<u>Stream:</u> Tabeguache Creek

Executive Summary

Water Division: 4
Water District: 40
CDOW#: 43480
CWCB ID: 10/4/A-010

Segment: CONFLUENCE WITH NORTH FORK TABEGUACHE CREEK TO CONFLUENCE WITH FORTY-SEVEN CREEK
Upper Terminus: CONFLUENCE WITH NOTH FORK TABEGUACHE CREEK (Latitude 38° 22’ 43.49”N) (Longitude 108° 27’ 43.97”W)

Lower Terminus: CONFLUENCE WITH FORTY-SEVEN CREEK (Latitude 38° 22’ 9.52”N) (Longitude 108° 31’ 5.07”W)

Watershed: San Miguel (HUC#: 14030003)
Counties: Montrose
Length: 3.66 miles
USGS Quad(s): Starvation Point, Big Bucktail Creek, Nucla
Flow Recommendation: 3.5 cfs (April 1 – June 30)
2.0 cfs (July 1 – October 31)
1.6 cfs (November 1 – March 31)

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 ISF Rule 5i.

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 U.S. Forest Service (USFS) 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 originates on the Uncompahgre Plateau at an elevation of 9,840 feet and flows generally southwesterly for 27.5 miles as it drops to an elevation of 5,010 feet at its confluence with the San Miguel River. One hundred percent of the land on the 3.66 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 confluence with North Fork Tabeguache Creek and extending downstream to the confluence with Forty-Seven Creek. The proposed segment is located approximately 8.5 miles northeast of the town of Nucla. Staff has received one recommendation for this segment, from the USFS and the recommendation for this segment is discussed below.

Instream Flow Recommendation

The USFS recommended 3.5 cfs (April 1 – June 30), 2.0 cfs (July 1 – October 31), and 1.6 cfs (November 1 – March 31). These recommendations were based on their October 15, 1993 and July 7, 2009 data collection efforts and staff's water availability analyses.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Confluence with NF Tabeguache Creek	Confluence with Forty-Seven Creek	3.66	0%	100%

2% of the lands are owned by the BLM and 98% of the lands are owned by the USFS.

Biological Data

Tabeguache Creek is a low gradient stream with moderate sinuosity. There is close to an even ratio of pools to riffles. Larger pools occur at the tail of steeper riffles/drops and often go into long runs before tailing out. There are a few sections of step pools and various pockets of cover among large boulders. The substrate was largely polished sandstone of boulder and cobble size. There are also many sections with numerous finer substrates, particularly sand. The Riparian habitat is diverse with willows, cottonwoods, ponderosa pine, and oak scrub.

Fisheries surveys conducted in 2008 indicate that the stream environment supports self-sustaining populations of fish. The sample was dominated by speckled dace but also included rainbow trout, molted sculpin, and blue head sucker. Visual observation of cobbles revealed a variety of caddis fly larvae and mayfly nymphs. Low flows are common in the late summer and fall, and may be a limiting factor for fish production and movement during this time. The stream channel provides good pool habitat during summer and winter flows.

Field Survey Data

USFS 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 will result in the maintenance of aquatic habitat in pools and runs for most life stages of fish and aquatic invertebrates (Nehring 1979; Espegren 1996).

For this segment of 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 (cfs)	250%-40%	Summer (3/3)	Winter (2/3)
USFS & CDOW	10/5/1993	1.28	3.2 – 0.5	Out of Range	Out of Range
USFS	7/16/2009	1.86	4.65 – 0.75	4.0 cfs	3.8 cfs
USFS	7/16/2009	1.73	4.3 – 0.7	3.0 cfs	2.0 cfs
USFS	7/16/2009	16.1	4.0 – 0.6	3.5 cfs	3.2 cfs

CDOW= Colorado Division of Wildlife

The summer flow recommendation, which meets 3 of 3 criteria and is within the accuracy range of the R2CROSS model, is 3.5 cfs. The winter flow recommendation, which meets 2 of 3 criteria and is within the accuracy range of the R2CROSS model is 3.0 cfs. Due to water availability constraints the winter flow recommendation was lowered to 1.6 cfs.

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 Tabeguache Creek (above Forty Seven Creek) no such gage is available at the LT. There is a gage on the upper reach of Tabeguache Creek. However, this gage was not useful for this analysis because it was operated for only 7 years during the period 1946 to 1953. To describe the normal flow regime at Tabeguache Creek above the LT it was necessary to use a

"representative" gage station. The gage station selected for this purpose was SAN MIGUEL RIVER @ NATURITA (USGS 09175500) (less San Miguel River nr Nucla USGS 09174000). The gage is at an elevation of 5,392.85 ft above mean sea level (amsl) and has a drainage area[1] of 420 mi^2. The hydrograph (plot of discharge over time) produced from this gage includes the effects of an upstream transbasin diversion and many within the basin. The transbasin diversion was 100% consumptive to the basin while the remaining diversions were only partially consumptive. To make the measured data from San Miguel @ Naturita Creek transferrable to Tabeguache Creek above the LT, the diversions were added back to the measured representative hydrograph. The resulting "adjusted" hydrograph could then be used on Tabeguache Creek above the LT by multiplying the "adjusted" hydrograph by an area ratio; specifically, the area of Tabeguache Creek above the LT (70.86 mi^2 above the LT) to San Miguel R @ Naturita (420 mi^2 above the gage). Next, the resulting proportioned "adjusted" hydrograph would itself be "adjusted" (decreased) to reflect the existing depletions on Tabeguache Creek above the LT resulting from upstream consumptive irrigation uses and transbasin diversions. 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 Tabeguache Creek is to compute the Geometric Mean of the area-prorated "adjusted" data values from the San Miguel @ Naturita Creek hydrograph. This step is of value because of the inherent statistical limitation 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.

