<u>Stream:</u> Left Fork Carr Creek

Executive Summary

Water Division: 5
Water District: 70
CPW#: 19691
CWCB ID: 14/5/A-004

Segment: HEADWATERS TO FRANKLIN DITCH NO.2 HEADGATE

Upper Terminus: HEADWATERS IN THE VICINITY OF
UTM North: 4388551.13 UTM East: 189602.68

Lower Terminus: FRANKLIN DITCH NO.2 HEADGATE AT
UTM North: 4384477.09 UTM East: 198529.14

Watershed: Parachute-Roan (HUC #: 14010006)
Counties: Garfield
Length: 6.43 miles
USGS Quad(s): Henderson Ridge
Flow Recommendation: 2.0 cfs (4/1 – 8/31)
1.0 cfs (9/1 – 10/31)
0.75 cfs (11/1 – 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. The Bureau of Land Management (BLM) recommended this segment of Left Fork Carr Creek to the CWCB for a water right under the Instream Flow Program. Left Fork Carr Creek is being considered because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

Left Fork Carr Creek is approximately 8 miles long and originates on the east flank of Upper 4A Mountain at an elevation of 8,600 feet. It flows in a southeasterly direction as it drops to an elevation of 6,450 feet where it joins Carr Creek. Forty-seven percent of the land on the 6.43 mile segment addressed by this report is publicly owned (see Table 1). Left Fork Carr Creek is located within Garfield County and the total drainage area of the creek is approximately 12.9 square miles.

The subject of this report is a segment of Left Fork Carr Creek from the headwaters extending downstream to the Franklin Ditch No. 2 headgate. The proposed segment is located approximately 22 miles northwest of the town of De Beque. Staff has received one recommendation for this segment from the BLM, which is discussed below.

Instream Flow Recommendation

BLM recommended flows 2.0 cfs (4/1 – 8/31), 1.0 cfs (9/1 – 10/31) and 0.75 cfs (11/1 – 3/31), based on its May 16, 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 Left Fork Carr Creek

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Headwaters	Franklin Ditch No. 2 headgate	6.43	53%	47%

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

Biological Data

Left Fork Carr 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 riffle, run, and deep pool habitats to support a salmonid fishery.

Fisheries surveys have revealed a self-sustaining population of genetically pure native cutthroat trout, which are a priority conservation species for the BLM. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The riparian community along Left Fork Carr Creek is robust and recovering from historic grazing practices, providing good cover and shading for the stream. The riparian community is comprised mainly of narrowleaf cottonwood, willow, and dogwood.

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, 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 rate required.

Table 2. Summary of R2Cross measurements and analysis for Left Fork Carr Creek

Party	Date	Q (cfs)	Accuracy Range (cfs)	Winter (2/3) (cfs)	Summer (3/3) (cfs)
BLM	5/16/2012	1.62	0.6 – 4.1	1.35	2.20
BLM	5/16/2012	1.82	0.7 – 4.6	1.59	1.74
			Averages	1.47	1.97

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.

2.0 cubic feet per second is recommended for the snowmelt runoff and high temperature period from April 1 through August 31. This recommendation is driven by the average velocity and depth criteria. 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 limited time when snowmelt runoff and early summer flows are available.

1.0 cubic feet per second is recommended for the fall period from September 1 to October 31. This recommendation is driven by the wetted perimeter criteria. This flow rate is capable of maintaining pool habitat in the creek and preventing excessively water high temperatures.

0.75 cubic feet per second is recommended for the late fall and winter period from November 1 to March 31. This recommendation is driven by limited water availability. This flow rate meets the wetted perimeter criteria and provides an average velocity of 0.75 feet per second. 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 Left Fork Carr Creek represents the headwaters of a relatively small (11 square mile) drainage basin. The average elevation of the basin is 7,990 ft and the average precipitation is 22.19 inches. A review of water rights indicates no diversion of surface water and 10 rights for less than 0.1 cfs to use springs within the contributing drainage basin. Therefore, the hydrology on the proposed reach of Left Fork Carr Creek represents essentially natural or unaltered flow conditions.

