

PART TWO:

RECOVERY IMPLEMENTATION PROGRAM
RECOVERY ACTION PLAN
(RIPRAP)

**RECOVERY IMPLEMENTATION PROGRAM
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(RIPRAP)**

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1.0 INTRODUCTION

1.1 RECOVERY PROGRAM PURPOSE

The purpose of the Recovery Implementation Program for Endangered Fishes in the Upper Colorado River Basin (Recovery Program) is to recover the humpback chub (*Gila cypha*), bonytail (*G. elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), and razorback sucker (*Xyrauchen texanus*) while existing and new water development proceeds in the Upper Basin (i.e., Upper Colorado River Basin upstream of Glen Canyon Dam, excluding the San Juan River; Cooperative Agreement, 1988) in compliance with the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). Further, the Recovery Program is intended to serve as a reasonable and prudent alternative to avoid the likelihood of jeopardy to the continued existence of the endangered fishes and to avoid the likely destruction or adverse modification of critical habitat in Section 7 consultations on depletion impacts related to new projects and all impacts (except the discharge of pollutants such as trace elements, heavy metals, and pesticides) associated with historic water projects in the Upper Basin.

1.2 SPECIES RECOVERY GOALS

The overall goal for recovery of the four endangered fishes is to achieve naturally self-sustaining populations and to protect the habitat on which those populations depend. Recovery plans for these species have been developed under Section 4(f) of the Endangered Species Act (U.S. Fish and Wildlife Service 1990a, 1990b, 1991, 1998), and the final rule determining critical habitat was published in the *Federal Register* on March 21, 1994 (59 FR 13374; Appendix). The recovery plans provide a biological and research-oriented approach to recovery and include a recommendation for detailed management and site-specific implementation plans. They refer to species recovery in both the Upper and Lower basins, but fail to include specific demographic criteria for self-sustaining, viable populations and site-specific management actions/tasks to minimize or remove threats.

On August 1, 2002, the U.S. Fish and Wildlife Service (Service) approved final recovery goals for the endangered fishes to serve as amendments and supplements to the existing recovery plans (U.S. Fish and Wildlife Service 2002a, 2002b, 2002c, 2002d). According to Section 4(f)(1) of the Endangered Species Act, these recovery goals describe what is necessary for downlisting and delisting each of the species by identifying site-specific management actions/tasks necessary to minimize or remove threats; establishing objective, measurable criteria that consider demographic and genetic needs for self-sustaining, viable populations; and providing estimates of the time to achieve recovery. The Service has begun the process of reviewing and updating the species recovery goals in 2007.

In the context of the recovery goals, recovery of humpback chub, bonytail, and razorback sucker is considered across the Upper and Lower basins (each basin is

treated as a “recovery unit”), with separate recovery criteria developed for each of the two recovery units. Recovery of Colorado pikeminnow is considered necessary only for the Upper Colorado River Basin (including the San Juan River subbasin). The Recovery Program and the San Juan River Basin Recovery Implementation Program provide for the coordinated implementation of management actions/tasks that contribute to recovery in the Upper Basin recovery unit.

1.3 RECOVERY ACTION PLAN PURPOSE

This Recovery Implementation Program Recovery Action Plan (RIPRAP) has been developed using the best, most current information available and the recovery goals for the four endangered fish species. The RIPRAP is intended to provide an operational plan for implementing the Recovery Program, including development of the Recovery Program's annual work plan and future budget needs. Specifically, the RIPRAP identifies the feasible actions that are necessary to recover the endangered fishes, including schedules and budgets for implementing those actions. The RIPRAP also identifies the specific recovery actions that must be accomplished in order for the Recovery Program to serve as a reasonable and prudent alternative to avoid the likelihood of jeopardy to the continued existence of the endangered fishes and to avoid the likely destruction or adverse modification of critical habitat in Section 7 consultations for depletion impacts of new projects and all existing or past impacts related to historic water projects (except impacts from contaminants) in the Upper Basin, in accordance with the October 15, 1993 Section 7 Agreement (Revised March 8, 2000). The RIPRAP was developed in support of that Agreement.

1.4 ESTIMATED COST OF RECOVERY ACTIONS

The estimated total budget for the Recovery Program from FY 2007–FY 2011 is approximately \$54.2 million. Funding for the Recovery Program is expected to come from the following sources:

- a. An annual operating budget of approximately \$6 million, totaling roughly \$32 million from FY 2007–FY 2011 as it is adjusted annually for inflation. The source of these funds will be: Western Area Power Administration and the U.S. Bureau of Reclamation (hydropower revenues); the U.S. Fish and Wildlife Service; and the States of Colorado, Utah, and Wyoming. Additional annual funding will come from water development depletion fees. Under the Recovery Program, proponents of new water projects which undergo Section 7 Endangered Species Act consultation have agreed to pay a one-time depletion fee based on a project's average annual depletion. The rate is adjusted annually for inflation: as of October 1, 2006 it was \$17.24 per acre foot; the rate increases to \$17.79 per acre foot as of October 1, 2007. The actual rate of water development has not been projected.

- b. Approximately \$83.1 million will be spent between FY 1999 and FY 2010 for capital projects, including: acquisition of water and water rights to implement and maintain adequate instream flows for the fish; building fish passages and hatcheries; and restoring flooded bottomlands. P.L. 106-392 authorized this funding in October 2000; P.L. 107-375 extended construction authority from 2005 to 2008; and P.L. 109-183 authorized Federal appropriations through 2010, increased authorized Federal appropriations from \$46 million to \$61 million, and increased the capital funding total from \$62 million to \$77 million plus adjustments for inflation to the Federal portion. The actual cost of any one capital project will depend on final planning, design and budgeting. Costs for individual projects will be modified to more accurately reflect expected costs as the work plans are updated annually.

1.5 MEASURING PROGRESS TOWARD RECOVERY AND SCHEDULING RIPRAP ACTIVITIES

To achieve recovery in the Upper Basin, it will be essential to fully implement all of the actions in the RIPRAP; this will be accomplished only through cooperation by all Program participants. In general, actions will be scheduled such that recovery will be achieved in the most expeditious and cost-effective manner possible. However, decisions associated with ongoing Section 7 consultations may require some adjustment in the schedule to ensure recovery of the endangered fishes while water development continues.

Recovery actions likely to result in a measurable population response, a measurable improvement in habitat for the fishes, legal protection of flows needed for recovery, or a reduction in the threat of immediate extinction have been determined by the Service to be most important in determining the extent to which the Recovery Program provides the reasonable and prudent alternatives to jeopardy for projects undergoing Section 7 consultation. These actions are identified by the caret ">" in the Action Plans. Actions that the Service believes will contribute to the RIPRAP serving as a reasonable and prudent alternative to adverse modification of critical habitat are identified by an asterisk (*). These caret and (or) asterisked actions will generally be given highest priority.

The Recovery Program continually evaluates the outcome of completed RIPRAP actions to determine their effectiveness in helping to achieve recovery. Ultimately, success of recovery efforts will be measured by species response (change in population size, distribution, composition, etc.). However, it may be many years before such responses are evident. In the interim, the Recovery Program also will gage its progress towards recovery by accomplishment of the actions identified in the RIPRAP.

