BEFORE THE COLORADO WATER CONSERVATION BOARD

STATE OF COLORADO

IN THE MATTER OF PROPOSED INSTREAM FLOW APPROPRIATION
DIVISION 4: SAN MIGUEL RIVER

PREHEARING STATEMENT OF THE BOARD OF COUNTY COMMISSIONERS OF MONTROSE COUNTY, COLORADO

Pursuant to Rule 5n of the Rules Concerning the Colorado Instream Flow and Natural Lake Level, 2 CCR 408-2 ("ISF Rules") and the Hearing Officer's Notice of Prehearing Conference & Deadlines for Submissions, dated June 1, 2011, the Board of County Commissioners of Montrose County ("Montrose County") hereby submits its prehearing statement contesting the Colorado Water Conservation Board's ("CWCB") intent to appropriate an instream flow ("ISF") on the subject reach of the San Miguel River ("Subject Reach") in the amounts set forth in the CWCB staff recommendation.

A. FACTUAL & LEGAL CLAIMS

1. Montrose County is a political subdivision of the State of Colorado, and seeks to ensure, for the benefit of the citizens of Montrose County, the present and future beneficial use of those waters available by law and interstate compact. In December of 2010, Montrose County filed six applications with the District Court, Water Division No 4, Colorado, seeking determinations of water rights to meet the water demands of present and future water users in the west-end of Montrose County. These water rights will supply a total reliable yield of approximately 6,400 acre-feet per year of fully-consumable and reusable water, in addition to existing supplies, to help meet present and future water demands.

2. The Subject Reach is located in the western portion of Montrose County. Montrose County is concerned that, as currently proposed, the ISF for the Subject Reach could harm Montrose County, as well as other municipal, quasi-municipal and private water users in Montrose County, in developing water rights and beneficially using water in the San Miguel River basin, including but not limited to, any future change actions and future exchanges through the Subject Reach.

3. The CWCB is vested with exclusive authority to appropriate water rights for instream flow purposes. C.R.S. § 37-92-102(3). Under such authority, the CWCB has "the duty to appropriate only the minimum amount of water necessary to reasonably preserve the [natural] environment...." *Aspen Wilderness Workshop v. Colorado Water Conservation Bd.*, 901 P.2d 1251, 1257 (Colo. 1995) (emphasis added).

4. To make a valid appropriation of an instream flow right, the CWCB must comply with the procedural and substantive requirements of C.R.S. § 37-92-102, including, without limitation, making the determinations required by C.R.S. § 37-92-102(3)(c) and Rule 5i of the ISF Rules.

5. Any ISF appropriation for the Subject Reach shall not deprive the people of the state of Colorado of the beneficial use of those waters available by law and interstate compact. C.R.S. § 37-92-102(3).

6. Any ISF appropriation for the Subject Reach "shall be subject to the present uses or exchanges of water being made by other water users pursuant to appropriation or practices in existence on the date of such appropriation, whether or not previously confirmed by court order or decree." C.R.S. § 37-92-102(3)(b).

7. The CWCB must determine that there is a natural environment that can be preserved to a reasonable degree by the proposed ISF. C.R.S. § 37-92-102(3)(c); ISF Rule 5i(1). In making any such determination, the CWCB must limit its consideration solely to the Subject Reach. The ISF recommendations by the DOW and BLM, and their supporting documents, cite statewide efforts to enhance the habitat of and flows for the bluehead sucker, flannelmouth sucker and roundtail chub, including in the flow-limited Dolores River below the Subject Reach; however, the habitat and flow enhancement objectives for other reaches of other rivers are irrelevant to consideration of the natural environment in the Subject Reach. The purpose of the ISF appropriation can only be to preserve the natural environment within the Subject Reach.

8. The ISF recommendation is based on PHABSIM modeling limited to adult life stages of the flannelmouth and bluehead suckers. As described in the July 8, 2011 report by Don Conklin (Exhibit A), any determination of the existence and scope of a natural environment within the Subject Reach should consider additional life stages and species.

9. The proposed ISF for the Subject Reach, as recommended by the CWCB's staff, DOW, and BLM, exceeds the minimum amount(s) necessary to preserve the natural environment in the Subject Reach to a reasonable degree.

i. As described in the July 8, 2011 report by Don Conklin (Exhibit A), the ISF rates recommended by the DOW and BLM appear to target "optimum" habitat conditions and to "maximize" the natural environment in the Subject Reach. Such objectives go beyond the CWCB's statutory authority to appropriate only the minimum flows necessary to preserve the natural environment to a reasonable degree.

ii. As described in the July 14, 2011 report by Deere & Ault (Exhibit C), the hydrological analysis used to develop and support the ISF recommendation for the Subject Reach includes unreasonable assumptions and methodologies, and, therefore, does not accurately reflect water availability in the Subject Reach.

iii. As previously described in Paragraph 8, above, the habitat modeling utilized to develop the ISF recommendation was limited to the adult life stage for only two species. Consideration of additional life stages and species demonstrates that flow rates lower than presently recommend for the ISF are appropriate for preserving the natural environment in the Subject Reach to a reasonable degree.

iv. Documents appended to the DOW and BLM recommendations identify that an "excellent native fish community" exists within the Subject Reach. As described in the July 8, 2011 report by Don Conklin (Exhibit A), these native fish populations exist under a historical flow regime that is significantly lower than the recommended ISF rates for the Subject Reach. The alternative flow rates set forth in Section D, below, are more consistent with the historical flow regime in the Subject Reach, and represent the minimum amounts that will preserve the natural environment within the Subject Reach to a reasonable degree.

v. As previously noted in Paragraph 7, above, the DOW and BLM recommendations identify efforts outside the Subject Reach to enhance flows and habitat for certain fish species. Statements in these and other documents identify that flows in the lower San Miguel are being sought in furtherance of habitat efforts in the Dolores River, where poor fish populations are reported. However, the CWCB's legal authority to appropriate an ISF for the Subject Reach is limited solely to the minimum amount necessary to preserve the natural environment in the Subject Reach.

10. As described in the July 15, 2011 report by Deere & Ault (Exhibit D) the proposed ISF will deprive the citizens of Montrose County the beneficial use of water available by law and compact.

11. Any ISF appropriation for the Subject Reach must be consistent with Montrose County's proposed alternative seasons and flow rates set forth in Section D.1, below, and must include, at a minimum, the terms and conditions set forth in Section D.2, below, in order to preserve any natural environment in the Subject Reach to a reasonable degree in a manner consistent with the CWCB's obligations under Colorado law. *See* C.R.S. § 37-92-102(4)(a).

12. To the extent not expressly outlined above, Montrose County may assert any additional factual and/or legal claims set forth in the documents listed in Section B, below. In addition, Montrose County reserves the right to identify and assert additional legal and factual claims following review of the prehearing statements of the Contesting Parties, or others with Party or Contested Hearing Participant status, and following review of documents subsequently made available to Montrose County pursuant to a pending document request to the CWCB/DOW, and a pending FOIA request to the BLM.

B. EXHIBITS TO BE INTRODUCED AT HEARING

The following is a list of exhibits that Montrose County may provide at the hearing:

1. July 8, 2011 memo/report from Mr. Don Conklin, GEI Consultants, Inc., attached hereto as Exhibit A.

2. Resume of Mr. Don Conklin, attached hereto as Exhibit B.

3. July 14, 2011 report by Deere & Ault Consultants, Inc., re: hydrologic data and statistical hydrology, attached hereto as Exhibit C.

4. July 15, 2011 report by Deere & Ault Consultants, Inc., re: ISF impacts on compact entitlements, attached hereto as Exhibit D.

5. Resumes of Mr. Dan Ault and Mr. Branden Effland, attached hereto as Exhibits E & F, respectively.

6. Undated presentation by Dan Kowalski, Rick Anderson, Jim White & Barry Nehring re: *Native Fish of the Lower Dolores River*, attached hereto as Exhibit G.

7. December 15, 2010 presentation by Dan Kowalski re: *Native & Sport Fish of the San Miguel and Dolores Rivers*, attached hereto as Exhibit H.

8. Excerpts (Pages 1, 3, & 37 - 40) from the BLM Colorado Southwest Resource Advisory Council's *Wild and Scenic River Suitability Recommendations for the San Miguel and Dolores Rivers and Tributaries*, attached hereto as Exhibit I. The complete version of this document is available online at: http://www.blm.gov/pgdata/etc/medialib/blm/co/field_offices/uncompahgre_field/rmp/wsr_docs.Par.31074.File.dat/2011-0225%20WSR%20Dolores%20San%20Miguel%20Segment%20Analysis%20RAC%20Recommendation.pdf

9. Summary table of water rights applications filed in the District Court, Water Division No. 4, Colorado, by Montrose County in December 2010, attached hereto as Exhibit J.

10. Draft Executive Summary of the CWCB Staff's San Miguel River instream flow recommendation, attached hereto as Exhibit K.

11. Any additional documents that are not presently available to Montrose County and are subsequently made available to Montrose County pursuant to a pending document request to the CWCB/DOW, and a pending FOIA request to the BLM.

12. Any and all exhibits listed in the prehearing statements of the Contesting Parties, or others with Party or Contested Hearing Participant status, whether or not introduced or offered.

13. Montrose County reserves the right to update its list of exhibits in its rebuttal prehearing statement.

C. WITNESSES

Montrose County provides the following list of witnesses that may testify at the hearing as described below, may give rebuttal testimony, and may be available at the hearing to answer questions from the Board:

1. Mr. Don Conklin, GEI Consultants, Inc, 4601 DTC Boulevard, Suite 900, Denver, CO 80237, 303-662-0100. Mr. Conklin is an Aquatic Ecologist and may testify as to his evaluation of the proposed ISF for the Subject Reach, his prior field work on the San Miguel and other rivers, the facts and opinions set forth in his July 8, 2011 report (Exhibit A), the extent of any natural environment in the Subject Reach, the minimum flows necessary to preserve any natural environment in the Subject Reach to a reasonable degree, and other relevant facts or opinions within his expertise as an Aquatic Ecologist.

2. Mr. Dan Ault, P.E., and/or Branden Effland. P.E., Deere & Ault Consultants, Inc., 600 S. Airport Road, Building A, Suite 205, Longmont, CO 80503, 303-651-1468. Mr. Ault and/or Mr. Effland are licensed professional engineers, specialize in water resources engineering, planning and administration, and may testify as to their evaluation of the proposed ISF for the Subject Reach, the facts and opinions set forth in their July 14 & 15, 2011 reports (Exhibits C & D), water availability and hydrology of the San Miguel River, terms and conditions necessary to prevent injury to existing water rights and/or the depravation of the beneficial use of water available by law and interstate compact, and other relevant facts or opinions within their expertise as water engineers.

3. Mr. Brian W. Wilson, P.E., Montrose County Public Works, 161 South Townsend Ave., Montrose, CO 81401, 970-252-7000. Mr. Wilson is the Director of Public Works for Montrose County and may testify as to Montrose County's efforts to develop a water supply for the benefit of its citizens, the potential effects of the proposed ISF appropriation on the present and future uses of water in Montrose County, and other relevant facts and information.

4. Any other witness listed in the prehearing statements of the Contesting Parties, or others with Party or Contested Hearing Participant status.

D. ALTERNATIVE PROPOSAL

1. Instream flow amounts and seasons. Montrose County's proposed alternative for the seasons and amounts of the ISF appropriation for the Subject Reach is articulated in the July 8, 2011 report by Don Conklin (Exhibit A), and summarized as follows:

SEASON	AMOUNT
April 15 – June 14	200 c.f.s.
June 15 – August 31	90 c.f.s.
September 1 – April 14	65 c.f.s

2. Terms and conditions. Montrose County asserts that the following, together with the above alternative proposed seasons and amounts, are necessary terms and conditions for the CWCB to adopt and attach to any ISF appropriation, and any resulting decree, for the Subject Reach, in accordance with § 37-92-102(4)(a), C.R.S.:

A. Existing uses.

i. Pursuant to § 37-92-102(3)(b), C.R.S., this instream flow appropriation shall be subject to the present uses or exchanges of water being made by other water users, pursuant to appropriation or practices in existence on the date of this appropriation, whether or not previously confirmed by court order or decree. The CWCB will apply this provision if the proponent provides adequate documentation and verification of present uses and exchanges.

ii. The Board shall specifically identify existing uses or exchanges of water in the decree for the San Miguel River ISF if those uses/exchanges are documented and verified as set forth below.

Within 6 months from the date of filing the ISF water court application, a person claiming an existing use of water that falls under this statute must provide an affidavit to the Board from a person with personal knowledge of the existing use. The affidavit should set forth:

- the person's name and how the person obtained personal knowledge of the use;
- a full description of the amount legally diverted, months diverted and type of use; and
- a statement that the use was occurring on or about the date that the CWCB appropriated the ISF water right.

Upon receipt of such an affidavit, CWCB staff will consult with the water commissioner for the affected area to verify the claimed use. After receiving verification, staff will recommend that the CWCB include the description of the claimed use in the San Miguel River ISF decree so the Division of Water Resources knows to administer the instream flow water right as junior to the existing use. Below is an example of how a § 102(3)(b) use would be documented in an ISF decree:

> Based upon the affidavit of James Diverter (attached as Exhibit A and incorporated herein) and discussions with Water Commissioner Carl Curtailer, the CWCB agrees that James Diverter's diversion of water from Wet Creek for the first fill of and storage in Beautiful Pond in the amount of 5.05 acre-feet, and use of said stored water for irrigation of Mr. Diverter's ___ acres of land, were uses of water in existence on the date the CWCB appropriated the instream flow water right applied for herein.

The CWCB's instream flow water right described herein is subject to Mr. Diverter's water use described above pursuant to § 37-92-102(3)(b). The limited subordination of the instream flow water right to Mr. Diverter's preexisting water use pursuant to § 37-92-102(3)(b) in this case shall not interfere with the administration of Mr. Diverter's water rights as against other water rights, and shall not result in general subordination of the CWCB's ISF water right decreed herein to any other water rights junior to that instream flow water right.

B. Colorado River Compact.

i. During any period identified by the Upper Colorado River Commission in a finding issued pursuant to Article VIII(d)(8) of the Upper Colorado River Basin Compact of 1948 for curtailment of Colorado River basin water uses within Colorado, which the State of Colorado has agreed to implement in a manner that impacts water diversions within Water Division 4, the CWCB agrees that this ISF water right will be administered in accordance with compact curtailment rules adopted by the State of Colorado that are then in effect, if any. If no such compact curtailment rules are then in effect, it is the intent of the CWCB that this instream flow right will not be administered to prevent or limit the use of water that may be consumptively used in the San Miguel River basin during such a period of compact curtailment.

ii. This ISF water right will not be administered to prevent or limit exchanges within, through, or affecting this ISF reach of water that may be consumptively used in the San Miguel River basin during such a period of compact curtailment, including exchanges of such water to storage prior to and in anticipation of such curtailment.

C. Future water rights applications.

i. The CWCB agrees not to file a statement of opposition to applications for water rights in the San Miguel River basin made after the date of appropriation of this ISF water right that result in depletions that do not exceed 100 acre-feet. This term and condition does not preclude the CWCB from enforcing this ISF appropriation in accordance with the priority system.

ii. The CWCB agrees to evaluate applications for water rights made after the date of this filing to determine whether they are appropriate for application of the Injury with Mitigation Rule 8i(3) of the Rules Concerning the Instream Flow and Natural Lake Level Program.

iii. The CWCB agrees not to file a statement of opposition to applications for changes of water rights in the San Miguel River basin made after the date of appropriation of this ISF water right in order to protect this ISF water right against injury from the change.

D. Regulatory permitting. It is the intent of the CWCB that this ISF provide protection of the natural environment only to the extent authorized by state statute as against adjudications of water rights made after the date of this filing. The CWCB intends that the ISF water right decreed herein is not appropriate for consideration as a streamflow standard in other administrative or regulatory permitting contexts.

E. No precedent. This ISF is a unique ISF appropriation in that it involves the mainstem of the San Miguel River above the confluence with the Dolores River, the relative size of that river, the current level of water supply development, the anticipated level of future development for municipal, agricultural, recreational, and other purposes, and the river's overall importance to the State of Colorado. The terms of this appropriation are part of a compromise and settlement and are unique circumstances that shall not establish any precedent and shall not be construed as a commitment to include any specific findings of fact, conclusions of law or administrative practices in future appropriations.

E. WRITTEN TESTIMONY

In the event that Mr. Conklin, or Mr. Ault or Mr. Effland are unable to testify at the hearing, Montrose County will submit their above-listed reports (Exhibits A, C & D) as their written testimony to be considered by the CWCB. Montrose County is not submitting any additional written testimony with this Prehearing Statement, but reserves the right to submit written testimony in its rebuttal statement based on the information included in the prehearing

statements provided by the Contesting Parties, or others with Party or Contested Hearing Participant status.

F. LEGAL MEMORANDA

Montrose County is not submitting legal memoranda with this Prehearing Statement, but reserves the right to submit legal memoranda in its rebuttal statement based on the information included in the prehearing statements provided by the Contesting Parties, or others with Party or Contested Hearing Participant status.

Dated this 15th day of July, 2011

PETROS & WHITE, LLC

By: _____
Charles B. White, No. 9241
David S. Hayes, No. 28661

ATTORNEYS FOR THE BOARD OF COUNTY
COMMISSIONERS OF MONTROSE COUNTY

CERTIFICATE OF SERVICE

I hereby certify that on this 15th day of July, 2011, I have duly served 25 copies of the foregoing **PREHEARING STATEMENT** via courier, addressed as follows:

Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203

In addition, I hereby certify that I have duly served the foregoing **PREHEARING STATEMENT** upon the following parties herein by e-mail or by depositing copies of the same in the United States mail, postage prepaid, addressed as follows:

Linda Bassi
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203
Linda.bassi@state.co.us

Susan Schneider – Staff Attorney
Natural Resources and Environment Section
Colorado Department of Law
1525 Sherman Street, 7th Floor
Denver, CO 80203
Susan.schneider@state.co.us

Mark Uppendahl
Colorado Division of Wildlife
6060 Broadway
Denver, Co 80216
Mark.uppendahl@state.co.us

Roy Smith
DOI, BLM, Colorado State Office
2850 Youngfield Street
Lakewood, CO 80215-7093
Roy_Smith@co.blm.gov

Farmer's Water Development Company
c/o David Alexander, President
P.O. Box 10
Norwood, CO 81423
FarmersWDC@hahoo.com

Sheep Mountain Alliance
c/o Jennifer Russell and Nathaniel Smith
Russell & Pieterse, LLC
P.O. Box 2673
Telluride, CO 81435
Jenny.russell@lawtelluride.com
Nate.smith@lawtelluride.com

Southwestern Water Conservation District
Norwood Water Commission
Lone Cone Ditch & Reservoir Company
c/o John B. Spear, Janice C. Sheftel, Adam T. Reeves
Maynes, Bradford, Shipps & Sheftel, LLP
835 E. 2nd Avenue, No. 123
Durango, CO 81301
bspear@mbssllp.com
jsheftel@mbssllp.com
areeves@mbssllp.com

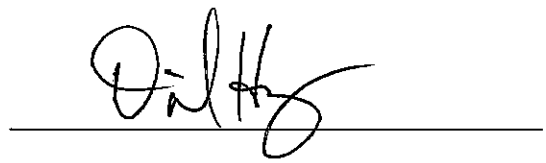
Western Resources Advocates, The
Wilderness Society
c/o Robert Harris, Bart Miller
2260 Baseline Road, Suite 200
Boulder, CO 80302
bmiller@westernresources.org
rharris@westernresources.org

San Miguel Water Conservancy District
c/o Raymond Snyder, President
P.O. Box 126
Norwood, CO 81423

San Miguel Water Conservancy District
c/o Robert W. Bray, Secretary
P.O. Box 65
Redvale, CO 81431

Board of County Commissioners of San Miguel County
c/o Becky King
San Miguel County Attorney's Office
P.O. Box 791
Telluride, CO 81435
beckyk@sanmiguelcounty.org

Colorado Environmental Coalition, San Juan Citizens Alliance, American Whitewater, Western Colorado Congress, Center for Native Ecosystems
c/o Becky Long
1536 Wynkoop Street, # 5C
Denver, CO 80202
Becky@ourcolorado.org



Geotechnical
Environmental
Water Resources
Ecological

GEI Consultants

Memo

To: Colorado Water Conservation Board

From: Don Conklin

Date: July 8, 2011

Re: Evaluation of Proposed San Miguel River Instream Flow Recommendation

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I have reviewed the instream flow recommendations for the lower San Miguel River segment from Calamity Draw downstream to its mouth at the Dolores River. I have also reviewed the available documents used to develop the Instream Flow Recommendation by the Colorado Division of Wildlife (CDOW) and the U. S. Bureau of Land Management (BLM). I have also recently met with the CDOW and the staff of the Colorado Water Conservation Board (CWCB) concerning the flow recommendations. This memo contains my conclusions concerning the recommended minimum flows based on new information from CDOW and new habitat modeling information. This evaluation updates an earlier memo from January 2011.

The agencies' instream flow recommendations are based on habitat modeling with R2CROSS and Physical Habitat Simulation (PHABSIM) for the San Miguel River. These techniques are widely used in Colorado for assessing minimum flows. The R2CROSS information appears to have been collected in the standard manner. However, this technique is usually more useful in smaller streams than the San Miguel River. The more useful and robust PHABSIM technique provides better information for a river of this size and was used by CDOW and BLM as the primary basis to support the flow recommendations. CDOW modeled habitat availability for adult bluehead and adult flannelmouth suckers, two fish species native to the San Miguel River.

The agencies present biological sampling data from 2001 and 2008 indicating the presence of bluehead and flannelmouth suckers and two other native species, speckled dace and roundtail chub, in the lower San Miguel River. The CDOW information includes the conclusion that the lower San Miguel River contains an excellent native fish community. The information does not indicate that the fish populations in the San Miguel River are declining. Sampling by GEI on another project in 2008 and 2009 in the San Miguel River near Naturita, just a few miles upstream of the reach in question, also demonstrated that both sucker species were common to abundant. The fish populations in the river at present are being preserved with the historical flow regime that has occurred over the years without designated minimum flows. These two native sucker species are in decline in some areas in western Colorado, including the Dolores River. CDOW lists insufficient flow as one reason for the decline in native fish species in the Dolores River.

The purpose of Colorado's Instream Flow Program is "reasonable preservation of the natural environment" as stated in the Instream Flow Recommendation. However, the flows recommended by CDOW and BLM for the San Miguel River are higher than needed to preserve the natural environment. The agencies' recommendation states that a flow of 325 cfs for the spring and early summer runoff period "is the **minimum** [emphasis added] amount necessary to preserve the natural environment…based on the assumption that 325 cfs would preserve 90% of the weighted useable area available to the bluehead sucker and 100% of the weighted useable area available to the flannelmouth sucker." The agencies' recommendation further states that "the instream flow recommendation of 170 cfs [during the early summer period of the year] was derived to **maximize** [emphasis added] the existing bluehead and flannelmouth sucker habitat available…." Maximizing

GEI Consultants, Inc./Ecological Division
4601 DTC Boulevard, Suite 900, Denver, CO 80237
303.662.0100 fax: 303.662.8757
www.geiconsultants.com

habitat availability and attempting to ensure 90-100% of the optimum habitat for native suckers is not the stated purpose of the instream flow program. According to the PHABSIM information, a flow of 170 cfs to 325 cfs results in near-optimum habitat for adult flannelmouth suckers and relatively high levels of habitat for adult bluehead suckers but, as discussed below in this memo, cannot preserve a level of habitat for fish. This memo further evaluates the recommended instream flows based on habitat modeling for native species and based on the recent historical habitat patterns that have occurred in this segment of the river from 1954 through 2007.

PHABSIM Habitat Modeling

PHABSIM modeling by CDOW was used to determine habitat relationships for only the adult life stage of flannelmouth and bluehead suckers. Information was not presented for other life stages of these two species, such as for spawning, fry or juvenile fish, or for other native species in the river. Therefore, the habitat needs of other components of the native fish community were not taken into account in the recommendation. Fry and juvenile suckers tend to have optimum habitat at lower flows than adults. Young suckers hatch in late spring or early summer, when flows are usually high in the river, and are vulnerable to being swept downstream. If the CDOW had modeled habitat relationships for the younger life stages, the optimum and minimum flow recommendations for preserving young suckers would be lower than for adult suckers alone. By not modeling habitat for other life stages, the agencies did not take into account important stages in the life history of the suckers. Taking into account the habitat needs of young fish would have resulted in lower instream flow recommendations. Similarly, both bluehead and flannelmouth sucker adults are some of the largest fish in the river and have similar preferences for deep water and moderate to fast velocity. Their PHABIM habitat relationships are similar. Taking into account habitat relationships for other native species of different (smaller) sizes and different habitat preferences would result in lower recommended instream flows.

In order to investigate the habitat needs of other life stages and species in the river, I used the PHABSIM model developed by CDOW for this segment of the San Miguel River to model habitat for sucker fry and dace, a small species of minnow. Habitat use information is not available for bluehead and flannelmouth sucker fry, so habitat was modeled using information for white sucker fry. This is reasonable because white sucker is a common species native to the east slope of Colorado and is in the same genus as the west slope native bluehead and flannelmouth suckers with similar habitat use. Similarly, habitat use information is not available for speckled dace so habitat modeling used information for longnose dace. This is reasonable because longnose dace is a common species native to the east slope of Colorado and is in the same genus as speckled dace with similar habitat use. Speckled dace is a native species of minnow in the San Miguel River and was collected by CDOW in both 2001 and 2008 and can be very abundant in the San Miguel River based on sampling by GEI in 2008 and 2009 in a nearby segment.

The habitat modeling for sucker fry and dace indicates high levels of habitat availability at much lower flows than for the adult suckers (Figure 1). Minimum flows needed to maintain habitat for dace and sucker fry would be much lower than for adult suckers, demonstrating that there would have been lower recommended instream flows if the agencies had modeled habitat for other species and life stages of the native fish community. For the smaller-bodied dace, optimum flows are approximately half that for the adult suckers. For dace, flows of approximately 50 to 100 cfs provide a high proportion of optimum habitat. For sucker fry, habitat availability is low at all flows, but decreases consistently as flows increase. Optimizing habitat for adult suckers would result in minimizing habitat for fry. A flow regime should balance the habitat needs of the different life stages in order to ensure that fry can survive and the sucker species can be maintained from year to year. For sucker fry, optimum flows are very low and minimum flows for this life stage would also be very low.

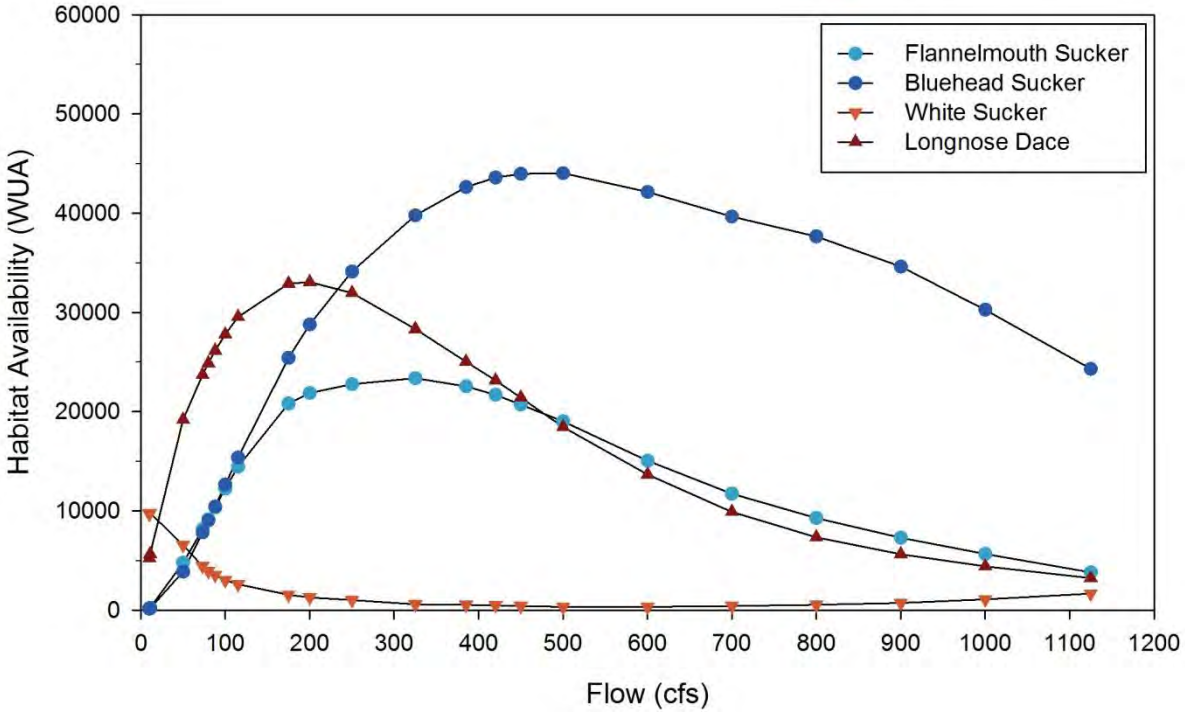


Figure 1: Habitat versus flow relationships for fish in the San Miguel River based on PHABSIM modeling.

Flow Availability

The recommended instream flows do not appear to be available for nearly half the time based on the historical Uravan Gage flow duration table in the DRAFT CDOW/BLM document. This indicates that the existing aquatic environment is being preserved with much lower flows than the recommendations. The FINAL CDOW/BLM document demonstrates that the recommendations are close to average flows in winter, yet average flow levels would not be met in approximately half the years. Since the purpose of instream flows is to preserve the existing aquatic environment, the recommended flows are more than what is necessary. Recommend flows that are met more frequently with existing hydrology would be more reasonable as minimum flows.

The recommended flows consist of five seasonal periods. This level of complexity is unusual and may not be necessary. Two seasonal tiers are more common and three tiers may be reasonable to account for seasonal changes and higher flows during spring runoff. The recommended flows appear to be designed as a flow regime to enhance habitat for the adults of the two sucker species rather than as minimum flows to maintain and preserve the existing healthy aquatic environment.

Time Series of Historical Habitat

By combining the historical flow data from 1954 to 2007 for the river segment with the habitat relationships in Figure 1, a time series of habitat availability was generated. This results in daily habitat values for each the four species/life stages of fish modeled with PHABSIM for each day from the 1954 to 2007 period of record. This information was used to evaluate the proportion of time that actual habitat availability met the habitat level at the recommended minimum flows in each of the five

time periods in the agencies' recommendation. This analysis evaluates the issue of historical habitat patterns relative to the habitat at the recommended flows.

The habitat level at 325 cfs recommended by the agencies for the runoff period (April 15 to June 14) has not been met historically from 75% to 100% of the time between 1954 and 2007 (Figure 2). This demonstrates that the existing healthy populations of native fish in the river have been maintained at habitat levels that are below the agencies' recommended levels for the majority of the runoff period. For flannelmouth sucker adults, the agencies' recommended flow is actually the optimum flow for this species. The flow on every day of the historical period was either higher or lower than 325 cfs, which, due to the shape of the habitat relationship curve (Figure 1), results in habitat levels lower than the recommended levels 100% of the time. Sucker fry were not modeled during this period because they are not yet present in the river in the runoff season. Sucker fry were only modeled during the two summer periods after spawning when they are present in the river.

