

## **Stream: San Miguel River**

### **Executive Summary**

Water Division: 4

Water District: 60

CDOW#: 46842

CWCB ID: 09/4/A-009

**Segment:** Confluence with Calamity Draw to Confluence with Dolores River

**Upper Terminus:** CONFLUENCE WITH CALAMITY DRAW

(Latitude 38° 15' 23.58"N) (Longitude 108° 36' 48.82"W)

**Lower Terminus:** CONFLUENCE WITH DOLORES RIVER

(Latitude 38° 22' 46.6"N) (Longitude 108° 48' 1.3"W)

**Watershed:** San Miguel (HUC#: 14030003)

**Counties:** Montrose

**Length:** 17.24 miles

**USGS Quad(s):** Nucla, Uravan, Atkinson Creek, Red Canyon

**Flow Recommendation:** 325 cfs (April 15 – June 14)  
170 cfs (June 15 – July 31)  
115 cfs (August 1 – August 31)  
80 cfs (September 1 – February 29)  
115 cfs (March 1 – April 14)



## **Staff Analysis and Recommendation**

### **Summary**

The information contained in this report and the associated instream flow file folder forms the basis for staff's instream flow recommendation to be considered by the Board. It is staff's opinion that the information contained in this report is sufficient to support the findings required in Rule 5.

Colorado's Instream Flow Program 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 CWCB 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 Instream Flow Program, the statute directs the CWCB to request instream flow recommendations from other state and federal agencies. The Bureau of Land Management (BLM) and Colorado Division of Wildlife (CDOW) recommended this segment of the San Miguel River to the CWCB for inclusion into the Instream Flow Program. The San Miguel River is being considered for inclusion into the Instream Flow Program because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

The San Miguel River is approximately 70 miles long. It begins on the north side of Wasatch Mountain at an elevation of 9,100 feet and terminates at the confluence with the Dolores River at an elevation of 4,900 feet. Of the 17.24 mile segment addressed by this report, approximately 28% of the segment is located on federal lands. This segment of the San Miguel River is located within Montrose County and generally flows in a northwesterly direction. The San Miguel River has a total drainage area of approximately 1,500 square miles. The San Miguel Basin is the largest tributary to the Dolores River and is part of the Upper Colorado System. The one million acre San Miguel Basin is about 60 % semi-arid rangeland and agricultural land, both comprising the lower elevations. The remaining 40% of the basin is in higher elevation, forested subalpine and alpine zones in the San Juan Mountains. Most of the flow in the San Miguel River (240,000 acre-feet per year) is derived from snowmelt at 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.

The subject of this report is a segment of the San Miguel River beginning at the confluence with Calamity Draw and extending downstream to the confluence with the Dolores River. The proposed segment is located approximately 3 miles west of the Town of Nucla. The staff has received one joint recommendation for this segment from the BLM & CDOW. The recommendation for this segment is discussed below.

## Instream Flow Recommendation

The BLM & CDOW are recommending 325 cfs (April 15 – June 14), 170 cfs (June 15 – July 31), 115 cfs (August 1 – August 31), 80 cfs (September 1 – February 29) and 115 cfs (March 1 – April 14) based on their data collection efforts and staff's water availability analyses.

## Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Confluence w/ Calamity Draw	Confluence w/ Dolores River	17.24	72%	28%

100% 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*), flannemouth sucker (*Catostomus latipinnis*), mottled sculpin (*Cottus bairdi*), roundtail chub (*Gila robusta*), speckled dace (*Rhinichthys osculus*) and white sucker (*Catostomus commersoni*). 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 River, at Tabeguache Creek, and upstream of Tabeguache Creek.

Roundtail chub (*Gila robusta*) is recognized by the State of Colorado as a species of special concern. The roundtail chub, flannemouth 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 habitats.

The CDOW, BLM and five other state wildlife agencies 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.

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 (Bezzerrides and Bestgen 2002). Roundtail chub are often found in stream reaches that have a complexity of pool and riffle habitats (Bezzerrides 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 (Bezzerrides and Bestgen 2002).

The flannemouth sucker is a good indicator species for flow and habitat relationships (Stewart and Anderson 2006-CR1). The flannemouth sucker is a large fish reaching up to almost 2 feet in length. Historically, the flannemouth 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, flannemouth sucker are present in the Colorado River and numerous tributaries including the Gunnison River up to the Aspinall Unit reservoirs (Bezzerrides and Bestgen 2002), the Uncompahgre River (Sigler and Miller 1963) and the Dolores River. Flannemouth 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. Flannemouth 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).

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).

## **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), 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.

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. 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 flannemouth 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 flannemouth 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 are important for invertebrate productivity. When riffle habitats are maintained, there are 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.

## **Biological Flow Recommendation**

DOW and BLM staff, using a combination of PHABSIM/RHABSIM and R2CROSS methodologies, developed the proposed instream flow recommendations for the San Miguel River. 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.

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

<b>Party</b>	<b>Q</b>	<b>Method</b>	<b>250%-40%</b>	<b>Summer (3/3)</b>	<b>Winter (2/3)</b>
BLM & CDOW	450, 325, 175, 100	PHABSIM/ RHABSIM	1125 - 40	500 (bluehead) 325 (flannelmouth)*	---
BLM & CDOW	450, 325, 175, 100	Standard R2X	1125 - 40	650	115

\* The PHABSIM/RHABSIM analysis was used to only quantify the suitable versus unsuitable hydraulic habitat attributes of bluehead and flannel mouth 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.

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 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 believes 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 (Anderson & Stewart).

