<u>Stream:</u> Dolores River

Executive Summary

Water Division: 4
Water District: 63
CPW#: 39760
CWCB ID: 14/4/A-006

Segment: CONFLUENCE SAN MIGUEL RIVER TO CONFLUENCE WEST CREEK

Upper Terminus: CONFLUENCE SAN MIGUEL RIVER AT
UTM North: 4254788.25 UTM East: 167728.07

Lower Terminus: CONFLUENCE WEST CREEK AT
UTM North: 4288483.48 UTM East: 154090.30

Watershed: Lower Dolores (HUC #: 14030004)
Counties: Mesa, Montrose
Length: 34.21 miles
USGS Quad(s): Gateway, Juanita Arch, Red Canyon, Roc Creek
Flow Recommendation: 900 cfs (4/15 – 6/14)
400 cfs (6/15 – 7/15)
200 cfs (7/16 – 8/14)
100 cfs (8/15 – 3/15
200 cfs (3/16 – 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 agencies., the statute directs the CWCB to request instream flow recommendations from other state and federal The Bureau of Land Management (BLM) and Colorado Parks and Wildlife (CPW) jointly recommended this segment of Dolores River to the CWCB for a water right under the Instream Flow Program. The Dolores River is being considered because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

The Dolores River is approximately 189 miles long and originates in the San Juan National Forest near Bolam Pass at an elevation of 11,640 feet. It flows in a southwesterly direction as it drops to an elevation of 4,560 feet where it crosses the Colorado - Utah border. Sixty-one percent of the land on the 34.21 mile segment addressed by this report is publicly owned (see Table 1). The recommended segment of the Dolores River is located within Mesa and Montrose Counties and the total drainage area of the river is approximately 4,400 square miles.

The subject of this report is a segment of Dolores River from the confluence with the San Miguel River extending downstream to the confluence with West Creek. The proposed segment is located immediately upstream of the Town of Gateway. The BLM and CPW both have submitted recommendations for this segment to Staff, which are discussed below.

Instream Flow Recommendation

BLM and CPW recommended flows of 900 cfs (4/15 – 6/14), 400 cfs (6/15 – 7/15), 200 cfs (7/16 – 8/14), 100 cfs (8/15 – 3/15 and 200 cfs (3/16 – 4/14), based on data collection and modeling efforts.

Land Status Review

Table 1. Summary of land ownership data in the vicinity of the proposed ISF on the Dolores River.

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Confluence with San Miguel River	Confluence with West Creek	34.21	39%	61%

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

Biological Data

Fisheries

Fishery surveys taken during 2007 and 2009 by the Colorado Division of Wildlife indicate that the stream environment supports bluehead sucker (*Catostomus discobolus*), flannelmouth sucker *Catostomus latipinnis*, roundtail chub (*Gila robusta*), and speckled dace (*Rhinichthys osculus*). The surveys indicated that 89% of the fish captured were native species, and that all of these species were represented by individuals of multiple age classes. This reach of the Dolores River appears to be one of the best populations of native fish within Colorado.

Roundtail chub (*Gila robusta*) is recognized by the State of Colorado as a species of special concern. CPW's Administrative Directive W-7 (2007) describes the process and criteria for placing species into this management status. In short, vulnerable species can either be listed as state threatened or endangered or as a species of special concern. There are a number of factors that might lead to this management classification, but in the case of the roundtail chub, this species is known to be in decline in its historic range and there are biotic and abiotic threats (habitat degradation and non-native competition) to the chub's continued survival.

The roundtail chub, flannelmouth sucker (*Catostomus latipinnis*) and bluehead sucker (*Catostomus discobolus*) are considered sensitive species by the BLM. Criteria that apply to BLM sensitive species include the following: 1) species under status review by the U.S. Fish and Wildlife Service; or 2) species with numbers declining so rapidly that federal listing may become necessary; or 3) species with typically small and widely dispersed populations; or 4) species inhabiting ecological refugia or other specialized or unique habits.

The CPW, BLM, numerous state wildlife agencies, federal agencies, and others have developed a "Range-Wide Conservation Agreement and Strategy" to direct management for these species. This plan provides direction and goals for research, monitoring, and overall management of the three species. The success of management strategies will depend upon the voluntary implementation of these strategies by the signatories. Special attention will need to be given to habitat degradation and influence of non-native species interactions within the native range of these species. The intention of these plans is to increase populations and distribution of the identified species, thereby assisting in the long-term

persistence of the species. The habitat protection that is afforded by an instream flow water right fits into the range of actions that the signatories agreed to pursue under this agreement. The success of such plans could potentially curtail the need for federal listing of these species under the Endangered Species Act (ESA). These species are not currently federally listed.

Macroinvertebrates

The BLM performed macroinvertebrate surveys during July 2013. The BLM utilized a sampling protocol developed by the National Aquatic Monitoring Center (NAMC), designed to generate data sufficient to characterize the status and trend of aquatic macroinvertebrate assemblages, including quantifying the effects of human disturbances and/or restoration actions. The BLM will provide these results to the CWCB, along with its analysis of the health and status of the macroinvertebrate community.

