

Long-Range Plan

San Juan River Basin Recovery Implementation Program

The logo for the San Juan River Basin Recovery Implementation Program is circular, featuring a fish in the center. The text "San Juan River Basin" is arched above the fish, and "Recovery Implementation Program" is arched below it. The background of the logo is a colorful, concentric design. To the right of the logo is a rectangular photograph of a wide river valley with a winding river, surrounded by green hills and mountains under a blue sky.

San Juan River Basin
Recovery Implementation Program

August 2010

LONG-RANGE PLAN

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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 (SJRRIP 2006, 1992) and updated in 2006 by the Coordination Committee (SJRRIP 2006). A new version of the Document is expected in 2010 that will accommodate a number of revisions initiated by the Coordination Committee in 2009. 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 a cooperative agreement (SJRRIP 2006, 1992), including state and federal agencies and Native American Tribes. Water development and conservation interests are also Program participants.

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 LRP uses research information from past San Juan River studies, as well as that from other regions and Program evaluation reports to identify multi-year research, monitoring, and recovery actions necessary to achieve the Program goals.

The need for a long-range plan was identified in the original Program Document (SJRRIP 1992). 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 program was completed in 1997 and it became necessary to revise and update the LRP to provide guidance on the implementation and management phase of the Program. This revised LRP was a culmination of drafts that updated the 1995 plan and identified new recovery actions based on evaluation and review of the Program's progress (Holden 2000; Miller 2006; SJRRIP 2006) and on species recovery goals. The LRP will be reviewed annually and updated as needed. 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 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 to 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 shall 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. Annual Work Plans identify and describe 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 Annual Work Plans and helps link Program activities for

continuity and consistency. Approval of Annual Work Plans and budgets by the Coordination Committee is based, in part, on consistency and compliance with the LRP and available funds.

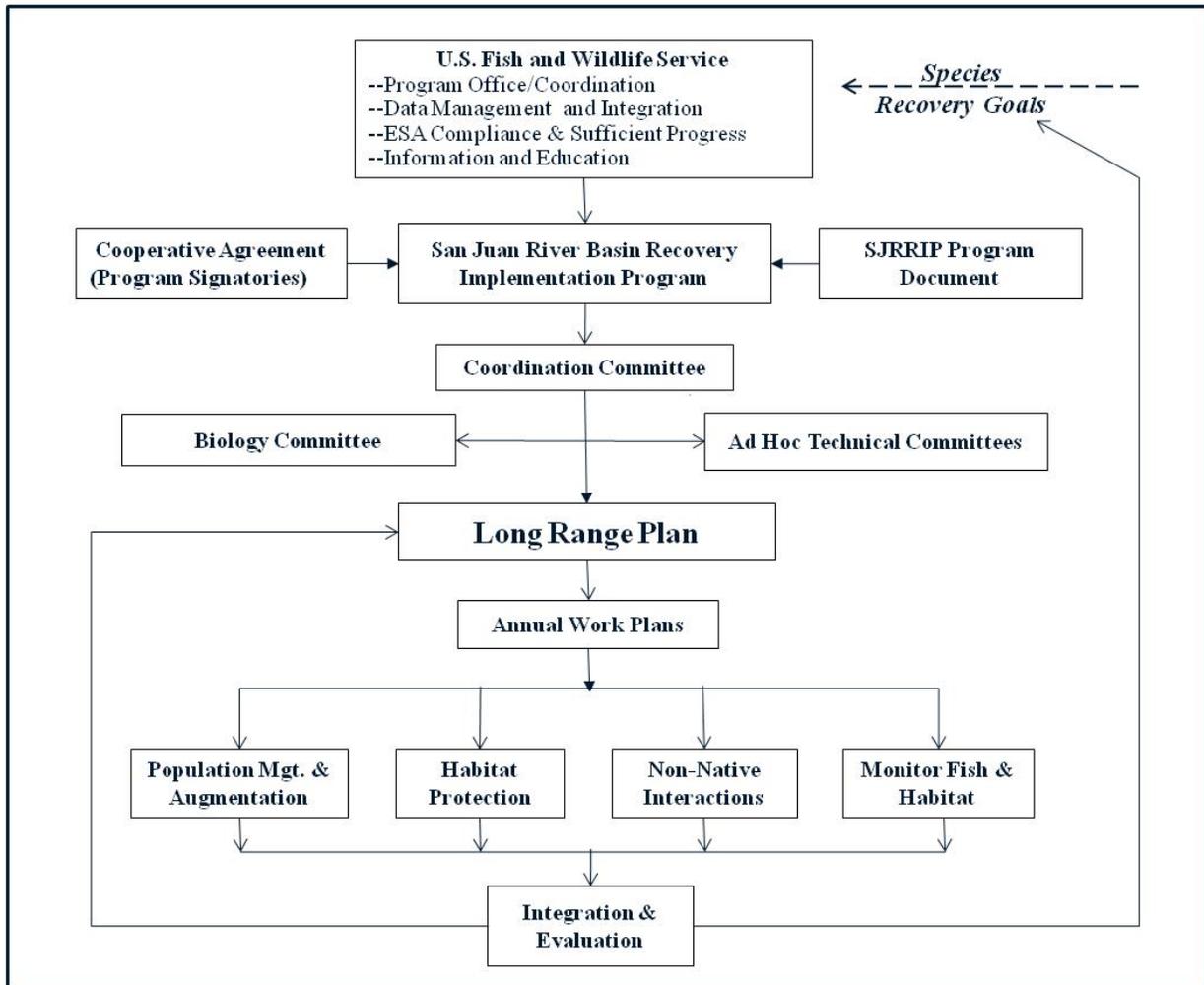


Figure 1. Components and relationships of the San Juan River Basin Recovery Implementation Program including the Long-Range Plan.

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.

Annual funding reliability is critical to the success of the Program. The Program must be conducted on a continuous basis, and recovery actions need to be funded in a timely manner. Prior to 2001, Program funding was provided by Reclamation, the Bureau of Indian Affairs, and the Service. On January 24, 2000, Congress enacted Public Law 106-392 that authorized and directed Reclamation to fund the San Juan River Basin Recovery Implementation Program and the Upper Colorado River Endangered Fish Recovery Program (UCRRP). 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 recovery programs, and authorized cost-sharing of capital costs for implementing recovery projects for both recovery programs through the use of federal appropriations, CRSP power revenues, and state and local funding contributions. If the availability of power revenues proves insufficient to meet the annual base funding and capital project needs exceed revenues, Western Area Power Administration and Reclamation may 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 Service is currently conducting five-year status reviews for both species and will incorporate revised recovery goals into updated recovery plans by the end of 2010. All stakeholders will have the opportunity to comment when these documents are published in the Federal Register. The UCRRP implements and coordinates these management actions in the Upper Colorado River Basin in Colorado, Utah, and Wyoming, exclusive of the San Juan River Basin. The San Juan River Basin Recovery Implementation Program implements and coordinates these management actions in the San Juan River and its tributaries in Colorado, New Mexico, and Utah. 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.

Demographic criteria and recovery factor criteria for the San Juan River Basin identified in the 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 the San Juan River Basin Recovery Implementation 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.

Colorado Pikeminnow

Demographic Criteria

Recovery of the Colorado pikeminnow is considered necessary only in the Upper Colorado River Basin. Recovery is dependent on the maintenance of a wild population of at least 2,600 adults in the Green River subbasin and at least 700 adults in the upper Colorado River subbasin, as well as a target of 1,000 subadults in the San Juan River subbasin (note that recovery goals consider the San Juan drainage as a subbasin of the Upper Colorado River Basin). Once each described population is established, the downlist monitoring period is 5 years and the delist period is an additional 8 years.

Downlist criteria

The downlist criteria for the Colorado pikeminnow are based on the establishment and maintenance, for a 5-year period, of two self-sustaining populations of at least 2,600 adults each, including one in the upper Colorado River subbasin and one in the Green River subbasin. Downlisting will also depend on the establishment of a 1,000 subadults in the San Juan River subbasin through augmentation and/or natural reproduction. The following are the criteria quoted from the recovery goals for the Colorado pikeminnow (Service 2002a):

Upper Colorado River Subbasin

1. A self-sustaining population of at least 700 adults (number based on inferences about carrying capacity) is maintained over a 5-year period, starting with the first point estimate acceptable to the Service, such that:
 - a. the trend in adult (age 7+; ≥ 450 mm TL) point estimates does not decline significantly, and
 - b. mean estimated recruitment of age-6 (400–449 mm TL) naturally produced fish equals or exceeds mean annual adult mortality.

San Juan River Subbasin

1. A target 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.

Delist criteria

The delist criteria for the Colorado pikeminnow are based on maintenance of a self-sustaining population of at least 2,600 adults (MVP, minimum viable population size) in the Green River for an

additional 8 years beyond downlisting. Also, either the upper Colorado River subbasin population exceeds 1,000 adults, or populations of 700 and 800 adults are established and maintained in the upper Colorado River subbasin and the San Juan River subbasin, respectively, for the 8-year delist period. In order for the species to be delisted, all threats must be sufficiently minimized or removed. The following are criteria quoted from recovery goals for the Colorado pikeminnow (Service 2002a):

Upper Colorado River and San Juan River Subbasins

1. One of the following must be met over an 8-year period beyond downlisting, starting with the first point estimate acceptable to the Service:

A self-sustaining population that exceeds 1,000 adults (age 7+; ≥ 450 mm TL) is maintained in the upper Colorado River subbasin **OR** a self-sustaining population that exceeds 700 adults is maintained in the upper Colorado River subbasin and a self-sustaining population that exceeds 800 adults is maintained in the San Juan River subbasin, such that for each population (numbers of adults based on inferences about carrying capacity):

- a. the trend in adult point estimates does not decline significantly, and
- b. mean estimated recruitment of age-6 (400–449 mm TL) naturally produced fish equals or exceeds mean annual adult mortality.

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).

Razorback Sucker

Demographic Criteria

Recovery of the razorback sucker in all regions of the Colorado River System is dependent on the establishment of wild populations from stocking of hatchery-produced fish. In order for the species to be considered for downlisting, each population must consist of fish that are spawned and hatched in the wild; hatchery fish cannot be included in recovery demographic criteria. Once each self-sustaining population is established, the downlist monitoring period is 5 years and the delist period is an additional 3 years.