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 and Analysis

After receiving the cooperating agency's biologic recommendation, the CWCB staff conducted an evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation. This evaluation was done through a computation that is, in essence, a "water balance". In concept, a "water balance" computation can be viewed as an accounting exercise. When done in its most rigorous form, the water balance parses precipitation into all the avenues water pursues after it is deposited as rain, snow, or ice. In other words, given a specified amount of water deposition (input), the balance tries to account for all water depletions (losses) until a selected end point is reached. Water losses include depletions due to evaporation and transpiration, deliveries into ground water storage, temporary surface storage, incorporations into plant and animal tissue and so forth. These losses are individually or collectively subtracted from the input to reveal the net amount of stream runoff as represented by the discharge measured by stream gages.

In its analysis, CWCB staff has attempted to use this idea of balancing inputs and losses to determine if water is available for the recommended instream flow appropriation. Of course, this analysis must be a practical exercise rather than a lengthy, and costly, scientific investigation. As a result, staff has simplified the process by lumping together some variables and employing certain rational and scientifically supportable assumptions. The process may be described through the following description of the steps used to complete the evaluation for this particular stream.

The first step required in determining water availability is a determination of the hydrologic regime at the Lower Terminus (LT) of the recommended ISF reach. In the best case, this means looking at the data from a gage at the LT. Further, this data, in the best case, has been collected for a long period of time (the longer the better) including wet and dry periods. In the case of **San Miguel River**, there is a USGS gage record of discharge on the creek. However, the gage station is upstream from the LT. The USGS gage is SAN MIGUEL RIVER AT URAVAN, CO (USGS 09177000); it has a period of record (POR), of 42 years collected between 1953 and 2007. The gage is at an elevation of 5,000 ft above mean sea level (amsl) and has a drainage area of 1499 mi<sup>2</sup>. The hydrograph (plot of discharge over time) produced from this gage includes the consumptive uses of numerous diversions in the basin above the gage. However, the existence of these diversions is not a major limitation upon the use of the data from the gage. To make the measured data transferable to San Miguel River above the LT, the consumptive portions of these diversions were added back to the measured hydrograph. The resulting "adjusted" hydrograph could then be used on San Miguel River above the LT by multiplying the "adjusted" gage

