

Long-Range Plan

San Juan River Basin Recovery Implementation Program



September 2015

LONG-RANGE PLAN

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TABLE OF CONTENTS

INTRODUCTION.....1

 BACKGROUND..... 1

 PURPOSE..... 2

 AUTHORITY..... 3

DEMOGRAPHIC AND RECOVERY FACTOR CRITERIA4

 RAZORBACK SUCKER..... 4

Demographic Criteria 4

 Downlisting 5

 Delisting..... 5

Recovery Factor Criteria 6

 COLORADO PIKEMINNOW..... 6

Demographic Criteria 6

 Downlisting 6

 Delisting..... 7

Recovery Factor Criteria 7

RECOVERY ELEMENTS AND ACTIONS.....8

 TASKS THAT ADDRESS RECOVERY GOALS 9

 ONGOING ACTIONS..... 11

 DESCRIPTION OF PROGRAM ELEMENTS 12

Element 1. Management and Augmentation of Populations of Colorado Pikeminnow and Razorback Sucker..... 12

Element 2. Protection, Management, and Augmentation of Habitat 17

Element 3. Management of Nonnative Aquatic Species 28

Element 4. Monitoring and Evaluation of Fish and Habitat in Support of Recovery Actions..... 32

Element 5. Program Coordination and Assessment of Progress toward Recovery..... 44

Element 6. Information and Education 49

LITERATURE CITED.....52

APPENDICES 60

 APPENDIX A. TASKS, PRIORITIES, RESPONSIBILITIES, DATES, AND DESCRIPTIONS FOR ELEMENTS OF THE LONG-RANGE PLAN 60

Table A1. Element 1— Management and Augmentation of Populations of Colorado Pikeminnow and Razorback Sucker. 62

Table A2. Element 2 — Protection, Management, and Augmentation of Habitat..... 66

Table A3. Element 3 — Management of Nonnative Aquatic Species. 73

Table A4. Element 4 — Monitoring and Evaluation of Fish and Habitat in Support of Recovery Actions. 77

Table A5. Element 5 — Program Coordination and Assessment of Progress toward Recovery. 89

Table A6. Element 6.—Information and Education. 92

 APPENDIX B. COMPLETED LONG-RANGE PLAN TASKS 93

LIST OF TABLES

Table 1. LRP goals/actions/tasks that address recovery criteria for each species and status9-11

Table 2. Ongoing reports and workshops to be generated through this Long-Range Plan.....11-12

LIST OF FIGURES

Figure 1. Components and relationships of the San Juan River Basin Recovery Implementation Program including the Long Range Plan 3

INTRODUCTION

Background

The San Juan River Basin Recovery Implementation Program (Program) was initiated in October 1992 to protect and recover populations of two federally-listed endangered fish species in the San Juan River Basin (Basin) while water development proceeds in compliance with all applicable federal, state, and tribal laws. The two listed fish species are the Colorado pikeminnow (*Ptychocheilus lucius*; formerly known as Colorado squawfish) and razorback sucker (*Xyrauchen texanus*). Activities and actions within the Program serve as the "reasonable and prudent alternative" for projects in the San Juan River Basin and help to ensure that those projects will not jeopardize the continued existence of the endangered species. It is anticipated that actions taken under the Program will benefit other native fishes in the Basin and prevent them from becoming endangered.

The goals of the Program are:

1. To conserve populations of Colorado pikeminnow and razorback sucker in the Basin consistent with the recovery goals established under the Endangered Species Act of 1973, as amended, 16 U.S.C. §§ 1531 *et seq.* (ESA).
2. To proceed with water development in the Basin in compliance with federal and state laws, interstate compacts, U.S. Supreme Court decisions, and federal trust responsibilities to the Southern Ute Tribe, Ute Mountain Ute Tribe, Jicarilla Apache Nation, and Navajo Nation.

The Program was initiated with the signing of a Cooperative Agreement in 1992 after the rediscovery and documentation of successful spawning by Colorado pikeminnow and the continued presence of razorback sucker in the San Juan River. Adult and young-of-year Colorado pikeminnow and adult razorback sucker were collected during 1987-1989 by biologists gathering detailed fish community data for use in potential razorback sucker reintroduction efforts (Platania et al. 1991). This discovery resulted in the reinitiation of Section 7 consultation through the Bureau of Reclamation (Reclamation) for the Animas-La Plata Project; and subsequently, the Navajo Indian Irrigation Project underwent Section 7 consultation through the Bureau of Indian Affairs.

A 7-year research program, conducted during 1991-1997, provided a baseline of information that identified and characterized factors limiting the two endangered species. The research program was incorporated into the Recovery Program when it was formed in 1992. Culmination of the research program in 1997 marked the end of the research phase and the beginning of the implementation and management phase for the Program. In 1991, a Program Document (Document) was developed to provide the framework for Program implementation. The original Document was adopted in 1992 by the Cooperative Agreement signatories. The Document was modified by the Coordination Committee in 2006, 2010, and 2012 (SJRRIP 2012). The Document outlines the Program's purposes, authorities, structure, and operating procedures including funding and budgeting. The Document details the purposes of the Program's committees and defines their composition, authorities, and duties. The Document also includes a description of the process for conducting Section 7 consultations and for reviewing sufficient progress. The Section 7 procedures specifically reference implementation of a long-range plan as the principal means for determination of ESA compliance for water projects in the Basin. The Program operates through committee processes that identify the actions needed to attain the Program goals. The committees include representatives of the signatories to the Cooperative Agreement (extended in 2006 to September 30, 2023), including state and federal agencies and Native American Tribes. Water development and conservation interests are also participants of the Program.

Purpose

The purpose of this Long-Range Plan (LRP) is to identify specific actions to be implemented in the Basin that will contribute to recovery of the Colorado pikeminnow and razorback sucker in accordance with species recovery goals (U.S. Fish and Wildlife Service [Service] 2002a, 2002b). Recovery of both protected species will be accomplished within the context of conservation and management of the entire native fish assemblage and in a manner that does not compromise, impair, or diminish persistence of unprotected native fishes. The updated LRP is based on research information from past studies in San Juan River Basin and other regions and Program evaluation reports to identify multi-year research, monitoring, and recovery actions necessary to achieve the Program goals.

The first LRP was developed in 1995 by the Biology Committee and was intended primarily to guide the Program through the completion of a 7-year research program to identify and characterize factors limiting the two endangered species. The research phase of the Program was completed in 1997 and the LRP was updated and revised to provide guidance on the implementation and management phase of the Program. This LRP is a culmination of drafts and reports that updated the 1995 plan (Holden 2000; Miller 2006a; USFWS 2010, 2012). New recovery actions are identified that are based on evaluation and review of the Program's progress and on species recovery goals. The LRP is reviewed and updated annually. The relationship of the LRP to the various Program components is shown in Figure 1.

This LRP identifies actions and tasks to be accomplished and the estimated time frame for carrying out these tasks and activities consistent with species recovery and appropriate for evaluating Program progress. This LRP identifies and describes the progression and priority of implementing identified recovery actions that are expected to result in recovery and delisting of the Colorado pikeminnow and razorback sucker. Because actions identified in this LRP are linked to recovery goals and plans adopted by the Service (USFWS 2002a, 2002b), accomplishing the actions and tasks described in this LRP constitutes the milestones toward achieving recovery of the endangered fish species. As long as these actions and tasks are satisfactorily met and demonstrably contribute toward recovery of the listed fishes, it is the mutual expectation of the participants that the Program serves as the foundation for a reasonable and prudent alternative for Section 7 consultations, but does not preclude the development of reasonable and prudent alternatives independent of the Program.

In order to define and describe specific program activities and projects for upcoming years, the Program develops an Annual Work Plan (AWP). The AWP identifies and describes activities to be conducted by the Program in a given year for conservation of the endangered species. The LRP guides the Program in the development of the AWP and helps link Program activities for continuity and consistency. Approval of the AWP and budgets by the Coordination Committee is based, in part, on consistency and compliance with the LRP and available funds.

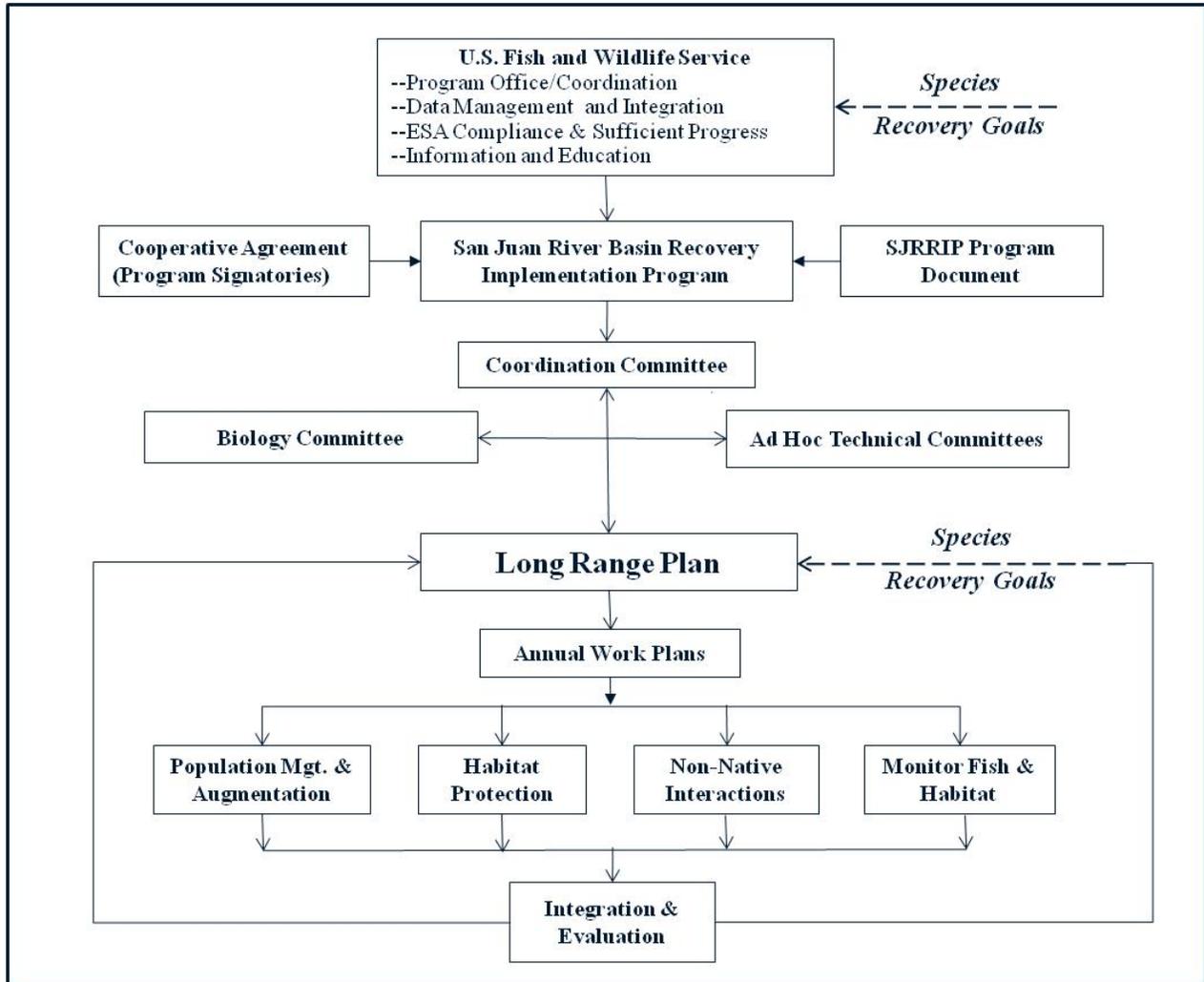


Figure 1. Components and relationships of the San Juan River Basin Recovery Implementation Program including the Long-Range Plan.

Authority

The Program became operational in October 1992 upon execution of a Cooperative Agreement signed by representatives of the Department of the Interior; the States of Colorado and New Mexico, and the Ute Mountain Ute and Southern Ute tribes; and the Jicarilla Apache Nation. The Bureau of Land Management became a participant in the Program in October 1993 as a condition of a Biological Opinion regarding oil and gas development in the Basin, and the Navajo Nation joined the Program in November 1996. In 2006, the 1992 Cooperative Agreement was extended through 2023.

Funding reliability is critical to the success of the Program to ensure that the Program is conducted on a continuous basis and that high priority recovery elements are funded every year. Prior to 2001, funding of the Program was provided by Reclamation, the BIA, and the Service. On January 24, 2000, Congress enacted Public Law 106-392 that authorized and directed Reclamation to fund this Program and the Upper Colorado River Endangered Fish Recovery Program. Public Law 106-392 authorized the Secretary of the Interior to use Colorado River Storage Project (CRSP) power revenues to fund annual base costs of both programs and to provide a cost-share, to be matched by state cost-shares, towards the costs of implementing capital recovery

projects under both recovery programs. The legislation also authorized federal appropriations to be made to contribute a federal cost-share towards implementation of the capital recovery projects. Public Law 112-270, signed into law on January 14, 2013, extended the authorization to expend CRSP power revenues for base (non-capital) funding for the two programs through 2019. If the availability of power revenues proves insufficient to meet the annual base funding, the Western Area Power Administration and Reclamation will request federal appropriations to meet these needs.

DEMOGRAPHIC AND RECOVERY FACTOR CRITERIA

Recovery goals for Colorado pikeminnow and razorback sucker identify demographic and recovery factor criteria needed to achieve recovery of the species in the Colorado River System (Service 2002a, 2002b). The recovery goals provide site-specific management actions; objective, measurable criteria; and estimates of time and costs as guidance for each of the recovery programs. The Upper Colorado River Endangered Fish Recovery Program implements and coordinates these management actions in the Upper Colorado River Basin in Colorado, Utah, and Wyoming, exclusive of the San Juan River Basin. This Program implements and coordinates these management actions in the San Juan River and its tributaries in Colorado, New Mexico, and Utah. The Service is currently in the process of updating the recovery plan for the Colorado pikeminnow and will revise the recovery goals, as necessary, through that process and incorporate them into the new plan for the species. A draft recovery plan was sent to the Upper Colorado and San Juan Programs for a stakeholder review on December 5, 2014. The Service hosted two half-day webinars for the Recovery Programs in April and May of 2015, to discuss the draft plan and the comments received to date. Program participants were asked to submit written comments after the webinars by June 5, 2015. A public comment period will occur via Federal Register notice at a yet to be determined date. The Service has not set a timeframe for updating the recovery plan for razorback sucker.

Demographic criteria and recovery factor criteria for the San Juan River Basin identified in the current recovery goals are summarized below. The demographic criteria identify the number of populations, numbers of individuals in each population, and the recruitment rates necessary for downlisting and delisting each species. The recovery factor criteria identify actions that should be taken to minimize or remove threats to each of the endangered fish species as identified for each of the five listing factors in Section 4(a)(1) of the ESA. As described in the species recovery goals, implementation of actions and achievement of criteria for downlisting and delisting of the Colorado pikeminnow and razorback sucker are the responsibility of each of the conservation programs in charge of management of these species for their region of the Colorado River System. Hence, achievement of demographic and listing factor criteria in the San Juan River Basin is the responsibility of this Program. The demographic criteria and recovery factor criteria for each of the two endangered fish species are provided in this LRP to help identify specific actions and tasks that are considered necessary for downlisting and delisting these species.

Razorback Sucker

Demographic Criteria

Objective, measurable criteria for recovery of razorback sucker in the Colorado River Basin were developed for each of two recovery units, the Upper Basin and the Lower Basin¹ (Service 2002b). Recovery

¹ The Upper Basin includes the Green River, Upper Colorado River, and San Juan River subbasins, and the Lower Basin includes the Colorado River mainstem and its tributaries from Glen Canyon Dam downstream to the southerly International Boundary with Mexico.

of the species is considered necessary in both the upper and lower basins. In order for the species to be considered for downlisting, each population must consist of fish that are recruiting into the adult population in the wild. When recruitment in the wild occurs, hatchery fish can be included in recovery demographic criteria and count towards recovery. Without viable wild populations, self-sustaining populations need to be established through augmentation with hatchery-produced fish. Once each self-sustaining population is established, the downlist monitoring period is five years and the delist period is an additional three years.

Downlisting

Downlisting can occur if, over a five-year period:

1. genetically and demographically viable, self-sustaining populations are maintained in the Green River subbasin and EITHER in the Upper Colorado River subbasin or the San Juan River subbasin such that: (a) the trend in adult (age 4+;>400mm TL) point estimates for each of the two populations does not decline significantly; (b) the mean estimated recruitment of age-3 (300-399 mm TL) naturally produced fish equals or exceeds mean annual adult mortality for each of the two populations; and (c) each point estimate for each of the two populations exceeds 5,800 adults (5,800 is the estimated minimum viable population [MVP] needed to ensure long-term genetic and demographic viability);
2. a genetic refuge is maintained in Lake Mojave in the lower basin recovery unit;
3. two genetically and demographically viable, self-sustaining populations are maintained in the lower basin recovery unit (e.g., Colorado River mainstream and/or tributaries) such that: (a) the trend in adult point estimates for each population does not decline significantly; (b) mean estimated recruitment of age-3 naturally produced fish equals or exceeds mean annual adult mortality for each population; and (c) each point estimate for each population exceeds 5,800 adults; and,
4. certain site-specific management tasks to minimize or remove threats have been identified, developed and implemented.

Delisting

Delisting can occur if, over a three-year period beyond downlisting:

1. genetically and demographically viable, self-sustaining populations are maintained in the Green River subbasin and EITHER in the Upper Colorado River subbasin or the San Juan River subbasin such that: (a) the trend in adult point estimates for each of the two populations does not decline significantly; (b) mean estimated recruitment of age-3 naturally produced fish equals or exceeds mean annual adult mortality for each of the two populations; and (c) each point estimate for each of the two populations exceeds 5,800 adults;
2. a genetic refuge is maintained in Lake Mojave;
3. two genetically and demographically viable, self-sustaining populations are maintained in the lower basin recovery unit such that: (a) the trend in adult point estimates for each population does not decline significantly; (b) mean estimated recruitment of age-3 naturally produced fish equals or exceeds mean annual adult mortality for each population; and (c) each point estimate for each population exceeds 5,800 adults; and,
4. certain site-specific management tasks to minimize or remove threats have been finalized and implemented, and necessary levels of protection are attained.

Recovery Factor Criteria

Recovery factor criteria in the recovery goals describe site-specific management actions necessary to minimize or remove threats to the species and support wild self-sustaining populations. This LRP incorporates these actions to ensure that this Program is carrying out activities consistent with species recovery. Actions 2 and 5 do not apply to the San Juan River, but are included to show the full scale of actions necessary to address threats to the razorback sucker. The following actions are quoted from the razorback sucker recovery goals (Service 2002b):

1. Reestablish populations with hatchery-produced fish.
2. Identify and maintain genetic variability of razorback sucker in Lake Mohave.
3. 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.
4. Provide passage over barriers within occupied habitat to allow unimpeded movement and, potentially, range expansion.
5. Investigate options for providing appropriate water temperatures in the Gunnison River.
6. Minimize entrainment of subadults and adults at diversion/out-take structures.
7. Ensure adequate protection from overutilization.
8. Ensure adequate protection from diseases and parasites.
9. Regulate nonnative fish releases and escapement into the main river, floodplain, and tributaries.
10. Control problematic nonnative fishes as needed.
11. Minimize the risk of hazardous-materials spills in critical habitat.
12. Remediate water-quality problems.
13. Minimize the threat of hybridization with white sucker.
14. Provide for the long-term management and protection of populations and their habitats beyond delisting (i.e., conservation plans).

Colorado Pikeminnow

Demographic Criteria

Objective, measurable criteria for recovery of Colorado pikeminnow in the Colorado River Basin were developed for the Upper Colorado River Basin (Service 2002a). Recovery of the species is considered necessary only in the Upper Basin because of the status of the populations and because information on Colorado pikeminnow biology support application of the metapopulation concept to extant populations. The need for self-sustaining populations in the Lower Basin and associated site-specific management actions and tasks necessary to minimize or remove threats will be reevaluated during the recovery plan update and status reviews of the species.

Downlisting

Downlisting can occur if, over a five-year period, the Upper Basin metapopulation is maintained such that:

1. a genetically and demographically viable, self-sustaining population is maintained in the Green River subbasin such that: (a) the trends in separate adult (age 7+; >450 mm TL) point estimates for the middle Green River and the lower Green River do not decline significantly; (b) the mean estimated recruitment of age-6 (400-449 mm TL) naturally produced fish equals or exceeds mean annual adult

mortality for the Green River subbasin; and (c) each population point estimate for the Green River subbasin exceeds 2,600 adults (2,600 is the estimated minimum viable population [MVP] needed to ensure long-term genetic and demographic viability);

2. a self-sustaining population of at least 700 adults (number based on inferences about carrying capacity) is maintained in the Upper Colorado River subbasin such that: (a) the trend in adult point estimates does not decline significantly; and (b) the mean estimated recruitment of age-6 naturally produced fish equals or exceeds mean annual adult mortality;
3. a target number of 1,000 age-5+ fish (>300 mm TL; number based on estimated survival of stocked fish and inferences about carrying capacity) is established through augmentation and/or natural reproduction in the San Juan River subbasin; and,
4. certain site-specific management tasks to minimize or remove threats have been identified, developed and implemented.

Delisting

Delisting can occur if, over a seven-year period beyond downlisting, the upper basin metapopulation is maintained such that:

1. a genetically and demographically viable, self-sustaining population is maintained in the Green River subbasin such that: (a) the trends in separate adult point estimates for the middle Green River and the lower Green River do not decline significantly; (b) the mean estimated recruitment of age-6 naturally produced fish equals or exceeds mean annual adult mortality for the Green River subbasin; and (c) each population point estimate for the Green River subbasin exceeds 2,600 adults;
2. either the Upper Colorado River subbasin self-sustaining population exceeds 1,000 adults **OR** the Upper Colorado River subbasin self-sustaining population exceeds 700 adults and San Juan River subbasin population is self-sustaining and exceeds 800 adults (numbers based on inferences about carrying capacity) such that for each population: (a) the trend in adult point estimates does not decline significantly; and (b) the mean estimated recruitment of age-6 naturally produced fish equals or exceeds mean annual adult mortality; and,
3. certain site-specific management tasks to minimize or remove threats have been finalized and implemented, and necessary levels of protection are attained.

Recovery Factor Criteria

Recovery factor criteria in the recovery goals describe site-specific management actions necessary to minimize or remove threats to the species and support wild self-sustaining populations. This LRP incorporates these actions to ensure that the Program is carrying out activities consistent with species recovery. Action 3 does not apply to the San Juan River subbasin, but is included to show the full scale of actions necessary to address threats to the Colorado pikeminnow. The following actions are quoted from the recovery goals for the Colorado pikeminnow (Service 2002a):

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. Investigate options for providing appropriate water temperatures in the Gunnison River.
4. Minimize entrainment of subadults and adults in diversion canals.
5. Ensure adequate protection from overutilization.
6. Ensure adequate protection from diseases and parasites.
7. Regulate nonnative fish releases and escapement into the main river, floodplain, and tributaries.
8. Control problematic nonnative fishes as needed.
9. Minimize the risk of hazardous-materials spills in critical habitat.
10. Remediate water-quality problems.
11. Provide for the long-term management and protection of populations and their habitats beyond delisting (i.e., conservation plans).

RECOVERY ELEMENTS AND ACTIONS

This LRP consists of the following six Program elements:

1. Management and Augmentation of Populations of Colorado Pikeminnow and Razorback Sucker.
2. Protection, Management, and Augmentation of Habitat.
3. Management of Nonnative Aquatic Species.
4. Monitoring and Evaluation of Fish and Habitat in Support of Recovery Actions.
5. Program Coordination and Assessment of Progress toward Recovery.
6. Information and Education

This LRP identifies activities believed necessary to recover the Colorado pikeminnow and razorback sucker in the San Juan River Basin. The LRP describes what actions will be implemented, who will implement them, when they will be implemented, and why. Details of how actions and tasks will be carried out are left to supporting documents and plans, such as genetics management plans, augmentation plans, monitoring plans, and annual work plans. This LRP functions under the principles of adaptive management where annual updates and periodic revisions are necessary to ensure use of the best available scientific information in modifying or eliminating existing activities and formulating future Program activities.

The LRP is intended to facilitate evaluation of the Program's progress toward species recovery and development of sufficient progress reports for ESA Section 7 compliance. Furthermore, this LRP is designed to facilitate tracking of projects and associated budgets to assist the Program Coordinator and Reclamation's budget office. Goals, actions, and tasks are identified that began in 1992, at the initiation of the Recovery Program. Numerous tasks have been completed and that information used to develop strategies for management actions, monitoring, and research. Including past Program activities in the LRP provides documentation and accounting of activities, time schedules, and successes and failures of each. This institutional knowledge of the Program will enable interested parties to review overall Program progress over time. Current goals, actions, and tasks are described in the narrative sections for each Recovery Element. Appendix A is used to track tasks and includes priorities, start and end times, primary responsibilities, and status. Priorities assigned to tasks reflect necessary actions identified in recovery goals. Completed tasks are included in Appendix B.

Recovery Elements 1, 2, and 3 include management actions to recover the two endangered fish, whereas Recovery Elements 4 and 5 include activities to monitor, evaluate, and assess if the management actions are achieving the intended purposes. Although the primary goal of this Program is to conserve populations of Colorado pikeminnow and razorback sucker in the Basin consistent with species recovery goals,

it is also important to ensure protection, restoration, and maintenance of the components of the physical and aquatic habitats that supports them. Environmental conditions that support the endangered species also provide suitable conditions for the native fish community and vice versa. Native fishes provide an important food source for the predaceous Colorado pikeminnow, are important in maintaining ecological balance and food web dynamics, and serve as indicator species for a healthy ecosystem. The San Juan River Basin supports seven fish species native to the warm reaches of the drainage, including roundtail chub (*Gila robusta*), Colorado pikeminnow, speckled dace (*Rhinichthys osculus*), bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), razorback sucker, and mottled sculpin (*Cottus bairdi*) (Holden 1999).

Tasks That Address Recovery Goals

This LRP addresses the species recovery goals through specific tasks that detail actions necessary to quantify demographic criteria and remove or minimize species threats (Table 1). For example, the LRP identifies tasks that reestablish endangered populations with hatchery fish in a systematic manner and tasks for monitoring population abundance. Numerous tasks help to provide and legally protect habitat, especially flows, and also provide for fish passage, as well as minimize entrainment. A series of ongoing tasks continue to be evaluated, including protection from overutilization and diseases and parasites, as well as water-quality remediation and minimizing the risk of hazardous materials spills. Control of problematic nonnative fish, regulating their escapement, and minimizing the threat of hybridization for razorback sucker are also important activities of this Program and the subject of several tasks.

Table 1 also provides a brief description of the status of the Program's progress toward achieving the recovery goals criteria. For more detailed information on results and activities, see the narrative descriptions for each Recovery Element and the status sections for individual tasks in the Appendix A tables.

Table 1. LRP goals, actions, and tasks, by number, that address recovery goals criteria for each species and status.

| Recovery Goals Criteria | LRP Goals, Actions, and Tasks | Status |
|--|---|--|
| Reestablish populations with hatchery-produced fish | 1.1; 1.1.1; 1.2; 1.3; 1.1.2 (Colorado pikeminnow); 1.1.3 (razorback sucker) | Stocking programs to reestablish populations of both species have been ongoing since the Program's inception. These efforts are successfully increasing the number of fish of both species. |
| Ensure adequate protection from diseases and parasites | 4.1.7 | Fish captured during annual monitoring are inspected for disease and parasites, field notes taken, and findings included in annual reports. To date, no significant problems have been observed. Appropriate actions will be taken if problems are detected. |
| Minimize threat of hybridization | 4.1.6 (razorback sucker only) | Fish captured during annual monitoring are inspected for hybridization, field notes taken, and findings included in annual reports. To date, no significant problems have been observed. Appropriate actions will be taken if problems are detected. |
| Minimize risk of hazardous-materials spills | 2.5; 2.5.1; 2.5.3 | An assessment of potential hazardous material threats was conducted by The Nature Conservancy (TNC). A final report is expected in May 2015. Based on threats identified, a plan for remediating potential hazardous materials spills will be developed. |

| Recovery Goals Criteria | LRP Goals, Actions, and Tasks | Status |
|---|---|--|
| Remediate water-quality problems | 2.5; 2.5.1; 2.5.2 | Initial investigations revealed a suite of water quality issues on the San Juan River, but more information is needed to better determine the effects on CPM and RBS populations. The Service has the lead in facilitating this effort and is working in coordination with other agencies to develop strategies for research and monitoring and to develop a basin-wide strategy to accomplish this task. |
| Provide and legally protect habitat | 2.1; 2.1.1; 2.1.2; 2.2; 2.2.1-2.2.4 | Navajo Dam has been operated in accordance with flow recommendations developed by the Program since 1999. Releases are made to provide sufficient water at times, in quantities, and for durations necessary to protect the endangered fish and their designated critical habitat while maintaining the other authorized purposes of the Navajo Dam. The 1999 flow recommendations will be reviewed and revised starting in 2015. The Program is also partnering with TNC to restore side channel and backwater habitats. Several sites along the river have been restored and are being monitored by the Program for persistence and functionality. Legal protection of habitat has not been identified as a problem at this time so is not being pursued by the Program. |
| Provide passage over barriers | 2.3; 2.3.1; 2.3.1.3-2.3.1.7; 2.3.2; 2.3.2.1-2.3.2.3 | Range fragmentation in the San Juan River impedes movement of fish and access to spawning areas and feeding grounds. Eight major diversion structures on the mainstem San Juan River were identified, ranging from soil and boulder dikes to concrete and metal weirs over which the entire river flows. Fish passage has been restored at three of the sites. The other five sites as well as additional sites on the Animas River are being evaluated to determine what type of passage may be needed. |
| Minimize entrainment at diversion structures. | 2.4; 2.4.1; 2.4.1.1-2.4.1.5; 2.4.2; 2.4.2.1-2.4.2.2 | Entrainment and/or impingement of all life stages of native and endangered fishes at diversion structures are a potential impediment to recovery. Five structures on the San Juan River and two on the Animas River have been identified that could potentially entrain fish. A deflection weir to reduce entrainment of endangered fishes in the Hogback Canal was constructed in 2013 and its effectiveness being evaluated. In 2015, the Program will issue a RFP for an assessment of potential entrainment sites in the San Juan and Animas rivers. |
| Control problematic nonnative fishes | 3.1;3.1.1; 3.1.1.1-3.1.1.7 | The Program has been implementing an extensive riverwide nonnative fish management program to remove nonnative fish annually since 2008. The effort has drastically reduced carp numbers and is altering the population structure of channel catfish. The Program annually reviews results of monitoring and analyses and makes adjustments to methods to increase exploitation rates of catfish and improve effectiveness of the nonnative fish removal program. |

| Recovery Goals Criteria | LRP Goals, Actions, and Tasks | Status |
|---|--|---|
| Regulate nonnative fish releases and escapement | 3.2; 3.2.1-3.2.3 | A draft sport fish stocking policy for the San Juan River Basin has been developed and is being reviewed for signature by the States of New Mexico, Utah, Colorado, and the Tribes. This along with other efforts to prevent introduction of nonnative species will become part of a comprehensive nonnative species management plan for the Program. |
| Demographic criteria | 4.1;4.1.1-4.1.4.; 4.4; 4.4.1-4.4.4; 5.2; 5.2.1-5.2.2 | Monitoring and research data collected from San Juan River Basin is analyzed annually by the Program to assess progress toward achieving the demographic criteria that identifies the number of populations, numbers of individuals in each population, and the recruitment rates necessary for downlisting and delisting each species. |

Ongoing Actions

A series of ongoing reports and other activities are identified in this LRP. The reports are designed to provide cohesive and periodic updates on specific issues and are distinct from project reports that describe the findings of a particular study. These reports are provided to the Coordination Committee, the Program Coordinator, Reclamation, and the technical committees and are listed in Table 2. Also listed in Table 2 are workshops to be held, as necessary, to help coordinate Program activities, evaluate recovery activities, and provide technical assistance to biologists on population estimators and monitoring.

