<u>Stream:</u> East Divide Creek (Upper Segment)

Executive Summary

Water Division: 5
Water District: 45
CPW#: 20830
CWCB ID: 12/5/A-003

Segment: CONFLUENCE GENNINGS CREEK TO CONFLUENCE CAMP CREEK

Upper Terminus: CONFLUENCE GENNINGS CREEK AT
UTM North: 4357464.01 UTM East: 286847.73

Lower Terminus: CONFLUENCE CAMP CREEK AT
UTM North: 4362318.95 UTM East: 286791.88

Watershed: Colorado headwaters-Plateau (HUC#: 14010005)
Counties: Garfield, Mesa
Length: 3.49 miles
USGS Quad(s): Center Mountain, Quaker Mesa
Flow Recommendation: 1.4 cfs (4/1 – 4/15)
4.8 cfs (4/16 – 6/30)
1.5 cfs (7/1 – 7/15)
1.2 cfs (7/16 – 7/30)
0.3 cfs (8/1 – 3/31)

Staff Analysis and Recommendation

Summary

The information contained in this report and the associated supporting data and analyses (located at http://cwcb.state.co.us/environment/instream-flow-program/Pages/2014ProposedInstreamFlowAppropriations.aspx) form 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 by ISF 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. Colorado Parks and Wildlife (CPW) recommended this segment of East Divide Creek to the CWCB for a water right under the Instream Flow Program. East Divide Creek is being considered because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

East Divide Creek is approximately 18.1 miles long and originates on the east flank of Mosquito Mountain at an elevation of 9,050 feet. It flows in a northwesterly direction as it drops to an elevation of 7,900 feet where it joins with West Divide Creek to form Divide Creek. Eighty-Eight percent of the land on the 3.49 mile segment addressed by this report is publicly owned (see Table 1). East Divide Creek is located within Garfield and Mesa Counties and the total drainage area of the creek is approximately 48.7 square miles.

The subject of this report is a segment of East Divide Creek from the confluence with Gennings Creek extending downstream to the confluence with Camp Creek. The proposed segment is located approximately 13 miles southeast of the town of Silt. Staff has received one recommendation for this segment from the CPW, which is discussed below.

Instream Flow Recommendation

CPW recommended a flows of 1.4 cfs (4/1 – 4/15), 4.8 cfs (4/16 – 6/30), 1.5 cfs (7/1 – 7/15), 1.2 cfs (7/16 – 7/30) and 0.3 cfs (8/1 – 3/31) based on its July 7, 2010 and August 17, 2010 data collection efforts and staff's water availability analyses.

Land Status Review

Table 1. Summary of land ownership data in the vicinity of the proposed ISF on the upper segment of East Divide Creek

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Confluence Gennings Creek	Confluence Camp Creek	3.49	12%	88%

All of the public lands in this segment are managed by the USFS.

Biological Data

East Divide Creek is classified as a medium stream (between 20 to 35 feet wide) and fishery surveys indicate the stream environment supports Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) and rainbow trout (*Oncorhynchus mykiss*).

Field Survey Data

CPW 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 CPW 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. Colorado Parks and Wildlife has determined that maintaining these three hydraulic parameters at adequate levels across riffle habitat types also will maintain aquatic habitat in pools and runs for most life stages of fish and aquatic invertebrates (Nehring 1979; Espegren 1996).

For this segment of stream, two data sets were collected, with the results shown in Table 2 below. Table 2 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 (250% 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. 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 2. Summary of R2Cross measurements and analysis for the upper segment of East Divide Creek

Party	Date	Q (cfs)	Accuracy Range (cfs)	Winter (2/3) (cfs)	Summer (3/3) (cfs)
CPW	7/7/2010	8.51	3.3 – 20.8	Out of range	4.8
CPW	8/17/2010	0.48	0.2 – 1.2	0.5	Out of range
			Averages	0.5	4.8

The summer flow recommendation which met 3 of 3 hydraulic criteria and was within the accuracy range of the model is 4.8 cfs. The winter flow recommendation which met 2 of 3 hydraulic criteria and was within the accuracy range of the model range is 0.5 cfs. The winter recommendation was lowered

to 0.3 cfs due to water availability constraints. Shoulder month recommendations were adjusted to reflect the timing and amount of flow estimated from the water availability analysis.

