Stream: West Divide Creek

Executive Summary

Water Division: 5
Water District: 45
CPW#: 22967
CWCB ID: 12/5/A-005

Segment: CONFLUENCE LITTLE BEAVER CREEK TO CONFLUENCE MOSQUITO CREEK

Upper Terminus: CONFLUENCE LITTLE BEAVER CREEK AT
UTM North: 4349667.71 UTM East: 287897.56

Lower Terminus: CONFLUENCE MOSQUITO CREEK AT
UTM North: 4354003.75 UTM East: 279099.23

Watershed: Colorado headwaters-Plateau (HUC#: 14010005)
Counties: Mesa
Length: 8.11 miles
USGS Quad(s): Flatiron Mountain, Quaker Mesa
Flow Recommendation: 14.1 cfs (4/16 – 7/15)
4.20 cfs (7/16 – 7/31)
1.14 cfs (8/1 – 3/14)
4.20 cfs (3/15 – 4/15)

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 West Divide Creek to the CWCB for a water right under the Instream Flow Program. West 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.

West Divide Creek is approximately 27 miles long and originates on the west flank of Haystack Mountain at an elevation of 10,550 feet. It flows in a northwesterly direction as it drops to an elevation of 5,850 feet where it joins with East Divide Creek to form Divide Creek. Eight-seven percent of the land on the 8.11 mile segment addressed by this report is publicly owned (see Table 1). West Divide Creek is located within Mesa County and the total drainage area of the creek is approximately 129 square miles.

The subject of this report is a segment of West Divide Creek beginning at the confluence with Little Beaver Creek and extending downstream to the confluence with Mosquito Creek. The proposed segment is located approximately 15 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 flow 14.1 cfs (4/16 – 7/15), 4.20 cfs (7/16 – 7/31), 1.14 cfs (8/1 – 3/14) and 4.20 cfs (3/15 – 4/15), based on its July 6, 2010 and August 18, 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 West Divide Creek.

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Confl. Little Beaver Creek	Confl. Mosquito Creek	8.11	13%	87%

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

Biological Data

West Divide Creek is classified as a large stream (between 35 to 59 feet wide) and fishery surveys indicate the stream environment supports Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*), rainbow trout (*Oncorhynchus mykiss*), bluehead sucker (Catostomus discobolu), mottled sculpin (Cottus bairdi) and speckled dace (Rhinichthys osculus).

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, four 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 West Divide Creek.

Party	Date	Q (cfs)	Accuracy Range (cfs)	Winter (2/3) (cfs)	Summer(3/3) (cfs)
CPW	7/6/2010	10.7	4.4 -27.4	5.7	15.5
CPW	7/6/2010	15.2	6.1 – 37.9	11.1	12.8
CPW	8/18/2010	2.5	1.1 – 7.0	Outside of range	Outside of range
CPW	8/18/2010	2.4	1.0 – 6.2	4.6	Outside of range
			Averages	7.13	14.15

The winter flow recommendations which met 2 of 3 hydraulic criteria and that were within the accuracy range of the model ranged from 11.1 cfs to 4.6 cfs. Averaging the winter flow recommendations that fell within the accuracy range of the model resulted in a winter flow recommendation of 7.1 cfs. The winter recommendation was lowered to 1.14 cfs due to water availability constraints.

The summer flow recommendations which met 3 of 3 hydraulic criteria and that were within the accuracy range of the model ranged from 15.5 cfs to 12.8 cfs. Averaging the summer flow recommendations that fell within the accuracy range of the model resulted in a summer flow recommendation of 14.1 cfs. The 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 reach of West Divide Creek has a 47.1 square mile drainage basin. The average elevation of the basin is 8,870 ft and the average precipitation is 30.85 inches. There is one ditch diversion located in the basin tributary to the proposed instream flow reach (Reno Ditch No 1, appropriation date 1974, 6.0 cfs). There are also 59 small spring water rights with a total of 0.116 cfs in decreed diversions. The largest influence on hydrology in the proposed instream flow reach are two transbasin imports, Thompson Creek Feeder Ditch (District 38, 24.0 cfs) and the Divide Creek Highline Ditch (District 40, 49.56 cfs). Therefore, hydrology in this drainage basin does not represent natural flow conditions.