Riparian Community

The Dolores River riparian community has been heavily impacted by invasion of non-native tamarisk. Depending upon the location, the tamarisk component of the riparian community can range from 10 to 80% of vegetation cover. However, there are still extensive occurrences of native species, including Rio Grande Cottonwood, Narrow-leaf Cottonwood, Box Elder, Coyote Willow, Skunkbrush, and New Mexico Privet. In many locations, tamarisk dominates the zone immediately adjacent to the river channel and native species dominate the first terrace that is slightly elevated above the river channel. Even with the tamarisk impact, the river banks are in stable condition and excessive erosion does not appear to be impacting the aquatic community.

The Dolores River Restoration Partnership is making a major investment in treating the invasive species along the river. The Partnership's objective is to increase the vigor and extent of native riparian species, including Rio Grande Cottonwood, Narrow-leaf Cottonwood, Box Elder, Coyote Willow, New Mexico Privet, and Skunkbrush. For the river corridor to successfully transition back to a vegetation community dominated by native species, a supporting hydrologic regime will be required that provides periodic flooding and maintains groundwater levels within the root zone of the riparian community.

While the proposed instream flow water right does not protect the highest flood flows, BLM and CPW believe that the proposed seasonal variations in flow rates will provide good support for groundwater levels in near-stream alluvial deposits. This support is accomplished by protecting stream flow during the snowmelt runoff period which is the flow that recharges near-stream alluvial deposits. In addition, by protecting base flows during seasonally dry periods, groundwater levels in near-stream alluvial deposits can be maintained during high temperature and high evapotranspiration periods. Maintenance of groundwater levels in near-stream alluvial deposits during both periods will sustain the health and vigor of the riparian community.

Flow Quantification Methodology

PHABSIM and R2Cross Methodology

The CPW and BLM evaluated all of the data collected to date and determined that the best flow recommendation would be derived from a combination of methods. PHABSIM (Physical Habitat Simulation) is a widely accepted method for quantifying the suitable versus unsuitable hydraulic habitat attributes of selected species and life stages as a function of discharge. R2CROSS is best suited for identifying flows with specific hydraulic criteria across riffle type habitats. The State of Colorado has used R2CROSS extensively in the past to appropriate instream flow water rights. PHABSIM is widely used in North America to quantify instream flow requirements.

CPW and BLM determined that exclusive use of the standard R2CROSS method would not be appropriate for this reach of the Dolores River due to its large width (over 100 feet wide in most places), type of fish species present (warm/cool water species) and its big river channel morphology that includes extensive run, pool, and glide habitat. In addition, only a very small percentage of the fish habitat in this reach is comprised of riffles. For these reasons, CPW and BLM decided to utilize PHABSIM results to develop flow recommendation for the snowmelt runoff months between March and August. This is the portion of the year when the three sensitive species are using run, pool, glide, and riffle habitat to complete important parts of their life cycles, such as spawning and recruitment of young of the year. Habitat availability is critical during this period for maintaining the biomass and age diversity of the three sensitive fish species.

CPW and BLM decided to use the R2Cross methodology to develop flow recommendations during the base flow portions of the year from August through March. This is the period when there is substantial competition between individuals for physical habitat space, foraging areas, and limited food supplies. During this period, it is critical for the three species to be able to move between habitat areas to make full use of the limited physical habitat. Riffles are the first location where low flows can limit passage between habitat types, so it as appropriate to develop flow recommendations that focus on the fish passage function.

To select an appropriate location for PHABSIM modeling, CPW and BLM staff conducted reconnaissance throughout the 34-mile reach to identify its typical habitat characteristics, including channel widths, substrate types, depths, and velocities. The CPW and BLM staff then selected an 1,800-foot reach of stream, located approximately seven miles upstream from the Town of Gateway, as a location that could represent the full variety of habitat types found within the 34-mile reach. The CPW and BLM staff established and monumented seven transects that incorporate different mesohabitat types, including riffles, runs, pools and glides. These seven different cross-sections formed the basis for the PHABSIM/RHABSIM study conducted by the CPW and BLM.

BLM and CPW staff also ran data from the seven cross-sections through the R2Cross model. Since the seven cross-sections include only one cross-section of riffle habitat, CPW and BLM staff also collected data from four additional representative riffle cross-sections at other locations on the river. The additional cross-section data collection was designed to increase the reliability of the R2Cross model in predicting hydraulic characteristics that would be experienced at various flow rates within the 34-mile reach.

The initial recommendations based on the PHABSIM and R2CROSS modeling are designed to address the unique biologic requirements of this stream reach without regard to water availability. In addition to the criteria developed using the PHABSIM methodology and RHABSIM software, the three standard instream flow hydraulic parameters used in R2CROSS (average depth, percent wetted perimeter and average velocity) were also used to calculate and inform the biologic instream flow recommendations.

Application of Habitat Suitability Criteria

Habitat suitability criteria (HSC) were developed by CPW Aquatic Researcher Richard Anderson, in collaboration with Gregory Stewart from the Department of Geosciences Oregon State University (Anderson and Stewart, 2003). The basis for this study was a 1999 request from the CWCB for the CPW to provide biologically justified instream flow recommendations for the Yampa and Colorado Rivers based on habitat and flow requirements for non-endangered native fish. Anderson and Stewart used two–dimensional (2D) modeling to develop habitat suitability criteria for bluehead and flannelmouth suckers, two native species. Their methods and results are more fully described in Anderson and Stewart (2003), Stewart et al. (2005), Stewart and Anderson (2007), and Anderson and Stewart (2007).