Table 2. Ongoing reports and workshops identified in this Long-Range Plan.

| Identified Task | Report or Workshop | Schedule/Interval | Status/Action(s) Required |
|--------------------|--|--|---|
| 5.2.1.1 | Standardized database; for all stocked and recaptured Colorado pikeminnow and razorback sucker in order to determine the fate of stocked fish. | Annual entry of data with appropriate documentation. | Program Office maintains and annually updates the database; Principal Investigators annually provide data to Program Office by Dec. 31; consolidated data redistributed by Jan. 31. |
| 4.1.1.2 | Annual Fish Monitoring Report; to ensure that the best sampling design and strategies are employed. | Annual reports by Biology Committee; compiled by Program Office; posted on Program website | Principal Investigators provide draft reports by March 31 and present results at annual meeting in May. Final reports provided to Program Office by June 30. |
| 5.2.1.2 | Data synthesis and integration report; evaluates progress toward minimizing limiting factors, details ongoing Program activities, and assesses current status of native and endangered fish populations. | Annually but may vary in timing due to competing fiscal resources, project scheduling, or significant new information. | Program Office and Principal Investigators conduct focused data integration to address high priority data needs identified by the Biology Committee. Draft reports by March 31 and present results at annual meeting in May. Final reports due by June 30 |
| 4.1.1.1 | Standardized Fish Monitoring Plan; to assess the presence, status, and trends of Colorado pikeminnow and razorback sucker. | Standing report is revised as necessary by the Program Office and Biology Committee. | Program Office and Biology Committee will continually evaluate the Program’s Comprehensive Monitoring Plan and Protocols. The Plan was updated in 2012. |
| 4.2.1.1 | Standardized Habitat Monitoring Plan; to assess habitat and flow relationships. | Standing report is part of the Program’s Monitoring Plan and Protocols; revised as necessary. | Program Office and Biology Committee updated the Program’s Habitat Monitoring Protocols in 2012. |
| 2.2.1.2 2.2.2.1 | Flow recommendations update report; evaluates and updates flow | Environmental Flows Workshop #1 was held in | Completion of Reclamation’s next generation of the SJRB Hydrology Model |

| Identified Task | Report or Workshop | Schedule/Interval | Status/Action(s) Required |
|-----------------|---|--|--|
| 4.4.4.4 | recommendations and response of native and endangered fishes to flow recommendations. | Feb. 2015; Environmental Flows Workshop #2 has not been scheduled yet. | is expected in 2015. A technical workshop was held in Feb. 2015 to modify methods for implementing the 1999 flow recommendations. A comprehensive review and revision of the 1999 flow recommendations is expected to begin in 2015. |
| 4.1.1.3 | Monitoring Plan Workshop: to coordinate sampling design, data collection, and desired precision and detection levels for detecting responses. | As necessary. | Series of three monitoring workshops were held by the Biology Committee in 2009. |
| 4.2.1.2 | Habitat Monitoring and Mapping Workshop; to refine and improve habitat evaluation methods. | As necessary. | Workshop to address this issue was held in January 2012. Program Office and Biology Committee using workshop results to refine current methods and develop new ones. |
| 4.1.4.4 | Population Estimation Workshop; to evaluate population estimators used in other systems to identify the most reliable and suitable estimator(s) for Colorado pikeminnow and razorback sucker. | As necessary. | A population estimate workshop was held in 2007. |
| 3.1.1.5 | Non-native fish control workshop; to evaluate the non-native fish management program. | As necessary. | Non-native fish workshop was held in May 2010. |

Description of Program Elements

The elements and associated tasks are designed to guide the Program through 2023 with annual updates as new information is obtained. This schedule is consistent with the Recovery Program goals that estimate recovery for the razorback sucker and Colorado pikeminnow by the year 2023.

For each Recovery Element, a general explanation of the recovery activities and background are provided in the following narrative sections. Specific goals, actions, and tasks deemed necessary to achieve each element are identified at the end of each section. The goals under each element describe major targets that need to be achieved in order to fulfill the specified element; actions identified under each goal describe the principle actions; and the tasks describe the specific activities or projects. Appendix A tables include the identified tasks and provides a priority, the year(s) in which the activity is planned, the lead Program participant(s), and a status update for each task (updated annually). Tasks are moved to Appendix B when they are completed.

Element 1. Management and Augmentation of Populations of Colorado Pikeminnow and Razorback Sucker

This element ensures that the Program's augmentation protocols maintain genetically diverse fish species while producing and rearing Colorado pikeminnow and razorback sucker to stock in the river system. Wild self-sustaining populations of Colorado pikeminnow and razorback sucker have currently not been documented in the San Juan River Basin. Recovery goals for both species identify the need to establish self-sustaining populations through augmentation with hatchery-produced fish. The Program has adopted a genetics management plan (Crist and Ryden 2003) that identifies appropriate genetic lineages for use in hatchery

programs and stocking efforts for the San Juan River. Augmentation plans for each of the two endangered species were originally developed by Ryden (2003a, 2003b) and updated as needed. Production, rearing, and stocking of these fish need to continue to establish wild populations. The numbers and size of fish that need to be produced are identified in the species augmentation plans. Stocking protocols and fate of stocked fish are monitored and evaluated to determine the best strategies for enhancing survival and recruitment. Survival models are used to estimate and adjust stocking goals of augmentation plans and to ensure that sufficient numbers of genetically viable fish are being stocked.

Surveys in the late 1980s reported a few wild Colorado pikeminnow and razorback sucker in the San Juan River (Platania 1990; Platania et al. 1991). Prior to initiation of the Program, the Service proposed stocking razorback sucker into the San Juan River in 1986 to restore the species to the river. The effort was not undertaken, but Colorado pikeminnow and razorback sucker persistence in the river was documented. An experimental stocking program for razorback sucker began in 1994, under Program auspices, and experimental stocking of Colorado pikeminnow began in 1996. In the early years of the stocking program, finding consistent sources of the two listed species for stocking, the right facilities, and the best methods were challenging and involved much trial and error. Since its inception, the Program continues to identify and develop strategies for producing and rearing both Colorado pikeminnow and razorback sucker, including hatchery production and grow-out facilities.

Today, brood stocks of razorback sucker and Colorado pikeminnow are held at Southwestern Native Aquatic Resources & Recovery Center (SNARRC) at Dexter, New Mexico where fish are spawned, hatched, and reared. Brood stocks of Colorado pikeminnow are also held at the Colorado Division of Wildlife J.W. Mumma Native Species Hatchery at Alamosa, Colorado and brood stocks of razorback sucker are held at Ouray National Fish Hatchery – Grand Valley Unit (NFH-GVU) at Grand Junction, Colorado. The Program uses grow-out facilities to produce larger razorback sucker (>300 mm total length) for stocking to enhance survival. Since 1998, Navajo Agricultural Products Industry (NAPI) Ponds located on the Navajo Indian Irrigation Project (NIIP) have been used to grow-out razorback sucker from SNARRC for the stocking program. From 2007-2013, Uvalde National Fish Hatchery (Uvalde) in Uvalde, Texas was used to rear and stock 11,400 >300 mm razorback suckers to meet stocking goals. Low recaptures rates of razorback sucker stocked from Uvalde, prompted the Service and the Program to discontinue using this facility (Durst 2011). Final fish distributions from Uvalde occurred in October of 2013. In 2010, the Coordination Committee approved cost sharing with the Upper Colorado River Endangered Fish Recovery Program to construct, operate, and maintain Horsethief Canyon Native Fish Facility (HCNFF) at Ouray NFH's GVU. This facility became operational in 2012 and includes four 0.25-acre hatchery ponds for use by the Program to grow-out razorback sucker for the San Juan River stocking program. In addition to the fish produced by these facilities, excess fish from other facilities that raise Colorado pikeminnow and razorback sucker are occasionally stocked into the San Juan River.

While the overall goals for Element 1, *Management and Augmentation of Populations of Colorado Pikeminnow and Razorback Sucker*, are the same for both the Colorado pikeminnow and razorback sucker, i.e., Establish Genetically and Demographically Viable, Self-Sustaining Colorado Pikeminnow and Razorback Sucker Populations (Goal 1.1), Identify and Implement Strategies for Improving the RBS and CPM Augmentation Program and Genetic Integrity (Goal 1.2), and Support Operations and Maintenance of Facilities to Support RBS and CPM Stocking Programs (Goal 1.3), some actions and tasks vary by species.

Element 1- Specific goals, actions, and tasks

Goal 1.1—Establish Genetically and Demographically Viable, Self-Sustaining CPM and RBS Populations.

Action 1.1.1 Develop plans for rearing and stocking CPM and RBS.

Task 1.1.1.1 Review and update augmentation plan for CPM and adjust stocking goals as needed.

Numerous stocking plans for Colorado pikeminnow have been developed and updated since stocking began. Current stocking plans are: *Augmentation of Colorado pikeminnow (Ptychocheilus lucius) in the San Juan River Phase II, 2010-2020, Augmentation Plan* (Furr 2010) and *Stocking plan and protocol for the augmentation of Colorado pikeminnow (Ptychocheilus lucius) in the San Juan River* (Furr and Davis 2009b).

Task 1.1.1.2 Review and update augmentation plan for RBS and adjust stocking goals as needed.

Numerous stocking plans for razorback sucker have been developed and updated since stocking began. Current stocking plans include: *A stocking plan and production protocol for razorback sucker (Xyrauchen texanus) reared at NAPI ponds* (Furr and Davis 2009a); *An augmentation plan for razorback sucker in the San Juan River: Addendum to the five-year augmentation plan for razorback sucker in the San Juan River* (Ryden 2003b); and, *An augmentation plan for razorback sucker in the San Juan River. Addendum # 2: Justification for changing the beginning date of the eight-year stocking period (Final)* (Ryden 2005a).

Action 1.1.2 Produce, rear, and stock sufficient numbers of CPM to meet stocking goals of augmentation plan.**Task 1.1.2.1** Annually produce and rear at least 400,000 age-0 CPM (50–55 mm TL) at SNARRC.

At least 400,000 age-0 (50–55 mm TL) CPM will be produced and reared annually at SNARRC and will continue until further production capacity is identified and/or stocking targets are modified by the Program (see Task 1.1.1.1).

Task 1.1.2.2 Stock at least 400,000 age-0 (50–55 mm TL) CPM annually into the San Juan River.

At least 400,000 age-0 (50–55 mm TL) CPM will be released annually from SNARRC into the San Juan River and will continue until stocking targets are modified by the Program (see Task 1.1.1.1).

Task 1.1.2.3 Opportunistically stock available CPM in excess of those described above.

Excess CPM may be available from the upper basin or other sources. On a case by case basis and if deemed appropriate, these should be procured and stocked opportunistically in excess of the numbers described above.

Action 1.1.3 Produce, rear, and stock sufficient numbers of RBS to meet stocking goals of augmentation plan.**Task 1.1.3.1** Produce and rear RBS at SNARRC for stocking into grow-out facilities.

RBS will be produced and reared annually at SNARRC and in accordance with the genetics management plan and stocked into grow-out facilities, currently NAPI ponds. All fish will be marked with PIT tags (see Task 1.1.1.2).

Task 1.1.3.2 Rear and stock hatchery-reared RBS into three NAPI grow-out ponds (3,000-3,500 fish per pond, > 200 mm TL).

PIT-tagged RBS will be and stocked annually into three NAPI grow-out ponds with 3,000-3,500 (> 200 mm TL) hatchery-reared RBS produced at SNARRC (expected harvest of 40-

60%). Using a single cohort strategy, all fish will be re-tagged, if necessary, and stocked into the San Juan River within 12 months (see Task 1.1.1.2).

Task 1.1.3.4 Stock at least 91,200 RBS (> 300 mm TL) during eight year stocking period or 11,400 per year.

At least 91,200 RBS (> 300 mm TL) will be harvested from grow-out ponds and/or supplemental hatchery facilities and stocked into the SJR over an 8-year period or 11,400 per year. A 2005 addendum to the stocking plan specified the eight-year stocking period to begin when the production program was at full implementation, estimated to start no later than 2007. Time frame for current 8-year stocking plan is 2009-2016 (see Task 1.1.1.2).

Task 1.1.3.5 Opportunistically stock available RBS in excess of the 11,400 per year described above.

Excess RBS may be available from the upper basin or other sources. On a case by case basis and if deemed appropriate, these will be procured and stocked opportunistically in excess of the 12,000 described above.

Task 1.1.3.6 Produce > 2,000 RBS per year (>300 mm TL) at Horsethief Canyon Native Fish Facility (HCNFF), part of the larger Ouray National Fish Hatchery – Grand Valley Unit (ONFH-GVU) in Grand Junction, CO.

This facility became operational in 2012 and includes four 0.25-acre hatchery ponds for use by the Program. 2,000-4,000 razorback sucker will be reared at HCNFF for use in the Program's stocking program.

Goal 1.2— Identify and Implement Strategies for Improving the RBS and CPM Augmentation Program and Genetic Integrity.

Action 1.2.1 Implement methods to evaluate status and success of stocked RBS and CPM.

Task 1.2.1.1 Maintain a standardized database for all stocked and recaptured RBS and CPM in order to determine the fate of stocked fish.

All RBS and CPM released into the San Juan River will be tabulated and tracked to understand survival of fish and success of the augmentation program. All fish of sufficient size will be PIT-tagged and recorded in the Program's standardized PIT-tag database. The database will be updated annually by the Program Office and accessible to researchers.

Task 1.2.1.2 Identify, describe, and implement strategies for improving survival and retention of stocked razorback sucker and Colorado pikeminnow, including acclimation prior to stocking, size of fish stocked, time and location of stocking, physiological conditioning, and predator avoidance.

Factors that limit or impede survival of stocked RBS and CPM will be identified and strategies will be developed to eliminate or ameliorate these factors. Scientific evidence shows that acclimation by fish before release may reduce dispersal and increase survival. Experiments are being conducted to evaluate dispersal and survival of fish released directly into the wild vs. fish held at on-site acclimation pens. Protocols for acclimating stocked CPM were developed in 2009 (Furr and Davis 2009b).

The Program ceased production and stocking of age-1+ Colorado pikeminnow in 2011 based on results from data analyses that showed a limited return rate and relatively higher production

costs compared to fish stocked at age-0 (Durst 2011). Using the Program's standardized database, Durst (2013) also found low recaptures rates of RBS stocked from Uvalde NFH (2007-2013). This prompted the Service and the Program to discontinue using this facility. Final fish distributions from Uvalde occurred in October of 2013.

Task 1.2.1.3 Identify and implement a method for tracking genetics of Colorado pikeminnow and razorback sucker in the San Juan River to determine if and to what extent wild produced individuals depart from genetic structure of parental stock (hatchery derived).

A genetics management plan was developed (Crist and Ryden 2003). Ongoing genetic monitoring of fish stocks is necessary to ensure genetic integrity of CPM and RBS. When adult progeny of stocked fish are available, Crist and Ryden (2003) recommended conducting periodic monitoring to ensure that inbreeding depression is not occurring.

Goal 1.3— Support Operations and Maintenance of Facilities and Equipment to Support RBS and CPM Stocking Programs.

Action 1.3.1. Support production and grow-out facilities.

Task 1.3.1.1 Support operation and maintenance of hatchery facilities at SNARRC for CPM and RBS production.

Task 1.3.1.3 Support operation and maintenance of Navajo Agricultural Products Industry (NAPI) grow-out ponds for RBS production.

Task 1.3.1.4 Support operation and maintenance of Horse Thief Canyon fish rearing ponds for RBS production.

Action 1.3.2 Implement a PIT tag marking program to insure all stocked and/or encountered endangered fish are fitted with PIT tags to track individual RBS and CPM in support of evaluation and assessment activities.

Task 1.3.2.1 Procure adequate numbers of PIT tags for marking native and endangered fish.

PIT tags are the standard marking tool for the endangered fishes.

Task 1.3.2.2 Install and maintain remote PIT tag detectors in the river to passively track fish presence/absence and movement.

Three sites on the San Juan River were originally identified for installation of a passive PIT tag detector. Permanent PIT tag detectors were successfully installed at two of these sites, PNM Diversion (2015) and Hogback Fish Weir (2014). Installation of a reader across the river at Mexican Hat was not viable. A permanent readers were installed at PNM fish passage and PNM Weir in 2014 and 2015. As part of other research projects, permanent or temporary readers have been installed in other location such as San Juan River tributaries and below the Lake Powell waterfall. The Program will continue to explore options for placing other remote readers in the river.

Element 2. Protection, Management, and Augmentation of Habitat

This element identifies actions and tasks that address protection, management, and augmentation of the physical and aquatic habitats needed to support recovery of Colorado pikeminnow and razorback sucker populations including suitable flows, range, the native fish community, and water quality. Following seven years of research on flows and habitat in the San Juan River Basin completed in 1997, the Biology Committee recommended a program of flow releases from Navajo Dam that would mimic the river's natural hydrograph, thereby improving habitat for native fishes including the Colorado pikeminnow and razorback sucker (Holden, ed. 1999). These flow recommendations were based on scientifically-established relationships between flow regime (frequency, timing, magnitude, duration, rate of change, and seasonality of water flow), river geomorphology, and habitat and life history of the two endangered fish species. Reclamation began operating Navajo Dam according to the flow recommendations in 1999 and implemented the flow recommendations using operations decision criteria established in the Final Environmental Impact Statement for operations of the Navajo Dam through 2014 (Reclamation 2006). Releases are made to provide sufficient water at times, in quantities, and for durations necessary to protect the endangered fish and their designated critical habitat while maintaining the other authorized purposes of the Navajo Dam. Biologists have been monitoring the effects of Program's activities, including flow management, for more than twenty years using standardized monitoring protocols established by Propst et al. (2000, 2006) for most of that period.

The authors of the 1999 flow recommendations noted that the flow recommendations were subject to review and revision through an adaptive management process based on monitoring data. Several scientific reports by the Biology Committee and other researchers concluded that prescribed flows from Navajo Dam may not have achieved the expected outcome in terms of channel complexity and fish habitat and maintenance identified in the 1999 flow recommendations (Miller 2006, Bliesner 2010, SWCA Environmental Consultants 2012). Upon reviewing 1999-2003 monitoring results, the Biology Committee determined that although the prescribed flows were successful in some regards, they have been largely unsuccessful in creating and maintaining the secondary channels and backwater habitat critical to reproduction of the endangered fish (Miller 2006). Bliesner (2010) reported that habitat complexity important to all life stages is diminishing. Several committee members also suggested during a 2012 habitat monitoring workshop (SWCA Environmental Consultants 2012) that encroachment onto the San Juan River floodplain by non-native plants is degrading habitat for endangered fish by "armoring" banks and simplifying the river channel. This bank armoring reduces habitat complexity often associated with higher numbers of Colorado pikeminnow and razorback sucker. The lack of the intended habitat response to the flow recommendations may also be attributed to an apparent change in hydrologic conditions in the 1999 to 2013 period as compared to the longer term period since 1971 (Reclamation 2014). These results suggest that implementation of the initial flow recommendations using the 2006 operations decision criteria may not create and maintain enough habitat to achieve recovery goals for the endangered fish.

Task 2.2.1.2 in this LRP is included to insure the flow recommendations are reviewed and revised based on monitoring data, the new San Juan River Basin hydrologic model, updated climate change projections for stream flow, and expanded scientific knowledge of flow-ecology relationships. To initiate the process, the Program held an environmental flow workshop in February 2015 to make modifications to the existing process for implementing the flow recommendations to partially address apparent weaknesses in the decision criteria as a result of the drier hydrologic conditions that have occurred in the basin in the last decade (Alliant Environmental 2015). During the workshop, a process was also developed for conducting a comprehensive review and revision of the 1999 flow recommendations starting in 2015.

Review of the current scientific literature and relevant case studies as part of a 2014 evaluation conducted by TNC indicates that both water market transactions and irrigation system improvements that integrate infrastructure modernization with operational changes can successfully reduce agricultural river diversions for the benefit of endangered fish. This study identified multiple opportunities to collaborate with

agricultural, municipal, and industrial water users in the San Juan Basin to reduce river diversions through water use efficiency improvements, thereby supporting environmental flows.”

Non-flow alternatives to create and maintain suitable habitats and restore channel complexity that work in conjunction with flows are being investigated including mechanical manipulation and removal of invasive riparian species at selected locations. Non-flow alternatives for creating and maintaining suitable habitat could also help offset possible effects of climate variability and to augment the beneficial effects of flow recommendations. In 2011, the Program partnered with TNC on a New Mexico Environment Department River Ecosystem Restoration Initiative (RERI) project to use mechanical manipulation to restore secondary channels along the San Juan River. Construction on these Phase I sites were completed in November 2011. The Program conducted physical and biological monitoring of the sites to assess functionality, sustainability, fish use, and nonnative vegetation encroachment rate. The information collected was used to determine feasibility, location, and design for additional sites. In 2014, TNC completed Phase II of the channel restoration project using private mitigation funds. This brings the total amount of secondary channels restored to 7.1 miles. Monitoring of larval and small-bodied native fish at the original 6 RERI sites continued in 2014 and both larval and small-bodied fish were captured in good numbers at the restored sites. To provide additional information on the persistence of aquatic habitats and to measure changes in habitat features, larval fish abundance and small-bodied fish abundance from prior to spring runoff to late fall, more intensive monitoring of the Phase II site and a nearby control site will begin in 2015.

Cold water releases from Navajo Dam were identified as a factor potentially limiting reproduction and upstream distribution of the endangered fishes in the San Juan River (Bliesner and Lamarra 2000). Based on modeling of reservoir and release temperatures (Cutler 2006) and an assessment of longitudinal warming and fish temperature requirements (Lamarra 2007), the Biology Committee determined a temperature control device (TCD) at Navajo Reservoir was not warranted. At that time, impacts to spawning and rearing from cold releases from Navajo Dam into the San Juan River appeared to be minimal and it was thought that spawning was determined more by time-of-year than temperature cues. A TCD may provide seasonal range expansion above critical habitat but it is unknown if range expansion above critical habitat is necessary for recovery. Larval fish surveys conducted on the San Juan River since 1991 indicate that temperature has a greater impact on the spawning period (Brandenburg and Farrington 2009). As a result of the Program’s 2012 Habitat Monitoring Workshop, the Biology Committee determined that the extent of riverine habitat available as well as what is being used by the various life stages of the target species needs to be quantified so that management actions to extend that availability can be evaluated. The committee prioritized expanding habitat monitoring into the Animas River and above the Animas River confluence of the San Juan River focusing on temperature and blockages. Miller (2015) documented long-term changes in distribution of temperature from high flows since 1993 and prolonged cold water conditions (temperature depression) that could negatively impact timing, number, and size of larvae which suggests a need to revisit thermal modeling and potential thermal modification to Navajo Dam releases.

Range fragmentation in the San Juan River impedes movement of fish and access to spawning areas and feeding grounds. Additional range for Colorado pikeminnow and razorback sucker is being provided through modification of water diversions that allow fish to move upstream and downstream. This LRP identifies actions that provide fish passage at diversions that will enable fish to move freely for over 180 miles from the Lake Powell inflow upstream past the confluence of the Animas River. Some of the fish passage facilities selectively pass fish and help to diminish movement by problematic nonnative fishes to key habitats of native and endangered fishes. Eight major diversion structures on the mainstem San Juan River in New Mexico were identified, ranging from soil and boulder dikes to concrete and metal weirs over which the entire river flows. The most upstream of these structures are dikes and levees at the heads of the Citizens Ditch and the Hammond Canal. They are upstream of the Animas River confluence and outside of designated critical habitat for both species. These cooler reaches of river are not likely to be occupied by Colorado pikeminnow and razorback sucker. Five structures, located downstream of Farmington, were identified by Masslich and

Hoden (1996) as impediments or partial impediments to fish movement. Fish access was restored at three sites by removing Cudei Diversion Dam at River Mile (RM) ~142 and constructing a passive fish passages at Hogback Diversion Dam at RM 159 in 2001, and constructing a selective fish passage at Public Service Company of New Mexico (PNM) Weir at RM 166.6 in 2003.

Two other potential impediments for fish passage occur in the mainstem San Juan River, Arizona Public Service Company (APS) Weir at RM 163.3 and Fruitland Diversion Dam at RM 178.5. Stamp et al. (2005) identified the need for fish passage at the APS structure and concluded a fish passage was not needed at Fruitland irrigation diversion structure, at that time, but recommended that it be re-evaluated after maintenance work is performed to confirm that the height or composition of the dam is not altered relative to the conditions documented in the study. These two sites are scheduled for reevaluation and modification in 2017.

A waterfall formed at Piute Farms in the lower San Juan River at the Lake Powell inflow (river mile 1.1) in 2003 when water levels of that reservoir declined below ~3,660 feet. This waterfall is an impediment to upstream movement of native and endangered fishes, but also impedes nonnative fishes from moving upstream from the reservoir. The Biology Committee discussed the need for an artificial barrier at the lower end of the San Juan River to exclude nonnative predators and/or potential competitors from recolonizing the river when water levels in Lake Powell rise and the waterfall is again inundated. Reclamation assessed the risk of this occurring and concluded that there is a 60 to 75% chance that the waterfall will be inundated for a total of 30 months (not necessarily continuously) between 2008 and 2030. The waterfall did become inundated for a short period in 2011 when the lake elevation rose above 3,660 feet between July 31 and August 9. It is unknown how many native and nonnative fishes moved into the river during that time; however, sampling crews have subsequently captured razorback suckers in the San Juan River that were captured, tagged, and released in Lake Powell in 2011 (Francis et al. 2015). Strategies for providing passage of native and endangered fishes from Lake Powell around the waterfall into the San Juan River have been evaluated (e.g., barriers, passive non-native fish removal, temporary weirs). If a barrier is determined to be necessary, measures for providing selective upstream passage for native species will be developed.

Designated Critical Habitat for the endangered fish in the San Juan River basin extends approximately 35 miles downstream into Lake Powell to Neskahai Canyon. Any razorback suckers or Colorado pikeminnows existing in this portion of Lake Powell are considered to be part of the San Juan River fish assemblage. A two-year fish survey of the San Juan Arm of Lake Powell was initiated by the Program in 2011 to assess the extent of San Juan River fish lost over the waterfall especially as it relates to the Program's augmentation program to recover the listed species. During sampling in 2011 and 2012, 147 razorback suckers and 25 Colorado pikeminnows that were released in the San Juan River were captured in the reservoir (Francis et al. 2015). Considering the limited amount of samples taken during the two years and limited amount of lake area that could be covered, it is assumed there are large numbers of razorback suckers present in Lake Powell. Biologists also documented active spawning grounds and razorback sucker reproduction and believe recruitment may be occurring. Inter-basin exchange of razorback suckers between the San Juan, Colorado, and Green rivers was also documented. Considering limited slackwater or backwater habitats on the San Juan River, Lake Powell may be essential to recruitment and potential recovery of the species in this river basin (Francis et al. 2015). In 2014, the Upper Colorado Endangered Fish Recovery Program initiated sampling in the Colorado River Arm of Lake Powell and will repeat it in that location again in 2015. Additional sampling in areas of Lake Powell downstream from the San Juan and Colorado river arms of the lake is needed to help determine the extent of razorback sucker distribution within the lake. The information gained from all Lake Powell surveys will be used by the Program to determine future Program management actions regarding Lake Powell.

Entrainment of all life stages of native and endangered fishes in diversion structures is another potential impediment to recovery. In 2005, the Program funded the design of fish screens or a deflection weir for the Hogback diversion to reduce entrainment of endangered fishes in the Hogback Canal. A fish deflection

weir was installed at the Hogback Canal in 2013. Principles for minimizing entrainment that are learned from the experimental Hogback Canal design will potentially be used to construct these features on other diversions and canals. An assessment of potential entrainment structures in the San Juan and Animas rivers will be conducted in 2015.

Based on data collection and an evaluation from the 7-year research period by Holden (2000), the Biology Committee concluded that water quality in the San Juan River was not a limiting factor to recovery of the endangered fishes or to restoration and maintenance of the native fish community. In a comprehensive review of water quality and contaminants in the San Juan River, Abell (1994) found a large quantity of information available on water contaminants and pollutants, primarily abiotic data, but very little data linking those contaminants to fish health. She found many of the studies could not be compared to each other due to varying methodologies and detection levels. She emphasized the need for agencies responsible for protecting and restoring Colorado Basin fish populations to work together to insure future sampling efforts complement each other to provide as complete a picture as possible of contaminants in the basin. In a synoptic study of contaminants data from the 7-year research period, Simpson and Lusk (1999) concluded that selenium was a contaminant risk for the razorback sucker. The Service has serious concerns with current levels of mercury and selenium found in the tissues of razorback sucker and Colorado pikeminnow in the Upper Colorado River Basin and believes a comprehensive contaminants monitoring and remediation plan is needed to identify sources and magnitude of water quality threats that are adversely affecting the endangered species. This type of effort will require pooling of resources within the Upper Colorado River Basin and the expertise of the Biology Committee, contaminant biologists, fish toxicologists, and management and policy experts.

The Program's goal is to recover both of the endangered fishes within the context of conservation and management of the entire native fish assemblage that supports them. Protection of native aquatic species is critical to the recovery of the Colorado pikeminnow and razorback sucker. Although the Program has not identified any specific recovery actions to actively manage the native fish community, the restoration of backwater habitats and efforts to maintain or increase habitat complexity are active management tools for conserving all native fish species. The Program has been monitoring the native fish community since its inception to assess the status of the native fish community and to determine if specific management actions will be needed in the future to recover the listed species. The Program collaborates with other ongoing programs that are actively managing other native species. For example, three native species, flannelmouth sucker, bluehead sucker, and roundtail chub, have some level of state sensitive species status in each of the states they occur in (Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming). In 2006, a range-wide conservation agreement and strategy was signed by each of the six state agencies as well as federal and tribal agencies with the goal of implementing conservation measures and reducing threats to the species in order to conserve populations and prevent the need for federal listing under the Endangered Species Act. Conservation actions have included three species monitoring, research, propagation and stocking of roundtail chub, removal of invasive nonnative species, and habitat conservation and restoration.