1.6 RECOVERY ACTION PLAN STRUCTURE

The substance of the RIPRAP is in Section 4.0, the Recovery Action Plans. It is here that the specific recovery actions are listed. The first Recovery Action Plan identifies

general recovery program support activities important to the success of the Recovery Program. The following two Recovery Action Plans are for the Green and Colorado rivers and their subbasins in the Upper Basin. Each action plan is arranged by specific activities to be accomplished within the "recovery elements" listed below:

- I. Identify and protect instream flows;
- II. Restore and protect habitat;
- III. Reduce negative impacts of nonnative fishes and sportfish management activities;
- IV. Conserve genetic integrity and augment or restore populations;
- V. Monitor populations and habitat and conduct research to support recovery actions;
- VI. Increase public awareness and support for the endangered fishes and the Recovery Program (in the General Recovery Program Support Action Plan only); and
- VII. Provide program planning and support (in the General Recovery Program Support Action Plan only).

The Recovery Action Plans (Section 4.0) have been formatted as tables for ease of scheduling and tracking activities. A general discussion of activities under each recovery element and of recovery priorities in each subbasin is found in Sections 2.0 and 3.0, respectively. Projected budgets are broken out in Section 5.0.

2.0 DISCUSSION OF RECOVERY ACTION PLAN ELEMENTS

The Recovery Action Plan tables contain only very brief descriptions of recovery actions planned in each subbasin. In this section, recovery activities are explained in more detail, as they apply Upper Basin wide.

2.1 I. IDENTIFY AND PROTECT INSTREAM FLOWS

Recovery cannot be accomplished without securing, protecting, and managing sufficient habitat to support self-sustaining populations of the endangered fishes. Identification and protection of instream flows are key elements in this process. The first step in instream-flow protection is to identify flow regimes needed by the fish. In the Recovery Program, determining flow needs is primarily the responsibility of the Service (in cooperation with other participants). Factors considered in determining flow needs include: flow effects on reproduction and recruitment; flow effects on food supplies and nonnative fishes; and interrelationships between flow and other habitat parameters believed to be important for the fish, such as channel structure, sediment transport, substrate characteristics, vegetative encroachment, and water temperature. Flow recommendations often are made in stages, with initial flow recommendations based on the best available scientific information, historic conditions, and extrapolation from similar reaches. Recommendations then are refined following additional field research.

The contribution of tributaries to recovery was ranked by Tyus and Saunders (2001). A strategic plan was completed in 2003 that identified geomorphology research priorities to refine the flow recommendations and address the Recovery Goals (LaGory et al. 2003).

Flow recommendations have been approved for reaches of the Colorado (Osmundson and Kaeding 1991; McAda 2003), Yampa (Modde and Smith 1995; Modde et al. 1999), Green (Muth et al. 2000), Gunnison (McAda 2003), and Duchesne (Modde and Keleher 2003) rivers. Flows in the Little Snake River after estimated future depletions were identified in the Yampa River Management Plan and Environmental Assessment (Roehm 2004). Interim flow recommendations for the White River were completed in 2004 (Irving et al. 2004) and will be reviewed in 2007. Flow recommendations for the Colorado River below the Green River are pending completion of the Aspinall Unit EIS. Flow recommendations for other rivers or river reaches will be developed as deemed necessary to achieve recovery.

Colorado

Flow protection mechanisms are organized according to their initial or dominant attribute. If a change in the ownership of a water right (by purchase, lease, etc.) is central to flow protection, then flow protection is placed under "Acquire." A change in water right ownership to protect flows will usually be accompanied by a legal proceeding to change the nature or use of the water right, but this proceeding is still considered to be part of the "acquisition" of flow protection. Except for acquisition of conditional water rights in Colorado, such water rights acquisition also will result in physical alteration of flow conditions and will not just protect existing conditions.

Where flow protection involves filing for a new water right, it is placed under "Appropriate." With this mechanism, the ownership of the water right is established in the first instance, rather than being conveyed to a subsequent owner. In Colorado, the appropriation of an instream water right follows a structured process developed by the Colorado Water Conservation Board (CWCB) in 1997. The process begins with a Service flow recommendation, which is reviewed by CWCB and the Colorado Division of Wildlife (CDOW). Then CWCB issues a notice of intent to appropriate, followed by their approval to appropriate. Finally, the Attorney General must make a water court filing to confirm the appropriation and to avoid postponement of the appropriation's priority date. It may take 3 to 4 years from the notice of intent to appropriate to obtain a decree from the water court, depending on the nature of any litigation over the filing. In appropriation, the water right will have a relatively junior priority date (the date CWCB issued the notice of intent to appropriate), and only existing flow conditions can be protected. In most cases, this process has lacked support and thus proven to have limited use in the Recovery Program. Therefore, the Recovery Program adopted a programmatic biological opinion (PBO) approach on the Colorado and Yampa rivers and will apply a similar approach to the Gunnison River. Recovery Program participants anticipate that this process will prove effective in protecting instream flows for the

endangered fishes. The Recovery Program and CWCB will reevaluate the need for instream-flow filings 5 years after each PBO is in place.

Flows also may be protected through the physical alteration of flow conditions by reoperating a reservoir or other component of an existing or new water project. This kind of flow protection is placed under "Deliver" in the Recovery Action Plans and will usually involve both a change of water right ownership, including the lease of storage water, and a change in the legal nature of the water rights. (A management agreement between Federal agencies also may be involved, as in the case of the Aspinall Unit, and compensation will be required where storage water is already under contract.)

Utah

Legal protection of flows in Utah will be achieved differently than in Colorado. Several approaches can be taken under Utah water law to protect instream flows, including: 1) acquiring existing water rights and filing change applications to provide for instream flow purposes; 2) withdrawing unappropriated waters by governor's proclamation; 3) approving presently filed and future applications subject to minimum flow levels; and 4) with proper compensation, preparing and executing contracts and subordinating diversions associated with approved and perfected rights. Although current Utah water law may not fully provide for all aspects of instream-flow protection, Utah does believe they can provide an adequate level of protection.

Utah examined available flow protection approaches and determined that the strategy they will use most commonly will be to condition the approval of presently filed and new applications, making them subject to predetermined streamflow levels. To accomplish this, the State Engineer adds a condition of approval to water-right applications (within the area) filed after the policy is adopted. The condition states that whenever the flow of the Green River (or other streams) drops below the predetermined streamflow level, then diversions associated with water rights approved after the condition is imposed are prohibited. Based on past legal challenges to the State's authority to impose conditions associated with new approvals, it was determined that this is within the authority of the State Engineer. This approach does not specifically recognize an instream-flow right; however, it does protect the flows from being diverted and used by subsequently approved water rights. This approach was adopted as policy by the State Engineer. The policy requires that presently filed and new applications to be approved are subject to the summer and fall flow recommendations. As flow recommendations are finalized and accepted, Utah will review options for protecting the recommended flows.

2.2 II. RESTORE AND PROTECT HABITAT

Important elements of habitat protection include restoring and managing in-channel habitat and historically flooded bottomland areas, restoring passage to historically occupied river reaches, preventing fish entrainment at diversion structures (if

warranted), enhancing water temperatures, and reducing or eliminating the impacts of contaminants.

