<u>Stream:</u> East Fork Parachute Creek

Executive Summary

Water Division: 5
Water District: 39
CPW#: 21460
CWCB ID: 14/5/A-003

Segment: CONFLUENCE BULLGULCH TO BLM BOUNDARY

Upper Terminus: CONFLUENCE BULL GULCH AT
UTM North: 4383629.51 UTM East: 241002.27

Lower Terminus: BLM BOUNDARY AT
UTM North: 4385096.90 UTM East: 239652.69

Watershed: Parachute-Roan (HUC #: 14010006)
Counties: Garfield
Length: 1.28 miles
USGS Quad(s): Forked Gulch
Flow Recommendation: 5.0 cfs (4/15 – 6/30)
0.65 cfs (7/1 – 4/14)

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. The Bureau of Land Management (BLM) recommended this segment of East Fork Parachute Creek to the CWCB for a water right under the Instream Flow Program. East Fork Parachute 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 Fork Parachute Creek is approximately 12.0 miles long and originates on the Roan Plateau at an elevation of 8,400 feet. It flows in a westerly direction as it drops to an elevation of 5,750 feet where it joins Middle Fork Parachute Creek. One hundred percent of the land on the 1.28 mile segment addressed by this report is publicly owned (see Table 1). East Fork Parachute Creek is located within Garfield County and the total drainage area of the creek is approximately 41 square miles.

The subject of this report is a segment of East Fork Parachute Creek from the confluence with Bull Gulch extending downstream to the BLM boundary. The proposed segment is located approximately 8 miles northwest of the town of Parachute. Staff has received one recommendation for this segment from the BLM, which is discussed below.

Instream Flow Recommendation

BLM recommended flows of 5.0 cfs (4/15 – 6/30) and 0.65 cfs (7/1 – 4/14), based on its August 24, 2001, August 15, 2011 and May 17, 2012 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 East Fork Parachute Creek.

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Confluence Bull Gulch	BLM Boundary	1.28	0%	100%

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

Biological Data

East Fork Parachute Creek is a cold-water, high gradient stream in a narrow canyon. The stream is confined by bedrock and generally has large substrate. The stream has a good mix of run and deep pool habitats to support a salmonid fishery, but the limiting factor on the creek is riffle habitat for spawning.

Fishery surveys indicate the creek supports a self-sustaining population of brook trout. Intensive macroinvertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, stonefly, and black fly.

The riparian community along East Fork Parachute Creek is very robust, providing good cover and shading for the stream. The riparian community is comprised mainly of box elder and maple. The Colorado Natural Heritage Program reports that four significant plant communities have been identified along this reach, including hanging Garden Sullivantia (rare Colorado endemic species), box elder/narrowleaf cottonwood/red osier dogwood (rare globally and statewide), blue spruce/red osier dogwood, and Utah fescue.

Field Survey Data

BLM 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 BLM 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, six 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 rate required.

Table 2. Summary of R2Cross measurements and analysis for East Fork Parachute Creek.

Party	Date	Q (cfs)	Accuracy Range (cfs)	Winter (2/3) (cfs)	Summer(3/3) (cfs)
BLM	8/24/2001	0.28	0.1 – 0.7	0.70	Out of range
BLM	8/15/2011	0.36	0.1 – 0.9	0.66	Out of range
BLM	8/15/2011	0.43	0.2 – 1.1	0.62	Out of range
BLM	5/17/2012	2.14	0.9 – 5.4	2.61	Out of range
BLM	5/17/2012	1.99	0.8 – 5.0	1.69	Out of range
BLM	5/172012	2.43	1.0 – 6.1	2.14	Out of range
			Averages	1.40	9.35

BLM's analysis of this data, coordinated with Colorado Parks and Wildlife, indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree.

5.0 cubic feet per second is recommended for the snowmelt runoff and high temperature period from April 15 through June 30. This recommendation is driven by the average velocity criteria, and represents a flow rate that is within the confidence interval for the data sets that were collected. Even though this flow doesn't provide 1.0 foot per second average velocity, it does provide an average velocity of 0.8 feet per second, which BLM believes is sufficient in this step-pool stream environment. This creek experiences consistently low flows during late summer and fall, so it is important to protect as much physical habitat as possible during the very limited time when snowmelt runoff and early summer flows are available.