The bluehead and flannelmouth sucker habitat suitability criteria were used to develop specific hydraulic criteria that were incorporated into a PHABSIM/RHABSIM analysis. Stewart and Anderson determined that "Abundance of bluehead sucker was a reliable indicator for instream flows and habitat maintenance for the native fish assemblage. In the Colorado, Gunnison and Yampa Rivers, bluehead sucker habitat peaked at flows of 600 to 1,200 cfs. This flow range also resulted in high habitat diversity and high native fish biomass." Their assumption that flows that maintained adequate bluehead sucker abundance (about 25% of fish over 15 cm) would also maintain adequate flannelmouth sucker and roundtail chub habitat was validated by this study.

CPW and BLM determined that the flannelmouth sucker and bluehead sucker would be the primary indicator species for the biologically based instream flow recommendation. The reason for considering the needs of both species is that they have somewhat different habitat preferences. Flannelmouth sucker have stronger preference for pool, glide, and run habitats, while bluehead sucker abundance is directly related to availability and quality of riffle habitats. Roundtail chub primarily utilize habitats with slower velocities, typically found in pools. CPW and BLM determined that if sufficient flows were protected

for flannelmouth sucker and bluehead sucker needs, there would also be sufficient water to maintain pool habitats relied upon by roundtail chub.

When developing recommendations for flow rates to support flannelmouth sucker and bluehead sucker, BLM and CPW personnel examined tables and graphs produced by the PHABSIM model that show amounts of "weighted usable area" (suitable habitat) available at various flow rates for each of the two species. The BLM and CPW then identified the most "efficient" flow rate for providing habitat protection. In this case, the most "efficient" flow rate is defined as the minimum flow rate that protects at least 90 percent of the habitat that is potentially available within the stream channel for both species. For example, if a PHABSIM modeling run showed that an equal amount of weighted usable area was available at either of two different flow rates, then the lower flow rate was identified for protection because it is more efficient. In addition, when identifying minimum flow rates, BLM and CPW personnel also considered the amount of time weighted usable area is available, specifically the number of days within a calendar year. CPW and BLM considered this factor because much of the potential habitat in the Dolores River is available during only a very short time period during the peak of snowmelt runoff.

Application of R2Cross Criteria

The primary objective of most cross section methodologies, including R2CROSS, is to maintain quality riffles. Riffles are the habitat most vulnerable to dewatering, and are important for invertebrate productivity. As noted previously, riffles comprise only a very small portion of the total habitat area in this stream reach, so the importance of maintaining riffle habitats is magnified even further. BLM and CPW performed a reconnaissance to identify the various types of riffles within this stream reach, based upon width, substrate, and average water velocity. The two agencies then selected four representative riffles for further R2CROSS analysis.

BLM and CPW personnel applied the following criteria in evaluating the R2CROSS modeling runs:

• Maintain 70% of wetted perimeter, given that the channel width typically exceeds 60 feet. This follows R2Cross criteria based on Nehring (1979).

• Maintain 1.3 feet per second average velocity and maintain 1.0 average depth. BLM and CPW altered the Nehring (1979) criteria for average velocity and average depth to be more species specific to the habitat needs for flannelmouth sucker and bluehead sucker. This criteria is recommended by Anderson and Steward (2003) to maintain marginally suitable habitat for flannelmouth sucker and bluehead sucker.

The R2CROSS model provides reliable predictive results for flows that are up to 250% of the flow measured during the data collection effort. It also provides reliable predictive results for flows down to 40% of the flow measured during the data collection effort. This range, from 40% to 250% of flows measured during the data collection, is referred to as the "confidence interval" for R2CROSS modeling.

When the flow rate that meets the instream flow criteria fell outside of this confidence interval, data from that cross section were not used to develop instream flow recommendations. The results from cross sections with usable results (inside the confidence interval) were averaged to develop the recommended flow rates.

Biological Flow Recommendations

Overview of Recommended Flow Rates

The recommended flow values were determined using the best professional judgment of CPW and BLM biologists and hydrologists. The CPW and BLM professionals reviewed and evaluated the results of the Physical Habitat Simulation (PHABSIM) Methodology and RHABSIM software PHABSIM/RHABSIM analysis. They also reviewed the R2CROSS analysis, using the criteria set forth above in this executive summary. These initial flow recommendations were based on the physical and biological data collected to date and do not incorporate any water availability constraints.

The PHABSIM/RHABSIM data analysis shows that the maximum amount of usable habitat for bluehead suckers is produced at a flow of 1200 cfs and for flannelmouth suckers at a flow of 875 cfs. BLM and CPW staff determined that a flow rate of 900 cfs would adequately protect the flannelmouth sucker habitat while protecting more than 90% of the usable habitat for bluehead sucker. BLM and CPW staff also noted that this usable habitat is typically available for only two months of the year. Accordingly, the initial biological recommendation for the snowmelt period between March 15 and August 14 is 900 cfs.

The R2CROSS analysis indicated that a fall/winter flow rate of approximately 100 cfs was necessary to meet two out of the three of the critical hydraulic criteria in the cross - section selected by the BLM and CPW. This flow rate is an average of the R2Cross results collected in five different riffles. BLM and CPW personnel also determined that a flow of 100 cfs would also protect other habitat types, such as pools and glides, during the base flow period. According, the initial biological recommendation for the base flow period between August 15 and March 14 is 100 cfs.

