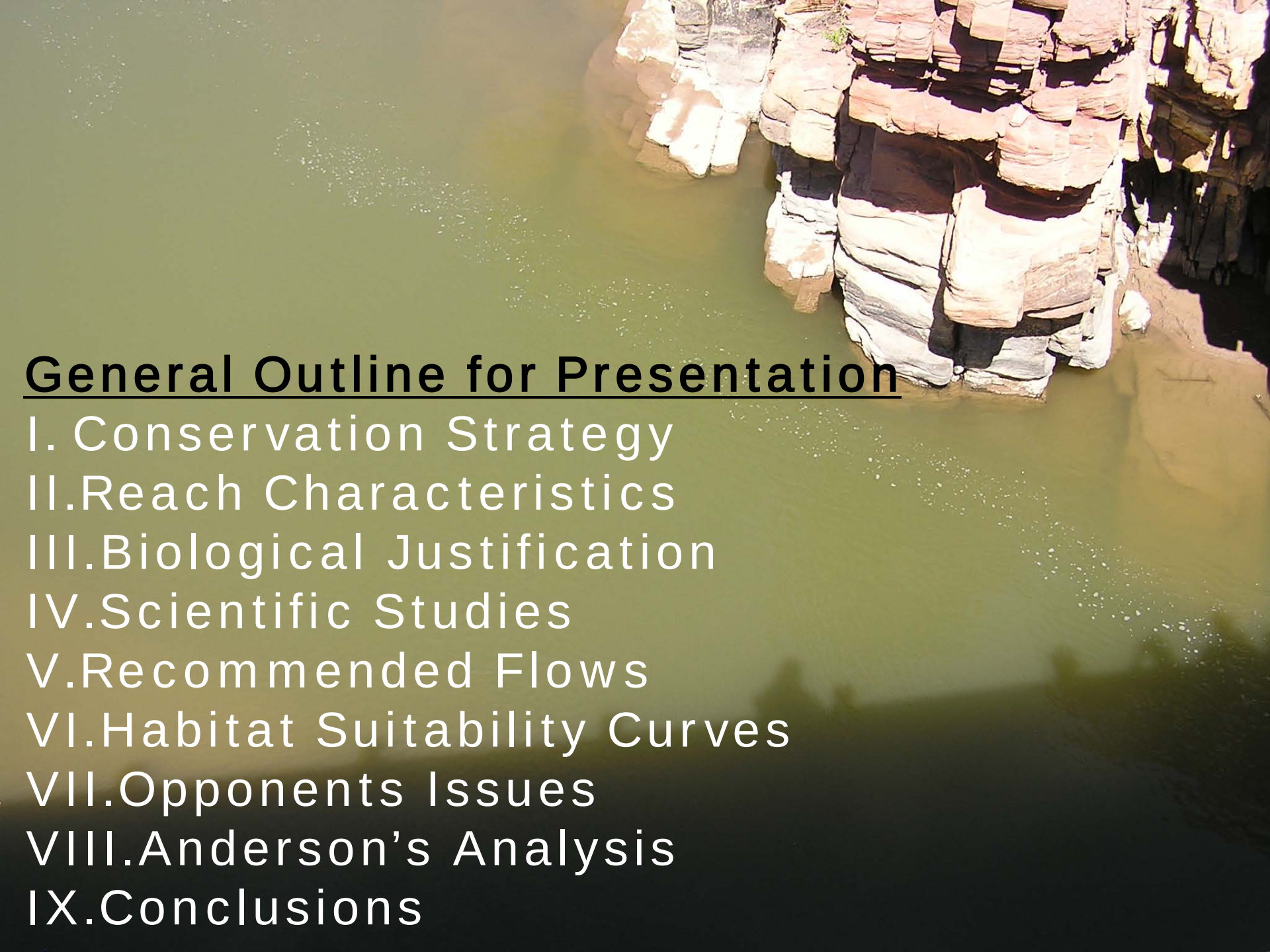
BUREAU OF LAND MANAGEMENT COLORADO PARKS AND WILDLIFE'S INSTREAM FLOW RECOMMENDATIONS FOR THE SAN MIGUEL RIVER

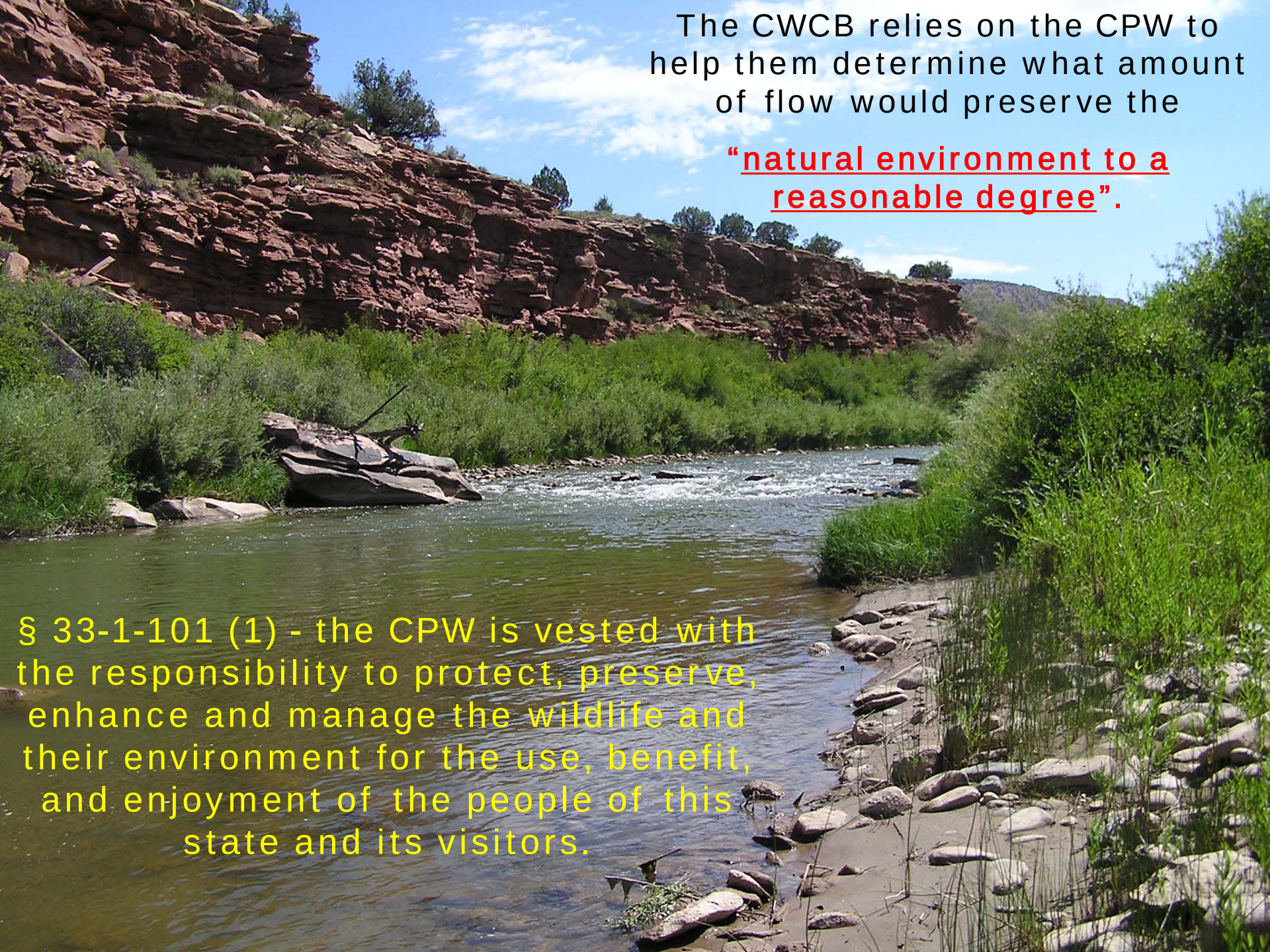
BLM



General Outline for Presentation

I. Conservation Strategy
II. Reach Characteristics
III. Biological Justification
IV. Scientific Studies
V. Recommended Flows
VI. Habitat Suitability Curves
VII. Opponents Issues
VIII. Anderson's Analysis
IX. Conclusions

Conservation Strategy

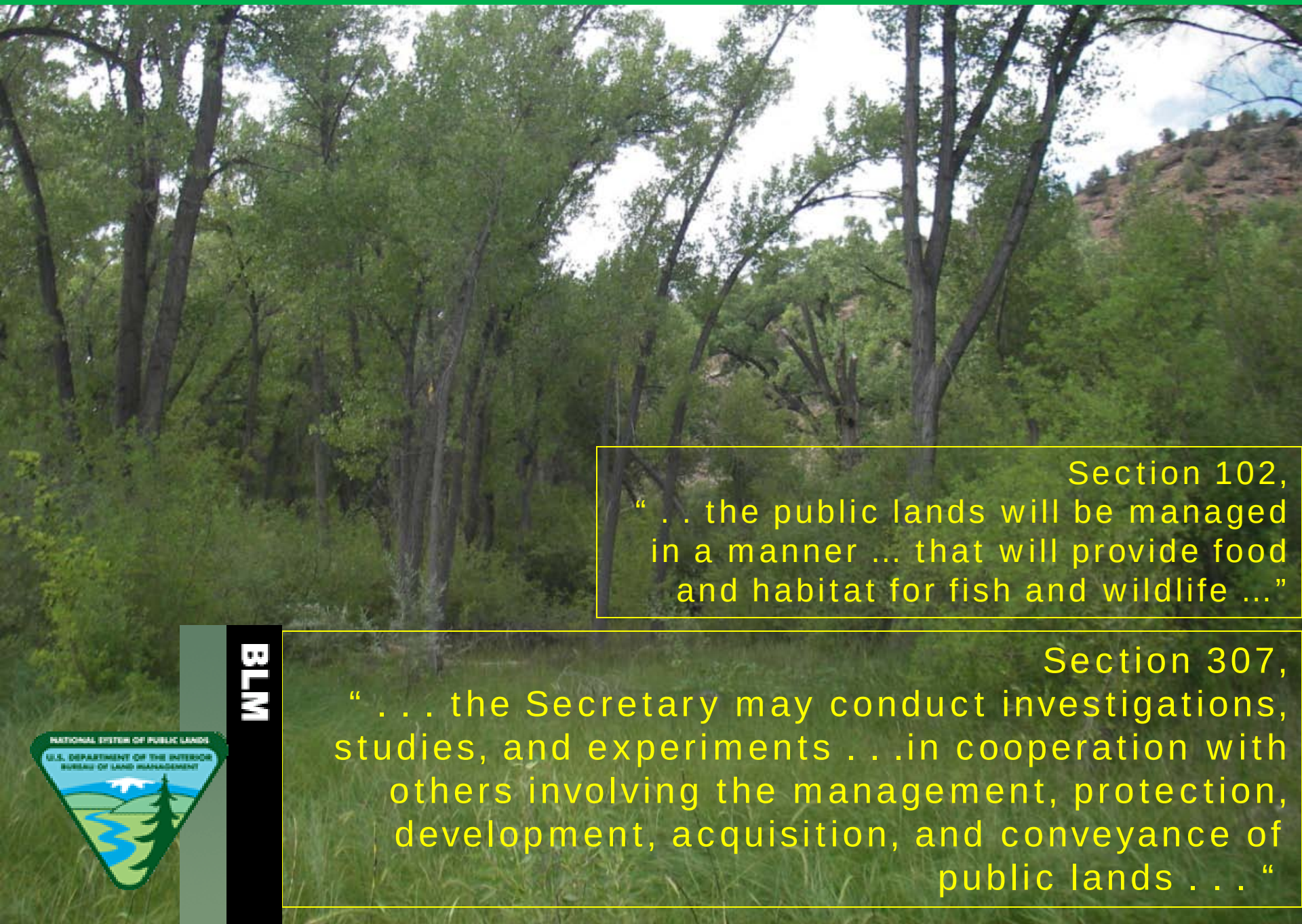


The CWCB relies on the CPW to help them determine what amount of flow would preserve the

"natural environment to a reasonable degree".

§ 33-1-101 (1) - the CPW is vested with the responsibility to protect, preserve, enhance and manage the wildlife and their environment for the use, benefit, and enjoyment of the people of this state and its visitors.

Federal Land Policy and Management Act



Section 102,
" . . the public lands will be managed in a manner ... that will provide food and habitat for fish and wildlife ..."