0.65 cubic feet per second is recommended for the late fall and winter period from July 1 to April 14. This recommendation is driven by limited water availability, and the 0.65 cfs recommendation is outside of the confidence interval for three of the six cross sections that were collected. It should provide sufficient flow to prevent pools from freezing and protect overwintering fish.

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 East Fork Parachute Creek has a 22.4 square mile drainage basin. The average elevation of the basin is 8,580 ft and the average precipitation is 24.13 inches. There are 94 small spring water rights within the drainage basin, the largest is 0.11 cfs and the total of all 94 is .99 cfs. These water rights likely have minimal impact and streamflow is essentially natural.

There are two historical USGS gages within or near the recommended reach. The upstream gage, East Fork Parachute Creek near Anvil Points, Colorado (USGS 09092960, operated from 1976 to 1983), was located about 1.1 miles upstream from the proposed upper terminus of the ISF reach. The lower gage, East Fork Parachute Creek near Rulison, Colorado (USGS 09092970, operated from 1976 to 1983), was located about 0.5 mile downstream from the upper terminus of the recommended reach. Both gages operated at about the same time and during most of the year the streamflow recorded at each gage is similar. However, the lower gage near Rulison often recorded zero flow during winter months while the upstream gage recorded streamflow. It is likely that the creek became frozen at the lower gage location during winter months. This is because the lower gage is located in a portion of a canyon oriented more North-South which results in more shading. The upper gage is located in a section of the canyon that is oriented more East-West and receives more direct sunlight.

Data Analysis

Due to potential ice effects associated with the lower gage, the upper gage was used to analyze water availability. The record for this gage was extended through regression analysis with the Parachute River near Parachute (USGS 09093000, operated from 1948 to 1986). The regression was good, with an r^2 value of 0.892. This extension resulted in a record from 1948 to 1986 with some gaps. The extended gage data was not scaled to the lower terminus of the proposed ISF reach because the upper and lower gage data were in close agreement during summer months indicating that there was little change in streamflow due to tributary inputs in that area.

The median streamflow, and upper and lower confidence intervals for the median streamflows were calculated using the extended gage dataset. Statistically there is 95% confidence that the true value of

the median is located within the confidence interval. The hydrograph (see Figure 1) shows that the proposed instream flow rate is below the median daily streamflow for all but 5 days at the end of June. Streamflow on those 5 days is well below the upper confidence interval for the median. Staff has concluded that water is available for appropriation on East Fork Parachute Creek.

Citations

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.