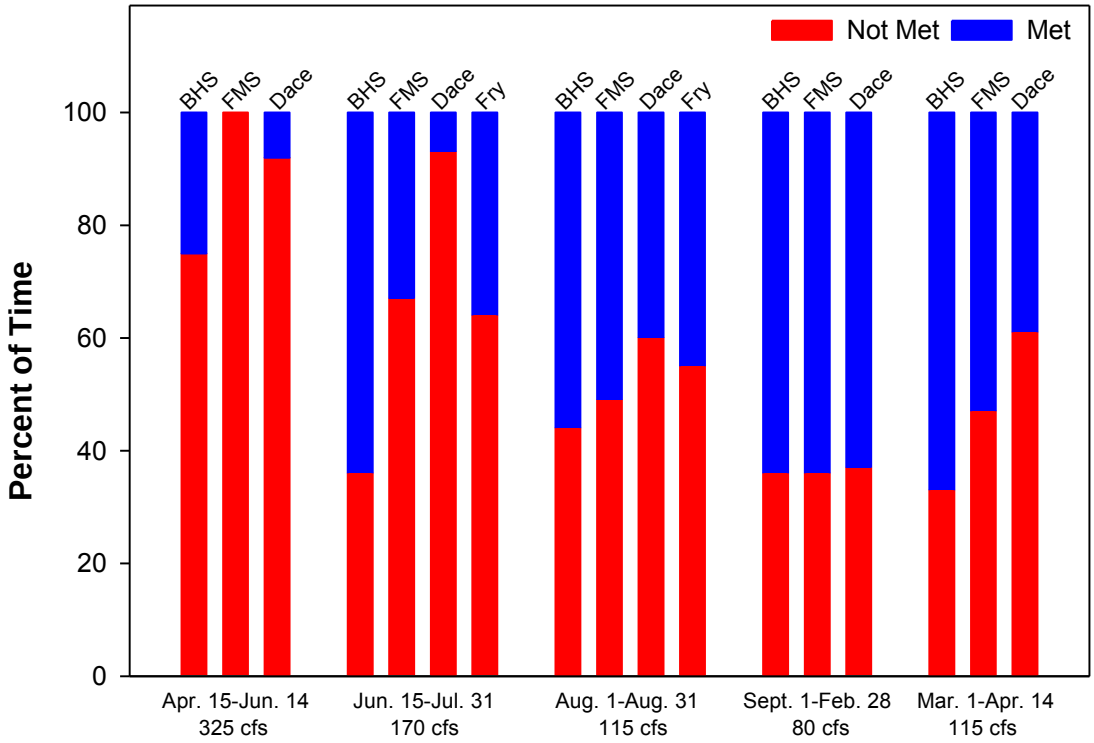


Figure 2: Percent of time historical daily habitat levels met the habitat level at the recommended flow for each species/life stage of fish, 1954 to 2007. BHS=bluehead sucker adult, FMS=flannelmouth sucker adult, Dace= longnose dace, Fry= white sucker fry.

For the other four time periods, historic habitat levels have been below the agencies recommended levels from 33% to 93% of the time in the corresponding periods (Figure 2). As was true for the runoff period, in each of the four other periods of the year the agencies recommended flow/habitat levels historically have not been met a high proportion of the time, and the healthy native fish populations persist and are preserved under the current flow regime. Recommended minimum flows that mimic current flows would preserve the existing healthy fish community.

Alternative Flow Recommendations

The available information indicates that the fish community in the lower San Miguel River is healthy. This reach of the river is classified as Warm 1 by the Colorado Water Quality Control Commission, indicating that it supports the expected abundance and diversity of fish. Therefore, the flows that are currently experienced in the river are sufficient to preserve the fishery and appropriating minimum flows that reflect current low flows would maintain the existing fish community. Alternative minimum flow recommendations are discussed below based on flow and habitat availability.

During the high flow period in late spring and early summer, the agencies' recommended flow of 325 cfs would be available in most years from April 15 to June 14, based on the flow data in the DRAFT agencies' filing. However, a flow of 200 cfs would be available approximately 90% of the years, would still provide 96% of optimum habitat for adult flannelmouth suckers, 65% of optimum habitat for adult bluehead suckers and near optimum habitat for dace. The lower minimum flow would be more suitable for sucker fry which would be hatching near the end of this period and are more sensitive to higher velocity. A minimum flow of 200 cfs is appropriate for the period from April 15 through June 14.

The agencies' recommendations of 170 cfs and 115 cfs through the summer are not available for approximately a third of the years in July and August. The existing fish community has apparently been preserved with lower flows in about one year out of three and at lower habitat levels from 36% to 93% of the time during these time periods (Table 2). Therefore, a lower minimum flow will preserve the fish community. A flow of 90 cfs would provide approximately 25% of optimum habitat for bluehead suckers, 44% for flannelmouth suckers and 79% for dace. A flow of 90 cfs would be available in almost all years in July. However, in the irrigation season in August, even this flow would be met only in two years out of three. A flow of 90 cfs would still provide more habitat than the lower winter flows that normally occur. A minimum flow of 90 cfs is appropriate for the period from June 15 through August 31.

For the fall and winter period, the agencies' recommendation is 80 cfs. This would be available only about 50-60% of the time in December through February. Lower historical flows in many years have preserved the existing fish community through the winter. The flow availability information indicates that flows of 65 cfs have been available through the winter in nearly eight out of ten years. A minimum flow of 65 cfs would provide approximately 20% of optimum habitat for bluehead suckers, over 35% for flannelmouth suckers, and nearly 65% for dace and is appropriate for the period from September 1 through April 14.

Don J. Conklin, Jr., Aquatic Ecologist

GEI Consultants

Education
M.S., Water Resources Management, (Specialization in Aquatic Ecology), University of Wisconsin-Madison, 1983
B.S., Biology, Cornell University, 1980

Background

Mr. Conklin is experienced in multiple aspects of aquatic ecology, especially fish, benthic macroinvertebrates, and their habitat. As a project manager, he has extensive experience with all aspects of aquatic studies including design of aquatic sampling programs, supervision of data collection, data analysis, laboratory analysis, and lab report preparation, field sampling of organisms in a variety of aquatic habitats, identification, and enumeration of biological samples, IFIM data collection and analysis, habitat evaluation, data reduction and statistical analysis and report preparation.

Mr. Conklin's projects have included work in a number of states including Colorado, Georgia, Idaho, Kentucky, Massachusetts, Montana, Nebraska, New Mexico, Nevada, North Carolina, South Dakota, Wisconsin, and Wyoming.

Experience

Bow Mar Lake Fishery Management, Bow Mar Owners, Inc., Littleton, CO. Project Manager. Recreational fishery management. Quantitatively sample fish from a private lake to assess current status of fishery resources and to monitor the year-to-year changes in the fishery and water quality. Also provide management recommendations for the future.

Cripple Creek Area Stream Aquatic Biological Monitoring, Cripple Creek and Victor Gold Mining Company, Cripple Creek, CO. Project Manager. Conduct an annual aquatic monitoring in several streams near Cripple Creek, Colorado, concentrating on fish, benthic invertebrate, and zooplankton populations. This information is being used for Use Attainability Analysis (UAA) studies, site-specific water quality standards, stream resegmentation, and monitoring of the annual variability of biological populations.

Golden Reward Mine Aquatic Biological Monitoring, Golden Reward Mining Company, Lead, SD. Project Manager. Conduct an analysis of invertebrate and algal samples and prepared an annual technical summary report for a long-term aquatic monitoring program for an existing mine.

Halligan-Seaman Environmental Impact Statement, U.S. Army Corps of Engineers, Larimer and Weld Counties, CO. Task Manager. Environmental Impact Statement (EIS) for the Halligan-Seaman Water Supply Projects. Review and summarize available current and historical aquatic biological and hydrological information from the Cache La Poudre River and the North Fork. Prepare the Aquatic Biological Resources sections of the DEIS.

Indian and Marshall Creeks Aquatic Biological Monitoring, Homestake Mining Company, Saguache County, CO. Project Manager. Conduct a seasonal aquatic monitoring program for Indian Creek and Marshall Creek near Salida, Colorado, concentrating on fish and benthic invertebrate populations.

Jordan Creek Aquatic Biological Monitoring, Hecla Mining Company, Stanley, ID. Project Manager. Conduct a field sampling of resident fish populations at sites on Jordan Creek and the Yankee Fork in the Salmon River drainage, bracketing an inactive gold mine as part of a long-term annual aquatic monitoring program.

Lower Whitewood Creek Aquatic Biological Review, Homestake Mining Company, Whitewood, SD. Project Manager. Review historical and current aquatic biological data on Whitewood Creek and the Belle

Fourche River, South Dakota, as part of a CERCLA 5-year review. Include comparative analyses of fish, fish habitat, fish tissues, invertebrates, and algae, as well as initiation of a long-term monitoring program for benthic invertebrates and fish population.

Moffat Collection System Environmental Impact Statement, U.S. Army Corps of Engineers, Statewide, CO. Task Manager. Environmental Impact Statement (EIS) for the Denver Water Moffat Collection System Project. Collect data on fish and invertebrates in the Fraser River Basin. Review and summarize available aquatic biological and hydrological information from the Fraser River, upper Colorado River, Williams Fork River, Blue River, South Boulder Creek, and South Platte River basins. Prepare the Aquatic Biological Resources sections of the DEIS.

NISP Environmental Impact Statement, U.S. Army Corps of Engineers, Larimer and Weld Counties, CO. Task Manager. Environmental Impact Statement (EIS) for the Northern Integrated Supply Project (NISP). Collect data on fish and invertebrates in the Cache La Poudre River. Review and summarize available current and historical aquatic biological and hydrological information from the river. Prepare the Aquatic Biological Resources sections of the DEIS.

North Fork Humboldt River Aquatic Assessment and Biological Monitoring, AngloGold Ashanti Corp., Elko County, NV. Project Manager. Provide review of aquatic life criteria issues, with specific reference to selenium, for the threatened species, Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) in the North Fork Humboldt River, Nevada. Include review of water quality, historic data, and periodic field sampling of fish for analysis of fish tissues and population structure.

North Fork Snake River Minimum Flow Evaluation, Arapahoe Basin Ski Area, Summit County, CO. Project Manager. Review snowmaking and minimum flow issues through use of Instream Flow Incremental Methodology and field sampling of fish and invertebrate populations in the North Fork of the Snake River. Include field measurements of habitat at multiple flows using IFIM, modeling of potential changes in available habitat with different flow regimes, and implementation of a long-term monitoring program for benthic invertebrates and fish populations.

Persigo Wash Reclassification Studies, City of Grand Junction, Grand Junction, CO. Project Manager. Provide expertise to address proposed stream classification changes on tributaries to the Colorado River near Grand Junction. Include review of ammonia toxicity issues, flow modification, habitat quality, and water quality (e.g., selenium toxicity) on fish populations in Persigo Wash. Include field sampling of fish populations and preparation of expert witness testimony for the Colorado Water Quality Control Commission.

Red River Aquatic Biological Monitoring, Chevron Mining, Inc., Questa, NM. Project Manager. Conduct sampling of fish and invertebrate populations in the Red River as part of an annual monitoring plan, as well as sediment toxicity testing. This effort was also used by the State of New Mexico as part of a TMDL study on the river.

Snowmass Creek Aquatic Biological Monitoring, Snowmass Water & Sanitation District, Snowmass, CO. Project Manager. Re-evaluate minimum flow determinations for protection of resident trout populations and development of a long-term monitoring program for trout populations in Snowmass Creek in west central Colorado in relation to water diversions.

Thompson and Squaw Creeks Aquatic Biological Monitoring, Thompson Creek Mining Company, Clayton, ID. Project Manager. Molybdenum mine along two tributaries of the Salmon River in central Idaho. Collect and process biological samples from stations on Thompson and Squaw Creeks, tributaries of the Salmon River, for an annual biological monitoring program. This long-term monitoring program of fish and invertebrate populations was initiated in 1980 and has continued to present.

Upper Whitewood Creek Aquatic Biological Monitoring, South Dakota Science and Technology Authority, Lead, SD. Project Manager. Conduct an aquatic monitoring program for Whitewood Creek near the confluence with Gold Run Creek. Includes annual sampling of fish and invertebrates and habitat measurements.

Wharf Aquatic Biological Monitoring, Wharf Resources, Lead, SD. Project Manager. Aquatic biological study of Annie Creek and Spearfish Creek, South Dakota, for CERCLA/Superfund Project. Study includes annual sampling and analysis of fish, invertebrate and algae populations, habitat evaluation and acute and chronic toxicity testing.

San Miguel River Reclassification Study, Tri-State Generation and Transmission Association, Inc., Nucla, CO. Project Manager. A temperature study of the San Miguel River was conducted to determine whether re-segmentation or re-classification of a coldwater segment is warranted, based on the natural temperature regime and the aquatic community. The thermal regime of the river was monitored with temperature loggers, and fish and macroinvertebrate populations were sampled on the longitudinal gradient of the river to determine where the coldwater segment ends and where the transition zone into a warmwater zone begins.

Southern Delivery System Environmental Impact Statement, U.S. Bureau of Reclamation, Statewide, CO. Task Manager. Environmental Impact Statement (EIS) for the City of Colorado Springs Southern Delivery System (SDS) Project. Collected data on fish, benthic macroinvertebrates, and fish habitat (PHABSIM) in the Arkansas River Basin. Incorporated the available biological information and project hydrology (using IHA) into Existing Environment and Effects Analysis Technical reports. Prepared the Aquatic Biological sections of the DEIS and FEIS.

Plum Creek Reclassification, Plum Creek Wastewater Authority, Castle Rock, CO. Project Manager. Conducted sampling of fish and benthic macroinvertebrates in several streams in the Plum Creek Basin near Castle Rock, Colorado. This information has been used for a Use Attainability Analysis (UAA, and determination of appropriate stream classification and water quality standards.

Upper Arkansas River Aquatic Biological Monitoring, Newmont Mining Company/Resurrection Mining, Leadville, CO. Project Manager. Continued seasonal monitoring of benthic invertebrate populations, and annual monitoring of fish populations and fish habitat quality for sites in the upper Arkansas River/California Gulch drainage near Leadville, Colorado.

Aurora Environmental Assessment, U.S. Bureau of Reclamation, Statewide, CO. Task Manager. Environmental Assessment (EA) for the City of Aurora Proposed Excess Capacity Contracts Project. Reviewed and summarized the available aquatic biological and hydrological information (using IHA). Prepared the Aquatic Resources sections of the EA.

Prairie Waters Aquatic Biological Evaluation, Aurora Water, Aurora, CO. Project Manager. Prepared the Aquatic Resources Technical Report for the Aurora Prairie Waters Project. Summarized the available data and evaluated the potential effects of the project.

Urbanized River Evaluation, South Platte Coalition for River Evaluation (SPCURE), Denver, CO. Project Manager. A study to develop a process for evaluating the expected condition for the aquatic biological communities in an urbanized river. Conducted synoptic sampling of fish and benthic macroinvertebrate populations and habitat measurements in the South Platte River through the Denver Metropolitan Area in Colorado.

Tarryall and Michigan Creeks Impact Evaluation, Centennial Water & Sanitation District, Park County, CO. Project Manager. Provided technical expertise with regard to flow impacts on trout populations

in Tarryall Creek and Michigan Creek as part of an analysis of water sales. Included field sampling of trout and assessment of habitat conditions at multiple sites in the project reach to assess the impacts of increased flows as a result of discontinuation of historic diversions for hay-meadow watering.

Bear Creek Temperature Evaluation, Evergreen Metropolitan District/Genesee Water & Sanitation District/Town of Morrison, Jefferson County, CO. Project Manager. Conducted temperature modeling on Bear Creek, Colorado, using USFWS instream temperature model (SSTEMP). Included collection of stream geometry parameters (slope, aspect, shading, etc.), historic flow and temperature data, and new continuous temperature data. Instream temperature changes were modeled under a variety of scenarios of native flow, tributary and effluent inflows to predict potential impacts to resident trout populations.

Ketring Lake Assessment and Restoration, City of Littleton, Littleton, CO. Project Manager. Provided technical assistance in lake management issues for a small urban lake. Conducted review of existing water quality, inflow, and sediment quality data and recommended potential management options to enhance recreational fishing opportunities and to limit algal production and designed lake reconstruction.

Sand Creek Selenium Studies, Conoco, Inc./City of Aurora/Metro Wastewater Reclamation District/Valero Energy, Aurora and Denver, CO. Project Manager. Assessment of resident fisheries and review of selenium toxicity for development of site-specific ambient water quality criteria for Sand Creek, Colorado.

Fugitt Creek Temperature Evaluation, Arch Minerals, Harlan County, KY. Project Manager. Temperature modeling of streams in southern Kentucky to determine the effects of a proposed coal strip mine on a resident trout population. The mine specifically proposed canopy removal and the construction of sediment settling ponds. Collected site-specific inputs for USGS instream temperature model (SSTEMP), including slope, aspect, vegetative canopy estimates, and established continuous recording temperature monitoring sites. Temperature changes were predicted using the SSTEMP temperature model on an annual basis, seasonal basis, and worst case scenario, and correlated with trout population data and species temperature tolerances to predict impacts.

Six Runs Creek Waste Spill Evaluation, DM Farms, Rose Hill, NC. Project Manager. Provided expert witness support with regard to potential effects of drainage from a confined-animal-feed-operation (hog farm) on receiving streams. Conducted assessment of existing water quality, habitat, and flow information, as well as field collection of habitat and flow data for use in modeling of dissolved oxygen and bacterial transport downstream of the operation. Included expert witness testimony in front of federal prosecutors.

Yellowstone Pipeline Environmental Impact Statement, Yellowstone Pipeline Co., Helena, MT. Project Manager. Environmental Impact Statement. Baseline aquatic studies for proposed underground pipeline routes. Collection of data on fish, invertebrates, algae, habitat parameters, and spawning redds. Compiled and summarized data for incorporation into an EIS.

Zortman Streams Use-Attainability-Analysis, Zortman Mining Company, Phillips County, MT. Project Manager. Conducted biological sampling in support of Use-Attainability Analyses for streams in the vicinity of an inactive gold mine in northeastern Montana. This analysis was in support of proposed NPDES permit limit determinations. Biological sampling included fish population sampling, benthic invertebrate and microinvertebrate population sampling, and detailed habitat measurements and RBP scoring over four seasons.

South Platte River pH Recommendation, Metro Wastewater Reclamation District, Denver, CO. Project Manager. Conducted a study of pH effects on aquatic life, with specific reference to populations in the South Platte River. Included a detailed literature review, combined with analysis of pH data from the river

and effluent compared to resident invertebrate and fisheries data over a 10-year period. Analysis included recommendations for a site-specific adjustment to pH of 6.0 to 9.0.

Bull River Bull Trout Population Evaluation, Avista Corporation, Noxon, MT. Project Manager. Collected field data to help determine the population status of the endangered bull trout (Salvelinus confluentus) in the Bull River and its drainage basin in northwestern Montana as part of FERC license conditions for two hydropower dams. This effort involved counting fish through snorkeling and electrofishing, PIT tagging, collecting length/weight data, and genetic tissue sampling. Analysis evaluated current status and recent changes in population levels in the drainage.

Lower Whitewood Creek Aquatic Biological Monitoring, Homestake Mining Company/Whitewood Development Corporation, Meade County, SD. Project Manager. Designed and implemented an aquatic baseline monitoring program for a proposed streamside tailings re-mining project along Whitewood Creek and the Belle Fourche River, South Dakota. Included sampling and analysis of fish, fish habitat, fish tissues, invertebrates, and algae.

Arkansas River Reclassification, City of Pueblo, Pueblo, CO. Project Manager. Provided a review of fish species composition, including historic and current records, instream habitat conditions, and prepared written testimony for a proposed reclassification of the lower Arkansas River, Colorado. Included expert witness testimony before the Colorado Water Quality Control Commission.

Snowmass Creek Minimum Flow Determination, Aspen Ski Company, Snowmass, CO. Project Manager. Minimum flow determinations. Evaluated minimum flow levels for protection of resident trout populations. Reviewed potential habitat enhancement options for Snowmass Creek in west central Colorado in relation to snowmaking diversions. Compiled report on the effects of the proposed minimum stream flows on trout populations.

Willow Creek Aquatic Biological Monitoring, Three Lakes Water and Sanitation District, Grand Lake, CO. Project Manager. Impact analysis and long-term monitoring. Conducted aquatic biological sampling of fish and benthic invertebrate populations in several small mountain streams in Colorado and compiled report on the effects of a nearby water treatment facility on those populations. This sampling was conducted with regard to stream classification issues.

Salmon River Salmon Stock Review, Thompson Creek Mining, Thompson Falls, ID. Project Manager. Research investigating the decline of Pacific salmon stocks in the Columbia River System.

Thompson Creek Mine Supplemental Environmental Impact Statement, Thompson Creek Mining Company, Thompson Falls, ID. Project Manager. Provided aquatic biological expertise in support of development of a supplemental EIS for the mine, specifically with regard to potential effects of predicted water quality on resident fish and salmon in Thompson and Squaw Creeks.

Crow Creek Aquatic Biological Review, City of Cheyenne, Cheyenne, WY. Project Manager. Review of water quality issues. Reviewed existing aquatic biological data, recreational fishery potential, and collected additional instream habitat information in Crow Creek, southeastern Wyoming, downstream of municipal wastewater reclamation effluent. Included technical review of data collected by state and federal agencies, as well as assessing off-site locations for instream habitat enhancement activities.

Urbanized Stream Evaluation, City of Atlanta, Bureau of Pollution Control, Atlanta, GA. Project Manager. Aquatic biological assessment of urban streams near Atlanta, Georgia. Conducted field sampling to gather data on the impact of Combined Sewer Overflows on receiving waters, and the application of water quality criteria for metals.

Blackhawk Environmental Impact Statement, City of Blackhawk, Blackhawk, CO. Project Manager. Provided technical support for aquatic biological issues for an Environmental Impact Statement for increasing water sources of a growing mountain community in central Colorado. Incorporated and evaluated biological, chemical and fish habitat data into Baseline Report.

Stream PCB Evaluation, Confidential Client, MA. Project Manager. Recreational fisheries studies on a stream in Massachusetts, with regard to potential organic chemical contamination. Study included review of available literature, field sampling of fish and invertebrate populations and assessment of recreational fishing potential in support of risk assessment activities.

Eastlake Reservoir #3 Recreational Fishery Evaluation, Thornton, CO. Project Manager. Recreational fishery management. Conducted aquatic biological survey to determine current conditions and potential for future development as a Natural Area. Study included field sampling with various gear types and suggesting options for habitat improvement and enhancing the fishery from a recreational point of view.

Smoky Canyon Phosphate Mine Evaluation, Simplot Mining, ID. Conducted field sampling of fish and habitat and data analysis as part of an analysis of potential impacts of selenium and elevated TDS in streams near phosphate mines in southeastern Idaho.

Noranda Mine Environmental Impact Statement, Noranda Mining, WI. Baseline aquatic studies for a proposed mine in northern Wisconsin. Developed sampling program, supervised the collection of aquatic biological data, including fish, invertebrates, algae, aquatic plants and habitat, data analysis and report preparation.

Ralston Creek Use-Attainability-Analysis, City of Arvada, Arvada, CO. Project Manager. Use-attainability analysis of Ralston Creek and selected tributaries, Colorado. Study of fish, invertebrate and algal populations to discern possible non-point source impacts to assist in site-specific stream classification and water quality criteria issues.

Habitat Use Investigation, Nebraska Public Power District, The Central Nebraska Public Power and Irrigation District, Columbus, NE. Project Manager. Habitat preference study Platte River, Nebraska. Developed habitat preference criteria for game and forage fish in the Platte River. Assisted with study design, data analysis and report writing as part of FERC relicensing studies.

Kingsley Dam FERC Relicensing, The Central Nebraska Public Power and Irrigation District, Columbus, NE. Project Manager. Impact assessment. Evaluation of the effects of a hydroelectric facility on the biota of Lake Ogallala in western Nebraska for FERC relicensing. Analyzed fish, recreational fishery, invertebrate and water quality data collected during an intensive study of the effects of hydropower operations on aquatic life and a recreational fishery of a receiving lake/stream system. Sampled fish with boat electroshocking units, gill nets, and trap nets, designed and conducted an extensive creel survey. Analyzed biological and chemical data and prepared reports.

Summit County Streams Minimum Flow Determinations, Keystone, Breckenridge and Copper Mountain Ski Areas, CO. Minimum flow determinations for streams near ski areas in central Colorado. Survey of existing invertebrate communities, fish populations and water chemistry along with review of hydrographs and IFIM output to address minimum flow recommendations below snowmaking diversions.

Idarado Impact Evaluation, Idarado Mining Company, CO. Project Manager. Impact assessment. Evaluation of the effects of historic metal mining and milling activity in the upper San Miguel River, Red Mountain Creek, and Ridgway Reservoir in southwest Colorado. Included sampling fish populations, water quality, phytoplankton, zooplankton, benthic invertebrates, and a creel survey.

Two Forks Environmental Impact Statement, Denver Water Board, Denver, CO. Project Manager. Environmental Impact Statement Reports for a large metropolitan water department in Colorado. Incorporated and evaluated biological, chemical and IFIM habitat data into Baseline, Impact, Cumulative Impact and Mitigation Reports for the Two Forks EIS. Also, responded to comments to the EIS process from various federal, state, and local agencies.

Systemwide Stream Habitat Evaluation, Denver Water Board, Denver, CO. Project Manager. Instream trout habitat modeling at over 30 sites throughout the upper South Platte River, Williams Fork River, Fraser River, and Blue River Basins using IFIM methodology. Assisted with study design and implementation, field site selection, data collection, computer analysis and report preparation.

Two Forks Environmental Impact Statement, Denver Water Board, Denver, CO. Project Manager. Biological survey of over 75 mainstem stations and tributaries on the North Fork South Platte River, South Platte River, Blue River, South Boulder Creek and the Williams Fork River in central Colorado. Collected field chemical parameters, conducted electrofishing, and collected and processed invertebrate samples and fish population samples and prepared reports to provide baseline information for a Systemwide Environmental Impact Statement.

Professional Certifications

IFIM Training – completed course work given by the U.S. Fish and Wildlife Service
IFIM 201, Problem solving with IFIM
IFIM 305, Field Techniques for Stream Habitat Analysis
IFIM 310, Using the computer based Physical Habitat Simulation System (PHABSIM)

Professional Memberships

America Fisheries Society
North America Benthological Society
North American Lake Management Society
Colorado Lake and Reservoir Management Society

Publications

Bergstedt, L. C., J. W. Chadwick, D. J. Conklin, and S. P. Canton. 2005. Improvements in brown trout and invertebrate populations in the Arkansas River during reclamation efforts on California Gulch. Pp. 54-73. IN: *Proceedings of a Joint Conference of American Society of Mining and Reclamation*. 22nd Annual National Conference, June 19-23, 2005, Breckenridge, CO.

Canton, S. P., L. C. Bergstedt, J. W. Chadwick, and D. J. Conklin, Jr. 2005. The importance of identifying natural variation in aquatic communities: the Thompson Creek Molybdenum Mine example. Pp. 181-190. IN: *Proceedings of a Joint Conference of American Society of Mining and Reclamation*. 22nd Annual National Conference, June 19-23, 2005, Breckenridge, CO.

Chadwick, J. W., S. P. Canton, D. J. Conklin, and L. C. Bergstedt. 2005. Determining sources of water quality impacts using biological monitoring: the Molycorp Questa Molybdenum Mine example. Pp. 211-223. IN: *Proceedings of a Joint Conference of American Society of Mining and Reclamation*. 22nd Annual National Conference, June 19-23, 2005, Breckenridge, CO.

Chadwick, J. W., L. C. Bergstedt, D. J. Conklin, and S. P. Canton. 2004. Drought and trout – sometimes less is more. Pp. 1-13. IN: de Carvalho Freitas, C.E., M. Petrere, Jr., A.A.F. Rivas, and D. MacKinlay (eds.). Symposium Proceedings, *Fish Communities and Fisheries*, VI International Congress on the Biology of Fish. Manaus, Brazil, August 1-5, 2004.

Canton, S. P., J. W. Chadwick and D. J. Conklin, Jr. 1997. Aquatic Biology and Fisheries. Pp. 324-329 in Chapter 7, Environmental Permitting. D. W. Struhsacker (chapter ed.). IN: J. J. Marcus (senior ed.) *Mining Environmental Handbook: Effects of Mining on the Environment and American Environmental Controls on Mining.* Imperial College Press, London.

Chadwick, J. W., D. J. Conklin, Jr., P. L. Winkle, and S. P. Canton. 1997. Fish species composition in the central Platte River, Nebraska. *The Southwestern Naturalist* 42(3):280-290.

Conklin, D. J., Jr., S. P. Canton, J. W. Chadwick, and W. J. Miller. 1995. Habitat suitability curves for selected fish species in the central Platte River, Nebraska. *Rivers* 5:250-266.

Miller, W. J., J. W. Chadwick, S. P. Canton, D. J. Conklin, Jr., and E. Y. Chrisp. 1991. The use of IFIM for evaluating effects of a flow alternative on fish habitat in a river system with competing water demands. IN: *Water Power '91.* ASCE. Denver, CO.

Peckarsky, B. L., P. R. Fraissinet, M. A. Penton, and D. J. Conklin, Jr. 1990. *Freshwater Macroinvertebrates of Northeastern North America.* Cornell University Press. Ithaca, NY.

Chadwick, J. W., S. P. Canton, D. J. Conklin, Jr., and D. Kraus. 1989. Lake Ogallala, Nebraska. *Lake Line* 9:37-40.

Winters, D. S., J. W. Chadwick, D. J. Conklin, and W. J. Miller. 1988. Winter field methodologies for determination of habitat utilization of brown and rainbow trout in two Colorado mountain rivers. *Proceedings of the Species Criteria Workshop.* U.S. Fish and Wildlife Service Instream Flow Group.

Peckarsky, B. L., S. I. Dodson, and D. J. Conklin, Jr. 1985. *A Key to the Aquatic Insects of Streams in the Vicinity of the Rocky Mountain Biological Lab, Including Chironomid Larvae from Streams and Ponds.* Colorado Division of Wildlife. Denver, CO.

Water Resources Management Program. 1983. *Fox Lake: A Water Quality and Management Study.* Report No. 121. University of Wisconsin-Madison, Institute for Environmental Studies. Madison, WI.

DEERE & AULT
CONSULTANTS, INC.

MEMORANDUM

TO: **Colorado Water Conservation Board**

FROM: **Daniel V. Ault, P.E., and Branden Effland, P.E.**

DATE: **June 14, 2011**

RE: **Review of FINAL San Miguel River ISF Executive Summary - Hydrologic Data and Analysis Section and Supporting Statistical Hydrology**

Deere & Ault Consultants, Inc. (D&A), on behalf of Montrose County, has reviewed the FINAL version of the Executive Summary of the Instream Flow Recommendation prepared by the Colorado Water Conservation Board (CWCB), the Colorado Division of Wildlife (CDOW), and the U.S. Bureau of Land Management (BLM) for the lower San Miguel River (i.e., Confluence with Calamity Draw to Confluence with Dolores River). D&A's review concentrated on the section of the document titled: "Hydrologic Data and Analysis". Mr. Don Conklin of GEI Consultants, also on behalf of Montrose County, reviewed the portions of the document related to minimum flow recommendations required for habitat preservation and documented his comments in a January 14, 2011 memorandum and an update to that memorandum dated July 8, 2011. This memorandum contains the comments and opinions generated by D&A's review of the Executive Summary, originally documented in a previous memorandum dated January 27, 2011, and additional conclusions developed more recently upon receipt of the CWCB's statistical hydrology. This memorandum supersedes the January 27, 2011 memorandum. The following are D&A's conclusions:

1. The CWCB developed a synthetic gage record for the Lower Terminus (LT) of the recommended instream flow (ISF) which is 17.24 miles downstream of the upper terminus of the ISF reach. By adjusting the existing USGS stream gage for the San Miguel River at Uravan, CO (#09177000) ("Uravan Gage")to represent the flow regime at the very most downstream location of the ISF reach, it is likely the CWCB created a synthetic gage that is less representative of the hydrologic conditions of the entire reach. The existing Uravan Gage, which is already located within the lower one-third of the ISF reach, is the better record for describing water availability within the ISF reach.

2. D&A reviewed the CWCB's synthetic hydrological analysis (i.e., MS Excel spreadsheet titled: "Synthetic Hydrology Data from CWCB.xlsx.") used to describe the water availability at the LT. D&A generally understands the methodology the CWCB suggests it used to develop the water availability at the LT as was described in the FINAL version of the Executive Summary. However, the results of the hydrological analysis developed by the CWCB appear to be in error. D&A has compared the CWCB's "geometric mean

600 S. Airport Road, Building A, Suite 205
Longmont, CO 80503
Phone: 303-651-1468 ● Fax: 303-651-1469

of the area-prorated adjusted data values from the San Miguel River at Uravan hydrograph" (i.e., synthetic hydrograph at the LT or the San Miguel River at the confluence with the Dolores River) with the mean daily discharge at the Uravan Gage (see **Appendix A** for daily values and **Table 1** for a monthly summary). The CWCB's adjustments result in decreases in availability at the LT in the months of January through May and November through December. The positive adjustments, representing additional flow at the LT, begin in the month of June and range from adjustments of 9.6 percent in June to a maximum of 48.6 percent in the month of September.