To achieve this element, six recovery goals were established to: provide suitable habitat (*Goal 2.1*); provide suitable flows (*Goal 2.2*); provide increased range (*Goal 2.3*); minimize fish entrainment (*Goal 2.4*); provide suitable water quality (*Goal 2.5*), and manage the native fish community (*Goal 2.6*). Providing suitable habitat actions and tasks focus primarily on creating and maintaining habitat complexity to minimize loss and degradation of habitat and managing flows to create and maintain suitable habitat. An action is also included to evaluate and implement habitat restoration strategies to augment the function of flow to create and maintain suitable habitat. The actions and tasks related to providing suitable flows focus on implementing flow regimes beneficial to both listed species and the native fish community, providing flow recommendations and guidance for releases out of Navajo Dam, and maintaining a San Juan River hydrology model to evaluate flow recommendations and basin hydrology over time. Actions and tasks to increase range include construction and maintenance of Program structures at diversions to allow for fish passage in the San Juan River mainstem and tributaries. An action is also included to evaluate passage of San Juan River fish into Lake Powell in light of

the waterfall that has formed and to assess the potential for non-native fish movement into the river if the waterfall becomes inundated. Actions and tasks to minimize fish entrainment identify diversion structures in the San Juan River mainstem and tributaries that need to be assessed and modified, if necessary, to prevent fish mortality. Water quality actions and tasks focus on identifying water quality and contaminant problems that could affect the listed fish and the native fish community, remediating those problems, and minimizing the risk of hazardous materials spills. Actions and tasks to manage the native fish community currently focus on assessing the health of the native fish community as an important component of suitable habitat. Many of the tasks identified in Element 2 will be assessed through tasks under Element 4, *Monitoring and Evaluation of Fish and Habitat in Support of Recovery Actions*.

Element 2 - Specific goals, actions, and tasks

Goal 2.1—Provide Suitable Habitat to Support Recovery of CPM and RBS Populations.

Action 2.1.1 Create and maintain habitat complexity to minimize loss and degradation of habitat for the endangered fish in the SJR.

Task 2.1.1.1 Support implementation of TNC’s Conservation/Habitat Planning Project.

Habitat monitoring and research has shown a downward trend in channel complexity, an important habitat component for the endangered fishes. The Recovery Program recognizes flow management coupled with mechanical methods is needed to create and maintain backwaters and side channels. To date, funding for this type of work has come from outside the Recovery Program. The Recovery Program is providing a variety of assistance in support of these ongoing projects.

Action 2.1.2 Implement habitat restoration strategies to augment the function of river flow to create and maintain suitable habitat.

Task 2.1.2.1 Develop and implement a plan for feasible habitat restoration strategies and implement such a plan as funding becomes available.

Other habitat creation and restoration strategies will be developed and implemented, as identified by Program review processes.

Action 2.1.3 Procure products, equipment, and materials in support of **Goals 2.1 – 2.6**

Task 2.1.3.1 Obtain river videography.

High definition videography taken in late summer during base flow conditions is used for developing maps of the river, evaluating habitat relationships, and providing a database for comparing future conditions (See Goal 4.2 – Monitor Habitat Availability and Use).

Task 2.1.3.2 Support operation and maintenance of San Juan River stream gages as necessary to monitor flows in the river.

USGS streamflow gaging stations in the San Juan River provide important flow data for Program monitoring, research, and assessment of environmental flows. Five gages on the main stem of the river are important for operating Navajo Dam and implementing the Program’s flow recommendations. The Program provides funding to the USGS for additional flow measurements to improve gaging reliability at San Juan near Archuleta, San Juan at Farmington, San Juan at Shiprock, and San Juan at Four Corners (See Goal 4.2 – Monitor Habitat Availability and Use).

Goal 2.2—Provide Suitable Flows to Support Recovery of CPM and RBS Populations in the San Juan Basin.

Action 2.2.1 Develop flow regimes to provide adequate flow and function to maintain habitat for CPM and RBS.

Task 2.2.1.1 Implement flows that provide suitable habitat for endangered fishes and other native fishes in the San Juan River.

Flow recommendations were developed in 1999 to provide sufficient water at times, quantities, and durations necessary to protect the endangered fishes and their designated critical habitat (Holden 1999). Reclamation has been operating Navajo Dam according to the Flow Recommendations since 1999. Reclamation implements the flow recommendations by making releases based on operations decision criteria developed in 2006 (Navajo Ops BO), hydrologic conditions, and operational constraints while maintaining the other authorized purposes of the Navajo Unit. Slight modifications to the 2006 operations decision criteria were made in 2015 primarily to adjust for prolonged dry hydrologic conditions in the San Juan River Basin.

Task 2.2.1.2 Develop and implement a process for revising flow recommendations

The Service will coordinate and oversee development of any revisions to the Program's flow recommendations (Program Document 2012). The process for revising flow recommendations will be based on monitoring data, the San Juan River Basin hydrologic model, updated climate change projections for stream flow, and scientific knowledge of flow-ecology relationships. The revised flow recommendations will be produced by the Program Office with technical guidance from the Biology Committee and outside experts. The revised flow recommendations will be reviewed and commented on by the Biology and Coordination Committees. Following review and any necessary revisions, the Program Office will submit the revised flow recommendations to the Service Regional Office and Reclamation for further review, revision, approval, and implementation.

Action 2.2.2 Develop and maintain a hydrology model to evaluate flow recommendations in the context of water supply and demand in the Basin.

Task 2.2.2.1 Develop, evaluate, and refine a San Juan Basin Hydrology Model (SJBHM) that provides a scientifically sound and biologically relevant representation of the San Juan River.

A SJBHM was developed by Reclamation in 1995 to provide a tool to analyze ways to manage flows in the San Juan River Basin for the benefit of endangered fishes while allowing water development to proceed. The purpose of the model is to: a) provide input to the development and periodic evaluation and analysis of flow recommendations, and b) assess the impact of project development on basin depletions and recommended flows for endangered fishes. Model development has undergone two generations (Generations I and II) and development of a third generation model is in progress. The utility and effectiveness of the hydrology model is evaluated periodically by technical experts appointed by Program participants.

Task 2.2.2.2 Conduct peer review of the hydrology model by qualified specialists not affiliated with the Program.

An independent peer review will be conducted of the hydrology model to determine if the model properly represents San Juan River hydrology and to ensure that the model can be used to evaluate flow recommendations.

Task 2.2.2.3 Provide model analysis for the evaluation of flow recommendations.

Model analyses for the evaluation of flow recommendations and project impacts will be conducted by Reclamation, the Program's technical committees and experts at the request of the Coordination Committee or Service.

Action 2.2.3 Coordinate with Reclamation on Navajo Dam operations.**Task 2.2.3.1** Provide input and recommendations to the Service and Reclamation on alternate dam operations when extreme hydrologic conditions prevent flow recommendations from being met.

Reclamation holds quarterly meetings with stakeholders on operations of Navajo Dam. Reclamation will coordinate these meetings and solicit input from stakeholders.

Task 2.2.3.2 Make determination of perturbation for Navajo Dam operations.

Perturbation as it relates to the flow recommendations is a year in which the nursery habitat has been deteriorated by storm events to a level requiring flushing. Perturbations are calculated by storm events between July 27th and Dec 31st of the previous calendar year. For instance, a storm event occurring August 1st 2003 would be counted in Perturbation Year 2004. If the number for storm event days is greater than 12, it is counted as a perturbation year. A storm event day, as described in the flow recommendations, is defined as a day when the daily gain in flow between Farmington and Bluff, and the daily flow at Bluff, were each more than 150 cfs greater than the preceding 5 day average. A storm event day is given a weight of 2 if the gain in flow was 3,000 cfs or more. Reclamation provides a determination of perturbation in January of each year. The Biology Committee reviews the determination.

Action 2.2.4 Provide and protect flows in the San Juan River consistent with flow recommendations.**Task 2.2.4.1** Develop and implement mechanisms for protecting water required to meet flow recommendations.

Reclamation will coordinate with the States of New Mexico and Colorado to ensure protection of water released from Navajo Reservoir storage intended to fulfill flow recommendations.

Task 2.2.4.2 Develop contingency strategies to meet the functions provided by flow recommendations during extended periods of droughts.

Alternative strategies for meeting the functions provided by flow recommendations during extended periods of droughts will be developed, as needed.

Task 2.2.4.3 Collaborate with agricultural, municipal, and industrial water users in the San Juan Basin to promote water use efficiency savings and water market transactions that support environmental flows.**Goal 2.3**—Provide Increased Range to Support Recovery of CPM and RBS Populations in the San Juan Basin.**Action 2.3.1** Identify blockages to fish passage at diversion structures in the San Juan River and provide and maintain fish passage where needed.**Task 2.3.1.4** Provide and maintain fish passage at the Public Service Company of New Mexico (PNM) Weir.

Selective fish passage at Public Service Company of New Mexico (PNM) Weir was completed in 2003 and is operated by the Navajo Nation.

Task 2.3.1.5 Investigate the need for fish passage at the Arizona Public Service Company (APS) Weir and provide and maintain fish passage, if deemed necessary.

An evaluation of the need for fish passage at the APS diversion structure was done in 2005 (Stamp et al. 2005). It was concluded that in most years, there is the potential for spawning Colorado pikeminnow to be impeded by the diversion eliminating 16 miles of upstream habitat. In low spring runoff, there is potential for spawning razorback sucker to be impeded by the diversion and unable to access upstream habitat.

Task 2.3.1.6 Investigate the need for fish passage at the Fruitland Diversion and provide and maintain fish passage, if deemed necessary.

The Fruitland Diversion is owned by the Navajo Nation. An evaluation of the need for fish passage at the Fruitland diversion structure was done in 2005 (Stamp et al. 2005). It was concluded that 1) the rock dam structure does not significantly hinder fish passage, except perhaps at very high discharges (8,000 cfs and greater) and 2) that the rock dam be visited and photographed immediately after maintenance work is next performed to confirm that the height or composition of the dam relative to the conditions documented in this study are not substantially altered.

Task 2.3.1.7 Investigate the need for passage of native and endangered fishes from Lake Powell around the waterfall into the San Juan River and provide and maintain fish passage, if deemed necessary.

Strategies for providing fish passage around the waterfall need to include the potential for non-native fish movement into the river if the waterfall becomes inundated. If a barrier is determined to be necessary, the BC believes it should provide selective upstream passage for native species and should be built in a location where it can be operated, possibly at Mexican Hat. See Task 3.2.3.1.

Action 2.3.2 Identify impediments to fish passage in San Juan River tributaries to increase range.

Task 2.3.2.1 Investigate the need for fish passage at the Animas Pump Station #2 and provide and maintain fish passage, if deemed necessary.

Francis (2007) investigated fish passage and canal entrainment of native sucker populations in the Animas River. He identified City of Farmington's Animas Pump Station #2 (RM 11.9) and Farmer Ditch Diversion (RM 21.9) as having the greatest potential to be barriers for native fish movement on the Animas River. He found the Animas Pump Station #2 was a seasonal barrier to fish passage.

Task 2.3.2.2 Investigate the need for fish passage at the Farmer's Ditch Diversion and provide and maintain fish passage, if deemed necessary.

Francis (2007) investigated fish passage and canal entrainment of native sucker populations in the Animas River. He identified City of Farmington's Animas Pump Station #2 (RM 11.9) and Farmer Ditch Diversion (RM 21.9) as having the greatest potential to be barriers for native fish movement on the Animas River. He found the Farmer's Ditch Diversion was a significant barrier to native sucker movement.

Task 2.3.2.3 Investigate the need for fish passage at diversion structures in the Animas River and provide and maintain fish passage, if deemed necessary for range expansion.

In 2015, an assessment of entrainment hazards will be conducted in the San Juan and Animas rivers from Mexican Hat, Utah upstream to the Highway 64 crossing of the San Juan River, approximately 10 miles east of Bloomfield in the San Juan River and to Durango in the Animas River

Goal 2.4—Minimize fish entrainment at diversion structures in the San Juan Basin.

Action 2.4.1 Identify diversions that could potentially entrain endangered fish in the San Juan River and remediate where necessary.

Diversions and canals on the San Juan and Animas rivers will be evaluated for potential entrainment of fish. This may lead to design and construction of fish screens or deflection weirs to address significant entrainment issues. An assessment of potential entrainment structures in the San Juan and Animas rivers will be conducted in 2015.

Task 2.4.1.1 Design, construct, and maintain a fish deflection weir at the Hogback Diversion.

An assessment of fish entrainment done at Hogback Diversion Canal in 2004-2005 (Renfro, Platania, Dudley 2006) found Colorado pikeminnow were being entrained in the canal. A fish deflection weir was designed and constructed for the Hogback Diversion. Construction was completed in FY2013.

Task 2.4.1.2 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the Arizona Public Service Company (APS) Weir.

Task 2.4.1.3 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the Fruitland Canal.

An assessment of fish entrainment was done at Fruitland Canal in 2005 (Renfro, Platania, Dudley 2006) found 19 Colorado pikeminnow entrained. They concluded fish are not generally being entrained in small canals but recommended stocking after cessation of annual diversion activities or stock downstream of diversion heads to minimize entrainment.

Task 2.4.1.4 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the Jewett Valley Ditch.

An assessment of fish entrainment was done at Jewett Valley Ditch in 2005 (Renfro, Platania, Dudley 2006). They concluded fishes are not generally being entrained in small canals but recommended stocking after cessation of annual diversion activities or stock downstream of diversion heads to minimize entrainment.

Task 2.4.1.5 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the San Juan Generating Station.

Action 2.4.2 Identify diversions that could potentially entrain endangered fishes in San Juan River tributaries and remediate where necessary.

Task 2.4.2.1 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at Animas Pump Station #2.

Francis (2007) identified Farmers Ditch Diversion on the Animas (RM 21.9) as having great potential to cause significant loss to YOY fish through entrainment. An assessment of potential entrainment structures in the San Juan and Animas rivers will be conducted in 2015.

Task 2.4.2.2 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the Farmer's Ditch Diversion.

Francis (2007) identified Farmers Ditch Diversion on the Animas (RM 21.9) as having great potential to cause significant loss to YOY fish through entrainment. An assessment of potential entrainment structures in the San Juan and Animas rivers will be conducted in 2015.

Task 2.4.2.3 Investigate the need for and construct, if appropriate, a fish screens or deflection weirs at diversion structures in the Animas River.

Francis (2007) investigated entrainment of native suckers in diversion canals in the Animas River. Although a specific study to estimate entrainment losses was not conducted, he concluded that results of YOY sampling indicate there is enough native YOY sucker recruitment in the reaches above Animas Pump Station #2 and Farmer Ditch Diversion that entrainment in canals and pump stations on the Animas River could occur. An assessment of potential entrainment structures in the San Juan and Animas rivers will be conducted in 2015.

Goal 2.5 —Provide Suitable Water Quality to Support Recovery of CPM and RBS Populations.

Action 2.5.1 Describe water quality and identify potential problems to native and endangered fishes.

Task 2.5.1.1 Coordinate with other agencies to evaluate water quality of the San Juan River Basin and identify potential effects to native and endangered fish.

Initial investigations revealed a suite of water quality issues on the San Juan River, but none could be independently or synergistically linked to failure of the CPM or RBS populations. In coordination with other agencies, strategies for research and monitoring will be developed.

Task 2.5.1.2 Compile and synthesize historic water quality information on the San Juan River to identify water quality parameters that may be detrimental to native and endangered fish species (e.g., mercury, selenium, polycyclic aromatic hydrocarbons [PAHs]).

Historic water quality information for the San Juan River was compiled and evaluated in 1994 to identify water quality parameters that may be potentially detrimental to native and endangered fish species (Abell 1994). Results of the 7-year research period were assimilated by Holden (2000). Simpson and Lusk (1999) summarized contaminants data from the 7-year research period. Continuation of water quality monitoring and compilation of information is needed to evaluate trends and patterns of various water quality components.

Task 2.5.1.3 Conduct an evaluation of water quality as potential limiting factors to recovery.

Various studies have been completed that assessed various aspects of water quality (e.g., Abell 1994; Buhl and Hamilton 2000; Hamilton and Buhl 1997a, 1997b; Odell 1995, 1997; Wilson et al. 1995). Additional studies will be conducted, as necessary, to evaluate water quality and its effect on recovery of the listed species.

Action 2.5.2 Remediate Water Quality Problems.

Task 2.5.2.1 Develop and implement a comprehensive contaminants monitoring plan to identify water quality threats to the endangered species.

The steps to developing this plan would include: defining issues and the process for plan development, defining the role of the Program in contaminants assessment with concurrence by the CC, and identifying specific monitoring tasks for the Program and incorporate into the LRP. This task was identified in the 2010 and 2012 Sufficient Progress Report as needed to benefit the recovery of the endangered fishes, the Service recognizes this effort will require pooling of resources within the Upper Colorado River Basin and the expertise of the Biology Committee, contaminant biologists, fish toxicologists, and management and policy experts. The Service has the lead in facilitating this effort.

Task 2.5.2.2 Identify effects of contaminants on recovery of endangered fishes.

Task 2.5.2.3 Provide assistance in developing recommended water quality criteria for problematic contaminants for consideration by state and federal water quality regulatory agencies when those agencies adopt enforceable water quality standards.

Action 2.5.3 Minimize the risk of hazardous-materials spills in critical habitat.

Task 2.5.3.1 Identify and remediate potential sources of hazardous materials in areas of designated critical habitat (e.g., petroleum-product pipelines within the 100-year floodplain, riverside retention ponds).

The Program will identify and remediate any potential sources of hazardous materials, such as gas lines, transportation corridor near and across the river, oil product pipelines, riverside retention ponds, etc.

Task 2.5.3.2 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.

This task involves coordinating with partners to implement State and Federal emergency-response plans that contain the necessary preventive measures for hazardous-materials spill and includes prevention and quick response to hazardous-materials spills.

Task 2.5.3.3 Assess the need for 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.

Task 2.5.3.4 Develop Best Management Practices for heavy equipment use within the 100 year floodplain.

Goal 2.6— Manage the Native Fish Community to Assist in Recovery of the Endangered Species.

Colorado pikeminnow and razorback sucker evolved with the other native fishes of the San Juan River Basin. The Colorado pikeminnow historically depended on the native fish community as its' main food base. The razorback sucker is one of three native suckers in the San Juan River basin. Maintaining a healthy native fish community is considered an important component of suitable habitat necessary to recover the endangered fish.

Action 2.6.1. Develop, implement, and evaluate the most effective strategies for maintaining the native fish community upon which the endangered species depend.

Task 2.6.1.1. Use active capture techniques to assess native fish abundance.

Task 2.6.1.2. Conduct annual review of native fish abundance and potential implications to recovery of the endangered fishes.

The native fish community will be evaluated annually to determine the condition of the native fish populations in relation to the overall goals of the recovery program.

Task 2.6.1.3. Develop a comprehensive management plan in conjunction with the non-native fish management plan and the endangered species augmentation plans and recovery goals.

A comprehensive management plan would include objectives for the biological response of the native fish community to annual flow regimes. A goal of the management plan is to determine relative annual reproductive success of the native fish community and determine population trends, including size structure of adult and juvenile fishes.

Element 3. Management of Nonnative Aquatic Species

This element identifies actions to reduce potentially negative interactions between the endangered fish species and problematic nonnative fish species. Over twenty species of nonnative fishes have been documented within the San Juan River Basin. Nonnative fishes can numerically dominate riverine habitats and communities, negatively interacting with native and endangered fish species, and contributing to their decline (Mueller 2005). The 2002 recovery goals for Colorado pikeminnow and razorback sucker (Service 2002a, 2002b) identified predation and competition by nonnative fish species as a primary threat to these endangered species. The recovery goals state that the management of nonnative fishes should be implemented in two steps: (1) develop management programs to identify the levels of management needed to minimize or remove the threat for selected species in selected river reaches (requirement for downlisting), and (2) implement the identified levels of nonnative fish management (requirement for delisting). Nonnative fish management actions conducted by the Program are consistent with these actions.

The suite of nonnative fishes in the San Juan River includes warm-water sport fishes and non-sport fishes (Brandenburg and Gido 1999; Brooks et al. 2000). Rainbow trout and brown trout comprise the tailwater trout fishery below Navajo Dam (Ahlm 1993; Larson and Ahlm 1994) and do not occupy the same river reaches as the endangered fishes, which are found farther downstream in warmer water. The non-sport fish include several species of minnows and suckers with little or no commercial or sport value. No known strategy will eliminate these unwanted species from the Basin and their populations need to be reduced to a level that minimizes or removes the threat of predation and competition to native species. Channel catfish *Ictalurus punctatus* and common carp *Cyprinus carpio* have been identified as a detriment to the recovery of Colorado pikeminnow and razorback sucker (USFW 2002a, b) and are the primary focus of the Program's nonnative species removal program.

Mechanical removal of nonnative fishes in the upper and middle sections of the San Juan River began on a limited basis in 1998. Intensive removal efforts began in 2001 with focus on a section of river from PNM Weir to Hogback Diversion (RM 166.6 - 159.0). In addition to this section, intensive nonnative removal from Hogback Diversion to Shiprock Bridge (RM 158.8 – 147.9) has been conducted since 2003. Based on observed increases in channel catfish abundance (Ryden 2007, 2008), efforts were expanded in 2008 to include intensive removal from Shiprock Bridge to Mexican Hat, UT (RM 147.9 – 52.9) (Duran 2013). Nonnative removal in the lower San Juan River began in 2001. Since 2003, the focus has been on reducing channel catfish and other large-bodied nonnative fishes that occur in the river from Mexican Hat to Clay Hills, UT between river miles (RM 52.8-2.9). Additionally, opportunistic removal of nonnative fishes during research and monitoring activities has augmented this effort. Other removal measures that have been implemented include the operation of the selective fish passage at PNM Weir. Since the facility began operation in 2003, all nonnative fishes that

pass through this structure are removed. Nonnative fish stocking and baitfish policies of affected states are evaluated and nonnative fishes are not being stocked in critical habitat of the endangered fishes in the San Juan River. Measurable objectives and quantitative methods for assessing and maintaining effectiveness of nonnative fish control are developed and implemented through this LRP.

Sport fishes are important to recreational and commercial interests throughout the southwestern United States; however, management of sport fishes sometimes conflicts with conservation of native fish species (Clarkson et al. 2005). The San Juan River does not receive a great deal of fishing pressure other than the blue ribbon trout fishery in the tailwaters of Navajo Dam. Nevertheless, appropriate sport fish management is necessary and important to minimize conflicts and ensure conservation of native and endangered fish species. The States of Utah and New Mexico currently have open bag limits on channel catfish and striped bass in the San Juan River. The State of Colorado allows daily bag limits of 10 fish of each species. Although recreational fishing pressure on the San Juan River is limited, maintenance of these regulations will aid the Program in the goal of limiting nonnative fish distribution and abundance. Navajo Nation sport fishing regulations are also included in meeting this goal.

The Biology Committee held a nonnative fish control workshop in 2010 to evaluate and modify the nonnative fish management program. A strong message that came out of the workshop was the importance of prevention in managing nonnative species. Nonnative introductions are not limited to fish as all introduced nonnative aquatic species have the potential to become an invasive species. Overall, introduced or stocked aquatic species undermine and hamper recovery actions. For the San Juan River, a waterfall at Lake Powell currently keeps nonnative fishes from entering the river from that source but other reservoirs in the basin could be sources. Lake Nighthorse, an off-stream reservoir on Basin Creek in the Animas River watershed near Durango, CO, was completed in 2011 as part of the Animas-La Plata project. Water is pumped uphill from the Animas River and impounded in the reservoir by Ridges Basin Dam. The outlet structure was designed with an energy dissipating sleeve valve inside the discharge pipe to prevent survival and release of fish into the San Juan River Basin (Bark et al. 2013). Fathead minnow and crayfish (*Orconectes spp.*) were present in Basin Creek before the reservoir filled (White, J., CPW, personal communication 2012). Since the reservoir filled mottled sculpin (*Cottus bairdi*), Iowa darter (*Etheostoma exile*), white, bluehead, and flannelmouth suckers have been documented in the reservoir (Bark et al. 2013). Researchers examined survival of nonnative fish species and embryos, post-larvae and fingerling age classes through the energy dissipating sleeve valve at increments of atmospheric pressure associated various lake elevations as the reservoir filled from 2009-2011. In general, survival of all age classes and species decreased as the reservoir filled and the atmospheric pressure increased but intact eggs could not be destroyed at any of the reservoir. Reclamation is developing a management plan which will include stocking of only trout and salmon species and additional monitoring of releases. The Program needs to be vigilant about preventing introductions of all nonnative species. Nonnative species that are already in the system but not currently a problem need to be tracked because any number of events could potentially trigger a problem.

To achieve this element, two goals have been established to manage nonnative species that could impact the Program's ability to recover the endangered fish species in the San Juan River. These include controlling problematic nonnative fishes (*Goal 3.1*) and preventing the introduction and establishment of other nonnative invasive species (*Goal 3.2*). The actions and tasks under Goal 3.1 focus on full implementation of the nonnative fish control strategy initiated in 2008, evaluation of methods, assessment of effects on the fish community, and development of targets for nonnative fish removal. Goal 3.2 includes actions and tasks that focus on establishing policies and agreements with states and tribes to manage sport fish and bait species in the San Juan River in a manner compatible with endangered fish recovery and to identify potential invasive nonnative species and control their introduction and escapement into the main stem, floodplain, and tributaries. Included are tasks to assess the effects of non-native fish from Lake Powell and from other sources on the fish community in the San Juan River and to track all nonnative species in the basin to the extent possible.

Element 3 - Specific goals, actions, and tasks

Goal 3.1—Control Problematic Nonnative Fishes.

Action 3.1.1 Develop, implement, and evaluate the most effective strategies for reducing problematic nonnative fishes.

Task 3.1.1.1 Mechanically remove nonnative fishes to achieve objectives

Nonnative fish removal in the San Juan River began on a limited basis in 2006. Full implementation of the nonnative fishes control strategy began in 2008. Based on data collected over time from monitoring and removal efforts, increases and reallocation of effort have been made to improve nonnative fish removal effectiveness and efficiency.

Task 3.1.1.2 Remove nonnative fishes at selective fishes passage structures.

Nonnative fishes are removed at PNM selective fish passage structure (see Task 2.3.1.4).

Task 3.1.1.3 Remove nonnative fishes during Program research and monitoring activities.

Nonnative fishes captured during other Program activities are removed when possible.

Task 3.1.1.4 Conduct annual review of the success of the nonnative fish control strategy.

The nonnative fish reduction strategy will be evaluated annually to determine if current efforts are meeting established criteria. If criteria are not being met, increases or reallocation of effort may be necessary or alternative strategies identified and implemented. Data will be integrated with other Program data (Element 4)

Task 3.1.1.5 Develop a comprehensive non-native species management plan, including measurable river wide objectives to determine effects of removal effort on native fishes.

The BC held a workshop in 2010 to evaluate the non-native fish control program and make adjustments as appropriate. Recommendations from the workshop will be prioritized including developing a comprehensive non-native species management plan that includes monitoring and removal protocols, strategies, data integration, milestones and targets, and adaptive management components. Additionally, the comprehensive non-native species management plan will include measurable river-wide objectives to determine the effects of removal efforts on native and non-native fishes and establishment of non-native fish removal metrics and milestones to gauge success of removal efforts. Data and information from the workshop and annual nonnative fish removal will be used to develop a comprehensive non-native species management plan for the Program.

Task 3.1.1.6 Establish target criteria for reduction of problematic nonnative fish species to estimate time, effort, and cost for controlling nonnative fishes.

Target criteria will be established for reduction of the most problematic nonnative fish species. These criteria will describe annual and long-term target removal levels. These criteria may be expressed as percentage reduction of the total population, as generated by Ricker stock-recruitment models; or as exploitation rate, such as the Kwak and Peterson model. These models estimate the proportion of population reduction necessary to cause recruitment failure; i.e., mortality exceeds survival. Bioenergetics models may also apply.

Task 3.1.1.7 Evaluate and implement effective alternative nonnative fish reduction methods.

The effectiveness of mechanical removal will be evaluated by analyzing trends in catch rates, length distributions, population size of nonnative fishes, and determining if removal criteria are being met. If mechanical removal is determined to be ineffective, alternative methods will be developed, evaluated, and implemented. These may include use of chemicals (e.g., rotenone, cyanide), species-specific viruses (e.g., carp viremia), and genetic manipulation (e.g., Trojan gene). The BC held a workshop in 2010 to evaluate the non-native fish control program and make adjustments as appropriate. A recommendations from the workshop called for evaluating, selecting, and testing techniques that target the disruption of spawning or removal of juvenile catfish.

Goal 3.2—Prevent introduction and establishment of other nonnative invasive species.

Action 3.2.1 Ensure that sport fishing regulations and enforcement are consistent with endangered fish recovery.

Task 3.2.1.1 Review sport fishing regulations and revise, as necessary, to ensure consistency with endangered fish recovery.

State and tribal fishing regulations will be reviewed. Recommendations may be made for new regulations or revision of existing regulations that are consistent with endangered fish recovery. An example is to increase or remove bag limits for problematic nonnative species.

Task 3.2.1.2 Collaborate with state and tribal agencies to enforce fishing regulations.

Illicit translocation of nonnative fishes can introduce new problematic species and expands their range. The Recovery Program will collaborate with states and Navajo Nation law enforcement agencies to reduce illicit translocations, including baitfish and live-well releases.

Action 3.2.2 Develop and implement policies and agreements among stakeholders on nonnative game fish management to prevent introduction of invasive species

Task 3.2.2.1 Develop and implement a sport fish stocking policy among the states and tribes.

A sport fish stocking policy among the States and Tribes for the San Juan River Basin has been developed and is currently in the signature process. The plan will be implemented upon completion.

Task 3.2.2.2 Execute agreements among the states and tribes to prevent the spread of nonnative invasive species.

One or more agreements will be executed, as needed, among the States of New Mexico, Utah, Colorado, and the Tribes to implement a nonnative sport fish stocking policy.

Action 3.2.3 Identify potential invasive nonnative species and control their introduction and escapement into the mainstem, floodplain, and tributaries.

Task 3.2.3.1 Consolidate all information for a comprehensive report and risk assessment of waterfall inundation and associated immigration of nonnative fishes from Lake Powell including options and recommendations for potential management actions.

At present, a natural waterfall exists at the outflow of the San Juan River that prevents access by most fish from Lake Powell. The probability of waterfall inundation was assessed. The

waterfall became inundated for a short period in 2011 when the lake elevation went above 3,660 feet between July 31 and August 9. Endangered fishes were documented moving into the river during that time. Measures will be identified to reduce the risk of non-native intrusion, if necessary.

Task 3.2.3.2 Develop a plan to control non-native fish entering the San Juan River from Lake Powell and be prepared to implement when the lake refills.

Measures identified necessary in Task 2.3.1.7 will be implemented to reduce the risk of immigration of nonnative fishes from Lake Powell, as feasible and necessary. If a barrier is determined to be necessary, the BC believes it should provide selective upstream passage for native species and should be built in a location where it can be operated, possibly at Mexican Hat.

Task 3.2.3.3 Identify major sources of nonnative fishes from tributaries and off-channel features to minimize invasion of riverine habitats by problematic species.