Left Fork Carr Creek is a tributary in the headwaters of the Roan Creek basin. There is not a current or historic gage on Left Fork Carr Creek, but there are three historic gages in the Roan Creek basin (09094200 Roan Creek above Clear Creek, 09094400 Clear Creek near De Beque, and 09095000 Roan Creek near De Beque). All three gages are much lower in the system and have much larger drainage basins (more than 10 times the size of Left Fork Carr Creek). Large differences in drainage basin size may produce inaccurate results when scaled to a much smaller drainage basin. Archfield and Vogel (2009) suggest drainage basin area scaling ratios between 0.5 and 2.5. These gages also have consumptive depletions that complicate their use as representative gages.

In some cases diversion records can be used to provide an indication of water availability in a stream reach. The lower terminus of the proposed reach is the Franklin Ditch No 2 (WDID 7000541, 1.82 cfs). This structure has a daily record that is intermittent from 1973 to 2011. 1977, 1989-1992, 1994-1998, 2003-2004 all have the water commissioner comment, “no water available”, but it is unknown whether water was not legally or physically available. There are also 6 years when the structure was not useable. Both the land owner and the water commissioner indicated that the Franklin Ditch does not typically sweep the stream and there are more senior water rights downstream. These issues and the lack of information during the winter make it difficult to use this diversion record as a proxy for streamflow.

Data Analysis

Due to limited available data staff utilized StreamStats, a statistical hydrologic program, to estimate natural streamflow on Left Fork Carr Creek. StreamStats utilizes 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.

The hydrograph (Figure 1) shows that the proposed instream flow rate is below the mean-monthly streamflow and that water is available. No revisions to the proposed ISF were necessary to meet 3 of 3 criteria in the summer. However, the original proposed winter rate was reduced due to water availability concerns. Staff has concluded that water is available for appropriation on Left Fork Carr 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.

