Stream: Tabeguache Creek (Lower Segment)

Executive Summary

Water Division: 4
Water District: 60
CDOW#: 43480
CWCB ID: 09/4/A-011

Segment: Headgate of Templeton Ditch to Confluence with San Miguel River

Upper Terminus: HEADGATE OF TEMPLETON DTICH
(Latitude 38° 21’ 41.98”N) (Longitude 108° 35’ 24.68”W)

Lower Terminus: CONFLUENCE WITH SAN MIGUEL RIVER
(Latitude 38° 21’ 25.6”N) (Longitude 108° 42’ 42.2”W)

Watershed: San Miguel (HUC#: 14030003)
Counties: Montrose
Length: 9.7 miles
USGS Quads: Uravan, Nucla
Flow Recommendation: 4.75 cfs (March 15 - June 30)

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 5.40.

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) recommended this segment of Tabeguache Creek to the CWCB for inclusion into the Instream Flow Program. Tabeguache Creek 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.

Tabeguache Creek is approximately 27.5 miles long. It begins within the Uncompahgre National Forest at an elevation of 9,840 feet and generally flows in a westerly direction until it terminates at the confluence with the San Miguel River at an elevation of 5,010 feet. Approximately 79% of the land on the 9.7 mile segment addressed by this report is publicly owned. Tabeguache Creek is located within Montrose County and the total drainage area of the creek is approximately 152 square miles.

The subject of this report is a segment of Tabeguache Creek beginning at the headgate of Templeton Ditch and extending downstream to the confluence with the San Miguel River. The proposed segment is located approximately 11 miles northwest of Naturita. Staff has received one recommendation for this segment, from the BLM. The recommendation for this segment is discussed below.

Instream Flow Recommendation

The BLM recommended a seasonal flow of 4.75 cfs (March 15 - June 30), based on their data collection efforts, staff's water availability analyses, and information provided by local stakeholders.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Headgate of Templeton Ditch	Confluence with San Miguel River	9.7	21%	79%

100% of the public lands are owned by the BLM.

Biological Data

Below the headgate of the Templeton Ditch, this segment is characterized by a slightly wider stream valley, and larger substrate. The stream channel is larger because of high-volume, short-duration snowmelt runoff flows from Shavano, Campbell, and Spring creeks. The creek supports a narrowleaf cottonwood-sandbar willow-skunkbrush sumac-chokecherry riparian community. Fishery surveys indicate that the lower part of the reach is important for sensitive species habitat. Stream samples during spring spawning season have documented flannelmouth sucker and roundtail chub. In addition, surveys have documented the presence of red shiner and speckled dace. It is likely that both the sensitive and non-sensitive species move into the creek from the San Miguel River to spawn, most likely when they are cued by rising stream temperatures.

Field Survey Data

BLM and CDOW staff used the R2Cross methodology to quantify the amount of water required to preserve the natural environment to a reasonable degree. The R2Cross method requires that stream discharge and channel profile data be collected in a riffle stream habitat type. Riffles are most easily visualized, as the stream habitat types that would dry up first should streamflow cease. This type of hydraulic data collection consists of setting up a transect, surveying the stream channel geometry, and measuring the stream discharge.

Biological Flow Recommendation

The CWCB staff relied upon the biological expertise of the cooperating agencies to interpret output from the R2Cross data collected to develop the initial, biologic instream flow recommendation. This initial recommendation is designed to address the unique biologic requirements of each stream without regard to water availability. Three instream flow hydraulic parameters, average depth, percent wetted perimeter, and average velocity are used to develop biologic instream flow recommendations. The CDOW has determined that maintaining these three hydraulic parameters at adequate levels across riffle habitat types, aquatic habitat in pools and runs will also be maintained for most life stages of fish and aquatic invertebrates (Nehring 1979; Espegren 1996).