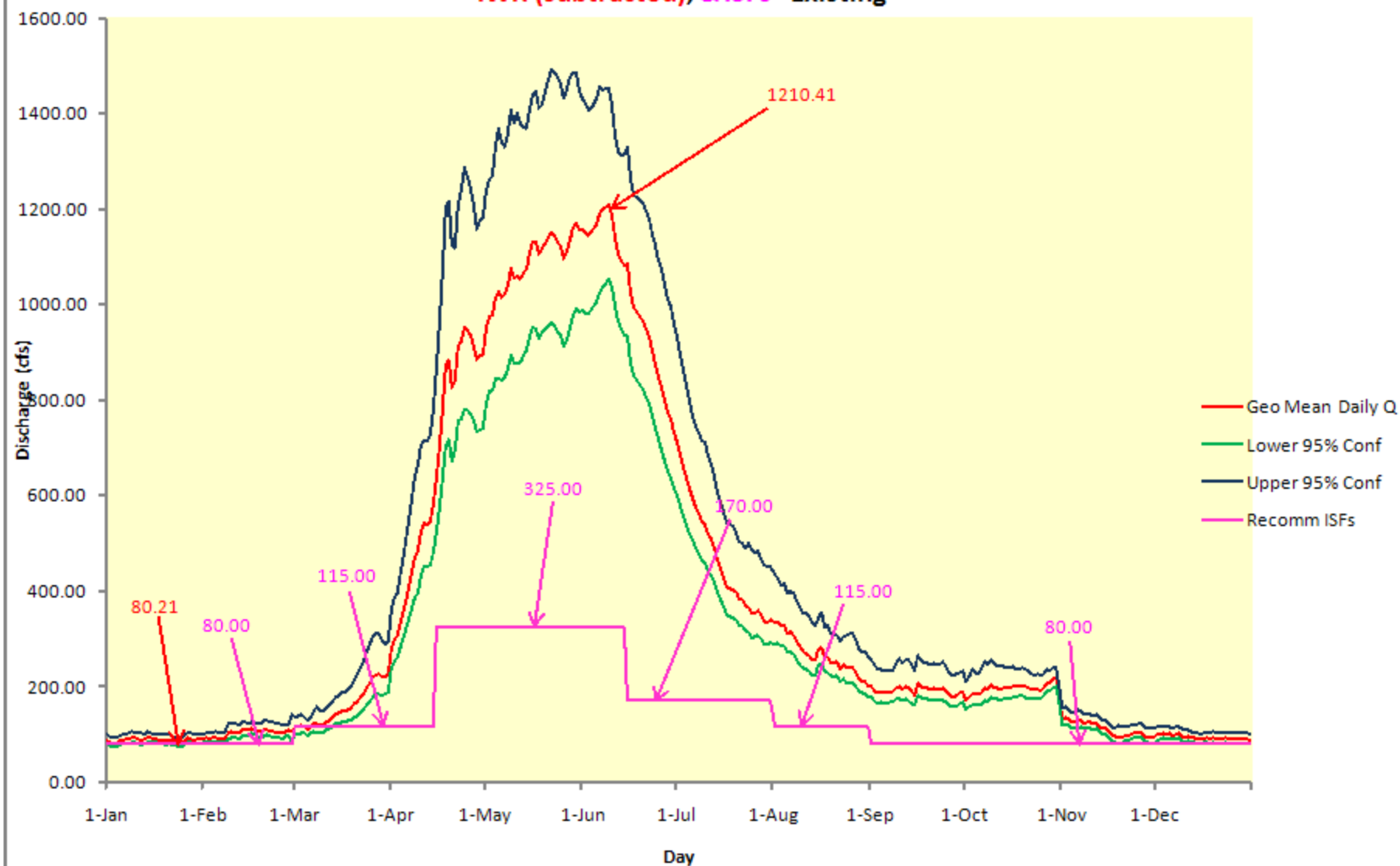


discharge values by an area ratio; specifically, the area of San Miguel River above the LT (1557.17 mi<sup>2</sup>) to San Miguel River at Uravan (1499 mi<sup>2</sup>). Next, the resulting proportioned “adjusted” hydrograph was itself “adjusted” (decreased) to reflect depletions on San Miguel River above the LT resulting from upstream consumptive irrigation uses. The final hydrograph represents a distribution of flow over time that has been reduced to reflect existing human uses.

{The following discussion is based upon the US Geological Survey’s *Techniques of Water-Resources Investigations Series, Book 4: Hydrologic Analysis and Interpretation, Chapter A3: Statistical Methods in Water Resources* (Chapter 3: Describing Uncertainty) by D.R. Helsel and R. M. Hirsch. This technical reference provides the scientific background and guidance important to the systematic interpretation of hydrologic data. The document is available online and is a valuable aid to understanding and interpreting the analyses described here.}

The next step in producing a representation of the discharge at San Miguel River above LT is to compute the Geometric Mean of the area-prorated “adjusted” data values from the San Miguel River at Uravan hydrograph. This step is of value because of the inherent statistical limitations found in any collection of data intended to measure natural stream discharge. Without getting into the details of statistical theory, it is worth noting that a set of discharge measurements is inherently limited, no matter how well collected, due to the difficulties attendant to data collection, especially hydrologic data. To give deference to this fact and to increase the value of the hydrograph product of this analysis, the Geometric Means of the data were computed and plotted along with the 95% Confidence Intervals about the data. The resultant hydrograph, including recommended Instream Flow values, is displayed in Figure 1 with the data displayed in Table 2.

**Geometric Mean Daily Q San Miguel R abv LT (proportioned on San Miguel R at Uravan, adjusted for diversions and IWR depletions {added back}), Adjusted for San Miguel R abv LT IWR (subtracted), & ISFs - Existing**



**Table 2. Geometric Mean Existing Cond** (with IWR subtracted) San Miguel abv LT  
Proportioned on San Miguel R at Uravan abv Gage **Baseline Cond** (with IWR consumption added back)

Date	GM (abv LT) Prorated by 103.88%	Lower 95% Conf Prorated by 103.88%	Upper 95% Conf Prorated by 103.88%	Recommended ISF (cfs)
1-Jan	87.97	80.15	98.83	80.00
2-Jan	82.24	74.81	92.72	80.00
3-Jan	81.55	74.10	92.11	80.00
4-Jan	80.70	72.51	93.00	80.00
5-Jan	86.31	78.30	97.65	80.00
6-Jan	87.50	79.67	98.46	80.00
7-Jan	89.03	80.95	100.49	80.00
8-Jan	89.91	81.49	101.96	80.00
9-Jan	92.51	83.95	104.53	80.00
10-Jan	91.98	83.64	103.66	80.00
11-Jan	89.47	80.22	103.21	80.00
12-Jan	86.78	76.94	102.91	80.00
13-Jan	89.52	81.32	101.04	80.00
14-Jan	92.44	83.56	105.07	80.00
15-Jan	92.12	83.93	103.46	80.00
16-Jan	90.57	83.23	100.44	80.00
17-Jan	89.40	81.71	99.95	80.00
18-Jan	87.85	79.52	99.77	80.00
19-Jan	87.77	78.98	100.70	80.00
20-Jan	86.99	78.34	99.72	80.00
21-Jan	87.65	79.44	99.34	80.00
22-Jan	85.54	77.80	96.42	80.00
23-Jan	83.44	75.95	93.95	80.00
24-Jan	80.21	72.38	91.73	80.00
25-Jan	81.88	73.61	94.39	80.00
26-Jan	87.75	79.73	99.03	80.00
27-Jan	92.12	83.78	103.83	80.00
28-Jan	91.22	83.11	102.49	80.00
29-Jan	88.02	80.30	98.69	80.00
30-Jan	88.23	80.81	98.32	80.00
31-Jan	88.38	81.12	98.18	80.00
1-Feb	90.35	83.04	100.14	80.00
2-Feb	91.46	83.54	102.36	80.00
3-Feb	91.17	82.34	103.89	80.00
4-Feb	91.44	83.14	103.05	80.00
5-Feb	92.01	83.06	104.84	80.00
6-Feb	90.33	82.25	101.61	80.00

