Upper Colorado River Endangered Fish Recovery Program

RECOVERY IMPLEMENTATION PROGRAM
SECTION 7 CONSULTATION, SUFFICIENT PROGRESS,
AND HISTORIC PROJECTS AGREEMENT
October 15, 1993 (Revised March 8, 2000)

AND

RECOVERY IMPLEMENTATION PROGRAM
RECOVERY ACTION PLAN
(RIPRAP)

May 17, 2018

PREFACE

This document was originally finalized on October 15, 1993. Part One received a minor revision on March 8, 2000, to accommodate programmatic biological opinions. Part Two has been revised to accommodate annual updates, designation of critical habitat for the endangered fishes, and development of specific recovery goals for each of the species.

PART ONE: Section 7 Consultation, Sufficient Progress, and Historic Projects Agreement

Sections 4.1.5, 4.1.6, and 5.3.4 of the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program) outline procedures for consultation pursuant to Section 7 of the Endangered Species Act on water projects in the Upper Colorado River Basin. The Section 7 Agreement (including Section 7 Consultation, Sufficient Progress, and Historic Projects Agreement) was developed by Recovery Program participants to clarify how Section 7 consultations will be conducted on water depletion impacts related to new projects and impacts associated with historic projects (existing projects requiring a new Federal action) in the Upper Basin.

PART TWO: Recovery Implementation Program Recovery Action Plan

The Recovery Implementation Program Recovery Action Plan (RIPRAP) was developed by the Recovery Program participants in support of the Section 7 Agreement using the best, most current information available and the recovery goals for the four endangered fish species. It identifies specific actions and time frames currently believed to be required to recover the endangered fishes in the most expeditious manner in the Upper Basin. The RIPRAP is the Recovery Program's long range plan. It contains dates for accomplishing specific actions over the next 5 years and beyond. The RIPRAP is a measure of accomplishment the U.S. Fish and Wildlife Service uses to determine if the Recovery Program can continue to serve as a reasonable and prudent alternative for projects undergoing Section 7 consultation to avoid the likelihood of jeopardy to the continued existence of the endangered fishes as well as to avoid the likely destruction or adverse modification of critical habitat.

PART ONE:

RECOVERY IMPLEMENTATION PROGRAM
SECTION 7 CONSULTATION, SUFFICIENT PROGRESS,
AND HISTORIC PROJECTS AGREEMENT

Agreement

Section 7 Consultation, Sufficient Progress, and Historic Projects

Recovery Implementation Program for the Endangered Fish Species
in the Upper Colorado River Basin

October 15, 1993
Revised March 8, 2000

I. Background

The Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (RIP) is intended to go considerably beyond offsetting water depletion impacts by providing for the full recovery of the four endangered fishes. The RIP participants recognize that timely progress toward recovery in accordance with a well-defined action plan is essential to the purposes of the RIP, including both the recovery of the endangered fishes and providing for water development to proceed in compliance with State law, Interstate Compacts, and the Endangered Species Act (ESA). Recovery activities which result in significant protection and improvement of the endangered fish populations and their habitat need to receive high priority in future planning, budgeting, and decision making. The RIP participants accept that certain positive population responses to RIP initiatives are not likely to be measurable for many years due to the time required for the endangered fishes to reach reproductive maturity, limited knowledge about their life history and habitat requirements, sampling difficulties and limitations, and other factors. The RIP participants also recognize that further degradation of endangered fish habitats and populations will make recovery increasingly difficult.

II. RIP Recovery Action Plan (RIPRAP)

The Recovery Action Plan (RIPRAP) identifies actions currently believed to be required to recover the endangered fishes in the most expeditious manner possible in the upper basin. It has been developed using the best information available and the recovery goals established for the four endangered fish species. By reference, the RIPRAP is incorporated and considered part of this agreement. The RIPRAP will be an adaptive management plan because additional information, changing priorities, and the development of the States' entitlement may require modifications to the RIPRAP. The RIPRAP will be reviewed annually and modified or updated, if necessary, by September 30 of each year or prior to adoption of the annual work plan, whichever comes first. The RIPRAP will serve as a guide for all future planning, research, and recovery efforts, including the annual work-planning and budget decision process.

The RIP is intended to provide the reasonable and prudent alternatives for projects undergoing Section 7 consultation in the upper basin. While some recovery actions in the RIPRAP are expected to have more direct or immediate benefits for the endangered fishes than others, all are considered necessary to accomplish the objectives of the RIP. Recovery actions which protect or improve habitat conditions and result in more immediate, positive population responses will be most important in determining the extent to which the RIP provides the reasonable and prudent alternatives for projects undergoing Section 7 consultation. In general, these actions will be given highest priority in the RIPRAP.

The Fish and Wildlife Service (FWS) will determine whether progress by the RIP provides a reasonable and prudent alternative based on the following factors:

a. Actions which 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.
b. Status of fish population.
c. Adequacy of flows.
d. Magnitude of the impact of projects.

Therefore, these factors were considered in the development and prioritization of the recovery actions in the RIPRAP.

III. Framework for Agreement

The following describes the agreement among RIP participants on a framework for conducting Section 7 consultations on depletion impacts related to new projects (as defined in Section 4.1.5 a. of the RIP) and impacts[1] associated with historic projects in the Upper Colorado River Basin. This agreement is meant to supplement and clarify the process outlined in Sections 4.1.5, 4.1.6 and 5.3.4 of the RIP. This agreement applies only to the four Colorado River endangered fishes in the Upper Colorado River Basin, excluding the San Juan River, and is not a precedent for other endangered species or locations.

1. Activities and accomplishments under the RIP are intended to provide the reasonable and prudent alternatives which avoid the likelihood of jeopardy to the continued existence of the endangered Colorado River fishes (hereinafter the "reasonable and prudent alternative") resulting from depletion impacts of new projects and all existing or past impacts related to historic projects with the exception of the discharge by historic projects of pollutants such as trace elements, heavy metals, and pesticides. However, where a programmatic biological opinion applies, the appropriate provisions of such an opinion will apply to future individual consultations.

   The RIP participants intend the RIP also to provide the reasonable and prudent alternatives which avoid the likely destruction or adverse modification of critical habitat, to the same extent as it does to avoid the likelihood of jeopardy. Once critical habitat for the endangered fishes is formally designated, the RIP participants will make any necessary amendments to the RIPRAP to fulfill such intent.

2. The RIP is intended to offset both the direct and depletion impacts of historic projects occurring prior to January 22, 1988 (the date when the Cooperative Agreement for the RIP was executed) if such offsets are needed to recover the fishes. Under certain circumstances, historic projects may be subject to consultation under Section 7 of the ESA. An increase in depletions from a historic project occurring after January 22, 1988, will be subject to the depletion charge. Except for the circumstances described in item 11 below, depletion charges or other measures will

[1] All impacts except the discharge of pollutants such as trace elements, heavy metals, and pesticides.

not be required from historic projects which undergo Section 7 consultation in the future.

3. The Bureau of Reclamation (BR) and the Western Area Power Administration will operate projects authorized and funded pursuant to Federal reclamation law consistent with its responsibilities under Section 7 of the ESA and with any existing contracts. No depletion charge will be required on depletions from BR projects as long as BR continues its contributions to the RIP's annual budget.

4. The FWS will assess the impacts of projects that require Section 7 consultation and determine if progress toward recovery has been sufficient for the RIP to serve as a reasonable and prudent alternative. The FWS will use accomplishments under the RIP as its measure of sufficient progress. The FWS will also consider whether the probable success of the RIP is compromised as a result of a specific depletion or the cumulative effect of depletions. Support activities (funding, research, information and education, etc.) in the RIP contribute to sufficient progress to the extent that they help achieve 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. Generally, sufficient progress will be evaluated separately for the Colorado and Green River subbasins (but not individual tributaries within each subbasin). However, the FWS will give due consideration to progress throughout the upper basin in evaluating sufficient progress.

5. If sufficient progress is being achieved, biological opinions will identify the activities and accomplishments of the RIP that support it serving as a reasonable and prudent alternative.

6. If sufficient progress is not being achieved, biological opinions for new and historic projects will be written to identify which action(s) in the RIPRAP must be completed to avoid jeopardy. Specific recovery actions will be implemented according to the schedule identified in the RIPRAP. The FWS will confer with the Management Committee on the identification of these actions within established timeframes for the Section 7 consultation. For historic projects, these actions will serve as the reasonable and prudent alternative as long as they are completed according to the schedule identified in the RIPRAP. For new projects, these actions will serve as a reasonable and prudent alternative so long as they are completed before the impact of the project occurs. The FWS has ultimate authority and responsibility for determining whether progress is sufficient to enable it to rely upon the RIP as a reasonable and prudent alternative and identifying actions necessary to avoid jeopardy.

7. Certain situations may result in the FWS determining that the recovery action in previously rendered biological opinions are no longer serving as a reasonable and prudent alternative. These situations may include, but are not limited, to:

    a. Critical deadlines for specified recovery actions are missed;
    b. Specified recovery actions are determined to be infeasible; and
    c. Significant new information about the needs or population status of the fishes becomes available;

8. The FWS will notify the Implementation and Management Committees when a situation may result in the RIP not serving as a reasonable and prudent alternative.

The Management Committee will work with the FWS to evaluate the situation and develop the most appropriate response to restore the RIP as a reasonable and prudent alternative (such as adjusting a recovery action so it can be achieved, developing a supplemental recovery action, shortening the timeframe on other recovery actions, etc.).

9. The RIP is responsible for providing flows which the FWS determines are essential to recovery of the endangered fishes. Whether or not a Section 7 review is required, the RIP will work cooperatively with the owners/operators of historic projects on a voluntary basis to implement recovery actions needed to recover the endangered fishes.

10. The responsibility for the efficiency and effectiveness of the RIP, and for its viability as a reasonable and prudent alternative, rests upon RIP participants, not with individual project proponents. RIP participants fully share that responsibility.

11. If the RIP cannot be restored to provide the reasonable and prudent alternative per item 8, above, as a last resort the FWS will develop a reasonable and prudent alternative, if available, with the lead Federal Agency and the project proponent. (RIP participants recognize that such actions would be inconsistent with the intended operation of the RIP). The option of requesting a depletion charge on historic projects or other measures on new or historic projects will only be used in the event that the RIPRAP does not or can not be amended to serve as a reasonable and prudent alternative. In this situation, the reasonable and prudent alternative will be consistent with the intended purpose of the action, within the Federal Agency's legal authority and jurisdiction to implement, and will be economically and technologically feasible.

12. This agreement becomes effective upon adoption of the RIPRAP by the Implementation Committee. Until the RIPRAP is adopted, the FWS will use the procedures in this agreement and the January 1993, draft RIPRAP as the basis for identifying reasonable and prudent alternatives.

13. Experience may dictate a need to modify this agreement in the future. This agreement may be modified or amended by consensus of all the RIP participants. A review of the agreement may be initiated by any voting member of the Implementation Committee.

PART TWO:

RECOVERY IMPLEMENTATION PROGRAM
RECOVERY ACTION PLAN
(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.*), state water and wildlife law, interstate compacts, and authorized purposes of Bureau of Reclamation projects. 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[1] 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.

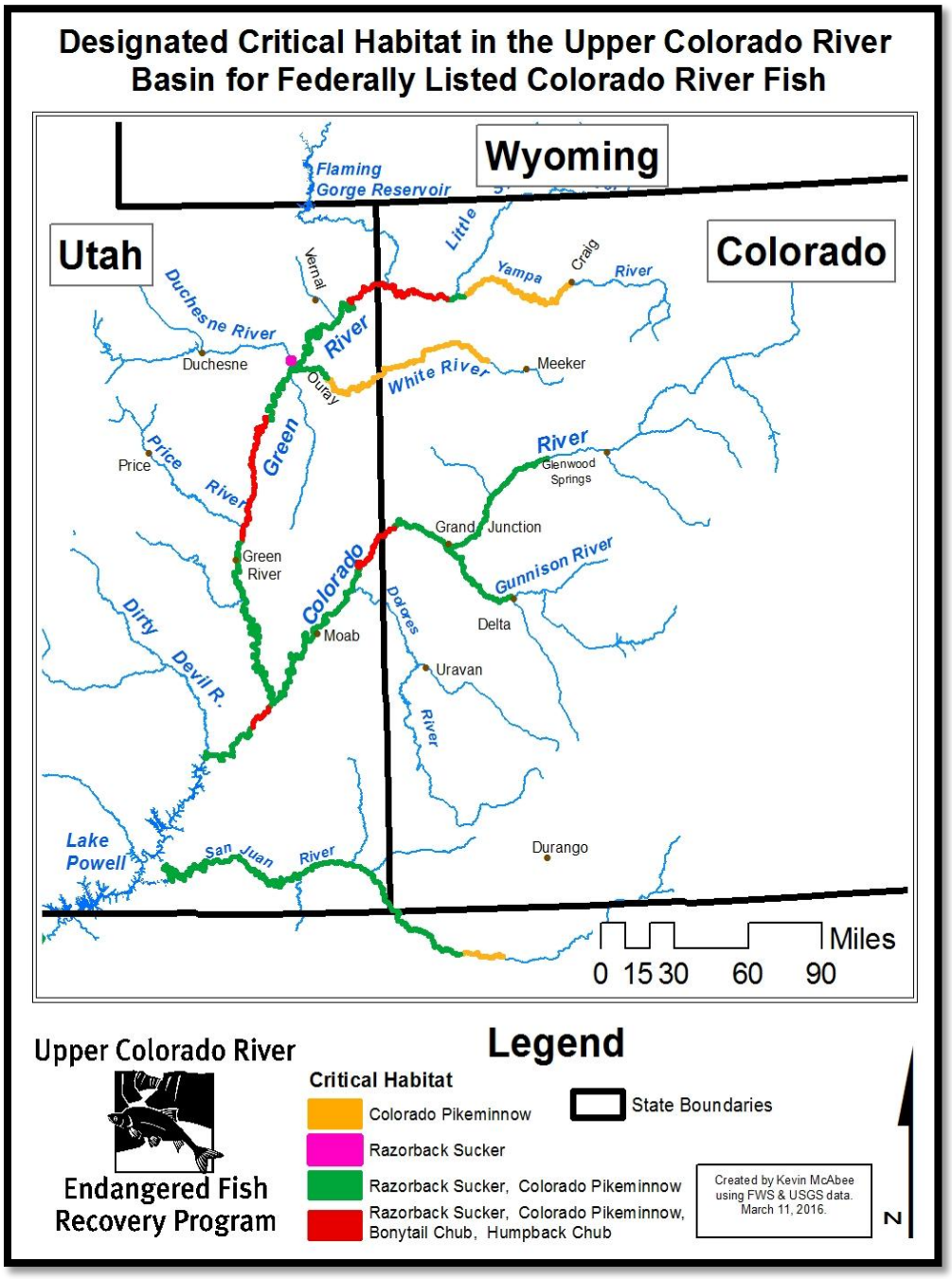
1.2 SPECIES RECOVERY GOALS/PLANS

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 (ESA; 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). Once critical habitat was designated (see map on next page), the RIPRAP was reviewed by the Service and modified in coordination with the Management Committee. Final recovery goals for the four endangered fish, which amend and supplement the former recovery plans, were approved in August 2002 (U.S. Fish and Wildlife Service 2002a, 2002b, 2002c, 2002d).

The 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. In a lawsuit by Grand Canyon Trust over the humpback chub recovery goals, U.S. District Court 9th Circuit ruled that review of the substance of

[1]Prior to 2009, the Service concluded that the impacts associated with any amount of water depletion in the Upper Colorado River resulted in a Section 7 jeopardy opinion. Since 2009, the Service requires action agencies to incorporate the Recovery Program and its associated recovery actions as applicant-committed Conservation Measures, which results in non-jeopardy biological opinions.

Service recovery plans is inappropriate under the Administrative Procedure Act and the ESA, but ordered the goals vacated until time and cost estimates are updated. The Service is in the process of reviewing and updating the species recovery plans.



In the context of the recovery goals/plans, recovery of humpback chub, bonytail, and razorback sucker will occur in 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. Based on the Colorado pikeminnow recovery plan, recovery of Colorado pikeminnow will occur in 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 to achieve recovery in the Upper Basin recovery unit.

Five-year status reviews were completed for Colorado pikeminnow and humpback chub in 2011 (USFWS 2011 a & b) and for bonytail and razorback sucker in 2012 (USFWS 2012 a & b). The reviews found that the species remain "endangered." Progress was indicated on whether a recovery factor criterion was "met", "partially met", or "not met."

In light of expanding numbers and distribution of razorback sucker, a species status assessment (SSA), was initiated for the razorback sucker in late 2015 with completion anticipated in 2018. The Service uses SSA reports to characterize species needs, species current condition, and species viability.

In 2012, the Service convened a Colorado Pikeminnow Recovery Team to revise that species' recovery plan to incorporate new information; the Recovery Team was expanded to include state partners in 2013. A draft Recovery Plan was reviewed by stakeholders in 2015. The stakeholders asked the Service to defer further revision of the plan until a population viability analysis (PVA) and species status assessment (SSA) can be prepared. The Service initiated the PVA and SSA in early 2016 and anticipates completion in 2018.

In 2016, the Service convened a Humpback Chub Recovery Team, which finalized an SSA in December of 2017. A five-year status review was complete in March of 2018.

The Program Director's office has recommended deferring update of the bonytail recovery plan until new information warrants, but will complete a five-year status review in 2018.

1.3 RECOVERY ACTION PLAN PURPOSE

This Recovery Implementation Program Recovery Action Plan (RIPRAP) has been developed and updated using the best, most current information available on the species' status and the recovery goals for the four endangered fish species. The RIPRAP is intended to provide an operational plan and schedule for implementing recovery actions by the Recovery Program, including development of the Recovery Program's annual work plan and future budget needs. Specifically, the RIPRAP identifies the actions that are necessary to recover the endangered fishes, including schedules and budgets for implementing those actions. Accomplishment of these

recovery actions allows the Recovery Program to provide ESA compliance for depletion impacts of new projects and all existing or past impacts related to water projects in place when the Recovery Program was initiated (January 21, 1988) (historic water projects), except impacts from contaminants, in accordance with the October 15, 1993 Section 7 Agreement (Revised March 8, 2000). The RIPRAP was incorporated and is considered part of that Agreement.

1.4 ESTIMATED COST OF RECOVERY ACTIONS

The estimated total budget for the Recovery Program from FY 2018–FY 2023 is approximately $56 million[2]. Funding for the Recovery Program is expected to come from the following sources:

a. An annual operating budget of approximately $7 million, adjusted annually for inflation. As per passage of PL 112-270, which reauthorized PL 106-392, annual funding will be applied to the full suite of the Recovery Program's actions through FY2019, with the exception of capital projects. The sources of these funds are hydropower revenues from the Colorado River Storage Project; the U.S. Fish and Wildlife Service; and the States of Colorado, Utah, and Wyoming. In 2017, non-federal Recovery Program(s) partners introduced legislation to reauthorize PL 106-392 to provide full funding through 2023 (H.R. 4465 and S.2166). Additional annual funding will come from one-time water development depletion fees on new projects (post-January 21, 1988). Under the Recovery Program, proponents of new water projects, which undergo Section 7 Endangered Species Act consultation, 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, 2017, the fee was $21.17 per acre-foot; the rate increases to $21.61 per acre-foot as of October 1, 2018. The actual rate of water development has not been projected therefore it is difficult to predict the amount of this funding source on an annual basis. Through FY2016, depletion fees and interest earned on these fees totaled $2,446,700. These funds may be accumulated and are used to fund recovery actions pursuant to decisions made by the Recovery Program on an annual basis.

b. Approximately $9.53 million will be spent between FY 2018 and FY 2023 for remaining capital projects. P.L. 106-392 authorized capital 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,

[2] Expenditures to date may be found in the pie charts of the most recent *Program Highlights* briefing document.

and increased the capital-funding total from $62 million to $77 million plus adjustments for inflation to the Federal portion. In March 2009, Section 9107 of P.L. 111-11 authorized an additional $15 million in federal funds and extended the capital construction period through 2023.

1.5 MEASURING PROGRESS TOWARD RECOVERY AND SCHEDULING RIPRAP ACTIVITIES

To achieve recovery in the Upper Basin, it is essential to fully implement all of the actions in the RIPRAP. This can be accomplished only through cooperation by all Recovery Program participants. In general, actions will be scheduled such that recovery will be achieved in the most expeditious and cost-effective manner possible. However, the schedule may require some adjustment based on sequence and impacts of water development and management actions to ensure recovery of the endangered fishes while water development continues.

The Recovery Program continually evaluates the outcome of completed RIPRAP actions to determine their effectiveness in contributing to recovery. Ultimately, success of recovery actions 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. Toward that end, Program participants assess progress and update the RIPRAP annually.

1.6 RECOVERY ACTION PLAN STRUCTURE

The substance of the RIPRAP is in Section 4.0, where the specific recovery actions are listed in the RIPRAP tables. In addition, significant accomplishments and shortcomings of the past year are identified in the RIPRAP tables, developed as part of the Recovery Program's annual assessment and update of the RIPRAP.

The RIPRAP tables schedule activities through 2023 (the Recovery Program's Cooperative Agreement is effective through September 30, 2023). Activities that have led to recovery of the endangered fishes will need to be continued after these species are delisted or the Recovery Program ends. Therefore, the RIPRAP tables identify the activities that Program participants anticipate will continue post-Program.

The first section of the Recovery Action Plan tables identifies general support activities important to the success of the Recovery Program. The subsequent sections that follow the General Recovery Action Plan are for the Green and Colorado rivers and their subbasins in the Upper Basin. Each subbasin table includes recovery actions arranged by 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 table only); and
VII. Provide program planning and support (in the General Recovery Program Support table only).

Section 4.0 is provided in table format 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.

2.0 DESCRIPTION OF RECOVERY ACTION PLAN ELEMENTS

The Recovery Action Plan tables contain brief descriptions of specific recovery actions in each subbasin. This section provides a general description of each recovery element. Specific recovery actions being carried out in each subbasin are discussed in Section 3.0.

2.1 I. IDENTIFY AND PROTECT INSTREAM FLOWS

Recovery cannot be accomplished without securing, protecting, and managing sufficient flows to provide habitat to support self-sustaining endangered fish populations. 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, typically characterized in terms of peak and base flow needs over a range of hydrologic conditions. 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).

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. In addition:

- Interim flow recommendations for the White River were completed in 2004 (Irving et al. 2004), and are currently under revision. A White River management plan will be drafted in 2018, which will ultimately serve as the basis for a White River programmatic biological opinion. This management plan will assess the likely impacts of possible future water development on the river flows relative to these flow recommendations.

- Under the Gunnison River Basin Programmatic Biological Opinion and Aspinall Unit Study Plan (2011), the Recovery Program is conducting monitoring to assess how well the operation of the Aspinall Unit contributes to meeting target flows in the Gunnison and Colorado Rivers and to help determine if managed flows from the Gunnison and the Colorado rivers are sufficient for recovery on the Colorado River between the Gunnison River and the Green River confluences.

- Flow and temperature recommendations for the Green River below Flaming Gorge Dam (Muth et al. 2000) are being evaluated by a Recovery Program workgroup, with proposed updates to those recommendations anticipated in 2018.

In 2012, USGS finalized results of a sediment transport study on three rivers in the upper Colorado River basin. Samples were collected on the Colorado River at Cameo, Stateline, and Cisco; on the Gunnison River at Grand Junction; and on the Green River at Jensen and the town of Green River (Williams et al. 2013). These results provide a methodology that will help the Recovery Program understand how flow recommendations may be benefitting recovery of the endangered fishes. A team of experts convened in 2013 and 2014 to review the findings and to recommend methodologies to determine whether the current peak flow recommendations are achieving objectives. The resulting Peak Flow Technical Supplement (LaGory et al., 2015) offers a range of study approaches and prioritizes river reaches to evaluate the peak flow aspects of the Program's flow recommendations. A high priority is placed on collecting suspended sediment data within ongoing programs of NPS and USGS. In 2017, the Recovery Program funded USGS to expand the existing network of fine sediment monitoring stations in the Green River subbasin (near Jensen, UT and near Ouray, UT). Studies and monitoring recommended in the Supplement to address high priority information needs have been incorporated into the RIPRAP.

In 2011 and 2012, the Service and The Nature Conservancy formatted the Recovery Program's flow recommendations and three National Wildlife Refuge water rights for inclusion as non-consumptive water needs in the Colorado River Basin Water Supply and Demand Study (Basin Study) conducted by the Bureau of Reclamation. The study encompasses all seven Colorado River Basin States. It looks at current and future imbalances in water supply and demand in the basin and adjacent areas through 2060 including projected effects associated with climate change, and attempts to develop and analyze options and strategies to resolve imbalances. The final report was published in December 2012 (available at: http://www.usbr.gov/lc/region/programs/crbstudy.html); updates of this effort are planned every 5 years. As per recommendation from the Basin Study and under the WaterSMART Grants program, a review of alternative decision support platforms and tools for incorporating ecological and recreational flows into water management for the Colorado River Basin was completed in 2013. (Alexander et al. 2013).

In 2014, the Service participated in the workgroup for Environmental and Recreational flows of the Colorado Basin Water Supply. The White River from Kenny Reservoir to the Green River and the Colorado River from the Gunnison River to the confluence of the Green River were chosen as two of the four focus reaches. The next phase will be to identify scientific uncertainties and opportunities to address those uncertainties, document mechanisms or programs that have been successful protecting environmental and river-based recreational resources, and explore and document opportunities and potential solutions that might be applied at a scale larger that the focus reaches.

Colorado

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 Colorado Parks and Wildlife (CPW). Then CWCB issues a notice of intent to appropriate, followed by Board approval to appropriate. Finally, the Attorney General must make a water court filing to confirm the appropriation and to establish 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). In some cases, the appropriation process has lacked support and thus proven to have limited use in the Recovery Program. Therefore, the Recovery Program adopted alternative means of legally providing and protecting flows in some reaches by combining water project re-operations and contracts for the delivery of storage water (e.g., Grand Valley Water Management Plan and deliveries from the Historic Users Pool at Green Mountain Reservoir), and has put programmatic biological opinions (PBOs) in place to monitor new depletions of existing

flows on the Yampa, Little Snake, Gunnison, and Colorado Rivers. Under these PBOs, the Recovery Program and the CWCB will periodically evaluate the need to appropriate new instream flow water rights in Colorado to legally protect such flows. Recovery Program participants anticipate that these methods will prove effective in ensuring instream flows for the endangered fishes.

Where flows are provided through the physical alteration of flow conditions by re-operating a reservoir or other component of an existing or new water project, various contracts with reservoir owners may be needed to legally protect the deliveries from storage from re-diversion. Contracts for the delivery and protection of storage releases may be combined with purchase of water rights in Colorado and their physical or legal transfer to supplement storage releases (e.g. Redtop Ditch). Water rights historically used for other purposes may also be purchased or leased in Colorado and temporarily or permanently transferred to instream use to increase and legally protect flows needed for recovery, but his method has not been used to date.

Utah

Utah officials believe that flows to the Lower Colorado River Basin under the Colorado River Compact have and will continue to ensure sufficient quantities of water remain in the Green River to satisfy the recommended flow requirements. Additional methodologies to protect stream flows exist in Utah but are limited. Current approaches include: 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 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 can provide an increased level of protection.

This RIPRAP originally contemplated that the Utah State Engineer would establish, by policy, legal protection for endangered fish recommended flows. In 1994, the State Engineer adopted a policy to subordinate future water right application approvals to required fish flows during the summer and autumn periods from Flaming Gorge Reservoir to the confluence of the Duchesne River. There was little resistance to this initial policy adoption and few policy disputes ensued in subsequent years even though the State Engineer’s statutory authority to approve vested instream flow rights is limited to certain entities and circumstances. In 2006, the Utah State Engineer began a public process to extend the policy to protect recommended flows for endangered fish to all seasons and over the entire length of the Green River in Utah, pursuant to RIPRAP objectives. Public concern over the practical distribution implications associated with subordinating to recommended flows led to questions about the State Engineer’s authority to establish instream flow water rights. Ultimately, in 2009, the State Engineer

concluded that other means to legally protect flows should be explored to avoid a contest over the extent of his statutory authority. The Recovery Program's Water Acquisition Committee formed a task force to develop additional options for protecting fish flows on the Green River. In 2010, Utah identified a legal and technical process and schedule to protect recommended year-round flows for the endangered fishes on the Green River in Utah (Utah Department of Natural Resources 2010). This schedule was updated as follows in 2013 and 2017
:

1) Identify issues, concerns and timeframe, 2007-2010
2) Prioritize potential methods and criteria for flow protection, 2009-2011
3) Amalgamate technical information needed to model and resolve issues, 2010-2011
4) Develop model for analysis of historic and future scenarios, 2010-2011
5) Analyze model results, 2017
6) Establish internal policy committee to work with Program partners to explore flow protection options, 2016-2018.
7) Obtain additional authority to protect flows, 2018
8) Implement legal protection, 2016-2019.

With the modeling complete and the report in preparation, Utah continues to make progress evaluating the most appropriate means to protect fish flows with the framework of State water law. An internal policy committee working on flow protection has been receiving input from other Program partners and continues to evaluate a variety of options being proposed.

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 many of the rivers are channelized by levees, dikes, riprap, and tamarisk. Fish access to 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 bonytail, and the seasonal timing of razorback sucker reproduction suggests an adaptation for utilizing these habitats. Restoring access to these warm and productive habitats is intended to provide the growth and conditioning environments that appear crucial for

recovery of self-sustaining razorback sucker populations. In addition, juvenile Colorado pikeminnow also use these areas for feeding and adults stage in these habitats prior to migrating to spawning areas. Inundation of floodplain habitats, although most important for razorback sucker, will benefit bonytail and other native fishes by providing growth and conditioning environments and by restoring ecological processes dependent on periodic river-floodplain connections. Restoration of floodplain habitats is achieved through a combination of increased peak flows, prolonged peak-flow duration, lower bank or levee heights, levee removal, and constructed inlets. Studies have shown that a full benefit of these floodplain habitats has been reduced by the presence of large numbers of predacious and competing nonnative fish (Christopherson et al. 2004; Modde and Haines 2005).

The Recovery Action Plan tables 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 evaluated for restoration potential. Site acquisition began in 1994 and continued through 2003. Since 2003, the Recovery 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 Recovery Program has shifted from restoration/acquisition of additional floodplain sites to better management of sites already acquired or otherwise available. Success will be measured by the response of the endangered fish populations.

The General Recovery Program Support Action Plan table includes 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, riprap, 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 (Nelson 1998); Phase 2 determined how to accomplish that restoration and protection (Tetra Tech 2000). 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. Speas et al. (2017) reviewed the Recovery Program's state of knowledge relative to floodplain management. They recommended that successful rearing of razorback sucker larvae to the YOY stage will require: 1) the ability to exclude large-bodied nonnative fish from the wetland during the larval entrainment period; 2) maintenance of water levels using water control structures and external water sources; and 3) capture, enumeration and release of YOY fish into the main channel Green River as the wetland is drained in the fall months.

Passage barriers have fragmented endangered fish populations and their habitats, resulting in confinement of the fishes to 20 percent of their former range in the Upper Basin. 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 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 Plan tables contain tasks to assess and make recommendations for fish passage at various dams and diversion structures. The need for passage was determined at four sites: Redlands, Grand Valley Irrigation Company (GVIC), Price Stubb, and the Grand Valley Project (GVP). Passage has been restored at all four locations. A fish passage was completed in 2012 on the Hartland Diversion on the Gunnison River near Delta by NRCS and local interests that benefits both endangered and native fishes. A newly rebuilt Tusher Diversion on the Green River near Green River, Utah includes a fish passage component, designed similar to the Price Stubb fish passage, and was completed in 2016. Long-term effectiveness of these fish passages will require upstream sediment management (GVP and Redlands passages); in-passage debris removal (Price Stubb and Tusher Diversion passages); and continued operation of selective fish passage structures (GVP and Redlands passages).

Diversion canals have been found to entrain native and endangered fishes. The Recovery Program has constructed fish screens on major diversion on the Colorado and Gunnison rivers. Construction of fish screens was completed at the Grand Valley Project and Redlands Water and Power Company diversion during 2005. Construction of a screen at the Grand Valley Irrigation Company diversion canal was completed in 2002 and additional improvements to this screen are anticipated. The Grand Valley screens on the Colorado and Gunnison rivers are operated as much as feasible through the irrigation season, though debris and other concerns sometimes interrupt operation. Evaluation of potential entrainment into irrigation canals is an important part of the Recovery Program's decision-making process for screening canals. Studies of Colorado pikeminnow entrainment into diversion structures on the Yampa River began in 2007 (Hawkins 2009), and continued at the Maybell Ditch in 2011-2012 (Speas et al. 2014). During a two-year study, only one endangered fish, a Colorado pikeminnow, was detected in the Maybell Ditch (in 2012). Evaluation of potential entrainment of endangered fishes at the Green River Canal near Green River, Utah has been considered by the Recovery Program for many years, first being undertaken by Kitcheyan et al in 2001. Stationary PIT antennas have been deployed in the canal since 2013, documenting high levels of entrainment. All four endangered species continue to be documented in the canal through 2017. Based on these findings, the Program is pursuing a vertical weir wall paired with a fish screen in the Green River Canal below

the Thayn Hydro facility to reduce entrainment at this site (instead of the wedge wire screens used in Grand Valley fish screens).

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 (e.g. Reclamation's participation in the Gunnison River Basin Selenium Management Program) that are working to identify problem sites, evaluate contaminant impacts, and reduce or eliminate those impacts. Specifically, the Service will identify actions needed to reduce selenium contamination to levels that will not impede recovery and identify existing pipeline river crossings that need to have spill-control devices installed. New petroleum pipelines with a Federal nexus are required by the Service through the Section 7 process to have shutoff valves. Not all pipelines have a Federal nexus; therefore, the Program Director's office discussed concerns with existing and future pipelines with the States' oil and gas divisions. The Service also is working with EPA, BLM, and USDOT to identify existing pipeline crossings that may need shutoff valves. Additionally, the Service and UDWR have worked with EPA on spill response contingency planning.

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

The introduction, establishment, and proliferation of nonnative fishes are considered the primary threat to the recovery of four Colorado River endangered fishes. Unfortunately, in the upper Colorado River basin, despite years of significant effort, the nonnative threat remains largely uncontrolled. Only 13 of more than 50 fish species that now occur in the Upper Basin are native (Bezzerides and Bestgen 2002). Over the last 100 years, native fishes have decreased in range and abundance, while introduced fishes have concurrently become more widespread and abundant (Carlson & Muth 1989, Martinez et al. 1994; Bezzerides & Bestgen 2002; Francis & Ryden 2014). An increasing body of evidence characterizes the negative interactions of nonnative fishes with the endangered fishes (Hawkins & Nesler 1991; Minckley 1991; Lentsch et al. 1998; Bezzerides & Bestgen 2002; Francis & Ryden 2014), including predation and competition. Direct evidence of predation includes native fish tags being detected in predatory fishes (Staffeldt et al. 2017), native fishes obtained from stomach contents of nonnative fishes (Francis and Ryden 2014), and by visual observation of predation. Other means by which nonnative fishes may adversely affect native fishes are by competition for food and niche space.

Warm water game fish, primarily stocked in reservoirs for recreational purposes, are thought to have the greatest adverse effect on endangered native fishes. Of those species, large-bodied predators are considered the most problematic – specifically

centrarchids (smallmouth bass), esocids (northern pike), and percids (walleye). For example, during the 1990s, the Yampa River experienced a dramatic increase in northern pike and smallmouth bass numbers. Predation by these two piscivorous species wreaked havoc on the native fish community. Biologists documented significant declines of native fish densities in the Yampa River since that time (Bestgen et al. 2015).

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. In addition, northern pike are known to prey on large-bodied native fishes (Martinez 2001, Hawkins et al. 2005, Martin and Wright 2010) including adult Colorado pikeminnow, native roundtail chub (*Gila robusta*), flannelmouth and bluehead suckers, and may feed on humpback chubs in the Yampa River. More recently, Francis and Ryden documented juvenile Colorado pikeminnow in the guts of nonnative walleye and reported a simultaneous decline in Colorado pikeminnow abundance in the lower Colorado River between 2010 and 2014, while walleye populations were increasing (Francis and Ryden 2014). Recently, numbers of walleye have increased in the Green and lower Colorado rivers and burbot have been discovered in the Green River below Flaming Gorge Dam. Both of these species also pose a significant predatory and competitive threat to native and endangered fishes (Francis and Ryden 2014, Gardunio et al. 2011).

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 (Upper Colorado River Endangered Fish Recovery Program 2004). Through 2009, emphasis was focused on the control activities identified in these strategies. Development of a new basin wide strategy for the management of nonnative aquatic species began in 2009, and was finalized in early 2014 (Nonnative Fish *ad hoc* Committee 2014). This strategy emphasizes prevention as a major component in efforts to control existing invasive impacts and to avoid similar impacts arising from existing or new species in additional locations within the Upper Basin.

All nonnative fish control activities are evaluated for effectiveness annually. By thoroughly evaluating the smallmouth bass and northern pike control strategies in the

Yampa River basin, the Larval Fish Lab at CSU provided the Program with guiding principles for nonnative removal in the entire basin. Specifically, both of these comprehensive evaluations indicate that the Recovery Program should focus on disrupting reproduction in the river and preventing immigration into river habitats, such as by limiting the escapement of these species from reservoirs.

Disrupting in-river reproduction and preventing reservoir escapement are now the two key tenets of nonnative fish management. Limiting reproduction is accomplished through targeted removal of smallmouth bass during the spawn (the Surge) and by netting northern pike in backwaters in the Yampa River. Landscape scale spawning disruptions of smallmouth bass via water management are also being considered (Bestgen and Hill 2016). Reservoir escapement is primarily prevented through installation of physical screens on outlets or channels and nets on spillways. Currently Starvation[3], Elkhead and Rifle Gap Reservoirs, and Highline Lake, all have screened releases, while Ridgway and Red Fleet Reservoirs, and Lake Catamount, are planned for screening in the future.

The States and the Service also have developed procedures for stocking of nonnative fishes in the Upper Basin (USFWS 1996a, 1996b). The procedures are designed to reduce the impact on native fishes from 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 cooperative agreement has been signed by the States and the Service implementing the Stocking Procedures. The Stocking Procedures were revised in 2009 (USFWS 2009) and the cooperative agreement was updated. In 2013, the Colorado Wildlife Commission updated changes to Colorado's Wildlife Regulations that apply the provisions of the revised Stocking Procedures to the private aquaculture industry, in waters of both the Upper Colorado and San Juan River. The provisions of the revised Stocking Procedures also are part of Utah's stocking policy (including private aquaculture, which can only stock sterile salmonids without specific State review and approval). All private fish stocking in Wyoming also is subject to State review. Harvest regulations also play a key role in nonnative fish management. The Upper Basin States have liberalized bag and possession limits for the 'worst of the worse' predators (northern pike, smallmouth bass, walleye, and burbot). Utah and Wyoming have implemented must kill regulations for these species where appropriate. Colorado Parks and Wildlife has developed a "catch and keep" outreach strategy, paired with unlimited harvest and harvest incentives in regulation, as opposed to must kill regulations. The Colorado Wildlife Commission ratified unlimited harvest regulations for smallmouth bass and northern pike on the western slope, which took effect on April 1, 2016.

[3] The screen on Starvation is a temporary structure, but screens all spills.

The Recovery Program now implements a comprehensive strategy for nonnative fish management, focusing on in-river removal, reservoir escapement, and policy and outreach components. Over the past decade, the Recovery Program has committed millions of dollars and thousands of hours to removing these problematic predators from hundreds of miles of rivers in the upper Colorado River basin. What began over fifteen years ago as a pilot removal effort in 6 miles of the Yampa River now constitutes a basin-wide removal effort in more than 600 river miles, with some river reaches receiving up to 10 to 15 passes to disrupt spawning. In addition to this labor intensive effort, Recovery Program stakeholders are now preventing individuals from escaping reservoirs, implementing appropriate stocking and harvest policies, and conducting outreach on the problems of nonnative fish.

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.

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 to the entire Upper Basin. 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 (Williamson and Wydowski 1994), Genetics Management Plan (Czapla 1999), Coordinated Hatchery Facility Plan (Wydowski 1994), and the Revised Integrated Stocking Plan (Integrated Stocking Plan Revision Committee 2015). 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.

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. 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 State of Colorado operates the J. W. Mumma Native Aquatic Species Restoration Facility in Alamosa, Colorado. The State of Utah raises bonytail at the Wahweap State Fish Hatchery in Big Water, Utah. The U.S. Fish and Wildlife Service operates the Ouray National Fish Hatchery with units near Grand Junction, Colorado (Grand Valley Unit) and Vernal, Utah (Randlett Unit). With a few exceptions, these facilities have achieved their stocking targets for the past six years.

The Integrated Stocking Plan (Nesler et al. 2003) provided specific annual numbers of fish and their sizes to be produced at Recovery Program hatcheries and stocked into Upper Colorado River Basin river reaches. This plan has been implemented for over 10 years and has been revised based on recent estimates of survival of the stocked fish. The revised stocking plan (Integrated Stocking Plan Revision Committee 2015) recommends stocking larger bonytail and razorback suckers and releasing bonytail in

floodplain habitats instead of canyon-bound reaches, since new information suggests floodplains may be more suitable habitat. Revisions to augmentation and restoration stocking (primarily for razorback sucker and bonytail) are intended to directly aid in 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.

Humpback chub are not currently being stocked; however, augmentation of existing small populations is being considered and additional brood fish from wild populations are being brought into hatcheries. An ad hoc group reviewed the population and known genetics information from all the humpback populations and concluded that the Recovery Program should: 1) use a decision tree to guide choices in creating a refuge population and potentially stocking fish into the wild; and 2) genetically test, and if appropriate, use humpback chub collected from Westwater Canyon and Black Rocks and potentially Desolation Canyon to develop a refugia for Upper Colorado River Basin genetics. Those populations have been shown to genetically represent most populations in the upper basin (Douglas and Douglas 2007,). A draft report on the genetics of *Gila* spp. (Bohn, in prep), including humpback chub, indicates historical hybridization (not anthropogenic) occurred between humpback chub and roundtail chub in Black Rocks. The authors identified two management units in the upper basin: Desolation-Cataract and Black Rocks-Westwater. Authors did not recommend separate broodstocks, rather both management units be represented in a single Upper Basin broodstock, with individuals taken from multiple sites within each management unit to maintain genetic diversity. Report will be finalized upon inclusion of Westwater samples.

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 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.

The Recovery Program is updating data management to track individual fish via passive integrated transponder (PIT) tags implanted in endangered fish handled by Recovery Program hatchery and research personnel. In recent years, tag, and re-sight events

have greatly increased, primarily from increased number and survival of stocked fish, increased sampling associated with nonnative fish activities, and detections from several remote antennas installed in locations throughout the Upper Basin. Antennas have significantly increased tag detections and researchers have now begun to incorporate these data into demographic analyses. Colorado Natural Heritage Program has designed and built a web-based database that will store and query the large amount of tag data the Recovery Program now manages (The Species Tagging, Research, and Monitoring System [STReaMS], www.streamsystem.org). The database allows Recovery Program partners to input data easily and effectively, and allows researchers and the public to interact with the data under various permission levels. STReaMS launched in 2016, with structural and quality control improvements occurring in 2017. In 2018, the focus will switch to enhancing user tools and providing additional query options.

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 projects as warranted;
- 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 and their constituents.

Numerous site-specific activities are undertaken to promote understanding of, and support for, Recovery Program actions and to involve the public in decisions that 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.

In recent years, the Program has begun to place additional emphasis on educating the public regarding the gravity of illegal stocking. CPW and UDWR have placed signs warning the public not to transplant fish at various fisheries in western Colorado. Colorado, Wyoming, and Utah fishing regulations call special attention to the problem of and penalties for illegal stocking. Colorado's Nonnative Fish Management Work Group will consider illicit introductions as a component of a strategy to respond to Service's sufficient progress assessment.

The information and education element continues to develop a number of products including an annual *Field Report* (print and digital editions); up-to-date fact sheets; interpretive signs and displays; bookmarks; annual *Program Highlights* and other briefing documents; and a website. In addition, the Recovery Program actively seeks news media coverage of its activities. Special educational publications are produced as needed. The Recovery Program also integrates social media into outreach strategies as appropriate.

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, 109-183, 111-11 and 112-270), an annual publication is produced that highlights accomplishments of both recovery programs. The *Program Highlights* publication serves as a briefing document for use by the non-Federal partners' annual visit to Washington, D.C., and is used for numerous other purposes throughout the year.