For this stream, four data sets were collected with the results shown in Table 1 below. Table 1 shows who collected the data (Party), the date the data was collected (Date), the measured discharge at the time of the survey (Q), the accuracy range of the predicted flows based on Manning's Equation (240% and 40% of Q), the summer flow recommendation based on meeting 3 of 3 hydraulic criteria and the winter flow recommendation based upon 2 of 3 hydraulic criteria. It is believed that recommendations that fall outside of the accuracy range of the model, over 250% of the measured discharge or under 40% of the measured discharge may not give an accurate estimate of the necessary instream flow required.

Table 1: Data

Party	Date	Q	250%-40%	Summer (3/3)	Winter (2/3)
BLM/CDOW	6/19/2003	2.51	6.3 – 1.0	out of range	2.86
BLM/CDOW	6/19/2003	2.13	5.3 – 0.9	out of range	1.80
BLM/CDOW	6/2/2006	8.1	20.2 – 3.2	3.89	out of range
BLM/CDOW	6/2/2006	8.09	20.2 – 3.2	5.62	out of range

The summer seasonal flow recommendation, which meets 3 of 3 criteria and is within the accuracy range of the R2CROSS model is 4.75 cfs. This recommendation was derived by averaging the results of the two data sets.

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. Of course, the measured stream flow need not be the end point of interest; indeed, when looking at issues of water use to extinction stream flow measurements may only describe intermediate steps in the complex accounting process that is a water balance carried out to a net value of zero.

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 **Tabeguache Creek – Lower** no such gage is available at the LT; although flows have been gaged on Tabeguache Creek. A gage was located in the upstream reaches (Tabeguache Creek near Nucla). However, the data from this gage was of limited value being both old and a short Period of Record (POR). While the use of some of this data might be possible, it made sense to examine nearby drainages for gages with better data records that could serve as "representative" gage stations.

SAN MIGUEL RIVER AT NATURITA, CO (USGS 09175500) was selected as the "representative" gage for the flow regime of Tabeguache Creek – Lower at LT. This gage has a longer and more current data record than the Tabeguache Cr. gage and San Miguel River gage is near and morphologically similar to Tabeguache Cr. Specifically, the San Miguel gage has a 53 year POR collected between 1917 and 1981. The gage is at an elevation of 5,392.85 ft above

mean sea level (amsl) and has a drainage area of 1,069 mi^2. (Data for this station was modified by removal of data from the San Miguel River near Nucla basin gage to isolate the representative portion of the basin and reduce the effective drainage basin size to 420 mi^2.) While the hydrograph (plot of discharge over time) produced from these gages includes the consumptive use of numerous upstream diversions, the diversions do not preclude the use of the data from the gage. To make the measured data transferable to Tabeguache Creek – Lower above the LT, the consumptive portions of diversions were added back to the measured hydrograph. The "adjusted" hydrograph that resulted could be used on Tabeguache Creek - Lower above the LT by multiplying the "adjusted" gage discharge values by an area ratio; specifically, the area of Tabeguache Creek – Lower above the LT (151.97 mi^2) to San Miguel River at Naturita, CO (modified) (420 mi^2). The resulting proportioned hydrograph was itself "adjusted" to reflect the consumptive irrigation depletions (decreased) and out-of-basin diversions (decreased) that occur upstream of Tabeguache Creek – Lower above the LT. The final hydrograph thus 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 Tabeguache Creek – Lower above the LT was to compute the Geometric Mean of the area-prorated data values from the San Miguel River at Naturita, CO (modified) Hydrograph. This step is of value because of the inherent statistical weaknesses 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 inaccurate, no matter how well collected, due to the difficulties attendant to data collection, especially hydrologic data. In this particular case, the short period of record lends even greater merit to the use of this statistical tool. 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.