D&A's understanding of the CWCB methodology suggests that the CWCB established a "virgin gage" (i.e., void of all existing human uses and representative of only tributary runoff) at the location of the Uravan Gage, moved it to the LT by adjusting it by the drainage area ratio of 1.0388 (1557.17 mi^2/1499 mi^2) and ultimately reducing it by the pre-determined upstream human uses (i.e., upstream depletions) resulting primarily from upstream irrigation use. If this methodology was used, the resultant mean daily discharge at the LT would be approximately 3.88 percent higher than those experienced at the Uravan Gage, not 8.8 percent higher as calculated by the CWCB (**Table 1**). However, this methodology is flawed in that it assumes the drainage area that lies downstream of the Uravan Gage contributes to runoff, on a square mile basis, equal to the drainage area at the top of the San Miguel River basin, which the CWCB has previously stated contributes primarily to the flow within the basin as a result of snowmelt.

As a check to the CWCB's area ratio method, D&A utilized the USGS's Web-based Geographic Information System application, "StreamStats", to delineate the respective drainage basins tributary to the existing Uravan Gage and the LT. In general, StreamStats is used to estimate streamflow statistics for ungaged sites using an empirical regression analysis. StreamStats, using precipitation data compiled by the NRCS, the NWCC and Oregon State University, determined the mean annual precipitation of the Uravan Gage basin to be 21.97 inches and 21.75 inches for the LT basin. The mean annual precipitation values determined by StreamStats support D&A's opinion that the drainage area below the Uravan Gage experiences lower annual precipitation than does the upper basin and therefore reduces the overall mean basin precipitation. D&A determined a total basin precipitation volume by multiplying the mean annual precipitation values by their respective drainage areas. A more appropriate adjustment factor can be developed by comparing the precipitation volume of the LT basin (approx. 1.8063×10^6 ac-ft) with the Uravan Gage basin (approx. 1.7564×10^6 ac-ft) and developing a "precipitation volume ratio", in this case 1.0284 ($1.8063 \times 10^6 / 1.7564 \times 10^6$) which should result in an increase in expected flow at the LT of 2.84 percent. As shown in **Table 1**, the CWCB's average annual increase in flow at the LT is approximately 8.8 percent higher than the flow at the Uravan Gage, a percentage increase that is over twice that of the drainage area ratio and three times that of D&A's precipitation volume ratio.

It is therefore D&A's opinion that synthetic flows developed by the CWCB as an estimate of availability of water at the LT are in error. Based on D&A's understanding of the CWCB's area ratio methodology and D&A's alternative precipitation volume ratio

analysis, the synthetic flows at the LT should be consistently three to four percent higher than flows experienced at the Uravan Gage. The broad assumptions used by the CWCB to determine average monthly upstream irrigation consumption, return flows, etc. led to significant errors in the mass balance which resulted in the reduction of flow in some months, which D&A cannot explain or understand, and large, nearly fifty percent, increases in others. Because of these apparent errors, it is D&A's opinion that the CWCB should use the existing mean daily discharge record of the USGS San Miguel River at Uravan, CO gage as the basis of its availability analyses and ISF recommendations.

3. The CWCB, after creating synthetic flow data meant to represent discharge at the San Miguel River at the LT, computed a geometric mean of the adjusted daily flow data. The CWCB then plotted the daily geometric mean of the LT gage in comparison to their recommended instream flows. This comparison is not useful in and of itself. If the geometric mean happens to be similar to the median, the flow data provided is only indicative of the flow that would be available half the time, or 5 out of 10 years. An analysis similar to what was presented in the CWCB's DRAFT Executive Summary is more useful. Table 2 of the CWCB's DRAFT Executive Summary presented the estimated flow of the San Miguel River at the Uravan Gage in terms of a percentage of exceedance. The percentage of exceedance provides the probability of a certain flow rate to be equaled or exceeded. Figure 1 in the CWCB's FINAL Executive Summary illustrates that the ISF is below the mean but it does not provide an indication of how often the ISF is equaled or exceeded, only that the mean flows are greater than the ISF.

4. The hydrologic analysis conducted and documented in the CWCB's DRAFT Executive Summary using the physical data (1954-2004) collected by the Uravan Gage, coupled together with the percent exceedance analysis, provides a better comparison of the minimum instream flow recommendations with physical availability within the San Miguel ISF reach. The hydrology presented in the CWCB's Final Executive Summary contains errors, as described above, and does not contain nor allow for a percent exceedance analysis, and furthermore creates a synthetic hydrologic regime that is less representative of the entire ISF reach than what is already established by the Uravan Gage record.

TABLE 1

Monthly Summary[1] of CWCB Statistical Hydrograph at Lower Terminus

(Compared to USGS Gage at Uravan, CO)

(1954 - 2007)

Month	Mean Daily Discharge at USGS Uravan Gage (cfs)	CWCB Statistical Hydrology at Lower Terminus (cfs)	CWCB's Average Daily Adjustment to Flow (cfs)	Average Monthly Adjustment (ac-ft)	Average Percent Increase (%)	Maximum Daily Adjustment to Flow (cfs)
Jan	87.8	87.6	-0.2	-11.8	-0.2%	1.6
Feb	106.0	102.4	-3.6	-198.2	-3.2%	1.3
Mar	203.1	157.6	-45.5	-2,797.1	-19.8%	-7.2
Apr	809.1	662.2	-146.9	-8,742.1	-17.4%	-27.8
May	1118.7	1085.2	-33.5	-2,058.9	-3.0%	57.8
Jun	929.5	1020.0	90.5	5,384.6	9.6%	145.2
Jul	394.5	468.7	74.2	4,564.3	20.4%	91.9
Aug	187.1	266.3	79.2	4,870.7	43.0%	103.0
Sep	130.3	192.1	61.8	3,678.9	48.6%	78.2
Oct	147.8	195.5	47.7	2,933.6	33.3%	79.9
Nov	117.6	111.1	-6.4	-382.8	-5.6%	-1.0
Dec	94.4	93.4	-1.0	-59.7	-1.0%	1.4
Annual Totals (in ac-ft)	**261,417**	**268,599**		**7,181**	**8.8%**	

[1] See Appendix A for daily values.

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Jan	1-Jan	88	87.97	-0.03	0.0%
	2-Jan	82	82.24	0.24	0.3%
	3-Jan	81	81.55	0.55	0.7%
	4-Jan	82	80.70	-1.30	-1.6%
	5-Jan	86	86.31	0.31	0.4%
	6-Jan	87	87.50	0.50	0.6%
	7-Jan	89	89.03	0.03	0.0%
	8-Jan	90	89.91	-0.09	-0.1%
	9-Jan	93	92.51	-0.49	-0.5%
	10-Jan	92	91.98	-0.02	0.0%
	11-Jan	92	89.47	-2.53	-2.7%
	12-Jan	91	86.78	-4.22	-4.6%
	13-Jan	90	89.52	-0.48	-0.5%
	14-Jan	94	92.44	-1.56	-1.7%
	15-Jan	92	92.12	0.12	0.1%
	16-Jan	89	90.57	1.57	1.8%
	17-Jan	88	89.40	1.40	1.6%
	18-Jan	88	87.85	-0.15	-0.2%
	19-Jan	89	87.77	-1.23	-1.4%
	20-Jan	88	86.99	-1.01	-1.1%
	21-Jan	88	87.65	-0.35	-0.4%
	22-Jan	85	85.54	0.54	0.6%
	23-Jan	83	83.44	0.44	0.5%
	24-Jan	81	80.21	-0.79	-1.0%
	25-Jan	83	81.88	-1.12	-1.3%
	26-Jan	88	87.75	-0.25	-0.3%
	27-Jan	92	92.12	0.12	0.1%
	28-Jan	91	91.22	0.22	0.2%
	29-Jan	87	88.02	1.02	1.2%
	30-Jan	87	88.23	1.23	1.4%
	31-Jan	87	88.38	1.38	1.6%
	Average	***88***	***87.65***	***-0.19***	***-0.2%***
	Min	***81***	***80.21***	***-4.22***	***-4.6%***
	Max	***94***	***92.51***	***1.57***	***1.8%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Feb	1-Feb	89	90.35	1.35	1.5%
	2-Feb	91	91.46	0.46	0.5%
	3-Feb	92	91.17	-0.83	-0.9%
	4-Feb	91	91.44	0.44	0.5%
	5-Feb	93	92.01	-0.99	-1.1%
	6-Feb	90	90.33	0.33	0.4%
	7-Feb	91	91.14	0.14	0.2%
	8-Feb	95	93.06	-1.94	-2.0%
	9-Feb	110	102.61	-7.39	-6.7%
	10-Feb	110	105.57	-4.43	-4.0%
	11-Feb	112	104.39	-7.61	-6.8%
	12-Feb	108	102.47	-5.53	-5.1%
	13-Feb	117	108.34	-8.66	-7.4%
	14-Feb	113	108.50	-4.50	-4.0%
	15-Feb	110	109.49	-0.51	-0.5%
	16-Feb	112	111.47	-0.53	-0.5%
	17-Feb	113	109.49	-3.51	-3.1%
	18-Feb	109	106.71	-2.29	-2.1%
	19-Feb	109	105.66	-3.34	-3.1%
	20-Feb	116	109.80	-6.20	-5.3%
	21-Feb	116	110.11	-5.89	-5.1%
	22-Feb	113	107.38	-5.62	-5.0%
	23-Feb	114	106.10	-7.90	-6.9%
	24-Feb	112	104.09	-7.91	-7.1%
	25-Feb	111	104.18	-6.82	-6.1%
	26-Feb	107	102.13	-4.87	-4.6%
	27-Feb	107	105.16	-1.84	-1.7%
	28-Feb	110	107.91	-2.09	-1.9%
	29-Feb	112	106.99	-5.01	-4.5%
	Average	***106***	***102.40***	***-3.57***	***-3.2%***
	Min	***89***	***90.33***	***-8.66***	***-7.4%***
	Max	***117***	***111.47***	***1.35***	***1.5%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Mar	1-Mar	122	114.28	-7.72	-6.3%
	2-Mar	134	115.30	-18.70	-14.0%
	3-Mar	133	117.78	-15.22	-11.4%
	4-Mar	127	115.30	-11.70	-9.2%
	5-Mar	118	110.33	-7.67	-6.5%
	6-Mar	123	115.84	-7.16	-5.8%
	7-Mar	141	122.01	-18.99	-13.5%
	8-Mar	163	123.44	-39.56	-24.3%
	9-Mar	139	119.83	-19.17	-13.8%
	10-Mar	141	120.33	-20.67	-14.7%
	11-Mar	143	125.23	-17.77	-12.4%
	12-Mar	149	129.24	-19.76	-13.3%
	13-Mar	157	134.05	-22.95	-14.6%
	14-Mar	171	143.00	-28.00	-16.4%
	15-Mar	171	144.23	-26.77	-15.7%
	16-Mar	177	148.65	-28.35	-16.0%
	17-Mar	180	149.08	-30.92	-17.2%
	18-Mar	189	150.93	-38.07	-20.1%
	19-Mar	202	153.80	-48.20	-23.9%
	20-Mar	218	163.25	-54.75	-25.1%
	21-Mar	245	168.56	-76.44	-31.2%
	22-Mar	254	177.12	-76.88	-30.3%
	23-Mar	269	185.50	-83.50	-31.0%
	24-Mar	289	196.50	-92.50	-32.0%
	25-Mar	301	207.59	-93.41	-31.0%
	26-Mar	326	219.32	-106.68	-32.7%
	27-Mar	323	224.59	-98.41	-30.5%
	28-Mar	319	225.41	-93.59	-29.3%
	29-Mar	301	221.34	-79.66	-26.5%
	30-Mar	282	219.54	-62.46	-22.1%
	31-Mar	290	225.43	-64.57	-22.3%
	Average	***203***	***157.64***	***-45.49***	***-19.8%***
	Min	***118***	***110.33***	***-106.68***	***-32.7%***
	Max	***326***	***225.43***	***-7.16***	***-5.8%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Apr	1-Apr	312	279.77	-32.23	-10.3%
	2-Apr	338	296.76	-41.24	-12.2%
	3-Apr	336	308.17	-27.83	-8.3%
	4-Apr	391	338.18	-52.82	-13.5%
	5-Apr	413	361.20	-51.80	-12.5%
	6-Apr	461	390.62	-70.38	-15.3%
	7-Apr	515	421.47	-93.53	-18.2%
	8-Apr	595	469.05	-125.95	-21.2%
	9-Apr	621	482.28	-138.72	-22.3%
	10-Apr	657	521.75	-135.25	-20.6%
	11-Apr	666	542.95	-123.05	-18.5%
	12-Apr	659	539.90	-119.10	-18.1%
	13-Apr	664	546.39	-117.61	-17.7%
	14-Apr	708	580.85	-127.15	-18.0%
	15-Apr	792	636.27	-155.73	-19.7%
	16-Apr	895	700.78	-194.22	-21.7%
	17-Apr	1010	779.55	-230.45	-22.8%
	18-Apr	1170	869.21	-300.79	-25.7%
	19-Apr	1180	883.86	-296.14	-25.1%
	20-Apr	1060	824.45	-235.55	-22.2%
	21-Apr	1010	841.64	-168.36	-16.7%
	22-Apr	1070	913.09	-156.91	-14.7%
	23-Apr	1120	922.13	-197.87	-17.7%
	24-Apr	1190	950.52	-239.48	-20.1%
	25-Apr	1160	946.98	-213.02	-18.4%
	26-Apr	1120	934.34	-185.66	-16.6%
	27-Apr	1070	913.57	-156.43	-14.6%
	28-Apr	1020	884.23	-135.77	-13.3%
	29-Apr	1040	892.50	-147.50	-14.2%
	30-Apr	1030	893.13	-136.87	-13.3%
	Average	***809***	***662.19***	***-146.91***	***-17.4%***
	Min	***312***	***279.77***	***-300.79***	***-25.7%***
	Max	***1190***	***950.52***	***-27.83***	***-8.3%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
May	1-May	1,030	947.30	-82.70	-8.0%
	2-May	1,040	976.21	-63.79	-6.1%
	3-May	1,040	978.86	-61.14	-5.9%
	4-May	1,110	1014.32	-95.68	-8.6%
	5-May	1,160	1025.55	-134.45	-11.6%
	6-May	1,130	1014.95	-115.05	-10.2%
	7-May	1,110	1020.25	-89.75	-8.1%
	8-May	1,130	1039.98	-90.02	-8.0%
	9-May	1,170	1075.89	-94.11	-8.0%
	10-May	1,140	1054.45	-85.55	-7.5%
	11-May	1,170	1059.09	-110.91	-9.5%
	12-May	1,120	1054.00	-66.00	-5.9%
	13-May	1,090	1067.24	-22.76	-2.1%
	14-May	1,080	1072.69	-7.31	-0.7%
	15-May	1,120	1108.12	-11.88	-1.1%
	16-May	1,130	1131.70	1.70	0.2%
	17-May	1,140	1130.14	-9.86	-0.9%
	18-May	1,090	1104.80	14.80	1.4%
	19-May	1,060	1117.81	57.81	5.5%
	20-May	1,090	1127.25	37.25	3.4%
	21-May	1,130	1140.65	10.65	0.9%
	22-May	1,150	1151.65	1.65	0.1%
	23-May	1,150	1144.75	-5.25	-0.5%
	24-May	1,150	1131.89	-18.11	-1.6%
	25-May	1,140	1121.88	-18.12	-1.6%
	26-May	1,110	1094.81	-15.19	-1.4%
	27-May	1,130	1110.28	-19.72	-1.7%
	28-May	1,150	1135.45	-14.55	-1.3%
	29-May	1,150	1161.10	11.10	1.0%
	30-May	1,150	1171.50	21.50	1.9%
	31-May	1120	1157.40	37.40	3.3%
	Average	***1119***	***1085.22***	***-33.48***	***-3.0%***
	Min	***1030***	***947.30***	***-134.45***	***-11.6%***
	Max	***1170***	***1171.50***	***57.81***	***5.5%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Jun	1-Jun	1,100	1156.98	56.98	5.2%
	2-Jun	1,090	1149.25	59.25	5.4%
	3-Jun	1,060	1145.33	85.33	8.1%
	4-Jun	1,060	1152.22	92.22	8.7%
	5-Jun	1,070	1167.55	97.55	9.1%
	6-Jun	1,090	1190.12	100.12	9.2%
	7-Jun	1,090	1197.89	107.89	9.9%
	8-Jun	1,100	1203.36	103.36	9.4%
	9-Jun	1,090	1210.41	120.41	11.0%
	10-Jun	1,050	1187.73	137.73	13.1%
	11-Jun	995	1140.20	145.20	14.6%
	12-Jun	967	1105.17	138.17	14.3%
	13-Jun	958	1091.40	133.40	13.9%
	14-Jun	957	1082.83	125.83	13.1%
	15-Jun	944	1086.42	142.42	15.1%
	16-Jun	924	1022.90	98.90	10.7%
	17-Jun	882	993.25	111.25	12.6%
	18-Jun	887	983.51	96.51	10.9%
	19-Jun	890	973.14	83.14	9.3%
	20-Jun	881	965.45	84.45	9.6%
	21-Jun	869	948.41	79.41	9.1%
	22-Jun	848	933.04	85.04	10.0%
	23-Jun	821	902.94	81.94	10.0%
	24-Jun	812	875.01	63.01	7.8%
	25-Jun	789	849.31	60.31	7.6%
	26-Jun	786	826.59	40.59	5.2%
	27-Jun	757	797.78	40.78	5.4%
	28-Jun	732	772.49	40.49	5.5%
	29-Jun	710	758.92	48.92	6.9%
	30-Jun	677	731.14	54.14	8.0%
	Average	***930***	***1020.02***	***90.49***	***9.6%***
	Min	***677***	***731.14***	***40.49***	***5.2%***
	Max	***1100***	***1210.41***	***145.20***	***15.1%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Jul	1-Jul	659	712.55	53.55	8.1%
	2-Jul	628	684.12	56.12	8.9%
	3-Jul	597	660.57	63.57	10.6%
	4-Jul	572	635.30	63.30	11.1%
	5-Jul	540	613.45	73.45	13.6%
	6-Jul	508	593.59	85.59	16.8%
	7-Jul	487	575.66	88.66	18.2%
	8-Jul	482	560.80	78.80	16.3%
	9-Jul	470	546.35	76.35	16.2%
	10-Jul	473	539.38	66.38	14.0%
	11-Jul	444	519.92	75.92	17.1%
	12-Jul	430	508.90	78.90	18.3%
	13-Jul	401	490.76	89.76	22.4%
	14-Jul	372	463.87	91.87	24.7%
	15-Jul	362	447.31	85.31	23.6%
	16-Jul	343	428.72	85.72	25.0%
	17-Jul	328	409.42	81.42	24.8%
	18-Jul	324	404.75	80.75	24.9%
	19-Jul	328	401.78	73.78	22.5%
	20-Jul	311	398.60	87.60	28.2%
	21-Jul	292	382.39	90.39	31.0%
	22-Jul	298	381.37	83.37	28.0%
	23-Jul	295	369.73	74.73	25.3%
	24-Jul	302	367.72	65.72	21.8%
	25-Jul	287	354.27	67.27	23.4%
	26-Jul	292	354.84	62.84	21.5%
	27-Jul	313	360.83	47.83	15.3%
	28-Jul	278	350.13	72.13	25.9%
	29-Jul	268	337.86	69.86	26.1%
	30-Jul	270	334.63	64.63	23.9%
	31-Jul	274	339.55	65.55	23.9%
	Average	***394***	***468.68***	***74.23***	***20.4%***
	Min	***268***	***334.63***	***47.83***	***8.1%***
	Max	***659***	***712.55***	***91.87***	***31.0%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Aug	1-Aug	251	332.86	81.86	32.6%
	2-Aug	233	335.24	102.24	43.9%
	3-Aug	224	327.02	103.02	46.0%
	4-Aug	230	328.17	98.17	42.7%
	5-Aug	221	311.19	90.19	40.8%
	6-Aug	232	313.29	81.29	35.0%
	7-Aug	226	308.31	82.31	36.4%
	8-Aug	211	293.69	82.69	39.2%
	9-Aug	198	283.72	85.72	43.3%
	10-Aug	182	273.76	91.76	50.4%
	11-Aug	196	269.96	73.96	37.7%
	12-Aug	185	266.04	81.04	43.8%
	13-Aug	171	255.58	84.58	49.5%
	14-Aug	164	254.47	90.47	55.2%
	15-Aug	177	277.09	100.09	56.5%
	16-Aug	200	282.45	82.45	41.2%
	17-Aug	162	263.60	101.60	62.7%
	18-Aug	175	260.85	85.85	49.1%
	19-Aug	155	250.37	95.37	61.5%
	20-Aug	167	249.72	82.72	49.5%
	21-Aug	164	251.65	87.65	53.4%
	22-Aug	153	237.79	84.79	55.4%
	23-Aug	162	244.45	82.45	50.9%
	24-Aug	191	238.03	47.03	24.6%
	25-Aug	192	238.49	46.49	24.2%
	26-Aug	187	239.07	52.07	27.8%
	27-Aug	169	230.65	61.65	36.5%
	28-Aug	149	216.13	67.13	45.1%
	29-Aug	145	211.57	66.57	45.9%
	30-Aug	172	208.78	36.78	21.4%
	31-Aug	155	200.62	45.62	29.4%
	Average	***187***	***266.28***	***79.21***	***43.0%***
	Min	***145***	***200.62***	***36.78***	***21.4%***
	Max	***251***	***335.24***	***103.02***	***62.7%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Sep	1-Sep	135	200.12	65.12	48.2%
	2-Sep	125	192.16	67.16	53.7%
	3-Sep	119	186.68	67.68	56.9%
	4-Sep	114	187.03	73.03	64.1%
	5-Sep	112	186.23	74.23	66.3%
	6-Sep	112	186.26	74.26	66.3%
	7-Sep	109	187.17	78.17	71.7%
	8-Sep	112	190.08	78.08	69.7%
	9-Sep	132	197.28	65.28	49.5%
	10-Sep	160	199.42	39.42	24.6%
	11-Sep	134	194.11	60.11	44.9%
	12-Sep	144	199.26	55.26	38.4%
	13-Sep	157	197.34	40.34	25.7%
	14-Sep	143	190.06	47.06	32.9%
	15-Sep	131	182.34	51.34	39.2%
	16-Sep	143	206.28	63.28	44.3%
	17-Sep	135	201.04	66.04	48.9%
	18-Sep	128	197.59	69.59	54.4%
	19-Sep	129	197.95	68.95	53.5%
	20-Sep	131	194.13	63.13	48.2%
	21-Sep	139	196.20	57.20	41.1%
	22-Sep	137	194.71	57.71	42.1%
	23-Sep	136	193.90	57.90	42.6%
	24-Sep	150	196.40	46.40	30.9%
	25-Sep	140	190.77	50.77	36.3%
	26-Sep	126	183.99	57.99	46.0%
	27-Sep	118	178.95	60.95	51.7%
	28-Sep	120	180.44	60.44	50.4%
	29-Sep	117	185.96	68.96	58.9%
	30-Sep	120	188.90	68.90	57.4%
	Average	***130***	***192.09***	***61.83***	***48.6%***
	Min	***109***	***178.95***	***39.42***	***24.6%***
	Max	***160***	***206.28***	***78.17***	***71.7%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Oct	1-Oct	120	172.33	52.33	43.6%
	2-Oct	127	177.40	50.40	39.7%
	3-Oct	159	184.85	25.85	16.3%
	4-Oct	143	183.44	40.44	28.3%
	5-Oct	135	183.06	48.06	35.6%
	6-Oct	177	186.96	9.96	5.6%
	7-Oct	182	196.42	14.42	7.9%
	8-Oct	164	193.86	29.86	18.2%
	9-Oct	172	202.21	30.21	17.6%
	10-Oct	170	198.02	28.02	16.5%
	11-Oct	158	197.11	39.11	24.8%
	12-Oct	154	195.39	41.39	26.9%
	13-Oct	155	197.67	42.67	27.5%
	14-Oct	149	196.87	47.87	32.1%
	15-Oct	152	197.70	45.70	30.1%
	16-Oct	153	200.92	47.92	31.3%
	17-Oct	147	200.24	53.24	36.2%
	18-Oct	148	200.95	52.95	35.8%
	19-Oct	148	201.91	53.91	36.4%
	20-Oct	145	199.54	54.54	37.6%
	21-Oct	148	195.64	47.64	32.2%
	22-Oct	139	194.48	55.48	39.9%
	23-Oct	135	192.98	57.98	42.9%
	24-Oct	136	194.42	58.42	43.0%
	25-Oct	135	191.65	56.65	42.0%
	26-Oct	139	197.87	58.87	42.4%
	27-Oct	143	207.89	64.89	45.4%
	28-Oct	136	207.07	71.07	52.3%
	29-Oct	140	215.07	75.07	53.6%
	30-Oct	137	216.86	79.86	58.3%
	31-Oct	137	181.24	44.24	32.3%
	Average	***148***	***195.55***	***47.71***	***33.3%***
	Min	***120***	***172.33***	***9.96***	***5.6%***
	Max	***182***	***216.86***	***79.86***	***58.3%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Nov	1-Nov	143	133.24	-9.76	-6.8%
	2-Nov	144	134.23	-9.77	-6.8%
	3-Nov	135	131.41	-3.59	-2.7%
	4-Nov	130	125.92	-4.08	-3.1%
	5-Nov	130	125.08	-4.92	-3.8%
	6-Nov	138	128.24	-9.76	-7.1%
	7-Nov	132	127.60	-4.40	-3.3%
	8-Nov	127	123.85	-3.15	-2.5%
	9-Nov	128	125.58	-2.42	-1.9%
	10-Nov	126	124.95	-1.05	-0.8%
	11-Nov	123	121.82	-1.18	-1.0%
	12-Nov	127	123.70	-3.30	-2.6%
	13-Nov	121	117.18	-3.82	-3.2%
	14-Nov	116	112.07	-3.93	-3.4%
	15-Nov	116	111.98	-4.02	-3.5%
	16-Nov	108	105.18	-2.82	-2.6%
	17-Nov	103	98.28	-4.72	-4.6%
	18-Nov	101	94.97	-6.03	-6.0%
	19-Nov	118	94.30	-23.70	-20.1%
	20-Nov	111	93.36	-17.64	-15.9%
	21-Nov	106	96.70	-9.30	-8.8%
	22-Nov	105	97.72	-7.28	-6.9%
	23-Nov	108	100.85	-7.15	-6.6%
	24-Nov	106	103.03	-2.97	-2.8%
	25-Nov	109	103.50	-5.50	-5.0%
	26-Nov	111	103.81	-7.19	-6.5%
	27-Nov	104	97.41	-6.59	-6.3%
	28-Nov	100	94.12	-5.88	-5.9%
	29-Nov	100	91.55	-8.45	-8.4%
	30-Nov	101	92.36	-8.64	-8.6%
	Average	***118***	***111.13***	***-6.43***	***-5.6%***
	Min	***100***	***91.55***	***-23.70***	***-20.1%***
	Max	***144***	***134.23***	***-1.05***	***-0.8%***

APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus

(1954-2007)

	Date	Mean Daily Discharge San Miguel River @ Uravan (cfs)	CWCB Adjusted Flow @ LT Gage (cfs)	Adjustment (cfs)	Percent Adjustment
Dec	1-Dec	101	98.72	-2.28	-2.3%
	2-Dec	101	100.86	-0.14	-0.1%
	3-Dec	103	102.72	-0.28	-0.3%
	4-Dec	102	100.97	-1.03	-1.0%
	5-Dec	101	101.19	0.19	0.2%
	6-Dec	98	97.63	-0.37	-0.4%
	7-Dec	100	101.18	1.18	1.2%
	8-Dec	100	101.39	1.39	1.4%
	9-Dec	98	96.57	-1.43	-1.5%
	10-Dec	95	93.26	-1.74	-1.8%
	11-Dec	97	96.86	-0.14	-0.1%
	12-Dec	93	93.28	0.28	0.3%
	13-Dec	92	92.05	0.05	0.1%
	14-Dec	90	88.93	-1.07	-1.2%
	15-Dec	89	89.18	0.18	0.2%
	16-Dec	91	91.22	0.22	0.2%
	17-Dec	93	91.75	-1.25	-1.3%
	18-Dec	91	90.25	-0.75	-0.8%
	19-Dec	93	91.60	-1.40	-1.5%
	20-Dec	92	90.02	-1.98	-2.2%
	21-Dec	91	88.57	-2.43	-2.7%
	22-Dec	90	89.28	-0.72	-0.8%
	23-Dec	92	91.43	-0.57	-0.6%
	24-Dec	90	89.49	-0.51	-0.6%
	25-Dec	91	90.04	-0.96	-1.1%
	26-Dec	92	90.36	-1.64	-1.8%
	27-Dec	91	88.60	-2.40	-2.6%
	28-Dec	92	89.97	-2.03	-2.2%
	29-Dec	93	90.77	-2.23	-2.4%
	30-Dec	94	88.63	-5.37	-5.7%
	31-Dec	89	88.15	-0.85	-1.0%
	Average	***94***	***93.38***	***-0.97***	***-1.0%***
	Min	***89***	***88.15***	***-5.37***	***-5.7%***
	Max	***103***	***102.72***	***1.39***	***1.4%***

DEERE & AULT
CONSULTANTS, INC.

MEMORANDUM

TO: **Colorado Water Conservation Board**

FROM: **Daniel V. Ault, P.E.**

DATE: **July 15, 2011**

RE: **Impact of the Proposed San Miguel River Instream Flow Filing on Water Available Under the Colorado River Basin Compact**

This memorandum summarizes Deere & Ault Consultants' (D&A) concerns regarding the impact of the Colorado Water Conservation Board (CWCB) Instream Flow (ISF) on San Miguel River water rights subject to a potential compact curtailment of diversions by Colorado River basin water users within Colorado under the provisions of the Colorado River Compact of 1922 and the Upper Colorado River Basin Compact of 1948. The Colorado River Compact provides that the states of the Upper Division of the Colorado River, including Colorado, will not cause the flow of the river at Lee's Ferry to be depleted below an aggregate of 75 million acre-feet for any period of 10 consecutive years. If the flow at Lee's Ferry is depleted in excess of the compact requirement, water rights with appropriation dates junior to November 24, 1922 could be curtailed.

PRE-COMPACT WATER RIGHTS

The Colorado Revised Statutes, Sections 37-92-102 (3) and (4)(d) provides that the CWCB can obtain decrees for minimum instream flows as it determines will preserve the natural environment to a reasonable degree while protecting existing uses within Colorado and not depriving the people of the State of Colorado of the beneficial use of those waters available by law and interstate compact. There is a potential that the proposed CWCB ISF could deprive the water users in the State of Colorado of the beneficial use of waters available according to the Colorado River Compact. In the event of a compact curtailment, the CWCB ISF right could be administered in such a way that would limit exchange of water rights on the San Miguel River with priority dates prior to November 24, 1922 ("Pre-1922 water rights") into upstream storage or to upstream locations requiring augmentation water. There are several Pre-1922 water rights that divert water from the San Miguel River within the currently proposed instream flow reach extending from the confluence of Calamity Draw down to the confluence with the Dolores River. The locations of these water rights are shown on the attached Figure 1, which is a schematic line diagram of water rights on the San Miguel River. These water rights include the following:

600 S. Airport Road, Building A, Suite 205
Longmont, CO 80503
Phone: 303-651-1468 ● Fax: 303-651-1469

Ditch Name	Appropriation Date	Flow Rate
Johnson Ditch	April 10, 1891	3.8 cfs
Johnson Ditch	February 16, 1903	3.75 cfs
Johnson Ditch	February 16, 1903	26.2 cfs
Johnson Ditch	July 21, 1913	16.8 cfs
Blake and Payson Pump Station	September 30, 1917	6.0 cfs
Richard's Pump Station No. 1	May 1, 1894	0.598 cfs
Richard's Pump Station No. 1	December 8, 1896	2.394 cfs
Richard's Pump Station No. 1	June 3, 1911	4.243 cfs

In Case No. 10CW194, Montrose County filed a change of water rights application for the four Johnson Ditch priorities and for an appropriative right of exchange on the San Miguel River from the Johnson Ditch to the Uravan Gage in the amount of 10.0 cfs. If Montrose County obtains a decree with a 2010 priority date, then these changed water rights and the proposed exchange would be senior to the CWCB ISF right, and a compact curtailment would not inhibit Montrose County's ability to exchange water upstream. However, if the Water Court does not grant Montrose County a water right senior to the CWCB ISF right, Montrose County's ability to exchange water upstream would be impacted by the proposed CWCB ISF right. In addition, the other Pre-1922 water rights previously mentioned could be prevented from being used as a substitute supply for an exchange to upstream locations as a result of the CWCB ISF filing. It is anticipated that in the event of compact curtailment, many water rights on the San Miguel River would be curtailed and Pre-1922 water rights would need to be exchanged to upstream locations for storage or to augment stream depletions for critical uses.