There are two gages in the vicinity of the proposed instream flow reach on West Divide Creek. West Divide below Willow Creek near Raven, Co (USGS 09089000, operated from 1938 to 1970) was located in approximately the middle of the proposed reach. This gage had a 35 square mile drainage basin and was influenced by transbasin water imports from the Thompson Creek Feeder Ditch and the Divide Creek Highline Ditch. West Divide Creek near Raven, CO (USGS 09089500, operated from 1955 to 2005 by the USGS and 2005 to present by DWR), is located approximately 2.3 miles downstream from the lower terminus. This gage has a 64.2 square mile drainage basin area and is influenced by the same transbasin water imports as the upper gage and an additional import from Owen's Creek Ditch (District 72, 18.9 cfs). The lower gage is also influenced by additional diversions between the proposed lower terminus and the gage location.

Data Analysis

The transbasin diversions complicate analysis for the proposed instream flow reach because they impact the gage record. All 3 transbasin diversions have diversion records from 1974 through 2012. Only the lower gage operated concurrently with the transbasin diversion records. Therefore, the diversion records for all 3 transbasin imports were subtracted from the lower gage in an effort to estimate the native flow on the reach. The native flow estimate was then scaled to the lower terminus using the area-precipiation 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. The scaling ratio used was within the recommended range (0.5 to 2.5) proposed by Archfield and Vogel (2009). The imports from the Thompson Creek Feeder Ditch and the Highline Ditch were added back to the scaled hydrology because these flows are available in the proposed instream flow reach.

This analysis resulted in an adjusted streamflow record that spanned 11/1/1974 to 9/30/2012. It should be noted that the gage was operated seasonally (spring through fall) from 1999 to present. Median streamflow and 95% confidence intervals for the median were calculated for the entire period of record. Statistically there is 95% confidence that the true value of the median is located within the confidence interval.

The hydrograph (Figure 1) shows the median streamflow and confidence interval for the median of the adjusted streamflow record. The proposed instream flow rate is below the median for all but 45 days and below the upper 95% confidence interval for all days. Staff has concluded that water is available for appropriation.

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.