Downlist criteria

The downlist criteria for the razorback sucker are based on establishment and maintenance, for a 5-year period, of four self-sustaining populations of 5,800 adults each, including two populations in the Upper Colorado River Basin and two in the lower basin. For the upper basin, one population will be established and maintained in the Green River subbasin, and the second in either the upper Colorado River subbasin or in the San Juan River subbasin according to the following criteria quoted from the razorback sucker recovery goals (Service 2002b):

Upper Colorado River and San Juan River Subbasins

1. A self-sustaining population is maintained in **EITHER** the upper Colorado River subbasin or the San Juan River subbasin over a 5-year period, starting with the first point estimate acceptable to the Service, such that for either population:
 - a. the trend in adult (age 4+; 400 mm TL) point estimates does not decline significantly, and
 - b. mean estimated recruitment of age-3 (300–399 mm TL) naturally produced fish equals or exceeds mean annual adult mortality, and
 - c. each point estimate exceeds 5,800 adults (MVP).

The minimum viable population (MVP) of 5,800 wild adults is defined as the number of adults necessary to maintain a genetically and demographically viable, self-sustaining population for about 200 years.

Delist criteria

The delist criteria for the razorback sucker are based on maintenance of four self-sustaining populations of at least 5,800 adults for an additional 3 years beyond downlisting. Also, in order for the species to be delisted, all threats to the species must be sufficiently minimized or removed. For the upper basin, one population will be maintained in the Green River subbasin,

and the second in either the upper Colorado River subbasin or in the San Juan River subbasin according to the following criteria quoted from the razorback sucker recovery goals (Service 2002b):

Upper Colorado River and San Juan River Subbasins

1. A self-sustaining population is maintained in **EITHER** the upper Colorado River subbasin or the San Juan River subbasin over a 3-year period, starting with the first point estimate acceptable to the Service, such that for either population:
 - a. the trend in adult (age 4+; 400 mm TL) point estimates does not decline significantly, and
 - b. mean estimated recruitment of age-3 (300–399 mm TL) naturally produced fish equals or exceeds mean annual adult mortality, and
 - c. each point estimate exceeds 5,800 adults (MVP).

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).

RECOVERY ELEMENTS AND ACTIONS

This LRP consists of the following six Program elements:

1. Management and Augmentation of Populations and Protection of Genetic Integrity.
2. Protection, Management, and Augmentation of Habitat.
3. Interactions between Native and Nonnative Fish Species.
4. Monitor Fish and Habitat and Conduct Research in Support of Recovery Actions.
5. Program Coordination and Data Integration and Evaluation for Recovery.
6. Information and Education

Several changes were made to the Recovery Elements for the 2010 LRP. In past LRP's, a separate element (Element 1) was included for *Development, Integration, and Evaluation of Information for Recovery*, to identify the need and process for integration and evaluation of existing information and development of new research as needed. Numerous tasks under this element were completed during the Program's 7-year research period and many others were duplicative with tasks under other elements. The actions and tasks under this important element were incorporated into the *Program Coordination* element, renamed *Program Coordination and Data Integration and Evaluation for Recovery* (Element 5), and into the other elements. This change reduces redundancy and places the primary responsibility for overseeing implementation of the data integration activity with the Program Office. Elements 2-5 of past LRP's were renumbered to Elements 1-4 but remain relatively the same with the exception of Element 4. In addition to monitoring fish and habitat, under this element the Program will identify and conduct research, as necessary, to assess the success of the recovery actions in achieving the goals of the Program.

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. Detailed descriptions of each task with priorities, primary responsibilities, and start and end times are provided in Appendix A. Priorities assigned to tasks in Appendix A reflect necessary actions identified in recovery goals. This LRP identifies actions and tasks 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 assess overall Program progress over time. Completed tasks are included in Appendix B.

Although one of the main goals 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 restoration and maintenance of the native fish community. 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). The LRP identifies tasks that reestablish populations with hatchery fish in a systematic manner 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. Tasks in this Long-Range Plan that address recovery goals criteria for each species.

Recovery Goals Criteria	Colorado Pikeminnow	Razorback Sucker
Demographic criteria	4.1.1.1,4.1.1.2,4.1.2.1-4.1.2.5, 4.1.3.3	4.1.1.1,4.1.1.2,4.1.2.1-4.1.2.5, 4.1.3.3
Reestablish populations with hatchery-produced fish	1.1.1.3, 1.1.1.4, 1.1.2.1-1.1.2.4	1.2.1.3, 1.2.1.4, 1.2.2.1-1.2.2.4,1.2.2.7
Provide and legally protect habitat	2.1.1.2-2.1.1.3, 2.1.4.1, 2.2.2.1-2.2.2.2	2.1.1.2-2.1.1.3, 2.1.4.1, 2.2.2.1-2.2.2.2
Provide passage over barriers	2.3.1.3-2.3.1.6	2.3.1.3-2.3.1.6
Minimize entrainment at diversion structures.	2.3.3.1-2.3.3.7	2.3.3.1-2.3.3.7
Ensure adequate protection from overutilization	3.2.1.1, 3.2.1.2,3.2.2.1-3.2.2.2	3.2.1.1, 3.2.1.2,3.2.2.1-3.2.2.2
Ensure adequate protection from diseases and parasites	1.3.2.2,5.2.3.1	1.3.2.3,5.2.3.1
Regulate nonnative fish releases and escapement	3.2.1.1-3.2.1.2,3.2.2.1,3.2.2.2	3.2.1.1-3.2.1.2,3.2.2.1,3.2.2.2
Control problematic nonnative fishes	3.1.1.4-3.1.1.9, 3.1.3.1-3.1.3.4,3.1.4.1	3.1.1.4-3.1.1.9, 3.1.3.1-3.1.3.4,3.1.4.1
Minimize risk of hazardous-materials spills	2.4.3.1	2.4.3.1

Remediate water-quality problems	2.4.1.1-2.4.1.2,5.2.3.1	2.4.1.1-2.4.1.2, 5.3.4.1,5.2.3.1
Minimize threat of hybridization	Not Applicable	1.3.3.1-1.3.3.3

Ongoing Reports

A series of ongoing reports or workshops 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. The LRP also identifies several workshops that should be held as necessary to help coordinate Program activities and to provide technical assistance to biologists on population estimators and monitoring. These workshops are also listed in Table 2.

Table 2. Ongoing reports to be produced through this Long-Range Plan.

Identified Task	Report or Workshop	Report Schedule/Interval	Status/Action(s) Required
5.2.2.2	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 currently conducting focused data integration annually to address high priority data needs identified by the Biology Committee in January.
2.1.2.1	Flow recommendations update report; evaluates and updates flow recommendations and response of native and endangered fishes to flow recommendations.	As necessary.	Reclamation currently developing SJRB Hydrology Model Gen3 after which a comprehensive review and revision of the flow recommendations will occur; expected to begin in 2012.
5.2.2.1	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.
4.1.1.1	Standardized Fish Monitoring Plan; to assess the presence, status, and trends of Colorado pikeminnow and razorback sucker.	Revision of the 2006 Monitoring Plan and Protocols (Propst et al. 2006) will be completed in 2010.	Program Office and Biology Committee currently in the process of completing an updated Comprehensive Monitoring Plan and Protocols.
4.2.1.1	Standardized Habitat Monitoring Plan; to assess habitat and flow relationships.	As necessary. Will be included in the 2010 version of the Program's Comprehensive Monitoring Plan.	See 4.1.1.1.
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.

4.1.1.3	Monitoring Plan Workshop: to coordinate sampling design, data collection, and desired precision and detection levels for detecting responses.	As necessary.	A series of three monitoring workshops were held by the Biology Committee in 2009. No workshop planned for 2010.
4.2.1.2	Habitat Monitoring and Mapping Workshop; to refine and improve habitat evaluation methods.	As necessary.	No workshop planned for 2010. A workshop to address this issue will be held in 2011.
4.1.3.2	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.	No workshop planned for 2010.
3.1.1.8	Non-native fish control workshop; to evaluate the non-native fish management program	As necessary.	A non-native fish workshop was held in May 2010.

Description of Program Elements

The elements and associated tasks are designed to guide the Program for federal fiscal years 2010 through 2023, with annual updates as new information is obtained. This schedule is consistent with the razorback sucker recovery goals that estimate recovery by the year 2023. Authorization for construction costs under P.L. 106-392 (as amended by P.L. 107-375) also extends to 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 the overall Program purpose are identified and described by element in Appendix A tables. 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 provide the status of each task and the years in which the activity is planned. Numerous tasks were completed during the Program's 7-year research period and the information used to develop strategies for management actions, monitoring, and research. These and other completed tasks are included in Appendix B.

Element 1. Management and Augmentation of Populations and Protection of Genetic Integrity

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 do not currently exist 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 (Ryden 2003a, 2003b) for each of the two endangered species were also developed. Production, rearing, and stocking of these fish need to continue to establish wild populations. Stocking protocols and fate of stocked fish should be monitored and evaluated to determine the best strategies for enhancing survival and recruitment.

Survival models should be 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 few wild Colorado pikeminnow or 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 San Juan 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 was begun in 1994, under Program auspices, and experimental stocking of Colorado pikeminnow was begun in 1996. Brood stocks of razorback sucker are held at Dexter National Fish Hatchery and Technology Center (NFH) where fish are spawned, hatched, and reared. Brood stocks of Colorado pikeminnow are also held at Dexter NFH and at the Colorado Division of Wildlife J.W. Mumma Native Species Hatchery where fish are spawned, hatched, and reared at each facility.

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. In addition to using Dexter NFH for maintaining broodstock, spawning, hatching, and rearing both species, the Program uses two other grow-out facilities to produce large razorback sucker (>300 mm total length) for stocking to enhance survival. These facilities include Uvalde National Fish Hatchery and Navajo Agricultural Products Industry (NAPI) Ponds located on the Navajo Indian Irrigation Project (NIIP). The numbers of fish that need to be produced by these facilities are identified in the species augmentation plans. In addition to the fish produced by these facilities, excess fish may be stocked into the San Juan River from other facilities that raise Colorado pikeminnow and razorback sucker. In 2010, the Coordination Committee approved cost sharing with the UCRRP in construction and operation and maintenance of Horse Thief Canyon Fish Rearing Ponds near Grand Junction, Colorado. This facility will include four 0.25-acre hatchery ponds for future use by the Program.