Historically, Upper Colorado River Basin floodplains were frequently inundated by spring runoff, but today much of the river is channelized by levees, dikes, rip-rap, and tamarisk. Fish access to these flooded bottomlands has been further reduced by decreased peak spring flows due to upstream impoundments. Numerous studies have suggested the importance of seasonal flooding to river productivity, and flooded bottomlands have been shown to contain large numbers of zooplankton and benthic organisms. Floodplain areas inundated and temporarily connected to the main channel by spring flows appear to be important habitats for all life stages of razorback sucker, and the seasonal timing of razorback sucker reproduction suggests an adaptation for utilizing these habitats. Restoring access to these warm and productive habitats would provide the growth and conditioning environments that appear crucial for recovery of self-sustaining razorback sucker populations. In addition, Colorado pikeminnow also use these areas for feeding prior to migrating to spawning areas. Inundation of floodplain habitats, although most important for razorback sucker, would benefit other native fishes by providing growth and conditioning environments and by restoring ecological processes dependent on periodic river-floodplain connections. Restoration of floodplain habitats could be achieved through a combination of increased peak flows, prolonged peak-flow duration, lower bank or levee heights, and constructed inlets. Studies have shown that full utilization of these floodplain habitats has been hampered by the presence of large numbers of predacious and competing nonnative fish. Studies are underway to determine how this interaction may be reduced to enhance use of these habitats by endangered fish. For example, additional evaluation of the floodplain reset theory will be needed to determine if nonnative fish can be reduced or eliminated during low-flow years.

The Recovery Action Plans contain tasks to identify and restore important flooded bottomland habitats. During 1994, the Recovery Program completed an inventory of floodplain habitats for 870 miles of the Colorado, Green, Gunnison, Yampa, and White rivers. From the list of inventoried habitats, high-priority sites were screened for restoration potential. Site acquisition began in 1994 and continued through 2003. Since 2003, the Program has completed the razorback sucker floodplain habitat model and floodplain management plans for the Green and Colorado River sub-basins (subject to revision as new information is gathered). Based on the model and these management plans, the Program has shifted from screening additional floodplain sites for potential restoration/acquisition to focusing on sites already acquired or otherwise available for management. Success will be measured by the response of the endangered fish populations.

The General Recovery Program Support Action Plan contains tasks to develop an issue paper on floodplain restoration and protection. This paper identified legal, institutional, and political strategies to enhance and protect floodplain habitats for the endangered fishes and ameliorate the effects of levees, diking, rip-rap, gravel mining, and other

forms of floodplain development. Phase 1 of the issue paper identified what floodplain restoration and protection is needed for the endangered fishes; Phase 2 determined how to accomplish that restoration and protection. The issue paper evaluated responsibilities of the Recovery Program, Recovery Program participants, and other agencies involved in floodplain development, regulation, and management, and their roles and responsibilities with respect to endangered species.

Passage barriers have fragmented endangered fish populations and their habitats, resulting in confinement of the fishes to 20 percent of their former range. Blockage of Colorado pikeminnow movement by dams and water-diversion structures has been suggested as an important cause of the decline of this species in the Upper Basin (Tyus 1984; U.S. Fish and Wildlife Service 1991). Restoring access to historically occupied habitats via fish passage ways was identified in the Colorado Squawfish [Pikeminnow] Recovery Plan (U.S. Fish and Wildlife Service 1991) and in the recovery goals (U.S. Fish and Wildlife Service 2002c) as one of several means to aid in Colorado pikeminnow recovery.

The Recovery Action Plans contain tasks to assess and make recommendations for fish passage at various dams and diversion structures. The need for passage already has been determined at four sites: Redlands, Grand Valley Irrigation Company (GVIC), Price Stubb, and the Grand Valley Project. Passage has been restored at the Redlands Diversion Dam on the Gunnison River and at the GVIC and GVP diversions on the mainstem Colorado River near Palisade, Colorado. Activities are underway to restore passage at Price-Stubb.

Diversion canals have been found to entrain native and endangered fishes. Construction of fish screens to prevent entrainment of adult and subadult fish is in the planning and design stage at Tusher Wash and construction was completed at the Grand Valley Project and Redlands during 2005. Construction of a screen at the GVIC diversion canal was completed in 2002, but additional improvements to this screen are anticipated. Potential entrainment of Colorado pikeminnow in diversion structures on the Yampa River may be evaluated beginning in 2007.

A number of potentially harmful contaminants (including selenium, petroleum derivatives, heavy metals, ammonia, and uranium) and suspected contaminant "hot spots" have been identified in the Upper Basin. It is the intent of the Recovery Program to support and encourage the activities of entities outside the Recovery Program that are working to identify problem sites, evaluate contaminant impacts, and reduce or eliminate those impacts.

2.3 III. REDUCE NEGATIVE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES

Fifty-two fish species occur in the Upper Basin, but only 13 of those are native species. Many of the nonnative fishes have been successful due to changes in the river system

that favor their survival over that of native fishes. Competition with and predation by nonnative species is widely assumed to have played a role in the decline of the endangered fishes (Tyus and Saunders 1996). However, evidence of direct impacts of introduced species on native fishes is difficult to obtain (Schoenherr 1981) and often is masked by human-caused habitat alterations (Moyle 1976).

In studies on the Green River, researchers documented that young Colorado pikeminnow constituted 5% of the diet of northern pike, even though young Colorado pikeminnow made up a much smaller portion of the available food base in the river (Crowl and Lentsch 1996). Researchers estimated that a single northern pike could consume 100 or more young Colorado pikeminnow per year. Also, northern pike are known to prey on adult Colorado pikeminnow, native roundtail chub (*Gila robusta*), flannelmouth and bluehead suckers, and may also feed on humpback chubs in the Yampa River. Colorado has completed a fisheries management plan for the Yampa River basin (a revision is pending). Smallmouth bass in the Yampa River have rapidly increased in abundance and pose a significant predatory and competitive threat to the endangered fishes.

Recovery Program activities related to nonnative fishes initially focused on identifying impacts/interactions and developing nonnative fish stocking procedures. Nonnative fish control strategies were developed to identify and prioritize options for controlling or removing nonnative fishes from river reaches occupied by the endangered fishes as well as other reaches that serve as production areas for nonnatives that subsequently disperse into occupied habitat (Tyus and Saunders 1996; Lentsch et al. 1996; Hawkins and Nesler 1991). In February 2004, the Recovery Program adopted a nonnative fish management policy that addresses the process of identifying and implementing nonnative fish management actions needed to recover the endangered fishes. Through 2006, emphasis has been focused on the control activities identified in these strategies. All nonnative fish control activities are being evaluated for effectiveness and continued as appropriate.

The States and the Service also have developed final procedures for stocking of nonnative fishes in the Upper Basin (USFWS 1996a, 1996b). The procedures are designed to reduce the impact on native fishes due to stocking of nonnative fishes in the Upper Basin and clarify the role of the States, the Service, and others in the review of stocking proposals. A memorandum of understanding has been signed by the States and the Service implementing the Stocking Procedures. The Stocking Procedures will be reviewed for possible revisions in 2007.

2.4 IV. CONSERVE GENETIC INTEGRITY AND AUGMENT OR RESTORE POPULATIONS

Species recovery depends on protecting and managing species genetic resources. This is a complex activity that includes: determining the genetic diversity of the endangered fishes; protecting species in refugia; planning, developing, and operating propagation

facilities; propagating fish for augmentation or restoration, research, and information and education; and planning, implementing, and evaluating augmentation or restoration of species. Stocking is only an interim tool in the Recovery Program because recovery, by definition, implies that the populations will be self-sustaining in the wild. The success of augmentation and restoration stocking is dependent on prior or concurrent implementation of other recovery actions such as flow protection, habitat restoration, and management of nonnative fishes. This dependency is reflected in the schedule of subbasin-specific actions in Section 4.0.

