



United States Department of the Interior
FISH AND WILDLIFE SERVICE

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In Reply Refer To:
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APR 19 2013

Mr. Jim Brooks
Coordination Committee
San Juan River Basin Recovery
Implementation Program
3800 Commons Ave NE
Albuquerque, New Mexico 87109

Dear Mr. Brooks:

The U.S. Fish and Wildlife Service (Service) has completed a Review and Assessment of the San Juan River Basin Recovery Implementation Program (Program) as defined in the Program Document (May 17, 2012). Service responsibility number 21 requires that the Service prepare on a biennial basis a written "Sufficient Progress" assessment of the Program's progress towards recovery of the Colorado pikeminnow and razorback sucker and the Program's ability to provide Endangered Species Act (ESA) compliance for water development and management activities in the San Juan River Basin. The report is also to include any corrective actions to ensure future ESA compliance in accordance with the *Principles for Conducting Endangered Species Act section 7 Consultations on Water Development and Water Management Activities Affecting Endangered Fish in the San Juan River Basin* (Principles).

Using the Principles, the Service determines whether progress by the Program is sufficient to provide a reasonable and prudent alternative or measure based on the following factors:

1. *Actions that will result in a measurable positive population response, a measurable improvement in habitat for the fishes, legal protection of flows needed for recovery, or a reduction in the threat of immediate extinction;*
2. *Status of fish populations;*
3. *Adequacy of flows; and*
4. *Magnitude of the impact of activities including, but not limited to, contaminant and fish migration impacts.*

The Principles, adopted by the Coordination Committee in 2002, constitute a guide to define how Program actions will be used to provide ESA compliance for water development and water

management activities. The Principles were reviewed by the Service and found to be consistent with the ESA and its implementing regulations (50 CFR Part 402). The Principles rely heavily on the Program's ability to implement the activities and actions found in the Program's Long Range Plan (LRP). Revisions to the LRP, including insertion of actions needed to achieve recovery, will normally occur during the annual review and update. All parties to the Program, including the Service, make recommendations to update the LRP. The Principles also state that if the Service concludes at any time and independent of any consultation that the Program is not implementing actions on schedule, and that this impacts the ability of the Program to provide measures for compliance with the ESA, the Service will provide a written assessment to the Coordination Committee. The assessment will include the Service's recommendations for corrective actions. The Coordination Committee will have an opportunity to modify timing, funding, and/or priorities in the LRP to ensure that the Service can rely on the Program to provide reasonable and prudent alternatives and measures.

For this Program assessment, the Service utilized the following sources of information: (1) the 2012 LRP; (2) the Program's annual, research, integration, and evaluation reports; (3) biological opinions including Navajo Reservoir Operations, Navajo Indian Irrigation Project, Animas-La Plata Project, and Navajo-Gallup Water Supply Project; and, (4) the population goals and management actions presented in the 2002 Recovery Goals for each species (USFWS 2002a, USFWS 2002b).

Service Determination

The Service considers the Program's overall progress toward recovery of Colorado pikeminnow and razorback sucker in the San Juan River to be sufficient for the Program to continue as the ESA compliance mechanism for water development and operations within the San Juan River Basin. The Program's actions and tasks described in the LRP and management activities in the Recovery Goals are being satisfactorily met, such that the Program will continue to serve as a foundation for reasonable and prudent alternatives in applicable Section 7 consultations.

U.S. Fish and Wildlife Service Recommendations

The Program Assessment includes specific recovery recommendations and actions. These recommendations are activities that the Program needs to implement to benefit the recovery of the endangered fish in the San Juan River. Completing the recommendations does not ensure recovery of Colorado pikeminnow or razorback sucker within the San Juan River Basin, but at a minimum, will allow the Program to better address threats to recovery and gauge where the Program stands in terms of progress toward recovery of these two species. The Service requests that the Program develop appropriate tasks and timeframes for each action that will be incorporated into the LRP during the annual LRP update.

Sincerely,

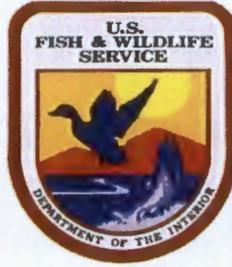
A handwritten signature in black ink, appearing to read "Ben M. Puffle". The signature is fluid and cursive, with the first name "Ben" being particularly prominent.

Regional Director

Mr. Jim Brooks

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cc: Field Supervisor, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, New Mexico
Field Supervisor, U.S. Fish and Wildlife Service, Colorado Ecological Services Field Office, Grand Junction, Colorado
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Recovery Coordinator, U.S. Fish and Wildlife Service, Region 2, Albuquerque, New Mexico



U.S. Fish and Wildlife Service

Review and Assessment

San Juan River Basin Recovery Implementation Program

February 2013

**U.S. Fish and Wildlife Service
Region 2**

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INTRODUCTION

The San Juan River Basin Recovery Implementation Program was formed to conserve the endangered Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*) in the San Juan River Basin while providing Endangered Species Act (ESA) compliance for water development and management activities. Every two years, the Fish and Wildlife Service (Service) assesses whether the San Juan River Basin Recovery Implementation Program's (Program) progress towards recovery of these species is sufficient for the Program to continue to serve as the reasonable and prudent alternative and reasonable and prudent measures for water development and management activities in the San Juan River Basin and identifies corrective action as necessary (Program 2001). In general, the Service uses the following criteria to evaluate the Program's sufficient progress toward achieving recovery for Colorado pikeminnow and razorback sucker in the San Juan River Basin:

1. actions that result in a measurable population response, a measurable improvement in habitat for endangered fishes, legal protection of flows necessary for recovery, or a reduction in the threat of immediate extinction;
2. status of the fish populations;
3. adequacy of flows; and
4. magnitude of the impact of projects.

This review and assessment report relies on recovery management actions detailed in the 2002 recovery goals, recovery demographic criteria for downlisting and delisting, and positive population response criteria for Colorado pikeminnow and razorback sucker to evaluate the Program's ability to provide ESA compliance for water development and water management activities based on its implemented actions (Reclamation 2001, Service 2002a, Service 2002b). The Program's Long Range Plan (LRP; Program 2012) steps down recovery management actions from the recovery goals and describes site-specific management actions thought necessary to minimize or remove threats and support wild self-sustaining populations of Colorado pikeminnow and razorback sucker (Service 2002a, Service 2002b). The Program uses the LRP to develop annual work plans that identify and describe specific activities and projects to be implemented in a given year.

For this Program assessment, the Service utilized the following sources of information: (1) the 2012 LRP; (2) the Program's annual, research, integration and evaluation reports; (3) the 2002 recovery goals for each species; and (4) past biological opinions that have relied on the Program for ESA compliance. The management actions from the recovery goals relevant to the San Juan River Basin are listed below (Service 2002a, Service 2002b). The Service anticipates that the successful implementation of these management actions to benefit Colorado pikeminnow and razorback sucker will ultimately lead to a positive population response by the endangered fish species that will result in achieving the recovery demographic criteria and remove the threats identified in the recovery goals (Service 2002a, Service 2002b).

1. Provide and legally protect habitat (including flow regimes necessary to restore and maintain required environmental conditions) necessary to provide adequate habitat and sufficient range for all life stages to support recovered populations.
2. Provide passage over barriers within occupied habitat to allow adequate movement and, potentially, range expansion.
3. Minimize entrainment of subadults and adults in diversion canals/out-take structures.
4. Ensure adequate protection from diseases and parasites.
5. Regulate non-native fish releases and escapement into the San Juan River, floodplain, and tributaries.
6. Control problematic non-native fishes as needed.
7. Minimize the risk of hazardous-materials spills in critical habitat.
8. Remediate water-quality problems.
9. Reestablish populations with hatchery-produced fish.
10. Minimize the threat of hybridization with white sucker [only applicable to razorback sucker].
11. Provide for the long-term management conservation plans to protect populations and their habitats beyond delisting [Efforts to develop long-term species conservation plans are not a priority until the Program is closer to meeting downlisting and delisting objectives.].