Consideration of Water Availability

After developing initial flow recommendations based exclusively upon maintenance of usable habitat and hydraulic characteristics, BLM and CPW reviewed the initial recommendations in light of water available during various times of the year. The BLM and CPW consideration of water availability was based upon an initial water availability analysis conducted by the CWCB staff. Consideration of water availability is very important for this recommendation because the amount of time (number of days in a calendar year) that habitat is available for the critical life functions of fish directly affects the health and viability of those populations.

After considering water availability, the initial flow recommendations were further modified as follows:

Time Period	% of 365-day year	Recommended Flow Rate	% of Weighted Usable Area Protected		Number of R2Cross Criteria Met
			Bluehead Sucker	Flannel-mouth Sucker	
April 15 to June 14 (61 days)	16.7%	900 cfs	94%	100%	3 of 3
June 15 to July 14 (30 days)	8.2 %	400 cfs	59%	66%	3 of 3
July 15 to August 14 (31 days)	8.5 %	200 cfs	30%	38%	3 of 3
August 15 to March 14 (212 days)	58%	100 cfs	8%	12%	2 of 3
March 15 to April 14 (31 days)	8.5%	200 cfs	30%	38%	3 of 3

The initial water availability analysis demonstrated that 900 cfs is available at least 50% of the time between April 15 and June 14, so no water availability adjustment was required during that time period. The biological flow recommendation of 900 cfs was reduced to 400 cfs for the June 15 through July 14 time period because of water availability concerns. The biological flow recommendation of 900 cfs flow was further reduced to 200 cfs during the July 15 to August 14 period because of water availability concerns. The recommendation for the June 15 to July 14 and July 15 to August 14 time periods are designed to maintain as much bluehead sucker and flannelmouth sucker habitat as possible during a period of the year when flows are rapidly declining. The descending limb of the hydrograph occurs at the warmest time of the year when the species are most active and are attempting to put on weight to survive limited food availability during winter.

The biological flow recommendation of 900 cfs was also reduced to 200 cfs for the March 15 to April 14 period because of water availability concerns. Protection of higher flows associated with the beginning of snowmelt runoff is warranted during this period because it is the beginning of the portion of the year when the sensitive fishes complete critical parts of their life cycles, including the commencement of spawning activities in early spring.

The R2CROSS Method suggests that fall/winter flows should be maintained at 100 cfs, which meets two of the three of the identified critical hydraulic criteria. The flow rate of 100 cfs was not reduced to address water availability concerns, because the initial water availability analysis performed by the CWCB suggests that 100 cfs is available at least 50% of the time during the time period between August 15 and March 14.

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 reach on the Dolores River receives water from the Dolores River, the San Miguel River, and a number of small tributaries that enter the reach between the confluence of the Dolores and San Miguel Rivers and the proposed lower terminus. The Dolores and San Miguel Rivers each have historical municipal and irrigation water uses that alter the nature flow of the system (CWCB, 2005). However, hydrology on the Dolores and San Miguel Rivers have been altered to different degrees.

Dolores River

The Dolores River has experienced significant changes in hydrology. There are a number of reservoirs on the system upstream from the proposed instream flow reach: Groundhog, McPhee, Summit, and Narraguinnep. Many of these reservoirs are part of large water projects such as the Montezuma Valley Irrigation Company (MVIC), the Summit Reservoir System, and the Dolores Project (CWCB, 2012).

The Dolores Project, which includes McPhee Dam and nearly 200 miles of canals, tunnels, pipelines and laterals, significantly alters the flow regime in the proposed instream flow (ISF) reach. The Dolores Project was developed by the United States Bureau of Reclamation (USBR) and supplies an average

annual volume of 90,900 acre-feet to Dove Creek, Towaoc, and the Montezuma Valley (USBR, 2012). Many of these are transbasin diversions that export water from the Dolores River system to the San Juan River system. The majority of decreed water uses occur upstream from McPhee Reservoir. The exceptions are a fish pool, senior downstream water rights, and flows necessary for a salinity control project in the Paradox Valley.

Construction of McPhee Dam started in 1980 and was completed in 1984 (Voggesser, 2001). Other portions of the project were completed later, such as the Great Cut Pumping Plant in 1987 and the McPhee Powerplant in 1993. The Dove Creek Canal and Towaoc Canal were completed in 1987 and 1993 respectively. The USBR declared the Dolores Project "substantially complete" in 1995 with "final completion" in September 1998 after correcting minor design and construction deficiencies in laterals and canals (Voggesser, 2001). The full Dolores Project was online and in use by 1999 or 2000, with 2000 the typical date given (Ken Curtis - Dolores Water Conservancy District, personal communication).

Operation of McPhee Dam and the Dolores Project in conjunction with natural flow conditions results in variable hydrology from year to year. In some years, no appreciable spill is released from McPhee Dam. In other years, there are substantial releases from McPhee Dam that resemble snow-melt runoff hydrology.