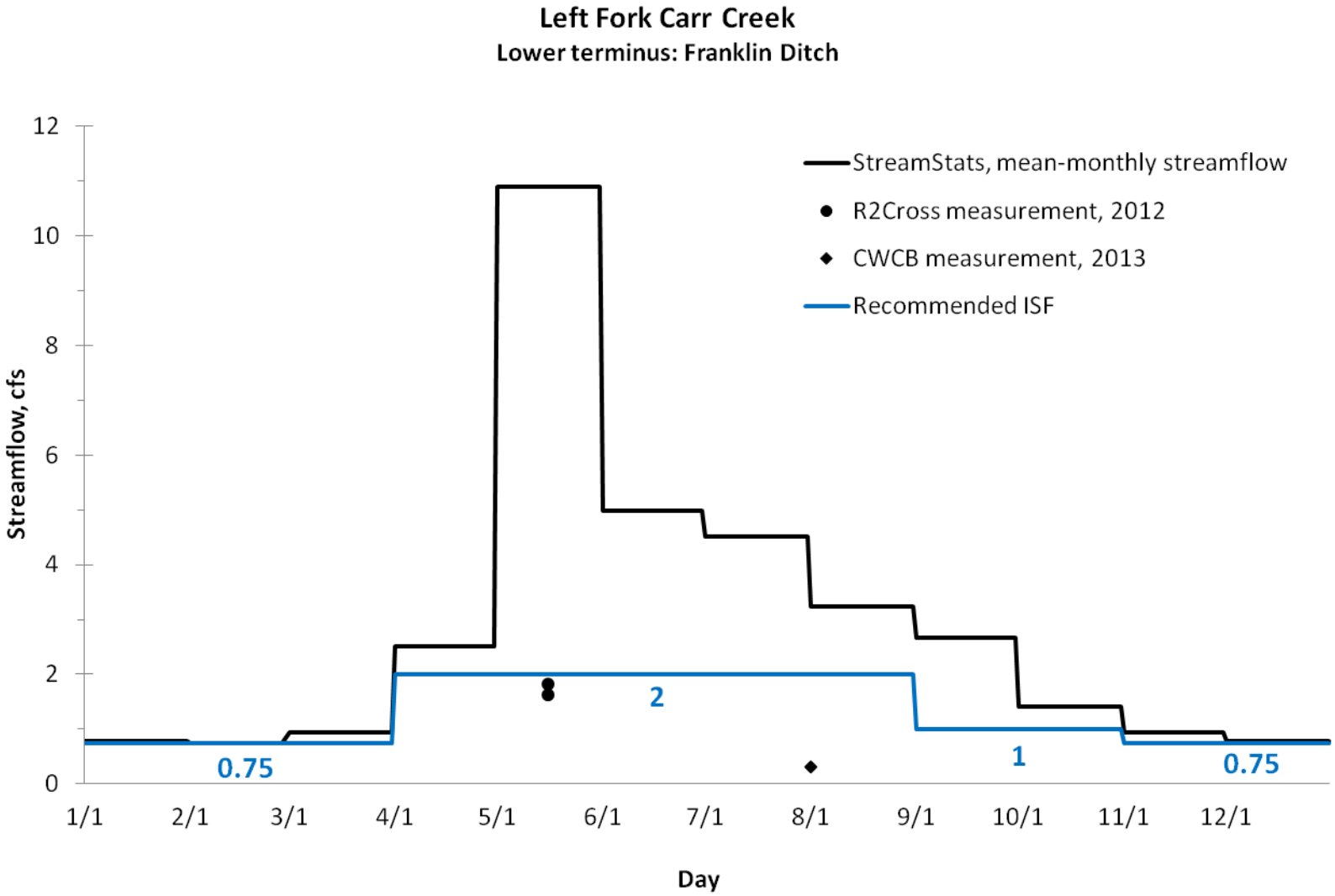


Figure 1. Hydrograph showing streamflow data and the proposed ISF rate on Left Fork Carr Creek.

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 10 small springs that are decreed in the basin. Staff has concluded that a new junior appropriation of water rights on Left Fork Carr 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: HEADWATERS TO FRANKLIN DITCH NO.2 HEADGATE

Upper Terminus: HEADWATERS IN THE VICINITY OF
UTM North: 4388551.13 UTM East: 189602.68
(Latitude 39° 35' 25.76"N) (Longitude 108° 36' 51.8"W)
NE NE Section 28, Township 5 South, Range 100 West 6th PM
1,014' West of the East Section Line; 500' South of the North Section Line

Lower Terminus: FRANKLIN DITCH NO.2 HEADGATE AT
UTM North: 4384477.09 UTM East: 198529.14
(Latitude 39° 33' 25.33"N) (Longitude 108° 30' 31.62"W)
SW SW Section 1, Township 6 South, Range 100 West 6th PM
965' East of the West Section Line; 603' North of the South Section Line

Watershed: Parachute-Roan (HUC #: 14010006)
Counties: Garfield
Length: 6.43 miles
USGS Quad(s): Henderson Ridge
Flow Recommendation: 2.0 cfs (4/1 – 8/31)
1.0 cfs (9/1 – 10/31)
0.75 cfs (11/1 – 3/31)

