Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-1

Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, 2 CCR 408-2

(Rules effective 9/14/2025)

DEPARTMENT OF NATURAL RESOURCES

Colorado Water Conservation Board

RULES CONCERNING THE COLORADO INSTREAM FLOW AND NATURAL LAKE LEVEL PROGRAM

2 CCR 408-2 (*Effective 9/14/2025*)

---

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 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 the 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.

5i. Required Findings.

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.

(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 determination 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 for §§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. In the case of loans made pursuant to Section 37-83-105(1)(c), C.R.S., an owner of a decreed storage water right may loan water to the CWCB to preserve or improve the natural environment to a reasonable degree for stream reaches in which the Board does not hold a decreed instream flow water right. 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. In the case of loans made pursuant to Section 37-83-105(1)(c), C.R.S., such documentation shall include an analysis of historical diversions to storage and/or releases of the loaned water right for its decreed beneficial uses, as relevant;

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. For any expedited loan, the CWCB shall comply with any terms and conditions imposed by the State Engineer to prevent injury. In addition, for loans made pursuant to Section 37-83-105(1)(c), C.R.S. of stored water for use in stream reaches in which the Board does not hold a decreed instream flow water right, the Board will:

i. request and review a biological analysis from CPW concerning the extent to which the proposed loan will preserve or improve the natural environment to a reasonable degree, and review any other biological or scientific evidence presented to the Board; and

ii. make findings on flow rate(s), time period(s), and reach(es) of stream appropriate to preserve or improve the natural environment to a reasonable degree with the loaned water.

(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, or loans to preserve or improve the natural environment to a reasonable degree made pursuant to Section 37-83-105(1)(c), C.R.S. of stored water for use in stream reaches in which the Board does not hold a decreed instream flow water right, 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, or loans to preserve or improve the natural environment to a reasonable degree made pursuant to Section 37-83-105(1)(c), C.R.S., 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, and for loans made pursuant to Section 37-83-105(1)(c), C.R.S., make findings on the flow rate(s), time period(s), and reach(es) of stream to preserve or improve the natural environment to a reasonable degree with the loaned water; and

iii. for loans made pursuant to Section 37-83-105(1)(b), C.R.S., 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. In the case of loans made pursuant to Section 37-83-105(1)(c), C.R.S., such documentation shall include an analysis of historical diversions to storage and/or releases of the loaned water right for its decreed beneficial uses, as relevant;

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), or in the case of loans made pursuant to Section 37-83-105(1)(c), C.R.S, of stored water, such rate(s), time period(s), and reach(es) as determined by the Board to be necessary to preserve or improve the natural environment to a reasonable degree, 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.

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-2

May 2025 Staff's Board Memo

(*use these hyperlinks for Enclosures*)

https://cwcb.colorado.gov/2025-shoshone-isf-acquisition

(or)

https://dnrweblink.state.co.us/cwcbsearch/0/edoc/227319/10d%20Shoshone%20Bd%20Memo-ISF%20Acquisition%20w%20Encl%20and%20all%20Public%20Comment%20submitted.pdf?searchid=c75290c4-8d9a-4eef-8f6a-360bc0a92343

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: Rob Viehl, Chief
Kaylea White, Senior Water Resource Specialist
Stream and Lake Protection Section

DATE: May 21-22, 2025

SUBJECT: 10.d Proposed Acquisition of an Interest in the Shoshone Water Rights for Instream Flow Use on the Colorado River

---

I. Staff Recommendation

Pursuant to instream flow Rule 6b, the Board's consideration of this proposal at this meeting will initiate the 120-day period for Board review. **No formal action is required at this time.** Staff believe that this proposal for instream flow use is a valuable additional beneficial use of the historical Shoshone Power Plant water rights to preserve and improve the natural environment by restoring flows in the depleted reach of stream and improving river connectivity and habitat. This initial presentation of this proposal provides an opportunity for the Board and the public to identify questions or concerns that Staff and project partners can address at this or a subsequent meeting. Ultimately, the Board will be required to evaluate the appropriateness of the acquisition and, if accepted, to determine how best to utilize the acquired water to preserve and improve the natural environment, which will be subject to any terms and conditions imposed by the final change of water right decree.

II. Background

The proposed acquisition represents a rare opportunity for an important public-private partnership regarding operation of a large water right that has been, and will continue to be, important to most of the major water providers and water users in both the west slope and east slope of Colorado. This opportunity has come to CWCB after several decades of discussions and considerations of various options (both temporary and permanent) for managing the situation if the Shoshone Power Plant ceases to generate hydropower, and thus ceases use of the water rights. The Shoshone Water Rights, although physically impacting a relatively short reach of stream, because of its magnitude and location of operation can have an effect on a large part of the entire state of Colorado. Because of the magnitude of potential impacts, project partners are dedicated to maintaining river operations upon which water users statewide have historically relied and planned. Project partners will continue to

coordinate with the many other statewide water users during the water court process to ensure non-injury to other water rights, as is required by Colorado water law.

(1) Key Drivers of Colorado River Administration

A number of features drive the complex administration of the Colorado River within the state of Colorado. Multiple transmountain water diversions (TMDs) divert an average of nearly 500,000 acre-feet from the Colorado River and its tributaries on the "west slope" for front-range uses on the "east slope". The large **upstream** TMDs include: Adams Tunnel (Colorado-Big Thompson and Windy Gap projects managed by USBR and Northern Water); Robert's Tunnel (Denver Water); Moffat Tunnel (Denver Water); and Homestake Tunnel (Aurora and Colorado Springs). The large **downstream** TMDs include: Boustead Tunnel (Fry-Ark Project managed by SEWCD, CPW, and USFS); and Twin Lakes Tunnel (Twin Lakes Canal Company). In addition to the large TMDs, several large reservoirs are used to store water for east slope use, to replace east slope uses on the west slope, or as compensatory water for west slope use. The large **upstream** reservoirs include: the four reservoirs of the Colorado Big Thompson project (Lake Granby, Shadow Mountain Reservoir, Grand Lake, and Willow Creek Reservoir); Windy Gap Reservoir; Dillon Reservoir; Green Mountain Reservoir; Williams Fork Reservoir; Wolford Mountain Reservoir; and Homestake Reservoir. The main **downstream** reservoir is: Ruedi Reservoir. See the maps at **Enclosure A**. The large and dominant calling water rights are the Shoshone Water Rights (described below in **Section II (2))**, and the Cameo water rights demand for Grand Valley irrigators.

(2) State-based Planning and Management Efforts

State-funded planning efforts and processes have identified permanent protection of the Shoshone water rights as critical to the Colorado River. The Colorado Basin Roundtable's Basin Implementation Plan[1] states that, "Protecting the Shoshone Hydroelectric Plant [water rights], Grand Valley irrigators' water rights (Cameo Call), and the 15-Mile Reach are vital to both consumptive and nonconsumptive needs." It encourages all entities to "work together to ensure the Shoshone Hydroelectric Plant water rights are maintained in perpetuity to ensure downstream water deliveries are made." The Upper Colorado Wild and Scenic Alternative Management Plan[2] (W&S Plan) is a state-supported effort to develop an alternative to a Wild and Scenic designation to protect the Outstandingly Remarkable Values (ORVs) in the Colorado River from the confluence with the Blue River downstream to a location near No Name Creek, just downstream of Shoshone. This stakeholder-led plan, formally federally adopted in 2015, identifies the Shoshone and Cameo Water Rights as long-term protective measures that are "expected to provide significant protection of the ORVs." ORVs include

[1] Colorado Basin Implementation Plan, Volume 1, January 2022, https://dnrweblink.state.co.us/cwcbsearch/0/edoc/216707/Colorado_BIP_Volume1_2022.pdf
[2] Amended and Restated Upper Colorado River Wild and Scenic Stakeholder Group Management Plan, Adopted January 2012, Amended and Restated June 2020 Last revised July 2024 https://www.upcowildandscenic.com/uploads/1/3/5/3/135388668/amended_and_restated_sg_plan_july_2024.pdf

scenic, recreational fishing, recreational float-boating, geological, wildlife, historical, and paleontological values. According to the W&S Plan, the administrative call from these water rights "generally results in stream flow through the subject stream segments in amounts greater than would exist in the absence of the administrative call." Lastly, the Middle Colorado River Integrated Water Management Plan[3] (2021), which evaluated the Colorado River from Glenwood Canyon to De Beque Canyon, identified securing the permanent acquisition of the Shoshone Water Rights with the addition of an instream flow use as an important action that can benefit irrigation, municipal, recreational, and environmental interests.

III. The Proposal

The Colorado River Water Conservation District ("River District") and Public Service Company of Colorado ("PSCo") have offered to the Colorado Water Conservation Board ("CWCB") an interest in the Shoshone Water Rights for instream flow ("ISF") purposes on the mainstem of the Colorado River in Glenwood Canyon. See the maps at **Enclosure A,** the offer letter at **Enclosure B**. The Shoshone Water Rights are decreed for non-consumptive hydropower generation use at the Shoshone Hydroelectric Power Plant, currently owned by PSCo, a subsidiary of Xcel Energy. Through a December 2023 Purchase and Sale Agreement ("PSA), the River District agreed to purchase, and PSCo agreed to sell, the Shoshone Water Rights, so long as the water rights will be used for instream flow purposes to the extent they are not being used for power generation, contingent on a number of conditions including a PSCo lease for continued hydroelectric power generation while the power plant remains operable.

Under this proposal, the River District would purchase and maintain ownership of the water rights, while CWCB would hold perpetual ISF use rights, and PSCo would hold a lease for hydropower use. See draft ISF Agreement as **Enclosure C**. The Shoshone Water Rights offered to CWCB total 1,408 cfs, comprised of the Senior Shoshone Water Right in the amount of 1,250 cfs, and the Junior Shoshone Water Right in the amount of 158 cfs, (together, the "Shoshone Water Rights"), as further described below in **Section VI**. The CWCB would use these water rights, pursuant to their individual priorities, in the combined amount of up to 1,408 cfs, as recommended by Colorado Parks and Wildlife (see CPW recommendation as **Enclosure D**), to preserve and improve the natural environment to a reasonable degree in a 2.4 mile reach of the Colorado River between the Shoshone Power Diversion Dam and Tunnel and the Shoshone Power Plant Discharge Outlets ("Shoshone Reach"), as shown on the maps at **Enclosure A**.

To effectuate the proposal, a joint water court application will be required, in which CWCB, PSCo, and the River District will be co-applicants. In the water court application, the co-applicants will request a change of the beneficial use of the water rights to add instream flow use by the CWCB when the rights are not being used, or only partially being used, to generate hydropower. See draft water court application, as **Enclosure E.** The River District's proposed

[3] Middle Colorado River Integrated Water Management Plan, 2021
https://www.midcowatershed.org/iwmp

dedication of the exclusive right to use the Shoshone Water Rights for instream flow purposes to the CWCB is in accordance with section 37-92-102(3), C.R.S., and the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program, 2 CCR 408-2 ("ISF Rules").

IV. The Board's ISF Acquisition Procedures

ISF Rule 6 governs the Board's procedures to acquire water for ISF use. ISF Rule 6b gives the Board 120 days from the Board's first consideration of the proposed acquisition to determine what terms and conditions it will accept in an acquisition agreement for an interest in water to preserve and improve the natural environment. ISF Rule 6 requires a minimum of two Board meetings to allow for public input prior to taking final action on a proposed acquisition. The Board's initial consideration of this proposal at its May 2025 meeting initiates the 120-day time period for the Board to consider the proposed acquisition. ISF Rule 6e requires the Board to evaluate the appropriateness of the acquisition and, if accepted, to determine how best to utilize the acquired water to preserve or improve the natural environment. ISF Rule 6e lists several factors the Board shall consider in its evaluation of the acquisition, which are addressed in **Section VIII** of this memo.

The Board can take final action on the proposal at the following Board meeting in July 2025. However, ISF Rule 6m(4) provides that any person may request the Board to hold a hearing on the proposed acquisition, so long as such request is filed within 20 days after the first consideration, which is this May 2025 Board meeting. In the event a hearing is requested, the Board will need to take action to consider the request, and if granted, to appoint a Hearing Officer and schedule a hearing to occur within 120 days of this first consideration. Such hearing and final decision on the proposal could occur at the Board meeting in September 2025.

The Board can accept several types of ISF acquisitions for water, water rights, or interests in water, for various durations including temporary, long-term, and permanent acquisitions. Two different statutes govern the required processes after CWCB approval: (a) permanent acquisitions fall under 37-92-102(3) C.R.S., which operate under the jurisdiction of the Water Court; and (b) temporary loan acquisitions fall under 37-83-105 C.R.S., which operate under the jurisdiction of the Division of Water Resources. This proposal is for a permanent acquisition of an interest in water under 37-92-102(3) that requires judicial action by the water court to allow a new beneficial use under Colorado water rights law. The Board can accept the interest in the water right, but the water right must be changed in water court to allow the additional ISF use under a final decree before the ISF use can occur. Acceptance of the full decreed amount by the CWCB Board is essential so that the full decreed water right may be changed in water court; however, the future use of the Shoshone Water Right shall be subject to any terms and conditions imposed by the change of water right final water court decree. See generally 37-92-305(3) C.R.S. (regarding changes of water rights by the water courts). The water court process is required, as a standard procedure under the Water Rights and Determination Act of 1969, 37-92-101 C.R.S. ("the 1969 Act"), and so long as proper

notice is given, the water court shall have jurisdiction over all parties affected thereby, whether or not they chose to appear.

As required by statutes and regulations, CWCB staff has provided proper notice and requests for recommendations regarding this proposal. CWCB staff has requested recommendations from the Colorado Division of Parks and Wildlife (CPW), the U.S. Department of Agriculture, and the U.S. Department of Interior. Pursuant to ISF Rule 6m(1), CWCB staff has provided notice of the proposed acquisition to all persons on the appropriate ISF Subscription Mailing Lists and provided notice to the State Engineer's Substitute Supply Plan Notification List for Water Division 5.

V. The Board Actions to Date

In response to the River District's September 2023 application to the CWCB for a Non-Reimbursable Investment Project seeking funding toward the purchase of the water rights associated with the Shoshone Power Plant, on January 25, 2024, the CWCB held a virtual workshop. At the workshop, presentations and discussions on the Shoshone Water Right Permanency Project included reviews of agreements and the ISF acquisition process with a general timeline. Board action followed during the January 29, 2024 CWCB Board meeting, in which the CWCB Board unanimously approved the request to partially fund the River District's purchase of the Shoshone Hydro Plant water rights. The 2024 Project's Bill (HB 24-1435) Section 14(2), states:

> (2) (a) For the 2024-25 state fiscal year, $20,000,000 is appropriated to the department of natural resources for use by the Colorado water conservation board. This appropriation is from the Colorado water conservation board construction fund created in section 37-60-121, C.R.S. To implement this subsection (2)(a), the Colorado water conservation board may use this appropriation to partner with the Colorado river water conservation district in the purchase of the water rights owned by the public service company of Colorado and currently used for the operation of the Shoshone power plant. The Colorado water conservation board shall vote to release the money to the Colorado river water conservation district after confirming that the closing conditions of the purchase and sale agreement between the Colorado river water conservation district and the public service company of Colorado have been met.
>
> (b) The money appropriated in subsection (2)(a) of this section remains available for the designated purposes until June 30, 2031.

VI. The Shoshone Water Rights

The Shoshone Water Rights are currently used as decreed, for power generation by PSCo at the hydroelectric power plant (the "Shoshone Power Plant") located on the mainstem of the Colorado River in Glenwood Canyon, approximately six miles upstream of the City of

Glenwood Springs. The Shoshone Power Plant produces hydroelectric energy by means of PSCo's diversion of the Shoshone Water Rights (consisting of the 1905 senior priority water right in the amount of 1,250 cfs, and a 1940 junior priority water right in the amount of 158 cfs), further described as follows:

(i) The Glenwood Power Canal and Pipeline water right, decreed on December 9, 1907, in Civil Action No. 466, Eagle County District Court, in the amount of 1,250 cfs with an appropriation date of January 7, 1902, for power, mining, milling, manufacturing, lighting, heating, and traction purposes; and as decreed absolute by the Eagle County District Court on February 27, 1911, in Civil Action No. 553 (the "Senior Shoshone Water Right"); and

(ii) The Shoshone Hydro Plant Diversion No. 2 water right, decreed absolute on February 7, 1956, in Civil Action No. 1123, Eagle County District Court, in the amount of 158 cfs, with an appropriation date of May 15, 1929, for manufacturing and generation of electrical energy (the "Junior Shoshone Water Right").

See Shoshone decrees as **Attachment 2 to Enclosure F.** The water diverted by PSCo for hydropower generation use is returned to the Colorado River after such water is conveyed through the Shoshone Power Plant's penstocks and turbines to the river at the plant's discharge outlets, approximately 2.4 miles downstream of the point of diversion at the Shoshone Diversion Dam and Tunnel, as depicted on the maps attached as **Enclosure A**.

Administration and measurement of the Shoshone Water Rights has historically occurred using the streamflow gauge (USGS 09070500) located on the Colorado River near Dotsero, Colorado ("Dotsero Gage"). Consistent with historical administration, the "Natural Flow" is the amount of water in the Colorado River measured at the Dotsero Gage, including the amount of water usable under by the Shoshone Water Rights when those water rights are in priority, except that the Natural Flow does not include any water released from storage and conducted into the Colorado River upstream of the Dotsero Gage (accounting for evaporation and transit loss), which water is intended for delivery for use downstream of the discharge outlets for the Shoshone Power Plant.

VII. Summary of Proposed ISF Use

Under this proposal, CWCB would enter into a Water Right Dedication and ISF Agreement ("ISF Agreement") with the River District and PSCo, which dedicates to CWCB a perpetual ISF use of the Shoshone Water Rights. See draft ISF Agreement as **Enclosure C**. Pursuant to the PSA between the River District and PSCo, with an effective date of January 1, 2024, the River District is the contract purchaser of the Shoshone Water Rights. The PSA provides that PSCo, and its successors and assigns, is entitled to a leasehold interest in the Shoshone Water Rights for continued use of the Shoshone Water Rights for hydropower generation at the Shoshone Power Plant. See the "Lease," the form of which is attached to the PSA at **Attachment 3 to Enclosure F**.

CWCB would apply its acquired exclusive right for ISF use in the Shoshone Reach through approximately 2.4 miles on the Colorado River. The ISF use serves to preserve and improve the natural environment to a reasonable degree using the acquired interest in the Shoshone Water Rights for a combined rate of ***up to*** 1,408 cfs (under the 1902 senior right of 1250 cfs, and the 1929 junior right of 158 cfs), as further described above in **Section VI**. The water rights would retain their original individual priority dates with respect to water rights administration. Downstream of the Shoshone Reach, the return flows from use of the Shoshone Water Rights become part of the natural stream flow in the Colorado River and are available for appropriation and use by water rights holders. The CWCB would accept the proposed interest in the full decreed amount of the Shoshone Water Rights, which ISF use will then be subsequently limited by any terms and conditions imposed by the change of water right final water court decree, as required to prevent injury to other water users, both upstream and downstream of the Shoshone Reach. CPW analysis indicates that the best use of the acquired water rights is to preserve and improve the natural environment in the Shoshone Reach of the Colorado River at any rate up to full decreed amount of 1,408 cfs, and that fish habitat will also be improved in the Shoshone Reach at streamflows up to at least 3,000 cfs. See CPW's recommendation letter and report as **Enclosure D**. CPW evaluated the higher flow rates partly because, at times, there has been, and will continue to be, other water in the stream, including shepherded reservoir releases flowing through this stream reach for delivery to downstream uses. These higher flow rates consist of Natural Flow available to the Shoshone Water Rights combined with the shepherded water.

Because this acquisition is for non-consumptive water rights, and has no associated historical consumptive use, the provisions of sections 37-92-102(3) and 305(3)(b), C.R.S. (requiring that all contracts or agreements for interests in water, and the water court decree implementing the contracts or agreements, to state that the board or the lessor, lender, or donor may bring about beneficial use of the historical consumptive use of the leased, loaned, or donated water right downstream of the instream flow reach as fully consumable water) are not relevant and do not apply to this acquisition.

The Shoshone Water Rights influence flow in the Colorado River and its tributaries both upstream and downstream of the Shoshone Reach. Administration and use of the Shoshone Water Rights for ISF use in the Shoshone Reach is intended to replicate the historical administration and use of the Shoshone Water Rights. Administration and use of the water rights for ISF purposes in the Shoshone Reach will allow for the continuance of administrative practices and water availability scenarios upon which water users have relied, and for the continuance of water supply plans for many entities both upstream and downstream of the Shoshone Reach. **Upstream,** this will help maintain the historical stream flow conditions in the Colorado River mainstem and its tributaries upon which upstream water users have relied, including conditions for CWCB's many upstream ISF water rights. **Downstream**, because administration and use of the Shoshone Water Rights for ISF use in the Shoshone Reach should not change, this use will maintain required historical return flows in the Colorado River mainstem upon which downstream water users have relied, including downstream ISF water rights. Maintaining such downstream return flow conditions is a standard requirement in

water court for water rights change cases. Factors the Board is required to consider are discussed below in **Section VIII**.

VIII. Factors Required for CWCB to Consider

Pursuant to ISF Rule 6e, 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, as discussed under each of the enumerated 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;***

The proposed reach for ISF use of the Shoshone Water Rights, the Shoshone Reach, is an approximately 2.4-mile reach of the Colorado River in Glenwood Canyon between the Shoshone Power Diversion Dam and Tunnel ("Upstream Terminus"), and the Shoshone Power Plant Discharge Outlets ("Downstream Terminus"). See maps in **Enclosure A**. The Shoshone Reach is defined by the Shoshone Water Rights decrees and historical operations. The Shoshone Power Plant takes water from the Colorado River via the Shoshone Diversion Dam and Tunnel, which is located upstream of the Shoshone Power Plant. This historical use of the Shoshone Water Rights for power generation depletes the Shoshone Reach by the full diversion amount during plant operation. Once water is diverted from the river at the Shoshone Diversion Dam, it is conveyed through a tunnel in the canyon walls, before dropping through two turbines and returning to the Colorado River via discharge outlets located just beneath the Shoshone Power Plant, which is the historical location of return flows. There is not an existing ISF water right in this reach, and no existing ISF relies on the return flows except to the extent that return flows may flow, if not consumed, to the 15-Mile Reach ISF water rights decreed in Case Nos. 92CW286 and 94CW330. The natural environment to be preserved and improved is within this 2.4-mile reach of the Colorado River in Glenwood Canyon, as further discussed in **Section VIII (5)** below.

Upstream of the Shoshone Reach, the CWCB holds over 300 decreed ISF water rights that protect nearly 1,500 miles of streams and rivers. See maps in **Enclosure A.** These ISFs, held on behalf of the people of Colorado, preserve headwater streams tributary to the mainstems, as well as mainstem reaches of the Colorado, Blue, and Eagle Rivers. These ISF water rights protect values that range from conserving native Colorado Cutthroat Trout to recreationally important Gold Medal sport fisheries throughout the upper basin. The ISFs above the Shoshone Reach were appropriated based on the stream conditions that existed at the time of the appropriation. When calling, the Shoshone Water Rights have historically curtailed junior diverting water rights on the tributaries, effectively bringing streamflow through these

upstream ISF reaches, particularly during low-flow conditions when calls are necessarily placed. For example, in 2023, Fraser River streamflow dropped significantly, and upon investigation, it was found that when the Shoshone call was abruptly turned off, diverters were able to take an additional 9-10 cfs from two different tributaries to the Fraser River. DWR could not curtail the water rights without a senior call in effect. This dried up Vasquez Creek and reduced streamflow below the decreed ISF rates on the Fraser River. This is just one example to demonstrate that without maintenance of the historical flow regime, there is potential for stream conditions to change significantly in the upper portion of the basin, both on the mainstem and on the tributaries, resulting in less streamflow for existing ISF water rights.

Downstream from the Shoshone Reach, the CWCB holds numerous decreed ISF water rights in the headwater streams tributary to the mainstems, as well as in mainstem reaches of the Roaring Fork, Crystal, and Colorado Rivers that are indirectly impacted by operations of the Shoshone Water Rights. See maps in **Enclosure A.** Potential impacts to these downstream ISF water rights by Shoshone operations are complex and depend on operations of both large and small individual water rights, which is difficult to parse, demonstrating the degree of entanglement of ISF water rights with other operations over several different river basins.

(2) The natural flow regime;

The headwaters of the Colorado River originate in the State of Colorado in Rocky Mountain National Park along the continental divide at about ~14,300 feet in elevation. The Colorado River flows for about 166 miles through Grand Lake, Kremmling, and Glenwood Canyon before reaching the Shoshone Powerplant Diversion Dam. Flows in the Shoshone Reach are the result of a natural snowmelt runoff flow regime, together with significant flow alteration due to water uses throughout the 4,470 square mile basin.

Streamflow in the Colorado River is highly variable year to year and seasonally due to natural differences in snowpack, rain events, and baseflow processes. There are also many sources of flow alteration in the upstream basin including multiple TMDs, large reservoirs, smaller reservoirs, in-basin diversions, and other releases to the 15-Mile Reach. These different water uses have a variety of effects from reducing the total flow volume to changing the magnitude or timing of water reaching the Shoshone Reach.

The USGS measures streamflow at the Colorado River Dotsero Gage, USGS 09070500), approximately 8.5 miles upstream from the Shoshone Reach. The Dotsero Gage, which includes effects from upstream water uses, indicates that for the full gage period of record from 1940 to 2024, monthly mean flows are between 4,600 and 6,100 cfs during runoff and between 850 cfs and 1,200 cfs during winter months. Peak streamflow during snowmelt runoff can be as low as 2,000 cfs in drought years such as 2002 and over 22,000 cfs in extreme runoff years like in 1984.

(3) Any potential material injury to existing decreed water rights;

Within the Shoshone Reach, there are no other water rights or diversions. However, a number of augmentation plans and exchanges extend through this reach. By maintaining the non-consumptive nature of the water rights, along with continuing operation of the water rights in their historical manner, the exchanges and augmentation plans should be unaffected by the new ISF use. This proposed acquisition is intended to maintain historical use and replicate historical return flows.

There are many existing decreed junior and senior water rights located both upstream and downstream of the Shoshone Water Rights and the associated Shoshone Reach. Many junior upstream users can continue to divert during a Shoshone call because they operate under either individual augmentation plans or are covered by the Green Mountain Reservoir historic user pool releases ("HUP"). Downstream users rely on the return flows from the Shoshone operation. Because the historical operation is to be maintained with the proposed ISF use, both the upstream and downstream water rights will be protected against injury. The upstream water rights should experience the same operation of their water rights, which will continue to rely on the existing augmentation plans and HUP protections. The downstream users can continue to rely on maintenance of historical return flows from this new non-consumptive ISF use. The details of the historical use that is to be replicated will appropriately be analyzed during the required water court process, is designed to investigate such details. Use of the Shoshone Water Rights for ISF and hydropower purposes shall be subject to any terms and conditions imposed by the change of water right decree to be entered by the water court.

(4) The historical consumptive use and historical return flows of the water right proposed for acquisition that may be available for instream flow use;

The Shoshone Water Rights have been used throughout most of the 20th century and are still in operation today. This long period of hydropower plant operation provides a robust historical use period that will result in acquired water rights that can be used for ISF beneficial use upon completion of a change case. The exact amount and timing of water that can be put to ISF use will be determined during the water court change case. It is the intent of the proposed acquisition to replicate the historical use and historical return flows while applying this non-consumptive water right to ISF use within the historically depleted stream reach. Because the historical use is for non-consumptive power generation, the measure of the water right is its historical use, rather than a historical consumptive use. Pursuant to any restrictive terms and conditions in the final water court decree, so long as the return flows are maintained to the stream downstream of the Shoshone Reach, the full historical diversion amount will become available for ISF use within the Shoshone Reach, to the extent the water rights are not being used to generate hydropower. As with any change of water rights, determining the historical use amount can be a complicated, time-consuming, and potentially controversial endeavor. During the water court process, parties to the change case will present and discuss their engineering analyses and legal positions regarding the historical use

of the Shoshone Water Rights using various types of measures, models, and operations regarding historical stream flow, diversions, administration, reservoir releases, water rights analysis, and power generation. Several numerical and conceptual models will likely be discussed as part of the water court process, which will rely on water rights experts and will be a multi-year process to develop decree terms and conditions regarding the amount of water that will be available for ISF use under the Shoshone Water Rights. Interested parties to date have expressed support for this proposal in general but have expressed hesitation on the historical use analysis and resulting amount of water that will be available for ISF use. Details regarding limits on timing and amounts will be evaluated during the water court process and will be imposed by the final water court decree.

> ***(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;***

The Shoshone Reach of the Colorado River runs through the central portion of Glenwood Canyon, a confined canyon where the river over time carved a deep gorge that runs nearly 15 miles between 2,500 feet high walls of sedimentary rock. The canyon is a heavily trafficked corridor, the river and its floodplain are confined by Interstate 70, a streamside recreational path, and railroad. The Shoshone Reach of the Colorado River in Glenwood Canyon supports a high-quality fishery, even in its dewatered state with limited available habitat. The legal diversion by the Shoshone Water Rights of the entirety of the Colorado River when flows are less than 1,408 cfs leaves the Shoshone Reach in a dewatered state. Under seasonally low flows with diminished conditions, aquatic habitat persists, specifically in deep pools and glides isolated by steep boulder drops or shallow riffles. Despite the anthropogenic alteration of the Colorado River through Glenwood Canyon, the Shoshone Reach continues to support a variety of native and sport fisheries and some limited riparian areas. Wildlife commonly encountered include bighorn sheep, river otters, beaver, Mule Deer, elk, Peregrine Falcons, and eagles. Riparian and upland plant communities generally consist of cottonwood and alder in the riparian areas, and oak, pine, spruce, fir, and aspen trees in the uplands. The unique canyon geology includes caves, springs, and geothermal outputs. Consistent base flows and periodic high flows would provide major benefits in the Shoshone Reach that include maintenance of food webs and sediment dynamics, dampening of temperature extremes, and increased aquatic habitat. See GEI's report as **Enclosure G**.

Given the demonstrated biological benefits within the Shoshone Reach, to the Colorado River headwaters and tributaries, and to the mainstem Colorado River below the power plant, CPW staff believe this is an appropriate acquisition and recommends the CWCB accept the interest in the acquired water. CPW's analysis indicates that the best use of the acquired water rights is to preserve and improve the natural environment in the Shoshone Reach of the Colorado River at any rate up to the full decreed amount of 1,408 cfs, and that fish habitat will also be improved in the Shoshone Reach at streamflows up to at least 3,000 cfs. See CPW's recommendation letter and report as **Enclosure D**. CPW evaluated the higher flow rates because, at times, there has been, and will continue to be, other water in the stream,

including shepherded reservoir releases flowing through this stream reach for delivery to downstream uses. These higher flow rates consist of Natural Flow available to the Shoshone Water Rights combined with the shepherded water.

(6) The location of other water rights on the subject stream(s);

Within the Shoshone Reach, there are no other water rights or diversions. However, a number of augmentation plans, exchanges, and water deliveries extend through the Shoshone Reach. There are many decreed junior and senior water rights located both upstream and downstream of the Shoshone Reach. See **Section II (1)** above, for a list of the main structures. See the discussion regarding protection from injury above, in **Section VIII (3)**.

(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;

CWCB will ensure that the change of the Shoshone Water Rights to allow ISF uses will not expand the historical use of the water right and will not reduce the return flows that were maintained by the historical diversions. Use of the Shoshone Water Rights for ISF and hydropower purposes shall be subject to terms and conditions imposed by the change of water right decree to be entered by the water court, which will restrict the future use. Downstream of the Shoshone Reach, the return flows from use of the Shoshone Water Rights will become part of the natural stream flow in the Colorado River and will be available for other uses as it was historically. CWCB will ensure that this acquisition will not have an effect on interstate compact issues.

(8) The effect of the proposed acquisition on the maximum utilization of the waters of the state;

The beneficial use of the Shoshone Water Right under this acquisition will be for non-consumptive ISF use in the Shoshone Reach. Because the water right is non-consumptive, any other use of this water right must also be non-consumptive, which includes very few types of other water uses. CWCB will ensure that changing these water rights to include ISF use will allow the same level of utilization of the non-consumptive Shoshone Water Rights, which will not alter water available for other uses. Therefore, CWCB will ensure that use of the Shoshone Water Rights for instream flow to preserve and improve the Colorado River in the Shoshone Reach will continue to allow maximum utilization of the waters of the State of Colorado. At the lower terminus of the Shoshone Reach, the historical return flow will be maintained and will become part of the natural stream flow available for downstream water uses, both consumptive and nonconsumptive. There are several large diversions downstream of the Shoshone Reach which rely on the historical return flows. Furthermore, for any return flows that remain in the river, that are not diverted and consumed between Shoshone and the 15-Mile Reach, have been used, and may continue to be used, by the ISF water right held by CWCB in 15-Mile Reach as another non-consumptive use. Consequently, by not expanding the

historical use, and by continuing the utilization of the Shoshone Water Rights, CWCB will ensure that this acquisition will not have a negative effect on the maximum utilization of the waters of the state.

(9) Whether the water acquired will be available for subsequent use or reuse downstream;

The River District and PSCo will not claim any right of use of the Shoshone Water Rights downstream of the Shoshone Reach in the change case filed for this acquisition. CWCB will not claim any such right, but rather any right of use in the Shoshone Water Rights ends at the Lower Terminus of the Shoshone Reach. Downstream of the Shoshone Reach, the return flows from use of the Shoshone Water Rights will become part of the natural stream flow in the Colorado River and will be available for appropriation and use by water rights holders.

Because this acquisition is for non-consumptive water rights, for which the return flow from use of these water rights will become part of the natural stream flow downstream of the Shoshone Reach, the provisions of §§37-92-102(3) and 305(3)(b), C.R.S. (requiring that all contracts or agreements for interests in water, and the water court decree implementing the contracts or agreements, to state the board or the lessor, lender, or donor may bring about beneficial use of the historical consumptive use of the leased, loaned, or donated water right downstream of the instream flow reach as fully consumable water) are not relevant and do not apply to this acquisition.

(10) The cost to complete the transaction or any other associated costs;

The River District has applied for a non-reimbursable grant in the amount of $20 million from CWCB, which CWCB has approved to help pay for a portion of their $99 million purchase of this water right from PSCo. This acquisition for ISF use is part of the grant process and does not require additional payments from the funds specifically allocated for ISF acquisitions from the construction fund. Other funds for the purchase include $20 million committed by River District's Board of Directors, over $16 million committed by west slope supporters, and $40 million awarded but not yet contracted by the U.S. Bureau of Reclamation as part of the Inflation Reduction Act's Upper Basin Environmental Drought Mitigation, Bucket 2 Ecosystem ("B2E") Financial Assistance Program. CWCB's other associated costs to complete the transaction include time commitments by staff and the Attorney General's Office for the Board process and water court processes, followed by operational needs with record keeping, which are all part of CWCB's normal operating budget.

(11) The administrability of the acquired water right when used for instream flow purposes;

The Colorado Division of Water Resources ("DWR") administers calls for the Shoshone Water Rights which have resulted in the curtailment of junior water rights upstream of the Shoshone Power Plant. The administration of the water rights, whether for hydropower use or for ISF

use, should remain the same as the historical practice and should be unaffected by this additional ISF use. The Senior Shoshone Water Right is one of the most senior water rights on the Colorado River. During significant periods of the year, there is not sufficient water to satisfy all water rights decreed on the Colorado River and its tributaries within the State of Colorado, thus administration of calls against junior water rights have been placed, by both the senior and the junior Shoshone Water Rights. Administration and measurement of the Shoshone Water Rights has historically occurred using the Dotsero Gage. Consistent with historical administration, the Natural Flow is the amount of water in the Colorado River measured at the Dotsero Gage, including the amount of water usable by the Shoshone Water Rights when those water rights are in priority, except that the Natural Flow does not include any water released from storage and conducted into the Colorado River upstream of the Dotsero Gage (accounting for evaporation and transit loss), which water is intended for delivery for use downstream of the discharge outlets for the Shoshone Power Plant.

IX. Conclusion

At a future Board meeting in which the Board will be asked to take final action, it is anticipated that Staff will recommend that the Board take the following actions:

- Determine that the CWCB accepts a perpetual interest in the Shoshone Water Rights for instream flow use up to the full decreed amounts to preserve and improve the natural environment to a reasonable degree;
- Direct the CWCB Director to sign the ISF Agreement, so long as it is substantially similar to the draft ISF Agreement attached to the Board memo;
- Determine that the best use of the acquired interest in the Shoshone Water Rights is to preserve and improve the natural environment to a reasonable degree within the Shoshone Reach of the Colorado River, up to the flow rates recommended by CPW, which will be included in the water court application; and
- Direct Staff to work with the Attorney General's Office and the Co-Applicants to file a water court application requesting to add an instream flow use to the Shoshone Water Rights in accordance with 37-92-102(3).

The Board can take final action on this proposal at the following Board meeting in July 2025 if no hearing is requested. However, if a hearing is requested within 20 days of the day the Board hears the proposal, and the Board grants the request, the hearing must be held within 120 days of May 21, 2025. The hearing and final action could occur at the September 2025 Board meeting. If the Board accepts the acquisition, a water court application would be filed, and the multi-year water court process could begin.

Enclosures:

A. Maps
    A1. Shoshone Reach
    A2. Colorado River Basin Transbasin Diversions and Reservoirs
    A3. Colorado River Basin ISF Water Rights
B. River District & PSCo's Offer Letter
C. Draft ISF Agreement
D. CPW's Recommendation Letter and Report
    D1. CPW's Letter of Recommendation
    D2. CPW's Biological Evaluation Report
E. Draft Water Court Application
F. River District's Technical Memorandum - with Attachments
    Attachment 1. Shoshone Water Rights Decrees
    Attachment 2. Maps
    Attachment 3. 2016 Shoshone Outage Protocol Agreement
    Attachment 4. Draft Instream Flow Agreement
    Attachment 5. 2024 Miller Report
    Attachment 6. 2025 Ecosystem Report
    Attachment 7. USFS-BLM Report
    Attachment 8. HU Assessment
    Attachment 9. Check Case Memo
    Attachment 10. Purchase and Sale Agreement
    Attachment 11. Hydros Yield Assessment
    Attachment 12. Hydros Yield Addendum
    Attachment 13. ISF Benefits Memorandum
    Attachment 14. Draft Water Court Application
G. GEI Report - GEI Consultants, Inc., April 2025 "Review of the Effects of Flow on Biology and Stream Processes, Glenwood Canyon"
H. Public Comment Letters (Aurora & Colorado Springs Utilities)

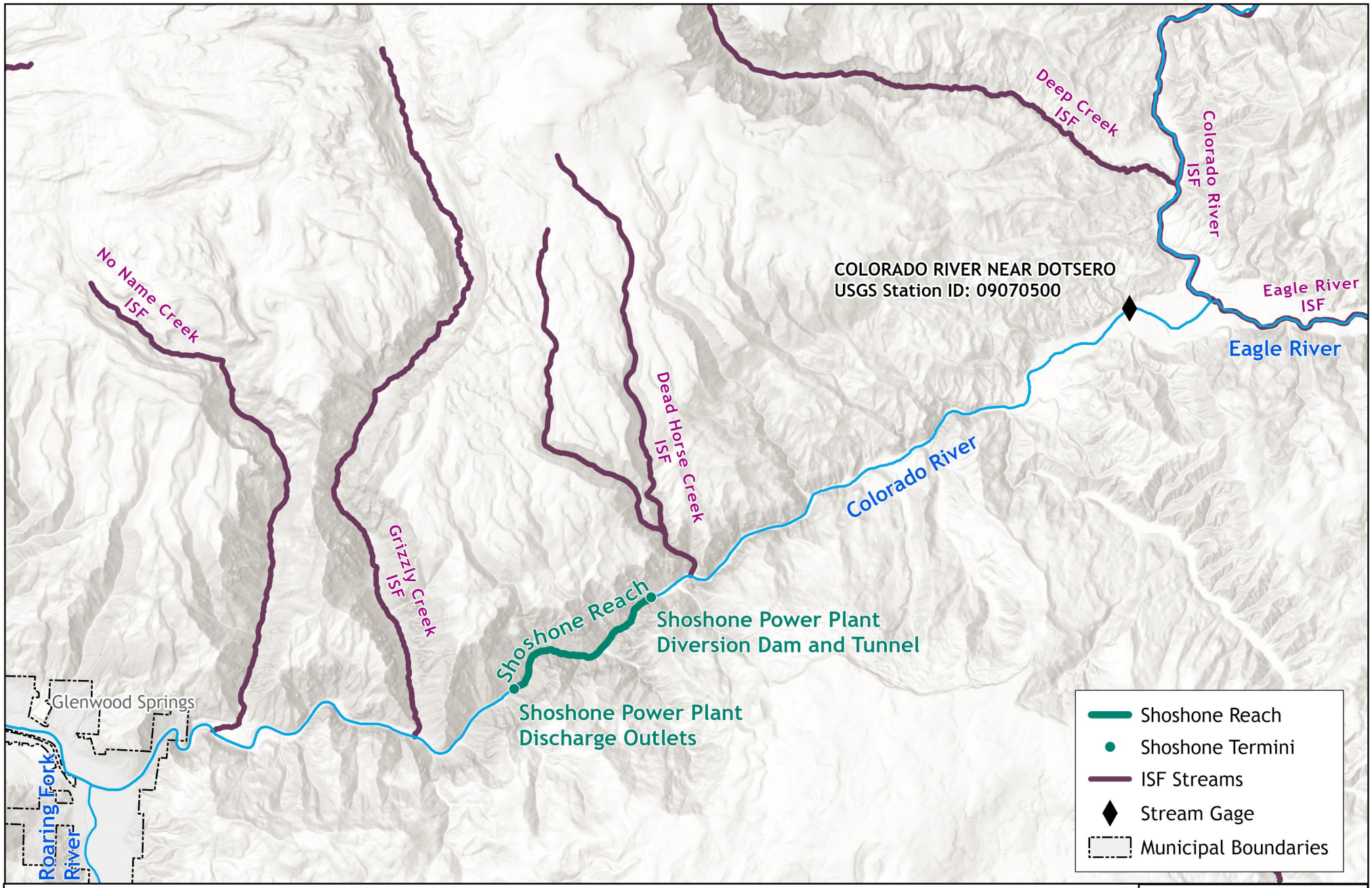
Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-3