The Recovery Program has recognized the need to increase augmentation and restoration stocking (primarily for razorback sucker and bonytail), both for recovery of the species and to establish fish in the system to be able to demonstrate that habitat and instream flow activities are having an effect on endangered fish recovery. The Recovery Program is implementing an integrated stocking plan developed for bonytail, Colorado pikeminnow (stocking on hold), and razorback sucker. The Recovery Program continues to evaluate the need for implementing an integrated stocking plan for humpback chub especially for restoring specific stocks thought to be too low for adequate natural recruitment. Humpback chub is not currently being stocked; however, augmentation of existing small populations may become necessary.

Studies to confirm genetic diversity have been vital to genetics management of the endangered fishes. Species are being protected in refugia to develop broodstocks and guard against catastrophe. Representatives of species thought to be in immediate danger of extinction are brought into refugia immediately. Refugia populations of species are developed using paired breeding matrices to maximize genetic variability and maintain genetic integrity.

Most of this work is included under the General Recovery Program Support Action Plan because it applies Upper Basin wide. Subbasin-specific activities of augmenting or restoring species are placed under the subbasin Action Plans. Augmentation or restoration plans are being implemented, fish produced, and river reaches restored and augmented with those fish. The effects of these augmentation efforts need to be monitored and evaluated.

Four basic documents are used to plan, implement, and coordinate genetics management and artificial propagation for the endangered fishes. These are the Genetics Management Guidelines, Genetics Management Plan, Integrated Stocking Plan, and Coordinated Hatchery Facility Plan (Facility Plan). All four of these plans have been developed and will be revised or updated as needed.

The Genetics Management Guidelines document provides the rationale, genetics concepts, and genetic risks to be considered in genetics-management planning and implementation. For example, it indicates that a fish population is the fundamental unit of genetics management and that its definition and characterization, relative to other populations, are important. Genetic surveys have been part of the identification and

characterization process. Further, the prioritization and genetics management required for each population is determined by its relative population status, demographic trends, and genetics data derived from the surveys.

The Genetics Management Plan is the operational document. It tells the "what, who, when, where" of implementation. It identifies specific objectives, tasks, activities, and type of facilities necessary to accomplish Recovery Program goals, i.e., protect population genetic integrity or restore a self-sustaining population in the wild. It is the action plan developed for implementation, directed by the Recovery Program goals, and structured along the format presented in the Genetics Management Planning Guidelines document.

Genetics management requires a great deal of operational activity. Refugia and propagation facilities have been planned, built, and are now operated in a coordinated fashion. The Integrated Stocking Plan (Nesler et al. 2003) provides specific annual numbers of fish and their sizes to be produced at Program hatcheries and stocked into Upper Colorado River Basin river reaches.

Facilities are required to meet long-term (5 years or more) augmentation and restoration stocking needs. The plans for these facilities are the Coordinated Hatchery Facility Plan and the Facilities Plan. These plans, in accordance with the Genetics Management Plan, define facilities required to meet propagation needs, identify fish needs that can be met by existing facilities, and recommend expansion or modification of existing facilities.

2.5 V. MONITOR POPULATIONS AND HABITAT AND CONDUCT RESEARCH TO SUPPORT RECOVERY ACTIONS

This category consists primarily of research and monitoring activities that have application to more than one of the foregoing elements. In the General Recovery Program Support Action Plan, this element includes: monitoring populations and habitat and annually assessing changes in habitat and population parameters (i.e., population estimates); determining gaps in existing life-history information and recommending and conducting research to fill those gaps; and improving scientific research and sampling techniques. Research activities are identified for each subbasin only to the extent that such activities are related to another recovery action in that subbasin. Such identification now, however, does not preclude further research in that subbasin that may be identified later or that is identified in the General Recovery Program Support Action Plan.2.6

VI. INCREASE PUBLIC AWARENESS AND SUPPORT FOR THE ENDANGERED FISHES AND THE RECOVERY PROGRAM

Public information and education is crucial to the Recovery Program's success. A strategic, multi-faceted information and education program is being implemented to:

develop public involvement strategies at the beginning of any and all projects; educate target audiences (including media, the public and elected officials) about endangered fish and increase their understanding of and support for the recovery of these fish at local, state and national levels; provide opportunities for the public to participate in activities that support recovery; and improve communication and cooperation among members of the Recovery Program.

Numerous site-specific activities are undertaken to promote understanding of, and support for, Recovery Program actions and to involve the public in decisions which may impact specific locations in the Upper Basin. These include public meetings, presentations, communications (e-mails, newsletters, etc.), exhibits and distribution of Recovery Program publications.

The information and education program continues to develop a number of products including an annual newsletter; up-to-date fact sheets; interpretive signs and displays; bookmarks; Congressional briefing documents; and a public website. In addition, the Recovery Program actively seeks news media coverage of its activities. Special educational publications are produced as needed.

Because funding for capital construction and ongoing operation and maintenance (O&M) for the Upper Colorado River and San Juan River Basin Recovery Programs is tied together in Federal legislation (public laws 106-392, 107-375 and 109-183) through 2008 for capital projects and 2011 for O&M, an annual publication is produced that highlights accomplishments of both programs. The *Program Highlights* publication serves as a briefing document for the partners' annual visit to Washington, D.C., and is used for numerous other purposes throughout the year.

In 2005, leaders of both Recovery Programs agreed to work more closely in the future to coordinate communication and outreach efforts. This helps ensure that shared audiences receive accurate, consistent information about the endangered fish species and efforts to recover them. It is also more cost-effective by sharing publication production costs and exhibit fees. In 2006, a logo and banner stand were developed for the San Juan River Basin Recovery Implementation Program. In addition, modifications were made to the Upper Colorado River Recovery Program's exhibit to promote both programs and the *Swimming Upstream* newsletter content was integrated. An integrated brochure is planned for 2007.

The Recovery Programs will continue to work with other organizations throughout the Colorado River Basin to ensure that information about the endangered fishes is consistent and accurate.

2.7 VII. PROVIDE PROGRAM PLANNING AND SUPPORT

This work also is placed entirely under the General Recovery Program Support Action Plan. Recovery Program planning and support includes planning and tracking recovery

activities, participation in Recovery Program committees, and managing, directing, and coordinating the overall Recovery Program. Another important program support activity involves securing the funding necessary to implement the Recovery Program.

3.0 DISCUSSION OF SUBBASIN RECOVERY PRIORITIES

Following is a summary of the importance of the various subbasins in the Upper Colorado River Basin to the endangered fishes and a brief discussion of the major actions directed at recovering the endangered fishes in these subbasins. A more detailed accounting of the activities, including funding requirements and schedules is found in Sections 4.0 and 5.0.