To achieve this element, a goal has been established for each species. While the overall goal is the same for both the Colorado pikeminnow and razorback sucker, *Establish Genetically and Demographically Viable, Self-Sustaining Colorado Pikeminnow and Razorback Sucker Populations (Goals 1.1 and 1.2)*, the actions and tasks vary. Actions common to both species include: 1) developing plans for rearing and stocking; 2) producing, rearing, and stocking sufficient numbers to meet stocking goals of the augmentation plans; 3) monitoring status and success of the stocked fish; 4) insuring genetic viability; and, 5) evaluating factors limiting population recovery (*Actions 1.1.1-1.1.2, 1.2.1-1.2.2, and 1.3.1-1.3.4*). *Action 1.3.3* is included for razorback sucker to evaluate the risk of hybridization among sucker species.

Element 2. Protection, Management, and Augmentation of Habitat

This element identifies actions and tasks that address protection, management, and augmentation of suitable flows, habitat, range, and water quality to support recovery of Colorado pikeminnow and razorback sucker populations. Flow recommendations were developed for the San Juan River (Holden 1999) and are being implemented and evaluated. The foundation for these flow recommendations is mimicry of the natural flow regime of the San Juan River. Ecological communities and species have adapted and evolved to temporal flow variations specific to different riverine systems (Poff et al. 1997). Providing flows that reflect a more

natural regime is necessary to provide the ecological conditions for restoring and maintaining natural biological variability and health (Stanford et al. 1996). For the San Juan River, the intent was to use linkages between hydrology, geomorphology, habitat and biology to define mimicry in terms of flow magnitude, duration, and frequency for runoff and base flow periods. These flow characteristics were to be compared with statistics of the pre-Navajo Dam river hydrology to refine the flow recommendations.

Flow recommendations for the San Juan River were developed in part to aid in the creation and maintenance of habitats important to various life stages of native and endangered fish species. Monitoring habitat availability, use, and change in availability in response to flow conditions is important to the evaluation and refinement of the flow recommendations and to the recovery of the San Juan River populations of Colorado pikeminnow and razorback sucker. The data integration analyses of 2006 indicated that complex channel reaches (those with high habitat diversity, islands, multiple channels and complex channel margins) correlate positively to native fish abundance. Backwater and low-velocity habitats are more likely to occur in these reaches, and capture locations of YOY endangered fishes also tends to be correlated with channel complexity. Hence, flow management is most effective for providing suitable habitats when the processes that create and maintain complex channel reaches, or result in the loss or creation of backwaters and other habitats important to the endangered fishes are understood and monitored. In addition to providing suitable flows, it is imperative that fish have full access to important river reaches.

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 fish to key habitats of native and endangered fishes. There are eight major diversion structures on the mainstem San Juan River in New Mexico, 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, which are upstream of the Animas River confluence and outside of designated critical habitat for either species. These cooler reaches of river are not likely to currently be occupied by Colorado pikeminnow and razorback sucker. Five structures, located downstream of Farmington, were identified 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 fish passages at Hogback Diversion Dam at RM 159 in 2001 and Public Service Company of New Mexico (PNM) Weir at RM 166.6 in 2003. Arizona Public Service Company Weir at RM 163.3 and Fruitland Diversion Dam at RM 178.5, the last two potential impediments for fish passage, are being evaluated to determine the degree of impediment to fish movement and the feasibility of modifying the structures.

Another potential impediment to recovery is entrainment of all life stages of native and endangered fishes in diversion structures. In 2005, the Program funded the design of fish screens or deflection weirs for the Hogback diversion to reduce entrainment of endangered fishes into the Hogback Canal. Construction of a deflection weir at the Hogback Canal is expected to be completed in 2012, given current budget limitations and the status of preconstruction activities. Principles for minimizing entrainment that are learned from the Hogback Canal design will be used to construct these features on other diversions and canals.

A waterfall formed at Piute Farms in the lower San Juan River at the Lake Powell inflow when the water elevation of that reservoir declined below 3,660 feet in 2003. This waterfall is an impediment to upstream movement of native and endangered fish, but also impedes nonnative fish 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 predators from recolonizing the river when water levels in Lake Powell rise and the waterfall is 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. Probabilities for longer inundation are available. The Biology Committee has also discussed the need to assess the extent of fish lost over the waterfall especially as it relates to the Program's augmentation program to recover the listed species. The Program Office was tasked with developing a comprehensive report on the issue in coordination with the Biology Committee. The report will include a risk assessment of the impacts of waterfall inundation including non-native fish invasion on the native fish community, fish emigration, habitat fragmentation, and recovery of the listed species. It will consider management options (e.g., barrier, passive non-native fish removal, temporary weirs) and provide recommendations.

An important goal of this element is to provide suitable habitat to support recovered populations of Colorado pikeminnow and razorback sucker. Suitable habitat is intrinsically linked to river flows and the Program is evaluating and identifying flows that provide suitable habitat for various life stages of each of the endangered species. Backwaters are important habitats for young and adult Colorado pikeminnow and razorback sucker but are in low abundance in the San Juan River. Initial results of studies in the San Juan River suggest that stocking and holding young Colorado pikeminnow in low-velocity habitats may increase their retention and survival in the river compared to stocking them in high-velocity habitats. The ability to construct experimental backwaters to aid in the retention of stocked Colorado pikeminnow was evaluated and recommended (Bliesner and Lamarra 2000, 2002, 2007) but existing low velocity retention areas were found that negated the need for mechanically creating backwaters for stocking purposes. The Program's habitat and geomorphology studies have recently shown that nonnative vegetation encroachment (primarily Russian olive and tamarisk) has contributed to long-term narrowing and simplification of the river channel and may affect the ability of the river to provide important habitats for young endangered fishes (Bliesner 2004, Bliesner and Lamarra 2007). Mechanical removal of these invasive riparian species at selected locations and timed to match high flows, may be necessary and feasible to restore channel complexity. Research on mechanical augmentation of habitat is being conducted under this LRP and when determined feasible, the Biology Committee will recommend implementation of habitat construction.

Cold 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. Impacts to spawning and rearing from cold releases from Navajo Dam into the San Juan River appeared to be minimal and spawning is determined by time-of-year more than temperature cue. A TCD may provide seasonal range expansion above critical habitat but it is unknown if range expansion above critical habitat is necessary for recovery. The Biology Committee surmised at their May 17-18, 2007 meeting that additional information was needed to fully address the issue.

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 cannot be compared to each other due to varying methodologies and detection levels. She emphasized the need for agencies responsible for protecting and restoring 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 harm from selenium as a contaminant issue 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 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.

To achieve this element, four recovery goals have been established to provide suitable flows (*Goal 2.1*), suitable habitat (*Goal 2.2*), increased range (*Goal 2.3*), and suitable water quality (*Goal 2.4*). The actions and tasks related to suitable flows focus on implementing flow regimes beneficial to both species, 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. The suitable habitat actions and tasks focus primarily on identifying, characterizing, and quantifying habitat and on managing flows to provide 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. Actions and tasks to increase range include construction and maintenance of Program structures at diversions to allow for fish passage and prevent entrainment. 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. Water quality actions and tasks focus on monitoring water quality and contaminants, assessing effects on species recovery, and minimizing the risk of hazardous materials spills.

Element 3. Interactions between Native and Nonnative Fish Species

This element identifies actions to reduce negative interactions between the endangered fish species and problematic nonnative fish species. Over twenty species of nonnative fish have been documented from the San Juan River Basin, compared to nine native species. 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 management actions to address threats posed by 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 further 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 will need to be reduced to a level that minimizes or removes the threat of predation and competition to native species.

Although nonnative fish are problematic in the San Juan River, fish numbers in most reaches are dominated by native species. Mechanical removal of nonnative fish in the San Juan River began in 1997 and is ongoing. Additionally, opportunistic removal of nonnative fish during research and monitoring activities augments this effort. Intensive removal efforts began in 1999 in the river near Farmington and in 2002 in the canyon section between Mexican Hat and Clay Hills, Utah. Other measures such as a selective fish passage structure at PNM Weir have been implemented and will continue to be operated. Measurable objectives and quantitative methods for assessing and maintaining effectiveness of nonnative fish control will be developed and implemented through this LRP. Nonnative fish stocking and baitfish policies of affected states have been evaluated and nonnative fish are not being stocked in critical habitat of the endangered fishes in the San Juan River.

Sport fish are important to recreational and commercial interests throughout the southwestern United States. Management of these species 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.

To achieve this element, two goals have been established to control problematic nonnative fishes as needed (*Goal 3.1*) and manage sport fish in a manner compatible with endangered fish recovery (*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. Also included are actions and tasks to handle removed fish in collaboration with state and tribal agencies and to assess the effects of non-native fish from Lake Powell and other sources on the fish community in the San Juan River. Goal 3.2 includes actions and tasks that focus on establishing policies and agreements with states and tribes to manage sport fish in the San Juan River in a manner compatible with endangered fish recovery.

Element 4. Monitor Fish and Habitat and Conduct Research in Support of Recovery Actions

Monitoring the San Juan River fish populations and their habitat is necessary to evaluate management actions and to document the Program's progress toward achieving species recovery. The Program developed a standardized fish monitoring plan and protocols that describes the sampling design and strategies to be used in monitoring Colorado pikeminnow and razorback sucker as part of fish community monitoring (Propst et al. 2000). Through a series of monitoring workshops held by the Biology Committee in 2009, the monitoring plan and protocols were evaluated and an updated comprehensive monitoring plan is being developed (SJRRIP 2010). The new plan includes updated and expanded monitoring protocol sections and a section that addresses annual data synthesis and integration.

Monitoring the endangered fish provides information necessary to assess the status and trends of the Colorado pikeminnow and razorback sucker populations in order to gauge progress toward recovery. Ongoing monitoring of stocked and wild fish will help to evaluate the success of stocking strategies and the need for additional hatchery augmentation. Once populations are established, reliable and precise population estimates will help to determine if downlist and delist criteria of recovery goals are being achieved, as is currently being done for Colorado pikeminnow and humpback chub in the upper Colorado and Green rivers. Recovery goals for the Colorado pikeminnow and razorback sucker are closely linked between this Program and the UCRRP, and annual monitoring of fish populations in the San Juan River should continue in order to determine survival of stocked fish, reproduction, and recruitment. 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. Relationships between catch rate estimators and mark-recapture population estimates of fish in the upper basin may be helpful in developing these criteria. 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, habitat monitoring should be 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 2010 version. The plan is designed to monitor and evaluate habitat changes with time and management actions. The data and information from habitat monitoring will be integrated with different monitoring activities to assess the effectiveness of management actions, such as flow management, fish population estimates, and nonnative fish population abundances.