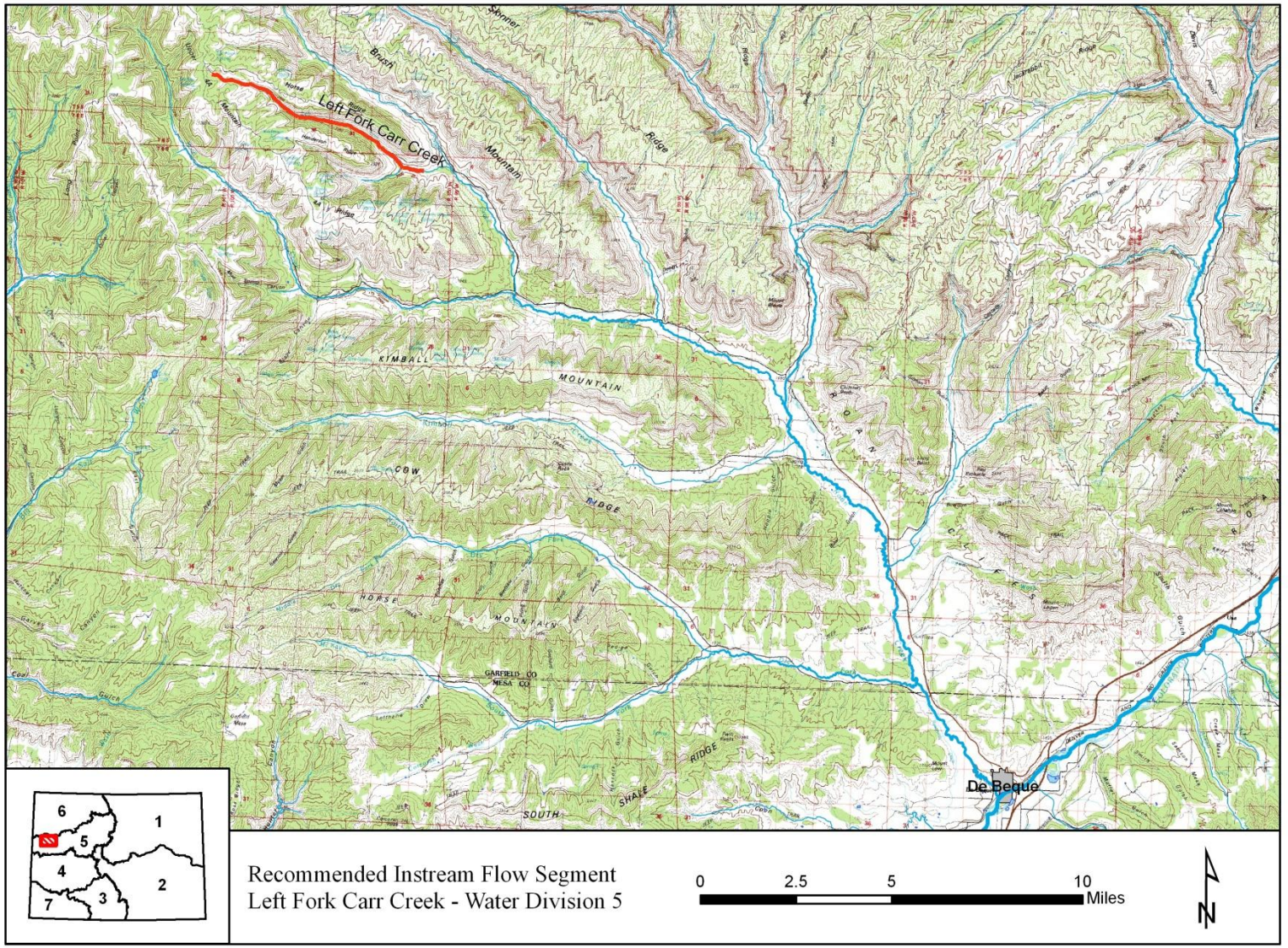
Metadata Descriptions:

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).

