearing once the logistics of the November meeting are determined.

Pursuant to Rule 5n. of the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, the Hearing Officer hereby establishes the following deadlines for written submissions, designation of witnesses and exhibits, and the date of the prehearing conference.

Wednesday, September 3, 2025: Prehearing Statements and Written Comments Due

Prehearing Statements

On or before September 3, 2025, 5:00 p.m., each Party shall submit an electronic copy of its prehearing statement via email to the CWCB's Hearing Officer at jen.mele@coag.gov. The prehearing statement shall identify all exhibits, engineering data, biological data and reports or other information that the Party will rely upon at the hearing and shall contain:

i) a specific statement of the factual and legal claims asserted (issues to be resolved) and the legal basis upon which the Party will rely;
ii) copies of all exhibits to be introduced at the hearing;
iii) a list of witnesses to be called and a brief description of their testimony;
iv) any alternative proposal to the proposed instream flow appropriation;
v) all written testimony to be offered into evidence at the hearing; and,
vi) any legal memoranda.

By this deadline, each Party shall also deliver a copy of its prehearing statement, by

email, to all other Parties, and the Assistant Attorney General representing the Staff, Christopher Davis.

Written Comments
On or before September 3, 2025, 5:00 p.m., Contested Hearing Participants may submit an electronic copy of any written comments they would like the CWCB to consider at the hearing to the CWCB's Hearing Officer at jen.mele@coag.gov.

By this deadline, each Party shall also deliver a copy of its written comments, by email, to all other Parties, Contested Hearing Participants, and the Assistant Attorney General representing the Staff, Christopher Davis.

The CWCB will not consider information, other than rebuttal statements, submitted by the Parties after this deadline except for good cause shown.

Wednesday, September 10, 2025: Prehearing Conference 10:00 a.m.

The prehearing conference will be held on September 10th at 10:00 AM via Zoom or Google Meet and will afford the Parties the opportunity to address such issues as time limitations for each Party to present at the hearing, avoiding presentation of duplicative information, consolidation of concerns, etc. The Parties may formulate stipulations respecting the issues to be raised, witnesses and exhibits to be presented, and any other matters which may be agreed to or admitted by the Parties. At the prehearing conference, each Party shall identify any objections to the procedures or evidence it anticipates raising at the hearing unless such objections could not have been reasonably determined by the time of the prehearing conference.

Wednesday, October 22, 2025: Rebuttal Statements Due

On or before 5:00 p.m., each Party shall file an electronic copy of any rebuttal statement, including testimony, legal memoranda and exhibits, via email, with the CWCB's Hearing Officer. By this deadline, each Party shall also deliver its rebuttal statement, by email, to all other Parties, and the Assistant Attorney General representing the Staff. The CWCB will not consider information submitted by any Party after this deadline except for good cause shown.

Wed.-Thurs., November 19-20, 2025: Hearing Date

The hearing for this matter is scheduled for the CWCB's meeting November 19-20, 2025, in the Denver Metro Area. The exact location and time of the hearing is yet to be determined.

In addition to other matters related to the conduct of the hearing, the Hearing Officer will determine the final time allocations for each Party to present its case after consideration of, among other things, the prehearing statements and the number of

witnesses. Time allocations given will be for total presentation time, meaning the overall allocation will be applicable to both the Parties' direct presentations and rebuttal presentations. The Hearing Officer may limit testimony or presentation of evidence to prevent repetitive, irrelevant, or unnecessary testimony.

The Hearing Officer acts as hearing chair at the hearing. Parties may not cross-examine witnesses. The Hearing Officer provides remaining time at the conclusion of all direct testimony for Parties to provide rebuttal testimony based on the remaining amount of the Parties' time allocations. Board member questions to the Parties do not count against the Parties' time allocations and are not time barred in any manner.

Once all public comments and arguments have been heard, the Hearing Officer will close the hearing record, and the Board will commence deliberations. During this time, the Board will discuss the information they have received and make decisions on the proposal in public session.

During deliberations and decision-making, no comment from any Party or other members of the public will be accepted unless the Board votes to re-open the hearing to take additional information.

Dated this 6th day of August 2025.

Jennifer L. Mele
First Assistant Attorney General
Water Conservation Unit
Colorado Attorney General's Office
1300 Broadway, 7th Floor
Denver, CO 80203
720-508-6282
Jen.Mele@coag.gov

Certificate of Service

Contested CWCB ISF Appropriations on East Muddy Creek

I hereby certify that on August 6th, 2025, a true and correct copy of the foregoing NOTICE OF PREHEARING CONFERENCE & DEADLINES FOR SUBMISSIONS was served via email, to the parties referenced in the Party Status below:

Hearing Officer

Jennifer L. Mele First Assistant Attorney General Water Conservation Unit Colorado Attorney General's Office 1300 Broadway, 7th Floor Denver, CO 80203 720-508-6282 Jen.Mele@coag.gov

Party Status

Colorado Water Conservation Board Robert Viehl Colorado Water Conservation Board 1313 Sherman Street, Room 718 Denver, CO 80203 720-854-3237 rob.viehl@state.co.us Christopher Davis Assistant Attorney General Water Resources Unit Colorado Attorney General's Office 1300 Broadway, 7th Floor Denver, CO 80203 720-508-6280 Christopher.Davis@coag.gov	Bureau of Land Management Roy Smith Bureau of Land Management Denver Federal Center, Building 40 Lakewood, CO 80215 303-239-3940 r20smith@blm.gov