In order to preserve the ability of water rights in the San Miguel River basin to continue diverting water during a period of compact curtailment and avoid any impact from the CWCB ISF water right, the following terms and conditions are proposed:

- During any period identified by the Upper Colorado River Commission in a finding issued pursuant to Article VIII(d)(8) of the Upper Colorado River Basin Compact of 1948 for curtailment of Colorado River basin water uses within Colorado, which the State of Colorado has agreed to implement in a manner that impacts water diversions within Water Division 4, the CWCB agrees that this ISF water right will be administered in accordance with compact curtailment rules adopted by the State of Colorado that are then in effect, if any. If no such compact curtailment rules are then in effect, it is the intent of the CWCB that this instream flow right will not be administered to prevent or limit the use of water that may be consumptively used in the San Miguel River basin during such a period of compact curtailment.

- This ISF water right will not be administered to prevent or limit exchanges within, through, or affecting this ISF reach of water that may be consumptively used in the San Miguel River basin during such a period of compact curtailment, including exchanges of such water to storage prior to and in anticipation of such curtailment.

FUTURE UTILIZATION OF COMPACT ENTITLEMENTS

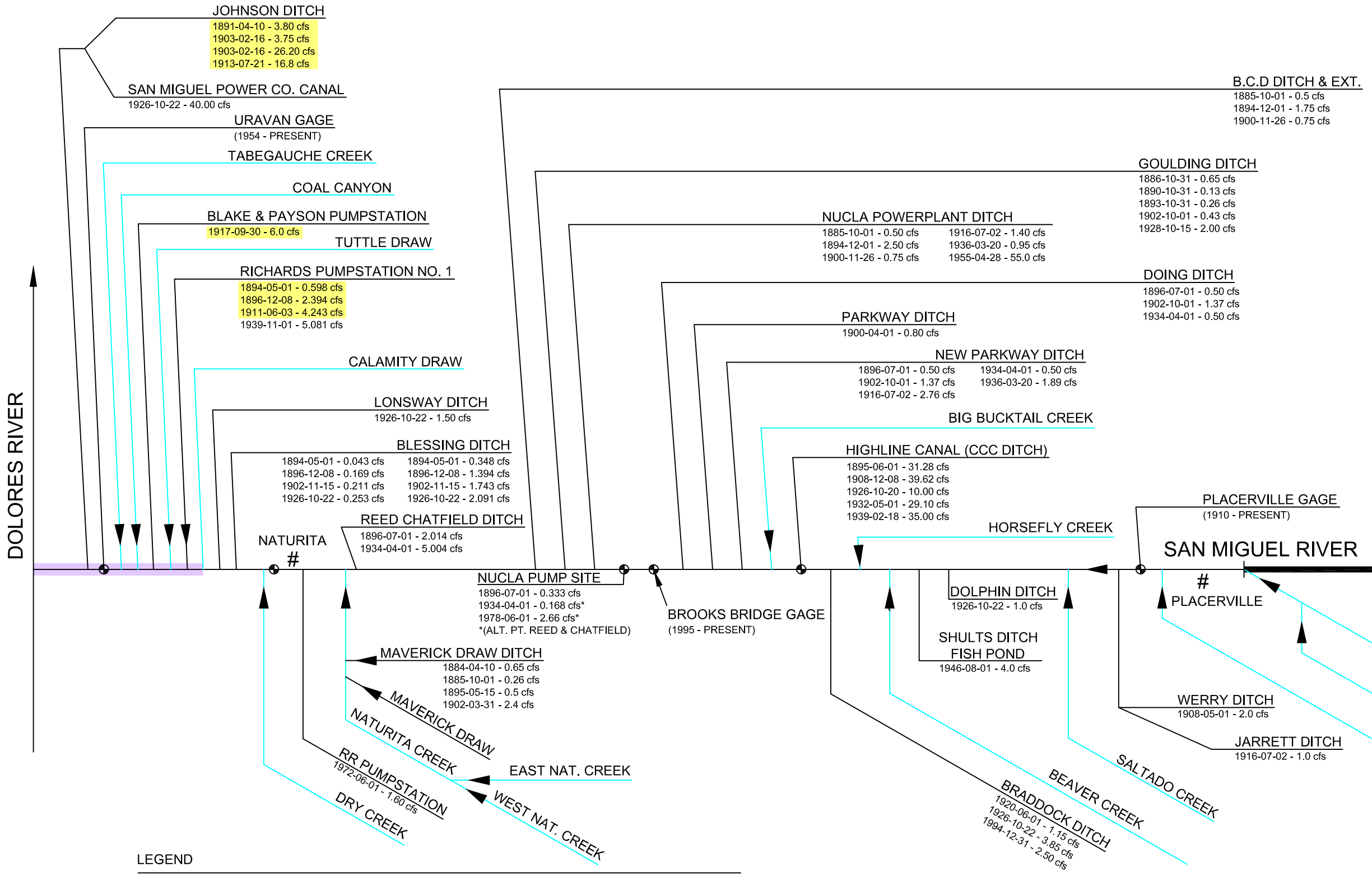
As summarized in D&A's June 20, 2011 memorandum to the Montrose County Commissioners entitled "*2060 Water Demand for the West End of Montrose County*," there will be an increase in demand of 6,400 acre-feet per year in the western portion of Montrose County by the year 2060. However, water demands in the western portion of Montrose County beyond the year 2060 could be even higher.

One of the fundamental goals of the CWCB is to develop waters of the State to "*fully utilize State Compact entitlements*." Utilization of water within the San Miguel River basin is a component of fully utilizing the State's compact entitlement under the Colorado River Compact. In 1994, the CWCB formed a work group referred to as the "Endangered Fish Flow and Colorado River Compact Water Development Workgroup", which prepared a report on November 2, 1995 entitled, "*Colorado River Compact Water Development Projection.*" The 1995 report (Table 4) includes estimates of future potential depletions that could occur in the Dolores River basin in order to fully utilize the State's compact entitlement.

This report estimated future potential annual depletions in Colorado's Dolores River basin to be in the range of 35,187 acre-feet to as high as 225,213 acre-feet. Although the range of future potential depletions for the San Miguel River basin within the Dolores River basin was not determined in this report, an approximation of future depletions can be made by comparing the amount of water available at the mouth of the San Miguel River as a percentage of the flow in the Dolores River. This methodology is consistent with the methodology used in the report to divide up Colorado River Basin future development projections between the mainstem of the Colorado River, the Gunnison River and the Dolores River. The average annual natural flow of the Dolores River basin in Colorado is approximately 843,500 acre-feet. The average annual natural flow at the mouth of the San Miguel River at the Uravan Gage is approximately 300,000 acre-feet. The amount of water available from the San Miguel River is approximately 35.6 percent of the total Dolores River basin flow, which would result in a range of potential future depletions for the San Miguel River basin in the range of 12,500 to 80,200 acre-feet.

Therefore, based on the 1995 report, the minimum depletion necessary for future uses in the San Miguel River basin in order to fully utilize the State's share of Colorado River Compact would be approximately 12,500 acre-feet. This minimum amount of future depletion is nearly double the amount that was filed on by Montrose County in their 2010 water rights applications.

As shown in Figures 2 and 3, the proposed CWCB ISF is frequently higher than the actual flow of the San Miguel River at the Uravan/Colorado Gage during dry years. Figure 2 shows a comparison of the actual mean daily discharge for the Uravan Gage in 2002 as compared to the CWCB ISF. Figure 3 shows a comparison of the mean daily discharge for a typical dry year as compared to the CWCB ISF flow rates. In Figure 3, the typical dry year hydrograph is the average of mean daily discharges for the five driest years in the 1954 through 2010 study period, which includes the years 1959, 1977, 1981, 1990, and 2002. As shown in these graphs, in dry years the proposed CWCB ISF flow rates could deprive development of compact entitlements in the West End of Montrose County on the San Miguel River beyond the level of existing water rights filings.



JOB NO. 0410.001.00

SAN MIGUEL RIVER
Water Rights Diagram

DEERE & AULT CONSULTANTS, INC.

FIGURE NO. 1

DATE: 7-14-11

SCALE: NTS

FIGURE 2

San Miguel River

USGS Gage at Uravan, CO

2002 Mean Daily Discharge

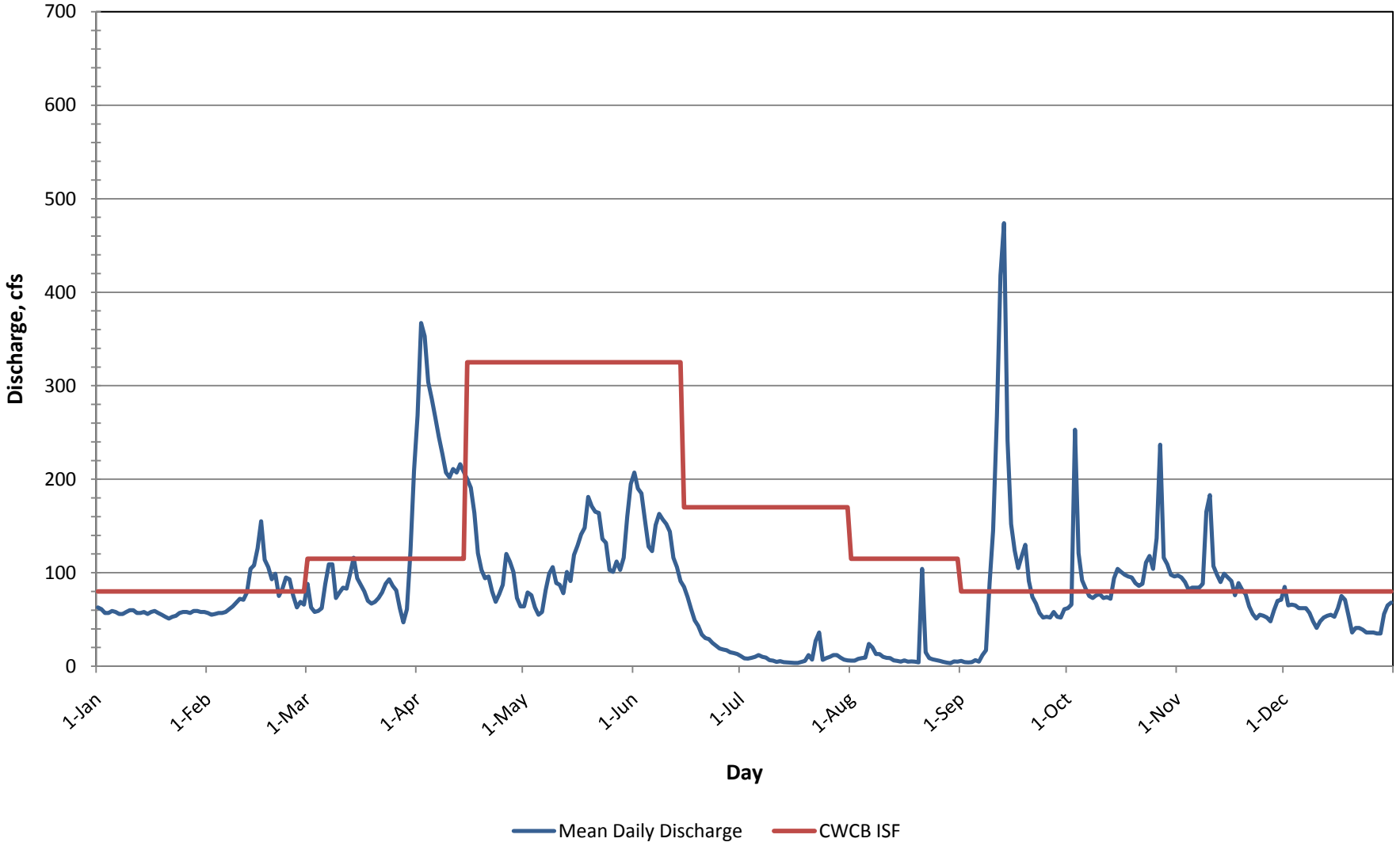
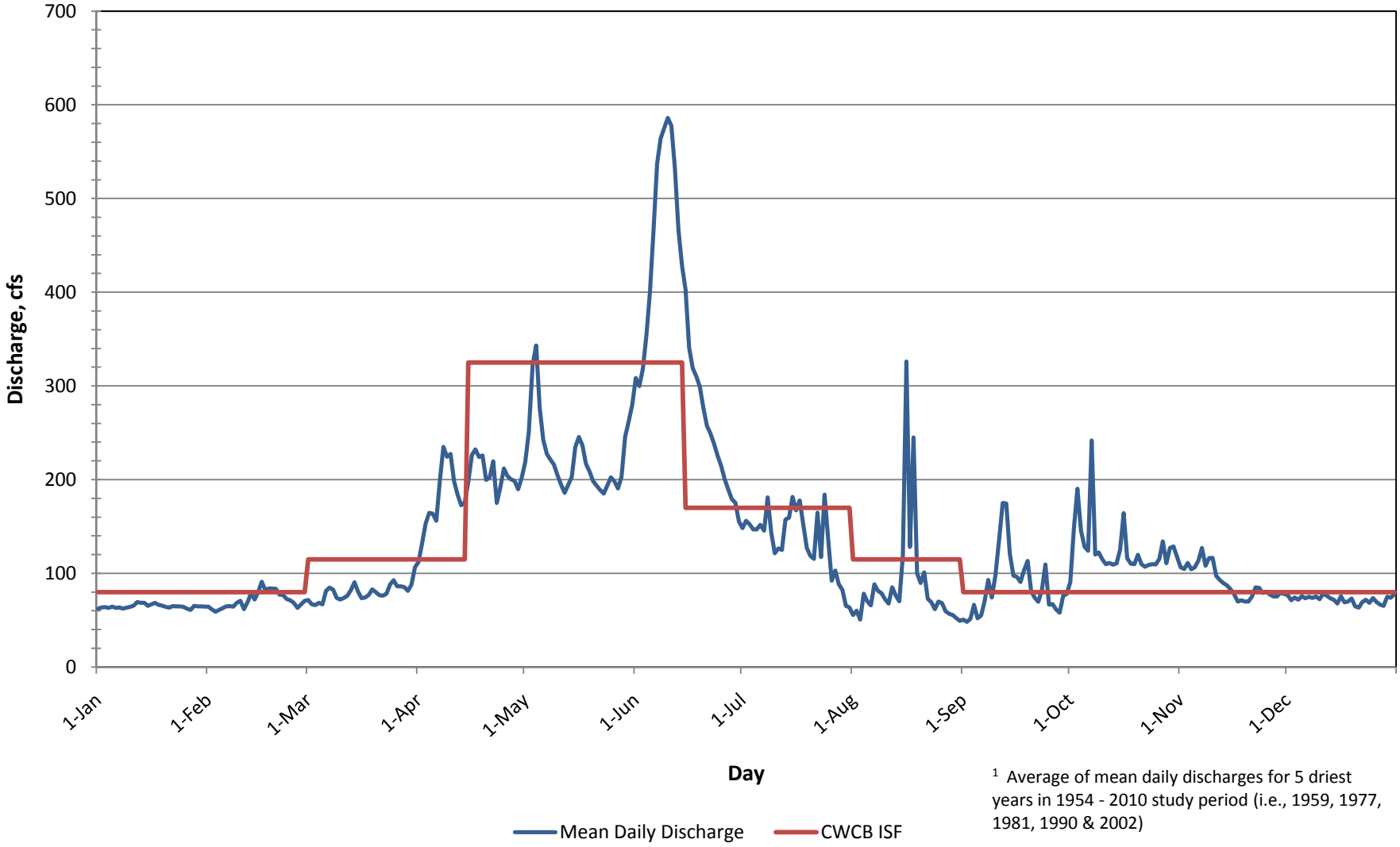


FIGURE 3

San Miguel River

USGS Gage at Uravan, CO

Dry Year[1] Mean Daily Discharge



[1] Average of mean daily discharges for 5 driest years in 1954 - 2010 study period (i.e., 1959, 1977, 1981, 1990 & 2002)

Daniel V. Ault, P.E.

President

EDUCATION AND SPECIAL TRAINING

M.S. Civil Engineering, Colorado State University, 1981
B.S., Civil and Environmental Engineering, University of Colorado-Boulder, 1976

REGISTRATIONS/CERTIFICATIONS

Professional Engineer, Colorado

PROFESSIONAL ORGANIZATIONS/ASSOCIATIONS

American Water Resources Association
American Society of Civil Engineers
Colorado Water Congress

QUALIFICATIONS

Mr. Ault has managed a wide variety of engineering projects ranging in scope from feasibility studies to large scale dam and reservoir design. His areas of expertise include water rights, water resources engineering, surface and groundwater hydrology, river basin operation studies, hydraulic design, and dam design.

Mr. Ault has been active in the planning and design of municipal, agricultural, and domestic water supplies. In the water rights and water resources engineering fields, the types of projects managed by Mr. Ault have included surface and groundwater hydrology studies, water rights analyses, water quality analyses, financial and economic feasibility studies for water rights, reservoir operations studies, computer modeling of river systems, and groundwater modeling. Mr. Ault has provided expert witness testimony in water rights litigation and other water resources related litigation, as well as general consultation to municipal water users, private water users, water and sanitation districts, ditch companies, and water user's associations.

In the civil engineering field, Mr. Ault has managed a large variety of feasibility studies, preliminary designs, final designs, and construction engineering for pipelines, open channel canals, spillways, dams, reservoirs, pump stations, and a variety of hydraulic structures. In combination with his water rights experience, the civil design experience has been applied successfully to the development of numerous raw water supply systems for a variety of water users.

RELEVANT EXPERIENCE

Water Resources Project Experience

Rio Grande Project. Mr. Ault has provided engineering technical assistance to the Department of Justice and Bureau of Reclamation to resolve water rights and operational issues that have developed as part of a water rights litigation proceeding. Entities involved include the Bureau of Reclamation, State of Colorado, State of New Mexico, State of Texas, International Compact Commission, Elephant Butte

Irrigation District, El Paso County Water Improvement District No. 1, and other water users within the Rio Grande Project. Mr. Ault conducted surface water hydrologic investigations, development of an operating plan, analysis of Rio Grande Project yields, analyses of water quality impacts and negotiations with other parties to assist in the settlement of their water rights litigation. Mr. Ault will provide expert witness testimony should the on-going litigation proceed to trial.

Aurora - General Water Resources Engineering. Mr. Ault has provided on-going water resources consulting services to the City of Aurora since 1985. Aurora provides water to approximately 307,000 people within its City limits. Services have included water resources planning, water rights analyses and litigation support. Mr. Ault managed an extensive investigation of the lawn irrigation return flows (LIRFs) within the City's service area and provided engineering support to quantify LIRF credits in Case No. 02CW341. He also provided engineering and litigation support to the City with its augmentation plan for irrigation of parks and golf courses, utilizing its LIRF credits in Case No. 06CW257. Mr. Ault has provided water rights consulting to Aurora for its applications for new junior water rights filings, changes of use of water rights, and as an objector in protecting the City's interests from injury from other water users' water rights applications.

Aurora - Prairie Waters Project. The Prairie Waters Project (PWP) consists of diversion of Aurora's South Platte River water rights near Brighton, Colorado, to natural purification systems, referred to as Aquifer Recharge and Recovery (ARR) sites, where the movement of water through sand and gravel takes the water through a natural cleaning process. The ARR sites are sealed from the surrounding alluvial material by constructing a low permeability barrier. Water is pumped from the ARR sites to a pump station and delivered to the City of Aurora through 34 miles of a 60-inch diameter pipeline. PWP water will be treated at the Peter Binney Water Purification Facility. The project will initially provide an annual water supply of 10,000 acre-feet by the year 2011. Mr. Ault provided technical assistance on various aspects of this project, including the initial investigations regarding the feasibility and planning of this project, water rights investigations, and development of a model of the Aurora Raw Water Model System that included the new water sources and components of the PWP. The model was used to predict yields from the PWP and assist in the planning of water acquisition needs, storage requirements, and sizing of water delivery components. Mr. Ault provided engineering and litigation support to the City for their applications for the PWP conditional water rights, exchanges, and plan for augmentation in Case Nos. 03CW414, 03CW415, and 06CW104.

Thornton Northern Water Supply Project. This project involved a series of engineering studies relating to the City of Thornton's proposed diversion of water from the Water Supply and Storage Company system and subsequent delivery of water to the Poudre River, South Platte River, and City of Thornton via pipeline. Engineering analyses included documentation of the historic use of the water rights, groundwater studies to document historic return flows from irrigation, analysis of exchange potential on the Poudre River, analysis of the yield of 1986 direct flow water rights, development of a groundwater model and river model of the lower Poudre River basin, development of a model of Thornton's raw water supply system, general consulting relating to optimization of Thornton's water rights and objection to other water rights cases on the Poudre River. Extensive expert witness testimony was provided on this project during the course of depositions and a 53-day trial. In 1994, the District Court, Water Division No. 1, State of Colorado, awarded the City of Thornton a decree authorizing the diversion of an average of 56,800 acre-feet per year.

Central City Water Rights. Since 1995, Mr. Ault has provided consulting services to Central City involving water resources planning, modeling, and adjudication of Central City's portfolio of water rights. Mr. Ault managed the development of a daily operational computer model for Central City's raw water supply system. Mr. Ault has conducted numerous analyses of Central City's water rights and other

competing water rights in the vicinity of Central City. He was the lead expert witness for Central City in a Water Court proceeding which successfully adjudicated several new junior water rights for Central City, including direct flow rights, storage rights, appropriative rights of exchange, and a plan for augmentation.

South Platte Reservoir Project. Project Manager for the design of hydraulic structures appurtenant to a 6,400 acre-foot lined gravel pit storage reservoir. This work included 9,000 feet of 48-inch pipeline, 60 cfs pump station, ditch rehabilitation, and 20,000 cfs flood bypass channel.

Harper Lake Dam and Reservoir. Project Manager for feasibility study through design and construction of a $3.5 million municipal raw water storage reservoir including dam, pump station, pipeline, and other appurtenant structures. Acted as liaison between City of Louisville, Colorado and CWCB on this jointly funded project.

Pueblo Exchange Study. Project Manager for engineering studies related to plans for reuse and exchange involving over 50 exchanges on the Arkansas River. Supervised development of an operational computer model of Pueblo's Arkansas River and transmountain water resources including analysis of the impact of various exchanges on Pueblo's rights. Provided expert witness testimony.

Clear Creek Exchange Study. Project Manager for engineering study to determine feasibility of exchanging City of Thornton water rights into Standley Reservoir for Adolph Coors Company and Golden effluent downstream. Supervised development of a computer model of Thornton's Clear Creek rights, yield projections, cost estimates, and operational analysis of system. Provided expert witness testimony.

McDowell Ranch Transfer. Conducted all engineering studies, prepared exhibits, and was expert witness in transfer of water rights from eight irrigation ditches near Fairplay, Colorado to municipal use by City of Thornton, resulting in successful transfer of 1,600 acre-feet per year.

City of Longmont Transfers. Project Manager for City of Longmont exchange of use of water rights from six irrigation ditches to municipal use resulting in successful transfer of 7,000 acre-feet per year.

City of Boulder. Primary expert witness for District 6 Water Users as objector to transfer by City of Boulder involving transfer of water rights from five irrigation ditches to municipal use.

City of Golden. Analysis of plan for augmentation involving storage reservoirs, claim for lawn irrigation return flow credit, transfer to direct flow irrigation rights to municipal use, claim for sewage effluent reuse credit. Services provided to objector.

Coffintop Reservoir Feasibility Study. Project Manager and principal author of a study to determine the feasibility of constructing a 116,000 acre-foot reservoir for municipal and agricultural use. Study included reservoir sizing and location, dam type, hydroelectric power generation including FERC licensing, pumped storage, and economic analysis.

Windy Gap Reuse. Project Manager on study to determine feasibility of supplying reusable effluent derived from first use of Windy Gap water to downstream user.

Groundwater Modeling Experience

City of Longmont. Project Manager for development of finite-difference model of the City of Longmont and vicinity to determine the amount, timing and location of agricultural irrigation return flows and municipal lawn irrigation return flows to St. Vrain Creek.

Lower Cache la Poudre River Basin. Principal in charge of hydrogeologic studies and development of a MODFLOW computer model to determine the amount, timing and location of stream depletions to the Poudre River and its tributaries and to determine the impact on groundwater levels due to dry-up of 120 irrigated farms as part of the City of Thornton Northern Water Supply Project.

City of Pueblo. Project Manager for hydrogeologic studies and development of MODFLOW computer model of the City of Pueblo service area and vicinity to determine the amount, timing and location of lawn irrigation return flows to Fountain Creek and the Arkansas River.

Black Squirrel Creek Basin. Staff engineer responsible for data collection, model development, model calibration and model implementation of a predecessor of the MODFLOW model used to model the impact of various pumping scenarios in the Black Squirrel Creek Basin.

South Park Conjunctive Use Project. Performed peer review of the field data collection and assisted in the set-up and development of a five-layer MODFLOW model of the South Park aquifer.

Aurora Lawn Irrigation Return Flow Project. Project Manager for hydrogeologic studies and development of MODFLOW computer model of the City of Aurora service area and vicinity to determine the amount, timing and location of lawn irrigation return flows to Sand Creek, Cherry Creek and their tributaries.

PUBLICATIONS

Solak, M.E., Griffith, D.A., Ault, D.V., and Severin, M.A., 2000, "*Innovative Design Approaches for the South Platte Reservoir*," Proceedings, Assoc. of State Dam Safety Officials, West Region Annual Conference, May 15-19.

Ault, D.V., and Hesemann, T.J., 1994, "*Application of Groundwater Models in Water Rights Transfers, Case Study: City of Thornton, Colorado, Northern Water Supply Project*," Proceedings, 1994 Groundwater Modeling Conference, August 10-12.

Ault, D.V., 1981, "*Calibration of a River Basin Simulation Model (MODSIM)*," CSU, Civil Engineering Department, September.

SUMMARY OF EXPERT WITNESS EXPERIENCE
DANIEL V. AULT, P.E.

Case	Client	Description
FRICO, Burlington Ditch Company and Henrylyn Irrigation District Case No. 02CW403	City of Aurora, Colorado (Opposer)	Deposition and trial testimony in the adjudication of change of use of direct flow and storage water rights, alternate points of diversion and places of storage, river exchange, junior conditional direct flow and storage rights, and plan for augmentation.
City of Aurora Application for Storage Rights and Underground Storage Rights Case No. 03CW414	City of Aurora, Colorado (Applicant)	Trial testimony in the adjudication of conditional storage rights and underground storage rights.
FRICO, Burlington Ditch Company, and Henrylyn Irrigation District Case No. 02CW105-A	City of Aurora, Colorado (Opposer)	Deposition testimony in the adjudication of a private in-ditch exchange involving South Platte River storage rights.
Central City Water Rights Applications: Case Nos. 91CW125, 92CW168, 94CW063, 96CW1032	Central City, Colorado (Applicant)	Adjudication of conditional direct flow, storage and exchange rights; change of use of water rights; and plan for augmentation on Clear Creek and North Clear Creek.
Prairie Ditch Company Recharge Plan Case No. 96CW045	Prairie Ditch Company (Applicant)	Adjudication of the use of surface water rights from the Rio Grande River to recharge the unconfined aquifer of the Closed Basin of the San Luis Valley.
City of Black Hawk Augmentation Plan Case No. 94CW036	Central City, Colorado (Opposer)	Plan for augmentation (614 acre-feet per year); change of use of water rights (460 acre-feet per year).
City of Black Hawk Water Rights Adjudication Case Nos. 92CW058, 92CW059, 93CW055	Central City, Colorado (Opposer)	Adjudication of City of Black Hawk's filing for conditional direct flow, storage and exchange rights on Clear Creek and North Clear Creek.
South Park Conjunctive Use Project Case No. 96CW014	Duncan, Ostrander and Dingess for City of Aurora, Colorado (Applicant)	Engineering feasibility and groundwater investigations for deep wells, recharge basins, and augmentation facilities.
Centennial Water and Sanitation District v. Kiewit Construction Company et.al. Case No. 93CV905	Centennial Water and Sanitation District (Petitioner)	Condemnation proceeding involving value of 6,200 acre-foot storage reservoir on 215 acre parcel.
West Pueblo Ditch Case No. 90CW55	Board of Water Works of Pueblo, Colorado (Applicant)	Change of use of an agricultural water right to municipal use in the City of Pueblo involving change of 1,540 acre-feet per year.
Senate Bill 89-181 Rules and Regulations	Board of Water Works of Pueblo, Colorado	Preliminary hearing before the State Engineer regarding implementation of the Rules and Regulations for Senate Bill 89-181.

Case	Client	Description
Clear Creek Water Quality Restoration Plan (aka Cosmic Exchange) Case No. 88CW268	City of Thornton, City of Westminster, and Adolph Coors Company (Applicants)	Adjudication of a series of exchanges involving storage of treated sewage effluent and subsequent exchange to various points of diversion on Clear Creek. Exchange up to 149.5 cfs and 3,980 acre-feet per year.
Thornton Northern Water Supply Project Case Nos. 86CW401, 402, 403, and 87CW332	City of Thornton (Applicant)	Change of use of water rights, river exchanges, ditch exchanges, and conditional water rights appropriations on the Poudre River. Testified regarding agricultural use of the water rights, groundwater modeling, river system operational modeling, and project feasibility. Final decree approved diversions averaging 56,800 acre-feet per year.
American Water Development Case No. 86CW46	American Water Development (Applicant)	Deposition testimony related to river modeling and other engineering studies to support a plan for augmentation involving replacement of well pumping depletions with surface water supplies in the San Luis Valley of Colorado.
Cohagen Plan for Augmentation Case No. 85CV137	John Cohagen (Applicant)	Adjudication of conditional water rights and plan for augmentation for commercial nursery operation near Boulder, Colorado.
Northern Colorado Water Conservancy District Poudre Project Case Nos. 85CW206, 207, et.al.	City of Thornton (Opposer)	Analysis of impacts of the Poudre Project on City of Thornton's water rights. Conducted computer modeling of available storage water and impact on Thornton's project due to storage of water in Grey Mountain Reservoir.
Board of Water Works Exchange Plan Case Nos. 84CW177, 178, and 86CW111	Board of Water Works of Pueblo, Colorado (Applicant)	Case involving claims for reusable return flows from transmountain water, exchange of the transmountain return flows to storage, and exchange of stored water between reservoirs owned or leased by Pueblo.
Board of Water Works Lawn Irrigation Return Flow Case 84CW117(B) and 90CW55(B)	Board of Water Works of Pueblo, Colorado (Applicant)	Case involving quantification of return flows from non-sewered sources, primarily lawns and landscape irrigation. Final decree approved claims for up to 4,000 acre-feet per year.
Ed Cole Case No. 84CW1113-3	Ed Cole (Plaintiff)	Civil Action regarding flooding and mud slide damages.
Byron Wells Drain Case No. 83CW172	Byron Wells (Applicant)	Water rights adjudication for drainage pipeline near Louisville, Colorado.
Golden Plan for Augmentation Case No. 83CW361	City of Thornton (Opposer)	Case involving lawn irrigation return flow, reuse of municipal sewage effluent, effect of proposed plan on Thornton's Clear Creek water rights.
Thornton South Platte/Clear Creek Exchange Plan Case Nos. 83CW81 and 90CW231	City of Thornton (Applicant)	Two cases involving exchange of water rights from the South Platte River upstream into Standley Lake Reservoir and other points on Clear Creek. Decrees authorized exchange up to 200 cfs.