Section 307,
" . . . the Secretary may conduct investigations, studies, and experiments . . .in cooperation with others involving the management, protection, development, acquisition, and conveyance of public lands . . . "

BLM

RANGE-WIDE CONSERVATION AGREEMENT AND STRATEGY FOR

ROUNDTAIL CHUB Gila robusta, BLUEHEAD SUCKER Catostomus discobolus, AND FLANNELMOUTH SUCKER Catostomus latipinnis

Prepared for
Colorado River Fish and Wildlife Council

The state agencies signatory to this document are:
Arizona Game and Fish Department
Colorado Division of Wildlife
Nevada Department of Wildlife
New Mexico Department of Game and Fish
Utah Division of Wildlife Resources
Wyoming Game and Fish Department

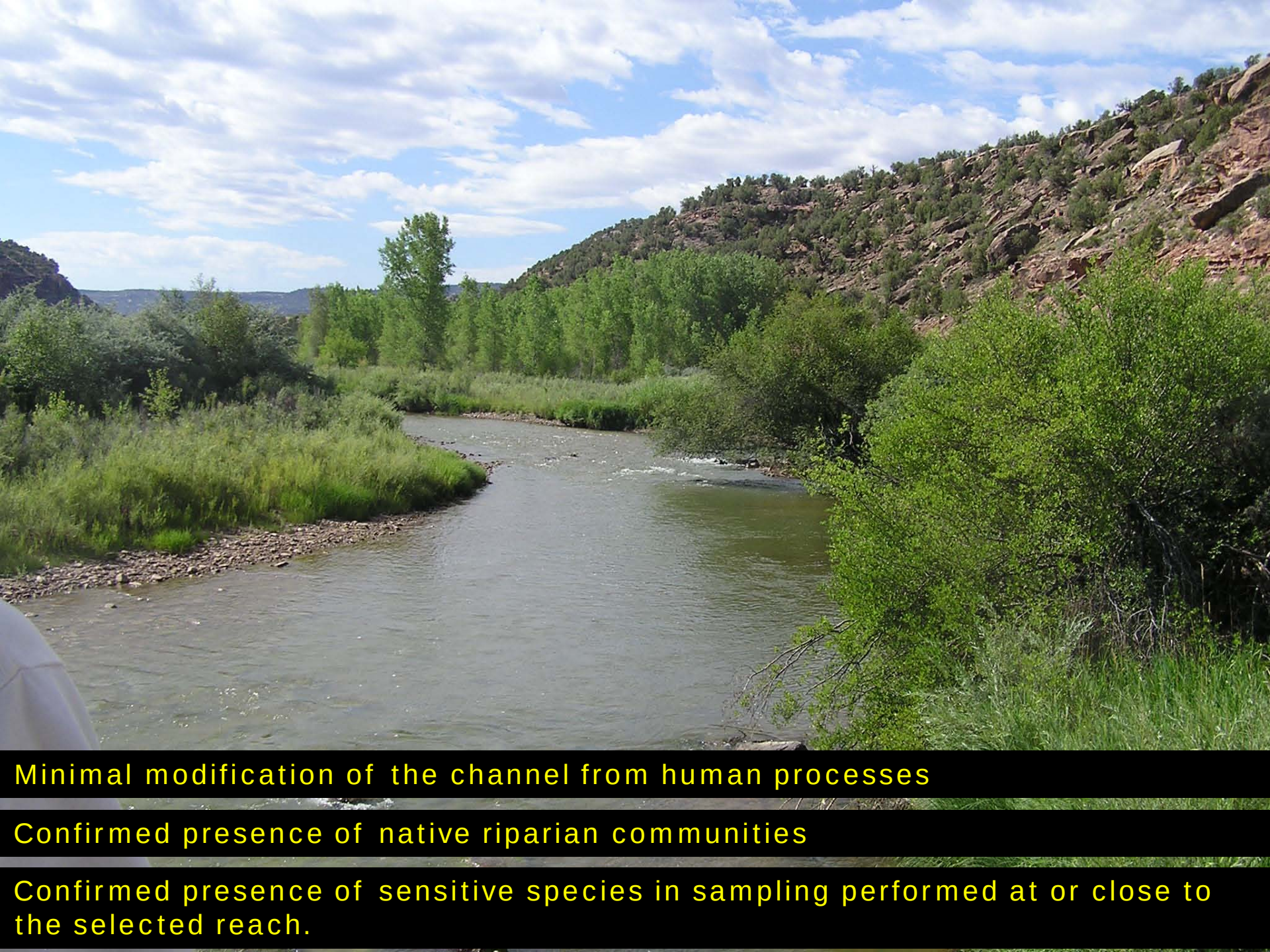
Opponents question if the stream reach selected for the instream flow study is a “representative reach”.

REACH CHARACTERISTICS

Representative Reach

BLM&CPW Staff selected a reach that:

1) Provided a snapshot of an unmodified stream channel with intact hydrologic processes, and
2) Was representative of the San Miguel River between Calamity Draw and the Dolores River, in terms of hydraulic parameters and fish habitat parameters.



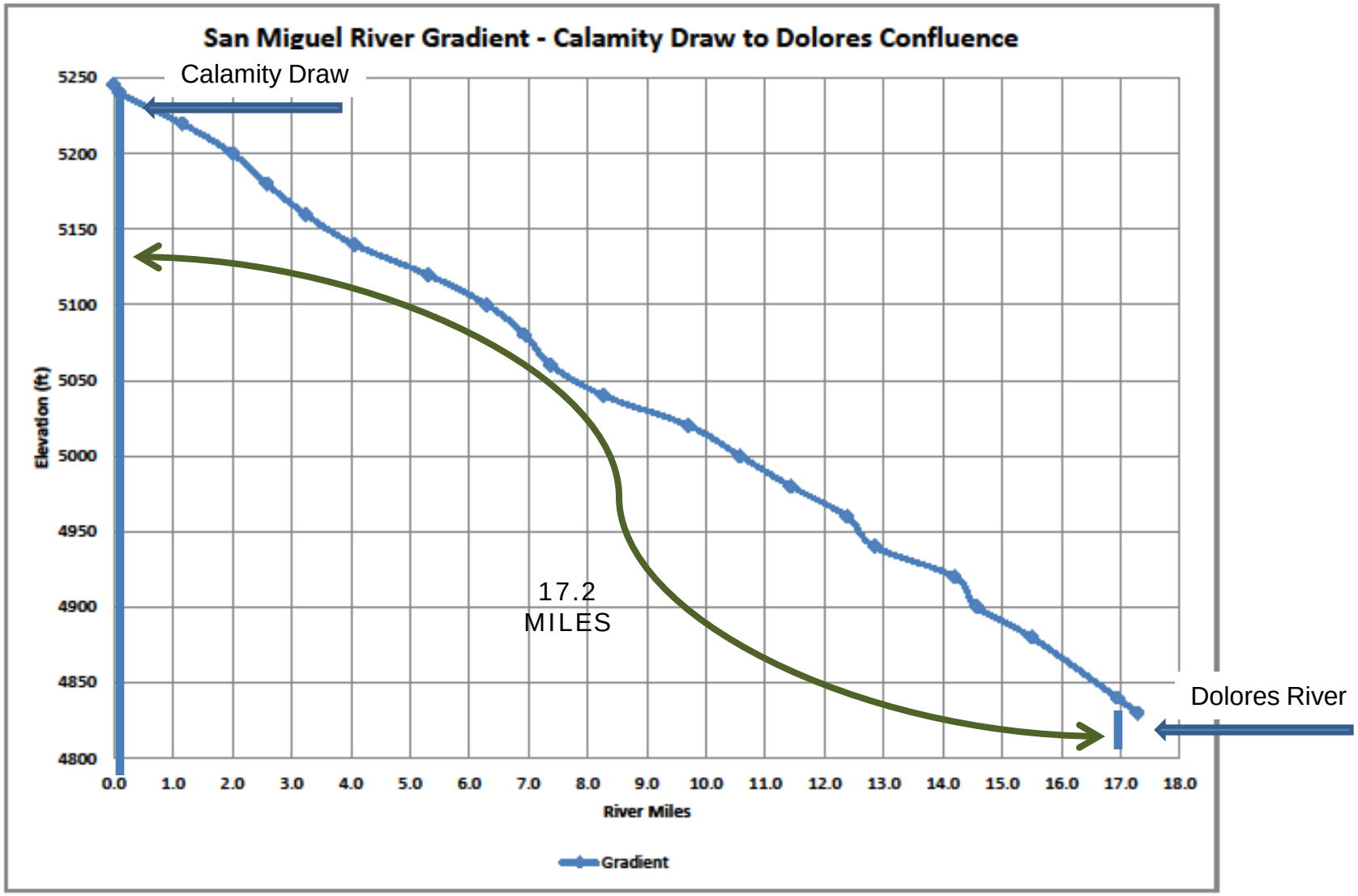
Minimal modification of the channel from human processes

Confirmed presence of native riparian communities

Confirmed presence of sensitive species in sampling performed at or close to the selected reach.

Contains a representation of the habitat types most critical for the various life stages of the three sensitive species.

Channel widths in the modeling location duplicate the range of widths found in the reach between Calamity Draw and confluence with the Dolores River.



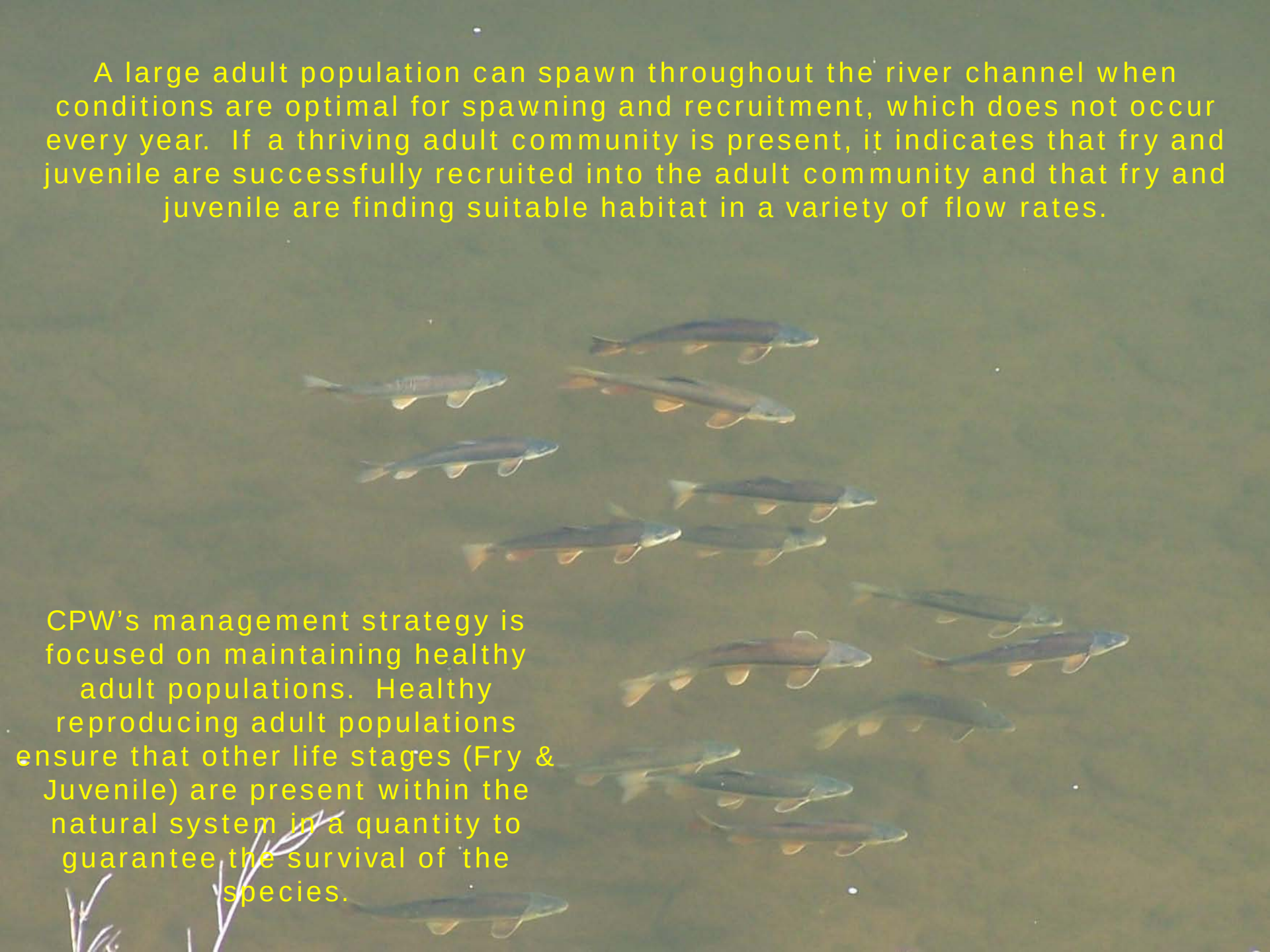
Channel gradient in the modeling location is in the middle of the range of gradients found in the reach between Calamity Draw and confluence with the Dolores River.

CONCLUSION

BLM and CPW chose the Nature Conservancy location for PHABSIM modeling because it met qualitative criteria for a natural stream channel and fish habitat, and because it meets quantitative hydraulic parameters for a representative stream reach.

Biological Justification

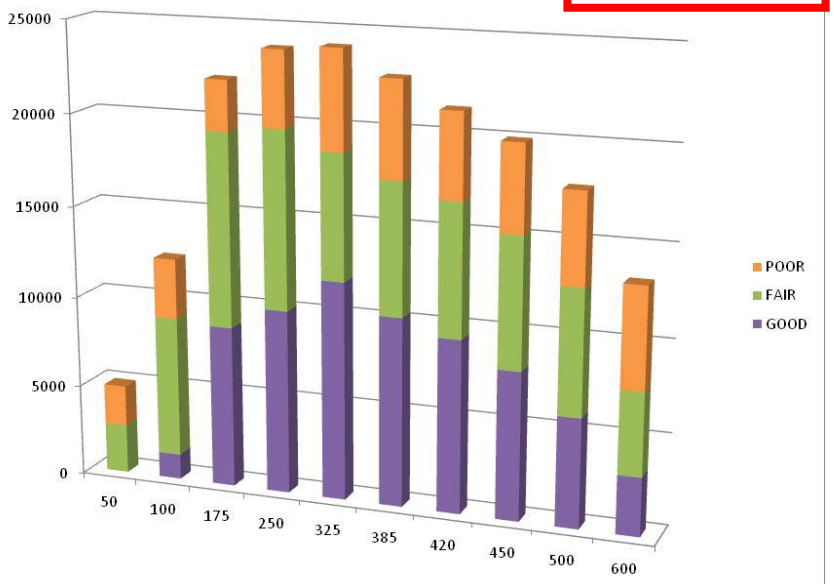
A large adult population can spawn throughout the river channel when conditions are optimal for spawning and recruitment, which does not occur every year. If a thriving adult community is present, it indicates that fry and juvenile are successfully recruited into the adult community and that fry and juvenile are finding suitable habitat in a variety of flow rates.



