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Flow Management and Endangered Fish in the Dolores River, 2012 - 2017

U.S. Bureau of Reclamation
Upper Colorado Region
Western Colorado Area Office

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Flow Management and Endangered Fish in the Dolores River during 2012 – 2017

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Mission Statements

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Executive Summary

This report partially fulfills reporting requirements for conservation recommendations pertaining to the Dolores River in the Final Gunnison River Basin Programmatic Biological Opinion (PBO; U.S. Fish and Wildlife Service, 2009). Specifically, the PBO states that Reclamation will assess and provide a report to the Service on the extent to which flow management on the Dolores River may contribute to endangered fish recovery. To complete this assessment, we draw on three lines of evidence gathered during 2012 – 2017 to assess the extent to which flow management may have contributed to endangered fish recovery. First, we consider hydrologic data from 2012 through 2017 in relation to flow objectives set forth in the Lower Dolores River Implementation, Monitoring and Evaluation Plan for Native Fish (IME Plan; American Whitewater et al. 2014) to determine the extent to which objectives set forth in the plan have been met. The IME Plan recommends flows to benefit native fish communities primarily through channel maintenance and optimal base flow conditions. Secondly, we examine non-listed native fish information collected prior to and following the 2009 PBO to examine potential effects on native fish found between McPhee Dam and the San Miguel River. Finally, we examine endangered fish data collected from a fish detection antenna deployed in the lowermost reaches of the Dolores River (below the San Miguel River) during 2013 -2017 in relation to hydrologic data and non-listed native fish information in an effort to infer potential benefits from flow management on endangered fish recovery.

While it seems clear that a small subset of endangered fish utilize the lower reaches of the Dolores River on a seasonal basis, available information appears insufficient to identify linkages between Reclamation's flow management at McPhee Dam and endangered fish recovery. This is due largely to limited amounts of fish detection antenna data and lack of a robust pre-IME Plan baseline data series on endangered fish use of the Dolores River. Also, endangered fish mostly occupy the lower reaches of the Dolores River where the hydrology is strongly controlled by the San Miguel River, which tends to obscure effects of the dam most of the time.

It appears that flows in the Slick Rock Canyon (Colorado) and extreme lower reaches of the Dolores River in Utah have met or surpassed a considerable number of IME Plan peak and base flow targets during the years 2012 – 2017, with considerable progress made in 2016 and 2017 when spill management achiev upper habitat maintenance thresholds throughout the system. In the lower Dolores River in Utah where endangered fish are most often encountered, IME Plan flushing flows occurred to some extent every year of the period considered, but as stated previously a majority of these flow volumes are attributed to the San Miguel River, not releases from McPhee Dam. Effects of the 2017 spill are still being evaluated at this time and should provide considerable insight into effects of these flows as they relate to non-listed native fish and their habitats in Colorado.

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Introduction

This report partially fulfills reporting requirements for conservation recommendations pertaining to the Dolores River in the Final Gunnison River Basin Programmatic Biological Opinion (PBO; U.S. Fish and Wildlife Service [Service] 2009). Specifically, the PBO states that Reclamation will assess and provide a report to the Service on the extent to which flow management on the Dolores River may contribute to endangered fish recovery. The conservation recommendations themselves consist of the following three elements:

1. [The Service] recommend(s) that Reclamation continue support efforts of the three species[1] conservation strategy on a range-wide basis, including conservation efforts on the Dolores River.
2. [The Service] recommend(s) that Reclamation continue to work with the Biology Committee to consider spill and flow management options to benefit the native fishery in the middle and lower Dolores River while continuing to honor commitments related to downstream rafting.
3. [The Service] recommend(s) that Reclamation continue to take an active role in the Dolores River Dialogue, in particular activities related to native fish.

Reclamation has been an active participant of the Dolores River Dialogue (DRD) since its inception in 2004, and is currently an active member of the Monitoring and Recommendation Team (MRT). The MRT provides management recommendations to Reclamation on releases to the lower Dolores River (from McPhee Dam to the confluence of the San Miguel River) for the native and non-native fishes and rafting. Reclamation also takes an active role in the Biology Committee in identifying base flow needs and possibilities. Annual base release water budgets are drafted by Colorado Parks and Wildlife and recommendations are made to project operators. More details of Reclamation's activities related to the three conservation recommendations listed above appear in a series of annual reports prepared by Reclamation since 2012 (see Appendix A).

While recommendations 1 – 3 above do not specifically mention separate activities for endangered species of fish, the Service acknowledged in the PBO that "improving the habitat for the three species of concern in the Dolores River will also improve habitat conditions for Colorado pikeminnow and potentially other endangered fish, because the Dolores River was historic habitat" (Service 2009). Pursuant to recommendation (2) above, then, the goal of this report is to "…assess and report the extent to which…flow management may contribute to endangered fish recovery" (Service 2009).

Background

The Dolores River (Figure 1) originates in the mountains of the San Juan National Forest in Southwestern Colorado and flows about 250 miles in a northwesterly direction before joining the Colorado River near the Dewey Bridge (Highway 128) in southeastern Utah. The river system

[1] The "three species" are roundtail chub *Gila robusta*, flannelmouth sucker *Catostomus lattipinis*, and bluehead sucker *Catostomus discobolus*.

drains a 4,574 mi² area in Colorado and Utah and is heavily regulated by McPhee Dam near Cortez, Colorado. Average annual discharge of the Dolores River declined from 504 cfs (as measured at Bedrock, CO) to about 240 cfs after dam construction in 1984. The lowermost reaches of the Dolores River receive considerable flow input (ca. 67%; Figure 2) from the San Miguel River on a year-round basis, which provides some aquatic habitat stability in those reaches.

The fish community of the Dolores River varies from cool- and cold-water species such as trout in the tailwaters of McPhee Reservoir to a predominantly warmwater community near the confluence with the Colorado River. Occurrence of native species has varied over time but most surveys usually include presence of flannelmouth sucker, bluehead sucker, roundtail chub, and speckled dace *Rhinycthes osculus*. These four species are most common in areas upstream of the Utah/Colorado state line, whereas the lower 22 miles of the Dolores River frequently includes a higher percentage of non-native fish species such as common carp *Cyprinus carpio* and channel catfish *Ictalurus punctatus.* Valdez et al. (1992) attributed this mix of native and non-native species to the proximity of the Colorado River, which functions as a source of both types of fish.

Occurrence of endangered fish species commonly found in the main-channel Colorado River (Colorado pikeminnow *Ptychocheilus lucius*, razorback sucker *Xyrauchen texanus*, humpback chub *Gila cypha* and bonytail *Gila elegans*) has historically been sporadic in the Lower Dolores Rivert due to lack of a standardized monitoring program. Observations of Colorado pikeminnow were made throughout the 1950's through the 1970's, but levels of abundance and other life history information is lacking. Valdez et al. (1982) failed to document the species in the Lower Dolores River, but Valdez et al. (1992) captured four specimens within 0.2 km of the Colorado River confluence. Observations of razorback sucker and bonytail are even more infrequent, and to our knowledge humpback chub have never been reported in the Dolores River.

A number of threats face the persistence of both non-listed native and endangered fish in the Dolores River, including water development, non-native fish proliferation, water quality, and other anthropogenic impacts. Thus, information regarding use of the Dolores River by these fish is useful in the development and implementation of conservation actions to ensure their persistence in the system.

Approach

In this report, we draw on three lines of evidence gathered during 2012 – 2017 to assess the extent to which flow management may have contributed to endangered fish recovery. First, we consider hydrologic data from 2012 through 2017 in relation to flow objectives set forth in the Lower Dolores River Implementation, Monitoring and Evaluation Plan for Native Fish (IME Plan[2]; American Whitewater et al. 2014) to determine the extent to which objectives set forth in the plan have been met. The IME Plan recommends flows to benefit native fish communities through channel maintenance, thermal modification, and providing optimal base flow conditions. We will examine Dolores River flow data collected at three locations: McPhee Dam (Reclamation 2018), USGS gauge 09168730 near Slick Rock, CO (USGS 2017a), the USGS

[2] The complex chronology of events which led to current Dolores River flow management in general and completion of the IME Plan in particular is described in annual reports found in Appendix A.

gauge near the Rio Mesa Center in Utah (USGS gauge 09180000; USGS 2017b), and the USGS San Miguel River near Uravan, Colorado (USGS 0917700; USGS 2017c).

Secondly, we examine non-listed native fish information collected prior to and following the 2009 PBO to examine potential effects on native fish found between McPhee Dam and the San Miguel River. Finally, we examine endangered fish data collected from a fish detection antenna deployed in the lowermost reaches of the Dolores River (below the San Miguel River) during 2013 -2017 in relation to hydrologic data and non-listed native fish information in an effort to infer potential benefits from flow management on endangered fish recovery.

IME Plan objectives

The IME Plan (American Whitewater et al. 2014) is a complex document which contains a myriad of guidelines and recommendations for flow and temperature management that should function to benefit the native fish community in the Dolores River, and readers are referred to that document for a more in-depth grasp of their scientific foundations and implementation guidance. For the purposes of this report, they are summarized as follows:

1. Spill management. Spill management is an essential component to facilitate multiple benefits to the downstream native fishery (specifically, geomorphic functions of flushing and habitat maintenance flows; maintenance of favorable thermal regime for native fish spawning and survival; and conservation of the base flow pool). Spill objectives vary according to each year's hydrology and are characterized by the following flow volume scenarios: 25KAF, 50KAF, 66 KAF, 100KAF, and 200KAF, which correspond to specific peak flow thresholds for channel maintenance and sediment transport (see #3, below).
2. Thermal modification. Sufficient flows are required in March and April of each year to suppress river temperatures and prevent spawning of native fish prior to peak flows for whitewater rafting. The concern is that offspring which hatch early would be subject to cold shock during the whitewater rafting peak flow period.
3. Sediment transport. Improved coordination of spill releases to meet sediment transport objectives would be beneficial to sediment transport and habitat maintenance. Generally, increases in the magnitude and frequency of spill events downstream of McPhee that restored pre-dam stream power would benefit transport capacity and habitats downstream. Flow thresholds are identified as follows: Flushing flows to mobilize fine sediment (400-800 cfs), flushing flows to mobilize D_{50}[3] particles in half of all riffles (800-2,000 cfs), habitat maintenance flows to mobilize D_{50} – D_{84} particles in most riffles (2,000 – 3,400 cfs), and habitat maintenance flows to provide overbank flooding and significant movement of D_{84} particles (>3,400 cfs).
4. Base flow management. Optimal base flows for native fishes range between 150 and 300 cfs, but in practice base flow recommendations range seasonally from 25 – 35 cfs (winter), 50 cfs (spring), 60 – 120 cfs (summer) and 40 – 60 cfs (fall).

[3] D50 and D84 refer to the particle size classes observed in the active stream channel or more specifically for habitat maintenance flows, in riffles. D50 indicates the median particle size in the sample (50% of the particles are smaller). D84 is a larger clast size indicating that 84% - approximately two standard deviations above the median in a normally distributed sample - are smaller.

While these objectives were developed for the Dolores River between McPhee Dam and the San Miguel River, we will consider them as benchmarks for the river below the San Miguel River as well, which means that contributions from the latter during the spring runoff period would compound effects of largely spill-driven dam releases from upstream. Benefits for native fish which accrue from spill objectives should apply to some extent to endangered fish habitat found below the San Miguel River, but this assumption has several serious limitations (see *Caveats*, below). We evaluate the years 2012 – 2017 for which there are annual reports describing operations and Reclamation's participation in Appendix A.

We do not consider the thermal modification objective in this report because the Dolores River thermograph in the region below the San Miguel River resembles a largely natural or unregulated pattern (i.e., dome-shaped over the course of a year; Figure 3). This is probably because thermal effects of releases from McPhee Dam are mostly attenuated due to the long distance from the dam and the modest release volumes during late winter and early spring. Temperatures in the lower river are also below 15°C during the months of March and April, so risk of premature spawning is accordingly low.

In addition to the mostly instream habitat-directed objectives listed above, the IME Plan also includes guidance to prevent escapement of non-native fish from McPhee reservoir. Smallmouth bass *Micropterus dolomieu* and Walleye *Sander vitreus* are prolific and significant predators on native fish, and both species occur in McPhee Reservoir. The IME Plan's recommendations to prevent escapement of these and other non-native fish from McPhee reservoir include two measures: Avoid using the spillway at McPhee Dam, and use of the lowermost reservoir outlet (either the bypass tubes or the lowest selective withdrawal outlet) during managed (spill) releases to avoid entraining non-native fishes. Such precautions have also been advocated by the Upper Colorado River Endangered Fish Recovery Program (Recovery Program) as a preventative step to minimize escapement in other settings (for example, Ridgeway Reservoir on the Uncompahgre River, CO).

Native fish surveys

The Colorado Division of Parks and Wildlife (CPW) has conducted periodic fishery sampling on the Dolores River between McPhee Dam and the San Miguel River for several decades. We obtained from CPW several presentations and annual reports on their findings circa 2008 and two more recent reports from 2016 and 2017, which were both years when McPhee Reservoir spilled (White 2008, 2016, 2017a, 2017b). Additionally, the Utah Division of Wildlife Resources (UDWR) sampled the fish community in the Utah portion of the Dolores River in 2005 (Walker et al. 2007) and 2013 (Keller and Hart 2014). This information will be considered in light of the available hydrology data as it relates to IME Plan flow objectives and also observations of endangered fish collected through passive remote methods (next section).

Endangered fish detections

In 2013, Reclamation installed a passive interrogation array (PIA) in the Dolores River on the property of the Rio Mesa Center (University of Utah), an outdoor teaching facility located about eight river miles upstream from the Colorado River. The system was fully operational by December 2014. The Rio Mesa PIA consists of two large (ca. 33 m by 1 m) antenna panels which are anchored to the Dolores River streambed and span its width. Except for occasional

power supply interruptions, the antennas continuously scan the Dolores River water column for the presence of fish implanted with passive internal transponder (PIT) tags, which are tiny (ca 12 mm) glass tags fitted with a transponder and microchip which, when activated by the antenna's transceiver, will return a unique 10-digit alphanumeric code to the system's data logger. The observations are time and date stamped and are downloaded remotely via cell or satellite modems. This technology affords mostly continuous 24/7 sampling for individual PIT-tagged fish. Detection efficiency is high but not perfect (usually about 80% based on observations from other systems). All fish stocked by the Recovery Program (bonytail, razorback sucker) are implanted with PIT tags, and a high percentage of wild-spawned fish (Colorado pikeminnow, humpback chub) contain tags as well.