San Miguel River

The San Miguel is also influenced by storage reservoirs and irrigation diversions. Reservoirs include Gurley, Miramonte, Trout Lake, and Lake Hope. The United States Geological Survey (USGS) estimates 28,000 acres of irrigated lands upstream from the Uravan gage (USGS, 2013). Although streamflow on the San Miguel has been altered, it has not been impacted to the same degree as the Dolores River. The hydrograph for the San Miguel River exhibits more natural hydrology that follows patterns more typical of snow-melt driven systems.

Analysis Method

The upper Dolores River basin represents a complex system that has changed through time as different water projects were implemented. Given changes in use and available gage and diversion data, there are a number of time-frames and methods that could be used to analyze and determine water availability in the proposed instream flow reach. These range from relatively simple analysis of gage records to more comprehensive modeling efforts. Because of the complexities in this system, the final analysis is based on the Colorado Decision Support System (CDSS) Statemod model. This model has the capacity to simulate current operations of the Dolores River project using historical hydrology data. This model was selected for the final water availability analysis because staff believes it represents the best available data and analysis method for the Dolores River. This analysis method also aims to address concerns expressed during public outreach that water availability analyses reflect the full implementation of the Dolores Project.

CDSS

Statemod is a modeling system developed by the CWCB for water supply planning purposes, as part of the Colorado Decision Support System (CDSS). This model uses streamflow data, diversion records, water rights, reservoir contents, operating rules, return flow estimates, and consumptive use estimates among other datasets. The model simulates streamflow, native flow, and other information at specific locations in a basin (called nodes) for either monthly or daily time-steps. The model can be used to simulate different conditions including: 1) historic simulations that use historic hydrology based on historic operations of reservoirs and diversions; and 2) baseline simulations that use historic hydrology, but current operating rules and practices. The baseline simulation was used in staff's final water availability analysis because it had the ability to account for the completed Dolores River project.

The San Juan Statemod model contains the Dolores River and simulates flow from 1974 to 2006. This model was updated in 2010 as part of Colorado River Water Availability (CRWAS) Study and includes the operating procedures for the Dolores Project. Staff refined the San Juan model in the vicinity of the proposed instream flow reach. Nodes were added to the model to simulate flow conditions at the proposed upstream and downstream instream termini. Other modifications were made to improve accounting for irrigation diversions, return flows, and gains and losses within the reach due to tributary inflow, groundwater seepage, and other processes. More detailed information about the model modifications is available in the Dolores River Water Availability Technical Memo. Once modifications were complete, the daily baseline simulation was recalculated.

Water Availability Results

The simulated daily streamflow at the lower terminus was exported from the model and imported into Excel for analysis. The median streamflow, and upper and lower confidence intervals for the median streamflows were calculated. 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 351 of 365 days. The proposed ISF is higher than the median for 6 days in July, 6 days in August, and 2 days in September. The ISF is below the upper 95% confidence interval for all days of the year. Based on this analysis, staff concludes that water is available for appropriation.