Figure 1

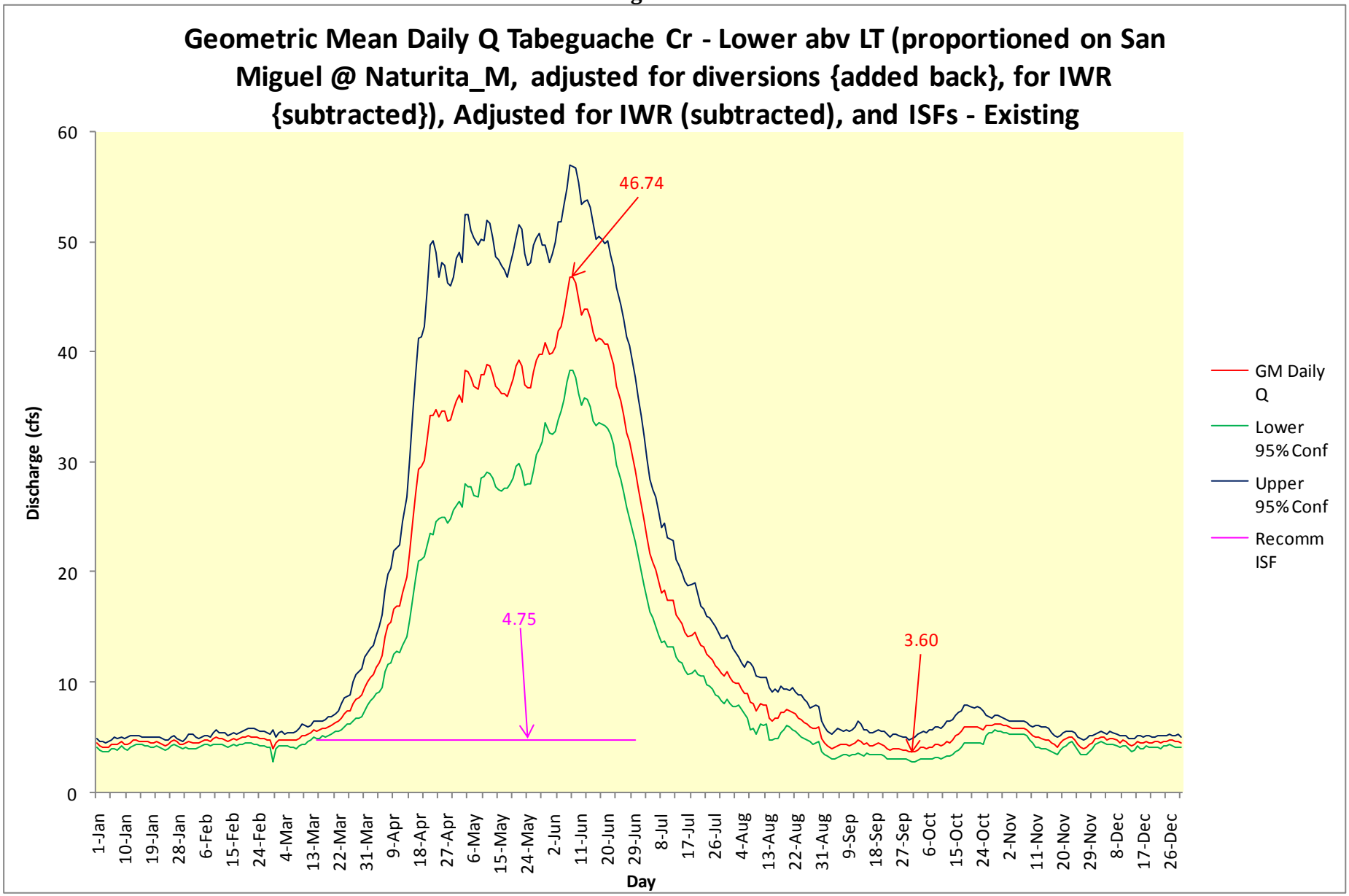

Geometric Mean Daily Q Tabeguache Cr - Lower abv LT (proportioned on San Miguel @ Naturita_M, adjusted for diversions {added back}, for IWR {subtracted}), Adjusted for IWR (subtracted), and ISFs - Existing
Discharge (cfs)
60
50
40
30
20
10
0
46.74
4.75
3.60
GM Daily Q
Lower 95% Conf
Upper 95% Conf
Recomm ISF
1-Jan
10-Jan
19-Jan
28-Jan
6-Feb
15-Feb
24-Feb
4-Mar
13-Mar
22-Mar
31-Mar
9-Apr
18-Apr
27-Apr
6-May
15-May
24-May
2-Jun
11-Jun
20-Jun
29-Jun
8-Jul
17-Jul
26-Jul
4-Aug
13-Aug
22-Aug
31-Aug
9-Sep
18-Sep
27-Sep
6-Oct
15-Oct
24-Oct
2-Nov
11-Nov
20-Nov
29-Nov
8-Dec
17-Dec
26-Dec
Day