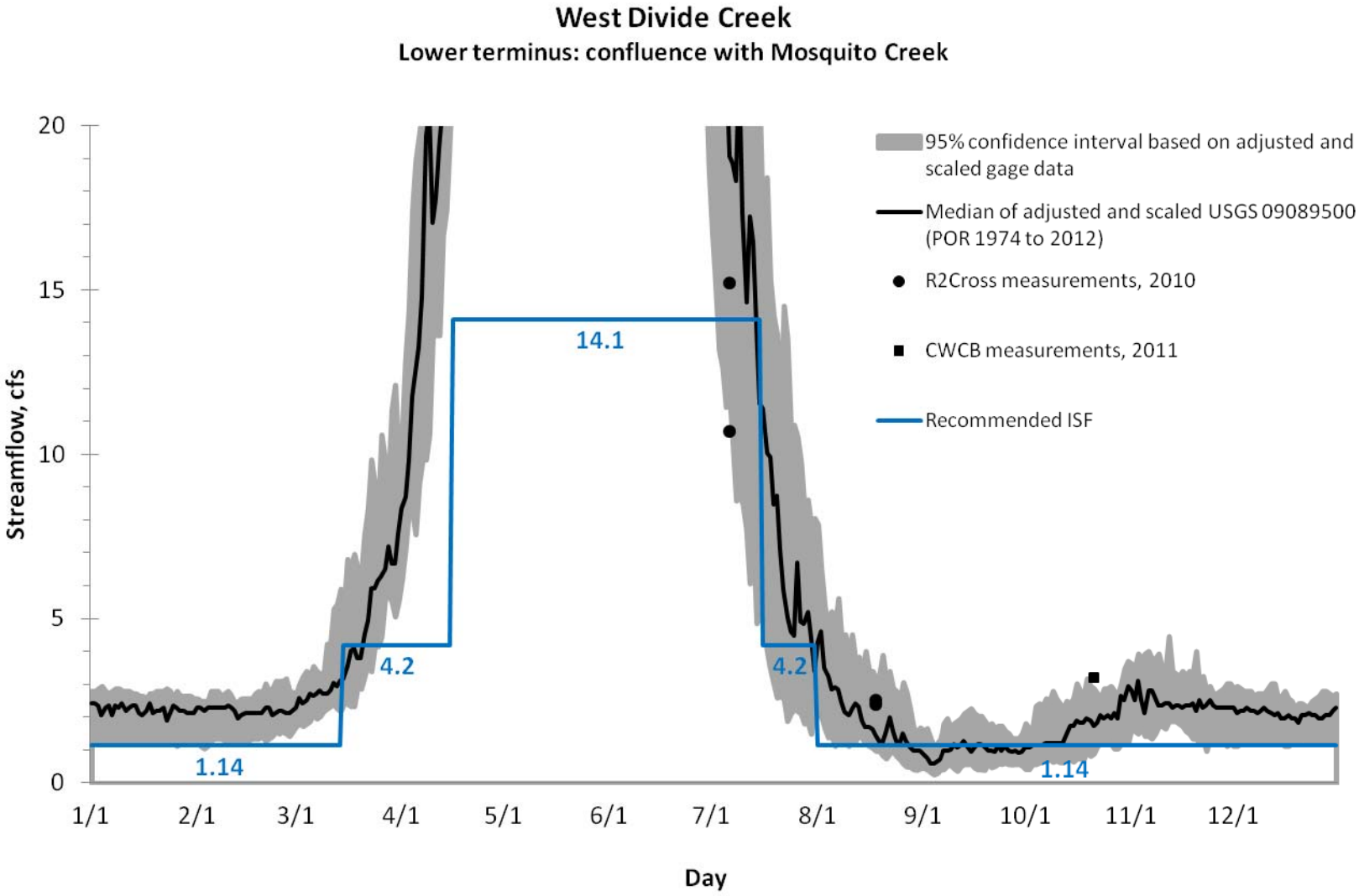


Figure 1. Hydrograph showing streamflow data and the proposed ISF rate on West Divide Creek.

Existing Water Rights

Staff has analyzed the water rights tabulation and determined that there are no decreed absolute surface diversions located on this reach of stream. However, there are two senior water rights that import water into the basin. Staff has concluded that a new junior appropriation of water rights on West 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 LITTLE BEAVER CREEK TO CONFLUENCE MOSQUITO CREEK

Upper Terminus: CONFLUENCE LITTLE BEAVER CREEK AT
UTM North: 4349667.71 UTM East: 287897.56
(Latitude 39° 16' 13.51"N) (Longitude 107° 27' 31.28"W)
NW SE Section 17, Township 9 South, Range 90 West 6th PM
1,712' West of the East Section Line; 1,784' North of the South Section Line

Lower Terminus: CONFLUENCE MOSQUITO CREEK AT
UTM North: 4354003.75 UTM East: 279099.23
(Latitude 39° 18' 26.12"N) (Longitude 107° 33' 43.23"W)
NE NW Section 4, Township 9 South, Range 91 West 6th PM
1,513' East of the West Section Line; 815' South of the North Section Line

Watershed: Colorado headwaters-Plateau (HUC#: 14010005)
Counties: Mesa
Length: 8.11 miles
USGS Quad(s): Flatiron Mountain, Quaker Mesa
Flow Recommendation: 14.1 cfs (4/16 – 7/15)
4.20 cfs (7/16 – 7/31)
1.14 cfs (8/1 – 3/14)
4.20 cfs (3/15 – 4/15)