3.1 GREEN RIVER

3.1.1 Importance

The Green River system supports populations of humpback chub and Colorado pikeminnow, and it historically supported populations of bonytail and razorback sucker. The importance of the Green River to the endangered fishes has been established by the Recovery Program and recognized by many biologists. The Colorado Squawfish [Pikeminnow] Recovery Plan (U.S. Fish and Wildlife Service 1991) listed the Green River as the highest priority area for recovery of the species, and the recovery goals (U.S. Fish and Wildlife Service 2002c) consider the Green River subbasin as the center of the Upper Basin Colorado pikeminnow metapopulation. Habitat in Desolation and Gray canyons supports a self-sustaining humpback chub population, and the last known riverine concentration of wild bonytail was in the Green River within Dinosaur National Monument (U.S. Fish and Wildlife Service 1990a, 1990b, 2002a, 2002b). Recovery plans for humpback chub (U.S. Fish and Wildlife Service 1990a) and bonytail (U.S. Fish and Wildlife Service 1990b) identified the Green River in Desolation and Gray canyons and in Dinosaur National Monument as important to recovery. Until recently, the Green River supported the last known riverine concentration of wild razorback sucker (Lanigan and Tyus 1989; U.S. Fish and Wildlife Service 1998, 2002d).

3.1.2 Recovery Actions

Recovery actions in the Green River have focused on refining the operation of Flaming Gorge dam to enhance habitat conditions for the endangered fishes. A biological opinion was issued on the operation of Flaming Gorge Dam in 1992. This opinion contained seasonal flow recommendations for the Green River at Jensen, Utah, and called for additional research under a specific set of research flows to collect information needed to refine the flow recommendations (particularly flow recommendations for spring and winter) and to develop flow recommendations for other areas of the Green River. The effects of the test flows on the endangered fishes and their habitat were evaluated through a variety of studies through 1997, and a final report including revised

flow recommendations was completed (Muth et al. 2000). National Environmental Policy Act (NEPA) compliance on reoperation of Flaming Gorge Dam was completed in 2006 with a Record of Decision executed in February. A new biological opinion was completed in 2005. A study plan for the implementation and evaluation of flow and temperature recommendations for endangered fishes in the Green River downstream of Flaming Gorge Dam was completed in 2007 (Green River Study Plan ad hoc Committee 2007).

Flow recommendations also have been developed for some tributaries to the Green River, such as the Yampa, White (interim flow recommendations), and Duchesne rivers. Tributary and mainstem flow recommendations will be carefully coordinated to address recovery needs from an Upper Basin wide perspective.

An element of the 1992 Flaming Gorge Dam biological opinion identified the need to protect dam releases from possible diversion in the occupied habitat of the endangered fishes. The initial focus of this effort was to legally protect Flaming Gorge releases in the Green River down to the confluence of the Duchesne River for the months of July through October. Flow protection for the remainder of the year (November–June) and downstream to Canyonlands National Park will be addressed by Utah now that the final Environmental Impact Statement, Record of Decision, and biological opinion on reoperation of Flaming Gorge Dam have been issued.

Other Green River activities involve restoration of bottomlands adjacent to the Green River that flood in the spring and provide important habitat for razorback sucker and Colorado pikeminnow. Levees have been breached to restore 9 sites (574 acres) and perpetual easements have been acquired on six properties (1008 acres).

Projects to identify nonnative fish control strategies for the Green River have been implemented. Active control of northern pike (*Esox lucius*) began in 2001. Active control of smallmouth bass began in 2004.

Refuge (captive) populations of razorback sucker collected from the Green River are being maintained at the Ouray National Fish Hatchery, Ouray, Utah, with backup broodstock being maintained at Wahweap State Fish hatchery, Big Water, Utah. A plan for augmenting razorback sucker in the Green River using hatchery propagated fish was developed and is currently being implemented. Stocking of bonytail in Lodore Canyon was initiated in 2000 in accordance with a stocking plan developed by the State of Colorado. The integrated stocking plan requires stocking of bonytail and razorback sucker in the Green River near Jensen and Green River, Utah.

Population estimates began in 2001 for Colorado pikeminnow in the entire Green River subbasin (Bestgen et al. 2005). Population estimates for humpback chub in Desolation and Gray canyons were conducted in 2001 and 2002, and expanded in 2003 (Jackson and Hudson 2005).

Contamination of water in Stewart Lake and Ashley Creek near Jensen, Utah, with selenium may adversely affect razorback sucker. The Service, U.S. Environmental Protection Agency, and U.S. Bureau of Reclamation (Reclamation) are actively pursuing clean-up activities in these areas independent of the Recovery Program.

3.2 YAMPA RIVER AND LITTLE SNAKE RIVER

3.2.1 Importance

The Yampa River is the largest remaining essentially unregulated river in the Upper Colorado River Basin, and its inflow into the Green River, 65 miles downstream of Flaming Gorge Dam, ameliorates some effects of dam operation on river flow, sediment load, and temperature (Muth et al. 2000). Holden (1980) concluded that flows from the Yampa River, especially spring peak flows, were crucial to the maintenance of the Green River's "large-river" characteristics and, therefore, very important to maintaining suitable conditions in the Green River downstream of the confluence. The Yampa River supports resident subadult and adult Colorado pikeminnow, contains one of the primary Colorado pikeminnow spawning areas in the Upper Basin and is a major producer of fish for the entire Green River subbasin (Tyus and Karp 1989). A small population of humpback chub exists in the Yampa River in Dinosaur National Monument (Tyus and Karp 1989; U.S. Fish and Wildlife Service 1990a, 2002a). Spawning aggregations of adult razorback sucker were observed near the mouth of the Yampa River, and adult razorback sucker were captured upstream to the mouth of the Little Snake River (Tyus and Karp 1989). The lower portion of the Yampa River was part of the historic range of bonytail and is associated with some of the most recent captures of this very rare fish. The Bonytail Recovery Plan (U.S. Fish and Wildlife Service 1990b) identified the Yampa River within Dinosaur National Monument as a high priority recovery and/or restoration site.

The Little Snake River provides approximately 28% of the Yampa River's flow and 60% of the Yampa River's sediment supply. The sediment supply of the Little Snake River is believed to be important to the maintenance of backwater nursery areas utilized by young Colorado pikeminnow in the Green River (Smith and Green 1991). Adult Colorado pikeminnow have been captured in the Little Snake River upstream to near Baggs, Wyoming, and humpback chub have been captured in the lower 10 miles of the Little Snake River (U.S. Fish and Wildlife Service 2002a, 2002c).

3.2.2 Recovery Actions

Recovery actions in the Yampa River are focused on control of nonnative fishes and maintaining and legally protecting the flow regime required to recover the endangered fishes. To achieve these objectives, the Recovery Program developed the Yampa River Management Plan which identifies management actions necessary to provide and protect the needs of the endangered fishes while existing depletions for human use continue and water resources are developed to serve foreseeable future human needs

in the Yampa River basin (Roehm 2004). The plan proposed to augment Yampa River base flows in accordance with the Yampa River flow recommendations (Modde et al. 1999). Of thirteen alternatives identified and evaluated in the Plan, enlargement of Elkhead Reservoir provided the most reliable water supply at a moderate cost. Construction of the enlargement is complete and water is expected to be provided on a test basis in 2007. The Program funded a 5,000 af pool of permanent storage out of the 12,000 af Elkhead enlargement and may lease up to an additional 2,000 af on an as-needed basis.

Colorado filed for a junior instream-flow water right for the Yampa River between the confluences of the Williams Fork and Little Snake rivers in December 1995. Forty-eight statements of opposition were filed against these filings in State water court.