To achieve this element, goals have been established to monitor fish populations, habitat use and availability, and to use monitoring information to evaluate the fish community and ecosystem responses to recovery actions (*Goals 4.1-4.3, respectively*). The focus is on implementation of a 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 habitat. Actions and tasks are also included to use adaptive management strategies to evaluate and assess results and methods to refine current methodologies and develop and implement new monitoring and research strategies to insure Program recovery actions are making progress toward recovery of razorback sucker and Colorado pikeminnow.

Element 5. Program Coordination and Data Integration and Evaluation for Recovery

The U.S. Fish and Wildlife Service is responsible for coordinating the San Juan River Basin Recovery Implementation Program. To fulfill this responsibility, the Service has appointed a Program Coordinator who is responsible for overall Program planning and management, information integration and review, and facilitation of contracting funding and management. The Bureau of 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 have 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 for 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 insuring 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.

Development, Integration, and Evaluation of Information for 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 during 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 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 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 periodic revision of the LRP. Periodic synthesis of this information is vital to interpreting results of research and management so that informed decisions might be made on future management actions and strategies.

To achieve this element, three goals have been established to facilitate Program planning and management as described above (*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*). Goal 5.2 includes establishing and maintaining a comprehensive Program database, synthesizing and evaluating information from all activities and studies, identifying limiting factors, ensuring new information is developed, and ensuring scientific integrity (*Actions 5.2.1-5.2.5*).

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.

Using a shared approach, the two recovery programs coordinate their outreach efforts to ensure that common audiences receive accurate and consistent information about the endangered fish species 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, the majority of affected parties are interested in the recovery efforts taking place for both programs.

To achieve this element, a goal was established to increase public awareness and support for the endangered fish 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.

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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. Interactions between Native and Nonnative Fish Species.
4. Monitor Fish and Habitat and Conduct Research in Support of Recovery Actions.
5. Program Coordination and Data Integration and Evaluation for Recovery.
6. Information and Education

The following are criteria used as guidance for “Recovery Goals Priority” used 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, As Needed, As Requested, On Hold, Completed

The following are abbreviations used in the following Tables:

BC	Biology Committee
BIA	Bureau of Indian Affairs
BOR	Bureau of Reclamation
CC	Coordination Committee
CPM	Colorado pikeminnow
DNFH	Dexter National Fish Hatchery and Technology Center
FWS	U.S. Fish and Wildlife Service
GJ	Grand Junction
NMDGF	New Mexico Game and Fish Department
NN	Navajo Nation
PO	Program Office
RBS	Razorback sucker
UNFH	Uvalde National Fish Hatchery

Table A1. Tasks, priorities, responsibilities, dates, and descriptions for Element 1.—Management and Augmentation of Populations and Protection of Genetic Integrity.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	Goal 1.1—Establish a Genetically and Demographically Viable, Self-Sustaining CPM Population.									
	Action 1.1.1 Develop plans for rearing and stocking CPM.									
<i>H</i>	Task 1.1.1.3 Evaluate and adjust stocking goals of augmentation plan.	BC, PO	Ongoing	X						Bioenergetics models and/or population recruitment models may be used to estimate and evaluate stocking goals of the augmentation plan. These models help to determine the numbers of stocked fish necessary to achieve species recovery goals considering observed survival and recruitment rates. This information will help to adjust stocking rates accordingly.
<i>H</i>	Task 1.1.1.4 Review and update CPM augmentation plan as needed.	FWS, PO, BC	Ongoing	X	X	X	X	X	X	An annual review of the CPM augmentation plan (Ryden 2005, 2003) will evaluate whether the stocking goals are being met and if the plan is adequate to achieve goals. The augmentation plan will be updated as needed. Stocking protocols for acclimation were developed in 2009 (<i>draft</i> , Furr and Davis 2009). A draft CPM Stocking Plan for 2010-2020 is currently under review.
	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 300,000 age-0 (50–55 mm TL) and 3,000 age-1 CPM at Dexter NFH.	FWS, DNFH	Ongoing	X						At least 300,000 age-0 (50–55 mm TL) CPM will be produced and reared annually at the Dexter NFH for an 8-year period, 2002–2009.
<i>C</i>	Task 1.1.2.2 Annually stock >300,000 age-0 CPM.	FWS, DNFH	Ongoing	X						At least 300,000 age-0 (50–55 mm TL) CPM will be released annually from the Dexter NFH, into the San Juan River for an 8- year period, 2002–2009.
<i>C</i>	Task 1.1.2.3 Annually stock 3,000 age-1 CPM.	FWS, DNFH	Ongoing	X						A total of 3,000 age-1 CPM will be stocked and PIT tagged annually in the San Juan River through 2009.
<i>M</i>	Task 1.1.2.4 Opportunistically stock available CPM in excess of those described above.	FWS, PO, BC	Ongoing	X						Excess CPM may be available from the upper basin or other sources. These should be procured and stocked opportunistically in excess of the numbers described above.
	Goal 1.2—Establish a Genetically and Demographically Viable, Self-Sustaining RBS Population.									

P	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	Action 1.2.1 Develop plans for rearing and stocking RBS.									
H	Task 1.2.1.3 Estimate and adjust stocking goals of augmentation plan.	FWS, BC, PO	Ongoing	X						Bioenergetics models and/or population recruitment models may be used to estimate and evaluate stocking goals of the augmentation plan. These models help to determine the numbers of stocked fish necessary to achieve species recovery goals considering observed survival and recruitment rates. This information will help to adjust stocking rates accordingly.
H	Task 1.2.1.4 Review and update RBS augmentation plan as needed.	BC, FWS, PO	Ongoing	X	X	X	X	X	X	An annual review of the RBS augmentation plan (Ryden 2005, 2003, 1997) will evaluate whether the stocking goals are being met and if the plan is adequate to achieve species recovery goals. A 2005 addendum to the stocking plan suggested the 8-year stocking period (2003-2011) begin when the production program was at full implementation, estimated to start no later than 2007. The augmentation plan will be updated as needed.
	Action 1.2.2 Produce, rear, and stock sufficient numbers of RBS to meet stocking goals of augmentation plan.									
C	Task 1.2.2.1 Produce and rear RBS at Dexter NFH for stocking to grow-out facilities.	DNFH	Ongoing	X	X					RBS will be produced and reared annually at Dexter NFH in accordance with the genetics management plan and stocked into grow-out facilities, currently NAPI ponds and Uvalde NFH. Fish of sufficient size should be marked with PIT tags. Eight-year time period, 2003-2011 (see Task 1.2.1.4).
C	Task 1.2.2.2 Annually stock three NAPI grow-out ponds with 3,000-3,500 fish per pond (> 200 mm TL) hatchery-reared RBS.	DNFH, NN	Ongoing	X	X					RBS will be stocked annually into three NAPI grow-out ponds with 3,000-3,500 (> 200 mm TL) hatchery-reared RBS produced at Dexter NFH (expectation to harvest 40-60%) using a single cohort strategy; pit tag and stock 300 mm fish in 12 months. Eight-year time period, 2003-2011 (see Task 1.2.1.4).
C	Task 1.2.2.3 Produce 12,000 RBS per year (>300 mm TL) at Uvalde NFH.	UNFH	Ongoing	X	X					A total of 12,000 RBS per year (>300 mm TL) will be produced annually at Uvalde NFH. Eight-year time period, 2003-2011 (see Task 1.2.1.4).

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
<i>C</i>	Task 1.2.2.4 Stock at least 91,200 RBS (> 300 mm TL) during 2003-2011 or 11,400 per year.	FWS	Ongoing	X	X					At least 91,200 RBS (> 300 mm TL) will be harvested annually from grow-out ponds and/or supplemental hatchery facilities and stocked into the San Juan River over an 8-year period, 2003-2011, 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 (see Task 1.2.1.4).
<i>M</i>	Task 1.2.2.7 Opportunistically stock available RBS in excess of the 11,400 described above.	PO, FWS	Ongoing	X	X					Excess RBS may be available from the upper basin or other sources. These should be procured and stocked opportunistically in excess of the 12,000 described above. Eight-year time period, 2003-2011 (see Task 1.2.1.4).
	Goal 1.3— Monitor and Evaluate RBS and CPM Augmentation Program and Genetic Integrity.									
	Action 1.3.1 Monitor status and success of stocked RBS and CPM.									
<i>H</i>	Task 1.3.1.1 Determine survival and recruitment of stocked RBS and CPM to assess stocking success and to determine when to implement mark-recapture population estimates.	FWS, BC	Ongoing	X	X					Every RBS and CPM captured will be examined for marks (e.g., coded wire tag, PIT tag, etc.) and information will be assimilated on these marked fish to estimate survival and recruitment. The numbers of stocked RBS surviving in the wild will be estimated from the monitoring program (see Goal 4.1 Monitor Fish Populations). These surviving fish will help to contribute toward reproduction in the wild and eventual species recovery.
<i>H</i>	Task 1.3.1.2 Develop a standardized database for all stocked and recaptured RBS and CPM in order to determine the fate of stocked fish	PO	Ongoing	X	X	X	X	X	X	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. Fish of sufficient size will be PIT-tagged and a standardized database will be established and updated annually for access by researchers. This database is part of the overall Program database (see Task 5.2.1.1).
	Action 1.3.2 Evaluate factors limiting RBS and CPM population recovery.									