[1] Subtracting the area of San Miguel R nr Nucla from the area of San Miguel R @ Naturita

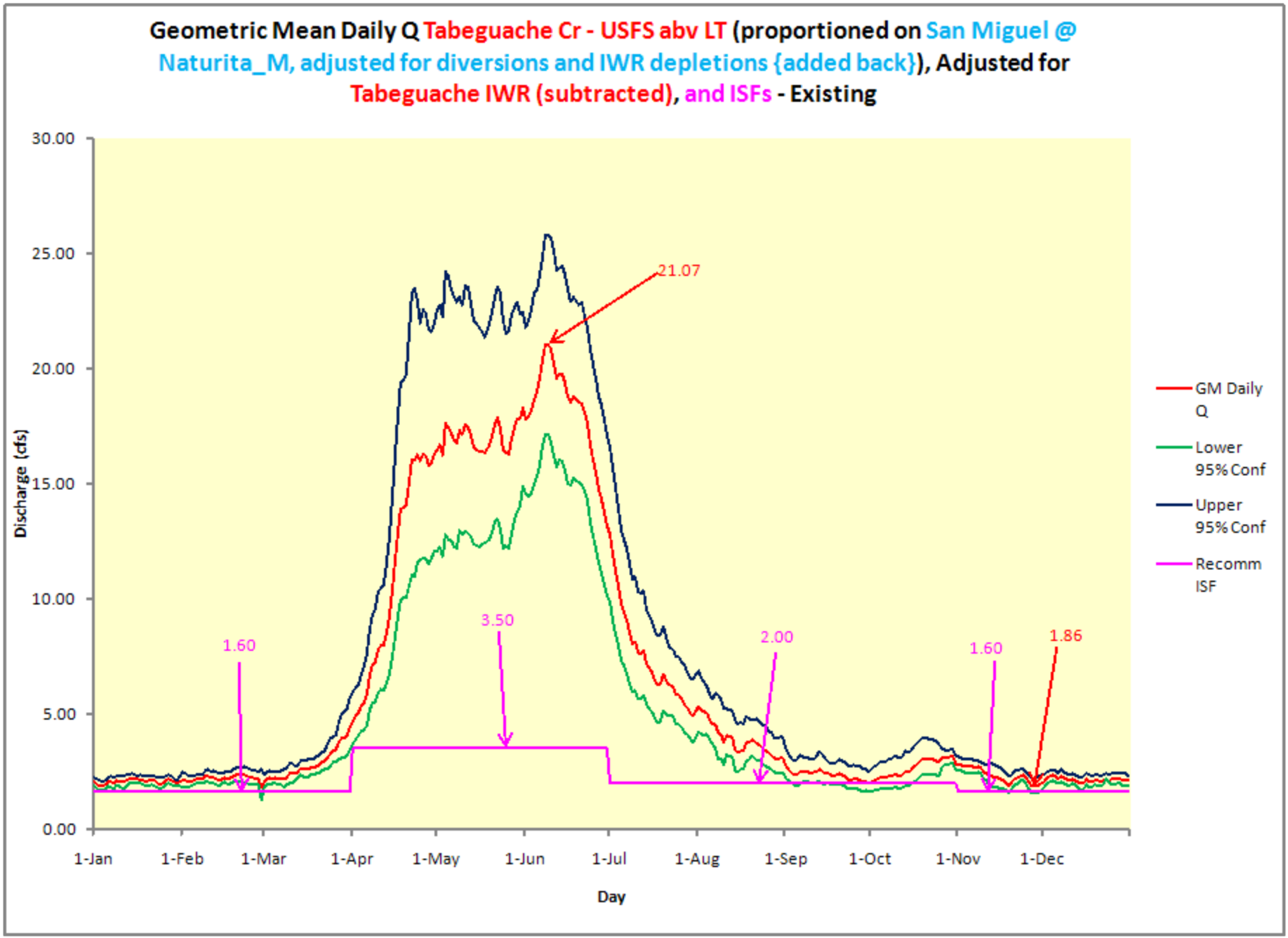

Geometric Mean Daily Q Tabeguache Cr - USFS abv LT (proportioned on San Miguel @ Naturita_M, adjusted for diversions and IWR depletions {added back}), Adjusted for Tabeguache IWR (subtracted), and ISFs - Existing
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Discharge (cfs)
21.07
1.60
3.50
2.00
1.60
1.86
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Day
GM Daily Q
Lower 95% Conf
Upper 95% Conf
Recomm ISF

Table 2. Geometric Mean Existing Cond (IWR subtracted) Tabeguache Creek Recommended Prop on San Miguel R @ Naturita_M abv gage Baseline Cond				
Date	**GM (abv LT) Prorated by 16.87%**	**Lower 95% Conf Prorated by 16.87%**	**Upper 95% Conf Prorated by 16.87%**	**Recommended ISF (cfs)**
1-Jan	2.05165	1.860179	2.262829	1.60
2-Jan	1.934987	1.738618	2.153536	1.60
3-Jan	1.880816	1.677479	2.1088	1.60
4-Jan	1.870748	1.685585	2.07625	1.60
5-Jan	1.917406	1.733602	2.120696	1.60
6-Jan	2.024262	1.84302	2.223327	1.60
7-Jan	2.041941	1.81621	2.295728	1.60
8-Jan	1.99413	1.771644	2.244557	1.60
9-Jan	2.110715	1.930529	2.307719	1.60
10-Jan	2.040056	1.820316	2.286322	1.60
11-Jan	2.027758	1.77565	2.315661	1.60
12-Jan	2.091046	1.857863	2.353496	1.60
13-Jan	2.166214	1.965571	2.387337	1.60
14-Jan	2.196198	2.007534	2.402592	1.60
15-Jan	2.161741	1.982907	2.356703	1.60
16-Jan	2.148029	1.983137	2.326632	1.60
17-Jan	2.141482	1.964779	2.334076	1.60
18-Jan	2.12898	1.954247	2.319336	1.60
19-Jan	2.080822	1.877969	2.305586	1.60
20-Jan	2.097645	1.891784	2.325907	1.60
21-Jan	2.108072	1.927905	2.305076	1.60
22-Jan	2.090193	1.895186	2.305265	1.60
23-Jan	2.016472	1.815942	2.239146	1.60
24-Jan	1.961069	1.735481	2.21598	1.60
25-Jan	2.014469	1.822104	2.227143	1.60
26-Jan	2.110589	1.94535	2.289863	1.60
27-Jan	2.178025	2.005002	2.365978	1.60
28-Jan	2.113654	1.957752	2.281972	1.60
29-Jan	2.024605	1.867689	2.194706	1.60
30-Jan	1.986487	1.841395	2.143011	1.60
31-Jan	2.068286	1.869171	2.288612	1.60
1-Feb	2.128362	1.832014	2.472648	1.60
2-Feb	2.102284	1.818583	2.430244	1.60
3-Feb	2.061504	1.8353	2.315589	1.60
4-Feb	2.059029	1.862734	2.276008	1.60
5-Feb	2.117266	1.930029	2.322667	1.60
6-Feb	2.186844	2.013621	2.374967	1.60
7-Feb	2.181999	1.999783	2.380818	1.60
8-Feb	2.148201	1.968428	2.344391	1.60