Major sources of nonnative fish from tributaries and off-channel features will be identified, including inflowing streams, riverside ponds, canals, or other features. Isotopes may be used to locate sources of nonnative fish with established signatures of source waters. Measures to reduce escapement of nonnative fishes from these sources will be identified. The BC held a workshop in 2010 to evaluate the non-native fish control program and make adjustments as appropriate.

Task 3.2.3.4 Implement measures to reduce escapement of nonnative fishes from tributaries and off-channel features, as necessary.

Measures will be implemented to reduce escapement of nonnative fishes from tributaries and off-channel features, as necessary. Lake Nighthorse on the Animas River has been identified as a potential source of nonnative fishes. The BO assumes no escapement; however, tests have shown the sleeve valve on the outlet structure does not prevent 100% escapement as originally anticipated, especially for early life history stages. Nonnative Animas River fishes that have become established in the reservoir and warm water fishes that could be stocked into the reservoir could escape into the San Juan River system.

Task 3.2.3.5 Coordinate with other programs, agencies, and activities to track occurrences of nonnative species in the San Juan River Basin and, if a potential invasive species problem is identified, develop and implement preventive actions as appropriate.

Element 4. Monitoring and Evaluation of Fish and Habitat in Support of Recovery Actions

Monitoring San Juan River native and nonnative fish populations and their habitat is necessary to evaluate management actions and to assess the Program's progress toward achieving recovery of the two endangered fish species. The Biology Committee developed a standardized fish monitoring plan and protocols in 2000 that describes the sampling design and strategies to be used in monitoring Colorado pikeminnow and razorback sucker and their habitat as part of the entire fish community (Propst et al. 2000). The monitoring program also provides a basis of new information to be used to update management and conservation activities as part of the Program's adaptive management process. The monitoring plan and protocols were updated in 2006 (Propst et al. 2006) and through a series of monitoring workshops held by the Biology Committee in 2009, the monitoring plan and protocols were evaluated and updated again in 2012 (SJRRIP 2012). The new

fish and habitat monitoring plan includes updated and expanded monitoring protocol sections and a section that addresses annual and long-term data synthesis and integration.

Ongoing monitoring of stocked and wild Colorado pikeminnow and razorback sucker is necessary to evaluate the success of the augmentation strategy and make adjustments, as necessary, to achieve the Program's goal of establishing self-sustaining populations of both species. Bestgen (2009) used methods similar to those he used in the Green and Colorado River subbasins to analyze the survival of stocked razorback suckers in the San Juan River using mark-recapture data. He showed season of stocking and size at stocking was related to increased survival. Durst's mark-recapture data analyses resulted in changes to the stocking program regarding hatchery source for razorback sucker and age at stocking for Colorado pikeminnow (Durst 2011, 2013). The results of analyses using mark-recapture data are useful for improving stocking procedures to increase the survival of both species and these analyses are repeated regularly. Continued annual monitoring of the endangered fish populations in the San Juan River is also important for documenting reproduction and recruitment, an indicator of a self-sustaining population. Once populations are established, reliable and precise population estimates will be conducted to determine when the downlist and delist criteria specified in the species recovery goals are being achieved. Because recovery goals require wild populations, criteria are needed to supplement catch rate estimators with mark-recapture population estimates of wild-produced adults and juveniles. The recovery goals for the Colorado pikeminnow and razorback sucker include the Green, Colorado, and San Juan rivers; therefore, this Program and the Upper Colorado River Endangered Fish Recovery Program are closely linked. Population estimate monitoring is currently being done for Colorado pikeminnow and humpback chub in the upper Colorado and Green rivers. Relationships between catch rate estimators and mark-recapture population estimates of fish in the upper basin may be helpful in developing these criteria for the San Juan River. Implementation of mark-recapture estimators will require a comprehensive assessment of logistics, personnel, equipment, and funds.

Other native and nonnative fish populations are being monitored to better understand the status and trends of these species and their inter-relationships with the endangered fish species. To the extent possible, river-wide habitat monitoring is closely coordinated and integrated with fish community monitoring to allow assessment of changing habitat availability and fish use in response to management actions and population recovery. Standardized habitat monitoring for the San Juan River was included in the 2000 monitoring plan and was reviewed and revised for the 2012 version. The plan is designed to monitor and evaluate river-wide habitat changes through time. A focused habitat monitoring workshop was held in January 2012 to evaluate, refine, and improve the river-wide habitat monitoring and mapping work on the San Juan River to insure the Program implements methodologies that are conducive to answering outstanding questions. The Program started conducting physical and biological monitoring at specific sites along the river where secondary channels were restored in 2011 to assess functionality, sustainability, fish use, and nonnative vegetation encroachment rate. The information collected showed both larval and small-bodied native fish in good numbers and was used to determine feasibility, location, and design for additional sites completed in 2014. Additional intensive monitoring at the restored sites will provide information on the persistence of aquatic habitats and measure changes in habitat features, larval fish abundance and small-bodied fish abundance from prior to spring runoff to late fall for use in restoring more sites in the future.

Annual and long-term data synthesis and integration is a critical component of the Program's fish and habitat monitoring plan. To adequately evaluate the management actions, the data from all monitoring, management, and research activities are collectively synthesized as a comprehensive data set. The monitoring data are analyzed for each individual protocol during annual data analysis by the principal investigator for each protocol. This annual data analysis uses statistics appropriate for each protocol to test relevant hypotheses and examine data temporally and spatially. The integrated data from individual protocols are used to address questions that require data synthesized across protocols. Some synthesis questions can be addressed with the annual monitoring data whereas other questions require datasets over multiple years or specific research

efforts. Prioritization of questions relevant to Colorado pikeminnow and razorback sucker recovery in the San Juan River is critical to carrying out annual and long-term data integration exercises.

To achieve this element, five goals have been established to monitor fish populations (*Goal 4.1*), to monitor habitat use and availability (*Goal 4.2*), monitor and evaluate habitat restoration strategies and projects (*Goal 4.3*), to integrate and synthesize monitoring data and other information to evaluate fish community and ecosystem responses to recovery actions (*Goal 4.4*) and to identify and conduct research and monitoring in support of recovery actions (*Goal 4.5*). The focus is on implementation of a long-term, standardized monitoring program that was developed to track the presence, status, and trends of endangered fish populations and the native fish community and to monitor existing and restored habitat. In addition, data from all monitoring, management activities and research are integrated and synthesized annually to assess the status of the fish community, evaluate ecosystem responses to the management actions, and support broader, long-term data and information needs. Actions and tasks are included that use adaptive management concepts to evaluate and assess results and methods to refine current methodologies and develop and implement new monitoring and research strategies. A primary purpose of the actions and tasks under Element 4 is to collect and evaluate data in such a way that the Program's progress toward achieving recovery of razorback sucker and Colorado pikeminnow in the San Juan River can be adequately tracked and assessed.

Element 4 - Specific goals, actions, and tasks

Goal—4.1 Monitor Fish Populations of the San Juan River Basin.

Action 4.1.1 Develop a Standardized Monitoring Plan for fishes.

Task 4.1.1.1 Develop and revise a Standardized Fish Monitoring Plan to assess the presence, status, and trends of Colorado pikeminnow and razorback sucker and fish community.

A Monitoring Plan and Protocols was developed for the San Juan River Basin in 2000 and updated in 2006 to identify changes in the endangered and other native fish populations, status, distributions, and habitat conditions (Propst et al. 2006). The BC held workshops in 2009 and 2012 and an updated plan was completed in 2012. The goals of the plan are to: 1) track the status and trends of endangered and other fish populations in the San Juan River, 2) track changes in abiotic parameters, including water quality, channel morphology, and habitat, important to the fish community, and 3) utilize data collected under Goals 1 and 2 to help assess progress towards recovery of endangered fish species. The monitoring plan describes protocols for monitoring larval fishes, YOY and small-bodied fishes, subadults and adults; and channel geomorphology, cobble bars, backwaters, habitat mapping, as well as water temperature, and water quality.

Task 4.1.1.2 Analyze and evaluate monitoring data and produce Annual Fish Monitoring Reports to ensure that the best sampling design and strategies are employed.

As a goal of the monitoring plan, this task will a) determine relative annual reproductive success of CPM and RBS; and b) determine population trends, including size-structure of adult and juvenile fishes.

Task 4.1.1.3 Organize and conduct Monitoring Plan Workshops, as necessary, to coordinate sampling design, data collection, and desired precision and detection levels for detecting responses.

Monitoring workshops were held in 2009 and 2012 to coordinate sampling design, data collection, and desired precision and detection levels for detecting responses. An update of the

plan was completed in 2012. Additional workshops will be held as necessary to accomplish Action 4.1.1.

Action 4.1.2 Implement a Standardized Monitoring Plan to track the presence, status, and trends of endangered fish populations.

Task 4.1.2.1 Conduct larval fish studies to determine if reproduction is occurring, locate spawning and nursery areas, and to gauge the extent of annual reproduction.

Monitoring of larval CPM has been conducted since 1991 (1991-2001 drift net surveys, 2002 to present seining collections). For RBS monitoring began in 1998 (seining data).

Task 4.1.2.2 Conduct juvenile and small-bodied fish sampling to determine if young fishes are surviving and recruiting into the population and locate areas and habitats used for rearing.

Long-term small-bodied fish monitoring has been in place since 1998.

Task 4.1.2.3 Conduct adult fish studies to estimate relative densities of fishes (CPUE) and to estimate population size (mark-recapture estimates).

Long term monitoring of sub-adult and adult large-bodied fishes has been in place since 1998.

Task 4.1.2.4 Conduct fish studies in the San Juan River Arm of Lake Powell as needed to assess presence/absence of San Juan River endangered fish populations.

A fish survey of Lake Powell was conducted in 2011 and 2012. In 2014, the Colorado arm of Lake Powell will be surveyed with funding from outside the recovery programs.

Task 4.1.2.5 Deposit, process, and secure San Juan River fish specimens, field notes, and associated data at an organized permanent repository.

Since 1987, the Museum of Southwestern Biology (MSB), Division of Fishes at the University of New Mexico (UNM), in Albuquerque has served as the primary repository for collections of fishes (eggs, larvae, and adults) and field notes taken for the Program. In addition to curation and deposition, species identification and data are verified, entered into an electronic catalog, and geo-referenced in ArcView.

Task 4.1.2.6 Collect scales, otoliths, and/or fin rays from fishes captured during monitoring and nonnative fish removal activities for future analyses.

Scales and/or fins rays can be used for aging fish and potentially for distinguishing natural recruitment of fish with no tags or that have lost tags. A Standard Operating Protocol for collecting scales was established in 2011 and used to collect scales from unmarked fishes captured during fish monitoring and nonnative fish removal activities. Further analysis showed scales were not as reliable as fin rays for determining natal origin. In 2014, the Program switched from collecting scales to fin rays from untagged fish.

Action 4.1.3 Collect data on the endangered native and nonnative fish communities during other Program management activities, when possible.

Task 4.1.3.1 Collect data on the endangered fish and native fish community during nonnative fish control activities to aid in tracking the presence, status, and trends of endangered fish populations.

Task 4.1.3.2 Collect data on the endangered fish and native fish community during PNM selective fish passage operations to aid in tracking the presence, status, and trends of endangered fish populations.

Action 4.1.4 Obtain reliable population estimates of RBS and CPM.

Task 4.1.4.2 Use mark-recapture population estimators, when available, in conjunction with catch per unit effort estimators, to provide reliable estimates of adults, subadults, survival, and recruitment consistent with recovery goals criteria to gauge recovery of CPM and RBS.

Through long-term monitoring, non-native fish removal, and stocking programs, implement and refine mark-recapture population estimates for RBS and CPM that provide reliable and precise estimates of subadult and adults, as well as estimates of survival. After workshops in 2009, the BC determined existing Program catch per unit effort estimators will be used to do population estimates in the near term.

Task 4.1.4.3 Analyze mark-recapture data (obtained from the Pit-Tag database) with methods used by Bestgen (2009) to estimate survival rates of razorback sucker.

Bestgen (2009) used methods similar to those used in the Upper Colorado River Basin, in the Green and Colorado River subbasins, to analyze the survival of razorback suckers in the San Juan River using mark-recapture data. These analyses will be replicated every 3-5 years.

Task 4.1.4.4 Conduct Population Estimation Workshops, as necessary, to evaluate population estimators used in other systems to identify the most reliable and suitable estimator(s) for Colorado pikeminnow and razorback sucker.

Monitoring workshops were held in 2009 to evaluate population estimators to be used for RBS and CPM in the San Juan River. Estimation techniques used in other systems were evaluated to identify the most reliable and suitable estimators. The monitoring plan was updated based on workshop results.

Action 4.1.5 Evaluate status and success of stocked RBS and CPM.

Task 4.1.5.1 Determine survival and movement of stocked RBS and CPM to assess stocking success and to determine when to implement mark-recapture population estimates.

All RBS and CPM captured will be examined for tags (e.g., coded wire tag, PIT tag) and untagged fish that are large enough will be tagged. All information on individual fish will be retained in the Program's database and be used to estimate survival and movement. The numbers of stocked RBS and CPM surviving in the wild will be estimated from the monitoring program and other Program management activities. These surviving fish will help to contribute toward reproduction in the wild, recruitment, and eventually species recovery

Action 4.1.6 Evaluate the risk of hybridization among sucker species.

Task 4.1.6.1 Quantify the extent of hybridization among native suckers to determine if stocking large numbers of hatchery razorback suckers into the San Juan River will reduce genetic diversity and viability of razorback sucker and/or flannelmouth sucker.

Hybridization may be reducing genetic viability of native suckers and may require actions such as mechanical removal to reduce white suckers. There is some information on the extent of hybridization between native suckers (i.e., razorback, flannelmouth, bluehead) (Turner et al.

2002, 2008). Hybridization between native suckers appears to be low at present in the San Juan River. Observational surveys are conducted in conjunction with annual monitoring and any fish anomalies observed are included in annual reports to track the occurrence of hybrids. If, and when, the frequency of occurrence appears to increase, a focused reassessment will be conducted.

Task 4.1.6.2 Quantify the extent of hybridization between native suckers with nonnative white suckers to determine if hybridization is reducing genetic diversity and viability of native suckers (i.e., razorback, flannelmouth, bluehead).

Hybridization between native suckers and nonnative white suckers does not currently appear to be a problem in the San Juan River. Fin clips of suspected hybrids maintained in 95% EtOH have been retained at the Museum of Southwest Biology for analysis. There is some information on the extent of hybridization between native suckers and nonnative white suckers in the San Juan River (Turner et al. 2002, 2008). If, and when, the frequency of occurrence appears to increase, a focused reassessment will be conducted.

Task 4.1.6.3 Identify and implement necessary actions to minimize hybridization among native suckers and nonnative suckers.

If, and when, the frequency of occurrence of hybridization appears to increase, necessary actions to minimize hybridization among native suckers and nonnative suckers will be identified and implemented.

Action 4.1.7 Monitor health of fish in the San Juan River to ensure adequate protection from diseases and parasites.

Task 4.1.7.1 Track health of fish in the San Juan River to ensure adequate protection from diseases and parasites.

Ensuring adequate protection from diseases and parasites is identified as a potential limiting factor for RBS and CPM population recovery. During fish handling and capture activities on the San Juan River, ocular inspections of general fish health and condition are conducted and any indication of poor health of endangered fishes is logged and reported.

Task 4.1.7.2 Investigate potential health problems; identify causes and recommend corrective actions if any indications of poor health are of concern.

In 2011, opercular deformities in larval razorback sucker samples appeared to be potentially increasing. To investigate, a one-year opercular deformity study was initiated in 2013 and completed in 2014. Of the native sucker species, the frequency of opercular deformity was highest in razorback sucker (23.6%), and present in similar frequencies in bluehead sucker (6.3%) and flannelmouth sucker (4.4%). Linking a source to the deformities is difficult because multiple factors acting independently or synergistically, can cause deformities (Barkstedt 2015). The frequency of opercular deformities in larval fish samples will be recorded by the larval fish monitoring project and tracked for future attention, if necessary.

Goal 4.2—Monitor Habitat Availability and Use.

Action 4.2.1 Develop a standardized monitoring program for habitat.

Task 4.2.1.1 Develop and revise Standardized Habitat Monitoring Plan.

BC workshops were conducted in 2009 and 2012 to evaluate current fish and habitat monitoring and develop a comprehensive plan for both fish and habitat monitoring. The Program Office and Biology Committee used workshop results to refine current methods and develop new ones. The Program's 2006 monitoring plan was updated in 2012.

Task 4.2.1.2 Organize and conduct Habitat Monitoring and Mapping Workshops, as necessary, to refine and improve habitat evaluation methods.

A BC workshop was conducted in 2009 to evaluate current fish and habitat monitoring and develop a comprehensive plan for both fish and habitat monitoring. A focused habitat monitoring workshop was held in January 2012.

Action 4.2.2 Implement a standardized monitoring program for habitat.

Task 4.2.2.1 Map habitat at different flows as described in the Standardized Habitat Monitoring Plan

Task 4.2.2.2 Monitor long-term habitat response of the river channel to flow recommendations.

Long-term river-wide response of the river channel (i.e., aggradation or degradation) will be monitored and related to observed river discharge to assess gross overall channel change.

Task 4.2.2.3 Monitor water quality in the San Juan River (see Action 2.4.1.).

Elevated levels of selenium and mercury have been detected in the San Juan River and identified by the Fish and Wildlife Service as potential causes of failure of CPM or RBS populations. Continued monitoring of critical water quality parameters is needed to track and assess water quality effects on the endangered fish. Long-term monitoring for selenium and temperature is a required measure in the NIIP BO. The Program currently monitors temperature.

Task 4.2.2.4 Monitor stream flows.

There are five USGS streamflow gaging stations on the main stem of the San Juan River that are very important to management of the river and the operation of Navajo dam to implement the San Juan Recovery Implementation Program (SJRIP) flow recommendations. Stream gaging data on the San Juan River are necessary to reliably implement and revise the SJRIP flow recommendations. The Program provides funding to the USGS to take additional flow measurements as needed at the four San Juan River gages in New Mexico. The four gages are San Juan near Archuleta, San Juan at Farmington, San Juan at Shiprock, and San Juan at Four Corners. (Note: Base cost for operation of the stations is paid for by non-Program funds.)

Task 4.2.2.5 Monitor water temperature.

Daily water temperature data at key locations are used by researchers and allow future assessment of the impact of releases from Navajo Dam on critical habitat.

Action 4.2.3 Identify, characterize, and quantify suitable habitat.

Task 4.2.3.1 Assess data collected to identify and describe flow-habitat relationships.

Available data collected to date is used to accomplish this task.

Task 4.2.3.3 Determine the extent various flow releases from Navajo Dam have on the seasonal and longitudinal distributions of endangered fishes and other native and nonnative fishes.

Flow recommendations were designed to maintain channel complexity and provide necessary habitats for native and endangered fishes. This task links with information gathered on hydrology of flow recommendations.

Task 4.2.3.4 Characterize channel geomorphology and river channel dynamics to better understand flow-habitat relationships.

Program monitors various aspects of habitat and flow. Available data collected to date is used to accomplish this task

Action 4.2.4 Determine habitat/fish relationships.

Task 4.2.4.1 Identify and quantify principal river reaches and attributes of habitats important to each life stage of endangered fish.

An understanding of river reaches and habitats used by CPM and RBS is important in understanding how flows and other management actions benefit these habitats. Habitats used by various life stages of CPM and RBS should be monitored and related to flow and river location. The Detailed Reach Study completed in 2010 focused on this task (Bliesner et al. 2010). Also, habitat information is routinely collected by Program scientists conducting the annual fish monitoring. The BC carefully reviews these findings annually to gain additional insight into habitat/fish relations.

Task 4.2.4.2 Relate geo-referenced fish capture data to habitat data.

This was initiated during the detailed reach study (Bliesner et al 2010). Recording GPS coordinates is a SOP of the larval fish monitoring project. Starting in 2010, monitoring crews started recording GPS coordinates for all captures and recaptures during monitoring and nonnative fish removal activities. Geo-referenced fish capture data and habitat data are used by researchers, as needed, to meet specific information needs.

Task 4.2.4.3 Determine, to the extent possible, habitat/fish relationships, the level of data needed to accomplish this, and the cost of collecting the data.

Information from the Program's long term monitoring program, the detailed reach study, and monitoring workshops conducted in 2009 and 2012 are being used by the Program Office and Biology Committee to address this task.

Goal 4.3—Monitor and Evaluate Habitat Restoration Strategies and Projects

Action 4.3.1 Evaluate and implement habitat restoration strategies to augment the function of river flow to create and maintain suitable habitat.

The Program's Monitoring Plan and Protocols (Feb 2012) provides a standardized methodology to guide the SJRRIP's annual and long-term monitoring activities. The goal of the comprehensive monitoring plan is to provide a standardized methodology to guide the Program's annual and long-term monitoring activities to evaluate the progress of endangered fish species towards recovery. The primary goal for habitat monitoring is to track water quality, temperature, channel morphology, and habitat in the San Juan River to evaluate the

effect of management actions, including flow recommendations, on populations of native and non-native fishes in the San Juan River.

Task 4.3.1.1 Use data and information gathered from habitat assessments as the foundation for identifying and evaluating the need to implement other recovery actions, including but not limited to, habitat modification (flow or mechanically induced) and population augmentation.

Flow recommendations continue to be implemented and evaluated. A great deal of information has been collected, and continues to be collected, on the San Juan River fishes. This information is continually assimilated, synthesized, and interpreted to describe best strategies for providing suitable habitat for native and endangered fishes.

Task 4.3.1.2 Evaluate construction of side channel and backwater habitats to serve as low-velocity nursery habitat if lack of those habitats are found to be limiting recovery.

Side channels and backwaters serve as low-velocity nursery habitats for native and endangered fishes. The Program is working on this task through development of TNC's Conservation/Habitat Planning Project. Several side channels have been mechanically restored and a backwater restoration project is being planned for 2016.

Task 4.3.1.3 Evaluate selective nonnative vegetation removal in conjunction with high flow conditions for habitat creation and maintenance.

Tamarisk and Russian olive have encroached into riparian areas, stabilized the channel, and reduced the availability of the complex channel habitat favored by native and endangered fishes. The Program is working on this task through development of TNC's Conservation/Habitat Planning Project

Task 4.3.1.4 Evaluate large-scale nonnative vegetation control, as feasible and necessary.

Task 4.3.1.5 Evaluate non-flow alternatives that would work in conjunction with flows to meet the functions provided by flow recommendations.

Non-flow alternatives should be evaluated to help offset possible effects of climate variability and to augment the beneficial effects of flow recommendations. The Program is working on this task through development of SJBHM Gen III and TNC's Conservation/Habitat Planning Project

Action 4.3.2 Monitor Habitat Restoration Projects

Task 4.3.2.1 Monitoring TNC's restoration sites

Phase I sites were monitored during various flows between November 2011 and February 2013. By February 2013 at 500 cfs, two of the six restored channels contained water and maintained an upstream connection with the primary channel, and a third channel is expected to flow at 700 cfs. Fish presence in restored sites was monitored in 2012; RBS larvae were collected at two of the six RERI sites and all sites contained suitable nursery habitat between April and August 2012. Additional Phase II sites were completed in 2014 and monitoring for functionality, persistence, fish use, and nonnative vegetation encroachment will begin at the sites in 2015.

Goal 4.4—Integrate and Synthesize Monitoring Data and Information to Evaluate Fish Community and Ecosystem Responses to Recovery Actions.

Action 4.4.1 Describe life history parameters of wild CPM and RBS.

Task 4.4.1.1 Document and quantify reproduction, survival, and recruitment.

Survival will be estimated by age group for RBS and CPM. Survival can be estimated from periodic comparison of abundance estimates and from mark-recapture analyses. Recruitment will be estimated from periodic abundance estimates of subadults and adults. Estimates of recruitment are demographic criteria of recovery goals. This task is addressed annually by Program scientists and the BC through the review of each year's fish monitoring data.

Action 4.4.2 Develop fish community and ecosystem response strategies and implement appropriate monitoring and research strategies to evaluate ecosystem response.

Task 4.4.2.1 Develop a centralized database that incorporates all San Juan River data from standardized monitoring and integrate this into the Program database.

The San Juan River Basin Recovery Implementation Program maintains a centralized database of all monitoring activities. This database is part of the overall Program database. See Task 5.2.1.1.

Task 4.4.2.2 Use previous and current data collected during ongoing investigations to characterize dynamics of native fishes and their response to management activities intended to improve the status of listed species.

In coordination with the BC, the Program Office is responsible for ensuring that information is integrated and synthesized to evaluate Program progress toward recovery. See Goal 5.2.

Task 4.4.2.3 Update San Juan River population model and use with other existing data to evaluate fish community response to recovery actions.

A San Juan River population model was developed by Miller and Lamarra in 2006 to assist in evaluating possible responses by fish species to management actions. An update to the model was completed in 2014 and a workshop was held in December 2014 to review the updated model. It is currently in review by the Biology Committee and Program peer reviewers.

Task 4.4.2.4 Develop and implement an integrated fish and habitat monitoring plan that includes an annual process for assessing and modifying monitoring activities so that current status of native and endangered fish populations and habitat can be assessed and progress toward recovery can be determined.

Workshops were conducted in 2009 and 2012 to evaluate current fish and habitat monitoring. A stated purpose of the workshops was to develop an integrated fish and habitat monitoring plan that includes annual evaluation and data integration, and an adaptive management component.

Action 4.4.3 Use data from monitoring and management actions and research information to evaluate and modify recovery activities, as necessary, to ensure progress toward recovery.

Task 4.4.3.1 Identify, describe, and implement strategies for improving long-term survival and recruitment of razorback sucker and Colorado pikeminnow including but not limited to nonnative fish removal, enhancing habitat and food resources, enhancing genetic diversity and viability, and mitigating causes of range fragmentation.

Use adaptive management strategies to eliminate, add, or adjust monitoring and research activities and management actions to obtain needed information and improve species and habitat status and condition.

Task 4.4.3.2 Use data and information gathered from fish surveys, hatchery augmentation, and survival studies to describe the best strategies for establishing wild populations of endangered fishes and restoring the native fish community.

Information will be integrated and evaluated on a continual basis to assess stocking success and establishment of wild populations of CPM and RBS.

Task 4.4.3.3 Use data and information gathered from the nonnative fish control program to evaluate effects of nonnative fish removal on distribution, abundance, and demographics (e.g., fish size, age, sexual maturity) of the endangered fish populations, the native fish community, and nonnative fish populations.

Fish populations respond in various ways to severe reduction from mechanical removal. These responses need to be evaluated to determine if removal will require different strategies for minimizing negative impacts to native and endangered fish species. Ongoing evaluation is needed, including assessment of new technologies for controlling nonnative fishes. Full implementation of the current nonnative fish control strategy began in 2008. The BC held a workshop in 2010 to evaluate the non-native fish control program and made adjustments.

Task 4.4.3.4 Use data and information gathered from habitat assessments as the foundation for evaluating the effectiveness of the flow recommendations and operations decision criteria for Navajo Dam in providing suitable habitat for the endangered fishes.

The 1999 flow recommendations continue to be implemented and evaluated. Considerable data have been collected and continue to be collected on habitats in the San Juan River. This information is continually assimilated, synthesized, and interpreted to assess and evaluate the effectiveness of Navajo Dam releases. Results from the past decade suggest that implementation of the 1999 flow recommendations may not be creating and maintaining enough habitat to achieve recovery goals for the endangered fish. In 2014, the Program initiated a process to begin reviewing and revising the flow recommendations based on monitoring data, the new San Juan River Basin hydrologic model, updated climate change projections for stream flow, and expanded scientific knowledge of flow-ecology relationships. In February 2015, an environmental flow workshop was held to make minimal modifications to the process for implementing the current flow recommendations to partially address apparent weaknesses in the current process and improve flexibility in making releases. A comprehensive review and revision of the 1999 flow recommendations will also begin in 2015.

Action 4.4.4 Review and evaluate San Juan River stream flow in light of hydrology variability.

Task 4.4.4.1 Conduct a comprehensive analysis of hydrologic variability in the San Juan River.

The challenges and complexities of ensuring a sustainable water supply and meeting future demand in an over-allocated and highly variable system such as the Colorado River have been recognized and documented in several studies conducted by Reclamation and the Basin States over the past several decades. Concerns regarding the reliability of the Colorado River system to meet future Basin resource needs are even more apparent, given the likelihood of increasing demand for water throughout the Basin coupled with projections of reduced supply due to climate change. It was against this backdrop that the Colorado River Basin Water Supply and

Demand Study which includes the San Juan River Basin was conducted by Reclamation. Completed in 2012, the study purposes were to define current and future imbalances in water supply and demand in the Basin and the adjacent areas of the Basin States that receive Colorado River water over the next 50 years (through 2060), and to develop and analyze adaptation and mitigation strategies to resolve those imbalances. Based on results, contingency planning for water supply in the Colorado Basin is ongoing.

Task 4.4.4.2 Evaluate the possible and most probable impacts of hydrologic variability on future water availability.

The long-term consequences of climate change are unknown. Possible impacts on stream flow and other environmental variables need to be evaluated in order to identify possible contingencies and alternative management actions. Hydrologic variability on future water supply will be considered during the comprehensive review and revision of the 1999 flow recommendations set to begin in 2015.

Task 4.4.4.3 Evaluate the San Juan River's ability to meet the functions provided by the flow recommendations during extended periods of drought.

An evaluation of the river's ability to meet flow recommendations under periods of extended drought will be evaluated during the comprehensive review and revision of the 1999 flow recommendations set to begin in 2015.

Goal 4.5— Identify and Conduct Research and Monitoring in Support of Recovery Actions.

Action 4.5.1 Annually identify potential project/activities/questions/information needs (ongoing list)

Task 4.5.1.1 Annually, following review of the previous year's findings and data integration, identify and prioritize new projects, activities, questions, and information needs to be addressed in future work plans.

The BC identifies priority information needs annually and maintains an ongoing list. If a new activity/task is deemed high priority, it will be submitted to the CC for funding consideration. Some projects are funded by the Program, some by outside sources, and others not at all if low priority.

Action 4.5.2 Implement project/activities as necessary to obtain needed information.

Task 4.5.2.2 Develop a study/monitoring plan to assess the effectiveness of the Hogback fish weir in preventing entrainment of endangered and native fishes.

Passive PIT tag readers were installed at Hogback Fish Weir in 2014 to track movement of tagged fishes. Untagged and juvenile/larvae will not be detected by these readers. The experimental design of the fish weir to minimize entrainment will be thoroughly assessed.

Task 4.5.2.3 Determine how to distinguish stocked fish from naturally produced fish.

Scales were collected from unmarked Razorback Sucker in the San Juan River and Lake Powell from 2011-2013 and forwarded to ASIR for inclusion in a study to determine natal origin. Further analysis showed scales are not as reliable non-lethal material as fin rays for use in microchemical analysis to determine natal origin. In 2014, the Program switched from collecting scales to fin rays from untagged fish for use in determining natal origin. More results are expected from the project in 2015. See Task 4.1.2.6.