Caveats

The approach outlined above considers three independent lines of evidence in an attempt to elucidate potential effects of flow management at McPhee Dam on the Dolores River endangered fish community. The lines of evidence were not collected with the intent to identify linkages between dam operations and response of endangered fish. Thus, for this reason and those outlined below, at present it will be very difficult if not impossible to draw sound scientific conclusions about effects of dam operations on endangered fish.

Prior to installation of the Rio Mesa PIA, standardized monitoring of endangered fish in the Dolores River occurred only sporadically, and monitoring of non-listed native fish and habitat in response to IME flows occurs in Colorado where endangered fish have not been documented in decades. Monitoring efforts conducted by the Recovery Program are predominantly confined to reaches of the Upper Colorado River Basin designated as critical habitat, which does not include the Dolores River. While the UDWR and CPW have conducted fish community surveys on the Dolores River over the years, sampling frequency has been low and sporadic, and to our knowledge none of them have yielded confirmed captures of endangered fish.

We also stress that the IME Plan flow thresholds were formulated to produce stream habitat improvements and maintenance in the river between McPhee Dam and the San Miguel River. Thus, the IME Plan flow targets should be considered as points of reference and not as targets which were formulated for the Dolores River below the San Miguel River. It would be convenient to assume that benefits from such flows would manifest in some form below the San Miguel River as well, but this assumption is weakened due to the following considerations. First, while spills from McPhee Dam to perform channel maintenance during the spring peak period have occurred very recently (2016 – 2017). Evaluation of the efficacy of such flows on geomorphic conditions in the river between the dam and the San Miguel River do not appear to be available at present, so it would be premature to speculate on effects of these spills on the McPhee/San Miguel River reach of the Dolores River. Second, making the assumption that IME Plan flows will perform a similar geomorphic function below the San Miguel River (where the overwhelming majority of endangered fish have been found) is itself problematic since the San Miguel River on average contributes the majority (67%; Figure 2) of flows to the Dolores River below the confluence of the two. Any geomorphic benefit to the Dolores River below the San Miguel River attributable to IME Plan flows would be significantly confounded by effects of San Miguel River flows as well as channel characteristics of the Dolores River below the confluence.

Finally, detection data collected by the Rio Mesa Center PIA are available for the years 2014 through 2017 and will be considered in this report. Given the generally long lifespan of endangered fish (ca. 10-30 years as adults), however, it could be unrealistic to expect a population level response in the time that has elapsed since the 2009 PBO, especially since the IME Plan has been in place since 2012 or 2014, and the Rio Mesa PIA has been operational only since 2014. Given this short period of record, the sporadic nature of other sampling efforts, and other limitations discussed above, directly linking response of endangered fish in the Dolores River below the San Miguel River to operations at McPhee Dam with a high level of scientific certainly would be very difficult if not impossible at the present time.

Dolores River flow management and IME Plan objectives, 2012 – 2017

In this section we describe annual operations of McPhee Dam in relation to IME Plan flow objectives and how successful those operations were in terms of meeting flow objectives for the Dolores River immediately below McPhee Dam (dam releases), near Slick Rock (CO) and at the Rio Mesa Center in Utah. We evaluate two sets of flow objectives: 1) Spill management and sediment transport flow objectives and 2) seasonal base flow objectives. The purpose of this discussion is to establish a set of expectations of habitat quality and maintenance resulting from meeting IME Plan flow objectives, with the assumption that more frequently the objectives are met, the more high quality aquatic habitat would be created and/or maintained and the net response of fish populations would be expected to be positive over time. We discuss operations and flows on a year-by-year basis.

2012

Water year 2012 was relatively dry and McPhee Reservoir did not spill. Sediment transport thresholds were not realized in the vicinity immediately below McPhee Reservoir (Figure 4) and flows near Slick Rock (Figure 5) exceeded the lower tier flushing flows threshold (400 cfs) for one day. At Rio Mesa Center, flows exceeded the upper tier flushing flows threshold (800 cfs) for nine days (Figure 6), mostly due to spring runoff flows from the San Miguel River (Figures 2, 7).

Base flow releases from McPhee Dam largely met the lower thresholds of all seasonal base flow objectives, and exceeded the summer base flow minimum (60 cfs) for most of June – August (Figure 8). Flows at Slick Rock and Rio Mesa Center also exceeded seasonal base flow targets most of the time.

2013

Water year 2013 was extremely dry in the Dolores River basin and the reservoir did not spill. Project water allocations received only a 26% supply. The downstream releases volume was 8,163 AF.

No sediment transport flow objectives were met in the vicinity of McPhee Dam (Figure 4), but the lower flushing flow threshold (400 cfs) near Slick Rock was exceeded for two days (Figure 5). Lower tier flushing flow thresholds were exceeded for 36 days at the Rio Mesa Center (again mostly due to runoff from the San Miguel River; Figures 2, 6, 7) and the upper flushing flow threshold (800 cfs) was exceeded for one day.

No seasonal base flow objectives were met in 2013 at McPhee Dam (Figure 9). Summer flows near Slick Rock were erratic due to flash flood activity, so base flow thresholds were exceeded sporadically throughout much of the summer period. Flows at the Rio Mesa Center were mostly above base flow targets for much of the year.

2014

McPhee Reservoir did not spill in 2014. Project water allocations received a nearly full supply, and the downstream releases volume was 26,392 AF.

No sediment transport flow objectives were met in the vicinity of McPhee Dam (Figure 4), but the lower flushing flow threshold was exceeded for one day near Slick Rock (Figure 5), and for 99 days at the Rio Mesa Center (again mostly due to contributions from the San Miguel River; Figures 2, 6, 7) where the upper flushing flow threshold was also exceeded for 33 days.

Base flow releases from McPhee Dam were below the 50 cfs recommendation for the months of March and April, and dipped below the summer objective in July, and a similar pattern was observed near Slick Rock (Figure 10). Flows at Rio Mesa Center exceeded seasonal base flow targets most of the time.

2015

McPhee Reservoir did not spill in 2015. Project water allocations received a full supply. The downstream releases volume was 31,798 AF.

No sediment transport flow objectives were met in the vicinity of McPhee Dam, but the lower flushing flow threshold was exceeded for one day near Slick Rock (Figure 5) and was exceeded or 86 days at the Rio Mesa Center (again mostly due to flows from the San Miguel River; Figures 2, 6, 7). The upper flushing flow threshold was exceeded for 51 days at the Rio Mesa Center and the lower habitat maintenance flow threshold (2,000 cfs) was exceeded for three days.

Base flow releases from McPhee Dam were below flow objectives for March and April (50 cfs) but exceeded the summer base flow minimum (60 cfs) for most of June – August (Figure 11); a similar pattern was observed near Slick Rock. Flows at Rio Mesa Center exceeded seasonal base flow targets most of the time.

2016

In 2016 McPhee Reservoir spilled 27,037 acre feet as well as provided a full project water supply of 31,798 acre feet below McPhee Dam.

The lower flushing flow threshold was exceeded for 16 days in the vicinity of McPhee Dam, and the upper threshold was exceeded for 7 days (Figure 4). The lower flushing flow threshold was exceeded for 17 days near Slick Rock (Figure 5), and the upper threshold was exceeded for eight days. Lower flushing flow thresholds were exceeded for 119 days at the Rio Mesa Center (again mostly due to runoff from the San Miguel River; Figures 2, 6, 7), the upper flushing flow threshold was exceeded for 76 days, and the lower habitat maintenance flow threshold was exceeded for 11 days.

Base flow releases from McPhee Dam largely met the lower thresholds of all seasonal base flow objectives, and exceeded the summer base flow minimum (60 cfs) for most of June – August

(Figure 12). Flows near Slick Rock were below the lower threshold during August through the following fall. Flows at the Rio Mesa Center exceeded seasonal base flow targets most of the time.

2017

In 2017 McPhee Reservoir spilled 204,908 AF as well as provided a full Project water supply of 31,798 AF below McPhee Dam.

Immediately below McPhee Dam, all sediment transport flow thresholds were exceeded for 80, 63, 7 and 4 days for the both the lower and upper flushing flow thresholds and the lower and upper (3,400 cfs) habitat maintenance flow thresholds, respectively (Figure 4); a nearly identical distribution of exceedances was also observed near Slick Rock (Figure 5). Flows at the Rio Mesa Center exceeded all sediment transport thresholds for 140, 107, 43 and 5 days at the lower and upper flushing flow thresholds and the lower and upper habitat maintenance flow thresholds, respectively (Figure 6).

Base flow releases from McPhee Dam largely met the lower thresholds of all seasonal base flow objectives, as did flows near Slick Rock and the Rio Mesa Center (Figure 13).

Operations to prevent escapement of nonnative fish from McPhee Reservoir

Reclamation has been working with CPW since McPhee Reservoir filled to minimize non-native fish escapement by using the lower levels of the Selective Level Outlet Works and making releases from the bottom of the reservoir. Consistent with the IME Plan, Reclamation also plans their spring spill management operations such that the spillway has never been used except for 1996 when river outlet works were repaired[4]. Thus, chances of spillway escapement of invasive predators in the upper portions of the water column (such as smallmouth bass and walleye) have been minimized (Vern Harrell, Reclamation [retired], personal communication). Secondly, Reclamation releases all water from McPhee Reservoir through the lowermost selective withdrawal gate which is most commonly below the level of thermal stratification in summer months, so chances of cool- and warm water invasive fish escapement are likewise reduced. These two management actions have been recommended by the Recovery Program as a best management practice to hedge against escapement of nonnative fish, and the policy has been implemented informally in other settings in the river basin such as Ridgeway Reservoir in Colorado. To date, CPW netting operations at the outlet of the McPhee Dam powerplant have yielded little evidence of nonnative fish escapement beyond occasional eviscerated fish carcasses.

Finally, in 2017, CPW worked closely with Reclamation to time spills from McPhee Reservoir to coincide with the smallmouth bass spawning period, which may have disrupted their spawning period in the Dolores River (see next section). A similar proposal to curtail smallmouth bass production is currently being considered by Reclamation below Flaming Gorge Dam. In addition to fish surveys in 2017, a major monitoring effort for riparian and stream geomorphology resources was launched in an attempt to document effects of the 4,000 cfs spill from McPhee Reservoir. This information, while forthcoming, is very likely to shed light on the degree of instream habitat improvement occurred as a result of the 2017 spill.

[4] Smallmouth bass escaped from McPhee Reservoir at this time (V. Harrell, personal communication).

Native Fish Surveys

White (2008) summarized historical fishery information from the Dolores River below McPhee dam in relation to more recent surveys conducted by CPW in 2007 and 2008. He characterized the fish community as varying from mostly cold- or cool water non-native species in the Bradfield – Dove Creek reach to a predominantly warm water, mixed native and non-native fish community in the vicinity of the San Miguel River. The community at the Bradfield – Dove Creek reach was comprised mostly of cold water brown trout *Salmo trutta* and rainbow trout *Oncorhynchus mykiss*. During 2007-2008, the warm water-preferring smallmouth bass appeared in the community between Pyramid Mountain and Slick Rock Canyon; the latter was comprised overwhelmingly of native species (roundtail chub, flannelmouth sucker), although fish density was sparse. The Gateway to Utah state line reach was comprised of all three species of concern (flannemouth and abundant bluehead sucker, few roundtail chub), although common carp and channel catfish were also present.

Trends in native fish abundance over time are less clear. Whereas long-term catches of roundtail chub at the Dove Creek pump station do not display a strong positive or negative trend (Figure 14), more recent (but prior to the 2009 PBO) information from the Big Gypsum reach suggests a more negative trajectory for all three species of concern through 2008 (Figure 15). Anderson (2005) concluded that sedimentation appeared to have increased suitable habitat for black bullhead *Ameiurus melas* and he further speculated that predation by a large bullhead population could be responsible for the reduced flannelmouth sucker and roundtail chub abundance in 2004.

Results from CPW surveys in 2016 and 2017 seemingly yielded more positive results from a native fish standpoint than prior to 2008. In 2016, juveniles of native suckers appeared in the sampling for the seventh year in a row, and for the first time smallmouth bass and non-native white sucker *Catostomus commersoni* were absent from the Dove Creek and Ponderosa Gorge reaches (White 2016). However, impacts from regulation—mainly diminished peak flow magnitude and frequency—were still very obvious, as evidenced by narrow channels and dense vegetation on mid-channel islands.

Sampling continued in 2017, which was the second year in a row McPhee Dam had spilled and provided opportunities for extensive sampling using electrofishing rafts (White 2017a, 2017b). In Slick Rock Canyon, electrofishing catch per unit effort (CPUE) during the 2017 sampling was 0.43 fish/minute compared to 0.22 fish/min in 2007, and the overwhelming majority of fish were native species (95%). Evidence of a large juvenile roundtail chub cohort was also documented, as was some evidence of diminished smallmouth bass reproduction (only 2% of young-of-year catch) as a result of higher than average summer flows. No endangered fish were collected in any CPW survey we reviewed.

While it is tempting to ascribe these mostly positive findings to implementation of IME Plan flows, it must be remembered that those flows have only been implemented for a few years, and within years the degree of success in reaching each objective is variable (see previous section). Also, White (2017b) cautioned that lasting, positive effects of increased juvenile native fish abundance may not be realized for several years which is typical of long-lived fish such as the three species of concern. Some of the positive signs of population stability such as consistent appearance of juvenile fish had been observed prior too implementation of IME flows.

In the Utah portion of the Dolores River, Walker et al. (2007) documented an increase in percentages of native fish since the early 1990's (Valdez et al. 1992) from 29% to 43% in 2006. The fish community was comprised mostly of native suckers (flannelmouth and bluehead suckers), roundtail chub and speckled dace. Keller and Hart (2013) documented roughly the same percentage and composition of the native fish community in 2013. No endangered fish were encountered in either of these two recent studies.

Recent PIT tag data collected by the Rio Mesa Center PIA near the confluence of the Dolores and Colorado rivers suggests a sizeable number of suckers tagged in Colorado freely move between the upper and lower reaches of the Dolores River. In particular, in recent years many bluehead suckers tagged by CPW in the Uravan area on the San Miguel River were subsequently detected near the Dolores River confluence with the Colorado River, suggesting that the native sucker population could be more connected to the greater Colorado River system than previously thought (White 2017a).