P	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
H	Task 1.3.2.1 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	FWS	Ongoing	X	X	X	X	X	X	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 should be 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 (<i>draft</i> , Furr and Davis 2009).
H	Task 1.3.2.2 Track health of fish in the San Juan River to ensure adequate protection from diseases and parasites.	PO, P.I.s	Ongoing	X	X	X	X	X	X	During fish handling and capture activities on the San Juan River, optical inspections of general fish health and condition is conducted.
	Action 1.3.3 Evaluate the risk of hybridization among sucker species.									
M	Task 1.3.3.1 Quantify the extent of hybridization among native suckers to determine if releasing large numbers of hatchery razorback suckers into the San Juan River will reduce genetic diversity and viability of razorback sucker and/or flannelmouth sucker.	BC	Ongoing			X			\	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) and nonnative white suckers in the San Juan River (Turner et al. 2002, 2008). A reassessment should be conducted in 2012.
M	Task 1.3.3.2 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).	BC	Ongoing	X	X	X				Observational surveys are conducted during other Program activities. Hybridization between native suckers and nonnative white suckers does not currently appear to be a problem in the San Juan River. A reassessment should be conducted in 2012.
M	Task 1.3.3.3 Identify and implement necessary actions to minimize hybridization among native suckers and nonnative suckers.	BC	As needed			X				Reassessment should be conducted in 2012.
	Action 1.3.4 Assemble information from population management and augmentation.									
H	Task 1.3.4.1 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.	FWS, NMGF	Ongoing	X					2015	Information will be assimilated and evaluated on a continual basis to assess stocking success and establishment of wild populations of CPM and RBS.
H	Task 1.3.4.2 Assimilate the genetics information on CPM and RBS to describe best strategies for establishing and maintaining genetically viable wild populations of endangered fish.	FWS, NMGF	Ongoing	X					2015	Although a genetics management plan has been developed, ongoing genetic monitoring of fish stocks is necessary to ensure genetic integrity of CPM and RBS.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
<i>M</i>	Task 1.3.4.3 Monitor 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).	FWS								
	Goal 1.4— Support Operations and Maintenance of Facilities to Support RBS and CPM Stocking Programs.									
	Action 1.4.1. Support Production and Grow-out Facilities.									
<i>H</i>	Task 1.4.1.1 Support operation and maintenance of hatchery facilities (Dexter and Uvalde NFH) for RBS production.	PO, FWS	Ongoing	X	X	X	X	X	X	The operation and maintenance of hatchery facilities at Dexter and Uvalde NFH will be supported for RBS and CPM production.
<i>M</i>	Task 1.4.1.2 Operate and maintain NAPI grow-out ponds.	NN	Ongoing	X	X	X	X	X	X	The operation and maintenance of Navajo Agricultural Products Industry (NAPI) grow-out ponds will be supported for RBS production.

Table A2. Tasks, priorities, responsibilities, dates, and descriptions for Element 2.—Protection, Management, and Augmentation of Habitat.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	Goal 2.1—Provide Suitable Flows to Support Recovery of CPM and RBS Populations.									
	Action 2.1.1 Develop flow regimes to provide adequate base flow and function to maintain habitat for CPM and RBS.									
<i>H</i>	Task 2.1.1.2 Develop and implement a process for revising flow recommendations.	BOR, FWS	Pending	X	X	X				The process for revising flow recommendations uses information from habitat to flow relationships and the hydrology model. The flow recommendations will continue to be evaluated and revised until a long-term flow regime is established for the San Juan River and the RBS and CPM are recovered.
<i>H</i>	Task 2.1.1.3 Evaluate and update flow recommendations and response of native and endangered fishes to flow recommendations.	BC, FWS	As needed	X	X	X				Upon completion of Gen3 of the San Juan Basin Hydrology Model (SJBHM), the BC will assemble a report that evaluates and updates the flow recommendations. This report will be provided to the CC for approval.
	Action 2.1.2 Develop and maintain a hydrology model to evaluate flow recommendations in the context of water supply and demand in the Basin.									
<i>H</i>	Task 2.1.2.1 Develop, evaluate, and refine a San Juan Basin hydrology model that provides a scientifically sound and biologically relevant representation of the San Juan River.	FWS, BOR, BC	Ongoing	X	X	X	X			The SJBHM was developed to provide a tool to analyze ways to manage flows in the San Juan River Basin for the benefit of endangered fish 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 fish. Model development has undergone two generations (Generations I and II) and development of a third (Generation III) is in progress. The utility and effectiveness of the hydrology model is evaluated periodically by technical experts appointed by Program participants.
<i>M</i>	Task 2.1.2.2 Conduct peer review of the hydrology model by qualified specialists not affiliated with the Program.	PO	Pending	X	X					An independent peer review will be conducted of Generation III 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.

P	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
H	Task 2.1.2.3 Provide model analysis for the evaluation of flow recommendations.	BOR, BC	As requested							Model analyses for the evaluation of flow recommendations and project impacts will be conducted by the Program's technical committees and experts at the request of the Coordination Committee or FWS.
H	Task 2.1.2.4 Support operation and maintenance of stream gauges for San Juan River as needed	BOR, PO	Annually	X	X	X	X	X	X	Stream gauges necessary for monitoring flow of the San Juan River will be supported with supplemental discharge rating measurements as may be needed for improving gaging reliability.
	Action 2.1.3 Coordinate with BOR on Navajo Dam operations.			X						
M	Task 2.1.3.1 Provide input and recommendations to U.S. Fish and Wildlife Service and Bureau of Reclamation on alternate dam operations when extreme hydrologic conditions prevent flow recommendations from being met.	BC, PO	Ongoing							BOR will organize semi-annual meetings with stakeholders on operations of Navajo Dam. BOR will coordinate these meetings and solicit input from stakeholders.
H	Task 2.1.3.2 Make determination of perturbation for Navajo Dam operations.	BC	Annually	X	X	X	X	X	X	
	Action 2.1.4 Provide and protect flows in the San Juan River consistent with flow recommendations.									
C	Task 2.1.4.1 Develop and implement mechanisms for protecting water required to meet flow recommendations.	BOR	Ongoing	X	X	X	X	X	X	BOR 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.
	Action 2.1.5 Review and evaluate San Juan River stream flow in light of hydrology variability.									
H	Task 2.1.5.1 Conduct a comprehensive analysis of hydrologic variability in the San Juan River.	BOR, FWS	Pending	X	X					
M	Task 2.1.5.2 Evaluate the possible and most probable impacts of hydrologic variability on future water availability.	BOR, FWS	Pending	X	X					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.
M	Task 2.1.5.3 Evaluate ability of the river to meet the functions provided by the flow recommendations during extended periods of drought.	BOR, FWS, BC	Pending							An evaluation of the river's ability to meet flow recommendations under periods of extended drought should be evaluated.
	Task 2.1.5.4 Develop contingency strategies to meet the functions provided by flow recommendations during extended periods of droughts.	BOR, FWS, BC	Pending							Alternative strategies for meeting the functions provided by flow recommendations during extended periods of droughts should be developed.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
<i>H</i>	Task 2.1.5.5 Evaluate non-flow alternatives that would work in conjunction with flows to meet the functions provided by flow recommendations.	BOR, FWS, BC	Ongoing	X	X					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
	Goal 2.2—Provide Suitable Habitat to Support Recovery of CPM and RBS Populations.									
	Action 2.2.1 Identify, characterize, and quantify suitable habitat.									
<i>H</i>	Task 2.2.1.1 Assess data collected to identify and describe flow-habitat relationships.	PO, BC	Ongoing	X	X					Use available data collected to date to accomplish task.
<i>M</i>	Task 2.2.1.2 Identify habitats and areas of essential habitat to native and endangered fishes at different volumes of water released (including timing and duration) from Navajo Dam.	PO, BC	Ongoing	X						Fish may change distributional patterns with different flow regimes. These changes may be seasonal or caused by changes in habitat.
<i>M</i>	Task 2.2.1.3 Assess to what extent the seasonal and longitudinal distributions of endangered fishes and other native and nonnative fish species in response to various flow releases from Navajo Dam can be determined.	PO, BC	Ongoing	X						Flow recommendations were designed to maintain channel complexity and provide necessary habitats for native and endangered fishes. This task will link information gathered under Tasks 1.3.1.1 and 1.3.1.2 with the hydrology of flow recommendations.
<i>M</i>	Task 2.2.1.4 Characterize channel geomorphology and river channel dynamics to better understand flow-habitat relationships.	PO, BC	Ongoing	X	X					Use available data collected to date to accomplish task.
	Action 2.2.2 Provide suitable habitat.									
<i>C</i>	Task 2.2.2.1 Implement flows that provide suitable habitat for endangered fishes and other native fishes in the San Juan River.	BOR, FWS, BC	Ongoing	X	X	X	X	X	X	Flow recommendations were developed in 1999 (Holden 1999). Reclamation is implementing the flow recommendations through the operations decision criteria of Navajo Dam. Releases are made to provide sufficient releases of water at times, quantities, and durations necessary to protect the endangered fish and their designated critical habitat while maintaining the other authorized purposes of the Navajo Unit.
<i>H</i>	Task 2.2.2.2 Use data and information gathered from habitat assessments as the foundation for evaluating the effectiveness of the operations decision criteria for Navajo Dam in providing suitable habitat for the endangered fish.	FWS, BC	Ongoing	X	X	X	X	X	2015	Flow recommendations continue to be implemented and evaluated. A great deal of data and information has been collected, and continues to be collected on the San Juan River riverine habitats. This information needs to be continually assimilated, synthesized, and interpreted to assess and evaluate the effectiveness of Navajo Dam releases.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	Action 2.2.3 Evaluate and implement habitat restoration strategies to augment the function of river flow to create and maintain suitable habitat.									
<i>C</i>	Task 2.2.3.1 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.	FWS, BC	Ongoing	X	X	X	X	X	2015	Flow recommendations continue to be implemented and evaluated. A great deal of data and information has been collected, and continues to be collected, on the San Juan River fishes. This information needs to be continually assimilated, synthesized, and interpreted to describe best strategies for providing suitable habitat for native and endangered fish.
<i>H</i>	Task 2.2.3.2 Evaluate construction of backwater habitats to serve as low-velocity nursery habitat if lack of backwater habitat is found to be limiting recovery.	BOR, PO, BC NN	Ongoing							Backwaters serve as low-velocity nursery habitats for native and endangered fish. Backwaters will be mechanically created. Included as compliance measure in Navajo-Gallup BO.
<i>H</i>	Task 2.2.3.3 Evaluate selective nonnative vegetation removal in conjunction with high flow conditions for habitat creation and maintenance.	BOR, BC, FWS, NN	Ongoing	X	X					Tamarisk and Russian olive have encroached into riparian areas, stabilized the channel, and reduced channel complexity that is selected by native and endangered fishes.
<i>M</i>	Task 2.2.3.4 Evaluate large-scale nonnative vegetation control, as feasible and necessary.	BOR, BC, FWS, NN	As needed							Tamarisk and Russian olive have encroached into riparian areas, stabilized the channel, and reduced channel complexity that is selected by native and endangered fishes.
<i>H</i>	Task 2.2.3.5 Develop and implement a plan for feasible habitat restoration strategies and implement such plan as funding becomes available.	BOR, BC, FWS, NN	Ongoing	X	X					Other habitat creation and restoration strategies will be developed and implemented (2010–2012), as identified by Program review processes.
	Goal 2.3—Provide Increased Range to Support Recovery of CPM and RBS Populations.									
	Action 2.3.1 Provide and maintain fish passage at diversion structures.									
<i>C</i>	Task 2.3.1.3 Provide and maintain fish passage at the Hogback Diversion.	BIA, NN	Ongoing	X	X	X	X	X	2023	Passive fish passage at Hogback Diversion was completed in 2002. The Hogback Diversion is owned by the Navajo Nation
<i>C</i>	Task 2.3.1.4 Provide and maintain fish passage at the Public Service Company of New Mexico (PNM) Weir.	FWS, NN	Ongoing	X	X	X	X	X	2023	Selective fish passage at Public Service Company of New Mexico (PNM) Weir was completed in 2003.
<i>C</i>	Task 2.3.1.5 Provide and maintain fish passage at the Arizona Public Service Company (APS) Weir.	BOR	Pending	X	X	X	X	X	2015	An evaluation of the need for fish passage at the APS diversion structure was done in 2005 (Stamp et al. 2005). Design for fish passage at the Arizona Public Service Company (APS) Weir was completed in 2008.