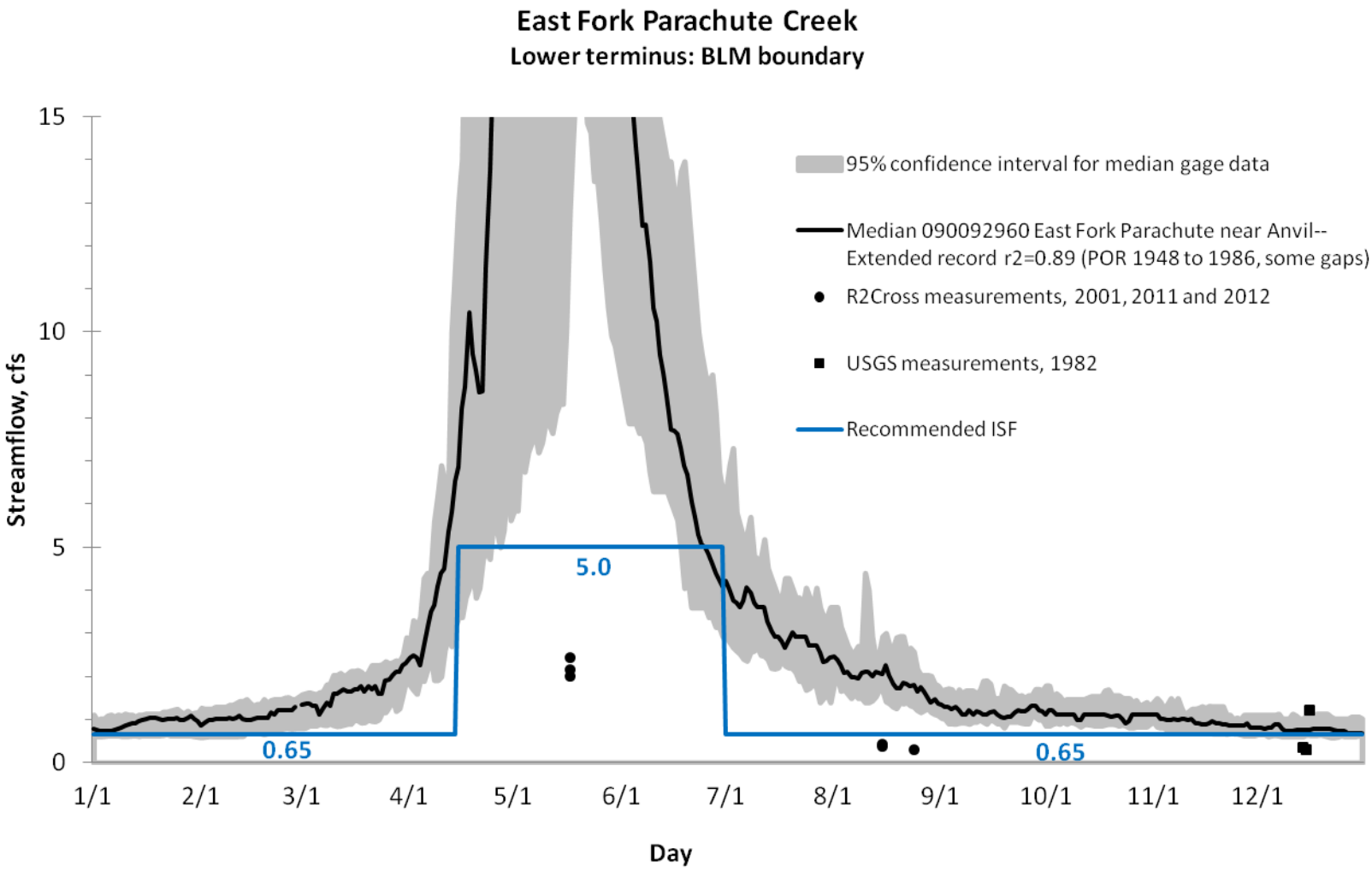


Figure 1. Hydrograph showing streamflow data and the proposed ISF rate on East Fork Parachute Creek.

Existing Water Rights

Staff has analyzed the water rights tabulation and determined that there are no decreed absolute surface diversions within this reach of stream; however, there are 94 small springs that are decreed in the basin. Staff has concluded that a new junior appropriation of water rights on East Fork Parachute 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 BULLGULCH TO BLM BOUNDARY

Upper Terminus: CONFLUENCE BULL GULCH AT
UTM North: 4383629.51 UTM East: 241002.27
(Latitude 39° 33' 47.8"N) (Longitude 108° 00' 53.31"W)
SE SE Section 35, Township 5 South, Range 95 West 6th PM
651' West of the East Section Line; 66' North of the South Section Line

Lower Terminus: BLM BOUNDARY AT
UTM North: 4385096.90 UTM East: 239652.69
(Latitude 39° 34' 33.86"N) (Longitude 108° 01' 51.86"W)
NW NW Section 35, Township 5 South, Range 95 West 6th PM
25' East of the West Section Line; 560' South of the North Section Line

Watershed: Parachute-Roan (HUC #: 14010006)
Counties: Garfield
Length: 1.28 miles
USGS Quad(s): Forked Gulch
Flow Recommendation: 5.0 cfs (4/15 – 6/30)
0.65 cfs (7/1 – 4/14)