As a result of concerns expressed by the Service and other Program participants, CWCB withdrew the baseflow and recovery flow instream-flow filings on the Yampa and Colorado rivers. With the approval of the PBO for the upper Colorado River upstream of the Gunnison River confluence, CDOW staff was instructed by CWCB to develop new methodologies and flow recommendations.

A cooperative agreement implementing the Yampa River Management Plan and a PBO were completed for the Yampa River in 2005. In 2009, the Recovery Program and CWCB will review CDOW's flow recommendation methodology and progress of performance under the Yampa PBO. During 2008 (the fourth year of the first 5-year period after completion of the PBO), the Recovery Program and CWCB will develop a process for assessing the need for further instream-flow protection for the endangered fishes in the Yampa River. On completion of this review, a determination will be made regarding the need for additional instream-flow protection for the endangered fishes.

Flows in the Little Snake River after estimated future depletions were identified in the Yampa River Management Plan and Environmental Assessment (Roehm 2004).

The Recovery Program has evaluated several low-head agricultural-water diversion dams on the Yampa River for Colorado pikeminnow passage. A variety of existing diversions between Craig, Colorado, and Dinosaur National Monument were inventoried in 1994–1995. Several diversions were identified as possible barriers to fish migration under certain conditions. However, due to uncertainties about whether these diversions were in fact barriers to Colorado pikeminnow movement during the migration period, a study was conducted to determine threshold flows for adult Colorado pikeminnow passage on the Yampa River between Craig and Dinosaur National Monument. It was determined that these barriers present little if any problem to fish movement during the periods when Colorado pikeminnow migrate to and from spawning habitats downstream. Entrainment of Colorado pikeminnow in larger diversions may be evaluated beginning in 2007.

The Recovery Program began removing nonnative sportfish from certain reaches of the Yampa River and, where feasible, relocating them to more acceptable waters in 1999. Active control of channel catfish in Yampa Canyon began in 2001. This work was discontinued in 2007 (except for incidental removal of very large fish) to focus on smallmouth bass control. In 2004, the Program began tagging northern pike in the Yampa River upstream of the Hayden Bridge to determine if it is a significant source of northern pike moving downstream into critical habitat. Active control of northern pike downstream of Hayden began in 2003. In 2005, CDOW began undertaking work to determine sources of northern pike that may gain access to endangered fish critical habitat in the Yampa River. Active control of smallmouth bass in a 12-mile treatment reach in Little Yampa Canyon, a 5-mile treatment reach in Lily Park, and in the lower Yampa River in Yampa Canyon began in 2004. The 12-mile treatment was expanded to 24 miles in 2006 in order to geographically include the targeted population. Control was also expanded in 2006 to include the South Beach reach immediately upstream of the Little Yampa Canyon treatment reach in order to focus control on concentration areas.

The Program's integrated stocking plan (Nesler et al. 2003) outlines plans for stocking bonytail in the middle Green and Yampa rivers. Stocking bonytail in the Yampa River was initiated in 2000.

3.3 DUCHESNE RIVER

3.3.1 Importance

Colorado pikeminnow and razorback sucker regularly utilize the mouth of the Duchesne River especially during spring runoff. Fishery surveys conducted in 1993 documented the use of the lower 15 miles of the Duchesne River by Colorado pikeminnow and razorback sucker. More recently, fish surveys have been conducted in the lower 33 miles of the Duchesne River and have documented seasonal use by Colorado pikeminnow and razorback sucker.

3.3.2 Recovery Actions

Initial flow recommendations were developed for the Duchesne River in 1995 to address immediate concerns of several proposed water projects being considered in the Duchesne River basin. A follow-up study to evaluate and refine these flow recommendations began in 1997 and was completed in 2003 (Modde and Keleher 2003). A water availability study was completed that identified sources of water to meet the flow recommendations. A coordinated reservoir operations study was completed in 2004. The Duchesne Biological Opinion issued in 1998 was updated in 2005. Agreements will be developed to provide flows in the Duchesne River for the endangered fishes.

Control of nonnative fishes in the Duchesne will be discontinued in 2007. Efforts will be reallocated to smallmouth bass concentration areas in the Green River. A study to determine escapement of nonnative fishes from Starvation Reservoir was begun in 2002; a final report was approved in January 2007. Results suggest that escapement is occurring, but not enough to warrant the installation of screens.

3.4 WHITE RIVER

3.4.1 Importance

Adult Colorado pikeminnow occupy the White River downstream of Taylor Draw Dam near Rangely, Colorado, in relatively high numbers. Adult Colorado pikeminnow resident to the White River spawn in the Green and Yampa rivers. Juvenile and subadult Colorado pikeminnow also utilize the White River on a year-round basis. Incidental captures of razorback sucker have been recorded in the lower White River. Construction of Taylor Draw Dam in 1984 blocked Colorado pikeminnow migration to upper portions of the White River.

3.4.2 Recovery Actions

A work plan for the White River was developed to synthesize current information about the endangered fish and provide recommendations for specific recovery actions, including the merits of providing fish passage at Taylor Draw Dam. Interim flow recommendations for the White River were completed in 2004 (Irving et al. 2004) and will be reviewed in 2007. The availability of data needed to update the flow recommendations will be assessed and a determination made regarding the need for and timing of refinement of the recommendations. Instream-flow filings are on hold pending reevaluation of how flows will be legally protected in Colorado.

3.5 COLORADO RIVER

3.5.1 Importance

The mainstem Colorado River from Rifle, Colorado, to Lake Powell, Utah, supports populations of humpback chub and Colorado pikeminnow, and is recognized as important to the recovery of all four endangered fishes (U.S. Fish and Wildlife Service 1990a, 1990b, 1991, 1998, 2002a, 2002b, 2002c, 2002d). Relatively large and healthy humpback chub populations occur at Black Rocks and Westwater Canyon near the Utah-Colorado state line. A smaller humpback chub population occurs in Cataract Canyon, and some of the last wild bonytail were collected in this river reach. All life stages of Colorado pikeminnow occur in the section of river from Palisade, Colorado, downstream to Lake Powell. Colorado pikeminnow have been translocated and stocked into the upper reach of the Colorado River between Palisade and Rifle, Colorado; natural access to this historic-habitat reach has been blocked since the early 1900's by three diversion dams near Palisade. Razorback sucker populations in the mainstem

Colorado River have declined precipitously in the past 20 years. In 1993, 67 adult razorback sucker were collected from isolated ponds adjacent to the Colorado River near Debeque, Colorado. Since then, only a few wild adult razorback sucker have been captured from the river, and there is no evidence of successful reproduction in the Colorado River.

3.5.2 Recovery Actions

A variety of recovery actions are planned, ongoing, or completed for the Colorado River. Numerous approaches are being taken to restore flows in the 15-mile reach immediately upstream of from the confluence of the Gunnison River to levels recommended by the Service. Reclamation has made available 5,000 acre-feet of water annually plus an additional 5,000 acre-feet in four of every five years from Ruedi Reservoir to augment flows in the 15-mile reach during July, August, and September. In addition, water is available from the lease of 10,825 acre-feet/year of water from Ruedi Reservoir and permanent commitment of 10,825 acre-feet/year from East and West slope water users. The East and West slope commitments were secured in 2000 by Memoranda of Agreement (MOA) with the Colorado River Water Conservation District (CRWCD) and Denver Water for delivery of 5,412 acre-feet of water from Wolford Mountain Reservoir and 5,412 acre-feet from Williams Fork Reservoir, respectively. By 2009, CRWCD and Denver Water will have a plan in place to permanently replace the water now being delivered by Wolford and Williams Fork reservoirs. Additional water is being provided through an MOA with CRWCD for delivery of up to 6,000 acre-feet of water from Wolford Mountain Reservoir.