9-Feb	2.270512	2.034266	2.534193	1.60
10-Feb	2.308676	2.039637	2.613203	1.60
11-Feb	2.23945	1.998462	2.509497	1.60
12-Feb	2.234592	1.983677	2.517245	1.60
13-Feb	2.203691	1.952942	2.486636	1.60
14-Feb	2.133211	1.892774	2.404191	1.60
15-Feb	2.18484	1.964953	2.429333	1.60
16-Feb	2.244514	2.034551	2.476145	1.60
17-Feb	2.185904	1.932841	2.472101	1.60
18-Feb	2.233319	1.985346	2.512265	1.60
19-Feb	2.291529	2.038087	2.576486	1.60
20-Feb	2.345178	2.084536	2.63841	1.60
21-Feb	2.359533	2.082576	2.673323	1.60
22-Feb	2.338565	2.048211	2.67008	1.60
23-Feb	2.333178	2.016203	2.699985	1.60
24-Feb	2.294349	1.983533	2.653869	1.60
25-Feb	2.249482	1.951576	2.592864	1.60
26-Feb	2.234105	1.956812	2.550692	1.60
27-Feb	2.195952	1.919094	2.512752	1.60
28-Feb	2.172421	1.910251	2.470571	1.60
1-Mar	1.822818	1.265711	2.625139	1.60
2-Mar	2.067264	1.820581	2.347371	1.60
3-Mar	2.189076	1.924832	2.489595	1.60
4-Mar	2.219204	1.934078	2.546364	1.60
5-Mar	2.204375	1.972163	2.463929	1.60
6-Mar	2.214813	1.975522	2.483088	1.60
7-Mar	2.188272	1.917797	2.496893	1.60
8-Mar	2.194674	1.903079	2.530948	1.60
9-Mar	2.180007	1.836545	2.587702	1.60
10-Mar	2.261509	1.921108	2.662226	1.60
11-Mar	2.399402	2.018724	2.851867	1.60
12-Mar	2.390881	2.011097	2.842384	1.60
13-Mar	2.415619	2.119198	2.753502	1.60
14-Mar	2.490417	2.210986	2.805165	1.60
15-Mar	2.650044	2.342805	2.997574	1.60
16-Mar	2.597421	2.260099	2.985089	1.60
17-Mar	2.605209	2.26044	3.002564	1.60
18-Mar	2.666931	2.353709	3.021834	1.60
19-Mar	2.66254	2.339586	3.030073	1.60
20-Mar	2.755839	2.406863	3.155414	1.60
21-Mar	2.789524	2.432226	3.19931	1.60
22-Mar	2.909177	2.554023	3.313717	1.60
23-Mar	2.968963	2.578466	3.418598	1.60
24-Mar	3.110781	2.603125	3.717439	1.60
25-Mar	3.288298	2.721881	3.972586	1.60
26-Mar	3.408862	2.887061	4.024972	1.60
27-Mar	3.43936	2.895413	4.085496	1.60

28-Mar	3.741102	3.011753	4.647077	1.60
29-Mar	3.940335	3.1093	4.993482	1.60
30-Mar	3.962679	3.092319	5.07801	1.60
31-Mar	4.078473	3.190052	5.214317	1.60
1-Apr	4.439335	3.435736	5.736091	3.50
2-Apr	4.687227	3.696821	5.949854	3.50
3-Apr	4.895678	3.901837	6.148895	3.50
4-Apr	5.043116	4.04978	6.286278	3.50
5-Apr	5.323901	4.22631	6.714024	3.50
6-Apr	5.501616	4.286856	7.071132	3.50
7-Apr	5.839767	4.507208	7.581347	3.50
8-Apr	6.668491	5.152788	8.644896	3.50
9-Apr	7.11265	5.450904	9.296916	3.50
10-Apr	7.271103	5.535869	9.567081	3.50
11-Apr	7.814109	5.922069	10.32809	3.50
12-Apr	7.964341	6.064843	10.4756	3.50
13-Apr	7.986192	6.018417	10.6157	3.50
14-Apr	8.541	6.327296	11.55019	3.50
15-Apr	9.182974	6.693692	12.61467	3.50
16-Apr	10.28303	7.423607	14.25509	3.50
17-Apr	11.56347	8.308577	16.11144	3.50
18-Apr	12.795	9.190185	17.83178	3.50
19-Apr	13.88598	9.944252	19.42076	3.50
20-Apr	13.96325	10.03681	19.45625	3.50
21-Apr	14.09414	10.04684	19.77999	3.50
22-Apr	15.01902	10.5485	21.38356	3.50
23-Apr	16.0293	11.05608	23.24078	3.50
24-Apr	16.06439	10.99755	23.47351	3.50
25-Apr	16.28876	11.56906	22.95572	3.50
26-Apr	16.00747	11.678	21.96479	3.50
27-Apr	16.30321	11.78557	22.57852	3.50
28-Apr	16.24559	11.78621	22.4175	3.50
29-Apr	15.81972	11.53125	21.7054	3.50
30-Apr	15.91749	11.74529	21.58352	3.50
1-May	16.27336	12.07297	21.93493	3.50
2-May	16.49247	12.05365	22.51562	3.50
3-May	16.70766	12.2323	22.77501	3.50
4-May	16.24068	11.83454	22.20669	3.50
5-May	17.65502	12.80811	24.25206	3.50
6-May	17.44198	12.57558	24.06404	3.50
7-May	17.19749	12.55771	23.43562	3.50
8-May	16.87321	12.24951	23.13169	3.50
9-May	16.74379	12.20126	22.86839	3.50
10-May	17.34656	12.97857	23.09561	3.50
11-May	17.12527	12.80013	22.78286	3.50
12-May	17.54324	12.94774	23.62036	3.50
13-May	17.46833	12.8852	23.53228	3.50