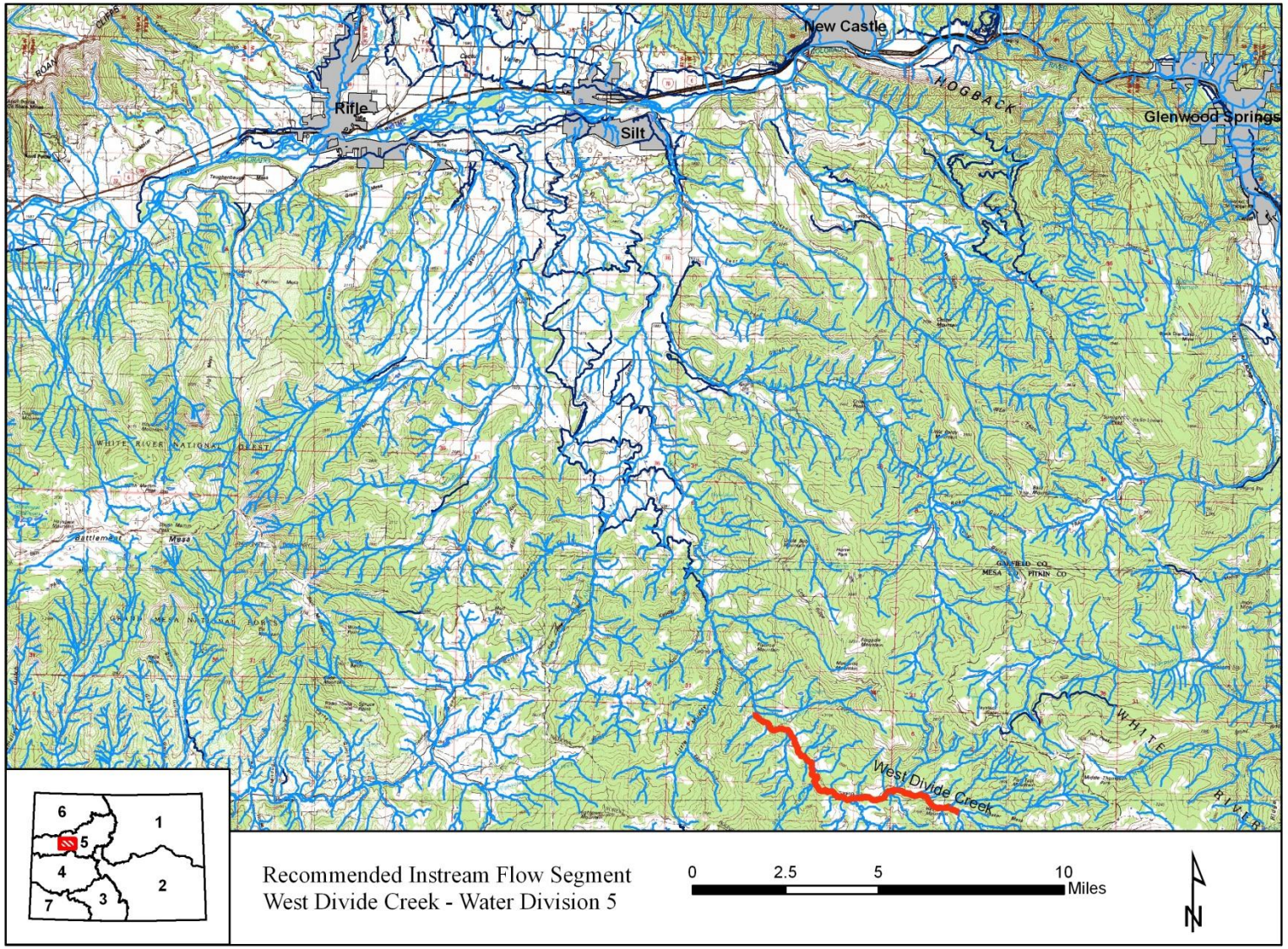
Metadata Descriptions:

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).