Element 5. Program Coordination and Assessment of Progress toward Recovery

The U.S. Fish and Wildlife Service is responsible for administering the San Juan River Basin Recovery Implementation Program. To fulfill this responsibility, the Service appoints a Program Coordinator who is responsible for overall Program planning, coordination, and management, information integration and review, and facilitation of contracting funding and management. Reclamation appoints a Funds Manager to maintain and distribute base and capital funds and administer contracts. The Program Coordinator, Program staff, and the Program's technical committees developed this LRP to facilitate achievement of recovery of the endangered fish species of the San Juan River Basin. There are two major components under this element, Program coordination and data integration and evaluation to assess the Program's progress toward achieving recovery.

Program Coordination

The Program Coordinator works with the Program's technical committees to identify and expedite individual projects that are needed to accomplish the LRP tasks for each of the Recovery Elements. The Program Coordinator, together with the Program's technical committees, drafts Annual Work Plans consisting of high priority individual projects, and forwards these to the Coordination Committee for review and approval. The Program Coordinator is responsible for maintaining records showing distribution and expenditures of all annual and capital funds expended under the Annual Work Plan by each funding source. The Program Coordinator is responsible for ensuring that the Program operates according to the Program Document; including the preparation of this LRP, the Annual Work Plans, budgets, and annual progress reports. In all these tasks, the Program Coordinator is assisted by the technical committees to ensure that appropriate work products are reviewed by the technical committees and all work products are approved by the Coordination Committee. The Program Coordinator annually compiles Program reports for transmittal to the involved agencies and to the Coordination Committee.

Assessment of Progress toward Recovery

Ongoing development, integration, and evaluation of information are essential for assessing progress toward species recovery as well as for guiding future Program direction. An important first step of the Program was implementation of a research phase to document distribution and abundance of resident fishes, characterize species life histories, and identify limiting factors. A 7-year research program, conducted from 1991 through 1997, provided a baseline of information and identified and characterized factors limiting the Colorado pikeminnow and razorback sucker (Holden 2000). The research program was incorporated into the Recovery Program when it was formed in 1992. An array of potential limiting factors have been investigated, including water quality, spawning habitat, nursery habitat, recruitment, hybridization, truncated range, capture-related stress, nonnative fishes, habitat quantity and diversity, flow regime, food, population size, disease, movement barriers, thermal regime, and entrainment in diversion structures. Although numerous activities have been implemented by the Program to address these factors, much remains to be learned about the life history of the endangered fishes, their relationships with other native and nonnative fishes, their habitat associations, and components of their environment that directly and indirectly influence their welfare.

Many of the actions and tasks identified in the initial 7-year research phase of the Program have been completed and the work has contributed to understanding the San Juan River Basin. However, because contemporary Colorado pikeminnow and razorback sucker populations in the San Juan River were extremely small, there is still the need to identify and characterize limitations to the establishment and maintenance of self-sustaining populations. Once a potential limiting factor is identified and characterized through monitoring and research, efforts are made to implement activities that will eliminate or mitigate its impacts. These activities may not always successfully eliminate threats and mitigation alternatives may be developed.

The knowledge gained from the initial and future research coupled with other Program activities is valuable in evaluating progress toward species recovery and guiding future Program direction through annual revisions of the LRP. Annual data collection and analyses included under Element 4, provide the information base for assessing the Program's progress toward achieving recovery. Long-term, broader-based integration and synthesis of this information is also vital to interpreting results of research and management so that informed decisions can be made on future management actions and strategies. The Program Office will use the information and results obtained under Element 4 to prepare on a biennial basis, a written "Sufficient Progress" assessment of the Program's progress towards recovery. This report, as mandated in the Program Document, will assess the Program's ability to provide ESA compliance for water development and management activities and identify any corrective actions needed to ensure future ESA compliance.

To achieve this element, three goals have been established to facilitate Program planning and management (*Goal 5.1*), ensure integration and synthesis of data and information to evaluate progress toward recovery (*Goal 5.2*), and facilitate contract and funding management (*Goal 5.3*). Accomplishment of *Goal 5.2* relies heavily on activities included in Element 4 such as establishing and maintaining a comprehensive Program database, annual monitoring data analyses, and synthesizing and evaluating information from all activities and studies.

Element 5 - Specific goals, actions, and tasks

Goal— 5.1 Facilitate Program Planning and Management.

Action 5.1.1 Provide Ongoing Program Management.

Task 5.1.1.1 Coordinate and schedule meetings and activities of the Coordination Committee and the technical committees, as necessary.

The Program Office will coordinate the activities of the Coordination Committee and the Program's technical committees, including providing notices, agendas, information packets, and providing draft and final summaries for committee and subcommittee meetings and conference calls as needed.

Task 5.1.1.2 Annually review and update the Long-Range Plan to reflect new information, new projects and Program progress.

The LRP is a living document that will be reviewed and revised annually according to the process described in the Program Document (2012). The Program Office will update the LRP in coordination with the CC and technical committees to reflect accomplishments during the past year, identify new projects needed to achieve goals, and describe any changes to ongoing projects. The LRP will include those actions the Program and Service believe are necessary to achieve recovery and those ESA compliance actions identified in the biological opinions that the Program has assumed responsibility for implementing.

Task 5.1.1.3 Convene annual Program coordination meetings to review the preceding year's monitoring, recovery and research data; assess progress toward recovery; and provide recommendations to modify the LRP.

The Program Coordinator will chair an annual meeting of the Coordination and Biology committees and the Service to review the preceding year's monitoring, recovery and research data, assess progress toward recovery, and provide recommendations to modify monitoring, recovery and research actions, as appropriate.

Task 5.1.1.4 Develop a list of prioritized actions and projects for the Annual Work Plan that most benefit recovery of the endangered fish populations.

Based on the LRP, the Program Office will work with the technical committees to develop a list of prioritized projects for the next Annual Work Plan. The prioritized list will be consistent with the LRP, include input from the technical committees, and be approved by the Coordination Committee.

Task 5.1.1.5 Develop and issue Requests for Proposals (RFPs) and request Scopes of Work (SOWs) for projects that most benefit recovery of the endangered fish populations.

Scopes of Work will be prepared for the list of prioritized projects and requests for proposals will be solicited, as needed. Upon receipt of the SOWs and responses to RFPs, the prioritized projects associated budgets will be compared to the availability of funds. Projects that are low on the priority list will not be included in the Annual Work Plan if funding is not available to fund all projects in that fiscal year. This effort will be conducted by the Program Coordinator. Unfunded, low priority projects may be considered in the next Annual Work Plan cycle.

Task 5.1.1.6 Assemble and review annual SOWs to identify most suitable projects for funding and implementation.

If the Program Office, in consultation with the Service and the Program's Coordination Committee and technical committees, identifies an action that may facilitate the recovery of the endangered fish populations in the San Juan River and the action is not included in the LRP, the Program Coordinator will forward to the Coordination Committee a recommendation for the inclusion of the action in the LRP, along with information on the identified action that the Coordination Committee needs to complete its review and approval of the recommendation. Approval will be based on whether the LRP accurately reflects the best scientific information available, the efficient implementation of recovery goals, and the management actions of the Program.

Action 5.1.2 Oversee and conduct Endangered Species Act (ESA) compliance.

Task 5.1.2.1 Administer the Program and review biological opinions (BOs) consistent with the Program's *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).

The Program is intended to provide measures for compliance with the ESA for water development and water management activities in the San Juan River Basin. The Coordination Committee in 2001 adopted the "Program Principles." The Principles constitute a guide to define how Program actions will be used to provide ESA compliance for water development and water management activities.

Task 5.1.2.2 Monitor and ensure implementation of Program actions identified as Reasonable and Prudent Alternatives (RPAs) and Reasonable and Prudent Measures (RPMs) in BOs.

The Program Office will ensure necessary actions are being implemented to meet the requirements of the BOs that rely on the Program for ESA compliance. The Coordination Committee will be informed of any problems or issues that may arise according to the Principles.

Goal 5.2—Ensure integration and synthesis of information to evaluate the Program’s progress toward recovery

Action 5.2.1 Synthesize and evaluate information from all studies to evaluate progress toward recovery.

Task 5.2.1.1 Establish and maintain a Program database of San Juan River information collected under the various Program projects including all rare fish collections.

The Program Office will maintain and continually improve the comprehensive San Juan River database to centralize data for all Program activities, including monitoring, stocked fish, nonnative fish control, etc. The database includes all rare fish collection information in a relational database for use by all Program participants.

Task 5.2.1.2 Conduct annual Program reviews and develop annual reports that integrate monitoring and research data and results to track and assess yearly Program progress toward recovery.

The Program Office will annually review Program progress to include review and evaluation of progress, annual, and final reports, as well as all monitoring, recovery and research activities, data, and results. The Program Office will ensure, in coordination with Program committees that all required Program documents are completed on schedule and as needed to accomplish the Program’s purposes and goals. This report will assess the preceding year’s monitoring data, progress toward recovery, and adaptive management recommendations, including recommendations for changes in direction, termination of projects, new projects, or other pertinent recommendations.

Task 5.2.1.3 Conduct a biennial comprehensive review and assessment of Program progress towards recovery (i.e., Sufficient Progress Report).

The Program Office will prepare on a biennial basis a “Sufficient Progress” assessment of the Program’s progress towards recovery, the Program’s continued ability to provide ESA compliance for water development and management activities, and any corrective actions needed to ensure future ESA compliance. A “Sufficient Progress” Report was completed in 2010 and 2013 and is currently in progress.

Action 5.2.2 Ensure new information is identified and developed, as necessary, to achieve Program goals and assess progress toward recovery.

Task 5.2.2.1 Coordinate and oversee development of revisions to the SJRB Hydrology Model and the Program’s flow recommendations.

The Program Office will work with Reclamation and other Program participants to improve, maintain, and utilize the Hydrology Model for use in revising the San Juan River flow recommendations. The next generation of Hydrology Model will be completed in 2015 and a review and revision of the flow recommendations will begin in 2015.

Task 5.2.2.2 Develop positive population response criteria for the razorback sucker and Colorado pikeminnow to meet recovery demographic criteria for downlisting and delisting specified in recovery goals/plans adopted by the Service.

This process will involve coordinating with the BC to: 1) evaluate past positive population response criteria for Colorado pikeminnow to develop reasonable criteria for the future; 2)

determine the cause of not meeting positive population response criteria; 3) identify any additional management actions necessary to attain those criteria that should be carried out by the Program; and, 4) reevaluate and update the criteria.

Task 5.2.2.3 Identify and evaluate limiting factors and determine research necessary research to identify actions that will minimize or remove these limiting factors.

The Program Office will use previous and current data and information from habitat assessments, annual monitoring, nonnative fish removal efforts, and ongoing investigations to characterize dynamics of native fishes and their response to management activities that are intended to improve the status of listed species. The Program will also include water quality assessments, and other ongoing monitoring data to better define the interdependence of protected and unprotected native species and to evaluate and identify potential limiting factors.

Task 5.2.2.4 Use monitoring and research information to evaluate and use adaptive management strategies to modify recovery activities, as necessary, to ensure progress toward recovery.

In coordination with the Program's technical committees, use adaptive management strategies to eliminate, add, or adjust monitoring and research activities and management actions to obtain needed information and improve species and habitat status and condition.

Task 5.2.2.5 Develop interim recovery benchmarks for the Colorado pikeminnow and razorback sucker that are tied to monitoring data and are consistent with the species recovery plans and goals, positive population criteria, Sufficient Progress Assessment, LRP, and Program Document.

The recovery benchmarks will be developed in coordination with the Biology Committee. If feasible, interim benchmarks will be developed for: (1) management actions identified in the recovery goals; (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. The benchmarks will be developed in conjunction with the Service's biennial comprehensive review and assessment of Program progress towards recovery (i.e., Sufficient Progress Report).

Action 5.2.3 Ensure scientific integrity of program information and coordination with other associated programs, projects, and studies.

Task 5.2.3.1 Maintain a standardized process for peer review by qualified specialists in appropriate technical disciplines for significant Program science projects and reports.

The Program Office will ensure that a standardized process for peer review is maintained. This review will be done by qualified specialists in appropriate technical disciplines for significant Program science projects and reports.

Task 5.2.3.2 Coordinate with activities of the Upper Colorado River Endangered Fish Program and other related programs and promote participation by Program partners.

The Program Office will participate in the five-year status review, updating of recovery goals for Colorado pikeminnow and razorback sucker, and preparing combined documents and reports (e.g., Report to Congress). San Juan River researchers and partners will be encouraged to participate in meetings such as the Upper Basin Researcher's Meeting to exchange information, reduce redundancy, and learn new techniques.

Goal 5.3—Facilitate contract and funding management.

Action 5.3.1 Ensure appropriate and legal contract and funding practices.

Task 5.3.1.1 Maintain and distribute annual base and capital funds allocated under the Annual Work Plan by each funding source.

The Program Office will work with the Reclamation to maintain and distribute all annual base and capital funds allocated under the Annual Work Plan by each funding source. Reclamation will administer the Program contracts funded with power revenues or state/local cost-shares. This task includes development of scopes of work, advertising of requests for proposals, managing the contractor selection process, contracting with the selected contractor, monitoring and reporting of performance to the Program, ensuring contractor compliance with the contract, and closeout of the contract.

Task 5.3.1.2 Administer Program contracts and provide an accounting of Program funds expended at the end of each federal fiscal year.

Reclamation will provide an accounting of Program funds and any matching funds from other sources within 60 days of the end of each federal fiscal year. An accounting of funds expended during the preceding year will be provided to the Program after the end of each federal fiscal year.

Task 5.3.1.3 Manage Capital Improvement Program to maintain records showing the distribution and expenditures of capital funds under the Annual Work Plan by each funding source, and provide an accounting of funds expended at the end of each federal fiscal year.

Reclamation will manage the Capital Improvement Program and work with the Program Office to maintain records showing the distribution and expenditures of capital funds expended under the Annual Work Plan by each funding source. An accounting of funds expended during the preceding year will be provided at the end of each federal fiscal year.

Element 6. Information and Education

The Upper Colorado River Endangered Fish Recovery Program and the San Juan River Basin Recovery Implementation Program each have a multi-stakeholder structure in which federal and state agencies work with public and private entities to recover endangered fish species in a manner that is consistent with federal, state, and tribal water laws. Although their structure and goals are similar, these recovery programs operate independently, working with their own program partners and governing committees to fulfill requirements detailed in their respective cooperative agreements. Nevertheless, the similarities in these programs provide for effective communication and public outreach under a coordinated effort. The funding for capital construction and ongoing operation and maintenance (O&M) for the Upper Colorado River and San Juan River Basin Recovery Programs is also tied together in Federal legislation (Public Laws 106-392, 107-375, 109-183, 111-11 and 112-270).

Using a shared approach, the two recovery programs coordinate their outreach efforts and work with other organizations throughout the Colorado River Basin to ensure common audiences receive consistent, current, and accurate information about the endangered fishes and efforts to recover them. These audiences include the general public, elected officials, Indian Tribes, landowners, anglers, river rafters and guides, environmental organizations, water and power developers, teachers, students, and Program participants. Although the geographic coverage of these recovery programs differs within the Upper Colorado River Basin, the majority of affected parties are interested in the recovery efforts taking place for both programs.

An annual publication is produced that highlights accomplishments of both programs. The Program Highlights publication serves as a briefing document for the non-Federal partners' annual visit to Washington, D.C., and is used for numerous other purposes throughout the year. In addition to the Program Highlights document, the Swimming Upstream newsletter and freestanding exhibits (in both small and large formats) promote both the Upper Colorado and San Juan programs. Shared outreach efforts help ensure accurate, consistent information about the endangered fish species and recovery programs is disseminated. A shared effort has also proven to be more cost-effective for publication production costs and exhibit fees.

To achieve this element, a goal was established to increase public awareness and support for the endangered fishes and the recovery program (*Goal 6.1*). Actions and tasks focus on providing information about the recovery program to the public and coordinating with the Upper Colorado River Endangered Fish Recovery Program to conduct an effective outreach program.

Element 6 - Specific goals, actions, and tasks

Goal 6.1—Increase Public Awareness and Support for the Endangered Fishes and the Recovery Program.

Action 6.1.1 Provide information to the public on the Program.

Task 6.1.1.1 Provide information through news articles, press releases, radio and television ads, and other media in Farmington, Durango, Albuquerque, and others in the area to inform the public of Program activities.

Public information will be provided through news articles, press releases, radio and television ads, and other media to inform the public of Program activities. The Program goal is to make at least six press releases per year.

Task 6.1.1.2 Provide notification of meeting times, dates, locations, and draft agendas for committee meetings to interested parties 30 days in advance of the meeting.

Task 6.1.1.3 Maintain a Program website.

Task 6.1.1.4 Develop a Program brochure.

A primary purpose of the brochure will be to give Principle Investigators Program information that can be given to individuals encountered on the river.

Action 6.1.2 Coordinate public outreach with the Upper Colorado River Endangered Fish Recovery Program.

Task 6.1.2.1 Develop and maintain a formal outreach support agreement between the two recovery programs.

A formal outreach support agreement is executed and maintained each year between the San Juan River Basin Recovery Implementation Program and the Upper Colorado River Endangered Fish Recovery Program. It is included and described in the Program Office's annual Scope of Work in the Program's Annual Work Plan.

Task 6.1.2.2 Develop and exchange information and materials to incorporate into PowerPoint presentations, newsletters, Program highlights and Program displays.

The Upper Colorado River Endangered Fish Recovery Program retains a full-time public relations coordinator on staff to oversee the exchange of information and materials between

the two Programs and to develop and distribute presentations, newsletters, Program highlights and Program displays.

Task 6.1.2.3 Participate in selected outreach efforts at local, state, and regional water conferences.

The information and education program will participate in selected outreach efforts at local, state, and regional water conferences.

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APPENDICES

APPENDIX A. Tasks, priorities, responsibilities, dates, and descriptions for elements of the Long-Range Plan

The following Recovery Element Tables 1-6 are included:

1. Management and Augmentation of Populations and Protection of Genetic Integrity
2. Protection, Management, and Augmentation of Habitat
3. Management of Nonnative Species
4. Monitoring and Evaluation of Fish and Habitat in Support of Recovery Actions
5. Program Coordination and Assessment of Progress toward Recovery
6. Information and Education

The following are criteria used as guidance for “Recovery Goals Priority” in the *P* column of the following tables:

| | |
|----------------------------------|--|
| Low (<i>L</i>) | The task is not linked to site-specific management actions of recovery goals and is not necessary for species recovery. |
| Medium (<i>M</i>) | The task is indirectly linked to site-specific management actions and may be supportive of species recovery. |
| High (<i>H</i>) | The task is linked or related to a site-specific management action cited in recovery goals and may be necessary to achieve species recovery goals. |
| Critical/Compliance (<i>C</i>) | The task reflects a site-specific management action cited in recovery goals or biological opinions as a compliance measure and is considered necessary to achieve species recovery (formerly Highest). |

Status Categories: Ongoing, Annually, Pending, To Be Determined (TBD), As Needed, As Requested, On Hold, Completed

The following are abbreviations used in the following Tables:

| | |
|-------|---|
| ASIR | American Southwest Ichthyological Researchers |
| BC | Biology Committee |
| BIA | Bureau of Indian Affairs |
| BHS | Bluehead sucker |
| BOR | Bureau of Reclamation |
| CC | Coordination Committee |
| CPM | Colorado pikeminnow |
| ERI | Ecosystems Research Incorporated |
| FMS | Flannelmouth sucker |
| FWS | U.S. Fish and Wildlife Service |
| GJ | Grand Junction |
| HCNFF | Horsethief Canyon Native Fish Facility |
| MEC | Miller Ecological Consultants |
| NFWF | National Fish and Wildlife Foundation |
| NMDGF | New Mexico Game and Fish Department |
| NN | Navajo Nation |

| | |
|--------|---|
| PO | Program Office |
| RBS | Razorback sucker |
| RERI | New Mexico River Ecosystem Restoration Initiative |
| SJRRIP | San Juan River Basin Recovery Implementation Program |
| SNARRC | Southwestern Native Aquatic Resources & Recovery Center |
| TNC | The Nature Conservancy |
| UNFH | Uvalde National Fish Hatchery |

Table A1. Element 1— Management and Augmentation of Populations of Colorado Pikeminnow and Razorback Sucker.

| <i>P</i> | Tasks | Start Date | End Date | Who | Status | Status of Activity | | | | | | | | | | | | | | | | | | | | |
|---|--|------------|----------|-------------------|----------|---|------|---------|------|---------|------------------|------|---------|------|---------|-------------------|------|-----|------|---------|--------------|------|-----|-------|--------|--------------|
| Goal 1.1 Establish Genetically and Demographically Viable, Self-Sustaining CPM and RBS Populations. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Action 1.1.1 Develop plans for rearing and stocking CPM and RBS. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>H</i> | 1.1.1.1 Review and update augmentation plan for CPM and adjust stocking goals as needed. | 2010 | 2020 | FWS, BC, PO | Ongoing | Time frame for current CPM stocking plan is 2010-2020. Review and update of 10-year stocking goals needs to occur before 2020. | | | | | | | | | | | | | | | | | | | | |
| <i>H</i> | 1.1.1.2 Review and update augmentation plan for RBS and adjust stocking goals as needed. | 2009 | 2016 | FWS, BC, PO | Ongoing | Time frame for current 8-year stocking plan is 2009-2016. Review and update of 8-year stocking goals needs to occur before 2016. | | | | | | | | | | | | | | | | | | | | |
| Action 1.1.2 Produce, rear, and stock sufficient numbers of CPM to meet stocking goals of augmentation plan. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>C</i> | Task 1.1.2.1 Annually produce and rear at least 400,000 age-0 CPM (50–55 mm TL) at SNARRC. | 2010 | 2020 | SNARRC | Annually | Under the current CPM stocking plan for the San Juan River, augmentation efforts focus on culturing and stocking ≥400,000 age-0 Colorado pikeminnow annually from 2011-2020 or as directed by the SJRRIP. SNARRC currently maintains a broodstock of 725 adult fish. In 2014, a total of 393,895 (6,105 fish below the target request) age-0 fish were stocked into the San Juan River as follows: <table border="1" style="margin-left: 20px;"> <tr> <td>11/5</td> <td>188,181</td> <td>60mm</td> <td>721 lbs</td> <td>Boyd Pk/PNM Weir</td> </tr> <tr> <td>11/5</td> <td>205,261</td> <td>45mm</td> <td>413 lbs</td> <td>Bird & River Park</td> </tr> <tr> <td>11/5</td> <td>248</td> <td>77mm</td> <td>1.7 lbs</td> <td>Hogback Weir</td> </tr> <tr> <td>11/5</td> <td>205</td> <td>183mm</td> <td>18 lbs</td> <td>Hogback Weir</td> </tr> </table> (SOW 15-8) | 11/5 | 188,181 | 60mm | 721 lbs | Boyd Pk/PNM Weir | 11/5 | 205,261 | 45mm | 413 lbs | Bird & River Park | 11/5 | 248 | 77mm | 1.7 lbs | Hogback Weir | 11/5 | 205 | 183mm | 18 lbs | Hogback Weir |
| 11/5 | 188,181 | 60mm | 721 lbs | Boyd Pk/PNM Weir | | | | | | | | | | | | | | | | | | | | | | |
| 11/5 | 205,261 | 45mm | 413 lbs | Bird & River Park | | | | | | | | | | | | | | | | | | | | | | |
| 11/5 | 248 | 77mm | 1.7 lbs | Hogback Weir | | | | | | | | | | | | | | | | | | | | | | |
| 11/5 | 205 | 183mm | 18 lbs | Hogback Weir | | | | | | | | | | | | | | | | | | | | | | |
| <i>C</i> | Task 1.1.2.2 Stock at least 400,000 age-0 CPM annually into the San Juan River | 2010 | 2020 | NMFWCO, SNARRC | Annually | In 2014, 393,442 YOY (2014 year class) CPM were stocked at four locations (2 on the San Juan, 2 on the Animas). Additionally, 453 were "stocked" as part of the Hogback Canal exclusionary weir wall evaluation (SOW 15-7). | | | | | | | | | | | | | | | | | | | | |
| <i>M</i> | Task 1.1.2.3 Opportunistically stock available CPM in excess of those described above. | 2010 | 2020 | NMFWCO, BC, PO | Annually | In 2014, we were just shy of the stocking target of 400,000/year, so no 'excess' were available for stocking in 2014. Evaluation on a case by case basis will occur if opportunistic fish become available to the Program in the future. | | | | | | | | | | | | | | | | | | | | |
| Action 1.1.3 Produce, rear, and stock sufficient numbers of RBS to meet stocking goals of augmentation plan. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>C</i> | Task 1.1.3.1 Produce and rear RBS at SNARRC for stocking to grow-out facilities. | 2009 | 2016 | SNARRC | Annually | The RBS stocking plan for the San River is for SNARRC to maintain a captive broodstock population large enough to produce RBS for annual stocking. A broodstock of 1,189 adult fish of Lake Mohave origin is currently being maintained and | | | | | | | | | | | | | | | | | | | | |

| P | Tasks | Start Date | End Date | Who | Status | Status of Activity | | | | | | | | | | | | | | | | | | | | |
|-------|--|------------|----------|------------------|----------|--|-----|-------|-----------|---------|-----------|-----|-------|-----------|---------|-----------|-----|-------|-----------|---------|--------|-------|-----|-------|-------|--------------|
| | | | | | | <p>managed as identified in SNARRC’s Razorback Sucker Genetics Management and Captive Propagation Plan (2004). In 2014, a total of 9,300 age-1 RBS were stocked into the NAPI ponds on April 9, 2014 and 212 in the SJR as follows:</p> <table border="1" data-bbox="1331 350 1957 464"> <tr> <td>4/9</td> <td>3,100</td> <td>185-305mm</td> <td>957 lbs</td> <td>E. Avocet</td> </tr> <tr> <td>4/9</td> <td>3,100</td> <td>185-305mm</td> <td>957 lbs</td> <td>W. Avocet</td> </tr> <tr> <td>4/9</td> <td>3,100</td> <td>185-305mm</td> <td>957 lbs</td> <td>Hidden</td> </tr> <tr> <td>11/15</td> <td>212</td> <td>160mm</td> <td>19lbs</td> <td>Hogback Weir</td> </tr> </table> <p>All fish are PIT tagged 30-45 days prior to hauling and stocking into the NAPI ponds. (SOW 15-9).</p> | 4/9 | 3,100 | 185-305mm | 957 lbs | E. Avocet | 4/9 | 3,100 | 185-305mm | 957 lbs | W. Avocet | 4/9 | 3,100 | 185-305mm | 957 lbs | Hidden | 11/15 | 212 | 160mm | 19lbs | Hogback Weir |
| 4/9 | 3,100 | 185-305mm | 957 lbs | E. Avocet | | | | | | | | | | | | | | | | | | | | | | |
| 4/9 | 3,100 | 185-305mm | 957 lbs | W. Avocet | | | | | | | | | | | | | | | | | | | | | | |
| 4/9 | 3,100 | 185-305mm | 957 lbs | Hidden | | | | | | | | | | | | | | | | | | | | | | |
| 11/15 | 212 | 160mm | 19lbs | Hogback Weir | | | | | | | | | | | | | | | | | | | | | | |
| C | Task 1.1.3.2 Produce RBS in three NAPI grow-out ponds (3,000-3,500 fish per pond, > 200 mm TL) and stock into the San Juan River. | 2009 | 2016 | NN, NMFWCO | Annually | 9,300 razorback suckers averaging 180 mm were stocked into the three NAPI Ponds in April 2014. Passive harvest occurred in September and active harvest was conducted on October 5-7, 2014. Overall, 4,155 razorback suckers averaging 368 mm were stocked into the San Juan River at various locations. (SOW 15-10) | | | | | | | | | | | | | | | | | | | | |
| C | Task 1.1.3.4 Stock at least 91,200 RBS (> 300 mm TL) during eight year stocking period or 11,400 per year. | 2009 | 2016 | NN, CRFP, NMFWCO | Annually | In 2014, 6,170 >300 mm TL RZB were stocked at various locations in the San Juan and Animas rivers in NM & 1 site in UT (Montezuma Creek). 2,015 RZB were delivered from Ouray/Horse Thief Canyon-GVU (2013 YC), and 4155 from NAPI ponds (2011 YC). Additionally, 212 age-1 RBS were "stocked" as part of the Hogback Canal exclusionary weir wall evaluation (SOW 15-7). | | | | | | | | | | | | | | | | | | | | |
| M | Task 1.1.3.5 Opportunistically stock available RBS in excess of the 11,400 described above. | 2009 | 2016 | NMFWCO, BC, PO | Annually | No RBS were opportunistically stocked in 2014. Stocking target of 11,400 RZB/year not fulfilled, but have already exceeded 91,200 RZB/8 years (92,822 since 2009, so met the goal in 6 years). No excess available in 2014. Evaluation on a case by case basis will occur if opportunistic fish become available to the Program in the future. | | | | | | | | | | | | | | | | | | | | |
| C | Task 1.1.3.6 Produce > 2,000 RBS per year (>300 mm TL) at Horsethief Canyon Native Fish Facility (HCNFF), which is part of the larger Ouray National Fish Hatchery – Grand Valley Unit (ONFH-GVU) in Grand Junction, CO. | 2013 | 2016 | FWS ONFH-GVU | Annually | Ponds became operational in summer 2012. The second year stockings of RBS from HCNFF occurred in October 2014. A total of 2,015 RBS (mean TL = 379 mm) were stocked as follows: 613 at Bloomfield, NM on October 6; 622 at Berg Park on October 8; 369 at PNM on October 14; and 411 at Montezuma Creek, UT on October 14. The SJRRIP was charged this year for harvesting, PIT-tagging, or transport/stocking in FY-14 (SOW 15-6). The next cohort -- to produce > 2,000 RZ of target size (> 300 mm TL) -- to be stocked in 2015 (SOW 15-6). (See Task 1.3.1.4) | | | | | | | | | | | | | | | | | | | | |

| <i>P</i> | Tasks | Start Date | End Date | Who | Status | Status of Activity |
|---|---|------------|-----------|--------------|-----------|---|
| Goal 1.2—Identify and Implement Strategies for Improving the RBS and CPM Augmentation Program and Genetic Integrity. | | | | | | |
| Action 1.2.1 Implement methods to evaluate status and success of stocked RBS and CPM. | | | | | | |
| <i>H</i> | Task 1.2.1.1 Maintain a standardized database for all stocked and recaptured RBS and CPM in order to determine the fate of stocked fish. | 2009 | 2023 | PO | Ongoing | The CPM and RBS PIT tag databases are currently being updated to reflect 2014 stocking, capture, and recapture efforts conducted by various SJRIP projects. The database currently contains 55,398 CPM and 147,630 RBS records, respectively (SOW15-33). |
| <i>H</i> | Task 1.2.1.2 Identify, describe, and implement strategies for improving survival and retention of stocked razorback sucker and Colorado pikeminnow, including acclimation prior to stocking, size of fish stocked, time and location of stocking, physiological conditioning, and predator avoidance. | 2009 | 2023 | FWS, NMFWCO | Ongoing | Developed and implemented an experimental stocking design for RBS to better understand the effects soft vs. hard release and stocking site has on retention/survival. Recapture data will be used to evaluate those effects. Stocking locations at PNM Weir (Fruitland ,NM) and upstream at Verde del Rio Park (Bloomfield, NM) on the San Juan River, plus Boyd and Berg Parks on the Animas River in Farmington, NM were used to reduce densities at stocking sites and to expand stocking range for YOY CPM. (SOW 15-7) |
| <i>L</i> | Task 1.2.1.3 Identify and implement a method for tracking genetics of Colorado pikeminnow and razorback sucker in the San Juan River to determine if and to what extent wild-produced individuals depart from genetic structure of parental stock (hatchery derived). | 2003 | 2023 | FWS | As needed | No action taken yet as wild-produced individuals remain rare. |
| Goal 1.3— Support Operations and Maintenance of Facilities to Support RBS and CPM Stocking Programs. | | | | | | |
| Action 1.3.1. Support production and grow-out facilities. | | | | | | |
| <i>H</i> | Task 1.3.1.1 Support operation and maintenance of hatchery facilities at SNARRC for CPM and RBS production. | 1994 | 2016/2020 | PO, FWS | Annually | Program provided funding for these projects via SOW 15-8 and SOW 15-9. |
| <i>H</i> | Task 1.3.1.3 Support operation and maintenance of NAPI grow-out ponds. | 1994 | 2023 | NN, FWS | Annually | Program provided funding for this project via SOW 15-10 |
| <i>H</i> | Task 1.3.1.4 Support operation, and maintenance of Horsethief Canyon Native Fish Facility (HCNFF), part of the larger Ouray National Fish Hatchery – Grand Valley Unit (ONFH-GVU) in Grand Junction, CO. | 2013 | 2023 | FWS ONFH-GVU | Annually | Program provided funding for this project via SOW 15-6. |
| Action 1.3.2 Implement a PIT tag marking program to insure all stocked and/or encountered endangered fish are fitted with PIT tags to track individual RBS and CPM in support of evaluation and assessment activities. | | | | | | |
| <i>H</i> | Task 1.3.2.1 Procure adequate numbers of PIT tags for marking native and endangered fish. | 1998 | 2023 | BOR | Ongoing | PIT tags were procured by BOR for 2015 (SOW 15-11). FWS-CRFP in Grand Junction distributed PIT tags to Dexter NFH, HCNFF, and field researchers in 2014. |

| <i>P</i> | Tasks | Start Date | End Date | Who | Status | Status of Activity |
|----------|--|------------|----------|-----|---------|---|
| <i>H</i> | Task 1.3.2.2 Install and maintain remote PIT tag detectors in the river to passively track fish presence/absence and movement. | 2012 | 2023 | BOR | Ongoing | Permanent passive PIT tag detectors were installed at TNC Phase II restoration sites west of Shiprock, NM, Hogback Fish Weir (RM 159), and PNM fish passage (RM 167) in 2014. A permanent detector was installed across half of the river at PNM Diversion. Coverage across the entire river will potentially be done after a year to see if the partial structure stays in place. Mobile detectors were also deployed at several locations in the river. |