Endangered Fish below the San Miguel River

Between November 2013 and October 2017, the Rio Mesa Center PIA detected 1,013 individual PIT-tagged fish consisting of 658 bonytail, 134 bluehead sucker, 74 flannelmouth sucker, 30 razorback sucker, 26 Colorado pikeminnow, 16 roundtail chub and 8 flannelmouth/razorback sucker hybrids. An additional 67 unidentified fish were also detected. Most Colorado pikeminnow were detected in the Dolores River during the months of June through September (Figure 16), whereas razorback sucker tended to appear in the river during the months of March through May (Figure 17). Except for anecdotal observations, detections of Colorado pikeminnow during 2015-2017 represent the first substantiated evidence of this species occurring in the Dolores River since 1991. Bonytail detections appeared to be most frequent immediately following stocking events in the Dolores River in 2014 and 2016 (Figure 18).

The timing of Colorado pikeminnow and razorback sucker detections in the Dolores River suggests usage to fulfill potentially one or more life history requirements. Use of the Dolores River by Colorado pikeminnow during the months of May and June are consistent with known spawning periods in other locations and were associated with the onset of favorable spawning temperatures (16 – 19°C; Muth et al. 2000). Occurrence over the course of the summer months (late June – September) could represent periods of feeding activity. Of the 26 Colorado pikeminnow detected in the Dolores River, seven (27%) had visited the tributary in two of the three years the species was detected, and one fish (4%) was detected in the tributary over three consecutive years (2015 – 2017). Consistent and sometimes repeated usage of the Dolores River suggests that the system could be important to some subset of the Upper Colorado River population.

Razorback sucker detection in the river occurred primarily on the increasing limb or the peak spring runoff flows, behavior which is very consistent with their known spawning biology (McAda and Wydoski 1980; Tyus 1987; Modde and Wick 1997). Temperatures in the Dolores River during the peak flow period (ca. 12°C) are also consistent with thermal attributes of spawning or movement associated with spawning (Tyus and Karp 1990). No sampling for larval drift occurred in the Dolores River during those years, however, so levels of spawning success cannot be assessed.

Among bonytail, there were a few examples of individual fish detected in the tributary two or three years after stocking, but overall retention of these fish in the Dolores River was low (less than 1% of each stocking event remained in the tributary). These low rates of return are similar to survival rates of individual cohorts stocked elsewhere in the Colorado River Basin.

Conclusions

While it seems clear that a small subset of endangered fish utilize the lower reaches of the Dolores River on a seasonal basis, available information appears insufficient to identify linkages between Reclamation's flow management at McPhee Dam and endangered fish recovery. This is due largely to limited data from the Rio Mesa PIA and lack of a robust pre-IME Plan baseline data series on endangered fish use of the Dolores River. Also, endangered fish mostly occupy the lower reaches of the Dolores River where the hydrology is strongly controlled by the San Miguel River, which tends to obscure effects of the dam most of the time.

It appears that flows in the Slick Rock Canyon and Rio Mesa Center reaches of the Dolores River have met or surpassed a considerable number of IME Plan peak and base flow targets during the years 2012 – 2017, with considerable progress made in 2016 and 2017 when spill management succeeded in achieving upper habitat maintenance thresholds in both Slick Rock Canyon and the Rio Mesa Center. At the latter site, where endangered fish are most often encountered, IME Plan flushing flows occurred to some extent every year of the period considered, but as stated previously a majority of these flow volumes are attributed to the San Miguel River, not releases from McPhee Dam. Effects of the 2017 spill are still being evaluated at this time and should provide considerable insight into effects of these flows as they relate to non-listed native fish and their habitats in Colorado.

Recommendations

Channel maintenance and modification form the basis of flow recommendations for endangered fish developed by the Recovery Program for all regulated reaches of the Colorado River basin. Efforts on the part of the CPW, Reclamation and district managers in the Dolores River Basin to meet IME Plan targets when hydrologic conditions permit are consistent with the Recovery Program's approach to recovery as it involves habitat improvement through channel maintenance and modification. If IME Plan flow objectives prove to accomplish what they were intended to do for the Dolores River and native fish, we recommend continuation of efforts to meet those objectives.

Continued efforts to remove and otherwise manage smallmouth bass abundance (including Reclamation's efforts to minimize escapement of non-native fish from McPhee Reservoir and CPW's smallmouth bass removal efforts) are at least as important as implementation of IME Plan flows in the continued campaign to make the Dolores River friendly to non-listed native and endangered fish. The Recovery Program has identified non-native fish as the most significant hurdle to endangered fish recovery, so efforts to address this threat in the Dolores River should continue and perhaps expanded.

The Dolores River has attracted the attention of the Recovery Program in recent years due to usage of its lower reaches by endangered fish, as a promising stocking location for bonytail, and as a source of undesirable smallmouth bass. If funding permits, the Rio Mesa PIA should thus

continue to be operated for the foreseeable future and continue the endangered fish period of record for the Dolores River, including relative success of bonytail stocking therein.

Acknowledgements

The author thanks Lesley McWhirter and Vern Harrell for their review and comments on drafts of this document.

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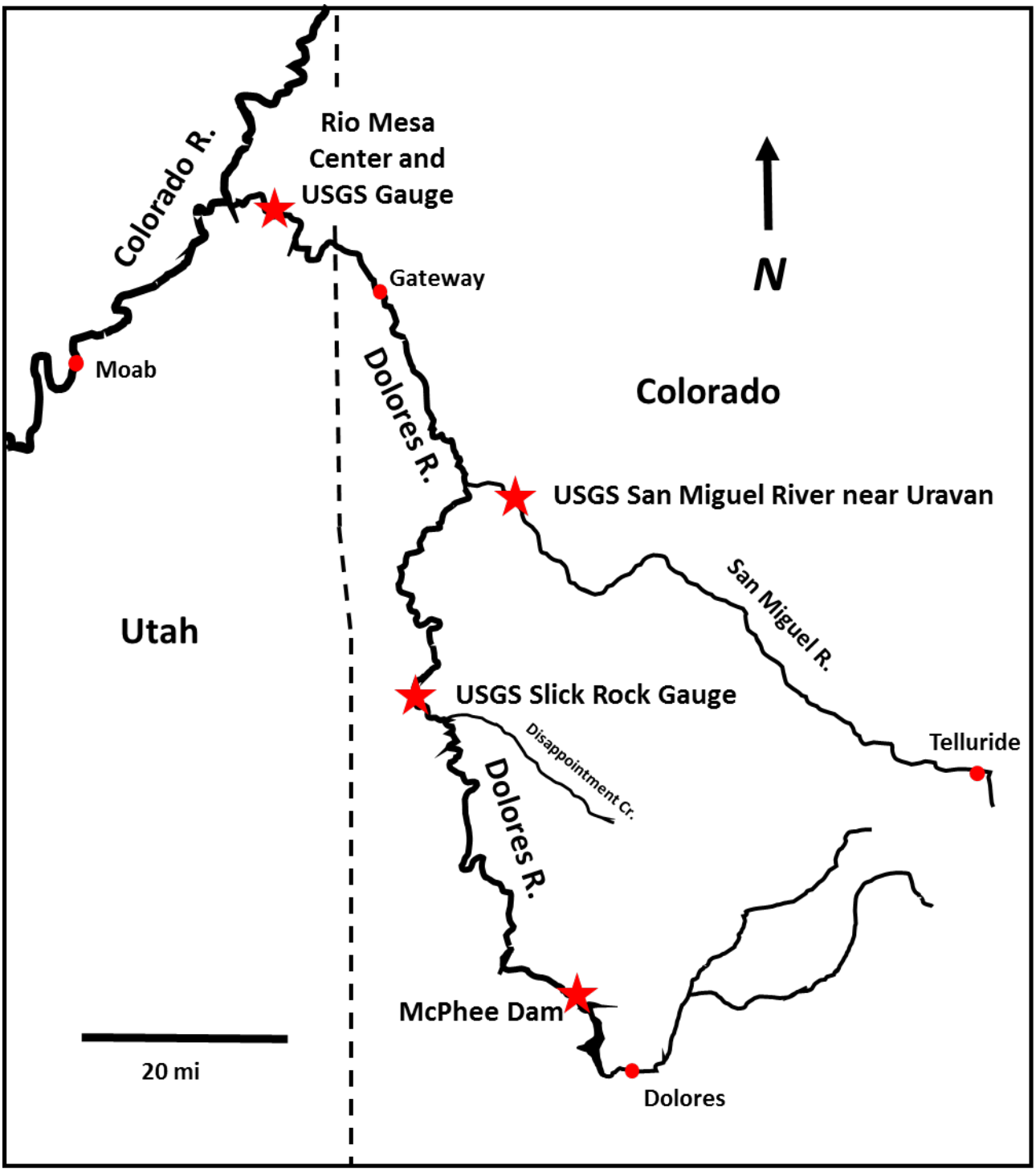


Figure 1. Dolores River, southwestern Colorado, showing key stream gauge locations at McPhee Dam and USGS gauges near Slick Rock, Colorado and Rio Mesa Center in Utah.

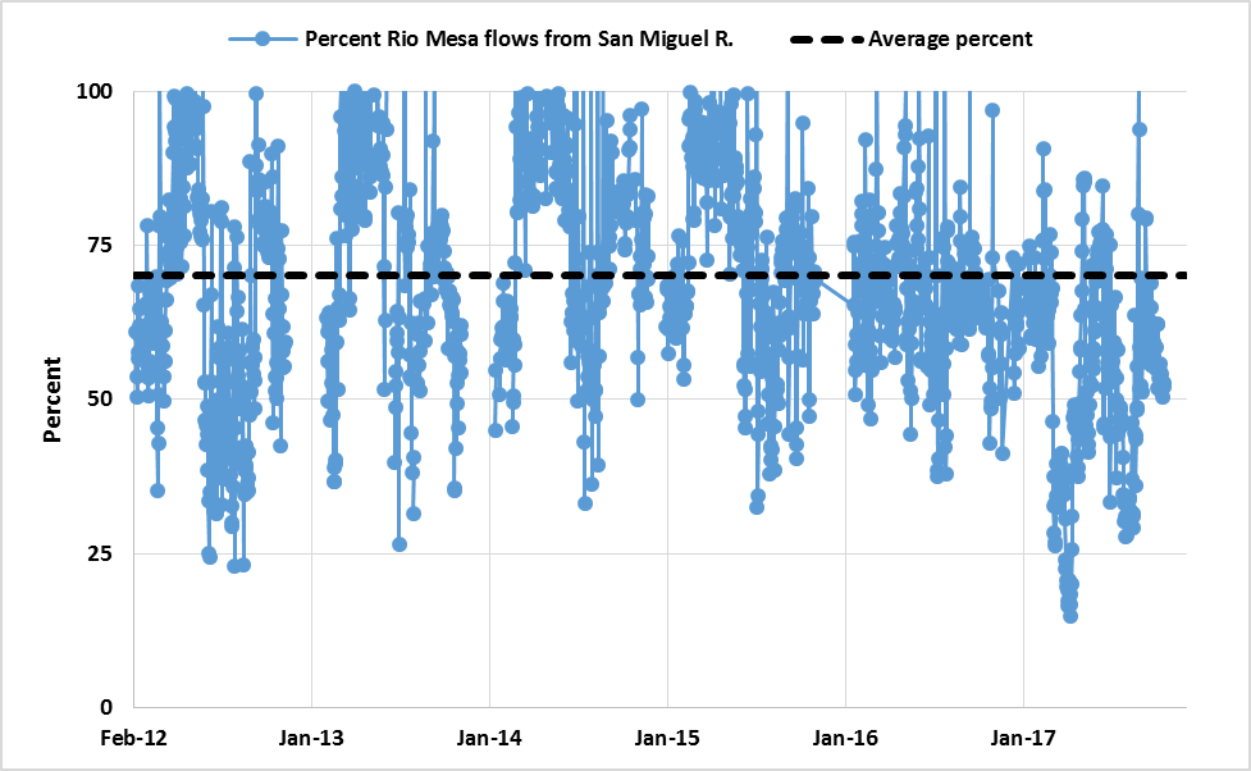


Figure 2. Percentage of flows measured at the Rio Mesa Center, UT which are attributed to flows measured at the USGS San Miguel River gauge near Uravan, CO. Dashed line indicates average percentages from the years 2012 through 2017.

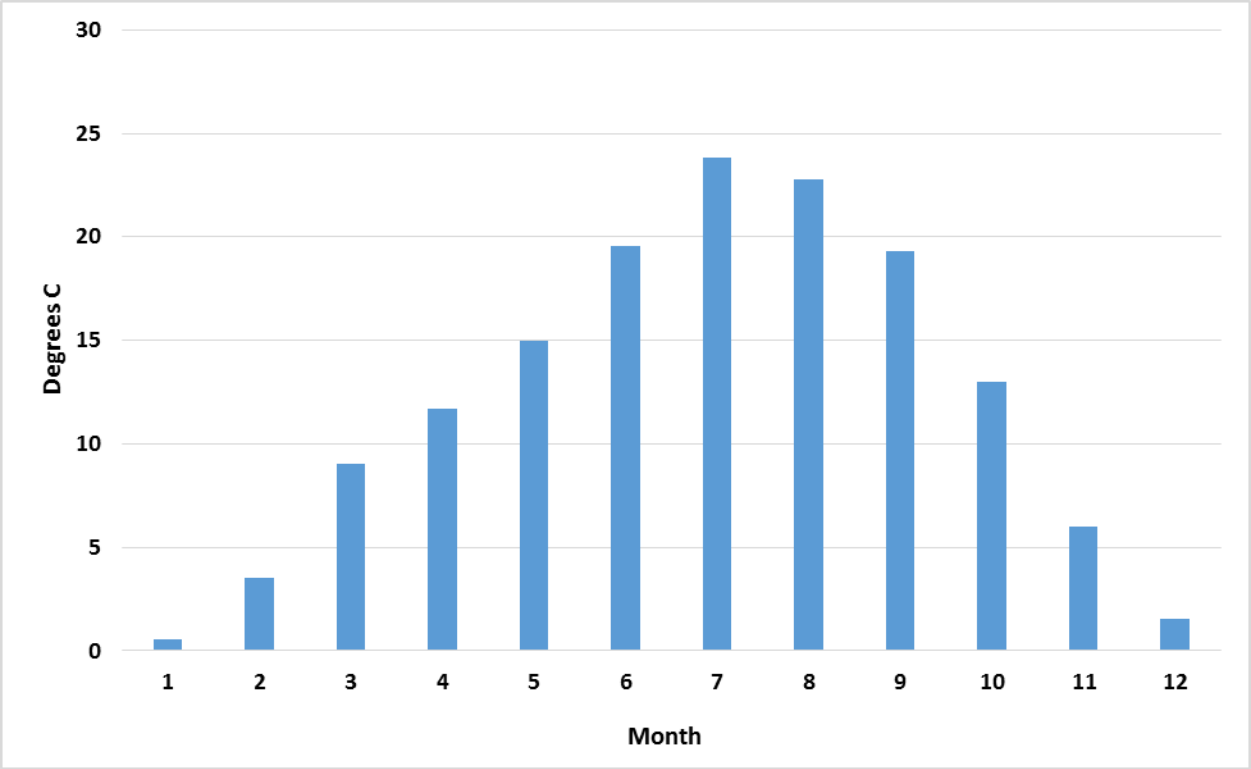


Figure 3. Dolores River temperatures (°C) measured at USGS gauge 09180000 near the Rio Mesa Center, UT. Data represent the 2012 – 2017 average and are available at https://waterdata.usgs.gov/ut/nwis/uv?site_no=09180000, accessed February 2018.