7-Feb	91.14	82.90	102.73	80.00
8-Feb	93.06	83.57	107.13	80.00
9-Feb	102.61	90.49	121.67	80.00
10-Feb	105.57	93.99	122.99	80.00
11-Feb	104.39	92.47	122.55	80.00
12-Feb	102.47	91.31	118.95	80.00
13-Feb	108.34	95.96	126.97	80.00
14-Feb	108.50	96.95	125.43	80.00
15-Feb	109.49	99.22	123.92	80.00
16-Feb	111.47	101.26	125.70	80.00
17-Feb	109.49	97.96	126.58	80.00
18-Feb	106.71	95.68	123.18	80.00
19-Feb	105.66	94.63	121.95	80.00
20-Feb	109.80	97.60	128.15	80.00
21-Feb	110.11	98.08	128.02	80.00
22-Feb	107.38	95.60	124.96	80.00
23-Feb	106.10	93.89	124.75	80.00
24-Feb	104.09	91.94	122.80	80.00
25-Feb	104.18	92.34	122.16	80.00
26-Feb	102.13	91.14	118.40	80.00
27-Feb	105.16	94.99	119.56	80.00
28-Feb	107.91	97.34	122.97	80.00
29-Feb	106.99	82.42	143.28	80.00
1-Mar	114.28	101.33	133.83	115.00
2-Mar	115.30	100.21	139.55	115.00
3-Mar	117.78	102.51	142.42	115.00
4-Mar	115.30	101.40	136.75	115.00
5-Mar	110.33	97.75	129.40	115.00
6-Mar	115.84	102.63	135.92	115.00
7-Mar	122.01	105.61	148.92	115.00
8-Mar	123.44	104.32	157.69	115.00
9-Mar	119.83	103.26	147.92	115.00
10-Mar	120.33	103.37	149.69	115.00
11-Mar	125.23	108.17	154.27	115.00
12-Mar	129.24	111.32	159.76	115.00
13-Mar	134.05	115.04	166.53	115.00
14-Mar	143.00	122.07	179.19	115.00
15-Mar	144.23	123.26	180.56	115.00
16-Mar	148.65	126.95	186.28	115.00
17-Mar	149.08	127.11	187.22	115.00
18-Mar	150.93	127.77	192.29	115.00
19-Mar	153.80	128.92	200.06	115.00
20-Mar	163.25	136.18	214.16	115.00

21-Mar	168.56	138.78	227.18	115.00
22-Mar	177.12	145.53	240.24	115.00
23-Mar	185.50	152.09	252.91	115.00
24-Mar	196.50	160.37	271.29	115.00
25-Mar	207.59	169.14	287.42	115.00
26-Mar	219.32	177.92	305.73	115.00
27-Mar	224.59	182.91	310.98	115.00
28-Mar	225.41	184.01	311.08	115.00
29-Mar	221.34	182.21	298.79	115.00
30-Mar	219.54	182.94	288.17	115.00
31-Mar	225.43	187.80	295.87	115.00
1-Apr	237.88	196.84	317.99	115.00
2-Apr	255.13	210.67	342.76	115.00
3-Apr	265.84	221.05	351.72	115.00
4-Apr	292.13	240.03	396.43	115.00
5-Apr	316.86	260.11	432.35	115.00
6-Apr	340.63	277.12	473.51	115.00
7-Apr	377.31	306.92	520.38	115.00
8-Apr	420.64	338.91	592.55	115.00
9-Apr	434.41	349.15	615.51	115.00
10-Apr	473.77	383.39	655.23	115.00
11-Apr	497.35	406.63	670.13	115.00
12-Apr	495.25	404.67	668.89	115.00
13-Apr	502.11	409.30	683.88	115.00
14-Apr	534.44	434.13	734.00	115.00
15-Apr	588.01	475.15	815.51	325.00
16-Apr	649.27	521.43	910.46	325.00
17-Apr	723.52	579.84	1014.57	325.00
18-Apr	811.80	646.80	1146.30	325.00
19-Apr	826.87	660.88	1158.27	325.00
20-Apr	769.36	618.52	1068.57	325.00
21-Apr	786.04	640.15	1063.08	325.00
22-Apr	850.66	694.66	1145.63	325.00
23-Apr	860.07	696.89	1174.64	325.00
24-Apr	889.81	717.60	1225.26	325.00
25-Apr	889.15	720.93	1209.73	325.00
26-Apr	877.21	714.09	1184.11	325.00
27-Apr	859.61	701.89	1153.49	325.00
28-Apr	831.58	681.94	1105.19	325.00
29-Apr	843.00	689.07	1128.43	325.00
30-Apr	842.62	688.87	1128.62	325.00
1-May	882.52	724.52	1173.17	325.00
2-May	909.49	751.12	1193.89	325.00

3-May	914.74	755.27	1202.57	325.00
4-May	950.85	779.85	1265.85	325.00
5-May	961.97	782.09	1303.50	325.00
6-May	951.43	776.91	1275.82	325.00
7-May	954.66	783.53	1264.45	325.00
8-May	973.39	798.04	1291.01	325.00
9-May	1004.13	821.50	1336.13	325.00
10-May	984.38	806.37	1307.07	325.00
11-May	991.58	808.04	1332.39	325.00
12-May	987.04	809.39	1310.42	325.00
13-May	996.34	823.22	1301.14	325.00
14-May	1003.68	833.14	1298.56	325.00
15-May	1038.98	864.04	1337.92	325.00
16-May	1055.72	876.41	1363.51	325.00
17-May	1053.75	871.30	1371.07	325.00
18-May	1028.79	852.65	1333.31	325.00
19-May	1036.46	862.05	1336.15	325.00
20-May	1045.48	865.69	1360.18	325.00
21-May	1055.32	870.25	1383.64	325.00
22-May	1064.07	874.79	1404.39	325.00
23-May	1058.65	869.96	1400.08	325.00
24-May	1047.92	859.41	1392.16	325.00
25-May	1035.78	849.45	1376.81	325.00
26-May	1007.73	825.58	1341.92	325.00
27-May	1021.41	836.56	1360.75	325.00
28-May	1046.23	859.02	1386.79	325.00
29-May	1074.42	890.42	1397.75	325.00
30-May	1084.61	902.50	1398.23	325.00
31-May	1072.08	897.55	1361.90	325.00
1-Jun	1071.02	902.23	1344.15	325.00
2-Jun	1063.25	895.78	1334.63	325.00
3-Jun	1058.48	895.80	1319.05	325.00
4-Jun	1064.66	902.30	1323.38	325.00
5-Jun	1077.00	912.73	1338.97	325.00
6-Jun	1096.30	929.36	1362.12	325.00
7-Jun	1106.81	946.37	1353.98	325.00
8-Jun	1112.82	951.09	1361.99	325.00
9-Jun	1117.89	959.44	1359.34	325.00
10-Jun	1096.09	944.89	1323.99	325.00
11-Jun	1052.58	909.39	1267.77	325.00
12-Jun	1018.95	877.79	1234.09	325.00
13-Jun	1003.30	860.10	1225.05	325.00
14-Jun	992.60	846.76	1222.70	325.00