Hummingbird Ranch

Jim Auster and Merrilee Bliss
Hummingbird Ranch
26140 Hwy 133
Somerset CO 81434
970-618-7692
jimauster@hotmail.com

/s/Sarah Glover

CWCB INSTREAM FLOW WORKSHOP

February, 8 2024

COLORADO

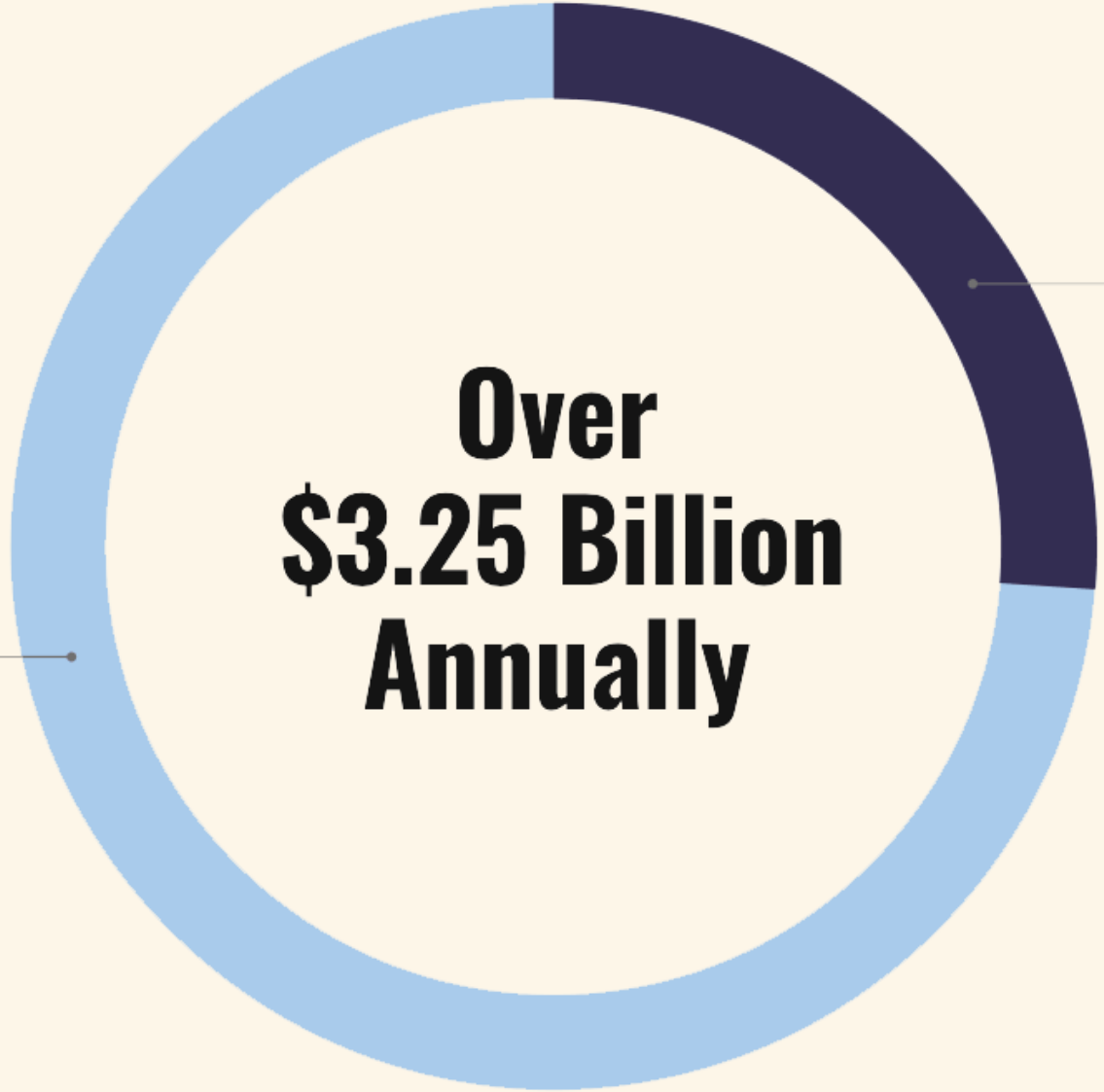
Colorado Water Conservation Board

Department of Natural Resources

ISF 50th Anniversary & Video

https://cwcb.colorado.gov

Anglers Bring $ to Colorado



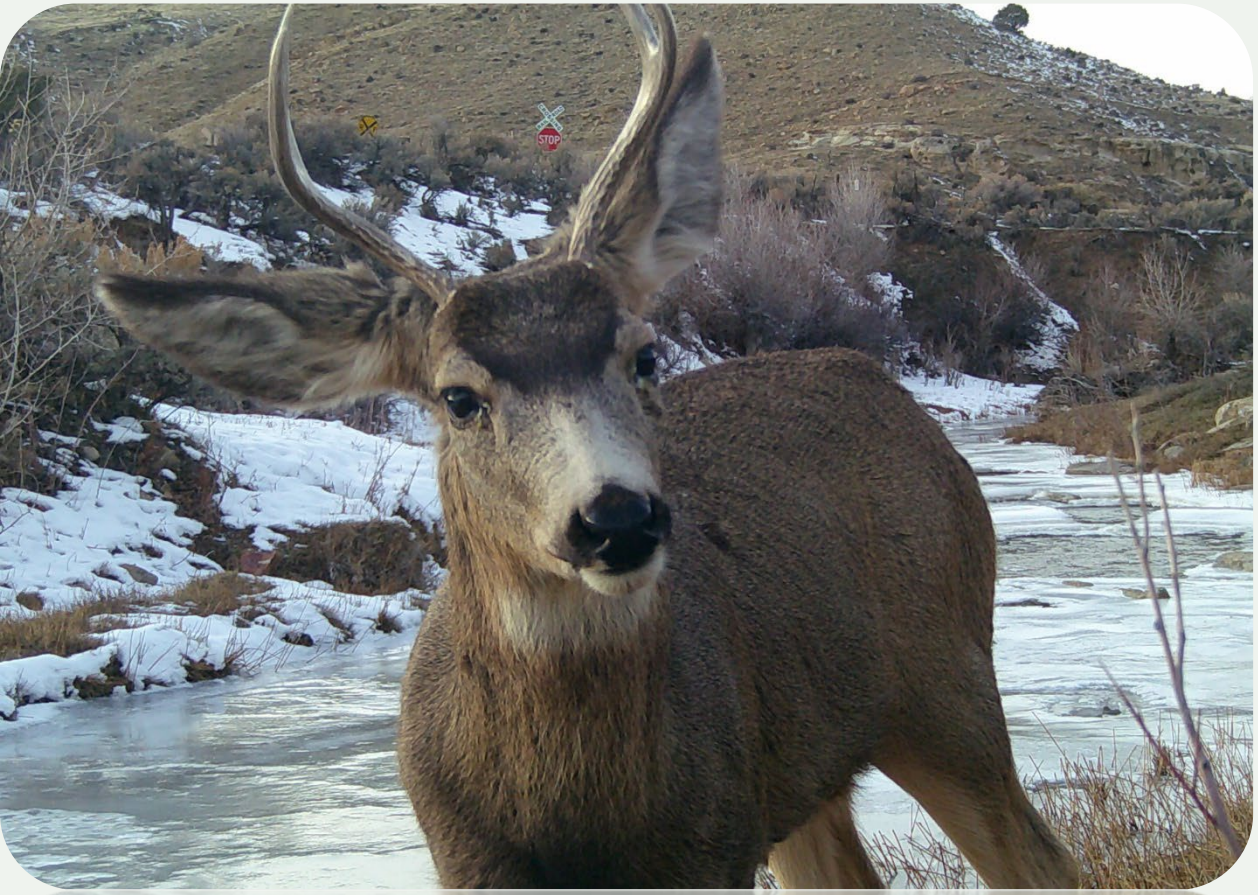
$843 Million

Hunters

$2.445 Billion

Anglers

COLORADO WILDLIFE COUNCIL



Instream Flow Appropriations (60min)

ISF Appropriations Process &

New Recommendations

Instream Flow Acquisitions

(30 min)

Overview & Request for water

Question & Answer *(10 min)*

ISF Workshop Agenda