14-May	17.1187	12.7163	22.90541	3.50
15-May	16.56301	12.35511	22.06877	3.50
16-May	16.48596	12.28852	21.98897	3.50
17-May	16.39231	12.25353	21.80401	3.50
18-May	16.40578	12.38679	21.61356	3.50
19-May	16.32038	12.42406	21.33318	3.50
20-May	16.6382	12.56743	21.91392	3.50
21-May	17.01744	12.85012	22.42454	3.50
22-May	17.57492	13.35014	23.03097	3.50
23-May	17.86403	13.4722	23.57797	3.50
24-May	17.4734	13.04071	23.27722	3.50
25-May	16.47963	12.21266	22.05945	3.50
26-May	16.34058	12.30088	21.55052	3.50
27-May	16.31026	12.20014	21.62436	3.50
28-May	16.97051	12.79355	22.3427	3.50
29-May	17.468	13.4046	22.61286	3.50
30-May	17.79999	13.7818	22.86105	3.50
31-May	17.7826	14.04702	22.40435	3.50
1-Jun	18.29433	14.87547	22.4207	3.50
2-Jun	17.82552	14.55165	21.76028	3.50
3-Jun	17.90203	14.4529	22.08921	3.50
4-Jun	18.15375	14.54691	22.56207	3.50
5-Jun	18.6885	14.91709	23.3109	3.50
6-Jun	18.95526	15.32228	23.36275	3.50
7-Jun	19.55313	15.81741	24.08468	3.50
8-Jun	20.36412	16.66043	24.81883	3.50
9-Jun	21.0544	17.11791	25.81847	3.50
10-Jun	21.06521	17.14856	25.80224	3.50
11-Jun	20.84128	16.84555	25.70702	3.50
12-Jun	20.25247	16.25019	25.16391	3.50
13-Jun	19.56879	15.73027	24.26901	3.50
14-Jun	19.77489	16.02545	24.33271	3.50
15-Jun	19.77836	15.9608	24.43712	3.50
16-Jun	19.42094	15.60062	24.10202	3.50
17-Jun	18.7833	15.01548	23.42115	3.50
18-Jun	18.51216	14.96064	22.84898	3.50
19-Jun	18.79188	15.24187	23.12934	3.50
20-Jun	18.64667	15.12566	22.94327	3.50
21-Jun	18.53245	15.06848	22.75195	3.50
22-Jun	18.49543	14.9329	22.86392	3.50
23-Jun	18.09988	14.69705	22.25078	3.50
24-Jun	17.61923	14.24061	21.75811	3.50
25-Jun	16.71644	13.37153	20.85243	3.50
26-Jun	16.05114	12.75042	20.16147	3.50
27-Jun	15.48616	12.21913	19.58251	3.50
28-Jun	14.77863	11.59367	18.79219	3.50
29-Jun	14.3237	11.0913	18.44667	3.50

30-Jun	13.71051	10.57413	17.72542	3.50
1-Jul	13.17049	10.1243	17.08772	2.00
2-Jul	12.78974	9.845601	16.57143	2.00
3-Jul	11.96487	9.081871	15.692	2.00
4-Jul	11.23103	8.454976	14.84209	2.00
5-Jul	10.53702	7.95835	13.87699	2.00
6-Jul	9.781356	7.334806	12.96646	2.00
7-Jul	9.456699	7.09518	12.53358	2.00
8-Jul	9.079141	6.733027	12.16652	2.00
9-Jul	8.526856	6.277946	11.49337	2.00
10-Jul	8.057743	5.949617	10.82722	2.00
11-Jul	8.14457	5.99765	10.97269	2.00
12-Jul	7.679736	5.669018	10.31851	2.00
13-Jul	7.631689	5.648444	10.23114	2.00
14-Jul	7.780426	5.831768	10.33624	2.00
15-Jul	7.180201	5.390473	9.52949	2.00
16-Jul	6.987502	5.243858	9.284602	2.00
17-Jul	6.804241	5.125302	9.007408	2.00
18-Jul	6.441544	4.807768	8.60251	2.00
19-Jul	6.267636	4.644057	8.431622	2.00
20-Jul	6.315738	4.702733	8.455164	2.00
21-Jul	6.729261	5.147999	8.830772	2.00
22-Jul	6.427743	4.981277	8.3251	2.00
23-Jul	6.240038	4.935674	7.921203	2.00
24-Jul	6.178057	4.914922	7.795393	2.00
25-Jul	5.835568	4.577975	7.472405	2.00
26-Jul	5.815031	4.552482	7.478558	2.00
27-Jul	5.647561	4.427343	7.254854	2.00
28-Jul	5.443049	4.209202	7.093717	2.00
29-Jul	5.268224	4.114111	6.79551	2.00
30-Jul	5.054665	3.924846	6.561523	2.00
31-Jul	4.937824	3.769616	6.52851	2.00
1-Aug	5.132032	3.975139	6.675667	2.00
2-Aug	5.381173	4.2472	6.87404	2.00
3-Aug	5.193559	4.144428	6.558771	2.00
4-Aug	5.09977	4.098978	6.391843	2.00
5-Aug	5.047615	4.137364	6.194928	2.00
6-Aug	4.771134	3.904453	5.868149	2.00
7-Aug	4.588457	3.731649	5.682956	2.00
8-Aug	4.547311	3.538624	5.907239	2.00
9-Aug	4.177896	3.048723	5.838574	2.00
10-Aug	4.131937	3.064404	5.674031	2.00
11-Aug	3.781063	2.783151	5.248163	2.00
12-Aug	4.092475	3.251479	5.203002	2.00
13-Aug	3.999398	3.145119	5.14413	2.00
14-Aug	4.02053	3.173905	5.148461	2.00
15-Aug	3.431506	2.546246	4.736975	2.00