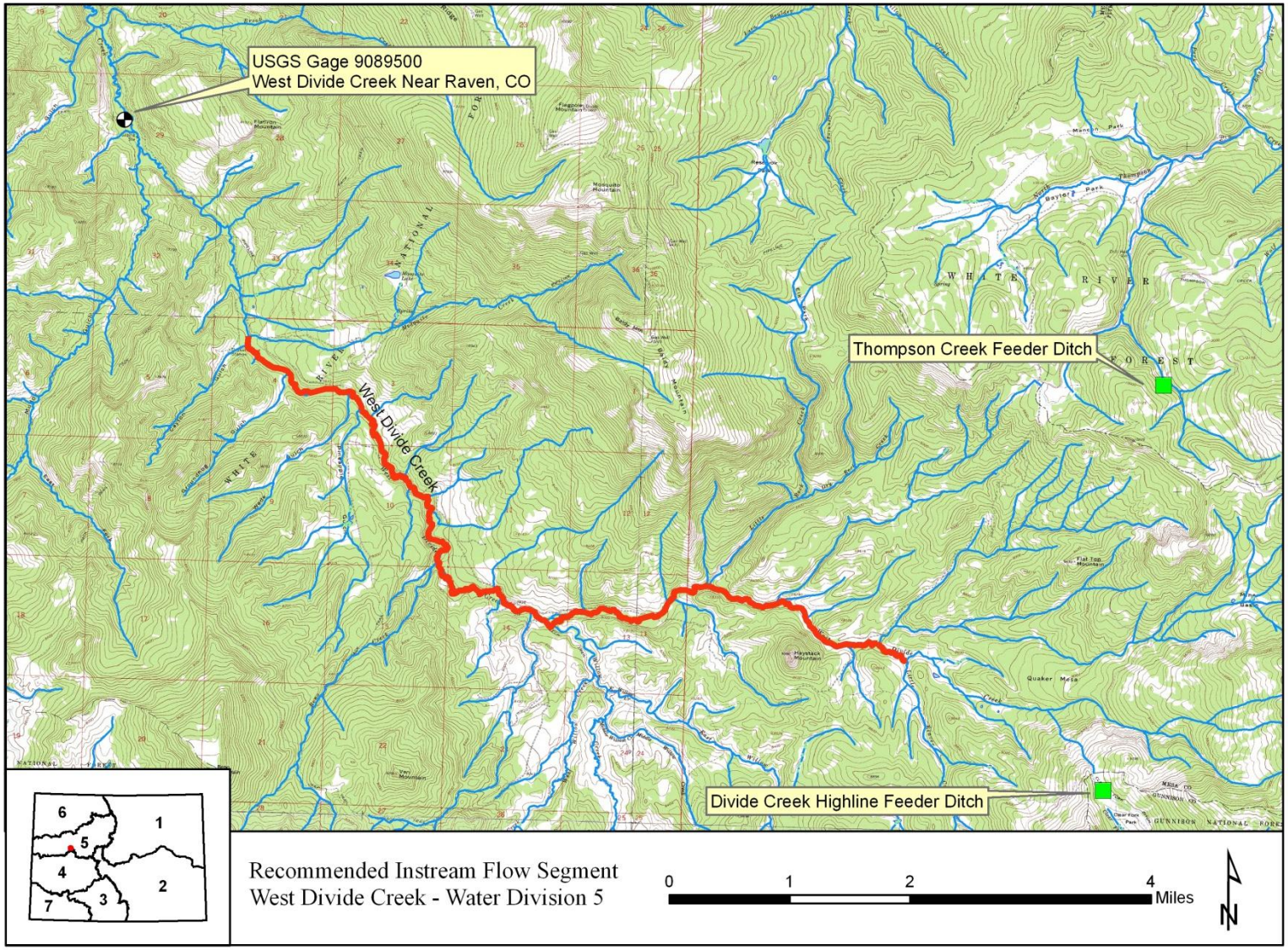
b) The PLSS locations were derived from CWCB GIS using 2005 PLSS data from the U.S. Bureau of Land Management's Geographic Coordinate Database