May 2025 Board Memo Enclosure A - Maps

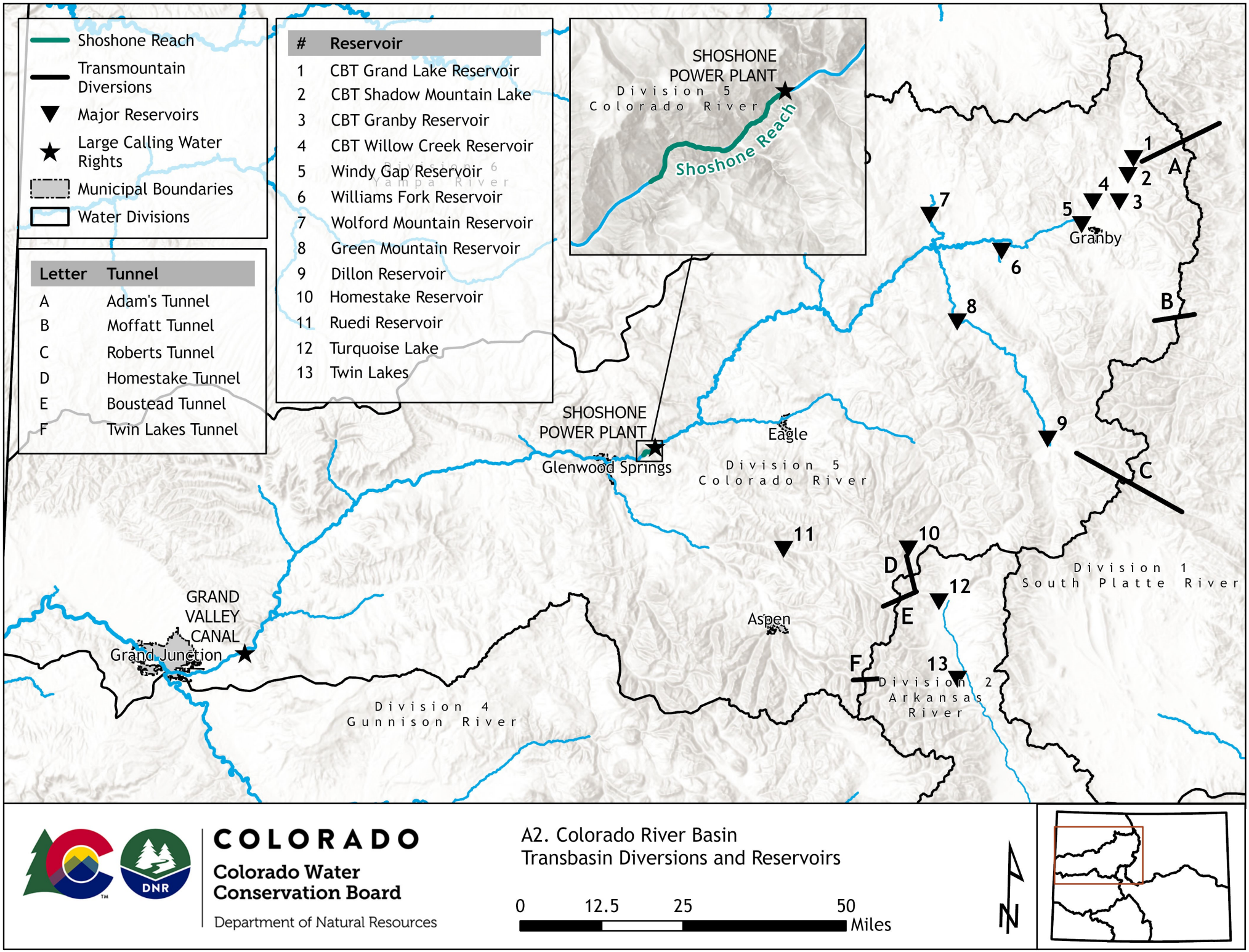


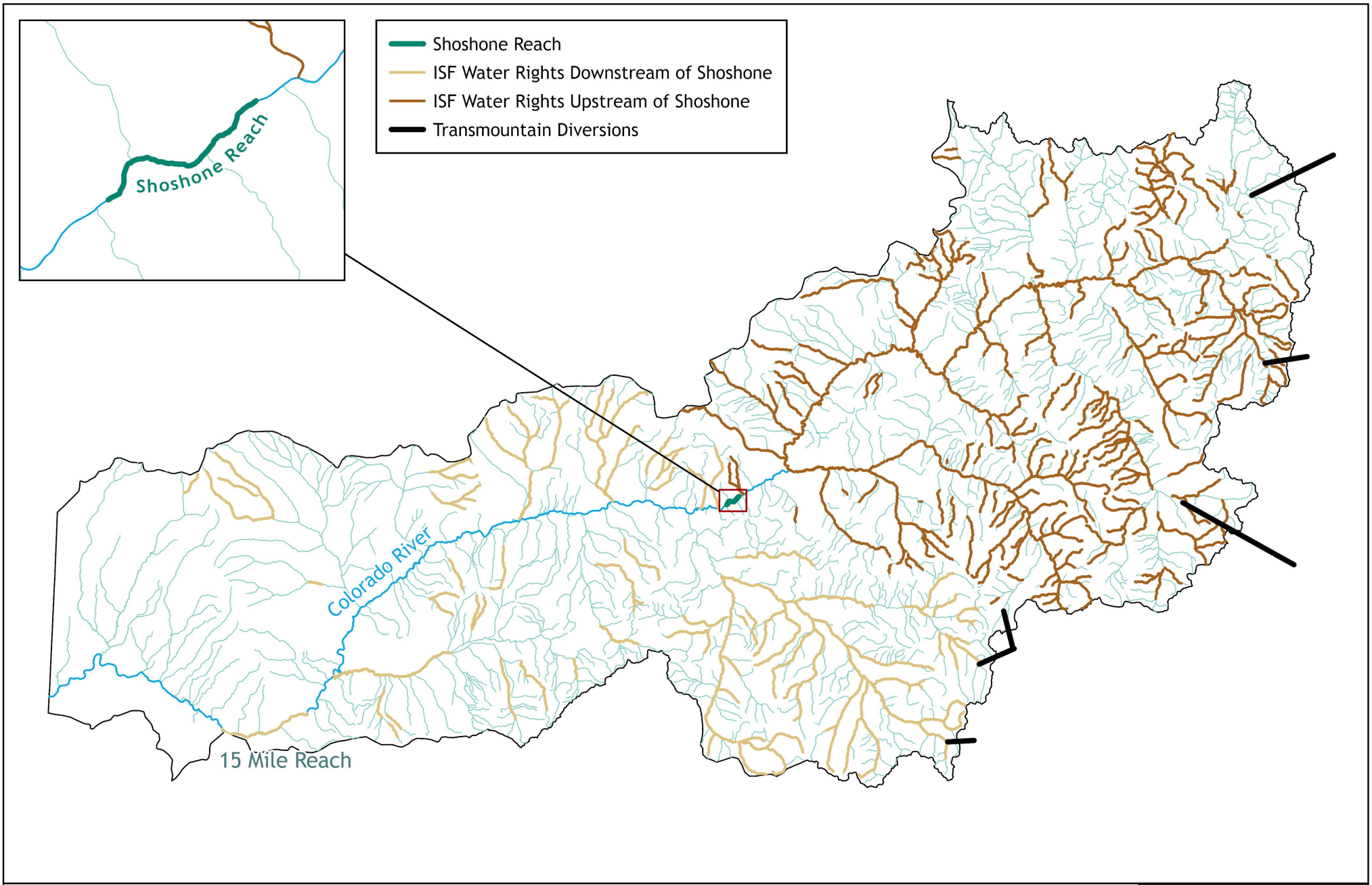
COLORADO
Colorado Water Conservation Board
Department of Natural Resources

A1. Shoshone Reach

0 1.25 2.5 5 Miles

N


Shoshone Reach
Transmountain Diversions
Major Reservoirs
Large Calling Water Rights
Municipal Boundaries
Water Divisions
Reservoir
1 CBT Grand Lake Reservoir
2 CBT Shadow Mountain Lake
3 CBT Granby Reservoir
4 CBT Willow Creek Reservoir
5 Windy Gap Reservoir
6 Williams Fork Reservoir
7 Wolford Mountain Reservoir
8 Green Mountain Reservoir
9 Dillon Reservoir
10 Homestake Reservoir
11 Ruedi Reservoir
12 Turquoise Lake
13 Twin Lakes
Letter Tunnel
A Adam's Tunnel
B Moffatt Tunnel
C Roberts Tunnel
D Homestake Tunnel
E Boustead Tunnel
F Twin Lakes Tunnel
SHOSHONE POWER PLANT
Division 5 Colorado River
Shoshone Reach
SHOSHONE POWER PLANT
Glenwood Springs
Eagle
Granby
Aspen
Grand Junction
GRAND VALLEY CANAL
Division 5 Colorado River
Division 4 Gunnison River
Division 1 South Platte River
Division 2 Arkansas River
COLORADO
Colorado Water Conservation Board
Department of Natural Resources
A2. Colorado River Basin
Transbasin Diversions and Reservoirs
0 12.5 25 50 Miles
N



COLORADO
Colorado Water Conservation Board
Department of Natural Resources

A3. Colorado River Basin ISF Water Rights

0 12.5 25 50 Miles

N

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-4

May 2025 Board Memo Enclosure C –

Draft ISF Agreement, dated May 2025

DRAFT
SHOSHONE WATER RIGHTS DEDICATION AND ISF AGREEMENT

(Shoshone Water Rights)

This WATER RIGHT DEDICATION and ISF AGREEMENT ("Agreement"), is made as of this ____ day of _____, 2025, by and between the Colorado Water Conservation Board ("CWCB"), an agency of the State of Colorado, the Colorado River Water Conservation District ("River District"), a political subdivision of the State of Colorado, and Public Service Company of Colorado, a Colorado corporation ("PSCo"). The CWCB, the River District, and PSCo may be hereinafter referred to individually as a "party," and together as the "parties."

RECITALS

A. The CWCB is an agency of the State of Colorado created to aid in the protection and development of the waters of the state for the benefit of its present and future inhabitants. In 1973, the General Assembly vested the CWCB with the exclusive authority to appropriate waters of the natural stream for minimum stream flows between specific points on a stream to preserve the natural environment to a reasonable degree.

B. Pursuant to section 37-92-102(3), C.R.S., the General Assembly has also vested the CWCB with the ability to acquire, by grant, purchase, donation, lease, or other contractual agreement, such water, water rights, and interests in water that are not on the division engineer's abandonment list in such amount as the CWCB determines is appropriate for stream flows to preserve and/or improve the natural environment to a reasonable degree.

C. The River District was created by the provisions of sections 37-46-101, C.R.S., *et seq*., to promote the health and general welfare of the State of Colorado by the conservation, use, and development of the water resources of the Colorado River and its principal tributaries. The River District constituents include West Slope governmental entities and water interests that desire to maintain in perpetuity the flow regime within Water Division 5 created by the historical exercise of the water rights that are the subject of this Agreement.

D. PSCo is a Colorado corporation and is the owner and operator of the hydroelectric power plant (the "Shoshone Power Plant") located on the mainstem of the Colorado River in Glenwood Canyon, approximately six miles upstream of Glenwood Springs, Colorado. The Shoshone Power Plant produces hydroelectric energy by means of PSCo's diversion of the following water rights:

(i) The Glenwood Power Canal and Pipeline water right, decreed on December 9, 1907, in Civil Action No. 466, Eagle County District Court, in the amount of 1,250 cubic feet per second of time ("c.f.s.") with an appropriation date

of January 7, 1902, for power, mining, milling, manufacturing, lighting and heating and traction purposes, and as decreed absolute by the Eagle County District Court on February 27, 1911, in Civil Action No. 553 (the "Senior Shoshone Water Right"); and

(ii) The Shoshone Hydro Plant Diversion No. 2 water right, decreed absolute on February 7, 1956, in Civil Action No. 1123, Eagle County District Court, in the amount of 158 c.f.s. with an appropriation date of May 15, 1929, for manufacturing and generation of electrical energy (the "Junior Shoshone Water Right").

Together, these two water rights are referred-to as the "Shoshone Water Rights".

E. The Senior Shoshone Water Right is one of the most senior water rights on the Colorado River. During significant periods of the year, there is not sufficient water to satisfy all water rights decreed on the Colorado River and its tributaries within the State of Colorado. At such times, when the measurable Natural Flow of the Colorado River drops below 1,408 c.f.s. (the sum of 1,250 c.f.s. attributable to the Senior Shoshone Water Right and 158 c.f.s. attributable to the Junior Shoshone Water Right) at the streamflow gauge (USGS 09070500) located on the Colorado River near Dotsero, Colorado ("Dotsero Gage"), the Colorado Division of Water Resources ("DWR") administers a call for the Shoshone Water Rights which results in the curtailment of junior water rights upstream of the Shoshone Power Plant. The Dotsero Gage is the location where the administration and measurement of the Shoshone Water Rights has historically occurred. The "Natural Flow" is the amount of water in the Colorado River measured at the Dotsero Gage, including the amount of water usable by the Shoshone Water Rights when those water rights are in priority, except that the "Natural Flow" does not include any water released from storage and conducted into the Colorado River upstream of the Dotsero Gage (accounting for evaporation and transit loss), which water is intended for delivery for use downstream of the discharge outlets for the Shoshone Power Plant.

F. The Shoshone Water Rights are decreed for non-consumptive hydropower generation use at the Shoshone Power Plant. All of the water diverted by PSCo for hydropower generation use is returned to the Colorado River after such water is conveyed through the Shoshone Power Plant's penstocks and turbines, to a point of return at the plant's discharge outlets that is approximately 2.4 miles downstream of the point of diversion at the Shoshone Diversion Dam and Tunnel, as depicted on the map attached as **Exhibit A**. The approximate locations of the "Shoshone Diversion Dam and Tunnel" and the outfall for the "Shoshone Power Plant Discharge Outlets" are as follows:

i. **Shoshone Power Plant Diversion Dam and Tunnel:** on the right bank, being the northerly bank, of the Colorado River whence the North quarter corner of Section Thirty (30), Township Five (5) South, Range Eighty-Seven (87) West of the 6th Principal Meridian bears North 23° 48'20" East 2,414.64 feet, in Garfield County, Colorado.

ii. **Shoshone Power Plant Discharge Outlets:** on the right bank, being the northerly bank, of the Colorado River whence the Southeast corner of Section Thirty-five (35), Township Five (5) South, Range Eighty-Eight (88) West of the 6th Principal Meridian bears South 29° 24' 14" East, 1,771 feet, in Garfield County, Colorado.[1]

The reach of stream between the Shoshone Power Diversion Dam and Tunnel and the Shoshone Power Plant Discharge Outlets is referred to herein as the "Shoshone Reach." Through this Agreement, the parties seek to preserve and improve the natural environment of the Colorado River within the Shoshone Reach to a reasonable degree.

G. Pursuant to the Purchase and Sale Agreement between the River District and PSCo, with an effective date of January 1, 2024 (the "PSA"), the River District is the contract purchaser of the Shoshone Water Rights. The PSA provides that PSCo, and its successors and assigns, is entitled to a perpetual leasehold interest in the Shoshone Water Rights for continued use of the Shoshone Water Rights for hydropower generation at the Shoshone Power Plant (the "Lease," the form of which is attached to the PSA as "Exhibit D"). The PSA (including all its Exhibits and Attachments) is attached and incorporated hereto as **Exhibit B**.

H. PSCo's historical exercise of the Shoshone Water Rights has resulted in a streamflow regime that has benefitted the natural environment of the Colorado River basin both upstream and downstream of the Shoshone Power Plant. In addition, the historical exercise of the Shoshone Water Rights has provided benefits to water users throughout the Colorado River basin by providing a relatively predictable water rights administration regime both upstream and downstream of the Shoshone Power Plant.

I. The parties wish to continue the general historical call operations and maintain the flow regime of the Colorado River, both upstream and downstream of the Shoshone Power Plant. In furtherance of that effort, and subject to the terms of this Agreement, the River District wishes to dedicate to the CWCB, at no additional cost to the CWCB, the exclusive right to use the Shoshone Water Rights for instream flow purposes within the proposed Shoshone Reach to the extent the water rights are not being used for hydropower generation purposes at the Shoshone Power Plant, subject to the requirements of this Agreement. To that end, and subject to the terms set forth herein, the River District, PSCo, and the CWCB agree to jointly file an application to adjudicate a change of the Shoshone Water Rights in Garfield County District Court, Water Division No. 5, (the "Water Court") to add instream flow use to preserve and improve the natural environment of the Shoshone Reach of the Colorado River to a reasonable degree as an additional beneficial use of the Shoshone Water Rights. Use of the Shoshone Water Rights for instream flow and hydropower purposes shall be subject to any terms and conditions imposed by the change of water right decree to be entered by the Water Court, further described in Paragraphs XX and XX below (the "Decree").

[1] The legal description set forth above for the Downstream Terminus (Shoshone Power Plant Discharge Outlets) is an approximate location developed by River District staff and may be supplemented or modified at the time a water court application is filed in Water Division No. 5.

J. At two regularly scheduled public meetings of the CWCB held on [date], and [date], the CWCB considered the River District's proposed dedication of the exclusive right to use the Shoshone Water Rights for instream flow purposes to the CWCB in accordance with section 37-92-102(3), C.R.S., and the Rules Concerning the Colorado Instream Flow and Natural Lake Level Program ("ISF Rule(s)"), 2 CCR 408-2. At its regularly scheduled meeting on [date], the CWCB determined that it is appropriate to enter this Agreement and that the best use of the acquired interest in the Shoshone Water Rights is use up to the full decreed amount of 1,408 c.f.s., for instream flow use to preserve and improve the natural environment to a reasonable degree within the Shoshone Reach. Such use of the Shoshone Water Rights for instream flow purposes can occur within the Shoshone Reach to the extent the Shoshone Water Rights are not being exercised for hydropower generation purposes at the Shoshone Power Plant, up to the full amount of 1,408 c.f.s. of Natural Flow (hereinafter, the "ISF Rate"), subject to the limitations described in Paragraphs 7 and 9 below.

K. The CWCB, the River District, and PSCo wish to cooperate to implement such legal mechanisms and to obtain such court decree and approvals as are necessary to change the Shoshone Water Rights to include instream flow use for the purpose of preserving and improving the natural environment within the Shoshone Reach, and to protect the Natural Flow ISF Rate through the Shoshone Reach to the extent it is not being exercised for hydropower generation purposes at the Shoshone Power Plant.

AGREEMENT

NOW THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties agree as follows:

DEDICATION

1. The Recitals to this Agreement are incorporated by this reference and shall constitute part of this Agreement.

2. The River District hereby dedicates to the CWCB, effective as of the date of closing of the PSA, at no additional cost to the CWCB, the exclusive right to use the Shoshone Water Rights for instream flow use within the Shoshone Reach, to the extent such water rights are not being used for hydropower generation purposes at the Shoshone Power Plant pursuant to the Lease, and subject to the requirements of Paragraph 9 below. The River District shall retain title to the Shoshone Water Rights.

3. This Agreement acknowledges the CWCB's consideration of the Colorado Parks and Wildlife analysis showing a biological need to preserve and improve the natural environment of the Shoshone Reach of the Colorado River to a reasonable degree.

4. The parties intend that the Decree, as further described in Paragraphs XX and XX below, shall confirm that the water attributable to the Shoshone Water Rights up to the available ISF Rate will remain in the stream to preserve and improve the environment to a reasonable

degree within the Shoshone Reach where the CWCB does not presently have a decreed instream flow right, to the extent the Shoshone Water Rights are not being used for hydropower generation purposes.

5. The parties intend that the Decree shall confirm that the Shoshone Water Rights shall be administered by the State Engineer and the Division Engineer for Water Division No. 5 ("Engineers") based on the Natural Flow at the Dotsero Gage. Instream flow use of the Shoshone Water Rights will be administered through the Shoshone Reach where the intended instream flow use will occur with the goal of utilizing the Shoshone Water Rights up to the available ISF Rate without diversion or exchange by intervening water users. The parties intend that the Decree shall also contain an affirmative finding which confirms that the change of the Shoshone Water Rights for the additional instream flow use is administrable by the Engineers and is capable of meeting all applicable statutory requirements.

6. In the event any new infrastructure or stream gaging stations are either necessary or desirable for the implementation of this Agreement, or in the event that any new infrastructure—including measuring devices—are deemed necessary by the Engineers with respect to the Shoshone Water Rights, the parties agree to work cooperatively with each other in good faith to accommodate the installation of any such infrastructure or gaging stations, which are necessary to make water available for use under this Agreement, in an efficient and economical manner.

CONDITIONS ON THE ADMINISTRATION AND EXERCISE OF THE SHOSHONE WATER RIGHTS FOR INSTREAM FLOW USE

7. It is the intent of the parties that the Shoshone Water Rights will be protected for instream flow use to the maximum extent possible as allowed under the Water Court Decree, to the extent the Shoshone Water Rights are not being used for power generation. To implement this mutual intent, the CWCB agrees that it will request administration of the Shoshone Water Rights for instream flow use in the Shoshone Reach of the Colorado River to preserve and improve the natural environment to a reasonable degree at all times when the Natural Flow of the Colorado River as measured at the Dotsero Gage is less than 1,408 c.f.s., subject only to the limitations set forth below:

   a. Any terms, conditions, and limits set forth in the Decree;

   b. Any reduction in instream flow use made pursuant to the terms and conditions of Paragraph 9, below, due to use or planned use of the Shoshone Water Right for power generation; and

   c. During any period wherein the CWCB and the River District jointly agree in writing to reduce the flow rate requested for administration of the Shoshone Water Rights for instream flow purposes.

8. Pursuant to ISF Rule 10, 2 CCR 408-2, the parties shall cooperate in the administration and monitoring of the instream flow use of the Shoshone Water Rights dedicated to the CWCB under this Agreement so that, subject to the terms of this Agreement and the Decree, the CWCB will maximize the use of the Shoshone Water Rights for instream flow purposes to the extent the rights are not being used for hydropower generation purposes at the Shoshone Power Plant. PSCo, the CWCB and the River District shall coordinate with DWR to monitor the flow and calculate the Natural Flow of the Colorado River at the Dotsero Gage as the point of administration for the Shoshone Water Rights for hydropower generation and instream flow use.

9. The CWCB and the River District shall notify PSCo of any request for administration required by the provisions of this Agreement. PSCo shall provide advance written notice to the River District and the CWCB at least thirty (30) days prior to any scheduled operations or maintenance activities that result in a full or partial shutdown of the Shoshone Power Plant, and shall provide notice as soon as reasonably possible of any unscheduled shutdown or reduction of Shoshone Power Plant operations. During the term of the Lease, the parties will coordinate on at least an annual basis to determine how the Shoshone Water Rights will be allocated between hydropower generation and instream flow use in a manner consistent with the terms and conditions of the Decree that (1) maximizes PSCo's ability to exercise the Shoshone Water Rights for hydropower generation purposes; and (2) maximizes the ability to use the Shoshone Water Rights for instream flow purposes to the extent the water rights are not being used for hydropower generation purposes at the Shoshone Power Plant, in a manner that does not reduce the availability of the Shoshone Water Rights for subsequent hydropower use. Upon termination of the Lease, this paragraph, and any other restrictions on the Shoshone Water Rights throughout this Agreement due to hydropower use, shall no longer be in effect, and, subsequent to any permanent decommissioning of the Shoshone Power Plant, instream flow shall be the only use of the Shoshone Water Rights.

10. Each party to this Agreement shall also immediately report, in writing, to the other parties the nature of any communications with the Engineers concerning the administration of the Shoshone Water Rights as contemplated by this Agreement. Following the closing of the PSA, the parties shall identify those persons and provide such contact information (including email and telephone number) to the other parties necessary to effectuate the purposes hereof.

11. Any rights created by this Agreement are contractual rights. Use by the CWCB for instream flow purposes in accordance with this Agreement does not provide the CWCB an ownership right in the Shoshone Water Rights or in any of the River District or PSCo's facilities or water rights as they exist now or may exist in the future.

12. The CWCB's contractual rights to and interest in the Shoshone Water Rights dedicated to the CWCB for use in the Shoshone Reach under this Agreement extends to and terminates at the downstream termination point of the Shoshone Reach, which is the stream accrual point for the current Shoshone Power Plant Discharge Outlets.

NO CREATION OF RIGHT OF SUCCESSIVE USE OF THE SHOSHONE WATER RIGHTS DOWNSTREAM OF THE SHOSHONE REACH

13. This Agreement does not recognize any use or create any right of use by the River District of the Shoshone Water Rights downstream of the Shoshone Reach. Notwithstanding the foregoing, this Paragraph 13 does not prevent any use by the River District or its constituents of the natural stream flow downstream of the Shoshone Reach within the priority system and in accordance with Colorado law and the Decree.

WATER COURT PROCEEDINGS

14. The parties shall file and diligently pursue a Water Court application and any necessary appeals to obtain the Decree in a final, unappealable form confirming a change of water right for the Shoshone Water Rights to include the additional use for instream flow purposes by the CWCB and confirming that the water attributable to the Shoshone Water Rights will be used for instream flow to preserve and improve the natural environment in the Shoshone Reach of the Colorado River to a reasonable degree up to the full amount of the ISF Rate , subject to the terms and conditions of the Decree and this Agreement. In such water court application, the CWCB, the River District, and PSCo shall be co-applicants for the purpose of advancing and protecting their contractual rights under this Agreement, including adjudicating a decreed right to use of the Shoshone Water Rights by the CWCB to preserve and improve the natural environment to a reasonable degree within the Shoshone Reach. Except as otherwise provided in the PSA, to which the CWCB is not subject, each party shall bear its own attorney fees and costs related to its participation in any water court adjudication contemplated under this Paragraph 14. Except for its own attorney fees and court filing fees, the CWCB is not responsible for paying costs of prosecuting the water court application, including the costs of hiring a consulting engineer or other witnesses in furtherance of such application, or attorney fees of any other party incurred in relation thereto.

15. The parties intend that the Decree shall confirm that to the extent the water dedicated under this Agreement is not being used for hydropower generation at the Shoshone Power Plant, such water shall be beneficially used by the CWCB for instream flow purposes to preserve and improve the natural environment of the Colorado River within the Shoshone Reach to a reasonable degree, subject to the terms and conditions of the Decree and this Agreement.

16. The parties agree that the Decree shall not confirm any new appropriation of water. N or shall any claim be included in the Water Court application except as expressly described in this Agreement. The parties further agree that, upon the successful prosecution of the Water Court application described in Paragraph 14, above, and upon the issuance of the Decree by the Water Court, no further claim for approval of any change of water right with respect to the Shoshone Water Rights shall be sought by any of the parties to this Agreement in the future without first obtaining the prior written consent of all the parties hereto. The River District agrees it will not transfer or otherwise encumber the rights to any other person or entity without the express written consent of the CWCB, with the exception of the right to enter into a promissory note and deed of trust to the benefit of

PSCo as provided by paragraph 3.1.d.2 of the PSA. The parties agree to request that the Water Court include an express statement in the Decree setting forth the limitations described in this Paragraph 16, to wit:

a. the decree does not confirm any new appropriation or change except to add instream flow;
b. no further claim for approval of any change of the Shoshone Water Rights will be sought by any of the applicants without written consent of the other applicants hereto; and
c. the River District will not transfer or otherwise encumber the Shoshone Water Rights to any other person or entity without the express written consent of the CWCB.

RECORDS AND ACCOUNTING

17. The River District shall be responsible for maintaining all records and accounting necessary for the implementation of this Agreement, using forms mutually agreeable to the parties, and all records required by the Engineers for the administration of the changed Shoshone Water Rights.

18. The River District will provide accounting related to the operation of this Agreement to the CWCB and PSCo.

MISCELLANEOUS PROVISIONS

19. The term of this Agreement is perpetual unless terminated in accordance with the terms of this Agreement.

20. This Agreement will automatically terminate and be of no further effect in the event that (i) the sale of the Shoshone Water Rights from PSCo to the River District does not close or occur, or (ii) the PSA is terminated or otherwise expires. Except as otherwise provided in the immediately preceding sentence in this Paragraph 20, this Agreement may be amended or terminated by the written agreement of the parties, and any such termination or amendment shall take effect only when signed by all of the parties to this Agreement or their successors in interest.

21. Neither the CWCB nor PSCo is responsible for construction or modification of any structures that may be necessary for use of the Shoshone Water Rights for instream flow purposes.

22. This Agreement shall not be assignable by any party without the written consent of all the parties hereto. Notwithstanding the foregoing, an assignment by PSCo of this Agreement to any successor or assign of its rights under the Lease is approved by the CWCB and River District without separate written consent, however thirty (30) days advanced written notice of the assignment to the River District and the CWCB is required, and PSCo may assign the Lease only to a successive owner or operator of the Shoshone Power Plant for power generation purposes. Notice and contact information shall be provided to all parties concurrent with any assignment. In the event of the termination of the Lease by PSCo or

its successors or assigns pursuant to Paragraph 26, below, the River District and CWCB will not be required to obtain the written consent of PSCo or its successors or assigns to assign this Agreement.

23. Pursuant to section 37-92-102(3), C.R.S., this Agreement shall be enforceable by each of the parties hereto as a water matter according to the terms and conditions of this Agreement. The parties further agree that the exclusive venue for and jurisdiction of any dispute pertaining to the interpretation or enforcement of this Agreement shall be the Water Court (as defined herein); *provided, however*, that before commencing any action for enforcement of this Agreement, the party alleging the violation shall notify the other parties in writing of the alleged violation and the parties shall make a good faith effort to resolve their differences through informal consultation.

24. The parties hereto acknowledge and agree that specific performance of this Agreement shall be the exclusive remedy for failure of any party to comply with any provision of this Agreement. The parties hereby waive any right to seek or collect damages for any breach or violation of this Agreement.

25. Enforcement of this Agreement and all rights and obligations hereunder are reserved solely to the CWCB, the River District, and PSCo, and not to any third party. Any services or benefits which third parties may receive or provide as a result of this Agreement are incidental to the Agreement and do not create any rights for such third parties.

26. The parties anticipate that at some point in the future, PSCo may permanently decommission the Shoshone Power Plant, and the Lease will terminate. In the event that the Lease terminates, then PSCo shall provide written notice to the parties of the termination of the Lease and PSCo's rights and obligations under this Agreement will also be deemed to be terminated; however, all rights and responsibilities between the CWCB and the River District will remain in effect. Upon termination of the Lease, all restrictions on the Shoshone Water Rights throughout this Agreement due to hydropower use shall no longer be in effect, and, subsequent to any permanent decommissioning of the Shoshone Power Plant, instream flow shall be the only use of the Shoshone Water Rights.

27. The provisions of §§37-92-102(3) and 305(3)(b), C.R.S. that require that all contracts or agreements for interests in water, and the water court decree implementing the contracts or agreements, to state the board or the lessor, lender, or donor may bring about beneficial use of the historical consumptive use of the leased, loaned, or donated water right downstream of the instream flow reach as fully consumable water are not relevant and do not apply to this acquisition.

28. In the event the Decree and this Agreement are inconsistent, the Decree shall control.

29. This Agreement shall be construed in accordance with the laws of the State of Colorado and shall be interpreted broadly to give effect to its purposes.

30. Any failure or delay by a party in exercising any of its rights, power, and remedies hereunder or in accordance with laws shall not lead to a waiver of such rights, and the waiver of any single or partial exercise of a party's rights shall not preclude such party from exercising such rights in any other way and exercising the remaining part of the party's rights.

31. Any notice, consent, waiver, request or other communication required or provided to be given under this Agreement shall be in writing and shall be sufficiently given and shall be deemed delivered when: (a) delivered personally; (b) transmitted by email to the then-designated address of the party, provided that a delivery receipt sent by the recipient is received by the sender, provided if the delivery receipt is sent on a non-business day, or after 5:00 p.m. local time at the physical address of the recipient, then the notice will be deemed received on the next business day; (c) two (2) business days after deposit with the United States Postal Service by certified or registered mail, return receipt requested, postage prepaid; or (d) one (1) business day following deposit with a nationally recognized overnight delivery service, in any event, addressed to the applicable party as set forth below, or at such address as either party may from time-to-time specify in writing to the other:

If to the CWCB:

Section Chief
Colorado Water Conservation Board
Stream and Lake Protection Section
1313 Sherman Street, Room 721
Denver, CO 80203
DNR_CWCBISF@state.co.us

and

Jen Mele
First Assistant Attorney General
Natural Resources and Environment Section
1300 Broadway, 7th Floor
Denver, CO 80203
jen.mele@coag.gov

If to PSCo:

Public Service Company of Colorado
Attn: Environmental Services
1800 Larimer Street, Suite 1300
Denver, CO 80202

and

Public Service Company of Colorado
Attn: Legal Dept. – Real Estate
1800 Larimer Street, Suite 1400
Denver, CO 80202

(303) 294-2222
Frances.A.Folin@xcelenergy.com

and

Welborn Sullivan Meck & Tooley, P.C.
Carolyn F. Burr, Esq.
James M. Noble, Esq.
1401 Lawrence Street, Suite 1800
Denver, CO 80202
(303) 830-2500
cburr@wsmtlaw.com
jnoble@wsmtlaw.com

If to the River District:

Colorado River Water Conservation District
General Manager
Andrew Mueller
201 Centennial St., Suite 200
Glenwood Springs, CO 81601
edinfo@crwcd.org

and

General Counsel,
Peter Fleming, Esq.
201 Centennial St., Suite 200
Glenwood Springs, CO 81601
(970) 945-8522
pfleming@crwcd.org

32. Each provision contained herein shall be severable and independent from each of the other provisions such that if at any time any one or more provisions herein are found to be invalid, illegal, or unenforceable, the validity, legality, or enforceability of the remaining provisions herein shall not be affected as a result thereof.

33. The effective date of this Agreement shall be the last date shown on the signature page or pages of this Agreement, provided however that parties' rights and obligations under this Agreement with specific regard to the exercise of the Shoshone Water Rights for instream flow purposes shall not commence until the closing date of the PSA. If the PSA is terminated according to its terms, then this Agreement shall also automatically terminate. This Agreement may be executed in two or more counterparts, each of which when so executed shall be deemed to be an original and all of which when taken together shall constitute one and the same instrument. The counterparts of this Agreement may be executed and delivered by electronic means (including portable document format) by either of the parties and the receiving party may rely on the receipt of such document so executed and delivered electronically as if the original had been received.

[remainder of page intentionally blank]

[signature page(s) follow]

IN WITNESS WHEREOF, the CWCB, the River District, and PSCo have executed this Agreement as of the last date of execution.

COLORADO WATER CONSERVATION BOARD

By: _____
Lauren Ris, Director

Date: _____

[signatures continue on next page]

[signature page to Water Right Dedication Agreement (Shoshone Water Rights)]

COLORADO RIVER WATER CONSERVATION DISTRICT

ATTEST:

By: _____
Andy Mueller, General Manager

BY: _____

Date: _____

[signatures continue on next page]

[signature page to Water Right Dedication Agreement (Shoshone Water Rights)]

PUBLIC SERVICE COMPANY OF COLORADO

By:_____
Robert Kenney, President

Date:_____

[signature page to Water Right Dedication Agreement (Shoshone Water Rights)]

Exhibit A
(Shoshone Diversion Dam and Tunnel)

Exhibit B
(Purchase and Sale Agreement)

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-5

May 2025 Board Memo Enclosure D –

CPW's Recommendation Letter and Report

(dated May 6, 2025)

COLORADO
Parks and Wildlife
Department of Natural Resources

Enclosure D1
Agenda Item 10.d
CWCB Board Meeting
May 21-22, 2025

May 6, 2025

Director Lauren Ris
Colorado Water Conservation Board
1313 Sherman Street, 7th Floor
Denver, CO 80203

Subject: Colorado Parks and Wildlife Recommendation on the Proposed Acquisition of an Interest in the Shoshone Hydroelectric Power Plant Water Rights

Dear Ms. Ris,

Colorado Parks and Wildlife (CPW) offers the following evaluation of the proposed instream flow (ISF) acquisition of water rights associated with the Shoshone Hydroelectric Power Plant, which are currently owned and operated by Public Service Company (PSCo), a subsidiary of Xcel Energy. The Colorado River District (CRD) is in the process of acquiring the Shoshone water rights and has proposed adding ISF as a beneficial use and making that water available to the Colorado Water Conservation Board (CWCB or Board) for the benefit of the aquatic ecosystem in the Colorado River. The CWCB will review this proposal and may accept an interest in the water rights through a two-board meeting administrative approval process, currently scheduled to commence in May. As required under CWCB's Instream Flow and Natural Lake Level Program Rules, CWCB has requested that CPW evaluate the aquatic benefits and provide recommendations on the proposed acquisition. CPW's perspective is offered under the mandate of our mission to perpetuate the wildlife resources of the state and provide enjoyable and sustainable outdoor recreation opportunities that educate and inspire current and future generations to serve as active stewards of Colorado's natural resources.

The Shoshone water rights include a 1250 cfs senior right with a 1905 priority date and a 158 cfs junior right with a 1940 priority date for a total decreed flow rate of 1408 cfs. The CRD is in the process of acquiring the Shoshone water rights from PSCo under procedures described in their Purchase and Sales Agreement executed in December 2023. If the CWCB votes to approve the acquisition by accepting an interest in the water rights, PSCo, CRD, and the CWCB will file a joint water court application to add ISF as a decreed beneficial use to the Shoshone water rights. Once a decree is obtained, the Shoshone water rights can be dedicated to CWCB to exercise ISF use

when the rights are not used to generate hydropower. Furthermore, should the power plant be decommissioned, ISF use will become the sole beneficial use for the water rights. The reach defined for ISF use extends from the point of diversion for the hydroelectric plant at the Shoshone Dam approximately 2.4 miles downstream to the outfall of the power plant discharge outlets. This reach, referred to as the Shoshone Reach, will benefit from a donation of the full water right (up to 1408 cfs) when in priority and as dictated by the water court change case.

The Shoshone water rights have a significant influence on administration of the Colorado River due to their seniority, magnitude, and location. An administrative call of the Shoshone water rights has historically served as an important legal mechanism for water right curtailment on the upper Colorado River mainstem and its tributaries, with broad implications for flow management throughout the Upper Colorado River watershed. Given the age of the power plant and operational challenges, permanent preservation of the Shoshone water rights has been contemplated for decades and prioritized in numerous planning efforts. As entirely non-consumptive water rights, partnering with the CWCB to utilize the state's ISF acquisition tool and dedicating the rights to ISF use was identified as an appropriate legal mechanism to protect the rights in perpetuity.

In response to CWCB's request, CPW's offers the attached report which details our assessment, professional opinions, and recommendations on the proposal. The report includes details about several factors the Board must consider in evaluating the appropriateness of the acquisition, specifically the natural environment and whether that natural environment will be preserved and/or improved to a reasonable degree by the water available from the proposed acquisition. The Shoshone Reach of the Colorado River is a high-gradient, dangerous segment of river, so no fishery and habitat studies existed in the reach prior to 2023. CPW staff conducted fishery surveys to fill this data gap and coordinated with CRD and CWCB staff to assess flow-habitat relationships using two-dimensional hydraulic habitat modeling.

Based on these assessments, CPW concludes there is a flow-dependent natural environment that can be preserved and improved by the proposed acquisition. The water right preserves the historical flow regime in the Colorado River upstream while improving flows in the Shoshone Reach by adding additional wetted area and suitable fish habitat to a historically dewatered section of the Colorado River. The best use of this water is to preserve and improve the natural environment at any flow rate up to 1408 cfs, the amount decreed for the subject water rights. Additionally, hydraulic-habitat modeling shows that fish habitat improves in the Shoshone Reach at flows up to at least 3000 cfs. However, this upper threshold of 3000 cfs is based on the upper limit of the hydraulic-habitat model. It is also our professional opinion that flows

greater than 3000 cfs provide improvements to fish habitat, specifically by supporting important geomorphic functions and habitat maintenance. Based on professional expertise, flows greater than 3000 cfs maintain an aquatic food base, provide additional thermal refuge areas, and support fish passage. Given the anticipated biological benefits, CPW staff believes this acquisition will preserve and improve the natural environment to a reasonable degree and recommends the CWCB accept the interest in the acquired water. CPW staff will be available at the May CWCB meeting to address the benefits provided by the proposal and to answer any questions about the fishery and associated flow benefits of dedicating the Shoshone water rights to ISF use.

Sincerely,

Jeff Davis

Director of Colorado Parks and Wildlife

Enclosure D2
Agenda Item 10.d
CWCB Board Meeting
May 21-22, 2025

Biological Evaluation of the Shoshone Water Rights Instream Flow Acquisition

Colorado Parks and Wildlife

May 6, 2025

Contents

1. Introduction

Built in the early 1900s, the Shoshone Hydroelectric Power Plant sits on the north bank of the Colorado River in the middle of Glenwood Canyon. Currently owned and operated by Public Service Company (PSCo), a subsidiary of Xcel Energy, the power plant and associated direct flow water rights are used to generate hydroelectric power by diverting flow from the Colorado River through two hydropower turbines. The water rights consist of a relatively senior water right with a 1905 priority date for 1250 cfs and a junior right with a 1940 priority date for 158 cfs. The combined total of 1408 cfs is decreed for non-consumptive beneficial use of power generation.

The seniority, magnitude and decreed use of these water rights, when combined with a call on the water right(s), have historically commanded water administration on the Colorado River. When a valid call is placed and administered at the Shoshone power plant, junior appropriators upstream are directed to curtail surface diversions or provide augmentation water to replace out of priority depletions to the calling right. Additionally, a Shoshone call dictates reservoir releases that supplement baseflows in the Upper Colorado River. During periods of low flows in the river, which can extend from the conclusion of spring runoff through the winter, the diversion is legally required to sweep, or divert the entirety of the river to place a call on the hydropower right. This administrative requirement results in the river channel being significantly dewatered for 2.4-miles between the Shoshone Dam and power plant outfall. Without the Shoshone call in place, junior appropriators are entitled to exercise their water rights, depleting streamflows throughout the Upper Colorado Basin and impacting many water rights, including instream flow (ISF) water rights held by the Colorado Water Conservation Board (CWCB).

The Colorado River District (CRD) is in the process of acquiring the Shoshone water rights from PSCo. In partnership with the CWCB, the CRD has proposed adding an ISF beneficial use to the water rights by filing a joint water court change case application. Once a decree is obtained, the Shoshone water rights can be dedicated to CWCB to exercise ISF use when the rights are not used or only partially used to generate hydropower. Furthermore, should the power plant be decommissioned, ISF use will become the sole beneficial use for the water rights. The reach defined for ISF use extends from the point of diversion for the hydropower plant at Shoshone Dam approximately 2.4 miles downstream to the power plant outfall (Map 1). This reach is referred to as the Shoshone Reach and is described in detail below.

CPW supports CWCB's ISF Program by providing biological and technical expertise and assists CWCB staff in making a determination of whether the natural environment will be preserved and/or improved to a reasonable degree by the water made available under the proposed acquisition. CPW staff use professional judgement and best available data to make that determination and in some instances collect additional biological data where little exists. The

Shoshone Reach of the Colorado River is a high-gradient, dangerous segment of river, so limited biological information existed in the reach prior to 2023. CPW reviewed existing data, collected additional data, and worked with CWCB, CRD, and consultants to develop additional studies for the proposed acquisition. The following report is CPW's evaluation of the proposed acquisition and CPW's recommendations to the Board pursuant to C.R.S.37-92-102(3).

2. Natural Environment & Biological Data

2.1 Natural Environment Overview

The Shoshone Reach of the Colorado River runs through the central portion of Glenwood Canyon, a confined canyon where the river over time carved a deep gorge that runs nearly 15-miles between 2,500 feet high walls of sedimentary rock. The canyon is a heavily trafficked corridor and the river and its floodplain are confined by Interstate 70, a streamside recreational path, and railroad. The river is heavily used by whitewater enthusiasts and floatboaters. In the Shoshone Reach, steep riverbed drops create renowned rapids for expert whitewater kayakers. Downstream of the outlet of Shoshone Power Plant, the Shoshone Rapids are targeted by private and commercial whitewater boaters spring through fall as flows allow. Immediately below the rapids, year-round casual and angler floatboating occurs from Grizzly Creek to Glenwood Springs. Throughout Glenwood Canyon, there are diverse outdoor recreational opportunities beyond river whitewater and floatboating including coldwater sportfishing, hiking, rock climbing, streamside bike and pedestrian trail use, vapor caves, and hot springs. These recreational opportunities provide the foundation of the local tourism-based economy.

The infrastructure and operation of the Shoshone water rights creates significant hydrological alteration to the Colorado River. The dam was constructed to impound and divert water for hydropower generation and creates a barrier to downstream sediment transport and upstream river connectivity for aquatic organisms, especially fish. For a Shoshone call to be administered the structure much divert the called priority water. This can result in the legal diversion of the entirety of the Colorado River when flows are less than 1408 cfs, which leaves the Shoshone Reach in a dewatered state. During seasonally low flows, the Colorado River flows are comprised of seepage from the dam (Photo 1), groundwater, and tributary inputs. Under these diminished flow conditions, aquatic habitat persists mainly in deep pools and glides that are isolated by steep boulder drops or shallow riffles that present passage challenges for fish. Aquatic organisms are impacted by habitat fragmentation and limited occupiable wetted habitat. Through the reach, there are many insurmountable drops created by the river gradient and large boulder constrictions. While the Shoshone water rights call may have specific localized impacts to the Shoshone Reach, there are broad benefits provided by the call in the form of flow supplementation to the Colorado River mainstem and its tributaries.

Despite the anthropogenic alteration of the Colorado River through Glenwood Canyon, the Shoshone Reach continues to support a variety of native and sport fisheries and some limited

riparian areas. Wildlife commonly encountered include bighorn sheep, river otters, beaver, Mule Deer, elk, Peregrine Falcons, and eagles. Riparian and upland plant communities generally consist of cottonwood and alder in the riparian areas, and oak, pine, spruce, fir, and aspen trees in the uplands. The unique canyon geology includes caves, springs, and geothermal outputs. The discrete and diffuse geothermal springs occur at the eastern and western ends of Glenwood Canyon, including one of the largest hot springs in the state of Colorado, Glenwood Hot Springs and in the popular Yampah Vapor Caves. These and other extraordinary values of the Colorado River between Gore Canyon and Glenwood Canyon qualify it as eligible for a federal Wild and Scenic Rivers designation.