Table 2. Geometric Mean Discharge and Recommended Instream Flows			
Date	Existing ISF	Recommended ISF	Proportioned Adjusted GM (abv gage) Adj (-) for Irr & (-) OoB from Tabeguache Cr – Lower abv LT
1-Jan			4.40
2-Jan			4.15
3-Jan			4.03
4-Jan			4.01
5-Jan			4.11
6-Jan			4.34
7-Jan			4.38
8-Jan			4.28
9-Jan			4.53
10-Jan			4.38
11-Jan			4.35
12-Jan			4.48
13-Jan			4.65
14-Jan			4.71
15-Jan			4.64
16-Jan			4.61
17-Jan			4.59
18-Jan			4.57
19-Jan			4.46
20-Jan			4.50
21-Jan			4.52
22-Jan			4.48
23-Jan			4.32
24-Jan			4.21
25-Jan			4.32
26-Jan			4.53
27-Jan			4.67
28-Jan			4.53
29-Jan			4.34
30-Jan			4.26
31-Jan			4.44
1-Feb			4.56
2-Feb			4.51
3-Feb			4.42
4-Feb			4.42
5-Feb			4.54
6-Feb			4.69
7-Feb			4.68
8-Feb			4.61
9-Feb			4.87
10-Feb			4.95
11-Feb			4.80
12-Feb			4.79

13-Feb		4.73
14-Feb		4.57
15-Feb		4.69
16-Feb		4.81
17-Feb		4.69
18-Feb		4.79
19-Feb		4.91
20-Feb		5.03
21-Feb		5.06
22-Feb		5.02
23-Feb		5.00
24-Feb		4.92
25-Feb		4.82
26-Feb		4.79
27-Feb		4.71
28-Feb		4.66
29-Feb		3.91
1-Mar		4.43
2-Mar		4.69
3-Mar		4.76
4-Mar		4.73
5-Mar		4.75
6-Mar		4.69
7-Mar		4.71
8-Mar		4.68
9-Mar		4.85
10-Mar		5.15
11-Mar		5.13
12-Mar		5.18
13-Mar		5.34
14-Mar		5.68
15-Mar	4.75	5.57
16-Mar	4.75	5.59
17-Mar	4.75	5.72
18-Mar	4.75	5.71
19-Mar	4.75	5.91
20-Mar	4.75	5.98
21-Mar	4.75	6.24
22-Mar	4.75	6.37
23-Mar	4.75	6.67
24-Mar	4.75	7.05
25-Mar	4.75	7.31
26-Mar	4.75	7.38
27-Mar	4.75	8.02
28-Mar	4.75	8.45
29-Mar	4.75	8.50
30-Mar	4.75	8.75
31-Mar	4.75	9.52
1-Apr	4.75	9.96

2-Apr	4.75	10.38
3-Apr	4.75	10.68
4-Apr	4.75	11.28
5-Apr	4.75	11.67
6-Apr	4.75	12.37
7-Apr	4.75	14.15
8-Apr	4.75	15.10
9-Apr	4.75	15.44
10-Apr	4.75	16.56
11-Apr	4.75	16.85
12-Apr	4.75	16.86
13-Apr	4.75	18.05
14-Apr	4.75	19.48
15-Apr	4.75	21.89
16-Apr	4.75	24.55
17-Apr	4.75	27.10
18-Apr	4.75	29.38
19-Apr	4.75	29.55
20-Apr	4.75	30.06
21-Apr	4.75	32.06
22-Apr	4.75	34.22
23-Apr	4.75	34.25
24-Apr	4.75	34.73
25-Apr	4.75	34.06
26-Apr	4.75	34.68
27-Apr	4.75	34.55
28-Apr	4.75	33.66
29-Apr	4.75	33.80
30-Apr	4.75	34.69
1-May	4.75	35.56
2-May	4.75	36.03
3-May	4.75	35.35
4-May	4.75	38.36
5-May	4.75	38.22
6-May	4.75	37.65
7-May	4.75	36.87
8-May	4.75	36.59
9-May	4.75	37.86
10-May	4.75	37.89
11-May	4.75	38.91
12-May	4.75	38.71
13-May	4.75	37.96
14-May	4.75	36.81
15-May	4.75	36.53
16-May	4.75	36.22
17-May	4.75	36.21
18-May	4.75	35.99
19-May	4.75	36.71
20-May	4.75	37.50