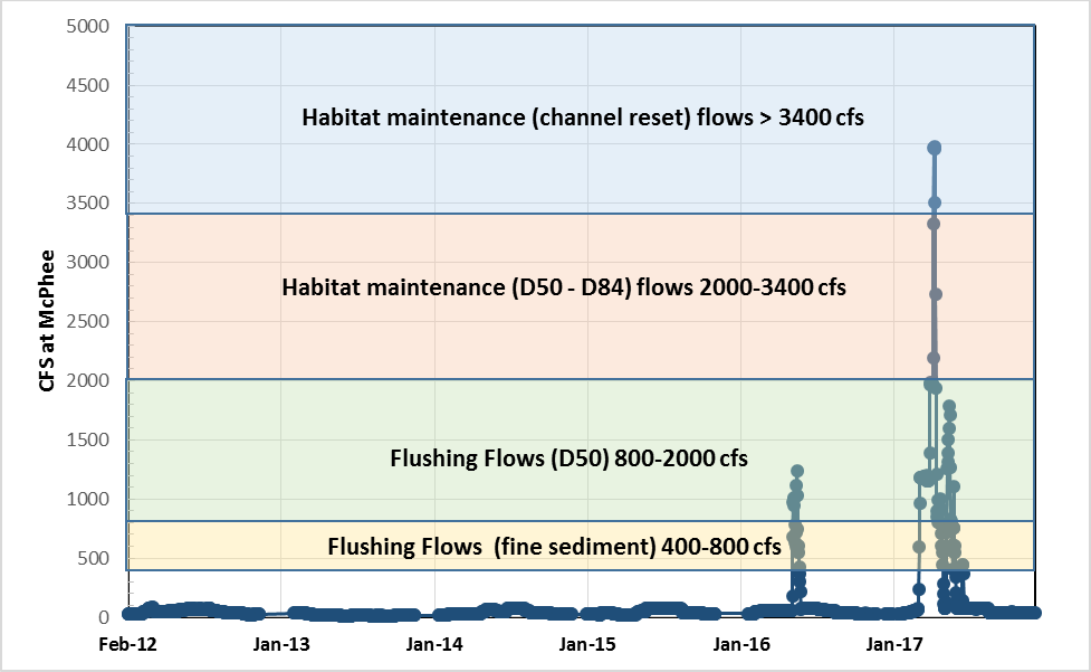


Figure 4. Releases (cubic feet per second, cfs) from McPhee Dam near Dolores, CO in relation to IME Plan flow objectives during the years 2012 – 2017. Data are from Reclamation (https://www.usbr.gov/rsvrWater/HistoricalApp.html, accessed March 2018.

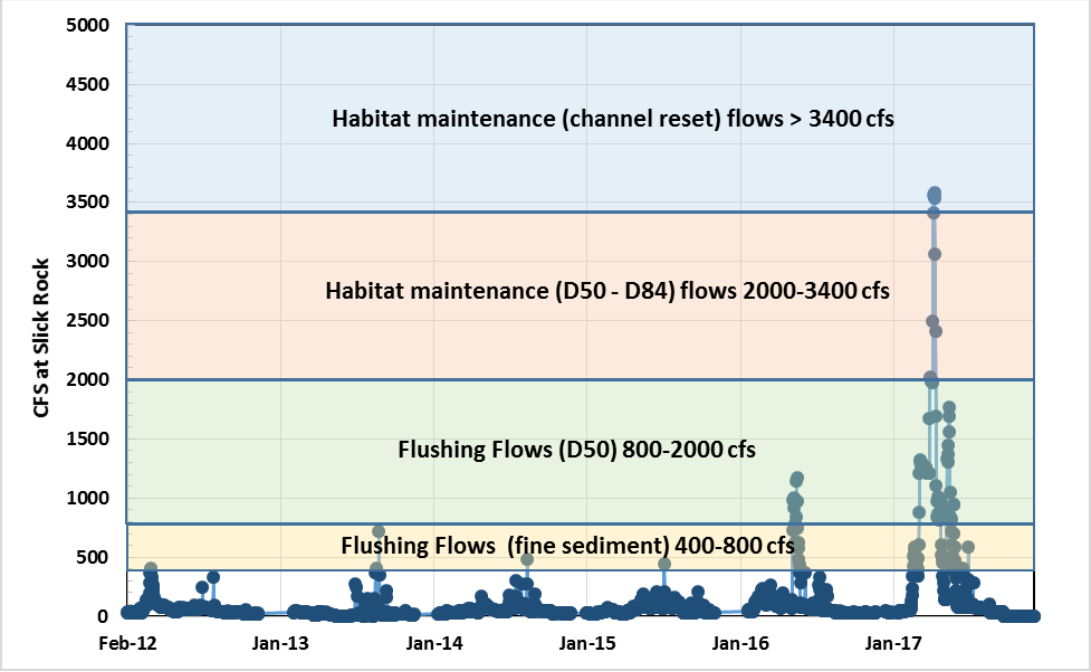


Figure 5. Dolores River flows (cfs) measured at USGS gauge 09168730 near Slick Rock, CO in relation to IME Plan flow objectives during 2012 – 2017. Data are from https://waterdata.usgs.gov/co/nwis/uv?site_no=09168730, accessed October 2017.

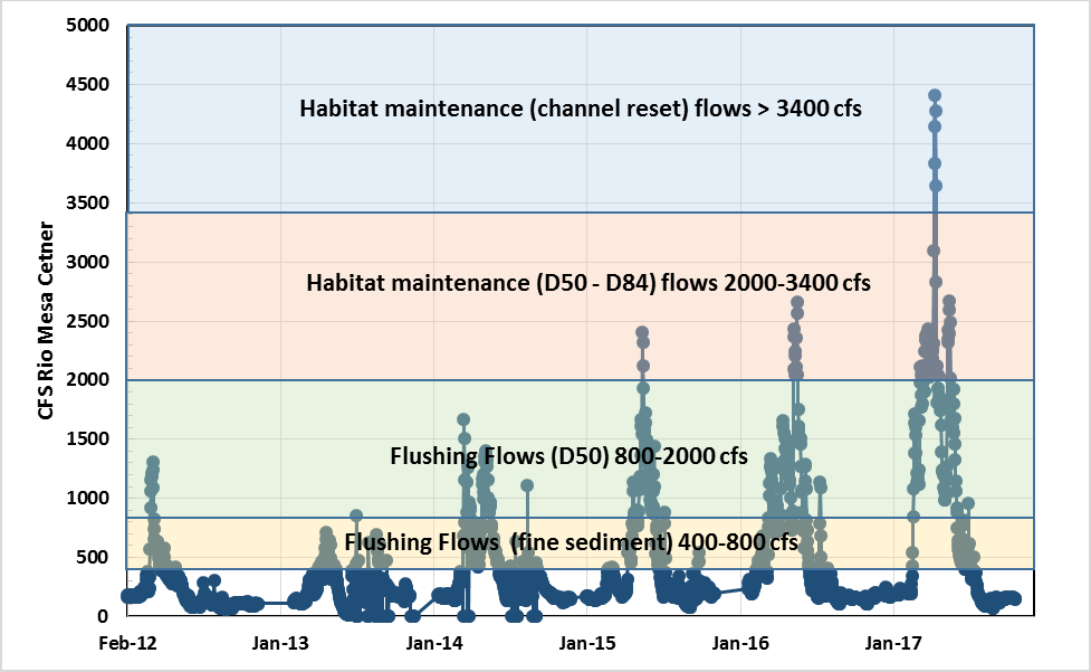


Figure 6. Dolores River flows (cfs) measured at USGS gauge 09180000 near the Rio Mesa Center, UT in relation to IME Plan flow objectives during 2012 – 2017. Data are from https://waterdata.usgs.gov/co/nwis/uv?site_no=09180000, accessed October 2017.

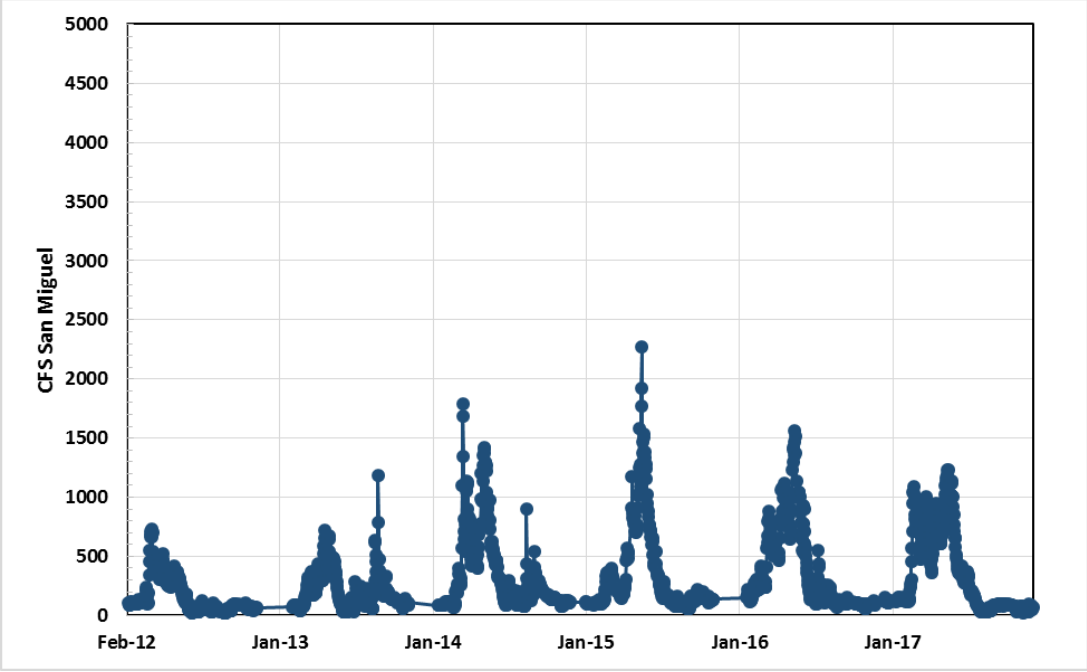


Figure 7. San Miguel River flows (cfs) measured at USGS gauge 09177000 near Uravan, CO during 2012 – 2017. Data are from https://waterdata.usgs.gov/co/nwis/uv?site_no=09177000, accessed October 2017.

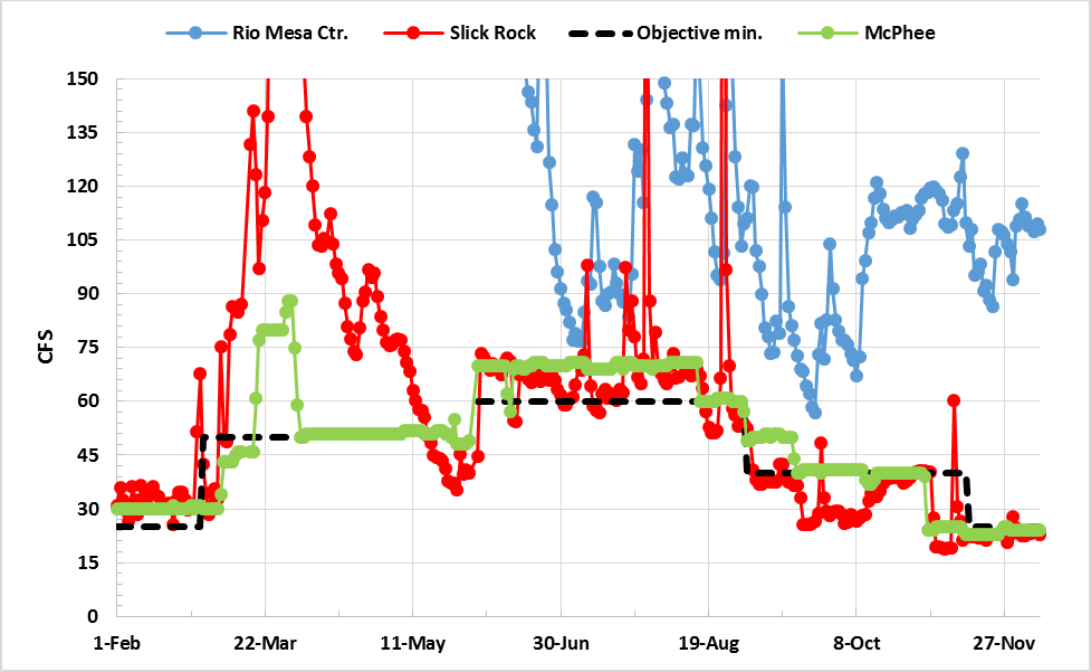


Figure 8. Dolores River base flows (≤150 cfs only) during 2012 at McPhee Dam (green), Slick Rock (red) and Rio Mesa Center (blue). Minimum IME Plan flow threshold for native fish habitat is shown in coarse dashed line.