In addition to the *Program Highlights* document, the *Swimming Upstream* field report and freestanding exhibits (in both small and large formats) promote both the Upper Colorado and San Juan recovery programs. Shared outreach efforts help ensure accurate, consistent information about the endangered fish species and efforts to recover them. They have also proved more cost-effective by sharing publication production costs and exhibit fees.

The Upper Colorado and San Juan recovery programs will continue to work with other organizations throughout the Colorado River Basin to ensure that information about the endangered fishes is consistent, current, 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 ACTIONS

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. Critical habitat in each of these subbasins is shown on the map on page 2. A more detailed accounting of the activities is found in Section 4.0.

3.1 GREEN RIVER

3.1.1 Importance

The Green River system supports wild populations of humpback chub and Colorado pikeminnow and historically supported populations of bonytail and razorback sucker. Colorado pikeminnow adult abundance in the Green River has declined over the past decade. Although wild spawning and recruitment are still occurring, recruitment rates have been low since the mid 1990's, and lambda has been below one since 2000, indicating the population is likely to continue to decline unless recruitment can be increased (Miller draft 2018). Humpback chub are spawning and recruiting in Desolation and Gray canyons in the Green River. Razorback sucker became functionally extirpated in the Green River in the late 1990's, but have been reestablished through augmentation stocking. Stocked adults are accumulating and spawning aggregations are now found in the middle and lower Green river. Collections of wild produced larval razorback have been on the increase in the Middle Green since 2007; wild produced Age 1+ juveniles were collected in the lower Green and Colorado rivers in 2013 and in the middle Green River in 2015. Bonytail are stocked in large numbers in the Green River, but are not surviving at high rates. Wild bonytail reproduction was confirmed in middle Green River wetlands (Stewart Lake and Johnson Bottom) in 2015 and 2016, prompting stocking into wetland habitats beginning in 2017.

The importance of the Green River to the endangered fishes has been established in Recovery Program planning. 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 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, acquiring and restoring floodplain habitats for endangered fish use, and managing populations of nonnative fish species. Flows in the Green River are influenced by tributary inputs, especially the Yampa River, as well as Flaming Gorge Dam releases. 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 and a Record of Decision were completed in 2006. 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). Following the 2006 Record of Decision, Reclamation provided peak flows that met or exceeded the Muth et al (2000) recommendations. Reclamation achieved these peak flow magnitudes and durations by timing Flaming Gorge releases to match peak Yampa River flow, thus minimizing releases needed to achieve the targets.

A 2011 synthesis by Bestgen et al. showed that after 1993, releases to match the Yampa peak occurred prior to larval razorback sucker drift and suggested that this approach may not be providing for successful razorback sucker recruitment. In response, the Recovery Program proposed that Reclamation place greater emphasis on the occurrence of razorback sucker larvae in channel margin habitats (an indication that larval drift is occurring in the river) as the “trigger” to determine when peak releases should occur from Flaming Gorge Dam (rather than trying to match the Yampa peak). A Larval Trigger Study Plan (LTSP; Larval Trigger Study Plan ad hoc Committee. 2012), consistent with the Muth et al. (2000) flow recommendations, is being implemented for an experimental period of about six years beginning in 2012. To date, LTSP operations have proven hugely successful, resulting in an autumn release of wild-produced Age-0 razorback sucker from floodplains to the Green River main channel; 2013-2016. In spring 2015, the Green River Evaluation and Assessment Team (GREAT) was convened to evaluate: 1) the Program's performance meeting the Muth et al. flow and temperature recommendations since the 2006 ROD; 2) the results of studies identified

in the Green River Study Plan (e.g. Floodplain Synth; BW-Synth; and Nonnative studies); and 3) the need for revision of the recommendations.

Flow recommendations also have been developed for some tributaries to the Green River, such as the Yampa, White (interim flow recommendations; currently under revision), and Duchesne rivers. In 2012, the PDO developed a position paper on minimum flow management in the Price River (Chart and Mohrman 2012). 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. In 2010, Utah identified a legal and technical process and schedule to protect recommended year-round flows for the endangered fishes on the Green River in Utah, which is scheduled to culminate with legal streamflow protection in 2019 (Utah Department of Natural Resources 2010; Mike Styler and Henry Maddux, UDNR, personal communication).

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 nine sites (574 acres) and six perpetual easements were acquired (1008 acres). Speas et al. (2017) reviewed the Recovery Program's floodplain management activities and provided recommendations for how to proceed (see Section 2.2. above).

Monitoring of fish entrainment at the Green River Canal near Green River, Utah demonstrate that all four endangered species are entrained, some at substantial levels. A weir wall and fish screen is scheduled to be constructed in winter of 2018/2019 to halt the entrainment of individuals. This project follows the reconstruction of the Tusher Diversion on the Green River, which included fish passage as a component of the rebuild.

Projects to identify nonnative fish management strategies for the Green River have been implemented. Active management of northern pike (*Esox lucius)* began in 2001. Active management of smallmouth bass began in 2004. Walleye also are emerging as a threat in the Green River and active management began in 2013. White sucker removal also is occurring to reduce hybridization with native suckers (Skorupski et al. 2012). Gizzard shad, green sunfish, and burbot are other species of concern, but active management of these species has not been proposed by the Recovery Program.

Increased catches of walleye in the middle Green River are likely linked to escapement of individuals from Starvation Reservoir (Duchesne subbasin) and an illegally introduced population in Red Fleet Reservoir (Johnson et al. 2014). UDWR completed a rotenone treatment of Red Fleet Reservoir in the fall of 2015 to eliminate this source population. The treatment was followed by stocking of compatible sport fish under an approved lake management plan, with plans for a downstream screening structure. Lake Powell may be a source of walleye in the lower Green River; however, a solution to prevent their escapement has not yet been developed.

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 maintained at Wahweap State Fish hatchery, Big Water, Utah. The Integrated Stocking Plan (Integrated Stocking Plan Revision Committee 2015) guides stocking efforts of both razorback sucker and bonytail in the Green River. In recent years, more emphasis has been placed on stocking larger individuals of both species.

Population estimates are conducted in the Green River subbasin for Colorado pikeminnow, humpback chub, and most recently for razorback sucker, but not for bonytail. Population estimates for Colorado pikeminnow in the entire Green River subbasin began in 2001 (Bestgen et al. 2005). These estimates are conducted on a 3-year on, 2-year off cycle, with the first three-year sampling period having occurred from 2001 to 2003. The second 3-year "on" period was completed during 2006–2008 and showed a continued decline in the numbers of adult fish in the Green River population (Bestgen et al. 2010). A third 3-year sampling period was completed in 2013. Preliminary analyses of the most recent data indicates that population has declined form roughly N= 4,000 adults in 2001 to approximately N= 2,000 in 2013. The most drastic declines in adult Colorado pikeminnow abundance have been reported in the Yampa River. However, in 2017, researchers from Colorado State University reported a large number (n=75) of unique Colorado pikeminnow detections at a PIT antenna deployed in the mouth of Vermillion Creek, a small tributary to the upper Green River in Browns Park, CO. This finding, as well as similar detections of all the endangered fish species at other PIT antenna locations, have researchers exploring how to best use this new technology to describe population dynamics.

Population estimates for humpback chub in Desolation and Gray canyons were conducted in 2001 and 2002, and expanded in 2003 (Jackson and Hudson 2005). In the mid-2000's, this population appeared to decline and recommendations were made to secure the genetics by bringing fish into captivity (Badame 2012). In 2009, twenty-five adult humpback chub were captured and taken to the Ouray National Fish Hatchery, Randlett Unit; of these 25, 11 remain. UDWR resumed humpback chub population estimation in Desolation and Gray Canyons in 2014; specific site estimates were extrapolated to canyon(s)-wide estimate of 1,863 adult humpback chub in 2014

and 1,672 adult humpback in 2015 (Howard and Caldwell 2018). There are no significant trends in site-specific population estimates between 2006 and 2015.

A razorback sucker population estimate for the Green River was completed for the first time using capture data from Colorado pikeminnow sampling trips. Estimates indicate a population ranging from 25,482 to 36,355 from 2011 to 2013, but capture probabilities were low resulting in imprecise estimates (Zelasko et al 2018).

Selenium contamination of water and soil in Stewart Lake and Ashley Creek near Jensen, Utah, may adversely affect endangered fishes. The Bureau of Reclamation and Utah Division of Wildlife Resources manages ongoing remediation of Stewart Lake, in the form of fill, drain, and dry. Historic selenium levels in bottom sediments exceeded 15 ppm but the goal is 4 ppm or less (USGS 2003). The most recent sediment samples, taken in 2012, average less than 9 ppm and indicate that selenium concentrations decline substantially following high flow years on the Green River. Despite elevated selenium levels, UDWR has documented rapid growth of razorback sucker larvae entrained into Stewart Lake under the LTSP suggesting it can play an important role in recovery of razorback sucker (Breen and Skorupski 2012, 2013, Schelly et al. 2014). The periodic draining and drying schedule used for both razorback sucker rearing and selenium remediation has created perfect conditions for cattail growth, which is currently impeding presence of razorback sucker. Continued coordination with the selenium remediation team is necessary to maximize secondary benefits (periods of inundation) to endangered fish.

3.2 YAMPA RIVER AND LITTLE SNAKE RIVER

3.2.1 Importance

The Yampa River is the largest remaining substantially 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 spring flows, 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 was a major producer of endangered fishes for the entire Green River subbasin (Tyus and Karp 1989). A small population of humpback chub historically existed in the Yampa River in Dinosaur National Monument (Tyus and Karp 1989; U.S. Fish and Wildlife Service 1990a, 2002a), but is now believed to be extirpated.

Historically, 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 was associated with some of the last captures of wild 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. As discussed earlier, the number of adult Colorado pikeminnow residing in the Yampa River has been greatly reduced, largely because of persistent high densities of nonnative predators, and perhaps also because of extended drought.

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.

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. Because of concerns expressed by the Service and other Recovery 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.

To achieve flow protection objectives, the Recovery Program developed the Yampa River Management Plan with extensive local input. The Plan 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). A cooperative agreement implementing the Yampa River Management Plan and a PBO were completed in 2005.

The Yampa River Management 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 an acceptable cost. Construction of enlargement for human and endangered fish water supplies is complete and water releases for the endangered fish began in 2007. The Recovery Program funded a 5,000 af pool of permanent storage out of the 12,000 af Elkhead enlargement and has the option to lease up to an additional 2,000 af on an as-needed basis from the Colorado River Water Conservation District. In 2017, the Recovery Program partnered with the Colorado River Water Conservation District, Maybell Irrigation District, and the Yampa-White River Roundtable to install flow measurement improvements and automate operations at the upper end of the Maybell Canal to allow the Maybell District to more quickly adjust its diversions and ensure that Elkhead fish releases remain in the Yampa River.

The Recovery Program and CWCB reevaluate the need for instream-flow filings or other protective mechanisms at least every 5 years and document their findings. The Recovery Program determined in November 2011 that additional permanent protection in the form of instream flow filings on the Yampa was not necessary at that time. As part of the pending Yampa River depletion accounting report, CWCB will make an estimate of current and projected future depletions and will recommend whether or not additional instream flow filings or other flow protection mechanisms should be considered.

Flow contributions from the Little Snake River, as they assist in recovery in the Yampa River, were identified after estimated future depletions were accounted for 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. Disturbance of fish habitat related to maintenance of diversion structures was evaluated and found to be minimal based on the limited area and duration of the disturbance. Several diversions were identified as possible barriers to fish migration under certain conditions (Hydrosphere 1995a). 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 (Masslich 1993). 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. Evaluation of entrainment of Colorado pikeminnow in the larger Maybell Canal diversion began in 2007 and continued in 2011 and 2012. Only one endangered fish, a Colorado pikeminnow, was detected in 2012 (Speas et al. 2014). The Service's 2014 Sufficient Progress memo concluded that due to relatively low rates of documented entrainment of endangered fish, an exclusion

device would not be cost effective at this time. The Service recommended that the Recovery Program should strive to offset impacts at the Maybell Canal by completing the Yampa River nonnative fish control actions identified in the RIPRAP.

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 management of channel catfish in Yampa Canyon began in 2001, but the Recovery Program discontinued this work in 2007 (except for incidental removal of very large fish) to focus on the control of smallmouth bass, whose population expanded dramatically in the early 2000s coincident with the abrupt decline in small-bodied and juvenile native fishes and a rapid increase in virile crayfish (*Orconectes virilis*) (Martinez 2012). Active removal of northern pike downstream of Hayden began in 2003. The Recovery Program now removes smallmouth bass and northern pike at some level of intensity from Steamboat Springs downstream to the confluence with the Green River.

Northern pike distribution in the Yampa River extends from reservoirs in the upper reaches downstream to the Green River, but pike numbers are highest in the cooler upstream reaches. CPW has completed several habitat remediation projects to reduce northern pike spawning habitat in the upper Yampa River near Steamboat Springs. Active removal of northern pike downstream of Hayden began in 2003. In 2004, the Recovery Program began tagging northern pike in the Yampa River upstream of the Hayden Bridge to determine if it is a significant upstream source of northern pike moving downstream into critical habitat. In 2005, CPW began work to determine sources of northern pike that may gain access to endangered fish critical habitat in the Yampa River. Prior to the 2011 sampling season, the Recovery Program recommended and CPW agreed to discontinuing the pike marking pass in the Yampa River buffer zone between Hayden and Craig. Translocation of pike to off-channel waters was discontinued in 2014.

In 2015, Colorado State University completed an investigation of northern pike abundance and population dynamics in the Yampa River during the removal period of 2004 to 2010 (Zelasko et al., 2015). Northern pike abundance was highest in upstream reaches, but survival was highest in downstream reaches. Combined immigration and recruitment from river and reservoir sources were determined to offset northern pike removal rates; therefore, northern pike removal rates in the Yampa River were deemed insufficient to reach removal targets without reducing reproduction and escapement. CPW and others have undertaken a spawning suppression project using gill nets in backwaters. This effort has captured many northern pike before they could reproduce and nearby electrofishing catch, rates have decreased.

Northern pike were illegally introduced into Stagecoach Reservoir and subsequently spread downstream into the privately owned Catamount Reservoir. Catamount is known to contribute northern pike downstream into the Yampa River, including in critical

habitat (Orabutt 2006; Finney and Haines 2008; Martin and Wright 2010). CPW conducts intensive mechanical removal of northern pike from Catamount Reservoir and is working with the Catamount Ranch and Club (CRC) to restore the trout fishery there. CRC has implemented must-kill for northern pike in the reservoir. Pike numbers and the size of captured pike have been reduced, but individuals can reinvade the reservoir from Stagecoach Reservoir upstream; however, only one pike confirmed to have escaped from Stagecoach Reservoir has been captured in Catamount Reservoir in the last 5 years.

Unlike northern pike, smallmouth bass densities in the Yampa River are higher in the lower, warmer portions of the river. Active removal 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 a greater portion of the targeted population. Removal 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. In 2009, smallmouth bass removal was expanded throughout critical habitat on the Yampa River. Prior to the 2011 sampling season, the Recovery Program recommended and CDOW agreed to cease translocation of adult smallmouth bass from the Yampa River into Elkhead Reservoir due to concerns about the rate of escapement of translocated and resident smallmouth bass from the reservoir and the propagule pressure and proliferative capacity of these escapees within critical habitat. The Recovery Program's multi-year assessment of smallmouth bass escapement from Elkhead Reservoir is complete (Breton et al. 2013) and demonstrated that a solution for nonnative fish escapement was needed. In 2016, Program partners completed installation of a net across the spillway to eliminate further escapement. The net is supported by an updated lake management plan that describes in-reservoir actions to disadvantage the existing populations of northern pike and smallmouth bass.

The programmatic synthesis of smallmouth bass (Breton et al. 2014) populations in the upper Colorado River basin is also completed. In general, abundant year classes of young smallmouth bass produced in low flow and warm years such as 2007 have potential to overwhelm removal efforts, and the year class persists for one or more years. Nonetheless, it appears that increased electrofishing removal efforts from 2007 to 2011 resulted in sustained reductions in density of smallmouth bass sub-adults and adults throughout the upper basin despite environmental conditions that favored smallmouth bass reproduction in some years (e.g. 2007 and 2009) (Breton et al. 2014).

The Recovery Program's Integrated Stocking Plan (Nesler et al. 2003) outlined plans for stocking bonytail in the middle Green River that included the confluence of the Yampa River. Stocking bonytail at the confluence of the Yampa and Green rivers was initiated in 2000. The Integrated Stocking Plan was revised (Integrated Stocking Plan Revision Committee 2015) and more and larger bonytail are currently being stocked at Echo Park

and/or Deerlodge. In 2017, over 2000 bonytail were stocked into the Yampa River at Hell's Canyon Ranch with the support of the landowner.

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 (Cranney 1994). Limited fish surveys conducted in the lower 33 miles of the Duchesne River documented presence of razorback sucker and bonytail (Groves and Fuller 2009). More recently, in 2010 one Colorado pikeminnow was found near the town of Randlett by the Ute Indian Tribe (Fuller and Groves 2010). An opportunistic survey in 2017 documented Colorado pikeminnow, bonytail, and razorback sucker presence, accompanied by concerning numbers of nonnative fish, including smallmouth bass, northern pike and walleye.

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. The 2005 update set targets for maintaining 50 cfs of baseflows year-round and 115 cfs of baseflows during periods of fish migration. It also formalized high flow recommendations based on an evaluation of the high flows that occurred during the 1977-2002 period of record and the response of sediment and other channel characteristics to these flows. Agreements were developed to provide flows in the Duchesne River for the endangered fishes, primarily based on voluntary cooperation between water managers, water users, and government agencies. Since 2005, the local Duchesne River Workgroup has improved water operations and provides baseflows for native fish at increasingly better frequencies (Central Utah Water Conservancy District, 2013).

The Recovery Program participated in rehabilitation of the Myton Townsite Diversion Dam on the Duchesne River (completed in 2009) to help implement the flow recommendations for the endangered fish. More recently, the Ute Tribe, Utah Division of Wildlife Resources, Bureau of Reclamation, and the U.S. Fish and Wildlife Service funded and constructed a selective fish passage structure on this diversion to allow fish

passage and to increase available habitat for endangered and other native fishes. In addition, a Candidate Conservation Agreement with Assurances (CCAA) and Safe Harbor Agreement (SHA) were finalized for the portions of the Duchesne River between the Myton and Knight diversions and the Strawberry River below Starvation Reservoir. These agreements between the State of Utah, U.S. Fish and Wildlife Service, and the Associated Water Users of the Strawberry and Duchesne Rivers, formalizes the agreement to allow water from Starvation Reservoir to reach the Myton Diversion without being claimed by irrigators in return for guarantees for no future Endangered Species Act requirements from the Service. UDWR operated the Myton Fish Passage in 2016 but did not document any endangered species. In 2017, Duchesne River flows were too high to operate the passage.

Nonnative fish management has occurred intermittently in the Duchesne River since the mid-2000s, but is not currently being conducted. An opportunistic survey conducted during high flows in 2017 demonstrated substantial walleye numbers and smallmouth bass of all size classes, demonstrating the need for actions in this basin. Nonnative fish escapement from reservoirs in the Duchesne River basin is considered a priority and solutions are being developed. In 2011, isotopic analyses indicated that Starvation Reservoir and/or Lake Powell are a source of walleye entering the Green River; therefore, preventative escapement measures were re-evaluated. UDWR has funded the design of a permanent screening solution for the Starvation Reservoir spillway stilling basin. A temporary barrier has been in place and operated the last four years. A permanent fish screen was planned for 2018 installation but has been delayed.

3.4 WHITE RIVER

3.4.1 Importance

Construction of Taylor Draw Dam in 1984 blocked native fish passage in the White River, including Colorado pikeminnow migration. However, adult Colorado pikeminnow occupy the White River downstream of Taylor Draw Dam near Rangely, Colorado, in relatively high numbers. Adult Colorado pikeminnow residing in the White River are known to spawn in the Green and Yampa rivers. However, in 2011, researchers documented for the first time razorback suckers and Colorado pikeminnow spawning in the White River (Webber et al. 2013). 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. A passive integrated antenna array near the Bonanza Bridge (installed September 2012) demonstrated that razorback sucker and Colorado pikeminnow use the Utah portion of the White River in higher numbers than previously thought. The White River within Utah appears to be a stronghold for native fishes and management efforts in this basin should strive to preserve this feature of the river (Breen and Hedrick 2009, 2010). However, a recent expansion of

smallmouth bass in the White River is a cause for concern for this native fish stronghold.

3.4.2 Recovery Actions

A work plan for the White River (Lentsch et al., 2000) 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 a review began in 2009. A White River management plan is being drafted in 2018, and will ultimately serve as the basis for a White River programmatic biological opinion (expected completion date of 2018 or 2019). This management plan will evaluate the effects of possible future water development on the ability to meet the flow recommendations. Instream-flow filings are on hold pending reevaluation of how flows will be legally protected in Colorado.

In 2011, researchers reported increasing abundance of smallmouth bass and evidence of reproduction below Taylor Draw Dam. The Recovery Program began intensive removal of smallmouth bass from the White River in 2012 and has increased effort in this subbasin in subsequent years. The clear, warm water below Taylor Draw Dam provides ideal spawning habitat for smallmouth bass, even in years in which other basins see reduced reproduction. The population is apparently increasing in distribution from Taylor Draw Dam downstream into Utah, with multiple age-classes present. Further efforts need to investigate how to sufficiently disadvantage this emerging population in a native fish stronghold.

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 dense populations of humpback chub occur at Black Rocks and Westwater canyons near the Utah-Colorado state line. Both populations appear to have experienced a decline around the year 2000 and remained low for over a decade (Elverud 2012; Francis and McAda 2011). Populations in both Black Rocks and Westwater stabilized in 2011-2012 and preliminary estimates from sampling in 2016-2017 show signs of population increases (Francis et al. 2016, Hines et al. 2016, T.Francis and B. Hines, unpublished data). A small but persistent humpback chub population occurs in Cataract Canyon where some of the last wild bonytail in the Colorado River were collected. All life stages of Colorado pikeminnow occur in the section of river from Palisade, Colorado, downstream to Lake

Powell. Numbers of adult Colorado pikeminnow have remained stable since 1992 (Osmundson and White 2009). However, the most recent (preliminary) population estimates (collected in 2013 - 2015) indicate the adult population has declined to about 400 individuals, among the lowest estimates on record. However, researchers report strong numbers of subadults and record high catch of age-0 Colorado pikeminnow in 2015. Age-0 catch remained strong in 2016, but dropped off dramatically in 2017. Since 2008, with the completion of the Price-Stubb fish passage structure (the third of three such capital projects), the endangered fish have regained access to historically occupied reaches of the Colorado River upstream of Palisade, Colorado. Wild razorback sucker populations in the mainstem Colorado River declined precipitously in the early years of the Recovery Program, but stocked individuals have been accumulating over the past decade. Wild-produced Age 1+ and 2+ juveniles were collected in the lower Colorado River in 2013.

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 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 permanent commitment of 10,825 acre-feet/year from East and West slope water users. East and West slope 10-year 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 (extended through 2013). To replace these interim sources of water and meet their obligations to provide 10,825 af of water to the 15-Mile Reach on a permanent basis, East and West slope water users cooperatively analyzed a wide range of alternatives, reaching consensus on the "Lake Granby-Ruedi" option. A contract to provide Ruedi Reservoir water by water user agreement to provide a permanent source of water was completed in 2012. The Lake Granby contracts/agreements were completed in 2013. Implementation of the permanent sources occurred during the 2013 irrigation season. The Service's average monthly summer minimum base flow recommendation of 810 cfs continues to be difficult to achieve / maintain during dry years. However, the summer base flow augmentation program often increases instantaneous flows in the 15-Mile Reach by 200 cfs or more. The Program is working to improve the overall strategy for flow augmentation in the 15-Mile Reach to be considered each spring and adjusted as the year progresses, addressing all possible sources of water, priorities, antecedent conditions, projected flows and supplies, including OMID, Grand Valley Project, CFOPS, etc. In 2015, 2016, and 2017 the CWCB entered into a one-year lease agreement with Ute Water

Conservancy District for water stored in Ruedi Reservoir to supplement flows for existing instream water rights on the Colorado. That agreement allowed CWCB to lease between 6,000 acre-feet and 12,000 acre-feet of water from Ruedi for instream flow use in the 15-Mile Reach. 9,000 acre-feet were leased in 2015; 12,000 acre-feet in 2016; and 6,000 acre-feet in 2017.

In April 2013, a combination of conditions (including below-average snowpack, low runoff, early onset of the irrigation season, cold temperatures curtailing upstream runoff, and conservation in upstream storage) resulted in flows of 50 cfs or less in the 15-Mile Reach. In the future, water users and the Service will address the potential for this situation to recur as part of the normal HUP calls regarding water management for the 15-Mile Reach and determine what measures if any should be taken based on current conditions. This should avoid a repeat of the extreme low flows in the spring. The Service and water users will formalize and implement more specific recommendations to deal with the situation should it recur in the future.

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. In 1994, Colorado filed for a 300 cubic feet per second instream flow right on the return flows available in the 15-Mile Reach during the same months. Final decrees for both of these water rights were issued in 1997. Colorado filed for junior instream-flow rights on additional base flows and recovery goals in the 15-Mile Reach in December 1995, which was opposed in State water court.

Because 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 or other protective mechanisms at least every 5 years and document their findings.

Water is being provided to the 15-Mile Reach through an MOA with CRWCD for delivery of up to 6,000 acre-feet of water from Wolford Mountain Reservoir. 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 expanded coordinated reservoir operations as recommended in the study report. Earlier coordinated reservoir operations for the 15-Mile Reach began in 1997.

From 1997 to 2017, 1,895,161 acre-feet of water has been released from reservoirs in the upper reaches of the mainstem (including Green Mountain, Ruedi, Wolford Mountain Williams Fork, Granby Windy Gap, Willow Creek, and the Palisade Bypass) to enhance spring and summer flows to improve habitat in the 15-Mile Reach near Grand Junction. Reclamation and the municipalities of Grand Junction, Palisade, and Fruita have signed municipal-recreation agreements to deliver additional Orchard Mesa Check Settlement water and Grand Valley Water Management Plan water to benefit endangered fish. In 2000, Reclamation entered a 5-year contract to deliver Green Mountain surplus water to the city of Grand Junction for municipal/recreational purposes and that contract was renewed on 8/29/2007 through 12/31/2012. In 2015, Reclamation and the municipalities signed a 40-year agreement that can accommodate as much as 66,000 af – the entire Green Mountain Historic Users Pool. Under the previous agreements, Reclamation has delivered as much as 61,000 af/year.

The Service completed their Gunnison River Basin Programmatic Biological Opinion (PBO) in December 2009. In April 2012, Reclamation signed their Record of Decision on an EIS to re-operate the Aspinall Unit to provide flows for endangered fish in the Gunnison and Colorado rivers. The Recovery Program will conduct monitoring under the PBO and the Aspinall Unit Study Plan (2011) to assess how well the operation of the Aspinall Unit contributes to meeting target flows in the Gunnison and Colorado rivers and to help determine if managed flows from the Gunnison and the Colorado rivers are sufficient for recovery in the Colorado River between the Gunnison River and Green River confluences. After this monitoring and assessment are completed, the Service's flow recommendations for the Colorado River at the Utah-Colorado state line (McAda 2003) may be revised, or others may be developed, as necessary.

Reclamation has constructed fish passage at the GVIC, GVP, and Price-Stubb diversion dams on the upper Colorado River. The Price-Stubb passage was retrofitted with PIT tag antennas in 2010 and has detected bonytail, razorback sucker, Colorado pikeminnow and other native fish. Fish passage at these diversion dams benefits all four species of endangered fish (as well as other non-listed, native species) 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. The Recovery Program also salvages fish from these canals when the screens cannot be operated full-time throughout the irrigation season. Salvage has been necessary every year since screens were completed. From 2009-2013, the GVIC screen was operating, on average, 60% of the days during the irrigation season; during 2017, it was operational about 71% of the season. During 2012 and 2013, the GVP screen was operating 77% of the days during the irrigation season; during 2017, it was, for the first time, operational every day of the irrigation season.

To restore floodplain habitats, levees have been breached at three sites (46 acres) and ten properties acquired in perpetual easement or fee title to protect 394 acres. Other off-channel ponds are managed to reduce the threat of nonnative inputs. Since 2015, Colorado Parks and Wildlife has operated a Merwin trap net at a connected pond near Rifle, CO to prevent northern pike from reaching the Colorado River.

Nonnative fish are also a threat to recovery in the Colorado River drainage. Active removal of smallmouth bass began in 2004, and largemouth bass, northern pike, white sucker, and walleye are targeted. A CSU/CDOW study to determine the source of centrarchid fishes suggested that floodplain pond contributions to riverine nonnative fish populations fluctuate with the inter-annual variations in flow regime and river–pond connectivity (Whitledge et al. 2007). Recovery Program projects remove nonnative fish from selected streamside ponds in order to limit the escape of these individuals into the river when they connect. Recovery Program concerns about increasing collections of northern pike in the Colorado River near Rifle led to increased removal efforts beginning in 2011. In 2013, CPW installed a fish screen to prevent nonnative fish escapement from Rifle Gap Reservoir in 2013. Northern pike are now rarely captured in the mainstem Colorado River, with only two individuals captured in 2017. Expansion of walleye numbers in the lower reaches observed in 2013 has raised concerns (these fish may be coming from Lake Powell) (Francis and Ryden 2014). Specifically, walleye catches have greatly increased in the lower reaches of the Colorado River, overlapping with nursery habitat for Colorado pikeminnow. Documented predation on juvenile Colorado pikeminnow (~250mm) in this reach demonstrates the impact that predatory walleye can have on recruitment of the long-lived pikeminnow. The expansion of gizzard shad from Lake Powell may be supporting high walleye numbers, as gizzard shad are a preferred prey for walleye and constituted the most numerous catch in the Colorado River in 2017.

Operation of the fish barrier net at Highline Reservoir has been ongoing since 1999; the net was replaced in March 2006 and again in March 2014. Annual maintenance at Highline Reservoir to flush sediment requires unscreened releases from the outlet works. These releases are carefully timed in late summer when released waters are anoxic to minimize escapement of smallmouth bass and largemouth bass, which occur in Highline Reservoir. A small gap between the net and the lake bottom was noted and repaired in 2017.

Razorback sucker and bonytail are being stocked in the Colorado River in accordance with the revised Integrated Stocking Plan (Integrated Stocking Plan Revision Committee 2015).

Razorback sucker spawning activity was documented in the Colorado River inflow of Lake Powell in 2014-2016 (near Trachyte Creek and Castle Butte). Biologists collected

954 adult razorback sucker between 2 and 14 years old from 2014-2016; 8% were without a PIT tag. In 2014, 811 larvae were collected and in 2015, biologists identified three spawning areas in the Lake Powell inflow area.

3.6 GUNNISON RIVER

3.6.1 Importance

The Gunnison River is currently occupied by Colorado pikeminnow, razorback sucker, and bonytail. Several adult Colorado pikeminnow were captured in the Gunnison River in fishery surveys conducted in 1992 and 1993. Unrestricted upstream migration of fish was limited by the 10-foot high Redlands diversion dam located 2 miles upstream from the mouth of the Gunnison River until construction of a selective fish ladder in 1996. 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 anglers near Delta, Colorado, between 1930 and 1950. Razorback sucker larvae were collected in the Gunnison River (Osmundson and Seal 2009), and the reach near Delta is considered a priority razorback sucker restoration site. The native fish assemblage in the Gunnison River is presently less impacted, compared to other rivers, by nonnative fishes (particularly piscivorous species). CPW management efforts are emphasizing preserving this feature of the river.

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, re-operating 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) for bottomland habitat. Construction of a fish ladder at the Redlands diversion dam provides passage of all four endangered fishes and other native fishes (as well as allowing exclusion of nonnative fishes). In 2010, the first humpback chub (previously captured in Westwater Canyon, Utah) used the ladder. In 2017, seven Colorado pikeminnow, two bonytail, one razorback sucker were caught at the Redlands fish ladder. All seven Colorado pikeminnow were translocated to Escalante at river mile 42.7 on the Gunnison River. To prevent entrainment of adult and subadult endangered fish into diversion canals, a fish screen was installed at Redlands in 2005. In 2017, the Redlands screen was in operation 87% of the days during the irrigation season.

A 5-year research plan to evaluate the effects of reoperation 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 flow recommendations in 2003 (McAda 2003).

The Service completed their Gunnison River Basin Programmatic Biological Opinion (PBO) in December 2009. In April 2012, Reclamation signed their Record of Decision on an EIS to re-operate the Aspinall Unit to provide flows for endangered fish in the Gunnison and Colorado rivers. A study plan to evaluate effects of Aspinall Unit operations to benefit habitat and recovery of endangered fishes in the Gunnison and Colorado rivers was completed in 2011 (Aspinall Unit Study Plan *ad hoc* Committee 2011). A Gunnison River fish community monitoring study was initiated in 2011 to evaluate Aspinall reoperation. A team of geomorphology experts convened in 2013 and 2014 to review the findings of the USGS sediment transport study (Williams et al., 2013) and recommend methodologies the Recovery Program should consider to further evaluate the physical habitat expectations of the peak flow recommendations for the Gunnison and Colorado rivers. Recommendations from the resulting Peak Flow Technical Supplement (LaGory et al. 2015) were incorporated into the RIPRAP. The supplement offers a range of study approaches and prioritizes river reaches to evaluate the peak flow aspects of the Program's flow recommendations. High priority is placed on collecting suspended sediment data and investigating bed load transport within ongoing programs of NPS and USGS. Pursuant to this objective, in May 2016 Toby Minear (USGS) used hydrophones to monitor bedload mobilization at selected locations in the Gunnison River, on the rising limb and peak of the spring hydrograph. A number of sites (mostly riffles) indicated bedload movement at 5,000 cfs, and nearly all sites at 9,000 cfs. Based on this and other studies, the Service's flow recommendations for the Gunnison River (McAda 2003) may be revised and then legal protection of Aspinall releases and State protection of instream flows in the Gunnison River will be addressed.

The 2009 Gunnison Basin PBO included a requirement for Reclamation to "develop and implement a Selenium Management Program (SMP), in cooperation with the State of Colorado and Gunnison River basin water users to reduce adverse effects of selenium on endangered fish species in the Gunnison and Colorado rivers…" An SMP Action Plan was developed and is updated regularly to reduce the existing selenium load from existing sources and prevent, minimize, or mitigate potential new selenium loading from new activities. Muscle plugs have been collected from endangered and surrogate species to determine baseline selenium concentrations and evaluate effectiveness of selenium remediation.

Beginning in 1995, the Service experimentally stocked razorback sucker in the Gunnison River near Delta. The State of Colorado stocking plan for razorback sucker was revised in 2003 to stock fewer but larger fish (as was the Program's Integrated Stocking Plan, Integrated Stocking Plan Revision Committee 2015). Stocking of razorback sucker continues in the Gunnison River, in accordance with the revised Integrated Stocking Plan.

In 2012, CPW treated Paonia Reservoir to remove a source population of nonnative northern pike. Actions like this are consistent with the Basinwide Strategy. CPW has

reported that illegally introduced smallmouth bass in Ridgway Reservoir on the Uncompahgre River (a tributary to the Gunnison) are increasing and occupying habitats near the spillway. CPW, the reservoir owners, and the Recovery Program are working together to develop short and long-term solutions to prevent these fish from escaping the reservoir. CPW implemented an unlimited harvest of smallmouth bass beginning April 1, 2015 and conducted a harvest tournament at the reservoir the last three years. Tri-County Water has avoided using the spillway since 2014, when the problem of smallmouth bass escapement was recognized. Stakeholders are working together to design and install a net at Ridgway Reservoir that is similar to the net at Elkhead Reservoir.

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 affected the river and may have contributed to the decline of Colorado pikeminnow in the Dolores River drainage (Valdez et al., 1982).

3.7.2 Recovery Actions

Recovery actions for the Dolores River drainage have been limited to efforts independent of the Recovery Program to try to prevent/limit escapement of nonnative sport fish (e.g., smallmouth bass, yellow perch, and kokanee salmon) from McPhee Reservoir. However, smallmouth bass have become established in the Dolores River and may be an additional source for this invasive species in the Colorado River. In 2013, CPW treated Miramonte Reservoir to remove a source population of nonnative smallmouth bass. In July 2017, CPW targeted the smallmouth bass by scheduling a three-day, 4,000 cfs release at a time when males were guarding the nest. On a 14-mile stretch from below Snaggletooth Rapid to Slick Rock Canyon, biologists removed 600 smallmouth bass. Walleye also are in McPhee Reservoir, but have not been captured downstream. The Recovery Program needs to determine if nonnative fishes in the Dolores River basin pose a threat to endangered fishes and determine appropriate response.

Environmental contaminant clean up is being pursued by State and Federal agencies independent of the Recovery Program. It is unknown if stocked bonytail are using the Dolores River. Utah conducted surveys on the Dolores in 2005 and 2013 and detected bluehead suckers, roundtail chub, and flannelmouth sucker (no bonytail were captured). The Recovery Program will consider the need for additional recovery actions in the Dolores River as new information becomes available. The Bureau of Reclamation

funded the installation of PIT antenna in the lower Dolores River in 2013 and 2014. The Dolores River Working Group is exploring opportunities for improving the viability of native fishes in the Dolores River below McPhee Dam. The Lower Dolores River Monitoring, Implementation & Evaluation Plan contains objectives for nonnative fish monitoring and removal.

In efforts to determine better locations to stock bonytail such as quiet still waters, flooded bottomlands, and tributaries, bonytail were stocked 8 miles above the confluence with the Colorado River in 2014. This stocking location is upstream of the PIT-tag antenna arrays. New analysis of PIT-tag detections indicate use of the Dolores by Colorado pikeminnow, bonytail, razorback sucker and several other native species (Speas, unpublished data). Most of the bonytail stocked into the Dolores moved out of the river in 2014.

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. 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:

ANL	Argonne National Laboratory
BR	U.S. Bureau of Reclamation
CO	State of Colorado
CDA	Colorado Department of Agriculture

CDOPR	Colorado Division of Parks and Outdoor Recreation (See also CPW)
CDOW	Colorado Division of Wildlife (See also CPW)
CPW	Colorado Parks and Wildlife (CDOPR & CDOW merged in 2011)
CRWCD	Colorado River Water Conservation District
CWCB	Colorado Water Conservation Board
FWS	U.S. Fish and Wildlife Service
	-ES Ecological Services
	-FAC Fish and Aquatic Conservation
	-RW Refuges and Wildlife
	-WR Water Resources
LFL	Larval Fish Laboratory
NWCD	Northern Water Conservancy District
PD/PDO	Recovery Program Director
TBD	To be determined
UT	State of Utah
UDWR	Utah Division of Wildlife Resources
UTWR	Utah Division of Water Resources
WAC	Water Acquisition Committee
WYGF	Wyoming Game and Fish Department

Explanation for Column E - Status

Term	Definition
Complete	Action finished
Ongoing	Action currently occurring with no planned end date, such as nonnative fish removal; time period may be defined in the status as well. i.e ongoing every other year, etc.
In progress	Action currently occurring, with a defined end date, such as an expected report, etc.
Pending	Action either has been halted or hasn't started yet, but has the potential to resume/start if Program wishes;
On hold	Action hasn't started yet or has been halted, and isnt expected to start/resume
Dropped	Action no longer expected to take place or need for action has been abandoned
As needed	*Used only as a qualifier with other term; Action only occurs in certain situations when the action is appropriate and fesible; This term can be applied to any term except complete.