Table A2. Element 2 — Protection, Management, and Augmentation of Habitat

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|---|------------|----------|------------------|----------|--|
| Goal 2.1 Provide Suitable Habitat to Support Recovery of CPM and RBS Populations | | | | | | |
| Action 2.1.1 Create and maintain habitat complexity to minimize loss and degradation of habitat for the endangered fish in the SJR | | | | | | |
| <i>C</i> | Task 2.1.1.1 Support implementation of TNC’s Conservation/Habitat Planning Project. | 2011 | 2015 | TNC, PO | Ongoing | In 2014, the Phase II channel restoration was completed at a complex site located between RM 134 and RM 137 using private mitigation funds. Restoration methods included: 1) re-establishing the secondary channel inlet (i.e. connection with the river) and cleaning out secondary and tertiary channels; 2) mechanical clearing and chemical treatment of Russian olive and saltcedar along banks; and 3) replacement-planting of willow poles. A total of 4.7 miles of channel restoration and 17 acres of exotic vegetation removal were completed. |
| Action 2.1.2 Implement habitat restoration strategies to augment the function of river flow to create and maintain suitable habitat. | | | | | | |
| <i>H</i> | Task 2.1.2.1 Develop and implement a plan for feasible habitat restoration strategies and implement such plan as funding becomes available. | 2015 | 2016 | BOR, BC, FWS, NN | Pending | This will likely be a topic for a workshop in the future once additional information is collected on the persistence of restored aquatic habitats and use by larval and small-bodied fish from prior to spring runoff to late fall, the retrospective analysis is completed, and the flow revision workshop is completed. |
| Action 2.1.3 Procure products, equipment, and materials in support of Goal 2.1 – 2.6 | | | | | | |
| <i>H</i> | Task 2.1.3.1.Obtain river videography | 1999 | 2023 | P.I.s | Annually | Habitat imagery (videography) was not obtained 2014. Lidar imagery was used for habitat mapping in 2014. Videography will be obtained in 2015, if possible (SOW 16-16). |
| <i>H</i> | Task 2.1.3.2 Support operation and maintenance of San Juan River stream gages as necessary to monitor flows in the river. | 1999 | 2023 | BOR, PO | Annually | The Program funded USGS to provide 12 additional flow measurements at four SJR gages in NM (Archuleta, Farmington, Shiprock, and Four Corners (SOW 15-13). |
| Goal 2.2—Provide Suitable Flows to Support Recovery of CPM and RBS Populations. | | | | | | |
| Action 2.2.1 Develop flow regimes to provide adequate flow and function to maintain habitat for CPM and RBS. | | | | | | |
| <i>C</i> | Task 2.2.1.1 Implement flows that provide suitable habitat for endangered fishes and other native fishes in the San Juan River. | 1999 | 2023 | BOR, FWS, BC | Ongoing | Reclamation operates Navajo Dam according the Recovery Program’s Flow Recommendations using operations decision criteria developed in 2006. Minimal modifications were made to the criteria during an environmental flow workshop in February 2015. |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|---|------------|----------|--------------|--------------|---|
| <i>H</i> | Task 2.2.1.2 Develop and implement a process for evaluating and revising flow recommendations. | 2015 | 2016 | BOR, FWS, BC | Pending | The process for revising flow recommendations will be based on monitoring data, the new San Juan River Basin hydrologic model, updated climate change projections for stream flow, and expanded scientific knowledge of flow-ecology relationships. To initiate the process, the Program held an environmental flow workshop in February 2015 to make minimal modifications to the existing process for implementing the flow recommendations to partially address apparent weaknesses in the decision criteria as a result of the drier hydrologic conditions that have occurred in the basin in the last decade. During the workshop a process was also developed for conducting a comprehensive review and revision of the 1999 flow recommendations starting in 2015. |
| Action 2.2.2 Develop and maintain a hydrology model to evaluate flow recommendations in the context of water supply and demand in the Basin. | | | | | | |
| <i>C</i> | Task 2.2.2.1 Develop, evaluate, and refine a San Juan Basin hydrology model that provides a scientifically sound and biologically relevant representation of the San Juan River. | 1995 | 2023 | BOR, FWS | Ongoing | Completion of San Juan Basin Hydrology Model (SJRHM) Generation III is expected in 2015 (SOW 15-12). |
| <i>M</i> | Task 2.2.2.2 Conduct peer review of the hydrology model by qualified specialists not affiliated with the Program. | 2015 | 2015 | PO | Pending | An independent peer review will be conducted of SJBHM Generation III when it is completed in 2015. |
| <i>H</i> | Task 2.2.2.3 Provide model analysis for the evaluation of flow recommendations. | 1999 | 2023 | BOR, FWS | As requested | No runs were requested in 2014. |
| Action 2.2.3 Coordinate with BOR on Navajo Dam operations. | | | | | | |
| <i>H</i> | Task 2.2.3.1 Provide input and recommendations to Fish and Wildlife Service and Reclamation on alternate dam operations when extreme hydrologic conditions prevent flow recommendations from being met. | 1999 | 2023 | BC, PO | Ongoing | The 2014 water year was the sixth straight year with below-average (30-year) hydrology in the San Juan River Basin. The April-July inflow to the reservoir was only 58% of average. Additionally, the reservoir went into the year with much below average storage. However, the Flow Recommendation Decision Tree did recommend that a 1-week spring peak release occur in late May. After discussion with the SJRIP, it was agreed that the spring peak release be forgone for 2014 in favor of recovering the reservoir and sustaining the ability to meet target baseflows. Operations at Navajo continued to be run very tightly, releasing the minimum required to meet the target baseflow while attempting to recover storage in the reservoir. |
| <i>H</i> | Task 2.2.3.2 Make determination of perturbation for Navajo Dam operations. | 2000 | 2023 | BOR, BC | Annually | Reclamation provided a determination of perturbation to the BC for their review on Feb. 19, 2015. 2013 was not a perturbation year (not enough qualifying storm events in calendar year 2012); 2014 was a perturbation year (due to the monsoons that occurred in calendar year 2013); 2015 is a perturbation year (due to storm events occurring in calendar year 2014) |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|---|------------|----------|-------------------|----------|--|
| Action 2.2.4 Provide and protect flows in the San Juan River consistent with flow recommendations. | | | | | | |
| <i>C</i> | Task 2.2.4.1 Develop and implement mechanisms for protecting water required to meet flow recommendations. | 1999 | 2023 | BOR | Ongoing | BOR actively coordinates with the appropriate parties to achieve the Program’s second goal of “proceeding with water development in the Basin in compliance with federal and state laws, interstate compacts, Supreme Court decrees, and federal trust responsibilities to the tribes.” |
| <i>C</i> | Task 2.2.4.2 Develop contingency strategies to meet the functions provided by flow recommendations during extended periods of droughts. | 2014 | 2017 | BOR, FWS, BC | Pending | In 2014, Reclamation proposed modifying the existing process for implementing the flow recommendations to partially address apparent weaknesses in the decision criteria as a result of the drier hydrologic conditions that have occurred in the basin during 1999 to 2013 period as compared to the longer term period since 1971. To reduce the risk of shortages and improve implementation of the flow recommendations, the BC recommended a “standard target elevation” of 6,063 with a flexibility range to reduce to 6,050 for biological flexibility and to forego a one week peak release in 2015. |
| <i>M</i> | Task 2.2.4.3 Collaborate with agricultural, municipal, and industrial water users in the San Juan Basin to promote water use efficiency savings and water market transactions that support environmental flows. | 2015 | 2023 | FWS, BOR, BC, TNC | Ongoing | A 2014 TNC review of the current scientific literature and case studies indicated that both water market transactions and irrigation system improvements that integrate infrastructure modernization with operational changes can successfully reduce agricultural river diversions for the benefit of endangered fish. The study identified multiple opportunities to collaborate with agricultural, municipal, and industrial water users in the San Juan Basin to reduce river diversions through water use efficiency improvements, thereby supporting environmental flows. |
| Goal 2.3—Provide Increased Range to Support Recovery of CPM and RBS Populations. | | | | | | |
| Action 2.3.1 Identify blockages to fish passage at diversion structures in the San Juan River and provide and maintain fish passage where needed. | | | | | | |
| <i>C</i> | Task 2.3.1.4 Provide and maintain fish passage at the Public Service Company of New Mexico (PNM) Weir. | 2003 | 2023 | FWS, NN | Ongoing | Program provides long-term funding for operation of a selective fish passage at PNM weir. Repairs and/or upgrades are being made to inflow gates and screens to alleviate upstream sediment deposition problem. PIT tag antennas were also installed in 2014 to evaluate fish passage efficiency. (SOW15-14) |
| <i>C</i> | Task 2.3.1.5 Investigate the need for fish passage at the Arizona Public Service Company (APS) Weir and provide and maintain fish passage, if deemed necessary. | 2005 | TBD | BOR, FWS | Pending | The need for fish passage at the APS Irrigation Diversion structure was identified in 2005 by Stamp et al. 2017 capital funds are budgeted for planning, engineering, and constructing fish passage at the APS Weir. |
| <i>C</i> | Task 2.3.1.6 Investigate the need for fish passage at the | 2005 | TBD | BOR, FWS, | Pending | Stamp et al. (2005) concluded a fish passage was not needed at |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|---|------------|----------|----------------------|----------|---|
| | Fruitland Diversion and provide and maintain fish passage, if deemed necessary. | | | NN | | Fruitland irrigation diversion structure, at that time, but recommended that it be re-evaluated after maintenance work is performed to confirm that the height or composition of the dam is not altered relative to the conditions documented in the study. 2017 capital funds are budgeted for planning and engineering, if necessary, constructing fish passage at the Fruitland Diversion Dam. |
| <i>H</i> | Task 2.3.1.7 Investigate the need for passage of native and endangered fish from Lake Powell around the waterfall into the San Juan River and provide and maintain fish passage, if deemed necessary. | TBD | TBD | FWS, BOR, BC | Pending | The need for a fish passage at the waterfall was discussed by the BC but no formal evaluation or further work has been initiated. |
| Action 2.3.2 Identify impediments to fish passage in San Juan River tributaries to increase range. | | | | | | |
| <i>H</i> | Task 2.3.2.1 Investigate the need for fish passage at the Animas Pump Station #2 and provide and maintain fish passage, if deemed necessary. | 2007 | TBD | BOR, FWS, BC | Ongoing | Francis (2007) investigated fish passage and canal entrainment of native sucker populations in the Animas River. He found the Animas Pump Station #2 was a seasonal barrier to fish passage and Farmer’s Ditch Diversion on the Animas was a significant barrier to native sucker movement. |
| <i>H</i> | Task 2.3.2.2 Investigate the need for fish passage at the Farmer’s Ditch Diversion and provide and maintain fish passage, if deemed necessary. | 2007 | TBD | BOR, FWS, BC | Ongoing | See above. |
| <i>H</i> | Task 2.3.2.3 Investigate the need for fish passage at other diversion structures in the Animas River and provide and maintain fish passage, if deemed necessary. | 2007 | TBD | BOR, FWS, BC | Ongoing | See above |
| Goal 2.4— Minimize fish entrainment at diversion structures in the San Juan Basin. | | | | | | |
| Action 2.4.1 Identify diversions that could potentially entrain endangered fish in the San Juan River and remediate where necessary. | | | | | | |
| <i>C</i> | Task 2.4.1.1 Design, construct, and maintain a fish deflection weir at the Hogback Diversion. | 2005 | 2015 | BOR, BC, PO, FWS, NN | Ongoing | A fish deflection weir at Hogback Diversion was completed in FY2013. PIT tag antennas were installed on the structure in 2014 and tests conducted to test for effectiveness. Of the 803 fish stocked for the experiment, 18 fish or 2.2% became entrained in the canal (i.e., lost from the river); however, overall detection was low. Additional tests are planned. |
| <i>C</i> | Task 2.4.1.2 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the Arizona Public Service Company (APS) Weir. | 2015 | 2016 | BOR, BC, PO, FWS | Pending | In 2015, an assessment of entrainment hazards will be conducted in the San Juan and Animas rivers from Mexican Hat, Utah upstream to the Highway 64 crossing of the San Juan River, approximately 10 miles east of Bloomfield in the San Juan River and to Durango in the Animas River. APS Weir entrainment may be addressed in conjunction with the planning |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|--|------------|----------|------------------|----------|---|
| | | | | | | and engineering work to begin in 2017 to restore fish passage at the weir. |
| <i>C</i> | Task 2.4.1.3 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the Fruitland Canal. | 2015 | 2016 | BOR, BC, PO, FWS | Pending | 19 Colorado pikeminnow were found in the Fruitland irrigation canal in 2005 (Renfro et al. 2006). The authors indicated entrainment of stocked fishes in the smaller canals could most easily be averted by timing stocking efforts to occur after the cessation of diversion activities. Fruitland Canal will be included in the entrainment assessment in 2015 (see Task 2.4.1.2) and could be addressed in conjunction with the planning and engineering work scheduled to begin in 2017 to restore fish passage at the canal. |
| <i>C</i> | Task 2.4.1.4 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the Jewett Valley Ditch. | 2015 | 2016 | BOR, FWS, BC, PO | Pending | No endangered fish were collected in this canal by Renfro et al. (2006) during surveys in 2005. Jewett Ditch will be included in the entrainment assessment in 2015 (see Task 2.4.1.2). |
| <i>C</i> | Task 2.4.1.5 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the San Juan Generating Station. | 2015 | 2016 | BOR, BC, PO, FWS | Pending | San Juan Generating Station will be included in the entrainment assessment in 2015 (see Task 2.4.1.2). |
| <i>C</i> | Task 2.4.1.6 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the Farmer’s Mutual Ditch. | 2015 | 2016 | BOR, BC, PO, FWS | Pending | No endangered fish were collected in this canal by Renfro et al. (2006) during surveys in 2005. Farmer’s Mutual Ditch will be included in the entrainment assessment in 2015 (see Task 2.4.1.2). |
| Action 2.4.2 Identify diversions that could potentially entrain endangered fish in San Juan River tributaries and remediate where necessary. | | | | | | |
| <i>C</i> | Task 2.4.2.1 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at Animas Pump Station #2. | 2015 | 2016 | BOR, BC, PO, FWS | Pending | Animas Pump Station #2 on the Animas (RM 11.9) will be included in the entrainment assessment in 2015 (see Task 2.4.1.2). |
| <i>C</i> | Task 2.4.2.2 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at the Farmer’s Ditch Diversion. | 2015 | 2016 | BOR, BC, PO, FWS | Pending | Farmers Ditch Diversion on the Animas (RM 21.9) will be included in the entrainment assessment in 2015 (see Task 2.4.1.2). |
| <i>C</i> | Task 2.4.2.3 Investigate the need for and construct, if appropriate, a fish screen or deflection weir at diversion structures in the Animas River. | 2015 | 2016 | BOR, BC, PO, FWS | Pending | Francis (2007) investigated entrainment of native suckers in diversion canals in the Animas River. Although a specific study to estimate entrainment losses was not conducted, he concluded YOY suckers may be entrained in canals and pump stations. Animas River diversions and ditches will be included in the entrainment assessment in 2015 (see Task 2.4.1.2). |
| Goal 2.5—Provide Suitable Water Quality to Support Recovery of CPM and RBS Populations. | | | | | | |
| Action 2.5.1 Describe water quality and identify potential problems to native and endangered fish. | | | | | | |
| <i>C</i> | Task 2.5.1.1 Coordinate with other agencies to evaluate water | 1999 | 2023 | FWS, BOR, | Ongoing | FWS is coordinating with other agencies; strategies for |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|---|------------|----------|--------------|----------|--|
| | quality of the San Juan River Basin and identify potential effects to native and endangered fish. | | | BC | | research and monitoring are being developed. |
| <i>C</i> | Task 2.5.1.2 Compile and synthesize historic water quality information on the San Juan River to identify water quality parameters that may be detrimental to native and endangered fish species (e.g., mercury, selenium, polycyclic aromatic hydrocarbons [PAHs]). | 1994 | 2023 | FWS, BOR, BC | Ongoing | See above |
| <i>C</i> | Task 2.5.1.3 Conduct an evaluation of water quality as potential limiting factors to recovery. | 1994 | 2023 | FWS | Ongoing | See above. |
| Action 2.5.2 Remediate Water Quality Problems | | | | | | |
| <i>C</i> | Task 2.5.2.1 Develop and implement a comprehensive contaminants monitoring plan to identify water quality threats to the endangered species. | 2010 | TBD | FWS | Pending | The FWS is working with other agencies to develop a basin-wide strategy to accomplish this task. |
| <i>C</i> | Task 2.5.2.2 Identify effects of contaminants on recovery of endangered fish. | 2010 | 2023 | FWS, BC | Ongoing | See above. |
| <i>C</i> | Task 2.5.2.3 Provide assistance in developing recommended water quality criteria for problematic contaminants for consideration by state and federal water quality regulatory agencies when those agencies adopt enforceable water quality standards. | 2010 | TBD | FWS | Ongoing | See above. |
| Action 2.5.3 Minimize the risk of hazardous-materials spills in critical habitat. | | | | | | |
| <i>C</i> | Task 2.5.3.1 Identify and remediate potential sources of hazardous materials in areas of designated critical habitat (e.g., petroleum-product pipelines within the 100-year floodplain, riverside retention ponds). | 2012 | TBD | FWS, TNC | Pending | First step: TNC will complete its identification of potential hazardous material threats in 2015 (SOW 09-16). Second step: Develop plan for remediating potential hazardous materials spills (includes Tasks 2.5.3.2-2.5.3.4). |
| <i>C</i> | Task 2.5.3.2 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. | TBD | TBD | FWS, PO | Ongoing | See above |
| <i>C</i> | Task 2.5.3.3 Assess the need for 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. | TBD | TBD | FWS, PO | Ongoing | Same as above. |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|--|------------|----------|--------------------------|----------|--|
| <i>C</i> | Task 2.5.3.4 Develop Best Management Practices for heavy equipment use within the 100 year floodplain. | TBD | TBD | FWS, PO | Ongoing | Same as above. |
| Goal 2.6— Manage the Native Fish Community to Assist in Recovery of the Endangered Species. | | | | | | |
| Action 2.6.1. Develop, implement, and evaluate the most effective strategies for maintaining the native fish community upon which the endangered species depend. | | | | | | |
| <i>H</i> | Task 2.6.1.1. Use active capture techniques to assess native fish abundance. | 1999 | 2023 | P.I.'s | Annually | Refer to Element 4 for monitoring and evaluation of fish and habitat activities. |
| <i>H</i> | Task 2.6.1.2. Conduct annual review of native fish abundance and potential implications to recovery of the endangered fish. | 1999 | 2023 | P.I.'s | Annually | Refer to Element 4 for monitoring and evaluation of fish and habitat activities. |
| <i>H</i> | Task 2.6.1.3 Develop a comprehensive management plan in conjunction with the non-native fish management plan and the endangered species augmentation plans and recovery goals. | 2000 | 2023 | PO, BC, FWS, NMDGF, UDWR | Ongoing | The Program's Monitoring Plan And Protocols (Feb 2012) are being used to implement standardized fish monitoring to assess the presence, status, and trends of Colorado pikeminnow, razorback sucker, and fish community. |

Table A3. Element 3 — Management of Nonnative Aquatic Species.

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|-------|------------|----------|-----|----------|---|
| Goal 3.1—Control Problematic Nonnative Fishes. | | | | | | |
| Action 3.1.1 Develop, implement, and evaluate the most effective strategies for reducing problematic nonnative fish. | | | | | | |

| P | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|--|------------|----------|--------------|----------|--|
| C | Task 3.1.1.1 Mechanically remove nonnative fish to achieve objectives. | 2002 | 2023 | NMFWCO, UDWR | Annually | <p>Intensive nonnative fish removal from RM 166.6 to 159 began in 2001 but effort was shifted in 2014 to areas of higher channel catfish abundance. A 5-day trip was completed from RM 147.9 to 94 in lieu of two 3-day trips from RM 166.6 to 159. This shift resulted in 769 channel catfish and 8 common carp being removed in 52.7 hours of electrofishing. Intensive removal from RM 158.6 to 147.9 began in 2003 and continued in 2014. Three trips were conducted in this section in 2014 resulting in 1,048 channel catfish and 35 common carp being removed. To maximize efforts, the Mar. trip in this section was moved to Aug. In this section, channel catfish catch rates have fluctuated over time with no decline in CPUE and common carp are infrequently collected and catch rates have significantly declined since intensive nonnative removal began. Intensive nonnative fish removal from RM 147.9 to 53 began on a limited basis in 2006 and effort was increased beginning in 2008 and continued through 2014. Four trips, 8 electrofishing passes, were completed in this section in 2014 resulting in 18,216 channel catfish and 49 common carp being removed. Catch rates for juvenile channel catfish were similar to 2013 but significantly lower than 2007, 2009, 2011 and 2012 values. In this section, adult channel catfish catch rates have shown no significant trend and Lincoln-Peterson population estimates for channel catfish resulted in point estimates for juvenile fish (200-299mm TL) of 27,348 fish and adult fish (>300mm TL) of 35,379. Catch rates of common carp continue to be less than one fish per hour. Common carp mean CPUE in this section was the lowest observed catch rate riverwide since the initiation of monitoring in 1996. (SOW 15-17 Upper).</p> <p>Nonnative fish removal activities have been ongoing in the lower San Juan River since 2002. Effort was shifted this year to the middle section of the river from Montezuma Creek to Mexican Hat to determine if catfish removal would be more effective. In 2014, 5 nonnative removal trips were conducted from RM 53 to RM 3 and 4 removal trips from RM 93.5 to 53. From RM 53 to 3, 18 black bullhead, one brown trout, 7,988 channel catfish, and 5 common carp were removed. From RM 93.5 to 53, 23 black bullhead, 3879 channel catfish, 7 common carp, one largemouth bass, one rainbow trout, two white suckers, and one yellow bullhead were removed. Catch rates for common carp have remained relatively low since 2004. Catch rates for channel catfish have remained steady over the past few years, but the size structure has changed with a majority of the fish being juveniles (<300 mm). Lincoln-Peterson population estimates for channel catfish in this section of river resulted in an estimate of 18,715. (SOW 15-18 Lower)</p> |
| C | Task 3.1.1.2 Remove nonnative fish at selective fish passage structures. | 2003 | 2023 | NN, FWS | Annually | <p>Nonnative fish were removed at PNM selective fish passage structure (see Task 2.3.1.4). The passage operated 7 days a week April 1-October 25. 131 total non-native fish were removed from the river at the PNM fish passage facility. Non-native fish captures were dominated by black bullheads and channel catfish. (SOW 15-14)</p> |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|--|------------|----------|-------------------|-------------|--|
| <i>H</i> | Task 3.1.1.3 Remove nonnative fish during all Program research and monitoring activities. | 1999 | 2023 | P.I.s | Ongoing | This is a SOP for the Program but no specific reporting requirements are in place. "Adult Monitoring" reports numbers of nonnative removed annually by that study. It provides a yearly snapshot of the relative number of nonnative fish in the SJR in relation to both T&E and common, sympatric large-bodied natives. It also reports the location (by age-class & 10-RM section) of channel catfish in the SJR to help inform the best locations for performing nonnative fish removal in the subsequent year. |
| <i>C</i> | Task 3.1.1.4 Conduct annual review of success of nonnative fish control strategy. | 1999 | 2023 | FWS, UDWR, BC | Annually | Success of riverwide nonnative fish removal is reviewed annually by P.I.'s and BC (SOW 15-17 Upper and 15-18 Lower). See above. |
| <i>C</i> | Task 3.1.1.5 Organize and conduct workshops, as necessary, to develop a comprehensive non-native species management plan, including measurable river wide objective to determine effects of removal effort on native and nonnative fishes. | 2010 | 2014 | NMFWCO, BC, PO | In progress | The BC held a workshop in 2010 to evaluate the non-native fish control program. Data and information from the workshop and annual nonnative fish removal is being used to develop a comprehensive non-native species management plan for the Program. |
| <i>H</i> | Task 3.1.1.6 Establish target criteria for reduction of problematic nonnative fish species to estimate time, effort, and cost for controlling nonnative fishes. | 2012 | 2023 | BC, FWS | Ongoing | See above. |
| <i>H</i> | Task 3.1.1.7 Evaluate and implement effective alternative nonnative fish reduction methods. | 2012 | 2023 | FWS, BC | Ongoing | See above. |
| Goal 3.2—Prevent introduction and establishment of other nonnative invasive species. | | | | | | |
| Action 3.2.1 Ensure that sport fishing regulations and enforcement are consistent with endangered fish recovery. | | | | | | |
| <i>M</i> | Task 3.2.1.1 Review sport fishing regulations and revise, as necessary, to ensure consistency with endangered fish recovery. | 1999 | 2023 | States, NN, PO,BC | Ongoing | See Tasks 3.2.2.1 and 3.2.2.2. |
| <i>M</i> | Task 3.2.1.2 Collaborate with state and tribal agencies to enforce fishing regulations. | 1999 | 2023 | States, NN, PO,BC | Ongoing | See Tasks 3.2.2.1 and 3.2.2.2. |
| Action 3.2.2 Develop and implement policies and agreements among stakeholders on nonnative game fish management to prevent introduction of invasive species | | | | | | |
| <i>C</i> | Task 3.2.2.1 Develop and implement a sport fish stocking policy among the states and tribes. | 2009 | 2015 | States, NN, PO,BC | In Progress | A draft sport fish stocking policy for the San Juan River Basin has been developed and needs to be signed by the States of New Mexico, Utah, Colorado, and the Tribes. |
| <i>H</i> | Task 3.2.2.2 Execute agreements among the states and tribes to prevent the spread of nonnative invasive species. | 2009 | 2015 | States, NN, PO,BC | In Progress | See above. |
| Action 3.2.3 Identify potential invasive nonnative species and control their introduction and escapement into the main river, floodplain, and tributaries. | | | | | | |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|----------|--|------------|----------|----------------|-----------|--|
| <i>L</i> | Task 3.2.3.1 Consolidate all information for a comprehensive report and risk assessment of waterfall inundation and associated immigration of nonnative fish from Lake Powell including options and recommendations for potential management actions. | TBD | TBD | PO, BC | On Hold | Information is being collected. No management actions are being proposed at this time. See Task 2.3.1.7 |
| <i>C</i> | Task 3.2.3.2 Develop a plan to control non-native fish entering the SJR from Lake Powell and be prepared to implement when the lake refills. | TBD | TBD | PO, BC | As needed | If a barrier/passage is determined to be necessary, a plan will be developed. See Task 2.3.1.7 |
| <i>H</i> | Task 3.2.3.3 Identify major sources of nonnative fish from tributaries and off-channel features to minimize reinvasion of riverine habitats by problematic species. | TBD | 2023 | BC | Ongoing | This will be part of a comprehensive non-native species management plan. |
| <i>C</i> | Task 3.2.3.4 Implement measures to reduce escapement of nonnative fish from tributaries and off-channel features, as necessary. | 2009 | 2023 | PO, BOR, FWS | As needed | Measures are being implemented at the recently constructed Lake Nighthorse on the Animas River. Nonnative fishes occur in the reservoir and they could potentially be released into San Juan River Basin. Tests have shown the sleeve valve on the outlet structure does not prevent 100% escapement as originally anticipated, especially for early life history stages. The management plan for the reservoir will only allow the stocking of trout and salmon species and include additional monitoring of releases. No other measures are being implemented, at this time, to reduce escapement of nonnative fish from tributaries and off-channel features. |
| <i>H</i> | Task 3.2.3.5 Coordinate with other programs, agencies, and activities to track occurrences of nonnative species in the San Juan River Basin and, if a potential invasive species problem is identified, develop and implement preventive actions as appropriate. | 1999 | 2023 | PO, BC, States | Ongoing | Channel catfish is currently the primary nonnative species of concern in the San Juan River. All nonnative fishes encountered during the Program's nonnative fish removal efforts are removed. No other invasive species problem has been identified in the San Juan River at this time. |

Table A4. Element 4 — Monitoring and Evaluation of Fish and Habitat in Support of Recovery Actions.