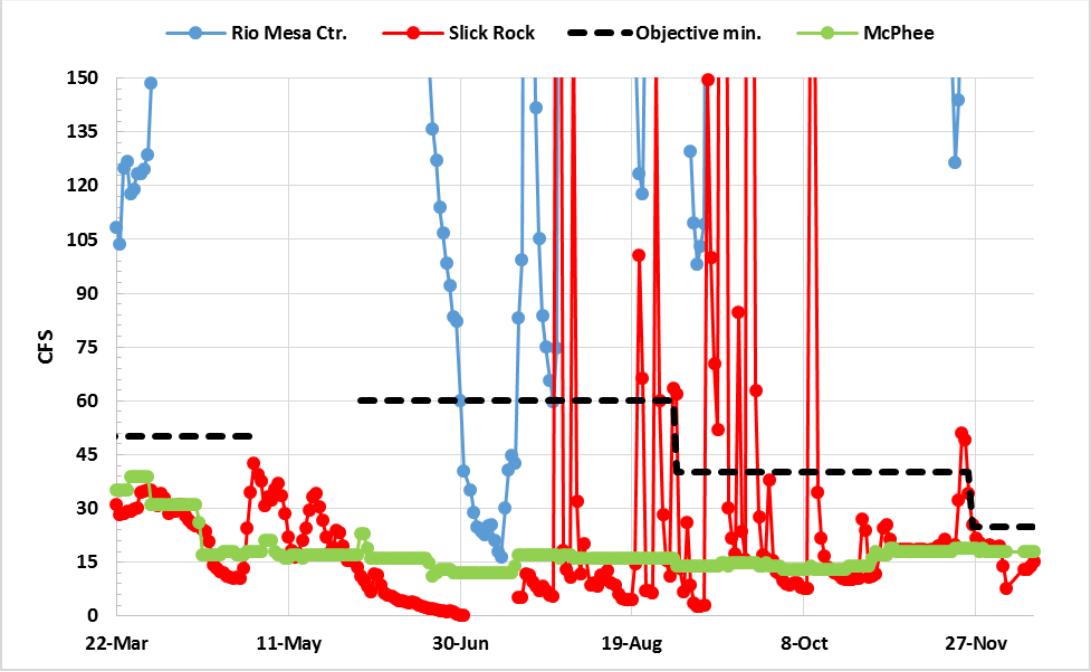


Figure 9. Dolores River base flows (≤150 cfs only) during 2013 at McPhee Dam (green), Slick Rock (red) and Rio Mesa Center (blue). Minimum IME Plan flow threshold for native fish habitat is shown in coarse dashed line.

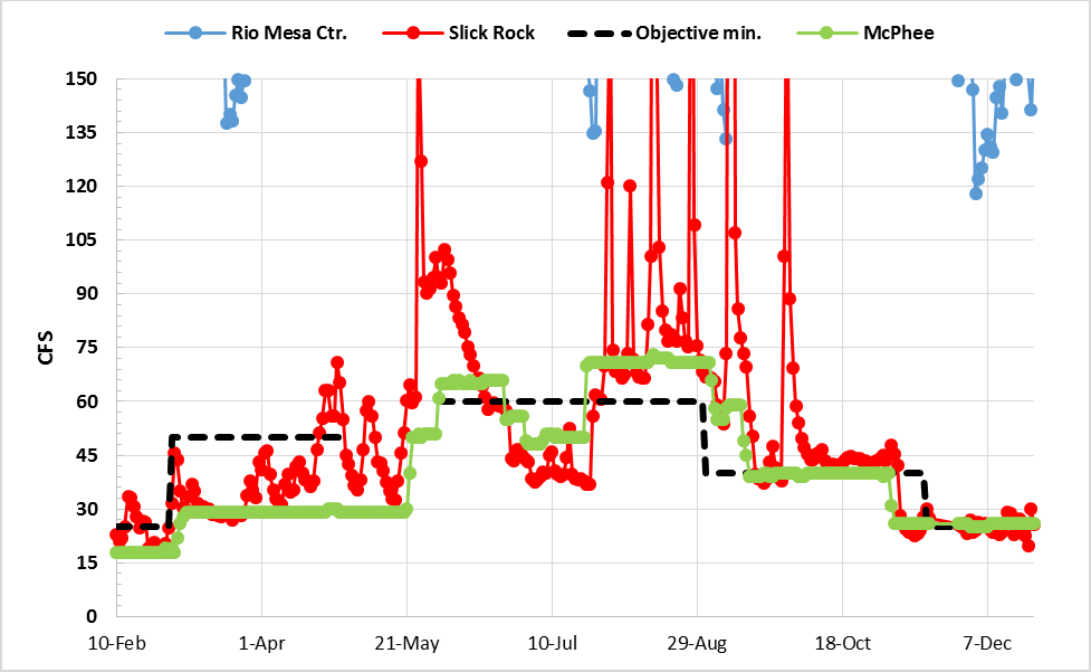


Figure 10. Dolores River base flows (≤150 cfs only) during 2014 at McPhee Dam (green), Slick Rock (red) and Rio Mesa Center (blue). Minimum IME Plan flow threshold for native fish habitat is shown in coarse dashed line.

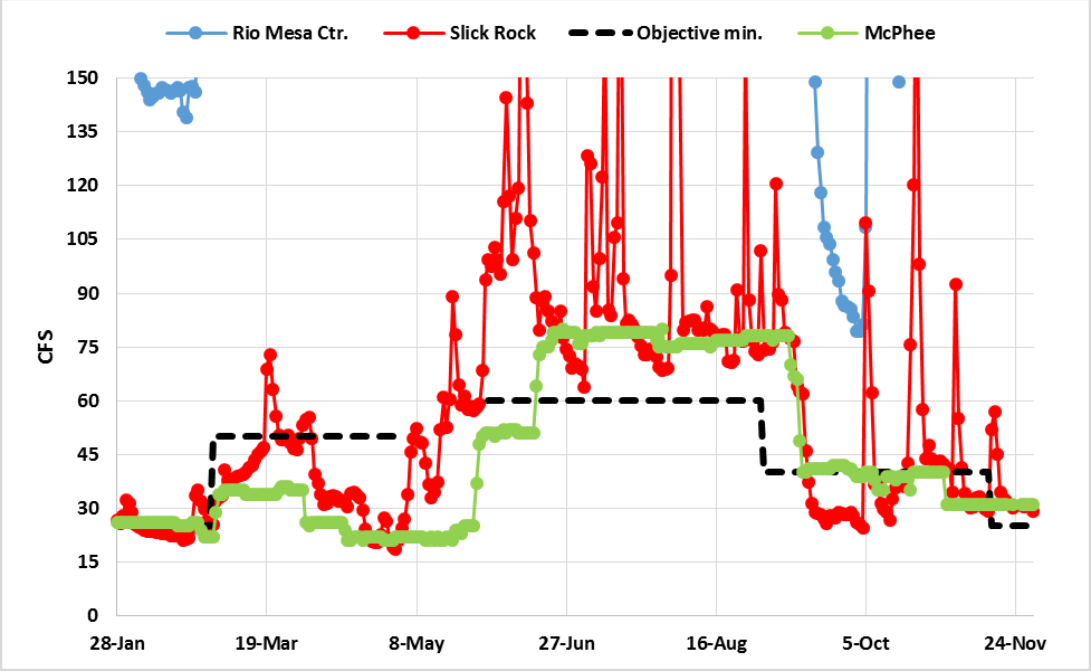


Figure 11. Dolores River base flows (≤150 cfs only) during 2015 at McPhee Dam (green), Slick Rock (red) and Rio Mesa Center (blue). Minimum IME Plan flow threshold for native fish habitat is shown in coarse dashed line.

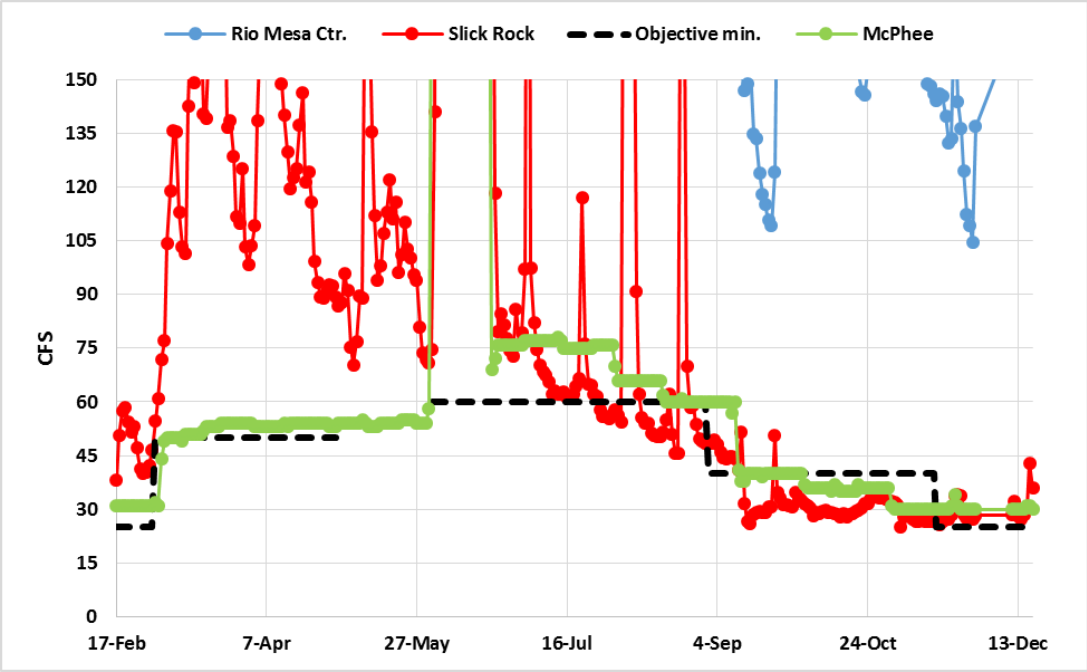


Figure 12. Dolores River base flows (≤150 cfs only) during 2016 at McPhee Dam (green), Slick Rock (red) and Rio Mesa Center (blue). Minimum IME Plan flow threshold for native fish habitat is shown in coarse dashed line.

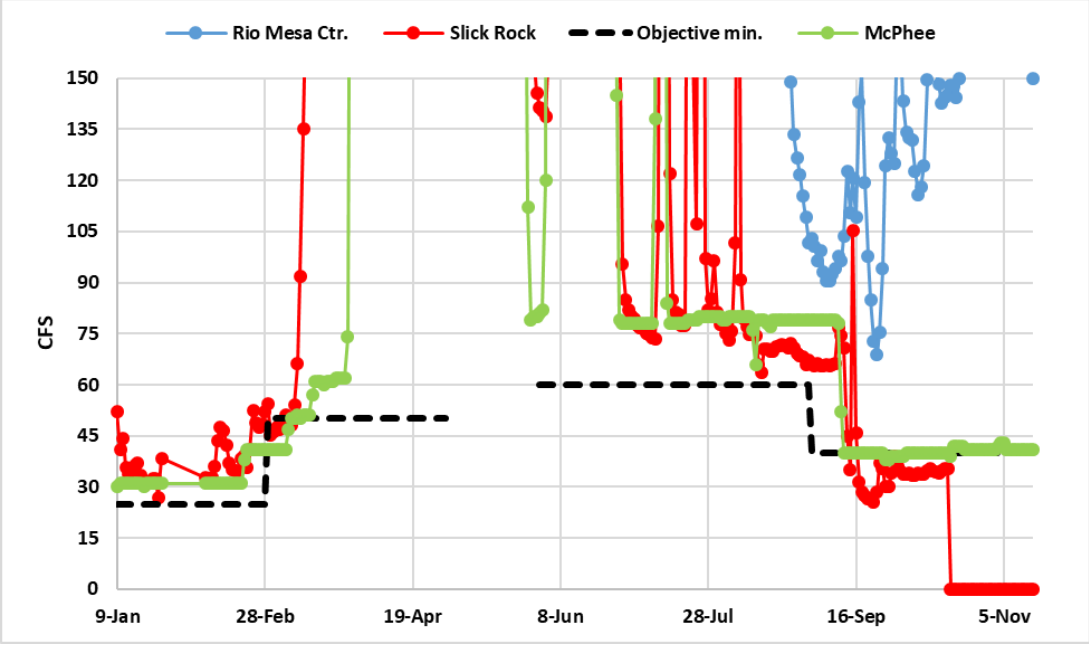


Figure 13. Dolores River base flows (≤150 cfs only) during 2017 at McPhee Dam (green), Slick Rock (red) and Rio Mesa Center (blue). Minimum IME Plan flow threshold for native fish habitat is shown in coarse dashed line.

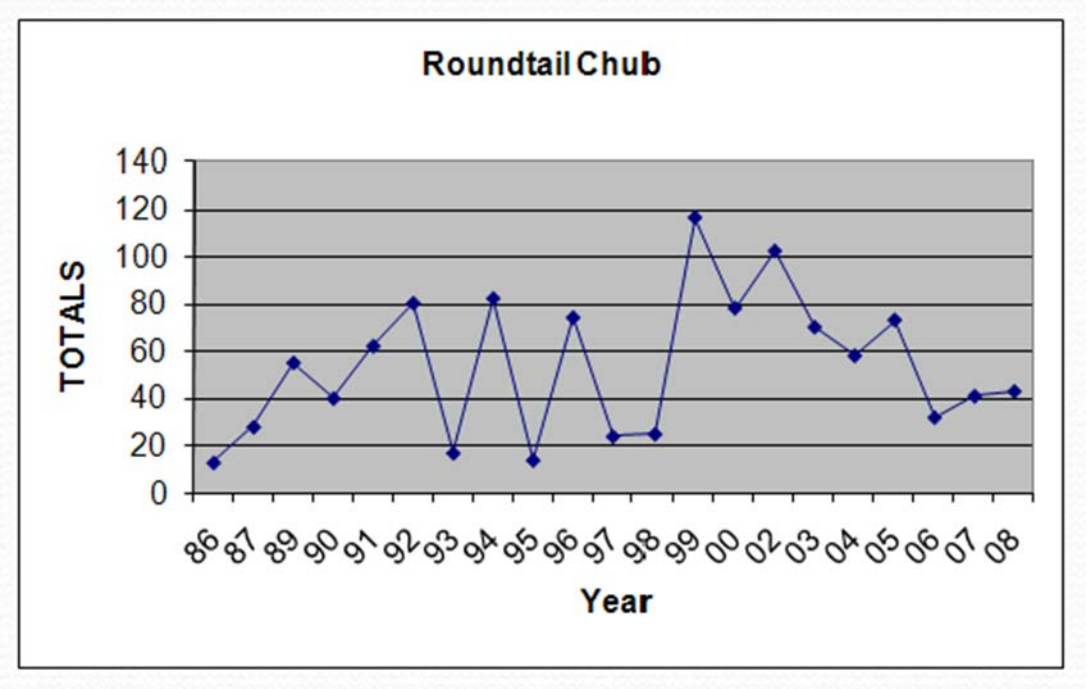


Figure 14. Total captures of roundtail chub in the Dolores River near the Dove Creek Pump Station, 1986-2008. Data courtesy of Jim White, Colorado Division of Parks and Wildlife.