GENERAL RECOVERY PROGRAM ACTION PLAN

		ACTIVITY	WHO	STATUS	FY 18 10/17-9/18	FY 19 10/18-9/19	FY20 10/19-9/20	FY21 10/20-9/21	FY22 10/21-9/22	FY23 10/22-9/23	Post-Program	Description of Anticipated Post-Program Activity	Assessment of significant accomplishments (!) and shortcomings (X) (Focused on February 1, 2017 - January 31, 2018)
	I.	**PROVIDE AND PROTECT INSTREAM FLOWS (HABITAT MANAGEMENT)**											
	I.A.	Evaluate methods for defining habitat-flow needs and select methods most appropriate to specific stream reaches.											
	I.A.1.	Review instream flow methodologies and assess the technical adequacy of current flow recommendations.	PD	Complete									
	I.A.2.	Develop recommendations for integrating geomorphology and food web studies into Recovery Program.	PD	Complete									
	I.A.3.	Evaluate CDOW's instream flow methodologies and flow recommendations for warmwater native fishes (Anderson) as they relate to flows needed for endangered fish recovery.	FWS/PD	Complete									
	I.A.4.	Develop strategic plan for geomorphic research and monitoring.	Program	Complete									
	I.A.4.a.	Develop strategy and design for studies to address geomorphic research priorities. Peak Flow Technical Supplement (LaGory et al. 2015) approved in January 2016.	Geo. Work Group	Complete								We anticipate that endangered fish flow recommendations will be in final form by 2023. Ongoing geomorphic research is anticipated, but needs to be identified.	See 1.4.b.(2): With the March 2017 installation of instrumentation at Ouray, USGS began collecting 15-minute acoustic monitoring data to measure suspended sediment at both the Ouray and Jensen Green River gages (#09272400 and #09261000). These data are already being posted to the web and will continue to be collected through at least FY2021, allowing for development of a sediment budget for this reach and establishing a better understanding of Green River sediment dynamics. Also in 2017, Dr. Toby Minear (U Colo) conducted three longitudinal hydrophone surveys of the White River, each of approximately 16 to 28 miles, to continue developing techniques for bedload sediment transport detection. While there was almost no detectable bedload movement at the flow magnitudes that materialized in May and June 2017 (considerably lower peaks than anticipated when planned in February), a substantial amount of channel survey work was completed that will support modeling the 38-mile reach and help the Program better understand conditions under which bedload becomes mobilized. The BC and WAC will need to determine whether to pursue further hydrophone technology proof-of-concept experimentation on this or other rivers.
	I.A.4.b.	Conduct needed geomorphic research and monitoring. See Williams et al. 2013 and I.A.4.a, above.											
	I.A.4.b.(1)	Periodically monitor future channel narrowing and compare to historic rates using aerial or satellite imagery in the Green River (between Yampa and White rivers), Gunnison River (Hartland Dam to Colorado River), and the Colorado River downstream of the Gunnison River (Peak Flow Tech Supplement priority).	Program	Pending	X	X	X	X	X	X	X		
	I.A.4.b.(2)	Monitor sediment mass balance in the middle Green River at Jensen and Ouray gages, Gunnison River downstream of Hartland Dam at Delta and Whitewater gages, and the Colorado River at Cameo and State Line gages above and below the confluence with the Gunnison River (Peak Flow Tech Supplement priority).	Program	Ongoing	X	X	X	X	X	X	X		Middle Green River is the priority reach at this time (Peak Flow Tech Supplement). See Green I.D.1.b.(2).
	I.B.	Develop and select methods for modifiable protection of instream flows in Colorado.											
	I.B.1.	Develop, evaluate and select, as appropriate, options for interim protection of instream flows until uncertainty concerning habitat needs and water availability can be resolved.											
	I.B.1.a.	Colorado Attorney General review.	CO	Complete									
	I.B.1.b.	CWCB approval/recommended action.	CWCB	Complete									
	I.B.1.c.	Adopt legislation or regulation, if necessary.	CWCB	Complete									
	I.B.2.	Evaluate options for allocating Colorado's compact entitlement among the five subbasins, the implications for water available to recover the endangered fishes, and implications of full protection of recovery flow recommendations on development of Colorado's compact entitlement.	CWCB	Complete									
	I.B.3.	Assess need for retirement of senior conditional water rights.	CWCB/FWS	Dropped									
	I.C.	Develop an enforcement agreement between the Service and appropriate State agencies to protect instream flows acquired under the Recovery Program for the endangered fishes.											
>*	I.C.1.	Colorado.	FWS/CWCB	Complete									

	I.D.	Develop tributary management plans (based in part on the tributary report, see V.F., pg. 23).										
	I.D.1.	Assess need for tributary management plans on a site specific basis.	PD	Complete								
	I.E.	Develop strategies for long-term flow protection	Program	In progress	X	X	X	X	X	X	X	Implement strategies via cooperative agreement. See General, VII.A.6.	PDO has drafted a spreadsheet identifying current and needed protections for instream flow in various river basins of the Upper Colorado system. This spreadsheet will be used as a tool for post-2023 flow protection planning with Recovery Program partners.
	II.	**RESTORE HABITAT (HABITAT DEVELOPMENT AND MAINTENANCE)**											
	II.A.	Restore flooded bottomland habitats.											
	II.A.1.	Conduct inventory of flooded bottomland habitat for potential restoration.	FWS-FR	Complete									
	II.A.2.	Screen high-priority sites for potential restoration/acquisition.	PD	Complete									
	II.B.	Support actions to reduce or eliminate contaminant impacts. [NOTE: Contaminants remediation (in all reaches) will be conducted independently of and funded outside of the Recovery Program]											Selenium and mercury are considered in appropriate section 7 consultations, such as coal mining and mineral leases.
	II.B.1.	Evaluate effects of selenium.	FWS-ES	Ongoing	X	X	X	X	X	X	X		The Recovery Program, UDWR, FWS, and Texas A&M University analyzed Selenium uptake in age-0 razorback sucker at Stewart Lake and Johnson Bottom wetlands (including riverine larval fish) between 2014 and 2017. A final report is expected in 2018 in support of a revised Stewart Lake management plan. USBR continues to fund (Salinity Control Program) a significant selenium remediation effort in the Gunnison and Uncompahgre river drainages as per the Gunnison PBO.
	II.B.1.a.	Identify actions to reduce selenium contamination to levels that will not impede recovery.	FWS-ES	Ongoing	X	X	X	X	X	X	X		USBR is considering re-initiating the Biological Opinion at Stewart Lake to ensure alignment of operations for both razorback sucker rearing and selenium remediation. The new proposed action at Stewart Lake will evaluate selenium concentrations in sediment, water, and biota.
	II.B.2.	Identify locations of petroleum-product pipelines and assess need for emergency shut-off valves.											US Department of Transportation hosts a GIS-based map of existing pipelines which has increased access for government employees (compared to public access).
>*	II.B.2.a.	Ensure that all new petroleum product pipelines have emergency shutoff valves.	FWS-ES	Ongoing	X	X	X	X	X	X	X	This should be a requirement of all Upper Basin State energy permitting offices and identified in post-Program cooperative agreements.	USFWS Ecological Services addresses this through Section 7 consultation, though not all pipeline approvals have a federal nexus resulting in consultation.
>*	II.B.2.b.	Identify locations of existing petroleum-product pipelines potentially affecting critical habitat and determine if they have emergency shutoff valves.	FWS-ES, States	Ongoing	X	X	X	X	X	X			See II.B.2.a
	II.B.3.	Review and recommend modifications to State and Federal hazardous materials spills emergency response programs.	FWS-ES	Ongoing	X	X	X	X	X	X			The EPA has developed a Sub-Area Spill Contingency Plan for the Green River and is now developing the same for the Colorado River drainage. EPA has posted the December 2015 darft on the website, but not the final.
	II.C.	Develop an issue paper on the desirability and practicality of restoring and protecting certain portions of the floodplain for endangered fishes and evaluate the floodplain restoration program.											
	II.C.1.	Identify what restoration and protection are needed by addressing: 1) biological merits of restoring the floodplain with emphasis on endangered fish recovery; 2) priority geographic areas; and 3) integration of a broader floodplain restoration initiative into the current Recovery Program floodplain restoration program.	PROGRAM	Complete									
	II.C.2.	Identify how to conduct restoration and protection by addressing: 1) restoration and protection tools/approaches; 2) institutional options for floodplain restoration; 3) costs/funding strategy; and 4) implementation steps and schedule.	PD/CO/UT	Complete									
	II.C.3.	Identify viable options and develop specific restoration strategies for selected geographic areas (e.g., Grand Valley, Green River).	PD	Complete									

	III.	**REDUCE NEGATIVE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES (NONNATIVE AND SPORTFISH MANAGEMENT)**											
	III.A.	Reduce negative interactions between nonnative and endangered fishes.											
	III.A.1.	Where not already generally known, identify negative impacts (e.g., predation, competition, hybridization) of problem species.											
	III.A.1.a.	Determine role of nonnative fishes as potential competitors with bonytails and determine size-specific vulnerability of bonytails to nonnative fish predators.	UDWR	Complete									
	III.A.1.b.	Assess impact of northern pike predation on Colorado pikeminnow in the Green River.	UDWR	Complete									
	III.A.1.c.	Re-evaluate levels of hybridization with white sucker and assess effects on razorback sucker populations. (Program will monitor for evidence of hybridization as razorbacks increase in the system.)	FWS/UDWR/ CSU	Ongoing	X	X	X	X	X	X	X	Continue to monitor hybridization as a threat to native fishes. States should control sources of white sucker when economically feasible.	Correct field ID of hybrids remain vital to understanding this issue. Hybridization between white sucker and native suckers is widespread, but apparently more problematic for flannelmouth sucker than other species. Preferred habitats of white sucker create increased opportunity for hybridization, such as the cooler water below Flaming Gorge dam (Kluender et al., 2017 Researchers Meeting presentation). Investigators raise concern that the level of white sucker hybridization in the White River is increasing, thus presenting a direct threat to the genetic integrity of the robust native catostomid community. White suckers still dominate the catch in the Yampa and Colorado rivers, but catch rates of hybrids remain lower.
>*	III.A.1.c.(1)	If necessary, implement actions to minimize hybridization between white sucker and razorback sucker.	FWS/UDWR/ CSU	As needed	X	X	X	X	X	X	X	Continue to remove hybrids to minimize threat to native fishes.	See above. White sucker and their hybrids are removed where encountered in Yampa, Green, White, Colorado, and Gunnison rivers. **!** UDWR pursuing modifications to Browns Park WMA to eliminate white sucker source population.
	III.A.2.	Identify and implement viable active control measures.											
	III.A.2.a.	Identify options (including selective removal) to reduce negative impacts of problem species and assess regulations and options (including harvest) to reduce negative impacts on native fishes from nonnative sportfish.	PD	Complete									
	III.A.2.b.	Review options and develop agreement with appropriate States on strategies and locations for implementing control options. Develop Nonnative Fish Management Policy.	FWS/STATES	Complete									
>*	III.A.2.c.	Evaluate the effectiveness (e.g., nonnative and native fish response) and develop and implement an integrated, viable active control program.	Program	Ongoing	X	X	X	X	X	X	X	Maintain an active, robust nonnative fish removal program to suppress nonnative fish to levels sufficient to support native fish populations.	**!** The Program continues to adjust nonnative fish actions to those deemed most effective and efficient. Adult catch rates of smallmouth bass and northern pike show declines in many locations, despite variable catches of younger fish, demonstrating a removal effect. The Program judged removal efforts appropriately planned and implemented, with no need for large-scale changes and did not hold a nonnative fish workshop in 2017. Stakeholders have increased focus on reservoir escapement based on results of smallmouth bass (Breton et al. 2014) and northern pike syntheses (Zelasko et al. 2015), and increased walleye catches. Reservoirs of interest are guided by provenance study (Johnson et al. 2014). In-river removal continues to focus on disrupting spawning and removing adults. Smallmouth bass removal during spawning (the 'Surge') and northern pike backwater netting are primary efforts to reduce reproduction of these species. Walleye do not appear to be self-sustaining in the river. Walleye are removed during times of lower water temperature in the spring and fall. In-river removal efforts generally occur as long as conditions are safe for crews and catch rates are productive. **X** Current low densities of Colorado pikeminnow throughout the upper basin are linked to the persistence of nonnative predators. Large-bodied predatory species

	III.A.2.c.(1)	Project-level synthesis: synthesize data on each species/river nonnative fish control effort and concomitant native fish response (e.g., smallmouth bass in the Yampa River and native fish response in the Yampa River) (completed by PI's and identified as a task in individual scopes of work). (YS G-3) See Bestgen et al., 2007 for Yampa River native fish response report (2003-2006) and Skorupski et al 2012 for Middle Green River native fish response report (2005-2008).	PI's	Ongoing							X	Monitor native fish populations response to nonnative fish populations	CSU LFL will provide synthesis report on Yampa River native fish response and Lodore/Whirlpool Canyon fish community. Smallmouth bass early life history report (Bestgen and Hill 2016b) finalized in 2016 demonstrated that short duration increases in flow could disrupt smallmouth bass spawning on a landscape scale (see III.A.2.g.).
	III.A.2.c.(2)	Programmatic synthesis: assimilate project-level data into a basinwide and population scale analyses of effectiveness of nonnative fish management. (Breton et al. 2013, 2014, Zelasko et al. 2015).(YS G-3)	PD	Complete							X	May need to reanalyze the effectiveness of nonnative fish removal efforts in future.	Northern pike and smallmouth bass syntheses demonstrated recruitment and immigration are offsetting removal efforts; therefore, Program must focus on reducing reproduction and reservoir escapement.
	III.A.2.c.(3)	Develop one or more standardized nonnative fish datasets to facilitate data analyses and information tracking (one dataset will incorporate all tagging data, others may incorporate all movement, mark-recapture, removal data, etc.) *YS G-1.) Relates to item V.A.1., Interagency Data Management.	Program	Ongoing	X	X	X	X	X	X	X	Store uniform data in a central location for further analysis of nonnative fish removal.	Ongoing. NNF PI's submit their standardized data sets to the PDO (formerly to CRFP-GJct) no later than March 15 each year. Nonnative fish collections are being stored in the broader STReaMS database effort.
	III.A.2.c.(4)	Evaluate additional techniques to improve data analysis (e.g., advanced software, exploitation models, ecosystem response models). (YS M-1,2). See, for example, Haines and Modde, 2007.	Program	Ongoing	X	X	X	X	X	X	X		
>*	III.A.2.d.	Close river reaches to angling where and when angling mortality is determined to be significant. (See specific river reaches.)	STATES	Ongoing, as needed									
	III.A.2.e.	Increase law enforcement activity to decrease angling mortality.	STATES	Ongoing									
>*	III.A.2.f.	Develop control program for removal of small nonnative cyprinids in backwaters and other low velocity habitats. (Trammell et al. 2002 and 2005 complete, but development and implementation of a control program is on hold.)	STATES	On hold									**X** Awaiting 158 report; nonnative cyprinid management on hold until Project 158 report reviewed.
>*	III.A.2.g.	Evaluate other methods for controlling nonnative fishes, including manipulation of flow and temperature, use of fish attractants, pathogens, genetic modification, and chemical piscicides. See Johnson et al. 2014 (YS N-1,2,3,4), Bestgen and Hill 2016.	Program	Ongoing	X	X	X	X	X	X	X	Novel techniques for nonnative fish suppression will always be important to consider and may be the only method for long term native fish protection.	A study plan (investigating biological and physical anticipated outcomes / uncertainties) for implementation of Flaming Gorge flow manipulation for bass control is being developed in concert with the evaluation of flow and temperature recommendations below Flaming Gorge Dam. Data collected in the Yampa River in 2015 during a natural flow spike (intense rain event) strongly supported the conclusions in Bestgen and Hill 2016. Increases in velocity, turbidity, and depth, and decreases in temperature are effective at moving male adult bass away from the nest and sweeping away fry and eggs. Lower basin researchers used ammonia to remove green sunfish below Glen Canyon Dam, indicating potential for upper basin application. A working group is considering using USBR's Challenge Grant process to request novel actions for nonnative fish control.
	III.B.	Reduce negative impacts to endangered fishes from sportfish management activities.											
	III.B.1.	Implementation Committee approval of Interim Nonnative Fish Stocking Procedures.	PD	Complete									
	III.B.2.	Implement Interim Nonnative Fish Stocking Procedures.											
	III.B.2.a.	Develop scope of work for evaluation of Interim Procedures.	PD	Complete									
	III.B.2.b.	Evaluate and revise Interim Procedures.	PD	Complete									
	III.B.3.	Finalize revised Nonnative Fish Stocking Procedures.											
	III.B.3.a.	Complete Biological Opinion/NEPA compliance.	FWS-ES/FR	Complete									
	III.B.3.b	Implementation Committee approval of revised Nonnative Fish Stocking Procedures.	PD	Complete									
	III.B.3.c.	State wildlife commissions approval, as necessary.	STATES	Complete									
	III.B.3.d.	Execute memoranda of agreement between Service and States.	FWS/STATES	Complete									
	III.B.4.	Incorporate final Procedures into State aquaculture permitting process.											
>*	III.B.4.a.	Colorado.	CDA/CDOW	Complete									
	III.B.4.a.(1)	Evaluate effectiveness of Colorado's stocking regulation.	CDOW	Complete									
>*	III.B.4.b.	Utah.	UDWR	Complete									
>*	III.B.4.c.	Wyoming.	WYGF	Complete									
	III.B.5.	Explore options for tribal acceptance of Nonnative Fish Stocking Procedures.	FWS-FR	Complete									
	III.B.6.	Review, evaluate, and revise as needed, the Nonnative Fish Stocking Procedures.	Program	As needed (to be reviewed in 2019)		X					X	Nonnative Fish Stocking Procedures should be followed and updated as needed.	States continue implementing the Nonnative Fish Stocking Procedures. Recent lake management plans reviewed under the Procedures include Elkhead, Rifle Gap, Red Fleet, and Starvation Reservoirs, and Pelican Lake.

	III.B.7.	Increase law enforcement activity to prevent illicit stocking.											
	III.B.7.a.	Develop plan	STATES	On Hold									States have no plans to develop a written document but do develop and implement actions on this important issue.
>*	III.B.7.b.	Implement actions	STATES	Ongoing	X	X	X	X	X	X	X	Illicit stocking is a major impediment to successful fisheries management and needs to be prevented as much as possible. Strict penalties for convictions are one way to deter such actions.	Wyoming, Colorado, and Utah annual fishing regulations brochures call attention to the problem of and penalties for illegal stocking. Utah is undertaking a review of collection, importation, and possession, which includes how illicit stocking is being enforced.
	III.B.8.	Evaluate designation of native fish conservation areas	STATES	On Hold							X	Evaluate and propose native fish conservation areas as appropriate.	States and partners continue to manage specific areas for native fish communities, but designating and advertising these areas under a specific name is not being currently considered by any state .
	III.C.	Evaluate sources of nonnative fishes into critical habitat using isotope technology. See Johnson et al. 2014.	CSU	Ongoing	X						X	Novel introductions (new species or new locations) of nonnative fishes should be evaluated (e.g. isotopic analysis) to determine provenance.	CSU investigations resulted in otolith markers for water chemistry for reservoirs throughout the basin (Johnson et al. 2014). Program continues to collect & retain otoliths under specific guidance to assure potential for future analysis, if needed. FWS Grand Junction received funding to work with USGS Lakewood to implement this technique to determine source of walleye in the lower Colorado and Green rivers. This technique also has forensic potential for prosecuting cases of illegal fish transport or possession of live fishes in illegal stocking cases.
	III.D.	Finalize the UCR Basin Nonnative and Invasive Aquatic Species Prevention and Control Strategy (Basinwide Strategy), Martinez et al. 2014.	PD	Complete							X	Follow concepts in the Basinwide Strategy to prevent new introductions of nonnative species, respond to new introductions, and evaluate ways to reduce nonnative species.	Most recent version of the Basinwide Strategy on Recovery Program website (updated in 2015).
	III.E.	Cease translocation of all nonnative predators to any fishery within the UCR.	States / Program	Complete								Translocations of nonnative fish have consistently been determined to be detrimental to native fish management and should not be employed.	All translocation ceased as of FY14.
	III.F.	The States will commit to remove northern pike and / or replace them with a Compatible (compatible with recovery) species (as identified in the Basinwide Strategy) throughout the UCR Basin. Specific waters will be targeted based on risk of escapement, opportunity and available resources.	States / Program	Ongoing	X	X	X	X	X	X	X	Continue to remove northern pike populations in the upper basin and replace them with compatible species.	States continue to remove and replace northern pike at specific reservoirs. CPW is removing northern pike at Lake Catamount, holding harvest tournaments that target northern pike at Elkhead and Stagecoach Reservoirs (see Yampa River), using Merwin trap at Mamm Creek gravel pit (see Colorado River), and has revised the Rifle Gap and Elkhead Reservoir LMPs to replace northern pike with other species. CPW approved pike derby in the upper Yampa River and bounty payments in Wolford and Green Mountain Reservoirs.
	III.F.1.	Implement 'must kill' regulations for northern pike throughout the UCR basin (exceptions may include waters where northern pike are being replaced by tiger muskie).	WY & UT	Complete							X	Utah and Wyoming will continue to enforce must-kill regulations	Must-kill regulations continue to be enacted.

	III.F.2.	Continue discussions concerning "must kill' regulations on northern pike throughout the UCR Basin to develop a proposal supported by law enforcement for regulatory consideration.	CO	Ongoing	X	X	X	X	X	X	X	CPW will continue to evaluate harvest regulations and enact appropriate regulations that appropriately respond to northern pike populations	Since 2016, CPW has convened a Nonnative Fish Workgroup of various stakeholders, including the Recovery Program, to discuss major topics for nonnative fish management, such as regualtion changes, outreach, and angler incentives. CPW has implemented regulation changes which removed protections for northern pike in West Slope water, which went into effect April 1, 2016. CPW is not considering must-kill regulations at this time and instead focuses on angler removal through incentives and liberalized regulations. A significant issue for the success of unlimited harvest regulations, the "catch and keep" strategy, and incentivized harvest is the ability of anglers to remove and keep fish they do not plan to consume. Therefore, a large portion of fish caught under unlimited harvest regulations and other incentive programs may be released back into the system by anglers, contrary to their intent. CPW will continue investigating modifications to fishing regulations to allow anglers to dispose of excess smallmouth bass and northern pike they don't plan to consume.
	III.G.	Remove smallmouth bass and / or replace them with a Compatible species (as identified in the Basinwide Strategy) everywhere they occur throughout the UCRB (exceptions = McPhee Res., Lake Powell Res., and upstream of Flaming Gorge Dam; and 'containment' may prove to be a viable management option for smallmouth bass at Starvation Res.). Specific waters will be targeted based on risk of escapement, opportunity and available resources.	States / Program	Ongoing	X	X	X	X	X	X	X	Continue to remove smallmouth bass populations where appropriate in the upper basin and replace them with compatible species.	States continue to remove, replace, and contain smallmouth bass at specific reservoirs. Starvation Reservoir is contained via temporary screen, Elkhead Reservoir is contained via screen and net. Smallmouth bass in Elkhead Reservoir and Ridgway Reservoir are being reduced through angler harvest. **X** The smallmouth bass population at Ridgway Reservoir continues to be unscreened, representing a large risk to the downstream native fish community in the Gunnison River. **X** Starvation Reservoir permanent screen was not installed in FY2017 or 2018 as planned.
	III.G.1.	Implement 'must kill' regulations for smallmouth bass throughout the UCR basin (see exceptions above).	UT	Complete								Utah and Wyoming will continue to enforce must-kill regulations	Must-kill regulations are in place.
	III.G.2.	Continue discussions concerning "must kill' regulations on smallmouth bass throughout the UCR Basin to develop a proposal supported by law enforcement for regulatory consideration.	CO	Ongoing	X	X	X	X	X	X	X	CPW will continue to evaluate harvest regulations and enact appropriate regulations that appropriately respond to smallmouth bass populations	Since 2016, CPW has convened a Nonnative Fish Workgroup of various stakeholders, including the Recovery Program, to discuss major topics for nonnative fish management, such as regualtion changes, outreach, and angler incentives. CPW has implemented regulation changes which removed protections for smallmouth bass in West Slope water (excluding Navajo and McPhee reservoirs), which went into effect April 1, 2016. CPW is not considering must-kill regulations at this time and instead focuses on angler removal through incentives and liberalized regulations. See also III.F.2. above regarding must-kill and angler fish disposal.
	III.H.	Reduce burbot numbers through all means practicable (including targeted removal) throughout the UCR Basin.	States / USFWS	Ongoing	X	X	X	X	X	X	X	Continue to work to prevent burbot establishment and will respond to any instance of burbot introduction.	Current harvest regulations (e.g., 'must kill' regulations; fishing derbies at Flaming Gorge) considered adequate. **X** Burbot Risk Assessment should be finalized. In light of burbot escapement and high runoff in 2017, burbot escapement risk should be fully understood.
	III.H.1.	Implement 'must kill' regulations for burbot throughout the UCR basin.	WY & UT	Complete								Utah and Wyoming will continue to enforce must-kill regulations	Must-kill regulations are in place.
	III.H.2.	Continue discussions concerning "must kill' regulations on burbot (as a preemptive measure) throughout the UCR Basin to develop a proposal supported by law enforcement for regulatory consideration.	CO	Ongoing	X	X	X	X	X	X	X	It is illegal to export, import, transport, stock, sell, or release Burbot in Colorado, and it will continue to be.	Since 2016, CPW has convened a Nonnative Fish Workgroup of various stakeholders, including the Recovery Program, to discuss major topics for nonnative fish management, such as regualtion changes, outreach, and angler incentives. See also III.F.2. above regarding must-kill and angler fish disposal. Burbot is illegal to export, import, transport, stock, sell, or release.

	III.I.	Reduce walleye numbers through all means practicable (including targeted removal) throughout the UCR Basin.	States / USFWS	Ongoing	X	X	X	X	X	X	X	Continue to monitor and remove walleye as appropriate in the UCR basin.	Walleye-specific removal passes continue in the Green and Colorado rivers, focusing on specific times and locations where catches are highest. Walleye removal is an ancillary component of Colorado pikeminnow population estimate work because the two species share niche overlap.
	III.J.	Promote increased production of sterile gamefish (e.g., hybrids, triploids), as Compatible sport fish.	Service / States / Program	Pending	X	X	X	X	X	X	X	Continue to investigate sterile gamefish (with appropriate containment) as an appropriate replacement for problematic nonnative species. Continue to investigate appropriate technology for triploidy induction and appropriate stocking strategies for triploidy populations.	Providing sterile gamefish is consistent with Basinwide Strategy and Nonnative Fish Stocking Procedures. The States and FWS are collaborating on this topic where appropriate and possible. Utah continue to stock 100% triploid walleye in Red Fleet Reservoir. Colorado stocked triploid walleye in Rifle Gap Reservoir. Utah and Colorado have agreed to share production of 100% triploidy if the other state cannot meet that threshold. UDWR and CPW are funding research projects to investigate many unknown aspects of walleye triploidy (spawning behavior, growth, survival, population dynamics, etc.). Utah is producing hybrid striped bass (wipers) for use in new LMPs and is researching the ability to produce sterile smallmouth bass.
	III.K.	Work with State Wildlife agencies and water user groups to increase awareness among States' legislatures and the courts of the ecological and financial ramifications of illicit introductions.	States and PD via Implementation Committee	Ongoing	X	X	X	X	X	X	X	Continue to provide information to legislatures and courts concerning the ecological and financial ramifications of illicit introductions.	
	IV.	**MANAGE GENETIC INTEGRITY AND AUGMENT OR RESTORE POPULATIONS (STOCKING ENDANGERED FISHES)**											
	IV.A.	Genetics Management.											
	IV.A.1.	Develop and approve Genetics Management Guidelines.	PD	Complete									
	IV.A.2.	Develop and implement Genetics Management Plan for all species and update as needed. Czapla 1999.	PD	Ongoing	X	X	X	X	X	X	X	Maintain genetic refugia for each of the species.	The genetics management is implemented via breeding protocols at the various hatcheries that maintain broodstock for razorback sucker (Ouray-Randlett and Grand Valley), bonytail (Southwest Native ARRC), Colorado pikeminnow (Southwest Native ARRC). Refugia humpback chub held at Ouray-Randlett and Grand Valley.
	IV.A.3.	Conduct genetic diversity studies (includes Gila taxonomy studies) and confirm presumptive genetic stocks based on all available information.											
	IV.A.3.a.	Razorback sucker.	BR	Complete									
	IV.A.3.b.	Bonytail and humpback chub.											
	IV.A.3.b.(1)	Morphological and allozyme analyses. (Draft 4/95)	PD	Complete									
	IV.A.3.b.(2)	Mitochondrial DNA analysis.	BR	Complete									
	IV.A.3.c.	Colorado pikeminnow.	PD	Complete									
>	IV.A.4.	Secure and manage the following species in hatcheries (according to the Genetics Management Plan).											
	IV.A.4.a.	Razorback sucker.											
	IV.A.4.a.(1)	Middle Green	FWS-FR	Ongoing	X	X	X	X	X	X	X	Maintain genetic refugia for each of the species.	Broodstock are currently maintained and in active use at Ouray National Fish Hatchery - Randlett.
	IV.A.4.a.(2)	Upper Colorado River.	FWS-FR	Ongoing	X	X	X	X	X	X	X	Maintain genetic refugia for each of the species.	Broodstock are currently maintained and in active use at Horsethief Canyon Native Fish Facility.
	IV.A.4.b.	Bonytail	UDWR/CPW	Ongoing	X	X	X	X	X	X	X	Maintain genetic refugia for each of the species.	Bonytail broodstock are currently maintained and in active use at Southwest Native Aquatic Resources and Recovery Center (Southwest Native ARRC).

	IV.A.4.c.	Humpback chub.										A draft report on the genetics of Gila spp. (Bohn, in prep), including humpback chub, indicates historical hybridization (not anthropogenic) occurred between humpback chub and roundtail chub in Black Rocks. The authors identified two management units in the upper basin: Deso-Cataract and Black Rocks-Westwater. Authors did not recommend separate broodstocks, rather both management units be represented in a single Upper Basin broodstock. Report will be finalized upon inclusion of Westwater samples.
	IV.A.4.c.(1)	Black Rocks Canyon.	FWS-FR	Ongoing	X	X	X	X	X	X	X	Maintain genetic refugia for each of the species.	Ten adult humpback chub from Black Rocks were brought into captivity. A total of 28 adult HBC from Black Rocks are being held at Horsethief Canyon Native Fish Facility. See IV.A.4.c.
	IV.A.4.c.(2)	Westwater Canyon.	UDWR	Ongoing	X	X	X	X	X	X	X	Maintain genetic refugia for each of the species.	
	IV.A.4.c.(3)	Cataract Canyon. (Broodstock currently represented by wild fish in the river.)	UDWR	Ongoing	X	X	X	X	X	X			
	IV.A.4.c.(4)	Yampa Canyon. (Broodstock had been considered represented by wild fish in the river; however, population appears to have declined and Recovery Program was unable to establish a refuge stock.)	FWS-FR	Dropped									
	IV.A.4.c.(5)	Desolation/Gray Canyons. (Broodstock currently represented by wild fish in the river; however, population appears to have declined and Recovery Program is establishing a refuge stock.)	UDWR	Ongoing	X	X	X	X	X	X	X	Maintain genetic refugia for each of the species.	25 humpback chub from Desolation Canyon were brought into Ouray NFH in 2009. Eleven remain at Ouray NFH-Randlett. Program may consider bringing in additional fish in future years. See IV.A.4.c.
	IV.A.4.d.	Colorado pikeminnow.											
	IV.A.4.d.(1)	Upper Colorado River Basin (Broodstock currently represented at Southwest Native ARRC and by wild fish in the river.)	FWS	Ongoing	X	X	X	X	X	X	X	It is important to maintain a broodstock of Colorado pikeminnow for genetic integrity.	Additional collection of young of year Colorado pikeminnow has been requested by Southwest Native ARRC to replenish broodstock. Program Office will work with Southwest Native ARRC and provide information to field crews.
	IV.B.	Conduct annual fish propagation activities.											
	IV.B.1.	Identify species needs for refugia, research, augmentation, and information and education.	PD	Ongoing	X	X	X	X	X	X	X		
	IV.B.2.	Implement revised integrated stocking plan (Integrated Stocking Plan Revision Committee 2015); supersedes all earlier stocking plans, including species-specific and individual basin plans.	FWS, UDWR, CPW	Ongoing	X	X	X	X	X	X	X		Hatcheries continue to stock 35,000 bonytail and 12,000 razorback sucker annually at the increased size recommended by this plan. See the Assmt-Gen Stocking worksheet. Bonytail are now stocked in habitats thought to enhance post-stocking survival, such as floodplains, tributary mouths, and backwaters.
	IV.B.3.	Conduct NEPA compliance and develop biological opinion on disposal of excess captive- reared endangered fish.	FWS-ES/FR	Complete									
	IV.C.	Operate and maintain facilities.											
	IV.C.1.	Ouray NFH: Randlett Unit.	FWS-FR	Ongoing	X	X	X	X	X	X	X	Operate and maintain facilities for genetic refugia	Depredation of larvae has been fully controlled; stocking numbers were met and exceeded in 2017. Consideration for aging facilities needs to be part of future planning.
	IV.C.2.	Ouray NFH: Grand Valley Unit.	FWS-FR	Ongoing	X	X	X	X	X	X	X	Operate and maintain facilities for genetic refugia	Consideration for aging facilities needs to be part of future planning.
	IV.C.3.	Wahweap.	UDWR	Ongoing	X	X	X	X	X	X	X	Operate and maintain facilities for genetic refugia	Consideration for aging facilities needs to be part of future planning.
	IV.C.4.	Mumma.	CPW	Ongoing	X	X	X	X	X	X	X	Operate and maintain facilities for genetic refugia	Consideration for aging facilities needs to be part of future planning.
	IV.D.	Plan, design, and construct needed facilities.											
	IV.D.1.	Develop Coordinated Hatchery Facility Plan based on revised State stocking plans.	PD	Complete									
	IV.D.2.	Design and construct appropriate facilities.											
	IV.D.2.a.	Ouray NFH: Randlett Unit.	FWS/BR	Complete									
	IV.D.2.b.	Wahweap.	UDWR/BR	Complete									
	IV.D.2.c.	Ouray NFH: Grand Valley Unit.	FWS/BR	Complete									
	IV.D.2.c.(1)	Construct ponds at Grand Valley to maintain secondary bonytail broodstock, humpback chub from Black Rocks, Westwater and Cataract Canyons, and additional rearing space for razorback sucker (leased ponds being discontinued).	FWS/BR	Complete									
	IV.D.2.d.	Acquire ponds for growout of endangered fishes.											
	IV.D.2.d.(1)	23 acres of growout ponds in the Green River basin.	FWS/STATES	Complete									
	IV.D.2.d.(2)	100 acres of growout ponds in the Colorado River basin.	FWS/STATES	Complete									

	IV.E.	Conduct monitoring to evaluate effectiveness and continuation of endangered fish stocking.										Will be a function of post Program monitoring	**!** Razorback adults continue to accumulate in the Green and Colorado sub-basins (including Colorado inflow to Lake Powell) and the larval catch has increased considerably in recent years. Spawning activity observed in numerous locations in the Green River, Colorado River, White River and Lake Powell. Pop estimates ranged from 25,482 (95% CI 10184-67749) in 2011 to 36,355 (95% CI 17,941-74854) in 2013 in a report by Zelasko et al. finalized in January of 2018. Post-stocking survival of bonytail does not meet expectations. Stocking locations are being evalulated; flow training and predator avoidance is still being considered.
	IV.E.1.	Assess the monitoring needed to evaluate the contribution to recovery of endangered fish stocking over relevant reaches, life stages, and generations. Assessment addressed in 2001 and 2004 workshops (Upper Colorado River Endangered Fish Recovery Program 2002, 2006); continued assessment ongoing.	LFL/STATES	Ongoing	X	X	X	X	X	X			
	IV.E.2.	Evaluate endangered fish stocking and revise augmentation plans, as needed. Initial evaluation complete: Zelasko et al. 2009, 2011.	FWS/LFL/ States/PD	Ongoing	X	X	X	X	X	X			
	IV.E.3	Modify stocking plans to ensure successful stocking.	Program	Ongoing	X	X	X	X	X	X			Recommendations by Zelasko et al. 2009; 2011 were incorporated into the Revised Integrated Stocking Plan. The plan was finalized and is being implemented (see Assessment-Gen Stocking worksheet).
	V.	**MONITOR POPULATIONS AND HABITAT AND CONDUCT RESEARCH TO SUPPORT RECOVERY ACTIONS (RESEARCH, MONITORING, AND DATA MANAGEMENT)**											
	V.A.	Measure and document population and habitat parameters to determine status and biological response to recovery actions.											In 2017, mark-recapture (M/R) population estimates for adult and juvenile humpback chub continued in Black Rocks and Westwater canyons; and CPE-based monitoring occurred for this species in Cataract canyon of the Colorado River. The 2nd year of the most recent 3 -yr rotation of M/R estimates for juvenile and adult Colorado pikeminnow occurred in the Green River Basin. Annual monitoring for Colorado pikeminnow YOY occurred throughout the Upper Basin.
	V.A.1.	Conduct interagency data management program to compile, manage, and maintain all research and monitoring data collected by the Recovery Program.	FWS-FR	Ongoing	X	X	X	X	X	X	X		STReaMS continues to improve with new structural component and additional datasets being added. Quality control and assessment and batch upload tools were created as scheduled. Advanced query builders were postponed to support the development of flagging tools that allow users to understand the quality of the data. In 2018, the focus will switch to advanced query builders and custom user tools.
	V.A.1.a.	Develop basinwide razorback monitoring program (implementation to be reflected in sub-basin worksheets). Bestgen et al. 2012.	LFL										
	V.A.1.a.(1)	Standardize light trap sampling	LFL	Ongoing	X	X							Capture efficiency and distance traveled to light traps being evaluated in the lab and field. Data and reporting should follow in future years.
	V.A.1.a.(2)	Investigate improving recapture rates through passive PIT tag monitoring, nets, etc. to improve population abundance estimates.	ALL	Ongoing	X	X	X	X	X	X	X	Continue to use all appropriate data to analyze the population dynamics for each population.	Stationary and portable PIT tag antennas continue to be used throughout the basin to add detections to the database and support population estimates. A population estimate workshop was held in March 2017 where population estimation with antenna data was discussed. Antennas are now routinely deployed along side other sampling efforts. Investigations need to continue to determine how this data is used most efficiently and effectively.
	V.A.2.	Evaluate population estimates.	PD	Ongoing	X	X	X	X	X	X	X	Continue to evaluate population estimates.	Population estimates are being assessed for the proper inclusion of antenna data.

	V.A.3.	Collect and submit data according to standard protocol (e.g., location, PIT tag #, length, weight, etc.) on endangered fish encountered in all field activities in order to provide annual information on population status outside of formal population estimates.	ALL	Ongoing	X	X	X	X	X	X	X	Continue collecting data in all field activities outside of formal population estimates.	**!** All data is collected and submitted to STReaMS on an annual basis using standardized protocols.
	V.B.	Conduct research to acquire needed life history information.											
	V.B.1.	Identify significant deficiencies in life history information and needed research.	PD	Ongoing	X	X	X	X	X	X			
	V.B.1.a.	Develop Research Framework (Valdez and Bestgen, 2011)	PD	Complete									
	V.B.1.a.(1)	Implement climate change initiative that outlines a strategy for dealing with the effects of drought.	Program	Pending									Impacts of climate change are considered in each individual program element and action. No climate initiative is planned at this time.
	V.B.2.	Conduct appropriate studies to provide needed life history information.	FWS-FR/ STATES	Ongoing	X	X	X	X	X	X			Recommendations for new information are being accomplished through various projects, such as projects 158, BW-Synth, 161, and the Streams database.
	V.B.2.a.	Evaluate need for imprinting based on reintroduction plans.	FWS-FR	Complete									
	V.B.2.b.	Investigate age-0 and age-1 humpback chub mortality (especially in Black Rocks/Westwater and Desolation canyons) as recommended in the Research Framework.	TBD	Ongoing	X	X	X	X	X	X			Hoop nets are being incorporated into sampling efforts. In Black Rocks, seining and hoop nets produced 211 YOY Gila, 2 age-1 Gila spp, 5 adult HBC, 18 adult roundtail and 1 adult Gila sp. Researcher's believe the 2017 year class of HBC to be moderate in size. In Cataract Canyon, hoop nets caught 46 juvenile Gila sp.
	V.C.	Develop and enhance scientific techniques required to complete recovery actions.											
	V.C.1.	Conduct marking study of young-of-the-year Colorado pikeminnow.	FWS-FR	Complete									
	V.D.	Establish sampling procedures to minimize adverse impacts to endangered fishes.											
	V.D.1.	Assess electrofishing injury impacts to endangered fishes.	LFL	Complete									
	V.D.2.	Implement scientific sampling protocols to minimize mortality for all endangered fishes.	FWS-ES/ STATES	Ongoing	X	X	X	X	X	X	X	Continue to implement sampling protocols to minimize mortality.	Continue to fine-tune settings on electrofishing equipment based on water quality conditions at collection sites.
	V.E.	Provide for long-term care, cataloging, and accessibility of preserved specimens.	PROGRAM	Ongoing	X	X	X	X	X	X	X	Continue to provide long-term care for preserved specimens.	LFL has the third largest specimen collection of 27 other museums reviewed online (and yet is the second youngest).
	V.F.	Assess relative biological importance of tributaries and their potential contributions to endangered fish recovery.	Contract	Complete									
	V.G.	Reevaluate overutilization for commercial, recreational, scientific or educational purposes and identify actions to ensure adequate protection.	FWS-ES	Ongoing	X	X	X	X	X	X			
	V.H.	Reevaluate effects of disease and parasites and identify actions to ensure adequate protection.	FWS-ES	Ongoing	X	X	X	X	X	X			
	VI.	**INCREASE PUBLIC AWARENESS AND SUPPORT FOR THE ENDANGERED FISHES AND THE RECOVERY PROGRAM. (Includes integration with San Juan River Recovery Implementation Program.)**											
	VI.A.	Conduct survey to measure public awareness of and attitudes toward endangered Colorado River fishes and the Recovery Program.	PD	Complete 1995.									
	VI.B.	Plan and implement information and education and public involvement activities for all significant Recovery Program actions (e.g. presentations, public meetings~~,~~ etc.).	PROGRAM	Ongoing	X	X	X	X	X	X	X	Consider continuing some presence at water user trade shows to educate and inform partners and the public about post-Program endangered fish conservation.	Attended various trade shows: Colorado Water Congress, Utah Water Users, Colorado Water Workshop, Rocky Mountain Coal Mining Institute Annual Conference, Western Slope Horticultural Society Annual Meeting and CRWUA. Attended public meetings such as, Northwest Colorado Oil and Gas Forum and Elkhead Reservoir Net Installation. I&E Tour of the Western Slope, found multiple placements for native fish brochure and other publications. Photographed classroom razorback sucker release at Connected Lakes State Park, at Ouray NWR for a USFWS classroom event and the Elkhead Fishing Tournament. Field outreach with rafters, anglers and campers in the Black Rocks section of Ruby Horsethief Canyon along the Colorado River. Attended Ute Water Children's Water Festival, and Endangered Species Day, May, 2017 at the Denver Aquarium. Had display at Palisade Farmer's Market, Palisade Peach Festival, Palisade, CO, Vernal Home and Garden Show and Vernal Art Show.
	VI.C.	Promote technical publication of study results.	PD	Ongoing	X	X	X	X	X	X	X		The Program supports authors' publishing their technical reports in professional journals (may use Program funds for publishing costs).