15-Jun	980.85	830.44	1223.84	170.00
16-Jun	930.06	784.07	1170.46	170.00
17-Jun	898.66	757.66	1132.61	170.00
18-Jun	889.09	745.97	1131.65	170.00
19-Jun	880.04	736.93	1124.81	170.00
20-Jun	872.43	729.93	1118.82	170.00
21-Jun	855.74	714.09	1104.05	170.00
22-Jun	839.79	700.45	1085.13	170.00
23-Jun	807.73	670.90	1053.44	170.00
24-Jun	780.30	644.69	1029.06	170.00
25-Jun	756.52	624.70	999.01	170.00
26-Jun	735.09	603.48	983.88	170.00
27-Jun	704.41	577.25	947.03	170.00
28-Jun	679.11	555.68	916.83	170.00
29-Jun	662.30	541.29	897.84	170.00
30-Jun	634.89	518.91	861.55	170.00
1-Jul	617.34	504.63	837.67	170.00
2-Jul	591.42	484.04	801.25	170.00
3-Jul	567.66	464.93	768.39	170.00
4-Jul	542.36	443.58	737.93	170.00
5-Jul	522.18	428.76	703.32	170.00
6-Jul	501.55	412.76	672.66	170.00
7-Jul	484.14	398.48	650.70	170.00
8-Jul	469.72	385.07	638.33	170.00
9-Jul	454.58	371.83	623.13	170.00
10-Jul	448.40	365.63	619.24	170.00
11-Jul	428.93	350.43	591.08	170.00
12-Jul	418.86	342.80	574.54	170.00
13-Jul	400.81	328.37	550.36	170.00
14-Jul	374.66	306.85	515.96	170.00
15-Jul	359.83	294.09	498.87	170.00
16-Jul	341.43	278.69	476.70	170.00
17-Jul	322.95	263.10	456.98	170.00
18-Jul	317.80	258.58	450.95	170.00
19-Jul	314.62	255.25	449.68	170.00
20-Jul	312.58	255.64	435.45	170.00
21-Jul	296.17	242.05	416.94	170.00
22-Jul	297.15	242.52	416.34	170.00
23-Jul	286.17	232.66	405.31	170.00
24-Jul	284.22	230.16	414.91	170.00
25-Jul	270.12	218.66	401.16	170.00
26-Jul	271.23	219.43	397.96	170.00
27-Jul	277.91	224.58	402.13	170.00

28-Jul	267.27	217.35	383.89	170.00
29-Jul	255.03	206.95	372.06	170.00
30-Jul	252.08	204.23	368.11	170.00
31-Jul	257.77	209.41	368.93	170.00
1-Aug	251.13	206.46	351.40	115.00
2-Aug	254.05	211.44	342.80	115.00
3-Aug	246.36	205.26	331.00	115.00
4-Aug	248.90	207.03	336.27	115.00
5-Aug	232.92	192.84	318.21	115.00
6-Aug	235.75	194.52	322.18	115.00
7-Aug	232.04	191.47	319.00	115.00
8-Aug	217.85	179.39	304.10	115.00
9-Aug	207.15	170.56	290.52	115.00
10-Aug	196.29	161.87	276.44	115.00
11-Aug	193.16	158.29	277.52	115.00
12-Aug	189.08	155.43	270.45	115.00
13-Aug	180.11	148.45	258.10	115.00
14-Aug	179.43	148.74	251.93	115.00
15-Aug	204.11	171.76	270.74	115.00
16-Aug	210.49	175.46	285.38	115.00
17-Aug	192.09	162.03	253.82	115.00
18-Aug	190.53	159.34	256.21	115.00
19-Aug	180.53	151.91	239.78	115.00
20-Aug	181.26	151.95	243.04	115.00
21-Aug	184.14	155.24	239.56	115.00
22-Aug	170.61	142.86	228.61	115.00
23-Aug	178.07	149.45	236.60	115.00
24-Aug	171.94	141.19	241.74	115.00
25-Aug	172.96	141.93	245.00	115.00
26-Aug	173.08	142.31	245.10	115.00
27-Aug	165.86	136.93	234.37	115.00
28-Aug	151.49	125.42	214.22	115.00
29-Aug	147.59	122.05	208.31	115.00
30-Aug	145.20	119.19	210.73	115.00
31-Aug	137.76	113.41	198.79	115.00
1-Sep	138.16	114.87	192.19	80.00
2-Sep	131.33	109.25	183.98	80.00
3-Sep	126.93	105.81	177.82	80.00
4-Sep	127.66	106.96	175.84	80.00
5-Sep	127.57	107.09	174.47	80.00
6-Sep	128.65	108.12	175.91	80.00
7-Sep	130.38	110.08	174.72	80.00
8-Sep	133.39	112.80	176.76	80.00