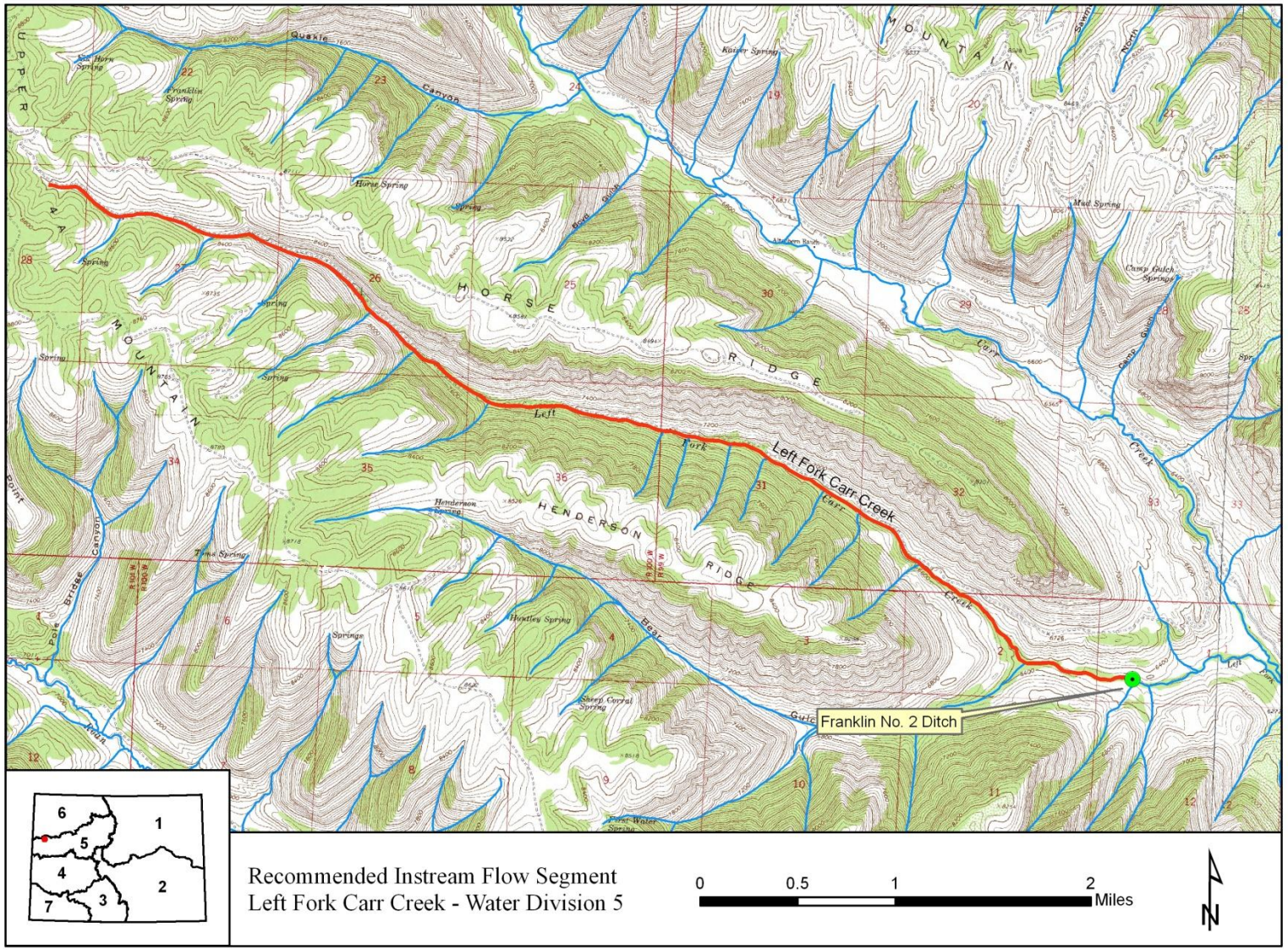
b) The PLSS locations were derived from CWCB GIS using 2005 PLSS data from the U.S. Bureau of Land Management's Geographic Coordinate Database