2.2 Colorado River Fish Community

2.2.1 Fish Community Overview

The Colorado River hosts a diversity of native river fishes and abundant coldwater sportfishes. The native fish community inhabiting the Colorado River in proximity to and through the Shoshone Reach includes multiple cold and cool water species, including small-bodied sculpin and dace, and larger-bodied Bluehead Suckers, Flannelmouth Suckers, and Roundtail Chub, which are naturally adapted to a wide range of mainstem river habitats and water quality conditions. A variety of coldwater salmonid species, both native and introduced, comprise the sportfish community, including (in order of abundance): Brown Trout, Rainbow Trout, Mountain Whitefish, and Cutthroat Trout. The coldwater sportfish thrive in colder temperatures and clearer waters than Colorado River mainstem native fish, but are able to withstand some seasonal perturbations including warmer summer water temperatures and occasional sediment flows from monsoonal rains. CPW manages the Colorado River from its headwaters downstream to Rifle for coldwater sportfish, including the Shoshone Reach. Near Rifle, warmer river temperatures develop as well as increased turbidity. Critical Habitat begins at the Highway 13 bridge in Rifle for the federally listed Threatened and Endangered river fishes, Colorado Pikeminnow and Razorback Sucker, and farther downstream near the Utah Border for Bonytail Chub and Humpback Chub. The diversity of Colorado River fishes and their life history characteristics are sustained by the variety of habitats and dramatic landscapes that characterize the river corridor in Western Colorado.

The current State Wildlife Action Plan (SWAP) identifies wildlife conservation priorities of CPW and recognizes the Bluehead Sucker, Flannelmouth Sucker, and Roundtail Chub (collectively known as the “Three Species”) as Tier 1 Species of Greatest Conservation Need. In the Colorado River and its tributaries, the Three Species persist from higher elevation waters around 8,000 feet downstream to the western desert and canyon reaches where they overlap with the Colorado River Threatened and Endangered fishes. As documented in the 2019 Rangewide Three Species Conservation Agreement and Strategy (“2019 Conservation Strategy”), the Three Species have become increasingly rare with significantly reduced occupancy in less than 50 percent of their historic range. The dramatic decline of the Three Species in mainstem rivers is attributed to habitat degradation due to hydrologic alterations and reduced water availability because of water diversions, fragmentation and passage

impediments from dams and diversions, and the widespread invasion of nonnative fishes that either hybridize with (in the case of native suckers), compete with, or predate upon native fishes. The ability of the Three Species to exploit ephemeral and intermittent tributary habitats and the seasonal movements (some greater than 100 miles) performed by native suckers, allows for their long-term persistence in the Colorado River.

The Upper Colorado River is well suited to coldwater fishes in its cooler high-elevation climate sustained by winter snowpack that provides cold waters that surge seasonally as runoff or upwells through springs. The widespread introduction of several trout species, Brown Trout, Rainbow Trout, and Brook Trout, and their salmonid relative, Mountain Whitefish, began in the late 1800s in the Colorado River basin. In the 1940s, Colorado wildlife officials introduced the Mountain Whitefish, another Colorado native fish, from its indigenous waters in the Yampa River to the Roaring Fork River to increase diversity in angling opportunities. Expansion of whitefish into the Colorado River above Glenwood Canyon is limited by Shoshone Dam, as it provides a substantial barrier to upstream fish passage. Once the only trout in the Colorado River, native Colorado River Cutthroat Trout continue to use the Colorado River mainstem periodically, but primarily sustain their populations in cold tributary streams where they are better suited to high elevation and isolated habitats than the introduced trout species. Coldwater sportfish and sculpin are best suited to the coldwater reaches of the Colorado River where high seasonal flows and higher stream gradients maintain hydraulic conditions for the maintenance of preferred habitats for reproduction, growth, and forage.

Rainbow Trout and Brown Trout are the two most popular sportfish targeted by anglers in Colorado (2020 Colorado Angler Survey Summary Report). Prioritized for Wild Sportfish Management, CPW categorizes the Colorado River as “302 - Salmonid Recreation Stream” which specifies that the fishery consists of mostly wild-produced trout, with some stocking of Whirling Disease (WD) resistant Rainbow Trout fingerlings to overcome losses from the WD parasite. Increasingly successful, the current fishery management strategy allows CPW to designate the Colorado River in Glenwood Canyon as a Quality Trout Water, as it is considered a productive, quality fishery where anglers are likely to catch quality-sized trout (greater than 14 inches). Fishing the Colorado River is an enticing recreational opportunity that attracts visitors and residents to the area and generates millions of dollars for local economies annually. Small native fish (sculpin and dace) serve as a nutritious food source along with a healthy macroinvertebrate community to support the sport fishery, and the rare native fishes occasionally encountered by anglers while fishing for sportfish add unexpected and unique encounters.

2.2.2 Fish Survey Results

Recent CPW fish surveys in the Shoshone Reach of the Colorado River (November 2023 and October 2024) revealed a notably high abundance of desirable fish species. These efforts were the first documented fish surveys by CPW in this section of river. The sampling included both opportunistic capture surveys for presence detection (spot electrofishing) and a population

survey to estimate relative fish abundance and biomass. The November 2023 survey occurred during an extended period of time when the Shoshone power plant was inoperable (February 2023-August 2024), allowing more natural flow conditions. Due to flow conditions, the 2023 survey was limited to electrofishing along the banks and wadeable river margins. Spot electrofishing in 2023 detected the presence of Brown Trout and Rainbow Trout, confirming trout will migrate into and use the Shoshone Reach following a period of restored flows.

In October 2024, extensive spot surveys were conducted in the dewatered river channel after the power plant came back online. The 2024 spot electrofishing surveys demonstrated the extent of Brown Trout, Rainbow Trout, dace, sculpin, Mountain Whitefish, and Longnose Sucker (in order of relative abundance) and confirmed their presence throughout the 2.4-mile Shoshone Reach. In October 2024, CPW staff also conducted a depletion estimate to survey the population for the first time in order to assess fish abundance, biomass, and size class structure of the fishery (Photo 2). Fish captured during the survey include in descending order of abundance: dace, Brown Trout (Photo 3), Rainbow Trout (Photo 4), Mountain Whitefish, Longnose Sucker, Bluehead Sucker (Photo 5), and sculpin. Table 1 summarizes the Abundance (fish/acre), Biomass (pounds/acre), and Total Fish Length from tip of nose to tip of tail in inches calculated for each fish species encountered.

Table 1: Summary of Abundance (fish per acre), Biomass (pounds per acre), and the average and range of Fish Total Lengths (inches) for an October 23, 2024 survey in a dewatered Colorado River reach between Shoshone Dam and Shoshone Hydropower Plant near Flag Buttress.

Fish Species	**Abundance** fish/acre	**Biomass** pounds/acre	**Fish Total Length Mean (Min-Max)** inches
Brown Trout	205	205.1	11.3 (3.9 – 21.9)
Rainbow Trout	157	125.6	13.0 (8.2 – 15.6)
Mountain Whitefish	20	10.2	10.6 (5.6 – 12.3)
Sculpin *spp*.	6	--	3.4 (3.2 – 3.6)
Dace *spp*.	260	--	3.8 (1.9 – 5.2)
Bluehead Sucker	8	2.3	8.3 (7.7 – 8.9)
Longnose Sucker	14	7.1	10.7 (10.0 – 11.3)

2.2.3 Fishery Discussion & Conclusion

Low flows in October 2024 in the Shoshone Reach provided CPW an opportunity to thoroughly evaluate the fishery in the high-gradient, boulder-lined river channel that would otherwise be

inaccessible. Though significantly depleted from its natural flow condition, the residual stream was sustained by a minimal flow of water bypassing the dam, perennial tributary flow, and spring flows that maintained pools, riffles, and runs to harbor a notable abundance of fishes. The presence of sub-adult Bluehead Suckers and a variety of age-classes of trout suggests that some spawning occurs in this reach in either mainstem or proximal tributary habitats. Juvenile and adult fish are able to find refuge from aquatic and terrestrial predators in the channel's limited wetted area, specifically in small habitat features created by large boulders and in runs and pools that hold residual depth. Furthermore, the persistence of large trout supports quality angling opportunities in the canyon-bound river that benefits local communities that are sustained by tourism-based economies.

The adaptability of the Three Species to intermittent and seasonally dynamic river conditions allows for their persistence in an altered river system. CPW researchers have documented the use of small tributary habitat in the Colorado River basin (Thompson and Hooley-Underwood 2019), where naturally ephemeral and intermittent stream conditions are similar to those in the Shoshone Reach under current hydropower diversion operations. Within proximity to Glenwood Canyon, fishery monitoring reaches at Lyons Gulch (6 miles upstream), No Name (lower Glenwood Canyon), South Canyon (6 miles downstream), and New Castle (13 miles downstream) have detected the presence of at least one of the Three Species during each sampling occasion between 2008 and 2024, and CPW considers the Colorado River to be occupied Three Species habitat throughout Glenwood Canyon.

The recent population survey of the Shoshone Reach in October 2024 documented the presence of juvenile Bluehead Suckers. Bluehead Sucker are more likely to exploit the local canyon reaches, as they are more often found in higher gradient, swifter velocity habitats compared to the Flannelmouth Sucker and Roundtail Chub (Thompson and Hooley-Underwood 2019). In particular, juvenile Bluehead Sucker primarily consume macroinvertebrates as a food source (2019 Conservation Strategy), thus they are likely to exploit the Shoshone Reach year-round based on the 2024 CPW macroinvertebrate and fish surveys. Flannelmouth Sucker are confirmed to use the Shoshone Reach, as a CPW PIT-tagged fish from the Eagle River was detected by a PIT-tag antenna in Debeque Canyon approximately 90 miles downstream, requiring the fish to migrate downstream through the Shoshone Reach, including the power plant diversion infrastructure. Despite their rarity, Roundtail Chub are regularly detected in approximately 50 percent of surveys at three locations surrounding Glenwood Canyon – Lyons Gulch, South Canyon, and New Castle – all of which exhibit habitat characteristics (low gradient, more turbid water) preferable to Roundtail compared to high-gradient canyon reaches (2019 Conservation Strategy). All Three Species use Glenwood Canyon at least briefly to access or find refuge given the dynamic conditions that offer seasonally and spatially variable resources. Ensuring the permanency of historical flows available through the Shoshone water right and restoring instream flow to dewatered Shoshone Reach will support the continued persistence of the Three Species in the Upper Colorado River.

The Shoshone Reach of the Colorado River in Glenwood Canyon supports a high-quality fishery, even in its seasonally dewatered state with limited wetted habitat. During the

October 2024 survey, the Shoshone Reach had very low flow, as the majority of the natural river flow above Shoshone Dam was diverted into the hydropower plant. The reduced channel, despite appearing from a distance to be flowing at a mere trickle, provides enough holding habitat in deep pools and glides and offers large cover features to harbor both small and large river fishes produced in the full spectrum of waters and resources lower in Glenwood Canyon. As the water recedes from the Shoshone Reach with declining seasonal flows, smaller fish find habitats with favorable velocities and small pools to occupy between large boulders. Microhabitats that support small-bodied fish like dace persist between small substrates and also support macroinvertebrate and algae food sources. Large predatory trout will find desirable slower velocities in deep, boulder-lined runs and pools where they successfully use these habitats to make a living through the winter – finding cover from their predators and hunting for their own prey. As encountered in the fish survey, an abundance of small-bodied prey, including sculpin, dace, and juvenile trout and suckers will sustain larger predatory trout. Rainbow Trout can subsist on the abundance of macroinvertebrates, a preferred prey item, that concentrate into the reduced wetted channel. Few competitors will invade their occupied habitat, especially for the adult fishes, as large drops in the river channel once connected by water become insurmountable (Photo 6). The presence of a variety of age classes of fish indicate that some supplemental reproduction for Colorado River native and sportfish populations occurs in the Shoshone Reach, particularly following a period of restored flows.

2.3 Biocriteria & the Macroinvertebrate Community

2.3.1 Biocriteria Overview

Macroinvertebrate data can be used to evaluate the overall health of a waterbody and to analyze stressors to an aquatic ecosystem using “biocriteria” or aquatic life metrics. Water quality samples only represent a singular moment in time and provide limited information on the combination of pollutants and stressors affecting a biological community. In contrast, macroinvertebrates are the best single assemblage for bioassessment due to their generally short life spans of approximately a year, limited migration patterns, representation in most Colorado habitats, and ease of collection. Although the Colorado Department of Health and Environment (CDPHE) has macroinvertebrate data for the COUCUC03 segment of the Colorado River from the outlet of Lake Granby to below the confluence with the Roaring Fork River, no sampling stations exist in Glenwood Canyon. To fill this data gap and assess biocriteria for the Shoshone Reach, CPW staff collected macroinvertebrate samples in the Colorado River at a location below Devils Hole Creek (CRblwDH) on November 5, 2024. During the sampling event, flows were very low (approximately 50 cfs) as the Shoshone power plant was operating (Photo 8). LRE Water performed laboratory identification of the samples and ran a standard 300-count sub-sample of the macroinvertebrate data through Colorado’s Ecological Data Application System (EDAS) program. Based on the analysis, CRblwDH meets the state thresholds for macroinvertebrate health and biodiversity.

2.3.2 Macroinvertebrate Survey Results

The summary tables below reports the macroinvertebrate community metrics that the state considers when assessing a stream's macroinvertebrate community and potential impairment. Macroinvertebrate metrics and thresholds are described in CDPHE Policy 10-1. Colorado's multi-metric index (MMI) is a combination of macroinvertebrate metrics used to score sites from 0 to 100. The MMI score for CRblwDH is 64.3 which exceeds the state's threshold (greater than 45) and meets the threshold for a "High Scoring Water" (greater than 56). The two auxiliary metrics used by CDPHE are the Hilsenhoff Biotic Index (HBI) and Shannon Diversity Index (SDI). HBI is an indicator of how many pollution-tolerant insects occupy the site where higher scores indicate a pollutant-tolerant community. The HBI score for CRblwDH, 4.44, is below the state threshold of 5.8 and considered typical. The SDI metric quantifies community biodiversity, with high scores indicating a greater variety of species present in a range from 0 to 5. The SDI score for this site is 2.17, narrowly meeting the state's threshold of greater than 2.1.

Table 2: Macroinvertebrate metrics (MMI, HBI and SDI) for CPW's macroinvertebrate survey site (CRblwDH) in the Shoshone Reach

Station ID	Waterbody Name	Location	Latitude	Longitude	Collection Date	Biotype	MMI	Hilsenhoff Biotic Index (HBI)	Shannon Diversity Index
WQCC Policy 10-1						1 (Transition)	> 45	< 5.8	> 2.1
CRblwDH	Colorado River	Below Devil's Hole	39.57608	-107.20968	05-Nov-24	1	64.3	4.44	2.17

Additional metrics analyzed by CPW staff evaluate the presence of sensitive macroinvertebrate species belonging to the mayfly (*Ephemeroptera*), stonefly (*Plecoptera*), or caddisfly (*Trichoptera*) orders, also known as "EPT" taxa. The metric "% EPT non-*Baetidae*" indicates how many insects belong to the EPT orders excluding the *Baetidae* family. *Baetidae* are mayfly species that are pollution-tolerant, so they are intentionally excluded from this metric. At the CRblwDH site, approximately 90% of the individuals collected in the sample belong to EPT orders while only 25% of those species belong to the EPT category which excludes *Baetidae*, indicating that a vast majority of EPT individuals at this site were pollution-tolerant *Baetidae* species. The "% Intolerant taxa" category assesses the percentage of the sample with pollution-intolerant species. At the CRblwDH site, despite a high presence of *Baetidae* species, there is a strong presence of pollution-intolerant taxa with 39.1% of the sample belonging to that category. This sample had 23 total taxa present, which demonstrates the macroinvertebrate community is species-rich, thus considered to have relatively high biodiversity. Of the 23 taxa present, 11 taxa were EPT species. The final metric assessed by CPW is sediment Tolerance Index Value (TIV) to characterize the sediment tolerance of the macroinvertebrate community on a ranking of 1 to 10. The sediment TIV score for this site is 5.62, meeting the threshold of less than 7.2 for this region. The relatively high abundance of sediment-sensitive macroinvertebrate species indicates that fine sediments are relatively low in the Shoshone Reach, which is expected in a high-gradient transport reach with an upstream on-channel dam.

Table 3: Additional macroinvertebrate metrics assessed for CPW's macroinvertebrate survey site (CRblwDH) in the Shoshone Reach

Station ID	Waterbody Name	Location	EPT % non Baetidae	% EPT	% Intolerant Taxa	Total Taxa	EPT Taxa	Sediment TIV
CRblwDH	Colorado River	Below Devil's Hole	24.7	90.5	39.1	23	11	5.62

2.3.3 Macroinvertebrate Community Discussion & Conclusion

All indices demonstrate Aquatic Life Use attainment at this site for the macroinvertebrate community despite dewatered conditions leading up to and during the sampling event. Approximately three months of extended dewatering occurred prior to sample collection. The sample was collected in a portion of a riffle where perennial water in a low-flow channel likely persists year-round despite the diversions into the power plant (Photo 9). Even under these low flow conditions, CRblwDH is meeting and even surpassing select thresholds for macroinvertebrate health and biodiversity in the low-flow channel. This indicates both good habitat and water quality are maintained in the consistently wetted portions of the channel. When Shoshone is operational and diverting, insects entrained in the river bed outside of the low-flow channel may perish as the channel dries. Several macroinvertebrate families within the orders of stonefly (6 families) and caddisfly (5 families) are present in the Colorado River upstream of Shoshone at a survey site sampled by Timberline Aquatics near Sweetwater, but are missing in the river below Shoshone Dam (GEI, 2025). Both stoneflies and caddisflies make limited movements and live attached to or under rocks. As the waters recede, they will become stranded. This is one explanation for the low SDI score and low percentage of EPT non-*Baetidae*. The missing families would likely occupy this segment of the Colorado River if there were consistent flow throughout the channel, and they may recolonize if consistent flows return.

With an overall diverse population of macroinvertebrates in the low-flow channel, the macroinvertebrate community in the Shoshone Reach has potential to improve. The current resident community of insects serves as a population center that would expand as the wetted channel area increases with additional flow. Particularly during the winter, additional flows will result in less anchor ice within the canyon, which will likely improve the macroinvertebrate community diversity. With fluctuating river flows, fish can move in to the Shoshone Reach when flow increases, but food may be limited in rewetted habitat if the majority of insects persist in the perennial low-flow channel. A healthy and diverse macroinvertebrate community is a crucial component of the ecosystem and indicates potential for healthy fish populations.

3. Instream Flow Evaluation & Flow-Habitat Relationships

3.1 Instream Flow Evaluation Overview

CPW supports CWCB's ISF Program by providing biological and technical expertise and assists the CWCB in making a determination of whether the natural environment will be preserved and/or improved to a reasonable degree by the water made available under the proposed acquisition. CPW staff use professional judgement and best available data to make that determination and in some instances may collect additional biological data to fill data gaps. No fishery or habitat studies existed in the Shoshone Reach prior to 2023 because its gradient and occasional high flows often make it inaccessible and dangerous. In addition to fisheries sampling conducted in 2023 and 2024, CPW staff recommended collecting data necessary for an instream flow evaluation using the Instream Flow Incremental Methodology (IFIM). IFIM is a widely accepted method used to quantify how hydraulic habitat attributes relevant to fish vary with flow over a representative reach. The two-part modeling approach uses habitat suitability criteria (HSC) indices and hydraulic modeling to evaluate habitat suitability as a function of discharge for specific aquatic species. IFIM has been widely used in Colorado for instream flow evaluations on large and complex rivers, namely the Dolores River, San Miguel River, Cache La Poudre River, Blue River, and Colorado River between Kremmling and Dotsero. The IFIM methodology uses a hydraulic model, paired with HSC for fish species and life stages of interest. Habitat suitability for hydraulic variables of depth and velocity, and sometimes substrate and cover, are combined into a composite score which can be summed over the representative study reach to calculate the area of suitable habitat, also known as weighted usable area (WUA). WUA is a measure of suitable fish habitat that varies as depth and velocity change with discharge.

3.1.1 Overview Freshwater Consulting Habitat Modeling – 2023-24

In November 2023, CRD contracted with two consulting firms, River Restoration and Freshwater Consulting, to evaluate hydraulic habitat-flow relationships in the Shoshone Reach using IFIM.

Two-dimensional (2D) hydraulic modeling was performed by River Restoration using SRH-2D on a representative reach of the Colorado River. The study reach, referred to as Site 1, measured 1850 feet long with an upper terminus approximately 0.5-mile downstream of the Shoshone Dam. Site 1 includes two large pools divided by riffle. Freshwater Consulting conducted habitat suitability analysis using a spreadsheet-based model and output from the 2D hydraulic model. Suitable habitat area was modeled for flows between 50 and 3000 cfs for four focal species in their adult life stage – Brown Trout, Rainbow Trout, Mountain Whitefish, and Flannelmouth Sucker. The seven selected flow rates modeled were 50, 250, 700, 1020, 1250, 1400, and 3000 cfs.

CPW reviewed and participated in the initial model scoping and selection of appropriate focal species and associated HSC. Site-specific HSC are derived from direct observations of actual

fish locations within river habitats. In the Shoshone Reach, deriving site-specific HSC was not possible due largely to safety concerns given dangerous river hydraulics, as well as time limitations. It is standard and accepted practice to use existing HSC from literature or comparable studies based on professional judgement when site-specific HSC is not possible. For the Shoshone Reach, HSC used previously for the Colorado River Wild and Scenic reach were adapted to include fish habitat preferences that are unique to a high-gradient, canyon study area such as the Shoshone Reach, namely deep pools. Adult life stages were selected because the characteristics of the canyon generally favor these larger-bodied, mature species.

3.1.2 Results Freshwater Consulting Habitat Modeling – 2023-24

Results summarized below are from the September 30, 2024 Freshwater Consulting Report. Results show that suitable habitat area (or WUA) increases rapidly between 50 to 700 cfs for all species. For the salmonid species (Brown Trout, Rainbow Trout, and Mountain Whitefish), WUA continues to increase precipitously up to 1020 cfs. Maximum WUA occurs at 1020 cfs for Brown Trout, 1400 cfs for Rainbow Trout, 1250 to 1400 cfs for Mountain Whitefish, and 700 cfs for Flannelmouth Sucker. Habitat suitability for Flannelmouth Sucker is lower than the other species overall and declines at flows greater than 700 cfs. This is because the preferred depth of Flannelmouth Sucker ranges between 1 to 4 feet with declining suitability at depths greater than 4 feet. Alternatively, HSC for salmonid species are high for depths 10 feet and greater. Given the abundance of deep water in the pool and run habitats that dominate Site 1, these flow-habitat relationships are explained.

Overall WUA, calculated by averaging the results of the four fish species, is maximized at 1250 cfs with modest declines at flows in the 1400 to 3000 cfs range. The decline in WUA at flows greater than 1400 cfs is driven in large part by high water velocities that are less suitable for all species. The initial results for Site 1 show the highest habitat availability for Brown Trout and Rainbow Trout, Mountain Whitefish, and Flannelmouth Sucker at flows in the range of 700 to 1400 cfs. The results show modest declines in suitable habitat between 1400 and 3000 cfs, although there is still suitable habitat available for fish species at higher flows. As incremental flows between 1400 and 3000 cfs were not assessed by Freshwater Consulting, it is difficult to directly evaluate the relationship between these higher flows and WUA.

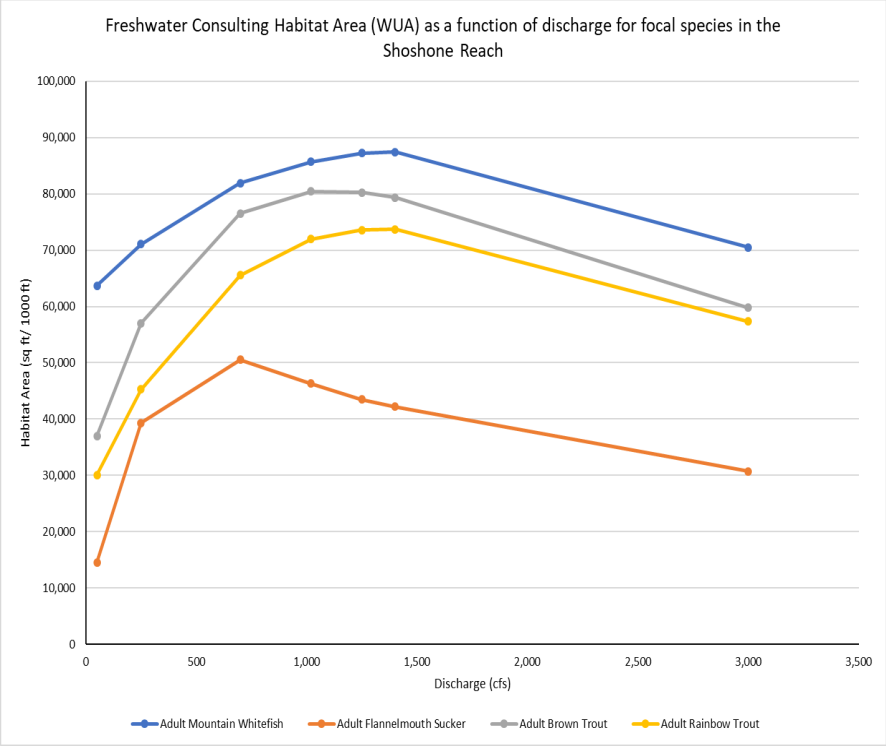


Figure 1: Freshwater Consulting assessment of Weighted Usable Area (WUA, square-feet per 1000 linear-feet of stream) across a range of river flows (cubic feet per second, CFS) for Site 1 in the Shoshone Reach of the Colorado River for four focal fish species.

3.2 Hydraulic Habitat Model Limitations

The Shoshone Reach is a high-gradient confined canyon with highly variable streambed roughness, water depths, and velocities (GEI, 2025). Within Colorado, there are multiple examples of canyon reaches like the Shoshone Reach supporting dynamic and high quality habitats for coldwater sportfish such as Brown Trout and Rainbow Trout, including the No Name Reach on the Colorado River, Gunnison Gorge on the Gunnison River, and Cheesman Canyon on the South Platte River. This is evidenced in abundance and biomass metrics documented in CPW fish surveys. Like the Shoshone Reach, many portions of these river reaches have hydraulic conditions that limit surveying efforts or make them impossible due to safety concerns. Complex hydraulics in canyon reaches like the Shoshone Reach also present nuanced fish habitat use that can be over-simplified by hydraulic habitat modeling.

The Freshwater Consulting results were developed from a single site with somewhat homogenous habitat features and a relatively coarse spatial resolution with a grid size of approximately 4 x 4 feet. While this grid size is appropriate for IFIM, it is unable to represent all microhabitat refugia used by fish. Site 1 is a pool dominated reach with two large pools divided by a boulder and cobble riffle. The reach was bound on the downstream end by a rapid created by an alluvial fan from Devils Hole Creek. This reach was selected for the survey because of surveyor safety concerns given hydraulic conditions at the time of the

survey. The limited hydraulic habitat perspective did not account for more complex habitat features present in the Shoshone Reach that are exploited by fish.

Much of the usable fish habitat in the Shoshone Reach, especially at higher flows, is in the form of velocity refuges created by variable bed substrate, large boulders, and the boundary layer of the streambed. 2D models simulate hydraulics in lateral and longitudinal directions, producing depth-average values for water velocity that moderate the variability in velocity throughout the water column. The use of depth-average velocity to calculate habitat suitability underestimates the amount of suitable habitat available in streambeds, particularly in rivers with high roughness like the Shoshone Reach of the Colorado River. Microhabitats and near-bed features used by fish are not captured with the depth-average velocities produced by the hydraulic model. Water velocities are typically lowest along the stream bed, and the variability in channels with high roughness will be even more pronounced. In channels with high roughness, actual velocities along the stream bed can be 40 to 60% lower than the depth-average velocity. Therefore, habitat suitability models which rely on depth-average velocity do not account for fish-favorable velocities in roughness features. In the Shoshone Reach, this likely resulted in an underestimate of suitable fish habitat.

3.2.1 Overview Ecosystem Sciences Habitat Modeling – 2024-25

During fall 2024, CRD contracted River Restoration and Ecosystem Sciences, an Idaho consulting firm, for additional modeling to better understand the relationship between fish habitat and flows in the Shoshone Reach. During the fall and winter of 2024-25, River Restoration and Ecosystem Sciences performed fieldwork to assess a second study site (Site 2) and address the limitations in the initial analysis. The addition of Site 2 increased the spatial coverage of the hydraulic habitat model and introduced increased channel complexity and habitat features into the model. The upper terminus of Study Site 2 is immediately downstream of Site 1 and the reach is approximately 1830 feet long. Site 2 is lower gradient and less constrained with a greater variety of habitat features, including a split-channel island, more variety in the bed composition, and complex riffle, run, and pool habitats. Adding Site 2 increased the total spatial representation of habitat evaluated to include approximately 29% of the Shoshone Reach. Lastly, five additional higher flow rates were also modeled for both sites to develop a better understanding of the habitat-flow relationships between 1500 and 3000 cfs. For the 2024-25 modeling effort, habitat suitability was evaluated at flows of 50, 250, 700, 1020, 1250, 1400, 1500, 1750, 2000, 2250, 2500, and 3000 cfs.

3.2.2 Results Ecosystem Sciences Habitat Modeling – 2024-25

Results summarized below are from the April 22, 2025 Ecosystem Sciences report. Results for Site 1 assessed by Ecosystem Sciences (Figure 2) demonstrate a similar trend to the Freshwater Consulting results (Figure 1) with steep increases in WUA for each species between 50 and 700 cfs. For Brown Trout and Rainbow Trout, WUA continues to increase sharply until 1020 cfs. Maximum WUA occurs at 2250 cfs for Brown Trout and Rainbow Trout,

2000 cfs for Mountain Whitefish, and 1500 cfs for Flannelmouth Sucker. Overall WUA is maximized at 2250 cfs. Above 2250 cfs, WUA generally plateaus and slightly declines between 2500 and 3000 cfs. This differs from the Freshwater Consulting Site 1 evaluation, but it is difficult to compare the two because incremental flows between 1400 and 3000 cfs were not evaluated by Freshwater Consulting.

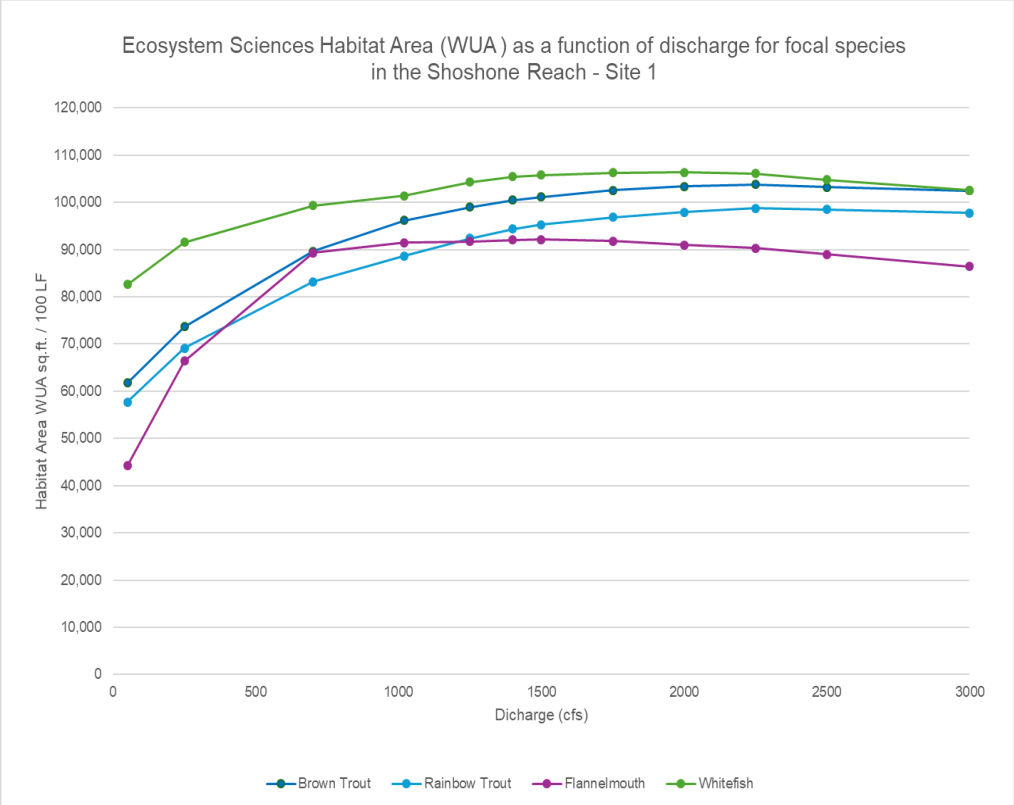


Figure 2: Ecosystem Sciences assessment of Weighted Usable Area (WUA, square-feet per 1000 linear-feet of stream), across a range of river flows (cubic feet per second, CFS) for Site 1 in the Shoshone Reach of the Colorado River for four resident fish species.

Results for Site 2 (Figure 3) demonstrate a trend of gradual and consistent increases in WUA for all four species as flows increase (as compared to the dramatic increase followed by a plateau in Site 1). Site 2 has a less constrained channel and floodplain compared to Site 1. Site 2 has more habitat complexity and depositional features that create a mid-channel island that splits the river at lower flows. Site 2 also contains deep pool and shallow riffle features similar to Site 1. For the four species evaluated, maximum WUA occurs at relatively high flows with a maximum WUA at 3000 cfs for the salmonid species and 2000 and 3000 cfs for Flannelmouth Sucker. Benefiting from the hydraulic complexity within Site 2 and supporting their lower depth and velocity preferences, WUA for Flannelmouth Sucker is greatest at Site 2. As flows increase in Site 2, portions of the islands inundate, and the split channels expand and connect, increasing the variety of depth and velocity conditions suitable for Flannelmouth Sucker. Conversely, for adult salmonids, WUA is lower at Site 2 than Site 1, though Site 2 still contains important habitats.

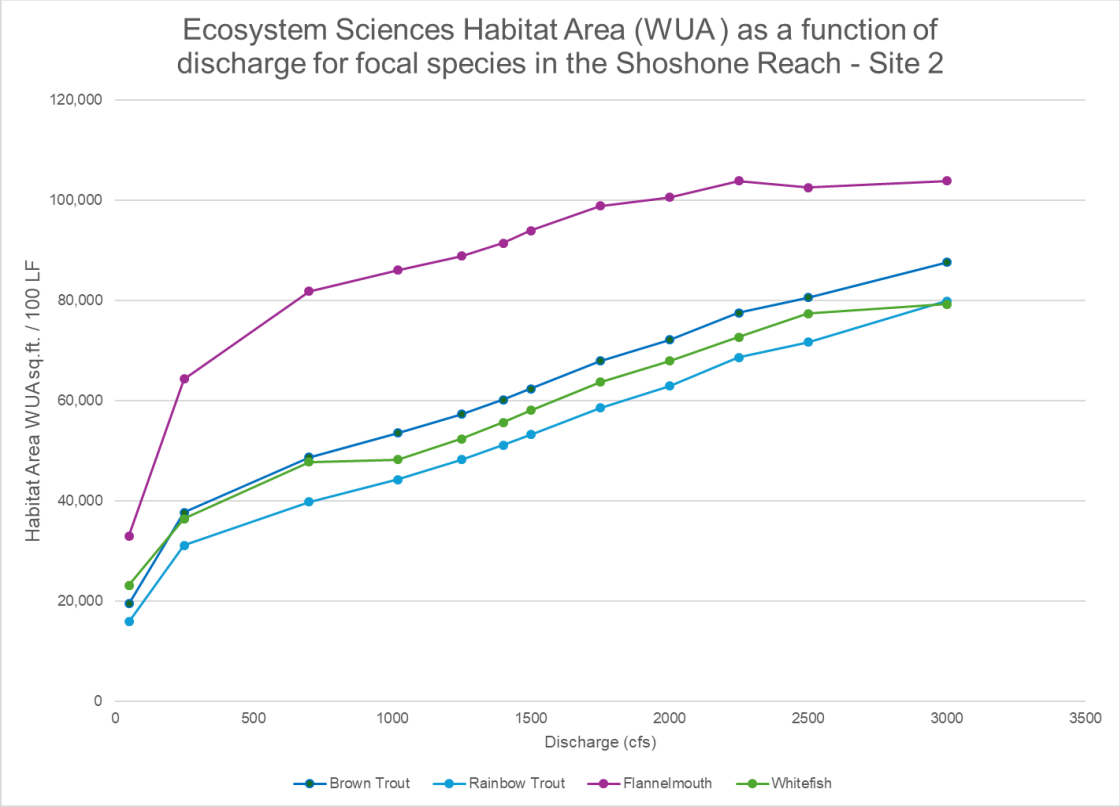


Figure 3: Ecosystem Sciences assessment of Weighted Usable Area (WUA, square-feet per 1000 linear-feet of stream), across a range of river flows (cubic feet per second, CFS) for Site 2 in the Shoshone Reach of the Colorado River in Glenwood Canyon for four resident fish species.

Adult life stage species were the focus of the habitat modeling because of complex hydraulic conditions in the Shoshone Reach. While not specifically modeled, juvenile trout will benefit from the same lower velocity, shallow habitats that benefit Flannelmouth Suckers. These conditions provide suitable rearing conditions for juvenile trout. Spawning habitat was not explicitly modeled but gravel bars provide spawning habitat for fish including Bluehead Suckers and Flannelmouth Suckers at a wide range of flows. Gravel bar deposits are present around the island features at Site 2 and is where Brown Trout redds were observed in late Fall 2024 (Photo 7).

3.2.3 Addressing Modeling Limitations

The Shoshone Reach is a high-gradient river with highly variable streambed roughness, water depths, and velocities which contributed to high velocities represented by the hydraulic model that under-represented actual suitable fish habitat availability. To address this issue, Ecosystem Sciences used an additive model to estimate the composite habitat suitability by adding depth and velocity suitability for each cell from the hydraulic model. Conversely, Freshwater Consulting used computations that multiplied depth and velocity suitability to estimate the composite habitat suitability score for each cell. The limitation of the multiplicative approach for composite suitability is that high depth-average velocities will result in low or zero habitat suitability scores for areas where suitable velocities are actually

present along the rough streambed. In Freshwater Consulting's computations, velocity suitability scores of zero will drive the overall habitat suitability to be deemed unsuitable. This misrepresents velocity refuges used by fish and underestimates suitable habitat because in reality suitable velocities exist along the streambed in roughness features. In fact, a substantial amount of these roughness features exist in the Shoshone Reach due to the highly variable substrate, velocities, and depths (GEI, 2025). Therefore, suitable habitat is under-represented by traditional IFIM modeling computations in steep canyon reaches like the Shoshone Reach. When using an additive model to estimate habitat suitability to account for a high degree of roughness in the channel, WUA results account for microhabitat features that provide important fish habitat.

3.3 Discussion and Conclusions on Flow-Habitat Relationships

Given the limitations and uncertainties discussed above, it is helpful to review the results from the Freshwater Consulting and Ecosystem Sciences reports in conjunction with one another. Freshwater Consulting used a more traditional approach for IFIM that multiplied depth and velocity suitability to estimate the composite habitat suitability and associated WUA. As previously discussed, this approach likely underestimated suitable habitat used by fish in the Shoshone Reach due to the use of depth-average velocity, particularly at higher flows. The Freshwater Consulting results indicate that overall WUA was highest between 1250 to 1400 cfs at Site 1 when averaged across the four fish species. Overall WUA increased steeply from 50 to 700 cfs before plateauing between 1020 and 1400 cfs and then declining from 1400 to 3000 cfs. As no flow values were evaluated between 1400 and 3000 cfs, it is not clear how WUA changed in between these values.

The Ecosystem Sciences report analyzed WUA at two sites within the Shoshone Reach, including the same site evaluated by Freshwater Consulting (Site 1), using an additive approach for estimating composite habitat suitability from modeled water depths and velocities. This approach was intended to address the aforementioned limitation of using depth-average velocity to calculate the composite habitat suitability. When averaged across all species, WUA peaked at 2250 cfs at Site 1. Similar to the Freshwater Consulting results, WUA increased sharply for all species between 50 and 700 cfs. WUA then increased gradually between 700 and 2000 cfs, and declined slightly between 2250 and 3000 cfs. At Site 2, there was a very steep increase in WUA between 50 and 250 cfs and a more moderated increase between 250 and 700 cfs when averaged across species. WUA then increased steadily from 1020 to 3000 cfs with no evidence of a distinct plateau.

When considered together, the habitat suitability studies by Ecosystem Sciences and Freshwater Consulting indicate that using the Shoshone water rights of 1250 and 158 cfs for a total of 1408 cfs would benefit fish habitat, as WUA consistently increased at both sites from 50 to 1400 cfs on average. However, the two reports differ in what happens to WUA above 1400 cfs. The Freshwater Consulting report indicates the WUA declines at 3000 cfs. In contrast, the Ecosystem Sciences report indicates that WUA continues to increase (Site 2) or remain relatively stable (Site 1) for flows greater than 1400 cfs. Given the limitations of

using depth-average velocity to estimate the total amount of suitable habitat in the Shoshone Reach, which provides complex and dynamic conditions that support fish, it is likely that habitat suitability does not decrease significantly as flows increase up to 3000 cfs due to the presence of lower velocities near roughness features.

3.3.1 Other Considerations in Assessing Flow-Habitat Relationships

With regard to suitable habitat, the importance of deep pools in habitat suitability models is often underestimated and modifications for the presumed importance of deep pools in the Shoshone Reach are substantiated by CPW research. Recent CPW research shows that residual pool depth is the most important physical habitat variable driving Brown Trout population biomass. Additionally, this research shows that Quality Brown Trout were only present in pools with depths of 3 feet or greater and total fish biomass increased with increasing residual pool depth (Kondratieff and Richer 2022). In addition to this research, many other studies from Colorado rivers have shown the value of deep pools in providing important habitat functions for native Cutthroat Trout and Mountain Whitefish, such as depth cover, overwinter and low-flow refugia (Harig et al. 2000, Behnke 2002, Beinstadt et al. 2004). Important pool habitat exists in the Shoshone Reach even under dewatered conditions. Additional water provided by the instream flow acquisition will support refreshening flows to maintain these pool habitats.

High flows provide important geomorphic and ecological functions related to sediment transport and habitat for benthic macroinvertebrates. Flushing fine sediment is critical to maintain habitat for fish and macroinvertebrates, especially in locations that receive episodic sediment inputs, which has been a recurring issue in Glenwood Canyon following recent wildfires. As wetted area increases with discharge, there is more habitat available for macroinvertebrates, the primary prey resource for the fishery. Higher flows may also activate new pathways through high-gradient rapids and steep drops, which could improve conditions for fish movement in some locations, providing access to a more optimal refuge habitat. The combination of increasing WUA and improved geomorphic and ecological functions indicates that using the Shoshone water rights for instream flow would be beneficial for the fishery in the study reach.

Instream flows in the Shoshone Reach will increase suitable habitat for coldwater sportfish and native species. Recent habitat suitability studies have demonstrated that when greater flows are present, the amount of usable habitat for Rainbow Trout, Brown Trout, and Mountain Whitefish increases substantially up to 1400 cfs (Freshwater Ecosystems 2024 and Ecosystem Sciences 2025) and will improve or maintain habitat to flows approaching 3000 cfs (Ecosystem Sciences 2025). Restored instream flows in the Shoshone Reach will increase wetted habitat area for fish and macroinvertebrates and will maintain pool depths that provide important cover and refugia in the Shoshone Reach, which, based on these corroborating studies, will promote increased fish abundance and enhanced angling opportunities for Quality Trout.

4. Colorado River System Assessment

In addition to benefitting the natural environment within the Shoshone Reach, the proposed acquisition will provide benefits throughout the Upper Colorado River by providing a call that maintains the historic flow regime and will continue to support the quality of fisheries. The following sections describe the benefits provided by the Shoshone water rights beyond the benefits to the Shoshone Reach.

4.1 Upper Colorado River Wild and Scenic Reach

Four segments of the Colorado River from Kremmling to No Name Creek in Glenwood Canyon (Map 2) were identified by the Bureau of Land Management (BLM) and U.S. Forest Service White River National Forest (WRNF) as eligible for inclusion in the Wild and Scenic Rivers system due to their Outstandingly Remarkable Values (ORVs). ORVs are unique or exemplary river-related values highlighted for protection for future generations. Within the Colorado River, the specific values include fishing, boating, scenic viewing, hiking, and geological features. The Wild and Scenic designation comes with protections from significant future channel and streamside development and can include federally-held water rights. Due to competing water needs and development in the Colorado River, a stakeholder group was formed to develop a plan to protect and enhance these values in lieu of a federal Wild and Scenic designation. The Upper Colorado River Wild and Scenic Stakeholder Group (SG) includes both east and west-slope water providers, local interests, environmental groups, and state agencies. The SG adopted a Wild and Scenic alternative management plan with the goal of protecting the ORV's without limitations imposed by the federal designation and water right. CPW is a cooperating agency in the SG Plan and participates in large part because the fishery in the Colorado River between Kremmling and Glenwood Springs is an important recreational asset with a high number of Quality Trout markers, high biomass, and high usage, the foundation of the Fishing ORV. CPW's fishery management goals include managing for desirable species of Brown Trout, Rainbow Trout, Mountain Whitefish, Bluehead Suckers, Flannelmouth Suckers, Roundtail Chub, sculpin, Speckled Dace, and Cutthroat Trout. Long-term fishery monitoring sites were established by CPW in 2008 throughout the Upper Colorado River Wild and Scenic reach to monitor fish population metrics and ensure that the Fishing ORV is protected (Map 3).