	VI.D.	Produce, distribute, and evaluate information and education products (such as Field Report, brochures, public website, social media, etc.); manage media relations, including contacting reporters, producing news releases, fact sheets, etc.	PD	Ongoing	X	X	X	X	X	X	X	Consider continuing these kinds of outreach to educate and inform partners and the public about post-Program endangered fish conservation.	"Swimming Upstream" field report is now an 8.5" x 11" booklet in full color. I&E Coordinator, Melanie Fischer delivered newsletters to the Craig Chamber of Commerce and spoke directly to them about distributing other publications to the public. Field report is well received and distributed widely. Produced a four-page brochure called "On the Path to Recovery" for distribution to Congressional aides to highlight progress made in the recovery of the endangered fishes. A new native fish brochure has been developed and will be available for distribution in 2018. They will be distributed to State Parks, fishing shops, and retail outdoor gear stores across the basin. A percentage of native fish brochures will be pocket laminated and given to field crews, river runners and angling guides for distribution to folks encountered on the river or for use in a boat to identify the thirteen native fish species of the upper Colorado River basin. A nonnative fish message is prominent on the front cover. Nonnative fish removal artwork has been developed for the Lil' Suckers beverage holders and have been produced. This product will be distributed to field crews, river runners and angling guides for distribution to people encountered on the river. Sets of 5x7 inch note cards have been developed with species pictures on the front one of the five elements of recovery highlighted on the back. Trading cards for students have been redesigned with species pictures to be distributed to classrooms. Temporary fish tatoos are packaged with trading cards. Vinyl
	VI.E.	Participate in development and circulation of interpretive exhibits about the Recovery Program and the endangered fish.	PD	Ongoing	X	X	X	X	X	X	X	Consider continuing interpretive exhibits to educate the public about post-Program endangered fish conservation.	Provided content and paid for interpretive sign at the Utah Field House of Natural History, in Vernal UT. Delivered content for signage at Stagecoach Reservoir highlighting the endangered fish and the importance of nonnative fish management. Providing support and supplies to two live endangered fish exhibits in Grand Junction, CO. and an aquaculture facility at Palisade High School. Provide aquarium supplies for the "Razorback in the Classroom" project in Colorado and Utah. Visited state parks in Colorado to determine potential locations for interpretive signage. 40 signs for UDWR were designed and manufactured. Installation of signs continues into 2018 along the Green and Colorado rivers.
	VI.F.	Maintain Recovery Program technical library and library web page.	PD	Ongoing	X	X	X	X	X	X	X	Partners will need to discuss whether CWCB Laserfiche site should become an archive for Recovery Program reports, or remain a living directory to which partners may continue to submit technical reports related to the endangered Colorado River fishes.	Program website is up to date with annual reports, scopes of work, technical reports, and meeting summaries. CWCB laserfiche library not updated.
	VII.	**PROVIDE PROGRAM PLANNING AND SUPPORT (PROGRAM MANAGEMENT)**											
	VII.A.	Determine actions required for recovery.											
	VII.A.1	Assure consistency of RIPRAP with currently approved recovery plans.	PD	Ongoing	X	X	X	X	X	X			
	VII.A.2.	Recognize the role of the Upper Colorado River Recovery Program in revised recovery plans.	FWS	Ongoing	X	X	X	X	X	X			
	VII.A.3.	Update, refine, and prioritize recovery actions (RIPRAP) annually.	PD	Ongoing	X	X	X	X	X	X			PDO coordinates RIPRAP updates annually.
	VII.A.4.	Develop Interim Management Objectives (IMOs) for each species and presumptive stock and an index to population status.	PD	Complete									
	VII.A.4.a.	Public and external peer review of IMOs.	FWS	Complete									
	VII.A.4.b.	Implementation Committee review and approval of IMOs.	ALL	Complete									
	VII.A.5.	Develop specific recovery goals.											
	VII.A.5.a.	Convene Recovery Team.	FWS	Complete									
	VII.A.5.b.	Develop recommended recovery goals.	PD/Contract	Complete									
	VII.A.5.c.	Biology Committee review of recommended recovery goals.	Program	Complete									
	VII.A.5.d.	Finalize recovery goals.	FWS/PD	Complete									

	VII.A.5.d.(1)	Update recovery goals and then revise recovery plans.	PD/FWS	In progress	X	X	X						In progress. The Colorado pikeminnow plan is on hold while a Population Viability Analysis and species status assessment (SSA) are developed. A draft final PVA report was submitted to the PDO and the PVA team in October 2017; next step - distribute the PVA report for review by the Program(s) Biology Committees. ! The Humpback Chub SSA was accepted as final by the USFWS Regional Director on Dec. 13, 2017; a 5-year review for this species is expected to be completed in March 2018. Because the PDO's focus through 2017 was on completing the HBC SSA, no additional work was completed on the Razorback Sucker SSA. The PDO will resume efforts to complete the Razorback Sucker SSA in 2018. The PDO will attempt to complete a 5-yr review for bonytail in FY2018. Preliminarily, we do not intend to draft an SSA for this species at this time nor do we recommend that the Service revise the bonytail recovery plan until we gather more information on survival and reproductive success.
	VII.A.5.e.	Conduct species status review every 5 years. See U.S. Fish and Wildlife Service 2011 a&b, 2012 a&b at http://www.coloradoriverrecovery.org/documents-publications/foundational-documents/recovery-goals.html.	FWS/Program	Ongoing	X					X			see (VII.A.5.d.(1)
	VII.A.6.	Identify elements of conservation plans to ensure long-term management and protection post-Program.	Program	Ongoing	X	X	X	X	X	X			
	VII.A.7.	Monitor and assess Recovery Program accomplishments annually.	PD	Ongoing	X	X	X	X	X	X			
	VII.A.8.	Develop biennial work plan to address priority needs.	PD	Ongoing	X	X	X	X	X	X			Biennial workplan was completed in 2017.
	VII.B.	Actively participate in Recovery Program committees and secure funding for annual work plan and larger projects (e.g., water acquisition, capital construction, and long term operation and maintenance) in accordance with the recovery actions and milestones (Utah, Colorado, Wyoming, Bureau of Reclamation, Fish and Wildlife Service, Western Area Power Administration, Water Users, Environmental Groups, Colorado River Energy Distributors Association and the National Park Service).	PD	Ongoing	X	X	X	X	X	X			Program stakeholders and Program Director's Office hold committee meetings at appropriate time intervals.
	VII.B.1.	As defined in PL 106-392, prepare joint report with San Juan River RIP on the utilization of power revenues for base funding, including recommendations regarding the need for continued base funding after 2011 that may be required to fulfill the goals of the Recovery Programs. Report was due to the committees of the U.S. Senate and House of Representatives 9/30/08 (submitted April 2010). Second, abbreviated report submitted December 2016 (Secretary of the Interior, 2016).	Program	Complete (2010); second report completed in 2016.									
	VII.C.	Manage, direct, and coordinate Recovery Program activities.	PD	Ongoing	X	X	X	X	X	X	X	Program partners will want to determine what post-Program coordination should look like.	
	VII.C.1.	Review Information and Education program (Management Committee).	PD	Complete									

Fish produced and stocked by facility in 2017

Facility	Species	Target	Stocked	Percent
Grand Valley (USFWS)	razorback sucker	6,000	7,420	124%
	bonytail	10,000	10,501	105%
Ouray (USFWS)	razorback sucker	6,000	8,186	136%
	bonytail	10,000	12,802	128%
Wahweap (Utah)	bonytail	10,660	11,046	104%
Mumma (Colorado)	bonytail	5,000	5,172	103%

Razorback sucker stocked by river 2017

Facility	River	Stocked
Grand Valley	Upper Colorado	5,327
	Gunnison	2,093
Ouray	Upper Green	6,380
	Lower Green	1,806

Bonytail stocked by river 2017

Facility	River	Stocked
Grand Valley	Colorado River	10,501
Ouray	Middle Green	9,766
	Lower Green	3,036
Wahweap	Middle Green	11,046
Mumma	Colorado River	2,851
	Yampa River	2,321

Total Numbers of Fish Stocked in the Upper Colorado River Basin Since 1995
Razorback Sucker Stocking in the Upper Colorado River Basin

Year	Stocking Goal	Colorado and Gunnison Rivers # Stocked	Colorado and Gunnison Rivers % Target	Middle Green River # Stocked	Middle Green River % Target	Lower Green River # Stocked	Lower Green River % Target
1995	Upper Colorado River experimental stocking plan (13,100 in	316	2%				
1996	13,100 in various size ranges	1,112	9%				
1997	13,100 in various size ranges	2,926	22%				
1998	26,200 in various size ranges	606	2%	387	No Plan		
1999	58,600 in various size ranges	6,155	11%	1,357	No Plan		
2000	104,800 in various size ranges	29,826	29%	224	No Plan		
2001	104,800 in various size ranges	6,199	6%				
2002	State Stocking Plans (CO = 16,440 300+ mm; UT = 18,500 >	11,374	69%			274	2%
2003	Integrated Stocking Plan (9,930 per reach)	5,541	56%	8,446	85%	2,377	24%
2004	Integrated Stocking Plan (9,930 per reach)	6,153	62%	9,619	97%	5,957	60%
2005	Integrated Stocking Plan (9,930 per reach)	10,284	104%	4,850	49%	4,231	43%
2006	Integrated Stocking Plan (9,930 per reach)	10,726	108%	5,021	51%	15,188	153%
2007	Integrated Stocking Plan (9,930 per reach)	10,064	101%	7,749	78%	8,549	86%
2008	Integrated Stocking Plan (9,930 per reach)	12,949	130%	11,677	118%	10,161	102%
2009	Integrated Stocking Plan (9,930 per reach)	17,975	181%	14,983	151%	5,017	51%
2010	Integrated Stocking Plan (9,930 per reach)	9,926	100%	10,926	110%	10,040	101%
2011	Integrated Stocking Plan (9,930 per reach)	12,019	121%	9,036	91%	12,496	126%
2012	Integrated Stocking Plan (9,930 per reach)	10,506	106%	11,191	113%	10,193	103%
	Total by River	164,657		95,466		84,483	
	Total	**344,606**					

		Facility					
		Ouray			Grand Valley		
Year	Stocking Goal	# Stocked	% Target	Avg Size	# Stocked	% Target	Avg Size
2013	Draft Revised Integrated Stocking Plan (6,000 per facility)	10,606	177%		10,061	168%	
2014	Draft Revised Integrated Stocking Plan (6,000 per facility)	6,601	110%	367.5	6,062	101%	367
2015	Revised Integrated Stocking Plan (6,000 per facility)	5,892	98%	373	3,165	53%	427
2016	Revised Integrated Stocking Plan (6,000 per facility)	2,322	39%	329	5,617	94%	382
2017	Revised Integrated Stocking Plan (6,000 per facility)	8,186	136%	340	7,420	124%	387
	Total by Facility	33,607			32,325		
	Grand Total	**65,932**					

Total Numbers of Fish Stocked in the Upper Colorado River Basin Since 1995
Colorado Pikeminnow Stocking in the Upper Colorado River Basin

Year	Stocking Goal	Colorado and Gunnison Rivers # Stocked	Colorado and Gunnison Rivers % Target
1995	Upper Colorado River experimental stocking plan (13,100 in	316	2%
1996	13,100 in various size ranges	1,112	9%

Total Numbers of Fish Stocked in the Upper Colorado River Basin Since 1995
Bonytail Stocking in the Upper Colorado River Basin

Year	Stocking Goal	Colorado and Gunnison Rivers # Stocked	Colorado and Gunnison Rivers % Target	Middle Green River # Stocked	Middle Green River % Target	Lower Green River # Stocked	Lower Green River % Target
2000	State Stocking Plans (CO = 12,000 200+ mm; UT = 16,280 µ=200 mm)	36274	223%			69192	425%
2001	State Stocking Plans (CO = 12,000 200+ mm; UT = 16,280 µ=200 mm)	37,968	233%	--		45522	280%
2002	State Stocking Plans (CO = 12,000 200+ mm; UT = 16,280 µ=200 mm)	16,464	101%	17713	1.09	8000	49%
2003	Integrated Stocking Plan (5,330 200+ mm per reach)	6303	118%	16927	3.18	3043	57%
2004	Integrated Stocking Plan (5,330 200+ mm per reach)	3,985	75%	3,500	0.66	3100	58%
2005	Integrated Stocking Plan (5,330 200+ mm per reach)	6,067	114%	5980	1.12	3100	58%
2006	Integrated Stocking Plan (5,330 200+ mm per reach)	5,554	104%	5045	0.95	3270	61%
2007	Integrated Stocking Plan (5,330 200+ mm per reach)	5,570	105%	5409	1.01	5404	101%
2008	Integrated Stocking Plan (5,330 200+ mm per reach)	5,896	111%	7,641	143%	5,336	100%
2009	Integrated Stocking Plan (5,330 200+ mm per reach)	5,085	95%	5,347	100%	5,403	101%
2010	Integrated Stocking Plan (5,330 200+ mm per reach)	2,450	46%	2,813	53%	5,347	100%
2011	Integrated Stocking Plan (5,330 200+ mm per reach)	5,454	102%	5,526	104%	--	0%
2012	Integrated Stocking Plan (5,330 200+ mm per reach)	5,452	102%	2,831	53%	2,695	51%
2013	Integrated Stocking Plan (5,330 200+ mm per reach)	2,934	55%	8,503	160%	0	0%
	Total by River	145,456		87,235		159,412	
	Total	**392,103**					

Year	Stocking Goal	Facility: Ouray # Stocked	Ouray % Target	Ouray Avg Size	Grand Valley # Stocked	Grand Valley % Target	Grand Valley Avg Size	Wahweap (UT) # Stocked	Wahweap (UT) % Target	Wahweap (UT) Avg Size	Mumma (CO NASRF) # Stocked	Mumma (CO NASRF) % Target	Mumma (CO NASRF) Avg Size
2013	Draft Revised Integrated Stocking Plan (10,000 per facility; Mumma = 5,000; µ=250 mm)	6,087	61%			0%			0%		5,400	108%	
2014	Draft Revised Integrated Stocking Plan (10,000 per facility; Mumma = 5,000; µ=250 mm)	15,196	152%	280.4	9,529	95%	254	15,671	157%	235.5	5,441	109%	321.9
2014	Untagged fry into CDOT pond, Debeque, Colorado							40,238					
2014	Untagged fry into Rio Mesa Res. Group Camp, Dolores River, Utah							5,923	Rio Mesa Res. Group Camp, Dolores River, Utah				
2015	Revised Integrated Stocking Plan (10,000 per facility; Mumma = 5,000; µ=250 mm)	10,131	101%	267	11,594	116%	274	13,427	134%	241.3	5,493	110%	320.6
2016	Revised Integrated Stocking Plan (10,000 per facility; Mumma = 5,000; µ=250 mm)	11,202	112%	269.2	10,324	103%	264	8,208	82%	252.5	6,027	121%	327
2017	Revised Integrated Stocking Plan (10,000 per facility; Mumma = 5,000; µ=250 mm)	12,802	128%	229	10,501	105%	250	11,046	110%	254.7	5,172	103%	313
2017	Untagged fish into Leota 4	9,413		<230 mm									
2017	Untagged fry into Johnson Bottoms and entrance canal	36,232											
2017	Untagged fish into Lake Powell							33,454					
	Total by Facility	101,063			41,948			127,967			27,533		
	Total	**298,511**											

GREEN RIVER ACTION PLAN: MAINSTEM

		ACTIVITY	WHO	STATUS	FY 18 10/17-9/18	FY 19 10/18-9/19	FY 20 10/19-9/20	FY21 10/20-9/21	FY22 10/21-9/22	FY23 10/22-9/23	Post-Program	Description of Anticipated Post-Program Activity	Assessment of significant accomplishments (!) and shortcomings (X), (Focused on February 1, 2017 - January 31, 2018)
	I.	**PROVIDE AND PROTECT INSTREAM FLOWS (HABITAT MANAGEMENT)**											
	I.A.	Green River above Duchesne River											
	I.A.1.	Initially identify year-round flows needed for recovery while providing experimental flows.											
	I.A.1.a.	Summer/fall.	FWS-ES	Complete									
	I.A.1.b.	Winter/spring.	FWS-ES	Complete									
	I.A.1.c.	Review summer/fall flow recommendation.	FWS-ES	Complete									
	I.A.2.	State acceptance of initial flow recommendations.											
	I.A.2.a.	Summer/Fall.	UT	Complete									
	I.A.2.b.	Winter/Spring.											
	I.A.2.b.(1)	Review scientific basis.	UT	Complete									
	I.A.2.b.(2)	Assess legal and physical availability of water.	UT	Complete									
	I.A.3.	Deliver identified flows.											
>*	I.A.3.a.	Operate Flaming Gorge pursuant to the 1992 Biological Opinion to provide summer and fall flows.	BR	Complete									
>*	I.A.3.b.	Operate Flaming Gorge to supply winter and spring test flows for research.	BR	Complete									
	I.A.3.c.	Complete NEPA and issue Record of Decision on reoperation of Flaming Gorge pursuant to Biological Opinion.	BR	Complete									
>*	I.A.3.d.	Operate Flaming Gorge Dam to provide winter and spring flows and revised summer/fall flows, pursuant to the new Biological Opinion and Record of Decision.	BR	Ongoing	X	X	X	X	X	X	X		Unregulated Apr-July flow into the Flaming Gorge Reservoir was approximately 226% of the 1981-2010 average. Reclamation operated the dam focusing on safety in 2017, aggressively freeing up storage to handle projected inflow. Full bypass releases of ~8600 cfs from Flaming Gorge were maintained from March 31 through July 4 (except May 12 thru June 5 when flows dropped to ~7,000 cfs). While conditions were "wet" in the upper Green River basin, conditions in the Yampa River basin were "average-dry", complicating the coordination of Flaming Gorge releases with Yampa flows, and allowing for Flaming Gorge operations pursuant to "moderately wet" conditions. The observed peak mean daily flow of 17,900 cfs at Jensen occurred on June 6, compared to a 20,300 cfs Muth et al. target under a "moderately wet" hydrologic condition. **X** Water temperature differences between the cooler Green River and the warmer Yampa River frequently exceeded the 5°C recommended by Muth et al. (2000), particularly after Colorado pikeminnow larvae were first observed on 1 July. For example, from 1-15 July, mean daily water temperatures averaged 7.7°C cooler in the Green River. Average August and September baseflows recorded at the Jensen gage (Reach 2) were 2,805 cfs and 2,684 cfs respectively. These flows fell within a preferred base flow range (1,700 - 3,000 cfs; Bestgen and Hill 2016), but higher flows during the early stages of pikeminnow drift likely resulted in poor retention of larvae in preferred habitats (see I.A.3.d.1).
	I.A.3.d.1.	Conduct real-time larval razorback and Colorado pikeminnow sampling to guide Flaming Gorge operations.	LFL/FWS	Ongoing	X	X	X	X	X	X	X		Researchers detected the first larval razorback sucker in middle Green River habitat on June 3 (Stewart Lake Drain) and June 6 (Cliff Creek). However the early elevated releases from Flaming Gorge Dam, early elevated Green River flows, and early filling of many wetlands precluded opportunities to adjust flows to entrain these larvae into target wetlands. **X** During the first week of July when larval pikeminnow drift began, flow in the Green River at Jensen ranged from 8,000 to 11,000 cfs, and it never fell below 3,100 cfs in July. As a consequence, fall pikeminnow catch rates were abnormally low (n=1 in middle green and n=25 in lower green) (see V.C.3).
	I.A.4.	Legally protect identified flows.											
	I.A.4.a.	Protect Summer/Fall flows.											
	I.A.4.a.(1)	Hold public meeting to establish future appropriation policy.	UT	Complete 10/94									
	I.A.4.a.(2)	Adopt and implement new policy (new appropriations subject to flow criteria).	UT	Complete 11/94									

>*	I.A.4.a.(3)	In 1994 the Utah State Engineer adopted a policy to protect flows required for the endangered fish on the Green River between Flaming Gorge Dam to the confluence of the Duchesne River by subordination of post-1994 applications to appropriate water and water right change applications during June 22 to November 1. To meet future needs new diversions totaling 20 cfs are exempt.	UT	Completed in 1994										
	I.A.4.a.(4)	Implement and evaluate effectiveness of policy.	UT	In progress	X	X	X	X	X	X	X			Policy is being implemented and has not been challenged. Evaluation of of effectiveness of policy likely will take place if a challenge arises or if a large project is proposed.
	I.A.4.b.	Protect Winter/Spring flows.												
	I.A.4.b.(1)	Hold public meeting to establish future appropriation policy.	UT	Complete										
	I.A.4.b.(2)	Identify legal and technical process and schedule for streamflow protection.												
	I.A.4.b.(2)(a)	Develop work plan (Utah Department of Natural Resources 2010)	UT	Complete										
	I.A.4.b.(2)(b)	Identify issues, concerns and timeframe.	UT	Complete										
	I.A.4.b.(2)(c)	Prioritize potential methods and criteria for flow protection.		In progress	X	X								
	I.A.4.b.(2)(d)	Amalgamate technical information needed to model and resolve modeling issues.	UT	Complete										
	I.A.4.b.(2)(e)	Develop model to analyze historic and future scenarios	UT	Complete										
	I.A.4.b.(2)(f)	Analyze model results	UT	In progress	X									Draft Technical Report complete; currently under review
	I.A.4.b.(2)(g)	Establish internal policy committee to work with Program partners to explore flow protection options.	UT	In progress	X	X								
	I.A.4.b.(2)(*h*)	As necessary, obtain additional authority to protect flows	UT	In progress	X	X								
	I.A.4.b.(2)(i)	Provide annual progress report to Management Committee (mid-November with other Program annual reports)	UT	In progress	X	X								In 2017, Utah's Green River Utah Water Acquisition Team (GRUWAT) performed additional modeling of Green River flows reflecting reasonably foreseeable future water development scenarios. Discussion of possible Green River flow protection strategies continue between Utah, FWS, TNC and Reclamation. Reclamation's proposed Flaming Gorge Reservoir exchange contract to service 73kaf of Utah's Ultimate Phase water rights is currently undergoing NEPA evaluation; that contract implementation may provide an effective mechanism for base flow protection. The NEPA evaluation will consider impacts to flow targets in Muth et al. (2000).
>*	I.A.4.b.(3)	Implement legal streamflow protection.	UT	Pending		X	X							Completion date will depend on how Utah ends up protecting flows.
	I.B.	<u>Green River below the Duchesne River</u>												
	I.B.1.	Initially identify year-round flows needed for recovery while providing experimental flows.	FWS-ES	Complete										

	I.B.2.	State acceptance of initial flow recommendations (dependent on development of initial flow recommendations).											
	I.B.2.a.	Review scientific basis.	UT	Complete									
	I.B.2.b.	Assess legal and physical availability of water from Green River and tributaries.	UT	Complete									
	I.B.3.	Legally protect identified flows (dependent on development of initial flow recommendations).											
	I.B.3.a.	Hold public meeting to establish future appropriation policy.	UT	Complete									
	I.B.3.b.	See I.A.4.b.(2-3), above. (As necessary, obtain additional authority to protect flows and Implement legal streamflow protection.)	UT	In progress	X								
	I.C.	Price River											
	I.C.1.	Determine endangered fish spring through autumn use of the Price River.	UT	Complete									
	I.C.2.	Determine winter use and seasonal flow needs for Colorado pikeminnow in the Price River.	UT/FWS	Complete									
	I.C.3.	Work with State of Utah and local water users to develop a plan to provide and enhance summer base flows (either increase average daily flows thresholds or increase the frequency that those flows occur) in the lower Price River that are conducive to pikeminnow use. For example, consider securing an emergency pool of water to avoid periods of dewatering in the lower Price River.	PD/UT/Water users	In progress	X								In April 2017, UDWR in association with TNC issued a SOW for the preliminary design of a project to enhance Olsen Reservoir to support the conservation of native fish on the Price River system. The project would secure excess irrigation water by agreement and store it in Olsen Reservoir for release during dry periods. Concurrently, efforts are underway upstream to possibly develop a reservoir on the Garley Wash tributary, and make associated efficiency improvements to existing irrigation systems. Anticipated benefits include substantial water savings, a portion of which could be delivered to Olsen Reservoir for controlled release when needed to support in-stream Price River flows. Also in 2017, Price Municipal Corporation applied for NRCS Regional Conservation Partnership Program funds to assist with a "Price Watershed Enhancement Project". PDO provided a letter of qualified support for those project components that could enhance native fish habitat.
>	I.C.4.	Implement plan to provide and enhance summer base flows (in the lower Price River	PD/UT/Water users	Pending		X	X	X	X	X	X		
	I.D.	Green River (Flaming Gorge to Colorado River)											10 water development projects in Wyoming slated for development wthin the next 10 years.
	I.D.1	Evaluate and revise as needed, flow regimes to benefit endangered fish populations. See Kitcheyan and Montagne 2005, Bestgen et al. 2006.	FWS/Program	Ongoing	X	X	X	X	X	X	X		See I.D.2.i. below
	I.D.2.	Develop study plan to evaluate flow recommendations.	FWS/BOR/ WAPA	Complete									
	I.D.2.a.	Evaluate survival of young and movement of subadult razorback suckers from floodplains into the mainstem in response to flows. See Hedrick et al. 2012 and Speas et al 2017.	UDWR	Ongoing	X	X	X	X	X	X	X		In 2017 during the filling of Stewart Lake, two submersible antennas set in the outlet canal leading to Stewart Lake detected 110 age-1 Razorbacks trying to re-enter the wetland that were tagged during the 2016 Stewart Lake draining operations. In addition, during 2017 sampling operations on the middle Green River (123b and 128), an additional 22 age-1 Razorback Suckers were captured that were tagged in 2016, with most of these captures occurring very close to the original tagging location. Finally, there were 22 untagged Razorback Suckers captured in 2017 that were all <150 mm, presumably fish produced in Stewart Lake that were too small to tag during the time of release.

	I.D.2.b.	Evaluate recent peak flow studies related to floodplain inundation and entrainment of larval razorback suckers.											
	I.D.2.b.(1)	Complete final report on entrainment of larval razorback suckers in floodplains.	UDWR/LFL	Complete									
	I.D.2.b.(2)	Monitor changes in the magnitude, timing, and size distribution of sediment. (Data series summarizing 2005-2008 daily sediment sampling on Gunnison, Green and Duchesne rivers [Williams et al. 2009} and scientific investigations report [Williams et al. 2013] completed.) See General I.A.4.b.(2).	USGS									See General I.A.4.a	! With the March 25, 2017 installation of instrumentation at Ouray, the USGS began collecting 15-minute acoustic monitoring data to measure suspended sediment at both the Ouray and Jensen Green River gages (#09272400 and #09261000). This data collection will continue through FY 2021 to help establish sediment transport relationships and clarify whether/how a sediment balance/imbalance in this Jensen-to-Ouray reach is propagating downstream. These Recovery Program sediment monitoring efforts complement longer standing continuous monitoring of suspended sediment transport by the NPS & USGS at Dinosaur National Monument (www.gcmrc.gov/discharge_qw_sediment/stations/DINO) and at Canyonlands National Park (www.gcmrc.gov/discharge_qw_sediment/stations/CL)
	I.D.2.b.(3)	Synthesize physical and biological data from recent peak flow studies related to floodplain inundation and entrainment of larval razorback suckers.	LFL	Complete									
	I.D.2.b.(4)	Develop a Larval Trigger Study Plan (LTSP) to experiment with timing Flaming Gorge releases to be coincident with the presence of wild produced larval razorback sucker, as recommended in Bestgen et al. 2011.	PD	Complete									
	I.D.2.b.(4)(a)	Implement LTSP		In progress	X	X	X	X	X	X	X	We expect USBR will use observed and/or predicted larval emergence to schedule spring releases from Flaming Gorge Reservoir.	Researchers detected the first larval razorback sucker in middle Green River habitat on June 3 (Stewart Lake Drain) and June 6 (Cliff Creek). However the early release of elevated flows from the dam (~8600 cfs; I.A.3.d. above) resulted in the filling of many floodplain wetlands prior to larval emergence, and/or limited opportunities to further elevate Green River flows subsequent to larval emergence. Flaming Gorge releases were decreased to ~7,000 cfs in early May in hopes of allowing for a modified LTSP operation. Releases were increased back to full bypass on June 5 for hydrologically reasons; these releases were coincident with larval razorback sucker emergence.
	I.D.2.b.(4)(b)	Integrate and synthesize LTSP reports for evaluation and recommended revision of flow and temperature recommendations.	PDO/USBR/Argonne/LFL	In progress	X								LTSP synthesis being performed as part of the GREAT review, see I.D.2.i.
	I.D.2.c.	Develop baseflow and spike flow study plan.	PDO/USBR/Argonne/LFL	In progress	X								Draft spike flow plan was submitted to the GREAT fall 2017; under review and will incorporate aspects of physical habitat monitoring in the final.
	I.D.2.c.(1)	Implement plan	PDO/USBR/Argonne/LFL	Pending		X	X	X	X	X	X		
	I.D.2.d.	Monitor larval razorback suckers in mainstem, and synthesize information on drift as related to flows and other conditions.											See I.A.3.d.1 above.
	I.D.2.d.(1)	Conduct annual monitoring of larval razorback suckers and analyze historic monitoring data.	FWS/LFL/UDWR	Ongoing	X	X	X	X	X	X	X		
	I.D.2.e.	Determine relationship of backwater development to sediment availability and peak flows in Reach 2. To be combined with I.D.2.f (4). Grippo et el. 2017.	LFL/Argonne	*Complete*									! BW Synth - Physical completed. Grippo et el. 2017.

	I.D.2.f.	Evaluate effect of base flow variability on backwater maintenance and quality.											
	I.D.2.f.(1)	Conduct annual monitoring of larval Colorado pikeminnow.	LFL	Ongoing	X	X	X	X	X	X	X		
	I.D.2.f.(2)	Monitor age-0 Colorado pikeminnow in backwaters.	UDWR	Ongoing	X	X	X	X	X	X	X		
	I.D.2.f.(3)	Evaluate response of native fish to nonnative predator removal	UDWR	Ongoing	X	X	X	X	X	X	X		
	I.D.2.f.(4)	Integrate biological and physical data on backwaters.	LFL/Argonne	Ongoing									
	I.D.2.f.(5)	Periodically monitor surface area and number of backwater habitats in the Green River using aerial or satellite imagery (Peak Flow Tech Supplement priority).	WAPA/ Argonne	Ongoing	X								This project is assessing the surface area and depth of backwaters in the middle Green River by integrating GPS sonar groundtruthing and remote sensing techniques. Surveys were conducted by WAPA and Argonne in FY17, and a final report is anticipated in FY18.
	I.D.2.g.	Determine influence of flow and temperature recommendations on entire fish community with emphasis on nonnative fish life history in lower Reach 1 and upper Reach 2.	LFL/FWS	Ongoing	X	X	X						Water temperatures in the Green River were very cold in 2017, both in early spring and summer, due to high and extended Flaming Gorge releases. **X** A high abundance of young northern pike was identified in the Browns Park reach of the Green River, and downstream, following the high and extended flow releases from Flaming Gorge. Prolonged inundation of vegetated backwaters, tributaries, and channel margin habitat suitable for northern pike reproduction likely contributed to more extensive reproduction of that species than has been documented in previous years (e.g., 31 YOY caught at Browns Park NWR in July, the most since sampling began in 2002). Fall-captured YOY northern pike varied widely in length reflecting several spawning bouts over the extended high flow season. At the NWR, 199 individual adult fish were captured in 2017, down considerably from 864 in 2016. Of these, 34 were native species, with most of the remainder being nonnative suckers or hybrids and salmonids.
	I.D.2.h.	Determine entrainment (see also Green River Study Plan) of nonnative fish at Flaming Gorge Dam.	UDWR	Ongoing	X	X	X						Prolonged high flows from Flaming Gorge likely increased entrainment rates in 2017. UDWR crews detected higher numbers of kokanee and lake trout in the middle Green, highlighting an ongoing risk of nonnative fish escapement. Program relies on UDWR tailrace surveys coupled with Project FR-115 and other studies conducted farther downstream to monitor escapement. UDWR provides annual data to nonnative fish coordinator. **X** Burbot Risk Assessment is overdue. As called for in recent Flaming Gorge flow request letters, UDWR, NPS, PDO, WAPA agreed to develop a risk assessment of burbot escapement. One burbot was collected in Reach 3 of the Green River in 2016.
	I.D.2.i.	Integrate and synthesize reports for evaluation and recommended revision of flow and temperature recommendations.	PD/FWS	Ongoing									**X** This evaluation is behind schedule. The GREAT team met regularly in 2017. Considerable hydrologic modeling has been performed to assess potential impacts of revised recommendations. The team systematically reviewed Muth et al. recommendations and discussed information that either supported the original recommendations or suggested the need for changes. Various Muth et al. tables have been updated, and a 'decision tree' created to help characterize how various flow management alternatives can be assessed, prioritized and timed by the Program in future years, based on hydrologic conditions and other real-time considerations. A draft study plan is under development to assess experimental smallmouth bass spike flows, but will not be included in the GREAT report. The draft report should be available for technical committee review in early 2018.
	I.E.	Assess need for tributary management plan for San Rafael River.											
	I.E.1.	Estimate future water demands on San Rafael River.	PD/Utah	Complete									

	I.E.2.	Develop tributary management plan for San Rafael River. Laub 2013.	BLM/Utah	Complete									The "Restoration and Monitoring Plan for Native Fish and Riparian Vegetation on the San Rafael River, Utah" (Laub, 2013) serves as the management plan as it includes fish passage, ecological flows, water quality, and monitoring plans.
	I.E.3.	Conduct appropriate Section 7 and NEPA compliance to implement tributary management plan.	BLM/Utah	Complete									
	II.	**RESTORE HABITAT (HABITAT DEVELOPMENT AND MAINTENANCE)**											
	II.A.	Restore and manage flooded bottomland habitat.											
	II.A.1.	Conduct site restoration.											
	II.A.1.a.	Old Charlie Wash.											
>*	II.A.1.a.(1)	Construct water control structure and fish kettle.	BR	Complete									
	II.A.2.	Acquire interest in high-priority flooded bottomland habitats between Ouray NWR and Jensen to benefit endangered fish.											
	II.A.2.a.	Identify and evaluate sites.	FWS-FR	Complete									
	II.A.2.b.	Pre-acquisition planning and identification of acquisition options.	PD	Complete									
	II.A.2.c.	Conduct appraisal/NEPA compliance.	PD	Complete									
>*	II.A.2.d.	Negotiate acquisition and acquire.	PD	Complete									
	II.A.2.e.	Evaluate effectiveness of land acquisition activities and provide recommendations.	PD	Complete									
	II.A.3.	Implement levee removal strategy at high-priority sites.											
	II.A.3.a.	Preconstruction (contaminants screening, floodablility assessments, environmental compliance, design, and engineering).	PD/BR	Complete									
>*	II.A.3.b.	Construction (levee breeching). [NOTE: Subject to review and approval for depression wetlands.]	BR	Complete									
>*	II.A.3.c.	Operate and maintain.	BR/FWS	Complete									
	II.A.3.d.	Evaluation.	FWS	Complete									
	II.A.4.	Develop Green River Subbasin Floodplain Management Plan (Valdez and Nelson 2004).	Program	Complete									
>*	II.A.4.a.	Implement, validate and refine Green River Subbasin Floodplain Management Plan (Valdez and Nelson 2004)											
	II.A.4.a.(1)	Survey levee breaches and associated connection channels for floodplain wetlands along the Green River between the Yampa and White Rivers.											
	II.A.4.a.(1)(a)	Conduct surveys following high-magnitude peak flows (e.g., > 20,000 cfs) to ensure continued connection in average years (similar to those conducted in 2012 and 2014) (Peak Flow Tech Supplement priority).	Program/ANL	Complete									Final reports for surveys conducted by Argonne and WAPA in 2012 and 2014 were approved by the Biology Committee in FY17. The GREAT will incorporate this survey information into their review of Muth et al. (2000).
	II.A.4.a.(1)(b)	Conduct new surveys of lower elevation downstream levee breaches and associated connection channels following lower magnitude peak flows that normally connect these channels (e.g., 12,000 to 15,000 cfs) (Peak Flow Tech Supplement priority).	Program/ANL	Complete									The final report for surveys conducted by Argonne and WAPA in 2016 were approved by the Biology Committee in FY17. The GREAT will incorporate this survey information into their review of Muth et al. (2000).

	II.A.5.	Manage and/or modify priority floodplain sites for nursery habitat for endangered fish (as identified in Floodplain Synthesis, LTSP, etc.) Bestgen et al. 2011, Speas et al. 2017.											The PDO worked closely with field biologists to develop a matrix of attributes / considerations to assist in prioritization of future floodplain renovation projects. Next steps in the prioritization process will require some field measurements, (i.e. critical survey elevations). BOR, State of Utah, USFWS, and BLM visited three floodplain sites (Above Brennan, Baeser Bend, and the Stirrup) in 2017 to evaluate their potential to satisfy the management criteria identified in Speas et al 2017. The MC approved $20K to support preliminary designs for renovation of the Stirrup site (a BLM owned property).
	II.A.5.a.	Stewart Lake	Program /UDWR	Ongoing	X	X	X	X	X	X	X	Ongoing site management by UDWR	Larval razorback sucker were detected in the Stewart Lake outlet canal on June 03; the outlet gates were opened to fill the wetland and entrain larvae on June 05. Larvae were colllected in the wetland on June 07. A max depth of 4.9 ft at the outlet was achieved, which was still short of maximum potential depth. High extended Flaming Gorge releases affected entrainment effeciency (see I.D.2.b.(4)(a) and I.A.3.d). Wetland sampling in July documented very few native fish captures. Supplemental water from Burns Bench canal was delivered from June 25 through Sept 28. Stewart Lake was drained from Oct 02 - 24, however, one of the gate structures precluded a complete drawdown (this problem has since been remedied). A total of 110,181 fish (189 natives, 109,992 nonnatives) were handled during the draining period. Only two razorback sucker YOY were collected; 12 adult bonytail and 13 presumptive YOY bonytail were also collected. X 13 nonnative yellow perch were colected in Stewart, which researchers suspect could have been escapees from Red Fleet Reservoir. UDWR worked closely with other State and local agencies to initiate a cattail management (fire) plan for Stewart Lake. Increasing spread of cattails in the wetland has decreased total habitat available to razorback sucker since LTSP initiation.
	II.A.5.b.	Johnson Bottom	Program/FWS-NWR	Ongoing	X	X	X	X	X	X	X	Ongoing site management by FWS.	USFWS and UDWR detected larval razorback sucker on June 06 and June 03, respectively. High Middle Green River flows resulting from safety of dam releases from Flaming Gorge Dam in April and May caused unrestricted access for all fish (including large bodied predators) to Johnson Bottom prior to larval presence. 2500 bonytail (avg TL = 228mm) were stocked into Johnson Bottom on May 10. Experimental releases of razorback sucker larvae also occurred at this site prior to wild larval detection. Wetland sampling in July resulted in two YOY razorback sucker, but was dominated by nonnative species (common carp, fathead minnow, green sunfish, black crappie, and brook stickleback). PIT antenna deployed in late July thru early August detected 226 bonytail (majority from the May 10 stocking) and 4 razorback sucker (from stockings in 2013, 2014, and n=2 in 2015). Draining occurred from Sept 19 thru Oct 26 and yielded: 134 adult bonytail (all from past Ouray hatchery stockings) and 45 age-0 razorback sucker (of unknown origin), which were transferred to the Green River at the mouth of the wetland canal outlet. One razorback sucker sampling mortality was confirmed as a wild produced fish. Note: oversummer growth of bonytail in Johnson Bottom was far better than observed in the Stirrup. **X** Nonnative fish dominated the catch during draining, and for the first time, nonnative walleye (n=2) and yellow perch were represented in the catch. USFWS researchers suspect that the walleye and yellow perch could have been escapees from Red Fleet Reservoir.
	II.A.5.c.	Old Charlie Wash.	Program/FWS-NWR	Pending							X	Ongoing site management by FWS.	

	II.A.5.d.	Sheppard Bottom	Program/FWS-NWR	Ongoing	X	X	X	X	X	X	X	Ongoing site management by FWS.	! Cooperative Recovery Initiative construction project completed prior to the spring peak. Fish screen installed between wetland units S2 and S3. Sampling on July 11 yielded 13 age-0 razorback sucker in the unscreened portion of the wetland. Sampling later in the year yielded only nonnative fish. Water quality (DO) dropped to extremely low levels throughout much of the summer in unit S3 (the focus of endangered fish management); researchers suspect that the amount of vegetation that had accumulated over the past several years contributed to a high biological oxygen demand when flooded.
	II.A.5.e.	Other sites	Program/various	Ongoing, as needed	X	X	X	X	X	X	X	Ongoing site management (various agencies).	The following floodplain sites connected in 2017, Escalante Ranch, Stewart Lake, Bonanza Bridge, Stirrup, Above Brennan, Johnson Bottom, Leota Bottom, Wyasket Lake, Sheppard Bottom, and Old Charley. Preliminary results indicate razorback sucker larvae were collected in Stewart Lake, Stirrup, and Johnson Bottom. Leota: Bonytail (n=3,457) were stocked in the lower units in spring 2017. Fish sampling in Unit 7 on Aug 9-10 yielded only nonnative species (black bullhead, carp, green sunfish, and black crappie). PIA deployed Aug 10 -21 detected 134 bonytail (n=71 from 2016 stockings; n=63 from the 2017 release). Above Brennan: Fish sampling in July 25-26 and October 4-5 yielded (5) razorback sucker (stock years: 2003, 2011, 2014, 2015; one untagged). Nonnatives dominated the catch, similar to the assemblage reported for Leota with the addition of white sucker, channel catfish, and a single Iowa darter. Stirrup: Bonytail (n=4,000) bonytail were stocked in the Stirrup on April 03. USFWS sampled (variety of techniques) the wetland on July 24-25, which resulted in ten bonytail captures – many had lost weight since the April stocking. PIA's were deployed for 18 days in September, which resulted in 214 bonytail (all from the April 2017 stocking) detections. USFWS and UDWR set fyke nets in October 4-5, which yielded one razorback sucker (TL=348mm; untagged) and one bonytail. Both summer and fall sampling efforts were dominated by nonnatives (green sunfish, black bullhead, fathead minnow, carp, and red shiner). Escalante: Bonytail were stocked in the spring, but none were recaptured during an August 8-9 sampling trip. Nonnatives (black bullhead, green sunfish, carp, white sucker and fathead minnow) comprised the August catch.
	II.B.	Restore native fish passage at instream barriers.											
	II.B.1.	Assess and make recommendations for fish passage at low flows at Tusher Wash.	FWS-FR/ -WR/BR	Complete									
	II.B.1.a	Maintain fish passage at Tusher Wash Diversion	BR/Water users	Ongoing	X	X	X	X	X	X	X	Maintain fish passage through O&M contract with local water users	O&M contract included with GRCC fish exclusion O&M (see II.B.2.d), which is awaiting signatures.
	II.B.2.	Screen Green River Canal to prevent endangered fish entrainment.											
	II.B.2.a.	Assess need.	UDWR	Complete									In 2017, 273 individual fish were detected in the Green River Canal during the irrigation season. Although this is fewer fish than seen in most other years, three of the four species continue to be detected, including 165 razorback sucker, 37 bonytail and 13 Colorado pikeminnow. Entrainment seemed highest following cessation of peak flows in early July. During November 2016 sampling of the Green River Canal, Utah Division of Wildlife Resources and United States Fish and Wildlife Service personnel captured and translocated five endangered Colorado pikeminnow, one bonytail, and twelve unidentified native chubs to the mainstem Green River. Additionally, one razorback sucker mortality was documented from the canal; the first since salvage sampling began in 2014. Crews also translocated seven bluehead suckers, seventy flannelmouth suckers, and twenty-two speckled dace.
	II.B.2.b.	Design.	BR, NRCS	In progress	X								Design completed and Draft Environmental Assessment released in January 2018. Design submitted to State of Utah for Stream Alteration permitting. Design consists of weir wall with additional screening and fish return channel.

>*	II.B.2.c.	Construct.	Utah, BR	Pending	X	X							Construction is planned for fall and winter 2018/2019.
>*	II.B.2.d.	Operate and maintain.	BR/Water users	Pending	X	X	X	X	X	X	X	Maintain fish screen through O&M contract with local water users	Maintenance of facility, including debris management, is included in an O&M contract with local water users which is currently awaiting signatures.
	II.C.	Enhance water temperatures to benefit endangered fishes.											
	II.C.1.	Identify options to release warmer water from Flaming Gorge Reservoir to restore native fish habitat in the Green River.	BR	Complete									
	II.C.2.	Meet temperature targets pursuant to Flaming Gorge ROD.	BR	Ongoing	X	X	X	X	X	X	X	USBR operates selective withdrawal structure at Flaming Gorge and monitors downstream temperature.	**X** Water temperature targets were not met in 2017 due to the extended high, cold flow releases from Flaming Gorge Dam resulting from the extremely wet upper Green River snow pack coupled with typical Yampa River temperatures associated with an average-dry hydrology. Differences between the cooler Green River and the warmer Yampa River frequently exceeded 5°C, particularly after Colorado pikeminnow larvae were first observed on 1 July. For example, from 1-15 July, mean daily water temperatures averaged 7.7°C cooler in the Green River. Reclamation followed the SWS operational plan, they were unable to meet the targets due to the high water.
	II.D.	Support actions to reduce or eliminate selenium impacts at Ashley Creek and Stewart Drain. [NOTE: selenium remediation (in all reaches) will be conducted independently of and funded outside of the Recovery Program.]	FWS-ES	Ongoing	X	X	X	X	X	X	X	USBR will continue to meet selenium remediation requirements under the latest Biological Opinion.	PDO undertaking selenium analysis of YOY razorback sucker that resided in Stewart Lake over summer since 2013. Utah Dept. of Water Quality funded multiple years of sample analysis beginning in 2016. Previously analyzed samples include larval fish (baseline), juvenile fish (test subjects), and other species (ecological surrogates). Draft results indicate razorback sucker do uptake selenium in Stewart Lake, but levels are decreasing over time. Uptake is apparently higher in lower water years and decreased uptake is likely related to improved supplemental water supply practices. Razorback sucker in Stewart Lake are growing, surviving, and emigrating despite selenium uptake. Razorback sucker from Johnson Bottom carry a lower selenium load than those at Stewart Lake. Riverine larval razorback also carry a selenium load. Final report expected in spring 2018.
	III.	**REDUCE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES (NONNATIVE AND SPORTFISH MANAGEMENT)**											
	III.A.	Reduce negative impacts to endangered fishes from sportfish management activities.											
	III.A.1.	Determine relationship between Flaming Gorge test flows and the fish community in Lodore Canyon..	UDWR	Complete									
>*	III.A.2.	Control escapement of nonnative fishes from Ouray National Wildlife Refuge originating from Pelican Lake.	FWS-RW	Complete									
>*	III.A.3.	Identify and control sources of catfish and centrarchids in the middle Green River.	UDWR	Complete									
	III.A.4.	Develop and implement control programs for nonnative fishes in river reaches occupied by the endangered fishes to identify required levels of control. Each control activity will be evaluated for effectiveness, and then continued as needed. See III.A.2.c.1.& 2. under General Recovery Program Support Action Plan.											
>*	III.A.4.a.	Northern pike in the middle Green River.	UDWR/FWS	Ongoing	X	X	X	X	X	X	X	Monitor and continue removal actions at appropriate levels	Northern pike captures increased to 71 in 2017, but remain well below numbers captured ~2014. High flows from Flaming Gorge during early season sampling likely increased catch rates in tributary and backwater areas.
	III.A.4.b.	Nonnative cyprinids and centrarchids in nursery habitats.											

>*	III.A.4.b.(1)	Small nonnative cyprinids from backwaters and other low-velocity habitats in the lower Green River.	UDWR	On hold									See General III.A.2.f. - Mechanical removal deemed ineffective (Trammell et al. 2005), but impacts can be reduced on a reach-wide scale through flow management, such as elevated base flows to support Colorado pikeminnow production (Bestgen et al. BW-Synth). Elevated baseflows produce negative impacts on nonnative cyprinid densities.
>*	III.A.4.b.(2)	Small nonnative cyprinids from backwaters and other low-velocity habitats in the middle Green River.	UDWR/FWS	On hold									**X** Awaiting 158 report; nonnative cyprinid management on hold until Project 158 report reviewed.
>*	III.A.4.b.(3)	Smallmouth bass in middle and lower Green River.	UDWR/FWS	Ongoing	X	X	X	X	X	X	X	Monitor and continue removal actions at appropriate levels	Echo-Split: Catch rates for bass >100mm were similar to the two previous years, but much less than years 2013 and 2014. Mark-recapture populations estimates were similar to 2016, but lower than 2015. Middle Green River: Overall catch rates increased in the 2017 because of an increase in sub-adult catch. Adult catch rates continue to decline annually since 2012, demonstrating a removal effect on adult size classes. Age-0 fish were substantially reduced from typical catches, likely from the prolonged Flaming Gorge releases. Desolation Canyon: Substantial declines from 2014 alleviate concerns about smallmouth bass establishment in this reach. Targeted smallmouth bass catch rate in 2017 was much lower than all previous years. Smallmouth bass continue to be found throughout the reach, but 53% of bass captured were in a ten mile concentration area.
>*	III.A.4.c.	Channel catfish (e.g. Deso./Gray Canyons) to protect humpback chub populations, and in the middle Green River to protect razorback sucker and Colorado pikeminnow. On hold pending development of more efficient techniques.	FWS/UDWR	On hold									Catfish >400mm removed include: one in Desolation Canyon, one in the middle Green, and three in Echo/Split.
>*	III.A.4.d.	Walleye in the middle and lower Green River	Program	Ongoing	X	X	X	X	X	X	X	Monitor and continue removal actions at appropriate levels	Crews removed a total of 229 walleye throughout the Green River sub-basin during various field efforts in 2017. Overall, both numbers of walleye encountered and catch-rates fell in 2017. The middle Green River accounts for the majority of this change. Overall catch on the lower Green River and CPUE increased slightly from 2016. Fifty-five walleye in spawning condition were encountered in the Green River, but walleye do not appear to be self-sustaining in the river.
	III.A.4.e.	Develop lake management plan for Red Fleet Reservoir to address walleye escapement.	UDWR	Complete									The Red Fleet LMP is being implemented. All stocked fish are surviving. Yellow perch and black crappie are reproducing. Triploid walleye are in poor condition, but UDWR hopes they improve with additional forage (YOY perch and crappie). Wipers are doing well.
>*	III.A.4.f.	Install permanent fish barrier at Red Fleet Reservoir.	UDWR	Ongoing	X	X	X				X	Maintain integrity of barrier long term.	Current proposal is a coanda screen below outlet and temporary stilling basin screen when needed. Coanda screen has been designed. Environmental compliance (NEPA and section 7) ongoing. Estimated construction in Fall 2019 at estimated total cost of $400,000.
>*	III.A.4.g.	Other emerging nonnative fishes.	UDWR/FWS	Ongoing	X	X	X	X	X	X	X	Monitor fish community of the Green River and respond appropriately to any new introductions or proliferation of nonnative species.	**X** Yellow perch were documented in both Stewart Lake and Johnson Bottom for the first time, likely from Red Fleet Reservoir escapement. **X** In 2017 two purported white crappie were collected from the middle Green River (awaiting genetic confirmation) and one confirmed in Echo Park. The first capture of this species occurred in Whirlpool Canyon in 2016. **X** All three grass carp captured in the lower Green River in 2017 were confirmed as fertile fish.