BRANDY LOGAN
New Appropriations
Water Resource Specialist

KAYLEA WHITE
Legal Protection/Acquisitions
Senior Water Resource Specialist

MARIELLE SIDELL
New Appropriations
Hydrologist

COLIN WATSON
Legal Protection
Engineer

ROB VIEHL
Section Chief

LAURA CORONA
New Appropriations
Hydrographer

PETE CONOVITZ
Acquisitions
Water Resource Specialist

SADE CROMRATIE CLEMONS
New Appropriations
DNR Contractor

KIM RICOTTA
Legal Protection
Paralegal

Instream Flow Team

CWCBStaff-27

Instream Flows (ISF) & Natural Lake Levels (NLL) What Are They?

Familiar Features

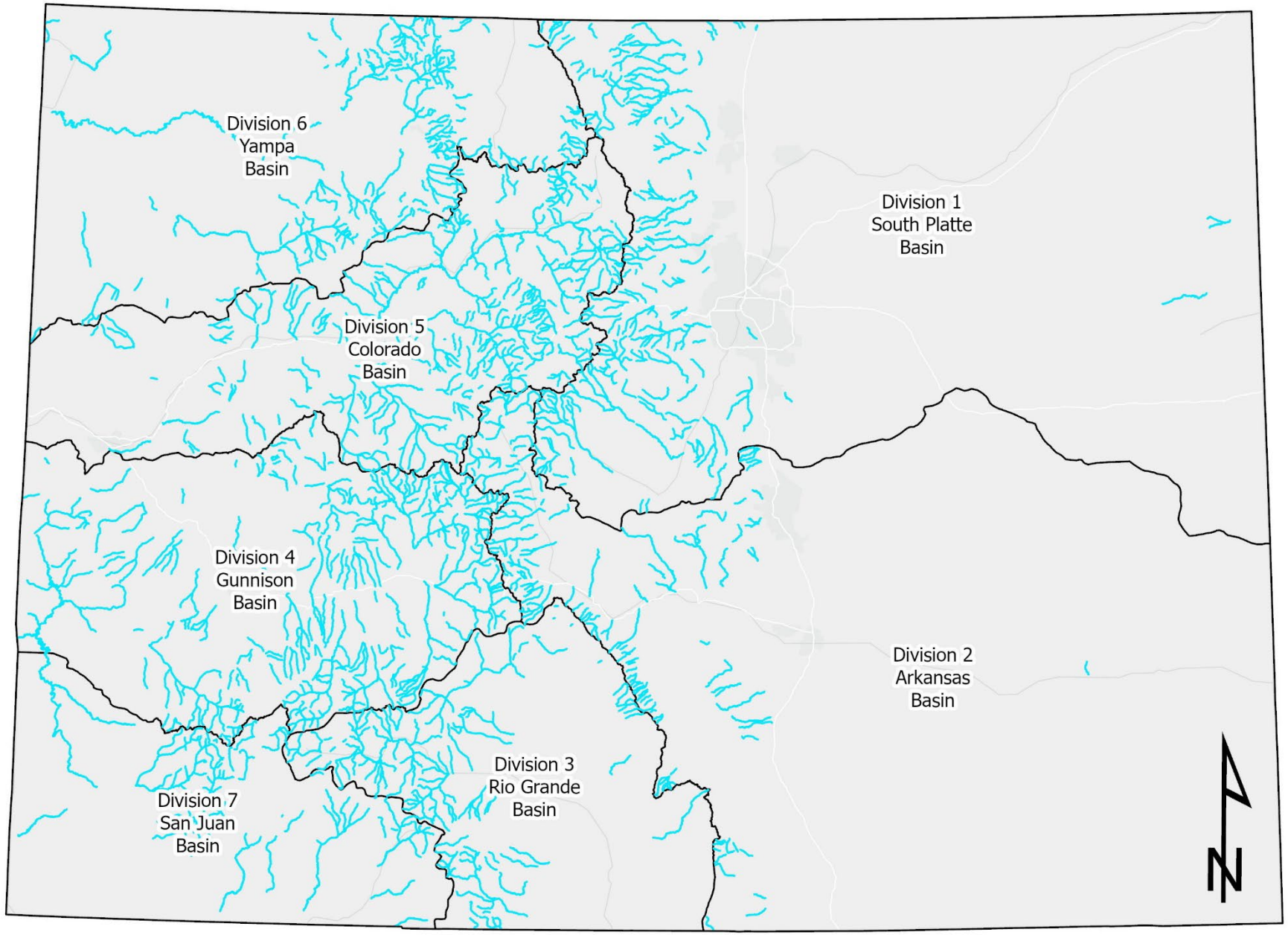
- Defined **Amount** & **Time**
- Administered within the State's **Prior Appropriation System**
- Recognized beneficial use