16-Aug	3.337915	2.49532	4.572095	2.00
17-Aug	3.426049	2.579395	4.667877	2.00
18-Aug	3.399985	2.590559	4.566001	2.00
19-Aug	3.775583	2.962232	4.925585	2.00
20-Aug	3.787286	3.051902	4.788778	2.00
21-Aug	3.89177	3.224549	4.760868	2.00
22-Aug	3.799191	3.112127	4.711454	2.00
23-Aug	3.731255	2.976825	4.778058	2.00
24-Aug	3.660427	2.95956	4.614592	2.00
25-Aug	3.522289	2.82164	4.497257	2.00
26-Aug	3.42267	2.695626	4.467743	2.00
27-Aug	3.325732	2.657611	4.269383	2.00
28-Aug	3.244535	2.591723	4.170252	2.00
29-Aug	3.098993	2.499198	3.94087	2.00
30-Aug	3.027307	2.391032	3.95688	2.00
31-Aug	3.082174	2.432055	4.030816	2.00
1-Sep	3.115988	2.500599	3.984773	2.00
2-Sep	2.778247	2.234301	3.531141	2.00
3-Sep	2.632563	2.141679	3.303787	2.00
4-Sep	2.471193	2.024241	3.08025	2.00
5-Sep	2.378873	1.948845	2.969272	2.00
6-Sep	2.371393	1.89614	3.049857	2.00
7-Sep	2.47265	1.953271	3.223245	2.00
8-Sep	2.501241	2.042936	3.126184	2.00
9-Sep	2.488778	2.049115	3.079404	2.00
10-Sep	2.493063	2.036285	3.111754	2.00
11-Sep	2.411361	1.968742	3.014125	2.00
12-Sep	2.459367	2.013222	3.059772	2.00
13-Sep	2.510172	2.035237	3.156814	2.00
14-Sep	2.606437	2.052043	3.390669	2.00
15-Sep	2.54274	2.019131	3.276465	2.00
16-Sep	2.4181	1.945623	3.070454	2.00
17-Sep	2.455888	2.04138	2.998969	2.00
18-Sep	2.345132	1.953156	2.858348	2.00
19-Sep	2.328954	1.918013	2.875668	2.00
20-Sep	2.348272	1.919281	2.924811	2.00
21-Sep	2.404221	1.955547	3.008618	2.00
22-Sep	2.367173	1.936416	2.941994	2.00
23-Sep	2.295728	1.854668	2.898055	2.00
24-Sep	2.205782	1.777244	2.796765	2.00
25-Sep	2.14304	1.736264	2.701972	2.00
26-Sep	2.161166	1.722472	2.774552	2.00
27-Sep	2.1638	1.73736	2.753106	2.00
28-Sep	2.126654	1.710938	2.699785	2.00
29-Sep	2.063501	1.651165	2.633045	2.00
30-Sep	2.077883	1.682922	2.612107	2.00
1-Oct	1.985245	1.600535	2.510726	2.00

2-Oct	2.049203	1.636776	2.618768	2.00
3-Oct	2.104921	1.667745	2.713411	2.00
4-Oct	2.159958	1.702841	2.797443	2.00
5-Oct	2.230706	1.752642	2.897739	2.00
6-Oct	2.241269	1.76006	2.911789	2.00
7-Oct	2.223562	1.745131	2.888585	2.00
8-Oct	2.288545	1.774765	3.011071	2.00
9-Oct	2.282458	1.766732	3.009432	2.00
10-Oct	2.365666	1.821939	3.132599	2.00
11-Oct	2.373895	1.825251	3.145608	2.00
12-Oct	2.303776	1.765222	3.067277	2.00
13-Oct	2.381837	1.821727	3.174077	2.00
14-Oct	2.504099	1.891821	3.377489	2.00
15-Oct	2.45285	1.844487	3.324874	2.00
16-Oct	2.517673	1.910515	3.372382	2.00
17-Oct	2.697228	2.056685	3.588545	2.00
18-Oct	2.765054	2.102666	3.684989	2.00
19-Oct	2.892166	2.228284	3.796533	2.00
20-Oct	3.016736	2.331984	3.9423	2.00
21-Oct	3.045846	2.374054	3.941858	2.00
22-Oct	3.042066	2.376359	3.926138	2.00
23-Oct	3.004649	2.358762	3.857891	2.00
24-Oct	3.03688	2.382584	3.901451	2.00
25-Oct	2.983008	2.351264	3.813846	2.00
26-Oct	2.909474	2.300059	3.708381	2.00
27-Oct	3.07738	2.689223	3.529676	2.00
28-Oct	3.111345	2.802799	3.458436	2.00
29-Oct	3.074701	2.769974	3.41753	2.00
30-Oct	3.152377	2.855887	3.483644	2.00
31-Oct	3.145255	2.844573	3.481125	2.00
1-Nov	2.874866	2.58937	3.19257	1.60
2-Nov	2.813242	2.525168	3.134181	1.60
3-Nov	2.784326	2.513416	3.084436	1.60
4-Nov	2.722855	2.456973	3.01751	1.60
5-Nov	2.710357	2.438608	3.012389	1.60
6-Nov	2.700942	2.425875	3.007199	1.60
7-Nov	2.705977	2.428838	3.014737	1.60
8-Nov	2.689149	2.436083	2.968503	1.60
9-Nov	2.706735	2.463834	2.973582	1.60
10-Nov	2.651565	2.39491	2.935725	1.60
11-Nov	2.495979	2.205644	2.824532	1.60
12-Nov	2.410199	2.091246	2.777798	1.60
13-Nov	2.315451	1.895036	2.829136	1.60
14-Nov	2.30339	1.866144	2.843084	1.60
15-Nov	2.246605	1.827904	2.761214	1.60
16-Nov	2.219896	1.807295	2.726694	1.60
17-Nov	2.167525	1.75044	2.68399	1.60