ASSESSMENT AND REVIEW OF PROGRESS TOWARD RECOVERY

The Service's assessment and review of the Program is based on evaluating the Program's: (1) successful implementation of the management actions identified in the recovery goals that are necessary to achieve species recovery; (2) recovery demographic criteria in the recovery goals to downlist and delist Colorado pikeminnow and razorback sucker; and (3) positive population response criteria developed to document and gauge demographic improvements for both species. Any corrective actions or recommendations to improve the Program's progress toward recovery are identified after each section.

IMPLEMENTATION OF RECOVERY ACTIONS FROM RECOVERY GOALS

1. Provide and legally protect habitat (including flow regimes necessary to restore and maintain required environmental conditions) necessary to provide adequate habitat and sufficient range for all life stages to support recovered populations.

FLOW REGIME

Element 2 of the LRP identifies actions for protection, management, and augmentation of habitat. These include implementing and revising flow recommendations which are intended to provide suitable habitat for native fish in the San Juan River.

The Program developed flow recommendations for the operation of Navajo Dam on the San Juan River in 1999 (Holden 2000). The flow recommendations are intended to mimic a natural flow regime characterized by variability in flow, spring peak flow, and low base flows. While flows above the 2,500 cfs target flow are only infrequently met, flow recommendations are not violated because the maximum number of years without meeting a particular target have not been exceeded (Westfall 2011). These flows are thought necessary to develop and maintain the habitat and hydrologic conditions needed for all life stages of Colorado pikeminnow, razorback sucker, and other native fishes (Holden 2000). However, it appears that low velocity habitats important to early life stages of the endangered fishes are not sufficiently abundant and complex habitats important to all life stages of endangered fishes are declining (Bliesner et al. 2010). The encroachment of non-native Russian olive and salt cedar have likely contributed to the long-term channel narrowing and simplification that have limited the intended effects of flows that can be obtained from Navajo Dam releases (Bliesner 2004, Bliesner and Lamarra 2007). Miller (2006) suggested that achieving higher peak flows during runoff, along with

changing the shape of the ascending and descending limb of the hydrograph, may be a higher priority than meeting the 2,500 and 5,000 cfs flow recommendations because higher flows (> 8,000 cfs) mobilize sediment and maintain channel complexity and backwater habitat. Flows of 2,500 cfs are not correlated with maintaining open interstitial space in cobble bars and flows of 5,000 cfs do not maintain backwater habitats as initially thought when the flow recommendations were developed (Miller 2006).

While the intent of the flow recommendations is to develop and maintain the habitat and hydrologic conditions favorable to the native fish community, the flow recommendations should be periodically evaluated to determine: (1) habitat response to flow recommendations; (2) whether the habitat response achieved is consistent with the objectives of the flow recommendations; and (3) endangered fish (or suitable native fish surrogate if endangered fish numbers are too low) response to the flow recommendations. Although endangered fishes were not considered, in general, native fish populations responded positively to years with high spring flow while non-native fish densities were higher during years with low summer flow (Gido and Propst 2012). Monitoring efforts at pre-selected lateral washes and canyons determined that more suitable larval backwater habitat was available at higher flows (Brandenburg et al. 2012). The Program is currently in the process of developing and validating the next generation of the San Juan River Basin Hydrology Model (SJRBM). As the model's hydrologic baseline is updated through 2013, alternative flow scenarios developed by the Program can be evaluated. Upon completion of the third generation of the SJRBM, the Program's Biology Committee, along with the Program Office, will evaluate and update the existing flow recommendations.

HABITAT

Element 2 of the LRP element also calls for identifying and implementing recovery actions other than flows such as mechanical and chemical treatment of non-native vegetation and secondary channel clearing and sluicing to provide suitable habitat for the native fish community.

The Service outlined reasonable and prudent measures and terms and conditions in the Navajo-Gallup Water Supply Project Biological Opinion to minimize incidental take of razorback sucker and Colorado pikeminnow. Via these measures and conditions, the Bureau of Reclamation (Reclamation), through the Program, will utilize capital funds to: (1) implement

measures to create and maintain habitat complexity and minimize the loss and long-term degradation of endangered fish habitat in the San Juan River; (2) investigate the use of non-flow habitat manipulations such as non-native vegetation removal, opening secondary channels, or reconnecting floodplains during high flows; and, (3) monitor habitat response to flow and non-flow actions. In 2011, The Nature Conservancy (TNC) in partnership with the Program used funding from New Mexico's River Ecosystem Restoration Initiative (RERI) to mechanically restore low velocity aquatic habitats to six sites in the San Juan River between Shiprock, NM and the Four Corners (RM 148-119). During this effort secondary channels were flushed, non-native vegetation was cleared and chemically treated, secondary channel inlets were cleared, and new secondary channels were excavated (Keller-Bliesner 2012). The Program is providing funding for three years for non-native vegetation control and maintenance, and monitoring to determine their persistence, fish use of these habitats, and evaluate the effectiveness of the different restoration methodologies. TNC, in collaboration with the Program, has committed to pursuing a second phase of channel and floodplain restoration at additional sites along the San Juan River. They expect to be able to contribute non-federal funds through 2012-2015 to conduct this work. The Program will continue to provide capital funding to augment this effort.

CLIMATE CHANGE

The LRP includes recovery actions (Action 2.2.5) necessary to review and evaluate the threat of climate change to razorback sucker and Colorado pikeminnow in the San Juan River.

Tasks to be completed under this action include: (1) conduct a comprehensive analysis of hydrologic variability; (2) evaluate the impacts of hydrologic variability on future water availability; (3) evaluate the Program's ability to meet flow recommendations during periods of extreme drought; and (4) develop contingency strategies to maintain sufficient flow during periods of extended drought. The updated SJRBHM and subsequent revisions to the flow recommendations will allow the Program to incorporate the possible effects of climate change into hydrologic analyses.

As directed by the terms and conditions of the Navajo-Gallup Water Supply Project Biological Opinion, Reclamation in cooperation with the Program will track potential climate change to determine effects to Colorado pikeminnow, razorback sucker, and their critical habitat. This tracking can be accomplished, in part, by monitoring timing and magnitude of spring runoff

to determine if potential changes limit the Program's ability to meet the flow recommendations. In the event of an inability to meet flow recommendations due to climate-induced changes in water availability, the Program should continue to explore mechanical creation and maintenance of habitat necessary for recovery.

TEMPERATURE

The LRP includes a recovery task (4.2.2.6) to monitor water temperature at key locations in the San Juan River to evaluate the impact of temperature on Colorado pikeminnow and razorback sucker.

The hypolimnetic release from Navajo Dam suppresses the temperature of the San Juan River and limits the potential spawning habitat for endangered fish in the San Juan River. Prior to the construction of Navajo Dam, water temperatures at Archuleta (almost 40 miles upstream of the Animas River confluence) were above the minimum spawning temperature threshold (20°C) for approximately two months (Holden 1999). Additionally, the minimum spawning temperature threshold at Shiprock (RM 147.9) prior to dam construction was exceeded for three months (Holden 1999). Since Navajo Dam was constructed, the spawning temperature threshold at Shiprock occurs two weeks later and for only one month compared to pre-dam conditions. Additionally, spawning in the San Juan River upstream of the Animas River confluence is unlikely to occur because of the persistent cold temperatures (Holden 1999, Lamarra 2007).

Lamarra (2007) reported that warmer summer temperatures in the San Juan River above the Animas River confluence would result in the upstream movement of fish, including Colorado pikeminnow that could potentially spawn in habitats that are currently unavailable due to the present thermal conditions. As identified in the Navajo Reservoir Operations Biological Opinion, Reclamation agreed to evaluate water temperature impacts of Navajo releases. Reclamation developed a model to investigate the effect of a temperature control device (TCD) at Navajo Dam on water temperatures in the San Juan River downstream of the dam (Cutler 2005). A TCD could increase the water temperature from May to October by as much as 8.4°C and 7.6°C in some years, but the average increase would only be 2°C and 1.4°C at Farmington and Shiprock, respectively (Cutler 2005). Cutler (2005) indicated that ideal temperatures of 20-25°C for Colorado pikeminnow and razorback sucker that occur in late June at Farmington could be achieved approximately two weeks earlier with a TCD. These temperatures are achieved in

July at Shiprock without a TCD. The Biology Committee determined that a TCD was not warranted on Navajo Dam because temperature impacts on spawning and rearing appear to be minimal. A TCD may provide seasonal range expansion above critical habitat but it is unknown if range expansion above critical habitat is necessary for recovery (Program 2012). The Program began stocking endangered fishes upstream of the Animas River confluence in both the San Juan and Animas Rivers in 2010 and 2011 to expand their range and promote post-stocking retention. During a razorback sucker stocking event in late October 2011, a single juvenile Colorado pikeminnow (147 mm TL) was collected during pre-stocking sampling (RM 186.7; Furr 2012a). This indicates that Colorado pikeminnow are using this upstream cooler reach at least seasonally. This area of the San Juan River (upstream of RM 180) has not normally been sampled during the annual fall monitoring effort; however, sampling in this reach began in 2012. There has been a general upstream trend in detection of larval razorback sucker and hence spawning further upstream in the San Juan River through time (Brandenburg and Farrington 2011). However, this trend appears to be related to the establishment of adult population in upstream reaches rather than any trend related to temperature.