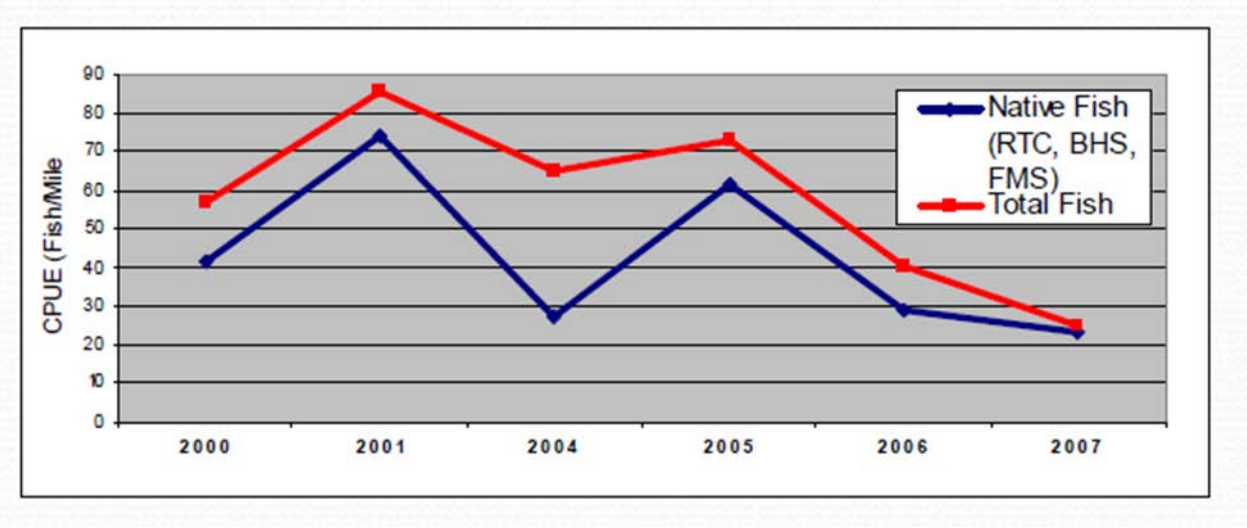


Figure 15. Catch-per-unit-effort of native fish (roundtail chub, bluehead sucker, flannelmouth sucker) in relation to total fish captured, Big Gypsum reach of the Dolores River, 2000-2017. Data courtesy of Jim White, Colorado Division of Parks and Wildlife.

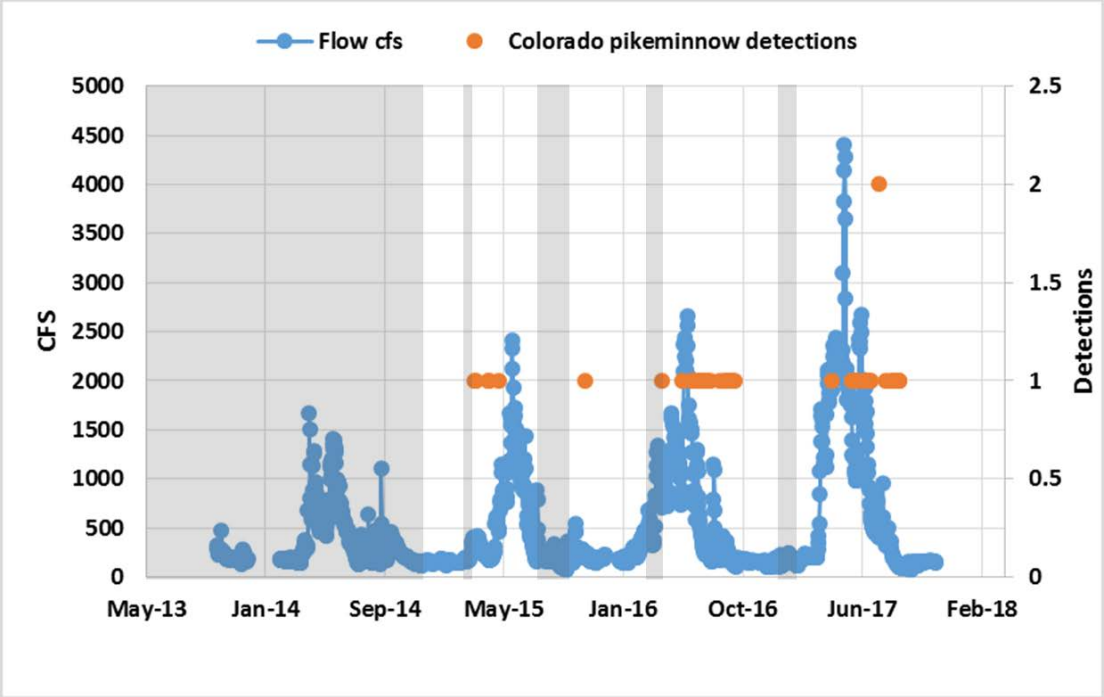


Figure 16. Detections of Colorado pikeminnow (orange symbols, right axis) in relation to flows (cfs) at the Rio Mesa Center, 2014 – 2017. Shaded areas indicate periods when PIA was offline.

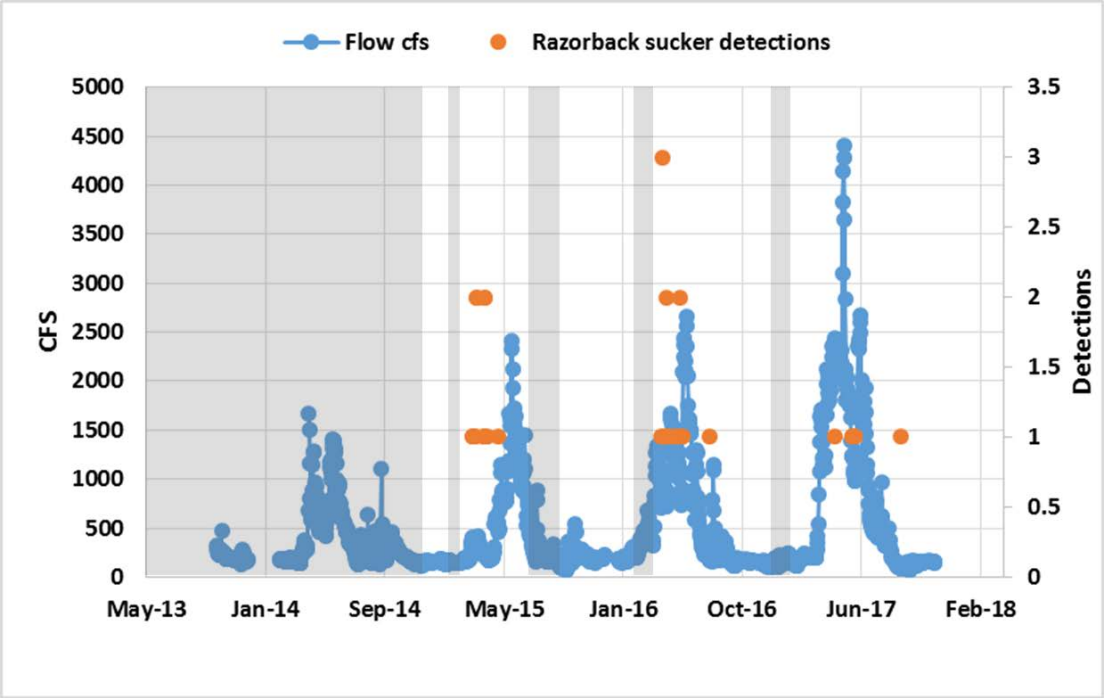


Figure 17. Detections of razorback sucker (orange symbols, right axis) in relation to flows (cfs) at the Rio Mesa Center, 2014 – 2017. Shaded areas indicate periods when PIA was offline.

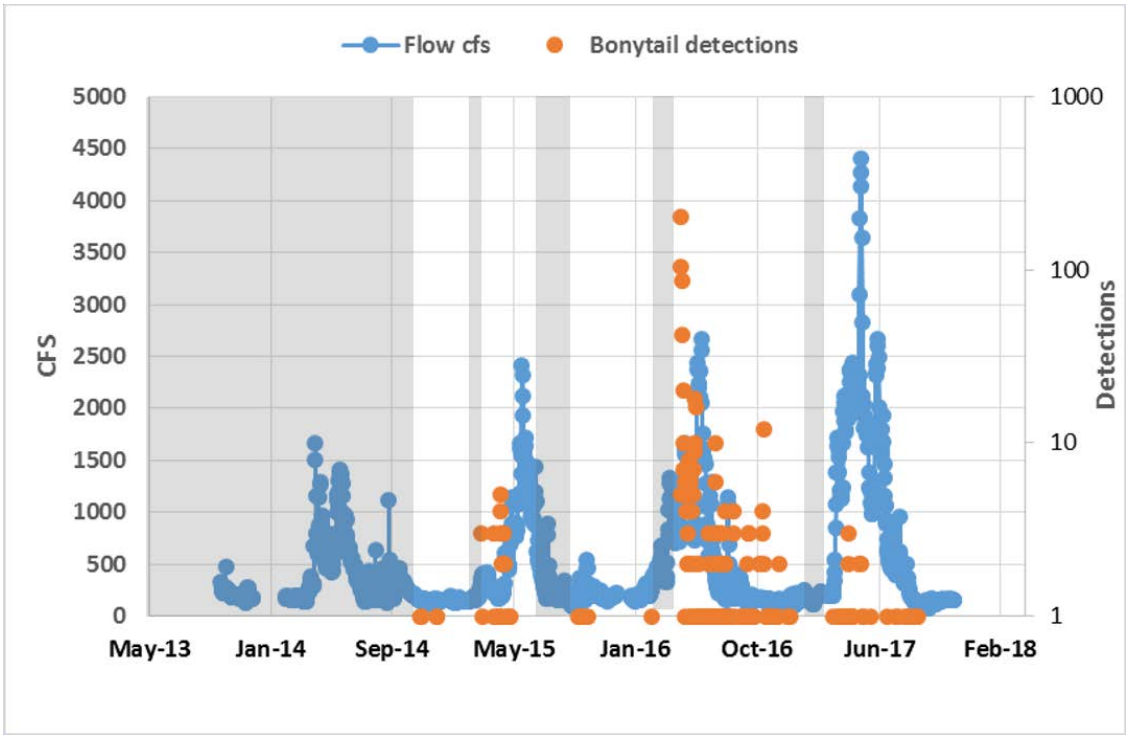


Figure 18. Detections of bonytail (orange symbols, right axis) in relation to flows (cfs) at the Rio Mesa Center, 2014 – 2017. Shaded areas indicate periods when PIA was offline.

APPENDIX A. Reclamation McPhee Dam annual reports.

Annual Flow Management of the Dolores River and Status of Conservations Recommendations Water Year 2012

Background: In 1975, the Dolores River was designated as a component of the National System of Wild and Scenic Rivers. Nearly 40-years later the San Juan Public Lands Center (SJPLC) began revising their San Juan National Forest Resource Management Plan. A requirement of the planning process was that all planning area rivers be assessed for their eligibility, classification, and suitability for inclusion in the National Wild and Scenic River System. The San Juan Public Lands Draft Land Management Plan (DLMP) found the Dolores River from the outlet of McPhee Reservoir to Bedrock Colorado to be preliminarily suitable for inclusion in the National Wild and Scenic River System. Outstandingly Remarkable Values (ORV's) identified in the DLMP for this section of the Dolores River include fish and wildlife resources, recreation, scenery, and other geological, ecological, and archeological values. Some of the specific ORV's are the roundtail chub, rafting, the New Mexico privet, canyon treefrog, and Eastwood's monkeyflower. Since the Dolores River Dialogue had been focusing on the lower Dolores River, the SJPLC felt that the DRD had potential to find an alternative to the Wild and Scenic suitability designation that would achieve similar protections for the stream and its ORV's.

In 2008, the SJPLC asked the DRD for assistance in protecting the ORV's and in considering alternatives to Wild and Scenic suitability. The DRD in conjunction with the SJPLC established the Lower Dolores River Working Group (LDWG) and began a process of understanding the human, ecological, and political dynamics at play on the lower Dolores River and how to best address the needs of the ORV's.

As an outcome of the LDWG, a legislative committee was established to consider an alternative to Wild and Scenic designation. A National Conservation Area was considered the best alternative and language is being drafted for legislative consideration. While drafting the language, it was determined that in order to protect the native fish ORV, assistance would be needed from native fishery experts. The "A Way Forward" committee was established and a team of scientists (Bill Miller, Kevin Bestgen, and Phaedra Budy) was hired to review existing data and summarize the status and trends of the three species from McPhee Dam to the confluence with the San Miguel River. The final report presented nine potential management opportunities that may assist with the improvement of the native fish. They are: spill management, base flow management, sediment transport flows, habitat maintenance flows, thermal regime modification, reducing the effects of introduced coldwater species, reducing the effects of introduced warm water species, and supplementing native fishes.

Upon completion of the A Way Forward final report, an Implementation Team (IT) consisting of water managers, NGOs, and State and Federal Agencies was formed to find ways to implement the nine recommendations. The IT, with financial assistance of the Colorado Water Conservation Board, has completed its first iteration of "The Lower Dolores River Implementation Monitoring and Evaluation Plan For Native Fish" dated August 2012. Public comments to the plan are being received and the second iteration will be issued in August 2013.

An electronic version of this plan and appendices can obtained from the Dolores River Dialogue website: http://ocs.fortlewis.edu/drd/

Downstream Releases: Downstream releases from McPhee Reservoir to the Dolores River are summarized on the attached graph. The reservoir did not spill this year and releases were made from the fishery pool.

Conservation Recommendation No. 1. *We recommend that Reclamation continue support efforts of the three species conservation strategy on a range-wide basis, including conservation efforts on the Dolores River.*

The Bureau of Reclamation has been an active participant of the Dolores River Dialogue since its inception in 2004, and is currently active in the Implementation Team efforts to manage downstream releases to the lower Dolores River (from McPhee Dam to the confluence of the San Juan Miguel River) for the Native fishes and rafting. We have: setup a pit-tag array upstream of Disappointment Creek to monitor the movement of native fishes in the Dolores River, established early water temperature suppression criteria to prevent premature spawning before a large controlled release from McPhee Dam, developed release ramping criteria that will perform sediment movement and channel maintenance while achieving boater goals for rafting.