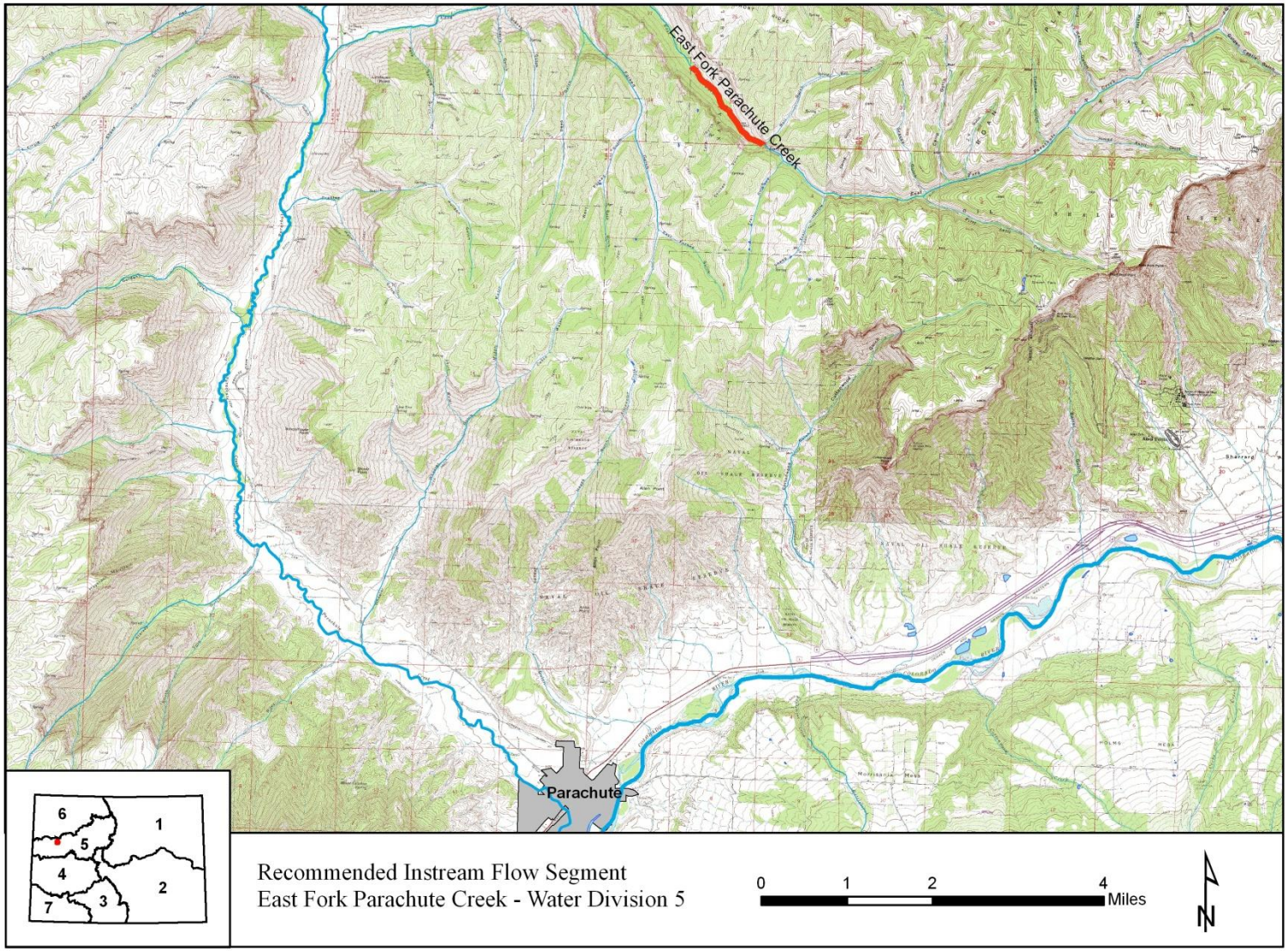
Metadata Descriptions:

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).