| P | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|--|------------|----------|--------------------------|-----------|---|
| Goal 4.1—Monitor Fish Populations of the San Juan River. | | | | | | |
| Action 4.1.1 Develop a Standardized Monitoring Plan for fish. | | | | | | |
| M | Task 4.1.1.1 Develop and revise, as needed, a Standardized Fish Monitoring Plan to assess the presence, status, and trends of Colorado pikeminnow, razorback sucker, and fish community. | 2000 | 2023 | PO, BC, FWS, NMDGF, UDWR | Ongoing | The Program’s Monitoring Plan and Protocols (Feb 2012) are being used to implement standardized fish monitoring. |
| H | Task 4.1.1.2 Analyze and evaluate monitoring data and produce Annual Fish Monitoring Reports to ensure that the best sampling design and strategies are employed. | 2000 | 2023 | PO, BC, P.I.’s | Annually | Annual reports are posted on the SJRRIP website each year: http://www.fws.gov/southwest/sjrip/index.cfm |
| H | Task 4.1.1.3 Organize and conduct Monitoring Plan Workshops, as necessary, to coordinate sampling design, data collection, and desired precision and detection levels for detecting responses. | 2000 | 2023 | PO, BC | As needed | Monitoring workshops were last held in 2009. See Task 4.1.1.1. |
| Action 4.1.2 Implement a Standardized Monitoring Plan to track the presence, status and trends of endangered fish populations. | | | | | | |
| H | Task 4.1.2.1 Conduct larval fish sampling to determine if reproduction is occurring, locate spawning and nursery areas, and to gauge the extent of annual reproduction. | 1998 | 2023 | P.I.s | Annually | <p>During 2014, five larval fish survey trips were conducted on the San Juan River between river miles 147.9 (Shiprock, NM) and 2.9 (Clay Hills Crossing, UT). A total of 290 collections were made encompassing 8,623m² of nursery habitat. These collections resulted in the capture of 20,508 specimens.</p> <p>A total of 312 larval Colorado Pikeminnow were collected between river miles 116.9 and 3.2. Prior to 2014, 58 larval Colorado Pikeminnow were collected during the 20 year period between 1993 and 2013 (drift-nets and larval seining collections). Back-calculated spawning dates for Colorado Pikeminnow ranged from 15 June to 2 July 2014. Larval Colorado Pikeminnow were present in 34 of the 290 collections.</p> <p>For the seventeenth consecutive year, spawning by adult Razorback Sucker was documented in the San Juan River. A total of 612 larval Razorback Sucker were collected between river miles 147.1 and 3.2. Larval Razorback Sucker were present in 85 of the 290 collections. Back-calculated spawning dates for Razorback Sucker ranged from 13 March to 30 June 2014. (SOW 15-21)</p> |

| P | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|---|------------|----------|-------|----------|---|
| H | Task 4.1.2.2 Conduct juvenile and small-bodied fish sampling to determine if young fish are surviving and recruiting into the population and locate the areas and habitat used for rearing. | 1998 | 2023 | P.I.s | Annually | From Oct. 1, 2013 through Sept. 30, 2014 the NMDGF conducted surveys of small bodied fishes on the San Juan River between Geomorphic Reaches 3-7. This sampling was conducted during two trips: 8-12 and 18-24 September, 2014. The 8-12 Sept. trip included an additional two days of sampling on the San Juan River above its confluence with the Animas River. TNC restored six secondary channels in the fall of 2011 and restored a complex of secondary and tertiary channels in the fall of 2014. These sites plus one control site were sampled for small bodied fishes or if dry, noted as such. In FY2014, 70 sites were sampled. A total of 70 sites were sampled and 19 CPM, 2 roundtail chub, and no RBS were captured. Analyses of these data will be reported to the Recovery Program in 2015 (SOW 15-20). |
| H | Task 4.1.2.3 Conduct adult fish sampling to estimate densities of fish (CPUE) and estimates of population size (mark-recapture estimates). | 1998 | 2023 | P.I.s | Annually | Adult Monitoring was conducted RM 195-77 in 2014 (full river to be sampled again in 2015). Scaled CPUE for both RBS and CPM in the SJR 1+ overwinter periods showed a significantly increasing trend over time (2003-2013). Adult CPM were collected in 2014 for the 5th year in a row, showing that Adult Monitoring is able to detect their presence if CPM are in the river. To determine when the Program should switch to riverwide pop. estimates, Adult Monitoring indicates we are getting close with the numbers collected of adult RBS (may already be there for adult RBS base on numbers) and CPM between 300-399 mm TL. However, these fish are all (or almost all) the result of stocking efforts and widespread recruitment of wild-produced RBS and CPM is still relatively rare. Common carp have become very rare in our collections in the intensive removal reaches (likely due to nonnative fish removal efforts). Channel catfish remain widespread (RM 180-77) with CPUE for channel catfish not significantly decreasing or increasing in the last 15 years. Despite the introduction of high numbers of stocked CPM (predators) and RBS (competitors) and repeated intensive electrofishing trips throughout the year, populations of native flannelmouth sucker and bluehead sucker have not changed significantly and remain common, widespread, and stable. In 2014, 15 miles of the San Juan River above the confluence of the Animas R. were sampled. The catch consisted of mainly native suckers, along with rainbow trout, brown trout, speckled dace, and 8 common carp. No catfish were collected during 2014 sampling above the Animas R. (SOW 15-19) |

| P | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|--|------------|----------|--------------------|----------|--|
| H | Task 4.1.2.4 Conduct fish studies in the SJR Arm of Lake Powell as needed to assess presence/absence of SJR endangered fish populations | 2011 | 2015 | P.I.s, FWS, PO, BC | Ongoing | Two years of RBS survey (2011-2012; SOWs 11-28 and 12-28) on the SJ Arm of Lake Powell showed the importance of 33 Lake Miles below the waterfall to the species and Spencer’s Camp and Neskahi Canyon areas for spawning. A total of 147 RBS captured, 36% of which were without PIT tags suggesting potential recruitment. A detectable native fish community was present with CPM (n=25), FMS (n=173), and BHS (n=2) making up 2.1% of the trammel net total catch. Of 69 larval samples collected, one native fish was collected in 2011, a RBS metalarvae (20.7 mm TL). The Colorado arm of Lake Powell is currently being surveyed by the UCR Program (2014-2018) with funding from outside the recovery programs. |
| H | Task 4.1.2.5 Deposit, process, and secure SJR fish specimens, field notes, and associated data at an organized permanent repository. | 1987 | 2023 | P.I.s | Annually | Since 1987, the Museum of Southwestern Biology (MSB), Division of Fishes at UNM, in Albuquerque has served as the primary repository for collections of fishes (eggs, larvae, and adults) and field notes taken for the Program. In addition to curation and deposition, species identification and data are verified, entered into an electronic catalog, and geo-referenced in ArcView. (SOW 15-22). |
| H | Task 4.1.2.6 Collect scales, otoliths, and/or fin rays from fish captured during monitoring and nonnative fish removal activities for future analyses. | 2012 | 2023 | P.I.s | Annually | Scales were collected from unmarked RBS in the SJR in 2011-2013 and forwarded to ASIR for use in the study to determine natal origin using microchemical analyses (see Task 4.5.2.3). It was determined that fin rays were a more reliable non-lethal material than scales for conducting microchemical analyses. During 2014, a new technique for collecting fin rays was implemented that allowed fin ray segments to be removed from closer to the base of the fin. This technique ensured that the cores of fin rays were present in samples so that natal signatures could be analyzed. Fin rays from wild caught RBS were collected on the SJR between RM 161.0 and 69.0. Between June and Sept., 89 RBS fin ray segments were collected for microchemical analyses. Otoliths were collected from 11 fish, 9 with known natal origins and 2 with unknown natal origins. Whole RBS were collected from the NAPI ponds and Ouray NNFH-GVU for fin ray and otolith microchemical analyses. |
| Action 4.1.3 Collect data on the endangered fish and native and nonnative fish communities during other Program management activities, when possible | | | | | | |
| H | Task 4.1.3.1 Collect data on the endangered fish and native fish community during nonnative fish control activities to aid in tracking the presence, status and trends of endangered fish populations. | 1998 | 2023 | FWS, BC, UDWR | Annually | <u>Upper San Juan River</u> - Work is conducted under the nonnative removal work by FWS (Region 2 and Region 6) and UDWR (SOW’s 15-17 and 15-18). CPM and RBS have been collected during intensive nonnative fish removal projects since their initiation in 2001. In 2014, nonnative fish removal crews sampling from RM’s 158.6 to 53 collected a total of 502 (470 unique) CPM and 1,448 (1,197 unique) RBS. Of the CPM, 33 |

| P | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|---|------------|----------|----------------|-----------|---|
| | | | | | | <p>adult fish (>450mm TL) were collected in 2014. The majority of RBS collected in 2014 had been in the river < 5 years; however, 21 fish were collected that have been in the river for >10 years. All rare fish data are summarized in an Excel database and submitted to the Program Office for inclusion into the comprehensive rare fish database. (SOW 15-17 Upper)</p> <p><u>Lower San Juan River</u> - A total of 456 Colorado pikeminnow (CPM) and 96 razorback sucker (RBS) were captured during nonnative removal efforts in 2014. The CPM collected consisted primarily of fish that had been stocked in the last two years with sizes ranging from 53 mm to 385 mm. The RBS collected ranged in size from 199 mm to 532 mm. All data collected on endangered fish was summarized in Excel spreadsheets and submitted to the Program Office for inclusion into the database (SOW 15-18 Lower).</p> |
| H | Task 4.1.3.2 Collect data on the endangered fish and native fish community during PNM selective fish passage operations to aid in tracking the presence, status and trends of endangered fish populations. | 2003 | 2023 | FWS, NN | Ongoing | The Navajo Nation operated the PNM fish passage (see Task 2.3.1.4) for 200 days in 2014 (7 days a week April 1-October 25). A total of 9,014 native fish were passed through the passage facility in 2014. The most dominate species were flannelmouth suckers and bluehead suckers. 10 razorback suckers and 40 Colorado pikeminnow were passed through the facility. Roundtail chub (n=2) were also captured at the fish passage in 2014 with one adult in breeding condition. (SOW 15-14) |
| Action 4.1.4 Obtain reliable population estimates of RBS and CPM. | | | | | | |
| H | Task 4.1.4.2 Use mark-recapture population estimators, when available, in conjunction with catch rate estimators, to provide reliable estimates of adults, subadults, survival, and recruitment consistent with recovery goals criteria to gauge recovery of CPM and RBS. | 1998 | TBD | FWS, BC, P.I.s | Ongoing | The Program is using catch rate estimators to do population estimates at this time. While not mark-recapture population estimators, the BC determined that population estimates developed with data from Adult Monitoring (which is a single-pass effort) and other Program data collection efforts will be used until the Program transitions from catch rate indices to mark-recapture population estimators for subadult and adult RBS and CPM. See 4.1.2.3. |
| H | Task 4.1.4.3 Analyze mark-recapture data with methods used by Bestgen (2009) to estimate survival rates of razorback sucker. | 2009 | TBD | PO, BC | Ongoing | These analyses are repeated every 3-5 years; the most recent being in 2014. |
| H | Task 4.1.4.4 Conduct Population Estimation Workshops, as necessary, to evaluate population estimators used in other systems to identify the most reliable and suitable estimator(s) for Colorado pikeminnow and razorback sucker. | 1999 | 2023 | PO, BC | As needed | No workshops are planned at this time. |
| Action 4.1.5 Evaluate status and success of stocked RBS and CPM. | | | | | | |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|--|------------|----------|-----------------|-----------|--|
| <i>H</i> | Task 4.1.5.1 Determine survival and recruitment of stocked RBS and CPM to assess stocking success and to determine when to implement mark-recapture population estimates. | 2009 | 2023 | FWS, BC | Ongoing | 2014 results from analysis done on “Adult Monitoring” data indicate that we are getting close with the number of adult RBS (we are actually probably there for adult RBS numbers-wise) and CPM between 300-399 mm TL are being seen in the river. However, these fish are all (or almost all) the result of stocking efforts and we are still lacking widespread recruitment of wild-produced RBS and CPM. |
| Action 4.1.6 Evaluate the risk of hybridization among sucker species. | | | | | | |
| <i>M</i> | Task 4.1.6.1 Quantify the extent of hybridization among native suckers to determine if stocking large numbers of hatchery razorback suckers into the San Juan River will reduce genetic diversity and viability of razorback sucker and/or flannelmouth sucker. | 2002 | 2023 | BC, P.I.s | Ongoing | Observational surveys are conducted in conjunction with annual monitoring. Hybridization between native suckers appears to be low at present. P.I.’s include a brief description of any fish anomalies observed in their annual reports to track the occurrence of hybrids. If, and when, the frequency of occurrence appears to increase, a focused reassessment will be conducted. |
| <i>M</i> | Task 4.1.6.2 Quantify the extent of hybridization between native suckers with nonnative white suckers to determine if hybridization is reducing genetic diversity and viability of native suckers (i.e., razorback sucker, flannelmouth sucker, bluehead sucker). | 2002 | 2023 | BC, P.I.s | Ongoing | Observational surveys are conducted in conjunction with annual monitoring. Hybridization between native suckers and nonnative white suckers is present but the rate of hybridization is relatively low and appears to be mostly limited to the upper sections of the river around Farmington, NM. P.I.’s include a brief description of any fish anomalies observed in their annual reports to track the occurrence of hybrids. If, and when, the frequency of occurrence appears to increase, a focused reassessment will be conducted. |
| <i>M</i> | Task 4.1.6.3 Identify and implement necessary actions to minimize hybridization among native suckers and nonnative suckers. | TBD | TBD | BC, P.I.s | As needed | At present, the risk appears to be minimal and no specific management actions are warranted. See Tasks 4.1.6.1 and 4.1.6.2. |
| Action 4.1.7. Monitor health of fish in the San Juan River to ensure adequate protection from diseases and parasites. | | | | | | |
| <i>C</i> | Task 4.1.7.1 Track health of fish in the San Juan River to ensure adequate protection from diseases and parasites. | 1998 | 2023 | PO, P.I.s | Ongoing | Ocular inspections of general fish health and condition are conducted during fish handling and capture activities on the San Juan River. Indications of poor health of endangered fishes are logged and reported. |
| <i>C</i> | Task 4.1.7.2 Investigate potential health problems, identify causes, and recommend corrective actions if any indications of poor health are of concern. | 1998 | 2023 | P.O., BC, P.I.s | As needed | No specific health problems have been identified that require action at this time. |
| Goal 4.2—Monitor Habitat Availability and Use. | | | | | | |
| Action 4.2.1 Develop a standardized monitoring program for habitat. | | | | | | |
| <i>M</i> | Task 4.2.1.1 Develop and revise Standardized Habitat Monitoring Plan. | 1999 | 2023 | BC | Ongoing | A revised Monitoring Plan And Protocols was completed Feb 2012. |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|---|------------|----------|----------------|-----------|---|
| <i>M</i> | Task 4.2.1.2 Organize and conduct Habitat Monitoring and Mapping Workshops, as necessary, to refine and improve habitat evaluation methods. | 1999 | 2023 | PO, BC | As needed | A focused habitat monitoring workshop was held in January 2012. |
| Action 4.2.2 Implement a standardized monitoring program for habitat. | | | | | | |
| | Task 4.2.2.1 Map habitat at different flows as described in the Standardized Habitat Monitoring Plan | 1999 | 2023 | P.I.s | Ongoing | Standardized Habitat protocols are being implemented (SOW 15-28). |
| <i>H</i> | Task 4.2.2.2 Monitor long-term habitat response of the river channel to flow recommendations. | 1999 | 2023 | BC | Ongoing | Standardized Habitat protocols are being implemented (SOW 15-28). |
| <i>C</i> | Task 4.2.2.3 Monitor water quality in the San Juan River (see Action 2.4.1.). | 1999 | 2023 | FWS, BIA, BOR | Ongoing | The Program monitors water temperature continually at 8 locations (SOW 15-28), but no longer routinely conducts water quality sampling. The BIA has been sampling water quality at 10 sites in the San Juan Basin since 1991. Parameters analyzed annually include: Al, Cl, Ni, nitrates, nitrites, orthophosphates, and sulfates. Parameters analyzed quarterly include: As, Cu, Pb, Mg, Hg, Na, Se, Zn, alkalinity, hardness, TDS, TSS, and turbidity. All data is available upon request. |
| <i>H</i> | Task 4.2.2.4 Monitor stream flows | 1999 | 2023 | USGS, P.I.s | Annually | USGS streamflow gaging stations on the SJR are providing flow data (SOW 15-13). |
| <i>C</i> | Task 4.2.2.5 Monitor water temperature | 1999 | 2023 | MEC, ERI, USGS | Annually | The Program monitored water temperature continually at 8 locations (SOW 14-28) and at 3 locations during larval fish sampling (SOW 15-21). In 2013, water temperatures were monitored at Navajo Dam, Archuleta, Farmington, Shiprock, Four Corners and Bluff. Tributaries were monitored at: Animas River at Farmington, McElmo Creek at the mouth. A new location was added in the San Juan River near CR550 upstream of Farmington. Recommendations for 2014 were to discontinue the monitoring by the Program and have USGS add real time water temperature monitoring in the San Juan River at Archuleta, Farmington, Four Corners, and the Animas at Farmington. The USGS currently has real-time water temperature monitoring at the Bluff (Mexican Hat) gage. The database would be updated and maintained as in past years. |
| Action 4.2.3 Identify, characterize, and quantify suitable habitat. | | | | | | |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|---|------------|----------|-----------|----------|---|
| <i>H</i> | Task 4.2.3.1 Assess data collected to identify and describe flow-habitat relationships. | 2012 | 2023 | PO, BC | Ongoing | Program is monitoring various aspects of habitat and flow (SOW 15-28 <i>Habitat Temperature Monitoring</i>). BC held a Habitat Monitoring Workshop in 2012. A retrospective habitat analysis of geomorphology and floodplain vegetation using existing data was conducted in 2013 with report due in 2014 (Task 4 of Habitat Temperature Monitoring SOW). In 2015, monitoring of the TNC’s Habitat Restoration Project Phase II sites and a nearby control site will begin (SOW 15-31). |
| <i>C</i> | Task 4.2.3.3 Determine the extent various flow releases from Navajo Dam have on the seasonal and longitudinal distributions of endangered fishes and other native and nonnative fish. | 2013 | TBD | PO, BC | Ongoing | See Task 4.2.3.1 above. |
| <i>M</i> | Task 4.2.3.4 Characterize channel geomorphology and river channel dynamics to better understand flow-habitat relationships. | 2013 | TBD | PO, BC | Ongoing | See Task 4.2.3.1 above. |
| Action 4.2.4 Identify and refine habitat/fish relationships. | | | | | | |
| <i>H</i> | Task 4.2.4.1 Identify and quantify principal river reaches and attributes of habitats important to each life stage of endangered fish. | 2010 | 2023 | FWS, BC | Ongoing | The BC reviewed data collected, to date, during annual researchers meetings to gain additional insight into habitat/fish relations. |
| <i>H</i> | Task 4.2.4.2 Relate geo-referenced fish capture data to habitat data, as needed. | 1999 | 2023 | P.I.s, PO | Ongoing | Starting in 2010, monitoring crews started recording GPS coordinates for all captures and recaptures during monitoring and nonnative fish removal activities. Geo-referenced fish capture data and habitat data are used by researchers, as needed, to meet specific information needs. |
| <i>H</i> | Task 4.2.4.3 Determine, to the extent possible, habitat/fish relationships, the level of data needed to accomplish this, and the cost of collecting the data. | 1999 | 2023 | FWS, BC | Ongoing | See Task 4.2.3.1 above. |
| Goal 4.3— Monitor and Evaluate Habitat Restoration Strategies and Projects | | | | | | |
| Action 4.3.1 Evaluate and implement habitat restoration strategies to augment the function of river flow to create and maintain suitable habitat. | | | | | | |
| <i>C</i> | Task 4.3.1.1 Use data and information gathered from habitat assessments as the foundation for identifying and evaluating the need to implement other recovery actions, including but not limited to, habitat modification (flow or mechanically induced) and population augmentation. | 1999 | 2023 | FWS, BC | Ongoing | Flow recommendations were implemented and evaluated using the standardized methodology that guides the Program’s annual and long-term monitoring activities (SJRRIP 2012).Monitoring of TNC’s Phase I and II habitat restoration sites is ongoing (SOW 15-31). |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|--|------------|----------|---------------------|----------|--|
| <i>H</i> | Task 4.3.1.2 Evaluate construction of backwater habitats to serve as low-velocity nursery habitat if lack of backwater habitat is found to be limiting recovery. | 2011 | 2015 | BOR, PO, BC NN, TNC | Ongoing | Monitoring for fish presence and functionality to serve as low-velocity nursery habitat is continuing at TNC's Phase I and II habitat restoration sites (SOW 15-31). |
| <i>H</i> | Task 4.3.1.3 Evaluate selective nonnative vegetation removal in conjunction with high flow conditions for habitat creation and maintenance. | 2013 | 2015 | BOR, BC, FWS, NN | Ongoing | The Program is working on this task through development of SJBHM Gen III, TNC's Conservation/Habitat Planning Project and associated monitoring, and the retrospective habitat analysis. |
| <i>M</i> | Task 4.3.1.4 Evaluate large-scale nonnative vegetation control, as feasible and necessary. | 2013 | 2015 | BOR, BC, FWS, NN | Ongoing | Same as above. |
| <i>H</i> | Task 4.3.1.5 Evaluate non-flow alternatives that would work in conjunction with flows to meet the functions provided by flow recommendations. | 2011 | 2015 | BOR, FWS, BC | Ongoing | Same as above. |
| Action 4.3.2 Monitor Habitat Restoration Projects. | | | | | | |
| <i>H</i> | Task 4.3.2.1 Monitor TNC's restoration sites | 2011 | 2023 | BC, PI's | Annually | <p>Phase I sites were monitored during various flows between November 2011 and February 2013. By February 2013 at 500 cfs, two of the six restored channels contained water and maintained an upstream connection with the primary channel, and a third channel is expected to flow at 700 cfs. Fish presence in restored sites was monitored in 2012; RBS larvae were collected at two of the six RERI sites and all sites contained suitable nursery habitat between April and August 2012. In 2013, Program monitoring crews collected good numbers of larval and small bodied native fish at the RERI sites including razorback sucker and Colorado pikeminnow.</p> <p>Monitoring of larval and small-bodied native fish in the original 6 RERI sites continued in 2014 and both larval and small-bodied fish were captured in good numbers at the restored sites. To provide additional information on the persistence of aquatic habitats and to measure changes in habitat features, larval fish abundance and small-bodied fish abundance from prior to spring runoff to late fall, more intensive monitoring of the Phase II site and a nearby control site will begin in 2015. Re-sprouting Russian olive and saltcedar at the 6 RERI sites were treated with herbicide in 2014. (SOW 15-31)</p> |
| Goal 4.4— Integrate And Synthesize Monitoring Data And Information To Evaluate Fish Community And Ecosystem Responses To Recovery Actions. | | | | | | |
| Action 4.4.1 Describe life history parameters of wild CPM and RBS. | | | | | | |
| <i>C</i> | Task 4.4.1.1 Document and quantify reproduction, survival, and recruitment. | 1992 | 2023 | FWS, BC | Ongoing | This task is addressed by Program scientists and the BC through the annual review of fish monitoring data collected. |
| Action 4.4.2 Develop fish community and ecosystem response strategies and implement appropriate monitoring and research strategies to evaluate ecosystem response. | | | | | | |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|----------|--|------------|----------|---------------------|-----------|--|
| <i>H</i> | Task 4.4.2.1 Develop a centralized database that incorporates all data from standardized monitoring and integrate into the Program database. | 2007 | 2023 | PO, BC | Ongoing | Data from the adult and small-bodied monitoring projects are updated through 2014 (SOW15-33). The larval monitoring data is currently being updated to include data through 2014. Temperature data has been integrated through 2013 from ASIR, KB, and MEC. Temperature data for 2014 is integrated with USGS gage stations. Habitat data has been summarized from 1992-2007. See Tasks 1.2.1.1 and 5.2.1.1. |
| <i>H</i> | Task 4.4.2.2 Use previous and current data collected during ongoing investigations to characterize dynamics of native fishes and their response to management activities intended to improve status of listed species. | 1992 | 2023 | PO, UNM, P.I.s., BC | Ongoing | <p>The “2014 Integrated PIT tag database summary of CPM and RBS in the San Juan River” will be completed per the timeline detailed in the SJRRIP’s Annual Cycle (SOW15-33).</p> <p>Two manuscripts from 2013 were published in 2014. “Movement and growth of juvenile Colorado pikeminnows in the San Juan River, Colorado, New Mexico, and Utah” was published in Transactions of the American Fisheries Society; and, “Fish community responses to mechanical removal of nonnative fishes in a large southwestern river” was published in Fisheries.</p> <p>Four proposed projects and one new project were investigated in 2014 (see SOW14-23). After preliminary investigation, two projects were deemed unfeasible due to data limitations and constraints: (4) “Environmental drivers of spawning and recruitment success of channel catfish”; (7) “Assess survival of Colorado pikeminnow to determine if current stocking numbers will meet goals of augmentation”. Two projects (one proposed and one new) were completed and published: (5) “Long-term dynamics of large-bodied fishes assessed from spatially intensive monitoring of a managed desert river.” was published in River Research and Applications; “Effects of longitudinal and lateral stream channel complexity on native and non-native fishes in an invaded desert stream” was published in Freshwater Biology. The extensive data analysis for one project was completed in 2014 but the manuscript will not be completed until 2015: (6) “Survival and movement of stocked Razorback sucker in the San Juan River, NM and UT”. (SOW15-23)</p> |
| <i>M</i> | Task 4.4.2.3 Update SJR population model and use with other existing data to evaluate fish community response to recovery actions. | 2006 | 2023 | PO, BC | As needed | An update to the San Juan River population model developed by Miller and Lamarra (2006) was completed in 2014. A Dec. 2014 workshop was held to review the updated model. It is currently in review by the BC and Program peer reviewers. The model should be operational in 2015 to assist in evaluating possible responses by fish species to management actions. |

| P | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|--|-------------------|-----------------|------------|-----------------|---|
| <i>H</i> | Task 4.4.3.1 Develop and implement an integrated fish and habitat monitoring plan that includes an annual process for assessing and modifying monitoring activities so that current status of native and endangered fish populations and habitat can be assessed and progress toward recovery can be determined. | 1999 | 2023 | PO, BC | Ongoing | See Tasks 4.4.1.1, 4.4.2.2 and 4.4.2.3. |
| Action 4.4.3 Use data from monitoring and management actions and research information to evaluate and modify recovery activities, as necessary, to ensure progress toward recovery. | | | | | | |
| <i>C</i> | Task 4.4.3.1 Identify, describe, and implement strategies for improving long-term survival and recruitment of razorback sucker and Colorado pikeminnow including but not limited to nonnative fish removal, enhancing habitat and food resources, enhancing genetic diversity and viability, and mitigating barriers to range fragmentation. | 1999 | 2023 | PO, BC | Ongoing | Program is using adaptive management strategies to accomplish this task. See Tasks 4.4.1.1, 4.4.2.2, and 4.4.2.3. |
| <i>H</i> | Task 4.4.3.2 Use data and information gathered from fish surveys, hatchery augmentation, and survival studies to describe best strategies for establishing wild populations of endangered fish and restoring the native fish community. | 1999 | 2023 | PO, BC | Ongoing | Information was assimilated and evaluated to assess stocking success and establishment of wild populations of CPM and RBS. See Tasks 4.4.1.1, 4.4.2.2, and 4.4.2.3. |
| <i>H</i> | Task 4.4.3.3 Use data and information gathered from nonnative fish efforts to evaluate effects of nonnative fish control on distribution, abundance, and demographics (e.g., fish size, age, sexual maturity) of the endangered fish populations, the native fish community, and nonnative fish populations. | 2008 | 2023 | FWS, BC | Ongoing | The BC held a workshop in 2010 to evaluate the non-native fish control program and made adjustments. Information was assimilated and evaluated to accomplish this task. See Tasks 4.4.1.1, 4.4.2.2, and 4.4.2.3. |
| <i>C</i> | Task 4.4.3.4 Use data and information gathered from habitat assessments as the foundation for evaluating the effectiveness of the flow recommendations and operations decision criteria for Navajo Dam in providing suitable habitat for the endangered fish. | 1999 | 2023 | FWS, BC | Ongoing | Flow recommendations are being implemented 1999-present. The Program collects habitat and fish data and information through its annual monitoring program. The Flow Recommendations revision process will begin in 2015. |
| Action 4.4.4. Review and evaluate San Juan River stream flow in light of hydrology variability. | | | | | | |
| <i>H</i> | Task 4.4.4.1 Conduct a comprehensive analysis of hydrologic variability in the San Juan River. | 2014 | 2017 | BOR, FWS | Pending | BOR completed Colorado River Basin Water Supply and Demand Study in 2012. This study includes the SJR Basin. A comprehensive analysis of hydrologic variability will occur during the flow recommendation revision in 2015. Gen3 of the San Juan Basin Hydrology Model will be used to evaluate various hydrologic scenarios. |
| <i>H</i> | Task 4.4.4.2 Evaluate the possible and most probable impacts of hydrologic variability on future water availability. | 2014 | 2017 | BOR, FWS | Pending | See above. |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|--|------------|----------|-----------------|----------|--|
| <i>H</i> | Task 4.4.4.3 Evaluate ability of the river to meet the functions provided by the flow recommendations during extended periods of drought. | 2014 | 2017 | BOR, FWS, BC | Pending | See above. |
| Goal 4.5— Identify and Conduct Research and Monitoring in Support of Recovery Actions | | | | | | |
| Action 4.5.1 Annually identify potential project/activities/questions/information needs (ongoing list). | | | | | | |
| <i>H</i> | Task 4.5.1.1 Annually, following review of the previous year’s findings and data integration, identify and prioritize new projects, activities, questions, and information needs to be addressed in future work plans. | 2000 | 2023 | BC, FWS, CC, PO | Ongoing | <p>The following information needs were identified:</p> <ul style="list-style-type: none"> • Information needs in support of flow recommendation review • Survey of potential entrainment structures in the San Juan and Animas rivers • Temperature modeling out of Navajo Dam and downstream • 2D modeling of floodplain using Lidar to capture overbank flows • Radiotelemetry Study • Tributary Sampling • Conduct Inventory of all potential problematic reservoirs (i.e., potential sources of nonnative species) • Enhanced/expanded larval studies • Determine negative impacts of the known contaminants (e.g., Hg and Se) effects on the native fishes of the San Juan River • Develop methodologies for integrating recapture data from different sampling methods for making population estimates (e.g., electrofishing, remote PIT tag readers) |
| Action 4.5.2 Implement project/activities as necessary to obtain needed information. | | | | | | |
| | Task 4.5.2.2 Develop and conduct a study/monitoring plan to assess the effectiveness of the Hogback fish weir in preventing entrainment of endangered and native fish. | 2014 | 2015 | BOR | Ongoing | Passive PIT tag readers were installed at Hogback Fish Weir in 2014 to track movement of tagged fish. Untagged and juvenile/larvae will not be detected by these readers. The fish weir’s ability to minimize entrainment was evaluated in 2015. Tagged CPM and RBS were released in or near the structure and detections by the readers recorded. Less than 3% of the small and subadult CPM and RBS were entrained in the channel |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|----------|--|------------|----------|------|----------|---|
| | Task 4.5.2.3 Determine how to distinguish stocked fish from naturally produced fish. | 2013 | 2023 | ASIR | Ongoing | <p>Scales, fin rays, and otoliths have been collected from marked and unmarked RBS in the SJR for use in the study to determine natal origin (see Task 4.1.2.6). Analysis showed fin rays were a more reliable non-lethal material for use in microchemical analysis than scales. In 2014, the Program switched from collecting scales to fin rays from tagged and untagged RBS. Of the 89 RBS fin ray segments collected in 2014, 50 segments came from PIT tagged RBS with known natal origins and 39 segments came from RBS with unknown natal origins. Otoliths were collected from 11 fish, 9 with known natal origins and 2 with unknown natal origins. Fin ray and otoliths were collected from whole RBS from the NAPI ponds and Ouray NFH-GVU for microchemical analyses.</p> <p>In January 2015, all fin ray and otoliths samples were taken to Woods Hole Oceanographic Institution and analyzed for strontium isotope ratio (87Sr/86Sr). All fin rays that did not show a distinct natal origin, as well as selected NAPI and Ouray NFH-GVU fin rays, were analyzed for elemental signatures. Isotopic and elemental data analyses are ongoing. (SOW 15-30)</p> |

Table A5. Element 5 — Program Coordination and Assessment of Progress toward Recovery.