Case	Client	Description
Harper Lake Reservoir Case No. 82CW467	City of Louisville (Applicant)	Water rights adjudication for 700 acre-foot storage right near Louisville, Colorado.
Lake Erie Transfer Case No. 82CW222	City of Thornton (Applicant)	Change of use of agricultural storage right to municipal use involving 166 acre-feet per year.
Robert Ball Case No. 82CW013	Robert Ball (Applicant)	Adjudication of storage right near Rustic, Colorado.
City of Longmont Transfers Case Nos. 81CW355, 356, 357, 360, 361, and 362	City of Longmont (Applicant)	Transfer of water rights from six irrigation ditches to municipal use in City of Longmont resulting in successful transfer of 7,000 acre-feet per year. Testimony included groundwater modeling of lawn irrigation return flows.
Kent Bowron Case No. 81CW172	Kent Bowron (Applicant)	Water rights adjudication for drainage pipeline and wells near Niwot, Colorado.
Pine Brook Plan for Augmentation Case No. 81CW466	Pine Brook Water District (Applicant)	Plan for augmentation involving wells, three irrigation ditches, and approximately 170 acre-feet per year.
Spicer versus Davis Case No. 81CW013	Harold Spicer (Defendant)	Civil action involving analysis of ditch conveyance losses, ditch capacities, and crop consumptive use.
West Gravel Lakes Case No. 81CW448	City of Thornton (Applicant)	Adjudication of 3,000 acre-foot storage right near confluence of Clear Creek and South Platte River.
Swiss Village Inn Case No. 79CW277	St. Vrain and Left Hand Water Conservancy District (Opposer)	Case involving claim for developed water from removal peat bog near Allenspark, Colorado.
Town of Jamestown Case No. 79CW333	Left Hand Ditch Company (Opposer)	Litigation involving plan for augmentation for Town of Jamestown, Colorado.
City of Boulder Case Nos. W-7569, W-7570, and W-8520-77	Water Users Association of District 6 (Opposer)	City of Boulder transfer to municipal use of water rights from five irrigation ditches with average annual yield of 3,300 acre-feet per year.
McDowell Ranch Transfer Case No. W-8435-76	City of Thornton (Applicant)	Transfer of water rights from eight irrigation ditches near Fairplay, Colorado to municipal use by the City of Thornton resulting in successful transfer of 1,600 acre-feet per year.
Aquapure Partnership	Aquapure Partnership (Applicant)	Change of water rights for four tributary wells near Wellington, Colorado.
Bessemer Ditch Company Case No. W-4427	Bessemer Ditch Company (Applicant)	Transfer of 150 cfs direct flow right to storage near Pueblo, Colorado.

Branden B. Effland, P.E.

Civil Engineer - Water Resources

EDUCATION AND SPECIAL TRAINING

B.S. Civil Engineering, South Dakota School of Mines & Technology, May, 1999

REGISTRATIONS / CERTIFICATIONS

- Professional Engineer - Colorado
- IDSCU Model Training, Colorado State University, 2004
- Introduction to Colorado Water Law, 2003
- Risk Assessment Methodology for Water (RAM-W), Sandia National Laboratories & Haestad Methods, Inc., 2002
- Streambank and Channel Stabilization and Reservoir Water Quality Enhancement Techniques, United States Army Corp of Engineers, 2001
- Introduction to ArcView GIS, ESRI, 2000
- Floodplain Delineation Using HEC-RAS, University of Colorado at Denver, 2000

QUALIFICATIONS

Mr. Effland has 11 years of experience in water resources and civil engineering. His expertise and experience is in water rights, hydraulics, hydrology, designs associated with water resource projects, raw water supply planning, and water resource computer modeling.

Mr. Effland has been involved in numerous municipal water resources and water rights tasks such as: preparation of Substitute Water Supply Plans (SWSPs); preparation of plans for augmentation for use of surface water and groundwater; determination of water availability for new water rights appropriations, including direct flow, storage, and river exchange appropriations; groundwater studies quantifying the historic amount, timing, and location of return flows from urban irrigation; feasibility level studies of facilities needed to perfect water rights; development of reservoir accounting; and cost estimates of facilities involved in water rights appropriations.

Mr. Effland has developed and applied a municipal raw water model in the course of conducting water rights and raw water supply planning investigations. He personally developed the complete revision and update to the Aurora Raw Water System Model (ARWSM) for the City of Aurora. ARSWM has been relied on by Aurora in its raw water planning, water rights acquisitions, and raw water facility development.

Mr. Effland has also conducted hydrologic and hydraulic analyses, and completed drainage planning and design for several transportation, land development, and capital improvement projects. His work included design of numerous drainage related structures including bridges, culverts, inlets and channels as well as authoring preliminary and final hydraulic reports. Mr. Effland has also utilized HEC-RAS to perform floodplain modeling, mapping and FEMA permitting.

Native Fish of the Lower Dolores River

Status, Trends, and Recommendations

Dan Kowalski Rick Anderson
Jim White Barry Nehring

Native Fish of the Dolores River

- Native Fish Species
- Current Status and Trends
- Comparisons to Other Rivers
- Native Fish Habitat-Flow Relationship
- Conclusions and Recommendations
  - Ann Oliver's Questions
  - Non-Native Fish Control
  - Lower Dolores Working Group Wild and Scenic Alternatives
- Discussion

Native Fish Species of the Dolores River

• Colorado Pikeminnow	FE, ST
• Bluehead Sucker	SS
• Flannelmouth Sucker	SS
• Roundtail Chub	SSC, SS
• Speckled Dace	
• Mottled Sculpin	
• Colorado River Cutthroat Trout	SSC

- Not Confirmed
  - Razorback Sucker — FE
  - Humpback Chub — FE
  - Bonytail — FE

FE- Federally Endangered
ST- State Threatened
SSC- State Species of Special Concern
SS- BLM Sensitive Species

Native Species Accounts

- Colorado Pikeminnow
  - Large predatory fish (70+ inches and 80 lbs)
  - Naturally lower density, move great distances
  - Habitat generalist but dependent on natural peak flows for habitat and spawning cues
  - Population declines associated with reduced peak flows in Colorado and Gunnison rivers
- Bluehead Sucker
  - Facultative herbivore, forages in riffles for algae, detritus, occasional invertebrates
  - Strongly associated with medi-riffle habitat, dependant on adequate base flows and quality of riffle habitat
  - Currently occupy about 50% of historic habitat

Native Species Accounts

- Flannelmouth Sucker
  - Omnivore consumes algae, detritus, invertebrates
  - Associated with deep semi-swift run habitat, can withstand reduced peak flows but limited by base flows and quality riffle-run habitat
  - Currently occupy about 45% of historic habitat
- Roundtail Chub
  - Opportunistic predator, aquatic insects major prey
  - Habitat generalist more associated with pool habitat, prefer murky water
  - More likely to be limited by food resources than habitat
  - Currently occupy about 45% of historic habitat

Flannelmouth Sucker

Colorado Pikeminnow

Roundtail Chub

Bluehead Sucker

Colorado Pikeminnow in the Dolores River

- Pikeminnow documented in the Dolores from 1950's to 1970's as far up river as Paradox Valley and into the lower end of the San Miguel
- Last sampled in the Dolores in 1992 in Utah and 1973 in CO
- Dolores confluence with the Colorado is an area with documented aggregations of pre-spawn pikeminnow
- 1992 pikeminnow habitat evaluation concluded the Dolores potentially contained habitat to support all life stages of CPM but habitat was severely impacted by low base flows
  - Concluded that base flows of 20 to 40 cfs reduced native fish habitat in the lower 170 miles of the Dolores River through decreased fish holding areas, dewatered nursery backwaters, impeded movement, and enhanced sedimentation

Historic Fish Population Sampling

- 1975 Holden and Stalnacker
  - 11 species, 4 natives: flannelmouth, bluehead, roundtail, speckled dace
- USFWS 1982
  - 16 species, 4 natives: flannelmouth, bluehead, roundtail, speckled dace
- Valdez 1992
  - 19 species, 6 natives: flannelmouth, bluehead, roundtail, speckled dace, mottled sculpin, Colorado pikeminnow
  - Concluded that native fish numbers and distribution were similar to 1982 study

Current Status of Fish Populations

Current Fish Populations

2007 Longitudinal Survey

Catch Per Unit Effort (CPUE) in Fish Per Mile

	Pyramid	Big Gypsum	Slickrock	Gateway
Flannelmouth	0.4	4.5	2.7	2.2
Bluehead	0.1	0.5	0.2	3.9
Roundtail	0.5	18.6	1.8	0.1
3 Native Spp.	1	23.6	4.7	6.2
Native Fish Composition	10%	94%	79%	51%

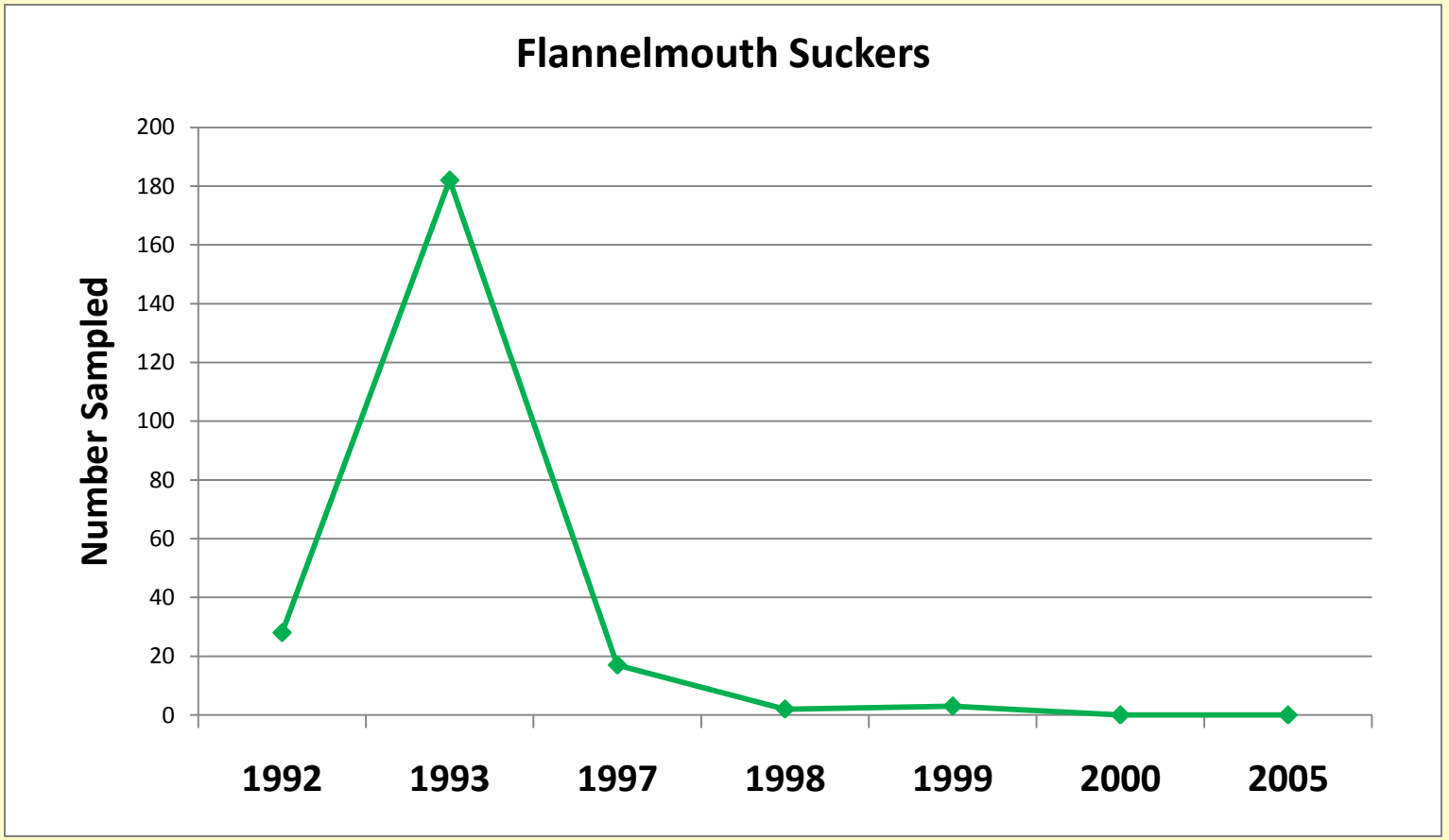
Current Fish Populations

2009 Sampling Below the San Miguel

Species	% Catch	Mean Length (in.)	Length Range (in.)	CPUE (fish/mile)
Bluehead Suckers	33	8.5	4.0-14.2	26.3
Flannelmouth Suckers	33	14.6	4.6-22.1	26.1
Roundtail Chubs	14	7.1	2.7-14.4	11.4
Speckled Dace	9	3.4	2.7-4.4	7.6
Channel Catfish	8	11.1	7.2-21.8	6.3
Common Carp	2	21.3	19.9-22.0	1.6
Red Shiner	1	3.0	2.9-3.1	0.4
Sand Shiner	0	2.8	2.8	0.2

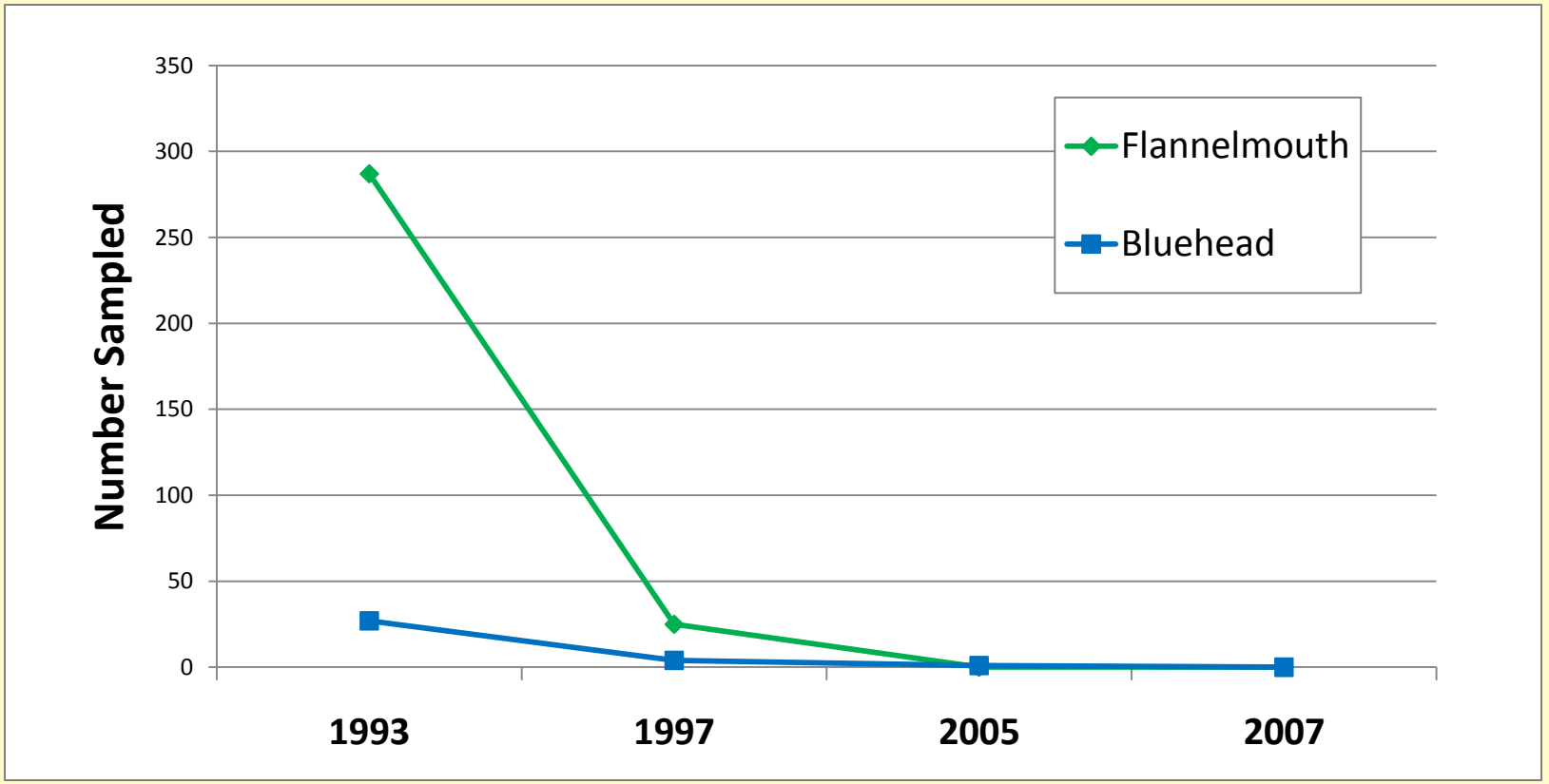
Native Fish Population Trends

Fish Population Trends
Metaska to Bradfield Bridge



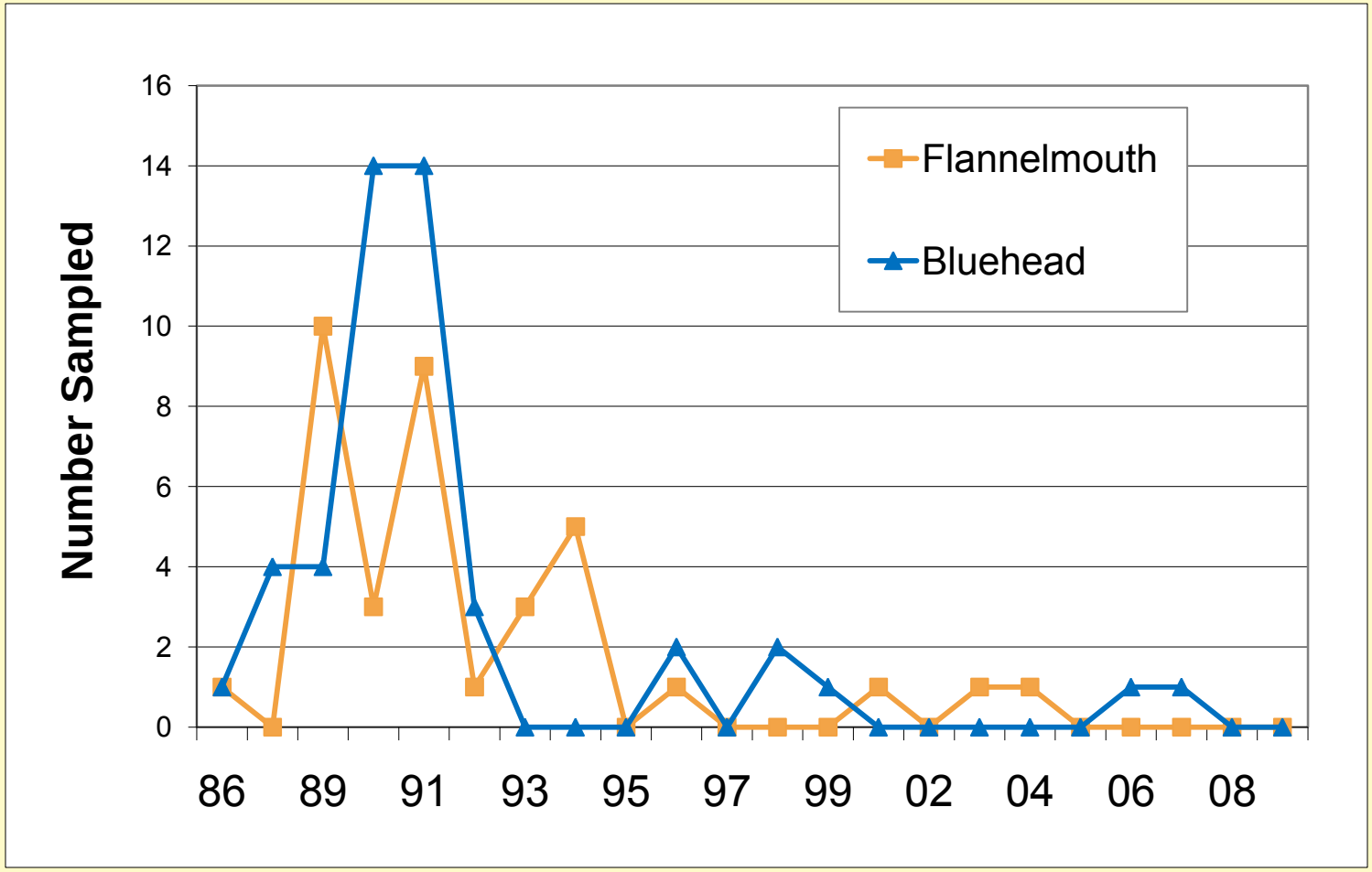
Bluehead suckers were also sampled in low numbers from1992-1997.
Biomass of flannelmouth suckers in 1993 was estimated at 23.1 kg/ha.
Average length of flannelmouths sampled 1992 to 1999 was 415 mm (16 in).

Fish Population Trends
Bradfield Bridge to Dove Creek



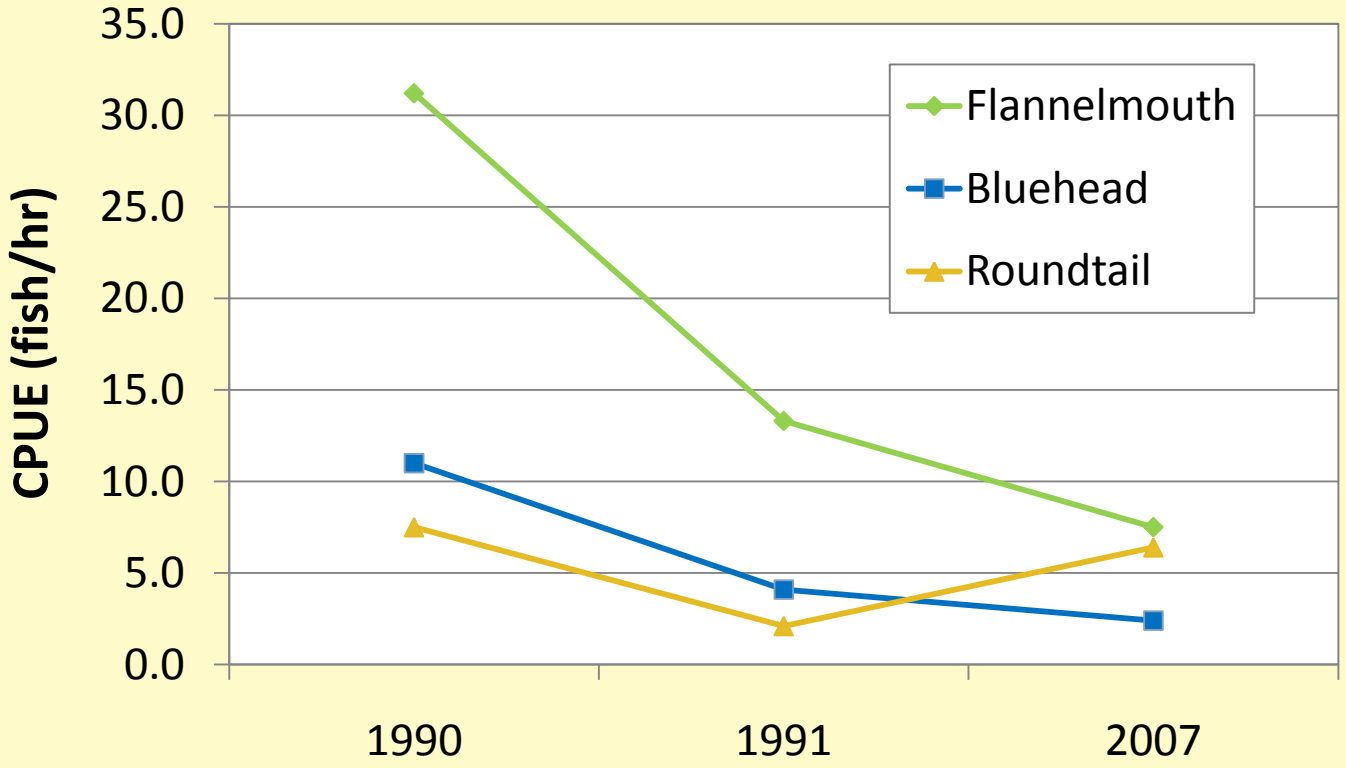
Biomass of flannelmouth suckers in 1993 was estimated at 57.9 kg/ha.
Average length of flannelmouths sampled 1993 to 1997 was 445 mm (17.5 in).

Fish Population Trends
Dove Creek Native Suckers



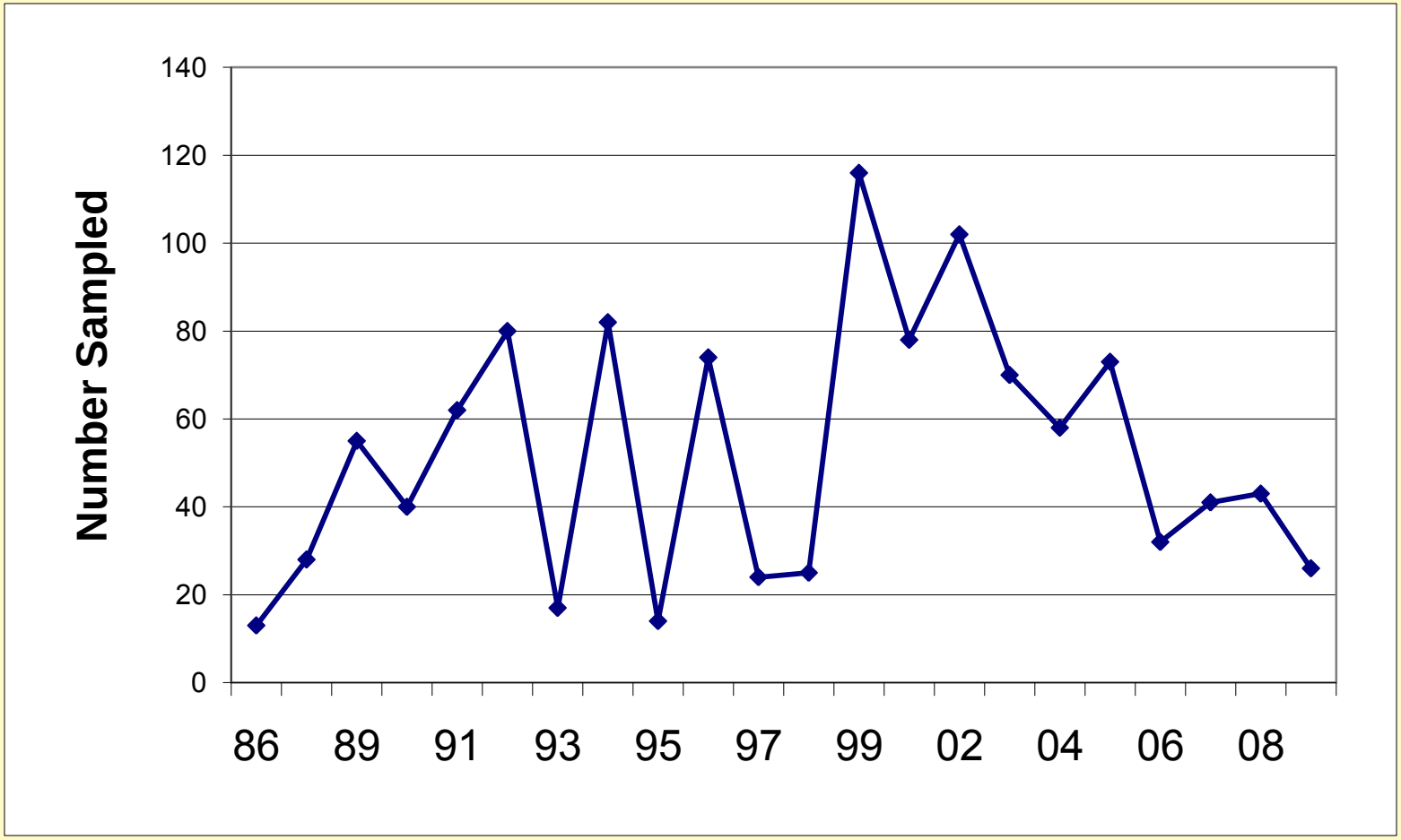
Fish Population Trends

Dove Creek to Gateway

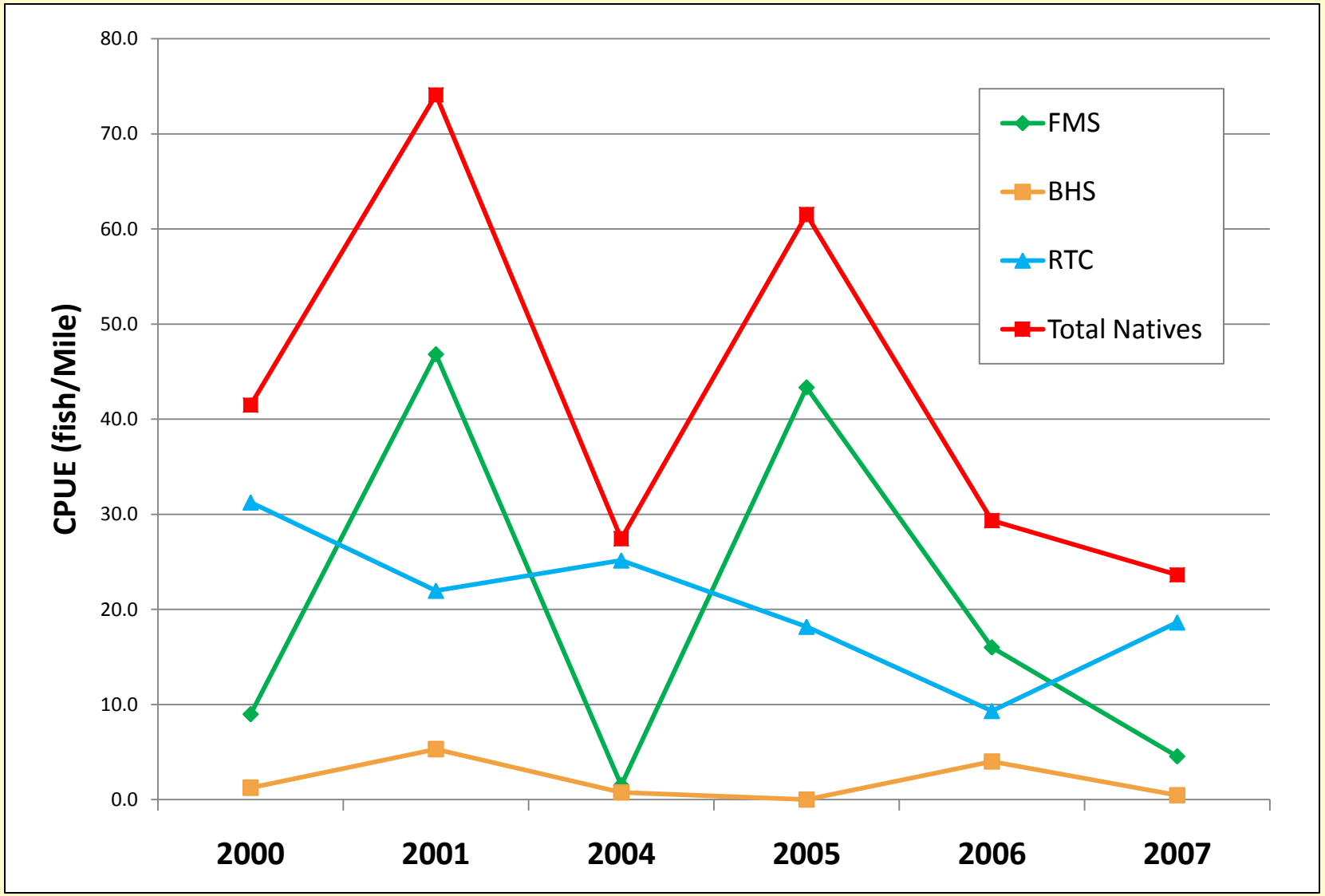


Surveys: 1990, 1991 Valdez, 2007 White and Kowalski

Fish Population Trends
Dove Creek Roundtail Chub



Fish Population Trends Big Gypsum



Native Fish Population Trends

- Native suckers increased in abundance from 1986 to early 1990's and then declined in numbers and range
  - Today native suckers are almost absent from 53 miles of previously occupied habitat above Disappointment Creek and their numbers have declined in the occupied range below
    - Large (>400 mm) adult flannelmouth suckers were common in the late 80's to early 90's up to Bradfield bridge and biomass was estimated between 20 and 60 kg/ha
  - Presently native fish appear no better or worse than pre-dam
  - Colorado pikeminnow has been extirpated from river post-dam
- Trout fishery below dam has followed similar trends