P	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
C	Task 2.3.1.6 Evaluate fish passage at the Fruitland Diversion.	BOR, NN	Pending	X	X	X	X	X	2015	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). A feasibility study was completed in 2008 for a simple but effective approach to improving fish passage at the Fruitland Diversion.
	Action 2.3.2 Evaluate passage of San Juan River fish into Lake Powell in light of the waterfall that has formed and assess the potential for non-native fish movement into the river if the waterfall becomes inundated.									
H	Task 2.3.2.2 Evaluate strategies for providing passage of native and endangered fish from Lake Powell around the waterfall into the San Juan River.	FWS, BOR, BC		X						If necessary, strategies for providing fish passage at this natural barrier should be developed. 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 Tasks 3.1.3.1 and 3.1.3.2).
	Action 2.3.3 Minimize fish entrainment at diversion structures.									
H	Task 2.3.3.1 Identify and evaluate diversions with potential endangered fish entrainment in the San Juan River.	BC		X	X					Diversions and canals 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.
C	Task 2.3.3.2 Design and construct a fish deflection weir at the Hogback Diversion.	BOR, BC, PO, FWS, NN	Ongoing	X	X	X				A fish deflection weir has been designed for the Hogback Diversion. BOR is working on securing a long-term contract for O&M and on NEPA and ESA compliance. A contract for construction may be awarded in FY2011.
C	Task 2.3.3.3 Evaluate the need for and construct, if appropriate, a fish screen or deflection weir at the Arizona Public Service Company (APS) Weir.	BOR, BC, POFWS	Pending							Need for a fish screen or deflection weir will be evaluated at the Arizona Public Service Company (APS) Weir.
C	Task 2.3.3.4 Evaluate the need for and construct, if appropriate, a fish screen or deflection weir at the Fruitland Canal.	BOR, BC, PO, FWS	Pending							Need for a fish screen or deflection weir will be evaluated at the Fruitland Canal.
C	Task 2.3.3.5 Evaluate the need for and construct, if appropriate, a fish screen or deflection weir at the Jewett Valley Ditch.	BOR, FWS	Pending							Need for a fish screen or deflection weir will be evaluated at the Jewett Valley Ditch.
C	Task 2.3.3.6 Evaluate the need for and construct, if appropriate, a fish screen or deflection weir at the San Juan Generating Station.	BOR, BC, PO, FWS	Pending							Need for a fish screen or deflection weir will be evaluated at the San Juan Generating Station.

P	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
C	Task 2.3.3.7 Evaluate the need for and construct, if appropriate, a fish screen or deflection weir at the Farmer's Mutual Ditch.	BOR, BC, PO, FWS	Pending							Need for a fish screen or deflection weir will be evaluated at Farmer's Mutual Ditch. Diversions on the San Juan River and Animas River should be evaluated.
	Goal 2.4—Provide Suitable Water Quality to Support Recovery of CPM and RBS Populations.									
	Action 2.4.1 Describe water quality and identify potential problems to native and endangered fish.									
C	Task 2.4.1.1 Evaluate water quality of the San Juan River Basin, in coordination with other agencies, and identify potential effects to native and endangered fish.	FWS, BOR, BC	Ongoing	X	X	X	X	X	X	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.
C	Task 2.4.1.2 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]).	BC, BOR	Ongoing	X	X	X	X	X	X	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.
C	Task 2.4.1.2 Evaluate water quality as potential limiting factors.	FWS	Ongoing	X	X	X	X	X	X	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).
	Action 2.4.3 Minimize the risk of hazardous-materials spills in critical habitat.									
C	Task 2.4.3.1 Identify and remediate potential sources of hazardous materials to areas of designated critical habitat (e.g., oil pipelines, riverside retention ponds).	FWS	Ongoing	X	X					The Program will identify and remediate any potential sources of hazardous materials, such as gas lines, oil product pipelines, riverside retention ponds, etc.

Table A3. Tasks, priorities, responsibilities, dates, and descriptions for Element 3.—Interactions between Native and Nonnative Fish Species.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	Goal 3.1—Control Problematic Nonnative Fishes as Needed.									
	Action 3.1.1 Develop, implement, and evaluate the most effective strategies for reducing problematic nonnative fish.									
<i>C</i>	Task 3.1.1.4 Mechanically remove nonnative fish to achieve objectives.	FWS, UDWR	Ongoing	X	X	X	X	X	X	Full implementation of the nonnative fish control strategy began in 2008. Principal Investigators: upper river control – Davis; lower river control – Elverud
<i>C</i>	Task 3.1.1.5 Conduct annual review of nonnative fish control strategy.	BC	Annually	X	X	X	X	X	X	The nonnative fish reduction strategy will be evaluated annually to determine if current efforts are meeting established criteria (Task 3.1.4.1). If criteria are not being met, increases or reallocation of effort may be necessary or alternative strategies identified and implemented.
<i>C</i>	Task 3.1.1.6 Evaluate and implement effective alternative nonnative fish reduction methods.	FWS, BC	Ongoing	X	X					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 will hold a workshop in 2010 to evaluate the non-native fish control program and make adjustments if appropriate
<i>C</i>	Task 3.1.1.7 Remove nonnative fish at selective fish passage structures.	NN, FWS	Ongoing	X	X	X	X	X	X	Nonnative fish will be removed at PNM selective fish passage structure (see Task 2.3.1.4).
<i>H</i>	Task 3.1.1.8 Evaluate effects of nonnative fish control on distribution, abundance, and demographics (e.g., fish size, age, and sexual maturity) of nonnative fish populations.	FWS, BC	Ongoing	X						Full implementation of the nonnative fish control strategy began in 2008. The BC will hold a workshop in 2010 to evaluate the non-native fish control program and make adjustments if appropriate

P	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
H	Task 3.1.1.9 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 and native fish community.	FWS, BC	Ongoing	X						Fish population 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. The BC will hold a workshop in 2010 to evaluate the non-native fish control program and make adjustments if appropriate
	Action 3.1.2 Establish and evaluate strategies for handling removed nonnative fish in collaboration with state and tribal agencies.									
M	Task 3.1.2.1 Evaluate and revise, as necessary, translocation strategy for channel catfish removed from the San Juan River.	FWS	Ongoing	X	X	X	X	X	X	Channel catfish removed from the San Juan River are translocated to closed impoundments within the San Juan River Basin. These translocations will be evaluated and revised, as necessary, to ensure compliance with all state, federal and tribal regulations.
M	Task 3.1.2.2 Implement standardized fish health analysis for translocated channel catfish to avoid transfer of harmful pathogens.	FWS	Ongoing	X	X	X	X	X	X	Standardized fish health analysis will be implemented on channel catfish every 2 years to identify and prevent the unintentional spread of harmful pathogens to local impoundments. If potential fish health problems are detected, the translocation strategy will be appropriately revised.
H	Task 3.1.2.3 Develop, evaluate, and implement standard procedures for disposal of fish that cannot be translocated.	FWS	Ongoing	X	X	X	X	X	X	Procedures for disposal of fish are important to maintain good relationships with affected stakeholders and the public.
	Action 3.1.3 Identify and regulate nonnative fish releases and escapement into the main river, floodplain, and tributaries.									
L	Task 3.1.3.1 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.	PO, BC	Ongoing	X						The risk of immigration of nonnative fishes from Lake Powell into the San Juan River will be assessed and measures will be identified to reduce the risk, if necessary. At present, a natural waterfall exists at the outflow of the San Juan River that prevents access by most fish from Lake Powell. PO and BC will develop workplan for comprehensive report.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
<i>L</i>	Task 3.1.3.2 Implement measures to reduce the risk of immigration of nonnative fish from Lake Powell, as feasible and necessary.	PO, BC	On hold							Measures identified necessary in Task 3.1.3.1 will be implemented to reduce the risk of immigration of nonnative fish 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 (see Tasks 2.3.2.2).
<i>H</i>	Task 3.1.3.3 Identify major sources of nonnative fish from tributaries and off-channel features to minimize reinvasion of riverine habitats by problematic species.	BC	Ongoing	X	X					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 fish from these sources will be identified. The BC will hold a workshop in 2010 to evaluate the non-native fish control program and make adjustments if appropriate
<i>C</i>	Task 3.1.3.4 Implement measures to reduce escapement of nonnative fish from tributaries and off-channel features, as necessary.	PO, BOR, FWS	Pending	X						Measures identified necessary in Task 3.1.3.3 will be implemented to reduce escapement of nonnative fish from tributaries and off-channel features, as necessary. Potential problems have been identified at the newly filling Lake Nighthorse. Warm water fish stocking was not originally anticipated; the BO assumes no escapement; the "bassomatic" may not prevent 100% escapement as originally anticipated; Animas River fish have been found in the reservoir (Contact: Rob Waldman, Reclamation).
	Action 3.1.4 Establish criteria for reduction of target nonnative fish populations.									
<i>H</i>	Task 3.1.4.1 Establish target criteria for reduction of problematic nonnative fish species to estimate time, effort, and cost for controlling nonnative fishes.	BC, FWS	Ongoing	X	X					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 ($\lambda < 1.0$). Bioenergetics models may also apply. The BC will hold a workshop in 2010 to evaluate the non-native fish control program and make adjustments if appropriate