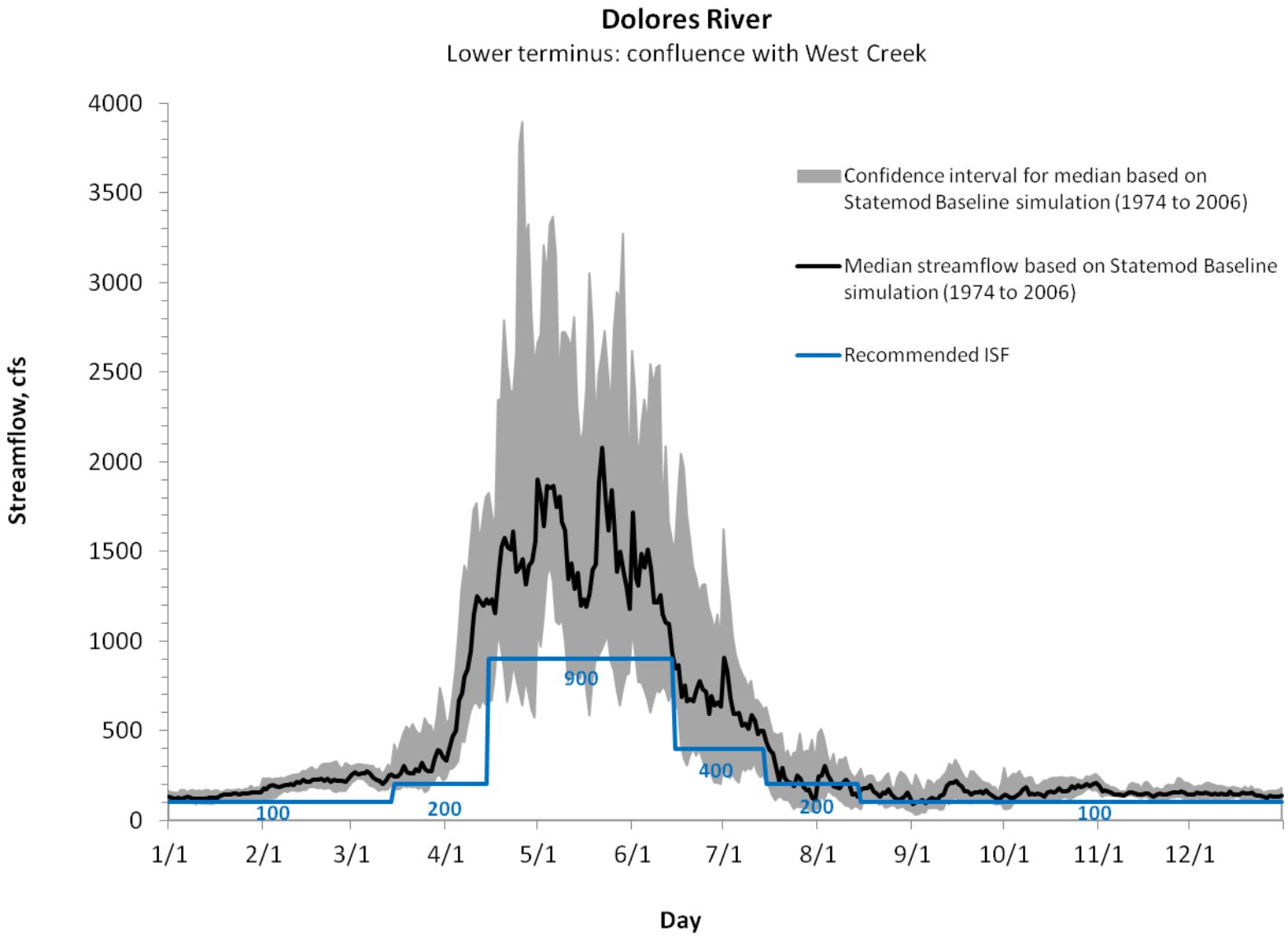

Figure 1. Hydrograph showing streamflow data and the proposed ISF rate on the Dolores River.

Citations

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Existing Water Rights

Staff has analyzed the water rights tabulation and determined that there are seven decreed absolute surface diversions within this reach of stream: Ben Ames Ditch, Case No. CA4952 for 4.10 cfs with a 3/1/1930 appropriation date; Castro Pumping Plant; Case No. W0637 for 4.5 cfs with a 10/11/1922 appropriation date; Foster Miner Ditch Point A, Case No. W0143 for 5.65 cfs with a 10/11/1922 appropriation date; Red Cross Ditch, Case No. CA4952 for 10.09 cfs with a 6/15/1918 appropriation date; Red Cross Ditch Point A, Case No. W0724, for 2.21 cfs and a 9/25/1922 appropriation date; Roc Creek Diversion, Case No. 07CW220, for 1.43 cfs with a 7/10/2006 appropriation date; and Sheep Shed Canyon Ditch, Case No. W3386 for 3 cfs with a 5/15/1906 appropriation date. Staff has concluded that a new junior appropriation of water rights on the Dolores River 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 SAN MIGUEL RIVER TO CONFLUENCE WEST CREEK

Upper Terminus: CONFLUENCE SAN MIGUEL RIVER AT
UTM North: 4254788.25 UTM East: 167728.07
(Latitude 38° 22' 46.6"N) (Longitude 108° 48' 12.89"W)
SW SE Section 25, Township 48 North, Range 18 West NM PM
2,126' West of the East Section Line; 285' North of the South Section Line

Lower Terminus: CONFLUENCE WEST CREEK AT
UTM North: 4288483.48 UTM East: 154090.30
(Latitude 38° 40' 38.57"N) (Longitude 108° 58' 33.67"W)
NE NW Section 22, Township 51 North, Range 19 West NM PM
1,563' East of the West Section Line; 388' South of the North Section Line

Watershed: Lower Dolores (HUC #: 14030004)
Counties: Mesa, Montrose
Length: 34.21 miles
USGS Quad(s): Gateway, Juanita Arch, Red Canyon, Roc Creek
Flow Recommendation: 900 cfs (4/15 – 6/14)
400 cfs (6/15 – 7/15)
200 cfs (7/16 – 8/14)
100 cfs (8/15 – 3/15
200 cfs (3/16 – 4/14)