Comparisons to Other Rivers
(Anderson 2002-2006)

	Gunnison (Delta)	Colorado (Clifton)	Yampa (Lily Park)	Dolores (Big Gypsum)
Hydrograph Alterations	**Reduced Peak, Good Base Flows**	**Reduced Peak, Good Base Flows**	**Natural Peak, Reduced base Flows**	**Reduced Peak, Reduced Base Flows**
Mean Annual Flow (cfs)	2,564	2,817	1,546	284
Slope (%)	0.16	0.2	0.2	0.15
Typical Base Flow (cfs)	1000	1000	250	30
Mean Velocity (m/s)	0.69	0.44	0.51	0.28
Mean Width (m)	42	59	57	21
Width/Depth Ratio	52	77	94	46
3 Species Biomass (kg/ha)	422	232	138	0.6*
Native Species Composition	69%	64%	58%	42%

*Dolores River from dam to Dove Creek supported 20-60 kg/ha native suckers in the early 1990's

Dolores and San Miguel River Comparison

	Dolores @ Bedrock	**San Miguel @ Uravan**
Watershed Size (mi^2)	2,024	1,499
Average Annual Discharge (af)	227,186*	262,269
Average Annual Discharge (cfs)	284	347
Native Fish Per Mile	14.2**	45.6

*1985 to present. Pre-dam average annual discharge was 340,526 af

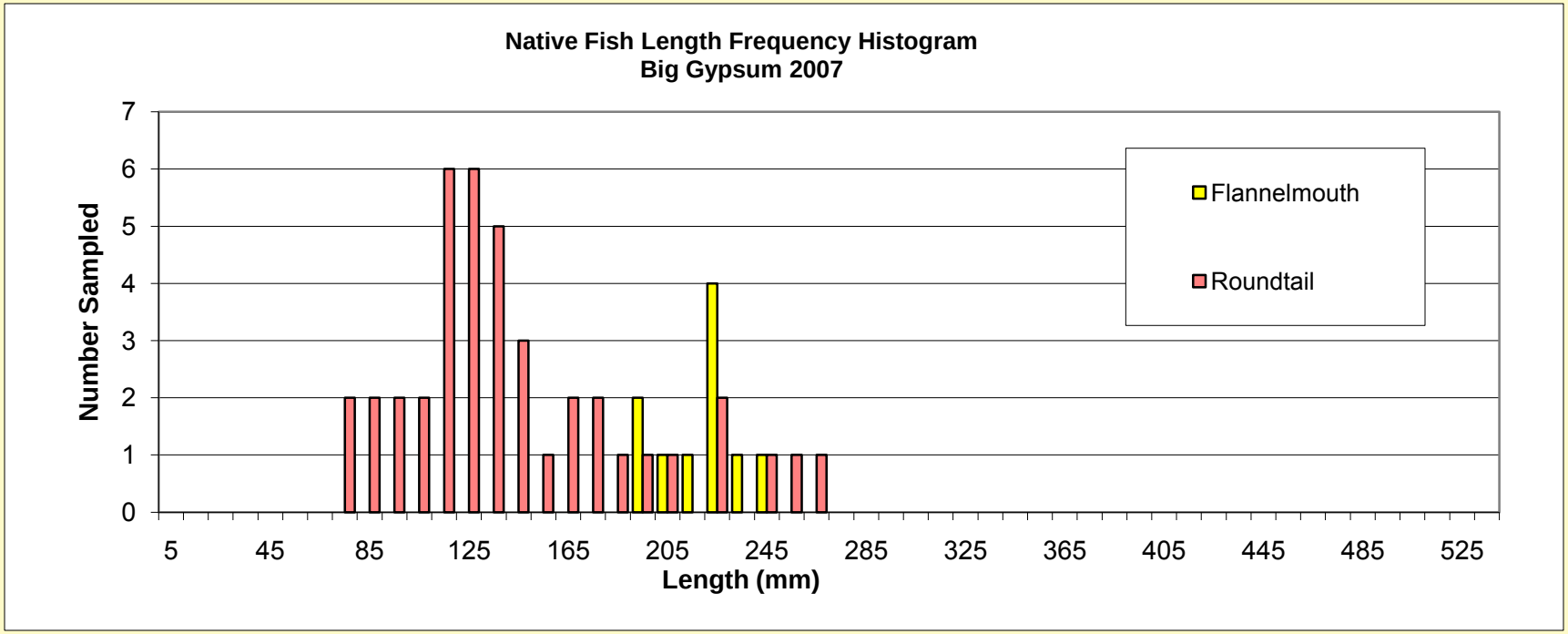
**Average from Big Gyp and Slickrock Canyon data 2007

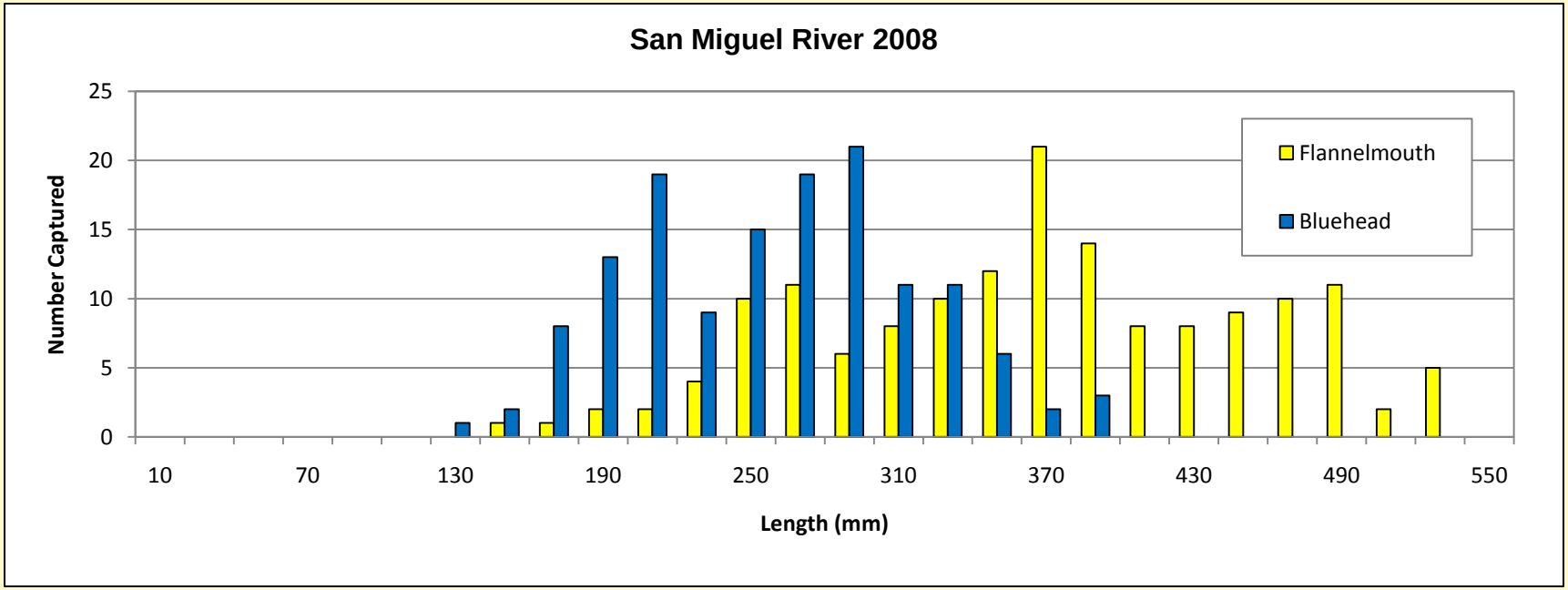
River Comparisons

Average Fish Length (in)

	Big Gyp 2007	San Miguel 2008	Gunnison 2008
FMS	8.6	14.5	13.6
BHS	7.2	10.2	10.7
RTC	5.7	8.2	9.2

- Native fish in the Dolores have a much smaller average size than other populations and sexually mature at smaller sizes
  - FMS usually mature at 4-6 years and 300-400 mm (12-16 in)
  - 2006 Sampling above Disappointment found 182 mm (7 in) FMS ripe with eggs
- Miniaturization could be an adaptation to habitat reductions


Native Fish Length Frequency Histogram
Big Gypsum 2007
Number Sampled
0
1
2
3
4
5
6
7
5
45
85
125
165
205
245
285
325
365
405
445
485
525
Length (mm)
Flannelmouth
Roundtail


San Miguel River 2008
Number Captured
0
5
10
15
20
25
10
70
130
190
250
310
370
430
490
550
Length (mm)
Flannelmouth
Bluehead

Current Native Fish Populations Conclusions

- Native fish have declined significantly in the Dolores in the last twenty years, one species of native fish is functionally extinct from the river
- Dolores River above the San Miguel has one of the poorest native fish population of any large western Colorado river
  - Supports less than 1 kg/ha of native fish compared to 100-400 kg/ha in other rivers and 20-60 kg/ha in Ponderosa Canyon in the late 1980's
  - Supports much smaller average sized fish, smaller size at maturity, and poor year class representation
- Dolores below the San Miguel confluence supports the best populations of native fish in the river

Native Fish Habitat Investigations

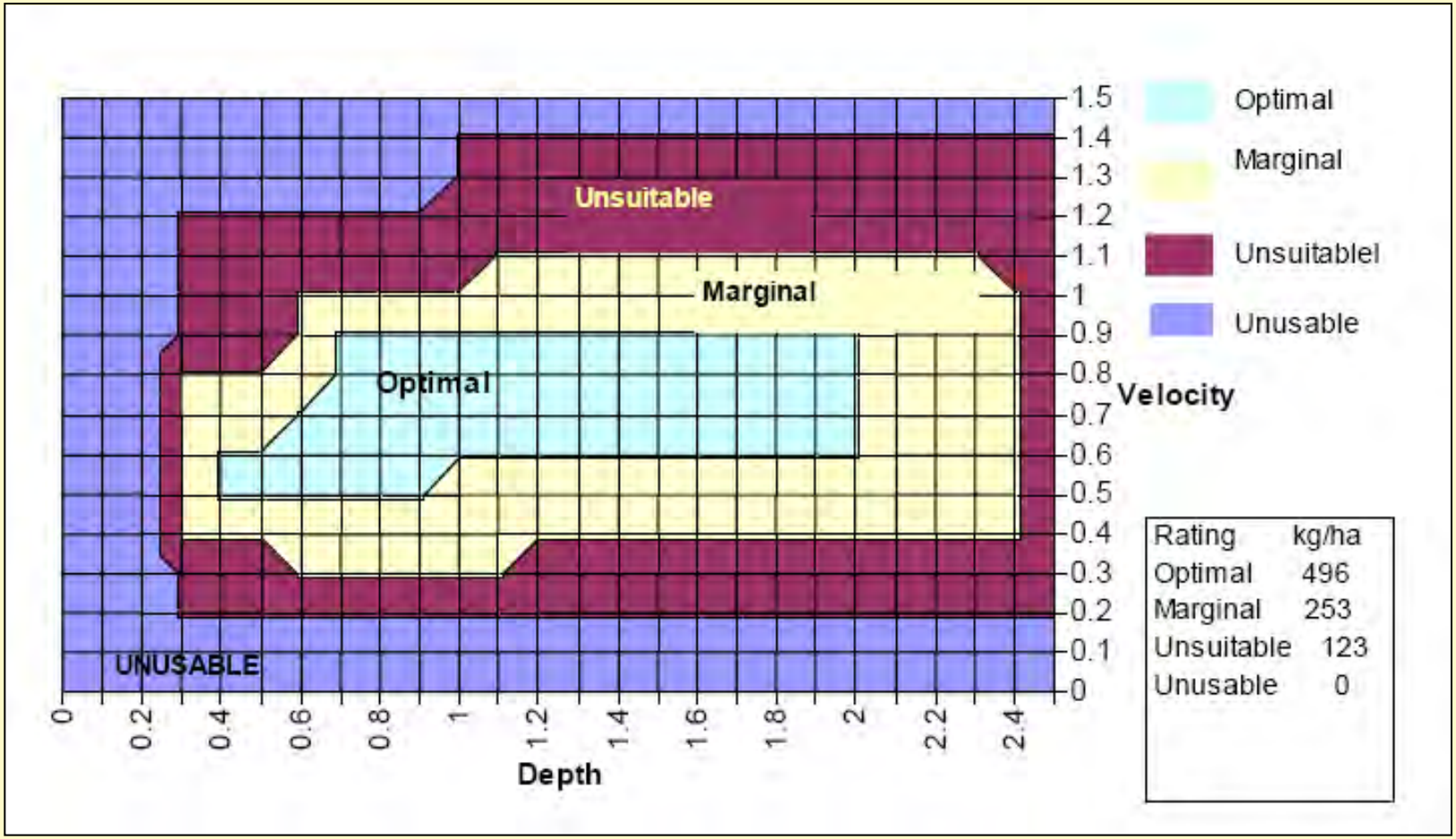
Native Fish Habitat Investigations

- CWCB Instream Flow Recommendation
  - 78 cfs to the San Miguel Confluence
  - R2Cross: 1 dimensional cross section method that focuses on ecological function of rivers indicated by riffle habitat quality
- PHABSIM Habitat Modeling
  - Nehring 1985: 150 cfs below the dam for the trout fishery
  - 1D habitat model that is effective in estimating microhabitat availability and is very useful for coldwater sportfish
- 1992 Pikeminnow Habitat Suitability Study
  - Suitable habitat in Dolores but impacted by low flows
  - Recommended minimum flows of 50-78 cfs for pikeminnow
- 2D Habitat Modeling for Native Fish
  - Anderson 2007

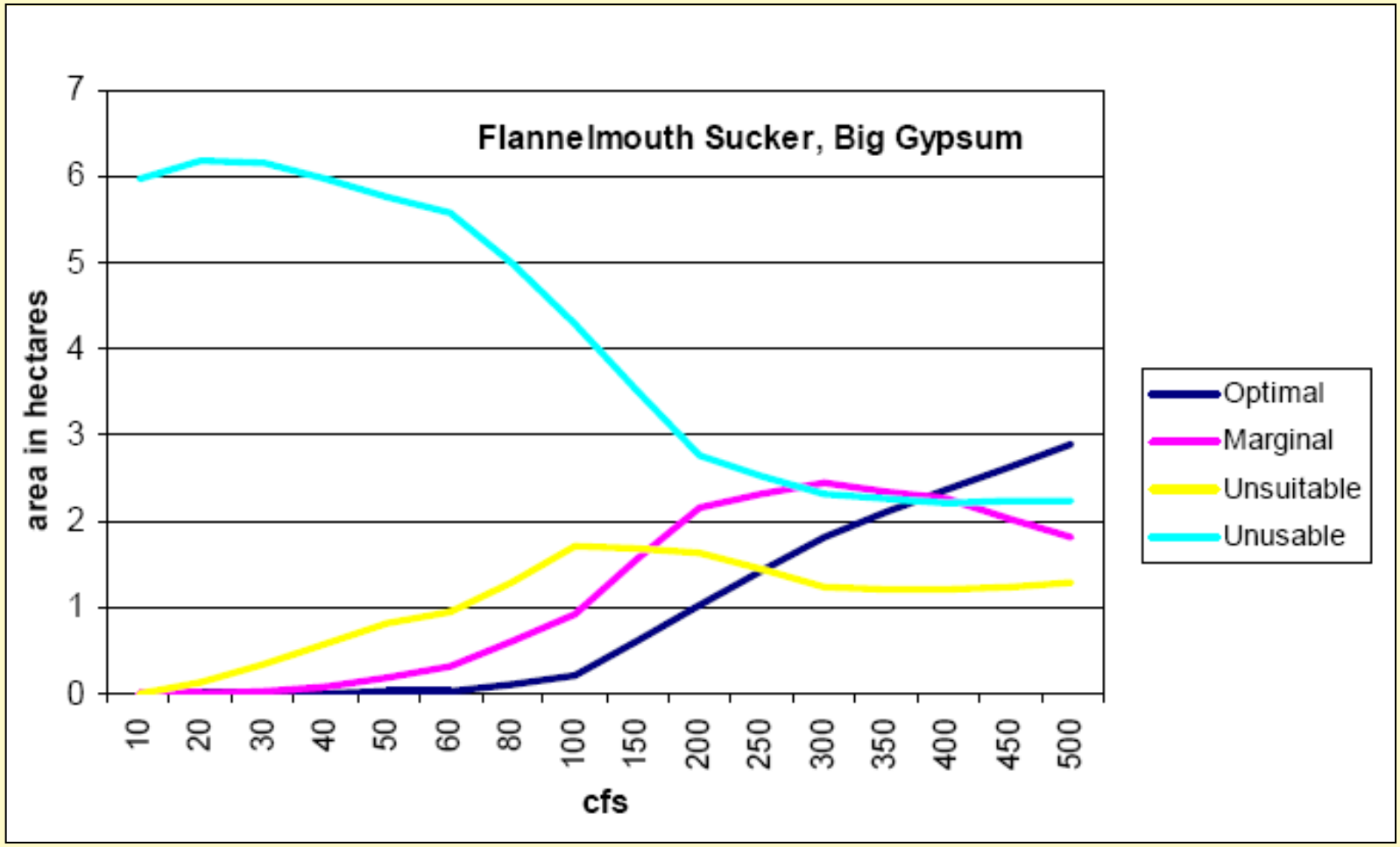
Native Fish Habitat Study 2000-2006

- 2-dimensional habitat modeling used to model fish habitat availability at the micro and meso habitat level
- Research grade sonar and total station GPS was used to survey habitat variables
- Habitat suitability models were developed with site specific electrofishing samples
  - Habitat suitability models were validated and did a good job of predicting observed fish biomass (r^2 of 0.74-0.90)

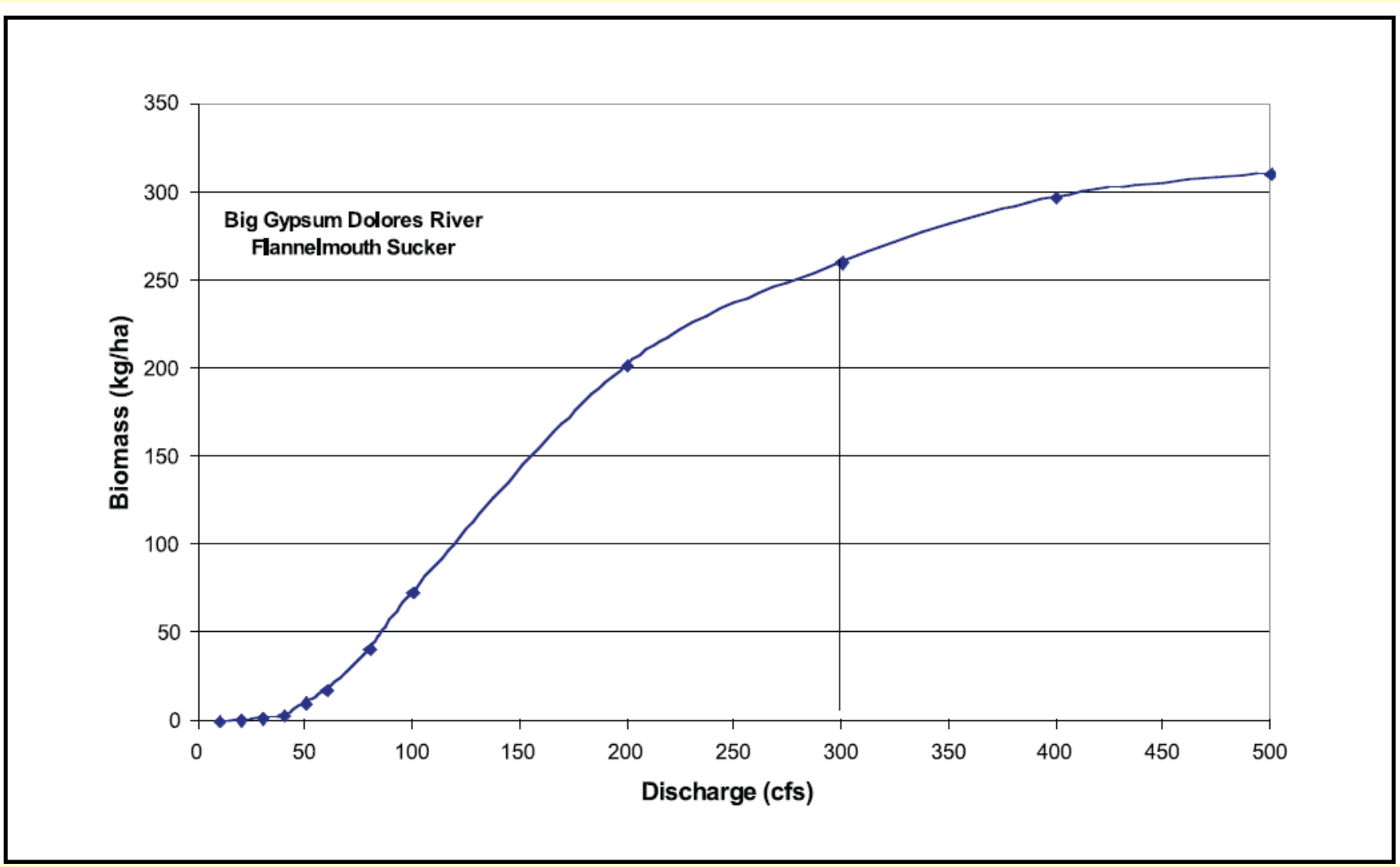
Flannelmouth Sucker Habitat Suitability Modeling



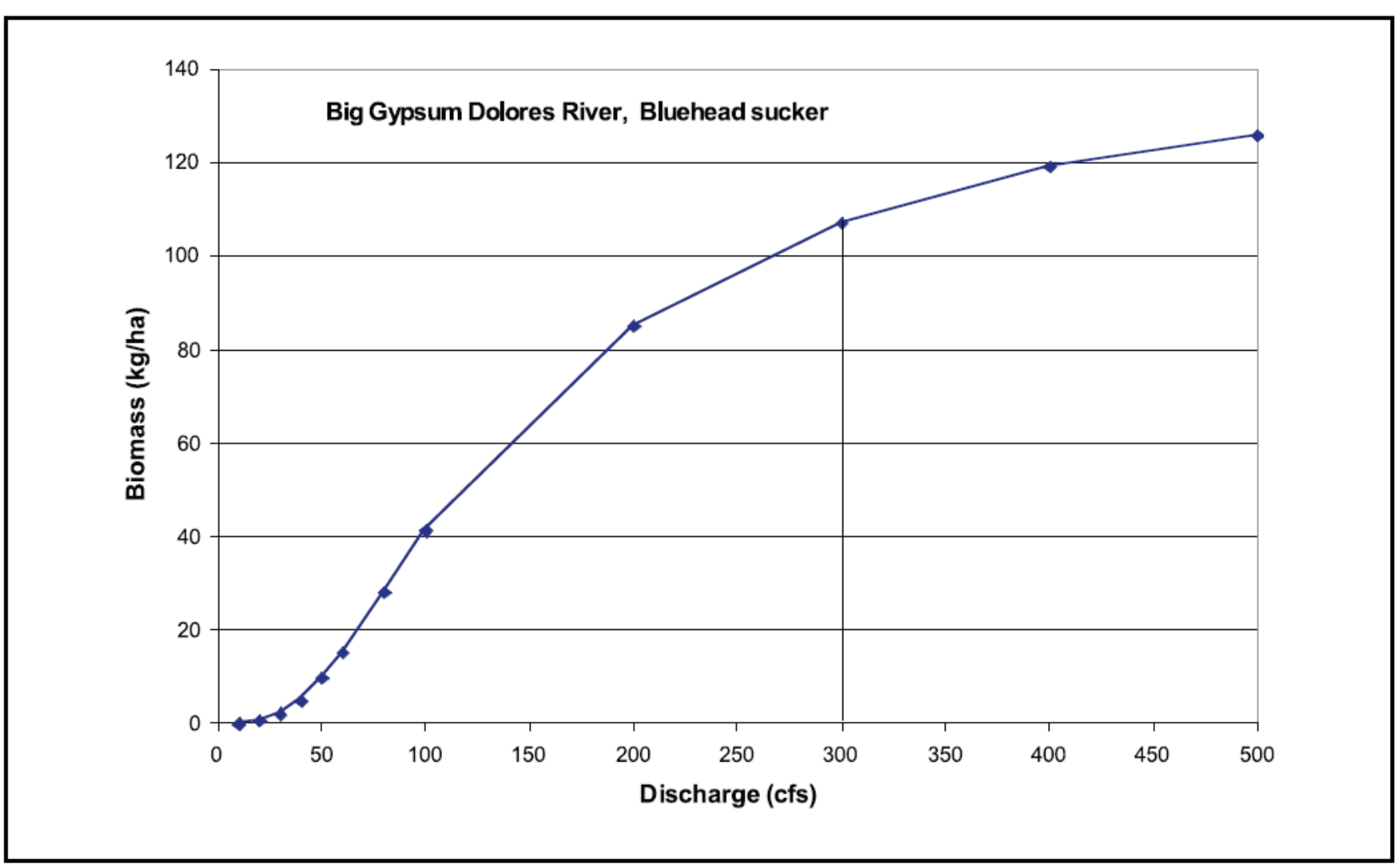
Flannelmouth Sucker Habitat-Flow Relationship



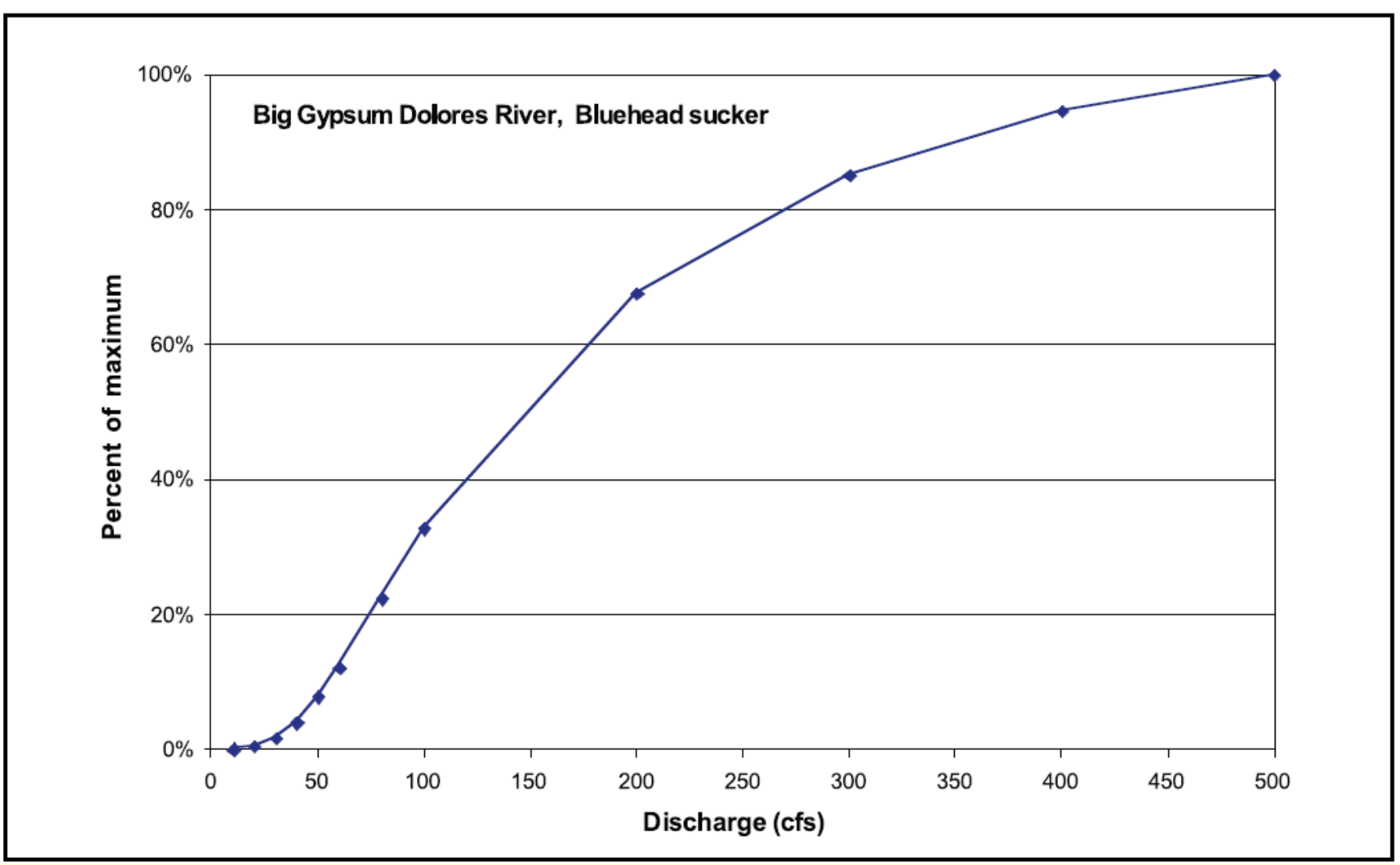
Flannelmouth Sucker Habitat Availability



Bluehead Sucker Biomass-Flow Relationship



Bluehead Sucker Habitat Availability



Summary of Native Fish Flow Study

- Flow of 300 cfs maximizes BHS and FMS habitat in the Dolores
- Concluded that inadequate riffle quantity and quality limited native fish habitat as well as decreased invertebrate productivity
  - Deep, higher velocity riffles were very rare in the Dolores at flows < 60 cfs
- Low flows result in too little velocity and depth in the majority of riffle and run habitats for FMS and BHS
- Poor invertebrate production due to lack of quality riffle habitat limits food resources for roundtail chub
- 80 cfs (60 cfs with spill) minimum flow recommendation at Big Gypsum that would protect 12-22% of maximum native fish habitat

Native Fish Habitat and Non-Native Fish

- Lack of high peak flows have resulted in bank encroachment, decreased width to depth ratio, and increased pool frequency
  - Post dam conditions have altered hydrograph and sediment dynamics
- Unnatural hydrograph, temperature, and sediment regime also creates more favorable conditions for non-native fish
  - NN fish are a problem in Dolores (smallmouth bass, catfish) but impacts pale in comparison to habitat issues
  - NN fish control efforts are not likely to be effective in the Dolores because of species present and available access
    - Extensive experience with fish control for pike, smallmouth, and bass in the Yampa and Colorado Rivers
  - Improving/maintaining native fish habitat is the key in discouraging non-native fish expansion (smallmouth bass)

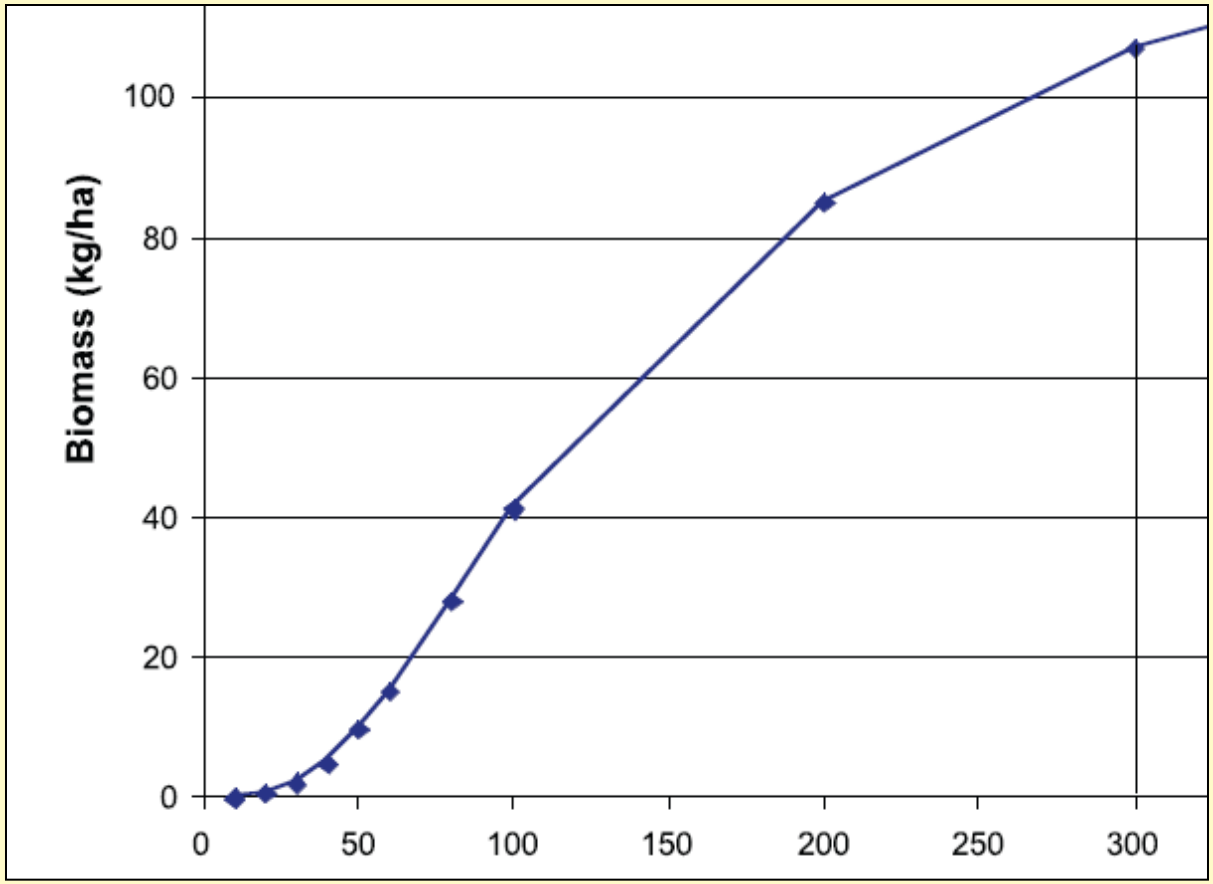
Native Fish Flow Needs

Min Flow Recommendation	Flow (cfs)	Location	Release Necessary (cfs)	Volume (af)	% Max Bluehead Biomass
CWCB Instream Flow	78	McPhee to San Miguel	94	68,037	22
Nehring 1985 (Trout)	150	Below McPhee	150	108,569	33
Anderson 2007 (With Spill)	60	Big Gypsum	72	52,113	12
Anderson 2007 (No Spill)	80	Big Gypsum	96	69,484	22
Current Fish Pool	41 (28 at Gyp)	Below McPhee	41	29,300	3

Current fish pool is 43% of the MINIMUM flow necessary to protect a barely viable fishery and protects less than 5% of native fish habitat

Native Fish Flow Needs

- Bad News: Current fish pool does not provide enough habitat for viable native fish populations
- Good News: Curve is steep, large habitat gains with a little more water



Questions from DRD

- What is known about the status of the 3 natives and the roundtail in particular in the Dolores River? What about the Four Endangered fish?
  - Native fish have declined significantly and are barely viable above the San Miguel
  - Endangered fish have been functionally extirpated from the river since the 1980's
- Is there data on trends? For what time period?
  - Good data on trends from 1986-Present, pre-dam data only spot sampling
- What is the strength of the data - how much certainty/uncertainty is associated?
  - Varies with each data set, sampling is generally CPUE population indices or minimum counts so measures of precision are not possible or necessary
  - High amount of certainty about conclusions due to magnitude of decline, current condition of fish population, and corroboration with habitat modeling studies
- What do we know about the reasons for the trends?
  - Lack of habitat due insufficient flow is the reason for native fish declines

Questions from DRD

- What key data gaps exist with respect to native fish?
  - Age/growth information, spawning ecology of natives, aquatic invertebrate data, temperature and nutrient issues, smallmouth bass age/grown and ecology
  - Data gaps are academically interesting but not necessary for management decisions

- What do we know about the flow needs for the native fish?
  - We have excellent information on flow needs of both native and sport fish, one of the most thoroughly researched subjects with state of the art techniques

- Given the dam, in your opinion, how can we ensure persistence of these fish in the Dolores?