RECOVERY ACTION 1: SUMMARY AND RECOMMENDATIONS

The Program is making sufficient progress in providing for and protecting the habitat necessary to support recovery of all life stages of endangered fish. However, the Service recommends that the Program prioritize existing tasks in the LRP that address the goal of providing and protecting habitat for all life stages to support recovered populations. Specifically: (1) monitor the restoration sites to determine the persistence and fish use of these habitats (Task 2.1.2.1). Continued monitoring at the restoration sites will also allow those sites to be evaluated to inform habitat restoration strategies that will aid the implementation of additional work (Action 2.2.6). The Program has committed to use capital funds to construct restoration sites that create and maintain habitat complexity. The Service agrees with this approach to minimize the loss and long-term degradation of endangered fish habitat in the San Juan River. This will involve the Program pursuing and supporting alternative means for accomplishing the habitat goals such as TNC's San Juan River Channel and Floodplain Restoration Phase 2. (2) Ensure that the tasks within Action 2.2.1, evaluating habitat and fish response to flow, are completed in order to develop and implement the process for revising the flow recommendations. (3) The Program's 2012 habitat monitoring workshop highlighted the need to measure the extent of

riverine habitat available and used by endangered fish so management actions that create habitat can be evaluated. This activity needs to be included in the LRP and should include the Animas River and San Juan River upstream of the Animas River confluence. The activity should focus on examining current and potential habitat availability. (4) Evaluate the possible effects of climate change on the timing and magnitude of runoff as it relates to the ability to meet the flow recommendations from Navajo Dam (Action 2.2.5).

2. Provide passage over barriers within occupied habitat to allow adequate movement, and potentially, range expansion.

Action 2.3.1 of the LRP details the Program's goal of providing and maintaining fish passage at diversion structures to increase the range of Colorado pikeminnow and razorback sucker in the San Juan River Basin.

The Program Evaluation Report (Holden 2000) identified five diversion structures between RM 180 and RM 140 as potential barriers to fish movement, particularly upstream movement: Fruitland Diversion (RM 178.5), Cudei Diversion (RM 142.0), Arizona Public Service Company Weir (APS Weir also know as Four Corners Generating Station Weir; RM 163.3), Hogback Diversion (RM 158.6), and Public Service Company of New Mexico Weir (PNM Weir also known as San Juan Generating Station Weir; RM 166.6). Ryden (2000) reported that Cudei Diversion, Hogback Diversion, and APS Weir were passable by fish at some flows but upstream movement was more restricted by PNM Weir, especially for non-native fish. Davis and Coleman (2004) reported that fish passage at the APS Weir was related to flow. Model results indicated that APS Weir was a barrier at low flows but not at high flows (Stamp et al. 2005).

Additionally, there are possible barriers in the Animas River. While neither the City of Farmington Animas Pumping Station (11.9 miles upstream from the San Juan River confluence) nor Farmer's Ditch Diversion (21.9 miles upstream from the San Juan River confluence) are complete barriers, Farmer's Ditch Diversion is a more significant barrier partly due to the lack of passable gates that are found at City of Farmington's Animas Pumping Station (Francis 2007). Passage at these potential barriers is likely related to flow and presumably passage is more likely at higher flows (Francis 2007). Unimpeded access to the Animas River could dramatically increase the range and useable habitat for endangered fish. The Animas River does not have the

same thermal limitations of the upper San Juan River because of the cold water releases from Navajo Dam.

In 2002, the Program constructed a nonselective fish passage at Hogback Diversion and replaced Cudei Diversion with a subsurface siphon that does not impact fish movement, restoring access to 36 miles of critical habitat (Davis and Coleman 2004). In 2003, a selective fish passage around the PNM weir was completed that allows native fish to continue upstream and non-native fish to be removed from the San Juan River. The Navajo Nation Department of Fish and Wildlife operates PNM passage to monitor fish use. A total of 27,507 native and 785 non-native fish used the PNM passage in 2011, including 707 Colorado pikeminnow and 39 razorback sucker (Morel 2012).

The Program has stocked endangered fish upstream of PNM weir in the Animas and San Juan Rivers to expand range and increase retention of these fish. Pre-stocking sampling has yielded Colorado pikeminnow and razorback sucker at Boyd Park (1 RM upstream of the San Juan River in the Animas River) and Colorado pikeminnow at Wild Horse Road (San Juan River RM 186.7), suggesting at least some endangered fish are using these upstream reaches (Furr 2012a, Furr 2012b). Because cold water releases from Navajo Dam limit range expansion in the San Juan River, providing access to more of the Animas River through the removal or modification of barriers may be the most effective means to increase the range of endangered fish in the San Juan River Basin.

Endangered fish are typically isolated from the San Juan River after passing over the waterfall that has been present, since 2002, on the lower San Juan River where the River enters Lake Powell near Piute Farms. However, the waterfall was temporarily inundated for approximately two weeks in late July 2011. After the brief period when the waterfall was inundated, four razorback sucker that had been previously collected in Lake Powell in 2011 were subsequently detected in the San Juan River later that same year. This indicates that razorback sucker can successfully negotiate the inundated waterfall (Francis et al. 2012) and enter back into the riverine system. At this time it is not known if razorback sucker are successfully recruiting in Lake Powell, the source-sink dynamics between lake and river populations remains unresolved. However, the previous assumption that there was only one-way directional movement from the river-to-lake has been revised to account for a two-way exchange in some years.

All identified impediments to fish movement on the San Juan River have been removed or modified with the exception of APS Weir and Fruitland Diversion. The Program has requested that Reclamation develop appropriate design alternatives for review and consideration by the Program for APS Weir and Fruitland Diversion (LRP Tasks 2.3.1.5 and 2.3.1.6, respectively). Reclamation is currently developing options that include a non-selective fish passage at APS Weir in conjunction with the supply intake for the Navajo-Gallup water supply project. To explore potential endangered fish range expansion, the Program should further investigate available habitat and possible barriers in the Animas River and the benefit and feasibility of their removal or redesign.

RECOVERY ACTION 2: SUMMARY AND RECOMMENDATIONS

The Program is making sufficient progress in providing fish passage over barriers in the San Juan River that allow for movement and range expansion by the endangered fish. The Program needs to continue pursuing fish passage at APS Weir and Fruitland Diversion in accordance with the LRP. Additionally the Service recommends that the Program add to the LRP tasks to investigate barriers in the Animas River, determine potential range expansion for endangered fish if they are removed or redesigned, and the feasibility of these tasks.

3. Minimize entrainment of subadults and adults in diversion canals/out-take structures.

The Program uses LRP Action 2.3.3 “Minimize fish entrainment at diversion structures” to address this recovery activity.

In addition to blocking upstream movement of adult fish, diversion dams may also impact recruitment by entraining fish. In 2004 and 2005, numerous native and non-native fishes, including over 200 Colorado pikeminnow (up to 315 mm SL), were detected in irrigation canals along the San Juan River but were most numerous in the Hogback Canal (Renfro et al. 2006). The Program opted to construct an experimental fish weir instead of a fish screen in the Hogback Canal. Construction is expected to be completed in March 2013. This project will include a remote PIT tag reader to determine if any tagged endangered fish are being lost to Hogback Canal. The Program should evaluate existing diversions to determine if endangered fish are being entrained or impinged. The LRP includes provisions that appropriate structures be

designed and installed at diversions and water out-take structures as necessary to minimize or prevent entrainment and impingement.