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

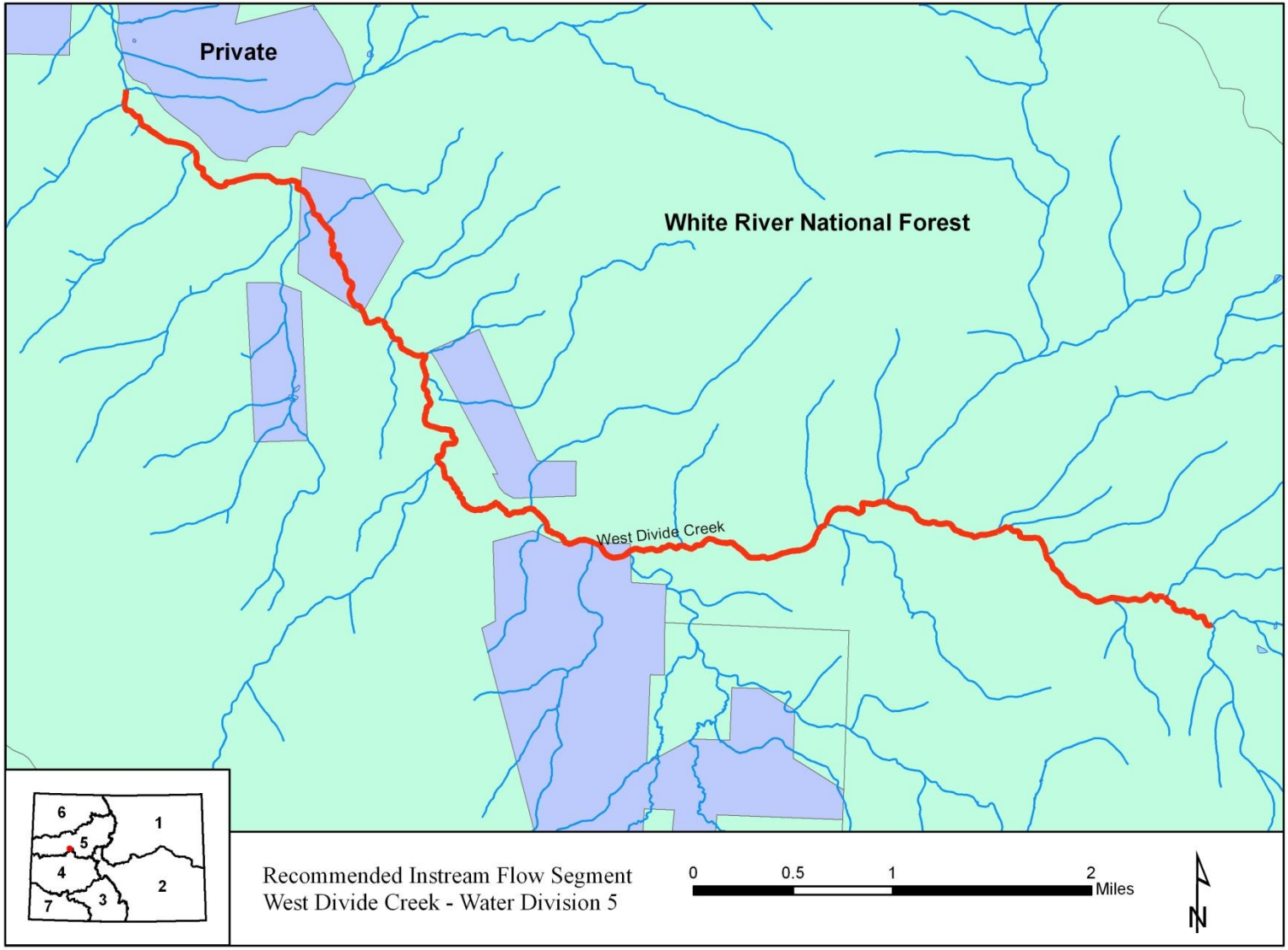
Vicinity Map



Water Rights Map



Land Use Map


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