Recommendations

- Increased downstream flows should be first priority
  - Fish pool should at least be at the 36,500 af identified in the 1996 EA with ultimate objective of year round minimum flow of at least 78 cfs
  - Current conditions provide less than 43% of the MINIMUM downstream flow needs and protects less than 4% of potential native sucker biomass
- Spill management is critical with so little water allocated for downstream release
  - Start spill April 1 and extend for as long as possible with clock on fish pool off
  - With 36,500 af fish pool and a 90 day spill would be 85% of minimum downstream flow needs and would protect about 10% BHS biomass

Recommendations

- Alternatives for Wild and Scenic Designations
  - Any alternative that does not increase downstream releases will **NOT** protect the fish ORV in Dolores
  - Status quo produces less than 5% of potential native fish habitat is only about 43% of necessary minimum flows
    - Downstream releases have actually declined and the fish pool has gotten smaller in the last 15 years, the water situation is getting worse not improving
- Protecting flows in the San Miguel River is essential for sustaining viable native fish populations in the Dolores River
  - State instream flow protection and/or Wild and Scenic Designation should be explored to protect San Miguel River flows

Future Plans

- DOW is compiling all Dolores River native fish data into a summary report that will include all historical fish sampling data, current distributions, and population trends
- A range-wide status assessment is also underway to evaluate historical distributions, current distribution, and make specific conservation recommendations
  - Range-wide Conservation Agreement and strategy for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker
  - Signatories include Sate of Colorado, BLM, and BOR
- Further monitoring efforts on the Dolores will not be a priority for DOW unless conditions for native fish improve
  - Spill management has not been favorable for fish sampling conditions and fish pool water is way too scarce to used for monitoring

Questions and Discussion

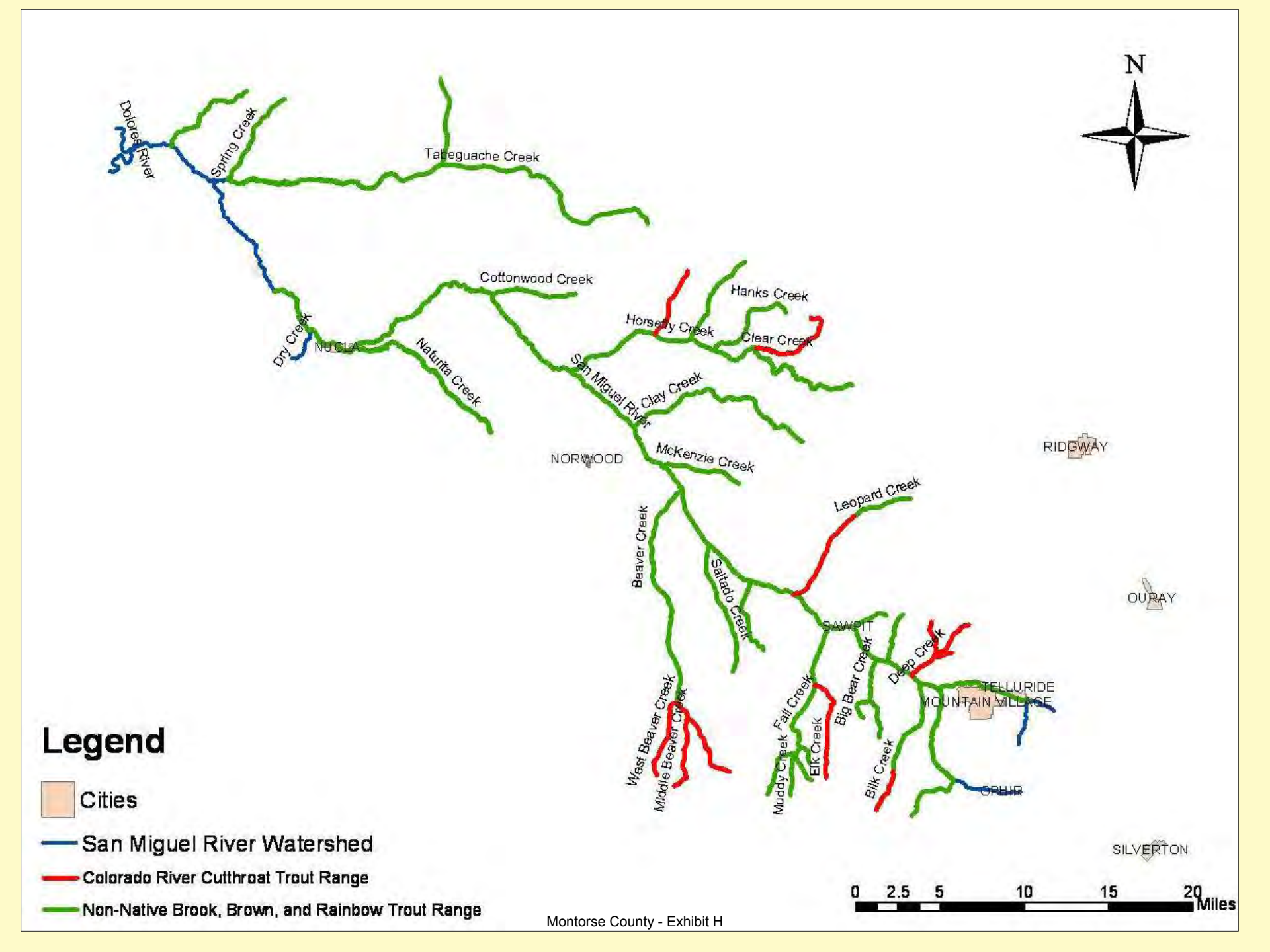
Native and Sport Fish of the San Miguel and Dolores Rivers

Dan Kowalski
Aquatic Biologist Montrose
12/15/2010

Native and Sport Fish of the San Miguel and Dolores River

- Sport Fish- Description& Distribution
- Native Fish Species- Description& Distribution
- Native Fish Trends in the Dolores River Basin
- Conclusions and Recommendations
- Discussion

Sport Fish of the San Miguel River


N
Dolores River
Spring Creek
Tabeguache Creek
Cottonwood Creek
Dry Creek
NUCLA
Naturita Creek
Horsefly Creek
Hanks Creek
Clear Creek
San Miguel River
Clay Creek
NORWOOD
McKenzie Creek
RIDGWAY
Leopard Creek
Beaver Creek
Saltado Creek
OURAY
SAWPIT
Deep Creek
Big Bear Creek
TELLURIDE
MOUNTAIN VILLAGE
West Beaver Creek
Middle Beaver Creek
Muddy Creek
Fall Creek
Elk Creek
Bilk Creek
OPHIR
SILVERTON
Legend
Cities
San Miguel River Watershed
Colorado River Cutthroat Trout Range
Non-Native Brook, Brown, and Rainbow Trout Range
0 2.5 5 10 15 20
Miles

Sport Fish of the San Miguel River

- Coldwater sport fisheries for brown, brook, rainbow, and cutthroat trout
- Mixture of wild trout management, native cutthroat management, and stocked sportfish management
- No sport fish ORV's identified by BLM
  - Fishing was identified as important recreational value on many segments
    - San Miguel Segments 1&2 are very important, highly used fisheries
    - Creel surveys indicate average catch rates but very high angler satisfaction
    - San Miguel Segment 2 exceeds Gold Medal Biomass standard some years and may deserve a fish ORV

Native Fish Species of the San Miguel River

• Colorado Pikeminnow	FE, ST
• Bluehead Sucker	SS
• Flannelmouth Sucker	SS
• Roundtail Chub	SSC, SS
• Speckled Dace	
• Mottled Sculpin	
• Colorado River Cutthroat Trout	SSC

FE- Federally Endangered
ST- State Threatened
SSC- State Species of Special Concern
SS- BLM Sensitive Species

Colorado Pikeminnow

- Large predatory fish (70+ inches and 80 lbs)
- Naturally lower density, move great distances
- Habitat generalist but depend on natural peak flows for habitat and spawning cues

Bluehead Sucker

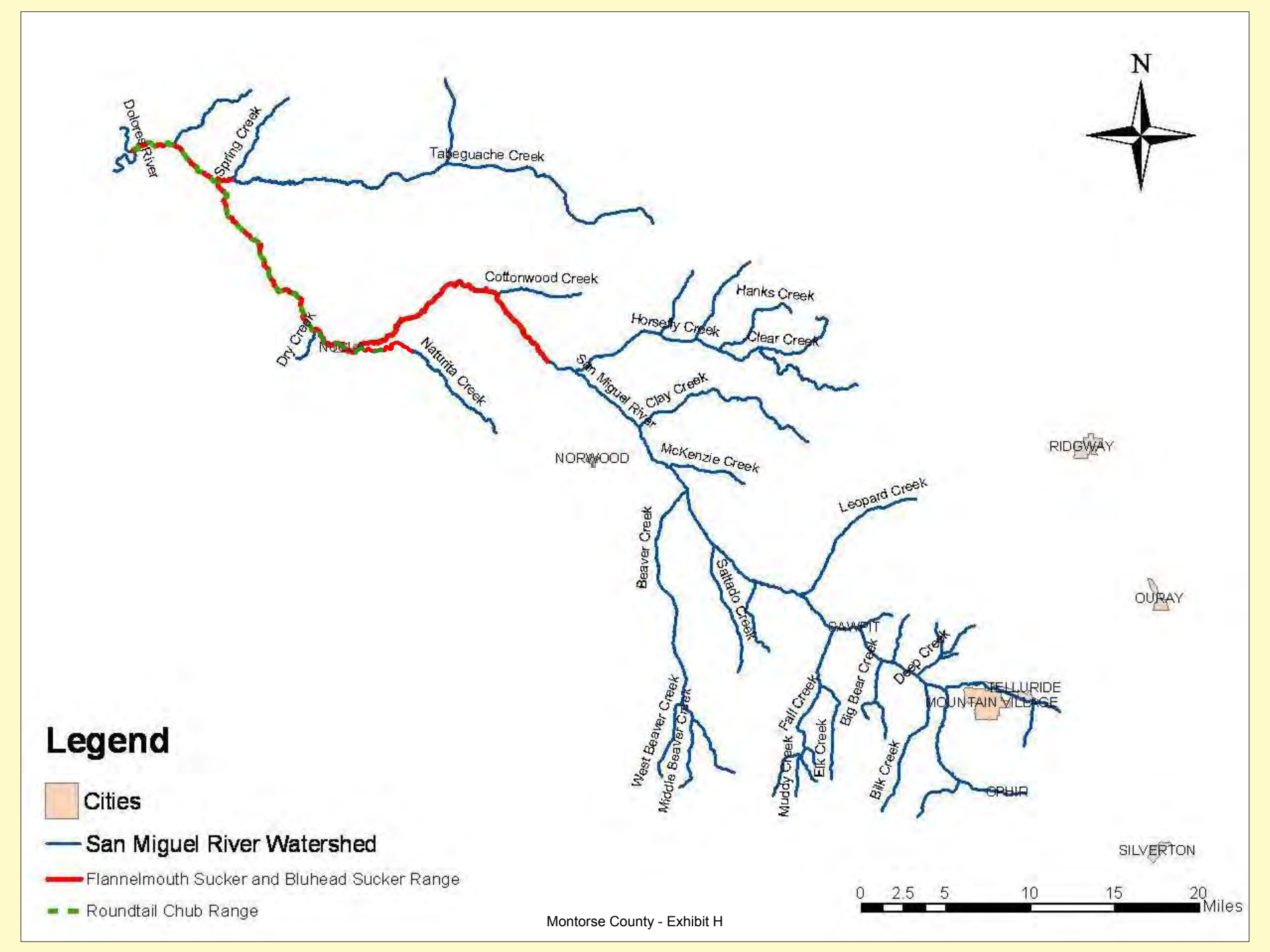
- Facultative herbivore, forages in riffles for algae, detritus, occasional invertebrates
- Strongly associated with riffle habitat
- Dependant on adequate base flows and quality of riffle habitat
- Currently occupy about 45% of historic habitat

Flannelmouth Sucker

- Omnivore- consumes algae, detritus, invertebrates
- Associated with deep run and riffle habitat
- Dependant on adequate base flows and quality of riffle/run habitat
- Currently occupy about 50% of historic habitat

Roundtail Chub

- Opportunistic predator, aquatic insects major prey
- Habitat generalist more associated with pool habitat, prefer murky water
- More likely to be limited by food resources than habitat, but reduced base flows reduce habitat
- Currently occupy about 55% of historic habitat

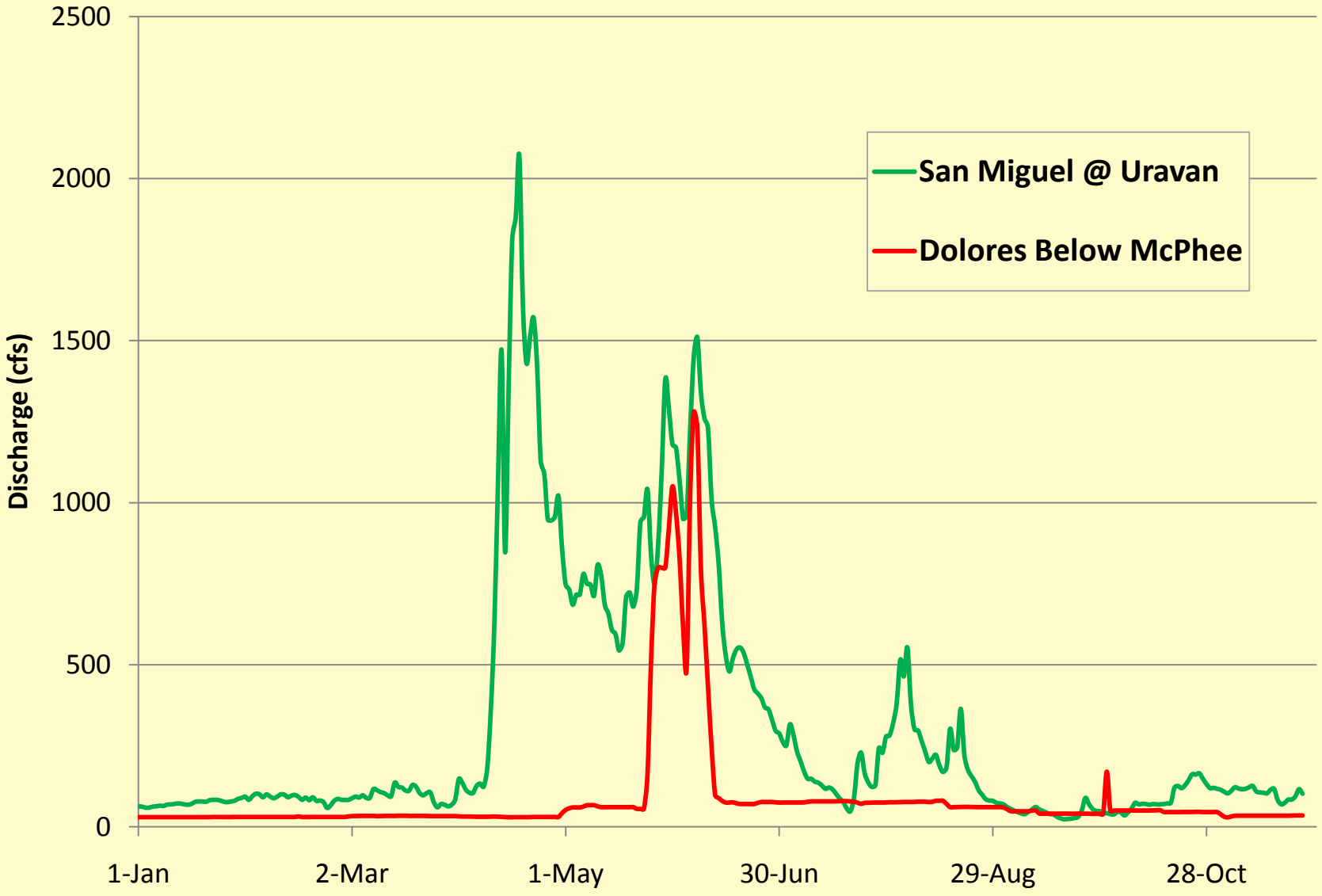


Montorse County - Exhibit H

Native Fish Habitat Needs

- The native warmwater fish species have adapted to live in large warmwater rivers with a natural snowmelt driven hydrograph
  - High spring peak flows for habitat maintenance and spawning cues
  - Adequate base flows to sustain all live stages of fish
- Large scale changes to the quantity of water or hydrograph pattern have led to the decline of these fish in many rivers
  - Reduced spring peak flows impacted fish in the Gunnison River
  - Reduced base flows impacted native fish in the Yampa River
  - Reduced peak and based flows have severely impacted fish in the Dolores River

Native Fish Habitat Needs



Native Fish Population Trends

Native Fish Population Trends in the San Miguel River

- Native fish populations in the San Miguel have been reduced in range and numbers from pre-settlement times
  - Colorado Pikeminnow extirpated
  - Habitat quantity and quality has been reduced in the middle San Miguel due to dewatering
- Native fish populations are much healthier than 20 years ago
- Water quality contamination from uranium mining at Uravan severely reduced range and numbers of native fish for many years
- Today the Dolores River below the San Miguel supports the healthiest native fish community of the entire Dolores river basin
  - This is chiefly due to the water quantity and natural hydrograph pattern of the San Miguel

Dolores and San Miguel Comparisons

- San Miguel River has a much healthier native fish community than the Dolores
- This is due primarily to water use in the basins and hydrograph patterns
  - The vast majority of water use in the upper Dolores occurs outside the river basin
    - Water is diverted from the Dolores and used in the San Juan River basin
  - The Dolores has an unnatural hydrograph due to the regulation of flows by McPhee Reservoir
    - Late peak flows, reduced peak flows, and reduced base flows
  - The San Miguel river also has large water diversions that impact native fish but all water use occurs within the basin
    - The river benefits from return flows and groundwater accretions

Threats to the Native Fish of the San Miguel

- If the native fish are doing well in the lower San Miguel why are we worried?
  - Rangewide these native fish species have declined
    - The 3 species have lost 45-55% of their total range in the Upper Colorado River basin
  - Of the 7 native fish species, 1 is endangered, 3 have been petitioned for ESA listing and a listing petition seems eminent for the 3 species
- The habitat that supports these fish in the San Miguel is unprotected
  - Flow alterations in the upper Dolores that have caused the decline of these fish could occur in the San Miguel

Recommendations

- Protecting flows in the San Miguel River is essential for sustaining viable native fish populations in the entire Dolores River Basin
- Large senior water rights in the San Miguel River basin actually protect both the sport fishery and the native fish habitat below Calamity Creek *Under Current Operations*
  - Some sort of permanent protection from future depletions is necessary to conserve the native fish habitat that is left
  - State Instream Flow Right and/or Wild and Scenic designation with Federal Reserve Water Right would protect the remaining habitat from future depletions and would not impact the existing senior water rights on the river

Recommendations Continued

- On the Dolores River (Segment #2), new management strategies are needed to conserve native fish
  - The current operations have led to serious declines in the range and numbers of native fish
  - See Department of Natural Resource recommendations on W&S alternatives
- Protect habitat and instream flows of tributaries (perennial & ephemeral) like Naturita Creek, La Sal Creek, Tabeguache Creek, Calamity Draw, Atkinson Creek, Mesa Creek etc.
- More sampling is necessary on the sport fishery in Norwood Canyon to make better recommendations

Questions and Discussion

BLM Colorado Southwest Resource Advisory Council
WILD AND SCENIC RIVER SUITABILITY RECOMMENDATIONS
for the San Miguel and Dolores Rivers and Tributaries

At the Colorado Statewide Resource Advisory Council (RAC) meeting held on February 25, 2011, the BLM Colorado Southwest RAC adopted Wild and Scenic River suitability recommendations proposed by the RAC Subgroup for the Uncompahgre Resource Management Plan. The following recommendations resulted from an extensive period of public meetings, analysis, and deliberation and will be considered by the BLM in formulating the preferred alternative for the Uncompahgre RMP.

Segment Number & Name/Eligibility Report Page #	BLM Eligibility Classification	Subgroup Recommendation	Notes/Justification
14 - Beaver Creek Page 57	Scenic	Suitable for Recreational classification	While mining is not a significant factor within the segment, the subgroup finds that the following issues render the segment better suited to classification as Recreational: • The classification would allow for a healthy balance of competing interests: protection of the ORV, while providing reasonable certainty that future water development projects would receive consideration and could move forward with minimal difficulty • The Norwood Water Commission has requested future rights to develop water via a pump station at Goat Creek (a significant project) and development of the Naturita Canal is moving forward • Overall, there was a great deal of public support for suitability. The Recreational classification would allow for development of water rights if the Vegetation ORV continues to be protected.
15 - Dry Creek Page 59	Wild	Not Suitable	The not suitable recommendation was based upon the following discussion: • The area does not receive significant visitation and the terrain protects the canyon to some extent • The biggest threats to the segment are oil and gas development (but there has not been much exploration to date) • ACEC designation as well as No Surface Occupancy (NSO) stipulations are potential management alternatives for the segment being considered during the RMP development process • Because the creek flows intermittently, the contribution of the segment to the National Wild and Scenic River program is questionable • With five miles of private land at the upper end of the segment and three miles of private land between the

Segment Number & Name/Eligibility Report Page #	BLM Eligibility Classification	Subgroup Recommendation	Notes/Justification
19 - San Miguel River, Segment 2 Page 70	Wild	Suitable with modifications	There is significant support for a suitable recommendation. The natural geography of the segment drove the subgroup's recommendation that the segment should be shortened to end at the Bennett property in order to protect the landowner's interests at Horsefly Creek, and the corridor should extend only to the canyon rims and end at the confluence with Horsefly Creek. In addition, the subgroup considered the overall land health to be of great concern for the segment. While the impact of grazing on the Vegetation ORV is addressed to some extent through the current ACEC and Special Recreation Management Area designations, WSR designation would provide longer lasting protections.
20 - San Miguel River, Segment 3 Page 73	Scenic	Suitable for Recreational classification	The subgroup recommends that the segment be reclassified as Recreational due to the CC Ditch and a dirt road that runs parallel to the river. In addition, the BLM has two campgrounds along this stretch and there are a significant number of mining claims in the area. This segment is popular for recreation gold mining. The Bennett property, as well as private land at the lower end of the segment, should be excluded from the suitability recommendation.
21 - San Miguel River, Segment 5 Page 76	Recreational	Suitable with modifications	The subgroup recommends that the segment be significantly reduced, beginning downstream from the Richards' property, running the length of TNC property, and terminating at the confluence with Tabeguache Creek. In addition, the group recommends that the boundaries of the protective corridor extend rim to rim and be delineated by existing developments and natural barriers (such as the state highway).
22 - San Miguel River, Segment 6 Page 79	Recreational	Suitable with modifications	The subgroup recommends that the segment begin downstream of Umetco Minerals Corporation property and terminate at the confluence with the Dolores River. The subgroup will contact the Department of Energy (DOE) regarding the Umetco Minerals Corporation Uravan site. If there is sufficient support, then DOE lands beginning at the bridge below Uravan could be included in the segment.

22 - SAN MIGUEL RIVER, SEGMENT 6

BLM Eligibility Classification: **Recreational**

ORVs: **Recreational, Fish, Historic, Vegetation**

Key Points:

- A stream flow regime that mimics the natural seasonal changes necessary for sustaining a healthy riparian vegetation community might only be attainable through WSR designation.
- Water yield contributes significantly to the proper hydrologic function of the Lower Dolores River downstream.
- The CWCB has declared its intent to appropriate a state instream flow for the lower San Miguel River.

River Segment Ownership (in Miles):

BLM	*USFS*	*State*	*Private*	TOTAL LENGTH	% FEDERAL
2.10				**2.10**	**100%**

Land Ownership within One-Half Mile Wide Corridor (in Acres): **Still to be calculated**

RESOURCE ADVISORY COUNCIL SUBGROUP ASSESSMENT

Recommendation: **Suitable for Recreational Classification with Modifications**

BASIS FOR RECOMMENDATION

The subgroup recommends that the segment begin downstream of Umetco Minerals Corporation property and terminate at the confluence with the Dolores River. The subgroup will contact the Department of Energy (DOE) regarding the Uravan site. If there is sufficient support, then DOE lands beginning at the bridge below Uravan could be included in the segment.

PUBLIC COMMENT SUMMARY

Supporting Suitability:

- Nine comments highlight the significant flow contribution of the San Miguel River in support of downstream river-related values (such as fish and riparian vegetation).
- Two comments note that private land is consolidated at one end of the segment and would not significantly affect implementing essential protective measures.
- Two comments support WSR designation and recommend that all mineral development be excluded from the corridor.
- One comment encourages the BLM to coordinate with other agencies to ensure protection of the extended riparian ecosystem.

- One comment expresses support for WSR designation without road closures.
- One comment states that WSR designation would provide recreational opportunities benefitting local economies.
- One comment expresses support for WSR designation in order to protect the outstanding river canyon setting and one of the last undammed rivers in Colorado.
- One comment expresses general support for designation of this segment.

Opposing Suitability:

- Montrose County has adopted a resolution opposing WSR designation, as it is thought not to be in the best interest of Montrose County citizens.
- Fifteen comments express concern that WSR designation could limit future mining activities in the corridor.
- Ten comments express the belief that the segment receives adequate protection through existing federal, state, and local regulations.
- Nine comments express concern that WSR designation could impact current and future water use.
- Six comments express concern that WSR designation could negatively impact historic uses of the area.
- Three comments state that WSR designation would fragment and make the area more difficult and costly to manage.
- Two comments state that WSR designation would hamper future economic development in the local area.
- Two comments express general opposition to WSR designation.

BLM ASSESSMENT

WATER RIGHTS AND USES

Water yield through the segment contributes significantly to the proper hydrologic function of the Lower Dolores River.

There is currently no instream flow protection for the segment. The BLM and CDOW have recommended and the CWCB has declared its intent to appropriate an instream flow for the lower San Miguel River (from the confluence of Calamity Draw to the confluence with the Dolores River) of 325 cfs (from April 15 to June 14), 170 cfs (from June 15 to July 31), 115 cfs (from August 1 to August 31), 80 cfs (from September 1 to February 28), and 115 cfs (from March 1 to April 14) structured to benefit the propagation of native warm water fishes. The CWCB will consider the appropriation recommendation at their January 25-26, 2011 meeting. Until an instream flow water right is appropriated, changes or enlargements to existing water rights, or new water rights could occur on private property, further diminishing flow.

While there are no existing impoundments within the segment, there are a few small impoundments upstream (including Trout Lake and Hope Lake on the Lake Fork tributary) and a few off-channel impoundments near the lower terminus associated with Cascabel Ranch.

There are a few small impoundments upstream of the segment (including Trout Lake and Hope Lake) located on the Lake Fork tributary.

According to estimates from the Colorado Decision Support System (HydroBase), there are more than 349,000 acre-feet of conditional storage water rights upstream of the segment, on either the mainstem or tributaries of the San Miguel River. If developed, these water rights would be senior to any instream flow or federal water right on this segment and could further diminish flow through this reach.

Much of the water needed to meet future demand would come from conservation practices and development of existing water rights, including some of the existing conditional water rights in the San Miguel Basin. Most of these conditional water rights are senior to both existing instream flow water rights and any instream flow created through WSR designation.

SWSI 2004 identified future potential dam sites on the San Miguel River (downstream of Leopard Creek near the confluence with Beaver Creek, and above Horsefly Creek) and major tributaries, including Horsefly Creek and Maverick Draw. According to a draft BLM San Miguel Instream Flow Assessment, although dam sites have been identified on the mainstem, they are unlikely to be developed given current costs and concerns with environmental impacts. This would also include the Saltado Reservoir with a conditional water right on the San Miguel River downstream of Specie Creek with a fill and refill right totaling over 140,000 acre-feet.

An instream flow or federal water right associated with WSR designation could restrict new water rights or changes to existing water rights.

Land Ownership and Uses

ROW and Withdrawals

ROWs within the corridor include Colorado State Highway 141, several county roads, telephone and powerlines, and an historic irrigation ditch and water pipeline.