RECOVERY ACTION 3: SUMMARY AND RECOMMENDATIONS

The Program is making sufficient progress in minimizing entrainment of fish in diversion canals and water out-take structures. The Program needs to ensure tasks in the LRP to evaluate the need for screens or deflection structures at the Arizona Public Service Company (APS) Weir, Fruitland Canal, Jewett Valley Ditch, San Juan Generating Station (PNM), and Farmer's Mutual Ditch are completed within a reasonable timeframe.

4. Ensure adequate protection from diseases and parasites.

The Program uses LRP Action 4.1.6, "Ensure adequate protection from disease and parasites" to address this recovery management action.

Fish health studies were conducted from 1992 to 1997 using flannelmouth and bluehead sucker as a surrogate for the endangered fish in the San Juan River. These studies investigated lesions and other abnormalities (Landye et al. 1999). In most years less than 1% of fish exhibited abnormalities but during some sampling periods as many as 3.5% of non-endangered suckers had abnormalities, primarily lesions (Landye et al. 1999). Based on these studies there was no indication that fish health was a limiting factor for Colorado pikeminnow or razorback sucker in the San Juan River (Holden 2000). Visual inspections of general fish health and condition occur on an annual basis during routine fish handling and capture activities on the San Juan River. Any increase in abnormalities could trigger an investigation to determine the threat of disease and parasites.

Although the source of the deformity is yet to be identified, opercle deformities in native larval suckers (including razorback suckers) were documented in 2011 (Brandenburg et al. 2012). Opercular deformities expose gills and may increase environmental stress, gill disease, and mortality (Paperna et al. 1990, Lindesjoo 1994). In 2013, the Program will conduct studies on archived and new specimens to determine the frequency of occurrence and spatial and temporal nature of this deformity.

RECOVERY ACTION 4: SUMMARY AND RECOMMENDATIONS

The Program is making sufficient progress to ensure that endangered fish have adequate protection from disease and parasites. Visual inspections of endangered fish should continue as part of the monitoring program. Any indication of poor health of endangered fish should be logged and reported. If the Program finds that indicators of poor health are a concern or an impediment to recovery, the Program should identify the causes and recommend corrective actions. In 2013, the Program will investigate cases of larval opercula deformities that were initially documented in 2011 using archived specimens to determine the frequency and extent of opercle deformities.

5. Regulate non-native fish releases and escapement into the San Juan River, floodplain, and tributaries.

The Program uses LRP Goal 3.2, “Prevent introduction and establishment of other non-native invasive species” to regulate non-native fish releases and escapement into the San Juan River. The action and tasks in the LRP associated with this recovery management action direct the Program to implement an agreement among relevant Federal, State, and Tribal agencies that prevents the introduction and establishment of non-native invasive species in the San Juan River Basin.

In February 2009, Chuck McCada (Service, Region 6) distributed a draft “Cooperative Agreement for Implementation of Procedures for Stocking Non-native Fish Species in the San Juan River Basin.” This document is similar to one developed for the Upper Colorado River Endangered Fish Recovery Program. The Biology Committee has reviewed and approved the draft cooperative agreement. The document includes a provision that all states will review stockings in addition to the required Federal review. New Mexico proposed revisions exempting stockings that have completed section 7 consultation but Colorado supports requiring both state and Federal review. While Tribes commented on earlier versions of the document, they need to provide input on the current revisions being considered. The cooperative agreement among Colorado Division of Parks and Wildlife, New Mexico Game and Fish Department, Utah Division of Wildlife Resources, Navajo Nation, Ute Mountain Ute Indian Tribe, Southern Ute Indian Tribe, and the U.S. Fish and Wildlife Service will require the signatures of all parties.

As part of the Animas-La Plata project, Lake Nighthorse was filled in 2011. Lake Nighthorse is an off-channel reservoir that was filled with water pumped from the Animas River. Outflow and water delivery from the reservoir is from Basin Creek (returning to the Animas River downstream from the pumping plant). The Program anticipates that non-native fish will become established in the reservoir. Reclamation has constructed a sleeve-valve as part of the outlet works to prevent escapement of any non-native fish life stages into Basin Creek (which could access the San Juan River via the Animas River). While initial test of the sleeve-valve indicated < 100% mortality of non-native fish larvae and eggs, a final report on these tests is forthcoming.

RECOVERY ACTION 5: SUMMARY AND RECOMMENDATIONS

The Program is making sufficient progress in regulating non-native fish releases in the San Juan River Basin but the Program needs to finalize the cooperative agreement and pursue the necessary signatures to implement the non-native stocking procedure as soon as possible since this Recovery Action has languished since at least 2009 (Action 3.2.2). The Program should review the results of the final report on the sleeve-valve test to determine the potential for non-native fish escapement from Lake Nighthorse and if other control measures or monitoring is necessary.

6. Control problematic non-native fishes as needed.

Goal 3.1 in the LRP details the Program's actions and tasks to control problematic non-native fish in the San Juan River. The recovery goals detail a two-step process that has been incorporated into the LRP to address the threat of non-native fish in the San Juan River Basin: (1) identify the level of management needed to minimize or remove the threat posed by non-native fish, and (2) implement the identified levels of non-native fish management.

The introduction of non-native species has been a major factor contributing to the extinction of many North American freshwater fish (Miller et al. 1989). Holden (2000) summarized the impact of non-native fish predation, competition, and hybridization on the native fish community in the San Juan River and Brooks et al. (2000) detailed the results of non-native fish interactions during the 7-year research period.

Limited mechanical removal of non-native fish began prior to 1999 and intensive removal of non-native fish via raft electrofishing has occurred in the upper and lower portions of

the San Juan River since 2001 and 2002, respectively (Duran et al. 2012, Gerig 2012). In 2006, the non-native fish removal program was extended to include the reach from Shiprock, NM to Mexican Hat, UT to remove non-native fish from a greater proportion of critical habitat. Non-native control efforts are focused on removing channel catfish and common carp; however, all non-native fishes collected are removed from the river. The selective fish passage at PNM Weir removes non-native fish while allowing native fish to pass upstream (Morel 2012).

The Program held a technical workshop in May 2010 to review and assess the non-native fish control program and make recommendations on how the current control program could more effectively reduce the threat of non-native species. In addition to the endorsement to continue the current level of non-native fish removal effort, the workshop participants recommended: (1) implementing a river-wide channel catfish marking trip in order to generate population and exploitation estimates; (2) evaluate techniques that target juvenile channel catfish; (3) establish non-native fish removal metrics and milestones to gauge success of removal efforts; (4) investigate alternative non-native fish removal strategies; and (5) develop a comprehensive non-native species management plan that includes monitoring and removal protocols, strategies, data integration, milestones and targets, and adaptive management components (Program 2011).

River-wide Schnabel population estimates for channel catfish increased from almost 132,000 in 1992 to nearly 275,000 in 1995 and common carp increased from over 26,000 to more than 107,000 during the same time period (Brooks et al. 2000). The Lincoln-Petersen population estimate from Shiprock, NM to Mexican Hat, UT in 2011 for adult channel catfish (> 300 mm TL) was 18,111, while the common carp (> 200 mm TL) estimate was 255 (Duran et al. 2012). The Lincoln-Peterson population estimate for channel catfish (> 200 mm TL) in the lower San Juan (between Mexican Hat and Clay Hills, UT) has ranged from 8,453 – 17,792 during 2008-2011 and the estimate of 8,453 in 2011 was significantly lower than estimates in 2008 and 2010 (Gerig 2012). Channel catfish capture rates (based on catch per unit effort – CPUE) have remained relatively constant in the lower river (Gerig 2012) while captures rates have decreased in the upper river (Duran et al. 2012). River-wide capture rates of channel catfish have remained relatively constant following the initiation of intensive non-native removal efforts, catfish populations are responding to removal efforts by shifting their distribution to middle sections of the river that have not experienced this long-term removal effort (D. Ryden personal communication). Capture rates of common carp have declined through time over the

entire river (Duran et al. 2012, Gerig 2012). Because trends in catch rate statistics may not be consistent with population abundance estimates, channel catfish population estimates should continue to allow for the calculation of exploitation rate and the evaluation of removal effectiveness.