Unique Features

- **Non-consumptive** minimum flows
- **Stream reach** or in a **natural lake**
- Beneficial use: **preserve natural environment**

Water Rights held for Citizens of Colorado by CWCB

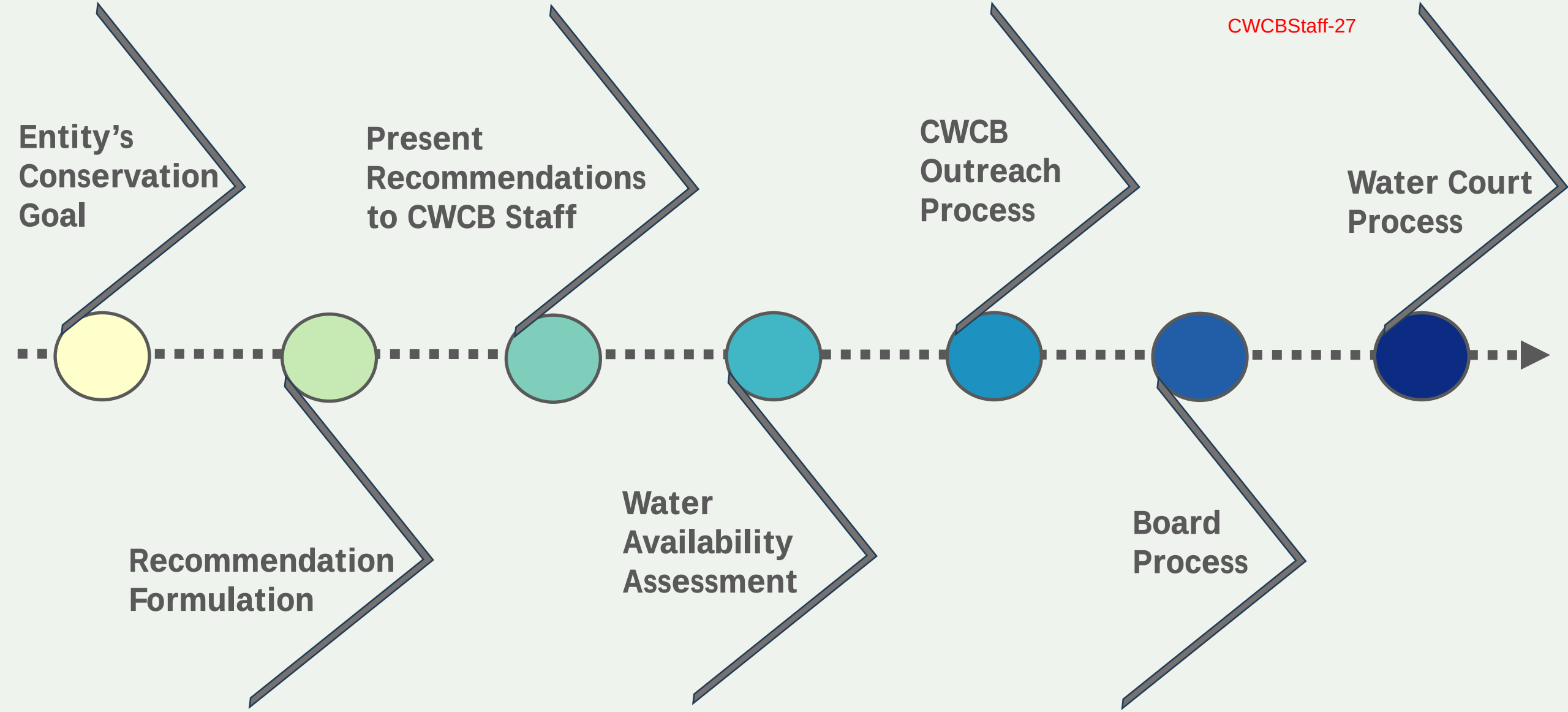
1,700+ Instream Flow & Natural Lake Level Water Rights



Mostly headwater catchments on the western slope of the state.