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|--|------------|----------|------------|-----------|---|
| Goal 5.1—Facilitate Program Planning and Management. | | | | | | |
| Action 5.1.1 Provide Ongoing Program Management. | | | | | | |
| <i>H</i> | Task 5.1.1.1 Coordinate and schedule meetings and activities of the Coordination Committee and the technical committees, as necessary. | 1992 | 2023 | PO | As Needed | In 2014, the Program Office organized 3 CC meetings/conference calls, 6 BC meetings/conference calls, the Annual Program Meeting, and the Annual Hydrology Meeting. |
| <i>H</i> | Task 5.1.1.2 Annually review and update the Long-Range Plan to reflect new information, new projects and Program progress. | 1995 | 2023 | PO, BC, CC | Annually | The 2014 LRP was approved by the CC May 23, 2014. |
| <i>H</i> | Task 5.1.1.3 Convene annual Program coordination meetings to review the preceding year’s monitoring, recovery and research data; assess progress toward recovery; and provide recommendations to modify the Long-Range Plan. | 1995 | 2023 | PO, BOR | Annually | Program’s 2014 Annual Meeting was held on May 22, 2014. |
| <i>H</i> | Task 5.1.1.4 Develop list of prioritized actions and projects for the Annual Work Plan that most benefit recovery of the endangered fish populations. | 1995 | 2023 | BC, PO | Annually | 2015 SOWs were provided to the Program Office by March 31, 2014. A draft Annual Work Plan with priority projects was provided to the committees in May 2014. |
| <i>H</i> | Task 5.1.1.5 Develop and issue Requests for Proposals (RFPs) and request Scopes of Work (SOWs) for projects that most benefit recovery of the endangered fish populations. | 1995 | 2023 | PO, BOR | Annually | See above. |
| <i>H</i> | Task 5.1.1.6 Assemble and review annual Scopes of Work to identify most suitable projects for funding and implementation. | 1995 | 2023 | PO, BOR | Annually | 2015 Annual Work Plan was approved by the CC September 10, 2014. |
| Action 5.1.2 Oversee and Conduct Endangered Species Act Compliance. | | | | | | |
| <i>H</i> | Task 5.1.2.1 Administer Program and review BOs consistent with the Program’s Principles. | 1995 | 2023 | PO | Ongoing | Annually conducted by the Program Office. |
| <i>H</i> | Task 5.1.2.2 Monitor and ensure implementation of Program actions identified as RPAs and RPMs in BOs. | 1995 | 2023 | PO | Ongoing | See above. |
| Goal 5.2— Ensure Integration and Synthesis of Information to Evaluate Program Progress Toward Recovery. | | | | | | |
| Action 5.2.1 Synthesize and evaluate information from all studies for Program to evaluate progress toward recovery. | | | | | | |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|---|------------|----------|-------------|-----------------|---|
| <i>H</i> | Task 5.2.1.1 Establish and maintain a Program database of information collected under the various Program projects including all rare fish collections. | 1995 | 2023 | PO | Annually | Program Office maintained the Program's database (SOW 15-33). The Program Office database manager is also working with the UCREFRP to develop a centralized common database of Upper Colorado River Basin data. The website, https://streamsystem.org , is under construction. |
| <i>H</i> | Task 5.2.1.2 Conduct annual Program reviews and develop annual reports that integrate monitoring and research data and results to track and assess yearly Program progress toward recovery. | 1995 | 2023 | PO, BC | Annually | 2013 Final Reports posted on Programs website: http://www.fws.gov/southwest/sjrip/ |
| <i>H</i> | Task 5.2.1.3 Conduct a biennial comprehensive review and assessment of Program progress towards recovery (i.e., Sufficient Progress Report). | 2014 | 2015 | PO, CC, FWS | Every two years | The biennial "Sufficient Progress" Report is in draft and being reviewed by the FWS. It will be completed and reviewed by the CC in 2015 and signed by the FWS in 2015. |
| Action 5.2.2 Ensure new information is identified and developed, as necessary to achieve Program goals and Assess Progress Toward Recovery. | | | | | | |
| <i>C</i> | Task 5.2.2.1 Coordinate and oversee development of revisions to the SJRB Hydrology Model and the Program's flow recommendations. | 2008 | 2015 | PO, BOR | In progress | Hydrology Model Generation III will be completed in 2015; flow recommendations revisions will begin in 2015. |
| <i>C</i> | Task 5.2.2.2 Develop positive population response criteria for the razorback sucker and Colorado pikeminnow for 2012-2016 to meet recovery demographic criteria for downlisting and delisting specified in recovery goals/plans adopted by the Service. | 2012 | 2015 | FWS, PO, BC | In progress | As of 2011, the Program met only 2 of 5 CPM positive population response criteria for 2007-2011. The Service is in the process of evaluating past criteria and developing new criteria for the period 2012 and beyond. |
| <i>C</i> | Task 5.2.2.3 Identify and evaluate limiting factors and determine necessary research to identify actions that will minimize or remove these limiting factors | 2002 | 2015 | FWS | Ongoing | See 2002 Recovery Goals for CPM and razorback sucker. The species recovery plans are being updated and limiting factors will be re-evaluated through that process. |
| <i>C</i> | Task 5.2.2.4 Use monitoring and research information to evaluate and use adaptive management strategies to modify recovery activities, as necessary, to ensure progress toward recovery. | 2012 | 2023 | FWS | Annually | Program activities are adjusted/modified based on current monitoring and research information. |
| <i>H</i> | Task 5.2.2.5 Develop interim recovery benchmarks for recovering the CPM and RBS by 2023 that are tied to monitoring data and are consistent with the species recovery plans and goals, Positive Population Criteria, Sufficient Progress Assessment, LRP, and Program Document. | 2014 | 2016 | FWS, BC | In progress | The Service will develop recovery benchmarks in coordination with the BC. Interim benchmarks will be developed for (1) implementation of management actions identified in the recovery goals (e.g., minimize threats); (2) recovery demographic criteria in the recovery goals to downlist and delist CPM and RBS; and (3) positive population response criteria developed to document and gauge demographic improvements for both species. Once developed, the benchmarks can be used during the Service's biennial comprehensive review and assessment of Program progress towards recovery (i.e., Sufficient Progress Report). |

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|--|---|------------|----------|---------|----------|---|
| Action 5.2.3 Ensure Scientific Integrity of Program Information and Coordination with other Associated Programs, Projects, and Studies. | | | | | | |
| <i>H</i> | Task 5.2.3.1 Maintain a standardized process for peer review by qualified specialists in appropriate technical disciplines for significant Program science projects and reports. | 1997 | 2023 | PO, BOR | Annually | The Program Office maintains a standardized process for peer review (SOW 15-35). |
| <i>H</i> | Task 5.2.3.2 Coordinate with activities of the Upper Colorado River Endangered Fish Program and other related programs and promote participation by SJRRIP partners. | 1992 | 2023 | PO, BC | Annually | The Program Office coordinated closely with the UCR Recovery Program and other related programs in 2014. |
| Goal 5.3—Facilitate Contract and Funding Management. | | | | | | |
| Action 5.3.1 Ensure appropriate and legal contract and funding practices. | | | | | | |
| <i>C</i> | Task 5.3.1.1 Maintain and distribute annual base and capital funds allocated under the Annual Work Plan by each funding source. | 1992 | 2023 | BOR, PO | Annually | The Program Office worked closely with the Bureau of Reclamation in 2014 to maintain and distribute all annual base and capital funds allocated under the Annual Work Plan by each funding source (SOW 15-34) |
| <i>H</i> | Task 5.3.1.2 Administer Program contracts and provide an accounting of Program funds expended at the end of each federal fiscal year. | 1992 | 2023 | BOR, PO | Annually | Reclamation provided an accounting of Program funds (SOW 15-34). |
| <i>H</i> | Task 5.3.1.3 Manage Capital Improvement Program to maintain records showing the distribution and expenditures of capital funds under the Annual Work Plan by each funding source, and provide an accounting of funds expended at the end of each federal fiscal year. | 1992 | 2023 | BOR, PO | Annually | Reclamation managed the Capital Improvement Program and worked with the Program Office to maintain those. |

Table A6. Element 6.—Information and Education.

| <i>P</i> | Tasks | Start Date | End Date | Who | Category | Status of Activity (focus on previous year) |
|---|---|------------|----------|-----|----------|---|
| Goal 6.1 Increase Public Awareness and Support for the Endangered Fishes and the Recovery Program. | | | | | | |
| Action 6.1.1 Provide information to the public on the Recovery Program. | | | | | | |
| <i>H</i> | Task 6.1.1.1 Provide information through news articles, press releases, radio and television ads, and other media in Farmington, Durango, Albuquerque, and others in the area to inform the public of Program activities. | 1992 | 2023 | PO | Ongoing | SOW 15-33 |
| <i>H</i> | Task 6.1.1.2 Provide notification of meeting times, dates, locations, and draft agendas for committee meetings to interested parties 30 days in advance of the meeting. | 1992 | 2023 | PO | Ongoing | SOW 15-33 |
| <i>H</i> | Task 6.1.1.3 Maintain a Recovery Program Website. | 2000 | 2023 | PO | Ongoing | http://www.fws.gov/southwest/sjrip/ |
| <i>H</i> | Task 6.1.1.4 Develop SJRRIP brochure. | 2012 | 2013 | PO | Ongoing | Educational posters and brochures of the Native Fishes of the San Juan River and Progress Towards Recovery were produced in 2014. They convey key scientific information about the biology of all the native fish species, and the extensive efforts to recover CPM and RBS within this drainage. They are being distributed throughout the SJR Basin. Posters and brochures are available from the Program Office. |
| Action 6.1.2 Coordinate public outreach with Upper Basin Recovery Program. | | | | | | |
| <i>H</i> | Task 6.1.2.1 Develop and maintain a formal outreach support agreement between the San Juan River Basin Recovery Implementation Program and the Upper Colorado River Endangered Fish Recovery Program. | 1999 | 2023 | PO | Annually | SOW 15-33 |
| <i>H</i> | Task 6.1.2.2 Develop and exchange information and materials to incorporate into PowerPoint presentations, newsletters, Program highlights and Program displays. | 1999 | 2023 | PO | Ongoing | SOW 15-33 |
| <i>H</i> | Task 6.1.2.3 Participate in selected outreach efforts at local, state, and regional water development conferences. | 1999 | 2023 | PO | Ongoing | SOW 15-33 |

Appendix B. Completed Long-Range Plan Tasks (from 2009 LRP Elements 1-7)

| Tasks | Recovery Goals Priority | Primary Responsibility | Start Date | Completion Date | Description and Comments |
|---|-------------------------|------------------------|------------|-----------------|---|
| Goal 1.1—Describe Biotic and Abiotic Baseline Conditions. | | | | | |
| Action 1.1.1 Determine the relative abundance and distribution of endangered fishes, as well as other native and nonnative fishes in the San Juan River Basin. | | | | | |
| Task 1.1.1.1 Conduct ichthyofaunal surveys of mainstem, tributary streams, and secondary channels to determine fish species associated with these habitats. | Medium (Completed) | FWS, NMGF, BC | 1987 | 1997 | Ichthyofaunal surveys were during 1987-1989 (Platania 1990) to determine the size of the remaining CPM population and to characterize the fish population of the San Juan River. Additional surveys were done during the 7-Year Research Program. |
| Task 1.1.1.2 Conduct radio telemetry investigations to help define species distributions, movements, spawning sites, and habitat use. | Medium (Completed) | FWS | 1991 | 2000 | Although this task was completed (Ryden 2000; Miller and Ptacek 2000), more radiotelemetry work may be necessary to better understand habitat use and movement of newly established populations of CPM and RBS. |
| Task 1.1.1.3 Monitor the distribution and abundance of wild fish populations in the San Juan River to document status and trends. | High (Completed) | BC | 1991 | 1997 | Results of the 7-Year Research Program were assimilated (Holden 2000) and strategies for research and monitoring were developed. |
| Action 1.1.2 Describe life history parameters of wild CPM and RBS. | | | | | |
| Task 1.1.2.2 Locate and describe areas of reproductive activity and nursery habitats to better understand species spawning needs. | High (Completed) | FWS, BC, NMGF | 1991 | 1997 | Reproduction should be documented from capture of ripe and gravid fish, drifting larvae, and age-0 fish. Wild adult CPM were radio-tracked during 1991-1997 (Ryden 2000) and in 1993-1994 to assess habitat use (Miller and Ptacek 2000). Results of the 7-Year Research Program were assimilated (Holden 2000) and strategies for research and monitoring were developed |
| Task 1.1.2.3 Describe and quantify habitats selected by various life stages of CPM and RBS. | High (Completed) | FWS, NMGF | 1991 | 1997 | Capture locations of RBS and CPM should be described and quantified and river flows documented. Results of the 7-Year Research Program were assimilated (Holden 2000) and strategies for research and monitoring were developed |

| Tasks | Recovery Goals Priority | Primary Responsibility | Start Date | Completion Date | Description and Comments |
|--|-------------------------|------------------------|------------|-----------------|---|
| Action 1.1.3 Describe and evaluate flow, habitat, and other abiotic relationships. | | | | | |
| Task 1.1.3.1 Describe, model and evaluate different flow regimes. | High (Completed) | FWS, BOR | 1995 | 1997 | Requested releases have been evaluated for response of habitat (Pucherelli and Clark 1990; Pucherelli and Goettlicher 1992; Goettlicher and Pucherelli 1994; Bliesner and Lamarra 2002) and fish (Propst et al. 1999). |
| Task 1.1.3.2 Determine response of geomorphology and habitat to flow with the use of habitat mapping and river geomorphology. | High (Completed) | FWS, NMGF | 1995 | 1997 | Relationships have been developed between channel geomorphology, mesohabitats, and river flow to identify flows that maximize habitat of various life stages of RBS and CPM (Archer and Crowl 2000b; Archer et al. 2000; Bliesner and Lamarra 2000, 2007; Gido and Propst 1999; Lamarra 2004; Miller and Ptacek 2000). River reaches with simple, moderate, and complex channels have been mapped for geomorphic features and mesohabitats. |
| Task 5.2.3.6 Refine and standardize habitat classification for consistent use with fish sampling and habitat mapping. | | | | | A standard habitat classification system is needed that can be used for fisheries, hydrology, and geomorphology. |
| Action 1.1.4 Identify and evaluate limiting factors and determine necessary research to identify actions that will minimize or remove these limiting factors. | | | | | |
| Task 1.1.4.1 Compile, evaluate, and synthesize historic water quality information on the San Juan River to identify water quality parameters that may be detrimental to native and endangered fish species (e.g., mercury, selenium, polycyclic aromatic hydrocarbons [PAHs]). | Highest | BC, BOR | 1991 | 1997 | Based on data collection and evaluation during the 7-year research period, the BC concluded that water quality in the San Juan River was not a limiting factor to recovery of the endangered fishes or to restoration and maintenance of the native fish community. Years of monitoring and research have not clearly linked water contaminants and pollutants with adverse effects to the CPM and razorback sucker (Abell 1994). In a synoptic study of contaminants data from the 7-year research period, Simpson and Lusk (1999) concluded harm from selenium as a contaminant issue for the razorback sucker. |
| Task 1.1.4.2 Determine and quantify | High | FWS, NMGF | 1991 | 1997 | Primary habitats used by wild fish have been |

| Tasks | Recovery Goals Priority | Primary Responsibility | Start Date | Completion Date | Description and Comments |
|---|-----------------------------------|------------------------|------------|-----------------|---|
| mesohabitat types and channel forms used by native and endangered fish. | (Completed) | | | | documented (Archer and Crowl 2000b; Archer et al. 2000; Bliesner and Lamarra 2000, 2007; Gido and Propst 1999; Lamarra 2004; Miller and Ptacek 2000). |
| Task 1.1.4.3 Evaluate effects of nonnative fish on native and endangered species and identify the most problematic nonnative species. | Highest (Completed) | FWS, NMGF | 1996 | 1999 | Initial evaluation of nonnative fish in the San Juan River has been completed (Brooks et al. 2000; Propst and Hobbes 2000). |
| Task 1.1.4.4 Estimate numbers of wild CPM and RBS in the San Juan River Basin and evaluate prospects for reestablishment of populations with and without hatchery augmentation. | High (Completed) | FWS, NMGF, BC | 1991 | 1997 | Numbers of wild CPM and RBS were found to be low in the San Juan River (Holden 2000). |
| Task 1.1.4.5 Survey health of fish in the San Juan River to ensure adequate protection from diseases and parasites. | Highest (Completed) | FWS | 1998 | 2000 | Fish health surveys were conducted on the San Juan River during 1992-1997 (Landye et al. 2000). |
| Action 1.1.5 Synthesize and integrate information to describe baseline conditions and to guide future actions. | | | | | |
| Task 1.1.5.1 Synthesize, integrate, and evaluate the 7-year research program. | High (Completed) | FWS, NMGF | | 2000 | A 7-Year Research Program was conducted 1991-1997 (Holden 2000). This effort helped to provide baseline information for the ichthyofauna of the San Juan River. During this program effort, methods were sometimes modified to meet the exigencies of the San Juan River, to incorporate new information and technologies, and to improve efficiency and quality of data collected. |
| Goal 1.2—Develop New Information as Necessary. | | | | | |
| Action 1.2.3 Assemble information from nonnative fish capture information. | | | | | |
| Task 1.2.3.1 Use data and information gathered from nonnative fish efforts to describe best strategies for minimizing negative impacts to native and endangered fish species. | Highest (Initial phase completed) | FWS, NMGF | 2000 | 2005 | A pilot study and ongoing investigations have been conducted to implement and evaluate the best strategies for controlling nonnative fish. Ongoing evaluation is needed, including assessment of new technologies for controlling nonnative fishes. |
| Goal 2.1—Establish a Genetically and Demographically Viable, Self- | | | | | |

| Tasks | Recovery Goals Priority | Primary Responsibility | Start Date | Completion Date | Description and Comments |
|--|-------------------------|------------------------|------------|-----------------|---|
| Sustaining CPM Population. | | | | | |
| Action 2.1.1 Develop plans for rearing and stocking CPM. | | | | | |
| Task 2.1.1.1 Develop a genetics management plan to guide artificial propagation and ensure genetic diversity and viability of CPM. | Highest (Completed) | FWS, DNFH | | 2003 | A Genetics Management Plan for RBS and CPM was developed in 2003 (Crist and Ryden 2003). |
| Task 2.1.1.2 Develop an augmentation plan for CPM to provide a strategy for producing, rearing, and stocking fish. | Highest (Completed) | FWS | | 2003 | An Augmentation Plan for CPM was developed in 2003 (Ryden 2003). |
| Action 1.1.2 Produce, rear, and stock sufficient numbers of CPM to meet stocking goals of augmentation plan. | | | | | |
| Task 1.1.2.1 Annually produce and rear at least 300,000 age-0 (50–55 mm TL) and 3,000 age-1 CPM at SNARRC. | Highest (Completed) | FWS, DNFH | 2000 | 2009 | At least 300,000 age-0 (50–55 mm TL) CPM will be produced and reared annually at the SNARRC for an 8-year period, 2002–2009. Analyses showed no survival advantage to stocking age-1 CPM. Goal revised in 2010 to produce, rear, and stock 400,000 age-0 CPM. |
| Task 1.1.2.2 Annually stock >300,000 age-0 CPM. | Highest (Completed) | FWS, DNFH | 2000 | 2009 | At least 300,000 age-0 (50–55 mm TL) CPM will be released annually from the SNARRC, into the San Juan River for an 8- year period, 2002–2009. See above. |
| Task 1.1.2.3 Annually stock 3,000 age-1 CPM. | Highest (Completed) | FWS, DNFH | 2000 | 2009 | A total of 3,000 age-1 CPM will be stocked and PIT tagged annually in the San Juan River through 2009. No age-1 CPM will be stocked beginning in 2011. |
| Goal 2.2—Establish a Genetically and Demographically Viable, Self-Sustaining RBS Population. | | | | | |
| Action 2.2.1 Develop plans for rearing and stocking RBS. | | | | | |
| Task 2.2.1.1 Develop a genetics management plan to guide artificial propagation and ensure genetic diversity and viability of RBS. | Highest (Completed) | FWS, BC | | 2003 | A Genetics Management Plan for RBS and CPM was developed in 2003 (Crist and Ryden 2003). |
| Task 2.2.1.2 Develop an augmentation plan for RBS to provide a strategy for producing, rearing, and stocking fish. | Highest (Completed) | FWS, BC | | 2003 | An experimental stocking program for RBS was conducted 1994-1997. An Augmentation Plan for RBS was developed in 1997 (Ryden 1997) for a 5- |

| Tasks | Recovery Goals Priority | Primary Responsibility | Start Date | Completion Date | Description and Comments |
|--|-------------------------|------------------------|------------|-----------------|---|
| | | | | | year period, 1997-2001, and recommended stocking 73,482 RBS; only 5,890 were stocked for a lack of hatchery and grow-out facilities. An addendum to the plan was developed in 2003 (Ryden 2003) to extend the program for 8 years, 2004-2011, and recommended stocking 91,200 age-2 RBS (> 300 mm TL) or 11,400 annually. |
| Goal 1.2—Evaluate RBS and CPM Augmentation Program and Genetic Integrity. | | | | | |
| Action 1.2.2 Evaluate methods to improve RBS and CPM stocking successes. | | | | | |
| Task 1.2.2.2 Assimilate the genetics information on CPM and RBS to describe best strategies for establishing and maintaining genetically viable wild populations of endangered fish. | Highest (Completed) | FWS, BR | | 2003 | <ul style="list-style-type: none"> • Genetics management plan for the endangered fishes of the San Juan River (Crist and Ryden 2003) • SNARRC Species Augmentation Plans |
| Goal 3.1—Provide Suitable Flows to Support Recovery of CPM and RBS Populations. | | | | | |
| Action 3.1.1 Develop flow regimes to provide adequate base flow and function to maintain habitat for CPM and RBS. | | | | | |
| Task 3.1.1.1 Identify and develop flow recommendations for the San Juan River. | Highest (Completed) | BC | | 1999 | Flow Recommendations for the San Juan River were developed and implemented in 1999 (Holden 1999). |
| Goal 3.3—Provide Increased Range to Support Recovery of CPM and RBS Populations. | | | | | |
| Action 3.3.1 Provide and maintain fish passage at diversion structures. | | | | | |
| Task 3.3.1.1 Identify and evaluate fish barriers in the San Juan River. | Highest (Completed) | BC | | 1996 | Fish barriers were identified and evaluated in 1996 by Masslich and Holden (1996). |
| Task 3.3.1.2 Remove Cudei Diversion to provide fish passage. | Highest (Completed) | BIA, NN | | 2001 | The Cudei Diversion was removed in 2001. The Cudei Diversion is owned by the Navajo Nation. |

| Tasks | Recovery Goals Priority | Primary Responsibility | Start Date | Completion Date | Description and Comments |
|---|-------------------------|------------------------|------------|-----------------|--|
| Task 3.3.1.3 Provide and maintain fish passage at the Hogback Diversion. | Highest (Completed) | BIA, NN | | 2002 | Fish passage at Hogback Diversion was completed in 2002. The Hogback Diversion is owned by the Navajo Nation. No maintenance is anticipated. |
| Task 3.3.1.4 Provide and maintain selective fish passage at the Public Service Company of New Mexico (PNM) Weir. | Highest (Completed) | FWS, NN | | 2003 | Fish passage at Public Service Company of New Mexico (PNM) Weir was completed in 2003. |
| Action 3.3.2 Evaluate fish passage for native and endangered fish species to and from Lake Powell in light of a natural waterfall at low reservoir elevations. | | | | | |
| Task 3.3.2.1 Identify extent of problem from natural waterfall on passage of native and nonnative fish from Lake Powell into the San Juan River. | High (Completed) | FWS, BOR, BC | 2009 | 2010 | The extent that the natural waterfall in the lower San Juan River impedes fish migration should be determined. BOR assessed the risk for predators recolonizing the river when water level in Lake Powell rises to a level that the waterfall is inundated. They concluded that there is a 60 to 75% chance the waterfall will be inundated for a total of 30 months (not necessarily continuously) between 2008 and 2030. Probabilities for longer inundation are available (6-26-07 CC Meeting). |
| Goal 3.4—Provide Suitable Water Quality to Support Recovery of CPM and RBS Populations. | | | | | |
| Action 3.4.2 Evaluate effects of river temperature on native and endangered fish. | | | | | |

| Tasks | Recovery Goals Priority | Primary Responsibility | Start Date | Completion Date | Description and Comments |
|--|-------------------------|------------------------|------------|-----------------|---|
| Task 3.4.2.1 Determine if cold water releases from Navajo Dam into the San Juan River impede endangered fish reproduction or limit endangered fish populations downstream of the Animas River. | High (Completed) | BC | | 2006 | Based on the reports, <i>SJR Fishes Response to Thermal Modification – A White Paper Investigation</i> (Lamarra 2007) and Cutler (2006) <i>Navajo Reservoir and SJR Temperature Study</i> , the BC determined a temperature control device (TCD) was not warranted. Impacts to spawning and rearing from cold releases from Navajo Dam into the SJR appeared to be minimal. Spawning is determined by time-of-year more than temperature cue. A TCD may provide seasonal range expansion above critical habitat but is unknown if range expansion above critical habitat is necessary for recovery. More information is needed (BC Meeting, May 17-18, 2007). |
| Goal 4.1—Control Problematic Nonnative Fishes as Needed. | | | | | |
| Action 4.1.1 Develop, implement, and evaluate the most effective strategies for reducing problematic nonnative fish. | | | | | |
| Task 4.1.1.1 Identify and prioritize the most problematic nonnative fish species. | Highest (Completed) | BC | 2000 | 2003 | This determination was made through a risk assessment and consensus of biologists. Davis (2003) identified channel catfish and common carp as the most problematic species. |
| Task 4.1.1.2 Design and implement a pilot program to evaluate nonnative fish control strategies and gears. | Highest (Completed) | FWS | 2000 | 2003 | The Nonnative Fish Monitoring And Control Plan (Davis 2003) served as a pilot program and identified removal reaches and evaluated sampling gears and strategies. |
| Task 4.1.1.3 Develop a long-term nonnative fish control strategy and specific objectives for nonnative fish control... | Highest (Completed) | FWS | 2009 | 2010 | A nonnative fish control strategy will be developed and implemented for the San Juan River. This strategy will identify removal tactics, gear types, personnel, and costs necessary to meet removal criteria established in Task 5.1.1.2. |
| Action 4.1.4 Obtain reliable population estimates of RBS and CPM. | | | | | |

| Tasks | Recovery Goals Priority | Primary Responsibility | Start Date | Completion Date | Description and Comments |
|--|-------------------------|------------------------|------------|-----------------|--|
| Task 4.1.4.1 Implement pilot project to develop mark-recapture population estimates to supplement catch rate estimators for reliable and precise population estimates to help determine if downlist and delist criteria of recovery goals are being achieved | 2009 | 2013 | BC | Ongoing | In 2009 and 2010, population estimates for Colorado pikeminnow (age 2+) and razorback sucker (if they had been in the river for one over-winter period) were calculated using data collected during nonnative fish removal efforts from Shiprock, NM to Clay Hills, UT. Specific mark/recapture trips were not completed; however, estimates were generated using data collected via standard nonnative fish removal methodologies. To develop point estimates, data were used from a variety of sampling trips that were conducted within one month of each other. Estimates were not generated in 2011 but will be generated using data collected during 2012. |
| Action 3.1.2 Establish and evaluate strategies for handling removed nonnative fish in collaboration with state and tribal agencies. | | | | | |
| Task 3.1.2.1 Evaluate and revise, as necessary, translocation strategy for channel catfish removed from the San Juan River. | | FWS | FWS | | Channel catfish are no longer translocated, in part, due to several reasons including: (1) cost/benefit of translocation in relation to unpredictability of catch among trips; (2) fish health concerns, specifically the accumulation of mercury in older channel catfish; and (3) fish importation concerns between the States of Utah and New Mexico. Channel catfish have not been translocated since 2006 and, at this point, there are no plans to reinstate this activity. Will not be pursued until the health concerns can be addressed. |
| Task 3.1.2.2 Implement standardized fish health analysis for translocated channel catfish to avoid transfer of harmful pathogens. | | FWS | FWS | | Standardized fish health testing should be implemented if the translocation of channel catfish is reinstated. |
| Task 3.1.2.3 Develop, evaluate, and implement standard procedures for disposal of fish that cannot be translocated. | | FWS | FWS | | Standard procedures have not been developed, to date. Current disposal is to bury, when feasible, all nonnative fishes removed from the San Juan River. |

| Tasks | Recovery Goals Priority | Primary Responsibility | Start Date | Completion Date | Description and Comments |
|---|-------------------------|------------------------|------------|-----------------|---|
| Goal 5.3— Integrate And Synthesize Monitoring Data And Information To Evaluate Fish Community And Ecosystem Responses To Recovery Actions. | | | | | |
| Action 5.3.1 Develop fish community and ecosystem response strategies | | | | | |
| Task 5.3.1.2 Develop an ecosystem model specific to the San Juan River and present it for approval by the Biology Committee. | Medium (Completed) | BC, FWS | 2000 | 2005 | Completed in 2000-2005. The Program may choose to further develop an ecosystem model specific to the San Juan River to assist in evaluating possible responses by fish species to management actions. |
| Task 5.3.1.3 Hold workshop on ecosystem model specific to the San Juan River to evaluate model and determine future direction of this effort | Medium (Completed) | FWS, BC | 2007 | 2007 | Workshop held in 2007. |
| Goal 7.1—Facilitate Program Planning and Management. | | | | | |
| Action 7.1.1 Develop and coordinate a Program plan. | | | | | |
| Task 7.1.1.1 Develop and implement a Long-Range Plan as a framework for ongoing and future Program activities. | Highest (Completed) | PO | 1995 | 1995 | A Long Range Plan was developed in 1995 (San Juan River Basin Recovery Implementation Program 1995). |