A waterfall between the San Juan River and Lake Powell currently serves as a barrier for non-native fish moving from the lake to the river. While the waterfall was temporarily inundated in 2011, this barrier is expected to persist into the near future and creates an opportunity to maximize the removal of non-native fish without immigration from Lake Powell. Four razorback suckers that were initially detected in Lake Powell were subsequently detected in the San Juan River in 2011 indicating they were able to negotiate the temporarily inundated waterfall (Francis et al. 2012); however, there was no evidence of non-native fish movement from Lake Powell into the San Juan River during this period (Gerig 2012).

With continued river-wide removal efforts, it is expected that numbers of large-bodied non-native predators and competitors will decline. However, a positive endangered fish population response cannot yet be linked to non-native removal efforts. Measurable objectives and methods for assessing and maintaining effectiveness of removal efforts should be developed and implemented river-wide. Efforts to determine river-wide population estimates for problematic non-native fish would allow researchers and managers to evaluate an exploitation rate of these populations to assess the effectiveness of removal efforts. It is expected that removal efforts will promote the survival of native fish as the level of predation by non-natives and competition between native and non-native fish is reduced.

RECOVERY ACTION 6: SUMMARY AND RECOMMENDATIONS

The Program is making sufficient progress in controlling problematic non-native fishes. However, apart from implementing efforts to generate river-wide channel catfish population and exploitation estimates, the Program has not yet carried out the recommendations made during the Non-native Fish Workshop conducted in May 2010. Although many of these recommendations are included in the LRP (See Tasks 3.1.1.4, 3.1.1.5, 3.1.1.6, and 3.1.1.7), the Program needs to prioritize implementation of these workshop recommendations. Specifically, the Program needs to: (1) evaluate techniques that target juvenile channel catfish; (2) establish non-native fish removal metrics and milestones to gauge success of removal efforts; (3) investigate alternative

non-native fish removal strategies; and (4) develop a comprehensive non-native species management plan that includes monitoring and removal protocols, strategies, data integration, milestones and targets, and adaptive management components. Additionally, a comprehensive non-native species management plan should include measurable river-wide objectives to determine the effects of removal efforts on native and non-native fishes as indicated in the previous Sufficient Progress Report.

7. Minimize the risk of hazardous-materials spills in critical habitat.

The Program uses LRP Goal 2.4 to address suitable water quality to support recovery of Colorado pikeminnow and razorback sucker populations in the San Juan River Basin.

Specific tasks outlined in the 2002 recovery goals (Service 2002a, Service 2002b) to address the risk of hazardous spills within critical habitat were reiterated in the 2006 Service draft assessment of the Program and the 2010 Service review and assessment of the Program (Service 2006, Service 2010). These tasks included: (1) review and recommend modifications to State and Federal hazardous-materials spills emergency-response plans to ensure adequate protection for razorback sucker and Colorado pikeminnow populations from hazardous-materials spills, including prevention and quick response to hazardous-materials spills; (2) implement State and Federal emergency-response plans that contain the necessary preventive measures for hazardous-materials spill; (3) identify the locations of all petroleum-product pipelines within the 100-year floodplain of critical habitat; and, (4) assess the need and install emergency shut-off valves on problematic petroleum-product pipelines within the 100-year floodplain of critical habitat to minimize the potential of spills. The Service recommended that the Program develop specific actions for implementation in 2013 to address minimizing the risks of hazardous material spills within critical habitat. These tasks are in progress, but have not been completed to date and may take several years to complete.

To accomplish these tasks, The Nature Conservancy, a Program participant, is conducting conservation planning activities that include conducting an analysis of hazardous materials threats, evaluating the need for physical habitat enhancements for the San Juan River ecosystems. The goal of this project is to collect and compile existing data to analyze existing and proposed hazardous material threats to the San Juan River ecosystems, identify best management practices, and make recommendations to minimize the risks of hazardous material

impacts on the San Juan River. There are other groups within the San Juan River Basin, including the San Juan Watershed Group, Animas Watershed Partnership, and the New Mexico Environment Department working on water quality issues within the San Juan River Basin. The Program should coordinate with these groups in order to share information and minimize redundancy in efforts to address this issue.

RECOVERY ACTION 7: SUMMARY AND RECOMMENDATIONS

Recommended tasks to minimize the risk of hazardous-material spills in critical habitat in the San Juan River Basin were included in the LRP following the 2006 Service draft assessment of the Program, these tasks are in progress. The Program should complete the threat assessment project and then develop individual tasks for inclusion in the LRP to be accomplished. This effort may require collaboration with other groups within the San Juan River Basin that are working on similar issues. Timelines for completion should be added to relevant tasks in the LRP as soon as possible. A timeline should be developed for the actions previously recommended by the Service: (1) review and recommend modifications to State and Federal hazardous-materials spills emergency-response plans to ensure adequate protection for razorback sucker and Colorado pikeminnow populations from hazardous-materials spills, including prevention and quick response to hazardous-materials spills; (2) implement State and Federal emergency-response plans that contain the necessary preventive measures for hazardous-materials spill; (3) identify the locations of all petroleum-product pipelines within the 100-year floodplain of critical habitat; (4) assess the need and install emergency shut-off valves on problematic petroleum-product pipelines within the 100-year floodplain of critical habitat to minimize the potential of spills; and (5) identify specific actions to minimize the risks of hazardous material spills within critical habitat.

8. Remediate water-quality problems.

The LRP addresses water quality in the San Juan River under Action 2.4.2 "Remediate water quality problems."

The Service continues to have concerns with current levels of mercury and selenium found in the tissues of razorback sucker and Colorado pikeminnow at certain locations in the Upper Colorado River Basin. Those concerns are because mercury and selenium contamination may be causing reproductive impairment (Service 2009). Mercury is a bioaccumulating

neurotoxin that affects the reproductive health of fish (Crump and Trudeau 2009). Mercury levels in Colorado pikeminnow over 400 mm TL suggested likely reproductive impairment (Service unpublished data). Razorback sucker shed excess dietary selenium in their eggs that can cause high embryo mortality if selenium levels are sufficiently high (Lemly 2002).

The Service also recognizes that remediation of these contaminants is beyond the scope and capabilities of the Program and will require the assistance and actions by other Federal and State agencies. As detailed in the 2010 Service review and assessment of the Program (Service 2010), the Service supports the Program Office taking a lead role in: (1) coordinating the development of a comprehensive contaminants monitoring plan for the San Juan River; (2) identifying the effects of contaminants on recovery of endangered fish; and (3) providing assistance in developing recommended water quality criteria for problematic contaminants for consideration by state and federal water quality regulatory agencies when adopting enforceable water quality standards. The Biology Committee, contaminant biologists, fish toxicologists, and management and policy expertise will be consulted with to develop the monitoring plan. The plan will be closely coordinated between Region 2 and Region 6 of the Fish and Wildlife Service and with the Upper Colorado Recovery Implementation Program. As previously recommended, the Program Office has taken the lead for establishing a working group from Region 2 and 6 that includes expertise from both Recovery Programs to begin the process of addressing the contaminant issue and in developing the monitoring plan.

RECOVERY ACTION 8: SUMMARY AND RECOMMENDATIONS

Due to the contamination concerns and the potential impact on recovery efforts for Colorado pikeminnow and razorback sucker population, the Service and Program Office are pursuing the development of a comprehensive approach to addressing the sources of mercury and selenium through current consultations. As a Program participant, the Service is currently working through the Ecological Services Field Offices in Regions 2 and 6 to develop a comprehensive contaminants monitoring strategy that will be the foundation for a plan that will be developed in cooperation with other entities to track water quality threats to the endangered species. As the Service conducts section 7 consultations on Federal actions with impacts related to water quality, the Program will need to incorporate relevant terms and conditions and reasonable and prudent measures from the consultation process into the LRP.

Recognizing the inherent complexities with these issues, the Service considers the Program's progress sufficient in addressing the water-quality issues within its sphere of influence. The Service supports the same recommendation it made in 2010, that the Program Office continue the lead role in: (1) developing a comprehensive contaminants monitoring plan for the San Juan River in cooperation with other entities to identify water quality threats to the endangered species; (2) identifying the effects of contaminants on recovery of endangered fish; and (3) providing assistance in developing recommended water quality criteria for problematic contaminants to be considered by state and federal water quality regulatory agencies when adopting enforceable water quality standards.