A key component of the SG Plan is "Long-Term Protection Measures" identified by the SG to provide for significant protection of the ORVs. The SG Plan specifically identifies the Shoshone water rights as critical to maintaining streamflows and protecting the ORVs in the Colorado River by calling water through the upstream Wild and Scenic segments to the power plant. According to the SG Plan, "this administrative call generally results in stream flow through the subject stream segments in amounts greater than would exist in the absence of the administrative call." Securing ISF water rights decreed to the CWCB was another key component to protecting ORVs on the Colorado River between Kremmling and Dotsero. In 2013, three ISF reaches were appropriated by CWCB on the Colorado River between the Blue River and the Eagle River confluence. CPW was involved in the quantification of these ISF segments and their associated flow rates. In addition to helping maintain flow-related ORVs,

the senior call by the Shoshone water rights helps to satisfy the CWCB's ISF rights, which are junior in priority. Maintaining adequate streamflows is crucial for supporting streamflow-influenced ORVs, specifically recreational fishing, floatboating, wildlife, botanical, and scenic qualities.

Table 4: Decreed ISF rights in the Wild and Scenic reach of the Colorado River

Segment	Decreed flow rates (cfs)	Priority Date
Colorado River between Blue River and Piney River	750 cfs (8/1 – 9/15) 500 cfs (9/16 – 5/14) 600 cfs (5/14 – 7/31)	07/12/2011
Colorado River between Piney River and Cabin Creek	800 cfs (8/1 – 9/15) 525 cfs (9/16 – 5/14) 650 cfs (5/15 – 7/31)	07/12/2011
Colorado River between Cabin Creek and Eagle River	900 cfs (5/15 – 6/15) 800 cfs (6/16 – 9/15) 650 cfs (9/16 – 5/14)	07/12/2011

4.2 Temperature Exceedances

Maintaining adequate seasonal streamflows is not only crucial for preserving ORVs but also plays a significant role in regulating water temperature. The Upper Colorado River's water temperature is influenced by seasonal precipitation, ambient air temperature, and flow conditions. The river flowing downstream from higher to lower elevation climates influences the natural warming trend from Kremmling to Glenwood Springs, with peak runoff periods temporarily moderating temperature differences along the stream gradient with high snowmelt flow volumes. During late summer and early fall, heat accumulation becomes more pronounced, particularly during low flow periods and when upstream reservoir releases are minimized. According to data reported annually by the SG, acute temperature standard exceedances did not occur between 2021 and 2025, as measured by the Daily Maximum (DM) temperature. However, chronic temperature standards exceedances (maximum weekly average temperature, MWAT) are a recurring issue across wet, dry, and average year-types during summer months. In 2023, an average water year, exceedances of the chronic temperature standard occurred upstream near Catamount and Red Dirt Creek beginning in early August and chronic temperature exceedances in Glenwood Canyon persisted for 3 to 4 weeks. In 2024, a wet water year, chronic temperature standard exceedances returned at Catamount and extended downstream through Glenwood Canyon from July through August, enduring for 2 to 3 weeks between Catamount and Red Dirt Creek and extending nearly 6 weeks from Dotsero to Glenwood Springs. Chronic temperature exceedances indicate repeated and extensive thermal stress is occurring in coldwater fishes during the summer months. Additional stresses such as hooking and handling stress from anglers or sediment

caused by monsoonal rain events, can create compounding impacts to fish health and mortality.

In 2010, CDPHE identified a reach of the Upper Colorado River from Kremmling to the Roaring Fork River on Colorado's Section 303(d) List of Impaired Waters due to repeated temperature exceedances that impair Aquatic Life Use (CDPHE Regulation #93). CDPHE identifies this segment at the lowest level of attainment, #5 - Impaired without a Total Maximum Daily Load (TMDL) plan, thus it has been a High Priority for TMDL development. In December 2024, CDPHE finalized Regulation #33 to create distinct water quality standards for the Upper Colorado River Basin. Regulation #33 specifies that temperature should maintain normal diurnal and seasonal fluctuations with no abrupt changes and not increase temperature at a magnitude, rate, and duration deemed deleterious to the resident aquatic life. The regulation sets temperature standards for the segment of the Colorado River between its confluence with the Blue River and the Roaring Fork River that are an amalgamation of Coldwater Stream temperature standards similar to those developed for Tier 1 species (Brook Trout & Cutthroat Trout) and Tier 2 species (other coldwater fishes) species depending on season.

Since the temperature impairment listing, stressful summer water temperatures above 70°F for coldwater sportfish in the Colorado River have become increasingly frequent. Seasonally high water temperatures resulting from low flows and hot ambient air temperatures can cause stress that impacts fish health, spawning success, and increases disease and mortality. Sediment flows from summer monsoonal rains can amplify physical stress on fish directly through tissue abrasions on skin and gills, and indirectly by enhancing solar radiation on the turbid waters. During sustained periods when daily water temperatures peak above 70°F and fish stress, disease, or mortality is observed in areas of moderate to high angling pressure, CPW implements voluntary fishing closures informing anglers not to fish in affected river reaches to protect local coldwater sportfisheries. Mountain Whitefish appear to be the most sensitive to summer stressors as mortalities with high temperatures, handling stress, and sediment events are documented more frequently than other fishes. Furthermore, their once notable spawning runs are significantly diminished in Grizzly Creek and No Name Creek in Glenwood Canyon. These same factors affect Rainbow Trout and Brown Trout where CPW has documented disease outbreaks and physiological stress from low water and high temperatures cause ubiquitous lesions and fungal infections on unusual numbers of trout and furunculosis outbreaks in the Eagle River, a tributary in close proximity to Glenwood Canyon.

Adequate and reliable river flows associated with the Shoshone call can help maintain water temperatures for popular coldwater sportfish. When ambient air temperatures are high in the late summer, additional flows can help mitigate excessive river warming. Greater flows not only moderates temperature effects directly, but it can also increase available wetted habitat, alleviate fish crowding, which reduces stress and disease transmission, and improves river connectivity to allow fish to move to more optimal habitat conditions elsewhere. In addition to Long-Term Protection Measures identified by the SG to protect the ORVs, the SG has identified Tier 2 "Cooperative Measures" which are voluntary actions to improve stream

conditions to protect the ORVs. Strategic releases from upstream reservoirs have been implemented in recent years to supplement low flows and mitigate harmful temperatures in the Colorado River.

4.3 Anchor ice and winter temperature issues

Low flows can also affect aquatic organisms in the winter. During periods of low flow, cold temperatures can impact fish in the Colorado River. When temperatures drop well below freezing, depleted baseflows can lead to the formation of anchor ice and ice dams that impound floating ice and water and deplete downstream reaches. Anchor ice can eliminate occupiable habitat for macroinvertebrates and fish. During freeze-thaw cycles, the ice dams can break, releasing a wave downstream that scours the riverbed causing localized mortality to macroinvertebrates and fish and flushes organisms downstream. The breaking of ice dams can also pose hazards for people and infrastructure near the river. In December 2010, an ice blockage on the Shoshone power plant intake prevented diversion to the penstocks and with the dam gates frozen closed, river flows were functionally shut off in the Colorado River between Shoshone Dam and Roaring Fork River from December 14 to 16, with the exception a few tributary inputs and springs. During the extensive dewatering of lower Glenwood Canyon, a fish kill occurred at the canyon mouth near hot spring inputs, leading to documented mortalities of trout and native sculpin due to high water temperatures. Additional streamflows from the proposed acquisition will mitigate incidences like this, as well as anchor ice formation. The proposed acquisition will also supplement baseflows providing additional useable overwintering habitat for fish and macroinvertebrates.

4.4 Lower Glenwood Canyon Fishery Resources

The Colorado River downstream of the Shoshone Reach supports a thriving coldwater sport fishery comprised of Brown Trout, Rainbow Trout, and Mountain Whitefish, as well as the Three Species. Return flows from the Shoshone power plant create and maintain a diversity of habitat features that support reproduction, recruitment, and seasonal needs of resident fishes. With more consistent flows below the power plant outfall, wetted habitat fluctuates more naturally with a less altered hydrograph, and habitat is maintained and connected by gradual seasonal changes in flow. CPW fish surveys from 2021, 2023, and 2024 consistently recorded high trout numbers, particularly quality-sized trout, reaffirming that lower Glenwood Canyon is a premier fishery. Traditional riverine riffle-pool sequences support a productive macroinvertebrate and fish community where sediment transport functions are maintained. These flows sustain a resilient aquatic ecosystem that is essential for both sport fishing and native fish conservation. Two large tributaries located downstream of the power plant, Grizzly Creek and No Name Creek, provide critical spawning habitat for Rainbow Trout, Brown Trout, and Mountain Whitefish. Reproductive habitat is generally limited by the fluvial geomorphology in the mainstem river in Glenwood Canyon, so connection to tributary habitats is important. These tributaries also contribute coldwater inputs as their headwaters originate at elevations well over 10,000 feet in the Flat Tops that encompass the northern portion of Glenwood Canyon. Self-sustaining trout and whitefish populations in the Colorado River are maintained by reproduction and recruitment from coldwater tributaries. Similarly, warm and

cool-water perennial, intermittent, and ephemeral tributaries play an important role in spawning for the native Three Species. Fishing regulations implemented by CPW recommend annual spawning closures for the Colorado River in and around the tributaries of Elk Creek, Canyon Creek in Garfield County, No Name Creek, and Grizzly Creek, as the aggregations of large river fish amassing in relatively small tributary streams are easy targets for anglers. Additional flows provided by the Shoshone water rights help ensure these tributary habitats are accessible, providing critical reproductive habitat and seasonally variable river resources for resident fish. Connectivity within mainstem habitats and accessibility to tributaries are both imperative to sustaining Colorado's outstanding sportfishing opportunities and long-term persistence of native fishes.

4.5 Quality Trout and Gold Medal Fisheries

CPW manages the Colorado River for Quality Trout fishing opportunities including Gold Medal Waters. A Quality Trout is defined as a trout that exceeds 14 inches in length, contributing to a high-quality fishing experience for anglers. Designated Gold Medal Trout fisheries exhibit a high density of Quality Trout (greater than 12 trout over 14 inches per acre) and high trout biomass (greater than 60 pounds per acre) that provide the highest quality fishing experiences. The fishery in the Colorado River provides increased opportunities to capture Quality Trout and reaches that meet Gold Medal criteria are designated Gold Medal Waters. The Colorado River is designated Gold Medal in two reaches upstream of the Shoshone Reach: Fraser to Troublesome Creek and Canyon Creek in Grand County to Rock Creek. Additionally, two tributaries to the Colorado River also contain Gold Metal Waters, the Blue River and Gore Creek. The historical flow regime provided by the Shoshone call and recent efforts to introduce whirling disease-resistant Rainbow Trout support fishery enhancements that strive to meet Gold Medal metrics in Glenwood Canyon. A more recent identification of the Colorado River as a Quality Trout Water from Rock Creek downstream to Rifle signals to anglers the increased opportunity and accessibility to catch large Quality Trout in the Colorado River, including through Glenwood Canyon. Maintaining the historical flow regime in the Colorado River is essential to sustaining the existing high-quality fishery and could facilitate the return of abundant wild Rainbow Trout and push the segment between Glenwood Canyon and Rifle towards a Gold Medal designation.

4.6 Maintaining and Restoring River Connectivity

The Upper Colorado River, including the Shoshone Reach, lies in an ecoregion termed the Colorado Plateau-Wyoming Basin of the Colorado Plateau and is a specified high priority habitat in the SWAP. These larger-order rivers contain habitat features that are unavailable in smaller streams, particularly deep pools and runs, and large backwaters and floodplain areas that are inundated during high flow events. As a result, they comprise the core habitat for several native big-river fish species, though these species are also occasionally found in smaller streams (e.g., the Three Species, Bluehead Sucker, Flannelmouth Sucker, Roundtail Chub, and the federally-listed river species: Colorado Pikeminnow, Razorback Sucker, Bonytail Chub, Humpback Chub). River conditions are considered moderately or highly

impacted in many river reaches due to dams and diversions that have altered the natural hydrograph to varying degrees as snowmelt-driven peak flows are greatly reduced, as are baseflows in many cases. Additionally, dams and diversion structures function as barriers preventing upstream movement of fishes that are highly migratory species which require many miles of connected habitat to move between spawning and rearing, foraging, and overwintering habitats. These hydrological alterations, combined with channelization, bank hardening, introduction of invasive species, and other anthropogenic and climatic stressors, have degraded the condition of associated in-channel and riparian habitats. Colorado's SWAP emphasizes the protection of resources, habitat, and natural processes in these rivers. Specifically, high priority conservation actions include the securing instream flow rights, restoration and maintenance of suitable hydrological regimes, and control of invasive nonnative fish.

The Shoshone Dam disrupts the hydrologic function and river connectivity of the Colorado River, significantly impacting aquatic habitat and fish populations. Immediately upstream of the dam, the river is pooled with a flat gradient and low water velocities, leading to excessive sediment deposition and the loss of essential riffle-run sequences that characterize a healthy river. This habitat degradation diminishes macroinvertebrate productivity, reduces native sculpin habitat, and eliminates crucial refugia for juvenile fish, ultimately limiting food availability and lowering fish productivity. This lentic, highly sedimented habitat favors only the invasive White Sucker that CPW actively removes in the Colorado Basin to prevent hybridization with native Flannelmouth and Bluehead Suckers. Additionally, the dam acts as a physical barrier to upstream and downstream fish movement when diversions are occurring, and an upstream velocity barrier when closed and spilling or when bottom release gates are open. Restricting the upstream movement of fish fragments their populations and reduces access to critical spawning and rearing habitats and optimal river resources that are essential to their persistence. By altering the Colorado River's flow regime and limiting sediment transport and fish passage, the Shoshone Dam severely impacts the ecological integrity of the Colorado River surrounding Glenwood Canyon.

Within the Shoshone Reach, restoring and maintaining a more natural hydrological regime will improve fish passage. With increased water volume, drop heights will be reduced at cascades and boulder drops and downstream pool depths will be increased which increases fish passage probability. Higher flows provide increased cross-sectional habitat connectivity and wetted channel complexity, which provides alternative pathways along the channel margins when velocities in the main channel are unfavorable. Reestablishing river flows will facilitate movement for resident fish species, including desirable sportfish and the Three Species. The Three Species are endemic to the Colorado River Basin and are an important assemblage of fish for the greater Colorado River ecosystem and significant to the natural heritage of the state. Trout, whitefish, and the native Three Species will make large movements to exploit seasonally variable resources and often return to the same places to spawn. Connecting long expanses of river systems allows for nutrient cycling, fish population resiliency, and preserves genetic diversity, which is especially important within declining native species populations like those of the Three Species.

Returning natural flow conditions directly upstream of the Shoshone Dam and through the Shoshone Reach would also enhance macroinvertebrate communities and strengthen the aquatic food web that supports trout and native species populations. Macroinvertebrate surveys upstream of Glenwood Canyon indicate a stable, diverse macroinvertebrate community dominated by mayflies, caddisflies, and other pollution-sensitive taxa, signaling good water quality and nutrient cycling. Perennial flows in the Shoshone Reach could sustain a similar diverse community, ensuring a steady supply of high-quality forage for sport and native fishes alike. Furthermore, with limited riparian communities that would otherwise harbor abundant terrestrial insect food inputs for fish, aquatic macroinvertebrate drift is an essential food resource from upstream (GEI, 2025). Connected river reaches and reliable baseflows would support a thriving ecosystem, promoting fish health and population stability in the Colorado River system as a whole.

4.7 Benefits to Existing Instream Flow Reaches

The continued operation of the Shoshone call results in upstream administration that helps maintain streamflows in the upper Colorado River and many of its major tributaries. When Shoshone is calling, junior water rights are curtailed and/or reservoir replacements are made resulting in increased flows to the Colorado River headwaters and major tributaries like the Fraser, Blue, and Eagle Rivers and their tributaries. Benefits are also realized to many decreed ISF reaches held by the CWCB in the upper Colorado River Basin. The CWCB holds 350 decreed instream flow water rights upstream of the Shoshone Power Plant (CRD, 2025). In their analysis of the Shoshone water rights' impact on existing ISF reaches, CRD analyzed differences in streamflow on two ISF reaches with and without the Shoshone call using the 2024 Colorado River StateMod model. Two ISF reaches were evaluated – the Colorado River between Kremmling and State Bridge and the Eagle River between Lake Creek and Brush Creek.

Based on this analysis, there is a clear trend for both ISF reaches, which experience reduced flows absent the Shoshone call, particularly during dry years and months of August through October. The analysis showed more days when the ISF was satisfied with the Shoshone call in place. Based on CRD's analysis, the Eagle River ISF, decreed for 45 cfs in the winter and 110 cfs in the summer, would see reduced flows by 5 cfs (all years) and 7 cfs (dry years) on average absent the Shoshone call. Impacts on flows in the Colorado River at Kremmling were particularly pronounced due to compounding upstream reductions. In dry years during the months of August through October, flows at Kremmling would be reduced by 80 cfs on average if the Shoshone Water Rights were not exercised and approximately 50 cfs across all years. Under current demands absent the Shoshone call, the amount of days when the ISF reach would be met is reduced by 31% in August through October for dry years and by 19% across all months in dry years. The findings of this analysis are significant, particularly as it relates to the Colorado River near Kremmling, which has been identified by CPW as a Quality Trout Water. The Eagle River has also been identified by CPW as a Quality Trout water.

5. Conclusion & CPW Recommendation

Securing the Shoshone water rights in perpetuity is a concept that has been contemplated for decades. This proposal has broad support from a wide variety of Western Slope constituents spanning irrigation, municipal, recreational, and environmental interests. Many of these interests have also contributed financially to support the project. Permanent protection of the Shoshone water rights has been identified in a number of state-funded planning documents, including the Colorado Basin Round Table's Basin Implementation Plan(s), the Upper Colorado Wild and Scenic Alternative SG Management Plan, and the Middle Colorado River Integrated Water Management Plan. The acquisition of this non-consumptive water right aligns with CPW conservation priorities as specified in the Colorado SWAP. Overall, the corroborating studies conducted within the Shoshone Reach and knowledge-based experience of CPW's aquatic experts demonstrate that the Shoshone water right supports baseflows, habitat connectivity and habitat maintenance, and attenuates seasonally stressful conditions for important sportfish and native fishes. More consistent use of the Shoshone water rights in the Shoshone Reach for ISF purposes will provide significant preservation and improvements to natural ecological processes that support fish and macroinvertebrate communities.

It is the opinion of CPW staff that the best use of this water is to preserve and improve the natural environment at any flow rate up to 1408 cfs (the amount decreed in the senior and junior water rights). Based on hydraulic-habitat modeling, fish habitat also improves in the Shoshone Reach at flows up to at least 3000 cfs. This upper threshold is based on the upper limit of modeled flows in the hydraulic-habitat model. It is our professional opinion that flows greater than 3000 cfs also provide improvements to fish habitat by supporting geomorphic functions (e.g. moving fine sediments required for clean spawning gravels and scour and maintenance of holding habitats), supporting the aquatic food web, supporting thermal refuge areas, and creating additional fish passage pathways. Because the Shoshone Reach has been historically dewatered when the plant is operating, we believe the offered water would establish flows necessary to both preserve and improve the natural environment. Furthermore, the water right preserves the historical flow regime in the Colorado River while improving flows in the Shoshone Reach by adding additional wetted area and suitable fish habitat to a historically dewatered section of the Colorado River.

Given the demonstrated biological benefits within the Shoshone Reach, to the Colorado River headwaters and tributaries, and to the mainstem Colorado River below the power plant, CPW staff believes this acquisition will preserve and improve the natural environment and recommends the CWCB accept the interest in the acquired water. CPW believes the best use of the acquired water rights is to preserve and improve the natural environment in the Shoshone Reach of the Colorado River at any rate up to full decreed amount of 1408 cfs. Fish habitat will also be improved in the Shoshone Reach at streamflows up to at least 3000 cfs.

Photos

Photo 1: Shoshone Dam leakage during November 5, 2025 macroinvertebrate sampling event by CPW staff

Photo 2: CPW fisheries crew surveys the dewatered Shoshone Reach of the Colorado in Glenwood Canyon on October 23, 2024. (Photo Credit: K. Bakich)

Photo 3: CPW aquatic staff prepares to weigh and measure a large Brown Trout captured in an October 23, 2024 fishery survey in the dewatered Shoshone Reach on the Colorado River. (Photo Credit: K. Bakich)

Photo 4: CPW aquatic staff shows off a Rainbow Trout captured during a fishery survey on October 23, 2024 in the dewatered Shoshone Reach on the Colorado River. (Photo Credit: K. Bakich)

Photo 5: Bluehead Sucker collected October 23, 2024 during a novel fishery survey in the dewatered Shoshone Reach on the Colorado River. (Photo Credit: K. Bakich)

Photo 6: Boulder constriction in the dewatered stream in the Shoshone Reach creates a >4-foot pour-over of stream water onto a flat boulder face is insurmountable to fish moving upstream. A small constricted side channel on the left of the photo has high-velocity laminar flows that also restrict upstream fish movement. (Photo Credit: K. Bakich)

Photo 7: The red arrow points to bright, clean gravels in the Shoshone Reach of the Colorado River that are indicative of a trout redd likely created by the spawning activities of local Brown Trout during a site visit in the late fall of 2024.

Photo 8: Low flow channel during November 5, 2024 macroinvertebrate sampling event. (Photo credit: M. May)

Photo 9: CPW staff collected macroinvertebrate data in the low flow channel. 11-5-2024 (Photo credit: M. May)

References

Colorado Parks and Wildlife. 2015. State Wildlife Action Plan: A Strategy for Conserving Wildlife in Colorado. Available at cpw.state.co.us/conservation-plans (4/17/2025).

Three Species Rangewide Conservation Team. 2019. Range-wide Conservation Agreement and Strategy for the Roundtail Chub Gila robusta, Bluehead Sucker Catostomus discobolus, and Flannelouth Sucker Catostomus latipinnis. Prepared by Utah Department of Natural Resources, Publication Number 06-18, September 2006, Revised 2019.

Thompson, K. G., and Z. E. Hooley-Underwood. 2019. Present Distribution of Three Colorado River Basin Native Non-game Fishes, and Their Use of Tributary Streams. Colorado Parks and Wildlife Technical Publication 52.

Kondratieff, M.C. and E.E. Richer. 2022 Stream Habitat Investigations and AssistanceProject Summary Annual Report. Colorado Parks and Wildlife, Aquatic Research Section. Fort Collins,Colorado. Pp110

Behnke, R.J. 2002. Trout and salmon of North America. The Free Press, New York.

Deinstadt, J. et al. 2004. "Survey of Fish Populations in Streams of the East Fork Carson River Drainage, California." California Department of Fish and Game. Administrative Report 2004 - 8. 252pp

CDPHE. August 10, 2020. Policy Statement 10-1. Aquatic Life Use Attainment Methodology to Determine Use Attainment for Rivers and Streams.

Freshwater Consulting. September 30, 2024. Shoshone Reach Instream Flow Habitat Data Analysis, Habitat Simulations and Habitat Evaluation of the Colorado River from the Shoshone Diversion to the Shoshone Power Plant Outfall.

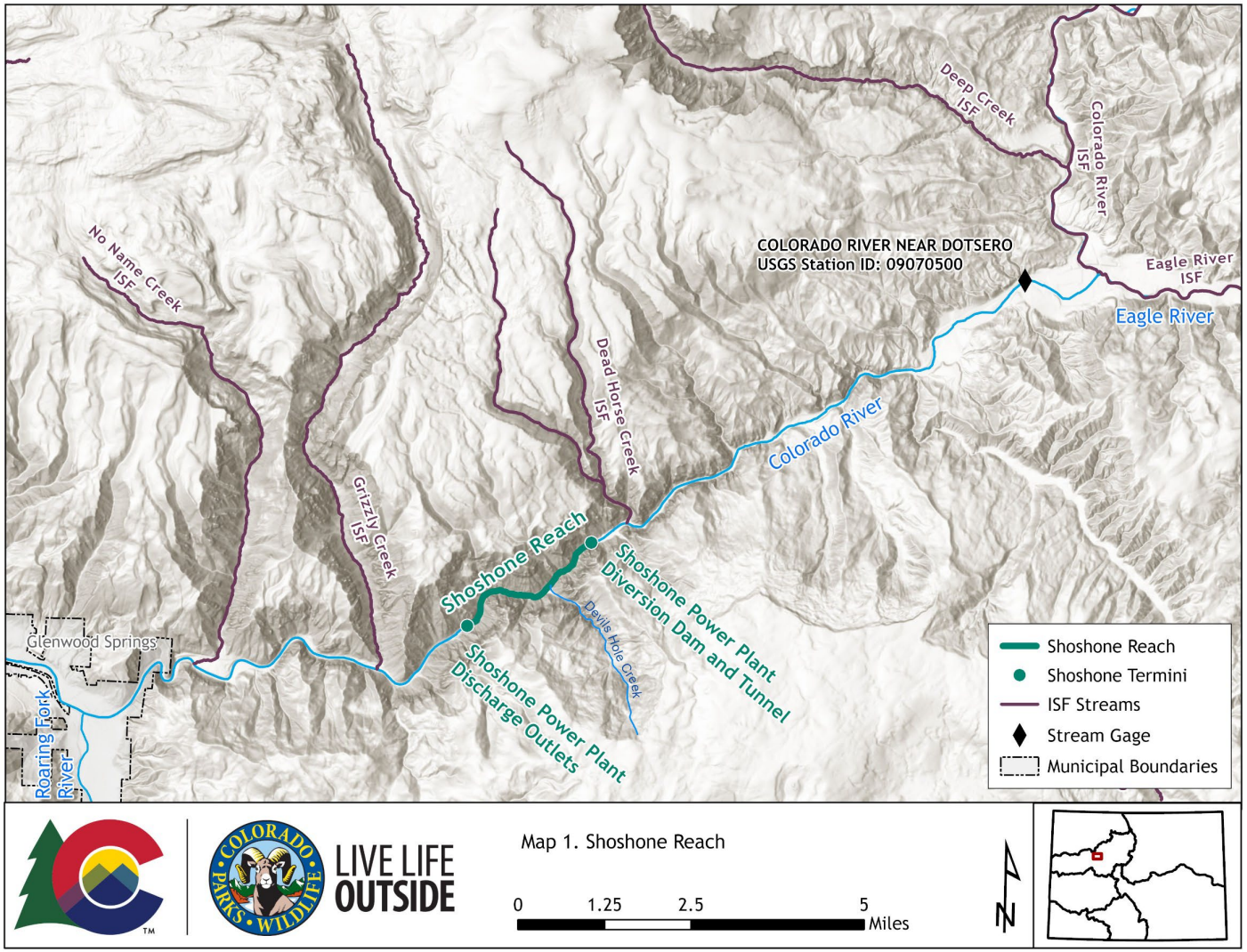
Ecosystem Sciences. April 22, 2025. Shoshone Reach Instream Flow Beneficial Use and Hydraulic Habitat Suitability Assessment.

GEI. April 2025. Review of the Effects of Flow on Biology and Stream Processes, Glenwood Canyon. Submitted to: Colorado Water Conservation Board.

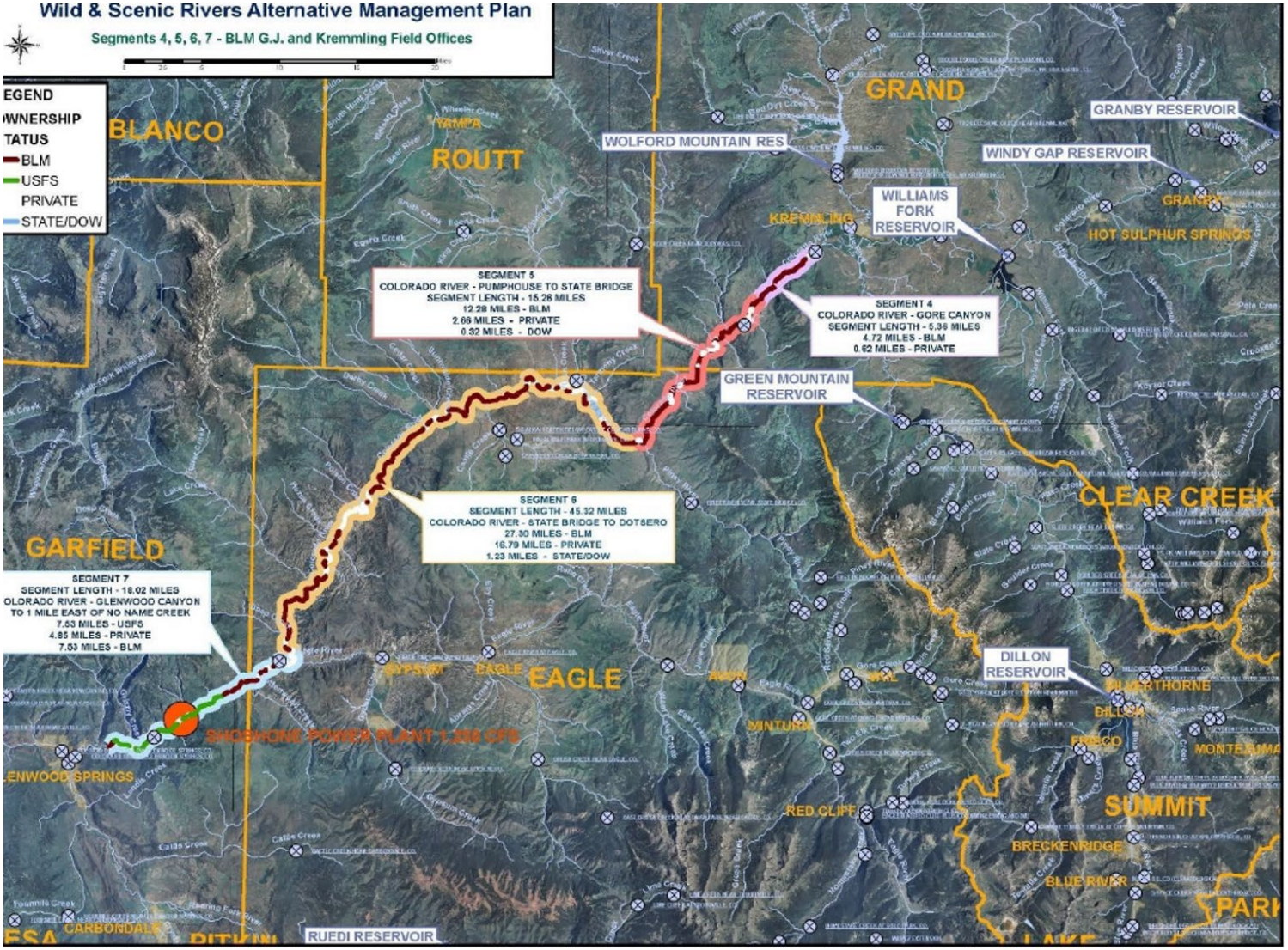
Amended and Restated Upper Colorado River Wild and Scenic Stakeholder Group Management Plan Adopted January 2012, Amended and Restated June 2020

Flinker, R. and B. Langenhuizen. 2025. Shoshone Water Rights Analysis on Decreed Instream Flow Reaches in the Colorado River Watershed. Colorado River District. 4-30-2025 Final Report.

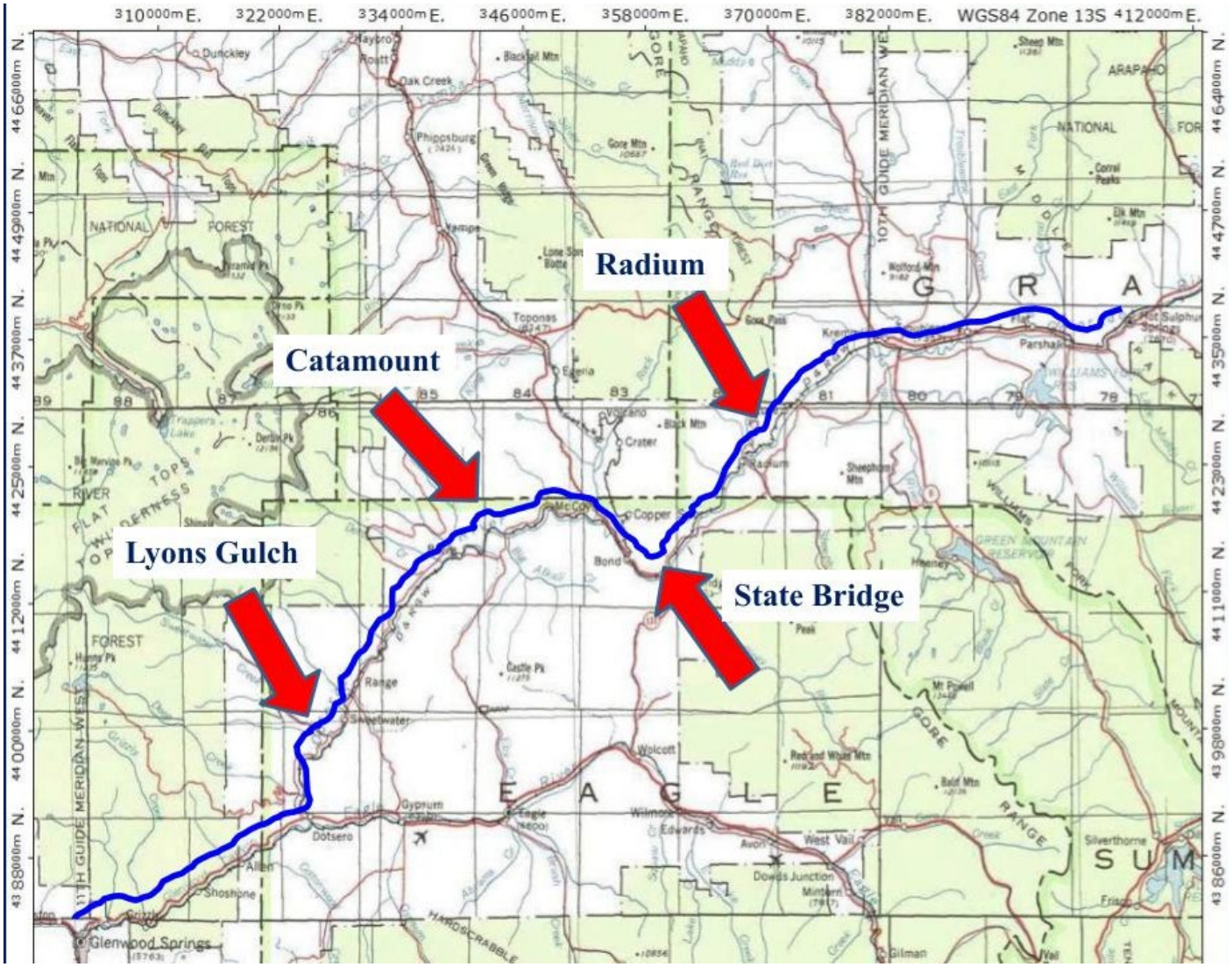
Platis, N. and G. J. Schilser. 2020. 2020 Colorado Angler Survey Summary Report. Prepared by Colorado Parks and Wildlife Aquatic Research Section, July 31, 2021.



Map 1. Proposed instream flow reach, the Shoshone Reach, where the Shoshone water rights will be dedicated for ISF use.



Map 2. Upper Colorado River Wild and Scenic Rivers segments (source: Amended and Restated Upper Colorado River Wild and Scenic Stakeholder Group Management Plan)



Map 3. CPW fishery monitoring sites in the Upper Colorado River Wild and Scenic stretch.

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-6

May Board Memo Enclosure E –

Draft Water Court Application

Enclosure E
Agenda Item 10.d
CWCB Board Meeting
May 21-22, 2025

DISTRICT COURT, WATER DIVISION 5, COLORADO
Garfield County Courthouse
109 8th Street, Suite 104
Glenwood Springs, CO 81601
(970) 947-3861

CONCERNING THE APPLICATION FOR WATER RIGHTS OF THE COLORADO WATER CONSERVATION BOARD, PUBLIC SERVICE COMPANY OF COLORADO, and THE COLORADO RIVER WATER CONSERVATION DISTRICT.

In GARFIELD AND EAGLE COUNTIES, COLORADO.

▲ COURT USE ONLY ▲

Attorney for Colorado Water Conservation Board:
PHILIP J. WEISER, Attorney General
JENNIFER L. MELE, Reg. No. 30720*
Natural Resources and Environment Section
Colorado Department of Law
1300 Broadway, 10th Floor
Denver, Colorado 80203
Phone: (720) 508-6282
Email: jennifer.mele@coag.gov

Attorneys for Public Service Company of Colorado:
Carolyn F. Burr, Reg. No. 25978
Jim M. Noble, Reg. No. 36716
WELBORN SULLIVAN MECK & TOOLEY, P.C.
1401 Lawrence Street, Suite 1800, Denver, Colorado 80202
Phone: (303) 830-2500
E-mail: cburr@wsmtlaw.com
jnoble@wsmtlaw.com

Attorneys for Colorado River Water Conservation District:
Names: Peter C. Fleming, Reg. No. 20805
Jason V. Turner, Reg. No. 35665
Bruce C. Walters, Reg. No. 50235
Address: 201 Centennial Street, Suite 200
Glenwood Springs, CO 81601
Phone: (970) 945-8522
E-mail: pfleming@crwcd.org
jturner@crwcd.org
bwalters@crwcd.org

Case Number:

Div.: Ctrm:

APPLICATION FOR CHANGE OF WATER RIGHTS

1. Names, mailing addresses, e-mail addresses, and telephone numbers of Co-Applicants.

Colorado Water Conservation Board (the "CWCB")
Attn: Director
1313 Sherman Street, Room 721
Denver, Colorado 80203
(303) 866-3441

Public Service Company of Colorado, a Colorado Corporation ("PSCo")
Jeff West, Senior Director, Environmental Services
3500 Blake Street, CO1453-03-MCB
Denver, CO 80205
(303) 571-2762

Colorado River Water Conservation District (the "River District")
Attn: Secretary/General Manager
201 Centennial Street, Suite 200
Glenwood Springs, CO 81601
(970) 945-8522

The above-listed parties shall be collectively referred to herein as "Co-Applicants."

Please send all copies of pleadings and correspondence to:

Jennifer L. Mele, Esq.
Natural Resources and Environment Section
Colorado Department of Law
1300 Broadway, 10th Floor
Denver, Colorado 80203
(Attorney for CWCB)

Carolyn F. Burr, Esq.
Jim M. Noble, Esq.
WELBORN SULLIVAN MECK & TOOLEY, P.C.
1401 Lawrence Street, Suite 1800
Denver, Colorado 80202
(Attorneys for PSCo)

Peter C. Fleming, Esq.
Jason V. Turner, Esq.
Bruce C. Walters, Esq.
201 Centennial Street, Suite 200
Glenwood Springs, CO 81601
(Attorneys for River District)

1. Summary of Application.

The CWCB is an agency of the State of Colorado created to aid in the protection and development of the waters of the state for the benefit of its present and future inhabitants. Pursuant to section 37-92-102(3), C.R.S., the CWCB is authorized to acquire, by grant, purchase, donation, lease, or other contractual agreement, such water, water rights, and interests in water that are not on the abandonment list in such amount as the CWCB determines is appropriate for stream flows to preserve and/or improve the natural environment to a reasonable degree. The River District is a political subdivision of the State of Colorado charged with, among other duties, promoting the health and general welfare of the inhabitants of the River District by the conservation, use, and development of the water resources of the Colorado River and its principal tributaries. *See* §§ 37-46-101, C.R.S., *et seq*. PSCo is a Colorado corporation and is the owner and operator of the Shoshone hydroelectric power plant ("Shoshone Power Plant") located on the mainstem of the Colorado River in Glenwood Canyon, approximately six miles upstream of the City of Glenwood Springs.

The Shoshone Power Plant produces hydroelectric energy by means of PSCo's diversion of the Shoshone Water Rights, which are more particularly described in paragraph 2 below. Pursuant to the January 1, 2024 Purchase and Sale Agreement between the River District and PSCo (the "PSA"), the River District is the contract purchaser of the Shoshone Water Rights. The "PSA" (including all exhibits) is attached and incorporated hereto as **Exhibit 1.**

At its bi-monthly meeting on September ____, 2025, the CWCB determined that acquiring from the River District the exclusive right to use the Shoshone Water Rights for instream flow purposes in the reach of the Colorado River described in paragraph 3.2., below, is appropriate to preserve and improve the natural environment to a reasonable degree pursuant to section 37-92-102(3), C.R.S. Co-Applicants entered into a Water Rights Dedication and Instream Flow Agreement with the CWCB on September ____, 2025 (the "ISF Agreement," attached and incorporated hereto as **Exhibit 2**). The ISF Agreement grants to the CWCB the exclusive right to use the Shoshone Water Rights to preserve and improve the natural environment within the approximately 2.4 mile-reach of the Colorado River that extends between the Shoshone Diversion Dam and the Shoshone Power Plant's discharge outlets (the "Shoshone Reach"). The PSA provides that PSCo, or its successors and assigns is entitled to a leasehold interest in the Shoshone Water Rights for continued use of those rights for hydropower generation at the Shoshone Power Plant so long as the plant is operating.

By this Application, Co-Applicants seek to add instream flow use by the CWCB to the decreed uses of the Shoshone Water Rights. The change of water rights decree shall confirm that water attributable to the historical exercise of the Shoshone Water Rights for hydropower generation will remain in the stream to preserve and improve the natural environment to a reasonable degree within the Shoshone Reach up to the full decreed rate of the Shoshone Water Rights of available "Natural Flow". For the purposes of this Application, the "Natural Flow" is the amount of water in the Colorado River measured at the streamflow gauge (USGS 09070500) on

the Colorado River near Dotsero, Colorado, located in Eagle County (the "Dotsero Gage"), including the amount of water usable by the Shoshone Water Rights when those water rights are in priority, except that the "Natural Flow" does not include any water released from storage and conducted into the Colorado River upstream of the Dotsero Gage (accounting for evaporation and transit loss), which water is intended for delivery for use downstream of the discharge outlets for the Shoshone Power Plant.

2. Decreed water rights for which change is sought and structures associated with the decreed water rights.

2.1. Glenwood Power Canal and Pipeline ("Senior Shoshone Water Right").

2.1.1. Previous Decrees. Civil Action No. 466, Eagle County District Court, decreed December 9, 1907, for a conditional water right, which was made absolute on February 27, 1911, in Civil Action No. 553.

2.1.2. Decreed Point of Diversion. The Shoshone Diversion Dam and Tunnel ("Point of Diversion") located on the right bank, being the northerly bank, of the Colorado River whence the North quarter corner of Section Thirty (30), Township Five (5) South, Range Eighty-Seven (87) West of the 6th Principal Meridian bears North 23° 48'20" East 2,414.64 feet, in Garfield County, Colorado.

2.1.3. Source. Colorado River.

2.1.4. Appropriation Date: January 7, 1902.

2.1.5. Decreed Uses. Power, mining, milling, manufacturing, lighting, heating, and traction purposes.

2.1.6. Amount. 1,250 cubic feet per second ("c.f.s.").

2.2. Shoshone Hydro Plant Diversion No. 2 ("Junior Shoshone Water Right").[1]

2.2.1. Previous Decrees. Civil Action No. 1123, Eagle County District Court, decreed absolute on February 7, 1956.

2.2.2. Decreed Point of Diversion. *See* ¶ 2.1.2. above.

2.2.3. Source. Colorado River.

2.2.4. Appropriation Date. May 15, 1929.

[1] The Senior Shoshone Water Right and Junior Shoshone Water Right are collectively referred to herein as the "Shoshone Water Rights" for a total combined rate of 1,408 c.f.s.

2.2.5. Decreed Uses. Manufacturing and generation of electrical energy.

2.2.6. Amount. 158 c.f.s.

2.3. Priorities, appropriation dates, total decreed amounts and rates of flow, and amounts Co-Applicants intend to change.

2.3.1. Co-Applicants seek to continue to use the full 1,408 c.f.s. decreed to the combined Shoshone Water Rights for the changed use for instream flow purposes, subject to terms and conditions preventing injury to other decreed water rights.