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	Goal 3.2—Manage Sport Fish in a Manner Compatible with Endangered Fish Recovery.									
	Action 3.2.1 Develop policies and agreements among affected stakeholders on nonnative game fish management.									
<i>C</i>	Task 3.2.1.1 Develop and implement a sport fish stocking policy among the states and tribes.	PO,BC, States	Pending	X	X	X	X	X	X	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.
<i>C</i>	Task 3.2.1.2 Execute agreements among the states and tribes.	CC, States	Pending	X						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 3.2.2 Ensure that fishing regulations and enforcement are consistent with endangered fish recovery.									
<i>M</i>	Task 3.2.2.1 Review fishing regulations and revise, as necessary, to ensure consistency with endangered fish recovery.	NMDGF , NN, PO	Ongoing							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.
<i>M</i>	Task 3.2.2.2 Collaborate with state and tribal agencies to enforce fishing regulations.	NMDGF , NN, PO	Ongoing	X	X	X	X	X	X	Illicit translocation of nonnative fish can introduce new problematic species and expands their range. The Recovery Program will collaborate with state and Navajo Nation law enforcement agencies to reduce illicit translocations, including baitfish and live-well releases.

Table A4. Tasks, priorities, responsibilities, dates, and descriptions for Element 4.—Monitor Fish and Habitat and Conduct Research in Support of Recovery Actions.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	Goal 4.1—Monitor Fish Populations of the San Juan River.									
	Action 4.1.1 Develop a standardized monitoring program for fish.									
<i>M</i>	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.	BC, FWS, PO, NMDGF	Ongoing	X	X	X	X	X	X	A Monitoring Plan And Protocols was developed for the San Juan River Bain in 2000 and updated in 2006 (Propst et al. 2006) to identify changes in the endangered and other native fish populations, status, distributions, and habitat conditions. 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. This monitoring plan describes protocols for monitoring larval drift, YOY and small-bodied fish, subadults and adults; and channel geomorphology, cobble bars, backwaters, habitat mapping; as well as water temperature, and water quality. BC held workshops in 2009 and an update of the plan is expected in 2010.
<i>M</i>	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.	BC	Annually	X	X	X	X	X	X	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.
<i>H</i>	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.	PO, BC	As needed	X						Monitoring workshops were held 2009 to coordinate sampling design, data collection, and desired precision and detection levels for detecting responses. An update of the plan is expected in 2010. Additional workshops will be held as necessary to accomplish 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.									
<i>H</i>	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.	P.I.s	Ongoing	X	X	X	X	X	X	Long-term CPM and RBS sucker larval fish surveys have been conducted since 2003. Principal Investigators: Propst, Brandenburg, and Farrington.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
<i>H</i>	Task 4.1.2.2 Conduct juvenile and small-bodied fish studies to determine if young fish are surviving and recruiting and the areas and habitat used for rearing.	P.I.s	Ongoing	X	X	X	X	X	X	Long-term small-bodied fish monitoring has been in place since 2003. Principal Investigator: Propst
<i>M</i>	Task 4.1.2.3 Conduct adult fish studies to estimate densities of fish (CPUE) and estimates of population size (mark-recapture estimates).	P.I.s	Ongoing	X	X	X	X	X	X	Long term monitoring of sub-adult and adult large-bodied fishes has been in place since 2003. Principal Investigator: Ryden.
<i>H</i>	Task 4.1.2.4 Collect catch rate statistics to estimate relative abundance of endangered fish populations.	P.I.s	Ongoing	X	X	X	X	X	X	Implemented via long-term monitoring, non-native fish removal, and stocking programs.
<i>H</i>	Task 4.1.2.5 Use mark-recapture population estimators, when feasible and in conjunction with catch rate estimators, to evaluate stocking success for CPM and RBS.	P.I.s	Ongoing	X	X	X	X	X	X	Implemented via long-term monitoring, non-native fish removal, and stocking programs.
	Action 4.1.3 Obtain reliable population estimates of RBS and CPM.									
<i>H</i>	Task 4.1.3.1 Develop target criteria to implement mark-recapture population estimates consistent with recovery goals requirements.	BC		X						Reliable and precise mark-recapture population estimates are required for recovery goals. Criteria will be developed to transition from catch rate indices to mark-recapture population estimators for subadult and adult RBS and CPM. These criteria may be numbers of fish per kilometer or a similar metric that signals when population sizes are sufficiently large to implement mark-recapture sampling. See Tasks 4.1.3.2 and 4.1.3.3.
<i>H</i>	Task 4.1.3.2 Conduct Population Estimation Workshops and evaluate population estimators used in other systems to identify the most reliable and suitable estimator(s) for Colorado pikeminnow and razorback sucker.	PO, BC	As needed							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 is being updated and will address this issue.
<i>H</i>	Task 4.1.3.3 Use mark-recapture population estimators, when feasible, and 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.	FWS, BC	Ongoing	X						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 mark-recapture data will be used to do population estimates in the near term.
<i>H</i>	Task 4.1.3.4 Procure adequate numbers of PIT tags for marking native and endangered fish.	BOR	Ongoing	X	X	X	X	X	X	PIT tags are the standard marking tool for the endangered fishes.
	Goal 4.2—Monitor Habitat Use and Availability.									
	Action 4.2.1 Develop a standardized monitoring program for habitat.									

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
<i>M</i>	Task 4.2.1.1 Modify the existing Standardized Habitat Monitoring Plan to incorporate findings from the 2005-2009 detailed reach study, if appropriate.	BC	Pending	X						BC workshops were conducted in 2009 to evaluate current fish and habitat monitoring and develop a comprehensive plan for both fish and habitat monitoring. Final results of the detailed reach results will be available in 2010. A comprehensive monitoring is being developed and will incorporate this information.
<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.	PO, BC	As needed							BC workshops were conducted in 2009 to evaluate current fish and habitat monitoring and develop a comprehensive plan for both fish and habitat monitoring.
	Action 4.2.2 Implement a standardized monitoring program for habitat.									
<i>H</i>	Task 4.2.2.1 Quantify attributes of habitats important to each life stage of endangered fish.	FWS, BC	Ongoing	X						Habitats used by various life stages of CPM and RBS should be monitored and related to flow and river location.
	Task 4.2.2.2 Map habitat at different flows as described in the Standardized Habitat Monitoring Plan	P.I.s	Ongoing	X	X	X	X	X	X	Principle Investigator: Bliesner
<i>H</i>	Task 4.2.2.3 Monitor long-term habitat response of the river channel to flow recommendations.	BC	Ongoing	X	X	X	X	X	X	Long-term river-wide response of the river channel (i.e., aggradation or degradation) will be monitored and related to the flow recommendations to assess gross overall channel change (as needed).
<i>C</i>	Task 4.2.2.4 Monitor water quality in the San Juan River (see Action 2.4.1.).	FWS, BIA, BOR	Ongoing	X	X	X	X	X	X	Elevated levels of selenium and mercury have been detected in the San Juan River and identified by the FWS 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. Principle Investigator: Bliesner
	Action 4.2.3 Identify and refine habitat/fish relationships.									
<i>H</i>	Task 4.2.3.1 Determine if a habitat/fish relationship can be defined, the probability of success, the level of data needed to accomplish this, and the cost of collecting the data.	FWS, BC								Workshops were conducted in 2009 to evaluate and modify current monitoring and data collection methodologies and address data integration. A comprehensive fish and habitat monitoring plan will be completed in 2010.
<i>H</i>	Task 4.2.3.2 Identify principal river reaches and habitats used by various life-stages of endangered fish.	FWS, BC								An understanding of river reaches and habitats used by CPM and RBS is important in understanding how flows benefit these habitats.
	Task 4.2.3.3 Relate geo-referenced fish capture data to habitat data.	P.I.s, PO	Ongoing	X	X					This was initiated by Bliesner during the detailed reach study. Starting in 2010, P.I.s will record GPS coordinates for all captures and recaptures during monitoring and nonnative fish removal activities.

P	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	Goal 4.3— Integrate And Synthesize Monitoring Data And Information To Evaluate Fish Community And Ecosystem Responses To Recovery Actions.									
	Action 4.3.1 Describe life history parameters of wild CPM and RBS.									
C	Task 4.3.1.1 Document and quantify reproduction, survival, and recruitment.	FWS, BC	Ongoing	X	X	X	X	X	X	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. 1992 - present
	Action 4.3.2 Develop fish community and ecosystem response strategies									
H	Task 4.3.2.1 Develop a centralized database that incorporates all data from standardized monitoring and integrate into the Program database.	PO, BC	Ongoing	X	X	X	X	X	X	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.
H	Task 4.3.2.2 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.	PO, BC	Ongoing	X	X	X	X	X	X	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.
H	Task 4.3.2.3 Use collected data to better define the interdependencies of protected and unprotected native species.	PO, BC	Ongoing	X	X	X	X	X	X	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.
M	Task 4.3.2.4 Evaluate and review available fisheries data for use in the model to evaluate recovery actions.	PO, BC	As needed							A great deal of information has been gathered on the fish community of the San Juan River. This information should be assimilated. Data Integration and Habitat and Fish Monitoring Workshops were held in 2009.
M	Task 4.3.2.5 Refine ecosystem model specific to the San Juan River and use with other existing data to evaluate fish community response to recovery actions.	PO, BC	As needed							The Program may evaluate existing ecosystem models (e.g., Ecopath, Ecosim, RAMAS, Vortex) to assist in evaluating possible responses by fish species to management actions.
	Action 4.3.3 Identify and implement appropriate monitoring and research strategies to evaluate ecosystem response									

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
<i>H</i>	Task 4.3.3.1 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.	PO, BC	Ongoing	X	X	X	X	X	X	Workshops were conducted in 2009 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. The plan is being developed and should be complete in 2010.
	Action 4.3.4 Use monitoring and research information to evaluate and modify recovery activities, as necessary, to ensure progress toward recovery.									
<i>C</i>	Task 4.3.4.1 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.	PO, BC	Ongoing	X	X	X	X	X	X	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.