CPW's management strategy is focused on maintaining healthy adult populations. Healthy reproducing adult populations ensure that other life stages (Fry & Juvenile) are present within the natural system in a quantity to guarantee the survival of the species.

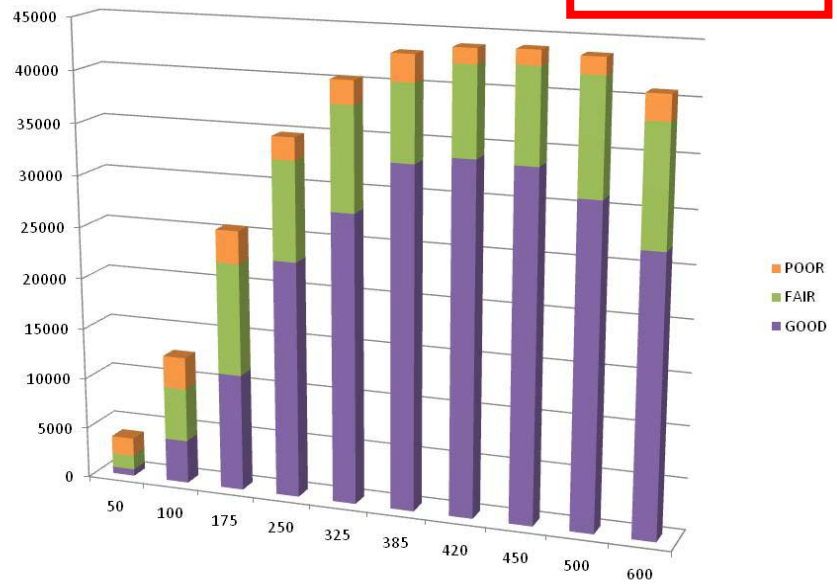
FLANNELMOUTH SUCKER

325 CFS



BLUEHEAD SUCKER

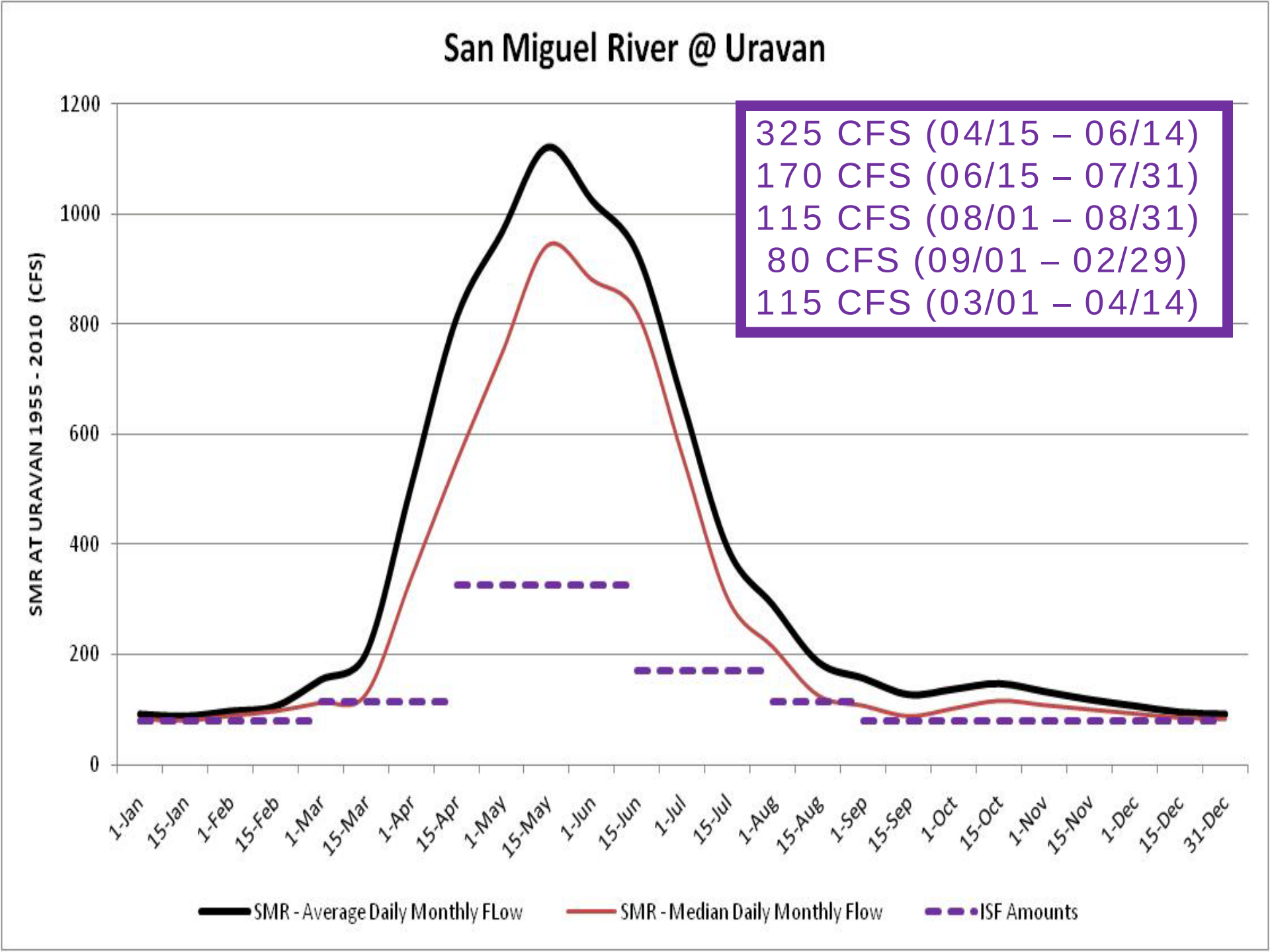
450 CFS



350 CFS

TNC - X #1 R2X - Runs

ELEV (FT)	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
94.57	7.18	79.44	2.92	4.45	232.01	82.11	100.00%	2.83	1277.28	5.51
92.87	8.88	58.17	2.02	2.75	117.23	59.36	72.30%	1.97	508.31	4.34
92.82	8.93	57.99	1.97	2.7	114.32	59.14	72.00%	1.93	488.71	4.27
92.77	8.98	57.82	1.93	2.65	111.43	58.92	71.80%	1.89	469.42	4.21
92.72	9.03	57.65	1.88	2.6	108.54	58.7	71.50%	1.85	450	4.15
92.67	9.08	57.47	1.84	2.55	105.66	58.48	71.20%	1.81	432.16	4.09
92.62	9.13	57.3	1.79	2.5	102.79	58.26	71.00%	1.76	414.3	4.03
92.57	9.18	57.13	1.75	2.45	99.93	58.05	70.70%	1.72	396.44	3.97
92.52	9.23	56.95	1.7	2.4	97.08	57.83	70.40%	1.68	378.58	3.90
92.47	9.28	56.78	1.66	2.35	94.24	57.61	70.20%	1.64	360.72	3.83
92.42	9.33	56.61	1.61	2.3	91.4	57.39	69.90%	1.59	342.86	3.75
92.37	9.38	56.43	1.57	2.25	88.58	57.17	69.60%	1.55	325	3.67
92.32	9.43	56.26	1.52	2.2	85.76	56.95	69.40%	1.51	312.78	3.65
92.27	9.48	56.09	1.48	2.15	82.95	56.73	69.10%	1.46	301.28	3.63
92.22	9.53	55.91	1.43	2.1	80.15	56.51	68.80%	1.42	289.78	3.62
92.17	9.58	55.74	1.39	2.05	77.36	56.29	68.60%	1.37	278.28	3.60
92.12	9.63	55.57	1.34	2	74.58	56.07	68.30%	1.33	266.78	3.58
92.07	9.68	55.39	1.3	1.95	71.8	55.85	68.00%	1.29	255.28	3.56
92.02	9.73	55.22	1.25	1.9	69.04	55.64	67.80%	1.24	243.78	3.53
91.97	9.78	55.05	1.2	1.85	66.28	55.42	67.50%	1.2	232.28	3.50
91.92	9.83	54.87	1.16	1.8	63.53	55.2	67.20%	1.15	220.78	3.48
91.87	9.88	54.7	1.11	1.75	60.79	54.98	67.00%	1.11	209.28	3.44
91.82	9.93	53.73	1.08	1.7	58.08	54.01	65.80%	1.08	197.78	3.41
91.77	9.98	52.77	1.05	1.65	55.42	53.03	64.60%	1.04	186.28	3.36
91.72	10.03	51.8	1.02	1.6	52.8	52.06	63.80%	1.01	174.78	3.31
91.67	10.08	51.55	0.97	1.55	50.22	51.79	63.50%	0.97	162.32	3.23
91.62	10.13	51.3	0.93	1.5	47.65	51.52	63.20%	0.92	149.89	3.15
91.57	10.18	51.05	0.88	1.45	45.09	51.25	62.80%	0.88	137.44	3.05
91.52	10.23	50.8	0.84	1.4	42.54	50.98	62.50%	0.83	125	2.94
91.47	10.28	50.55	0.79	1.35	40.01	50.7	62.20%	0.79	112.56	2.81
91.42	10.33	50.3	0.75	1.3	37.49	50.43	61.90%	0.74	100.12	2.67
91.37	10.38	49.4	0.71	1.25	35	49.53	60.80%	0.71	90.36	2.58
91.32	10.43	48.5	0.67	1.2	32.55	48.62	59.70%	0.67	81.06	2.49
91.27	10.48	47.58	0.63	1.15	30.15	47.7	58.50%	0.63	72.26	2.4
91.22	10.53	46.67	0.6	1.1	27.79	46.78	57.40%	0.59	63.92	2.3
91.17	10.58	45.62	0.56	1.05	25.48	45.73	56.10%	0.56	56.16	2.2
91.12	10.63	44.58	0.52	1	23.23	44.68	54.80%	0.52	48.87	2.1
91.07	10.68	43.54	0.48	0.95	21.03	43.64	53.60%	0.48	42.06	2
91.02	10.73	42.5	0.44	0.9	18.88	42.59	52.30%	0.44	35.71	1.89
90.97	10.78	39.37	0.43	0.85	16.83	39.46	48.40%	0.43	31.03	1.84
90.92	10.83	37.91	0.39	0.8	14.9	38	46.60%	0.39	25.97	1.74
90.87	10.88	34.71	0.38	0.75	13.08	34.78	42.70%	0.38	22.18	1.7
90.82	10.93	29	0.39	0.7	11.43	29.07	35.70%	0.39	19.95	1.75
90.77	10.98	28	0.36	0.65	10	28.07	34.40%	0.36	16.36	1.64
90.72	11.03	27	0.32	0.6	8.63	27.06	33.20%	0.32	13.1	1.52
90.67	11.08	26	0.28	0.55	7.3	26.06	32.00%	0.28	10.17	1.39
90.62	11.13	24.67	0.24	0.5	6.03	24.72	30.30%	0.24	7.67	1.27
90.57	11.18	23.33	0.21	0.45	4.83	23.38	28.70%	0.21	5.5	1.14
90.52	11.23	21.67	0.17	0.4	3.71	21.71	26.60%	0.17	3.72	1
90.47	11.28	20.21	0.13	0.35	2.66	20.25	24.90%	0.13	2.24	0.84
90.42	11.33	16.25	0.1	0.3	1.69	16.29	20.00%	0.1	1.21	0.72
90.37	11.38	10.84	0.09	0.25	1.01	10.86	13.30%	0.09	0.68	0.67
90.32	11.43	5.42	0.11	0.2	0.6	5.43	6.70%	0.11	0.45	0.75
90.27	11.48	4.38	0.08	0.15	0.36	4.39	5.40%	0.08	0.22	0.61
90.22	11.53	3.33	0.05	0.1	0.17	3.34	4.10%	0.05	0.07	0.44
90.17	11.58	1.67	0.03	0.05	0.04	1.67	2.10%	0.02	0.01	0.28
90.12	11.63	0	#DIV/0!	0	0	0	0.00%	#DIV/0!	#DIV/0!	#DIV/0!


San Miguel River @ Uravan
325 CFS (04/15 – 06/14)
170 CFS (06/15 – 07/31)
115 CFS (08/01 – 08/31)
80 CFS (09/01 – 02/29)
115 CFS (03/01 – 04/14)
SMR AT URAVAN 1955 - 2010 (CFS)
1200
1000
800
600
400
200
0
1-Jan
15-Jan
1-Feb
15-Feb
1-Mar
15-Mar
1-Apr
15-Apr
1-May
15-May
1-Jun
15-Jun
1-Jul
15-Jul
1-Aug
15-Aug
1-Sep
15-Sep
1-Oct
15-Oct
1-Nov
15-Nov
1-Dec
15-Dec
31-Dec
SMR - Average Daily Monthly FLow
SMR - Median Daily Monthly Flow
ISF Amounts

Scientific Studies

BLM&CPW Reviewed Existing Scientific Studies including studies completed by Retired CDOW Researcher Rick Anderson and The Flow Recommendation Study completed by the Biology Committee of the The San Juan River Basin Implementation Program.