Hydrologic Data and Analysis

CWCB staff conducts hydrologic analyses for each recommended instream flow (ISF) appropriation to provide the Board with a basis for making the determination that water is available. Each recommended ISF reach has a unique flow regime that depends on variables such as the timing, magnitude, and location of water inputs (such as rain, snow, and snowmelt) and water losses (such as diversions, reservoirs, evaporation and transpiration, groundwater recharge, etc). Although extensive and time consuming investigations of all variables may be possible, staff takes a pragmatic and cost-effective approach to analyze water availability. This approach focuses on streamflows and the influence of flow alterations, such as diversions, to understand how much water is physically available in the recommended reach.

Staff's hydrologic analysis is data-driven, meaning that staff gathers and evaluates the best available data and uses the best available analysis method for that data. Whenever possible, long-term stream gage data (period of record 20 or more years) will be used to evaluate streamflow. Other streamflow information such as short-term gages, temporary gages, spot streamflow measurements, diversion records, and StreamStats will be used when long-term gage data is not available. StreamStats, a statistical hydrologic program, uses regression equations developed by the USGS (Capesius and Stephens, 2009) to estimate mean flows for each month based on drainage basin area and average drainage basin precipitation. Diversion records will also be used to evaluate the effect of surface water diversions when necessary. Interviews with water commissioners, landowners, and ditch or reservoir operators can provide additional information. A range of analytical techniques may be employed to extend gage records, estimate streamflow in ungaged locations, and estimate the effects of diversions. The goal is to obtain the most detailed and reliable estimate of actual hydrology using the most efficient analysis technique.

The final product of the hydrologic analysis to determine water availability is a hydrograph, which shows streamflow and the proposed ISF rate over the course of one year. The hydrograph will show median daily values when daily data is available; otherwise, mean-monthly streamflow values will be presented.

Background Information

The proposed instream flow on the upper segment of East Divide Creek has a 10.6 square mile drainage basin. The average elevation of the basin is 9,190 ft and the average precipitation is 32.4 inches. There are 8 spring water rights with a total of 0.08 cfs in decreed diversions. In addition there are a number of small reservoirs including Alsbury Reservoir near the headwaters of the reach with a decreed 249.76 AF in volume. These uses alter the natural hydrology.

There was one historical USGS gage located approximately 8.3 miles downstream from the proposed lower terminus of the instream flow reach. This gage, East Divide Creek near Silt, CO (USGS 09090700) was operated from 1960 to 1965. There are six absolute surface water rights in the drainage

basin tributary to the gage location. These diversions have a total of 6.86 cfs in decreed water rights. The two largest diversions are the Hahn and Otten Ditch (appropriation dates 1908, 0.8 cfs; 1909, 0.36 cfs; and 1912, 2.03 cfs) and the Otten Ditch No 1 (appropriation date 1910, 1.32 cfs). The effects of these diversions are included in the gage record.

The East Divide Creek ditch is located approximately 11 miles downstream from the proposed lower terminus, or 2.9 miles downstream from the USGS gage. It is located downstream from the confluence with June creek and there does not appear to be any other substantial intervening tributaries. According to Water commissioner, Bill West, June Creek is typically dry by July 1st. Therefore, water available for diversion after July 1st is likely solely from East Divide Creek. East Divide Creek Ditch has several of the most senior water rights on East Divide Creek. It also has an extensive record with daily diversion information from 1975 to present. According to Mr. West, East Divide Creek Ditch does not necessarily sweep the stream, therefore use of the diversion record as a proxy for streamflow likely underestimates streamflow in East Divide Creek

Data Analysis

Due to the short period of record for the East Divide Creek gage, the West Divide Creek gage (USGS 09089500, operated 1955 to present) was used to extend the gage record with regression analysis. The West Divide Creek gage is affected by 3 transbasin imports, which could not be accounted for because there are not sufficient diversion records for the 1960 to 1965 time period when the gages over lapped. Nevertheless, the regression was good, with an r^2 value of 0.9283. This extension resulted in a record at the East Divide gage from 1955 to 2012.