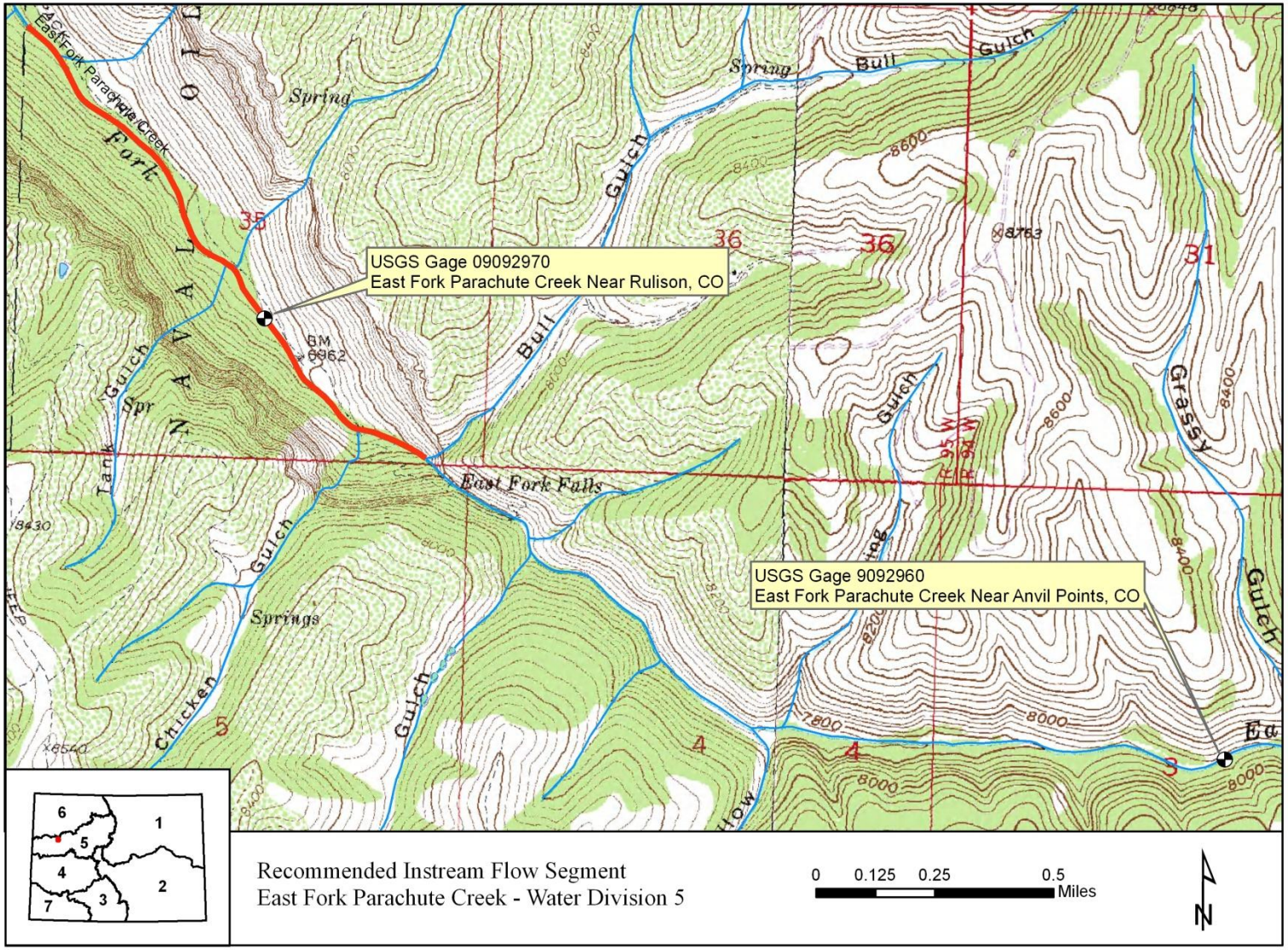
b) The PLSS locations were derived from CWCB GIS using 2005 PLSS data from the U.S. Bureau of Land Management's Geographic Coordinate Database