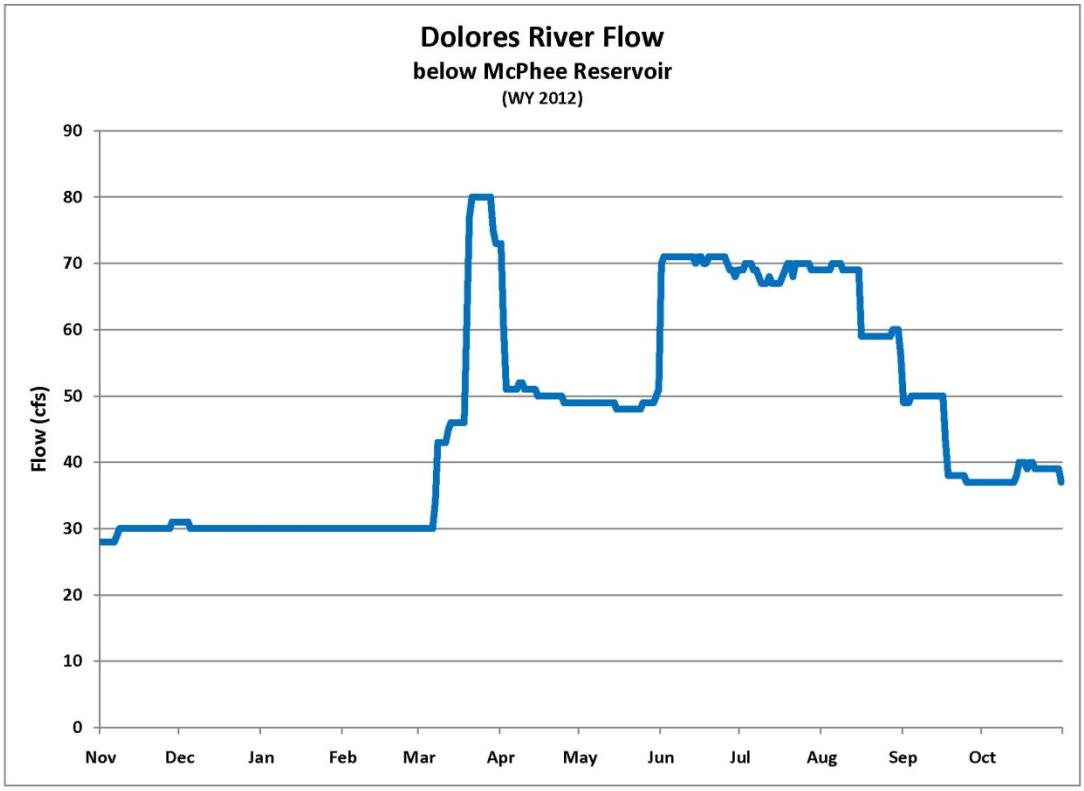
Conservation Recommendation No. 2. *We recommend that Reclamation continue to work with the Biology Committee to consider spill and flow management options to benefit the native fishery in the middle and lower Dolores River while continuing to honor commitments related to downstream rafting.*

The Biology committee was setup as an advisory committee for fishery pool management only. Reclamation and the Dolores Water Conservancy District are actively involved with the DRD and IT in performing spill management.

Reclamation takes an active role with the Biology Committee in identifying base needs and possibilities. Annual base release budgets are agreed upon by all members.

Conservation Recommendation No. 3. *We recommend that Reclamation continue to take an active role in the Dolores River Dialogue, in particular activities related to native fish.*

See background narrative.


Dolores River Flow
below McPhee Reservoir
(WY 2012)
Flow (cfs)
90
80
70
60
50
40
30
20
10
0
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct

Annual Flow Management of the Dolores River and Status of Conservations Recommendations Water Year 2013

Background: In 1975, the Dolores River was designated as a component of the National System of Wild and Scenic Rivers. Nearly 40-years later the San Juan Public Lands Center (SJPLC) began revising their San Juan National Forest Resource Management Plan. A requirement of the planning process was that all planning area rivers be assessed for their eligibility, classification, and suitability for inclusion in the National Wild and Scenic River System. The San Juan Public Lands Draft Land Management Plan (DLMP) found the Dolores River from the outlet of McPhee Reservoir to Bedrock Colorado to be preliminarily suitable for inclusion in the National Wild and Scenic River System. Outstandingly Remarkable Values (ORV's) identified in the DLMP for this section of the Dolores River include fish and wildlife resources, recreation, scenery, and other geological, ecological, and archeological values. Some of the specific ORV's are the roundtail chub, rafting, the New Mexico privet, canyon treefrog, and Eastwood's monkeyflower. Since the Dolores River Dialogue had been focusing on the lower Dolores River, the SJPLC felt that the DRD had potential to find an alternative to the Wild and Scenic suitability designation that would achieve similar protections for the stream and its ORV's.

In 2008, the SJPLC asked the DRD for assistance in protecting the ORV's and in considering alternatives to Wild and Scenic suitability. The DRD in conjunction with the SJPLC established the Lower Dolores River Working Group (LDWG) and began a process of understanding the human, ecological, and political dynamics at play on the lower Dolores River and how to best address the needs of the ORV's.

As an outcome of the LDWG, a legislative committee was established to consider an alternative to Wild and Scenic designation. A National Conservation Area was considered the best alternative and language is being drafted for legislative consideration. While drafting the language, it was determined that in order to protect the native fish ORV, assistance would be needed from native fishery experts. The "A Way Forward" committee was established and a team of scientists (Bill Miller, Kevin Bestgen, and Phaedra Budy) was hired to review existing data and summarize the status and trends of the three species from McPhee Dam to the confluence with the San Miguel River. The final report presented nine potential management opportunities that may assist with the improvement of the native fish. They are: spill management, base flow management, sediment transport flows, habitat maintenance flows, thermal regime modification, reducing the effects of introduced coldwater species, reducing the effects of introduced warm water species, and supplementing native fishes.

Upon completion of the A Way Forward final report, an Implementation Team (IT) consisting of water managers, NGOs, and State and Federal Agencies was formed to find ways to implement the nine recommendations. The IT, with financial assistance of the Colorado Water Conservation Board, has completed its first iteration of "The Lower Dolores River Implementation Monitoring and Evaluation Plan For Native Fish" dated August 2012. Public comments to the plan are being received and the second iteration is planned for the spring of 2014.

An electronic version of this plan and appendices can obtained from the Dolores River Dialogue website: http://ocs.fortlewis.edu/drd/

Downstream Releases: McPhee Reservoir did not spill this year. All downstream releases were made from the managed fishery pool. Project water allocations received only a 26% supply. The downstream releases volume is 8,163 – acre feet for water year 2013.

Downstream releases for water 2013 range from 12 CFS to 24 CFS.

Conservation Recommendation No. 1. *We recommend that Reclamation continue support efforts of the three species conservation strategy on a range-wide basis, including conservation efforts on the Dolores River.*

The Bureau of Reclamation has been an active participant of the Dolores River Dialogue since its inception in 2004, and is currently active in the Implementation Team efforts to manage downstream releases to the lower Dolores River (from McPhee Dam to the confluence of the San Juan Miguel River) for the Native fishes and rafting. We have: setup a pit-tag array upstream of Disappointment Creek to monitor the movement of native fishes in the Dolores River, established early water temperature suppression criteria to prevent premature spawning, installed real-time water temperature monitors near Disappointment Creek, developed release criteria that will perform sediment movement and channel maintenance while achieving boater goals for rafting.

Conservation Recommendation No. 2. *We recommend that Reclamation continue to work with the Biology Committee to consider spill and flow management options to benefit the native fishery in the middle and lower Dolores River while continuing to honor commitments related to downstream rafting.*

The Biology committee was setup as an advisory committee for fishery pool management only. Reclamation and the Dolores Water Conservancy District are actively involved with the DRD and IT in performing spill management.

Reclamation takes an active role with the Biology Committee in identifying base needs and possibilities. Annual base release budgets are drafted by Colorado Parks and Wildlife and agreed upon by all members.

Conservation Recommendation No. 3. *We recommend that Reclamation continue to take an active role in the Dolores River Dialogue, in particular activities related to native fish.*

See background narrative.

Annual Flow Management of the Dolores River and Status of Conservations Recommendations Water Year 2014

Background: In 1975, the Dolores River was designated as a component of the National System of Wild and Scenic Rivers. Nearly 40-years later the San Juan Public Lands Center (SJPLC) began revising their San Juan National Forest Resource Management Plan. A requirement of the planning process was that all planning area rivers be assessed for their eligibility, classification, and suitability for inclusion in the National Wild and Scenic River System. The San Juan Public Lands Draft Land Management Plan (DLMP) found the Dolores River from the outlet of McPhee Reservoir to Bedrock Colorado to be preliminarily suitable for inclusion in the National Wild and Scenic River System. Outstanding Remarkable Values (ORV's) identified in the DLMP for this section of the Dolores River include fish and wildlife resources, recreation, scenery, and other geological, ecological, and archeological values. Some of the specific ORV's are the roundtail chub, rafting, New Mexico privet, canyon treefrog, and Eastwood's monkeyflower. Since the Dolores River Dialogue (DRD) had been focusing on the lower Dolores River, the SJPLC felt that the DRD had potential to find an alternative to the Wild and Scenic suitability designation that would achieve similar protections for the stream and its ORV's.

In 2008, the SJPLC asked the DRD for assistance in protecting the ORV's and in considering alternatives to Wild and Scenic suitability. The DRD in conjunction with the SJPLC established the Lower Dolores River Working Group (LDWG) and began a process of understanding the human, ecological, and political dynamics at play on the lower Dolores River and how to best address the needs of the ORV's.

As an outcome of the LDWG, a legislative committee was established to consider an alternative to Wild and Scenic designation. A National Conservation Area was considered the best alternative and language is being drafted for legislative consideration. While drafting the language, it was determined that in order to protect the native fish ORV, assistance would be needed from native fishery experts. The "A Way Forward" committee was established and a team of scientists (Bill Miller, Kevin Bestgen, and Phaedra Budy) was hired to review existing data and summarize the status and trends of the three species from McPhee Dam to the confluence with the San Miguel River. The final report presented nine potential management opportunities that may assist with the improvement of the native fish. They are: spill management, base flow management, sediment transport flows, habitat maintenance flows, thermal regime modification, reducing the effects of introduced coldwater species, reducing the effects of introduced warm water species, and supplementing native fishes.

Upon completion of the A Way Forward final report, an Implementation Team (IT) consisting of water managers, NGOs, and State and Federal Agencies was formed to find ways to implement the nine recommendations. The IT, with financial assistance of the Colorado Water Conservation Board, completed its first iteration of "The Lower Dolores River Implementation, Monitoring and Evaluation Plan for Native Fish" in August 2012. Public comments to the plan were received, and the second iteration was published in June 2014.

An electronic version of this plan and appendices can obtained from the Dolores River Dialogue website: http://ocs.fortlewis.edu/drd/pdf/Lower-Dolores-River-Implementation-Monitoring-and-Evaluation-Plan-for-Native-Fish-June%202014.pdf

Downstream Releases: McPhee Reservoir did not spill this year. All downstream releases were made from the managed fishery pool. Project water allocations received a nearly full supply. The downstream releases volume is 26,392 – acre feet for water year 2014.

Downstream releases for water 2014 range from 70 CFS to 25 CFS.

Conservation Recommendation No. 1. *We recommend that Reclamation continue support efforts of the three species conservation strategy on a range-wide basis, including conservation efforts on the Dolores River.*

The Bureau of Reclamation has been an active participant of the Dolores River Dialogue since its inception in 2004, and is currently active in the Implementation Team efforts to manage downstream releases to the lower Dolores River (from McPhee Dam to the confluence of the San Juan Miguel River) for the Native fishes and rafting.

Conservation Recommendation No. 2. *We recommend that Reclamation continue to work with the Biology Committee to consider spill and flow management options to benefit the native fishery in the middle and lower Dolores River while continuing to honor commitments related to downstream rafting.*

The Biology committee was setup as an advisory committee for fishery pool management only. Reclamation and the Dolores Water Conservancy District are actively involved with the DRD and IT in performing spill management.

Reclamation takes an active role with the Biology Committee in identifying base needs and possibilities. Annual base release budgets are drafted by Colorado Parks and Wildlife and agreed upon by all members.

Conservation Recommendation No. 3. *We recommend that Reclamation continue to take an active role in the Dolores River Dialogue, in particular activities related to native fish.*

See background narrative.

Annual Flow Management of the Dolores River and Status of Conservation Recommendations Water Year 2015

Background: In 1975, the Dolores River was designated as a component of the National System of Wild and Scenic Rivers. Nearly 40-years later the San Juan Public Lands Center (SJPLC) began revising their San Juan National Forest Resource Management Plan. A requirement of the planning process was that all planning area rivers be assessed for their eligibility, classification, and suitability for inclusion in the National Wild and Scenic River System. The San Juan Public Lands Draft Land Management Plan (DLMP) found the Dolores River from the outlet of McPhee Reservoir to Bedrock Colorado to be preliminarily suitable for inclusion in the National Wild and Scenic River System. Outstanding Remarkable Values (ORV's) identified in the DLMP for this section of the Dolores River include fish and wildlife resources, recreation, scenery, and other geological, ecological, and archeological values. Some of the specific ORV's are the roundtail chub, rafting, New Mexico privet, canyon treefrog, and Eastwood's monkeyflower. Since the Dolores River Dialogue (DRD) had been focusing on the lower Dolores River, the SJPLC felt that the DRD had potential to find an alternative to the Wild and Scenic suitability designation that would achieve similar protections for the stream and its ORV's.

In 2008, the SJPLC asked the DRD for assistance in protecting the ORV's and in considering alternatives to Wild and Scenic suitability. The DRD in conjunction with the SJPLC established the Lower Dolores River Working Group (LDWG) and began a process of understanding the human, ecological, and political dynamics at play on the lower Dolores River and how to best address the needs of the ORV's.

As an outcome of the LDWG, a legislative committee was established to consider an alternative to Wild and Scenic designation. A National Conservation Area was considered the best alternative and language is being drafted for legislative consideration. While drafting the language, it was determined that in order to protect the native fish ORV, assistance would be needed from native fishery experts. The "A Way Forward" committee was established and a team of scientists (Bill Miller, Kevin Bestgen, and Phaedra Budy) was hired to review existing data and summarize the status and trends of the three species from McPhee Dam to the confluence with the San Miguel River. The final report presented nine potential management opportunities that may assist with the improvement of the native fish. They are: spill management, base flow management, sediment transport flows, habitat maintenance flows, thermal regime modification, reducing the effects of introduced coldwater species, reducing the effects of introduced warm water species, and supplementing native fishes.