Where are they Located?

NEW APPROPRIATIONS PROCESS



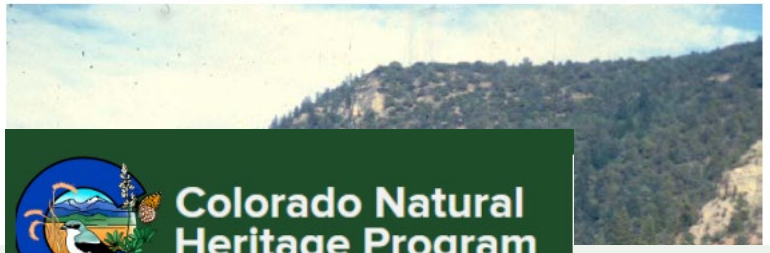
ISF New Appropriation Process

Entity's Conservation Goal

Native Cutthroat Trout

Boreal Toads

A Natural Heritage Assessment
San Miguel and Western Montrose Counties, Colorado



Colorado Natural Heritage Program

COLORADO PARKS & WILDLIFE

Present Distribution of Three Colorado River Basin Native Non-game Fishes, and Their Use of Tributaries

TECHNICAL PUBLICATION NUMBER 52 AUGUST 2019

ISF New Appropriation Process

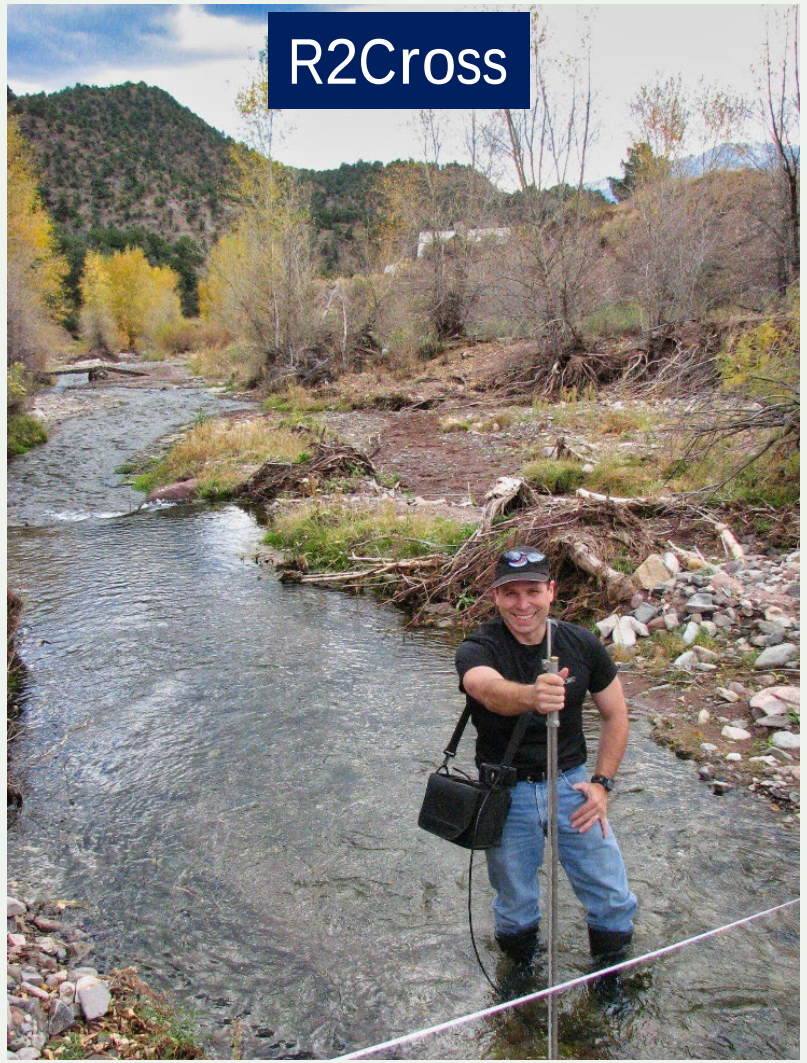
Recommendation Formulation

- **Identification of the natural environment**
- Determine site specific minimum flow needs

ISF New Appropriation Process

Recommendation Formulation

- Identification of the Natural Environment
- **Determine site specific minimum flow needs**



Habitat Criteria Example:
Average Depth of 0.2 ft
Average Velocity of 1.0 ft/sec
50% Wetted Perimeter