The extended gage data was scaled to the lower terminus of the proposed ISF using the area-precipitation method. The area-precipitation method estimates streamflow based on the ratio of the precipitation weighted drainage area at the lower terminus location to that of the gage location. This results in a scaling ratio of 0.3, which is below the 0.5 guideline suggested by Archfield and Vogel (2009) for drainage area scaling. No measurements in the proposed reach were available to evaluate the scaling ratio; however, because the gage data is located on East Divide Creek rather than in a different drainage, large differences in the timing of streamflows between the gage and the lower terminus are unlikely. Furthermore, the only other method available, StreamStats, produced much higher streamflow estimates. Therefore, the best available data in this case is the scaled extended gage data. The median streamflow, and upper and lower confidence intervals for the median streamflow were calculated using the adjusted gage dataset. Statistically there is 95% confidence that the true value of the median is located within the confidence interval.

The diversion record for East Divide Creek Ditch from July 1 to November 1 was also evaluated. The same scaling ratio was applied to the diversion record, assuming little or no difference in streamflow between the gage location and the East Divide Creek headgate in late summer and early fall. The median diversion and upper and lower confidence intervals for the median diversion were calculated. Statistically there is 95% confidence that the true value of the median diversion is located within the confidence interval. The East Divide Creek ditch diversion record shows that more water was available in the system in late summer and early fall than the gage data. Because the diversion record is based on

actual measurements, the diversion record is likely a more reliable estimate of streamflow during late summer and early fall than the extended gage data.

The hydrograph (Figure 1) shows the median of the scaled extended gage record, the median of the scaled East Divide Creek ditch diversion record from July 1 to November 1, scaled confidence intervals for the gage and the diversion records, spot measurements, and the recommended instream flow rate. The proposed instream flow rate is below the median or the upper confidence interval for the median of the gage data for all but 50 days in late summer and early fall. The proposed instream flow rate is below the median or upper confidence interval of the East Divide Creek ditch diversion record for each of those 50 days. Staff has concluded that water is available for appropriation on the upper segment of East Divide Creek.

Citations

Archfield, S.A., and R.M. Vogel, 2009, Map correlation method: selection of reference streamgage to estimate daily streamflow at ungaged catchments, Water Resources Research, vol 46, W10513, doi:10.10/29/2009WR008481.

Capesius, J.P. and V.C. Stephens, 2009, Regional regression equations for estimation of natural streamflow statistics in Colorado, Scientific Investigations Report 2009-5136.

Espegren, G.D., 1996, Development of Instream Flow Recommendations in Colorado Using R2CROSS, Colorado Water Conservation Board.

Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

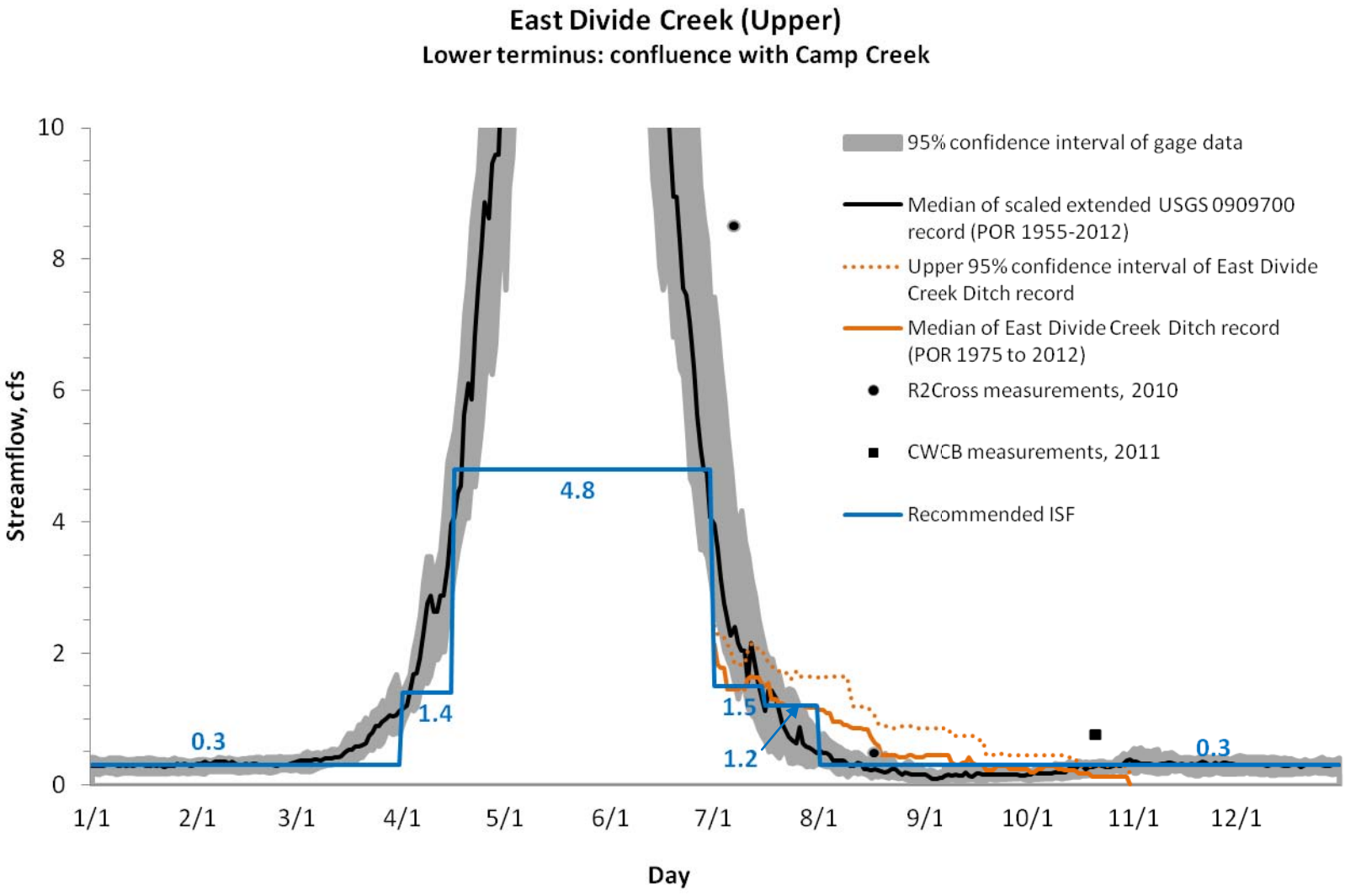


Figure 1. Hydrograph showing streamflow data, diversion data, and the proposed ISF rate on the upper segment of East Divide Creek.

Existing Water Rights

Staff has analyzed the water rights tabulation and determined that there is one decreed absolute surface diversions within this reach of stream for the East Divide Domestic Pipeline in case 79CW286 for 0.060 cfs with 9/1/1979 appropriation date. Staff has concluded that a new junior appropriation of water rights on the Lower Segment of East Divide Creek can exist 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 that the Board form its intent to appropriate on the following stream reach:

Segment: CONFLUENCE GENNINGS CREEK TO CONFLUENCE CAMP CREEK

Upper Terminus: CONFLUENCE GENNINGS CREEK AT
UTM North: 4357464.01 UTM East: 286847.73
(Latitude 39° 20' 25.26"N) (Longitude 107° 28' 23.95"W)
SW SW Section 20, Township 8 South, Range 90 West 6th PM
210' East of the West Section Line; 739' North of the South Section Line

Upper Terminus: CONFLUENCE CAMP CREEK AT
UTM North: 4362318.95 UTM East: 286791.88
(Latitude 39° 23' 2.55"N) (Longitude 107° 28' 31.83"W)
SE SE Section 6, Township 8 South, Range 90 West 6th PM
215' West of the East Section Line; 828' North of the South Section Line

Watershed: Colorado headwaters-Plateau (HUC#: 14010005)
Counties: Garfield, Mesa
Length: 3.49 miles
USGS Quad(s): Center Mountain, Quaker Mesa
Flow Recommendation: 1.4 cfs (4/1 – 4/15)
4.8 cfs (4/16 – 6/30)
1.5 cfs (7/1 – 7/15)
1.2 cfs (7/16 – 7/30)
0.3 cfs (8/1 – 3/31)