Shoshone Water Rights (all amounts are absolute and are in c.f.s.)			
Priority Date	**Appropriation Date**	**Adjudication Date**	**Total Decreed Rate of Diversion and Diversion Rate Co-Applicants Intend to Change**
December 5, 1905	January 7, 1902	December 9, 1907	1,250 c.f.s.
May 31, 1940	May 15, 1929	February 7, 1956	158 c.f.s.
TOTAL			**1,408 c.f.s.**

3. Detailed Description of Proposed Change of Water Right.

3.1. Addition of Instream Flow Use. In addition to the existing decreed hydropower generation use, Co-Applicants seek water court approval to add instream flow use of the Shoshone Water Rights exclusively by the CWCB pursuant to section 37-92-102(3), C.R.S., and the terms of the ISF Agreement (**Exhibit 2**), to preserve and improve the natural environment of the Shoshone Reach to a reasonable degree at flow rates up to 1,408 c.f.s. of Natural Flow, under their individual priorities, as measured and administered at the Dotsero Gage. Co-Applicants intend for the CWCB to use the Shoshone Water Rights for instream flow purposes to the extent that the Shoshone Water Rights are not being used by PSCo for hydropower generation at the Shoshone Power Plant. Subject to the terms and conditions of the ISF Agreement and the change of water rights decree requested herein, the CWCB shall exercise the Shoshone Water Rights for instream flow purposes to the extent that the water rights are not being exercised by PSCo for hydropower generation at the Shoshone Power Plant.

3.2. Shoshone Reach. The CWCB's instream flow use will occur in the following stream reach of the Colorado River ("the Shoshone Reach"), which is approximately 2.4 miles in length between the upstream and downstream termini. The Shoshone Reach is more particularly described below and is depicted on **Exhibit 3** attached hereto.

3.2.1. Upstream Terminus – Shoshone Power Plant Diversion Dam and Tunnel.

3.2.1.1. On the right bank, being the northerly bank, of the Colorado River whence the North quarter corner of Section Thirty (30), Township Five (5) South, Range Eighty-Seven (87) West of the 6th Principal Meridian bears North 23° 48'20" East 2,414.64 feet, in Garfield County, Colorado.

3.2.1.2. UTM Zone 13 NAD83; Easting: _____; Northing_____.

3.2.2. Downstream Terminus – Shoshone Power Plant Discharge Outlets.

3.2.2.1. On the right bank, being the northerly bank, of the Colorado River whence the Southeast corner of Section Thirty-five (35), Township Five (5) South, Range Eighty-Eight (88) West of the 6th Principal Meridian bears South 29° 24' 14" East, 1,771 feet, in Garfield County, Colorado.

3.2.2.2. UTM Zone 13 NAD83; Easting: _____; Northing _____.

3.2.3. Maximum Rate of Flow. The maximum rate of flow for the instream flow use of the Shoshone Water Rights will be their combined decreed rate of 1,408 c.f.s. of Natural Flow, under their individual priorities, for the purpose of preserving and improving the natural environment of the Shoshone Reach to a reasonable degree, subject to the terms and conditions of the change of water rights decree requested herein.

4. Quantification of Historical Exercise of the Shoshone Water Rights.

Co-Applicants will determine the historical use of the Shoshone Water Rights over a representative study period that includes wet years, dry years, and average years.

4.1. Historical Use.

4.1.1. The Shoshone Water Rights have been historically administered by the State Engineer and the Division Engineer for Water Division No. 5 (the "Engineers") at the Dotsero Gage, located approximately 8.5 miles upstream of the Shoshone Diversion Dam. The Shoshone Water Rights have historically been diverted by PSCo at the Shoshone Diversion Dam, as described in paragraph 3.2.1. above. The historical use of water attributable to the Shoshone Water Rights has been non-consumptive. The water historically diverted at the Shoshone Diversion Dam and run through the Shoshone Tunnel for delivery to the plant turbines was returned to the Colorado River at the outfall (i.e., discharge outlets) of the Shoshone Power Plant approximately 2.4 miles downstream of the Point of Diversion. *See* **Exhibit 3**. Notwithstanding the foregoing, the practice of diverting water attributable to the Shoshone Water Rights from the Colorado River and

into the Shoshone Tunnel for delivery to the Shoshone Power Plant means that the historical exercise of the Shoshone Water Rights has been depletive to the Shoshone Reach before the diversions are returned to the Colorado River at the Shoshone Power Plant Discharge Outlets (i.e., the Downstream Terminus described in ¶ 3.2.2. above).

4.1.2. [ ]

4.1.3. [ ]

5. Maintenance of Historical Return Flows.

5.1. Co-Applicants will maintain historical return flows by ensuring that any future use of the Shoshone Water Rights is consistent with the historical exercise of the Shoshone Water Rights, so that water will continue to be available in the stream at the same time, location, and amount at the Downstream Terminus. This maintenance of the historical return flow pattern will prevent injury to downstream water rights. Upon entry of the change of water rights decree requested herein, Co-Applicants shall maintain the return flows that historically accrued to the Colorado River at the location of the Downstream Terminus.

6. Name(s) and address(es) of owners of land on which structures are located.

6.1. _____.

WHEREFORE, the CWCB, PSCo, and the River District request the Water Court to award a change of water rights decree for the Shoshone Water Rights to confirm the addition of instream flow use by the CWCB, pursuant to section 37-92-102(3), C.R.S., to preserve and improve the natural environment to a reasonable degree in the Shoshone Reach, in the amounts and up to the full decreed 1,408 c.f.s. of Natural Flow, as set forth in this application.

Respectfully submitted this ____ day of _____, 2025.

COLORADO RIVER WATER CONSERVATION DISTRICT

By: _____
Peter C. Fleming (#20805)
Jason V. Turner (#35665)
Bruce C. Walters (#50235)
Attorneys for the Colorado River Water Conservation District

PHIL J. WEISER,
Attorney General

By: _____
Jennifer L. Mele (#30720)
First Assistant Attorney General
Water Conservation Unit
Natural Resource & Environment Section
Attorneys for Colorado Water Conservation Board

WELBORN SULLIVAN MECK & TOOLEY, P.C.

By: _____
Carolyn F. Burr, Reg. (#25978)
Jim M. Noble (#36716)
Attorneys for Public Service Company of Colorado

VERIFICATION

I, _____, state that I have read the foregoing Application for Change of Water Rights and verify its content. I declare under penalty of perjury under the laws of the State of Colorado that the foregoing is true and correct.

_____ _____

Printed Name **Signature**

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-7

May Board Memo Enclosure G –

GEI Report - GEI Consultants, Inc., April 2025 "Review of the Effects of Flow on Biology and Stream Processes, Glenwood Canyon".

GEI Consultants

Consulting Engineers and Scientists

Review of the Effects of Flow on Biology and Stream Processes, Glenwood Canyon

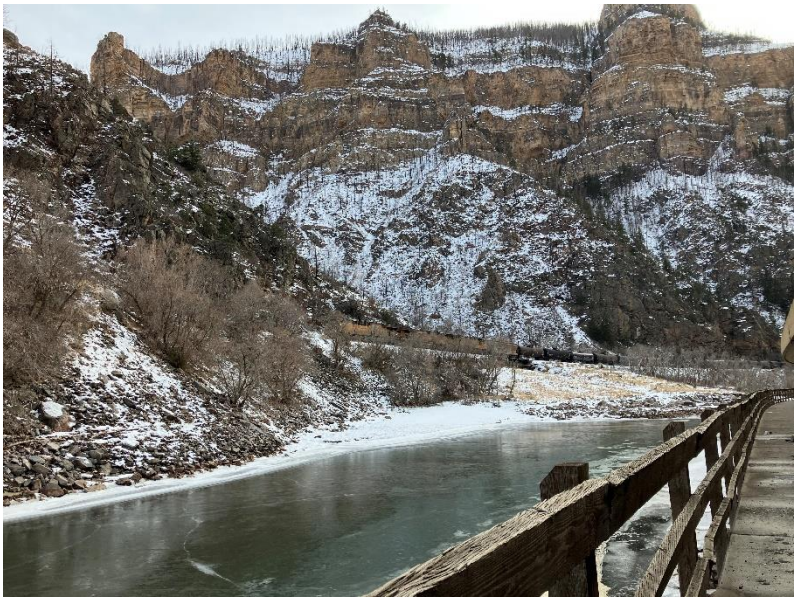
April 2025

Enclosure G
Agenda Item 10d
CWCB Board Meeting
May 21-22, 2025

Review of the Effects of Flow on Biology and Stream Processes, Glenwood Canyon

GEI Consultants

Consulting Engineers and Scientists



Submitted to:
Colorado Water Conservation Board
1313 Sherman St.
Denver, CO
80203

Submitted by:
GEI Consultants, Inc.
4601 DTC Boulevard, Suite 325
Denver, CO 80237

April 2025

4/11/2025
Ashley Ficke, Project Manager

4/11/2025
Jeniffer Lynch, Reviewer

Table of Contents

List of Figures

List of Tables

1. Introduction

This report details the benefits of instream flow for the reach of the Colorado River between the Shoshone Dam and the return at the Shoshone Power Plant (referred to hereafter as the Study Reach). The Study Reach is located in Glenwood Canyon and is characterized by steep gradients, limited floodplains, and large boulder substrate. Under moderate to high flow conditions, deep, turbulent, high-velocity flows are typical. This reach is also affected by water withdrawals by the power plant and often experiences flows that are lower than they would be under natural conditions. During the low flow season (i.e., in the months outside of spring runoff), the Study Reach can experience flows that are not continuous in time or space (intermittent flow) or fully dewatered conditions. The goal of this report is to discuss the effects of flow regime on the following: fish and macroinvertebrate populations, food webs, sediment and temperature regimes, and aquatic habitat. Because each of these are profoundly affected by flow, their relative health and function are discussed in the context of intermittent flow, consistent base flow, and higher flows (i.e., those approximating spring runoff).

This report was completed through a three-step process. First, available fish and macroinvertebrate data were reviewed and used to summarize existing biological conditions in the Study Reach. Second, the scientific literature was reviewed to determine the effects of flow on fish and macroinvertebrates, food webs, sediment and temperature regimes, and aquatic habitat. Third, this literature was synthesized with existing conditions to explain the implications of intermittency and the benefits of consistent base flows and higher seasonal flows for the Study Reach.

2. Fish

This section of the report contains species accounts for native fishes expected in the Study Reach, followed by a description of the existing fish assemblages in the Study Reach. Because fishery surveys are not common in the Study Reach, additional data were used to describe the fish assemblage present in this portion of the Upper Colorado River Drainage. A data request was submitted to Colorado Parks and Wildlife; the area covered in the query extended into the Eagle River in the vicinity of Gypsum, CO and into the Colorado River in the vicinity of Lyons Gulch on the upstream end and to the City of Glenwood Springs on the downstream end. The Study Reach is near the downstream end of the area covered by the query (Figure 2-1). This section concludes with a discussion of the potential benefits of increased instream flow for the resident fish assemblage in the Study Reach.

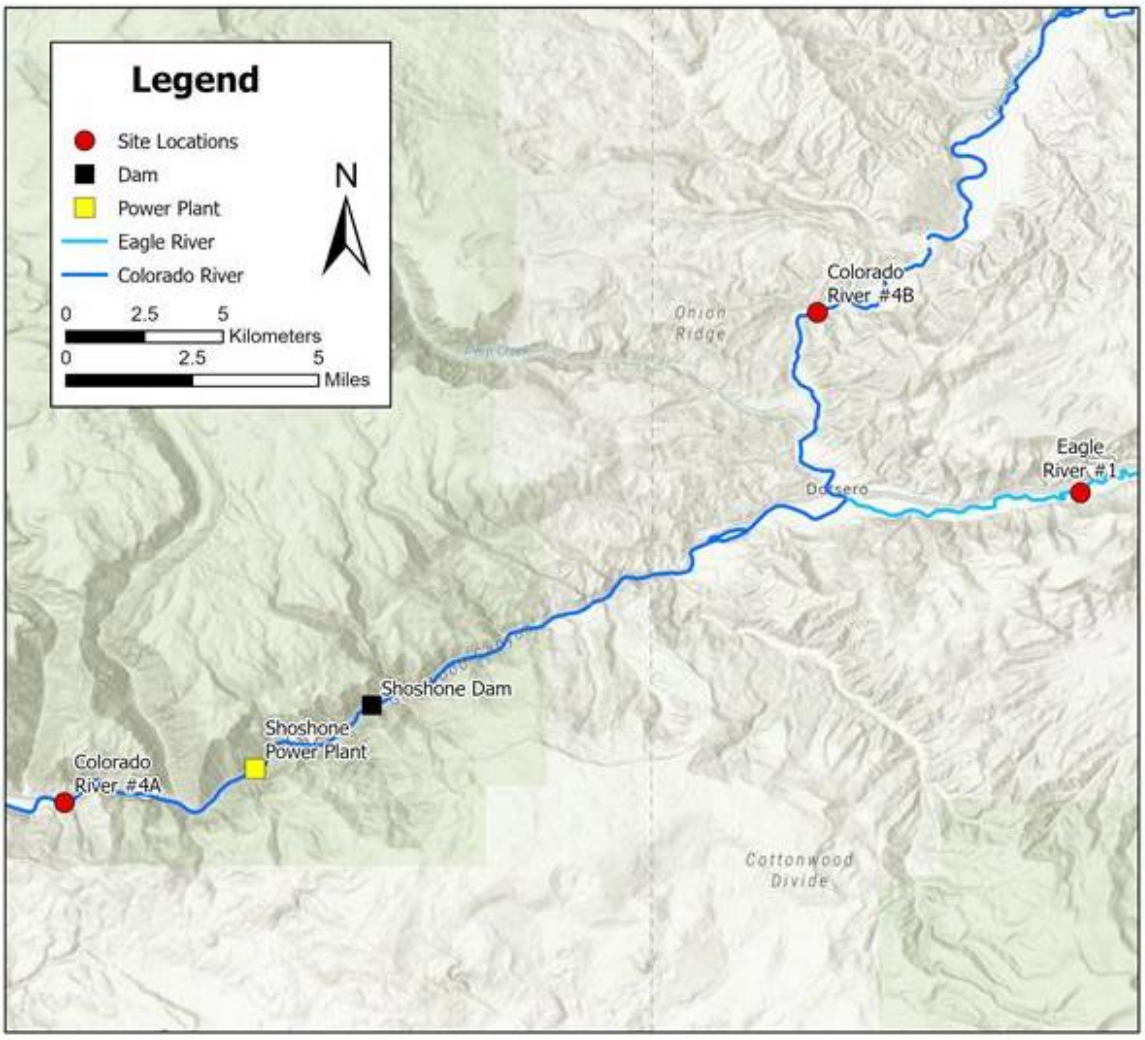


Figure 2-1.—Map of fish sampling sites on the Colorado River, within and upstream of the Study Reach.

2.1 Fish Species Accounts

2.1.1 Cutthroat Trout (Oncorhynchus clarki pleuriticus)

In Colorado, Colorado River Cutthroat Trout (CRCT) are primarily distributed in the colder waters of the Colorado River basin (Young 2008; Western Native Trout Status 2020). Current distribution of the CRCT is limited to isolated populations, and distribution of this species has declined to 1-13% of their historic range since the mid 1800's due to introductions of non-native salmonids and habitat alteration (Young, 2008, Olsen 2013). Hybridization with other Cutthroat Trout species and with Rainbow Trout (*Oncorhynchus mykiss*) has occurred to differing extents in native populations (Baxter and Stone 1995), further reducing CRCT distribution and probability of persistence. Even though Cutthroat Trout are relatively uncommon in the Study Reach, this species was chosen as a representative trout species in the Study Reach for two reasons. First, they are a native species and have been present in the Study Reach. Second, this species has similar habitat to Rainbow Trout and Brown Trout (*Salmo trutta*). However, they prefer lower temperatures than Brown Trout and Rainbow Trout and serve as the basis for the temperature regulations that apply to the Study Reach (See Section 5.2 for temperature criteria).

The average summer thermal temperature preference of CRCT is typically below 16°C along the western slope of the Rocky Mountains (Young 2008). CRCT prefer high gradient streams, but this may be because high gradient streams are not suitable habitat for many nonnative fish species (Young 2008). Like most salmonids, CRCT prefer pools in both summer and winter months to minimize bioenergetic expenditures (Young 2008).

CRCT mature at approximately two or three years of age and spawn from early spring to early July (Baxter and Stone 1995) after spring runoff flows have peaked (Young 1995). Adults can migrate long distances for preferential spawning habitat where they utilize clean gravel substrate for redds (Young 1995). Emergence of fry from the substrate is dependent on water temperature but generally occurs in late summer (Young 1995). Aquatic and terrestrial invertebrates comprise the majority of the CRCT diet (Baxter and Stone 1995, Young 1995), and CRCT forage primarily during daytime (Young 1995).

2.1.2 Speckled Dace (Rhinichthys osculus)

The known distribution of Speckled Dace is reported to be the western region of the United States (USFWS 2023), this species is native and widespread west of the Continental Divide (Baxter and Stone 1995, Woodling 1985). Speckled Dace distribution is largely defined by its tolerances of both high and low temperatures, but this species tolerates a broad thermal range (Batty 2010, Center for Biological Diversity 2020).

Habitat requirements of the Speckled Dace include but are not limited to shallow habitat in riffles, runs and pools, creeks, and small to medium rivers with a mostly rocky substrate (NatureServe 2025). This species can occupy moderately swift water habitat (Wallace and

Zaroban 2013) but is uncommon in water depths greater than three feet (Sigler and Sigler 1987). Speckled Dace are active during day and night, but they are more closely associated with the substrate at night. (Wallace and Zaroban 2013). They are found in shoals, or loose groups.

Speckled Dace mature at approximately two years of age (Sigler and Sigler 1987) spawn from early spring to summer and can spawn more than once in a year (Baxter and Stone 1995). Peak spawning activity occurs at a water temperature near 18°C. In the Yampa River, spawning occurred at temperatures between 15 and 22° C (Bestgen and Zelensky 2004). Spawning occurs beneath rocks and eggs are deposited and adhered to substrate (Baxter and Stone 1995, Sigler and Sigler 1987). Eggs hatch about 6 days after deposition, and fry emerge from gravel after an additional seven to eight days (Sigler and Sigler 1987). Speckled Dace are omnivorous, feeding on invertebrates, plant matter, and zooplankton (Baxter and Stone 1995, Sigler and Sigler 1987).

2.1.3 Native Sculpin (Cottus punctulatus, C. annae)

Genetic research supports the existence of two distinct sculpin species in the Upper Colorado River basin: *C. annae* and/or *C. punctulatus* (Young et al. 2022). Because they co-occur in some drainages, both species may be present in the Study Reach. Despite taxonomic uncertainty prior to the 2022 publication by Young et al., previous literature has accurately described sculpin ecology in Colorado. A brief summary is included below.

Native sculpin inhabit clear, cold streams with rock and gravel substrate, preferring benthic substrate for refuge and foraging (Baxter and Stone 1995). This species can occur in moderate to rapid current (Wallace and Zaroban 2013) and can tolerate water temperatures above 20°C (Wallace and Zaroban 2013, Woodling 1985). Native sculpin are not usually found where sedimentation has occurred, and interstitial habitat is not present (Woodling 1985).

Native sculpin mature at approximately three years of age (Woodling 1985). Spawning occurs beneath rocky substrate or submerged objects; native sculpin are known to share nest sites and guard nests after egg deposition (Baxter and Stone 1995). Spawning occurs between February and June, when water temperatures approach 10° C (Baxter and Stone 1995, Woodling 1985). Native sculpin are more active at night, foraging among benthic substrate (Baxter and Stone 1995). Diet includes aquatic insects, crustaceans, and small fish (Baxter and Stone 1995; Wallace and Zaroban 2013).

2.1.4 Bluehead Sucker (Catostomus discobolus)

Bluehead Sucker are found in tributaries and in larger rivers in western Colorado, Arizona, Idaho, New Mexico, Utah, and Wyoming (Woodling 1985). Adult Bluehead Sucker grow to between 11 and 18 inches and have been reported to reach ages over 20 years (Minckley 1991). Bluehead Sucker occupy a variety of habitats and are typically found in runs or riffles

with rocky substrate and water with moderate to fast velocity (Woodling 1985, Bezzerides and Bestgen 2002). They spawn in spring or early summer (Ptacek et al. 2005). Spawning has been observed over a cleaned area in gravel substrate and at temperatures ranging from 18 to 25 ° C (Maddux and Kepner 1988). They are benthic omnivores, feeding on invertebrates and other material from stones and rocks (Woodling 1985). Bluehead Sucker hybridize with native Flannelmouth Sucker (*Catostomus latipinnis*) and Mountain Sucker (*C. platyrhynchus*) and with non-native White Sucker (*C. commersonii*, Bezzerides and Bestgen 2002) and Longnose Sucker (*C. catostomus*). Nonnative suckers are a primary threat to Bluehead Sucker due to hybridization.

Bluehead Sucker rely on long-range migration as part of their life history (Bottcher 2009; Fraser et al. 2017). Individuals have been documented as moving hundreds of kilometers to access a variety of habitats, including spawning sites (Thompson and Hooley-Underwood 2019). Therefore, fragmentation is also a major threat to the persistence of this species.

2.1.5 Flannelmouth Sucker (Catostomus latipinnis)

The native range of the Flannelmouth Sucker is similar to that of Bluehead Sucker (Baxter and Stone 1995), but they prefer habitat in medium to large streams (Woodling 1985). Flannelmouth Sucker inhabit multiple habitat types including riffles, runs, eddies, pools, and backwaters (Woodling 1985, Valdez and Muth 2005) and are known to migrate long distances (Bezzerides and Bestgen 2002). Flannelmouth Sucker prefer water temperatures ranging from 10 to 27° C (Sublette et al. 1990). Flannelmouth Sucker can reach lengths of 22 inches or more (Baxter and Stone 1995) and are known to reach a maximum age of approximately 30 years (Minckley 1991).

Flannelmouth Sucker are lithophilic spawners; eggs are broadcast over clean substrate and adhere to gravel or rock crevices (Snyder et al. 2004). Flannelmouth Sucker are benthic omnivores foraging mainly on macroinvertebrates and algae (Valdez and Muth 2005).

Flannelmouth Sucker populations have declined throughout much of their historic range (Bezzerides and Bestgen 2002) due to habitat loss and habitat fragmentation. As with Bluehead Sucker, Flannelmouth Sucker hybridize with other native sucker species and non-native White Sucker and Longnose Sucker. Like Bluehead Sucker, Flannelmouth Sucker also make long-distance migrations and are threatened by habitat fragmentation (Bottcher 2009; Fraser et al. 2017).

2.1.6 Roundtail Chub (Gila robusta)

Roundtail Chub is a cyprinid fish species that can grow up to 20 inches in length (Valdez and Muth 2005). Roundtail Chub live in warm streams and larger rivers and utilize pools with cover that are adjacent to fast moving water. This species also concentrates in relatively swift, swirling waters below rapids (Minckley 1973). Maximum temperatures measured in Roundtail Chub habitat were 26.5° C (Bestgen and Propst 1989).

The average lifespan of this species is approximately eight to ten years (Brouder et al. 2000). Individuals first reproduce between ages two and five and spawn in May and June, shortly after peak runoff (Valdez and Muth 2005). Adhesive eggs are scattered over cobble and gravel substrate (Valdez and Muth 2005) and hatch after about five days (Muth 1990). Roundtail Chub are omnivores and consume a variable diet of algae, aquatic plants, invertebrates, fish, and reptiles (Minckley 1973). This species is threatened by nonnative species introductions and habitat fragmentation and destruction (Valdez and Muth 2005). This species also relies on extensive movement to fulfill its life history and is threatened by fragmentation (Bottcher 2009; Fraser et al. 2017).

2.1.7 Mountain Whitefish (Prosopium williamsoni)

Mountain Whitefish have a large natural range extending along both sides of the Continental Divide among the Rocky Mountains in Canada and the United States; its range includes the Colorado River Basin (Baxter and Stone 1995). Mountain Whitefish historically occupied the White and Yampa River Drainages and were subsequently introduced into the Upper Colorado Drainage. This species prefers large, clear, cold rivers with deep and fast water (Baxter and Stone 1995). Mountain Whitefish are fast growing long-lived species reaching a maximum length of about 20 inches. They migrate for spawning, feeding, and overwintering, preferring summer feeding habitat with water temperatures less than 15° C. Overwintering habitat is known to consist of relatively shallow water with large substrate (Schmidt et al. 2019) and deeper pool habitat (Pettit and Wallace 2011).

Mountain Whitefish become sexually mature at a length of about 8 – 10 inches at an age of about three years (Wallace and Zaroban 2013). This species spawns nocturnally from September through November when water temperatures range from 0 to 11°C (Wallace and Zaroban 2013). They migrate into smaller tributaries for spawning, disperse their eggs in cobble and gravel riffles, and return downstream to overwintering habitat (Wallace and Zaroban 2013). Eggs hatch in late winter or early spring (Baxter and Stone 1995, Wallace and Zaroban 2013), and fry remain in their natal stream until late summer before migrating downstream (Wallace and Zaroban 2013). Mountain Whitefish are mainly benthic foragers, consuming macroinvertebrates, small crustaceans, and fish eggs (Laakso 1951).

2.2 Current Fishery Conditions in the Study Reach

GEI requested survey data for the Upper Colorado and Eagle River from Colorado Parks and Wildlife (CPW) from 2010 to 2024 and has summarized the status of the fish populations in the vicinity of the Study Reach. Of note, sampling methods and goals differ by survey, so datasets are not directly comparable. However, all available surveys provide information on species presence and relative abundances. Based on the data provided, multiple surveys of the Colorado River and Eagle River from reaches both upstream and downstream of the Study Reach were conducted from 2010 to 2024.

In the Colorado River upstream of the confluence of the Eagle River (Colorado River #4B), populations are prolific and diverse. Brown Trout and White Sucker were frequently the dominant species (Figure 2-2). Longnose Sucker, Rainbow Trout, Flannelmouth Sucker, Bluehead Sucker, native sculpin, Speckled Dace, and hybrid suckers were also commonly collected. Smaller numbers of Roundtail Chub, Common Carp (*Cyprinus carpio*), and Cutthroat Trout were found during the various sampling events. Four species collected within the reach including Bluehead Sucker, Colorado River Cutthroat Trout, Flannelmouth Sucker, and Roundtail Chub are categorized by CPW as Tier 1 Species of Greatest Conservation Need (SGCN-1). The most recent sampling event in the database occurred in 2022; Brown Trout, Rainbow Trout, White Sucker were the most abundant species. Naturalized trout and White Sucker dominate the reach, with small numbers of native Mountain Whitefish and Speckled Dace also present.

In the Eagle River upstream of the confluence with the Colorado River (Eagle River #1) White Sucker and Brown Trout were the dominant species and were collected in surveys from 2010 through 2023 (Figure 2-3). Rainbow Trout, Longnose Sucker, and Mountain Whitefish were also commonly collected. Smaller numbers of Fathead Minnow (*Pimephales promelas*), native sculpin, Speckled Dace, Flannelmouth Sucker, Bluehead Sucker, and hybrid suckers were found during the various sampling events. Two SGCN-1 species, Bluehead Sucker and Flannelmouth Sucker, were collected within this reach from 2010 to 2023. The most recent sampling event in the database occurred in 2023; Brown Trout, White Sucker, and Fathead Minnow were the dominant species, with smaller numbers of Mountain Whitefish, Rainbow Trout, Longnose Sucker, hybrid suckers, and Speckled Dace.

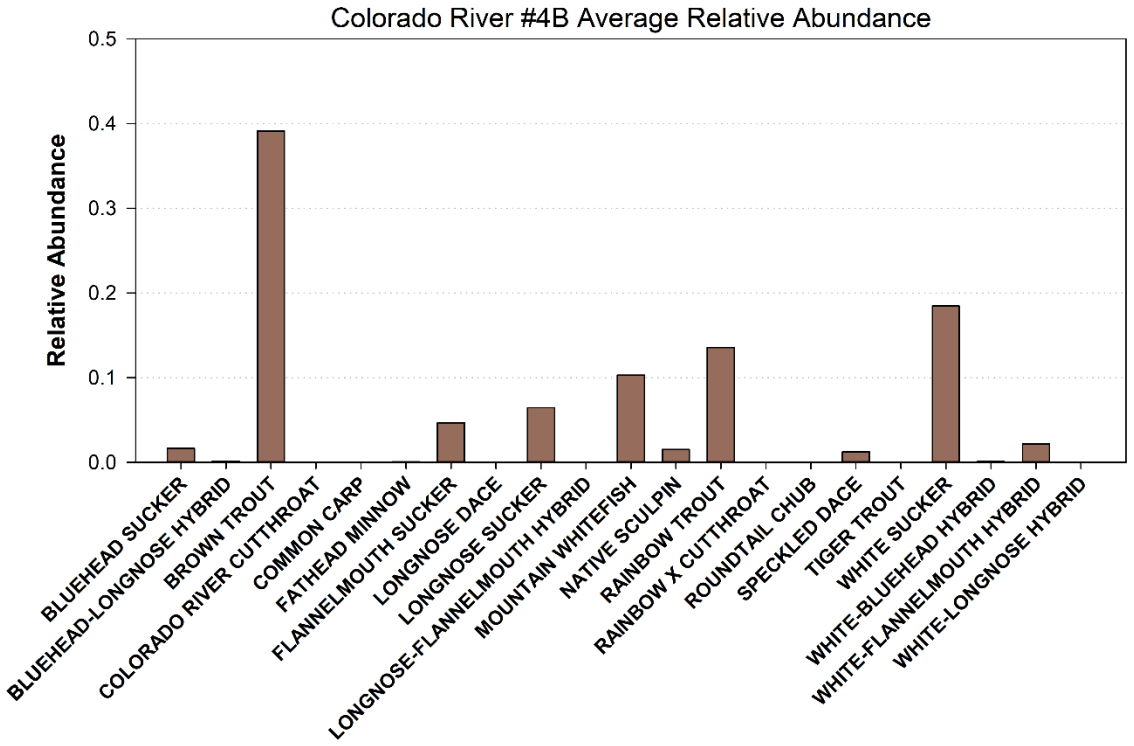


Figure 2-2.—Average relative abundance of fish species in the Colorado River #4B reach upstream of the confluence with the Eagle River. Sampling occurred in 2010, 2013, 2015, 2016, 2018, 2021, and 2022. Species without bars had average relative abundances less than 0.1%.

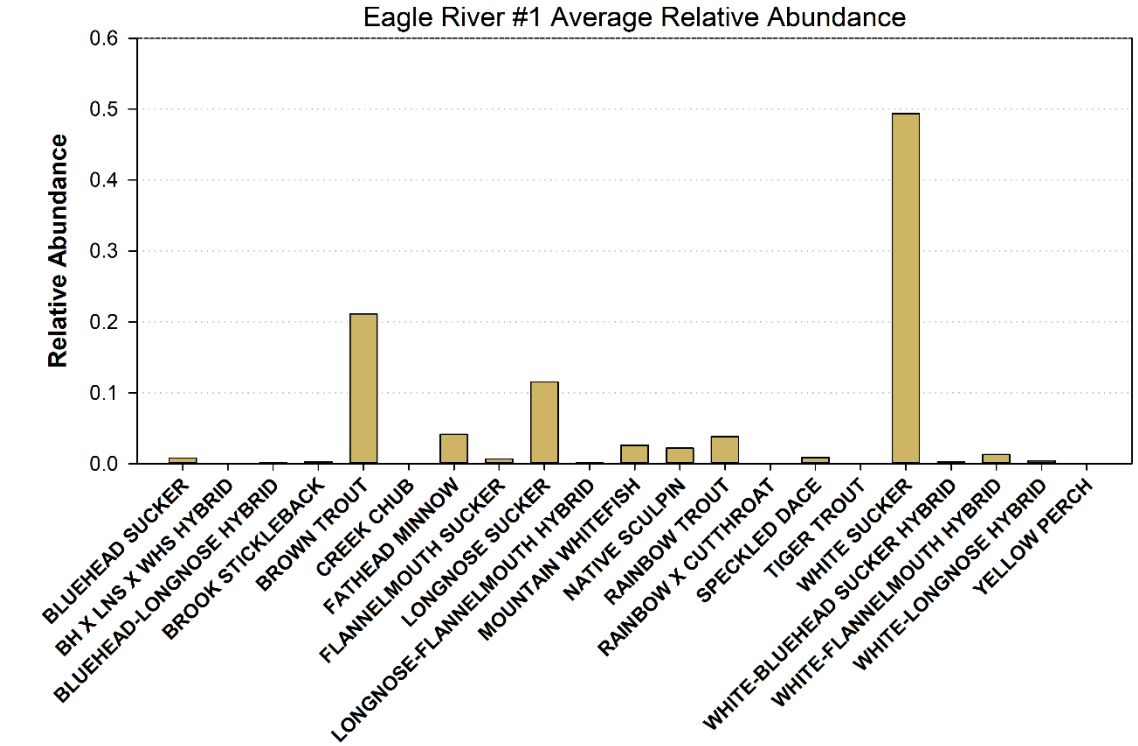


Figure 2-3.—Average relative abundance of fish species in the Eagle River #1 reach upstream of the confluence with the Colorado River. Sampling occurred in 2010, 2014, 2016, 2021, and 2023. Species without bars had relative abundances of less than 0.1%.

In the Colorado River downstream of the Study Reach just above Glenwood Springs, Colorado River #4A (at Grindstone Creek), was sampled in 2021, 2023, and 2024. Brown Trout were the dominant species and were collected in each survey (Figure 2-4). White Sucker, Mountain Whitefish, and Longnose Sucker were also commonly collected. Small numbers of Flannelmouth Sucker, native sculpin, Speckled Dace, and hybrid suckers were found during the three sampling events. The most recent sampling event occurred at this site in 2024; Brown Trout and Rainbow Trout were the dominant species. Lower numbers of Longnose Sucker, native sculpin, Mountain Whitefish, Speckled Dace, White Sucker, and hybrid suckers were also collected in 2024. Additionally, low numbers of two SGCN-1 species, Bluehead Sucker and Flannelmouth Sucker, were collected within this reach among all sampling events. Species diversity was lower at this site, with 12 species collected in 2021 and 2023; a total of 21 and 20 species were collected at Eagle River #1 and Colorado River #4B, respectively. However, the lower fish diversity at Colorado River #4A may be due to the lower number of surveys performed at this site. Despite the lower diversity, comparable numbers of Brown Trout and Rainbow Trout have been collected in most years among Colorado River #4A near Grindstone Creek, Colorado River #4B, and Eagle River #1.

The Study Reach, Colorado River #4A (Shoshone), was sampled once, in the fall of 2024, and the dominant species collected were Brown Trout and Rainbow Trout (Figure 2-5). Moderate numbers of Speckled Dace, Longnose Dace (*Rhinichthys cataractae*) and low numbers of native sculpin and Mountain Whitefish were also collected. One SGCN-1 species, Bluehead Sucker, was also collected at this site in low numbers. The total number of species/hybrids collected in this reach was lower than all other reaches analyzed but was mostly due to the absence of hybrid suckers. All species collected at Colorado River #4A Shoshone in 2024 were also present among all other reaches and years.

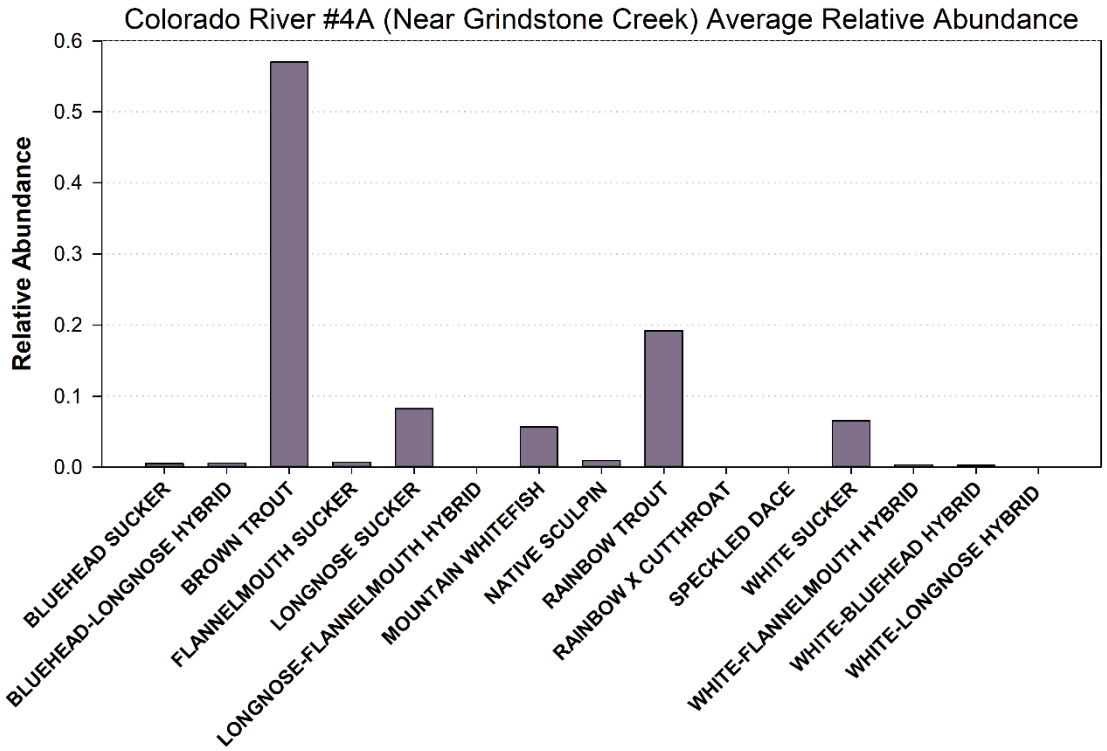


Figure 2-4.—Average relative abundance of fish species in the Colorado River #4A (at Grindstone Creek) downstream of the confluence of the Eagle River near Glenwood Springs, Colorado. Sampling occurred in 2021, 2023, and 2024. Species without bars had relative abundances of less than 0.1%.

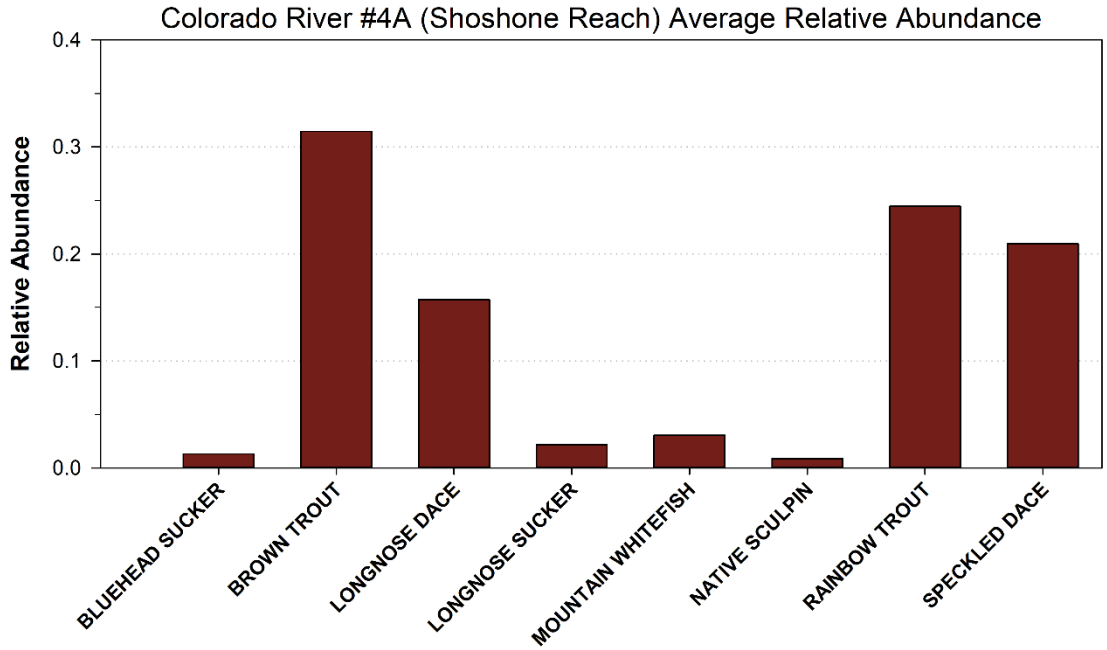


Figure 2-5.—Average relative abundance of fish species in the Colorado River #4A (Shoshone) downstream of the Shoshone Dam and upstream of the Shoshone Hydroelectric Station (referred to as the Study Reach in this report). Sampling occurred in 2024.

The fish density and fish biomass values in the Eagle River #1 site were generally higher than the Colorado River sites from 2010 through 2023 (Figure 2-6). At the Colorado River #4B site, these same metrics remained relatively stable from 2010 through 2022. Limited surveys were completed at the Colorado River #4A site; however, density and biomass values appear similar to Colorado River #4B site. Overall, fish densities have fluctuated considerably at the Eagle River #1 site from 2010 to 2023. The highest fish densities occurred in 2014 and 2021, with 6,285 and 1,818 fish per hectare, respectively. The density value was the highest at Colorado River #4B in 2010, with 732 fish per hectare. The extraordinarily high density values in the Eagle River were attributable to a large number of White Suckers.

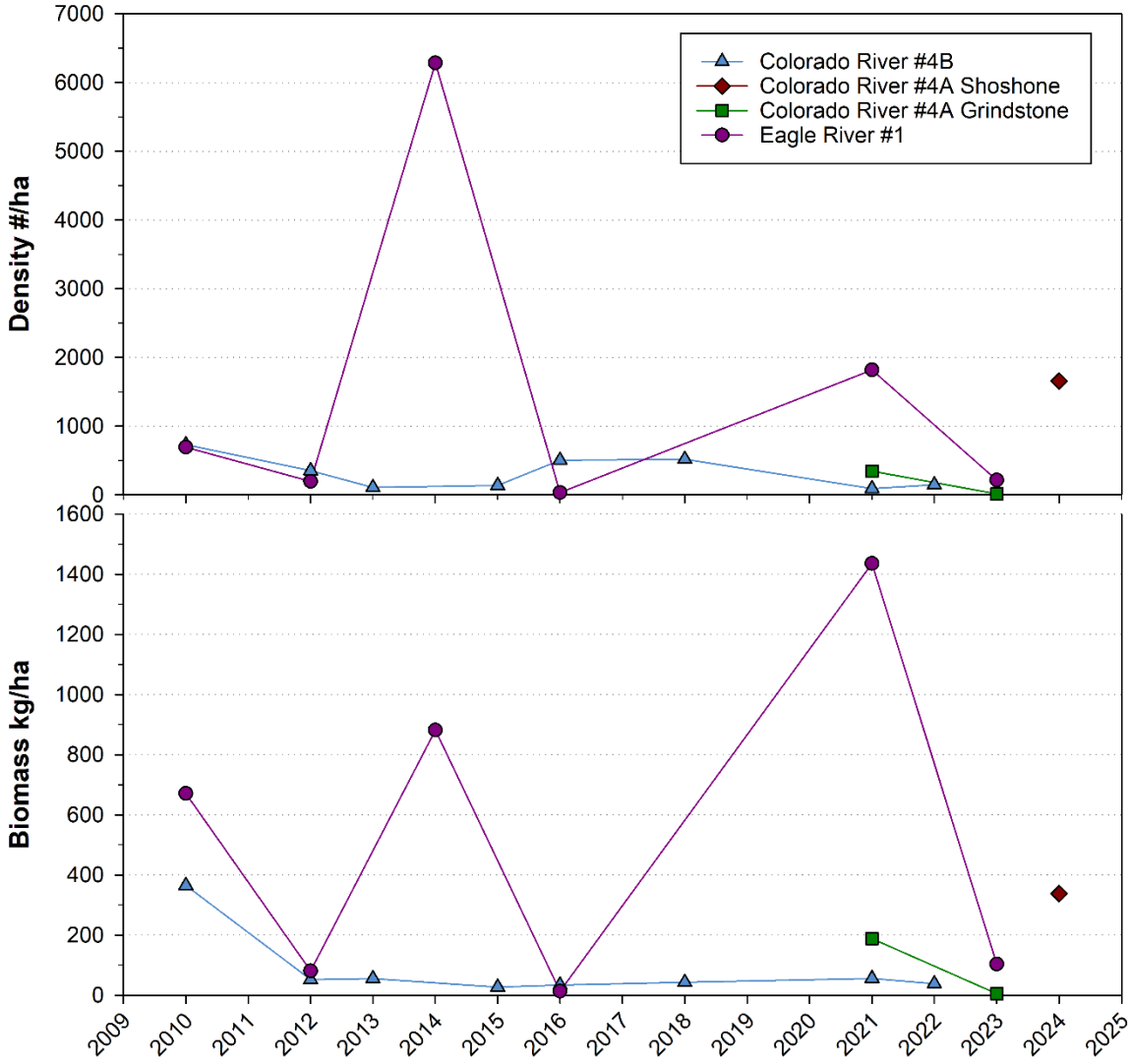


Figure 2-6.—Density and biomass of fish populations in the three Colorado River sites and the Eagle River site from 2010 to 2024.