Present Recommendations to CWCB Staff

CWCBStaff-27

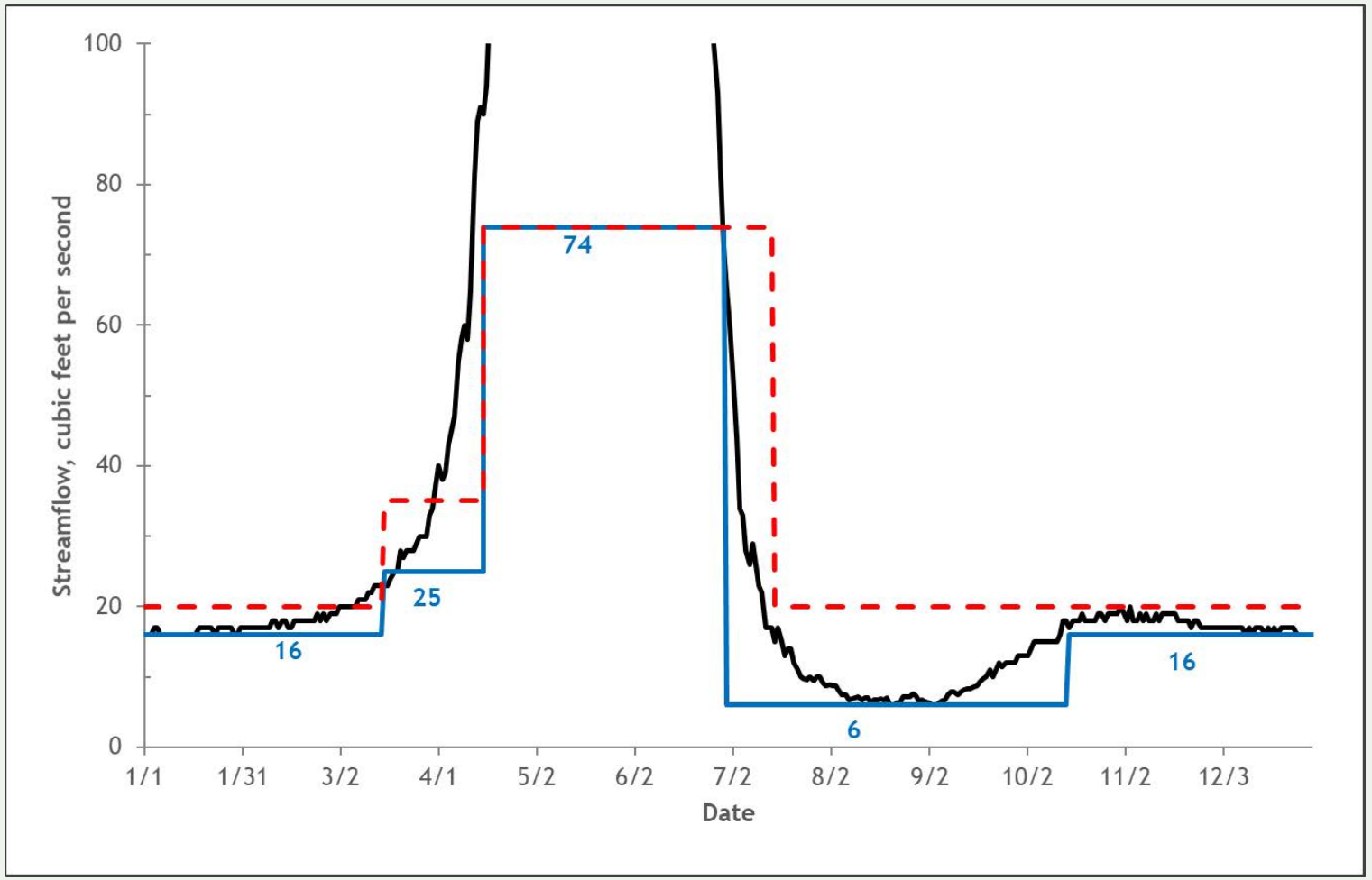
At Annual ISF Workshop

ISF New Appropriation Process

Water Availability Assessment

Data driven approach:

- Streamgage analysis
- Temporary streamgage
- Statistical model
- Diversion record
- Additional information



ISF New Appropriation Process

CWCB Outreach Process

- ISF subscription mailing list notices
- Stakeholder meetings
- Newspaper notices
- Landowner letters
- DWR

CWCB Public Notice of Recommended 2023 Instream Flow Appropriations in Water Divisions 1, 4, 5, & 6

rob.viehl@state.co.us Tue, Nov 15, 2022, 1:09 PM

to me

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

1313 Sherman Street, Room 718, Denver, Colorado 80203
Phone: (303) 866-3441 * Fax: (303) 866-4474
https://cwcb.colorado.gov/