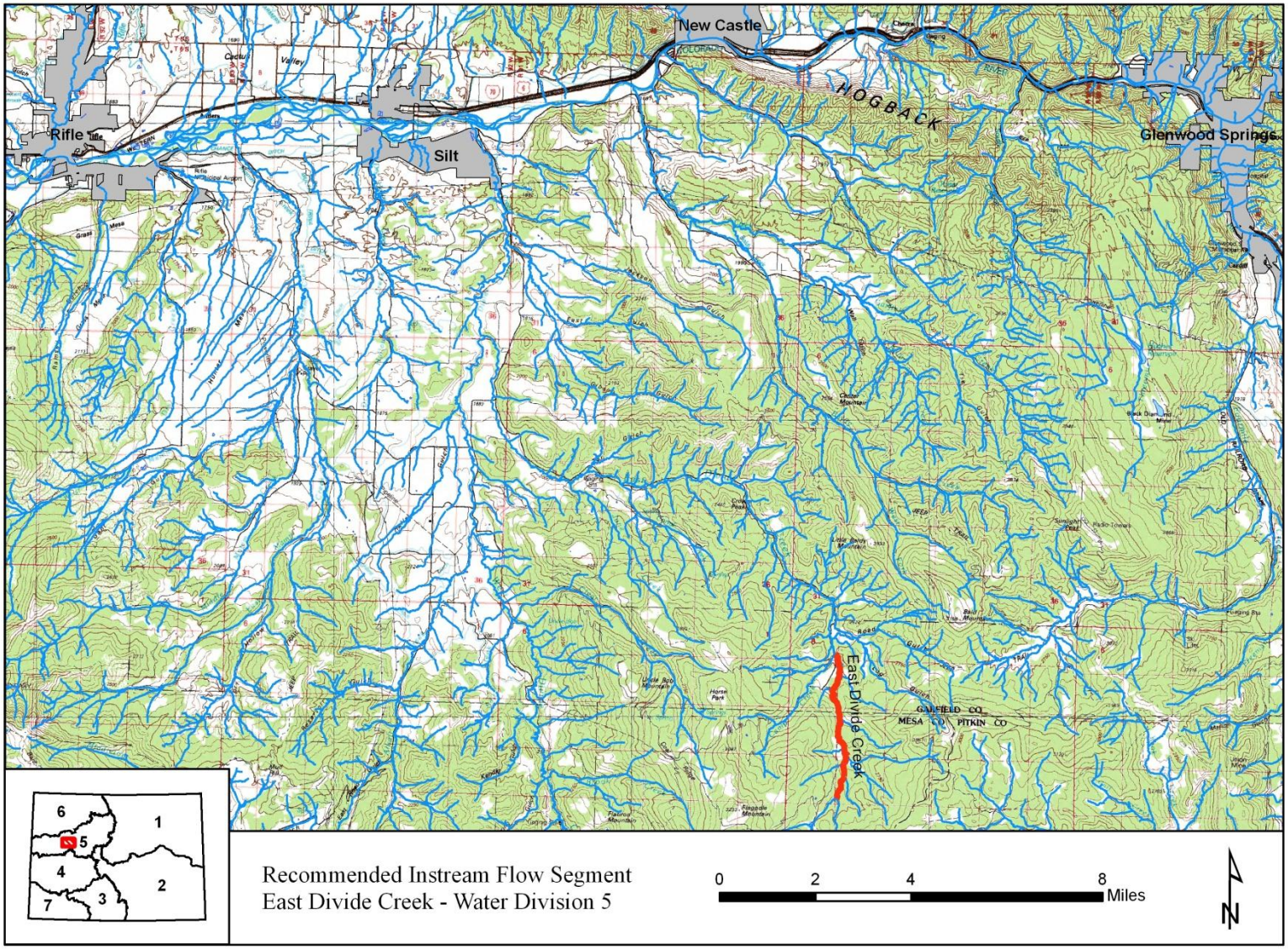
Metadata Descriptions:

a) The UTM, PLSS and Lat/Long locations for the upstream and downstream termini were derived from CWCB GIS using the National Hydrography Dataset (NHD).