In 1992, Colorado filed an application in State water court for a 581 cubic feet per second (cfs) instream-flow right in the 15-mile reach for the months of July, August, and September. A final decree was issued in 1997. Colorado filed for a junior instream-flow right for the 15-Mile Reach in December 1995, which was opposed in State water court.

As a result of concerns expressed by the Service and other Recovery Program participants, CWCB withdrew the baseflow and recovery flow instream-flow filings on the Colorado and Yampa rivers. With the approval of the PBO for the upper Colorado River upstream of the Gunnison River confluence, CDOW staff was instructed by CWCB to develop new methodologies and flow recommendations. The Recovery Program and CWCB will reevaluate the need for instream-flow filings 5 years as called for in the PBO.

Flow recommendations and protection for the Colorado River downstream from the confluence of the Gunnison River will be addressed following completion of the Biological Opinion on reoperation of the Aspinall Unit.

Other sources of water for the 15-mile reach include construction of the Grand Valley Water Management Project and operation of Federal and private projects. A study of

options for providing additional water primarily to augment spring peak flows was completed in 2003. Water users are exploring ways to increase participation in the expanded coordinated reservoir operations (CROS) as recommended in the study report and completed a CROS implementation plan in February 2006.

Reclamation has constructed fish passage at the GVIC and GVP diversion dams on the upper Colorado River. Construction of passage at the Price-Stubb diversion dam is scheduled for FY 2007-2008. Successfully providing fish passage at these diversion dams would benefit both Colorado pikeminnow and razorback sucker by providing access to approximately 50 miles of the river that was used historically by these fishes. To prevent entrainment of endangered fishes into diversion canals, fish screens have been constructed at GVIC and at the Grand Valley Project.

To restore floodplain habitats, levees have been breached to at 3 sites (46 acres) and ten properties acquired in perpetual easement or fee title to protect 394 acres.

Active control of smallmouth bass began in 2004. Operation of the fish barrier net at Highline Reservoir has been ongoing since 1999; the net was replaced in March 2006. CDOW began a study to determine the source of centrarchid fishes in 2003.

Razorback sucker and bonytail are being stocked in the Colorado River in accordance with the integrated stocking plan (Nesler et al. 2003).

3.6 GUNNISON RIVER

3.6.1 Importance

The Gunnison River is currently occupied by wild Colorado pikeminnow and is historic habitat for razorback sucker and bonytail. Several adult Colorado pikeminnow were captured in the Gunnison River in fishery surveys conducted in 1992 and 1993. Unrestricted migration of fish has been limited by the 10-foot high Redlands diversion dam located 2 miles upstream from the mouth of the Gunnison River. Several Colorado pikeminnow larvae have been collected in the Gunnison River upstream and downstream of the Redlands diversion dam. Kidd (1977) reported that adult razorback sucker were collected frequently by commercial fishermen near Delta, Colorado, between 1930 and 1950. Wild razorback sucker have not been collected in the Gunnison River in recent times, although the reach near Delta is considered a priority razorback sucker restoration site.

3.6.2 Recovery Actions

Recovery activities on the Gunnison River are focused on operating and evaluating a fish ladder at the Redlands diversion dam, reoperating the Aspinall Unit to improve flow/habitat conditions in the Gunnison River, and restoring flooded bottomland habitats near Delta. Perpetual easements have been acquired on three properties (198 acres).

Construction of a fish ladder at the Redlands diversion dam was completed in 1996 and has provided for passage of Colorado pikeminnow, razorback sucker, and other native fishes (as well as allowing exclusion of nonnative fishes). To prevent entrainment of adult and subadult endangered fish into diversion canals, a fish screen was installed at Redlands in 2005.

A 5-year research plan to evaluate the effects of the Aspinall Unit on the endangered fishes and their habitat was completed in 1997. During this research period, Reclamation and Western Area Power Administration provided test flows. The research culminated with the Service's final flow recommendations in 2003 (McAda 2003). Reclamation has begun the NEPA process and the Service will issue a biological opinion following completion of the EIS. Legal protection of Aspinall releases and State protection of instream flows in the Gunnison River will be addressed as the biological opinion on the Aspinall Unit is developed.

Beginning in 1995, the Service experimentally stocked razorback sucker in the Gunnison River near Delta. Nine razorback sucker have used the Redlands fish ladder since summer 2001 (one of which was stocked in 1996). The State of Colorado stocking plan for razorback sucker was revised in 2001 to stock fewer but larger fish. Larval razorback sucker were collected in the Gunnison River (8 in 2002, 7 in 2003, and 2 in 2005), indicating that stocked fish are reproducing. Stocking of razorback sucker continues in the Gunnison River, in accordance with the integrated stocking plan.

3.7 DOLORES RIVER

3.7.1 Importance

The Dolores River is historic habitat for Colorado pikeminnow; both adult and young-of-the-year fish were captured in the 1950's and 1960's. Valdez et al. (1991) documented the use of the lower 1 mile of river by Colorado pikeminnow. Uranium processing facilities operated during the late 1940's through the 1960's severely impacted the river and may have contributed to the decline of Colorado pikeminnow in the Dolores River drainage. Since 1996, bonytail have been stocked in the Colorado River near the confluence of the Dolores.

3.7.2 Recovery Actions

Recovery actions for the Dolores River drainage have been limited to preventing escapement of nonnative sport fish (e.g., smallmouth bass, yellow perch, and kokanee salmon) from McPhee Reservoir. Environmental contaminant clean-up is being pursued by State and Federal agencies independent of the Recovery Program. Inflows from the Dolores River that may be identified in the future as necessary to recover the endangered fishes on the mainstem of the Colorado River will need to be legally protected. It is unknown if stocked bonytail are using the Dolores River. Use of the

Dolores River by endangered fish, particularly stocked bonytail, will be evaluated by Utah.

4.0 RECOVERY ACTION PLANS

The tasks in these Recovery Action Plans are prioritized by their schedules. Schedules are shown where they have been identified (if all the year columns for an activity are blank, then the activity has not yet been scheduled). If a completion date has been identified, it is shown under the appropriate fiscal year. Where specific dates have not been identified, but an action is ongoing, beginning, or ending in a year, an "X" appears in that year's column. The "who" column identifies the lead responsible agency (listed first) and any cooperating agencies. The status column is used where additional narrative is needed to explain the duration, status, etc. of an activity. Once again, the caret ">" identifies those recovery actions which are expected to result in a measurable population response, a measurable improvement in habitat for the fishes, legal protection of flows needed for recovery, or a reduction in the threat of immediate extinction. An asterisk (*) identifies those activities which will contribute to the RIPRAP serving as a reasonable and prudent alternative to the likely destruction or adverse modification of critical habitat.

The Recovery Action Plans are formatted in stepdown-outline tables. This is reflected in the numbering system and indenting. Some actions which assess options or the feasibility of a recovery action are followed by a subsequent implementation step, and others are not, depending on how feasible the implementation step is considered to be at this time.