9. Reestablish populations with hatchery-produced fish.

Element 1 of the LRP "Management and augmentation of populations and protection of genetic integrity," identifies Program actions and tasks for stocking of hatchery-produced fish.

After experimental stocking of endangered fish during the 7-year research period, the Program developed an augmentation plan for razorback sucker (Ryden 1997). Originally, razorback sucker were reared at the Southwestern Native Aquatic Resource and Recovery Center (formerly Dexter National Fish Hatchery and Technology Center) and stocked into grow-out ponds at Navajo Agricultural Products Industry (NAPI) in the spring and harvested in the fall for stocking into the river. Between 1997 and 2001, only 8% of the total razorback sucker stocking goal of 73,482 fish was achieved (Furr 2012a). An addendum to the augmentation plan for razorback sucker was completed in 2003 to guide stocking efforts from 2004 to 2011 (Ryden 2003a). In 2004, only 2,989 razorback sucker were stocked into the San Juan River, well below the stocking objective of 11,400 age-2 (≥ 300 mm) fish. In May 2005, a second addendum was proposed to change the starting date of the eight-year razorback sucker stocking plan to 2009 so corrective measures to improve production could be implemented. Currently, razorback sucker continue to be spawned at the Southwestern Native Aquatic Resource and Recovery Center but are now stocked into grow-out ponds at both Uvalde National Fish Hatchery (Uvalde NFH) and NAPI ponds (Ryden 2005a). Fish produced and stocked from the NAPI ponds are supplemental to the 11,400 fish provided to the Program by Uvalde NFH (Furr and Davis 2009a). Starting in 2013 the Horsethief Canyon Native Fish Facility may also be used for razorback sucker grow-out to provide redundancy with existing facilities. Razorback sucker stocking goals have been attained since the start of the new eight-year augmentation effort in 2009 (Furr 2012a).

In 2002, the Program developed an augmentation plan to guide Colorado pikeminnow stocking in the San Juan River (Ryden 2003b). Colorado pikeminnow were reared at the Southwestern Native Aquatic Resource and Recovery Center to satisfy the Program's previous annual stocking objectives of 300,000 age-0 and 3,000 age-1+ pikeminnow. From 2005 to 2009, the Program met or exceeded the total stocking goal. The Colorado pikeminnow stocking plan (Ryden 2003b) expired in 2009; however, a Phase II stocking plan was developed (Furr and Davis 2009b) and is under review by the Program's Biology Committee. A review by Durst (2009) suggested that, while return rates (one year post release) of age-1 Colorado pikeminnow were almost 4 times greater than return rates of age-0 fish, the cost of the returned fish was 30 times greater for age-1 fish. As a result of this analysis, the new stocking plan shifts all augmentation efforts to production and stocking of age-0 Colorado pikeminnow and calls for the annual production and stocking of $\geq 400,000$ age-0 Colorado pikeminnow into the San Juan River from the Southwestern Native Aquatic Resource and Recovery Center (Furr and Davis 2009b). Age-0 Colorado pikeminnow were not stocked in 2010 due to quarantine issued at the Southwestern Native Aquatic Resource and Recovery Center and only 353 age-1+ Colorado pikeminnow were stocked (Furr 2012b). Following resolution of the Southwestern Native Aquatic Resource and Recovery Center quarantine, 214,720 Colorado pikeminnow that should have been stocked as age-0 in 2010 were stocked in 2011 as age-1 (Furr 2012b). In the final year of stocking age-1+ Colorado pikeminnow under the previous augmentation plan, 3,743 age-2 Colorado pikeminnow were stocked in 2011 (Furr 2012b). Over 400,000 age-0 Colorado pikeminnow were stocked in November 2011 under the current augmentation plan (Furr 2012b).

Of all the management actions to recover Colorado pikeminnow and razorback sucker in the San Juan River, stocking/augmentation with hatchery produced fish has led to the largest population response of the endangered fish because of its direct impact on increasing endangered fish numbers. However, because both species are long-lived it will take many years to determine if the Program's stocking activities are successful. Annual monitoring of larval fish indicates that both razorback sucker and Colorado pikeminnow are reproducing; however, there has been no widespread detection of endangered fish recruiting into the adult population for either species.

RECOVERY ACTION 9: SUMMARY AND RECOMMENDATIONS

The Program is making sufficient progress in reestablishing populations of endangered fish within the San Juan River with hatchery-produced fish. The Program needs to ensure

augmentation plans for both Colorado pikeminnow and razorback sucker are implemented as scheduled to guide stocking into the future and that stocking objectives are achieved annually. Because the current Colorado pikeminnow augmentation plan is still in draft format, appropriate actions should be taken to approve this document.

10. Minimize the threat of hybridization with white sucker.

LRP Action 4.1.5 evaluates the risk of hybridization among sucker species.

The Program evaluated the degree of razorback sucker hybridization using DNA-based genetic markers on larval fish (Turner et al. 2002). Of 61 total fish screened, Turner et al. (2002) detected only two hybrids; both were flannelmouth-bluehead sucker crosses. None of the eight razorback sucker screened indicated there was any evidence of white sucker-razorback sucker hybridization (Turner et al. 2002).

There is currently no regular genetic analysis of razorback sucker in the San Juan River, but morphological hybrids could be detected through routine monitoring activities. White suckers are removed during monitoring, non-native fish control, and other Program activities on the San Juan River. Annual monitoring suggests that white suckers are very rare in the San Juan River; since 1991 there have never been more than eight collected in a single year (Service unpublished data). The LRP indicates that the extent of hybridization between white sucker and razorback sucker should have been reassessed in 2012. No plans are in place to conduct this type of work.

RECOVERY ACTION 10: SUMMARY AND RECOMMENDATIONS

The Program is making sufficient progress in minimizing the threat of razorback sucker hybridization with white sucker; however, the LRP established 2012 as the year to reconfirm that razorback sucker hybridization with white sucker is not a threat to the species. Periodic reconfirmation of the status of razorback sucker – white sucker hybridization should occur according to the schedule established in the LRP or reprioritized as appropriate.

RECOVERY DEMOGRAPHIC CRITERIA FOR DOWNLISTING AND DELISTING BOTH SPECIES

For the San Juan River Basin, the Colorado pikeminnow recovery goals (Service 2002a) state that a target of 1,000 age-5+ Colorado pikeminnow established through augmentation or

natural reproduction is required for downlisting and a population of 800 self-sustaining adults maintained in the San Juan River is needed for delisting. These target numbers for Colorado pikeminnow are based on inferences about the carrying capacity of the San Juan River Basin (Service 2002a). The razorback sucker draft recovery goals (Service 2002b) target a population of 5,800 self-sustaining adults in the San Juan River. These targets highlight the need to regularly conduct population estimates in order to evaluate progress toward recovery for both endangered species.

During the seven-year research period (1991 to 1997), Ryden (2000) estimated that there were fewer than 50 adult Colorado pikeminnow in the San Juan River in any given year. In 2000, it was estimated that there were 19 wild adult pikeminnow in the San Juan River from RM 136.6 to RM 119.2 (95% C.I. 10-42; Ryden 2000). Lincoln-Petersen population estimates for Colorado pikeminnow (> 150 mm TL) from Mexican Hat to Clay Hills, UT indicates the population has increased from 300-700 during 2004-2008 to approximately 1,100 individuals over 2009-2011 (Gerig 2012). River-wide (RM 166.6 – 2.9) population estimates of age-2+ Colorado pikeminnow in the river for at least one overwinter period were approximately 4,500 and 5,400 for 2009 and 2010, respectively (Duran et al. 2011).

No wild razorback suckers were found during the seven-year research period (Holden 2000). A Schnabel multiple-census population model for stocked razorback sucker from RM 158.6 to RM 2.9 estimated that there were 268 razorbacks in October 2000 (Ryden 2001) and approximately 1,200 in October 2004 (Ryden 2005b). River-wide (RM 166.6 – 2.9) population estimates of razorback sucker in the river for at least one overwinter period were approximately 2,000 and 3,000 for 2009 and 2010, respectively (Duran et al. 2011). Hatchery-reared razorback sucker, especially fish larger than 350 mm introduced into the San Juan River in the 1990s, have survived and reproduced, as evidenced by recapture data and collection of larval fish (Brandenburg et al. 2012, Durst 2012). Razorback suckers in reproductive condition have been documented in the critical habitat portion of the San Juan River arm of Lake Powell (Francis et al. 2012). Although it has not been possible to conduct a population estimate of razorback suckers in Lake Powell, the Service is currently considering the role Lake Powell plays in terms of razorback sucker recovery.