Patterns in fish biomass explain further differences between the fish communities at the four sites (Figure 2-6). The highest biomass value of all sites was in 2021 at Eagle River #1; this

is the only site of the three sites sampled among multiple years that consistently supported a large number of larger-bodied fish such as White Suckers. Biomass was also relatively high at Site Colorado River #4A (Shoshone), which has only been sampled one time. The lowest biomass values occurred at Colorado River #4A (at Grindstone) in 2023 when low numbers were present. At Colorado River #4A (at Grindstone) in 2023, a relatively small number of large Brown Trout and Rainbow Trout comprised 71 percent of the total biomass. Biomass at Site Colorado River #4B has been relatively stable from 2012 through 2022.

Surveys recorded in CPW's database continued to indicate that White Sucker, Brown Trout and Mountain Whitefish were the most abundant species in almost all surveys. Rainbow Trout, Longnose Sucker, Bluehead Sucker, and Flannelmouth Sucker were also commonly collected and abundant. In addition, a small number of native sculpin, Speckled Dace, Cutthroat Trout species, Roundtail Chub, Tiger Trout, and hybrid suckers were present in several surveys. Despite variations in surveys due to survey goals and sampling methods, fish assemblages were similar between all sites and reflect the fact that nonnative fishes pose a significant threat to native fish persistence. Of note, Mountain Whitefish and Roundtail Chub were collected more frequently and often in high abundances from Colorado River #4B, above the Eagle River confluence, and Bluehead Sucker were common, and sucker hybrids were absent at Colorado River #4A (Shoshone).

2.3 Instream Flow Benefits to Fish

The fish assemblage described above is typical in perennial coldwater or transitional (i.e., between coldwater and warmwater) stream reaches in medium to large rivers on Colorado's Western Slope. Under the current flow regime, the fish assemblage in the Study Reach is subject to significant environmental challenges that are absent in perennial reaches.

Some of the species in the Study Reach can survive in intermittent streams. Most fish that live in intermittent streams do not have specialized adaptations to survive periods of zero flow, such as the ability to breathe air or aestivate. Instead, fishes such as suckers and salmonids survive in intermittent systems because they can tolerate the environmental conditions presented to them during intermittency (Kerezsy et al. 2017), or they emigrate from drying reaches into perennial ones. Suckers and salmonids are known to successfully use intermittent streams for spawning, refuge, and seasonal habitat (Levick et al. 2008; Kelly and Bruckerhoff 2024).

Despite their ability to tolerate intermittent systems, the resident fish assemblage in the Study Reach would benefit from consistent base flows for two reasons. First, even if abiotic conditions in an intermittent stream are conducive to survival, these systems are often food limited. For example, Brook Trout in intermittent Appalachian streams relied heavily on terrestrial insect prey during periods of low flow and did not switch to consuming more aquatic prey as available food was depleted (Courtwright et al. 2013). The authors noted that in 17 days of intermittency, the probability of individual fish having empty stomachs

increased from 4% to 37%. The Study Reach does not support extensive riparian vegetation, so food shortages downstream of the Shoshone Dam may be more severe during periods of zero flow because of a limited terrestrial prey subsidy. Second, intermittent systems contain shorter, simpler food webs than perennial streams. Based on a study of 36 North American streams of varying sizes, flow variability and intermittency significantly reduced aquatic food chain length and complexity, regardless of stream size (Sabo et al. 2010). For example, none of the intermittent streams in the study supported a piscivorous fish, and many of the intermittent streams supported small-bodied fishes or did not support fishes at all. This study implies that conditions in intermittent systems are not necessarily supportive of desirable species such as salmonids. However, if the Study Reach does receive intermittent flow, it is likely that resident fishes will use it on a seasonal basis, as recolonization of rewetted streams tends to be rapid. For example, rewetting of a stream in British Columbia resulted in the return of macroinvertebrates and spawning salmonids within a month (Decker et al. 2008). Rapid recolonization of the Study Reach could be expected after rewetting, particularly because it is close to a perennially flowing reach (e.g., Kerezsy et al. 2017; Kelly and Bruckerhoff 2024).

The expectation would be that an intermittent flow regime in the Study Reach would allow some resident fishes to seasonally inhabit the Study Reach. For example, the presence of native fish larvae (Bluehead Sucker, Flannelmouth Sucker, Roundtail Chub, and Speckled Dace) in the Colorado River in years of negligible runoff (Robinson et al. 1998), indicates that they are adapted to large interannual variations in flow. However, perennial flows would result in markedly improved conditions for fishes. Further, a perennial flow regime that exhibited some increase in flow during spring and early summer (i.e., during the natural spring runoff period) would greatly benefit the resident fishes in the Study Reach for the reasons discussed in the remainder of this report.

3. Macroinvertebrates

3.1 Macroinvertebrate Assemblages in the Study Reach

To provide information on the existing condition of macroinvertebrate assemblages in the reach of the Colorado River between the Shoshone Dam and the return at the Shoshone Power Plant (the "Study Reach"), a general internet search, a search of the Colorado Data Sharing Network (CDSN), and a search of the Water Quality Portal (WQP) of the National Water Quality Monitoring Council (NWQMC) Information System were all completed. No data from within or in the vicinity of the Study Reach were found in the CDSN database, but relevant data were available in the WQP. The internet search also produced multiple reports of macroinvertebrate surveys by Timberline Aquatics (Timberline) that were completed for the Upper Colorado River Wild & Scenic Stakeholder Group (Rees and Musto 2019, Rees and Grap 2019 Rees and Fenske 2022, Rees 2024a). In addition, CPW provided macroinvertebrate data for a single location sampled in November 2024.

Of the existing data, the site sampled by CPW was the only location that was surveyed within the Study Reach (Figure 3-1). The downstream extent of our searches for data in CDSN and WQP was the confluence of the Roaring Fork and the Colorado River, approximately 6.5 miles downstream of the Study Reach. No data were available between the Study Reach downstream to the mouth of the Roaring Fork. The data available from the WQP and Timberline were from samples collected upstream of the Study Reach and upstream of the confluence of the Colorado and Eagle rivers (Figure 3-1). Conditions are not strictly the same upstream of the confluence of the Colorado and Eagle rivers as downstream of it. However, the macroinvertebrate communities upstream of the confluence would likely share many of the attributes of the downstream communities in the absence of dewatering in the Study Reach.

CPW sampled a single site within the Study Reach in November 2024, described as being below Devil's Hole. While full operations of the Shoshone Hydroelectric Plant resumed in August 2024, likely leaving much of the Study Reach dewatered, the CPW located an area to sample that appeared to have perennial flow, most likely due to dam seepage and to input from springs on adjacent hillslopes. Based on this, data from this site does not represent the intermittent flow conditions present in much of the Study Reach when the plant is operating but instead provides information on what the macroinvertebrate assemblages could be expected to resemble throughout the Study Reach if consistent flows were present.

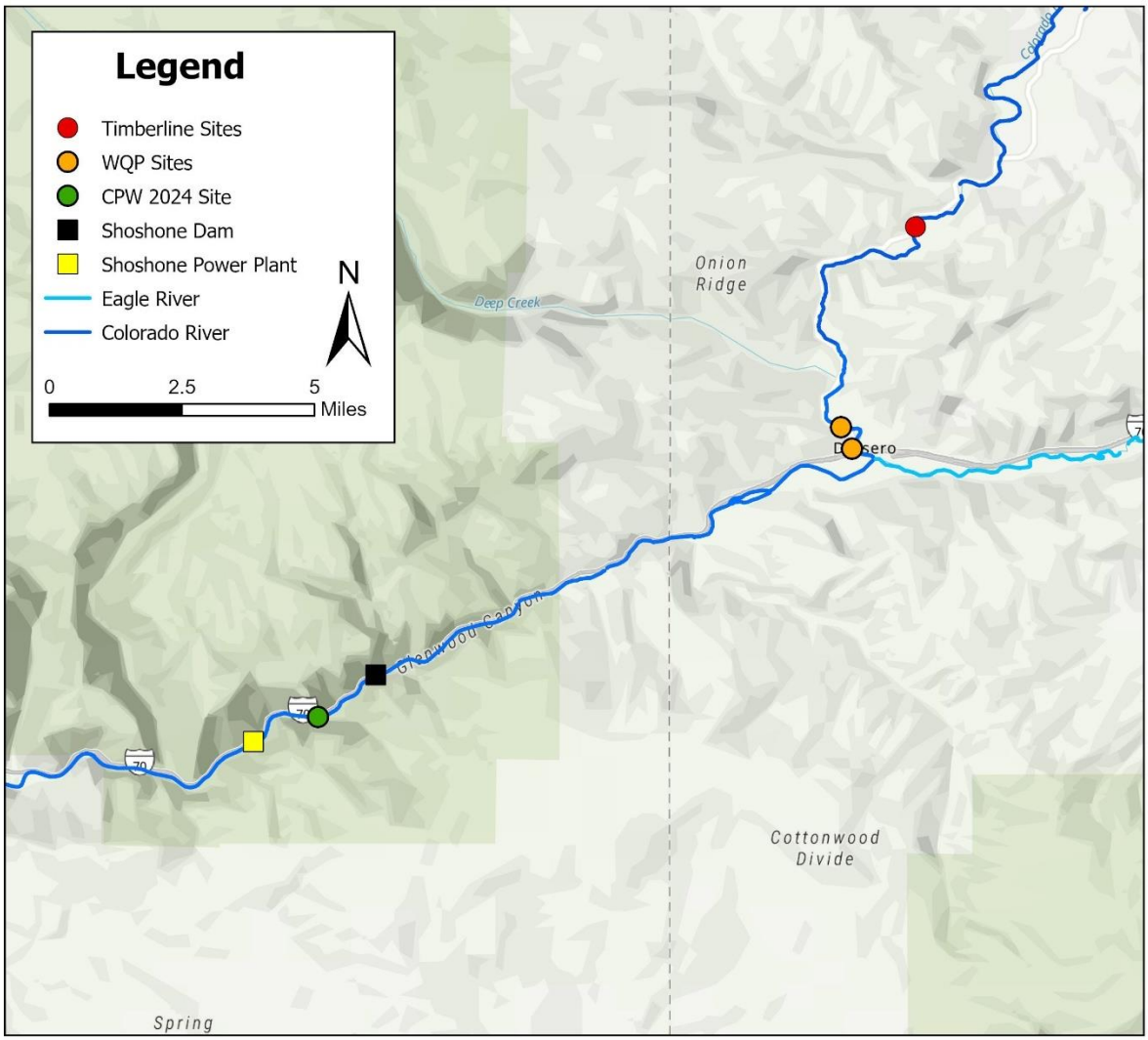


Figure 3-1.—Map of macroinvertebrate sampling sites on the Colorado River, within and upstream of the Study Reach.

Within the sample collected by the CPW in 2024, the generally sensitive Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa comprised 55 percent of the total number of taxa present, suggesting favorable conditions exist for these species (Table 3-1). The diversity value indicated that the community was slightly unbalanced; this resulted from a common and moderately tolerant mayfly taxon, *Baetis tricaudatus*, dominating the community, making up 64 percent of the total abundance. Multiple other mayfly taxa were also present at lower abundances, and these taxa included three mayflies from the Heptageniidae family, a family that is considered especially sensitive to metals as well as other disturbance (Kiffney and Clements1994; Clements et al. 2002, Clements et al. 2021) and generally prefers moderate to high current velocities. Sensitive stonefly and caddisfly taxa were also present, including a single salmonfly individual, *Pternonarcella badia*.

Table 3-1.—Summary of macroinvertebrate metrics for the samples collected from the Colorado River within and upstream of the Study Reach. Data are presented from upstream to downstream. NC = not calculated.

Year Sampled	Number of EPT Taxa	Number of Total Taxa	Diversity Value	MMI Score	HBI Score	TIVSED
Timberline Site						
2018	23	41	3.46	74.7	3.88	4.60
2019	21	41	3.20	71.6	2.64	4.66
2021	25	43	2.56	70.3	4.64	4.45
2023	22	44	3.43	73.4	3.42	4.58
WQP Sites						
2000	19	31	3.34	NC	NC	NC
2013	66	25	4.21	NC	NC	NC
CPW Site (Study Reach)						
2024	18	33	2.40	64.3	4.46	5.63

Multiple indices were calculated from the data provided by the CPW (Table 3-1). The Colorado Multimetric Index (MMI), a measure of macroinvertebrate community health (CDPHE 2020), was calculated to be 64.3, well over the threshold (45) indicating attainment of the aquatic life use. Being in attainment of the aquatic life indicates that the location sampled supports a wide variety of macroinvertebrate species, including sensitive species, and that there are no indications that the abundance or diversity of the community is impaired. This score is also over the threshold designating it as a high-scoring water (56). Such waters are considered exceptional and worth additional protections to prevent any declines in condition.

Two other indices were calculated to describe the macroinvertebrate community, including the Hilsenhoff Biotic Index (HBI) that evaluates the macroinvertebrate assemblages' tolerance to poor water quality and disturbance (Hilsenhoff 1987) and the Tolerance Indicator Value specific to sediment (TIV_{SED}) that evaluates the macroinvertebrate assemblages' tolerance to excessive fine sediment (CDPHE 2024). Values for both were favorable, with the HBI value suggesting conditions were "very good" based on the categorization scale and the TIV_{SED} suggesting that excessive fine sediment is not impacting the macroinvertebrate community. Of note, while metric values suggest a healthy community exists within this location with perennial flow in the Study Reach, scores associated with these metrics were generally lower for this site than for the sites further upstream (see following paragraphs). This may reflect the limited areas with perennial flow that are present within the Study Reach or could indicate that this location has experienced some drying periods in the past. Alternatively, differences in substrate composition or other aspects of the stream habitat may differ, accounting for the slightly lower values.

Macroinvertebrate data were collected on the Colorado River approximately 6 miles upstream of the confluence with the Eagle River over several years, with sampling conducted

in 2018, 2019, 2021, and 2023 (Rees and Musto 2019, Rees and Grap 2019, Rees and Fenske 2022, Rees 2024). In addition to the raw data, multiple metrics were provided in these reports for the samples collected (Table 3-1). Of note, additional sites on the Colorado River were sampled further upstream; the data presented here is from the site location that was in the closest vicinity to the Study Reach. As with the site sampled within the Study Reach, the generally sensitive EPT taxa comprised half or more of the total taxa present. The MMI values ranged from 70 to 75. These values indicated healthy communities were supported in this reach, and these scores were also above the high-scoring water threshold that indicates sensitive communities that are worth additional protection. Diversity values also suggested that balanced assemblages were present. Mayflies were the dominant group in all years, although, as in the CPW sample, typically the common and moderately tolerant mayfly taxon, *Baetis tricaudatus*, was the most abundant taxon. The HBI values were also favorable, categorizing the communities as excellent, very good, or good. The TIV_{SED} values were all less than the threshold for this region, indicating excessive fine sediment is not impacting the macroinvertebrate communities in this stream reach.

Two other sites were sampled upstream of the Study Reach and between 0.3 and 1.0 miles upstream of the confluence with the Eagle and Colorado rivers. Only raw data were available for these sites; the MMI, HBI, and TIV_{SED} values were not provided (Table 3-1). Also of note, data for these sites was included in the WQP database; little background information is provided in this database as to the purpose of the sampling or more specific details about sampling methods. The metrics calculated from these data are not necessarily comparable to the CPW and Timberline data because of this. The site 1.0 mile upstream of the confluence with the Eagle River was sampled in September 2013 and likely consisted of multiple composited replicates or a large area were sampled based on the data. Thirty-eight percent of the taxa were EPT taxa, and the diversity value again suggested a well-balanced community was present. In contrast to the samples collected farther upstream, the common and moderately pollution tolerant caddisfly, *Hydropsyche* sp., was the dominant species, comprising 24 percent of the relative abundance. In April 2000, a site was sampled 0.3 miles upstream of the confluence with the Eagle River. While the total number of taxa collected at this site was lower than observed at the Timberline or other WQP site, EPT taxa comprised 61 percent of the total taxa. Diversity was within the range observed at the other sites, and *B. tricaudatus* was again the dominant species, comprising over 30 percent of the relative abundance.

For the sites sampled by CPW and Timberline (Rees and Musto 2019, Rees and Grap 2019, Rees and Fenske 2022, Rees 2024a, 2024b) on both the Colorado and Eagle rivers, a functional feeding group analysis of the macroinvertebrate assemblage was completed. As is often typical, collector-gatherers or collector-filterers were the dominant groups. These groups feed on fine particulate organic matter in the substrate or water column, respectively. Scrapers which graze on algae by scraping it off of hard substrates or surfaces and are often considered sensitive to pollution and disturbance were also often abundant, although this

group was not well represented in the sample collected within the Study Reach. Shredders, which feed on coarse organic particulate matter such as leaves, and predators, which feed on other macroinvertebrates or organisms, were less abundant but were consistently present. The presence of at least a few long-lived taxa in these samples indicates conditions are favorable and stable over time in and upstream of the Study Reach in the Colorado River, although these taxa were more limited in the sample collected from the Study Reach itself.

3.2 Instream Flow Benefits to Macroinvertebrates

The macroinvertebrate communities described above are only found in perennial systems, but an intermittent flow regime could support a subset of the taxa found in perennial reaches. Intermittent streams can support a diverse macroinvertebrate community. Macroinvertebrates can tolerate periods of little to no flow through physiological adaptations such as tolerance of low dissolved oxygen and behavioral mechanisms such as refuging in the hyporheic zone during periods of no flow (Magland et al. 2020). However, densities and species richness tend to be lower than those found in perennial systems (Levick et al. 2008). The presence of a healthy community in the location within the Study Reach that appeared likely to have more consistent flows present suggests that if continuous flow were present throughout more of this reach, such a community could serve as a source population to provide individuals that could colonize newly wetted areas.

Intermittent streams present challenges ranging from water quality changes to increased predation risk by vertebrates (Stubbington et al. 2017). Environmental changes associated with cessation of flow create unsuitable conditions for taxa that prefer riffle habitat, rheophilic (i.e., flow-loving) taxa, and specialist feeders (Rolls et al. 2012). For example, riffles are more prone to drying than other stream habitat features, and filter feeders rely on flows for food delivery. Scrapers and shredders are also considered specialist feeders, and predators tend to be long-lived, taking one to three years to complete their life cycles. Many of these taxa cannot tolerate flow regimes that include zero-flow days. A 1994 study of an intermittent system in Australia tracked community richness as a function of flow; detritivores were most common during periods of no flow and predator taxa were the last to recolonize after flows resumed (Closs and Lake 1994).

Many of the taxa that do not tolerate intermittency (EPT taxa, select functional feeding groups, and long-lived taxa, Stubbington et al. 2017) provide high-quality forage for trout. Suttle et al. (2004) categorized specific macroinvertebrate families as being vulnerable to predation by juvenile trout, indicating these families are preferred forage for these fish. Several of these families, including mayflies in the family Baetidae, were well represented in the sample data for the Colorado River within and upstream of the Study Reach. Other groups present in lower abundances that were categorized as vulnerable included mayflies in the families Heptageniidae, Leptophlebidae, and Leptohyphidae, stoneflies in the Perlodidae family, caddisflies in the family Brachycentridae, and true flies in the Chironomidae family,

as well as occasional representatives in most of the remaining groups. Several of these EPT families are rheophilic and may presently be uncommon or absent in the Study Reach under current flow conditions other than within the limited locations that support more perennial flow such as the site sampled by CPW. If flows are persistent, these groups would likely become established, providing a forage base for trout and other fish species.

The macroinvertebrate community throughout most of the Study Reach is likely impacted by inconsistent and sometimes absent flows. Other than the locations where perennial flow is present due to dam seepage, groundwater upwellings, or tributary inflows, the current macroinvertebrate community in the Study Reach may be dominated by short-lived taxa such as many chironomid midges that can complete their life cycle quickly during the time that flow is present (Stubbington et al. 2017; Colorado Water Quality Control Division 2020). Other taxa that have adaptions that allow them to disperse aerially, have desiccation tolerant adaptions, or have the ability for certain life stages to persist in the hyporheic zone may also be present in the Study Reach. The expectation would be that if flows in the Study Reach were intermittent, the macroinvertebrate community would contain a subset of the taxa that were found in the samples from the Colorado River by CPW and Timberline and that these taxa would provide some forage for resident fishes. If flows were perennial, the macroinvertebrate communities in the Study Reach would be similar to the ones described from upstream of the Study Reach and within the Study Reach at the location exhibiting perennial flow. In other words, the robust communities found at these locations would presumably expand to all areas with perennial flow. The communities would be comprised of a high proportion of EPT taxa, diverse functional feeding groups, and long-lived taxa, many of which are preferred by trout. These communities would provide ample high-quality forage for fish.

4. Flow and Food Webs

Nutrient dynamics are strongly influenced by flow regime (Poff et al. 1997; Palmer and Ruhi 2019). Although flow regimes vary across river types and climates (Poff et al. 1997), human activities such as water withdrawal and reservoir operations are major influences on hydrological regimes and, therefore, nutrient dynamics (Jiang et al. 2021).

Nutrients are transported downstream in a cyclical fashion. They are taken up by organisms, transformed, and then released back into the water column, where they can be transported further downstream. This process, referred to as nutrient spiraling, requires physical transport of nutrients and biological uptake and transformation (Allen et al. 2021). Therefore, nutrient cycling is affected by flow changes because of their effects on transport rates and on the biological communities that process nutrients.

4.1 Consistent Base Flows Benefit Stream Food Webs

Reduction or cessation of flow can reduce or prevent nutrient and organic matter inputs from upstream, riparian, and hyporheic sources (von Schiller et al. 2017). Dam operations such as flow reduction can reduce the availability of already-limited nutrients such as phosphorus (Maavara et al. 2020) or impact nitrogen concentrations by altering microbial activity in streambed sediments (Merbt et al. 2016). Low flows can also alter nutrient dynamics by stranding of materials during flow recession or drying (von Schiller et al. 2017).

In addition, low flow or lack of flow can inhibit incorporation of raw materials into the food web in a number of ways. First, terrestrial plant litter is a crucial component of the aquatic food web in headwaters and mid-order river systems (Vannote er al. 1980, Rosi and Vallis 2016). This organic material is an integral component of the food web because it provides a primary food source for numerous bacterial and macroinvertebrate taxa. Bacteria living on organic matter can also provide significant nutrition to macroinvertebrates; Hall and Meyer (1998) determined that benthic macroinvertebrates obtained 10 to 100 percent of their carbon from this source. Low flows or lack of flow can inhibit or prevent transport of terrestrial plant litter within or downstream of a stream reach. Low flow or absence of flow can also strand terrestrial plant litter and make it unavailable to the aquatic food web.

Low flow or lack of flow also alters the microbial community in a stream system, which affects the food web. Microbes are essential for breakdown of leaf litter (Rolls et al. 2012) and for maintaining algal communities in aquatic habitat. Algal production can support invertebrate and fish production in a river and be of greater importance than allochthonous inputs (terrestrial inputs) in some systems. This may have particular applicability to the Study Reach, as it is characterized by a limited riparian community (and therefore potentially lower allochthonous inputs). Specific biochemicals that are synthesized by algal communities can

have an inordinate influence on productivity of multiple trophic levels (Brett et al. 2017). The algal community may synthesize long carbon chain polyunsaturated fatty acids, which provide high-quality nutrition to macroinvertebrates and therefore higher trophic levels (Guo et al. 2016). Microbial assemblages recover after drying periods, once aquatic habitat is restored with increased water levels, but an increase in the frequency and magnitude of drying periods greatly inhibits these assemblages from rebounding (Hall and Meyer 1998). When aquatic habitat is exposed to fully dry periods, as opposed to wetted periods, autotrophs (e.g., algae, cyanobacteria, and aquatic plants) are also slow to recolonize (Hall and Meyer 1998). Therefore, consistent base flow facilitates development of a more robust community of primary producers. Finally, low flow or lack of flow selects against certain macroinvertebrate taxa, such as shredders (See Section 3) which also break down organic matter such as leaves for incorporation into the aquatic food web.

4.2 Periodic High Flows Benefit Stream Food Webs

In rivers with variable hydrology, seasonal or occasional high-flow events play a crucial role in nutrient dynamics. These floods can redistribute materials across the floodplain, enhancing nutrient availability and influencing the productivity and diversity of aquatic and terrestrial ecosystems associated with the river (Bunn and Arthington 2002). A lack of periodic high flows in a river restricts connectivity to the floodplain and alters the exchange of energy between aquatic and terrestrial systems. For example, leaf litter availability to and terrestrial invertebrate input into aquatic habitats decline with a reduction in wetted area (Courtwright et al. 2013). Linkages between the terrestrial and aquatic environments are critical to stream health, as they promote reciprocal subsidies (i.e., beneficial exchanges of materials) between the two environments. The subsidies range from bacteria and organic matter to terrestrial invertebrates, and they are essential to the function of aquatic environments (Hall and Meyer 1998; Baxter et al. 2005). For example, multiple studies have shown that inundated floodplains subsidize food webs and increase growth and survival of juvenile salmonids (Sommer et al. 2001; Bellmore et al. 2013; Sturrock et al. 2022). The importance of reciprocal subsidies was demonstrated by Rolls et al. (2012); reduced connection to the floodplain can change the dominant energy source in a stream reach from allochthonous (i.e., external/terrestrial) to autochthonous (i.e., internal/aquatic, Rolls et al. 2012).

Regular exchange of materials between the limited aquatic floodplains and the aquatic environment would still support the aquatic food web in the Study Reach. However, macroinvertebrate prey transport may be more critical in the Study Reach than in lower-gradient reaches, simply because a limited riparian plant community may result in reduced input of terrestrial insect prey. Gresswell et al. (2005) found that shrub cover on stream bank habitat was highly associated with terrestrial prey availability for Coastal Cutthroat Trout and that terrestrial prey comprised seasonally varying but significant portions of trout diets. Saunders and Fausch (2012) determined that in forest and grassland stream ecosystems in the Colorado Rocky Mountains with two or more species of trout, terrestrial invertebrates falling

into streams from riparian vegetation provided 30 to 45 percent of trout annual energy consumption. Because trout benefit from terrestrial invertebrate prey, and because terrestrial insect inputs may be less common in canyon reaches, a healthy food web in the Study Reach will rely on sufficient base flow to maintain aquatic macroinvertebrate drift and to maintain robust, diverse macroinvertebrate populations (See sections 3.2 and 6.4 for more details).

4.3 Intermittent Flow Causes High Unpredictability in Aquatic Food Webs

The spatial and temporal variability of nutrient and prey availability is far higher in intermittent streams than in perennial ones. While the effects of drying were discussed earlier in this section, the variability in nutrient and organic matter availability during and after intermittency is discussed here.

During periods of intermittency, concentrations of nutrients and dissolved organic carbon exhibit high spatiotemporal variability (Stubbington et al. 2020). For example, high temperatures and solar radiation in isolated pools can stimulate high rates of photosynthesis and an uptake in nutrients that decreases water column concentrations. Conversely, in isolated pools with low algae and plant densities, evaporation can increase water column nutrient concentrations. Changing water temperatures also alter microbial activity, which has a large influence on rates of organic matter decomposition and resultant concentrations of dissolved organic carbon (Stubbington et al. 2020). Therefore, the conditions in an isolated pool are dependent on local conditions and the duration of drying and are not typically as stable as would be expected in a perennial system.

The return of consistent flows after intermittency can have significant effects on nutrient and organic matter availability, both within and downstream of the intermittent reach. During dry periods, breakdown of organic matter still occurs in the terrestrial environment (von Schiller et al. 2017), and rewetting causes significant and sudden inputs of allochthonous material. Recovery of bacterial metabolism is rapid and facilitates a pulse of nutrient availability, and flows deliver these materials and nutrients into and downstream of the reach (von Schiller et al. 2017). These “first-flush events” often have high nutrient concentrations and can create water quality issues downstream of the rewetted reach (Stubbington et al. 2020).

The food web in the Study Reach would benefit from a stable base flow that facilitated transport and cycling of organic material and nutrients. Higher flows that allowed periodic floodplain connection would confer benefits such as reciprocal prey subsidies and enhanced exchange of terrestrial and aquatic materials. Intermittent flows in the Study Reach would likely support a limited food web, particularly because of low rates of terrestrial leaf litter input. Finally, because streams are longitudinally constrained, changes in nutrient dynamics at upstream sites, particularly those near dams, can cause cascading effects downstream (Nixon 2003). Therefore, cycles of drying and rewetting in the Study Reach may lead to

periodic downstream disturbances in water quality, but this would depend on myriad factors such as nutrient dynamics during intermittency and flow rates upon rewetting.

5. Flow, Sediment, and Temperature

5.1 Flow Effects on Sediment Regimes in Rivers

Sediment transport in rivers is tightly coupled with water discharge and depends on sediment sources, valley geometry, and in-channel topography. Canyon reaches are typically considered transport reaches, where sediment is predominantly transported rather than sourced or stored (Schumm 1977). Sediment supply and transport capacity determine channel geometry and habitat availability, including bedforms such as riffles, pools, and bars. When averaged temporally at a point in space, the channel-maintaining discharge, or dominant discharge, can be defined as the single most effective discharge that shapes a channel's cross section. This discharge maximizes the flow frequency with the magnitude of geomorphic work, or amount of sediment transported by the channel. Classical geomorphology literature defines this discharge to typically occur every 1-2 years (Wolman and Miller 1960), though the actual recurrence can vary depending on characteristics of the environment (i.e., climate, flashiness, history of disturbance). Though actual channel geometry formation is much more complex and depends on the entire range of flows including baseflows and large floods, these intermediately occurring channel maintenance flows are a useful concept when assessing reaches for instream flows. Channel maintenance flows flush interstitial spaces, scour encroaching vegetation and create germination surfaces, maintain channel conveyance capacity, help maintain bedforms, and recruit and transport wood (Knighton 2014, Wohl 2014).

As sediment transport zones, canyon reaches typically do not contain the same magnitude of physical diversity and biogeochemical cycling as unconfined reaches (Wohl et al. 2018). Within canyon reaches that already lack prolific habitat diversity compared to unconfined reaches, small pockets of habitat are highly valuable as they provide refugia and seasonal habitat for resident species. Aside from the need for biotic inputs, physical maintenance of these pockets of habitat requires balance between flow and sediment regimes (Poff et al. 1997; Wohl et al. 2015).

Flow regulation from dams, reservoirs, hydropower, water diversion, and other water uses impacts channel morphology by disrupting the natural flow regime and the sediment balance (Poff et al. 1997; Wohl et al. 2015; Grant 2012; Church 1995). Typical changes in channel morphology in response to flow regulation include armoring, narrowing, and degradation, though aggradation can occur from the lack of transport capacity to remove sediment inputs from tributaries or suspended sediment (Schmidt and Wilcock 2008). Flow regulation decreases topographic diversity, including pool amplitude and frequency (Duffin et al. 2023), through the accumulation of fine sediments in pools and lack of scouring flows to maintain the pools. To combat this and other potentially negative impacts of flow regulation, several

approaches have been produced for regulated reaches to achieve ecological function with environmental flows that are designed to meet human and ecosystem needs (Poff et al. 2010). Functional flows can target specific ecological functions in regulated reaches (Yarnell et al. 2015) and can even be designed to favor native aquatic species over nonnatives (Chen and Olden 2017). Larger flows, such as seasonal transition flows and peak runoff, serve ecological functions that allow channels to maintain nutrient cycling and population dynamics, and to adjust to rapid sediment inputs such as landslides and debris flows (Yarnell et al., 2015, Figure 5-1).

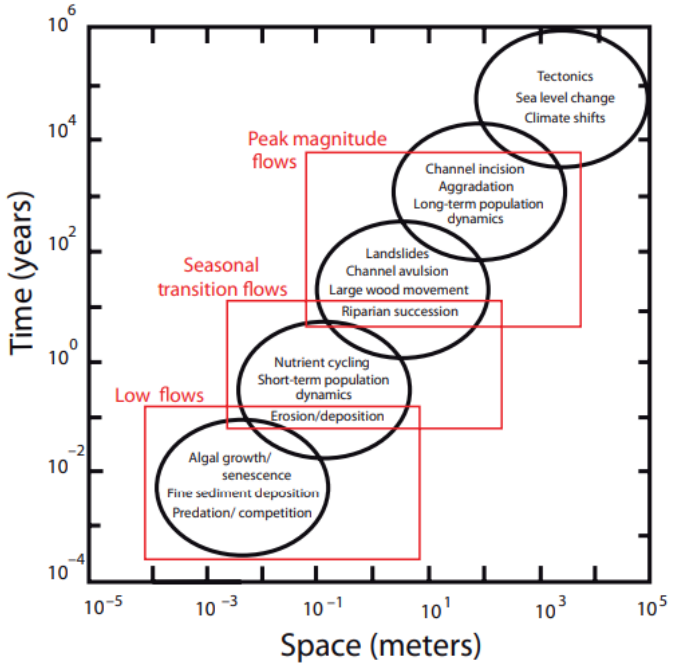


Figure 1. Examples of interrelated physical and ecological riverine processes at varying spatial and temporal scales. Key functional flows supporting specific processes are shown in boxes.

Figure 5-1.-- *Figure 1 of Yarnell et al. (2015) exemplifies the ecological and geomorphic significance of a range of flows.*

The designation of medium to high flows, or flushing flows, that regularly maintain ecosystem function on an annual to bi-annual time span, allows for the evacuation of fine material from the interstitial spaces between larger particles (Kondolf and Wilcock 1996). Flushing flows are often defined by the threshold of incipient motion for particles within the reach. Lower flows, such as consistent base flows, maintain the connection between surface water and groundwater, regulate the thermal regime, and provide consistent access to habitats along channel boundaries (Miller et al. 2016; Wohl et al., 2015). Rumsey et al. (2015) estimate that baseflows comprise up to 48% of total streamflow in the Upper Colorado River Basin. Though not as efficient at transporting sediment as flushing flows, baseflows can help prevent over-siltation of the streambed which could cause loss of habitat (Wohl et al. 2015).

The Study Reach lies within the burn scar of the 2020 Grizzly Creek Fire. Colluvial and tributary sediment sources, especially from debris flows following wildfire, add significant fine material to the Colorado River that may require flushing flows to allow the river to morphologically adjust. Extreme sediment sources such as debris flows also increase overbank flood hazards by filling in the riverbed and leading to lasting turbidity concerns (Rengers et al. 2024; Erku 2021). In 2021, a debris flow from Devil's Hole Creek, a perennial tributary entering the Colorado River from river left approximately one river mile downstream of the dam, temporarily dammed the Colorado River. Large sediment inputs and resulting flow disruptions have also occurred in Blue Gulch and the gulch near local landmark Flag Buttress at Interstate 70-mile marker 124 (Bakich, pers. comm. 2025). In addition to damaging infrastructure, debris flows create biological disturbances where recovery typically takes one to several years (Foster et al. 2020; Graber et al. 2023) but may take longer under regulated flow conditions. Biological consequences from extreme sediment inputs can include large fish kills, such as the July 2012 fish kill upstream of Dotsero caused by large sediment inputs following summer thunderstorms (Willoughby 2012). Flushing flows are necessary to redistribute fine sediment that is input to the channel from debris flows and flash floods.

In addition to extreme, infrequent events, annual high-yield sediment events also add significant sediment load to the channel within the reach. Seasonal high turbidity consistently occurs annually as upstream sources and tributaries input fine sediments to the water column. Annual anthropogenic influences also impact sediment loading, including excess sediment releases from opening of the dam gate during lower flows that do not have capacity to transport the sediment released (Bakich, pers. comm 2025). Whether increased sediment loading events are annual or episodic in nature, flushing flows are required to maintain sediment continuity within the reach.

Just as tributary junctions are biological hotspots more broadly within river networks (Benda et al. 2004), confluences with sediment sources within steep canyon reaches also serve as valuable habitat for biota. Debris fans from tributaries, debris flows, or avalanche chutes not only provide regular sources of sediment but also create adjacent channel morphology that provide velocity refugia to fish and macroinvertebrates. The velocity refugia occur in eddy pools and recirculation currents upstream and downstream of debris fans. These areas are small depositional environments in otherwise transport-dominated canyon reaches (Cinderelli and Cluer 1998, Figure 5-2). With consistent sediment input but absence of flushing flows, the velocity refugia provided in the slower recirculation currents may completely fill with sediment and eliminate disproportionately important habitat. Channel flushing flows are also known to be important in regulated canyon reaches because they allow for removal of sediment from the bed and redistribution of sediment into bars that macroinvertebrates rely on (Mueller et al. 2014; Mueller et al. 2018).

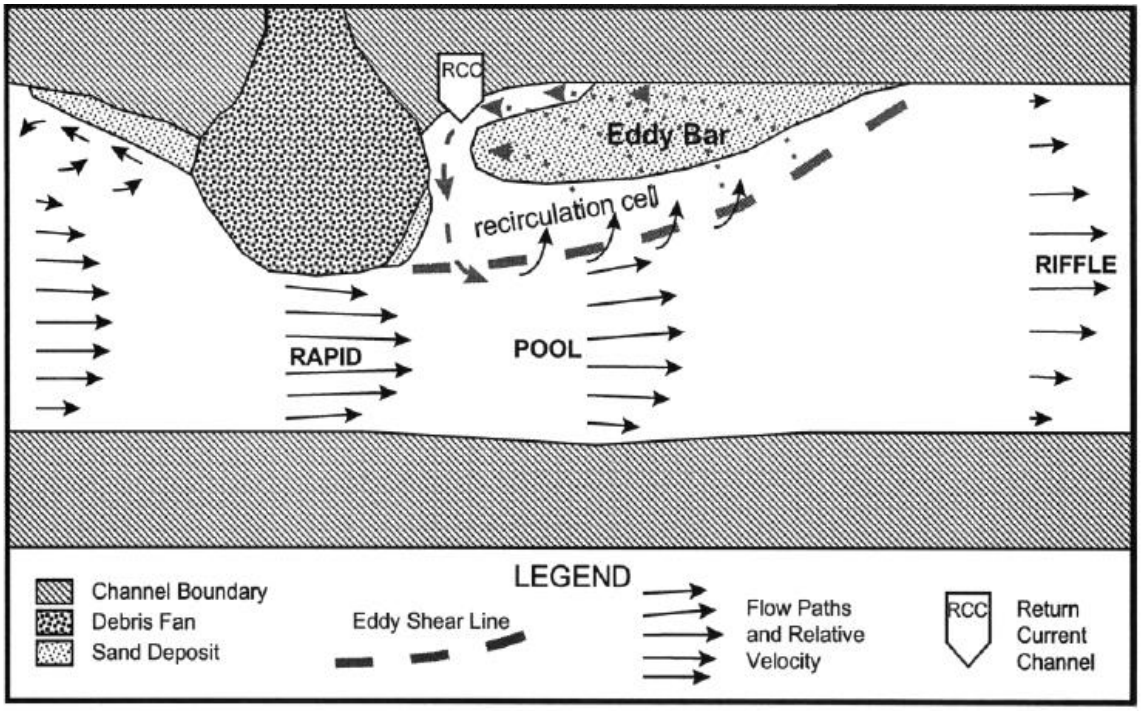


Figure 12. Schematic map showing typical channel margin sand deposits and features of lateral flow separation zones.

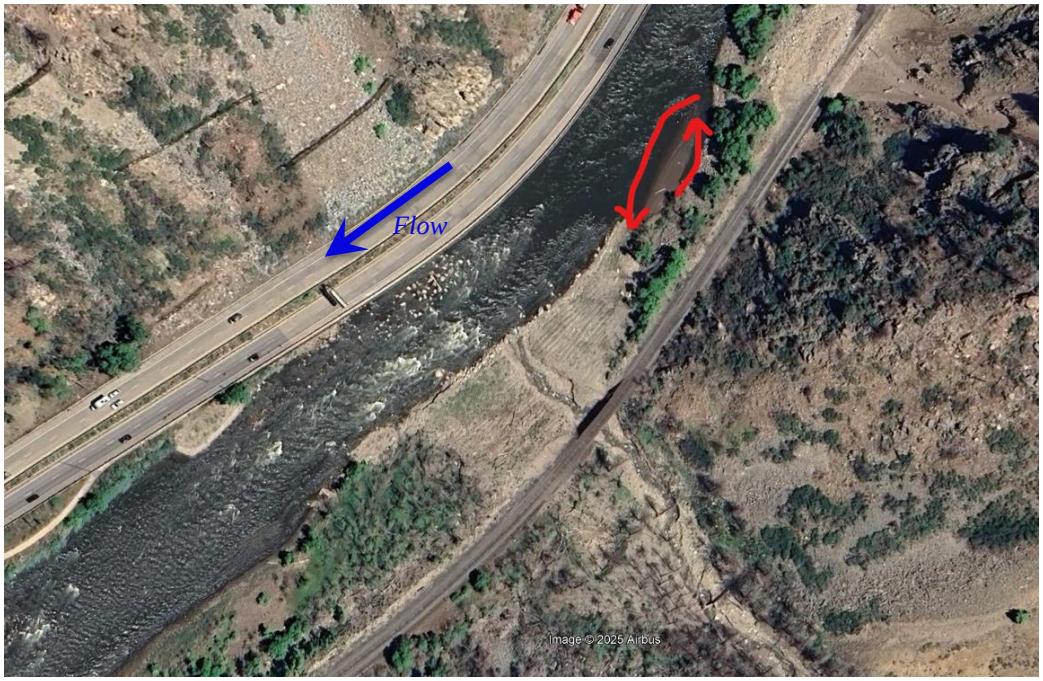


Figure 5-2.—*Cinderelli and Cluer (1998)'s Figure 12 provides a schematic of recirculation currents and eddy bars associated with sediment inputs at tributary junctions in canyon reaches (top). In Glenwood Canyon, these habitats are located upstream and downstream of steep tributary inputs (bottom).*

5.2 Flows Can Stabilize Temperatures in the Study Reach

The thermal regime of rivers controls biological function and timing, contributes to rates of biogeochemical cycling, and buffers ecological response to disturbances such as high temperature events (Olden and Naiman 2010). Major components of a stream's temperature regime include the annual range, the diel range, thermal periodicity, and the winter minimum and summer maximum temperatures (Giller and Malmqvist 1998). The range and distribution of temperatures in a stream system determine what species it can support. Aquatic species ranging from bacteria to fishes cannot regulate their body temperatures and have different thresholds of stream temperatures that they can tolerate, with decreased survival at and beyond the limits of their tolerance ranges. Accumulated thermal patterns, such as the number of days at or above a threshold temperature, determine species' maturation times and development times within their life cycles (Ward and Stanford 1982). Therefore, changes to thermal regimes can impact the survival of native coldwater and important sportfish species such as trout (Ficke et al. 2007; Bear et al. 2007; Elliot and Elliot 2010).

Stream temperature varies seasonally, daily, and spatially depending on solar radiation, atmospheric conditions, in-channel and surrounding topography, riparian vegetation, hyporheic exchange, interaction with groundwater, among other factors (Leach et al. 2023). Spatial thermal heterogeneity within streams is largely dependent on channel topography such as riffles, pools, and marginal backwater habitats. Various species selectively take advantage of thermal heterogeneity to optimize metabolic activity both under normal conditions and to maximize survival during times of stress (Armstrong et al. 2013). For example, over the course of a day, there may be more food availability in cold sections of a channel bed, but the rate of metabolism of the food obtained from colder sections can be optimized by moving to a warmer location. Increases in floodplain connectivity and habitat heterogeneity from river restoration, for example, can help enhance thermal heterogeneity that supports diverse species assemblages (Noone et al. 2024).

The thermal regime of a river is impacted by anthropogenic activity. Water temperatures below water infrastructure such as dams, and thus the ability for a stream to maintain thermal viability for species, is directly dependent on the volume of water in the stream and the temperature of the water released downstream (Mihalevich et al. 2020; Olden & Naiman 2010, Poole and Berman 2001). Inadequate flows do not provide volumes of water sufficient to buffer the impacts of radiation from extreme air temperatures (Sinokrot and Gulliver 2000), and flow diversions typically result in warm summer temperatures and cool winter temperatures outside of the river's typical range (Meier et al. 2003). Thermal regimes altered by flow regulation can also lead to asynchrony between natural seasonal patterns that cue growth, development and other components of the life cycles of species present in the reach (Vannote and Sweeney 1980; Olden and Naiman, 2010). The geomorphic homogenization of channel topography due to flow regulation (Duffin et al. 2023; Rahel 2002; Poff et al. 2007) reduces thermal heterogeneity and the opportunities for species to optimize metabolic

processes and survival through behavioral thermoregulation (Armstrong et al. 2013). Altered temperature regimes can alter the maturation time or development time of species native to the area and make them more sensitive to disturbance or more susceptible to predation.