STEWART (2000)

ANDERSON & STEWART (2003)

ANDERSON (2005)

ANDERSON, STEWART & WOHL (2005)

ANDERSON & STEWART (2006)

The "Mixer," a Colorado pikeminnow spawning area in the San Juan River.

Flow Recommendations for the San Juan River

May 1999

Prepared by:
The San Juan River Basin
Recovery Implementation Program
BIOLOGY COMMITTEE

Compiled and Edited by:
PAUL B. HOLDEN

The Biology Committee of the SJRIP consisted of individuals representing a wide range of organizations and interests.

1. Bureau of Indian Affairs,
2. USFWS (Regions 2 & 6),
3. Bureau of Reclamation,
4. Jicarilla-Apache Tribe,
5. Navajo Nation,
6. Southern Ute Tribe,
7. State of Colorado,
8. State of New Mexico,
9. Water Users.

Flow Recommendations for the San Juan River

The native fish instream flow recommendations for the San Juan River were the result of a seven-year study that was designed and performed by the Biology Committee of the SJRIP.

Existing Studies Contradict the Assumptions and Hypothesis in the Conklin Report that native species prefer low flows over high flows.

The "Mixer," a Colorado pikeminnow spawning area in the San Juan River.

Flow Recommendations for the San Juan River

May 1999

Prepared by:
The San Juan River Basin
Recovery Implementation Program
BIOLOGY COMMITTEE

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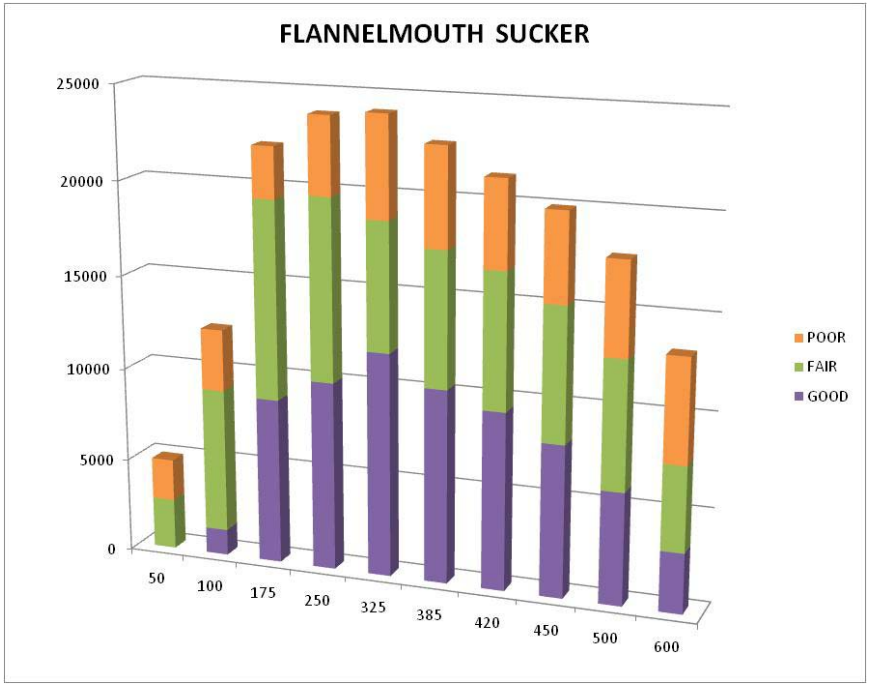
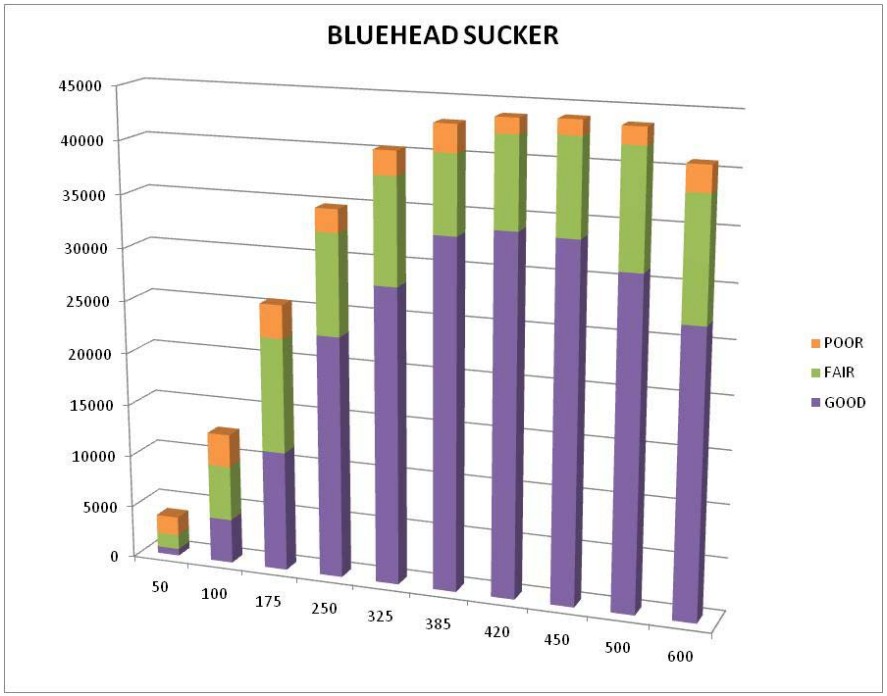




SJRIP study did not develop any specific habitat suitability curves for any life stages of the roundtail chub, speckled dace, bluehead sucker or flannelmouth sucker but it did provide specific observations regarding what flows provided these species with better reproductive success.

The results of this seven-year study, indicated that:

"*the young of bluehead sucker and speckled dace, …, were found in greater numbers during* **high flow years** *(emphasis added) compared with low flow years*" and bluehead sucker and speckled dace reproductive success increased with increasing duration of flows equal to or exceeding bankfull conditions.

Exhibit RS#5

San Miguel River @ Uravan Peak Flow

Date	q	rank (m) (m)	Exceed Prob (m/n+1)	% Exceed 100(m/n+1)	Return Int 1/P*100
9/6/1970	8910	1	0.0227	2	44.00
5/10/1983	8050	2	0.0455	5	22.00
4/19/1958	6690	3	0.0682	7	14.67
4/19/1979	6310	4	0.0909	9	11.00
5/11/1984	6260	5	0.1136	11	8.80
8/30/1957	5530	6	0.1364	14	7.33
4/18/1987	5470	7	0.1591	16	6.29
7/12/1975	4820	8	0.1818	18	5.50
8/23/1982	4540	9	0.2045	20	4.89
4/16/1985	4270	10	0.2273	23	4.40
4/11/1960	4210	11	0.2500	25	4.00
4/20/1997	4120	12	0.2727	27	3.67
4/24/1998	4120	13	0.2955	30	3.38
10/6/2006	3890	14	0.3182	32	3.14
4/28/1993	3870	15	0.3409	34	2.93
8/15/1956	3490	16	0.3636	36	2.75
4/26/1974	3460	17	0.3864	39	2.59
9/9/1976	3440	18	0.4091	41	2.44
8/20/1999	3380	19	0.4318	43	2.32
4/18/1962	3260	20	0.4545	45	2.20
4/23/1980	3220	21	0.4773	48	2.10
5/24/2005	3180	22	0.5000	50	2.00
8/18/1977	3140	23	0.5227	52	1.91
4/26/1955	3000	24	0.5455	55	1.83
4/8/1991	2740	25	0.5682	57	1.76
4/20/2008	2730	26	0.5909	59	1.69
4/27/1978	2690	27	0.6136	61	1.63
7/19/1986	2620	28	0.6364	64	1.57
9/7/2006	2520	29	0.6591	66	1.52
7/8/1990	2140	30	0.6818	68	1.47
9/10/2003	2130	31	0.7045	70	1.42
4/30/1961	2120	32	0.7273	73	1.38
5/9/2000	2090	33	0.7500	75	1.33
4/10/1992	1970	34	0.7727	77	1.29
9/8/1981	1780	35	0.7955	80	1.26
8/4/1959	1750	36	0.8182	82	1.22
4/19/2001	1490	37	0.8409	84	1.19
3/26/2004	1460	38	0.8636	86	1.16
6/1/1994	1390	39	0.8864	89	1.13
9/10/2002	1290	40	0.9091	91	1.10
4/8/1988	1240	41	0.9318	93	1.07
7/29/1989	1140	42	0.9545	95	1.05
9/25/1954	1040	43	0.9773	98	1.02

In addition to being important to the reproductive success of the native species, Dr. Miller pointed out in his instream flow report regarding the Colorado River:

"Peak flows are most important for habitat creation and maintenance. Peak flows of bankfull and higher are required at regular frequency for proper ecosystem function."

BLM&CPW have estimated that bankfull conditions on the San Miguel River at Uravan occur at a flow of approximately 2,520 cfs.*

* Based on flood-frequency data and the recurrence interval of 1.5 years

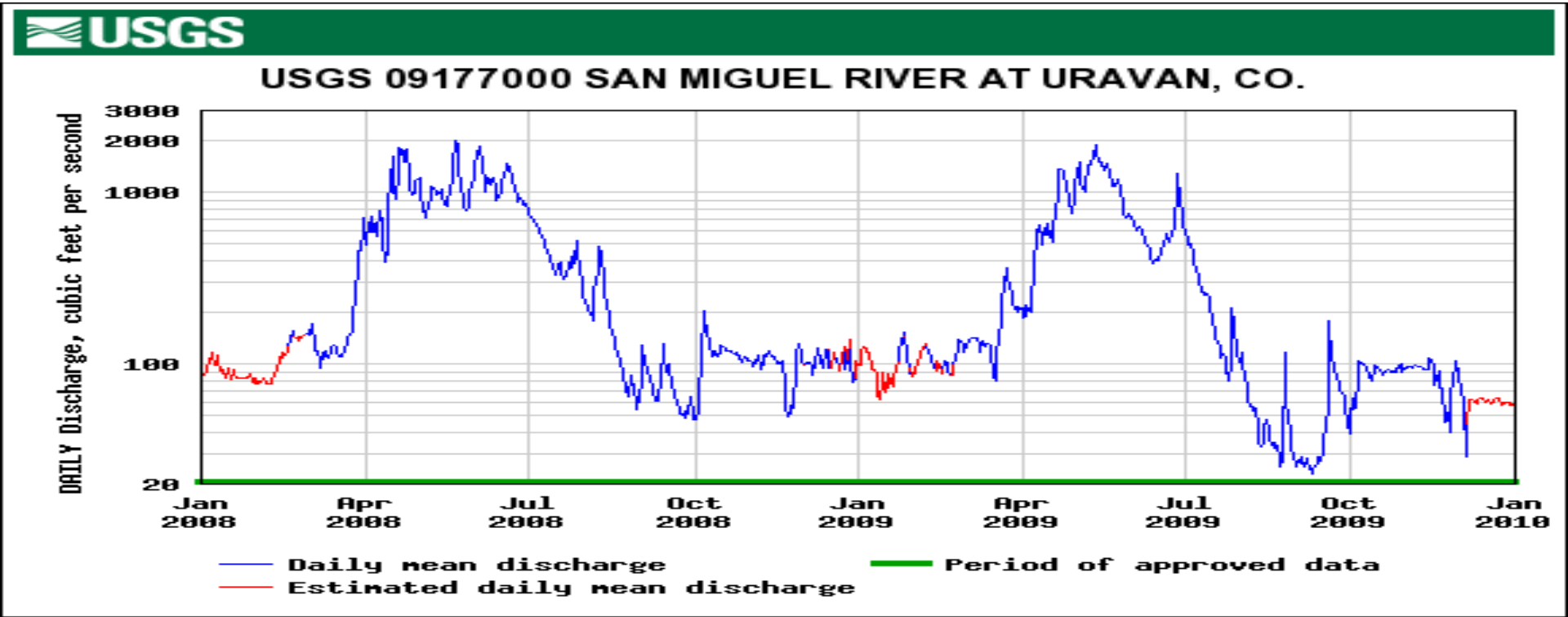
"Mimicry of the natural hydrograph is the foundation of the flow recommendation process for the San Juan River. Scientists have recently recognized that temporal (intra- and interannual) flow variability is necessary to create and maintain habitat and to maintain a healthy biological community in the long term."

This same concept is implied by Mr. Conklin several times in his report where he states :

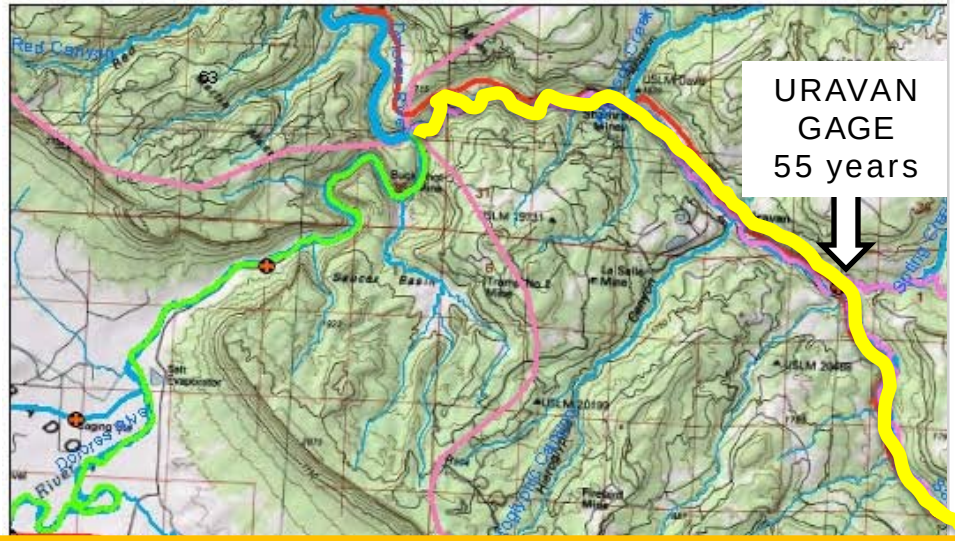
"*Recommended minimum flows that mimic current flows would preserve the existing healthy fish community*."