	IV.	**MANAGE GENETIC INTEGRITY AND AUGMENT OR RESTORE POPULATIONS (STOCKING ENDANGERED FISHES)**											
	IV.A.	Augment or restore populations as needed, and as guided by the Genetics Management Plan.											
	IV.A.1.	Develop integrated stocking plan for the four endangered fishes in the Green River.											
	IV.A.1.a.	Prepare plan.	UDWR	Complete									
	IV.A.1.b.	Program acceptance.	UDWR	Complete									
>	IV.A.1.c.	Implement plan. Superceded by Basinwide Integrated Stocking Plan (2015), see General IV.B.2.	UDWR	Ongoing	X	X	X	X	X	X	X		23,848 bonytail were stocked into the Green River by Wahweap and the Ouray Randlett Unit. 8,186 razorback sucker were stocked into the Green River by the Ouray Randlett Unit.
	IV.A.1.c.(1)	Conduct high-priority lab/field studies identified in bonytail reintroduction plan. *(Draft not accepted)*	UDWR	Dropped									
	IV.A.1.d.	Evaluate stocking success as identified in monitoring plan for stocked fish. Zelasko et al. 2018	LFL/FWS/ STATES/PD	Ongoing	X	X	X	X	X	X		Evaluations will be on basinwide scale and may not occur in every river. See General IV.E	Despite increases in captures of razorback suckers during Colorado pikeminnow abundance sampling, recaptures were inadequate to produce reliable parameter estimates for razorbacks. In Zelasko et al. 2018, the effects of length was not an important effect on survival rate estimates from 2011-2013; season of stocking was not an effect included in the analysis, but may have influenced survival and capture rates. None of the effects describe recent changes to the stocking plan, since the analysis included data collected only through ~June 2013 and the revised stocking plan was finalized in 2015, but authors do note that lengths at stocking have become more uniform over time (even under the old plan) and, since most fish captured were from more recent years, likely resulted in the lower importance of the effect in both survival and capture probability estimation. Recent changes to the stocking plan (size, season) may result in higher initial survival and negate or reduce the need to pursue other "pre-stocking strategies". Antenna data at razorback bar document the proportion of spawning fish associated with each stocking year.
	V.	**MONITOR POPULATIONS AND HABITAT AND CONDUCT RESEARCH TO SUPPORT RECOVERY ACTIONS (RESEARCH, MONITORING, AND DATA MANAGEMENT)**											
	V.A.	Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.											
	V.A.1.	Verify additional Colorado pikeminnow spawning areas in lower Green.	UT	Complete									
	V.A.2.	Identify additional razorback sucker spawning areas in lower Green.	UT	Complete									
	V.B.	Conduct population estimate for humpback chub.											
	V.B.1.	Desolation/Gray. (Sampling occurs in September and October, overlapping fiscal years. Sampling is conducted for 2 years, followed by no sampling for 2 years, with report write-up in the first year following sampling, then sampling resumes in September of the second year). See Jackson and Hudson 2005, Badame 2012. Howard and Caldwell 2018.	UDWR	Ongoing	X	X	X	X	X	X	X	Continue to estimate abundance of humpback chub in Desolation/Gray canyons.	The report finalizing 2014-2015 data was approved in January 2018; canyon wide population estimated to be 1,863 (95% CI 924-2,802) in 2014 and 1,672 (95% CI 756-2,789) in 2015. No additional sampling occurred.

	V.C.	Conduct population estimate for Colorado pikeminnow. Sampling is conducted for 3 years, followed by no sampling for 2 years.											
	V.C.1	Middle Green River (including Yampa and White rivers). See Bestgen et al. 2005 and 2010.	LFL/UDWR/ FWS	Ongoing	*X*	X	X	X	X	X	X	Continue to estimate abundance of Colorado pikeminnow in Middle Green River.	Abundance sampling occurred throughout the Green River basin; the number of adults captured was very low (n=164) across the basin; for refernce , 209 adults were captured during 2016 sampling. Juvenile captures increased in 2017, (n=338), especially in the lower Green River (n=262).
	V.C.2	Lower Green River. See Bestgen et al. 2005 and 2010.	LFL/UDWR/ FWS	Ongoing	X	X	X	X	X	X	X	Continue to estimate abundance of Colorado pikeminnow in Lower Green River.	*See above.*
	V.C.3	Monitor age-0 Colorado pikeminnow in backwaters.	UDWR	Ongoing	X	X	X	X	X	X		Continue monitoring age-0 Colorado pikeminnow.	Age-0 pikeminnow monitoring conducted as per protocols identified in Project #138. Annual monitoring has occurred since 1979. **X** In 2017, UDWR reported poor catches of YOY ((n=1) in middle Green River habitats; (n=25) in the lower Green River), which may be attributed to high base flow conditions during the onset of larval drift in July (see I.A.3.d.).
	V.D.	Complete monitoring plan in FY 11 (based, in part, on recommendations from evaluation of stocked razorback report). See Bestgen et al., 2012.	LFL/PD	Complete									
	V.D.1.	Implement razorback sucker monitoring plan. See Webber and Beers 2014.	LFL, UDWR, FWS	Ongoing	X	X	X	X	X	X	X		Capture data from pikeminnow monitoring was used to create razorback sucker population estimates for the basin from 2011-2013. Pop estimates ranged from 25,482 (95% CI 10184-67749) in 2011 to 36,355 (95% CI 17,941-74,854) in 2013 as per Zelasko et al. 2018 finalized in January of 2018. In addition, submersible antennas at spawning bars yielded 1,657 razorbacks, 55 Colorado pikeminnow, and 30 bonytail - significant increases from previous years.

GREEN RIVER ACTION PLAN: YAMPA RIVER

		ACTIVITY	WHO	STATUS	FY 18 10/17-9/18	FY 19 10/18-9/19	FY20 10/19-9/20	FY21 10/20-9/21	FY22 10/21-9/22	FY23 10/22-9/23	Post-Program	Description of Anticipated Post-Program Activity	Assessment of significant accomplishments (!) and shortcomings (X) (Focused on February 1, 2017 - January 31, 2018)
	I.	**PROVIDE AND PROTECT INSTREAM FLOWS (HABITAT MANAGEMENT)**											
	I.A.	Basin-wide activities											
	I.A.1.	Identify fish habitat and flow needs											
	I.A.1.a.	Complete Phase II feasibility study.	CRWCD/ CWCB/BR	Complete									
	I.A.1.b.	Revise and update estimates of basin water needs.	CRWCD/FWS	Complete									
	I.A.1.c.	Evaluate and recommend low flow and passage needs (also relates to restoration of fish passage, if needed -- Recovery Element II).	CDOW/FWS/ CRWCD	Complete									
	I.A.1.d.	Provide hydrology support to develop and evaluate flow augmentation alternatives.	CWCB	Complete									
	I.A.1.e.	Report synthesizing the results of water demand, low flow recommendations and hydrologic analyses.	FWS	Complete									
	I.A.1.f.	Install, operate, and/or maintain stream flow monitoring gages.	FWS	Ongoing	X	X	X	X	X	X	X	Continue gage O&M.	
	I.A.1.g.	Install, operate, and/or maintain sediment monitoring gages to support the Yampa River Management Plan (I.A.2 below).		Complete									NPS is monitoring sediment at Maybell.
	I.A.2.	Develop and implement Yampa River management plan (Roehm 2004).											
	I.A.2.a.	Negotiate a Cooperative agreement to implement the Yampa River management plan.	Program	Complete									
	I.A.2.a.(1)	Develop a biological assessment for the management plan; initiate intra-Service Section 7 consultation based on the Service intent to enter into the Cooperative Agreement.	FWS	Complete									
	I.A.2.a.(1)(a)	Complete intra-Service consultation, resulting in a programmatic biological opinion (PBO) for the Yampa Basin.	FWS	Complete									
	I.A.2.a.(2)	Fulfill NEPA requirements for the management plan.	FWS	Complete									
	I.A.2.b.	Sign Cooperative Agreement to implement the management plan.	FWS/Program/ Colorado/ CRWCD	Complete									
	I.A.3.	Develop public involvement plan.	FWS/CDOW	Complete									
	I.A.3.a	Implement public involvement plan.	FWS/CDOW	Complete									
	I.A.4.	Evaluate and revise as needed flow regimes to benefit endangered fish populations.	FWS/Program	Ongoing	X	X	X	X	X	X	X		
	I.B.	Yampa River above the Little Snake River											
	I.B.1	Initially identify year-round flows needed for recovery.	FWS-FR	Complete									
	I.B.2	Provide augmentation of low flows.											
	I.B.2.a	Identify and acquire water source(s).											
	I.B.2.a.(1)	Steamboat Lake.											
	I.B.2.a.(1)(a)	Change decree.	CDPOR	Complete 5/97									
>*	I.B.2.a.(1)(b)	Lease up to 2,000 af. to augment late summer flows.	FWS-WR	Complete									
	I.B.2.a.(1)(c)	Quantify transit losses.	CWCB	Complete									
	I.B.2.a.(2)	Elkhead Reservoir											
	I.B.2.a.(2)(a)	Identify and evaluate water supply alternatives for up to 7,000 af of stream flow augmentation.	Program	Complete									

	I.B.2.a.(2)(b)	Complete all necessary administrative, legal, environmental compliance, institutional and financial arrangements needed for development of Elkhead Reservoir enlargement.											
	I.B.2.a.(2)(b)i)	Complete environmental compliance.	CRWCD	Complete									
	I.B.2.a.(2)(b)ii)	Complete funding agreement.	CRWCD/CWCB	Complete									
	I.B.2.a.(2)(b)iii)	Construct	CRWCD	Complete									
>*	I.B.2.a.(2)(c)	Deliver water for endangered fish.	Program	Ongoing	X	*X*	X	X	X	X	X	Continue delivering Elkhead flows.	The April 2017 forecast of Apr-Jul flow at the Yampa at Deerlodge Park location was 1,050 KAF, indicating an "average-dry" year (65% exceedence). Actual observed runoff was 1,047 KAF. Peak average daily flow at the Deerlodge Park gage was 10,700 cfs on May 15 (compared to a long-term mean of 12,500), followed by a second peak of 9,970 cfs on June 9. The baseflow target for the Yampa River at Maybell was 134 cfs for the months of Aug through October. Beginning Aug 5 and continuing through Oct 2, a total of 4,170 AF of Elkhead Reservoir fish pool water was released to augment base flows. Flow dropped below the 134 cfs target for a total of 27 days during this period. **!** Structural improvements at the Maybell Canal headgates, partially financed by the Recovery Program, went into operation in 2017 for the first time. These improvements allow for better regulation of the Irrigation District's diversions, leaving more flow in the river.
	I.B.3.	Evaluate need for instream flow water rights.											
	I.B.3.a	Review scientific basis.	CWCB/CDOW	Complete									
	I.B.3.b	Assess legal and physical availability of water.	CWCB	Complete									
	I.B.3.c	Assess compact considerations.	CWCB	Complete									
	I.B.3.d.(1)	If necessary, evaluate how identified flows will be legally protected.	CWCB	Pending, if needed									
	I.B.3.e.	Revisit the need for instream flow filings or other flow protection mechanisms at least every 5 years.	CWCB/FWS/ WAC	Pending		X				X	X	Long-term flow protection agreements to ensure maintenance of adequate flows post-Program.	Yampa flow protection is in the form of a PBO, which could become invalid if the Program expires, and may already be out of date with respect to future water demands or adapted project operations. USFWS's position is that downlisting the endangered fish must presume current flow protections remain in place, and longer-term protections would be established. **X** A Program Flow Protection Workgroup was identified in 2017 to evaluate what kind of flow protection (e.g., conservation agreements) would be appropriate to succeed the Program. However, no meetings of that workgroup have yet been held, as the Program focused in 2017 on the development of flow protections for the Green and White Rivers. Meetings to identify broader post-2023 needs and flow protection strategies, including those applicable to the Yampa River basin, are anticipated in 2018.
	I.B.4.	Provide a depletion accounting report as outlined in the Yampa River PBO; including 1) calculation of past depletions every 5 years as a 10-year moving average as determined by CWCB and reported to FWS & the Program; 2) a back-casted baseline of current depletions that can be used in projecting the impact of significant new depletions; and 3) a recommendation and justification regarding whether or not additional instream flow filings or other flow protection mechanisms should be considered in light of projected future depletions and other factors.	CWCB/FWS	In progress	X					X	X		**X** Still overdue. CWCB to provide updated depletion accounting in the Yampa River after the Colorado River accounting is completed. This depletion accounting report is expected in 2018.
	I.C.	Little Snake River (Colorado and Wyoming)											
	I.C.1.	Evaluate importance of Little Snake to endangered fishes and develop management action plan. (Determine if habitat exists to protect under Colorado's instream flow program.)	BR/LFL	Complete									
	I.C.2.	Initially identify year-round flows needed for recovery (needed).											
	I.C.2.a.	Develop work plan.	BR/LFL	Complete									
	I.C.2.b.	Identify flows.	FWS-WR	Complete									

	I.C.3.	Evaluate need for instream flow water rights.												
	I.C.3.a.	Review scientific basis.	CWCB/CDOW	Complete										
	I.C.3.b.	Assess legal and physical availability of water.	CWCB	Complete										
	I.C.3.c.	Assess compact considerations.	CWCB	Complete										
	I.C.3.d.	Revisit the need for instream flow filings or other flow protection mechanisms at least every 5 years.	CWCB/FWS/ WAC	Pending	X					X	X			See I.B.3.e.
	I.C.3.d.(1)	If necessary, evaluate how identified flows will be legally protected.	CWCB/ Wyoming	Pending										
	I.C.4.	Assess Wyoming's current and future water needs.	Wyoming	Complete										
	I.D.	Yampa River below Little Snake River												
	I.D.1.	Initially identify year-round flows needed for recovery.	FWS-FR	Complete										
	I.D.1.a.	Modify based on revisions to environmental baseline.	FWS-WR	Complete										
	I.D.1.b.	Update flow recommendations to include flows from the Little Snake River.	FWS	Complete										
	I.D.2.	Evaluate need for instream flow water rights.												
	I.D.2.a.	Review scientific basis.	CWCB/CDOW	Complete										
	I.D.2.b.	Assess legal and physical availability of water.	CWCB	Complete										
	I.D.2.c.	Assess compact considerations.	CWCB	Complete										
	I.D.2.d.	Revisit the need for instream flow filings or other flow protection mechanisms at least every 5 years.	CWCB/FWS/ WAC	Pending	X					X	X			See I.B.3.e.
	I.D.2.d.(1)	If necessary, evaluate how identified flows will be legally protected.	CWCB	Pending										Continue to track proposed West Fork Reservoir in the Little Snake drainage.
	II.	**RESTORE HABITAT (HABITAT DEVELOPMENT AND MAINTENANCE)**												
	II.A.	Yampa River from Dinosaur National Monument to Craig, Colorado												
	II.A.1.	Restore native fish passage at instream barriers and reduce impacts of maintaining diversion structures. Note: disturbance of fish habitat related to maintenance of diversion structures was evaluated and found to be minimal based on the limited area and duration of the disturbance.												
	II.A.1.a.	Inventory potential barriers.	CRWCD	Complete										
	II.A.1.b.	Determine threshold (passage) flows between Craig and Dinosaur National Monument (low- flow dependent).	CDOW/FWS	Complete										
	II.A.1.c.	Develop guidelines to facilitate fish passage at new diversion structures.	PD/FWS-ES	Complete										
	II.A.2.	Reduce/eliminate entrainment of Colorado pikeminnow at diversion structures.												
	II.A.2.a.	Identify and evaluate existing diversion structures for entrainment of Colorado pikeminnow. Hawkins 2009, Speas et al. 2014.	PD/FWS-ES	Complete										
>*	II.A.2.b.	Develop and implement remedial measures, as necessary, to reduce or eliminate entrainment.	PD/CPW/ FWS	On hold										
	II.A.2.c.	Develop guidelines to reduce or eliminate entrainment at new diversion structures, if necessary.	PD/CDOW/ FWS	Complete										
	II.A.3.	Review NPS/USGS report to assess potential for negative impacts of elevated pH to endangered fish.	Program	Complete										
	III.	**REDUCE NEGATIVE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES (NONNATIVE AND SPORTFISH MANAGEMENT)**												
	III.A.	Develop guidance documents and revise as needed.												

	III.A.1.	Develop aquatic management plan (Colorado) to reduce nonnative fish impacts while providing sportfishing opportunities. CDOW 1998, 2010.	CDOW	Complete									
	III.A.2.	Develop Yampa River Nonnative Fish Control Strategy (Program)	Program	Complete									
>*	III.B.	Implement CPW Yampa Basin aquatic wildlife management plan and the Recovery Program's Yampa River Nonnative Fish Control Strategy. Each control activity will be evaluated for effectiveness and then continued as needed. See also III.A.2.c.1.& 2. under General Recovery Program Support Action Plan.	Program/ CPW	Complete									
	III.B.1.	Prevent nonnative fish introduction; reduce invasion and recruitment.											
	III.B.1.a.	Identify potential conflicts between present fisheries management in existing Elkhead Reservoir and endangered fishes and formulate Elkhead Lake Management Plan.	CDOW	Complete									
	III.B.1.a.(1)	Evaluate nonnative fish escapement and control options at Elkhead Reservoir (during and after Elkhead expansion construction). See Miller et al. 2005, Breton et al. 2013.	FWS-FR/ CPW	Complete								Escapement prevention must be maintained as long as smallmouth bass and northern pike continue to reside in Elkhead Reservoir.	CPW monitored the reservoir between the net and the spillway, collecting 8 smallmouth bass and one northern pike. It is unclear whether fish collected behind the spillway net were present before the spillway net was installed, or if the spillway net was compromised after installation.
>*	III.B.1.a.(2)	Implement control measures as needed to control escapement (during and after Elkhead expansion construction). Post-construction: monitor and maintain Elkhead screens (YS C-1).	Program	Complete								CPW will monitor and maintain Elkhead net per agreement with Program; CRWCD will maintain outlet screens.	CPW contracted the first cleaning of the Elkhead net in October of 2017, removing substantial algae.
	III.B.1.a.(2)(a)	Establish compatible sportfishery in Elkhead Reservoir	CPW	Ongoing	X	X	X	X	X	X	X	CPW will continue to stock Elkhead Reservoir with replacement fisheries pursuant to the LMP and continue to manage against smallmouth bass and northern pike.	CPW held the second harvest tournament in 2017. Anglers removed 963 smallmouth bass and 395 northern pike during the tournament, a substantial increase from 2016.
	III.B.1.a.(2)(a)(i)	Revise Lake Management Plan	CPW	Complete									
	III.B.1.a.(2)(a)(ii)	Install screen	CRWCD	Complete									
	III.B.1.a.(2)(a)(iii)	Develop / Implement Communications Plan	CPW / Program	Complete								CPW continues outreach about nonnative fish at Elkhead Reservoir through the harvest tournament and news media.	
	III.B.1.a.(2)(a)(iv)	Complete any necessary environmental compliance	CPW / CRWCD	Complete									
	III.B.1.a.(2)(v)	Identify and secure sources of replacement compatible sport fish.	CPW	Complete									
	III.B.1.a.(2)(a)*(vi)*	Stock compatible sport fish.	CPW	Ongoing	X	X	X	X	X	X	X	CPW will stock replacement fisheries until populations no longer warrant stocking.	CPW continues to implement the LMP, primarily through stocking of largemouth bass as a replacement for smallmouth bass.
>*	III.B.1.a.(2)(a)*(vii)*	Evaluate reservoir and associated habitats in the upper Elkhead Creek drainage / treat if necessary.	CPW / Program / CRWCD	Pending								Treatment of Elkhead Reservoir is still an option if smallmouth bass population cannot be adequately reduced or contained with the current net and LMP.	
	III.B.1.b.	Address escapement of northern pike from upstream reservoir sources.	Program	Ongoing	X	X	X	X	X	X	X	Continue addressing nonnative fish escapement at upstream reservoirs in the Yampa Basin through maintenance of escapement prevention devices and control actions.	CPW continues to plan to treat Chapman Reservoir, but needs reservoir mapping to determine size of reservoir for implementation.

>*	III.B.1.b.(1)	Convert and extend the ongoing Stagecoach Reservoir northern pike escapement study to a removal effort of northern pike and walleye.	CPW / Program	Pending									CPW no longer tags northern pike under standard sampling; all are removed. CPW would require Program funding to implement a targeted removal effort of northern pike and walleye (currently CPW conducts monitoring and removes pike). CPW continues to work with Upper Yampa Water Conservancy District on northern pike control options at Stagecoach Reservoir. CPW continues to support harvest tournament at Stagecoach, and requires removal of walleye and northern pike.
	III.B.1.b.(2)	Install escapement prevention at Lake Catamount	CPW / Program	Ongoing	X	X	X	X	X	X	X		CPW has continued work at Catamount to reduce northern pike population. Population has shifted to smaller individuals and other species have increased in abundance. Program and CPW spoke with Catamount Metro District to discuss potential for net installation. A working group has been convened to hear local stakeholder concerns and plan for potential alternatives. Working group will meet in 2018.
	III.B.1.c	Identify and evaluate natural and artificial spawning/nursery habitats for northern pike in the Yampa River for exclusion devices.	CDOW	Complete									
>*	III.B.1.c.(1)	Implement remedial measures to reduce pike reproduction in Yampa River.	Program/CPW	Ongoing	X	X	X	X	X	X	X		CPW continues to net backwater habitats to disrupt spawning and remove large reproducing adults. 724 northern pike were removed via backwater netting in 2017 during 43 days. CPW succesfully prolonged this effort (over doubling net days) in 2017 and implemented as long as nets were productive. CSU LFL and FWS continue to target backwater habitats in early season sampling to disrupt reproduction.
	III.B.1.c.(1)(a)	Evaluate feasibility of habitat modification at Walton Creek to eliminate / reduce northern pike spawning habitat. Bidelspach and Fairley 2015.	CPW / Program / BR	Complete									
>*	III.B.1.c.(1)(b)	Modify Walton Creek habitat as indicated through feasibility investigations.	CPW / Program / BR	Pending									Project implementation on hold for now because costs exceed $1 million, requiring important cost share from local stakeholders. Still a CPW priority and discussions ongoing. (Feasibility report ranked nine options, the two highest would cost $1.3 and $0.8 million respectively.)
	III.B.1.d	Review proposed new structures to minimize creation of habitat suitable for pike spawning/nursery.	CPW, FWS	Ongoing	X	X	X	X	X	X	X	States, FWS, and local governments will continue to require nonnative fish management as a key component of floodplain modifications.	Conflict can occur between desired and proposed wetlands creation/restoration in the upper Yampa River and the high density of northern pike due to the likelihood that additional wetland habitat would be invaded by northern pike or serve as reproduction/recruitment habitat. FWS & States comment on stream alteration actions. Review protocol needed with counties prior to pond construction in areas where undesirable nonnative fish may invade (e.g., golf course ponds). CPW and Program considering speaking to Routt County commissioners to request that new pond construction require screening.
	III.B.1.e	Other emerging nonnative species	Program	Ongoing	X	X	X	X	X	X	X	Monitor fish community of the Yampa River and respond appropriately to any new introductions or proliferation of nonnative species.	White sucker: see General, III.A.1.c.
	III.B.2.	Control nonnative fishes via mechanical removal											
	III.B.2.a.	Estimate nonnative abundance, status, trends & distribution (YS I-3)	Program	Ongoing	X	X	X	X	X	X	X	Monitor nonnative fish populations to track trends and distribution.	Crews marked and released smallmouth bass in Little Yampa Canyon to preserve this long term dataset and estimate abundance. Mark/recapture of northern pike between Steamboat and Hayden to occur within next 2-3 years.
	III.B.2.b.	Develop and refine nonnative fish removal criteria (YS K-1)	Program	Ongoing	X	X	X						Breton et al. 2014 concluded an early removal target criteria of 30 SMB /mile was too high; model helps us understand implications of smallmouth bass population abundance and size structure. Nonnative Fish Strategy (2014) recommended minimizing smallmouth bass to the greatest extent possible to remove propagule pressure.
	III.B.2.c.	Identify and evaluate gear types and methods to control nonnative fishes (YS I-5)	Program	Ongoing	X	X	X	X	X	X	X	Continually evaluate new gear for nonnative removal.	CPW and FWS continue to use gill nets to remove northern pike. CSU LFL continues to use multiple gear types to remove smallmouth bass

>*	III.B.2.d.	Remove (formerly "and translocate") northern pike from Yampa River designated critical habitat. See Hawkins et al. 2005. (YS J-1)	CPW/FWS/LFL	Ongoing	X	X	X	X	X	X	X	States will monitor and continue removal actions at appropriate levels.	**!** Northern pike electrofishing catch rate the lowest catch rate observed since intensive, annual electrofishing in the study area began in 2004. Intensive backwater netting and main channel electrofishing continue to impact this population.
>*	III.B.2.d.(1)	Remove northern pike and smallmouth bass above designated critical habitat (Craig, CO) (YS C-3)	CPW/FWS/LFL	Ongoing	X	X	X	X	X	X	X	Monitor and continue removal actions at appropriate levels.	**!** The number of northern pike removed annually declined markedly since Colorado Parks and Wildlife (CPW) began using gill nets to remove northern pike from the Yampa River in 2014.
>*	III.B.2.e.	Remove (formerly "and translocate") smallmouth bass in Yampa River designated critical habitat. (YS J-1)	CPW/LFL/FWS	Ongoing	X	X	X	X	X	X	X	Monitor and continue removal actions at appropriate levels.	In Little Yampa Canyon, abundance of adult Smallmouth Bass was among the three lowest of the past 14 years. Effort was almost tripled in Upper Maybell to combat this important reach. Continued effort to impact this reach during spawning is recommended. The overall catch rate for smallmouth bass this year was low in Yampa Canyon and was primarily fish spawned in 2012 and 2013. Smallmouth bass have not established in this reach. 2017 work will continue to intensify smallmouth bass removal / nesting disruption further into the spawning period (e.g., sampling schedules being extended to exploit smallmouth bass in post-peak flows on the Yampa). Smallmouth bass produced strong year classes in 2012 and 2013.
	III.B.2.f.	Control channel catfish in Yampa Canyon by removing fish >400mm. (Previous focus shifted to smallmouth bass with catfish >400 mm removed during smallmouth bass removal.)	FWS	Ongoing	X	X	X	X	X	X	X	Monitor and continue removal actions at appropriate levels.	USFWS removed 9 channel catfish meeting the size threshold in 2017. Higher flows may have decreased the catch in 2017.
	III.B.2.g.	Develop and refine native fish response criteria (YS K-2)	Program	Complete									
	III.B.2.h.	Monitor native and endangered fish response (YS L-2)	Program	Ongoing	X	X	X	X	X	X	X	Monitor endangered fish populations under a monitoring plan.	Compared to early sampling (2003-2004), Project #140 reports that native species richness in Little Yampa Canyon has increased as has abundance of native fishes and their frequency in samples between 2008 and 2011. However, 2012 -2016 numbers dropped precipitously compared to 2011. 2016 catches of native fish increased markedly compared to 2015. Comparison of native fish frequency and abundance in a control and treatment reach suggested that both nonnative predator removals, as well as environmental effects due mostly to higher water, are responsible for gains, and increase in bass reproduction in 2012 and 2013 are responsible for declines. Native species remain a strong component of the fish community in Lily Park and Yampa Canyon, which would presumably serve as a source to upstream reaches when nonnative predator abundances are reduced. Synthesis report of this data is included in FY16-17 Program Guidance. Project 110 fish community monitoring demonstrates native fish are common species within Dinosaur NM.
	III.B.2.i.	Remove bag and possession limits on warmwater nonnative sportfishes within critical habitat in Colorado.	CDOW	Complete									
	IV.	**MANAGE GENETIC INTEGRITY AND AUGMENT OR RESTORE POPULATIONS (STOCKING ENDANGERED FISHES)**											
	IV.A.	Yampa River in Dinosaur National Monument											
	IV.A.1.	Augment or restore populations as needed, and as guided by the Genetics Mgmt. Plan.											
	IV.A.1.a.	Develop integrated stocking plan for bonytail in the Yampa River.	CDOW	Complete									
>	IV.A.1.a.(1)	Implement stocking plan.	FWS/CPW	Ongoing	X	X	X	X	X	X			In 2017, 2,321 bonytail were stocked from Colorado's Mumma (NASRF) State Hatchery into the Yampa River at Hell's Canyon Ranch (formerly Mantle Ranch).
	IV.A.1.b.	Research the survivability of young-of-year Gila species in transport and hatcheries.	FWS/CDOW	Complete									

	IV.A.1.c	Evaluate feasibility of translocating humpback chub to Yampa River	NPS / WAPA / States / USBR / PDO	Ongoing	X	X							Stakeholders are evaluating a proposal to translocate humpback chub using fish from the upper basin or Grand Canyon.
	IV.A.1.d	Evaluate stocking success as identified in monitoring plan for stocked fish. Superceded by Basinwide Integrated Stocking Plan (2015), see General IV.B.2.	LFL/FWS/ States/PD	Ongoing	X	X	X	X	X	X			Gila are monitored under project 110, which would document the presence of stocked bonytail.
	V.	**MONITOR POPULATIONS AND HABITAT AND CONDUCT RESEARCH TO SUPPORT RECOVERY ACTIONS (RESEARCH, MONITORING, AND DATA MANAGEMENT)**											Adult Colorado pikeminnow popualtion estimation efforts in the Yampa River are a component of the Green River abundance estimates and are reported there. The results of annual larval pikeminnow monitoring in the lower Yampa River are also discussed in the Green River tab. Fish community monitoring in the middle Yampa River and in Yampa canyon are secondary objectives of nonnative fish removal activities and are referenced under that program element (see above).

GREEN RIVER ACTION PLAN: DUCHESNE RIVER

		ACTIVITY	WHO	STATUS	FY 18 10/17-9/18	FY 19 10/18-9/19	FY20 10/19-9/20	FY21 10/20-9/21	FY22 10/21-9/22	FY23 10/22-9/23	Post-Program	Description of Anticipated Post-Program Activity	Assessment of significant accomplishments (!) and shortcomings (X) (Focused on February 1, 2017 - January 31, 2018)
	I.	**PROVIDE AND PROTECT INSTREAM FLOWS (HABITAT MANAGEMENT)**											
	I.A.	Identify initial year-round flows needed for recovery.	FWS-ES	Complete									
	I.A.1.	Conduct hydrology/water availability study.	UT	Complete									
	I.A.2.	Conduct follow-up study to evaluate and refine flow recommendations.	FWS/UT	Complete									
	I.B.	State acceptance of initial flow recommendations (dependent on development of initial flow recommendations).											
	I.B.1.	Review scientific basis.	UT	Complete									
	I.B.2.	Assess legal and physical availability of water. See Central Utah Water Conservancy District 2013.	UT, CUWCD, FWS	Ongoing	X								At its Oct 2017 meeting, the Duchesne River Working Group (DRWG) acknowledged the need in 2018 to make a 5-year update to its 2013 water management report.
	I.C.	Legally protect and deliver identified flows.	UT, CUWCD, FWS	Ongoing	X	X	X	X	X	X	X	Lower Duchesne River Workgroup stakeholders, primarily Central Utah Water Conservancy District, will continue to supply flows according to the 2005 Biological Opinion.	The Duchesne River Basin April-through-July runoff at the Randlett gage was 149% of average. The 'Priority 4' target in a wet year like 2017 is 115 cfs at the Randlett gage from March to June, plus a 'Priority 1' target of 50 cfs through the low-flow season. In 2017, only one day fell below the March-June target, and no days fell below the 50 cfs target. To support these flows, 1,500 AF of releases were made from Big Sand Wash Reservoir. The average flow in Aug-Oct was 161 cfs. Peak Flow was 3,840 cfs on June 8. CUWCD and UDWR have investigated the outflow for these releases and believe its unlikely that fish escape alive.
	I.C.1.	Strawberry Valley Project.											
	I.C.1.a.	Determine amount of water available from the Strawberry Valley Project for fish use. (BR/CUWCD completed coordinated reservoir operations model in 2003. Task completion part of I.D.1) (This is part of the coordinated reservoir operation in I.D.)	USBR/DOI/PD/ Strawberry Water Users	Pending as opportunity arises									Water may become available for temporary leasing through Section 207. In 2017, 1,500 AF of Sec 207 water was leased from Big Sand Wash Reservoir to support Duchesne River base flows.
	I.C.2.	Management of Daniels Transbasin Diversion.											
	I.C.2.a.	Determine the amount of water available from the Daniels Diversion for endangered fish use and pattern and location for delivery. (BR/CUWCD completed coordinated reservoir operations model in 2003. Task completion part of I.D.1)	DOI/IBAT/FWS/ Mitig. Comm./ CUWCD/ Ute Tribe	Complete									
>*	I.C.2.b.	Develop agreements if feasible to deliver and protect water available from the Daniels Diversion.	UT/IBAT /FWS/DOI/ Mitig.Comm./ CUWCD	Ongoing	X	X	X	X	X	X	X	Lower Duchesne River Workgroup stakeholders, primarily Central Utah Water Conservancy District, will continue to fulfill agreements. If deemed necessary, Utah State Engineer may need to determine additional ways to protect flows.	Daniels Replacement Project water (2,900 AF) is available to support Duchesne flows. Once released from Starvation Reservoir, this water is protected by agreement among the CCAA/SHA parties (as opposed to Utah State water law). CUWCD must internally manage this water in accordance with Central Utah Project Completion Act (CUPCA) provision (Public Law 102-575), project purposes as given in the congressionally-approved Supplement to the 1988 Definite Plan Report for the Bonneville Unit (DPR), and other CUWCD contracts. No Daniels Replacement Project water was needed nor released in 2017 to support the already elevated Duchesne River base flow conditions.
	I.D.	Coordinate reservoir operation.											
	I.D.1.	Determine feasibility and benefits of coordinated reservoir operation.	BR/CUWCD/ DOI	Complete									
>*	I.D.2.	Develop agreements if feasible to coordinate reservoir operations and protect flows to the Green River.	BR/CUWCD/ UT/Ute Tribe	Ongoing	X	X	X	X	X	X	X	Lower Duchesne River Workgroup stakeholders will continue to investigate ways to protect water to Green River. If deemed necessary, Utah State Engineer may need to determine additional ways to protect flows.	The CCAA/SHA agreement legally protects flows to the Myton Diversion, but not all the way to the Green River. If the CCAA/SHA is successful, FWS recommends investigating how it might be modified to add water users between Myton and Green River, to protect flows all the way to the confluence. The flows currently appear to be protected in practice, but not legally.

>*	I.D.2.a.	Rehabilitate Myton Town diversion.	BR/CUWCD/ UT/Ute Tribe	Complete									The Myton Diversion fish passage was not operated in 2017, because unusually high flows made that impossible. However, upgrades were made to the structure in 2017: wooden slats were replaced with metal gates. Operation of the Myton passage is expected to resume in 2018.
	I.E.	Examine the feasibility of other options for obtaining water.	BR/DOI/PD/ Ute Tribe	Ongoing	X	X	X	X	X	X	X	Lower Duchesne River Workgroup stakeholders will continue to investigate additional options for obtaining water until 50 cfs base flow is easily met in most water years.	Water delivery continues to supply baseflows at a much improved rate, but available volumes and delivery constraints continue to preclude meeting base flows 100% of the summer period in drier years. Additional sources of water should continue to be investigated.
	I.F.	Determine need and feasibility of additional gaging.	BR/FWS/UT	Complete									
	I.F.1.	Construct additional gages, as needed.	TBD	Complete									
	I.G.	Evaluate and revise as needed, flow regimes to benefit endangered fish populations	FWS/Program	Pending				X					Utah DWR, working with local tribes, sampled fish in the Duchesne in 2017: 61% and 24% of captures above and below the Myton Diversion, respectively, were native species. Overall, seven bonytail (207-315 mm) and seven Colorado Pikeminnow (190-760 mm) were captured [note: razorback sucker were observed but not processed], compared to 184 smallmouth bass (all size classes). It is unlikely that enough new data have been gathered, at this point, to suggest revisions to the current Duschesne flow regime.
	III.	**REDUCE NEGATIVE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES (NONNATIVE AND SPORTFISH MANAGEMENT)**											
	III.A.	Reduce negative interactions between nonnative and endangered fishes.											
	III.A.1.	Identify most damaging nonnative fishes.	UDWR	Complete									
	III.A.2.	Assess options to control negative interactions from nonnative fishes from the Duchesne River to benefit Colorado pikeminnow and razorback sucker young-of-the-year.	UDWR	Complete									
	III.A.3.	Implement and evaluate the effects of viable measures to control negative interactions from nonnative fishes. (See III.A.3. under Green River Mainstem Action Plan.)											
	III.A.3.a.	Evaluate feasibility of screen on Bottle Hollow Reservoir to control nonnative fish escapement and explore alternative funding sources.	FWS-FAO/Ute Tribe/BOR	Complete									
>*	III.A.3.a.(1)	If feasible and necessary, screen Bottle Hollow Reservoir	Ute Tribe	Complete									
	III.A.3.b.	Evaluate escapement of nonnative fishes from Starvation Reservoir and the feasibility of screening.	UDWR	Complete									
	III.A.3.b.(1)	If feasible and necessary, screen Starvation Reservoir	UDWR/USBR /CUWCD	Ongoing (see below)									
	III.A.3.b (2)	Develop a management strategy to address escapement of walleye (and smallmouth bass) from Starvation Reservoir. UDWR 2014.	UDWR	Complete									
>*	III.A.3.b (3)	Implement recommendations from the escapement strategy.	UDWR, CUWCD, USBR, Program	Ongoing	X	X	X	X	X	X	X	UDWR will maintain the Starvation escapement screen and continue to implement the lake management plan.	A modular, hard wire temporary barrier has been in place during spills since 2015. Stilling basin treatments have taken place to remove fish that are present post-spill. **X** Construction was postponed in 2017 because of construction crew availability. Stakeholders continue to work towards a permanent solution, but process has possibly reverted back to the design phase.
>*	III.A.3.c.	Remove nonnative fish (smallmouth bass, channel catfish and northern pike). See III.A.2.c.1.& 2. under General Recovery Program Support Action Plan.	FWS-FR/Ute Tribe	On hold	X	X	X	X	X	X	X	UDWR and FWS will work with the Ute Tribe to implement removal at appropriate levels.	**!** Utah DWR, working with local tribes, sampled fish in the Duchesne in 2017. White suckers were the most abundant non-natives, dominating the catostomid community. Substantial numbers of smallmouth bass and walleye also were found in the lower river reaches. All size classes of smallmouth bass were found and high-quality habitat is present. Walleye less than 300mm were captured in the Duchesne and in the Green near the Duchesne confluence.

GREEN RIVER ACTION PLAN: WHITE RIVER

		ACTIVITY	WHO	STATUS	FY 18 10/17-9/18	FY 19 10/18-9/19	FY20 10/19-9/20	FY21 10/20-9/21	FY22 10/21-9/22	FY23 10/22-9/23	Post-Program	Description of Anticipated Post-Program Activity	Assessment of significant accomplishments (!) and shortcomings (X), (Focused on February 1, 2017 - January 31, 2018)
	I.	**PROVIDE AND PROTECT INSTREAM FLOWS (HABITAT MANAGEMENT)**											
	I.A.	Assess need for tributary management plan for the White River.	PD	Complete									White River Management Plan needed and in development
	I.A.1.	Estimate future water demands on the White River.	TBD	In progress	X	X							Wilson Water Group are using a modifed, daily-timestep version of StateMod to model current hydrologic conditions and a range of possible future water demand scenarios in the White River basin. This is being used to evaluate preliminary endangered fish flow targets against future demand scenarios.
	I.B.	Initially identify year-round flows needed for recovery.											
	I.B.1.	Develop work plan.	FWS-FR	Complete									
	I.B.2.	Identify flows. Initial report complete (Haines et al. 2004).	FWS-FR	In progress	X	X							Tom Econpouly (USFWS - Water Resources) has been leading this effort for the PDO. Biologists from UDWR and USFWS are assisting with updates to the biological basis for flow recommendations with new information gathered since 2010. FWS is using Wilson Water Group's modeling of historic and current baseline hydrologic conditions in the White River to develop flow recommendations to protect important components of the current annual hydrograph. FWS expects to complete a White River draft flow recommendations report in early 2018 for technical committee reviews. See General I.A.4.a. for description of bedload sediment transport detection in the White River conducted by Tony Minear.
	I.B.3.	Develop and implement a White River management plan	Program	Pending	X	X							The White River Workgroup's current schedule envisions completion of a White River Management Plan by mid-to-late 2018. CWCB is preparing an RFP to contract writing of the Management Plan. The Workgroup is preparing a draft annotated outline for Plan contents. The PDO and State of Utah continue to reach out to the Northern Ute Tribe, hoping to engage them as a partner in this process.
	I.B.3.a.	Conduct programmatic Section 7 and NEPA compliance on recovery actions and a level of future water demand.	FWS	Pending	X	X	X						FWS will prepare a PBO based on the White River Management Plan. FWS hopes to complete this PBO by the end of 2018.
	I.C.	Evaluate how identified flows will be legally protected.	CWCB	Pending	X	X							See I.B.3
	I.D.	State acceptance of initial flow recommendations (dependent on development of initial flow recommendations).											
	I.D.1.	Review scientific basis, dependent on development of flow recommendations by FWS.	UT/CO	Pending									See I.B.2
	I.D.2.	Assess legal and physical availability of water.	UT/CO	Complete									
	I.D.3.	Assess impacts of depletions on Colorado's Compact allocations.	CWCB	Complete									
	I.D.4	CWCB notice of intent to appropriate (in Colorado).	CWCB	On hold									
	I.E.	Legally protect identified flows (dependent on development of initial flow recommendations).											
	I.E.1.	Protect flows in Colorado.										Long term conservation flows will be identified in the White River Management Plan. This Management Plan (and the mechanism that implements it) could serve as a component of a future post-Program cooperative agreement.	
	I.E.1.a	Appropriate.											
	I.E.1.a.(1)	CWCB approval to appropriate.	CWCB	On hold									
>*	I.E.1.a.(2)	Colorado Attorney Generals Office file date.	CWCB	On hold									
>*	I.E.1.a.(3)	Water court adjudication (litigation dependent).	CWCB	On hold									

	I.E.2.	Protect flows in Utah.										Long term conservation flows will be identified in the White River Management Plan. This Management Plan (and the mechanism that implements it) could serve as a component of a future post-Program cooperative agreement.	
	I.E.2.a.	Hold public meeting to establish future appropriation policy.	UT	Complete									
	I.E.2.b.	Identify legal and technical process and schedule for streamflow protection.	UT	Ongoing	X	X							
>*	I.E.2.c.	Implement process for streamflow protection.	UT	Pending									
	I.F.	Evaluate and revise as needed flow regimes to benefit endangered fish populations.	FWS/Program	Ongoing	X	X	X						
	II.	**RESTORE HABITAT (HABITAT DEVELOPMENT AND MAINTENANCE)**											
	II.A.	Restore native fish passage at instream barriers.											
	II.A.1.	Assess and make recommendations for fish passage at Taylor Draw.	PD	Complete									
	III.	**REDUCE NEGATIVE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES (NONNATIVE AND SPORTFISH MANAGEMENT)**											
	III.A.	Reduce negative interactions between nonnative and endangered fishes.											
	III.A.1.	Monitor nonnative fishes in Kenney Reservoir and upstream. Initial assessment complete (Elmblad 1998).	CPW	Ongoing	X		X		X		X	CPW will continue to monitor fish communities upstream of Taylor Draw Dam.	Kenney Reservoir and the mainstem White River upstream of Kenney (below coldwater section) were most recently sampled in 2015. Kenney Reservoir: Before 2015, sampled in 2013, 2012, 2008, 2007 and earlier. All sampling has yielded nine native species and the following non-natives: black bullhead, black crappie, bluegill, channel catfish, common carp, fathead minnow, green sunfish, red shiner, white sucker, brown trout and rainbow trout. White River and tributaries upstream of Kenney: excluding coldwater portions, which have been sampled thoroughly, the following non-native, non-salmonid species have been collected at least once since 2000: black bullhead, channel catfish, fathead minnow, longnose dace, longnose sucker, plains topminnow, western mosquitofish, white sucker. Smallmouth bass have still not been collected in Kenney Reservoir or anywhere above.
	III.B.	Reduce negative impacts to endangered fishes from sportfish management activities.											
	III.B.1.	Assess adequacy of current regulations and options (including harvest) to reduce negative impacts on native fishes from nonnative sportfish and options to reduce angling mortality on native fishes below Kenney Reservoir.	CDOW	Complete									
	III.B.1.a.	If necessary, assess management options to reduce escapement of black crappie from Kenney Reservoir.	CDOW	Complete									
	III.B.2.	Preclude new nonnative species introductions, translocations or invasions to preserve native species dominance within critical habitat.	Program	Ongoing	X	X	X	X	X	X	X	Monitor and implement appropriate actions.	White sucker hybridization continues to be a concern.