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

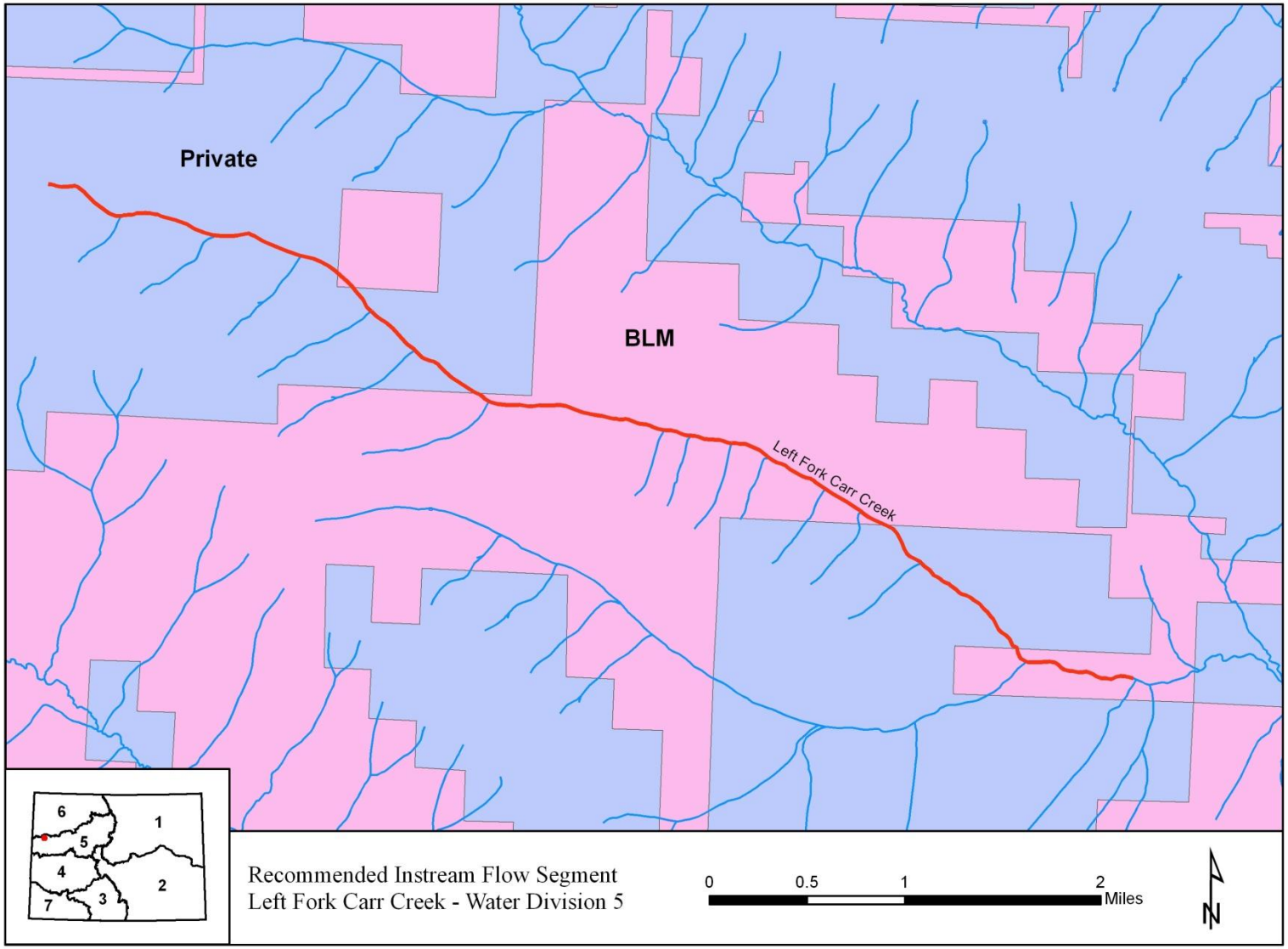
Vicinity Map



Water Rights Map



Land Use Map


Private
BLM
Left Fork Carr Creek
6
1
5
4
2
7
3
Recommended Instream Flow Segment
Left Fork Carr Creek - Water Division 5
0
0.5
1
2
Miles
N