18-Nov	2.089366	1.7225	2.53437	1.60
19-Nov	1.999859	1.670429	2.394257	1.60
20-Nov	1.895389	1.567932	2.291233	1.60
21-Nov	2.046347	1.753894	2.387565	1.60
22-Nov	2.19503	1.910201	2.522329	1.60
23-Nov	2.237391	1.959153	2.555143	1.60
24-Nov	2.324063	2.084955	2.590593	1.60
25-Nov	2.341921	2.111778	2.597145	1.60
26-Nov	2.218896	1.976093	2.491532	1.60
27-Nov	2.034189	1.768914	2.339245	1.60
28-Nov	1.872516	1.558777	2.249402	1.60
29-Nov	1.856105	1.57146	2.192309	1.60
30-Nov	1.882804	1.568495	2.260097	1.60
1-Dec	1.997967	1.69236	2.35876	1.60
2-Dec	2.070881	1.797763	2.385491	1.60
3-Dec	2.233481	2.017014	2.473179	1.60
4-Dec	2.280969	2.069604	2.51392	1.60
5-Dec	2.33896	2.136013	2.561191	1.60
6-Dec	2.293273	2.080289	2.528062	1.60
7-Dec	2.197984	1.995389	2.421149	1.60
8-Dec	2.288269	2.029506	2.580025	1.60
9-Dec	2.233471	1.989878	2.506884	1.60
10-Dec	2.169859	1.935951	2.432029	1.60
11-Dec	2.096968	1.861865	2.361758	1.60
12-Dec	2.178823	1.97164	2.407777	1.60
13-Dec	2.129777	1.924059	2.357491	1.60
14-Dec	2.033104	1.82116	2.269713	1.60
15-Dec	1.965972	1.718191	2.249485	1.60
16-Dec	2.007362	1.768384	2.278636	1.60
17-Dec	2.152264	1.937457	2.390887	1.60
18-Dec	2.073274	1.826951	2.352807	1.60
19-Dec	2.057489	1.821882	2.323566	1.60
20-Dec	2.142835	1.940493	2.366276	1.60
21-Dec	2.10311	1.878428	2.354668	1.60
22-Dec	2.084752	1.894016	2.294697	1.60
23-Dec	2.112425	1.911633	2.334309	1.60
24-Dec	2.131623	2.173256	2.393223	1.60
25-Dec	2.080732	2.080087	2.382452	1.60
26-Dec	2.156866	1.946094	2.390467	1.60
27-Dec	2.164747	1.956859	2.394719	1.60
28-Dec	2.200607	1.988025	2.43592	1.60
29-Dec	2.169772	1.968083	2.39213	1.60
30-Dec	2.127419	1.891386	2.392908	1.60
31-Dec	2.144198	1.887567	2.43572	1.60

Existing Water Right Information

There are no decreed surface diversions within this reach of stream; however, there is one surface water diversion upstream of the reach for the Glencoe Ditch (17.0 cfs with 1926 and 1935 appropriation dates). Staff has analyzed the water rights tabulation and contacted the Division Engineer Office (DEO) to identify any potential water availability problems.

After looking in detail at CWCB Staff's analysis, the Division Engineer and his staff voiced concern over water availability. Their analysis led them to conclude that less water was available than the amount computed by CWCB Staff. By the same token, when USDA Forest Service staff reviewed the CWCB analysis, they also questioned CWCB's numbers. The Forest Service's own water availability analysis for its recommendation indicated that more water was available than was indicated in the CWCB analysis. Because there is no functioning gage on Tabeguache Creek, CWCB Staff had to make use of a nearby similar gage. This approach is valid, but it requires the use of certain assumptions that may or may not be employed in other analyses.

In the case of Tabeguache Creek, the Division Engineer and staff chose to use data from a USGS gage situated in upper Tabeguache Creek. (USGS 09176500 Tabeguache Cr nr Nucla, CO). The period of record for this gage is both short and old; only about 7 years (Apr 1, 1946 to Sep 30, 1953) that includes the severe drought years of 1950 through 1953. Based upon the technical guidance USGS has given CWCB staff, a period of record of less than 10 years should be avoided if at all possible. In contrast, CWCB examined the long-term records of other gages in the area and concluded that using those gage records would produce more reliable results.

The USDA Forest Service chose to employ the USGS ungaged flow computation method called StreamStats. StreamStats uses data from gages with at least a 10-year period of record, along with basin characteristics such as area, elevation, precipitation, etc. to build region-specific regression equations that estimate ungaged discharge using basin characteristics for a subject watershed. Output from the StreamStats computations takes the form of an annual yield that can be apportioned month by month.

CWCB Staff chose to forego the use of StreamStats due to, among other things, the inability to produce daily values of discharge or account for the influence of existing water rights. By following its usual method of computing water availability, CWCB Staff could produce a day by day hydrograph that was sensitive to the information found in water rights records and took the form seen in the real data of the representative gage station. One weakness of this approach however, is the scale of the watersheds used in the analysis. The hydrograph from the representative gage is an amalgam of several basins at different elevations and sizes with different aspects. The area of Tabeguache Creek of interest here is a fairly small percentage of the area of the representative basin, and thus is likely to take a form that mimics the large basin, which may differ from the smaller basin. CWCB Staff determined the differences between

hydrograph shapes would not be so great as to outweigh the other benefits derived from the usual approach used in its water availability determinations.

In conclusion, CWCB Staff computed water availability using its standard method. The result was questioned by the Division Engineer and the recommender of this ISF (USFS). Both parties performed computations on their own and arrived at conflicting conclusions. CWCB Staff's results fell between those of the Division Engineer and the USFS. Differences of this sort are not unreasonable, given the many necessary assumptions underlying each approach as well as the need in each case to extrapolate to one degree or another. In view of the foregoing, CWCB Staff's values for water availability and its representation of the hydrograph at the lower terminus of the subject reach are reasonable.

Staff has determined that water is available for appropriation on Tabeguache Creek, between the confluence with the North Fork Tabeguache Creek and the confluence with Forty-Seven Creek, 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