	III.B.2.a.	Determine and implement an adequate level of mechanical removal to reduce smallmouth bass.	CPW/UDWR/Program	Ongoing	X	X	X	X	X	X	X	Monitor and continue removal actions at appropriate levels.	Similar to previous years, in 2017 a large population of adult smallmouth bass near Rangely, Colorado successfully spawned, and young fish dispersed downstream. The majority of 2017's catch were smaller fish in the Utah portion. **!** USFWS sampled additional river miles in the White River by gaining landowner permission, documenting densities of smallmouth bass similar to upstream reaches. Utah sampled hotspots of smallmouth bass and will adjust sampling in 2018 to further increase catch. **X** A dense population of smallmouth bass has established in the White River below Taylor Draw Dam. Spawning adults are densest near the clear releases from Taylor Draw Dam and continue downstream to Douglass Creek. Catch rates in Utah demonstrate a downstream expansion, especially of smaller size classes. Spawning is succesful even during higher water years. Additional removal activities are not possible because of access, safety, and potential native fish effects. Non-mechanical removal actions may be needed to protect this native fish community.
	V.	**MONITOR POPULATIONS AND HABITAT AND CONDUCT RESEARCH TO SUPPORT RECOVERY ACTIONS (RESEARCH, MONITORING, AND DATA MANAGEMENT)**											
	V.A.	Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.											
	V.A.1.	Determine relative abundance and fate of Colorado pikeminnow congregation below Kenney Reservoir.	FWS-FR	Complete									
	V.A.2.	Monitor the White River fish community downstream of Kenney Reservoir to determine long-term effects of mainstream impoundment on the White River.	FWS-FR	Complete									

COLORADO RIVER ACTION PLAN: MAINSTEM

		ACTIVITY	WHO	STATUS	FY 18 10/17-9/18	FY 19 10/18-9/19	FY20 10/19-9/20	FY21 10/20-9/21	FY22 10/21-9/22	FY23 10/22-9/23	Post-Program	Description of Anticipated Post-Program Activity	Assessment of significant accomplishments (!) and shortcomings (X), (Focused on February 1, 2017 - January 31, 2018)
	I.	**PROVIDE AND PROTECT INSTREAM FLOWS (HABITAT MANAGEMENT)**											
	I.A.	Colorado River above Gunnison River											
>*	I.A.1.	Develop, issue and implement PBO.	FWS	Complete									
	I.A.2.	Initially identify year-round flows needed for recovery.											
	I.A.2.a.	Rifle to Roller Dam.	FWS-FR	Complete									
	I.A.2.b.	Roller Dam to 15-Mile Reach.	FWS-FR	Complete									
	I.A.2.c.	15-Mile Reach.	FWS-FR	Complete									
	I.A.3.	Provide a depletion accounting report as outlined in the 15-Mile Reach PBO.											
	I.A.3.a.	Collect data.	CWCB/FWS-ES/BR	Ongoing	X	X	X	X	X	X	X		
	I.A.3.b.	Develop consumptive use and losses report with CRDSS model to verify level of depletions.	CWCB	Complete									
	I.A.3.c.	Calculate new depletions every 5 years (2006-2010, etc.) and record within the depletion report the Program and WAC determination regarding whether or not additional instream flow filings or other flow protection mechanisms should be considered.	CWCB	In progress	X					X	X		**X** Still overdue. CWCB is still working on internal review and approval of Wilson Water Group's (WWG) upper Colorado basin depletion accounting evaluation submitted in early 2017. We anticipate that CWCB will deliver this report to the Program early in 2018.
	I.A.4.	Evaluate need for instream flow water rights.											
	I.A.4.a.	Rifle to Roller Dam (Dependent on initial flow recommendations).											
	I.A.4.a.(1)	Assess legal and physical availability of water.	CWCB	Complete									
	I.A.4.a.(2)	Assess impacts of depletions on Colorado's Compact allocations.	CWCB	Complete									
	I.A.4.a.(3)	Revisit the need for instream flow filings or other flow protection mechanisms at least every 5 years.	CWCB/FWS	Pending	X					X	X		**X** The 2015 draft 15-Mile Reach PBO Review distributed to the BC and WAC in August 2016 has yet to be finalized. That report was originally anticipated in 2016. Comments were received in 2016 from water user and environmental representatives, but the report cannot be finalized until CWCB delivers their depletions report for the basin (see I.A.3.c). Any determination for additional flow protections rests with the Program and WAC, but will be recorded within the CWCB depletions report. The WAC discussed this in July and November 2011 and determined that additional permanent protection in the form of instream flow filings was not deemed necessary at this time. It appears unlikely that there have been significant new net depletions in the Colorado River since that time. A Program Flow Protection workgroup also has been formed to evaluate what kind of long-term flow protection (e.g., conservation agreements) would be appropriate to succeed the Program.
	I.A.4.a.(3)(a)	If necessary, evaluate how identified flows will be legally protected.	CWCB	On hold									
	I.A.4.b.	Roller Dam to 15-Mile Reach (Dependent on initial flow recommendations).											
	I.A.4.b.(1)	Assess legal and physical availability of water.	CWCB	Complete									
	I.A.4.b.(2)	Assess impacts of depletions on Colorado's Compact allocations.	CWCB	Complete									
	I.A.4.b.(3)	Revisit the need for instream flow filings or other flow protection mechanisms at least every 5 years.	CWCB/FWS	Pending							*X*		
	I.A.4.b.(3)(a)	If necessary, evaluate how identified flows will be legally protected.	CWCB	On hold									
	I.A.4.c.	15-Mile Reach.											
	I.A.4.c.(1)	Instream flow water right secured - 581 cfs (July - September).		Complete									
	I.A.4.c.(2)	Irrigation season return flows legally protected - 300 cfs.		Complete									

	I.A.5.	Provide and legally protect instream flows pursuant to Colorado River PBO.										Ensure that current water supply sources, agreements, and actions to augment flows in the 15-Mile Reach (including those that will expire, are based on voluntary participation, or are tied to a Program PBO) are either maintained for the long-term beyond 2023 or replaced with satifactory long-term agreements.	Snowpack in the upper Colorado River basin in 2017 was near-average. ! For the third year in a row, Coordinated Reservoir Operations (CROS) successfully boosted peak flows in the 15-Mile Reach, resulting in a daily peak flow at the Cameo gage of 16,600 cfs (compared to an average of 14,000 cfs), and 14,900 cfs at the Palisade gage. The baseflow target for the 15-Mile Reach this year was 1,240 cfs. A cumulative total 79,037 AF was released from the Green Mountain, Ruedi, Wolford, and Granby Reservoirs to augment base flows, helping to maintain those flows generally in the 850 to 1,600 cfs range throughout the August - October period, averaging 1,366 cfs. The lowest-flow month, September, averaged 1,130 cfs.
>*	I.A.5.a.	Pursuant to Ruedi Biological Opinion (and subsequently, the 15-Mile Reach PBO), deliver 5,000af annually & an additional 5,000af 4 out of 5 years (ongoing and protect by short-term agreement).	BR/CWCB	Ongoing	X	X	X	X	X	X	X	Continue to deliver available water	
>*	I.A.5.b.	Execute lease (through 2012) for Reclamation's 10,825 af from Ruedi Reservoir.	BR/FWS/ CWCB	Complete									This lease expired in 2012 and has been replaced with a Colorado River District contract (in perpetuity) for the delivery of 5,412.5 AF of Ruedi Resevoir water to the 15-Mile Reach, representing the West Slope's contribution to the 10,825 AF commitment.
>*	I.A.5.b.(1)	Provide water annually pursuant to long-term lease.	BR/CWCB	Complete									! In each year since 2015, CWCB and Ute Water have implemented a short term lease that provides an additional 6K to 12K AF of flow augmentation from Ruedi Reservoir. This lease, combined with the other summer augmentation pools, offsets the scheduled (2012) expiration of the 10,825 acft pool in Ruedi. supplements the other longer-term Ruedi Reservoir agreements that provide fish water for the 15-Mile Reach. The Ute lease provided 6,000 AF of augmentation water in 2017, bringing total 2017 Ruedi releases to benefit 15-Mile-Reach baseflows to 21,413 acft.
	I.A.5.c.	East and West slope water users provide 10,825 af pursuant to 15-Mile Reach PBO											
	I.A.5.c.(1)	Provide 10,825 af on an interim basis from Wolford and Williams Fork reservoirs.											
	I.A.5.c.(1)(a)	Execute 10-year agreement for delivery of 5,412.5 af by West Slope water users. Extend agreement through 2013.	CRWCD/FWS	Complete									
>*	I.A.5.c.(1)(a)(i)	Provide and protect water deliveries by West Slope water users.	CRWCD/ CWCB	Complete									
	I.A.5.c.(1)(b)	Execute 10-year agreement for delivery of 5,412.5 af by East Slope water users. Extend agreement through 2013.	DWD/FWS	Complete									
>*	I.A.5.c.(1)(b)(i)	Provide and protect water deliveries by East Slope water users.	DWD	Complete									
	I.A.5.c.(2)	Provide permanent delivery of 10,825 af in late summer/early fall to meet base flow needs.											
	I.A.5.c.(2)(a)	Identify options.	Water Users	Complete									
	I.A.5.c.(2)(b)	Select preferred alternative for delivery.	Water Users	Complete									
	I.A.5.c.(2)(c)	Sign agreement(s) for permanent delivery of 10,825.	Water Users	Complete									
>*	I.A.5.c.(2)(d)	Deliver and legally protect flows.	Water Users	Ongoing	X	X	X	X	X	X	X	Continue to deliver available water and protect instream flows	
	I.A.5.d.	Evaluate options for use of uncommitted Ruedi Reservoir water following Round II sales.	BR	Complete									
	I.A.5.e.	After Ruedi Round II water sales are completed, or commitments to contracts agreed to, resolve the disposition of remaining uncommitted water from Ruedi Reservoir.	BR/CWCB/ FWS	Complete									
>*	I.A.5.f.	Pursuant to Wolford Mountain (Muddy Creek) Biological Opinion, deliver up to 6,000 acre-feet of water.	CRWCD/FWS/ CWCB	Ongoing	X	X	X	X	X	X	X	Continue to deliver available water	See I.A.5. In 2017, 6,000 AF was delivered from Wolford Mountain Reservoir to augment irrigation season base flows in the15-Mile-Reach .
	I.A.5.g.	Coordinated reservoir operations.											
	I.A.5.g.(1)	Evaluate (final report). Implementation plan finalized 2/28/06.	BR	Complete									

>*	I.A.5.g.(2)	If available, deliver additional peak flows, evaluate process & hydrology, and provide annual report.	BR	Ongoing	X	X	X	X	X	X	X	Continue to deliver available water	See I.A.5. In 2017, 35,735 AF was released from five reservoirs through Coordinated Reservoir Operations (CROS) to successfully augment June peak flows in the15-Mile-Reach. See I.A.5.
	I.A.5.h.	Collbran Project.											
	I.A.5.h.(1)	Evaluate.	BR	Complete									
	I.A.5.h.(2)	Make recommendations	BR	Complete									
	I.A.5.i.	Silt Project.											
	I.A.5.i.(1)	Evaluate.	BR	Complete									
	I.A.5.i.(2)	Make recommendations.	CDOP/BR	Complete									
	I.A.5.j.	Grand Valley Water Management Project.											
	I.A.5.j.(1)	Evaluate.	BR	Complete									
	I.A.5.j.(2)	Complete Draft Grand Valley Water Management Environmental Assessment. The agreement to deliver Green Mountain Reservoir water to the Grand Valley Power Plant, pursuant to the Orchard Mesa Check Settlement, will also be covered in this draft environmental assessment.	BR	Complete									
>*	I.A.5.j.(3)	Design and construct features of the Grand Valley Water Management Project.	BR	Complete									
	I.A.5.j.(4)	Execute agreement for delivery of surplus Green Mountain Reservoir water up to the excess capacity of the Grand Valley Power Plant pursuant to the Orchard Mesa Check Settlement.	BR	Complete									
	I.A.5.j.(5)	Execute agreement (municipal water contract) to deliver additional Orchard Mesa Check Settlement water and Grand Valley Water Management Plan water to benefit endangered fish.	BR/City of Grand Jct.	Complete								Expires in 2055 and will likely need to be renewed.	
	I.A.5.j.(6)	Assess options and legally protect only additional Orchard Mesa Check Settlement water and Grand Valley Water Management Plan water.	BR	Complete									
	I.A.5.k.	Orchard Mesa Irrigation District (OMID) Canal Automation Project											
	I.A.5.k.(1)	Secure site for re-regulating reservoir	CRWCD	Complete									
	I.A.5.k.(2)	Develop acceptable cost-sharing agreement for escrow account to fund O&M costs.		Complete									
	I.A.5.k.(3)	Conduct environmental assessment											
>*	I.A.5.k.(4)	Design and construct features of the OMID project	In progress		X								! In 2017, OMID completed construction of a 74 acre-foot reregulating reservoir (financed by the Recovery Program), and initiated its operation during the 2017 irrigation season. Initial results have been positive, resulting in reduced OMID diversions from the Colorado River as the District benefits from increased efficiencies in its water deliveries. At full operation, this reservoir is anticipated to reduce diversions by approximately 17,000 AF annually.
	I.A.5.l.	Water Division 5 Coordinated Facilities Study (CFOPS).											
	I.A.5.l.(1)	Evaluate options for providing and protecting additional peak flows to the 15-Mile Reach. Phase I completed 2001; Phase II completed 2003 (Brown and Caldwell 2003).	Water Users	In progress	X								In 2017, the draft CFOPS report was circulated for Program partner technical review. A revised draft will be sent to water acquisition committee for review by May 1, 2018. Final report expected by July 1, 2018.
>*	I.A.5.l.(2)	Deliver additional peak flows as determined feasible in the evaluation.	TBD	Ongoing	X	X	X	X	X	X	X	Continue to deliver available water	
	I.A.6.	Review implementation of RIPRAP items to determine timely compliance with applicable schedules (every 2 yrs. beginning in 2003).	FWS	Ongoing		X		X		X	X		See I.A.4.a.(3) above; a draft 2015 15-Mile Reach PBO Review is being revised based on comments received.
	I.B.	Colorado River from the Gunnison to the Colorado-Utah State line (Includes the 18-Mile Reach											
	I.B.1.	Initially identify year-round flows needed for recovery.	FWS-FR	Complete									
	I.B.2.	Evaluate how identified flows will be legally protected.	CWCB	On hold									
	I.B.3.	State acceptance of initial flow recommendations.											
	I.B.3.a.	Review scientific basis, dependent on development of flow recommendations by FWS.	CWCB/CPW	Pending									
	I.B.3.b.	Assess legal and physical availability of water.	CWCB	Complete									

	I.B.3.c	Assess impacts of depletions on Colorado's Compact allocations.	CWCB	Complete									
	I.B.3.d.	CWCB notice of intent to appropriate (in Colorado).	CWCB	On hold									
	I.B.4.	Legally protect identified flows.											
>*	I.B.4.a.	Acquire (see Colorado River above Gunnison and Gunnison River).											
	I.B.4.b.	Appropriate.											
	I.B.4.b.(1)	CWCB approval to appropriate.	CWCB	On hold									
>*	I.B.4.b.(2)	Colorado Attorney Generals Office file date.	CWCB	On hold									
>*	I.B.4.b.(3)	Water court adjudication (litigation dependent).	CWCB	On hold									
	I.B.4.c.	Deliver and legally protect flows from Aspinall (see Colorado River above Gunnison and Gunnison River).											
>*	I.B.4.c.(1)	Operate Aspinall to provide test flows.	BR	Complete									
>*	I.B.4.c.(2)	Continue annual coordination meetings.	BR	Ongoing	X	X	X						
	I.B.4.c.(3)	Operate Aspinall to provide flows pursuant to biological opinion and record of decision.											The Recovery Program is monitoring fish community in the Gunnison River and in the Colorado River mainstem below the confluence (Project # 163) (post-Gunnison PBO and Aspinall ROD, see IB5). This reach is also one of three which USBR is evaluating robustness of modeling for environmental factors (post Basin Supply and Demand Study).
	I.B.4.c.(3)(a)	Determine if change in water right and/or contract is needed.	BR	Complete									
	I.B.4.c.(3)(b)	Enter into contract if needed.	BR	Complete									
>*	I.B.4.c.(3)(c)	Deliver flows.	BR	Complete									
	I.B.5.	Develop study plan to evaluate flow recommendations (Aspinall Study Plan)	Program	Complete									
	I.B.5.a.	Monitor Physical Response in the Colorado River to the Proposed Action											
	I.B.5.a.(1)	Opportunistically collect aerial photography during the peak flows to determine area of floodplain inundation at floodplain sites (Valdez and Nelson 2006)	BR	Ongoing as needed									NPS partners will others to collect data when funding and conditions allow. Aerial photography was collected by the Program during 2011 peak flow year.
	I.B.5.a.(2)	Opportunistically collect aerial photography during base flows to monitor channel width and complexity and to serve as base maps for habitat mapping.	BR	Ongoing as needed									NPS partners will others to collect data when funding and conditions allow. Aerial photography was collected by the Program during 2008 base flow year.
	I.B.5.a.(3)	Repeat depth-to-embededness surveys in the 18-mile reach.	Program	Pending									
	I.B.5.b.	Monitor Biological Responses in the Colorado River to the Proposed Action											
	I.B.5.b.(1)	Initiate a fish community monitoring study in Colorado River main channel and floodplain habitats (focus on 18-mile reach)	CPW/FWS	Ongoing	X	X	X						
	I.B.5.b.(2)	Assess primary and secondary productivity in cobble bars (runs and riffles)	TBD	Pending									
	I.B.5.b.(3)	Continue ongoing fish community monitoring (CPM and HBC pop estimation; CPM Age-0 monitoring)	FWS/UDWR	Ongoing	X	X	X						
	I.B.6.	Integrate and synthesize information to evaluate and recommend necessary revision of the proposed action	Program	Pending									
	I.C.	Colorado River from Colorado-Utah State line to Green River											
	I.C.1.	Initially identify year-round flows needed for recovery.	FWS-FR	Complete									
	I.C.2.	State acceptance of initial flow recommendations.											No need for action on items I.C.2 until such time as major water development is proposed along this reach.
	I.C.2.a.	Review scientific basis.	UT	Pending									
	I.C.2.b.	Assess legal and physical availability of water.	UT	Pending									
	I.C.3.	Legally protect identified flows.	UT	Pending									
	I.C.3.a.	Hold public meeting to establish future appropriation policy.	UT	Pending									
	I.C.3.b.	Adopt and implement new policy (new appropriations subject to flow criteria).	UT	Pending									

>*	I.C.3.c.	Prepare and execute contracts with water users as required to subordinate diversions associated with approved and/or perfected rights.	UT	Pending									
	I.D.	Colorado River below Green River											
	I.D.1.	Initially identify year-round flows needed for recovery.	FWS	Pending	X								After evaluation of flow recommendations in the Gunnison, Colorado, and Green rivers is completed, the Service needs to determine if combination of Colorado and Green River flows below the confluence are adequate for recovery.
	I.D.2.	Assess adequacy of combined flows from Colorado and Green rivers to provide fish habitat (and meet recovery goals) in the Cataract Canyon reach of the Colorado River.	FWS	Pending	X								See comment under 1.D.1.
	I.E.	Evaluate and revise as needed flow regimes to benefit endangered fish populations. See also 1.B.5.	FWS/Program	Ongoing	X	X	X						
	II.	**RESTORE HABITAT (HABITAT DEVELOPMENT AND MAINTENANCE)**											
	II.A.	Restore and manage flooded bottomland habitat.											
	II.A.1.	29-5/8 Road Gravel Pit (became part of larger “Hot Spot Complex” in 2003.)											
	II.A.1.a.	Develop and approve management plans.	FWS-FR	Complete									
	II.A.1.b.	Site design/complete environmental compliance.	BR	Complete									
>*	II.A.1.c.	Construct.	BR	Complete									
>*	II.A.1.d.	Operate and maintain.	BR	Pending, as needed									
	II.A.1.e.	Monitor and evaluate success; modify as needed.	FWS-FR	Pending, as needed									
	II.A.2.	Adobe Creek.											
	II.A.2.a.	Develop and approve management plans.	FWS-FR	Complete									
	II.A.2.b.	Site design/complete environmental compliance.	BR	Complete									
>*	II.A.2.c.	Construct.	BR	Complete									
>*	II.A.2.d.	Operate and maintain.	BR	Pending, as needed									
	II.A.2.e.	Monitor and evaluate success; modify as needed.	FWS-FR	Pending, as needed									
	II.A.3.	Walter Walker.											
	II.A.3.a.	Develop and approve management plans.	FWS-FR	Complete									
	II.A.3.b.	Site design/complete environmental compliance.	BR	Complete									
>*	II.A.3.c.	Construct.	BR	Complete									
>*	II.A.3.d.	Operate and maintain.	BR/FWS/ CDOW	Pending, as needed									
	II.A.3.e.	Monitor and evaluate success; modify as needed.	FWS-FR	Pending, as needed									
	II.A.4.	Develop and implement levee removal strategy at high-priority sites.											
	II.A.4.a.	Preconstruction (contaminants screening, floodability assessments, environmental compliance, design & engineering.	BR/FWS	Complete									
>*	II.A.4.b.	Construction (levee breaching) [NOTE: Subject to review and approval for depression wetlands.]	BR	Complete									
>*	II.A.4.c.	Operate and maintain.	BR/FWS	Complete									
	II.A.4.d.	Evaluation	FWS	Complete									
	II.A.5.	Acquire interest in high-priority flooded bottomland habitats.											
	II.A.5.a.	Identify and evaluate sites.	FWS	Complete									
	II.A.5.b.	Pre-acquisition planning and identification of acquisition options.	PD	Complete									
	II.A.5.c.	Conduct appraisal/NEPA compliance.	PD	Complete									
>*	II.A.5.d.	Negotiate and acquire.	PD	Complete									
	II.A.5.e.	Evaluate effectiveness of land acquisition activities and provide recommendations	PD	Complete									
	II.A.6.	Develop Colorado River Subbasin Floodplain Management Plan	Program	Complete									
>*	II.A.6.a.	Implement, validate and refine Colorado River Subbasin Floodplain Management Plan	Program	Ongoing	X	X	X	X	X	X	X		

	II.B.	Restore native fish passage at instream barriers.												See fish passage data under II.B.1.b.(3) and II.B.3.a.(3). Fish salvage was performed in the GVIC system in November 2016, collecting a total of 3,442 stranded native fish, including 8 endangered hatchery-produced razorback sucker and 1 endangered hatchery-produced bonytail. Fish salvage in the GVWUA Canal in 2016 collected a total of 54,254 native fish (including speckled dace,roundtail chub, flannelmouth sucker, and bluehead sucker), but no endangered species. The majority of these fish were collected from a short section of the canal (dubbed the "Hotspot") between 353/10 and 358/10 roads in Palisade, CO. No group meeting was held with Grand Valley irrigators in 2017. The PDO instream flow coordinator individually met with staff and toured the facilities of GVWUA, OMID, and GVIC. Regular communication between Grand Valley irrigators and other basin interests continued in 2017 via weekly HUP calls throughout the irrigation season and biannual HUP coordination meetings (chaired by USBR, and including Grand Valley Water Users, irrigation companies, the Colorado River District, District Engineers, FWS, and Program staff). Finally, the irrigators provide much-appreciated annual reports on their fish screen operations at the end of the irrigation season.
	II.B.1.	Restore passage at Grand Valley Irrigation Co. Diversion Dam (Palisade)												
	II.B.1.a.	Evaluate and implement viable options to restore fish passage.	BR/FWS	Complete										
	II.B.1.a.(1)	Obtain landowner consent/agreement.	BR	Complete										
	II.B.1.a.(2)	Site design/environmental compliance.	BR	Complete										
>*	II.B.1.a.(3)	Construct.	BR	Complete										
>*	II.B.1.a.(4)	Operate and maintain.	FWS-FR/BR	Ongoing	X	X	X	X	X	X	X	The GVIC passage will need to be maintained and operated in perpetuity.		
	II.B.1.a.(5)	Monitor and evaluate success.	FWS-FR/BR	Complete										
	II.B.1.b.	Screen GVIC diversion to prevent endangered fish entrainment, if warranted.												
	II.B.1.b.(1)	Design.	BR	Complete										
>*	II.B.1.b.(2)	Construct.	BR	Complete										
>*	II.B.1.b.(3)	Operate and maintain.	FWS-FR/BR	Ongoing	X	X	X	X	X	X	X	The GVIC screen will need to be maintained and operated in perpetuity.		GVIC fish passage screens were operated 71% of the time during the Apr 30 through Oct 30 2017 irrigation season. Shutdowns to deal with excessive debris, algae, or mechanical issues resulted in 150 days on, 61 days off.
	II.B.2.	Restore fish passage at Price Stubb.												
	II.B.2.a.	Evaluate and implement viable options.												
	II.B.2.a.(1)	Obtain landowner consent/agreement.	BR	Complete										
	II.B.2.a.(2)	Site design/environmental compliance.	BR	Complete										
>*	II.B.2.a.(3)	Construct.	BR	Complete										
>*	II.B.2.a.(4)	Operate and maintain.	BR	Ongoing	X	X	X	X	X	X	X	Maintenance (primarily debris removal at the upstream entry point) will need to be conducted in perpetuity. The State of Colorado and the USFWS will need to determine if continued operation of the PIT antenna is worthwhile.		
	II.B.2.a.(5)	Monitor and evaluate success.	FWS-FR/BR	Ongoing	X	X	X	X	X	X	X			The Price-Stubb PIT tag antennas (at river mile 188.3) produced multiple hits on 700 unique PIT tags during 2017. Six native species were detected including endangered bonytail (n=82). razorback sucker (n=133), and Colorado pikeminnow (n=19). The remainder are either 3-species or unidentified tags. The most movement occurred in April and May.
	II.B.3.	Restore fish passage at Government Highline (aka Grand Valley Project or Roller Dam).												
	II.B.3.a.	Evaluate and implement viable options.												
	II.B.3.a.(1)	Site design/environmental compliance.	BR	Complete										
>*	II.B.3.a.(2)	Construct.	BR	Complete										

>*	II.B.3.a.(3)	Operate and maintain.	BR	Ongoing	X	X	X	X	X	X	X	The GVP passage will need to be maintained and operated in perpetuity.	A total of 13,581 fish used this fish passage over a 183-day period in 2017. This is the fifth-highest total ever documented for this facility. Native fishes (and their hybrid forms) accounted for 83.6% of the total catch.This included 130 endangered razorback sucker (the highest annual total to ever make passage) and12 bonytail. Two humpback chub also made passage, bringing the total to 5 since operation began. The fourth and fifth ever Colorado pikeminnows made passage at Government Highline Dam in 2017; these fish had total lengths of 534 and 720 mm. In spring 2017, GVWUA opened the roller closest to the fish passage for several weeks during high spring flows to help sluice away the sediment bar. This worked well for about a month after base flows were reached. However, multiple rainstorm spikes and deposition of sediment on the inside bend of the river re-deposited large amounts of sediment and by late summer the upstream sediment bar had returned (as also occurred in 2016). This again caused the fish return tube to become unusable during low flow due to fish stranding and or impingement issues. FWS transported the enndangered fishes upstream several hundred yards and released them upstream of the sediment bar.
	II.B.3.a.(4)	Monitor and evaluate success.	FWS-FR/BR	Ongoing	X	X	X						
	II.B.3.b.	Screen Government Highline diversion to prevent endangered fish entrainment.											
	II.B.3.b.(1)	Design.	BR	Complete									
>*	II.B.3.b.(2)	Construct.	BR	Complete									
>*	II.B.3.b.(3)	Operate and maintain.	FWS-FR/BR	Ongoing	X	X	X	X	X	X	X	The GVP screen will need to be maintained and operated in perpetuity.	***!*** Operation of the GVWUA fish screen in 2017 began on Mar 27 and terminated Oct 31. These screens operated 100% of days during the irrigation season (281 days total), with only brief interruptions for minor operational and maintenance needs.
	II.C.	Support actions to reduce or eliminate contaminant impacts. [NOTE: Contaminants remediation (in all reaches) will be conducted independently of and funded outside of the Recovery Program.]											Barb Osmundson, though now retired, is finalizing a report for the FWS Grand Junction Office on the results of Colorado Pikeminnow mercury exposure studies undertaken since 2008. It is possible she also will provide summary reports on other environmental contaminants of concern in the upper Colorado River basin, including pesticides and pharmaceuticals. Collectively, these contaminant data have informed various past Section 7 ESA consultations, the latest being the reinitiated BLM Fluid Minerals PBO signed in 2017
	II.C.1.	Support actions to reduce or eliminate contaminant impacts of selenium in the Grand Valley.	FWS-ES	Ongoing	X	X	X	X	X	X	X		The Grand Junction Environmental Contaminants (EC) office provides the FWS Salinity Coordinator for the Colorado River Basin Salinity Control Program. Upon Barb Osmundson's 2017 retirement, Creed Clayton assumed this role. The position involves coordination with various Federal, state, and local programs to reduce salinity concentrations within the upper Colorado River Basin to meet salinity compact requirements at the US/Mexican Border. It also provides a link to Aspinall Biological Opinion (Reclamation) activities to reduce selenium concentrations in the Gunnison Basin and throughout the Colorado River Basin.
	II.C.2.	Support remediation of groundwater contamination at the Atlas Mill tailings site.	FWS-ES	Ongoing	X	X	X						
	II.C.3.	Identify measures to minimize risk of hazardous materials spills in Black Rocks and Westwater Canyon from transport along the adjacent railway to protect humpback chub populations.	FWS-ES	Ongoing	X	X	X						EPA has developed a Sub-Area Spill Contingency Plan for the Green River and is now developing the same for the Colorado River drainage. EPA initiated planning efforts for this plan in 2015 and Colorado EC staff has participated in these planning meetings and activities since early February of 2015.
	III.	**REDUCE NEGATIVE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES (NONNATIVE AND SPORTFISH MANAGEMENT)**											
	III.A.	Develop and implement control programs in reaches of the Colorado River occupied by endangered fishes. Each control activity will be evaluated for effectiveness and then continued as needed. See III.A.2.c.1.& 2. under General Recovery Program Support Action Plan.											
	III.A.1.	Determine relationship between Aspinall test flows and nonnative fish abundance.	UDWR/ FWS-FR	Complete									

>*	III.A.2.	Reclaim ponds in critical habitat.	CDOW	Complete									
	III.A.2.a.	Evaluate and make recommendations.	CDOW	Complete									
	III.A.3.	Nonnative cyprinids and centrarchids in nursery habitats.											
	III.A.3.a.	Remove small nonnative cyprinids from backwaters and other low velocity habitats.	CDOW/UDWR	Complete									
	III.A.3.b.	Remove nonnative centrarchids from backwaters and other low velocity habitats.	FWS	Complete									
	III.A.4.	Preclude escapement from ponds in critical habitat as needed and feasible.											CPW constructed a Merwin trap for the Mamm Creek Pit #1 and operated it since 2016. In 2017 it removed over 1600 nonnative fish, including over 300 northern pike. USFWS removed over 2600 nonnative fish from various other ponds that can conncet to the Colorado River.
	III.A.4.a.	Evaluate sources of nonnative fishes and make recommendations.	CPW/FWS	Ongoing								Continue to determine sources of problematic nonnative fishes and make recommendations as needed.	See General, III.C for discussion of isotopic analysis.
	III.A.4.b.	Screen Rifle Creek below Rifle Gap Dam (non-Program funds).										CPW will continue to operate and maintain screen.	
	III.A.4.b.(1)	Design with appropriate peer review	CPW/BOR /FWS	Complete									
>*	III.A.4.b.(2)	Construct screen (2013)	CPW	Complete									
	III.A.4.b.(3)	Finalize lake management plan, per Nonnative Fish Stocking Procedures	CPW	Complete									Rifle Gap LMP finalized in summer of 2015. **!** Per the LMP, removal of fertile walleye was performed in 2017 and stocking with triploid walleye replaced those individuals.
	III.A.4.b.(4)	Conduct follow-up monitoring prior to and following stocking to determine effectiveness of screen.	CPW	Ongoing	X	X	X	X	X	X	X	CPW will continue to monitor the screen for effectiveness.	CPW constructed screen in 2013. Over 400 nonnative fish have been precluded from escapement between 2013 and 2017. Based on sampling at the screen and in downstream locations, the screen is extremely effecient and succesful at reducing escapement.
>*	III.A.5.	Develop and implement program to identify required level of channel catfish control.	FWS	On hold									
>*	III.A.6.	Develop and implement program to identify required level of smallmouth bass control.	FWS/CPW	Ongoing	X	X	X	X	X	X	X	Monitor and continue removal actions at appropriate levels	Crews removed over 1700 smallmouth bass in 2017. Catches of age-0 smallmouth bass indicate a moderate year class (< 100 mm) was produced in 2017 in the Grand Valley reaches of the Upper Colorado. Adult catch rates decreased (57%) from 2016.
>*	III.A.7.	Develop and implement program to identify required level of northern pike control.	FWS/CPW	Ongoing	X	X	X	X	X	X	X	Monitor and continue removal actions at appropriate levels	Northern pike are not common in Colorado River removal efforts. Only two northern pike were collected in all sampling in 2017, both coming from a backwater betwen Rifle and Rulison.
>*	III.A.8.	Walleye in the Colorado River	Program	Ongoing	X	X	X	X	X	X	X	Monitor and continue removal actions at appropriate levels	In 2016, field crews removed a total of 116 adult walleye throughout the upper Colorado River, primarily under targeted walleye removal efforts. **X** Of concern is the high catches (68) of walleye only five miles below the Westwater Canyon humpback chub population.
	III.A.9	Other emerging nonnative fishes.	Program	Ongoing	X	X	X	X	X	X	X	Monitor fish community of the Colorado River and respond appropriately to any new introductions or proliferation of nonnative species.	**X** Gizzard shad were the most common species removed in the Colorado River in 2017. Over 2800 individuals were removed (33-475mm). This expansion may be exacerbating the increase in walleye numbers. **X** Both adult grass carp collected were tested for polidy and confirmed as fertile fish. Larval grass carp were confirmed from Lake Powell in 2015, representing the first instance of this species reproducing in the UCR basin. All grass carp stocking in the upper basin states is required to be with triploid (sterile) fish.
>*	III.A.10.	Upstream of Grand Valley Project dam: Determine and implement an adequate level of mechanical removal in the main channel. More importantly, use all techniques available to eradicate northern pike (and other nonnative species of concern) from floodplain habitats.	CPW/Program	Ongoing	X	X	X	X	X	X	X	Monitor fish community of the Colorado River and respond appropriately to any new introductions or proliferation of nonnative species.	CPW removed fish from Silt to DeBeque. Catch rates were low for problematic predators (2 northern pike and 11 smallmouth bass), but substantial numbers of green sunfish were removed.
	III.B.	Reduce negative impacts to endangered fishes from sportfish management activities.											

>*	III.B.1.	Evaluate control options and implement measures to control nonnative fish escapement from Highline Reservoir.	CDOW/ CRWCD	Complete										
	III.B.1.a.	Operate and maintain Highline Reservoir net.	CPW	Ongoing	X	X	X	X	X	X	X	CPW will maintain Highline Reservoir net (and it will need to be replaced periodically).	The net was replaced for the second time on March 14, 2014. CPW performed 4 net cleanings in 2017. Surveys between the net and spillway in the spring of 2017 showed an unexpectedly high number of fish present behind the spillway net, including multiple age classes of gizzard shad. The spillway net was inspected and adjusted in March 2017, primarily fixing small gaps under the bottom skirt.
	III.B.1.b.	Evaluate Highline Reservoir net.	CDOW	Complete									
	III.B.2.	Remove bag and possession limits on warmwater nonnative sportfishes within critical habitat in Colorado.	CDOW	Complete									
	III.B.3.	Develop basinwide aquatic management plan to reduce nonnative fish impacts while providing sportfishing opportunities.	CDOW	Complete									
>*	III.B.3.a.	Implement CPW's Colorado River Aquatic Management Plan.	CPW	Ongoing	X	X	X	X	X	X	X		
	IV.	**MANAGE GENETIC INTEGRITY AND AUGMENT OR RESTORE POPULATIONS (STOCKING ENDANGERED FISHES)**											
	IV.A.	Augment or restore populations as needed, and as guided by the Genetics Management Plan.											
	IV.A.1.	Razorback sucker.											
	IV.A.1.a.	Develop experimental augmentation plan and seek Program acceptance.	FWS-FR	Complete									
	IV.A.1.b.	Implement experimental augmentation plan.											
>	IV.A.1.b.(1)	Stock fish.	FWS-FR	Complete									
	IV.A.1.b.(2)	Monitor and evaluate results; make recommendations regarding further augmentation.	FWS-FR	Complete									
	IV.A.2.	Monitor the fish community in the upper Colorado River (above Palisade) and develop management action plan, including recommendations for Colorado pikeminnow and razorback sucker augmentation.	CDOW	Complete									
	IV.A.3.	Develop integrated stocking plan for razorbacks in the Colorado River in Colorado.	CDOW/PD	Complete									
	IV.A.3.a.	Program acceptance.	CDOW/PD	Complete									
>	IV.A.3.b.	Implement razorback sucker integrated stocking plan. Superceded by Basinwide Integrated Stocking Plan (2015), see General IV.B.2.	CPW/PD	Ongoing	X	X	X	X	X	X			5,327 razorback sucker were stocked into the Colorado River from the Ouray Grand Valley Unit.
	IV.A.3.c.	Evaluate stocking success as identified in monitoring plan for stocked fish. Zelasko et al. 2009, 2011.	Program	Ongoing	X	X	X	X	X	X			
	IV.A.4.	Develop integrated stocking plan for Colorado pikeminnow in the Colorado River in Colorado.	CDOW/PD	Complete									
	IV.A.4.a.	Program acceptance.	CDOW/PD	Complete									
	IV.A.5.	Develop integrated stocking plan for bonytail in the Colorado River from Palisade to Loma.	CDOW	Complete									
	IV.A.5.a.	Program acceptance.	CDOW/PD	Complete									
>	IV.A.5.b.	Implement bonytail integrated stocking plan. Superceded by Basinwide Integrated Stocking Plan (2015), see General IV.B.2.	FWS/CPW	Ongoing	X	X	X	X	X	X			in 2017, 13,352 bonytail were stocked into the Colorado by Mumma (NASRF) and the Ouray Grand Valley Unit.
	IV.A.5.c.	Evaluate stocking success as identified in monitoring plan for stocked fish.	Program	Ongoing	X	X	X	X	X	X			
	IV.A.6.	Develop integrated stocking plan for the four endangered fish in the Colorado River in Utah.											
	IV.A.6.a.	Prepare plan.	UDWR	Complete									
	IV.A.6.b.	Program acceptance.	UDWR	Complete									
>	IV.A.6.c.	Implement plan. Superceded by Basinwide Integrated Stocking Plan (2015), see General IV.B.2.	UDWR	Ongoing	X	X	X	X	X	X			Wahweap did not stock any fish in the Colorado River in Utah in 2017 because efforts were focused on the Green. Overall stocking targets were met.

	IV.A.6.d.	Evaluate stocking success as identified in monitoring plan for stocked fish. Zelasko et al. 2009, 2011.	LFL/FWS/ STATES	Ongoing	X	X	X	X	X	X			
	V.	**MONITOR POPULATIONS AND HABITAT AND CONDUCT RESEARCH TO SUPPORT RECOVERY ACTIONS (RESEARCH, MONITORING, AND DATA MANAGEMENT)**											
	V.A.	Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.											
	V.A.1.	Determine Colorado pikeminnow larval drift into Lake Powell.	NPS	Complete									
	V.B.	Monitor populations per requirements in the 15-Mile Reach PBO.											
	V.B.1.	Determine initial baselines and indices for Colorado pikeminnow and humpback chub.	PD	Complete									
	V.B.1.a.	Evaluate population response, per 15-Mile Reach PBO (every 5 years beginning in FY 05).	FWS	Ongoing	X	X	X	X	X	X			
	V.B.2.	Determine initial baselines and indices for razorback sucker and bonytail.	PD	Complete									
	V.B.2.a.	Evaluate population response, per 15-Mile Reach PBO (every 5 years beginning in FY 05).	FWS	Ongoing	X	X	X	X	X	X			
	V.B.3.	Revise population indices to conform to recovery goals.	FWS	Complete									
	V.B.4.	Monitor incidental take.											
	V.B.4.a.	Develop plan to monitor incidental take of endangered fi	FWS	Complete									
	V.B.4.b.	Implement plan to monitor incidental take of endangered fish in diversion structures.	FWS	Ongoing	X	X	X	X	X	X	X		In FY17, 3442 native fish were collected in the GVIC canal during fall sampling events including 8 razorback sucker and one bonytail. 54,254 native fish were collected in the GVWU canal and 35 fish were collected further down in the Price ditch, but no endangered fish were present at either location. All fish were returned to the river after biometric information was collected.
	V.C.	Estimate humpback chub populations. (Sampling occurs in September and October, overlapping fiscal years.)											
	V.C.1.	Black Rocks. See McAda 2002; Francis and McAda 2011; and Francis et al. 2016.	FWS	Ongoing	X	X	X	X	X	X	X	Continue to estimate abundance of humpback chub in Black Rocks.	Sampling incorporated trammel nets, hoop nets, electrofishing and submersible antennas for the second year, collectively catching 183 HBC. Ten were collected and added to the protected genetic population at Ouray National Fish Hatchery (GVU).
	V.C.2.	Westwater. See Hudson and Jackson 2003, Elverud 2012; Hines et al. 2016.	UDWR	Ongoing	X	X	X	X	X	X	X	Continue to estimate abundance of humpback chub in Westwater Canyon.	**!** Preliminary model averaged estimate for humpback chub for 2017 is 3,656 (95% CI 1,177-6,133, SE=1097, CV=0.30), indicating this population has stabilized since 2007 and now appears to be increasing. Catch rates dropped from 2016 levels but were the third highest since sampling began.
	V.C.3.	Cataract Canyon	UDWR	Ongoing	X	X	X	X	X	X	X	Continue to estimate CPUE of humpback chub in Cataract Canyon.	UDWR deployed trammel nets and hoop nets coupled with electrofishing. The CPE estimate for trammel netting was 0.04 fish/hr, the highest rate recorded since sampling began in 1991. UDWR still faces obstacles sampling additional habitat revealed by dropping lake levels - additional resources may be needed.
	V.D.	Estimate Colorado pikeminnow populations in the upper Colorado River (including Gunnison River). Three years sampling (e.g., FY 13, 14, 15) followed by two years no sampling; data analysis and report write-up in first year of no sampling (e.g., FY 16). See Osmundson and White 2009 and 2014.	FWS	Ongoing	X	X	X	X		X	X	Continue to estimate abundance of Colorado pikeminnow in upper Colorado River..	
	V.D.1	Monitor age-0 Colorado pikeminnow in backwaters	UDWR	Ongoing	X	X	X	X	X	X	X	Continue monitoring age-0 Colorado pikeminnow.	Age-0 pikeminnow monitoring conducted as per protocols identified in Project #138, continuing annual monitoring since 1986. In 2017, only 2 Colorado pikeminnow were caught in the lower Colorado. Concerns around lack of low-velocity habitat prompted recommendations to quantify changes in habitat. Authors recommend determination of optimal base flow for recruitment of YOY CPM on the lower Colorado.
	V.E.	Implement razorback sucker monitoring plan. See Osmundson and Seal 2009.	FWS, UDWR	Ongoing	X	X	X	X	X	X	X	Continue to estimate abundance of razorback sucker in upper Colorado River..	All life stages being monitored through projects 127, 138, and 163. See General, V.A.1.a.