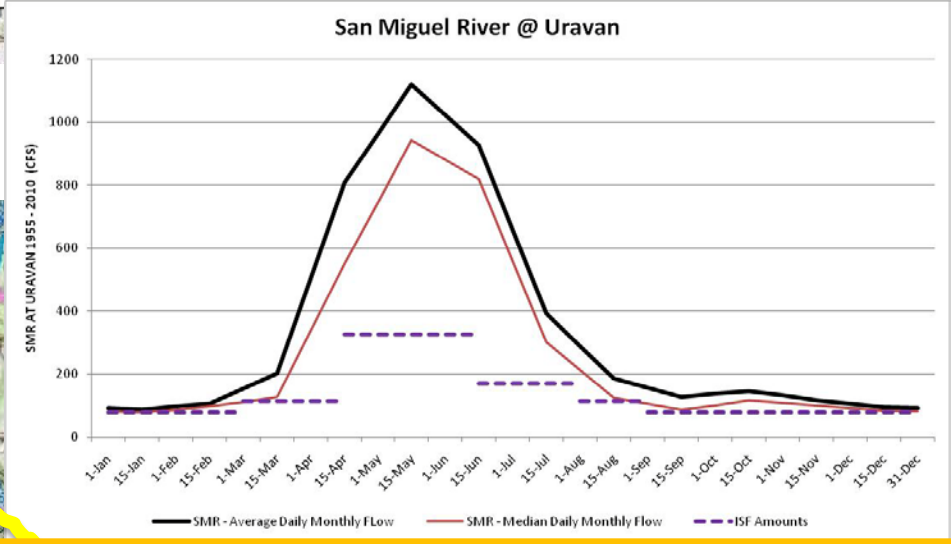
And

"*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*."

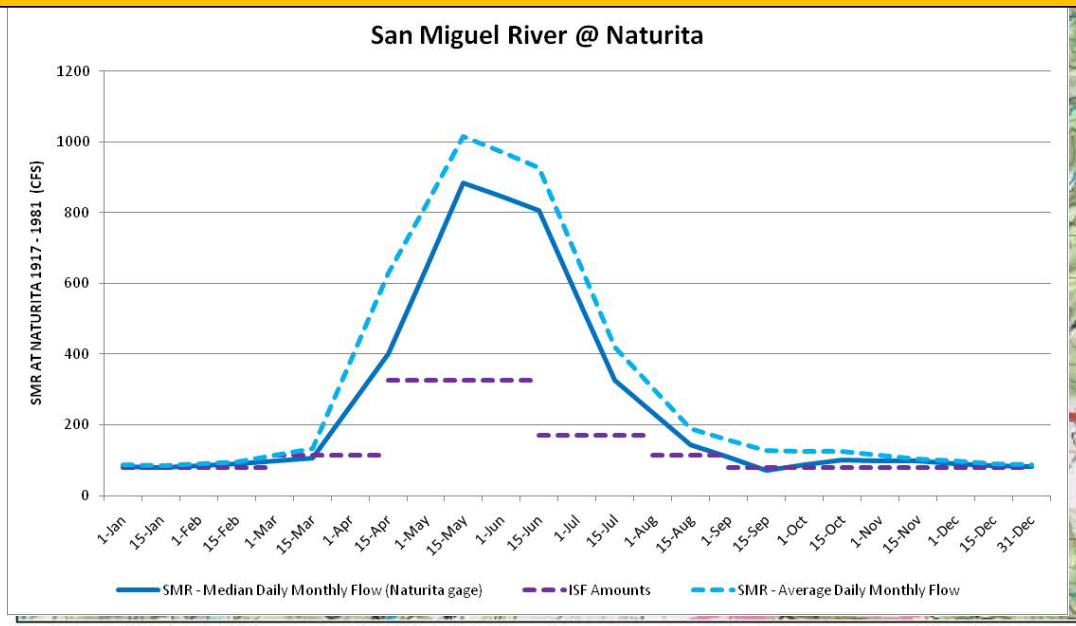


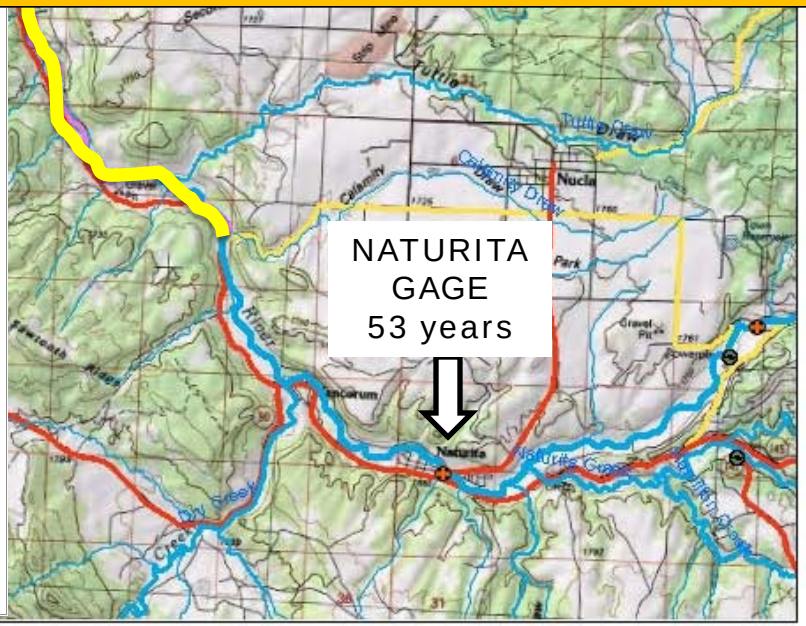
RECOMMENDED FLOWS





Opponents state that the proposed instream flow amounts are not reflective of flows in this section.