9-Sep	142.11	119.21	193.38	80.00
10-Sep	143.10	118.06	204.22	80.00
11-Sep	138.98	116.05	192.90	80.00
12-Sep	149.19	124.87	204.36	80.00
13-Sep	150.59	125.15	210.56	80.00
14-Sep	146.71	122.76	201.43	80.00
15-Sep	141.98	119.57	191.97	80.00
16-Sep	154.26	128.68	211.83	80.00
17-Sep	149.97	125.57	204.04	80.00
18-Sep	146.77	123.43	197.57	80.00
19-Sep	147.55	124.17	198.09	80.00
20-Sep	145.32	121.98	196.15	80.00
21-Sep	147.41	123.12	201.34	80.00
22-Sep	146.68	122.71	198.25	80.00
23-Sep	145.01	121.12	197.52	80.00
24-Sep	147.80	122.65	204.68	80.00
25-Sep	145.21	121.38	197.48	80.00
26-Sep	138.90	116.97	185.20	80.00
27-Sep	132.43	111.65	176.11	80.00
28-Sep	132.30	111.40	176.78	80.00
29-Sep	133.90	113.28	176.69	80.00
30-Sep	134.12	113.28	177.76	80.00
1-Oct	130.13	110.76	168.31	80.00
2-Oct	135.91	115.06	178.22	80.00
3-Oct	144.11	120.01	196.85	80.00
4-Oct	142.63	120.23	189.16	80.00
5-Oct	142.40	120.88	185.82	80.00
6-Oct	145.35	120.93	197.18	80.00
7-Oct	152.28	126.30	208.59	80.00
8-Oct	151.47	126.99	202.26	80.00
9-Oct	159.74	133.91	213.38	80.00
10-Oct	156.03	131.17	206.83	80.00
11-Oct	154.87	131.14	202.07	80.00
12-Oct	153.08	129.85	199.17	80.00
13-Oct	155.14	131.92	200.14	80.00
14-Oct	154.13	131.92	196.01	80.00
15-Oct	155.03	132.47	197.78	80.00
16-Oct	157.98	135.60	199.37	80.00
17-Oct	156.95	135.95	193.63	80.00
18-Oct	157.97	137.21	193.35	80.00
19-Oct	158.92	138.10	194.98	80.00
20-Oct	156.78	136.21	192.47	80.00
21-Oct	154.09	133.36	190.38	80.00

22-Oct	152.66	133.50	185.01	80.00
23-Oct	150.87	132.56	181.28	80.00
24-Oct	152.10	133.64	182.79	80.00
25-Oct	150.32	132.13	180.52	80.00
26-Oct	155.51	137.29	184.25	80.00
27-Oct	158.92	140.55	187.09	80.00
28-Oct	155.36	138.45	180.58	80.00
29-Oct	159.61	142.72	184.48	80.00
30-Oct	156.55	140.50	179.83	80.00
31-Oct	140.25	126.03	160.92	80.00
1-Nov	132.58	117.51	155.24	80.00
2-Nov	133.57	118.33	156.51	80.00
3-Nov	130.74	117.44	149.92	80.00
4-Nov	125.25	112.27	144.12	80.00
5-Nov	124.41	111.34	143.48	80.00
6-Nov	127.57	112.93	149.66	80.00
7-Nov	126.92	113.64	146.30	80.00
8-Nov	123.18	111.00	140.55	80.00
9-Nov	124.91	112.48	142.76	80.00
10-Nov	124.28	112.23	141.45	80.00
11-Nov	121.15	109.44	137.83	80.00
12-Nov	123.03	110.30	141.88	80.00
13-Nov	116.51	103.90	135.77	80.00
14-Nov	111.40	99.69	129.00	80.00
15-Nov	111.30	99.83	128.42	80.00
16-Nov	104.51	93.82	120.39	80.00
17-Nov	97.61	86.82	114.43	80.00
18-Nov	94.30	83.54	111.34	80.00
19-Nov	93.63	80.44	116.79	80.00
20-Nov	92.69	80.33	113.64	80.00
21-Nov	96.01	84.29	114.98	80.00
22-Nov	97.03	85.59	115.29	80.00
23-Nov	100.16	88.50	118.52	80.00
24-Nov	102.33	91.64	118.18	80.00
25-Nov	102.80	91.36	120.32	80.00
26-Nov	103.12	91.00	122.35	80.00
27-Nov	96.71	85.13	115.78	80.00
28-Nov	93.42	82.40	111.53	80.00
29-Nov	90.86	79.56	110.31	80.00
30-Nov	91.66	80.13	111.68	80.00
1-Dec	98.06	86.68	116.15	80.00
2-Dec	100.20	89.34	116.67	80.00
3-Dec	102.06	92.20	116.17	80.00