The current monitoring protocols include provisions to conduct population estimates and LRP Action 4.1.4 directs the Program to obtain reliable population estimates for Colorado

pikeminnow and razorback sucker. These regularly conducted population estimates are critical to evaluate progress toward recovery for both species.

RECOVERY DEMOGRAPHIC CRITERIA: SUMMARY AND RECOMMENDATIONS

The Program is making sufficient progress attaining the recovery demographic criteria for Colorado pikeminnow and razorback sucker. Although the numbers of Colorado pikeminnow and razorback suckers in appropriate size classes are clearly short of targets for downlisting and delisting established in the recovery demographic criteria, recent estimates indicate that populations of both fish species have grown compared to previous estimates. The Program should continue to provide reliable and precise population estimates in order for the Service to evaluate recovery and demographic criteria provided in species recovery goals.

POSITIVE POPULATION RESPONSE CRITERIA

As part of the Animas-La Plata Biological Opinion, Reclamation committed to operating Navajo Dam to mimicry of a natural hydrograph and to developing Positive Population Criteria to evaluate a positive population response for the endangered Colorado pikeminnow and razorback sucker. These criteria were developed in consultation with the Biology Committee and submitted to the Service for concurrence within one year of the date of the Animas-La Plata Biological Opinion. The criteria were developed to evaluate the population response of Colorado pikeminnow and razorback sucker to the operation of Navajo Dam mimicking a natural hydrograph in the San Juan River. The Positive Population Criteria are divided into two parts, the Interim Response Criteria (2002-2006) and the Positive Population Criteria (2007-2011) (Reclamation 2001).

The Interim Response Criteria developed for 2002-2006 have been met for both species. For the Colorado pikeminnow, these short-term criteria were: (1) collection of greater than 10 individuals larger than 350 mm during a standardized monitoring trip; (2) presence of wild larvae or YOY individuals in standardized monitoring collections in 2 of 5 years; and (3) range expansion above Hogback Diversion. The Interim Response Criteria for razorback sucker for 2002-2006 were: (1) collection of greater than 20 individuals larger than 300 mm during the annual fall standardized monitoring trip; (2) collection of greater than 0.15 individuals per hour of electrofishing larger than 300 mm; and (3) evidence of reproduction in standardized monitoring in at least 2 of 5 years.

Part two of the Positive Population Response Criteria was developed for 2007-2011 to build on Interim Response Criteria developed for 2002-2006. These criteria establish expectations for improvements in Colorado pikeminnow and razorback sucker population demographics. Attainment of the population response criteria for 2007-2011 depends on the successful implementation of various projects by the Program and will represent a significant step towards self-sustaining populations in the San Juan River. The criteria are intended to determine whether the stocked fish are capable of any of the following: (1) attaining adult size; (2) successfully reproducing and recruiting to young-of-year (YOY) age classes; or (3) recolonizing newly opened reaches of river.

Colorado Pikeminnow Positive Response Criteria 2007-2011

1. COLLECTION OF 10 OR MORE ADULT COLORADO PIKEMINNOW (≥ 450 MM TL) DURING A STANDARDIZED MONITORING TRIP.

In the five standardized monitoring trips conducted 2007-2011, a total of only 7 adult Colorado pikeminnow (≥ 450 mm TL) were collected and 4 adults was the most collected in a single year, 2010 (Ryden 2008, Ryden 2009, Ryden 2010, Ryden 2011, Service unpublished data). While Colorado pikeminnow are being captured during standardized monitoring trips, large reproductive fish that could contribute to a self-sustaining Colorado pikeminnow population are rarely captured. Due to past stocking efforts and predictions based on models, there should be more Colorado pikeminnow larger than 450 mm in the San Juan River than are being collected. These missing fish may fail to recruit to adulthood, avoid current sampling methodologies, or be present outside of the study area.

2. A POSITIVE TREND ANALYSIS OF ANNUAL ADULT/SUB-ADULT CPUE VALUES FROM STANDARDIZED MONITORING THAT INDICATES INCREASING NUMBERS OF FISH (REGRESSION ANALYSIS THAT RESULTS IN A SLOPE > 0 WITH A MINIMUM OF FOUR DATA POINTS), OR A RIVER-WIDE POPULATION ESTIMATE OF ADULT (≥ 450 MM TL) THAT EXCEEDS 400 INDIVIDUALS AND IS COMPOSED OF MULTIPLE AGE CLASSES.

River-wide (RM 166.6 – 2.9) population estimates of age-2+ Colorado pikeminnow in the river for at least one overwinter period were approximately 4,500 and 5,400 for 2009 and 2010, respectively (Duran et al. 2011). However, these estimates are primarily based on

juveniles because so few adults are regularly detected in the San Juan River. Overall scaled CPUE of Colorado pikeminnow indicate a positive trend through 2010 but insufficient numbers of adults are captured for a meaningful adult CPUE trend (Service unpublished data).

3. PRESENCE OF LARVAL OR YOY PIKEMINNOW IN STANDARDIZED MONITORING COLLECTIONS IN 3 OF 5 YEARS.

Larval Colorado pikeminnow have been collected in low numbers every year 2007-2011 except 2008 (Brandenburg et al. 2012).

4. A DENSITY OF 0.67/1000 M³ LARVAL COLORADO PIKEMINNOW IN STANDARDIZED DRIFT MONITORING DURING YEARS WHEN MONSOONS DO NOT HAVE A NEGATIVE EFFECT ON SAMPLING EFFICIENCY. OR A DENSITY OF 0.5/100 M² WILD YOUNG-OF-YEAR COLORADO PIKEMINNOW IN LOW VELOCITY HABITAT AS DETECTED DURING STANDARDIZED MONITORING.

Drift netting is no longer used in the larval fish sampling protocol, but a total of only 38 larval Colorado pikeminnow were collected from 2007-2011 using larval seines, approximately 0.05 larval pikeminnow per 100 m² of seining effort (Brandenburg et al. 2012). Both the larval and small-bodied monitoring program regularly capture YOY Colorado pikeminnow but these YOY fish are thought to be stocked individuals, nevertheless approximately 1.1 YOY Colorado pikeminnow were collected per 100 m² of larval seining effort but YOY Colorado pikeminnow has not exceeded 0.01/100 m² during small-bodied monitoring (Brandenberg et al. 2012, Gilbert et al. 2012).

5. RANGE EXPANSION ABOVE HOGBACK DIVERSION FOLLOWING REMOVAL OF THIS AND OTHER FISH BARRIERS.

Since the Hogback Diversion was modified in 2002, there have been 54 documented cases of Colorado pikeminnow implanted with PIT tags that have moved upstream of non-selective fish passage (Service unpublished data from 2003-2011). Therefore, Colorado pikeminnow have clearly expanded their range following the removal of these barriers.

POSITIVE POPULATION CRITERIA FOR COLORADO PIKEMINNOW: SUMMARY AND RECOMMENDATIONS

As of 2011, the Program has met only two (#3 and #5) of the five Colorado pikeminnow Positive Population Response Criteria for 2007-2011. While the Program is conducting management actions with the expectation of a positive population response by Colorado pikeminnow, the anticipated results are not being detected, particularly the criteria based on sufficient numbers of adult Colorado pikeminnow. It is possible that the assumptions and expectations that led to the development of the previous positive population response criteria were not realistic. Alternatively, current methodologies may not effectively detect adult Colorado pikeminnow or fish in these age and size classes may not be present in large numbers in the San Juan River Basin. The installation and use of passive PIT tag readers should provide additional monitoring data to provide a more complete understanding of tagged fish in the San Juan River. The Service is in the process of developing positive population response criteria for 2012 and beyond in order to continue to use these criteria as one tool to evaluate the Program's progress toward recovery.