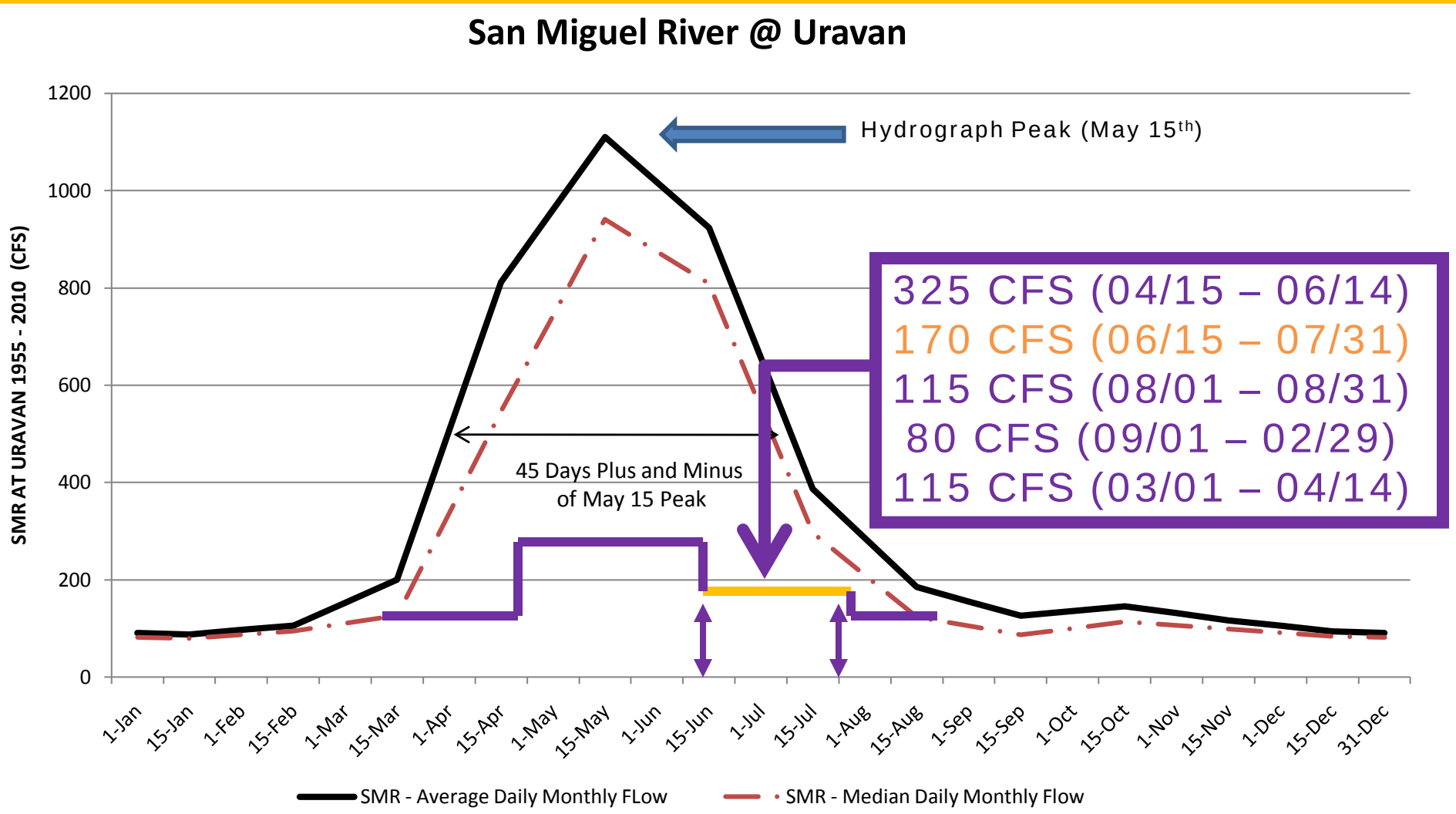




SAN MIGUEL RIVER
CALAMITY DRAW TO DOLORES RIVER

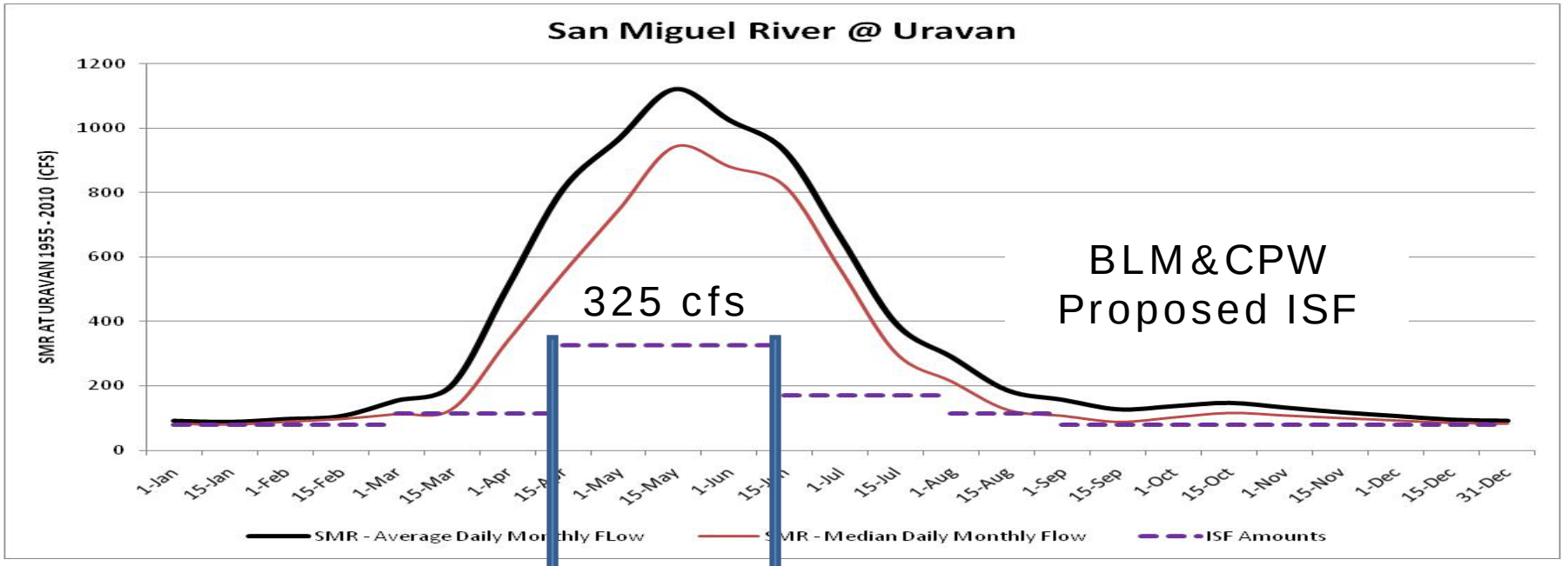
0 0.5 1 2 3 4 Miles

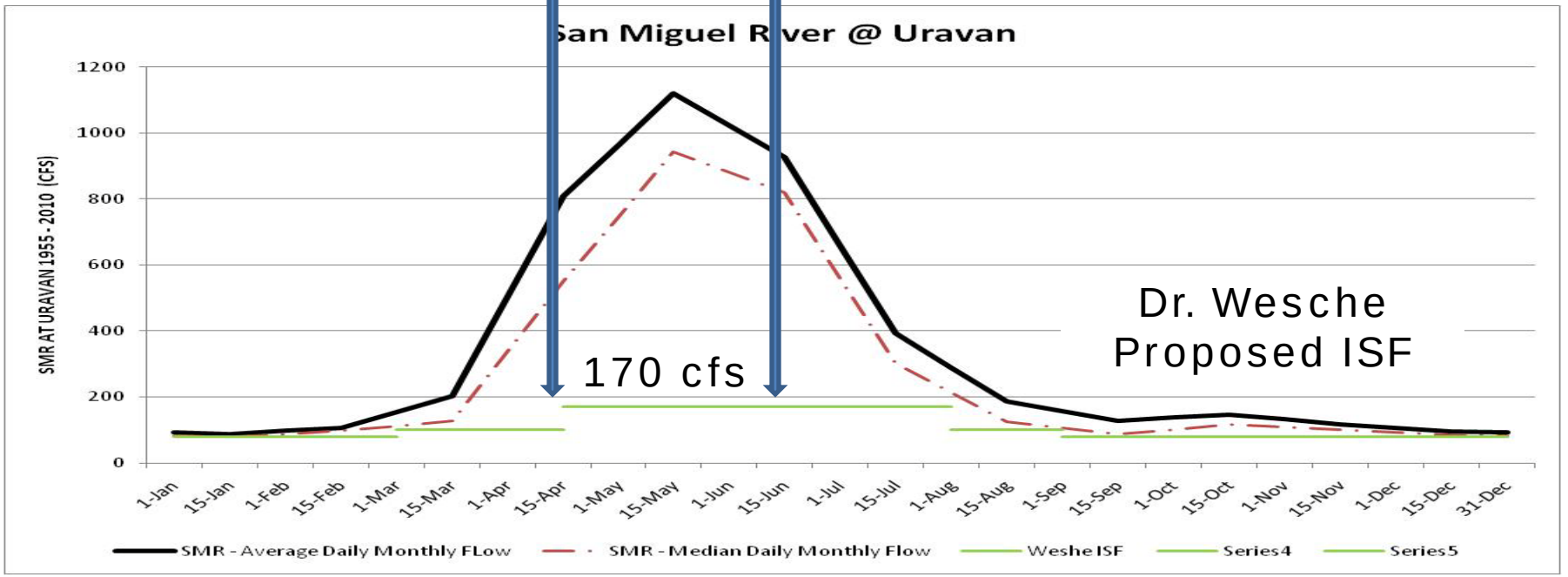
Dr. Wesche questioned if the roundtail chub habitat needs were considered.



Flannelmouth Sucker - spawn in spring and early summer, typically during May and June, and on the ascending limb or **peak of the hydrograph**.
Bluehead Sucker - spawn in mid-June to mid-July, typically during the descending limb of the hydrograph.

Roundtail Chub – spawn in mid-June to mid-July, typically during the descending limb of the hydrograph


San Miguel River @ Uravan
SMR AT URAVAN 1955 - 2010 (CFS)
1200
1000
800
600
400
200
0
1-Jan
15-Jan
1-Feb
15-Feb
1-Mar
15-Mar
1-Apr
15-Apr
1-May
15-May
1-Jun
15-Jun
1-Jul
15-Jul
1-Aug
15-Aug
1-Sep
15-Sep
1-Oct
15-Oct
1-Nov
15-Nov
1-Dec
15-Dec
31-Dec
325 cfs
BLM&CPW
Proposed ISF
SMR - Average Daily Monthly FLow
SMR - Median Daily Monthly Flow
ISF Amounts


San Miguel River @ Uravan
SMR AT URAVAN 1955 - 2010 (CFS)
1200
1000
800
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0
1-Jan
15-Jan
1-Feb
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1-Mar
15-Mar
1-Apr
15-Apr
1-May
15-May
1-Jun
15-Jun
1-Jul
15-Jul
1-Aug
15-Aug
1-Sep
15-Sep
1-Oct
15-Oct
1-Nov
15-Nov
1-Dec
15-Dec
31-Dec
170 cfs
Dr. Wesche
Proposed ISF
SMR - Average Daily Monthly FLow
SMR - Median Daily Monthly Flow
Weshe ISF
Series4
Series5

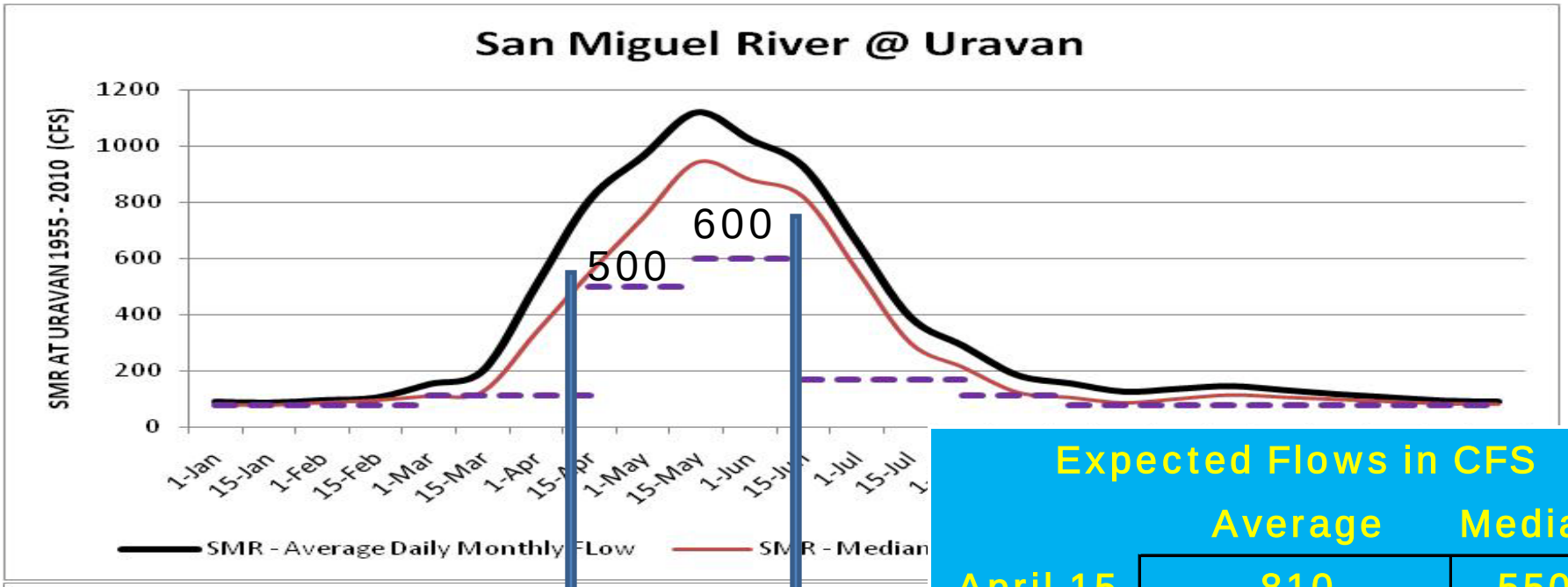
Peak Runoff Season Flow Recommendations

Recommender	4/15 – 5/14	5/15 – 6/14	Method
Anderson	325	600	Bank-Bottom Flow
Woodling	500	500	Adult Bluehead Habitat
BLM/CPW	325	325	Adult Flannelmouth Habitat/R2X Method
Conklin	200	200	White Sucker/Longnose Dace Habitat
Wesche	170	170	Equal WUA

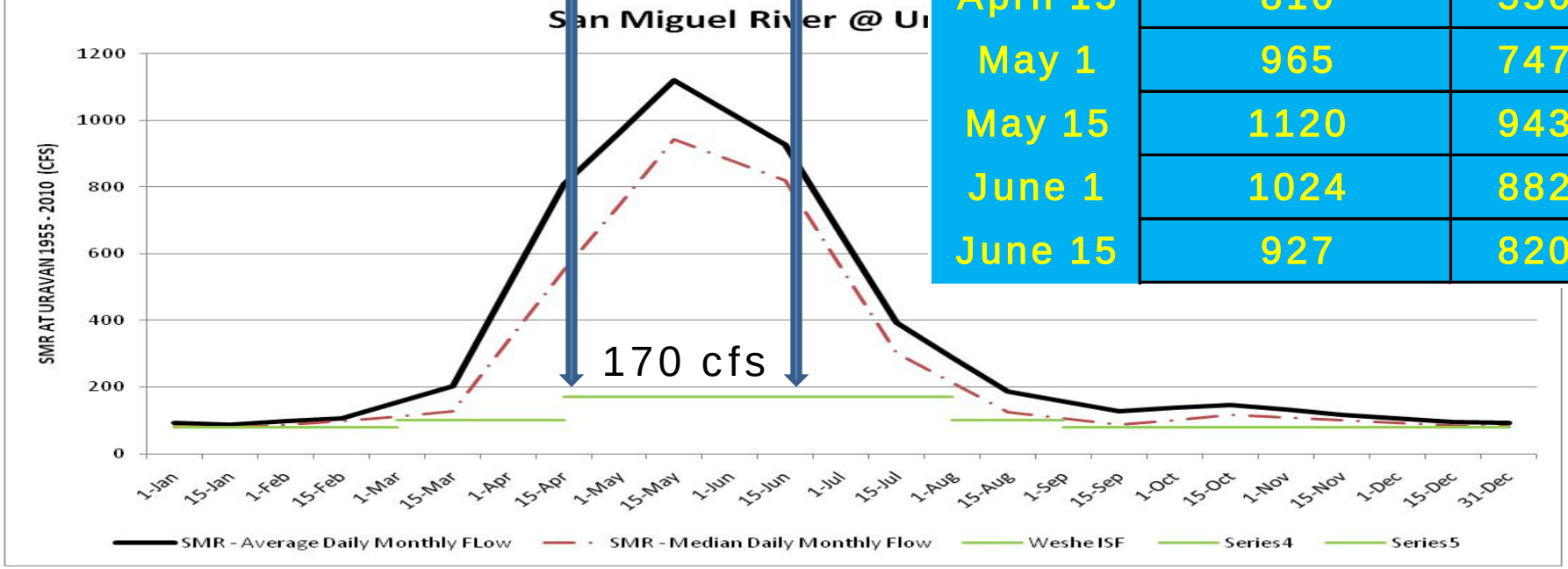
DEERE & AULT
CONSULTANTS, INC.

According to Uravan Gage records, average monthly flows for April, May, and June are 812 cfs, 1,110 cfs, and 923 cfs, respectively. **Average monthly flows in excess of the ISF recommendation are approximately 597 cfs, 804 cfs, and 687 cfs, respectively** (emphasis added).

Flow rates and volumes of this magnitude are difficult for most water users to divert, store or use due to practical infrastructure constraints (i.e., total ditch capacity, ditch capacity in excess of existing water rights being diverted, well capacity and available storage capacity). **Without large diversion capacities and storage reservoirs, a large portion of peak runoff flows, such as those experienced in the months of April, May and June, cannot be put to beneficial use** (emphasis added).



Expected Flows in CFS		
	Average	Median
April 15	810	550
May 1	965	747
May 15	1120	943
June 1	1024	882
June 15	927	820



Expected Flows in CFS		
	Average	Median
April 1	506	339
April 15	810	550
May 1	965	747
May 15	1120	943
June 1	1024	882
June 15	927	820
July 1	660	561

If the Opponents were truly interested in providing streamflows for spawning and fry life stages, as their pre-hearing statements indicate, they would be recommending that the BLM&CPW increase their instream flow recommendations to at least 339 cfs (the minimum flow during the April 1 to July 1 spawning season period for a median year hydrograph).