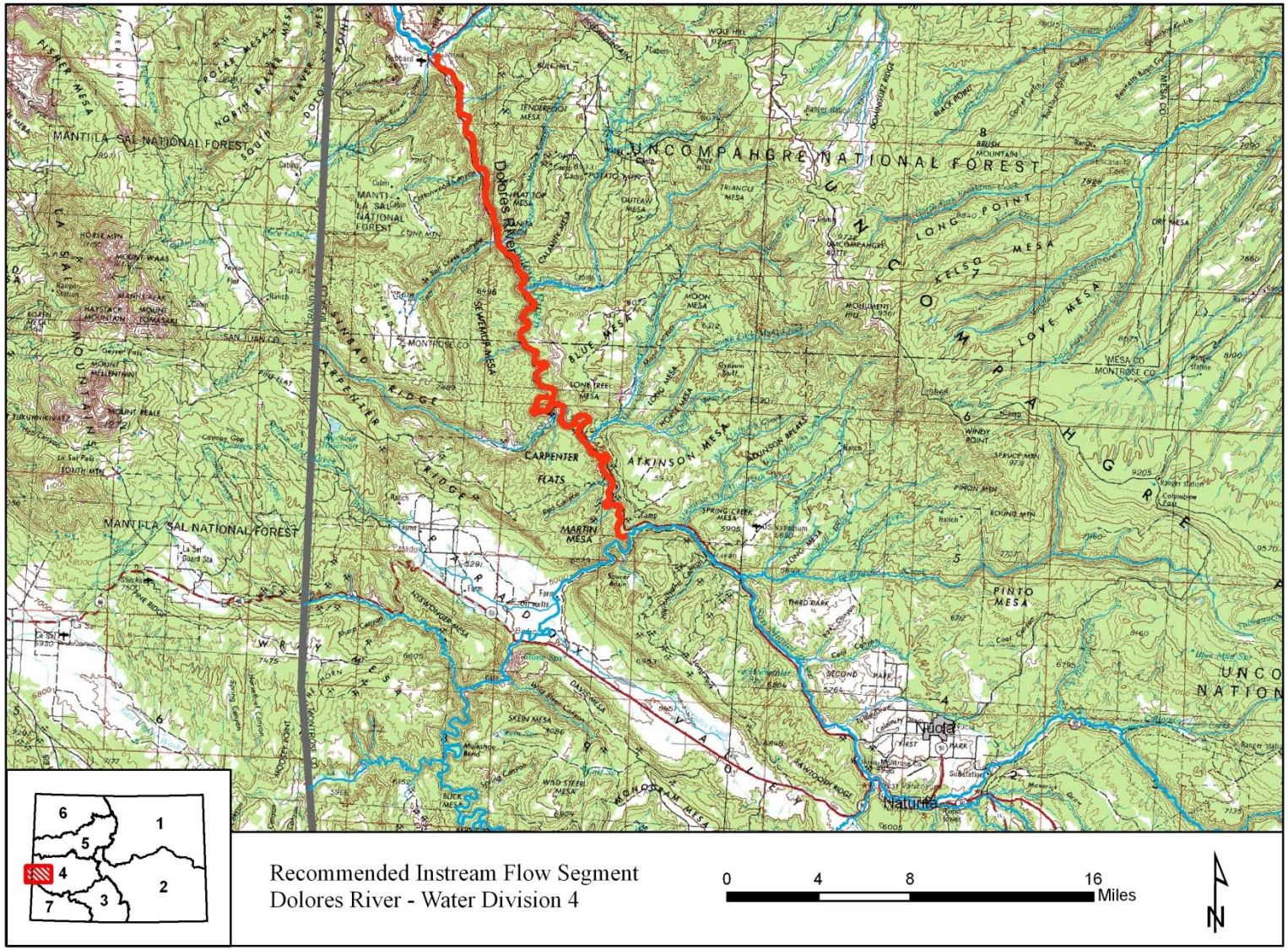
Metadata Descriptions:

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).

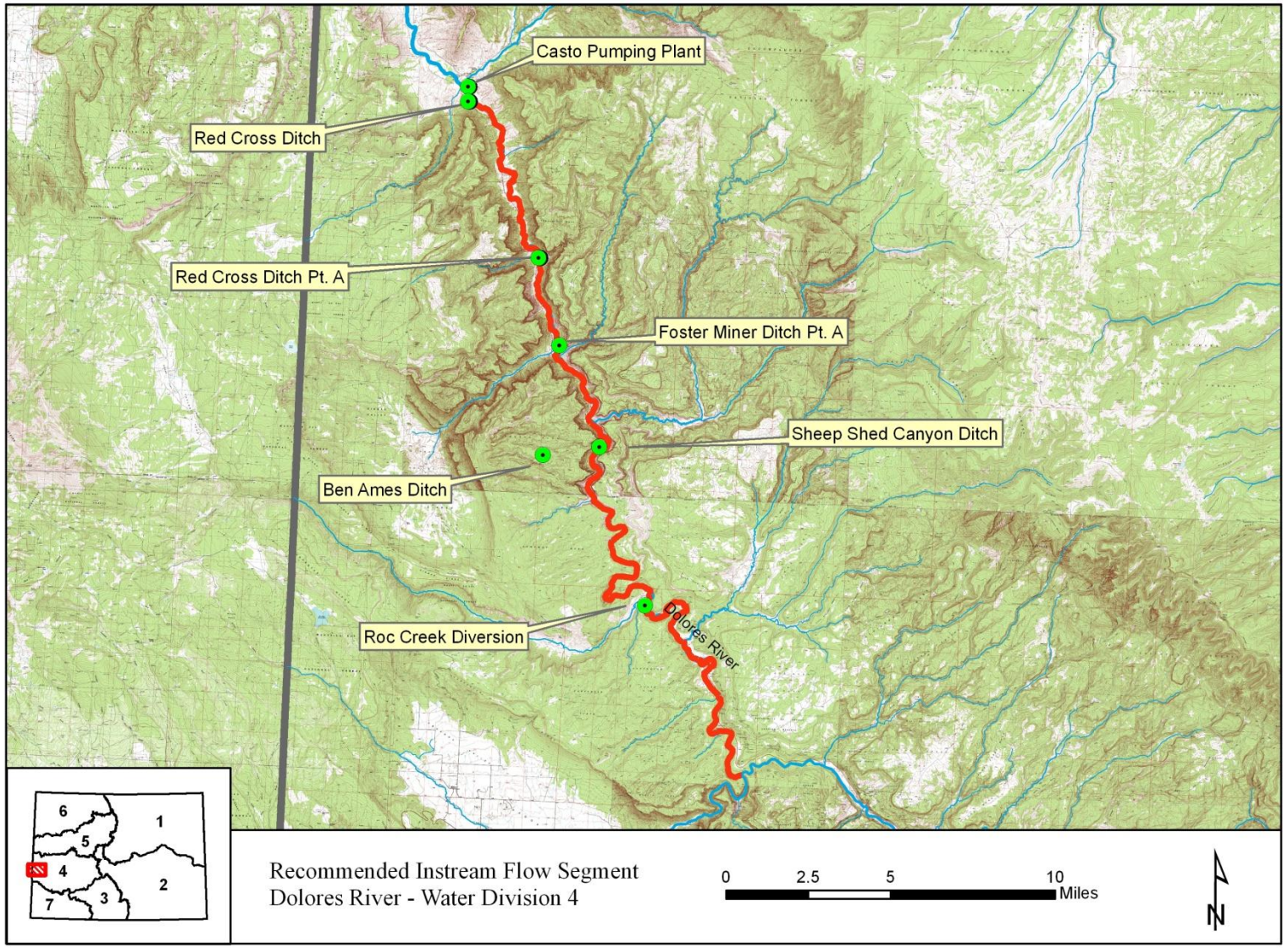
b) The PLSS locations were derived from CWCB GIS using 2005 PLSS data from the U.S. Bureau of Land Management's Geographic Coordinate Database