21-May	4.75	38.70
22-May	4.75	39.28
23-May	4.75	38.66
24-May	4.75	36.98
25-May	4.75	36.67
26-May	4.75	36.77
27-May	4.75	38.15
28-May	4.75	39.30
29-May	4.75	39.83
30-May	4.75	39.80
31-May	4.75	40.85
1-Jun	4.75	39.71
2-Jun	4.75	39.92
3-Jun	4.75	40.49
4-Jun	4.75	41.84
5-Jun	4.75	42.35
6-Jun	4.75	43.66
7-Jun	4.75	45.26
8-Jun	4.75	46.74
9-Jun	4.75	46.72
10-Jun	4.75	46.21
11-Jun	4.75	44.82
12-Jun	4.75	43.37
13-Jun	4.75	43.83
14-Jun	4.75	43.87
15-Jun	4.75	43.14
16-Jun	4.75	41.73
17-Jun	4.75	40.97
18-Jun	4.75	41.20
19-Jun	4.75	41.03
20-Jun	4.75	40.73
21-Jun	4.75	40.68
22-Jun	4.75	39.81
23-Jun	4.75	38.78
24-Jun	4.75	36.92
25-Jun	4.75	35.48
26-Jun	4.75	34.21
27-Jun	4.75	32.69
28-Jun	4.75	31.77
29-Jun	4.75	30.48
30-Jun	4.75	29.23
1-Jul		27.66
2-Jul		26.20
3-Jul		24.63
4-Jul		23.14
5-Jul		21.59
6-Jul		20.90
7-Jul		20.13
8-Jul		19.07

9-Jul	18.10
10-Jul	18.36
11-Jul	17.47
12-Jul	17.41
13-Jul	17.41
14-Jul	16.06
15-Jul	15.66
16-Jul	15.27
17-Jul	14.50
18-Jul	14.11
19-Jul	14.22
20-Jul	14.46
21-Jul	13.82
22-Jul	13.32
23-Jul	13.19
24-Jul	12.48
25-Jul	12.27
26-Jul	11.93
27-Jul	11.51
28-Jul	11.20
29-Jul	10.75
30-Jul	10.50
31-Jul	10.92
1-Aug	10.47
2-Aug	10.06
3-Aug	9.92
4-Aug	9.81
5-Aug	9.36
6-Aug	8.97
7-Aug	8.88
8-Aug	8.10
9-Aug	8.02
10-Aug	7.33
11-Aug	8.02
12-Aug	7.89
13-Aug	7.93
14-Aug	6.65
15-Aug	6.48
16-Aug	6.64
17-Aug	6.64
18-Aug	7.17
19-Aug	7.19
20-Aug	7.43
21-Aug	7.31
22-Aug	7.19
23-Aug	7.04
24-Aug	6.75
25-Aug	6.53
26-Aug	6.33