Habitat Suitability Curves

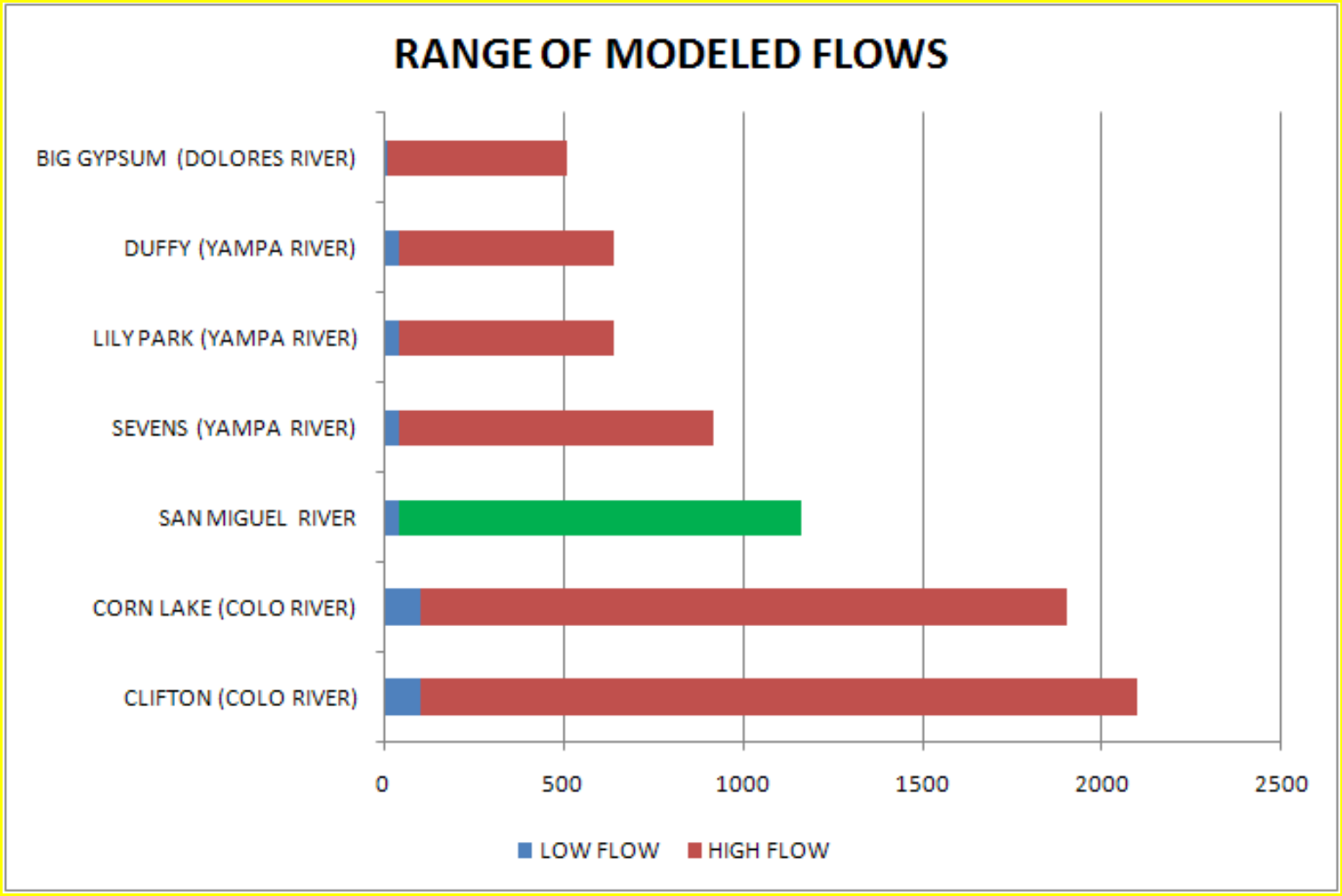
River Habitat Separated Into 16 Different Types.

BLM&CPW identified 11 of the 16 different habitat types indentified by Anderson and Stewart over the range of flows modeled in our 815 foot San Miguel River study reach.

Those mesohabitats identified by Anderson and Stewart are shown in the Table below:

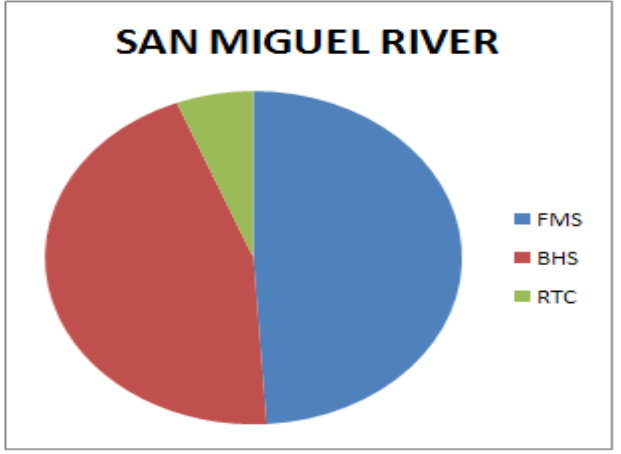
Depth and velocity criteria used to define meso-habitat types.								
Habitat Types Depth Velocity								
	m	m	m/s	m/s	ft	ft	ft/s	ft/s
1 Wetted-pool 0.01 – 0.2 < 0.15	0.01	0.2	0	0.15	0.0328	0.656	0	0.492
2 Shoal-pool 0.2 - 0.5 < 0.15	0.2	0.5	0	0.15	0.656	1.64	0	0.492
3 Shallow-pool 0.5 - 1.0 < 0.15	0.5	1	0	0.15	1.64	3.28	0	0.492
4 Medi–pool 1.0 - 2.0 < 0.15	1	2	0	0.15	3.28	6.56	0	0.492
5 Deep-pool > 2.0 < 0.15	2		0	0.15	6.56		0	0.492
6 Wetted-run .01 - 0.2 0.15 - .6	0.01	0.2	0.15	0.6	0.0328	0.656	0.492	1.968
7 Shoal-run 0.2 - 0.5 0.15 - .6	0.2	0.5	0.15	0.6	0.656	1.64	0.492	1.968
8 Shallow-run 0.5 to 1.0 0.15 - .6	0.5	1	0.15	0.6	1.64	3.28	0.492	1.968
9 Medi-run 1.0 to 2.0 0.15 - .6	1	2	0.15	0.6	3.28	6.56	0.492	1.968
10 Deep-run > 2.0 0.15 - .6	2		0.15	0.6	6.56		0.492	1.968
11 Shallow-riffle < 0.2 0.6 - 1.5	0.2		0.6	1.5	0	0.656	1.968	4.92
12 Riffle 0.2 to 0.5 0.6 - 1.5	0.2	0.5	0.6	1.5	0.656	1.64	1.968	4.92
13 Deep-riffle 0.5 to 1.0 0.6 - 1.5	0.5	1	0.6	1.5	1.64	3.28	1.968	4.92
14 Very-deep-riffle > 1.0 0.6 - 1.5	1		0.6	1.5	3.28		1.968	4.92
15 Shallow-rapid < 0.5 > 1.5	0	0.5		1.5	0	1.64	0	4.92
16 Deep-rapid > 0.5 > 1.5	0.5			1.5	1.64		0	4.92

BLM&CPW also compared the hydraulic conditions Anderson and Stewart used to develop the habitat availability curves to the hydraulic conditions we modeled in the San Miguel River (40 cfs to 1125 cfs).

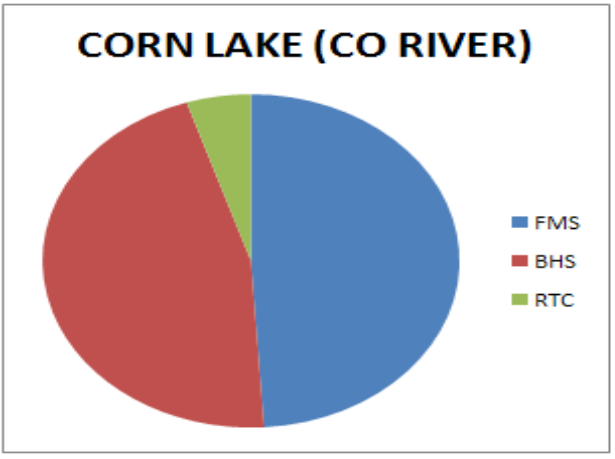


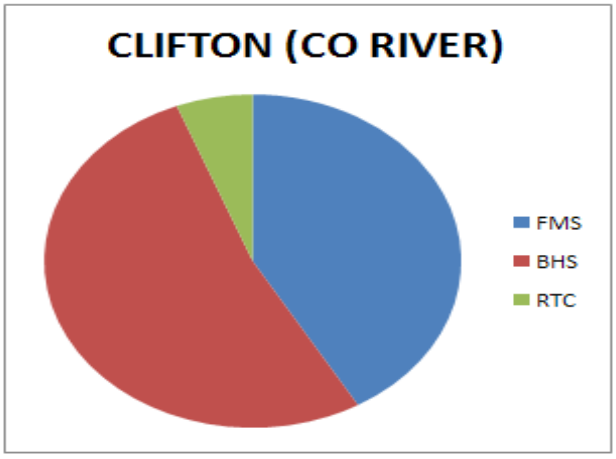
(see Anderson Riverine Fish Flow Investigations Federal Aid Project F-289-R6).

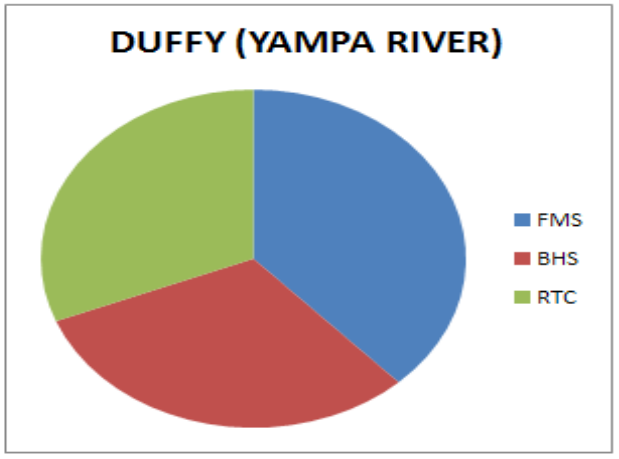
BLM&CPW also compared the relative composition of the native fish communities at the Anderson and Stewart study sites with the composition of the native fish community on the San Miguel River.

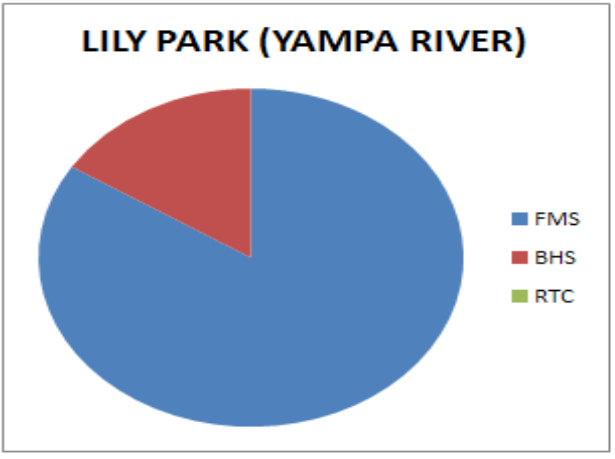


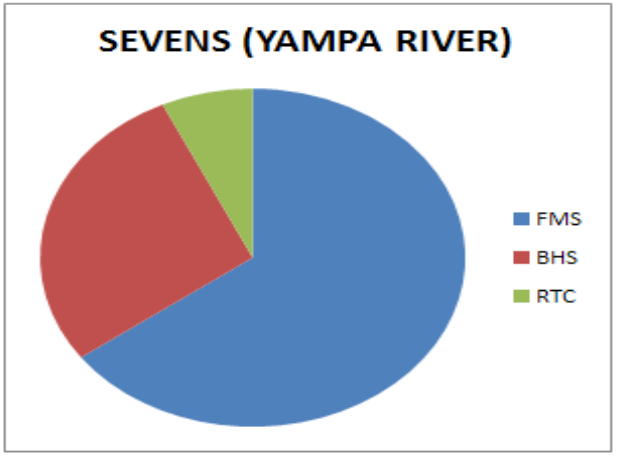
Percentage of Native Fish Community

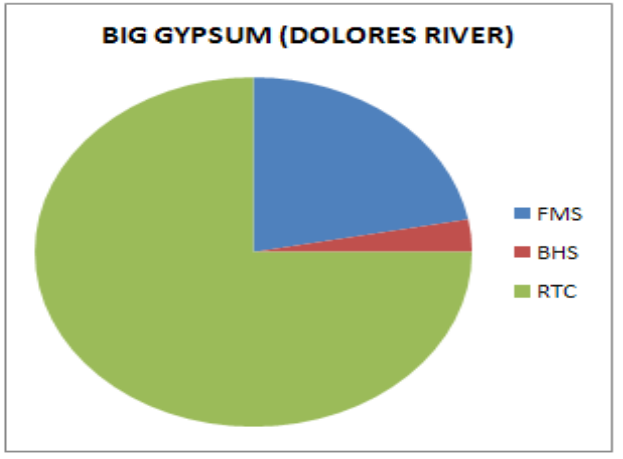










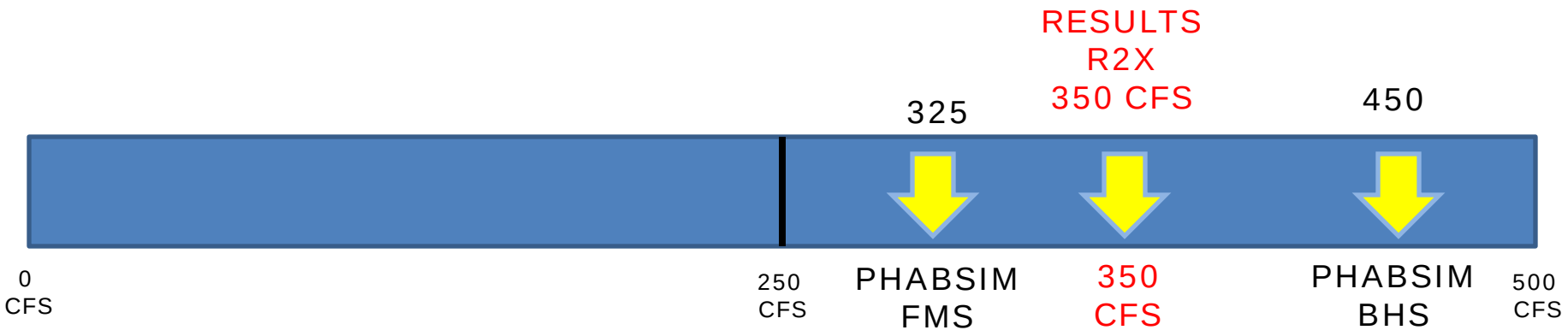


Opponents argue the depth and velocity criteria applied in the R2CROSS modeling were improperly applied. They also argue that the analysis of the flow at which maximum weighted usable area (WUA) for bluehead and flannelmouth sucker species is flawed.