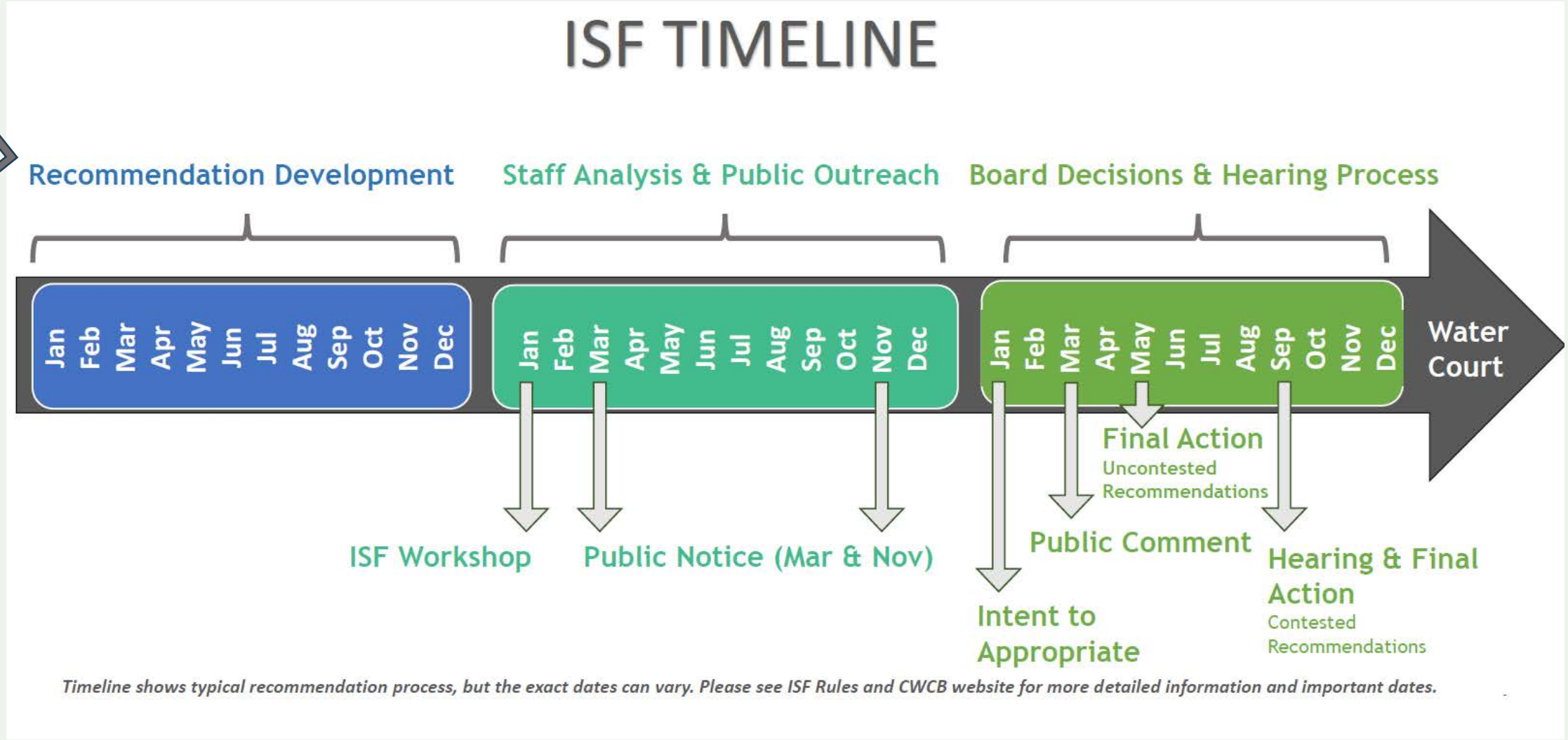
Pursuant to ISF Rule 5c. of the Rules Concerning the Colorado Instream Flow and Natural
notice identifies the streams and lake to be considered for instream flow (ISF) and natur
appropriations in 2023. At the January or March meeting of the Colorado Water Conserva
request that the Board form its intent to appropriate ISF and NLL water rights for the str
lake listed in table 2 below.

Information submitted to the CWCB is available online at:

The Colorado Water Conservation Board ("CWCB"), 1313 Sherman Street, Suite 718, Denver, Colorado 80203. Please direct communications regarding this notice to Robert Viehl, Chief of the Stream and Lake Protection Section rob.viehl@state.co.us, 303-866-3441 ext 3237: RECOMMENDATION FOR WATER RIGHT TO PRESERVE THE NATURAL ENVIRONMENT TO A REASONABLE DEGREE, IN GARFIELD COUNTY, COLORADO. The CWCB is the state water planning agency which, among other duties, is tasked with appropriating, acquiring and protecting instream flow (ISF) water rights to preserve and improve the natural environment to a reasonable degree for streams and lakes in the state. The CWCB is the only entity in the state that is authorized to appropriate ISF water rights. These water rights are held on behalf of the people of Colorado for the preservation of the water dependent natural environment. ISF water rights work within Colorado's water law system, and are junior to any existing rights and practices at the time of appropriation of the ISF. According to section 37-92-102 (3) (b), C.R.S. "Any such appropriation shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." For more information on whether this provision applies to specific undecreed uses of water in or above the proposed instream flow segments, and potential recognition of such uses in the CWCB's water court decree, or any other questions please contact Rob Viehl. CWCB staff and entities that recommended streams for ISF water rights are in the process