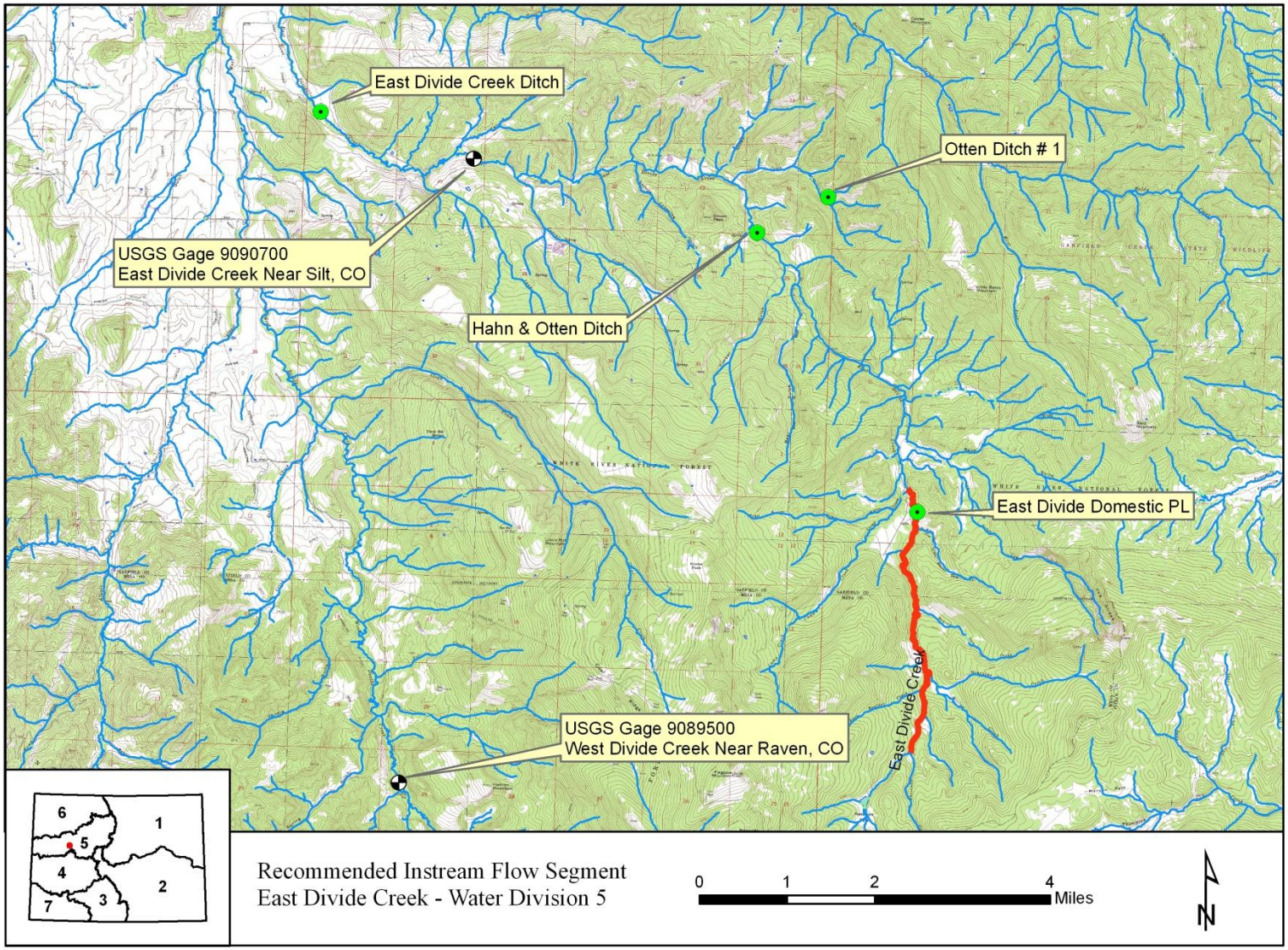
b) The PLSS locations were derived from CWCB GIS using 2005 PLSS data from the U.S. Bureau of Land Management's Geographic Coordinate Database