While portions of the segment are within an area classified as having hydropower potential, the Power Site classification does not preclude WSR designation.

Energy and Mineral Resources

There are existing oil and gas leases within the segment. Active mining claims occur within the corridor and have a prior existing right to mineral deposits.

Administration

WSR designation would complement BLM Colorado Public Land Health standards for riparian vegetation and special status species.

This segment supports habitat for native warm water fishes, and designation would be consistent with actions in the Range-wide Conservation Agreement and Strategy for Roundtail Chub *(Gila robusta)*, Bluehead Sucker *(Catostomus discobolus)*, and Flannelmouth Sucker *(Catostomus latipinnis)*.

The BLM is uncertain regarding the position of Umetco Minerals Corporation on WSR designation.

Potential Costs Associated with WSR Designation

Upon finding a segment suitable, the stream and corridor would be managed to protect the ORVs, with little additional funding needed. Following formal WSR designation, additional funding would be required for signage, public education, ranger patrols, and maintenance, the amount of which would vary, depending upon projected increases in visitor use, as well as the segment's size, location, and other attributes.

Costs for administering and managing this segment for the Recreational, Fish, Historic, and riparian Vegetation ORVs would be moderately to significantly higher than current funding levels. With easy access to the river corridor provided by the paralleling county road, visitor use would be expected to increase if designated. As a result, additional funding for facilities would likely be needed.

A county road currently infringes on the stream channel and riparian zone along portions of this reach. With future county plans to possibly widen the road, costly measures would be necessary to avoid additional impacts to the river corridor. If purchased from willing sellers, private lands in the upper reaches of the segment would add value for ORV protection.

Alternative Protective Measures Considered

While WSR designation would provide the most comprehensive protection for the ORVs, conservation easements on select private portions of the corridor would offer added value toward protecting the ORVs. If appropriated, a pending, state-based instream flow water right would help sustain the Fish and Vegetation ORVs.

TABULATION
Montrose County – Division 4 Water Court Applications

Case No.	Date Filed	Type	Structure Names	Date of Appropriation	Amount
10CW164	12/17/2010	Application for Conditional Water Rights	Nucla Pump Site and Pipeline	12/14/2010	3.11 c.f.s., conditional
			Highline Canal (CC Ditch)	12/14/2010	3.11 c.f.s., conditional
			Nucla Town Reservoir and First Enlargement	12/13/2010	300 AF, conditional
10CW165	12/17/2010	Application for Conditional Direct Flow Water Rights	Paradox Valley Pipeline	12/14/2010	1.0 c.f.s, conditional
10CW166	12/17/2010	Application for Conditional Water Storage Rights	Maverick Draw Reservoir No. 1	12/13/2010	6,700 AF, conditional; right to successive refills in the cumulative amount of 6,700 AF, conditional
			Maverick Draw Reservoir No. 2	12/13/2010	5,600 AF, conditional; right to successive refills in the cumulative amount of 5,600 AF, conditional
			Big Bucktail Reservoir	12/13/2010	6100 AF, conditional; right to successive refills in the cumulative amount of 12,200 AF, conditional
			Tuttle Draw Reservoir	12/13/2010	1,200 AF, conditional, right to successive refills in the cumulative amount of 2,400 AF, conditional
10CW167	12/20/2010	Application for Conditional Water Storage Rights	Maverick Draw Reservoir No. 1, First Enlargement	12/20/2010	15,000 AF, conditional, for each of the Reservoirs, as alternate places of storage with a total combined first fill capacity of 15,000 AF, together with a right to successive refills in the cumulative amount of 15,000 AF, conditional
			Maverick Draw Reservoir No. 2, First Enlargement	12/20/2010	15,000 AF, conditional, for each of the Reservoirs, as alternate places of storage with a total combined first fill capacity of 15,000 AF, together with a right to successive refills in the cumulative amount of 15,000 AF, conditional

Case No.	Date Filed	Type	Structure Names	Date of Appropriation	Amount
			Marie Scott Reservoir	12/20/2010	15,000 AF, conditional, for each of the Reservoirs, as alternate places of storage with a total combined first fill capacity of 15,000 AF, together with a right to successive refills in the cumulative amount of 15,000 AF, conditional
10CW169	12/20/2010	Application for Appropriative Rights of Exchange	Conditional Exchanges	12/14/2010	Various rates
10CW194	12/29/2010	Application for Change of Water Rights and Appropriative Right of Exchange	Johnson Ditch (change); Conditional Exchange	12/29/2010	10 c.f.s. (exchange)

Stream: SAN MIGUEL RIVER

Executive Summary

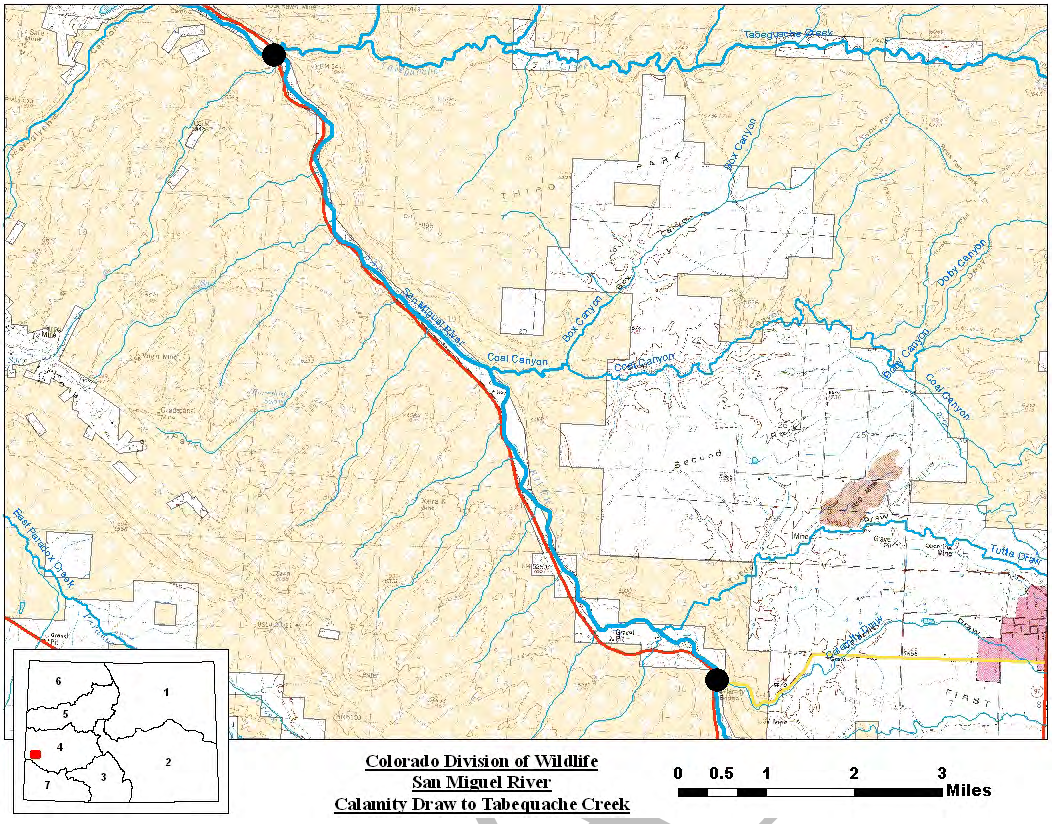
Water Division: 4
Water District: 60
CDOW#: 46842

Segment: CALAMITY DRAW to DOLORES RIVER

Upper Terminus: CALAMITY DRAW
Latitude: 38º 15’ 24.0”N Longitude: 108º 36’ 49.5"W

Lower Terminus: DOLORES RIVER
Latitude: 38º 22’ 47.1”N Longitude: 108º 48’ 12.3"W

Counties: Montrose County
Length: 16.5 miles
USGS Quad(s):
ISF Appropriation: 325 cfs (04/15 – 06/14) – (Uravan Gage)
170 cfs (06/15 – 07/31)
115 cfs (08/01 – 08/31)
80 cfs (09/01 – 02/28)
115 cfs (03/01 – 04/14)



Colorado Division of Wildlife
San Miguel River
Calamity Draw to Tabequache Creek

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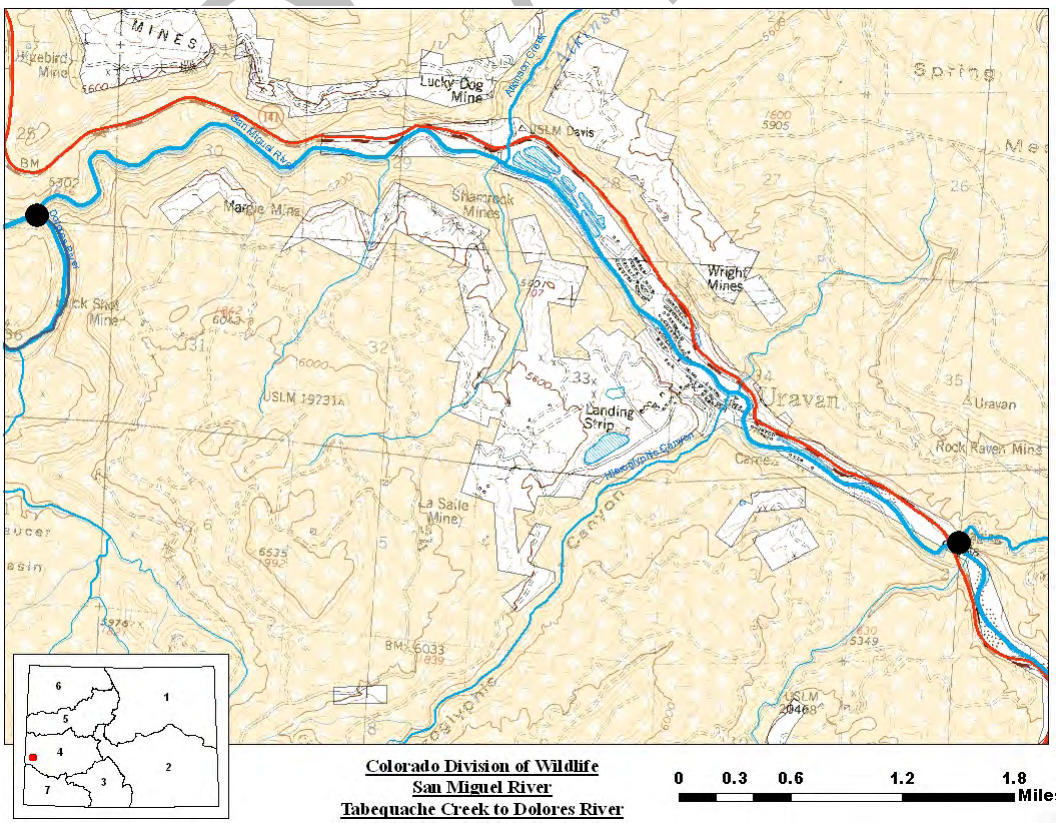

Colorado Division of Wildlife
San Miguel River
Tabequache Creek to Dolores River

0 0.3 0.6 1.2 1.8 Miles

The information contained in this report and the associated instream flow file folder forms the basis for the instream flow recommendation to be considered by the Colorado Water Conservation Board (Board). It is the Colorado Division of Wildlife (CDOW) and Bureau of Land Management (BLM) staff's opinion that the information contained in this report is sufficient to support the findings required in Rule 5(i).

The State of Colorado's Instream Flow Program (ISFP) was created in 1973 when the Colorado State Legislature recognized "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (See §37-92-102 (3) C.R.S.). The statute vests the Board with the exclusive authority to appropriate and acquire instream flow and natural lake level water rights. In order to encourage other entities to participate in Colorado's ISFP, the statute directs the Board to request instream flow recommendations from other state and federal agencies. The CDOW & BLM are jointly recommending this segment of San Miguel River to the Board for inclusion into the ISFP. The San Miguel River is being considered for inclusion into the ISFP because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

The CDOW is forwarding this instream flow recommendation to the Board to meet Colorado's policy "… that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors … and that, to carry out such program and policy, there shall be a continuous operation of planning, acquisition, and development of wildlife habitats and facilities for wildlife-related opportunities" (See §33-1-101 (1) C.R.S.). The CDOW Strategic Plan states "[h]ealthy aquatic environments are essential to maintain healthy and viable fisheries, and critical for self-sustaining populations. The [CDOW] desires to protect and enhance the quality and quantity of aquatic habitats."

The Bureau of Land Management is forwarding this instream flow recommendation to the Board because it is strongly interested in instream flow protection for the lower San Miguel River for multiple reasons. First, this portion of the river is known to provide habitat for flannelmouth sucker, bluehead sucker, and roundtail chub. The BLM, CDOW and others have signed a multi-state conservation agreement designed to protect and enhance habitat for these species, with the objective of preventing a listing of these species under the Endangered Species Act (see Appendex _). Establishment of instream flow protection for streams known to provide habitat for the species is identified as a priority conservation action under this agreement.

Second, the lower San Miguel River is known to provide habitat for globally imperiled riparian communities and other important riparian communities, because of the free-flowing hydrology of the river. These globally impaired communities include New Mexico Privet riparian shrubland and Skunkbrush riparian shrubland. Other important riparian communities include Narrowleaf Cottonwood Communities and Fremont Cottonwood communities. The Colorado Natural Heritage Program has identified two potential conservation areas along this reach of the river because of these riparian communities and species. Finally, BLM seeks to protect flows that support reclaimed acreage from the Umetco Superfund site. The reclamation effort is now complete, and the flows assist in maintaining the ecology of land parcels that were donated by Umetco as part of the Superfund settlement.

General Information

The San Miguel River is approximately 70 miles long. It begins on the north side of Wasatch Mountain at an elevation of approximately 9100 feet and terminates at the confluence with the Dolores River at an elevation of approximately 4900 feet. Of the 16.5 mile segment addressed by this report, approximately ___% of the segment, or ___ miles, is located on public lands. The San Miguel River is located within San Miguel and Montrose Counties. The total drainage area of the San Miguel River is approximately 1,500 square miles. The San Miguel River generally flows in a westerly direction. The San Miguel Basin is the largest tributary to the Dolores River and is part of the Upper Colorado River System. The one million acre San Miguel Basin is about 60 percent semi-arid rangeland and agricultural land, both comprising the lower elevations. The remaining 40 percent of the basin is in higher elevation, forested subalpine and alpine zones of the San Juan Mountains. Most of the flow in the San Miguel River (240,000 acre-feet per year) is derived from snowmelt at the higher elevations. Because of its relatively low, human population density and lack of large, water storage impoundments, the San Miguel Basin is considered to be one of the few ecologically and hydrologically intact river basins in Colorado (BLM Chap2)

The subject of this report is two segments of the San Miguel River. The first segment begins at the confluence with Calamity Draw and extends downstream to the confluence with Tabeguache Creek. The second segment begins at Tabeguache Creek and extends downstream to the confluence with the Dolores River. The proposed segments are located west of the towns of Nucla and Naturita. The instream flow recommendation for both segments is discussed below.

Species of Special Concern and Sensitive Species

Roundtail chub (*Gila robusta*) is recognized by the State of Colorado as a species of special concern. The roundtail chub, flannelmouth sucker (*Catostomus latipinnis*) and bluehead sucker (*Catostomus discobolus*) are considered sensitive species by the BLM. Criteria that apply to BLM sensitive species include the following: 1) species under status review by the U.S. Fish and Wildlife Service; or 2) species with numbers declining so rapidly that federal listing may become necessary; or 3) species with typically small and widely dispersed populations; or 4) species inhabiting ecological refugia or other specialized or unique habits.

The CDOW, BLM and others have developed a "Range-wide conservation agreement and strategy" to direct management for these species. This plan provides direction and goals for research and management of projects. The success of management strategies will depend upon the voluntary implementation of these strategies by the signatories. Special attention will need to be given to habitat degradation and influence of non-native species interactions within the native range of these species. The intention of these plans is to increase populations and distributions of identified species, thereby assisting in the long-term persistence of each species. The success of such plans could potentially curtail the need for federal listing of these species under the Endangered Species Act (ESA). These species are not currently federally listed.

ROUNDTAIL CHUB

Historically, roundtail chub were known to commonly occur in most medium to large tributaries of the Upper Colorado River Basin (Vanicek 1967, Holden and Stalnaker 1975, Joseph et al. 1977). Roundtail chub historically occurred in lower elevation (below 7,546 ft.) streams, including the Colorado, Dolores, Duchesne, Escalante, Green, Gunnison, Price, San Juan, San Rafael, White, and Yampa rivers (Bezzerides and Bestgen 2002). Roundtail chub are often found in stream reaches that have a complexity of pool and riffle habitats (Bezzerides and Bestgen 2002). Adults are found in eddies and pools adjacent to strong current and use instream boulders as cover (Sigler and Sigler 1996, Brouder et al., 2000). Roundtail chub begin spawning when water temperatures reach about 65°F (Vanicek and Kramer 1969, Joseph et al. 1977). In most Colorado River tributaries this increase in temperature coincides with a decrease in discharge after peak runoff (Bezzerides and Bestgen 2002).

FLANNELMOUTH SUCKER

The flannelmouth sucker is a good indicator species for flow and habitat relationships (Stewart and Anderson 2006-CR1). The flannelmouth sucker is a large fish reaching up to almost 2 feet in length. Historically, the flannelmouth sucker was commonly found in most, if not all, medium to large, lower elevation rivers of the Upper Colorado River drainage (upstream of Glen Canyon Dam). Within the State of Colorado, flannelmouth sucker are present in the Colorado River and numerous tributaries including the Gunnison River up to the Aspinall Unit reservoirs (Bezzerides and Bestgen 2002), the Uncompahgre River (Sigler and Miller 1963) and the Dolores River. Flannelmouth suckers are typically found in slower, warmer rivers in plateau regions of the Colorado River drainage (Deacon and Mize 1997). They usually inhabit the mainstem of moderate to large rivers but are occasionally found in small streams. This species frequents pools and deep runs but can also be found in the mouths of tributaries, riffles, and backwaters. Flannelmouth sucker typically spawn in the Upper Colorado River basin between April and June (McAda 1977, McAda and Wydoski 1980, Snyder and Muth 1990, Tyus and Karp 1990).

BLUEHEAD SUCKER

The bluehead sucker provides the most information for justifying instream flow needs to maintain the native fish assemblage (Stewart and Anderson 2006-CR1). The bluehead sucker is a large fish reaching up to 17 inches in length. This species is found in a large variety of river systems ranging from large rivers with discharges of several thousand cfs to small creeks with less than a couple of cfs (Smith 1966). Adult bluehead suckers exhibit a strong preference for specific habitat types (Holden and Stalnaker 1975). This species has been reported to typically be found in runs or riffles with rock or gravel substrate (Vanicek 1967, Holden and Stalnaker 1975, Carlson et al. 1979, Sublette et al. 1990). The bluehead sucker is known to feed on invertebrates, which have their highest densities in riffles. Although the species generally inhabits streams with cool temperatures, bluehead suckers have been found inhabiting small creeks with water temperatures as high as 82.4° F (Smith 1966).

Instream Flow Recommendation(s)

The CDOW & BLM are recommending 325 cfs, high flow period (spring/summer), and 115 cfs, low flow period (fall/winter), based on their data collection efforts. These flow recommendations are based on the physical and biological data collected to date and do not incorporate any water availability constraints.

- 325 cubic feet per second is required to maintain a reasonable amount of bluehead and flannelmouth sucker usable spring and summer habitat, in addition to maintaining the three principal hydraulic criteria of average depth, average velocity and percent wetted perimeter at adequate levels;
- 115 cubic feet per second is required to maintain a reasonable amount of bluehead and flannelmouth sucker usable fall and winter habitat, in addition to maintaining two of the three principal hydraulic criteria.

The recommended flow values were determined using the best professional judgment of CDOW and BLM biologists and hydrologists. The CDOW and BLM professionals reviewed and evaluated the results of the Physical Habitat Simulation (PHABSIM) Methodology and RHABSIM software PHABSIM/RHABSIM analysis. They also reviewed the R2CROSS analysis, using standard hydraulic criteria.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
CALAMITY DRAW	TABAUCHE CREEK	10.0	___	___
TABAUCHE CREEK	DOLORES RIVER	6.5		

___% of the public lands are managed by the BLM.

Biological Data

Over the past ten years, the CDOW and BLM have been collecting stream cross-section information, natural environment data, and other data needed to quantify the instream flow needs for this reach of the San Miguel River. The San Miguel River is classified as a large river (over 100 feet wide) and fishery surveys in 2001 indicate the stream environment supports: bluehead sucker (*Catostomus discobolus*), flannelmouth sucker *Catostomus latipinnis*, mottled sculpin (*Cottus bairdi*), roundtail chub (*Gila robusta*), speckled dace (*Rhinichthys osculus*) and white sucker (*Catostomus commersoni*) (See CDOW Fish Survey in Appendix _).

In addition, the BLM has been collecting aquatic invertebrate samples, for several years, at several sites within the proposed instream flow reaches. These sites include the San Miguel upstream of the Dolores, at Tabequache Creek and upstream of Tabequache Creek (see Appendix _).

Biological and Field Survey Data

The CDOW and BLM collected transect and flow data for 7 different cross-sections within an 815 foot reach of stream. The transect data was collected at a site approximately 1.5 miles upstream from the confluence of the San Miguel River with Tabeguache Creek. These 7 transects incorporated different mesohabitat types including riffles, runs, pools and glides. These 7 different cross-sections formed the basis for the PHABSIM/RHABSIM study conducted by the CDOW and BLM. PHABSIM is widely used in North America to quantify instream flow

regimes and consists of two modeling components. The hydraulic component is a series of one-dimensional cross-sections that are linked to produce a series of rectangular cells that form a grid. Mean depth and velocity conditions are calculated for each cell for a given flow. The biological component is a set of suitability index curves for depth and velocity criteria that are used to rate micro-habitat suitability for each cell in the cross-sectional grid. Habitat availability is measured by an index called weighted useable area (WUA) [1], the summation of cell areas weighted by its suitability index. When plotted versus discharge WUA typically peaks at a single flow that is considered the flow that maximizes habitat. Please see appendix _ for more information on the PHABSIM Methodology.

For this study, 7 one-dimensional cross-sections were linked to produce the series of rectangular cells that formed the grid to estimate WUA. Mean depth and velocity conditions were calculated for each cell at 4 different measured flows (100, 175, 325 and 450 cfs). Habitat suitability criteria (HSC) were developed from the 2003 Riverine Fish Flow Investigation Study Report (Federal Aid Project F-289-R6) written and performed by Richard Anderson, CDOW Aquatic Researcher, and Gregory Stewart, Department of Geosciences Oregon State University[2]. The basis for this study was a 1999 request from the CWCB for the CDOW to provide biologically justified instream flow recommendations for the Yampa and Colorado Rivers based on habitat and flow requirements for non-endangered native fish. Anderson and Stewart used two–dimensional (2D) modeling to develop habitat suitability criteria for bluehead and flannelmouth suckers, two native species. Their methods and results are more fully described in Anderson and Stewart (2003) and Stewart and Anderson (2005) and (2006).

The bluehead and flannelmouth sucker habitat suitability criteria were used to develop specific hydraulic criteria that were incorporated into a PHABSIM/RHABSIM analysis.. Stewart and Anderson determined that "Abundance of bluehead sucker was a reliable indicator for instream flows and habitat maintenance for the native fish assemblage. In the Colorado, Gunnison and Yampa Rivers bluehead sucker habitat peaked at flows of 600 to 1,200 cfs. This flow range also resulted in high habitat diversity and high native fish biomass. Their assumption that flows that maintained adequate bluehead sucker abundance (about 25% of fish over 15 cm) would also maintain adequate flannelmouth sucker and roundtail chub habitat was validated by this study."

CDOW and BLM determined for this flow recommendation that the bluehead sucker would be the primary indicator species for the biologically based instream flow recommendation with the flannelmouth sucker being the secondary indicator species. The main reason for this is bluehead sucker abundance is directly related to availability and quality of riffle habitats. The primary objective of most cross section methodologies, including R2CROSS, is to maintain quality riffles. Riffles are the most vulnerable habitat to dewatering and riffles are important for invertebrate productivity. When riffle habitats are maintained there should be sufficient habitats for perpetuating carrying capacity (biomass) and composition for all members of the native fish assemblage (Nehring 1979). To verify the flow recommendations, CDOW and BLM compared results from their PHABSIM/RHABSIM study with results using the R2CROSS Methodology with standard criteria (see Appendix _).

[1] No Channel Material Indexes were used to quantify the WUA in this report.

[2] See "Impacts of stream flow alterations on native fish abundance and native fish habitat and the use of native fish population data to support instream flow recommendations made using a 2D instream flow methodology."

Transect 1 was located within a typical riffle section and was used in a standard R2CROSS analysis. The modeling results from these efforts are within the confidence interval produced by the R2CROSS model (see Table 1).

Biological Flow Recommendation

CDOW and BLM staff, using a combination of PHABSIM/RHABSIM and R2CROSS methodologies, developed the proposed instream flow recommendations for the San Miguel River (see Appendix _ for copies of the field data). Board staff relied upon the biological expertise of the cooperating agencies to interpret the output from the PHABSIM/RHABSIM and R2CROSS Methodologies to develop the initial, biologic instream flow recommendations.

These initial recommendations are designed to address the unique biologic requirements of each stream without regard to water availability. In addition to the criteria developed using the PHABSIM Methodology and RHABSIM Software, the three standard instream flow hydraulic parameters used in R2CROSS (average depth, percent wetted perimeter and average velocity) were also used to calculate and predict the biologic instream flow recommendations (see Table _ Below).

For this segment of stream, several data sets were collected with the results shown in Table 1 below. Table 1 shows who collected the data (Party), the measured discharge at the time of the surveys (Q), the accuracy range of the predicted flows based on Manning's Equation (240% and 40% of Q), the method used, the summer flow recommendation based on meeting 3 of 3 hydraulic criteria and the winter flow recommendation based upon 2 of 3 hydraulic criteria.

Table 1: Data

Party	Measured Q's	250%-40%	Method	Summer (3/3)	Winter (2/3)
DOW & BLM	450, 325, 175, 100	1125 - 40	PHABSIM / RHABSIM	500 (Bluehead) 325 (Flannelmouth)[3]	---
DOW & BLM	450, 325, 175, 100	1125 - 40	R2X Standard	650	115

DOW = Division of Wildlife; BLM = Bureau of Land Management

Biologic Flow Recommendation

The CDOW and BLM evaluated all of the data collected to date and determined that best flow recommendation would come from using the results from a combination of methods. PHABSIM is a widely accepted method for quantifying the suitable versus unsuitable hydraulic habitat attributes of selected species and life stages as a function of discharge. R2CROSS is best suited for identifying flows with specific hydraulic criteria across riffle type habitats. The State of Colorado has used R2CROSS extensively in the past to appropriate instream flow water rights. CDOW and BLM were concerned that the standard R2CROSS method may not be appropriate

[3] The PHABSIM/RHABSIM analysis was used to only quantify the suitable versus unsuitable hydraulic habitat attributes of bluehead and flannelmouth sucker adults as a function of discharge. Amounts shown reflect the discharge which produced the maximum amount of useable habitat based on the measured mesohabitat types.

for this reach of the San Miguel River due to its major width (over 75' wide in most places), type of fish species present (warm/cool water species) and its big river channel hydraulics and characteristics.

Accordingly, BLM and CDOW staff compared results from their PHABSIM/RHABSIM data analysis with their R2CROSS analysis. Using the results from the PHABSIM/RHABSIM data analysis, the maximum amount of usable habitat for bluehead suckers was produced at a flow of 500 cfs and for flannelmouth suckers at a flow of 325 cfs. The R2CROSS analysis indicated that a spring/summer flow of approximately 650 cfs was necessary to meet all three of the critical hydraulic criteria at this site and a fall/winter flow of 115 cfs would meet 2 of 3 of the hydraulic criteria.

CDOW and BLM are recommending that a flow of 325 cfs, for the time period of April 15 through June 14, is the minimum amount necessary to preserve the natural environment to a reasonable degree, for this reach of the San Miguel River. This is based on the assumption that 325 cfs would preserve 90% of the weighted useable area available to the bluehead sucker and 100% of the weighted useable area available to the flannelmouth sucker. BLM and CDOW staff also believe a flow that maintains adequate bluehead and flannelmouth sucker habitat should also maintain adequate roundtail chub habitat. The spring/summer flow of 325 cfs was reduced to 170 cfs for the June 15 through July 31 time period because of water availability concerns. The instream flow recommendation of 170 cfs was derived to maximize the existing bluehead and flannelmouth sucker habitat available under a declining hydrograph, by maintaining an average depth of 1.0 foot over the measured riffle cross-section. An average depth of 1.0 foot combined with average velocities exceeding 1.3 ft/sec, were determined to be marginally suitable bluehead sucker habitat (see Anderson & Stewart Report).

Because the PHABSIM/RHABSIM data only quantified suitable versus unsuitable hydraulic habitat as a function of discharge, CDOW and BLM staff used the results of the R2CROSS Method to develop the fall/winter instream flow recommendation of 115 cfs. The R2CROSS Method suggests that fall/winter flows should maintain at least 2 of 3 of the identified critical hydraulic criteria. At the Cross Section #1 site, 115 cfs meets 2 of 3 criteria (average depth and velocity) by providing on average, 0.8 feet of depth and velocities well over 1.0 ft/sec. The fall/winter flow recommendation was further reduced to 80 cfs, for the time period of September through February, due to water availability concerns. It should be noted however, that 80 cfs still maintains adequate velocity (approximately 2.5 ft/sec), a wetted perimeter of almost 60% and an average depth of nearly 0.7 feet.

Hydrologic Data

The BLM and CDOW staff conducted an evaluation of the stream hydrology to determine if water was physically available for the instream flow recommendation. The hydrograph below was derived from data collected by the USGS stream gage for the San Miguel River at Uravan, CO (#09177000), which has a drainage area of 1500 square miles (See Gage Summary in Appendix C). The total drainage area of this segment of the San Miguel River is approximately 1500 square miles. The period of record for this gage was 1954 to 2004, the period of record used by staff in their analysis was 1954 - 2004, or 50 years of record. Table 2 below displays the estimated flow of the San Miguel River at the gage, in terms of a percentage of exceedence.

Table 2: Estimated Stream Flow for SAN MIGUEL RIVER

Exceedences	January	February	March	April	May	June	July	August	September	October	November	December
1%	162.9	351	1044	3750	4123	2808	1770	958.5	612	432	370.6	217.8
5%	140	186.1	578.2	2610	2700	2240	1102	597.2	371	292.1	212	160
10%	130	155.7	383.2	1900	2220	1770	868	424.7	301	252	182	148
20%	120	130	252	1260	1724	1380	633.4	265.6	201	199	152	121
50%	80	97	128	550	943	820	301	125.5	88	116	100	85
80%	62	70	83	233	484	437	112	51.2	42	76.6	73	65
90%	55	61	70.8	130	271	298	61	27	29	53.8	61	57
95%	48	55	62	96	140.9	215	34	20.55	23	33	52	50
99%	40	40.73	47	55	61.9	38	6.63	5.91	14	20	32	36

Table 2 shows that the spring flow recommendation of 325 cfs is available at least 50% of the time April 15 through June 30. The high flow summer recommendation of 170 cfs is available at least 50% July 1 through July 31. The low flow summer recommendation of 115 cfs is available at least 50% August 1 though August 31 and March 1 through April 14 and the winter recommendation, reduced based on water availability concerns, of 80 cfs is available at least 50% September 1 through February 29. However, if additional water is determined to be available in further investigations, the CDOW and BLM would recommend enlarging the wintertime recommendation up to 115 cfs to preserve the natural environment to a reasonable degree.

Precipitation Data

CDOW and BLM staff identified _ local precipitation data sets located near the San Miguel River Drainage: _____ (see Precipitation Data in Appendix C).

Existing Water Right Information

CDOW and BLM staffs have analyzed the water rights tabulation and will consult with the Division Engineer's Office (DEO) to identify any potential water availability problems due to existing diversions. The upper terminus for the proposed instream flow reaches, Calamity Draw, was selected because it is the location where significant return flows accrue to the river from lands irrigated by the CC Highline Canal.

Montrose County - Exhibit K

Montrose County - Exhibit K