ISF New Appropriation Process

Board Process



ISF New Appropriation Process

Water Court Process

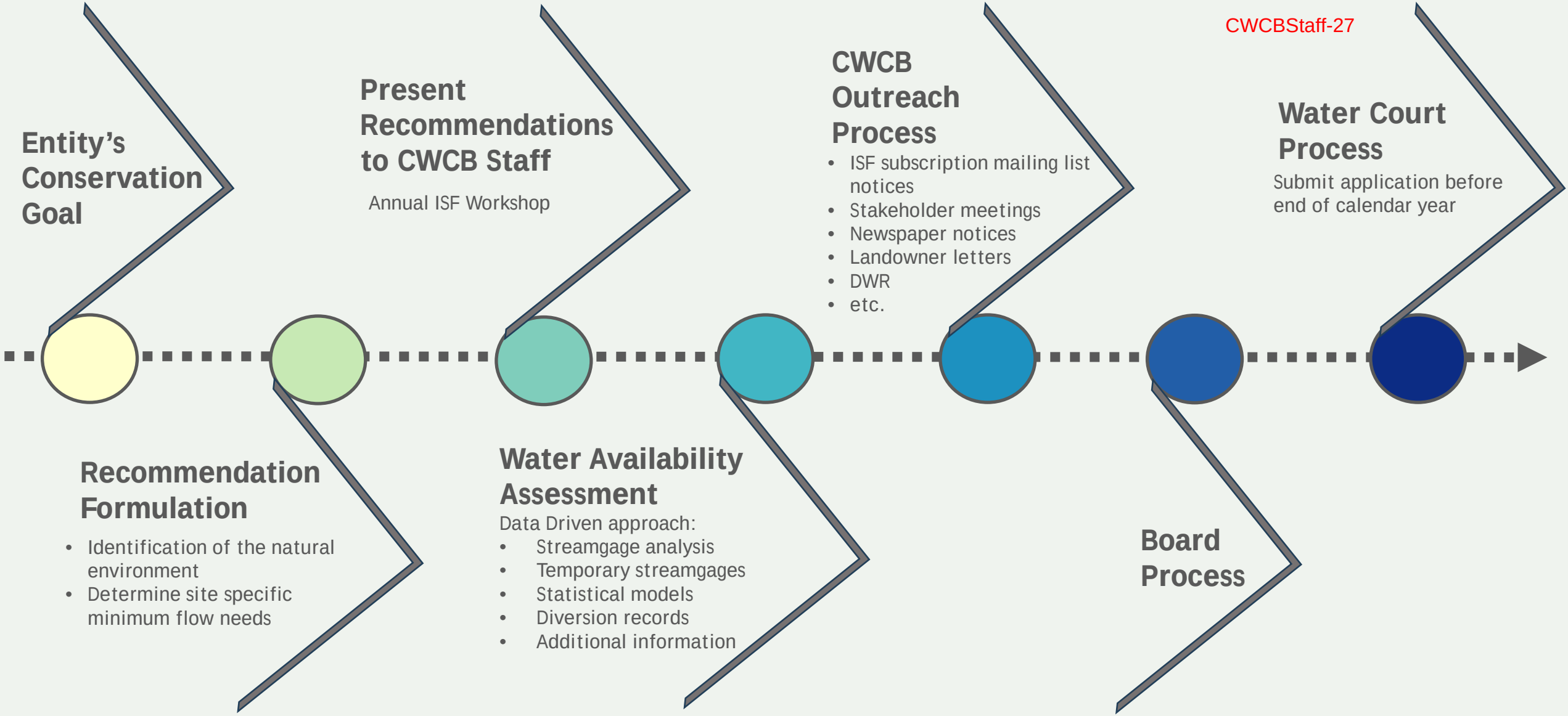
Submit Application Before End of Calendar Year

DATE FILED: December 13, 2021 5:35 PM
FILING ID: 93E59F28EC42F
CASE NUMBER: 2021CW3077

DISTRICT COURT, WATER DIVISION NO. 2, COLORADO 501 North Elizabeth Street, Suite 116 Pueblo, CO 81003	
CONCERNING THE APPLICATION FOR WATER RIGHTS OF: COLORADO WATER CONSERVATION BOARD, IN EAST FORK ARKANSAS RIVER, A NATURAL STREAM; IN THE ARKANSAS RIVER HEADWATERS WATERSHED, IN LAKE COUNTY, COLORADO	▲**COURT USE ONLY**▲
Attorneys for the Colorado Water Conservation Board: PHILIP J. WEISER, Attorney General MARC D. SARMIENTO,	Case No.: 2021CW___ Div. 2

ISF New Appropriation Process

CWCBStaff-27



ISF New Appropriation Process

Ongoing ISF Recommendations

CWCBStaff-27

Division 1

East Roaring Fork, Larimer County, CPW

Garber Creek, Douglas County, CPW

Platte Gulch, Park County CPW & Park County

West Plum Creek, Douglas County, CPW

Division 2

Cottonwood Creek, Custer County, CPW

Cottonwood Creek, Fremont County, BLM

East Gulch, Fremont County, BLM

Division 4

Beaver Dams Creek, Ouray County, CPW

Cunningham Creek, Delta County, CPW

East Fork Dry Creek, Montrose & Ouray Counties, CPW

East Muddy Creek, Gunnison County, BLM

Goat Creek, San Miguel County, BLM

Main Hubbard Creek, Delta County, CPW

Middle Hubbard Creek, Delta County, CPW

Pine Creek, CPW, Gunnison County, CPW

Sink Creek, Delta County, CPW

Steuben Creek (*Increase*), Gunnison, CPW

Uncompaghre River, Ouray County, CPW

Unnamed Tributary to East Fork Dry Creek, Montrose & Ouray Counties, CPW

West Hubbard Creek, Delta County, CPW

West Muddy Creek, Gunnison County, BLM

Division 5

Coon Creek, Mesa County, BLM

Derby Creek (Increase), Eagle County, BLM

Division 6

Bear Creek, Garfield County, CPW

Big Fish Creek, Garfield County, DPW

Clear Creek, Moffat County, BLM

East Marvine Creek, Rio Blanco County, CPW

Hauskins Creek, Garfield County, CPW

Hill Creek, Rio Blanco County, CPW

Lynx Creek, Garfield County, CPW

Milk Creek, Moffat County, BLM

Mirror Creek, Rio Blanco County, CPW

Pagoda Creek, Rio Blanco County, BLM

Paradise Creek, Garfield and Rio Blanco Counties, CPW

Picket Pin Creek, Garfield County, CPW

South Fork White River, Rio Blanco, CPW

Vermillion Creek, Moffat County, BLM

https://cwcb.colorado.gov/2024-isf-recommendations

2024 NEW RECOMMENDATIONS

CWCBStaff-27

KATIE BIRCH
Colorado Parks and Wildlife

ROY SMITH
Bureau of Land Management

JULIE NANIA
High Country Conservation Advocates

NICOLE GIBNEY
National Park Service

CONTACT US
laura.corona@state.co.us
cwcb.colorado.gov