Razorback Sucker Positive Response Criteria 2007-2011

1. COLLECTION OF 80 OR MORE ADULT RAZORBACK SUCKER (> 400 MM) DURING A STANDARDIZED MONITORING PROGRAM TRIP. OR AN INCREASE IN THE CPUE OF ADULT RAZORBACK SUCKER (> 400 MM) TO 0.6 FISH/HOUR DURING A STANDARDIZED MONITORING PROGRAM TRIP.

In each of the last two years there have been more than 80 adult razorback suckers collected during standardized monitoring trips with 83 and 114 collected in 2010 and 2011, respectively (Ryden 2011, Service unpublished data). This criteria was not attained in 2007-2009, only 69, 62, and 30 razorback suckers > 400 mm were collected in 2007, 2008, and 2009, respectively (Ryden 2008, Ryden, 2009, Ryden 2010). Scaled CPUE of razorback sucker with at least one overwinter period was approximately 0.75 fish/hour in 2010 and 2011 (Service unpublished data).

2. A RIVER-WIDE POPULATION ESTIMATE OF ADULT RAZORBACK SUCKER OF 2,900 OR MORE FISH.

River-wide (RM 166.6 – 2.9) population estimates of razorback sucker in the river for at least one overwinter period were approximately 2,000 and 3,000 for 2009 and 2010, respectively (Duran et al. 2011). These estimates include both sub-adult and adult razorback sucker while the criteria calls for 2,900 adult fish.

3. EVIDENCE OF INCREASED REPRODUCTION IN AT LEAST 3 OF 5 YEARS BASED ON STANDARDIZED MONITORING.

Razorback sucker larvae have been collected for the last 14 consecutive years (1998-2011; Brandenburg et al. 2012). Over 1,000 larval razorback suckers have been collected in each of the last two years and although larval razorback sucker are not as abundant as other native suckers, the catch rates of all of these species have increased over the last three years (Brandenburg et al. 2012).

4. RANGE EXPANSION ABOVE HOGBACK DIVERSION FOLLOWING REMOVAL AND/OR MODIFICATION OF FISH BARRIERS.

Since the Hogback Diversion was modified in 2002, there have been 56 documented cases of razorback sucker implanted with PIT tags that have moved upstream of the non-selective fish passage (Service unpublished data from 2003-2011). Thus, razorback suckers are able to utilize new areas of critical habitat that become available once barriers to movement are removed.

POSITIVE POPULATION CRITERIA FOR RAZORBACK SUCKER: SUMMARY AND RECOMMENDATIONS

The Program has met three of the four razorback sucker positive population response criteria for 2007-2011. The only outstanding criterion is a river-wide adult razorback sucker population estimate of 2,900 individuals. Regular reproduction and range expansion are encouraging for the recovery of this species within the San Juan River Basin. The Service is in the process of developing positive population response criteria for 2012 and beyond in order to continue to use these criteria as one tool to evaluate the Program's progress toward recovery.

CONCLUSION AND RECOMMENDATIONS

The Service applauds the Program participants' cooperation in carrying out beneficial recovery actions for Colorado pikeminnow and razorback sucker in the San Juan River Basin.

Based on the Service's evaluation of the Program's cumulative activities, status of the endangered fish, provision of adequate flows, and magnitude of water development projects, the Service considers the Program's overall progress toward recovery of Colorado pikeminnow and razorback sucker within the San Juan River Basin to be sufficient for the Program to continue as the ESA compliance mechanism for water development, management, and operations within the San Juan River Basin. The Program's actions and tasks described in the LRP and management activities in the draft Recovery Goals are being satisfactorily met, such that the Program will continue to serve as a foundation for reasonable and prudent alternatives and measures in applicable Section 7 consultations. Although recovery demographic criteria for downlisting and delisting have not been achieved, the overall population status of Colorado pikeminnow and razorback sucker in the San Juan River Basin has improved based on the Program's implementation of recovery actions.

To summarize this review and assessment, the Service views the following as significant Program accomplishments: (1) implementation of flow recommendations for the operation of Navajo Dam to mimic the natural flow regime; (2) the use of mechanical habitat manipulations to open secondary channels and maintain aquatic habitat complexity; (3) removal of in-river barriers to allow range expansion; (4) control of problematic non-native fishes; and (5) reestablishing populations with hatchery-produced fish. The Service considers the following corrective measures as a high priority for the Program: (1) the States of Colorado and New Mexico need to complete and implement the "Cooperative Agreement for Implementation of Procedures for Stocking Non-native Fish Species in the San Juan River Basin;" (2) the Program needs to continue work on the tasks detailed in the LRP to minimize the risk of hazardous-material spills in critical habitat; and (3) the Program Office, along with the Service staff from Regions 2 and 6, need to continue work on the tasks in the LRP designed to address water quality problems.

PROPOSED REVIEW OF THE LONG RANGE PLAN

The Service acknowledges that the Program has included the relevant goals, actions, and tasks in the LRP that are consistent with achieving the recovery goals for Colorado pikeminnow and razorback sucker. The Service recommends the Program prioritizes for implementation those existing tasks in the LRP that remain undefined, in addition to incorporating any new recommendations from this assessment. The Service requests that the Program review the LRP and develop implementation schedules for existing and new LRP tasks. The Service will continue to issue biennial sufficient progress reports to provide an assessment of the Program's ability in fulfilling future LRP tasks. The recommendations outlined below summarizes activities that the Service believes the Program should implement to benefit the recovery of the endangered fish in the San Juan River and for the Program to serve as the ESA compliance mechanism for water development projects within the San Juan River Basin. Moving forward with implementing these recommendations will allow the Program to continue to make significant progress toward recovery of the Colorado pikeminnow and razorback sucker within the San Juan River Basin.

1. Monitor the response of habitat manipulations and fund the construction of additional habitat restoration projects for creating and maintaining habitat complexity in the San Juan River.
2. Evaluate habitat and fish response to flow in order to develop and implement the process for revising flow recommendations.
3. Determine the extent of riverine habitat available in the Animas River and San Juan River upstream of the Animas River confluence.
4. Evaluate the effects of climate change on timing and magnitude of runoff as it relates to the ability to meet flow recommendations from Navajo Dam under different hydrological scenarios.
5. Ensure the Bureau of Reclamation moves forward with the design studies for fish passage improvements at APS Weir and Fruitland Diversion and investigate the implementation of additional fish passage improvements as needed in the San Juan and Animas Rivers.

6. Evaluate the need for fish screens or deflection weirs at other diversion and out-take structures along the San Juan River.
7. Prioritize implementation of non-native fish workshop recommendations.
 - a. Evaluate, select and test techniques that target the disruption of spawning or removal of juvenile catfish.
 - b. Establish non-native fish removal metrics and milestones to gauge success of the removal efforts.
 - c. Investigate alternative non-native fish removal strategies.
 - d. Develop a comprehensive non-native species management plan that includes monitoring and removal protocols, strategies, data integration, and river-wide objectives to determine the effects of removal efforts on native and non-native fishes.
8. Continue to work with Service Regions 2 and 6, States, Federal agencies and Basin Partners to develop a comprehensive contaminants monitoring strategy that will guide the identification and tracking of the sources of water quality threats that are adversely affecting the endangered species.
9. Minimize the risk of spills of hazardous materials within critical habitat. To fully address this recovery action, the Service recommends that the Program Office develop specific actions for accomplishing each of the following tasks and include appropriate actions and tasks in the LRP with time frames for completion.
 - a. Review and recommend modifications to State and Federal hazardous-materials spills emergency-response plans to ensure adequate protection for Colorado pikeminnow and razorback sucker populations from hazardous-materials spills, including prevention and quick response.
 - b. Ensure implementation of State and Federal emergency-response plans that contain the necessary preventive measures for hazardous-materials spill.

- c. Ensure identification of the locations of all petroleum-product pipelines within the 100-year floodplain of critical habitat and assess the need for emergency shut-off valves to minimize the potential for spills.
 - d. Ensure installation of emergency shut-off valves on problematic petroleum-product pipelines within the 100-year floodplain of critical habitat.
 - e. Develop Best Management Practices for heavy equipment use within the 100 year floodplain.
10. Finalize the cooperative agreement and pursue the necessary signatures to implement the non-native stocking procedures.
11. Reconfirm that hybridization with white sucker is not a threat to razorback sucker.

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