The Study Reach is categorized as a Cold Tier I stream temperature segment by the Colorado Department of Public Health and Environment (CDPHE), with some variations from typical Cold Tier I standards depending on the time of year (5 CCR 1002-33). As shown in Table 1, temperature standards for this reach include daily maximum temperature (DM, acute) of 21.2° C and maximum weekly average temperature (MWAT, chronic) of 16.9°C between April 1st and May 31st. Between June 1st and September 30th, the segment follows Cold Stream Tier II standards of 18.3° C MWAT and 24.3° C DM. From October 1st-October 31st, the standard for DM temperature is 21.2° C and the MWAT is 16.9° C. Between November 1st and March 31st, the segment is classified under Tier II with standards of 9° C and 13° C for MWAT and DM respectively (Table 5-1).

Table 5-1.—*Temperature standards for the Study Reach.*

	Temperature Standard (°C)	
Date Range	**Daily Maximum**	**Maximum Weekly Average Temperature**
April 1st–May 31st	21.2	16.9
June 1st–September 30th	24.3	18.3
October 1st–October 31st	21.2	16.9
November 1st–March 31st	13	9

Between 2021 and 2025, the daily temperature did not exceed the DM temperature standards at the USGS gages located upstream of the Study Reach at Dotsero or downstream of the Study Reach above Glenwood Springs (Figure 5-3). Weekly average temperatures exceed the defined standards both upstream and downstream of the Study Reach (Figure 5-4).

Though daily maximum temperatures fall within the regulatory standards for reaches upstream and downstream of the Study Reach, the reach does not meet the weekly average temperature standards that were developed in part to be compatible with the biology of resident fishes. Months of July and August did not meet MWAT standards consistently between 2021 and 2024 at the upstream and downstream gages. Flow intermittency or absence of flow within the Study Reach would likely exacerbate unfavorable temperature conditions within the Study Reach, because of a lack of appropriate-magnitude continuous (i.e., baseflow) and episodic (i.e., flushing flow) cold water inputs. Maintenance of spring runoff flows and baseflows could provide thermal benefits through channel maintaining flows that physically scour pools to offer thermal refugia during summer months, and via more consistent supply of cooler flowing water during baseflow.

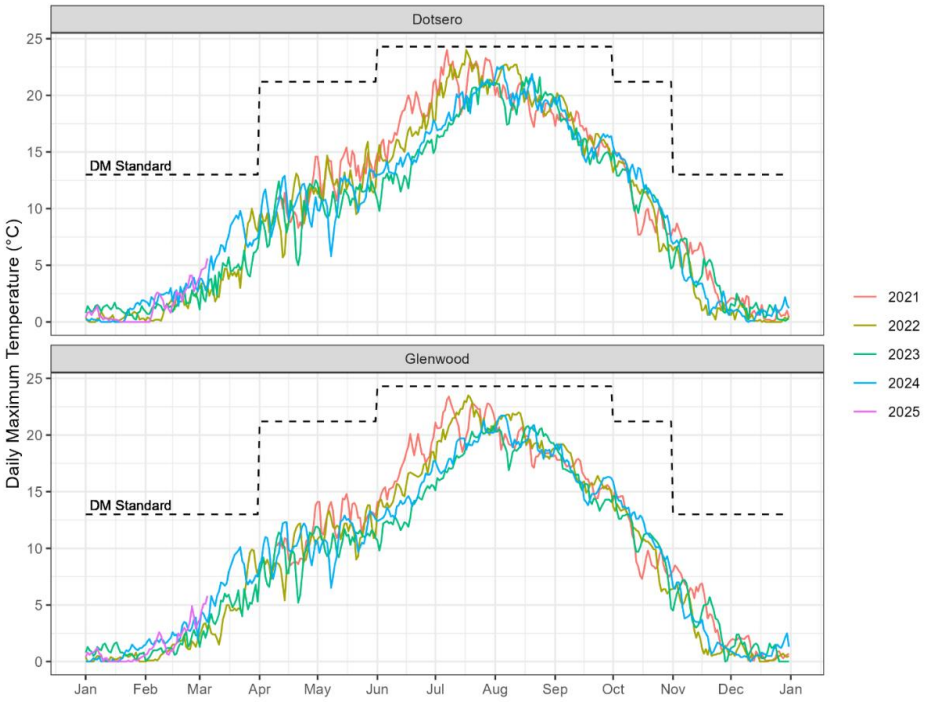


Figure 5-3.—*Daily maximum temperatures from Dotsero and Glenwood USFS stream gages on the Colorado River.*

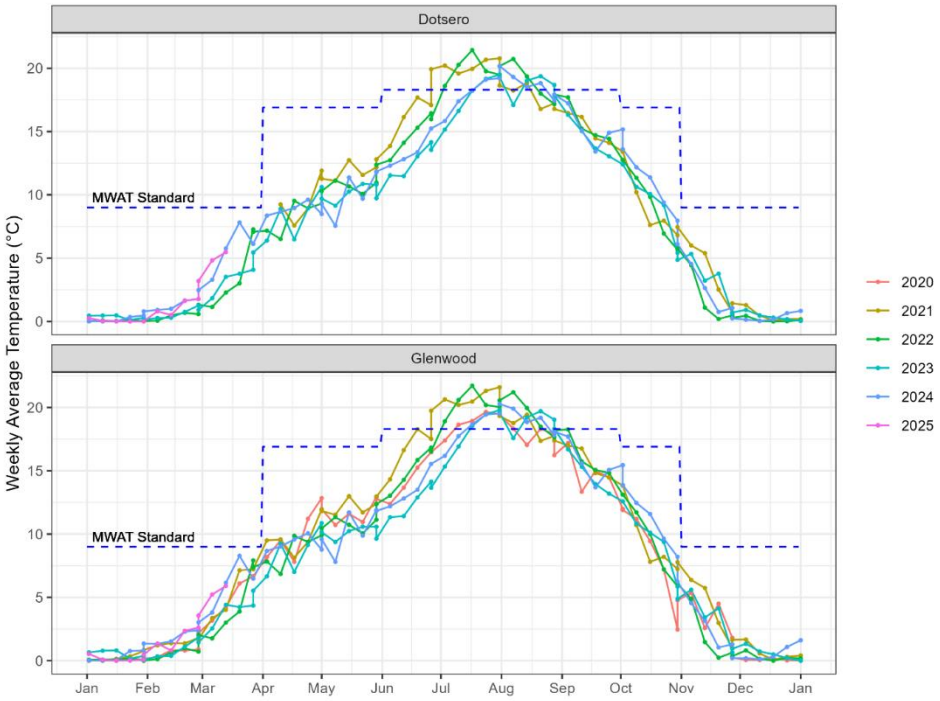


Figure 5-4.—Weekly *average temperature with MWAT standard temperature thresholds for Dotsero and Upstream of Glenwood USGS gages (Gages 09070500 and 09071750). The average weekly temperatures are calculated with continuous 15-minute temperature data.*

6. Flow and Aquatic Habitat

Stream flow and aquatic habitat availability are inextricably linked. To provide context for the ecological importance of the Study Reach, its value to native fishes is discussed in Section 6.1. Subsequent sections review the effects of flow regime in the Study Reach on habitat availability, habitat connectivity, flow-dependent biological processes that maintain connectivity, and habitat maintenance.

6.1 Native Fish Utilize Canyon Habitat

Canyon reaches are characterized by variability in flow velocity, water depth, and water temperature, because flow regimes vary in response to spring runoff from snowmelt, precipitation events, and drought. The interaction of this flow regime with the bed and bank features in canyon reaches create unique and seasonally dynamic fish habitat (Bustard and Narver 1975; Valdez et al. 2001). The Colorado River basin is largely a snowmelt driven system that experiences high water conditions in the spring and lower flow conditions in the summer that can be punctuated by high magnitude floods resulting from convective thunderstorms. This variable flow regime facilitates the survival and growth of native species as they are presumably adapted to find and utilize novel temporary habitat created by high flows.

Though field data is limited, use of canyon habitat has been documented for native fishes in the Colorado River, and these species benefit from habitats that are created by seasonal high flows. Further, connectivity between the main channel and its tributaries is also critical for native species. Connected and diverse rocky habitat found in many canyons is necessary for migration, spawning, feeding, and shelter for Bluehead Sucker and Roundtail Chub (USFWS 2018). The presence of Bluehead Sucker and the absence of White Sucker or hybrid suckers in the Study Reach supports this finding and also suggests that this area may be particularly valuable for native species. Backwaters can form when flows connect with the limited floodplain to provide nursery habitat that promotes fish growth and recruitment (Dodrill et al. 2016). Backwatering of tributaries by seasonally high flows in the Colorado River may have once provided critical rearing habitat for native juvenile fishes in the vicinity of Glen Canyon Dam (Robinson et al. 1998). Tributaries and connected floodplain are beneficial to Bluehead Sucker, Flannelmouth Sucker, and Roundtail Chub as they provide refuge (Bower et al. 2008), increase channel complexity (Fraser et al. 2017), and create spawning/nursery areas with increased nutrient availability (Magoulick and Kobza. 2003; Gido and Probst 1999). While these habitats are critical for early life stages of fish, they are utilized by all life stages. Connectivity between tributaries and the main stem provide an opportunity for native fishes to spawn in areas that are not typically utilized by undesirable nonnative species such as White Sucker or predatory species like Brown Trout (Hooley-Underwood et al. 2018;

Thompson and Hooley-Underwood 2019). Native species can be resident or migratory, but both will typically move into tributaries in spring when cued by a combination of increasing flows and increasing water temperatures; because they are often less regulated, tributaries tend to have a more natural flow pattern, thermal regime, and sediment load than mainstem systems (Fraser et al. 2017). Small ephemeral tributaries that are completely dry for most of the year also provide critical habitats for native fish. As snowmelt fills these tributaries, species such as Bluehead Sucker and Flannelmouth Sucker migrate from larger rivers to spawn in these reaches, and then quickly return to the river (Hooley-Underwood et al. 2018). Canyon habitat availability and the connectivity between the main stem of a river and its tributaries rely on sufficient flow in the main stem. Consistent base flows help maintain habitat availability in the main stem, and higher flows in spring help maintain connectivity to critical tributary habitat and to seasonally available habitats used by multiple life stages. For more details on the role of flow in maintaining sediment dynamics and physical habitat, please see Section 5.

While habitat preferences vary by fish species, Colorado's native fishes often utilize similar habitat. Bluehead Sucker and Roundtail Chub occurrence is associated with deep, rocky pools in the Colorado River. Both species feed on periphyton and macroinvertebrates that inhabit rocky substrate in canyon reaches (Holden and Stalnaker 1975; Baxter and Simon 1970). However, while species such as Roundtail Chub are associated with deep, rocky pool habitat, Speckled Dace prefer the swifter sections of pools and are not typically found in slackwater habitats (Vlach et al. 2005). Adult Flannelmouth Sucker, Bluehead Sucker, Rainbow Trout, and Brown Trout typically prefer deep water as they provide stable temperatures, larger substrates, and resting areas (Bustard and Narver 1975). Thus, inundation of the large substrate in the Study Reach should increase habitat availability, even if average velocities increase.

Further, because increased flows can increase habitat availability and variability, and because fish have species-specific habitat preferences, consistent base flows and high flows in spring may facilitate ecological partitioning in the Study Reach. Ecological partitioning occurs when aquatic habitat varies enough to allow species to occupy different physical locations based on their preferences. An extensive literature review of ecological partitioning in aquatic systems demonstrated that fish exhibit partitioning with respect to diet/food availability, physical habitat, and/or timing of usage, and that partitioning appears to allow coexistence of fish species (Ross 1986). This is significant for the Study Reach for two reasons. First, consistent base flow and increased flows in spring would increase habitat variability. Second, many of Colorado's native fishes lack behavioral mechanisms to deal with nonnative predators or competitors, and introduced game fishes such as Rainbow Trout are adapted to environments with limited fish species richness. Therefore, stable base flows sufficient to permit ecological partitioning could reduce negative interspecific (i.e., between-species) interactions, to the benefit of the resident fishes in the reach; this benefit could be increased with a flow regime that included higher flows during spring runoff. On the other

hand, habitat partitioning is less evident in streams with unstable flow regimes and/or large, sudden fluctuations in environmental variables like flow and water chemistry (e.g., Matthews and Hill 1980). Thus, it is possible that an intermittent flow regime or one where flows changed rapidly due to water management would limit or prevent ecological partitioning, consistent base flow would facilitate ecological partitioning, and high flows in spring would further increase opportunities for ecological partitioning in the Study Reach.

6.2 Instream Flows Maintain Interstitial Habitat

Interstitial spaces, or clear spaces between gravel and cobble substrate, are a major component of both physical and biological processes, and the absence of this habitat negatively impacts fish and macroinvertebrate assemblages (e.g., Kondolf et al. 1993; Gayraud and Philippe 2001). The biological implications of the available interstitial space among gravel and cobble stream substrate are discussed here. Specific flow dynamics required to maintain clean sediment are discussed in Section 5.1.

Interstitial spaces are a critical component of fish habitat. Fish such as sculpin and dace live some or all of their lives in the interstitial spaces in riffles (See Section 2.1). Further, interstitial spaces are critical for reproductive success of salmonids. Interstitial habitats are sensitive to low or intermittent flows for two reasons. First, because they do not store water like pools, riffles are particularly prone to drying during low flows (Rolls et al. 2012), which leads to loss of habitat for multiple fish species. Second, low flows and/or lack of flushing flows can facilitate infilling of interstitial spaces with fine sediment. Excess sediment can adversely affect salmonid spawning habitat by eliminating or reducing its capability to support fish eggs, alevins, and juvenile fish (Wood and Armitage 1997, Chapman 1988, and Moring 1982). The time between egg deposition and emergence of young from the gravel is typically several months for salmonids. During this time, fine sediment can have deleterious effects on embryonic development and emergence (Wood and Armitage 1997, Olsson and Petersen 1986). For example, infilling of interstitial spaces can prevent flow from delivering oxygen or removing metabolic wastes from salmonid redds and can prevent fry from emerging from the substrate (Kondolf et al. 1993, Moring 1982).

Excess sediment alters substrate composition (and therefore macroinvertebrate habitat) on the surface of a riverbed and within the hyporheic zone. Reduced substrate porosity and infilling of interstitial spaces eliminates habitat that is utilized and/or preferred by many macroinvertebrate taxa (Wood and Armitage 1997). For example, riffle-dwelling species such as caddisflies require benthic substrate with heterogenous substrate, interstitial spaces, and connectivity to the hyporheos for refuge and foraging habitat (e.g., Natsumeda and Iguchi 2019). Therefore, sedimentation of interstitial spaces at the streambed and in the hyporheic zone may significantly reduce macroinvertebrate habitat and limit secondary production (Richards et al. 1994). Excess sedimentation has been shown to affect macroinvertebrate assemblages by inducing emigration from the reach (Wood and Armitage

1997). Surface dwelling macroinvertebrates, especially those sensitive or most exposed to sediment like stoneflies and mayflies, will emigrate immediately in response to increasing sediment levels (Rosenberg and Wiens 1978).

Therefore, base flows, which help maintain sediment dynamics through near-constant transport of small amounts of fine sediment (Wohl et al. 2015, See Section 5.1), are important for maintenance of fish and macroinvertebrate habitat. Further, because the Study Reach receives sediment from canyon walls, ephemeral and perennial tributaries, and dam releases, higher, flushing flows may be needed to disrupt the riverbed armor layer and resuspend fine sediment that has infiltrated the benthos and hyporheic zone (Gayraud and Philippe 2001).

6.3 Instream Flows Maintain Longitudinal Habitat Connectivity

Moderate to high flows would likely increase the longitudinal connectivity within the Study Reach. A limited number of studies have examined the effects of flow on fish passage over natural obstacles. Some studies have indicated that low flows increase successful movement over waterfalls (e.g., Lennox et al. 2018), and others have indicated that low flows can prevent migration of adult salmonids (e.g., Warren et al. 2015). However, these studies focused on streams with perennial flow regimes and did not address the effects of extremely low flows or intermittent flows on fish passage; fish passage in the Study Reach is highly restricted under the current flow regime. Consistent base flows and periodic higher flows could facilitate fish passage through the Study Reach in multiple ways. First, increased flow can decrease effective drop heights in cascades and at vertical drops. An increase in pool depth downstream of an obstacle has a positive effect on fish passage probability and drop height from the pool to the crest of the obstacle decreases passage probability (Kondratieff and Myrick 2006, Lauritzen et al. 2010). Under high flows, the increase in downstream pool depth and the decrease in drop height can facilitate migration over obstacles for multiple fish species, including salmonids (e.g., Schwalme et al. 1985). Second, increased flows cause an increase in cross-sectional complexity; even if water velocities and turbulence in the thalweg present conditions that are not conducive to fish passage, alternate pathways will likely become available as new areas are inundated near the margins of the stream. Multiple studies of fish passage in a whitewater park demonstrated that adult trout and suckers were unable to move across selected structures at base flows but were able to do so at higher flows, presumably because multiple pathways for upstream movement become available as flows increase (e.g., Fox et al. 2016; Stevens et al. 2015). Increased flows in a confined reach of the Cache la Poudre River also appear to inundate alternate pathways for upstream fish movement (discussed briefly in Stack et al. 2024). This is likely the case in the Study Reach as well (Figure 6-1); many flow pathways that present vertical obstacles under low-flow conditions could likely be navigated without jumping at higher flows. Maintaining connectivity within the Study Reach will benefit resident fishes (See Section 2.1 for information on the importance of movement to native fishes).

6.4 Instream Flows Control Fish and Macroinvertebrate Drift

Ecological connectivity within the Study Reach also depends on drift of larval fishes and of macroinvertebrates; drift rates are affected by flow regime. Drift of early life stages of riverine fish is an important part of their life histories and may help maintain population connectivity and increase or maintain geographic range (Lechner et al. 2016). Native Colorado River fishes (e.g., Bluehead Sucker, Flannelmouth Sucker, Roundtail Chub, native sculpin, and Speckled Dace) hatch from eggs deposited from gravel bars. Larval drift begins in mid-July, on the descending limb of the hydrograph (Carter et al. 1986).

Dispersal by drift is a critical component of the life history of many fishes, as it transports them from spawning to rearing areas. Larvae drift passively with the current until they can swim well enough to leave the current and select near-shore habitats (Robinson et al. 1998). Thus, flows must be sufficient to allow dispersal from spawning to rearing areas. Flow-mediated drift to allow dispersal of early fish life stages within the Study Reach is still important, even though long-distance dispersal from upstream reaches would be prevented by the Shoshone Dam.

Figure 6-1.—*Vertical drop in Upper Death Rapid that would likely be more passable at higher flows.*

While most fish larvae drift on the descending limb of the hydrograph, macroinvertebrate drift occurs at a wide range of flows, including during floods and spring runoff. Drift is a fundamental process in rivers that allows macroinvertebrates to disperse and colonize new habitat, escape from predation, and avoid unfavorable conditions (Kennedy et al. 2013, Caldwell et al. 2018). Drift in response to flow can have a profound effect on macroinvertebrate community composition and size distribution. Most organisms are behavioral (i.e., not accidental) drifters at low flow, and drift appears to be species- and life-stage specific (i.e., due to varying swimming ability). A study by Kennedy et al. (2013) on the Colorado River below Glen Canyon Dam determined that short-term increases in discharge below the dam induced drift in mobile collector-gatherer macroinvertebrates. They also determined that a twofold increase in daily flow discharge increased drift concentrations linearly for chironomids and exponentially for certain amphipod and snail taxa, indicating that river discharge alters drift behavior among macroinvertebrate assemblages on a short time scale. A study on a small coldwater stream below an active diversion determined that invertebrate drift increased with increases in streamflow, average body size of invertebrates decreased with decreases in streamflow, and that significant reductions in streamflow significantly reduced drifting behavior (Caldwell et al. 2018). Macroinvertebrates will also accidentally enter the drift after being dislodged from substrate during high flows. For example, during an experimental flood on the Colorado River, macroinvertebrate drift densities followed the same pattern as sediment transport, indicating that drift was passive and not behavioral at peak or runoff flows (Robinson et al. 2004). While drift in response to high flow events can lead to large local reductions in macroinvertebrate density, the process is still beneficial. For example, investigations of the food web in the Colorado River downstream of Glen Canyon Dam before and after an experimental flood showed a dramatic decrease in macroinvertebrate density but an increase in fish biomass due to higher drift rates and higher production of more desirable macroinvertebrate prey (Collins et al. 2011).

Macroinvertebrates drift to disperse and maintain population connectivity, but this process also delivers macroinvertebrate prey to drift-feeding fishes. Drifting organisms account for large portions of certain fish species diets and is a crucial element in sustaining a natural and healthy river food web. Further, drift density and taxonomic composition is a function of local processes and not attributable to distant sources such as tributaries or distant, upstream reaches (Danehy et al. 2011), indicating that the magnitude and the variability of the flows released from Shoshone Dam would have direct effects on the rate and composition of drift in the Study Reach.

These studies on the effects of flows on macroinvertebrate drift illustrate the importance of consistent base flows and spring runoff flows in maintaining natural invertebrate behavior. Drift is affected by anthropogenic alteration of a wide range of flows, and altered drift patterns can subsequently alter macroinvertebrate assemblages (Caldwell et al. 2018). When alteration of high or low flows changes macroinvertebrate drift patterns, macroinvertebrate assemblages and the aquatic food web can be impacted.

6.5 High Flows Maintain Canyon Habitat

Peak flows are a crucial component for maintenance of aquatic habitat in canyons (Bunn and Arthington 2002). Higher flows increase aquatic habitat by inundating undercut banks, large, low-velocity spaces between boulders, and low-velocity areas downstream of boulders (referred to hereafter as velocity refuges) (e.g., Bustard and Narver, 1975). Providing consistent base flows and allowing them to increase during spring runoff would increase the availability of shoreline habitat for resident fishes. While habitat analyses based on hydraulic modeling may indicate that habitat suitability decreases once flows increase past a certain, site-specific threshold, high flow events typically do not significantly affect distribution and abundance of native fish in canyon reaches. Instead, negative effects have typically been observed in small-bodied invasive species (Valdez et al. 2001).

In many cases, the relationship between flow and aquatic habitat availability/quality is analyzed with a combination of hydraulic models and known information about fish habitat preferences. Often, these models indicate deterioration of habitat with increased flows. The disconnect between modeling results that indicate deteriorating habitat quality/quantity at high flows and the presence of native fish in canyon reaches at all flow stages likely has to do with an incomplete understanding of canyon systems. The incredible complexity of flow in steep canyon reaches is difficult to model, the understanding of fish swimming behavior in these complex flow fields is limited, and habitat suitability information for fish is typically not derived from deep, turbulent systems such as canyons. There is little question that use of one-dimensional, two-dimensional or three-dimensional hydrodynamic models (1D, 2D, and 3D models, respectively) greatly increase our understanding of how hydraulic conditions change with flow in natural systems. However, all hydraulic models have limitations, particularly at small scales that are relevant to a fish. For example, 1D and 2D hydraulic models provide cross-section and depth-averaged hydraulics, respectively, which are useful for characterizing habitat in low-gradient reaches such as pool-riffle complexes. Within canyon reaches, boulder roughness may create slower velocities and refugia at higher flow rates, which cannot be fully captured by these models. The terrain in the project area was captured using comprehensive drone and ground survey and used to develop a modeled surface of Upper Death Rapid in the Study Reach (Figure 6-2). This effort resulted in a representation of the complex and rough stream bed. However, despite detailed surveying, the large interstitial velocity refuges between the boulders in the Study Reach are not well-characterized (Figure 6-1). Further, species-specific microhabitat preferences in canyon habitat are not well understood, due to difficulties associated with collecting fish location data in fast, deep stream reaches. However, multiple laboratory and fishway prototype studies have shown that fish detect flow through multiple sensory pathways, utilize behaviors such as flow refuging and exploitation of vortices to save energy, and are adept at locating hydraulic conditions that are advantageous to them (e.g., Sutterlin and Waddy 1975; Castro-Santos 2005; Liao 2007). This suggests that fish are utilizing small-scale habitat patches in canyon reaches that cannot be described with hydraulic models.

Many of Colorado's native fishes are adapted to and can be found in canyon habitats, including the Study Reach. Consistent base flow in the Study Reach would provide year-round habitat for these species, as well as game species such as Brown Trout and Rainbow Trout, because they can utilize habitat in large interstitial or behind-boulder velocity refuges. Periodic high flows (i.e., increased flows during the spring runoff period) would increase habitat availability in the Study Reach by creating more habitat between and behind large boulders.

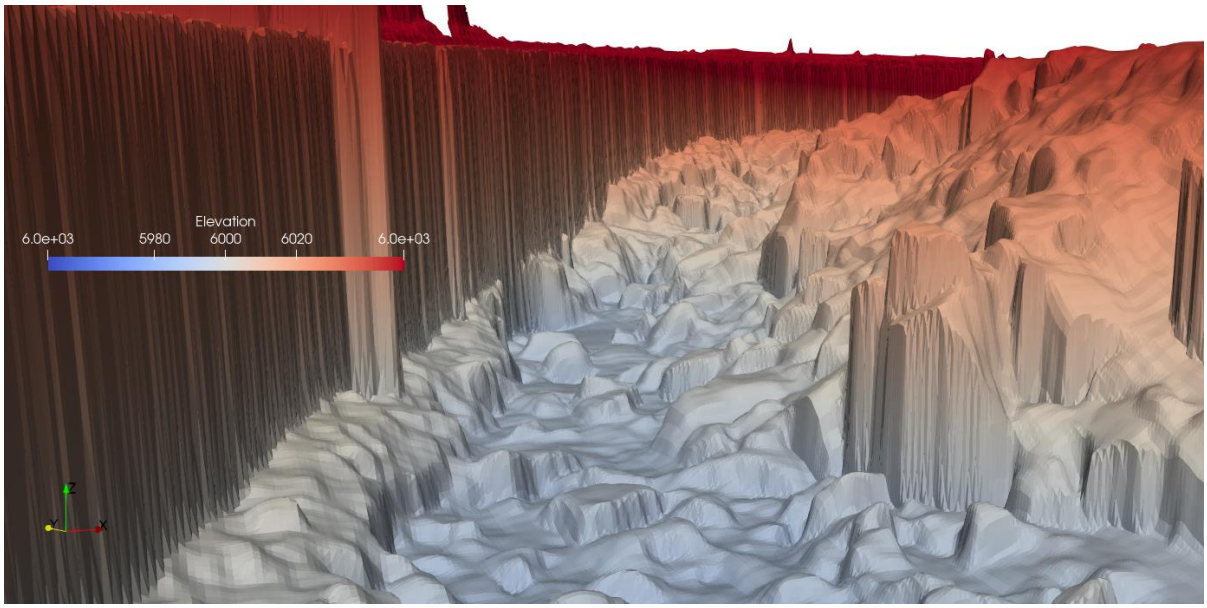


Figure 6-2.—*Modeled surface of Upper Death Rapid, below Shoshone Dam.*

7. Conclusion

The data, literature review, and syntheses contained in this report provide a biological basis for establishing consistent base flows and periodic high flows in the Study Reach. This synthesis incorporated information from studies focused on fish/macroinvertebrate biology, food webs, fluvial geomorphology, and lateral and longitudinal stream connectivity. Together, these studies show how a natural flow regime shapes and supports aquatic systems, and site-specific examples detail the potential benefits of instream flows for the Study Reach.

Fish data from the Study Reach and surrounding area on the Colorado River indicate that fish populations are relatively similar upstream of the Study Reach and within it. CPW data indicate that the Colorado River supports multiple SGCN-1 species (Colorado River Cutthroat Trout, Bluehead Sucker, Flannelmouth Sucker, and potentially Roundtail Chub), as well as Mountain Whitefish. The site sampled within the Study Reach displayed comparable sportfish densities and biomasses to the other sites, but it supported a lower number of nonnative species and hybrids than the other sites. These data suggest that the Study Reach may be particularly valuable to native fishes and that SGCN species and sportfish will inhabit the Study Reach in greater numbers given adequate flow conditions.

Macroinvertebrate data analyzed from a perennial section of the Study Reach and from upstream reaches on the Colorado River showed that sensitive taxa and long-lived taxa were present at all sites. Analysis of macroinvertebrate community metrics showed that the upstream Colorado River sites have greater diversity, slightly greater MMI scores, and more favorable HBI and TIV_{SED} scores than the Study Reach. The difference in scores suggests that existing flow conditions in the Study Reach are negatively affecting the macroinvertebrate assemblage by selecting for species more tolerant to disturbances such as sedimentation. The differences in scores upstream and within the Study Reach emphasizes the potential of the Study Reach to support a robust and ecologically valuable macroinvertebrate community, given a more natural flow regime.

Consistent base flows and periodic high flows would provide major benefits in the Study Reach that include maintenance of food webs and sediment dynamics, dampening of temperature extremes, and increased aquatic habitat. While intermittent flow regimes do support fish and macroinvertebrate communities, specific challenges exist in these systems. Food webs and nutrient dynamics are highly variable in space and time, sediment and temperature dynamics are altered compared to perennial systems, and aquatic habitat is not consistently connected or available. Thus, if an intermittent flow regime or a fully dewatered condition persists in the Study Reach, the fish and macroinvertebrate community will not be as robust as they are in adjacent reaches of the Colorado River.

Logistic difficulties associated with sampling limit our understanding of the geomorphic, biological, and ecological conditions in canyon habitats such as the Study Reach. However, based on the empirical data and the literature presented in this report, it is our opinion that the Study Reach will benefit significantly from consistent base flows, as well as periodic high flows, and that some or all of these benefits will propagate to downstream reaches of the Colorado River.

8. References

Armstrong, J. B., D. E. Schindler, C. P. Ruff, G. T. Brooks, K. E. Bentley, and C. E. Torgersen. 2013. Diel horizontal migration in streams: juvenile fish exploit spatial heterogeneity in thermal and trophic resources. *Ecology* 94(9):2066-2075.

Bakich 2025. Personal communication. Colorado Department of Natural Resources. Editorial comment on first submission to add context and anecdotal support.

Batty, A. 2010. Examination of speckled dace abundance, biology, and habitat in the Canadian range (master's research project). Simon Fraser University, School of Resource and Environmental Management.

Baxter, C. V., K. D. Fausch, and W. C. Saunders. 2005. Tangled webs: reciprocal flows of invertebrate prey link streams and riparian zones. Freshwater Biology 50:201-220.

Baxter, G. T. and J. R. Simon. 1970. Wyoming fishes. Wyoming Game and Fish Department Bulletin 4, Cheyenne, Wyoming.

Baxter, G. T., and M. D. Stone. 1995. Fishes of Wyoming. Wyoming Game and Fish Department, Cheyenne, Wyoming. 290 pp.

Bear, E. A., T. E. McMahon, and A. V. Zale. 2007. Comparative thermal requirements of westslope cutthroat trout and rainbow trout: implications for species interactions and development of thermal protection standards. Transactions of the American Fisheries Society 136(4):1113-1121.

Bellmore, J. R., C. V. Baxter, K. Martens, and P. J. Connolly. 2013. The floodplain food web mosaic: a study of its importance to salmon and steelhead with implications for their recovery. Ecological Applications 23(1):189-207.

Benda, L. E. E., N. L. Poff, D. Miller, T. Dunne, G. Reeves, G. Pess, G. and M. Pollock. 2004. The network dynamics hypothesis: how channel networks structure riverine habitats. *BioScience*, *54*(5):413-427.

Bestgen, K. R. and D. L. Propst. 1989. Distribution, status, and notes on the ecology of Gila robusta (Cyprinidae), in the Gila River drainage, New Mexico. Southwestern Naturalist 34(3):402-412.

Brett, M. T., S. E. Bunn, S. Chandra, A. W. E. Galloway, F. Guo, M. J. Kainz, P. Kankaala, D. C. P Lau, T. P. Moulton, M. E. Power, J. B. Rasmussen, S. J. Taiple, J. H. Thorp. J.

D. Wehr. 2017. How important are terrestrial organic carbon inputs for secondary production in freshwater ecosystems? Freshwater Biology 17:1-21.

Bottcher, J. L. 2009. Maintaining population persistence in the face of an extremely altered hydrograph: implications of three sensitive fishes in a tributary of the Green River, Utah. M.S. Thesis, Utah State University, Department of Watershed Science, Logan, UT.

Bower, M.R. et al. (2008) Habitat Features Affect Bluehead Sucker, Flannelmouth Sucker, and Roundtail Chub across a Headwater Tributary System in the Colorado River Basin, Journal of Freshwater Ecology, 23:3, 347-357.

Brouder, M. J., D. D. Rogers, and L. D. Avenetti. 2000. Life history and ecology of the Roundtail chub Gila robusta, from two streams in the Verde River basin. Arizona Game and Fish Department Research Branch, Technical Bulletin 3, Phoenix.

Bunn, S.E. and A. H. Arthington, 2002. Basic Principles and Ecological Consequences of Altered Flow Regimes for Aquatic Deflation Basin Lakes. Environmental Management 30(4):492-507.

Bustard, D. R. D. W. Narver. 1975. Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus kisutch) and Steelhead Trout (Salmo gairdneri). Canadian journal of fisheries and aquatic sciences. 32 (5), 667–680.

Caldwell, T., G. Rossi, R. Henery, and S. Chandra. 2018. Decreased streamflow impacts fish movement and energetics through reductions to invertebrate drift body size and abundance: Reduced streamflow changes drift, fish behavior and fish energetics. River Research and Applications. 34.

Carter, J. G., V. A. Lamarra, and R. J. Ryel. 1986. Drift of larval fishes in the Upper Colorado River. Journal of Freshwater Ecology 3(4):567-578.

Castro-Santos, T. 2005. Optimal swim speeds for traversing velocity barriers: an analysis of volitional high-speed swimming behavior of migratory fishes. Journal of Experimental Biology 208(3):421-432.

Cenderelli, D. A. and B. L. Cluer. 1998. Depositional processes and sediment supply in resistant-boundary channels: examples from two case studies. *Rivers Over Rock: Fluvial Processes in Bedrock Channels* 107:105-131.

Center for Biological Diversity. 2020. Petition to list three populations of speckled dace (Rhinichthys osculus nevadensis) in the Death Valley region under the Endangered Species Act: Amargosa Canyon speckled dace, Long Valley speckled dace, Owens speckled dace.

Chapman, D. W. 1988. Critical review of variables used to define effects of fines in redds of large salmonids. Transactions of the American Fisheries Society 117:1–21.

Chen, W. and J. D. Olden. 2017. Designing flows to resolve human and environmental water needs in a dam-regulated river. *Nature communications* 8(1):2158.

Church, M. 1995. Geomorphic response to river flow regulation: Case studies and time-scales. *Regulated Rivers: Research & Management* 11(1):3-22.

Clements, W.H., D. B. Herbst, M. I. Hornberger, C. A. Mebane, and T.M. Short. 2021. Long-term monitoring reveals convergent patterns of recovery from mining contamination across 4 western US watersheds. Freshwater Science 40(2).

Clements, W.H., D.M. Carlisle, L.A. Courtney, and E.A. Harrahy. 2002. Integrating observational and experimental approaches to demonstrate causation in stream biomonitoring studies. Environmental Toxicology and Chemistry 21: 1138-1146.

Closs, G. P. and P. S. Lake. 1994. Spatial and temporal variation in the structure of an intermittent-stream food web. Ecological Monographs 64(1):1-21.

Colorado Department of Public Health and Environment. 2024. Policy 98-1: Guidance for Implementation of Colorado's Narrative Sediment Standard Regulation #31, Section 31.11 (1)(a)(i). Denver, Colorado.

Colorado Department of Public Health and Environment, 2024. 5 CCR 1002-33: Regulation No. 33 - classifications and numeric standards for upper Colorado River Basin and North Platte River (Planning Region 12).

Colorado Department of Public Health and Environment. 2020. Policy Statement 10-1: Methodology to Determine Use Attainment for Rivers and Streams. Water Quality Control Commission. Denver, CO.

Colorado Water Quality Division. 2020. Basis for Protecting Intermittent and Ephemeral Waters. WQCD Prehearing Statement- Exhibit E. June 2020 Rulemaking Hearing.

Courtwright, J. and C. L. May. 2013. Importance of terrestrial subsidies for native brook trout I Appalachian intermittent streams. Freshwater Biology 58:2423-2438.

Cross, W. F., C. V. Baxter, K. C. Donner, E. J. Rosi-Marshall, T. A. Kennedy, R. O. Hall Jr., H. A. Wellard Kelly, and R. Scott Rogers. 2011. Ecosystem ecology meets adaptive management: food web response to a controlled flood on the Colorado River, Glen Canyon. Ecological Applications https://doi.org/10.1890/10-1719.1

Danehy, R. J., R. B. Langshaw, S. D. Duke, and R. E. Bilby. 2011. Drift distance of macroinvertebrates throughout summer in headwater tributaries of the Calapooia River. Fundamentals of Applied Limnology 178(2):111-120.

Decker, A. S., M. J. Bradford, and P. S. Higgins. 2008. Rate of biotic colonization following flow restoration below a diversion dam in the Bridge River, British Columbia. River Research and Applications 24(6):876-883. https://doi.org/10.1002/rra.1076

Dodrill, M. J., C. B. Yackulic, T. A. Kennedy, and J. W. Hayes. 2016. Prey size and availability limits maximum size of rainbow trout in a large tailwater: insights from a drift-foraging bioenergetics model. Canadian Journal of Fisheries and Aquatic Sciences 73 DOI: https://dx.doi.org/10/1139/cjfas-2015-0268.

Dodrill, M. J. et al. (2016) Assessing Predation Risks for Small Fish in a Large River Ecosystem between Contrasting Habitats and Turbidity Conditions. The American midland naturalist. 175 (2), 206–221.

Duffin, J., E. M. Yager, J. M. Buffington, R. Benjankar, C. Borden, and D. Tonina. 2023. Impact of flow regulation on stream morphology and habitat quality distribution. *Science of the Total Environment* 878:163016.

Elliot, J. M. and J. A. Elliot. 2010. Temperature requirements of Atlantic salmon *Salmo salar*, brown trout *Salmo trutta*, and Arctic charr, *Salvelinus alpinus*: predicting the effects of climate change. Journal of Fish Biology: https://doi.org/10.1111/j.1095-8649.2010.02762.x

Erku, R.: Silt water treatment plant feeling effects of Glenwood Canyon mudslides months later, https://www.postindependent.com/news/silt-water-treatment-plant-feeling-effects-of-glenwood-canyon-mudslides-months-later/, last access: 17 February 2025.

Ficke, A. D., C. A. Myrick, and L. J. Hansen. 2007. Potential impacts of global climate change on freshwater fisheries. *Reviews in Fish Biology and Fisheries* 17:581-613.

Foster, A. D., S. M. Claeson, P. A. Bisson, and J. Heimburg. 2020. Aquatic and riparian ecosystem recovery from debris flows in two western Washington streams, USA. *Ecology and Evolution* 10(6):2749-2777.

Fox, B. D., B. P. Bledsoe, E. Kolden, M. C. Kondratieff, and C. A. Myrick. 2016. Eco-hydraulic evaluation of a whitewater park as a fish passage barrier. Journal of the American Water Resources Association 1-23. DOI:10.1111/1752-1688.12397.

Fraser, G. S., D. L. Winkelman, K. R. Bestgen, and K.G. Thompson. 2017. Tributary Use by Imperiled Flannelmouth and Bluehead Suckers in the Upper Colorado River Basin. Transactions of the American Fisheries Society (1900). 146 (5), 858–870.

Gayraud, S. and M. Philippe. 2001. Does subsurface interstitial space influence general features and morphological traits of the benthic macroinvertebrate community in streams? Archiv fur Hydrobiologie. 151. 667-686.

Gido, K. B. and D. L. Probst. 1999. Habitat use and association of native and nonnative fishes in the San Juan River, New Mexico and Utah. Copeia 1999:321-332.

Giller, P.S. and B. Malmqvist. 1998. *The biology of streams and rivers*. Oxford University Press.

Graber, A.P., M. A. Thomas, and J. W. Kean. 2023. How long do runoff-generated debris-flow hazards persist after wildfire?. *Geophysical Research Letters* 50(19):e2023GL105101.

Grant, G.E. 2012. The Geomorphic Response of Gravel-Bed Rivers to Dams: Perspectives and Prospects. In Gravel-Bed Rivers (eds M. Church, P.M. Biron and A.G. Roy). https://doi.org/10.1002/9781119952497.ch15

Gresswell, R. E. and J. L. Li. 2005. Changing Patterns in Coastal Cutthroat Trout (*Oncorhynchus clarki clarki*) Diet and Prey in a Gradient of Deciduous Canopies. Canadian Journal of Aquatic Sciences, 62: 1797-1807.

Guo F., M. J. Kainz, F. Sheldon, and S. E. Bunn. 2016. The importance of high-quality algal food sources in stream food webs – current status and future perspective. Freshwater Biology, 61, 815-831.

Hall Jr., R. O. and J. L. Meyer. 1998. The trophic significance of bacteria in a detritus-based stream food web. Ecology 79(6):1995-2012.

Hilsenhoff, W.L. 1987. An improved biotic index of organic stream pollution. *Great Lakes Entomologist* 20(1): 31-39.

Holden, P. B. and C. B. Stalnaker. 1975. Distribution and abundance of mainstream fishes of the Middle and Upper Colorado River basins, 1967-1 973. Transactions of the American Fisheries Society 104:217-23 1.

Hooley-Underwood, Z. E., S. B. Stevens, N. R. Salinas, and K. G. Thompson. 2018. An intermittent stream supports extensive spawning of large-river native fishes. Transactions of the American Fisheries Society 148(2):426-441.

Jiang, S., L. Zhou, L. Ren, M. Wang, C.-Y. Xu, F. Yuan, Y. Liu, X. Yang, and Y. Ding. 2021. Development of a comprehensive framework for quantifying the impacts of climate change and human activities on river hydrological health variation. *Journal of Hydrology*. 600:126566. https://doi.org/10.1016/j.jhydrol.2021.126566.

Kelly, B. T. and L. A. Bruckerhoff. 2024. The life cycle of intermittent streams: how do fish communities respond to annual cycles of wetting and drying? Freshwater Biology 69(12):1914-1926. https://onlinelibrary.wiley.com/doi/10.1111/fwb.14351

Kennedy, T., C. Yackulic, W. Cross, P. Grams, M. Yard, and A. Copp. 2013. The relation between invertebrate drift and two primary controls, discharge and benthic densities, in a large regulated river. Freshwater Biology. 59.

Kerezsy, A., K. Gido, M. F. Magalhães, and P. H. Skelton. 2017. The Biota of Intermittent Rivers and Ephemeral Streams: Fishes. In T. Datry, N. Bonada, and A. Boulton (eds) Intermittent Rivers and Ephemeral Streams Ecology and Management. Elsevier Inc. London, United Kingdom.

Kiffney, P.M. and W.H. Clements. 1994. Effects of heavy metals on a macroinvertebrate assemblage from a Rocky Mountain stream in experimental microcosms. Journal of the North American Benthological Society 13: 511-523.

Knighton, D., 2014. Fluvial forms and processes: a new perspective. Routledge. https://doi.org/10.4324/9780203784662

Kondolf, G.M., M.J. Sale, and M.G. Wolman.1993. Modification of fluvial gravel size by spawning salmonids. Water Resources Research 29:2265–2274.

Kondolf, G.M., and P. R. Wilcock. 1996. The flushing flow problem—Defining and evaluating objectives: Water Resources Research 32(8):2589–2599. https://doi.org/10.1029/96WR00898.

Kondratieff, M. C. and C. A. Myrick. 2006. How high can brook trout jump? A laboratory evaluation of brook trout jumping performance. Transactions of the American Fisheries Society 135:361-370.

Kraus, J. M., J. F. Pomeranz, A. S. Todd, D. M. Walters, T. S. Schmidt, and R. B. Wanty. 2016. Aquatic pollution increases use of terrestrial prey subsidies by stream fish. Journal of Applied Ecology, 53, 44-53.

Laasko, M. 1951. Food Habits of the Yellowstone Whitefish Prosopium williamsoni cismontanus (Jordan), *Transactions of the American Fisheries Society* 80(1):99–109

Lauritzen, D. V., F. S. Hertel, L. K. Jordan, and M. S. Gordon. 2010. Salmon jumping: behavior, kinematics, and optimal conditions, with possible implications for fish passageway design. Bioinspiration and Biomimetics 5(3): https://www.doi.org/10.1088/1748-3182/5/3/035006.

Leach, J. A., C. Kelleher, B. L. Kurylyk, R. D. Moore, and B. T. Neilson. 2023. A primer on stream temperature processes. *Wiley Interdisciplinary Reviews: Water* 10(4):e1643.