Upon completion of the A Way Forward final report, an Implementation Team (IT) consisting of water managers, NGOs, and State and Federal Agencies was formed to find ways to implement the nine recommendations. The IT, with financial assistance of the Colorado Water Conservation Board, completed its first iteration of "The Lower Dolores River Implementation, Monitoring and Evaluation Plan for Native Fish" in August 2012. Public comments to the plan were received, and the second iteration was published in June 2014.

An electronic version of this plan and appendices can obtained from the Dolores River Dialogue website: http://ocs.fortlewis.edu/drd/pdf/Lower-Dolores-River-Implementation-Monitoring-and-Evaluation-Plan-for-Native-Fish-June%202014.pdf

Downstream Releases: McPhee Reservoir did not spill this year. All downstream releases were made from the managed fishery pool. Project water allocations received a full supply. The downstream releases volume is 31,798 – acre feet for water year 2015.

Downstream releases for water 2015 range from 80 CFS to 18 CFS.

Conservation Recommendation No. 1. *We recommend that Reclamation continue support efforts of the three species conservation strategy on a range-wide basis, including conservation efforts on the Dolores River.*

The Bureau of Reclamation has been an active participant of the Dolores River Dialogue since its inception in 2004, and is currently active in the development of the Implementation Teams recommendations to manage downstream releases to the lower Dolores River (from McPhee Dam to the confluence of the San Juan Miguel River) for the Native fishes and rafting.

Conservation Recommendation No. 2. *We recommend that Reclamation continue to work with the Biology Committee to consider spill and flow management options to benefit the native fishery in the middle and lower Dolores River while continuing to honor commitments related to downstream rafting.*

The Biology committee was setup as an advisory committee for fishery pool management only. Reclamation and the Dolores Water Conservancy District are actively involved with the DRD and IT in performing spill management.

Reclamation takes an active role in the Biology Committee in identifying base needs and possibilities. Annual base release budgets are drafted by Colorado Parks and Wildlife and recommendations are made to project operators.

Conservation Recommendation No. 3. *We recommend that Reclamation continue to take an active role in the Dolores River Dialogue, in particular activities related to native fish.*

See background narrative.

Annual Flow Management of the Dolores River and Status of Conservation Recommendations Water Year 2016

Background: In 1975, the Dolores River was designated as a component of the National System of Wild and Scenic Rivers. Nearly 40-years later the San Juan Public Lands Center (SJPLC) began revising their San Juan National Forest Resource Management Plan. A requirement of the planning process was that all planning area rivers be assessed for their eligibility, classification, and suitability for inclusion in the National Wild and Scenic River System. The San Juan Public Lands Draft Land Management Plan (DLMP) found the Dolores River from the outlet of McPhee Reservoir to Bedrock Colorado to be preliminarily suitable for inclusion in the National Wild and Scenic River System. Outstanding Remarkable Values (ORV's) identified in the DLMP for this section of the Dolores River include fish and wildlife resources, recreation, scenery, and other geological, ecological, and archeological values. Some of the specific ORV's are the roundtail chub, rafting, New Mexico privet, canyon treefrog, and Eastwood's monkeyflower. Since the Dolores River Dialogue (DRD) had been focusing on the lower Dolores River, the SJPLC felt that the DRD had potential to find an alternative to the Wild and Scenic suitability designation that would achieve similar protections for the stream and its ORV's.

In 2008, the SJPLC asked the DRD for assistance in protecting the ORV's and in considering alternatives to Wild and Scenic suitability. The DRD in conjunction with the SJPLC established the Lower Dolores River Working Group (LDWG) and began a process of understanding the human, ecological, and political dynamics at play on the lower Dolores River and how to best address the needs of the ORV's.

As an outcome of the LDWG, a legislative committee was established to consider an alternative to Wild and Scenic designation. A National Conservation Area was considered the best alternative and language is being drafted for legislative consideration. While drafting the language, it was determined that in order to protect the native fish ORV, assistance would be needed from native fishery experts. The "A Way Forward" committee was established and a team of scientists (Bill Miller, Kevin Bestgen, and Phaedra Budy) was hired to review existing data and summarize the status and trends of the three species from McPhee Dam to the confluence with the San Miguel River. The final report presented nine potential management opportunities that may assist with the improvement of the native fish. They are: spill management, base flow management, sediment transport flows, habitat maintenance flows, thermal regime modification, reducing the effects of introduced coldwater species, reducing the effects of introduced warm water species, and supplementing native fishes.

Upon completion of the A Way Forward final report, an Implementation Team (IT) consisting of water managers, NGOs, and State and Federal Agencies was formed to find ways to implement the nine recommendations. The IT, with financial assistance of the Colorado Water Conservation Board, completed its first iteration of "The Lower Dolores River Implementation, Monitoring and Evaluation Plan for Native Fish" in August 2012. Public comments to the plan were received, and the second iteration was published in June 2014.

An electronic version of this plan and appendices can obtained from the Dolores River Dialogue website: http://ocs.fortlewis.edu/drd/pdf/Lower-Dolores-River-Implementation-Monitoring-and-Evaluation-Plan-for-Native-Fish-June%202014.pdf

Downstream Releases: In 2016 McPhee Reservoir spilled 27,037 acre feet as well as provided a full Project water supply of 31,798 acre feet below McPhee Dam.

Downstream releases for water year 2016 ranged from 30 CFS to 1,200 CFS.

Conservation Recommendation No. 1. *We recommend that Reclamation continue support efforts of the three species conservation strategy on a range-wide basis, including conservation efforts on the Dolores River.*

The Bureau of Reclamation has been an active participant of the Dolores River Dialogue since its inception in 2004, and is currently an active member of the Monitoring and Recommendation Team (MRT), formerly the Implementation Team. The MRT provides management recommendations, to Reclamation, related to releases to the lower Dolores River (from McPhee Dam to the confluence of the San Juan Miguel River) for the native and non-native fishes and rafting.

Conservation Recommendation No. 2. *We recommend that Reclamation continue to work with the Biology Committee to consider spill and flow management options to benefit the native fishery in the middle and lower Dolores River while continuing to honor commitments related to downstream rafting.*

The Biology committee was setup as an advisory committee for fishery pool management only. Reclamation and the Dolores Water Conservancy District are actively involved with the DRD and MRT in performing spill management.

Reclamation takes an active role in the Biology Committee in identifying base needs and possibilities. Annual base release budgets are drafted by Colorado Parks and Wildlife and recommendations are made to project operators.

Conservation Recommendation No. 3. *We recommend that Reclamation continue to take an active role in the Dolores River Dialogue, in particular activities related to native fish.*

See background narrative.

Annual Flow Management of the Dolores River and Status of Conservation Recommendations Water Year 2017

Background: In 1975, the Dolores River was designated as a component of the National System of Wild and Scenic Rivers. Nearly 40-years later the San Juan Public Lands Center (SJPLC) began revising their San Juan National Forest Resource Management Plan. A requirement of the planning process was that all planning area rivers be assessed for their eligibility, classification, and suitability for inclusion in the National Wild and Scenic River System. The San Juan Public Lands Draft Land Management Plan (DLMP) found the Dolores River from the outlet of McPhee Reservoir to Bedrock Colorado to be preliminarily suitable for inclusion in the National Wild and Scenic River System. Outstanding Remarkable Values (ORV's) identified in the DLMP for this section of the Dolores River include fish and wildlife resources, recreation, scenery, and other geological, ecological, and archeological values. Some of the specific ORV's are the roundtail chub, rafting, New Mexico privet, canyon treefrog, and Eastwood's monkeyflower. Since the Dolores River Dialogue (DRD) had been focusing on the lower Dolores River, the SJPLC felt that the DRD had potential to find an alternative to the Wild and Scenic suitability designation that would achieve similar protections for the stream and its ORV's.

In 2008, the SJPLC asked the DRD for assistance in protecting the ORV's and in considering alternatives to Wild and Scenic suitability. The DRD in conjunction with the SJPLC established the Lower Dolores River Working Group (LDWG) and began a process of understanding the human, ecological, and political dynamics at play on the lower Dolores River and how to best address the needs of the ORV's.

As an outcome of the LDWG, a legislative committee was established to consider an alternative to Wild and Scenic designation. A National Conservation Area was considered the best alternative and language is being drafted for legislative consideration. While drafting the language, it was determined that in order to protect the native fish ORV, assistance would be needed from native fishery experts. The "A Way Forward" committee was established and a team of scientists (Bill Miller, Kevin Bestgen, and Phaedra Budy) was hired to review existing data and summarize the status and trends of the three species from McPhee Dam to the confluence with the San Miguel River. The final report presented nine potential management opportunities that may assist with the improvement of the native fish. They are: spill management, base flow management, sediment transport flows, habitat maintenance flows, thermal regime modification, reducing the effects of introduced coldwater species, reducing the effects of introduced warm water species, and supplementing native fishes.

Upon completion of the A Way Forward final report, an Implementation Team (IT) consisting of water managers, NGOs, and State and Federal Agencies was formed to find ways to implement the nine recommendations. The IT, with financial assistance of the Colorado Water Conservation Board, completed its first iteration of "The Lower Dolores River Implementation, Monitoring and Evaluation Plan for Native Fish" in August 2012. Public comments to the plan were received, and the second iteration was published in June 2014.

An electronic version of this plan and appendices can obtained from the Dolores River Dialogue website: http://ocs.fortlewis.edu/drd/pdf/Lower-Dolores-River-Implementation-Monitoring-and-Evaluation-Plan-for-Native-Fish-June%202014.pdf

Downstream Releases: In 2017 McPhee Reservoir spilled 204,908 acre feet as well as provided a full Project water supply of 31,798 acre feet below McPhee Dam.

Downstream releases for water year 2016 ranged from 30 CFS to 4,000 CFS.

Conservation Recommendation No. 1. *We recommend that Reclamation continue support efforts of the three species conservation strategy on a range-wide basis, including conservation efforts on the Dolores River.*

The Bureau of Reclamation has been an active participant of the Dolores River Dialogue since its inception in 2004, and is currently an active member of the Monitoring and Recommendation Team (MRT), formerly the Implementation Team. The MRT provides management recommendations, to Reclamation, related to releases to the lower Dolores River (from McPhee Dam to the confluence of the San Juan Miguel River) for the native and non-native fishes and rafting.

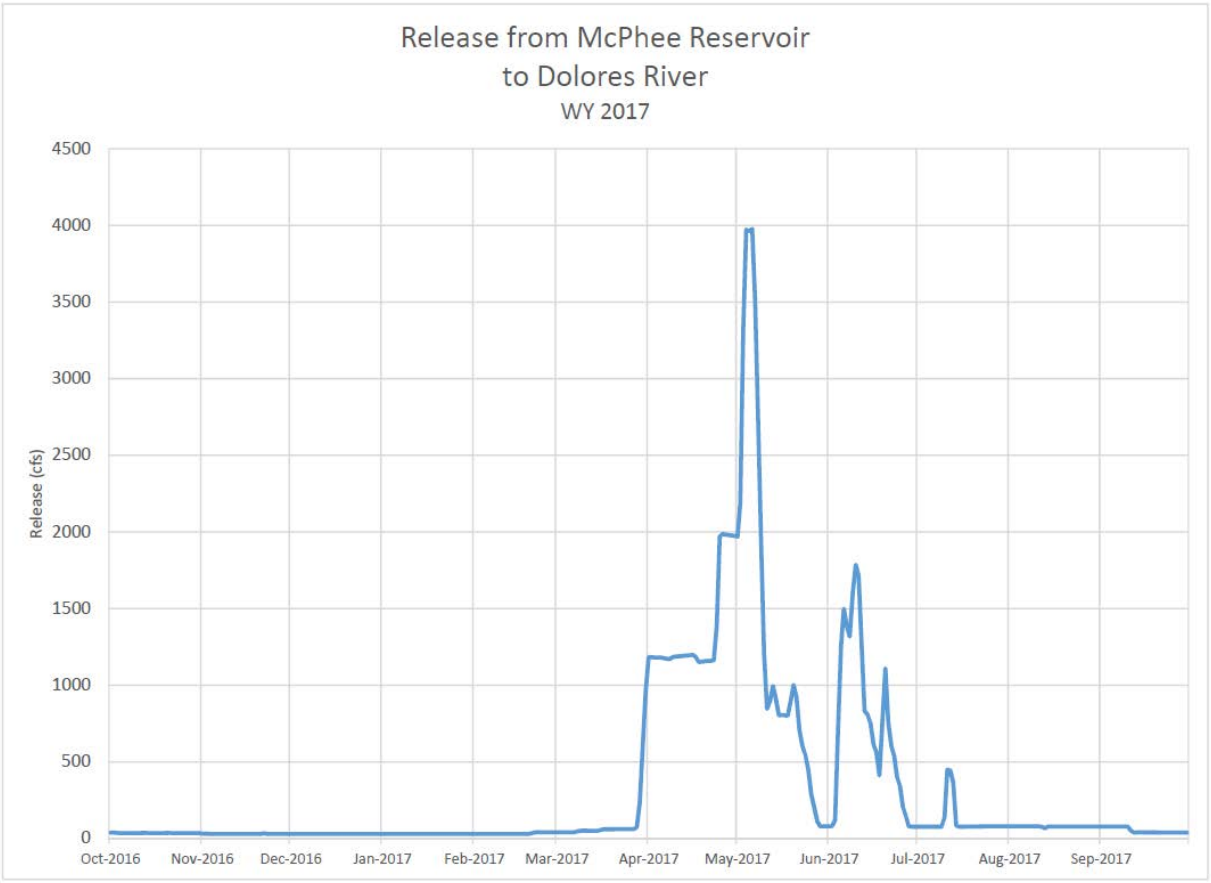
Conservation Recommendation No. 2. *We recommend that Reclamation continue to work with the Biology Committee to consider spill and flow management options to benefit the native fishery in the middle and lower Dolores River while continuing to honor commitments related to downstream rafting.*

The Biology committee was setup as an advisory committee for fishery pool management only. Reclamation and the Dolores Water Conservancy District are actively involved with the DRD and MRT in performing spill management.

Reclamation takes an active role in the Biology Committee in identifying base needs and possibilities. Annual base release budgets are drafted by Colorado Parks and Wildlife and recommendations are made to project operators.

Conservation Recommendation No. 3. *We recommend that Reclamation continue to take an active role in the Dolores River Dialogue, in particular activities related to native fish.*

See background narrative.


Release from McPhee Reservoir
to Dolores River
WY 2017
Release (cfs)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Oct-2016
Nov-2016
Dec-2016
Jan-2017
Feb-2017
Mar-2017
Apr-2017
May-2017
Jun-2017
Jul-2017
Aug-2017
Sep-2017