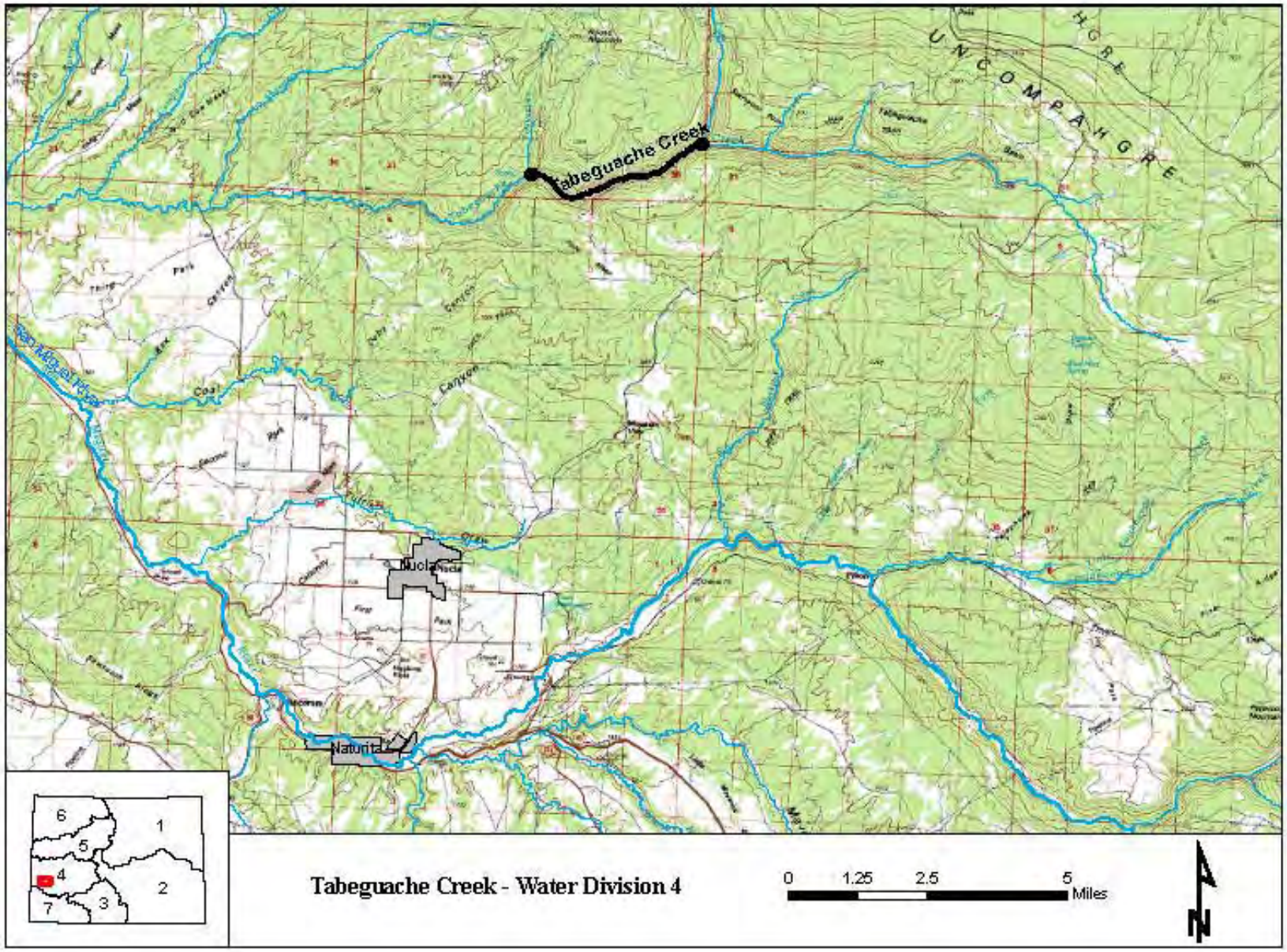
Staff recommends the Board form its intent to appropriate on the following stream reach:

Segment: CONFLUENCE WITH NORTH FORK TABEGUACHE CREEK TO CONFLUENCE WITH FORTY-SEVEN CREEK
Upper Terminus: CONFLUENCE WITH NORTH FORK TABEGUACHE CREEK
(Latitude 38° 22' 43.49"N) (Longitude 108° 27' 43.97"W)
UTM North: 4253516.36 UTM East: 197554.38
SE SE S25 T48N R15W NMPM
190' West of the East Section Line; 19' North of the South Section Line

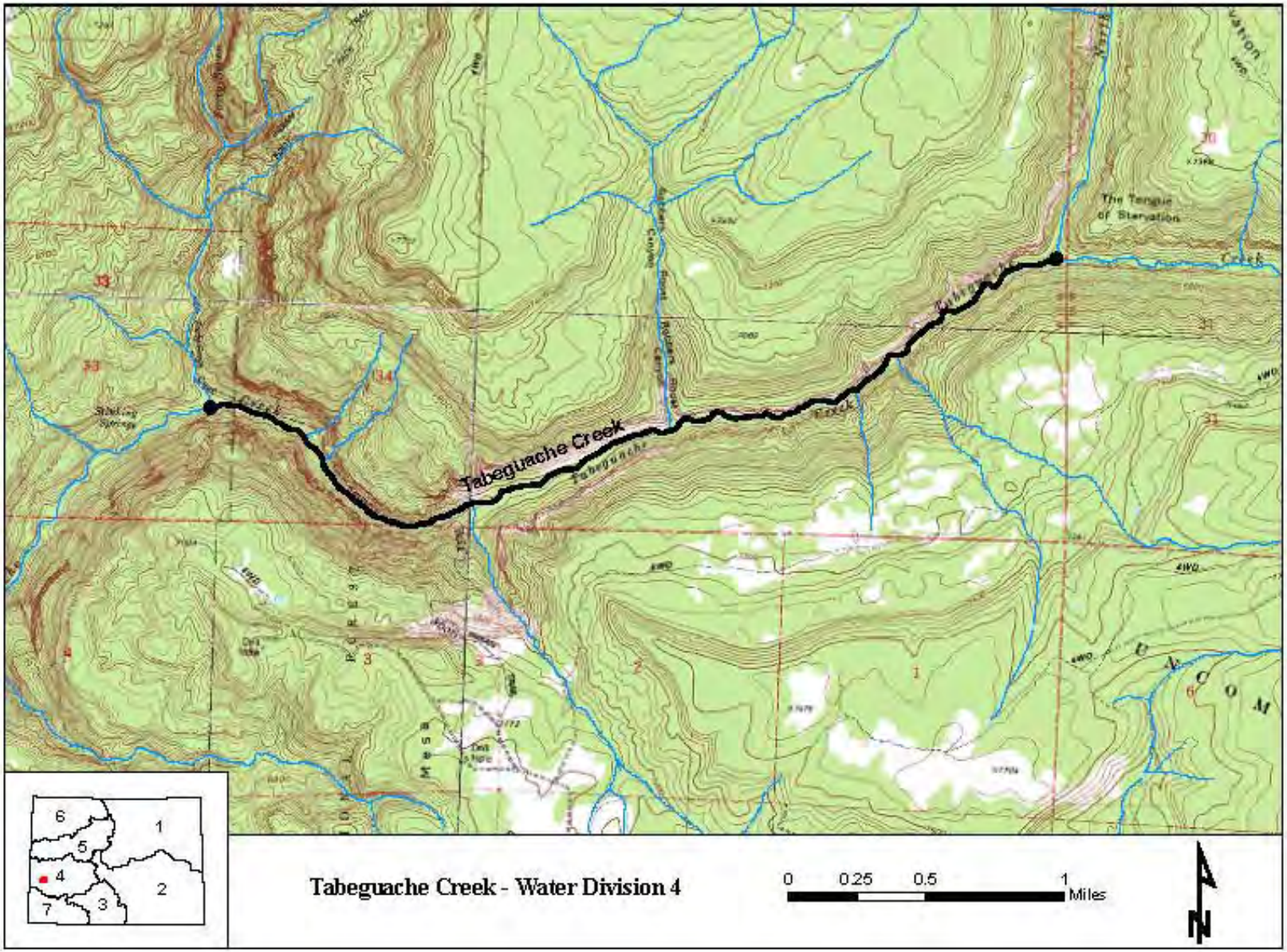
Lower Terminus: CONFLUENCE WITH FORTY-SEVEN CREEK
(Latitude 38° 22' 9.52"N) (Longitude 108° 31' 5.07"W)
UTM North: 4252653.68 UTM East: 192633.18
NE SE S33 T48N R15W NMPM
280' West of the East Section Line; 2130' North of the South Section Line