c) Projected Coordinate System: NAD 1983 UTM Zone 13N

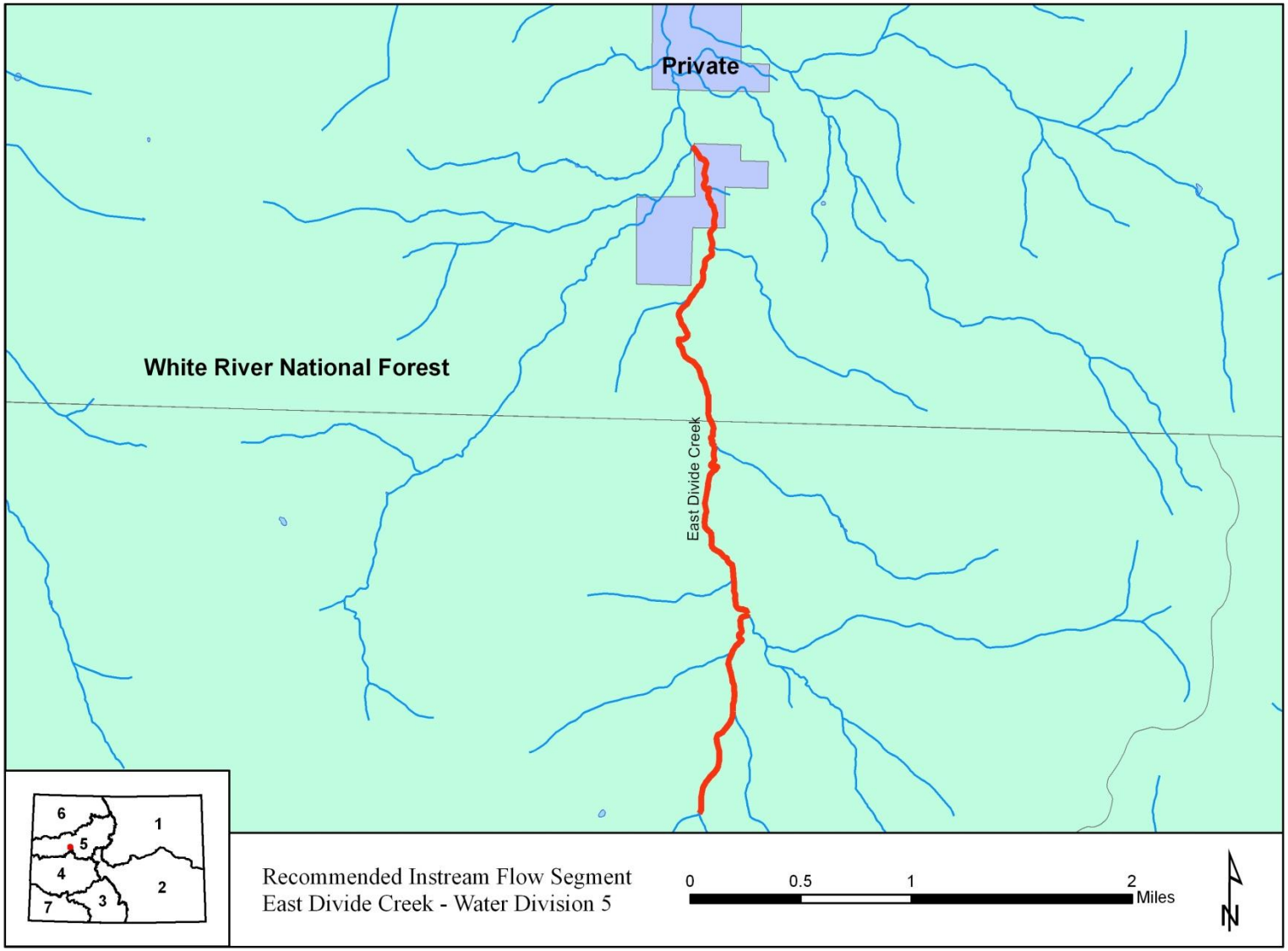
Vicinity Map



Water Rights Map



Land Use Map


Private
White River National Forest
East Divide Creek
6
1
5
4
2
7
3
Recommended Instream Flow Segment
East Divide Creek - Water Division 5
0
0.5
1
2
Miles
N