The following abbreviations are used to identify lead/cooperating agencies:

BR	U.S. Bureau of Reclamation
CO	State of Colorado
CDA	Colorado Department of Agriculture
CDOPR	Colorado Division of Parks and Outdoor Recreation
CDOW	Colorado Division of Wildlife
CRWCD	Colorado River Water Conservation District
CWCB	Colorado Water Conservation Board
FWS	U.S. Fish and Wildlife Service
	-ES Ecological Services
	-FR Fishery Resources
	-RW Refuges and Wildlife
	-WR Water Resources
LFL	Larval Fish Laboratory
NWCD	Northern Water Conservancy District
PD	Recovery Program Director
TBD	To be determined
UT	State of Utah
UDWR	Utah Division of Wildlife Resources
UTWR	Utah Division of Water Resources
WYGF	Wyoming Game and Fish Department

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APPENDIX: CRITICAL HABITAT ANALYSIS
September 8, 1994

BACKGROUND

The final rule determining critical habitat for the four endangered fishes was published in the Federal Register on March 21, 1994, and the final designation became effective on April 20, 1994. As stated in the Section 7 Agreement and in the RIPRAP, the Recovery Program is intended to serve as the reasonable and prudent alternative to avoid the likely destruction or adverse modification of critical habitat, as well as to avoid the likelihood of jeopardy to the continued existence of the endangered fishes resulting from depletion impacts of new projects and all existing or past impacts related to historic water projects with the exception of the discharge by historic projects of pollutants such as trace elements, heavy metals, and pesticides. Once critical habitat was designated, the Service reviewed the RIPRAP, and in coordination with the Recovery Program's Management Committee, developed modifications to fulfill this intent.

The Service's review concluded that many of the actions in the existing RIPRAP would not only contribute to allowing the Recovery Program to continue to serve as the reasonable and prudent alternative to avoid the likelihood of jeopardy to the continued existence of the endangered fishes, but also would avoid the likely destruction or adverse modification of critical habitat for the endangered fishes. Specifically, the RIPRAP already included several of the following kinds of habitat-related actions for each subbasin (except the Dolores River): instream-flow acquisition, legal protection, and delivery from modified reservoir operations; fish passage restoration; and flooded bottomland restoration. Thus, the critical habitat modifications to the RIPRAP were not extensive. They were primarily intended to provide further definition to recovery actions already in the RIPRAP and to provide increased certainty that the Recovery Program can continue to serve as the reasonable and prudent alternative for projects subject to Section 7 consultations. Since many historic projects will be required to reinitiate Section 7 consultation with the Service due to the critical habitat designation, the Service encouraged Recovery Program participants to complete these RIPRAP actions as quickly as possible to facilitate fish recovery.

Destruction or adverse modification of critical habitat is defined at 50 CFR 402.02 as a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Section 7 consultation is initiated by a Federal agency when its action may affect critical habitat by impacting any of the primary constituent elements or reducing the potential of critical habitat to develop those elements. The primary constituent elements defined in the final rule as necessary for survival and recovery of the four Colorado River endangered fishes include, but are not limited to, 1) water (quantity and quality), 2) physical habitat (areas inhabited or potentially habitable, including river channel, bottom lands, side channels, secondary channels, oxbows, backwaters, and other areas); and 3) biological environment (food

supply, predation, and competition). The Service reviewed the RIPRAP to determine if it addressed these constituent elements and to identify existing and new actions that will contribute to the RIPRAP serving as a reasonable and prudent alternative to the likely destruction or adverse modification of critical habitat. Then, in coordination with the Management Committee, the Service recommended additions needed to address all of the constituent elements, to better define the expected result of the recovery action, and to increase the certainty that the constituent elements of critical habitat would be protected.

MODIFICATIONS

1. Instream Flow Protection: Modifications were made under this recovery element to protect the water quantity constituent element.
 - a. Adjudication of the instream-flow appropriations to be filed by the Colorado Water Conservation Board (on the Yampa, Little Snake, White, Colorado, and Gunnison rivers) was added since these instream-flow appropriation filings will not be legally protected until they are adjudicated in water court. Adjudication may take up to three years after filing, depending on the amount of litigation.
 - b. To provide more immediate habitat improvements in the Grand Valley area via instream flows, a modification was made under water acquisition for the 15-mile reach to enter into an interim agreement for uncommitted water remaining in Ruedi Reservoir after Round II water sales are completed or commitments to contracts are agreed to. If flow recommendations for the 15-mile reach are met from other sources during this interim agreement (thereby causing the additional water from Ruedi to exceed the flow recommendations), Ruedi would be relieved of this additional obligation. At the end of the interim agreement (whether the flow recommendations have been met or not), Reclamation may pursue additional water sales; however, these sales would be subject to review under Section 7 of the Endangered Species Act.
2. Habitat Restoration: Modifications were made under this recovery element to protect the physical habitat constituent element.
 - a. Access to historically inundated floodplain habitats is believed to be very important to recovery of the razorback sucker and Colorado pikeminnow. Although the Recovery Program has begun a program to evaluate and restore flooded bottomland areas, the fish's riverine habitat has been and continues to be so channelized by levees, dikes, rip-rap, and tamarisk, that broader floodplain restoration and protection (e.g., through mechanisms such as landowner incentives, conservation easements, and perhaps zoning) is needed. Recovery Program participants were not sure exactly

how such mechanisms might be implemented, so an issue paper on restoration and protection of the floodplain has been developed. The issue paper first addressed what restoration and protection measures are needed and then how they might be accomplished. After completion of the issue paper, viable options were identified and a restoration strategy developed for selected geographic areas (e.g. Grand Valley and Ashley Valley). Floodplain restoration activities may be implemented by the Recovery Program or by Recovery Program participants individually. Responsibilities of other agencies were identified in the issue paper, and actions were implemented consistent with authorities outside the Recovery Program.

- b. The Recovery Program has been evaluating agricultural diversion structures in the Yampa River and has discovered that although not all of these structures impede Colorado pikeminnow passage, annual bulldozing in critical habitat in the river required to maintain many of these structures may destroy or adversely modify fish habitat. Upgrading these structures so that they are more secure would eliminate the need for annual bulldozing and consequent adverse modification of critical habitat.
 - c. Fish passage structures are planned for a number of diversion dams in the Upper Basin in the current RIPRAP. However, without screens or "entrainment preclusion structures," adult fish, especially razorback sucker, may go into the diversion canals. To keep fish in the more secure river habitat, a modification was made to include an entrainment preclusion structure on the proposed passage structure at the Grand Valley Project diversion (Roller Dam). Also, the need for an entrainment preclusion structure at Redlands diversion dam will be evaluated after construction of the fish ladder there.
3. Reduction of Negative Impacts of Nonnative Fishes and Sportfish Management Activities: Modifications were made under this recovery element to protect the constituent element of the fishes biological environment.
- a. Competition with and predation by introduced species is widely assumed to have played a role in the decline of the endangered fishes. The Recovery Program has been and continues to assess options to reduce negative impacts of problematic nonnative species, sportfish management, and angling mortality. Although we cannot yet fully predict the results of implementing some of these management options, we need to begin to implement the most viable ones. Therefore, actions have been added to implement (in cooperation with the States) viable measures which will decrease negative impacts of certain nonnative fishes, sportfish management, and angling mortality. Specific actions were added to selectively remove northern pike from the Yampa River and northern pike and centrarchids from the Gunnison River and possibly Paonia Reservoir.