4-Dec	100.31	90.37	114.81	80.00
5-Dec	100.53	90.49	115.15	80.00
6-Dec	96.97	87.52	110.67	80.00
7-Dec	100.52	90.58	114.90	80.00
8-Dec	100.73	90.78	115.11	80.00
9-Dec	95.92	85.68	111.49	80.00
10-Dec	92.60	82.65	107.94	80.00
11-Dec	96.23	86.92	109.76	80.00
12-Dec	92.68	84.06	104.94	80.00
13-Dec	91.45	82.85	103.68	80.00
14-Dec	88.33	79.42	101.55	80.00
15-Dec	88.58	80.38	100.16	80.00
16-Dec	90.62	82.65	101.59	80.00
17-Dec	91.14	82.31	103.80	80.00
18-Dec	89.63	80.81	102.40	80.00
19-Dec	90.99	82.05	103.94	80.00
20-Dec	89.41	80.03	103.54	80.00
21-Dec	87.95	78.76	101.90	80.00
22-Dec	88.67	80.15	100.96	80.00
23-Dec	90.81	82.27	102.98	80.00
24-Dec	88.88	80.21	101.46	80.00
25-Dec	89.42	80.85	101.73	80.00
26-Dec	89.77	80.89	102.72	80.00
27-Dec	88.01	78.92	101.52	80.00
28-Dec	89.39	80.15	103.09	80.00
29-Dec	90.19	81.07	103.55	80.00
30-Dec	88.05	78.04	103.67	80.00
31-Dec	87.84	79.96	98.81	80.00

## Existing Water Right Information

Staff has analyzed the water rights tabulation and has discussed the water availability analysis with the Division Engineer Office (DEO). There are four decreed surface diversions within this reach of stream: Richards Pump Station No. 1 (12.326 cfs, 1894/1896/1902/1926 appropriations), Blake & Payson Pump Station (6cfs, 1917 appropriation), Johnson Ditch (50.55 cfs, 1891/1903/1913 appropriations) and San Miguel Power Co. Canal (40 cfs, 1926 appropriation). Staff has determined that water is available for appropriation on the San Miguel River between the confluence with Calamity Draw and the confluence with the Dolores River, to preserve the natural environment to a reasonable degree without limiting or foreclosing the exercise of valid existing water rights.

## **CWCB Staff's Instream Flow Recommendation**

Staff recommends the Board form its intent to appropriate on the following stream reach:

**Segment:** Confluence with Calamity Draw to Confluence with Dolores River

**Upper Terminus:** CONFLUENCE WITH CALAMITY DRAW

(Latitude 38° 15' 23.58"N) (Longitude 108° 36' 48.82"W)

UTM North: 4240458.99 UTM East: 183798.21

SE NE S10 T46N R16W NMPM

285' West of the East Section Line; 1890' South of the North Section Line

**Lower Terminus:** CONFLUENCE WITH DOLORES RIVER

(Latitude 38° 22' 46.6"N) (Longitude 108° 48' 1.3"W)