27-Aug	6.15
28-Aug	5.85
29-Aug	5.70
30-Aug	5.83
31-Aug	5.91
1-Sep	4.78
2-Sep	4.50
3-Sep	4.17
4-Sep	3.97
5-Sep	4.01
6-Sep	4.23
7-Sep	4.29
8-Sep	4.28
9-Sep	4.32
10-Sep	4.20
11-Sep	4.35
12-Sep	4.45
13-Sep	4.69
14-Sep	4.55
15-Sep	4.30
16-Sep	4.41
17-Sep	4.24
18-Sep	4.21
19-Sep	4.26
20-Sep	4.38
21-Sep	4.32
22-Sep	4.17
23-Sep	3.97
24-Sep	3.84
25-Sep	3.93
26-Sep	3.93
27-Sep	3.85
28-Sep	3.82
29-Sep	3.85
30-Sep	3.65
1-Oct	3.60
2-Oct	3.72
3-Oct	3.83
4-Oct	3.99
5-Oct	4.01
6-Oct	3.97
7-Oct	4.11
8-Oct	4.10
9-Oct	4.28
10-Oct	4.29
11-Oct	4.14
12-Oct	4.31
13-Oct	4.58
14-Oct	4.51

15-Oct	4.67
16-Oct	5.05
17-Oct	5.20
18-Oct	5.47
19-Oct	5.86
20-Oct	5.93
21-Oct	5.92
22-Oct	5.84
23-Oct	5.91
24-Oct	5.79
25-Oct	5.63
26-Oct	5.99
27-Oct	6.07
28-Oct	5.99
29-Oct	6.21
30-Oct	6.21
31-Oct	6.11
1-Nov	6.03
2-Nov	5.97
3-Nov	5.84
4-Nov	5.81
5-Nov	5.79
6-Nov	5.80
7-Nov	5.77
8-Nov	5.81
9-Nov	5.69
10-Nov	5.35
11-Nov	5.17
12-Nov	4.97
13-Nov	4.94
14-Nov	4.82
15-Nov	4.76
16-Nov	4.65
17-Nov	4.48
18-Nov	4.29
19-Nov	4.06
20-Nov	4.39
21-Nov	4.71
22-Nov	4.80
23-Nov	4.98
24-Nov	5.02
25-Nov	4.76
26-Nov	4.36
27-Nov	4.02
28-Nov	3.98
29-Nov	4.04
30-Nov	4.28
1-Dec	4.44
2-Dec	4.79

3-Dec	4.89
4-Dec	5.02
5-Dec	4.92
6-Dec	4.71
7-Dec	4.91
8-Dec	4.79
9-Dec	4.65
10-Dec	4.50
11-Dec	4.67
12-Dec	4.57
13-Dec	4.36
14-Dec	4.22
15-Dec	4.31
16-Dec	4.62
17-Dec	4.45
18-Dec	4.41
19-Dec	4.60
20-Dec	4.51
21-Dec	4.47
22-Dec	4.53
23-Dec	4.57
24-Dec	4.46
25-Dec	4.63
26-Dec	4.64
27-Dec	4.72
28-Dec	4.65
29-Dec	4.56
30-Dec	4.60
31-Dec	4.48

Existing Water Right Information

Staff has analyzed the water rights tabulation and contacted the Division Engineer Office (DEO) to identify any potential water availability problems. There are two decreed surface diversions within this reach of stream, Croke Ditch (1 cfs conditional with a 1993 appropriation) and the Uravan Pipeline (0.10 cfs with a 1934 appropriation). Staff has determined that water is available for appropriation on Tabegauche Creek, between the headgate of the Templeton Ditch and the confluence with the San Miguel 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:

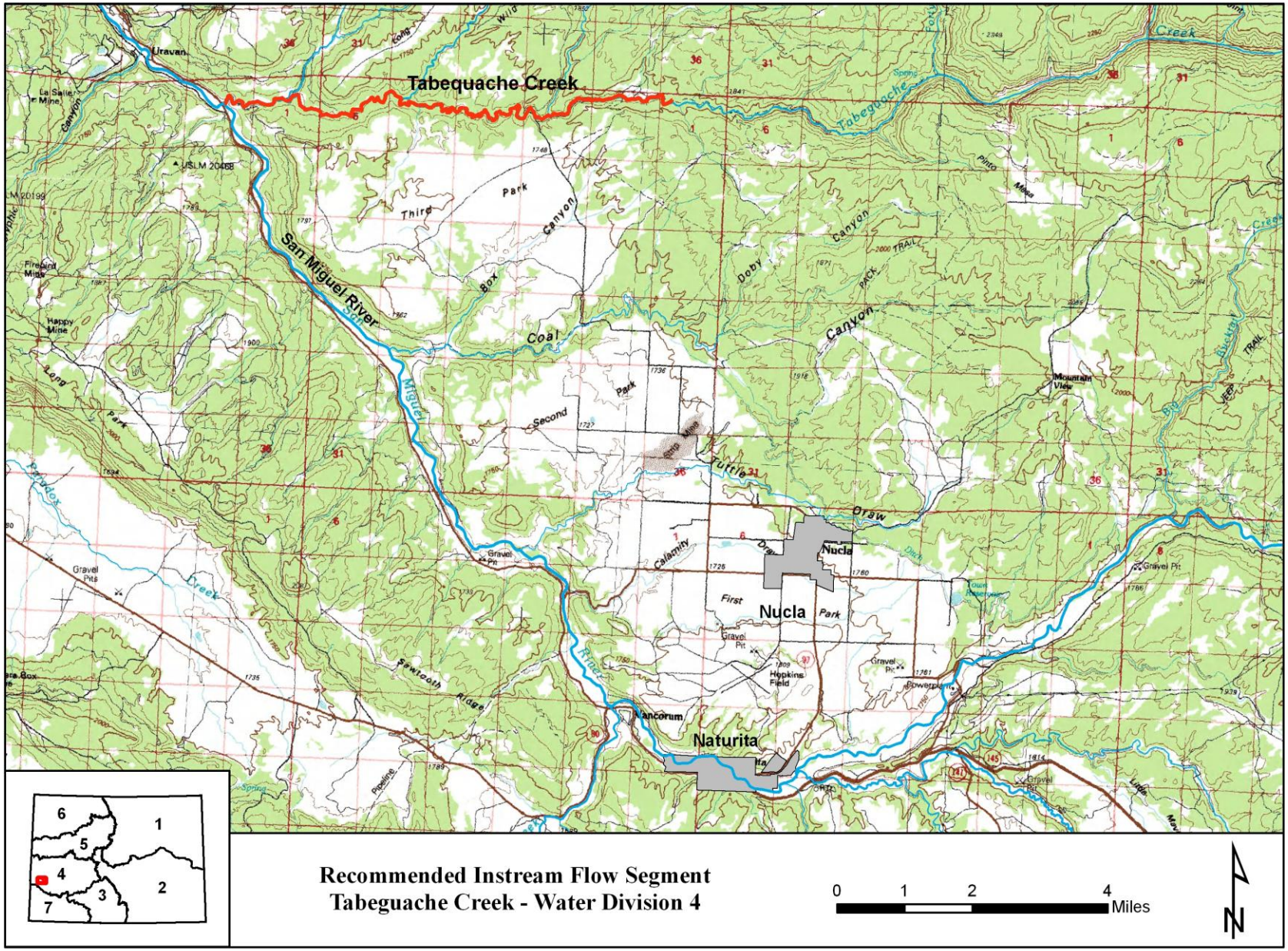
Segment: Headgate of Templeton Ditch to Confluence with San Miguel River

Upper Terminus: HEADGATE OF TEMPLETON DTICH
(Latitude 38° 21' 41.98"N) (Longitude 108° 35' 24.68"W)
UTM North: 4252047.7 UTM East: 186297.8
NW NW S1 T47N R16W NMPM
940' East of the West Section Line; 560' South of the North Section Line