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

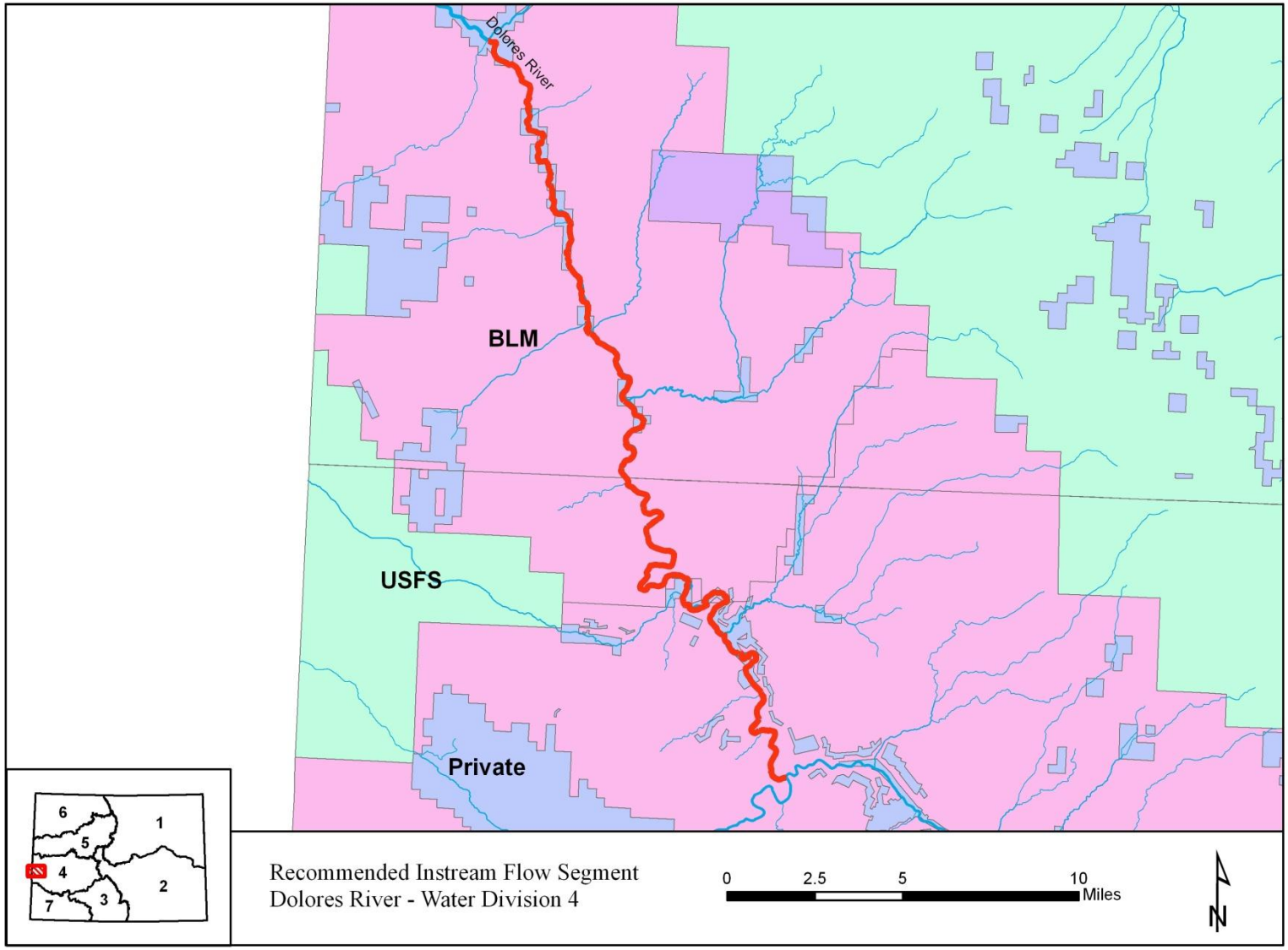
Vicinity Map



Water Rights Map



Land Use Map


Dolores River
BLM
USFS
Private
6
1
5
4
2
7
3
Recommended Instream Flow Segment
Dolores River - Water Division 4
0
2.5
5
10
Miles
N