UTM North: 4254788.31 UTM East: 167725.50

SW SE S25 T23N R18W NMPM

2120' West of the East Section Line; 290' North of the South Section Line

**Watershed:** San Miguel (HUC#: 14030003)

**Counties:** Montrose

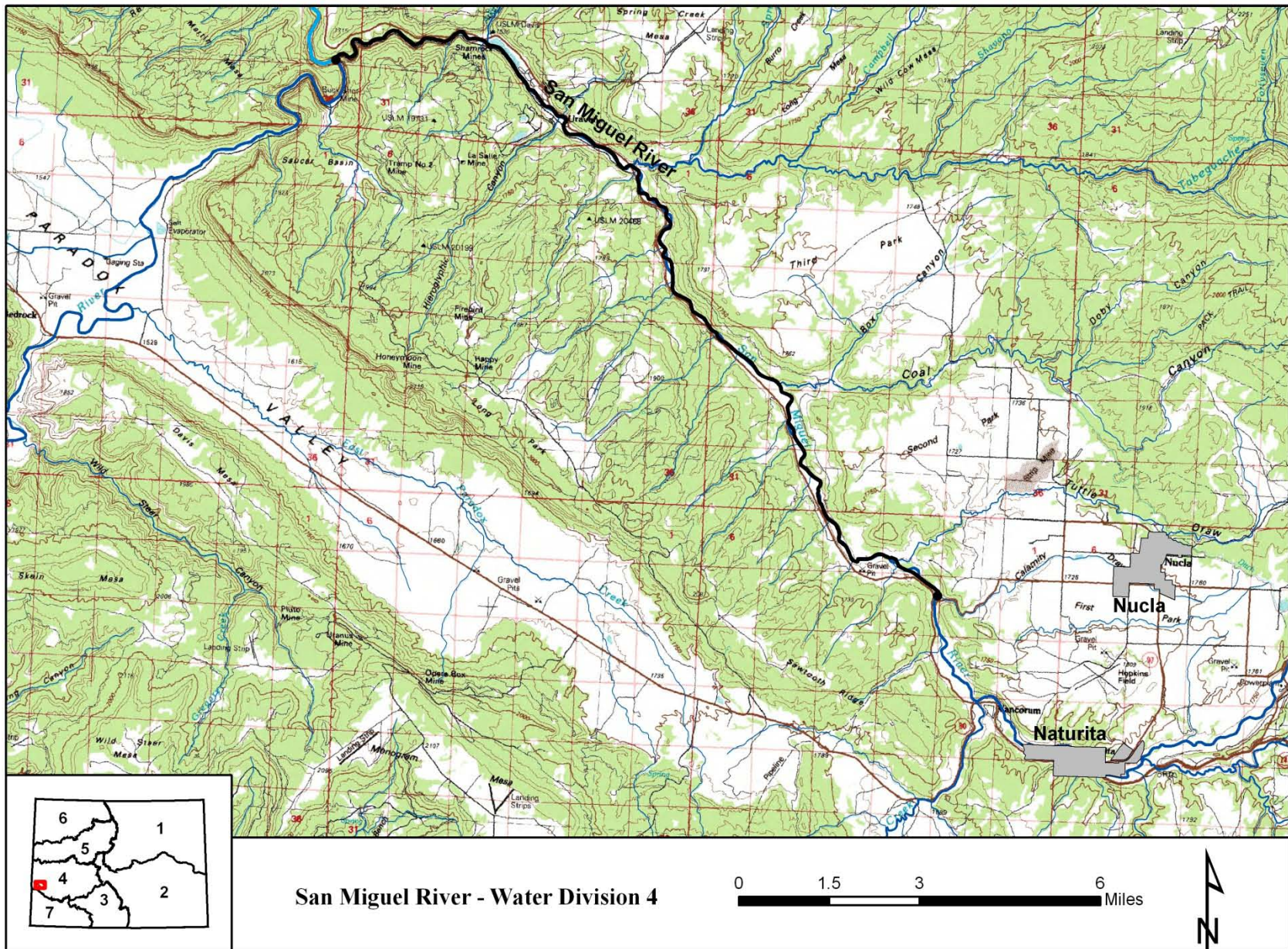
**Length:** 17.24 miles

**USGS Quad(s):** Nucla, Uravan, Atkinson Creek, Red Canyon

**Flow Recommendation:** 325 cfs (April 15 – June 14)  
170 cfs (June 15 – July 31)  
115 cfs (August 1 – August 31)  
80 cfs (September 1 – February 29)  
115 cfs (March 1 – April 14)

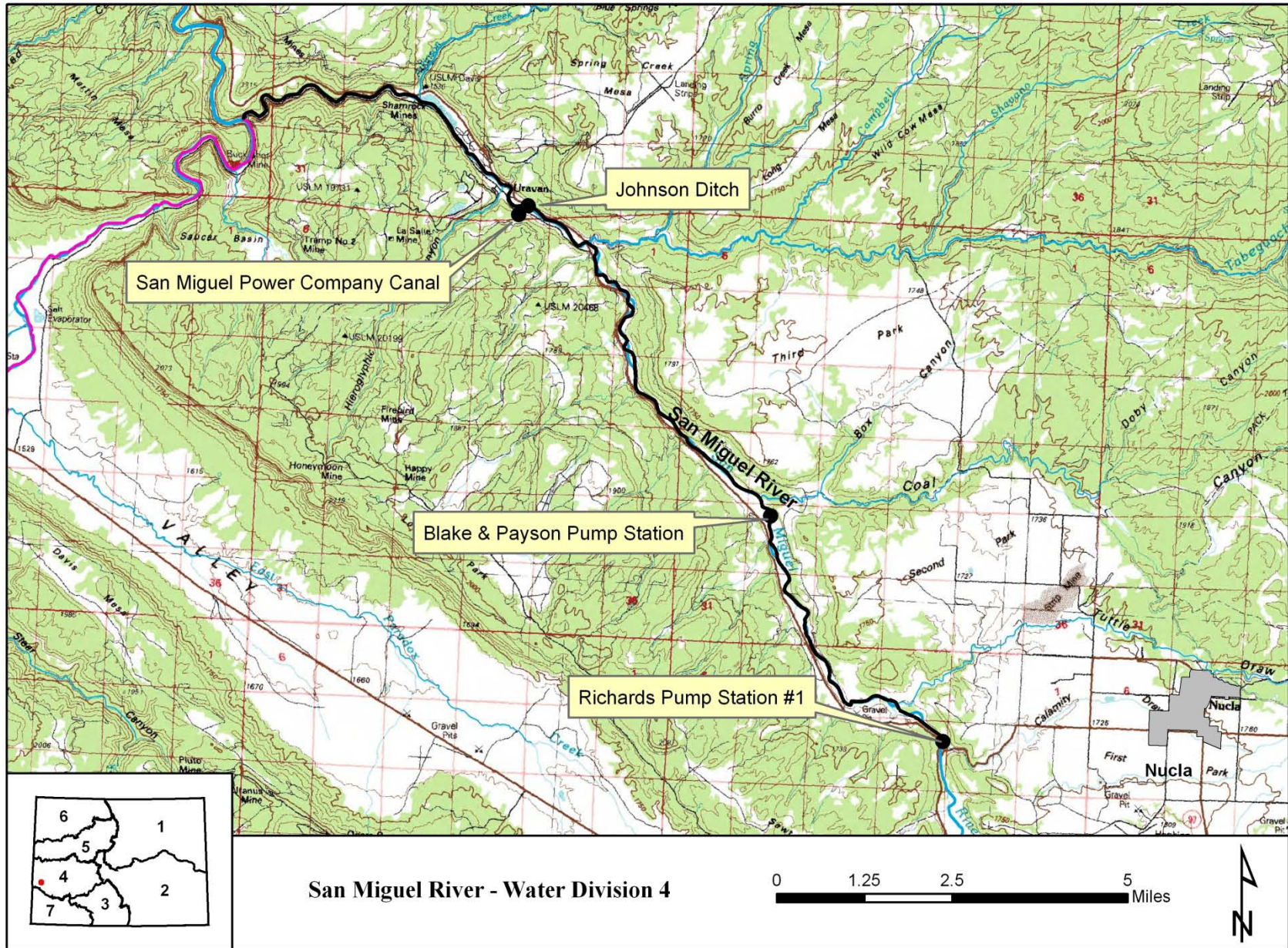


# Vicinity Map





# Water Rights Map





# Land Use Map