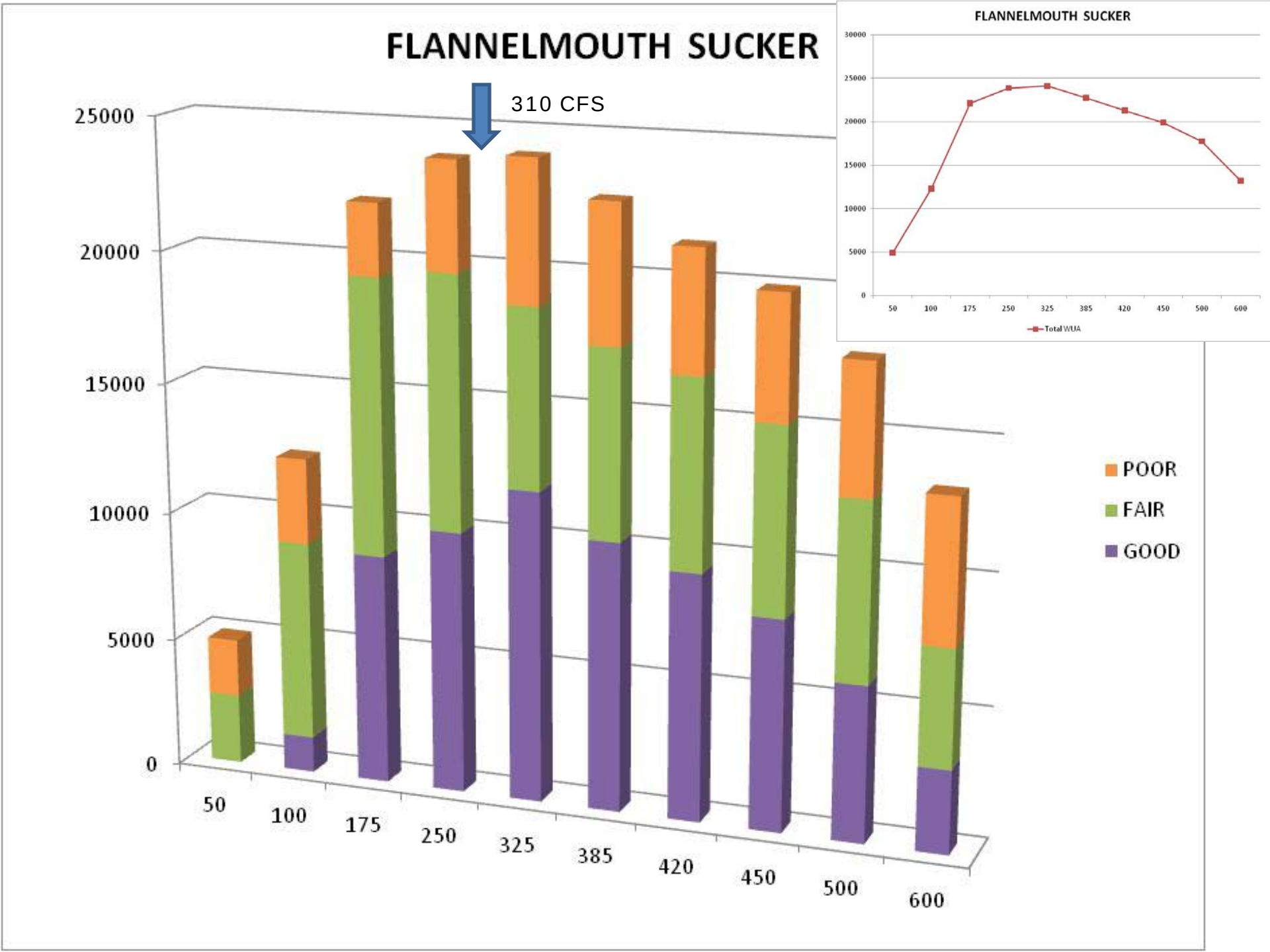
BLM&CPW compared results from their PHABSIM study with their results using the R2CROSS Methodology with developed bluehead sucker standard criteria. The results of the PHABSIM study indicated that 325 cfs maximized weighted useable area or habitat for flannelmouth suckers and 450 cfs maximized weighted useable area or habitat for bluehead suckers.

The difference between the flow amounts recommended by the PHABSIM study and the R2CROSS study using the developed BHS standard criteria of 1.0 foot depth and 1.3 foot/sec velocity in riffles results in:

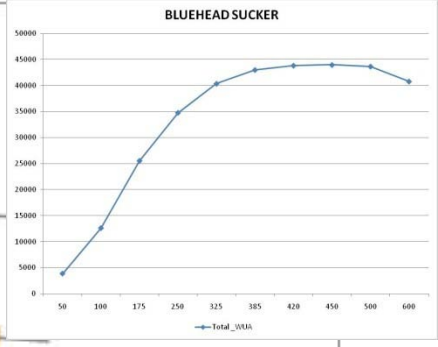
R2CROSS overestimated flows needed for flannelmouth sucker habitat by 7%
(350 cfs from R2CROSS vs. 325 cfs from PHABSIM)



R2CROSS underestimated flows required for bluehead sucker habitat by 23%
(350 cfs for R2CROSS vs. 450 cfs for PHABSIM).


FLANNELMOUTH SUCKER
310 CFS
25000
20000
15000
10000
5000
0
50
100
175
250
325
385
420
450
500
600
POOR
FAIR
GOOD
FLANNELMOUTH SUCKER
30000
25000
20000
15000
10000
5000
0
50
100
175
250
325
385
420
450
500
600
Total WUA

BLUEHEAD SUCKER



435 CFS

45000
40000
35000
30000
25000
20000
15000
10000
5000
0

50
100
175
250
325
385
420
450
500
600

POOR
FAIR
GOOD

Opponents argue that the biological justification, specifically the interpretation of PHABSIM modeling results, failed to consider;

1) the multiple life stages of bluehead sucker and flannelmouth sucker,
2) Relative abundance of sampled species,
3) The habitat requirements of the roundtail chub, and
4) The suitability of using the habitat curves developed by Anderson & Stewart on the San Miguel River

Opponents' Issues

Anderson Analysis

I was the DOW Researcher tasked with determining habitat suitability criteria for the bluehead sucker, flannelmouth sucker and roundtail chub.

This research provided data that were specifically meant to be applied to development of instream flow recommendations in the upper Colorado River basin.

My general conclusions from the San Miguel River fish data are:

1. The San Miguel Rivers' bluehead and flannelmouth sucker population structure was similar to the other rivers where habitat suitability criteria were identified.
2. The number of non-native species in the San Miguel is comparatively low, making it an important conservation population for the Colorado River system.
3. Roundtail chub numbers and percentage is lower in the San Miguel River, whereas channel catfish numbers are relatively higher.
4. The use of roundtail chub habitat preferences will not assist in justifying instream flow recommendations.

Bluehead Sucker

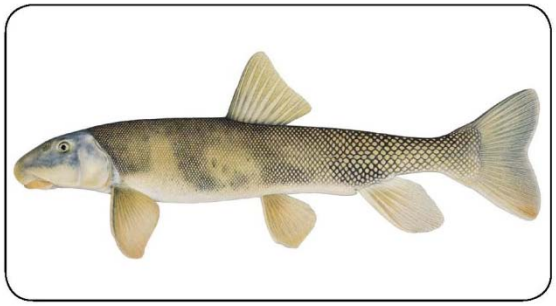
The bluehead sucker is a riffle obligate species, which is the reason it is nearly ideal for modeling the flow needs of the entire community. The R2Cross method identifies riffles as first limiting habitat and therefore the most critical habitat to protect. The prime importance of riffle habitat availability was also confirmed by the 2D modeling study of meso-habitat availability (Stewart and Anderson 2003).

Depth, velocity and wetted perimeter criteria were appropriately chosen, in my opinion, by CDOW and BLM staff who are thoroughly familiar with the R2Cross model and fluvial geomorphology. The larger bluehead sucker occupies riffle habitats and it is correct to use habitat needs for this species for R2Cross criteria.

Flannelmouth Sucker (*Catostomus latipinnis*):
A Technical Conservation Assessment

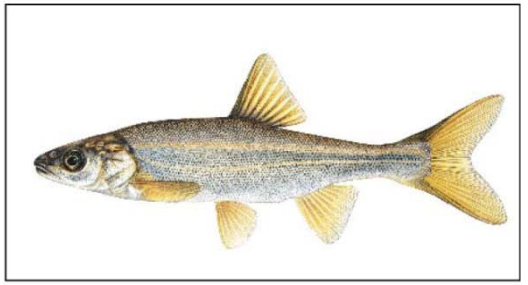
Prepared for the USDA Forest Service,
Rocky Mountain Region,
Species Conservation Project

Bluehead Sucker (*Catostomus discobolus*):
A Technical Conservation Assessment



Prepared for the USDA Forest Service,
Rocky Mountain Region,
Species Conservation Project

Roundtail Chub (*Gila robusta robusta*):
A Technical Conservation Assessment



Prepared for the USDA Forest Service,
Rocky Mountain Region,
Species Conservation Project

The specific depth and velocity criteria of 1.0 ft depth and 1.3 ft/sec velocity were extracted from Anderson and Stewart (2003). These numbers represented minimum values for habitat defined as marginally suited for adult bluehead sucker.

In my opinion the proposed flow recommendations are correct to focus on the adult life stages because they provide the clearest information concerning flow needs that will perpetuate the entire community.

Evaluation of Don Conklin comments

Speckled dace are small-sized fish (about 4 inches) and occupy a niche as bottom dwellers in riffle habitats primarily with cobble substrates. Substrate velocities are much less compared to just a few inches above. Therefore cobble substrates are more critical than depths or velocities for habitat suitability.

Another criticism was that native fish fry life-stages were not considered in the analysis. If these data were available, the issue would become how to interpret it. When biological reality does not indicate a problem with recruitment or fry survival at current flows, then the inclusion of fry-life stage data is not informative.

Mr. Conklin substituted data for white sucker, since habitat suitability curves for bluehead sucker fry and flannelmouth sucker fry were not available. Any conclusions made from white sucker fry WUA curves are of no value for this process. White sucker adult occupy pool habitat, they spawn later in the summer and fry are present during late summer (September) when flows are usually much less than earlier in the season.

Roundtail Chub

I disagree with the Dr. Wesche conclusion that spring flow recommendations require biological justifications based on spawning WUA habitat curves. Flows during the spawning period (spring) are very important and should not be ignored.

The spring flow recommendation of 325 cfs appears to address the minimum depth requirement for adult bluehead and flannelmouth sucker.

Neither Dr. Wesche nor Mr. Conklin has provided any scientific evidence indicating how maintaining below average flows in perpetuity, would preserve the natural environment to a reasonable degree. A specific example of just such a case is the Dolores River below McPhee Reservoir. The natural environment and the existing fish community below McPhee Reservoir are severely affected by the lack of high flows associated with a natural hydrograph.

"The fish community of the Dolores River appeared to be highly stressed.

Riffles and runs had large silt deposits and both forage and habitat potential seemed unnaturally low.

If the Colorado River data can be used as an example of a high-quality habitat and fishery, the Dolores River data can be useful as an example of very poor quality habitat conditions."

CONCLUSIONS

CONCLUSIONS

1. Existing studies have indicated high snow melt runoff flows and variability of flows are very important for reproductive success of the three sensitive fish species.
2. The snowmelt period flow recommended by BLM and CPW optimizes habitat, but it is significantly less than the bankfull flow recommended by the San Juan River studies.
3. Rick Anderson's Habitat Suitability Curves can appropriately be applied to the San Miguel River.
4. BLM and CPW used velocity and depth criteria that are in the low end of the range of the conditions preferred by the fishes.
5. The recommended flow rates are supported by both PHABSIM and R2Cross analysis.
6. The BLM and CPW optimizes habitat ONLY during the April 15-June 15 period, a critical period for fish reproduction.
7. The recommended flow rates for the remainder of the year does not optimize habitat. The flow rates for the remainder of the year have been reduced based upon water availability.

MEMORANDUM
TO: Colorado Water Conservation Board
FROM: Branden B. Effland, P.E., and Daniel V. Ault, P.E.
DATE: August 17, 2011
RE: Review of the Laura Belanger, P.E. July 12, 2011 Memorandum

TABLE 3

Average Monthly Flows at Uravan Gage in Excess of Recommended ISF

Month	Average Daily Flow at Uravan Gage in Excess of ISF (cfs)	Average Monthly Flow at Uravan Gage in Excess of ISF (AF)	Monthly Percentage of Annual Flow
Oct	71	4,428	2.6%
Nov	40	2,433	1.5%
Dec	22	1,320	0.8%
Jan	15	946	0.6%
Feb	31	1,700	1.0%
Mar	97	5,987	3.6%
Apr	597	35,536	21.3%
May	807	49,407	29.6%
Jun	687	40,850	24.4%
Jul	242	14,868	8.9%
Aug	97	5,946	3.6%
Sep	63	3,762	2.3%
Total		***167,183***	

The Figure below shows the range of flows that created and has maintained the natural environment found in the San Miguel River near Uravan. The upper solid line represents the maximum average monthly flow and the lower solid line represents the minimum average monthly flow for the period of 1955 to 2010 for the Uravan gage.