Watershed: San Miguel (HUC#: 14030003)
Counties: Montrose
Length: 3.66 miles
USGS Quad(s): Starvation Point, Big Bucktail Creek, Nucla
Flow Recommendation: 3.5 cfs (April 1 – June 30)
2.0 cfs (July 1 – October 31)
1.6 cfs (November 1 – March 31)

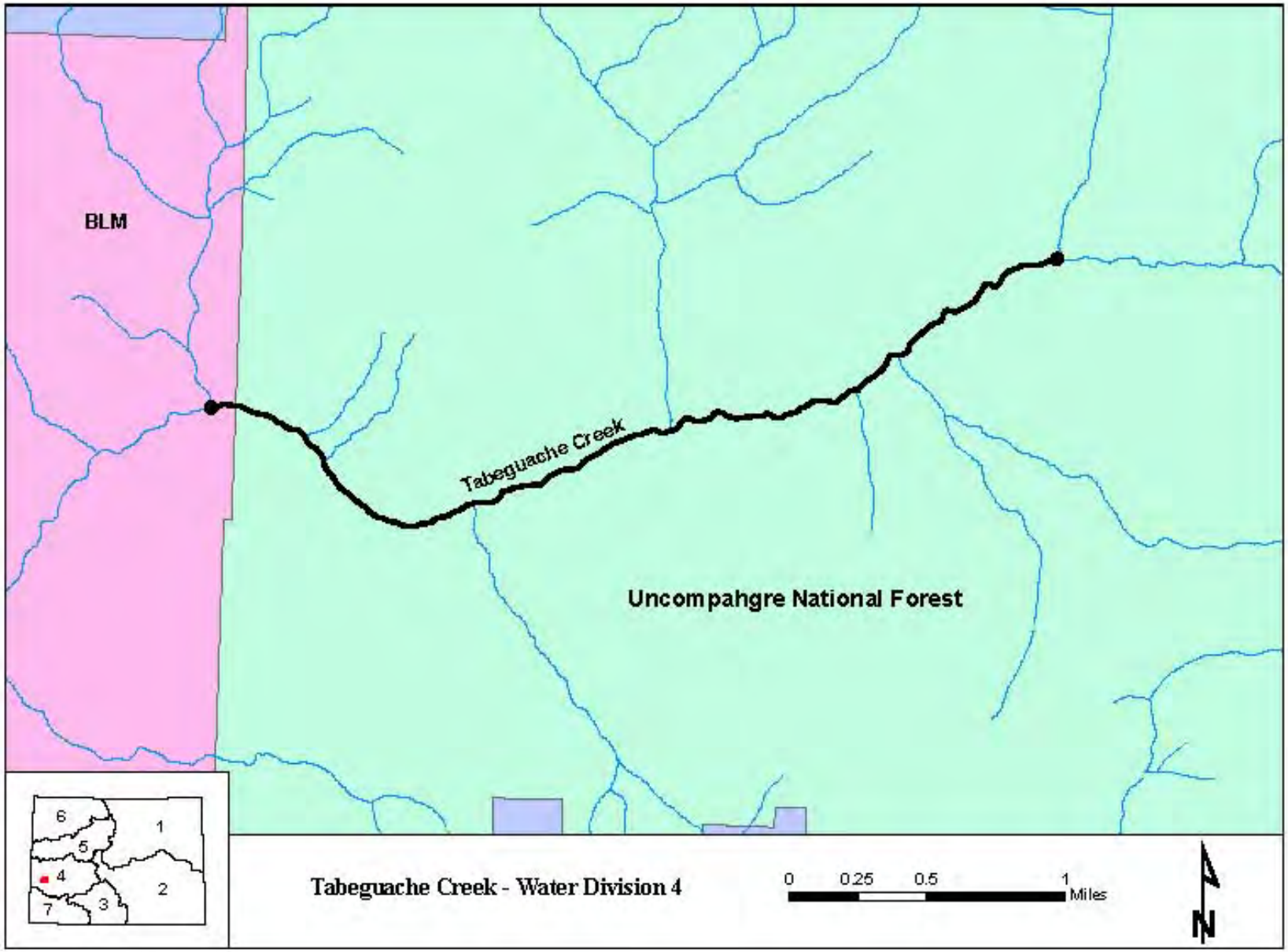
Vicinity Map



Water Rights Map



Land Use Map


BLM
Tabeguache Creek
Uncompahgre National Forest
6
1
5
4
2
7
3
Tabeguache Creek - Water Division 4
0
0.25
0.5
1
Miles
N