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

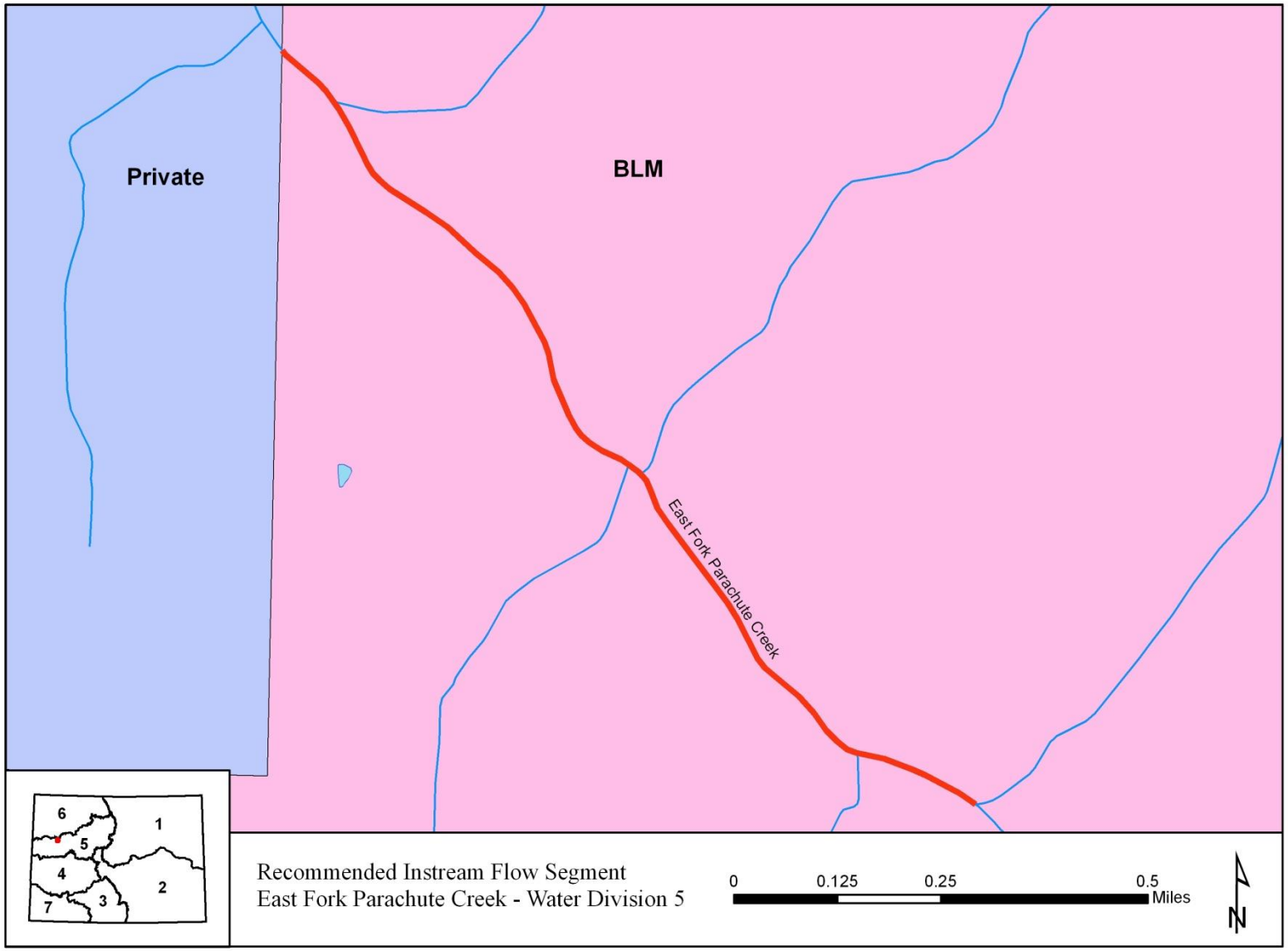
Vicinity Map



Water Rights Map



Land Use Map


Private
BLM
East Fork Parachute Creek
6
1
5
4
2
7
3
Recommended Instream Flow Segment
East Fork Parachute Creek - Water Division 5
0
0.125
0.25
0.5
Miles
N