Lechner, A., H. Keckeis, and P. Humphries. 2016. Patterns and processes in the drift of early developmental stages of fish in rivers: a review. Reviews in Fish Biology and Fisheries 26:471-489.

Lennox, R. J., E. B. Thorstad, O. H. Diserud, F. Økland, S. J. Cooke, I. Aasestad, and T. Forseth. 2018. Biotic and abiotic determinants of the ascent behavior of adult Atlantic salmon transiting passable waterfalls. River Research and Applications 34:907-917.

Levick, L., J. Fonseca, D. Goodrich, M. Hernandez, D. Semmens, J. Stromberg, R. Leidy, M. Scianni, D. P. Guertin, M. Tluczek, and W. Kepner. 2008. The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest. U.S. Environmental Protection Agency and USDA/ARS Southwest Watershed Research Center, EPA/600/R-08/134, ARS/233046, 116 pp.

Liao, J. C. 2007. A review of fish swimming mechanics and behavior in altered flows. Philosophical Transactions of the Royal Society B 362:1973-1993.

Maavara, T., Q. Chen, K. Van Meter, L. E. Brown, J. Zhang, J. Ni, and C. Zarfl. 2020. River dam impacts on biogeochemical cycling. *Nature Reviews Earth and Environment*. 1:103–116. https://doi.org/10.1038/s43017-020-0026-5.

Maddux, H. R., and W. G. Kepner. 1988. Spawning of Bluehead Sucker in Kanab Creek, Arizona (Pisces: Catostomidae). The Southwestern Naturalist, 33(5):364-365

Magoulick, D. D. and R. M. Kobza. 2003. The role of refugia for fishes during drought: a review and synthesis. Freshwater Biology 48: 1 186- 1 19

Matthews, W. J. and L. G. Hill. 1980. Habitat partitioning in the fish community of a southwestern river. The Southwestern Naturalist 25(1):51-66.

Merbt, S. N., L. Proia, J. I. Prosser, E. Martí, E. O. Casamayor, and D. Schiller. 2016. Stream drying drives microbial ammonia oxidation and first-flush nitrate export. *Ecology*. 97(9):2177–2528. https://doi.org/10.1002/ecy.1486.

Mihalevich, B. A., B. T. Neilson, C. A. Buahin, C. B. Yackulic, and J. C. Schmidt. 2020. Water temperature controls for regulated canyon-bound rivers. *Water Resources Research* 56(12):e2020WR027566.

Meier, W., C. Bonjour, A. Wüest, and P. Reichert. 2003. Modeling the effect of water diversion on the temperature of mountain streams. *Journal of Environmental Engineering* 129(8):755-764.

Miller, M. P., S. G. Buto, D. D. Susong, C. A. and Rumsey. 2016. The importance of base flow in sustaining surface water flow in the Upper Colorado River Basin. *Water Resources Research* 52(5):3547-3562.

Minckley, W. L. 1973. Fishes of Arizona. Arizona Game and Fish Department, Phoenix.

Minckley, W.L. 1991. Native fishes of the Grand Canyon: an obituary? Pages 124-177 in Colorado River Ecology and Dam Management, Proceedings of a Symposium May 24-25, 1990, Santa Fe, New Mexico. National Academy Press, Washington, D.C.

Moring, J. R. 1982. Decrease in stream gravel permeability after clear-cut logging: An indication of intergravel conditions for developing salmonid eggs and alevin. Hydrobiologia 88:295–298.

Mueller, E. R., P. E. Grams, J. C. Schmidt, J. E. Hazel Jr, J. S. Alexander, and M. Kaplinski. 2014. The influence of controlled floods on fine sediment storage in debris fan-affected canyons of the Colorado River basin. *Geomorphology* 226:65-75.

Mueller, E. R., P. E. Grams, J. E. Hazel Jr, and J. C. Schmidt. 2018. Variability in eddy sandbar dynamics during two decades of controlled flooding of the Colorado River in the Grand Canyon. *Sedimentary Geology* 363:181-199.

Muth, R. T. 1990. Ontogeny and taxonomy of Humpback Chub, Bonytail, and Roundtail Chub larvae and early juveniles. Doctoral dissertation. Colorado State University, Fort Collins

Natsumeda, T. and K. Iguchi. 2019. Habitat-specific effects of interstitial space between stream substrate particles on the colonization of aquatic organisms. International Aquatic Research 11:347–358.

NatureServe. 2025. NatureServe Explorer: an online encyclopedia of life. Arlington, Virginia. https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.100335/Rhinichthys_osculus (February 2025).

Noone, W. N., P. M. Edwards, Y. Pan, and C. Thorne. 2025. Floodplain Restoration and Its Effects on Summer Water Temperature and Macroinvertebrates in Whychus Creek, Oregon (USA). *River Research and Applications* 41(1):37-55.

Olden, J. D. and R. J. Naiman. 2010. Incorporating thermal regimes into environmental flows assessments: modifying dam operations to restore freshwater ecosystem integrity. *Freshwater Biology* 55(1):86-107.

Olsen, K. H. 2013. Colorado River Cutthroat Trout Habitat Resistance and Resilience to Climate Change. M.S. Thesis. Department of Watershed Sciences, Utah State University, Logan, UT.

Olsson, T.I., Persson, BG. Effects of gravel size and peat material concentrations on embryo survival and alevin emergence of brown trout, Salmo trutta L. Hydrobiologia 135, 9–14 (1986).

Palmer, M., and A. Ruhi. 2019. Linkages between flow regime, biota, and ecosystem processes: Implications for river restoration. *Science* 365(6459):aaw208. https://doi.org/10.1126/science.aaw208.

Pettit, S. W., & Wallace, R. L. (1975). Age, Growth, and Movement of Mountain Whitefish, Prosopium williamsoni (Girard), in the North Fork Clearwater River, Idaho. Transactions of the American Fisheries Society, 104(1), 68–76.

Petts, G. E. 1988. Accumulation of fine sediment within substrate gravels along two regulated rivers, UK. Regulated Rivers: Research and Management 2:141–153.

Poff, N. L., J. D. Allan, M. B. Bain, J. R. Karr, K. L. Prestegaard, B. D. Richter, R. E. Sparks, and J. C. Stromberg. 1997. The natural flow regime. *BioScience*, 47(11):769-784.

Poff, N. L., J. D. Olden, D. M. Merritt, and D. M. Pepin. 2007. Homogenization of regional river dynamics by dams and global biodiversity implications. Proceedings of the National Academy of Sciences USA 104:5732–5737.

Poff, N. L., B. D. Richter, A. H. Arthington, S. E. Bunn, R. J. Naiman, E. Kendy, M. Acreman, C. Apse, B. P. Bledsoe, M. C. Freeman, and J. Henriksen. 2010. The ecological limits of hydrologic alteration (ELOHA): a new framework for developing regional environmental flow standards. *Freshwater biology* 55(1):147-170.

Poole, G. C. and C. H. Berman. 2001. An ecological perspective on in-stream temperature: natural heat dynamics and mechanisms of human-caused thermal degradation. *Environmental management* 27:787-802.

Ptacek, J.A., D.E. Rees, and W.J. Miller. 2005. Bluehead Sucker (*Catostomus discobolus*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region.

Rahel, F.J., 2002. Homogenization of freshwater faunas. *Annual review of ecology and systematics*, *33*(1):291-315.

Rees, D.E. .2024a. Summary Report Benthic Macroinvertebrate Biomonitoring Study, Upper Colorado River 2023. Prepared for Upper Colorado river Wild and Scenic Stakeholder Group. Fort Collins, CO.

Rees, D.E. 2024b. Memorandum: Results from ERWC Benthic Macroinvertebrate Biomonitoring Study, 2023. To James Dilzell, Eagle River Watershed Council.

Rees, D.E. and D. Musto. .2019a. Summary Report Benthic Macroinvertebrate Biomonitoring Study, Upper Colorado River 2018. Prepared for Upper Colorado river Wild and Scenic Stakeholder Group. Fort Collins, CO.

Rees, D.E. and E.S. Grape. 2019b. Summary Report Benthic Macroinvertebrate Biomonitoring Study, Upper Colorado River 2019. Prepared for Upper Colorado river Wild and Scenic Stakeholder Group. Fort Collins, CO.

Rees, D.E. and K.R. Fenske. 2022. Benthic Macroinvertebrate Biomonitoring Study, Upper Colorado River 2021. Prepared for Upper Colorado River Wild and Scenic Stakeholder Group, Fort Collins, Colorado.

Rengers, F. K., S. Bower, A. Knapp, J. W. Kean, D. W. von Lembke, M. A. Thomas, J. Kostelnik, K. R. Barnhart, M. Bethel, J. E. Gartner, and M. Hille. 2024. Evaluating post-wildfire debris-flow rainfall thresholds and volume models at the 2020 Grizzly Creek Fire in Glenwood Canyon, Colorado, USA. *Natural Hazards and Earth System Sciences*, 24(6):2093-2114.

Richter, B. D., J.V. Baumgartner, R. Wigington, D.P. Braun. 1997. How much water does a river need? Freshwater Biology, 37, 231-249.

Robinson, C. T., S. Aebischer, and R. Uehlinger. 2004. Immediate and habitat-specific responses of macroinvertebrates to sequential, experimental floods. Journal of the North American Benthological Society 23(4):853-867.

Robinson, A. T., R. W. Clarkson, and R. E. Forrest. 1998. Dispersal of larval fishes in a regulated river tributary. Transactions of the American Fisheries Society 127:772-786.

Rolls, R. J., C. Leigh, and F. Sheldon. 2012. Mechanistic effects of low-flow hydrology on riverine ecosystems: ecological principles and consequences of alteration. Freshwater Science 31(4):1163-1186.

Rosenberg, D. M. and A. P. Wiens. 1978. Effects of sediment addition on macrobenthic invertebrates in a Northern Canadian River, Water Research 12(10):753-763.

Ross, S. T. 1986. Resource partitioning in fish assemblages: a review of field studies. Copeia (1986):352-388.

Rumsey, C. A., M. P. Miller, D. D. Susong, F. D. Tillman, and D. W. Anning. 2015. Regional scale estimates of baseflow and factors influencing baseflow in the Upper Colorado River Basin. *Journal of Hydrology: Regional Studies* 4:91-107.

Sabo, J. L., J. C. Finlay, T. Kennedy, and D. M. Post. 2010. The role of discharge variation in scaling of drainage area and food chain length in rivers. Science 330:965-967.

Saunders, W. C. and K. D. Fausch. 2012. Grazing management influences the subsidy of terrestrial prey to trout in central Rocky Mountain streams (USA). Freshwater Biology 57:1512-1529.

Schwalme, K., W. C. MacKay, and D. Lindner (1985) "Suitability of vertical slot and Denil fishways for passing north-temperate, nonsalmonid fish." Canadian Journal of Fisheries and Aquatic Sciences 42:1815-1822.

Schmidt, B., K. Fitzsimmons, and A. Paul. 2019. Mountain whitefish overwintering habitat use in the McLeod River. Data Report produced by Alberta Conservation Association, Sherwood Park, Alberta, Canada. 19pp.

Schmidt, J. C. and P. R. Wilcock. 2008. Metrics for assessing the downstream effects of dams. *Water Resources Research* 44(4).

Schumm, S.A. (1977) The Fluvial System. John Wiley and Sons, New York, 338 p.

Sigler, W. F. and J. W. Sigler. 1987. Fishes of the Great Basin - A Natural History. University of Nevada Press, 344-347.

Sinokrot, B.A. and J. S. Gulliver. 2000. In-stream flow impact on river water temperatures. *Journal of Hydraulic Research* 38(5):339-349.

Snyder, D. E., R. T. Muth, and C. L. Bjork. 2004. Catostomid fish larvae and early juveniles of the Upper Colorado River Basin – Morphological descriptions, comparisons, and computer-interactive key. Colorado State University Larval Fish Laboratory Technical Publication #42 DOW-R-T-42-04.

Sommer, T. R., M. L. Nobriga, W. C. Harrell, W. Batham, and W. J. Kimmerer. 2001. Floodplain rearing of juvenile Chinook salmon: evidence of enhanced growth and survival. Canadian Journal of Fisheries and Aquatic Sciences58:25-333.

Stack, T., M. P. Fairchild, R. Geiger, S. J. Oyler-McCance, J. A. Fike, C. M. Kennedy, D. L. Winkelman, and Y. Kanno. 2024. A genetic assessment of natural barriers for isolating a proposed Greenback Cutthroat Trout reintroduction area. North American Journal of Fisheries Management 44:1062-1072.

Stephens, T. A., B. P. Bledsoe, B. D. Fox, E. Kolden, and M. C. Kondratieff. 2015. Effects of whitewater parks on fish passage: a spatially explicit hydraulic analysis. Ecological Engineering 83:305-318.

Stubbington, R., M.T. Bogan, N. Bonada, A.J. Boulton, T. Datry, C. Leigh, and R.V. Vorste. 2017. The Biota of Intermittent Rivers and Ephemeral Streams: Aquatic Invertebrates. In T. Datry, N. Bonada, and A. Boulton (eds) Intermittent Rivers and Ephemeral Streams Ecology and Management. Elsevier Inc. London, United Kingdom.

Stubbington, R., A. Barthès, S. Bercea, R. Bolpagni, A. Bouchez, D. Bruno, G. Bunting, M. Cañedo-Argüelles, R. Chadd, N. Cid, D. Cvijanović, T. Datry, J. Durkota, J. England, C. Hayes, J. Heino, A. Laini, F. Leese, B. Loskotová, I. Maddock, D. Milosevic, M. Morais, A. Munné, M. Novais, P. Pařil, V. Pešić, M. Polàšek, I. Pozojević, M. del mar Sánchez-Montoya, R. Sarremejane, J. Soininen, M. Soria, M. Straka, L. Vardakas, C. G. Westwood, J. White, and M. Wilkes. 2020. Community Ecology and Biomonitoring in IRES. In: Magland, C., M. H. Alves, E. Calleja, T. Datry, G Dörflinger, J. England, A. Munne, and I. Tziortzis. Intermittent Rivers and Ephemeral Streams: What Water Managers Need to Know. Technical report – Cost ACTION CA 15113. 10.5218/zenodo.3888474

Sturrock, A.M., Ogaz, M., Neal, K. et al. 2022. Floodplain trophic subsidies in a modified river network: managed foodscapes of the future? *Landscape Ecology* 37:2991–3009.

Suttle, K.B., M.E. Power, J.M. Levine, ad C. McNeeley. 2004. How fine sediment in riverbeds impairs growth and survival of juvenile salmonids. Ecological Applications 14(4): 969-974.

Sutterlin, A. M. and S. Waddy. 1975. Possible role of the posterior lateral line in obstacle entrainment by brook trout (*Salvelinus fontinalis*). Journal of the Fisheries Research Board of Canada 32(12): https://doi.org/10/.1139/f75-281.

Thompson, K. G., and Z. E. Hooley-Underwood. 2019. Present Distribution of Three Colorado River Basin Native Non-game Fishes, and Their Use of Tributary Streams. Colorado Parks and Wildlife Technical Publication 52. U.S. Fish and Wildlife Service (USFWS). (2018) Humpback Chub (Gila cypha) 5-year review.

U.S. Fish and Wildlife Service (USFWS). 2023. *Speckled dace (Rhinichthys osculus) ecological risk screening summary* (Revised March 2023, Web Version March 26, 2024).

U.S. Fish and Wildlife Service, region VI. (1982). Fishes of the Upper Colorado River system; Present and future. Western Division, American Fisheries Society; U.S. Fish and Wildlife Service; U.S. Bureau of Reclamation. P-63

Valdez, R. A., T. L. Hoffnagle, C. C. McIvor, T. McKinney, and W. C. Leibfried. 2001 Effects of a Test Flood on Fishes of the Colorado River in Grand Canyon, Arizona. Ecological applications. 11 (3), 686–700.

Valdez, R.A. and R.T. Muth. 2005. Ecology and conservation of native fishes in the upper Colorado River basin. American Fisheries Society Symposium 45:157-204.

Vannote, R. L., G. W. Minshall, K. W. Cummins, J. R. Sedell, and C. E. Cushing. 1980. The River Continuum Concept. Canadian Journal of Aquatic Sciences 37: 130-137.

Vannote, R.L. and B. W. Sweeney. 1980. Geographic analysis of thermal equilibria: a conceptual model for evaluating the effect of natural and modified thermal regimes on aquatic insect communities. *The American Naturalist* 115(5):667-695.

von Schiller, D., S. Bernal, C. N. Dahm. And E. Marti. 2017. Nutrient and organic matter dynamics in intermittent rivers and ephemeral streams. In: Datry, T., N. Bonada, and A. Boulton (eds). Intermittent Rivers and Ephemeral Streams: Ecology and Management. Academic Press, London.

Wallace, R.L. and D.W. Zaroban. 2013. Native Fishes of Idaho. American Fisheries Society, Bethesda, MD.

Vlach, P., J. Dušek, M. Švátora, and P. Moravec. 2005. Fish assemblage structure, habitat and microhabitat preference of five fish species in a small stream. Folia Zoologica (Brno). 54 (4), 421-431.

Ward, J. V. and Stanford, J. A., 1982. Thermal responses in the evolutionary ecology of aquatic insects. *Annual review of entomology* 27(1):97-117.

Western Native Trout Initiative. 2020. Colorado River cutthroat trout (Oncorhynchus clarkii pleuriticus) data: Conservation strategy for Colorado River cutthroat trout (2006); Range-wide status of Colorado River cutthroat trout (2010); Addendum: Updated range-wide status information for Colorado River cutthroat trout for the period 2011-2015 (2020); Western Native Trout Status Report - Updated September 2020.

Willoughby, 2012. Big rains last week wash mud, silt into Colorado River, killing fish. The Denver Post. https://www.denverpost.com/2012/07/31/willoughby-big-rains-last-week-wash-mud-silt-into-colorado-river-killing-fish/. Accessed 18 March 2025.

Wohl, E., 2014. Rivers in the Landscape: Science and Management. John Wiley & Sons.

Wohl, E., B. P. Bledsoe, R. B. Jacobson, N. L. Poff, S. L. Rathburn, D. M. Walters, and A. C. Wilcox. 2015. The natural sediment regime in rivers: Broadening the foundation for ecosystem management. *BioScience* 65(4):358-371.

Wohl, E., K. B. Lininger, and D. N. Scott. 2018. River beads as a conceptual framework for building carbon storage and resilience to extreme climate events into river management. *Biogeochemistry* 141(3):365-383.

Wolman, M. G. and J. P. Miller. 1960. Magnitude and frequency of forces in geomorphic processes. The Journal of geology 68(1):54-74.

Wood, P. J. and P. D. Armitage. 1997. *Biological effects of fine sediment in the lotic environment*. Environmental Management 31: 203–217.

Woodling, J. and R. Bromby, R. 1985. *Colorado's little fish: a guide to the minnows and other lesser known fishes in the state of Colorado.* Colorado Division of Wildlife.

Yarnell, S. M., G. E. Petts, J. C. Schmidt, A. A. Whipple, E. E. Beller, C. N. Dahm, P. Goodwin, and J. H. Viers. 2015. Functional flows in modified riverscapes: hydrographs, habitats and opportunities. *BioScience* 65(10):963-972.

Young, M. K. 2008. Species conservation project report for the USDA Forest Service, Rocky Mountain Region. USDA Forest Service, Rocky Mountain Research Station.

Young, Michael K. 1995. Chapter 2. Colorado River cutthroat trout. In: Young, Michael K., tech. ed. Conservation assessment for inland cutthroat trout. General Technical Report RM-256. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. p. 16-23

Young, M. K., R. Smith, K. L. Pilgrim, D. J. Isaac, K. S. McKelvey, S. Parkes, J. Egge, and M. K. Schwartz. 2022. A molecular taxonomy of Cottus in western North America. Western North American Naturalist 82(2):307-345.

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-8

Witness List

WITNESS LIST
Shoshone Power Plant Water Rights

A. Rob Viehl, Section Chief of the CWCB Stream and Lake Protection Section

    a. Mr. Viehl may provide a presentation on the following:

        i. History and background of the project and CWCB's involvement in the potential acquisition

        ii. The process for the CWCB's acquisition of a water right or interest in a water right.

        iii. Factors the Board must consider when deciding whether to acquire a water right or interest in a water right.

    b. Mr. Viehl will be available to answer questions from the Board during the hearing.

    c. Mr. Viehl's resume is included as Exhibit CWCBStaff-10.

B. Kaylea White, Senior Resources Specialist with CWCB Stream and Lake Protection Section

    a. Ms. White may provide a presentation on the information contained in A.i above.

    b. Ms. White will be available to answer questions from the Board as required during the hearing.

    c. Ms. White's resume is included as Exhibit CWCBStaff-11.

C. Colin Watson, Water Resource Engineer with CWCB Stream and Lake Protection Section

    a. Mr. Watson may provide a presentation on the information contained in A.i above.

    b. Mr. Watson will be available to answer questions from the Board as required during the hearing.

    c. Mr. Watson's resume is included as Exhibit CWCBStaff-12.

D. Katie Birch, Instream Flow Coordinator with CPW; and/or Kendall Bakich, Glenwood Springs Area Aquatic Biologist with CPW

    a. Ms. Birch and/or Ms. Bakich may provide a presentation on the information contained in CPW's report, attached as Exhibit CWCBStaff-5, specifically as to the biological benefits of the potential acquisition and the natural environment that can be preserved and improved by the potential acquisition. CPW's analysis indicates that the best use of the water rights proposed to be acquired is to preserve and

improve the natural environment in the Shoshone Reach at any rate up to the full decreed amount of 1408 cfs, and that fish habitat will be improved in the Shoshone Reach at streamflows up to at least 3,000 cfs.

b. Ms. Birch will be available to answer questions from the Board as required during the hearing.

c. Ms. Birch's resume is included as Exhibit CWCBStaff-13.

E. Kara Scheel, Endangered Species Recovery Program Manager with the CWCB Interstate Federal and Water Information Section

a. Ms. Scheel may provide information about and respond to questions about the Upper Colorado River Recovery Program.

b. Ms. Scheel will be available to answer questions from the Board as required during the hearing.

c. Ms. Scheel's resume is included as Exhibit CWCBStaff-14.

*CWCB Staff may provide a presentation from any party necessary for rebuttal purposes.

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-9

Memo Re: Recovery Program Storage Supplies on the Colorado River

COLORADO
Colorado Water Conservation Board
Department of Natural Resources
1313 Sherman Street, Room 718
Denver, CO 80203

FROM: Kara Scheel, Endangered Species Recovery Program Manager

DATE: August 4, 2025

SUBJECT: Recovery Program Storage Supplies on the Colorado River

The continued viability of the Upper Colorado River Endangered Fish Recovery Program (Recovery Program) is essential not only to the threatened and endangered fish species of the Colorado River, but also to east and west slope water users in Colorado. Through the 15 Mile Reach (15 MR) Programmatic Biological Opinion (PBO), dated December 1999[1], the Recovery Program provides Endangered Species Act (ESA) compliance to all Colorado River water users upstream of the confluence with the Gunnison River. In accordance with the Section 7, Sufficient Progress, and Historic Projects Agreement, the U.S. Fish and Wildlife Service (USFWS) must review the Recovery Program actions annually to ensure "sufficient progress" toward the recovery of the four listed species to maintain compliance.

Essential to this review is the ability of the Program to provide adequate flows and habitat in the 15 MR. The mechanism in which the Recovery Program does this is through adding releases of water supplies stored in dedicated pools throughout the Upper Colorado River reservoir system to the natural flows. On average, the Recovery Program releases 62,000 AF of supplies from reservoir storage to the 15 MR annually, with the majority of those releases occurring between August and October each year.

The following provides a summary of storage supplies utilized by the Recovery Program.

I. Base Flow Augmentation

The following storage pools are dedicated for use in the 15 MR to meet minimum flow targets as defined by the 15 MR PBO. 15,825 AF of water are considered firm supplies.

[1] https://coloradoriverrecovery.org/uc/wp-content/uploads/sites/2/2021/09/FinalPBO.pdf

Table 1. Recovery Program Storage Pools in the Upper Colorado River Reservoir System

Pool	Amount	Type
East Slope 10,825 water (Granby)	5,412.5 AF	Firm
West Slope supplies 10,825 water (Ruedi)	5,412.5 AF	Firm
Ruedi firm pool	5,000 AF	Firm
Ruedi '4 in 5' pool	0 or 5,000 AF	Availability based on fill
Wolford fish pool	Up to 6,000 AF	Pro-rated based on fill
Green Mountain HUP Surplus	0 – 66,000 AF	Subject to availability
Leases/Donations (Ruedi Reservoir)	Up to 12,000 AF	varies

10,825 water: Through the 15 MR PBO, water users in the Colorado basin committed to provide 10,825 AF of water annually, to be split evenly between the east slope and the west slope. Through 2013, this water was provided through temporary agreements from Williams Fork Reservoir and Wolford Reservoir. Ultimately, water users signed an agreement with the Bureau of Reclamation (BOR) to permanently deliver 5,412.5 AF from Granby reservoir to account for east slope water users' contributions and 5,412.5 AF from Ruedi Reservoir to account for west slope water users' contributions. 10,825 water is considered firm supply and available to the Recovery Program every year.

Ruedi Firm Pool: 5,000 AF firm pool is also available annually to the Recovery Program. This pool was made available to the Recovery Program by the Bureau of Reclamation through Section 7 consultations with the USFWS completed for the construction of Ruedi Reservoir. This pool is not subject to shortages.

Ruedi '4 in 5 pool': The '4 in 5' pool in Ruedi Reservoir was named such because according to the original modeling completed for the reservoir, this 5,000 AF pool was only expected to be available 4 out of 5 years, or when Ruedi fully fills. It is not unusual for the Recovery Program to not receive the '4 in 5' pool. Since 1998, the '4 in 5' pool has been available 19 years, or 68% of years.

Wolford Fish Pool: The Colorado River Water Conservancy District (CRWCD) committed 10% of storable inflows in Wolford Reservoir, up to 6,000 AF, for delivery to the 15 MR through an MOU executed with the USFWS in 1998 pursuant to the Wolford Mountain

Reservoir biological opinion. It is not unusual for the Recovery Program to only receive a portion of the Wolford fish pool in dry years. Since 2013 (following when agreements were finalized for 10,825 water), the Recovery Program has received a prorated amount 5 of the 13 years, or 38% of years.

Green Mountain HUP Surplus: The Orchard Mesa Check Case ('Check Case') (91CW247) provides up to 66,000 AF annually from Green Mountain Reservoir power pool to help support base flows in the 15 MR. This 66,000 AF pool, commonly known as the 'Historic Users Pool' or 'HUP', has historically been the *largest supplier of water* to the 15 MR, accounting for 46% (average of 35,000 AF annually) of Recovery Program supplies from 1998 – 2024.

In order for the Recovery Program to utilize the HUP surplus, the operating criteria (as defined in paragraph 3.b.(1), (2), and (3) of the Check Case) must be met, and participating parties must determine that there is additional water in the HUP in surplus of the needs of the HUP beneficiaries. The three conditions include:

(1) The Orchard Mesa Check is physically operable.
(2) There is at least 66,000 AF in the HUP at GMR at the declared end of fill.
(3) The Shoshone Rights continue to be exercised in a manner substantially consistent with their historical operations for hydropower production at their currently decreed point of diversion.

Once a determination is made, HUP surplus water can be released from Green Mountain Reservoir and provided to locations at or near the top of the 15 MR.

If any of the operating criteria are not met, the Check Case is inoperable and the Recovery Program cannot benefit from any amount of HUP surplus water in the 15 MR. Additionally, if supplies are not surplus to the needs of the HUP beneficiaries, no surplus releases will be made (this occurred in 2002 and 2012).

Leases/Donations: Water has also been made available to help support base target flows for the 15MR through temporary lease agreements. Since 2015, the CWCB has leased water from Ute Water Conservation District and Garfield County. On average, the CWCB has leased 6,600 AF annually from these entities. In the past, the Recovery Program has also received leased water from the Colorado Water Trust, Roaring Fork Conservancy District, and the CRWCD.

II. Coordinated Reservoir Operations (CROs)

In years when there is sufficient snowpack, the Recovery Program partners and reservoir operators voluntarily participate in Coordinated Reservoir Operations (CROs).

CROS, can help enhance the natural peak flow of the Colorado River. Enhancement of the peak can be considered when peak flows are forecasted between 12,900 cfs and 26,000 cfs in the 15 MR. The goal of CROs is to help enhance both the magnitude and duration of the peak flows without impairing water rights or the yields of participating reservoirs. Reservoirs that have the ability to participate in CROs include:

- Green Mountain Reservoir
- Lake Granby
- Williams Fork Reservoir
- Willow Creek Reservoir
- Windy Gap
- Homestake Reservoir
- Wolford Reservoir
- Ruedi Reservoir
- Moffatt Tunnel
- Upper Blue Reservoir

CROS was first implemented in 1997 and has been operated 13 of the 29 years, to enhance peak flows in those years it occurred.

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-10

Resume of Rob Viehl

Robert Viehl

1313 Sherman Street
Denver, Colorado 80203

phone: (720) 854-3237
e-mail: rob.viehl@state.co.us

Work Experience

Section Chief, Stream & Lake Protection Section | Colorado Water Conservation Board, Denver, CO April 2022 – Present

- Serves as the agency's Senior Authority regarding Colorado's Instream Flow and Natural Lake Level Program ("ISF Program").
- Manages all aspects of Colorado's ISF Program, including the appropriation and acquisition of instream flow water rights, legal protection, and monitoring and enforcement of those rights.
- Manages and implements the goals of the Board, Director, and Deputy Director related to the planning and administration of the ISF Program.
- Coordinates and supervises the Section staff by developing and updating strategic plans and employee performance plans; adjusting goals, objectives and staff priorities when necessary; and conducting annual performance evaluations.

Deputy Section Chief, Stream & Lake Protection Section | Colorado Water Conservation Board, Denver, CO May 2018 – April 2022

- Project lead for development and processing of new instream flow (ISF) and natural lake level (NLL) recommendations, ensuring appropriation by the CWCB.
- Determine and recommend protective terms and conditions for new junior ISF appropriations, safeguarding state water rights.
- Serve as the primary authority for monitoring and enforcing state ISF water rights, ensuring compliance and resource protection.
- Coordinate and collaborate with the Department of Water Resources (DWR), Colorado Parks and Wildlife (CPW), and other agencies on the development, maintenance, and management of critical ISF data and information.
- Identify and investigate low flow situations on ISF reaches, determining and implementing appropriate corrective actions, including formal requests for administration to DWR.
- Manage and oversee section finances, including budgeting and administering large-scale contracts.

Water Resource Specialist, Stream & Lake Protection Section | Colorado Water Conservation Board, Denver, CO April 2007 – May 2018

- Successfully processed the appropriation of over 150 ISF water rights over a ten-year period.
- Conducted comprehensive reviews and analyses of biological and hydrological studies and recommendations for ISF water right appropriations.
- Performed detailed water right investigations and resource studies, essential for the appropriation of ISF and NLL water rights.
- Analyzed water court resumes to identify and mitigate potential injury to ISF water rights.
- Prepared and presented technical ISF recommendation reports for Board consideration.
- Reviewed terms and conditions on CWCB water court decrees to ensure no injury to ISF water rights.
- Provided expert technical support for the investigation and analysis of proposed water acquisitions for ISF use.
- Monitored ISF water rights utilizing flow alert systems, ISF DSS alert tools, and USGS & DWR real-time satellite gauges.

Administrative Assistant, Finance Section | Colorado Water Conservation Board, Denver, CO April 2006 – April 2007

- Maintained loan-required insurance certification forms and loan program database files.
- Filed UCC's and deeds of trust, along with loan collateral documents, with state and county officials.

Director of Administration and Finance | National Council for Science and the Environment, Washington D.C. May 2003 – July 2005

- Supervised staff, overseeing work performance and professional development.
- Formulated budgets and prepared successful applications for Federal Grants.
- Ensured rigorous grant compliance and timely reporting requirements were met.
- Submitted quarterly financial reports to the Board of Directors' Finance Committee.
- Submitted bi-annual lobbying reports to Congress.
- Managed all aspects of office operations, including administrative duties.

Office Manager | National Council for Science and the Environment, Washington D.C. April 2001 – May 2003

- Managed comprehensive financial functions including accounts payable, accounts receivable, bank reconciliation, and payroll.
- Compiled employee timesheets and accurately allocated costs to appropriate centers.
- Managed all personnel records and human resources functions, including employee benefits enrollment.
- Oversaw an annual membership campaign exceeding $500,000 for institutions of higher learning.
- Coordinated interactions and planned committee meetings between the Board of Directors and the Executive Director.

Education

- **University of Colorado at Boulder** Bachelor of Arts in Environmental Studies & Geography

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-11

Resume of Kaylea White

KAYLEA WHITE

1313 Sherman St., Suite 719, Denver, CO • 80203 • phone (720) 854-3240 • kaylea.white@state.co.us

LICENSES AND REGISTRATIONS

Colorado Licensed Attorney, #36917, 2005, *(currently inactive)*
Registered Geologist, California # 5460, 1989
Certified Hydrogeologist, California # 80, 1992
Private Pilot, VFR rating, Mammoth Mtn Airport, California, 1998
Wilderness First Responder and First Aid, National Certificates, 1998

EDUCATION

Vermont Law School, South Royalton, VT. **Juris Doctorate**, Aug 2002-May 2005
University of California, Santa Barbara, CA. PhD Student in Donald Bren School of Environmental Science & Management, 1999-2001. Left PhD program to pursue a law degree.
California State University, Fresno, CA. **Master of Science**, Hydro & Engineering Geology, 1989-1993
Trinity University, San Antonio, TX. **Bachelor of Science**, Geology/Earth Science, 1981-1985

PROFESSIONAL EXPERIENCE

Colorado Water Conservation Board, Denver, CO. *Senior Water Resources Specialist*, 2008-present
Manager of the program areas for legal protection and acquisitions of water rights in the Stream and Lake Protection Section of CWCB. Assist with rulemaking and legislative efforts. Provided expert testimony in Donala Water and Sanitation District, 2-09CW73, March 9, 2011.

Lind, Lawrence & Ottenhoff, Windsor, CO. *Associate Attorney*, 2006-2008
Lead attorney in water court litigation, including settlement negotiations, depositions and trial preparations.

S.S. Papadopulos & Assoc., Inc., San Francisco, CA. *Senior Project Hydrologist*, 2002
Responsible for marketing and development of water resources business; Provided consulting expert witness support for copper mine waste litigation.

Western Water Consulting, San Francisco, CA. *Owner/Water Resources Consultant*, 1997-2001
Assistant Project Coordinator for National Railroad Merger NEPA compliance EIS for the US Surface Transportation Board; water resources specialist for EIS impact analysis performed for the Central Utah Project Completion Act.

Montgomery Watson, Sacramento, CA. *Senior Water Resources Project Manager*, 1993-97
Wrote NEPA EIS and CEQA EIR documents for environmental impacts of major future water supply projects for local and federal water agencies including USBR, USACE, East Bay MUD; Designed and implemented analytical water supply models with IGSM (Integrated Groundwater and Surface water Model).

California Department of Water Resources (DWR), Fresno, CA. *Engineering Geologist*, 1988-93
Established the Kern Water Bank model of GW/SW aquifer storage and recovery water supply project for the State Water Project using MODFLOW; DWR representative for Salinas Basin water plan, including saline water intrusion management.

HWS Consulting, Lincoln, NE. *Staff Geologist*, 1986-88
Managed technical groundwater contamination remediation projects.

H.E. White – Petroleum Geologist, Austin, TX. *Geologist*, 1985-86
Assisted with oil and gas exploration, drilling, and mapping.

PUBLICATIONS

- Linda J. Bassi, Susan J. Schneider, and Kaylea M. White, "ISF Law – Stories about the Origin and Evolution of Colorado's Instream Flow Law in this Prior Appropriation State," 22 U. Denv. Water L. Rev. 389 (Spring 2019).

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-12

Resume of Colin Watson

Colin Watson, PE
Water Resources Engineer
Colorado Water Conservation Board
1313 Sherman Street, Denver, CO 80203

Education

Bachelor of Science, Civil Engineering
Colorado State University

Professional Registration

Licensed Professional Engineer in Colorado (#53324)

Professional Experience

Colorado Water Conservation Board
Water Resources Engineer
January 2019- Present

- Review Water Court applications to ensure instream flow water rights of the Colorado Water Conservation Board are protected and recommend opposition filings when necessary.
- Negotiate and develop proposed terms and conditions for inclusion in stipulations and decrees.
- Responsible for providing expert testimony and writing expert reports.
- Review engineering reports submitted in support of Water Court applications.
- Provide engineering support to Colorado Water Conservation Board and Attorney General Office staff in negotiations with water users and their consultants.
- Review substitute water supply plans for potential injury to ISF water rights and submit comments to the State Engineer's Office proposing terms and conditions that will prevent injury to ISF water rights.

Colorado Division of Water Resources
Water Resources Engineer
December 2017- January 2019

- Reviewed substitute water supply plan requests to determine the ability of the plan to operate without causing injury to senior water rights.
- Reviewed Water Court applications to determine potential issues and reported these findings to engineering staff members.
- Provided water supply comments to various county planning departments regarding proposed subdivisions and development projects.
- Reviewed referrals from State and Federal agencies and provided applicable comments.

- Fielded questions from the public and provided guidance regarding State policies and requirements.
- Evaluated permit applications for small and large capacity wells and approved or denied these applications.

Colorado Division of Water Resources, Division One
Municipal Augmentation and Accounting Coordinator
April 2013- December 2017

- Reviewed and provided comments on complex municipal water rights reporting pursuant to the terms and conditions of water court decrees, Revised Statutes, policies, rules, and regulations.
- Advised and assisted water resource managers of municipal and agricultural entities in the South Platte River basin by explaining the requirements associated with augmentation plans and change of water rights.
- Ensured that surface and groundwater diversions were in compliance with regulations and applicable Interstate Compacts.
- Recommended any necessary enforcement actions to supervisors for plans in violation of rules, regulations or Water Court decrees.
- Provided guidance to engineering consultants, municipal representatives, and the public in issues related to Colorado best management practices.
- Imparted both technical and non-technical knowledge to the public and water professionals regarding water right administration requirements in Colorado.

Expert Reports

- Engineering Report, Elk Run Ranch Aspen Holdings, LLC and 4303 Snowmass Creek, LLC, Case Nos. 21CW3085 & 21CW3086, June 30, 2023
- Engineering Report, Chris and Dale Van Aelstyn, Case No. 20CW3087, May 23, 2023
- Engineering Report, Upper Midnight, LLC, Case No. 20CW3139, October 18, 2021
- Engineering Report, Edgemont Ranch Metropolitan District, Case No. 14CW3013, July 2, 2021
- Engineering Report, Young Life and Upper Arkansas Water Conservancy District, Case No. 18CW3048, June 16, 2021
- Engineering Report, Upper Arkansas Water Conservancy District, Case No. 18CW3076, January 26, 2021
- Supplemental Engineering Report, City of Lafayette, City of Boulder, and Colorado Water Conservation Board, Case No. 17CW3212, November 6, 2020
- Engineering Report, City of Lafayette, City of Boulder, and Colorado Water Conservation Board, Case No. 17CW3212, May 29, 2020
- Engineering Report, United States of America, Case No. 16CW3193 (Division 1), August 13, 2019
- Engineering Report, John Hightower, Case No. 18CW3014 (Division 2), April 29, 2019
- Supplemental Engineering Report, Upper Arkansas Water Conservancy District, Case No. 17CW3037 (Division 2), March 12, 2019

Trial Testimony and Depositions

- Trial Testimony – None to date
- Deposition in Case Nos. 21CW3085 & 21CW3086 Concerning the Application for Water Rights of Elk Run Ranch Aspen Holdings, LLC and 4303 Snowmass Creek, LLC

Professional Organizations

- Colorado Section of the American Water Resources Association
- Colorado Water Officials Association

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-13

Resume of Katie Birch

KATIE BIRCH

Instream Flow Program Coordinator
Email: katie.birch@state.co.us | Phone: 970-252-6021

EDUCATION
University of Colorado Boulder - 2012
College of Engineering and Applied Science, B.S. Environmental/Civil Engineering

PROFESSIONAL EXPERIENCE

Instream Flow Program Coordinator, Colorado Parks and Wildlife
2018 – Present

Responsible for all aspects relating to quantification of instream flows in Colorado, including collecting information on the natural environment (fishery, aquatic macroinvertebrates, riparian condition, water quality), instream flow modeling (R2CROSS, PHABSIM) for the development of instream flow recommendations, and transmittal of CPW instream flow recommendations "with specificity and in writing" to CWCB for consideration and action. This includes providing the CWCB with biological and instream flow expertise on acquisition proposals, evaluating the benefit from proposed acquisitions, and loans, and addressing questions of water right injury, mitigation, and inundation.

Water Resources Engineer, Wilson Water Group
2016 –2018

Conducted water rights assessments for clients utilizing surface water simulation and consumptive use models. Conducted geospatial analyses and created point-flow models. Applied and refined Colorado Decision Support System tools and StateMod models to support water resources planning, water court applications, and settlement negotiations. Utilized tools to understand administration and inform direct and incidental opportunities for alternative operations of water rights.

Biological Science Technician, U.S. Forest Service, Aquatic & Riparian Effectiveness Monitoring Program
2015

Performed aquatic habitat assessment for hydrological condition of fish habitat, including channel mapping and cross sections, substrate mapping, macroinvertebrate collection and identification, water quality sampling, and diversion infrastructure evaluation to inventory fish passage and entrainment.

Crew Leader, Southwest Conservation Corps, Dolores River Restoration Partnership
2014

Responsible for oversight and logistical coordination between land managers, nonprofit, and volunteer efforts working to compile data and resources for implementation of a tamarisk removal and riparian restoration project. Led AmeriCorps volunteers in monitoring riparian data and assessing native and invasive species presence.

Staff Engineer, City of Steamboat Springs, Colorado
2013

Project management and oversight for city infrastructure projects, including scheduling, tracking, and overseeing permits to ensure infrastructure and private development were built in compliance with municipal regulation. Responsible for contractor education pertaining to low impact development, urban drainage, and best management practices.

LICENSURES AND TRAININGS

Engineer-In-Training
Colorado Department of Agriculture – Qualified Supervisor
Wildland Hydrology Applied Fluvial Geomorphology Level 1Course
Stream Functions Pyramid Workshop

Prehearing Statement of Staff of CWCB in the Matter of the Proposed Acquisition of an Interest in the Shoshone Power Plant Water Rights

CWCB Hearing September 2025

Exhibit

CWCBStaff-14

Resume of Kara Scheel

Kara Scheel, P.E.

kara.scheel@state.co.us ▿ (720) 537 – 2458 ▿ 1313 Sherman St, Denver, CO

WORK EXPERIENCE

Colorado Water Conservation Board (CWCB) **October 2018 - Present**
Endangered Species Recovery Program Manager *Denver, CO*

- Manages Colorado Water Conservation Board's participation in Endangered Species Act recovery programs and serves as Colorado's technical representative to the Platte River Recovery Implementation Program, the Upper Colorado Endangered Fish Recovery Program, and the San Juan River Basin Recovery Implementation Program
- Develops and implements water management strategies for native species and habitats through technical analysis, water rights analysis, and stakeholder coordination
- Identifies, evaluates, prioritizes, and manages projects for protected species recovery

Water Resource Engineer, Instream Flow Program

- Provided technical expertise for preserving streamflow across the state of Colorado for water dependent species through instream flow water rights appropriation and protection
- Collected data, performed hydrologic and hydraulic analyses, reviewed biological studies, produced technical analysis and reports, and provided recommendations to the Board as a technical subject matter expert
- Reviewed water court resumes and determined the potential for injury to the program's water rights

South Metro Water Supply Authority **April 2018 – September 2018**
Water Resource Engineer *South Denver, CO*

- Represented 13 water providers in Douglas and Arapahoe counties and assisted them in obtaining secure and sustainable water resources
- Led a conservation program, worked with large data sets, and facilitated stakeholder groups

HDR, Inc. **January 2014 – July 2016**
Water Resources EI *Denver, CO*

- Completed the basin wide water management plan for the South Platte Basin for incorporation into Colorado's Water Plan; worked to build a balanced plan for agricultural, municipal, and environmental needs; held several stakeholder meetings around the basin
- Assisted with inundation area mapping for small and large dam break studies
- Performed risk analysis of hydraulic structures and provided recommendations for system improvements and flood mitigation
- Designed and prepared drawings for restoration of aging infrastructure

EDUCATION

Colorado State University
Masters of Science, Civil Engineering *Fort Collins, CO*

University of Nebraska
Bachelors of Science, Biological Systems Engineering *Lincoln, NE*

LICENSURE

- Professional Engineer, State of Colorado