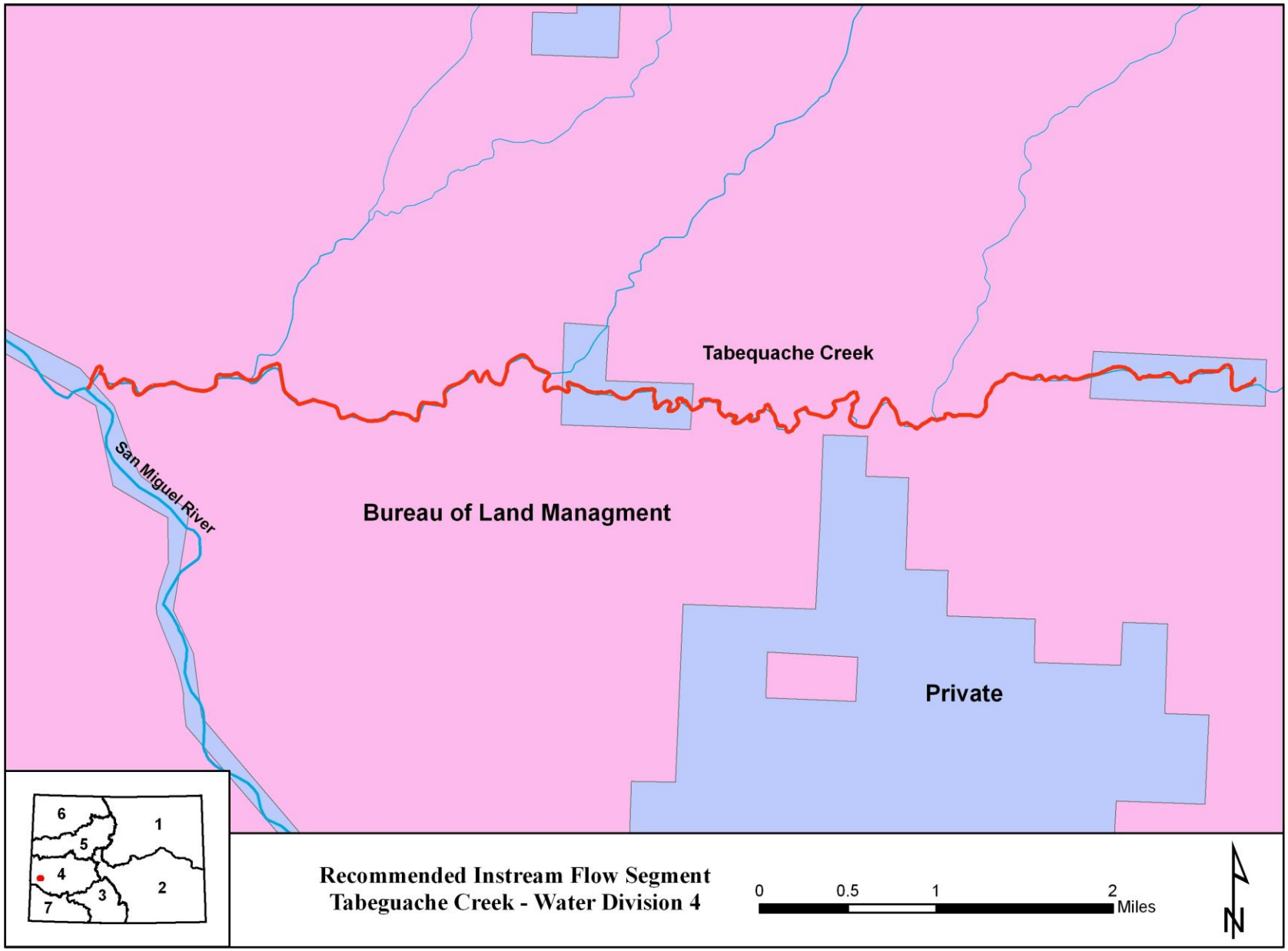
Lower Terminus: CONFLUENCE WITH SAN MIGUEL RIVER
(Latitude 38° 21' 25.54"N) (Longitude 108° 42' 42.57"W)
UTM North: 4251961.5 UTM East: 175645.7
SE NE S2 T47N R17W NMPM
2150' West of the East Section Line; 2120' South of the North Section Line

Watershed: San Miguel (HUC#: 14030003)
Counties: Montrose
Length: 9.7 miles
USGS Quads: Uravan, Nucla
Flow Recommendation: 4.75 cfs (March 15 - June 30)

Vicinity Map



Land Use Map


Tabequache Creek
San Miguel River
Bureau of Land Managment
Private
6
1
5
4
2
3
7
Recommended Instream Flow Segment
Tabeguache Creek - Water Division 4
0
0.5
1
2
Miles
N

Topographic & Water Rights Map