Table A5. Tasks, priorities, responsibilities, dates, and descriptions for Element 5.—Program Coordination and Data Integration and Evaluation for Recovery.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	Goal 5.1—Facilitate Program Planning and Management.									
	Action 5.1.1 Develop and coordinate Program Long Range Plan.									
<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.	PO, BC, CC	Annually	X	X	X	X	X	X	The LRP is a living document that will be reviewed and revised annually according to the process described in the SJRRIP Program Document (2006). The Program Office will update the LRP in coordination with the CC and technical committees to reflect accomplishments during the past year, new projects needed to achieve goals, and changes in timing of 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.
	Action 5.1.2 Provide ongoing Program management.									
<i>H</i>	Task 5.1.2.1 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.	PO, BOR	Annually	X	X	X	X	X	X	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.
<i>H</i>	Task 5.1.2.2 Develop list of prioritized actions and projects for the Annual Work Plan that most benefit recovery of the endangered fish populations.	BC, PO	Annually	X	X	X	X	X	X	Based on the Long-Range Plan, 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 Long Rang Plan, recommended by the technical committees and approved by the Coordination Committee.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
<i>H</i>	Task 5.1.2.3 Develop and issue Requests for Proposals (RFPs) for projects that most benefit recovery of the endangered fish populations.	PO, BOR	Annually	X	X	X	X	X	X	Scopes of work will be prepared for the list of prioritized projects and requests for proposals will be solicited. Upon receipt of the scopes of work, and responses to requests for proposals, the prioritized projects will have associated budgets. These will be compared to the availability of funds. Projects that are low on the priority list will not be included in the 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.
<i>H</i>	Task 5.1.2.4 Assemble and review annual scopes of work to identify most suitable projects for funding and implementation.	PO, BOR	Annually	X	X	X	X	X	X	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 Long-Range Plan, 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.
<i>C</i>	Task 5.1.2.5 Develop Annual Work Plan with scopes of work and budgets.	PO	Annually	X	X	X	X	X	X	Scopes of work will be developed by researchers in response to priority management actions and research needs identified in Task 5.1.2.2. These scopes of work will be incorporated into an Annual Work Plan and reviewed by the Biology Committee and recommendations forwarded to the Coordination Committee for approval.
<i>H</i>	Task 5.1.2.6 Coordinate and schedule meetings of the Coordination Committee and the technical committees, as necessary.	PO	Annually	X	X	X	X	X	X	The Program Office will coordinate and schedule meetings for the Coordination Committee and the technical committees.
	Goal 5.2— Ensure Integration and Synthesis of Information to Evaluate Program Progress Toward Recovery									
	Action 5.2.1 Integrate all Program monitoring, research, and reporting activities.									

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
<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.	PO	Annually	X	X	X	X	X	X	The Program Office will maintain and continually improve a comprehensive 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 Program participants.
	Action 5.2.2 Synthesize and evaluate information from all studies for Program to evaluate progress toward recovery.									
<i>H</i>	Task 5.2.2.1 Conduct annual review of Program progress and integrate all monitoring, recovery, and research activities, data and results.	PO, BC	Annually	X	X	X	X	X	X	The Program Office will annually review the Program’s progress towards recovering the endangered species. The Program Coordinator will be assisted by Program staff and the Biology Committee and will 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 purpose and goals.
<i>H</i>	Task 5.2.2.2 Produce report that evaluates progress toward minimizing limiting factors, ongoing Program activities, and assesses current status of native and endangered fish populations.	PO, BC	Ongoing	X	X	X	X	X	X	The Program Office will coordinate the assimilation of a synthesis report as needed that assesses current knowledge, new strategies, and progress toward species recovery. This report may occur every 5 years but may vary in timing due to competing fiscal resources or project scheduling or significant new information. 2003 - present
<i>H</i>	Task 5.2.2.3 Conduct a Program review and assessment of progress towards recovery (i.e., Sufficient Progress Report), and formal recommendations for changes in direction, termination of projects, new projects, and other important Program issues.	PO, FWS	As needed		X					The Program Office will prepare a Sufficient Progress Report, as needed, and will assist the Upper Basin Recovery Program in preparation of the Annual Report to Congress. These reports will describe and assess the Program’s progress toward species recovery.
	Action 5.2.3—Identify and Evaluate Limiting Factors									
<i>H</i>	Task 5.2.3.1— Assemble and use Program data and information from management activities and monitoring and other available information to identify and evaluate limiting factors and determine necessary research to identify actions that will minimize or remove these limiting factors	FWS	Ongoing	X	X	X	X	X	X	The Program Office will use previous and current data and information from habitat assessments, nonnative fish efforts, ongoing investigations to characterize dynamics of native fishes and their response to management activities intended to improve status of listed species, water quality assessments, and data collected to better define the interdependence of protected and unprotected native species to evaluate and identify potential limiting factors.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	Action 5.2.4—Ensure new information is identified and developed, as necessary to achieve Program goals	PO								
<i>H</i>	Task 5.2.4.1— Use monitoring and research information to evaluate and modify recovery activities, as necessary, to ensure progress toward recovery.	FWS	Ongoing	X	X	X	X	X	X	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.
	Action 5.2.5—Ensure Scientific Integrity of Program Information and Coordination with other Associated Programs, Projects, and Studies									
<i>H</i>	Task 5.2.5.1 Maintain a standardized process for peer review by qualified specialists in appropriate technical disciplines for significant Program science projects and reports.	PO, BOR	Annually	X	X	X	X	X	X	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.
<i>H</i>	Task 5.2.5.2 Participate in annual researcher’s meetings in conjunction with the Upper Basin Researcher’s Meeting to present results and interpretations of ongoing projects.	PO	Annually	X	X	X	X	X	X	Researchers will be encouraged to make presentations at the annual Upper Basin Researcher’s Meeting to review the preceding year’s monitoring, recovery and research data; assess progress toward recovery; and provide recommendations to modify research, monitoring, and recovery activities.
	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.	BOR, PO	Annually	X	X	X	X	X	X	The Program Office will work with the Bureau of Reclamation to maintain and distribute all annual base and capital funds allocated under the 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.
<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.	BOR, PO	Annually	X	X	X	X	X	X	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.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
<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.	BOR, PO	Annually	X	X	X	X	X	X	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 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.

Table A6. Tasks, priorities, responsibilities, dates, and descriptions for Element 6.—Information and Education.

<i>P</i>	Tasks	Who	Status	FY 10	FY 11	FY 12	FY 13	FY 14	Out Years	Description
	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 public information through news articles, press releases, radio and television ads, and other media to inform the public of Program activities in collaboration with the UCRRP I&E Coordinator. Provide press releases routinely on the SJRIP for distribution to the media in Farmington, Durango, Albuquerque, and others in the basin.	PO	Ongoing	X	X	X	X	X	X	Public information will be provided through news articles, press releases, radio and television ads, and other media to inform the public of Program activities.
<i>H</i>	Task 6.1.1.2 Maintain a Recovery Program Website	PO	Ongoing	X	X	X	X	X	X	http://www.fws.gov/southwest/sjrip/
	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.	PO	Ongoing	X	X	X	X	X	X	A formal outreach support agreement will be executed and maintained between the San Juan River Basin Recovery Implementation Program and the Upper Colorado River Endangered Fish Recovery Program.
<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.	PO	Ongoing	X	X	X	X	X	X	The I&E coordinator will develop and exchange information and materials to incorporate into PowerPoint presentations, newsletters, Program highlights and Program displays.
<i>H</i>	Task 6.1.2.3 Participate in selected outreach efforts at local, state, and regional water development conferences.	PO	Ongoing	X	X	X	X	X	X	The I&E program will participate in selected outreach efforts at local, state, and regional water development conferences.

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	High	FWS, NMGF	1991	1997	Capture locations of RBS and CPM should be

Tasks	Recovery Goals Priority	Primary Responsibility	Start Date	Completion Date	Description and Comments
selected by various life stages of CPM and RBS.	(Completed)				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
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.
Action 1.1.4 Identify and evaluate limiting factors and determine necessary research to identify actions that will minimize or remove these limiting factors.					
Task1.1.4.1 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 Colorado pikeminnow and razorback sucker

Tasks	Recovery Goals Priority	Primary Responsibility	Start Date	Completion Date	Description and Comments
					(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 mesohabitat types and channel forms used by native and endangered fish.	High (Completed)	FWS, NMGF	1991	1997	Primary habitats used by wild fish have been 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.					

Tasks	Recovery Goals Priority	Primary Responsibility	Start Date	Completion Date	Description and Comments
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-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).
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-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.

Tasks	Recovery Goals Priority	Primary Responsibility	Start Date	Completion Date	Description and Comments
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.
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.
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.					

Tasks	Recovery Goals Priority	Primary Responsibility	Start Date	Completion Date	Description and Comments
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.					
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.					

Tasks	Recovery Goals Priority	Primary Responsibility	Start Date	Completion Date	Description and Comments
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.
Goal 5.2—Monitor Habitat Use and Availability.					
Action 5.2.3 Identify and refine habitat/fish relationships.					
Task 5.2.3.4 Collect geo-referenced habitat and fish use habitat data in at least two selected reaches with complex morphology to determine habitat selection.	High (Pilot study completed in 2010)	BC	2007	2009	Geo-referenced habitat association data will be collected with fish capture data, as feasible, to provide habitat use data for RBS and CPM of all life stages.
Task 5.2.3.5 Map at high resolution and monitor changes in habitat in at least two selected reaches with complex morphology at different flows.	High (Pilot study completed in 2010)	BC	2007	2010	This task will use bankfull channel area, island counts, and bed-form topographic data to monitor response of at least two selected reaches with complex morphology and habitat to flow recommendations (2005-2009).
Task 5.2.3.6 Refine and standardize habitat classification for consistent use with fish sampling and habitat mapping.	High (Completed)	BC	2007	2010	A standard habitat classification system is needed that can be used for fisheries, hydrology, and geomorphology.
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					

Tasks	Recovery Goals Priority	Primary Responsibility	Start Date	Completion Date	Description and Comments
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).