COLORADO RIVER ACTION PLAN: GUNNISON RIVER

		ACTIVITY	WHO	STATUS	FY 18 10/17-9/18	FY 19 10/18-9/19	FY20 10/19-9/20	FY21 10/20-9/21	FY22 10/21-9/22	FY23 10/22-9/23	Post-Program	Description of Anticipated Post-Program Activity	Assessment of significant accomplishments (!) and shortcomings (X), (Focused on February 1, 2017 - January 31, 2018)
	I.	**PROVIDE AND PROTECT INSTREAM FLOWS (HABITAT MANAGEMENT)**											
	I.A.	Identify fish habitat and flow needs.											
	I.A.1.	Initially identify year-round flows needed for recovery (Flow recommendations will be provided upon completion of Aspinall Unit studies.)											
	I.A.1.a.	Complete draft technical synthesis report.	FWS	Complete									
	I.A.1.b.	Complete draft biological assessment.	BR	Complete									
	I.A.1.c.	Complete final technical synthesis report.	FWS	Complete									
	I.A.1.d.	Complete final biological assessment.	BR	Complete									
	I.A.1.e.	Complete draft NEPA document .	BR	Complete									
	I.A.1.f	Complete final NEPA document and record of decision.	BR	Complete									
	I.A.1.g	Complete ESA Section 7 consultation resulting in a programmatic biological opinion (PBO) for the Gunnison Basin.	FWS/BR/WAPA	Complete									
	I.B.	State acceptance of initial flow recommendations (Flow recommendations will be provided upon completion of Aspinall Unit studies.)											
	I.B.1.	Review scientific basis, dependent on development of flow recommendations by FWS.	CWCB/CDOW	Complete									
	I.B.2.	Assess legal and physical availability of water.	CWCB	Complete									
	I.B.3.	Assess impacts of depletions on Colorado's Compact allocations.	CWCB	Complete									
	I.B.4.	CWCB notice of intent to appropriate (in Colorado).	CWCB	On hold									
	I.C.	Legally protect identified flows.											
	I.C.1.	Acquire (flow recommendations will be provided upon completion of Aspinall Unit studies.)											
	I.C.1.a.	Assess, acquire and convert water rights to instream flows.	CWCB	On hold									
	I.C.2.	Appropriate (flow recommendations will be provided upon completion of Aspinall Unit studies.)											
	I.C.2.a.	CWCB approval to appropriate.	CWCB	On hold									
>*	I.C.2.b.	Colorado Attorney General's Office file date.	CWCB	On hold									
>*	I.C.2.c.	Water court adjudication (litigation dependent).	CWCB	On hold									
	I.C.3.	Deliver.											
>*	I.C.3.a.	Aspinall Unit supplemental releases to maintain 2,000 cfs minimum flow at Colorado-Utah state line 9 out of 10 years. Provide annual report. (Through 2001 only.)	BR	Complete									
	I.C.3.b.	Flows from Aspinall Unit for research studies.											
>*	I.C.3.b.(1)	Deliver flows.	BR	Complete									
>*	I.C.3.b.(2)	Protect research flows.	FWS/BR/CWCB	Complete									
>*	I.C.3.c.	Continue annual coordination meetings.	BR	Ongoing	X	X	X	X	X	X	X	USBR will continue coordination & releases.	
	I.C.3.d.	Flows from Paonia Reservoir in accordance with FWS Horsethief Biological Opinion.											
>*	I.C.3.d.(1)	Deliver flows.	BR	Ongoing	X	X	X	X	X	X	X	USBR will continue coordination & releases.	
	I.C.3.e.	Flows from Aspinall Unit pursuant to Aspinall Biological Opinion and record of decision..											The May 15, 2017, forecast Apr-Jul inflow for Blue Mesa Reservoir was an "Average Wet" 825 KAF, corresponding to a target peak flow at the Whitewater gage 14,040 cfs for two days, plus 8,070 cfs (half-bankfull) for 20 days, and an Aug-Dec baseflow of 1,050 cfs. Actual Blue Mesa inflow volume was 915,000 acre-feet (11% greater than forecast). A daily mean peak of 15,900 cfs was achieved at the Whitewater gage on May 26, with 4 days of flow above 14,040 cfs and 23 days above half-bankfull (all exceeding targets). Baseflow was maintained above 1,050 cfs for the entire Aug-Dec period.

	I.C.3.e.(1)	Determine if change in water right and/or contract is needed.	BR	Complete									
	I.C.3.e.(2)	Enter into contract if needed.	BR	Complete									
>*	I.C.3.e.(3)	Deliver flows.	BR	Ongoing	X	X	X	X	X	X	X	USBR will continue coordination & releases.	
	I.C.3.e.(3)(a)	Study Gunnison River return flows to determine consumptive use to be charged against flow deliveries.	USGS	Complete									
	I.D.	Evaluate and revise as needed flow regimes to benefit endangered fish populations. (Data series summarizing 2005-2008 daily sediment sampling on Gunnison, Green and Duchesne rivers completed [Williams et al. 2009] and scientific investigations report [Williams et al. 2013] completed)	FWS/Program	On hold									Effort was shifted to the Green and the White River in 2017, as recommended by the Peak Flow Technical Supplement, LaGory et al. 2015.
	I.D.1.	Develop study plan to evaluate flow recommendations / evaluate Selenium Management Program.	FWS/BOR/WAPA	Complete									
	I.D.1.a.	Monitor Physical Response in the Gunnison River to the Proposed Action.											
	I.D.1.a.(1)	Reinstate sediment monitoring in the Gunnison River as directed by project 85f.	Program	Pending									No activity on the Gunnison River in 2017. Project 85f 2017 sediment monitoring efforts were focused on Green River in Utah.
	I.D.1.a.(2)	Evaluate bed-load transport in gravel and cobble-bed portions of the Gunnison River below Hartland Dam (Peak Flow Tech Supplement priority).	Program	Pending									No activity on the Gunnison River in 2017. Project 85f 2017 sediment monitoring efforts were focused on Green River in Utah.
	I.D.1.a.(3)	Collect aerial photography during the peak flows to determine area of floodplain inundation at Escalante SWA and other sites.	Program	Pending									Lower priority site; no activity in 2017.
	I.D.1.a.(4)	Collect aerial photography during base flows to monitor channel width and complexity and to serve as base maps for habitat mapping.	BR	Pending									Lower priority site; no activity in 2017.
	I.D.1.a.(5)	Repeat depth-to-embeddedness (DTE) surveys in the Escalante area.	BR	Pending									Lower priority site; no activity in 2017.
	I.D.1.a.(6)	Evaluate the effect of operations to meet the Proposed Action on the Gunnison River thermal regime.	BR	Pending									Jana Mohrman, FWS volunteer, has initiated a review of water temperature data gathered and who uses it, for 2 sites: just below the Crystal Reservoir and just above the confluence of the North Fork Of the Gunnison.
	I.D.1.b.	Monitor Biological Responses in the Gunnison River to the Proposed Action.											
	I.D.1.b.(1)	Initiate a fish community monitoring study in Gunnison River main channel and floodplain habitats.	CPW/FWS	Ongoing	X	X	X						
	I.D.1.b.(2)	Assess primary and secondary productivity in cobble bars (runs and riffles).	TBD	Pending									
	I.D.1.c.	Support Reclamation's Selenium Management Program.											
	I.D.1.c.(1)	Collect tissues from endangered fish (or surrogate species) as directed by FWS (coordinated with fish community monitoring, I.D.1.b.(1)).	CPW/FWS	Pending									
	I.D.1.c.(2)	Investigate selenium toxicity in razorback sucker.	FWS	In Progress	X	X							Reclamation Selenium Report published in 2017. The final contaminants report under the PBO is in progress (Barb Osmundson, now working as FWS volunteer). A working draft of this report was shared (for informational purposes only) with the BC and PDO in October 2017.
	I.D.2.	Integrate and synthesize information to evaluate and recommend necessary revision of the proposed action (implement flow recommendation)	Program	In Progress	X	X							Awaiting final report under I.D.1.c.(1)
	I.E.	Initiate investigations of the feasibility of modifying releases from Aspinall Unit dams to increase water temperatures that would allow for upstream expansion of Colorado pikeminnow in the Gunnison River.	BR/Contract	Complete									

	II.	**RESTORE HABITAT (HABITAT DEVELOPMENT AND MAINTENANCE)**											
	II.A.	Restore and manage flooded bottomland habitat.											
	II.A.1.	Develop management plan for Escalante State Wildlife Area.		Complete 5/94									
	II.A.2.	Develop and implement levee removal strategy at high-priority sites.											
	II.A.2.a.	Preconstruction (contaminants screening, floodability assessments, environmental compliance, design & engineering).	BR	Complete									
>*	II.A.2.b.	Construction (levee removal)	BR	Complete									
	II.A.2.c.	Operate and maintain.	BR/FWS	Complete									
	II.A.2.d.	Evaluation.	FWS	Complete									
	II.A.3.	Acquire interest in high-priority flooded bottomland habitats.											
	II.A.3.a.	Identify and evaluate sites.	FWS	Complete									
	II.A.3.b.	Pre-acquisition planning and identification of acquisition options.	PD	Complete									
	II.A.3.c.	Conduct appraisal/NEPA compliance.	PD	Complete									
>*	II.A.3.d.	Negotiate & acquire.	PD	Complete									
	II.A.3.e.	Evaluate effectiveness of land acquisition activities and provide recommendations.	PD	Complete									
>*	II.A.4.	Develop and implement Colorado River Subbasin Floodplain Management Plan (Valdez and Nelson 2004b).	Program	Ongoing	X	X	X						
	II.B.	Restore native fish passage at instream barriers.											
	II.B.1.	Restore passage at Redlands.											
	II.B.1.a.	Assess and make recommendations for fish passage.	FWS	Complete									
	II.B.1.b.	Implement viable options to restore fish passage.											
	II.B.1.b.(1)	Design passage, conduct NEPA compliance.	BR	Complete									
>*	II.B.1.b.(2)	Construct fish ladder.	BR	Complete									
>*	II.B.1.c.	Operate and maintain fish ladder.	FWS-FR/BR	Ongoing	X	X	X	X	X	X	X	The Redlands fish ladder will need to be maintained and operated in perpetuity.	*!* In 2017, the Redlands fish passageway was operational from 19 April to 20 October. This was the 22nd year of operation. Seven Colorado pikeminnow were captured this year, bringing the total captured at this site since 1996 to 187. One razorback sucker was captured, bringing the 22-year total to 36. Two bonytail were captured. One humpback chub was captured. A total of 7,342 fish of all species were handled at the Redlands fish passage between April and October. Native fishes composed 72% of the total in 2017. Overall, native fish account for about 81% of all fish processed during the 22 years of this passageway's operation. All 7 pikeminnow were translocated to the Gunnison River at Escalante, river mile 42.7. The razorback sucker was translocated to Delta, river mile 57.1.
	II.B.1.d.	Monitor and evaluate success.	FWS-FR/BR	Complete									
	II.B.1.e	Identify minimum flows below Redlands Diversion Dam.	FWS-FR	Complete									
>*	II.B.1.f.	Deliver flows below Redlands.	BR	Ongoing	*X*	*X*	*X*	*X*	*X*	*X*	*X*	USBR will continue to provide flows for passage operation.	
	II.B.1.g.	Screen Redlands diversion structure to prevent endangered fish entrainment.											
	II.B.1.g.(1)	Design.	BR	Complete									
>*	II.B.1.g.(2)	Construct.	BR	Complete									
>*	II.B.1.h.	Operate and maintain fish screen.	Redlands	Ongoing	*X*	*X*	*X*	*X*	*X*	*X*	*X*	The Redlands fish screen will need to be maintained and operated in perpetuity.	The Redlands fish screen was put online May 1, and taken offline Oct 29 at the end of the 2017 irrigation season. The Redlands screen was operational for 87% of the irrigation season, with occasional outages for plant repairs and maintenance.
	II.B.2.	Restore passage at Hartland.											

	II.B.2.a.	Assess and make recommendations for fish passage. (Passage at Hartland not identified as necessary for recovery in species' recovery goals).	FWS-FR	Complete									
	II.B.2.b.	Evaluate viable options to restore fish passage.	BR	Complete									
	II.B.2.c.	Support local interests in efforts to pursue removal of the Hartland Diversion dam. [NOTE: These efforts will be conducted independently of and funded outside of the Recovery Program]	BR/FWS/PD	Complete									
	II.B.2.d.	Screen Hartland diversion to prevent endangered fish entrainment, if warranted.		Complete									
	II.B.2.d.(1)	Assess need.	BR/FWS/PD	Complete									
	III.	**REDUCE NEGATIVE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES (NONNATIVE AND SPORTFISH MANAGEMENT)**											
	III.A.	Reduce negative interactions between nonnative and endangered fishes.											
>*	III.A.1.	Reclaim ponds in critical habitat	CDOW	Complete									
	III.A.1.a.	Evaluate and make recommendations.	CDOW	Complete									
	III.A.2.	Develop basinwide aquatic management plan to reduce nonnative fish impacts while providing sportfishing opportunities.	CDOW	Complete									
>*	III.A.2.a.	Implement CPW's Gunnison River Aquatic Management Plan.	CPW	Ongoing	X	X	*X*	X	X	X	X	CPW will continue to implement plan.	
	III.A.3.	Preclude new nonnative species introductions, translocations or invasions to preserve native species dominance within critical habitat.	Program	Ongoing	X	X	*X*	X	X	X	X	Monitor and implement appropriate actions.	Riverine habitats in the Gunnison River drainage remain a native fish stronghold. All manner of prevention needs to take place to prevent nonnative fish from colonizing the Gunnison River.
>*	III.A.3.a	Install and maintain net to prevent escapement of smallmouth bass at Ridgway Reservoir.	CPW / BR	Ongoing	X	X	X	X	X	X	X	Stakeholders will continue to operate and maintain net per agreements (in development). CPW will continue to implement revised LMP (in draft).	An illicitly introduced smallmouth bass population in Ridgway Reservoir continues to threaten the downstream Gunnison River native fish community. The population was confirmed in 2013. Densities of smallmouth bass near the spillway were high, indicating a high risk of escarpment from reservoir spilling. **X** A working group focused on installing a nonnative fish escapement solution last met in May 2017; A preferred alternative is likely a net, but has not been confirmed. If a net, USBR will purchase a net once design criteria are finalized, with 0.25 inch openings. CPW implemented an unlimited harvest of smallmouth bass in Ridgway Reservoir beginning on April 1, 2015. **!** TriCounty Water Conservancy District successfully avoided spills from 2014 through 2017, even with substantial runoff in 2017. CPW conducted a harvest tournament for smallmouth bass each summer since 2015. They estimate that 53% of the smallmouth bass population was removed during the tournament in 2017, the highest percentage yet.
	III.A.3.b	Implement control measures to prevent escapement of northern pike at Crawford Reservoir.	CPW	Ongoing	X	X	X	X	X	X	X		Northern pike management at Crawford Reservoir continues. Removal has decreased the population. Additional water management options to further impact the population are not feasible at this time.
	IV.	**MANAGE GENETIC INTEGRITY AND AUGMENT OR RESTORE POPULATIONS (STOCKING ENDANGERED FISHES)**											
	IV.A.	Augment or restore populations as needed and as guided by the Genetics Management Plan.											
	IV.A.1.	Razorback sucker.											
	IV.A.1.a.	Develop experimental augmentation plan and seek Program acceptance.	FWS-FR	Complete									

	IV.A.1.b.	Implement experimental augmentation plan. (Goal: 10 adults/river mile.)												
>	IV.A.1.b.(1)	Stock fish.	FWS-FR	Complete										
	IV.A.1.b.(2)	Monitor and evaluate results; make recommendations regarding further augmentation.	FWS-FR	Complete										
	IV.A.2.	Develop integrated stocking plan for Colorado pikeminnow in the Gunnison River.												
	IV.A.2.a.	Program acceptance.		Complete										
>	IV.A.2.b.	Implement Colorado pikeminnow integrated stocking plan.	CPW/FWS	On hold										
	IV.A.2.c.	Evaluate stocking success as identified in monitoring plan for stocked fish.	FWS/CPW	On hold										
	IV.A.3.	Develop integrated stocking plan for razorback sucker in the Gunnison River.												
	IV.A.3.a.	Program acceptance.		Complete										
>	IV.A.3.b.	Implement razorback sucker integrated stocking plan. Superceded by Basinwide Integrated Stocking Plan (2015), see General IV.B.2.	CPW/FWS	Ongoing	X	X	X	X	X	X	X			2,093 razorbacks were stocked into the Gunnison River by the Ouray Grand Valley Unit.
	IV.A.3.c.	Evaluate stocking success as identified in monitoring plan for stocked fish.	LFL/FWS/STATES/PD	Ongoing	X	X	X	X	X	X	X			All life stages being monitored through project 163. See General, V.A.1.a.
	V.	**MONITOR POPULATIONS AND HABITAT AND CONDUCT RESEARCH TO SUPPORT RECOVERY ACTIONS (RESEARCH, MONITORING, AND DATA MANAGEMENT)**												
	V.A.	Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.												
	V.A.1.	Conduct Colorado pikeminnow and razorback sucker inventory in Gunnison River above Redlands.	FWS-FR	Complete										
	V.A.2.	Identify additional spawning sites of endangered fishes on the Gunnison River.	FWS-FR	Ongoing	X	X	X	X	X	X	X			Gunnison River fish community monitoring ongoing (Project #163), a draft report is expected in Spring of 2018. An August 7-11 electrofishing effort yielded 22 razorback sucker and one Colorado pikeminnow and numerous other native fishes. An October 2-6 electrofishing trip yielded 39 razorback sucker (25 recent stockers; 14 that had been at large for 1-5 years). **!** The Gunnison River remains free of smallmouth bass.

COLORADO RIVER ACTION PLAN: DOLORES RIVER

		ACTIVITY	WHO	STATUS	FY 18 10/17-9/18	FY 19 10/18-9/19	FY20 10/19-9/20	FY21 10/20-9/21	FY22 10/21-9/22	FY23 10/22-9/23	Post-Program	Description of Anticipated Post-Program Activity	Assessment of significant accomplishments (!) and shortcomings (X), (Focused on February 1, 2017 - January 31, 2018)
	III.	**REDUCE NEGATIVE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES (NONNATIVE AND SPORTFISH MANAGEMENT)**											
	III.A.	Reduce negative interactions between nonnative and endangered fishes.											
	III.A.1.	Assess need and options to control nonnative fish escapement from McPhee Reservoir.	BR	Complete									
	III.B.	Reduce negative impacts to endangered fishes from sportfish management activities.											
	III.B.1.	Identify potential conflicts between present fish management practices in McPhee Reservoir and endangered fishes and formulate an alternative management plan.	CDOW	Complete									
	III.B.2.	Recovery Program needs to determine if nonnative fishes in the Dolores River basin pose a threat to endangered fishes and determine appropriate response.	CPW	Ongoing	X	X	X	X	X	X	X		In 2017, above-average snowpack allowed for increased reservoir releases from McPhee and for additional sampling by CPW. CPW documented a 94% native fish community in Slick Rock Canyon. **!** In mid-July, CPW targeted the smallmouth bass by recommending a three-day, 4,000 cfs release at a time when males were guarding the nest. On a 14-mile stretch from below Snaggletooth Rapid to Slick Rock Canyon, biologists removed 600 smallmouth bass.
>*	III.B.2.a.	Reclaim Miramonte Reservoir.	CPW	Complete 2013									
	V.	**MONITOR POPULATIONS AND HABITAT AND CONDUCT RESEARCH TO SUPPORT RECOVERY ACTIONS (RESEARCH, MONITORING, AND DATA MANAGEMENT)**											
	V.A.	Survey native and nonnative fish in Dolores River (UDWR funding outside of Program).	UDWR/USBR/CPW	Complete									**!** PIT antennas (2014-2017) documented presence of 1013 individuals of six native species including Colorado pikeminnow (n=26), razorback sucker (n=30) and bonytail (n=658). Most detected bonytail were stocked in the Dolores and quickly emigrated, however, 8 bonytail and many razorback stocked in the Colorado moved into the Dolores voluntarily. Antenna data are the first evidence of Colorado pikeminnow in the Dolores since 1991.

Summary of 2017 Hydrologic Conditions

Upper Colorado River
Endangered Fish Recovery Program

Don Anderson

FLOW MANAGEMENT ASSESSMENT GRAPHICS

Upper Green, Duchesne, and San Rafael Rivers had unusually high April-July runoff:

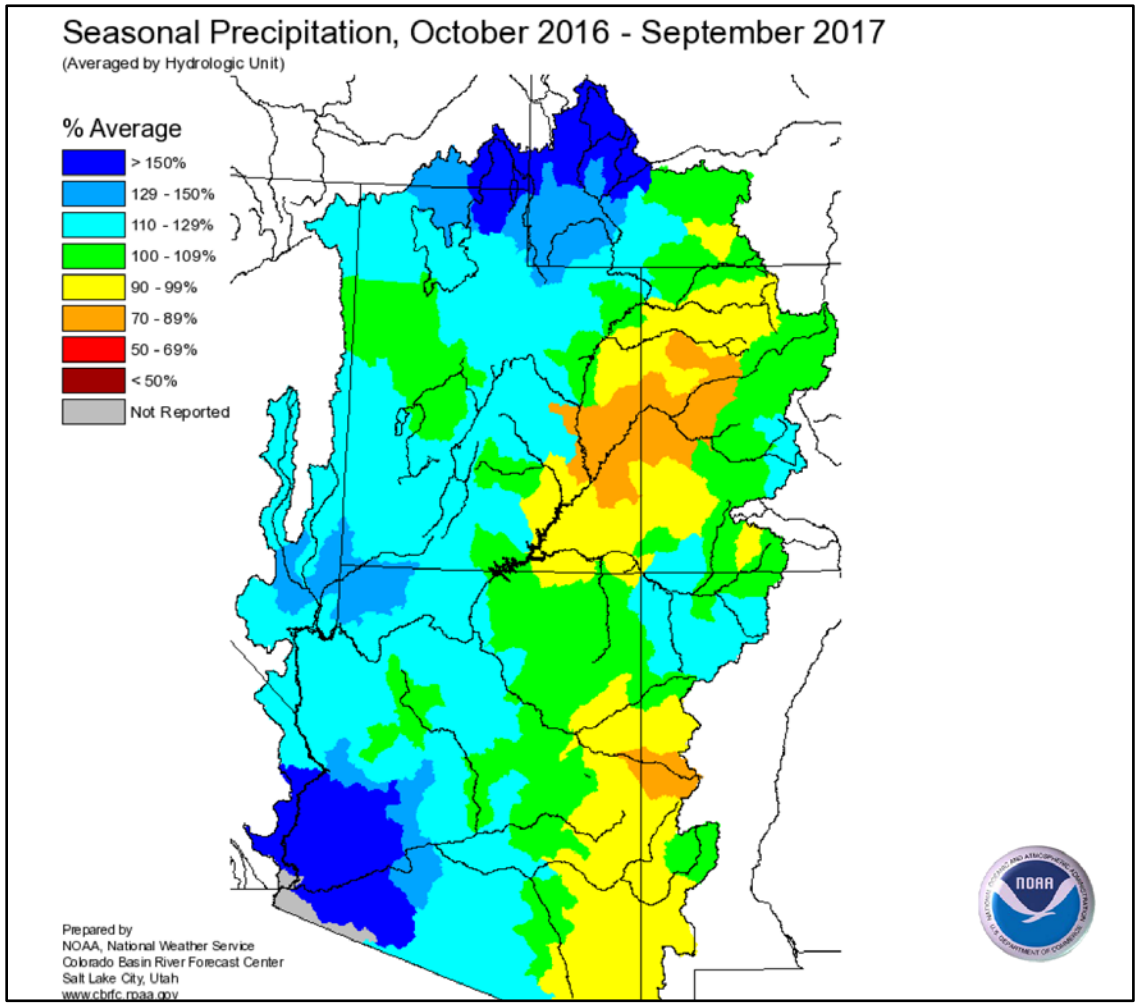
(April-July percentages of 1981-2010 average)

.. While the Gunnison and Dolores Rivers had above-average runoff:

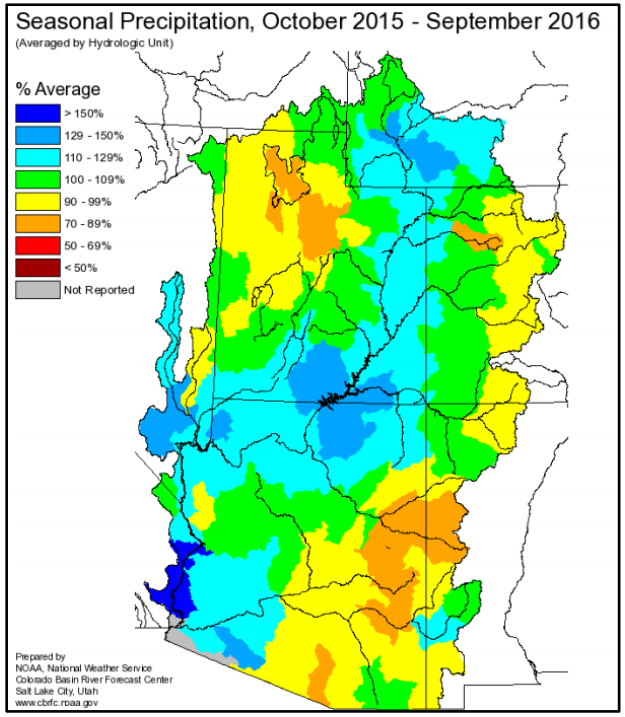
.. and the Yampa, White, and mainstem Colorado Rivers had below-average runoff:

FLOW MANAGEMENT ASSESSMENT GRAPHICS

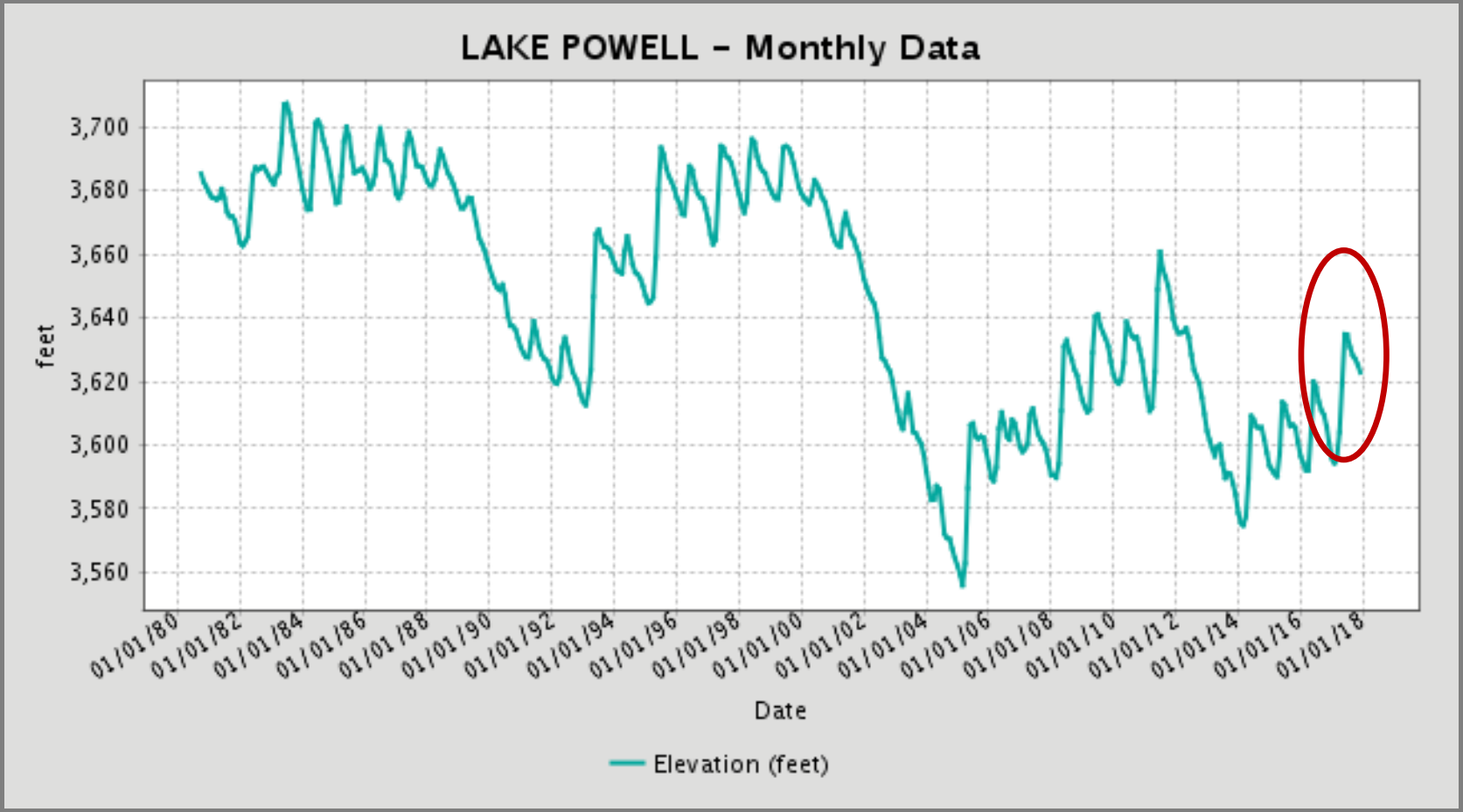
Water Year 2017: Precipitation in the Upper Colorado River Basin was substantially greater in many areas, with the notable exception of the lower mainstem Colorado, White and Yampa Rivers:



Water Year 2016



Lake Powell WY 2017 inflow: **110% of average** (11.9 MAF)
Elevation now **23 feet higher** than one year ago (57% capacity)



Levels of concern are 3525 ft (other reservoirs must deliver to Powell) and 3490 ft (below the hydro intakes)

2017 Spring Peak Flows

River	Location	Mean Daily Peak (cfs)	2017 Peak (cfs)	% of Avg Peak
Yampa	*Deerlodge Park*	12,500	10,700	86%
White	*Watson*	2,400	2,130	89%
Green	*Jensen*	16,500	17,900	108%
Green	*Green River*	18,500	21,800	118%
Gunnison	*Grand Junction*	8,000	15,900	199%
San Juan	*Bluff*	11,730	8,450	72%
Colorado	*Cameo*	19,000	16,600	87%
Colorado	*Palisade*	17,363	14,900	86%
Colorado	*Cisco*	23,000	26,200	114%

FLOW MANAGEMENT ASSESSMENT GRAPHICS

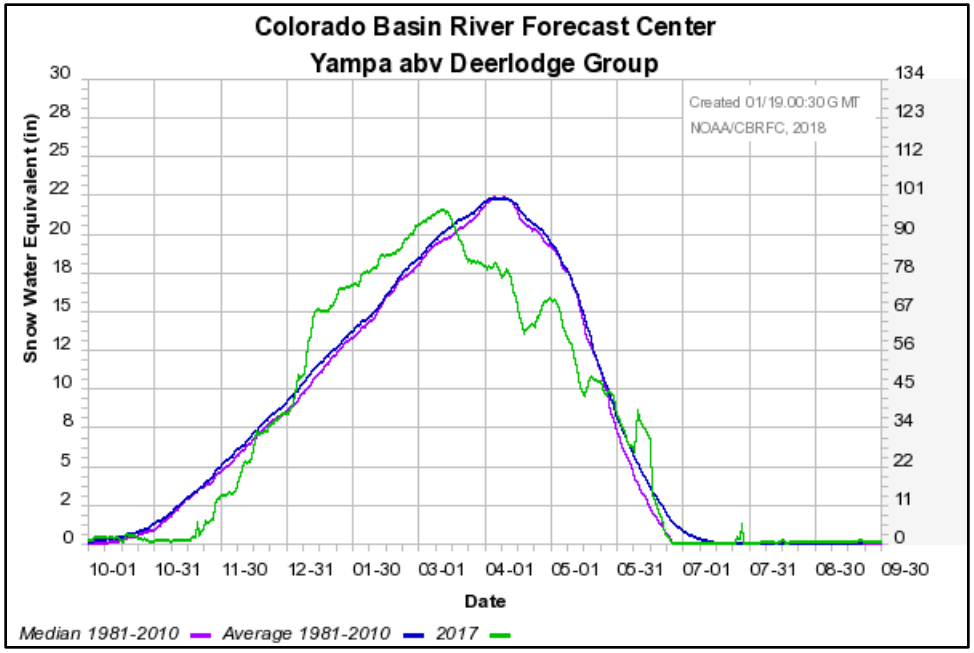
2017 Base Flows

River	Location	Total Aug-Oct Runoff as % Avg	Minimum (cfs)
Yampa	*Maybell*	80%	89
Yampa	*Deerlodge Park*	76%	95
White	*Watson*	77%	114
Green	*Jensen*	127%	1,910
Green	*Green River*	103%	2,080
Gunnison	*Grand Junction*	110%	1,820
San Juan	*Bluff*	65%	525
Colorado	*Cameo*	100%	2,150
Colorado	*Palisade*	107%	848
Colorado	*Cisco*	96%	3,430

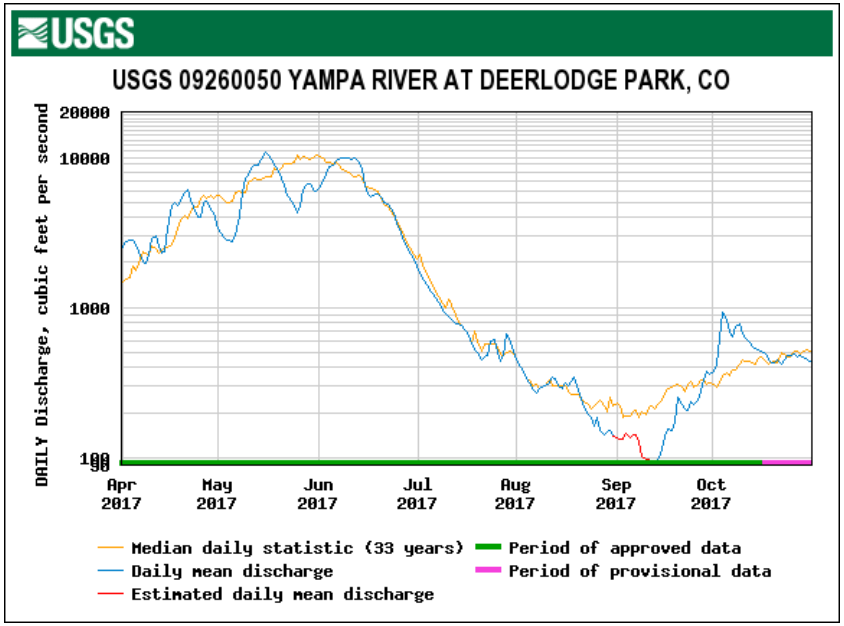
Averages are based on 1981-2010 period of record; in some cases some years from this period are missing.

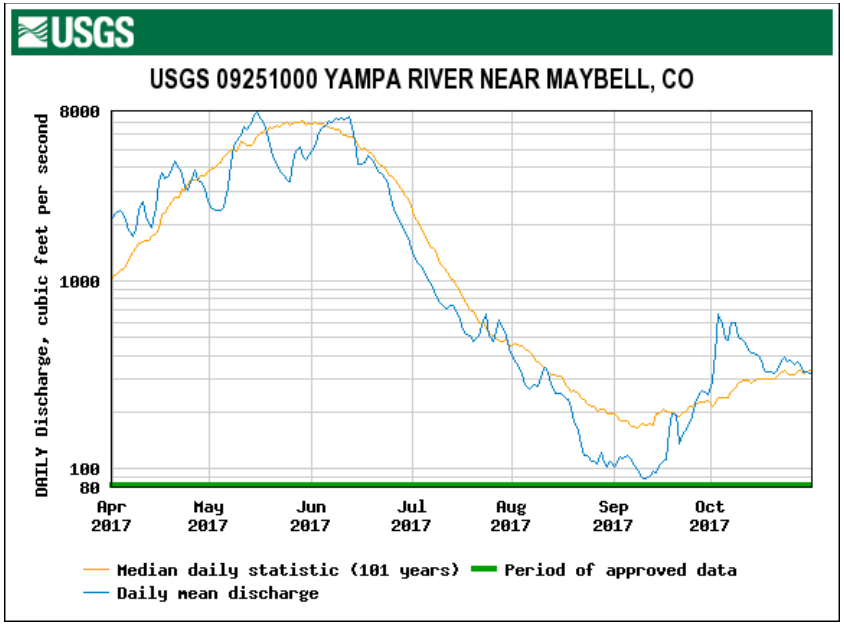
FLOW MANAGEMENT ASSESSMENT GRAPHICS

Yampa River Basin snow accumulation was above-average until mid-March, when early melt and limited snowfall depleted the snowpack:



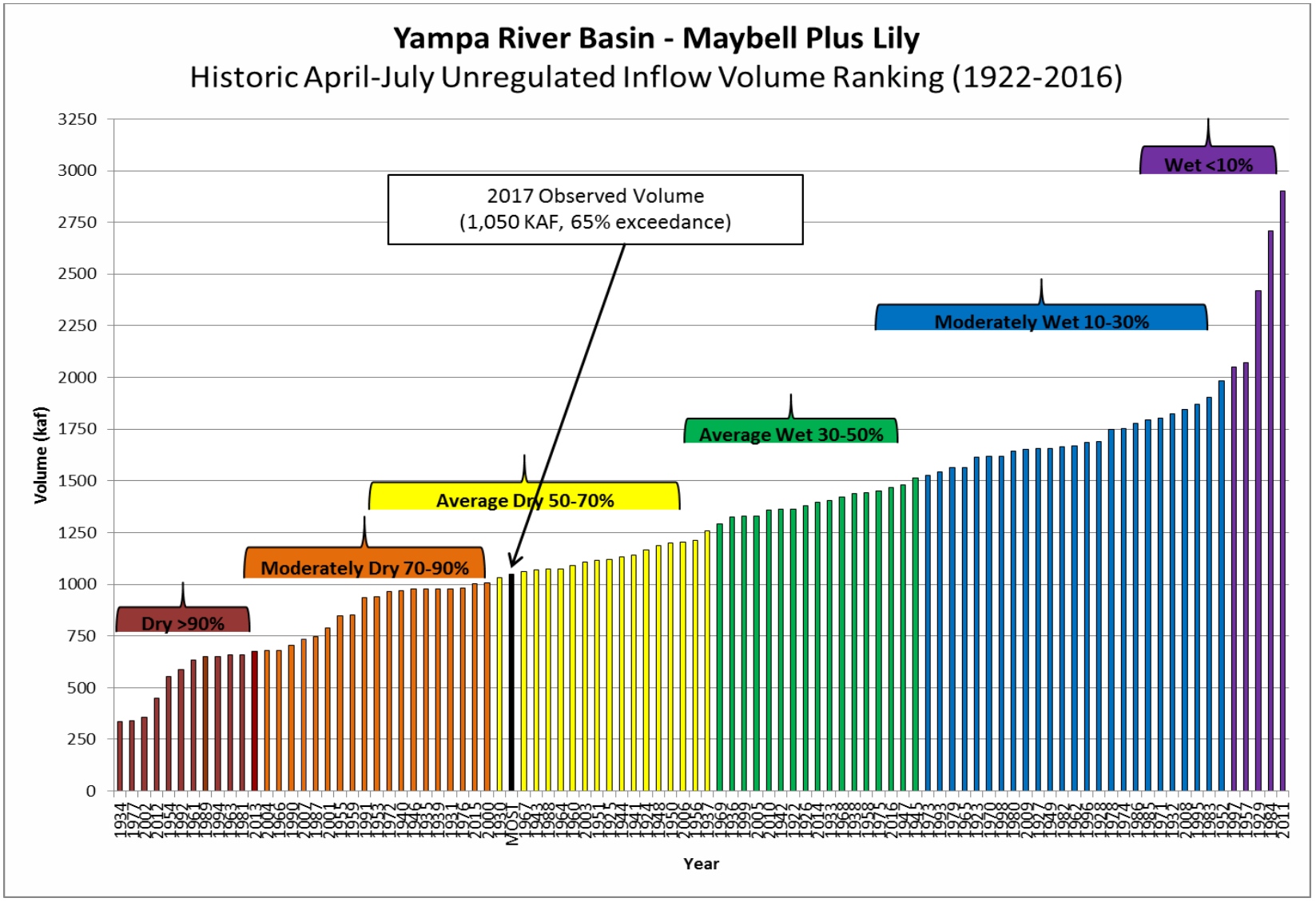
April through October Hydrographs:





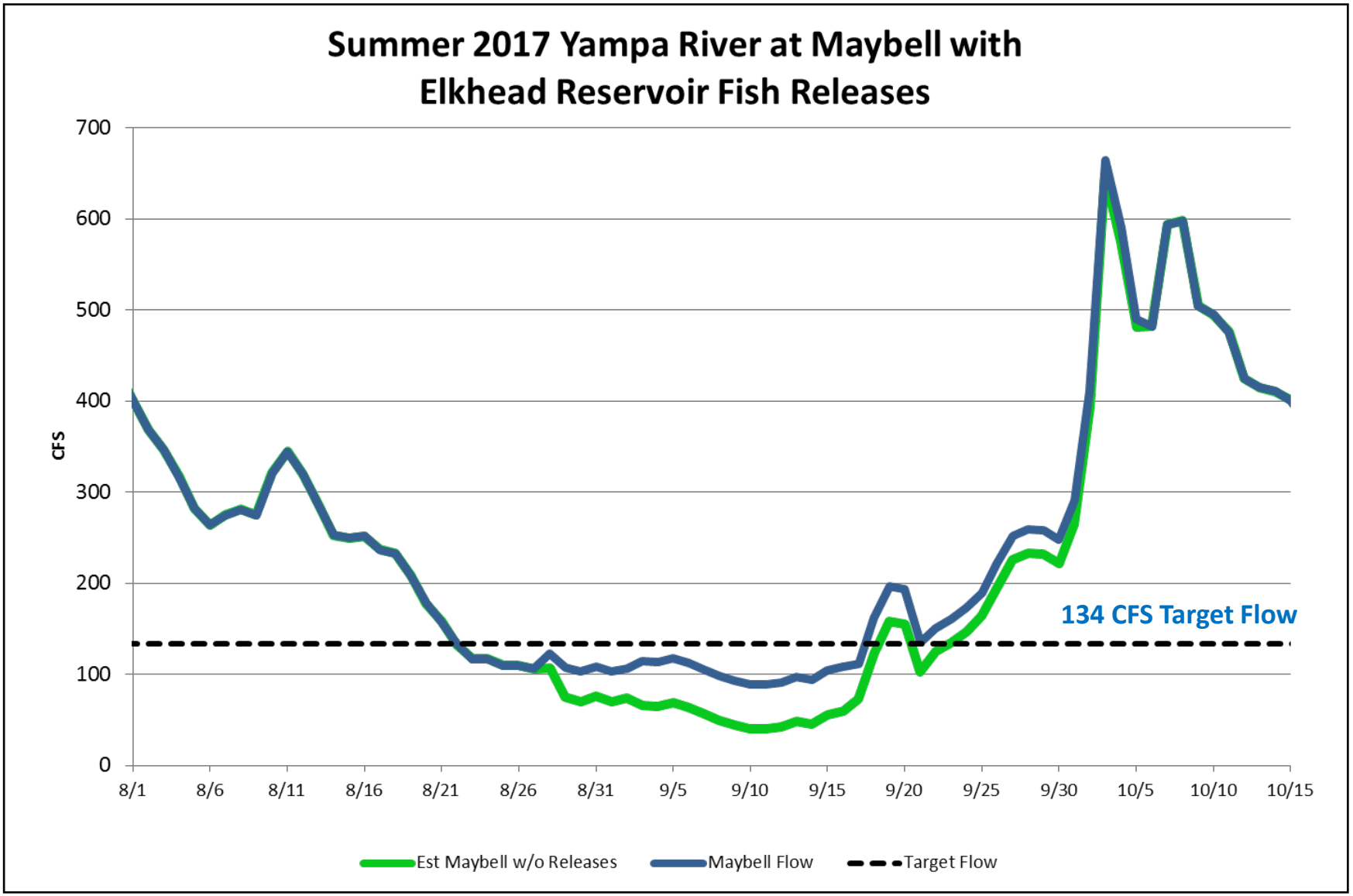
FLOW MANAGEMENT ASSESSMENT GRAPHICS

April-July runoff in the lower Yampa River Basin in 2017 (including Little Snake River inflow) fell into the "Average-Dry" category, at 65% exceedance:



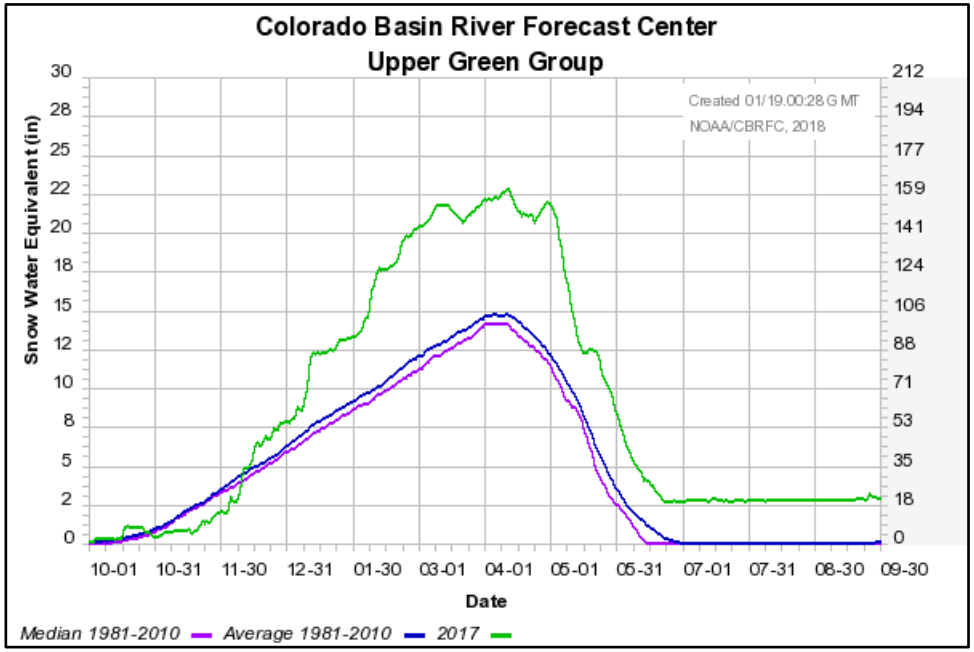
FLOW MANAGEMENT ASSESSMENT GRAPHICS

A total of 4,130 acre-feet of Elkhead Reservoir fish pool water was released during the 2017 irrigation season to augment base flows in the Yampa River:

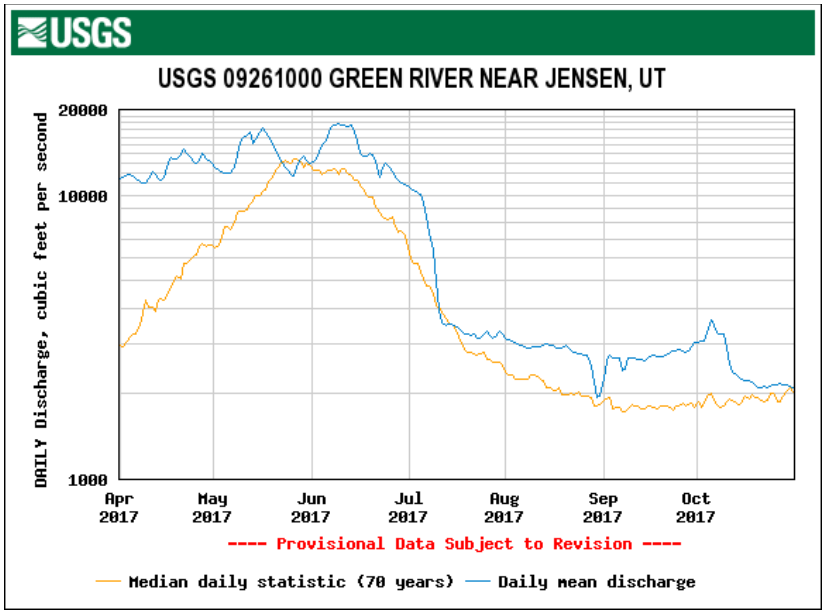


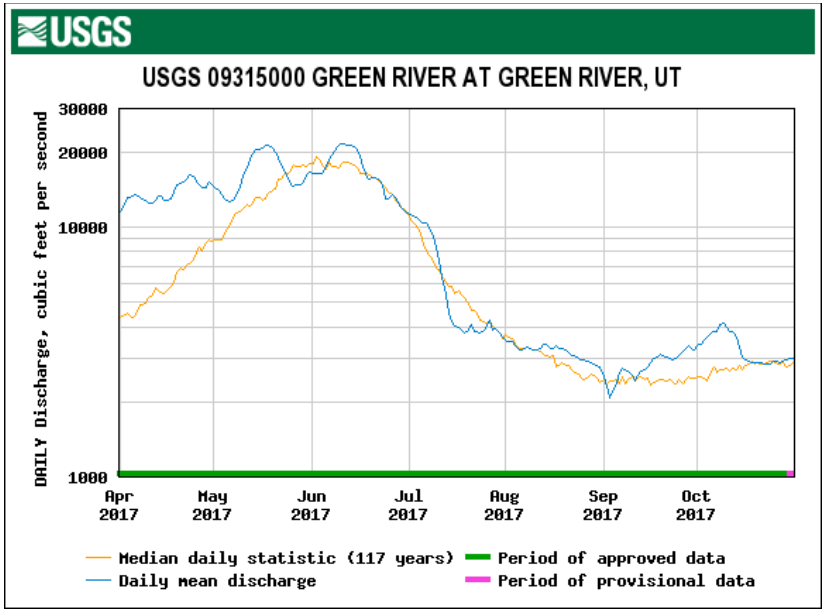
FLOW MANAGEMENT ASSESSMENT GRAPHICS

Snow accumulation in the basin upstream of Flaming Gorge Reservoir was well above-average throughout the season:



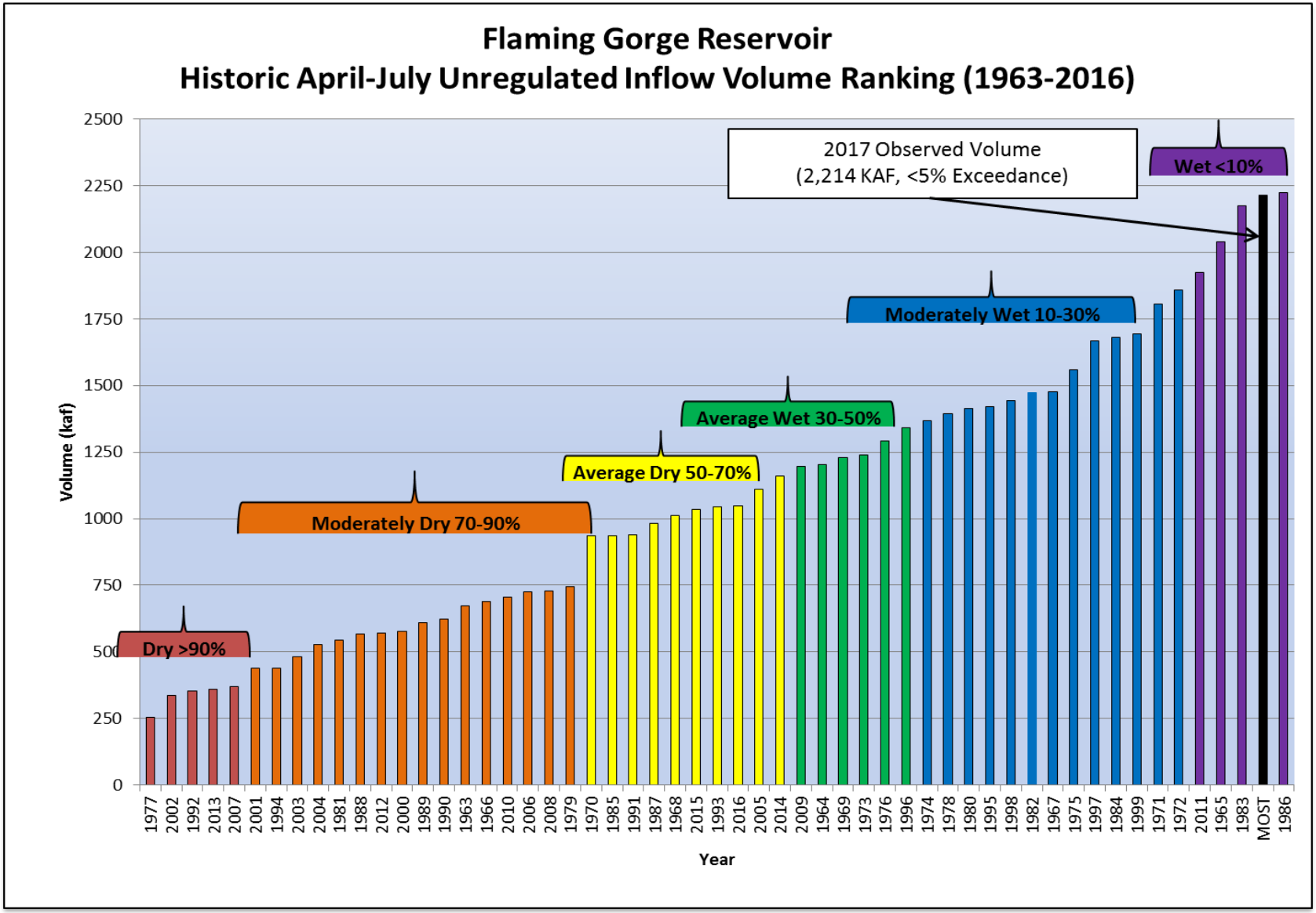
April through October Hydrographs:

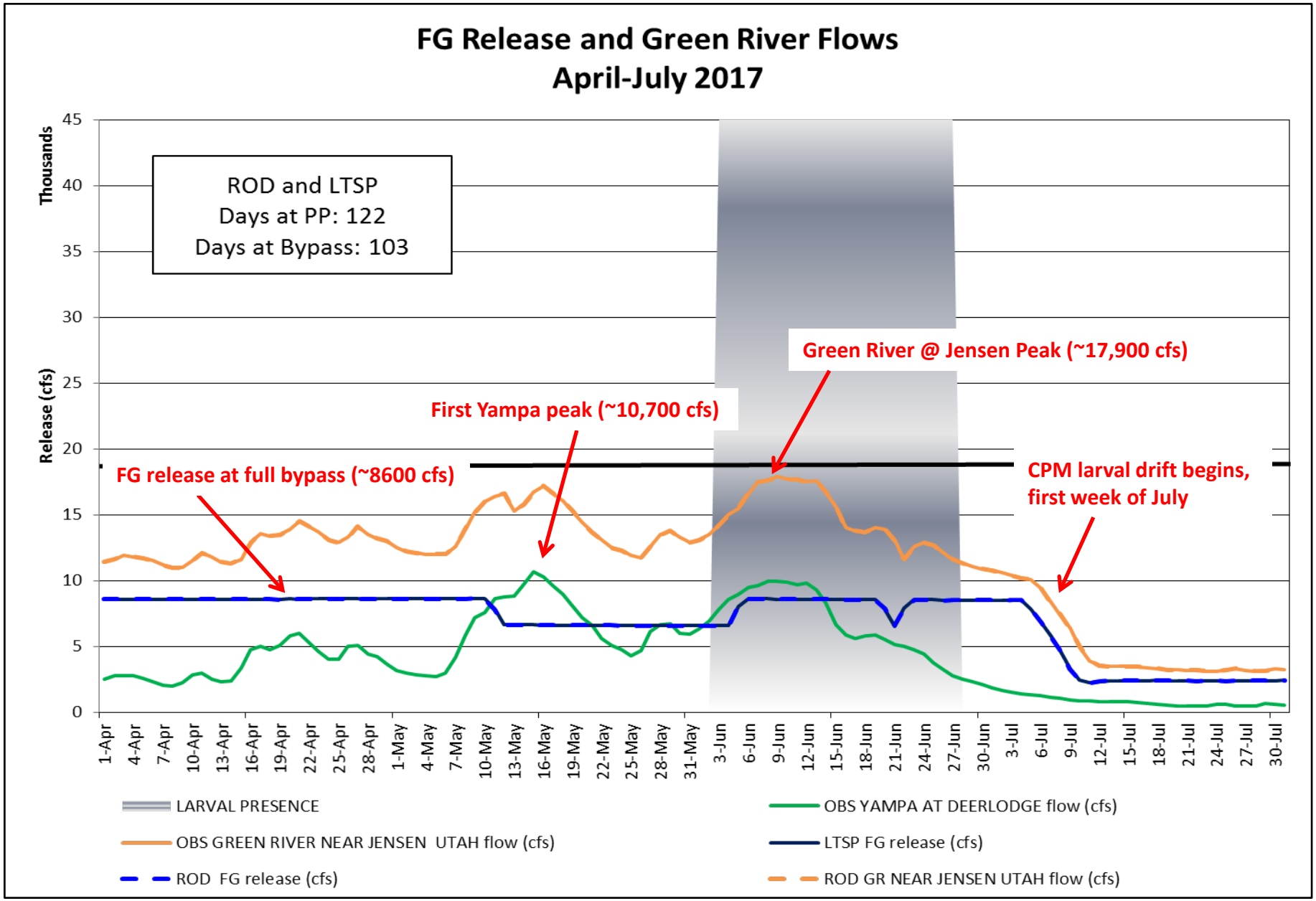




FLOW MANAGEMENT ASSESSMENT GRAPHICS

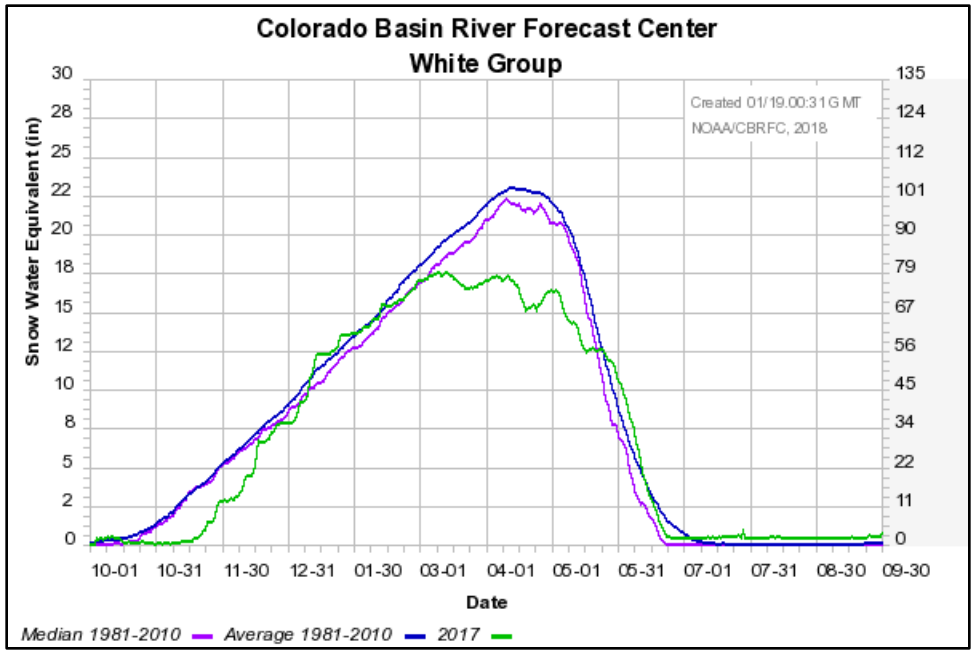
April-July runoff above Flaming Gorge in 2017 was near-record, and fell into the "Wet" category, at <5% exceedance:



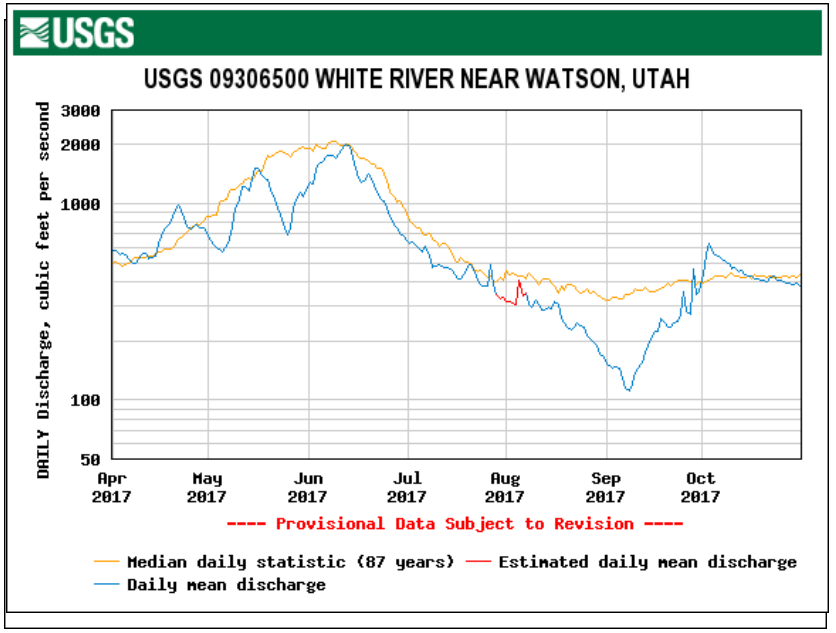

FG Release and Green River Flows
April-July 2017
ROD and LTSP
Days at PP: 122
Days at Bypass: 103
Thousands
Release (cfs)
45
40
35
30
25
20
15
10
5
0
Green River @ Jensen Peak (~17,900 cfs)
First Yampa peak (~10,700 cfs)
FG release at full bypass (~8600 cfs)
CPM larval drift begins, first week of July
1-Apr
4-Apr
7-Apr
10-Apr
13-Apr
16-Apr
19-Apr
22-Apr
25-Apr
28-Apr
1-May
4-May
7-May
10-May
13-May
16-May
19-May
22-May
25-May
28-May
31-May
3-Jun
6-Jun
9-Jun
12-Jun
15-Jun
18-Jun
21-Jun
24-Jun
27-Jun
30-Jun
3-Jul
6-Jul
9-Jul
12-Jul
15-Jul
18-Jul
21-Jul
24-Jul
27-Jul
30-Jul
LARVAL PRESENCE
OBS YAMPA AT DEERLODGE flow (cfs)
OBS GREEN RIVER NEAR JENSEN UTAH flow (cfs)
LTSP FG release (cfs)
ROD FG release (cfs)
ROD GR NEAR JENSEN UTAH flow (cfs)

FLOW MANAGEMENT ASSESSMENT GRAPHICS

Snow accumulation in the White River basin was near-average through mid-March, at which point it was depleted by early melt and limited additional snowfall:

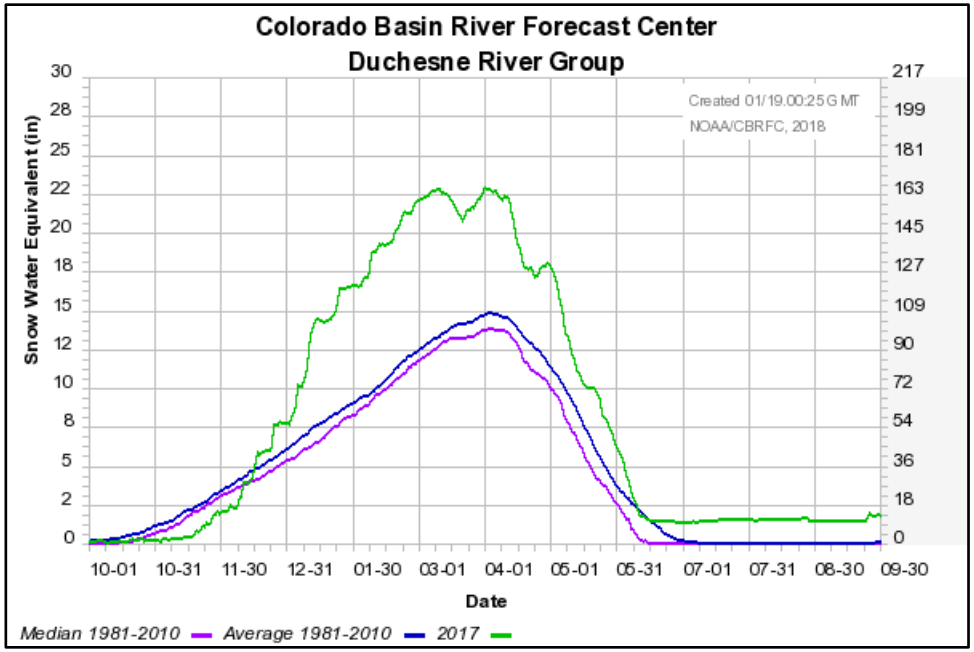


April through October Hydrograph:

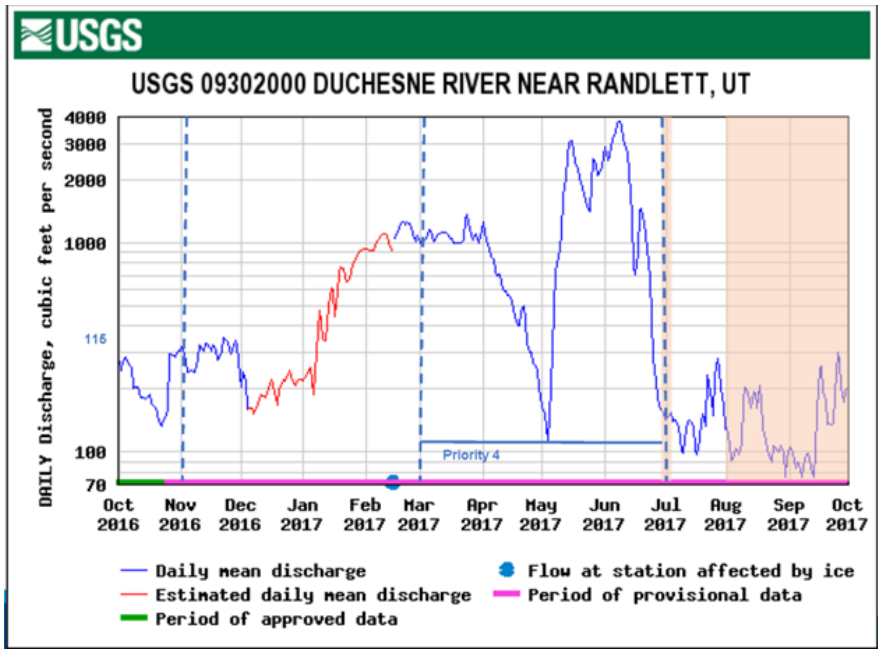


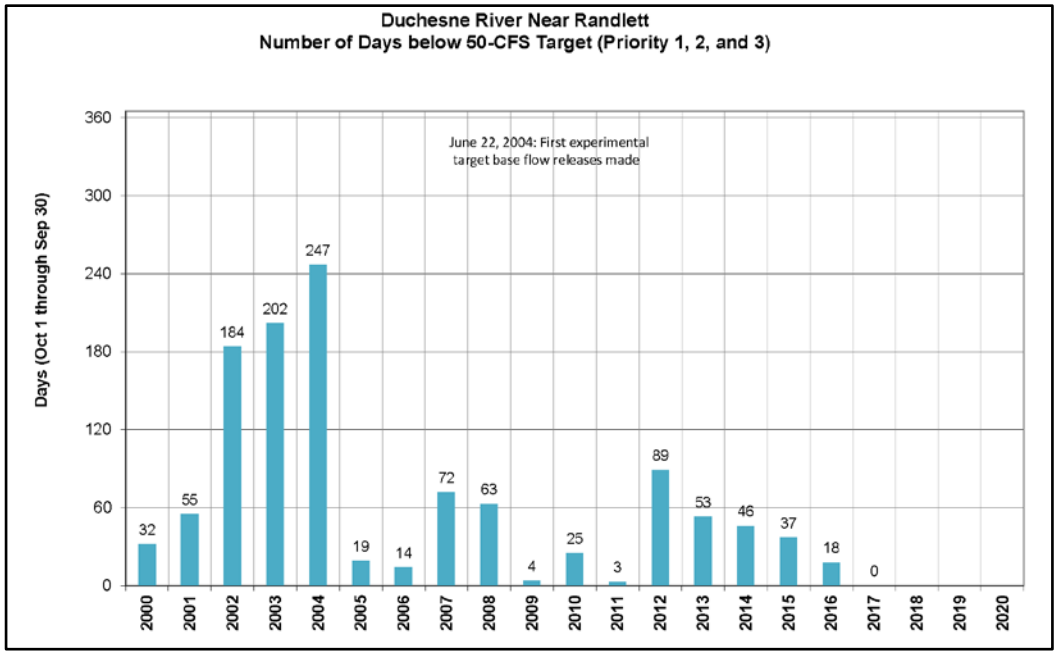
FLOW MANAGEMENT ASSESSMENT GRAPHICS

Snow accumulation in the Duchesne River basin was well above-average throughout the season:



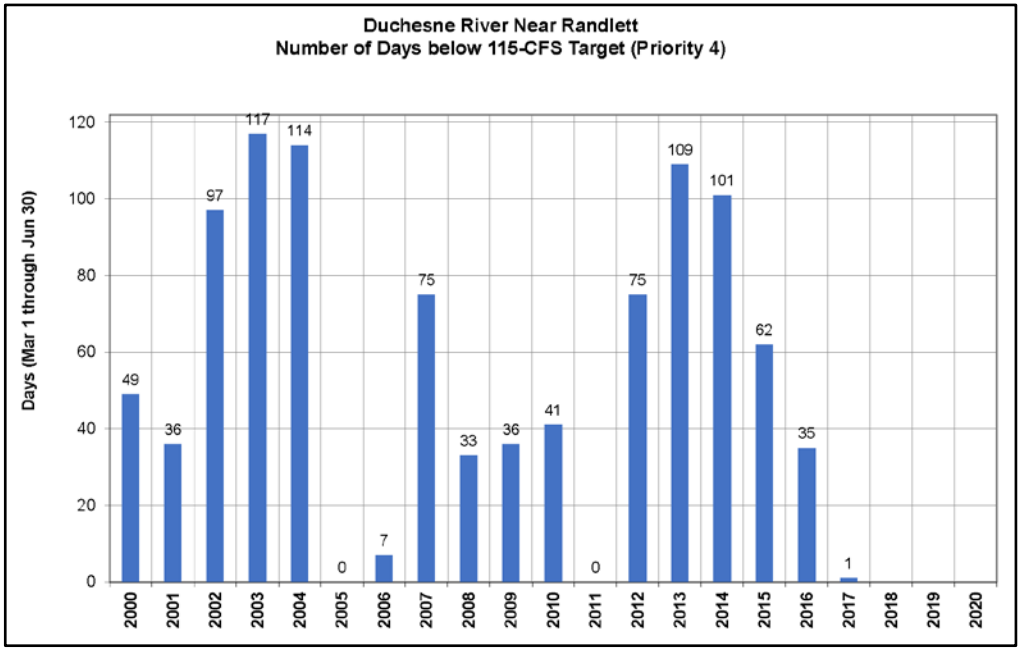
April through October Hydrograph:





The 'Priority 1, 2 and 3' flow targets at the Randlett gage are 50 cfs flow from Jul-Oct, Nov-Mar, and Mar-June, respectively. In 2017, for the first time since monitoring began, no days dipped below this target.

The 'Priority 4' flow target at the Randlett gage is 115 cfs flow from March 1 through June 30. In 2017, this was achieved for all but one day, a considerable improvement over the five previous years:



Due to the naturally high flows in the Duchesne River in 2017, the only water delivered to support instream flows was 1,500 acre-feet of DOI 'Section 207' water from Big Sand Wash Reservoir

WY 2017 Deliveries:

Daniels Replacement Project (Starvation)	*0 A-F*
DOI Section 207 (Starvation)	*0 A-F*
*Rediverted "44,400" Water (Starvation)**	*0 A-F*
*DOI Section 207 (Big Sand Wash)^*	*1,500 A-F*
	1,500 A-F

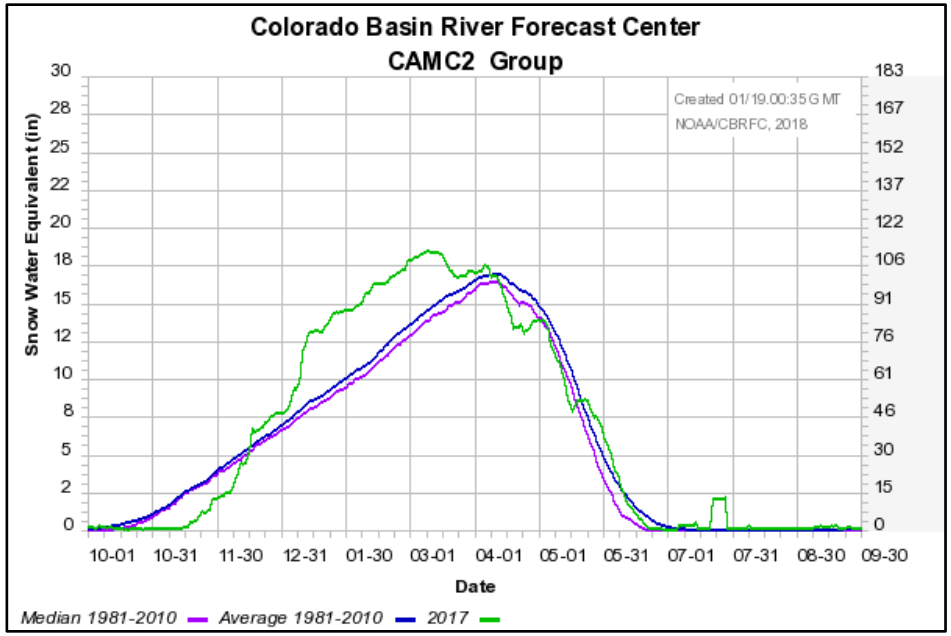
**Remaining DOI Section 207 (Starvation)*	*1,754 A-F*
^Remaining DOI Section 207 (Big Sand Wash)	*0 A-F*

FLOOD CONTROL RELEASES	
Jan-May A-F Released from Starvation	*96,468 A-F*
Jan-May A-F Released from Knight Diversion	*72,064 A-F*

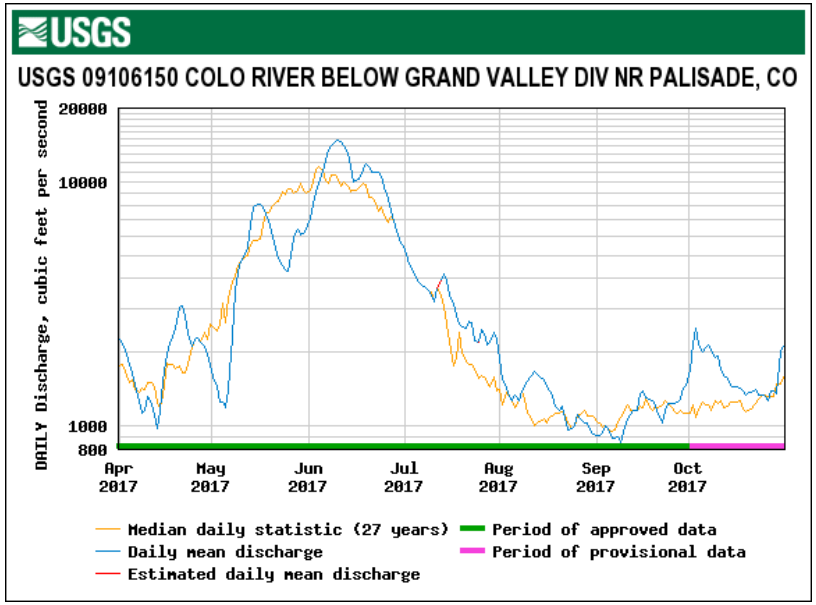
Maximum Elevation 5710.22 feet on June 27th - down 5,757 A-F

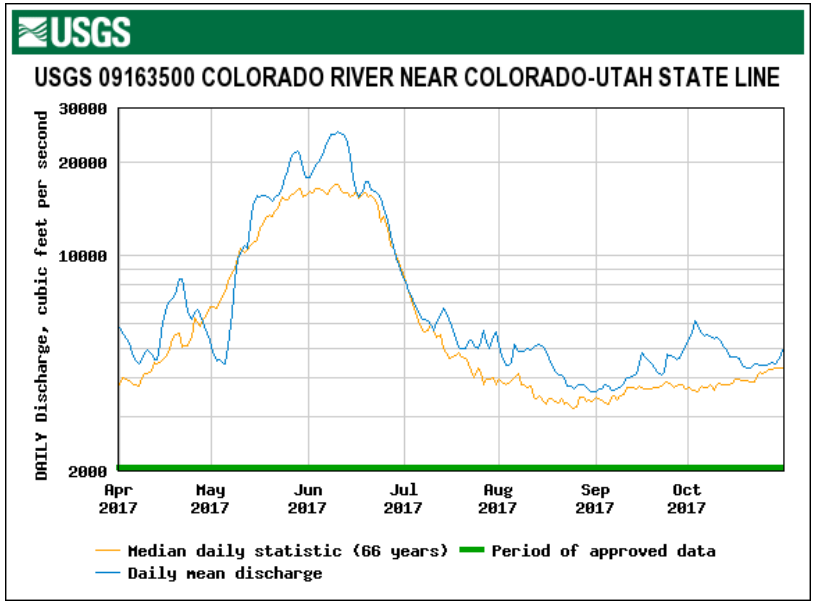
Upper Mainstem Colorado River

Snow accumulation in the upper mainstem Colorado River basin was above-average through early April, at which point accumulated snow decreased to near-normal:



April through October Hydrographs:





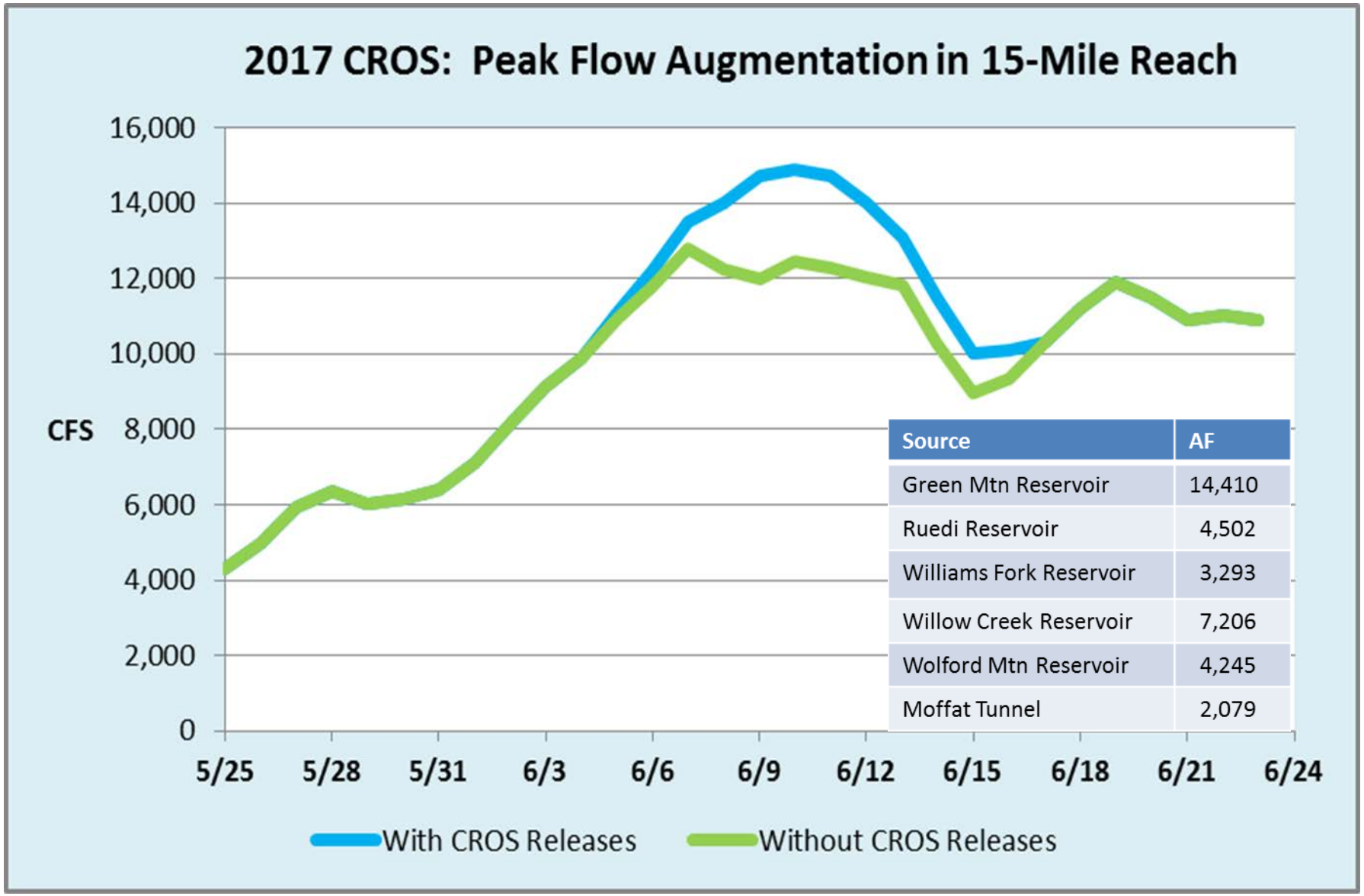
Summary, coordinated Reservoir Operations (CROS) to boost 15-Mile-Reach peak flows, since 1997 (years without CROS operations not listed)

Coordinated Reservoir Operations (CROS)					Augmentation of Peak Flows (AF released)					
Reservoir	Homestake	Lake Granby	Green Mtn	Ruedi	Williams Fork	Willow Creek	Windy Gap	Wolford Mtn	Moffat Tunnel	Total AF
1997			3,568	693	946			10,635		**15,842**
1998			12,482	5,106	1,672			4,431		**23,691**
1999		8,515	11,010	3,602	1,543	6,631		8,555		**39,856**
2006			6,788	6,297	6,625			9,007		**28,717**
2008			2,101	4,848						**6,949**
2009			14,113	5,858	5,044	2,638	2,061	13,069		**42,783**
2010			34,666	10,050	19,982			9,273		**73,971**
2015		18,002	11,292	4,599	2,733	8,000	906	4,587		**32,117**
2016	1,430		8,632	4,007	4,893			8,452	1,960	**29,374**
2017			14,410	4,502	3,293	7,206		4,245	2,079	**35,735**
Sum	**1,430**	**26,517**	**119,062**	**49,562**	**46,731**	**24,475**	**2,967**	**72,254**	**4,039**	**348,467**

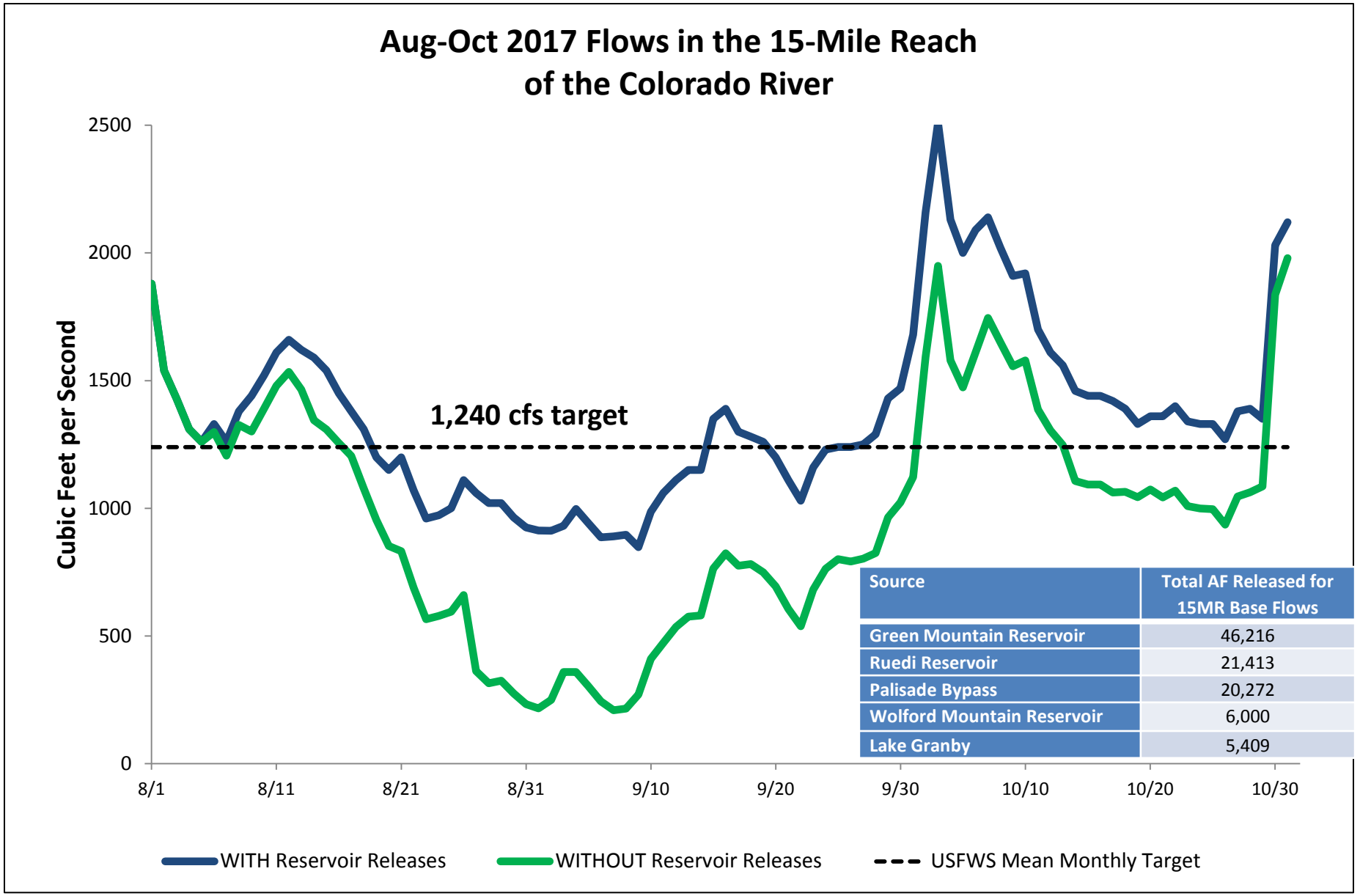
Summary of reservoir releases to augment August through October 15-Mile Reach base flows since 1998 (AF)

Reservoir	Lake Granby	Green Mountain	Palisade Bypass	Ruedi	Williams Fork	Willow Creek	Windy Gap	Wolford Mountain	Total acre-feet
1998		31,736		20,803				11,516	64,054
1999	26,914	29,277		20,418	1,825	649		4,939	84,022
2000		47,187		19,064	3,858			11,072	81,181
2001		34,656		21,345	5,369			8,577	69,947
2002		-	2,053	10,975	3,757			308	17,093
2003		47,526	10,161	20,434	3,757			286	82,164
2004		119	13,654	15,981	2,678			-	32,431
2005		31,200	19,143	17,163	3,814			1,000	72,321
2006		25,358	10,812	20,045	5,712			10,842	72,769
2007		32,745	10,625	14,650	2,624			7,037	67,681
2008	849	61,433	15,997	20,423	9,389		764		108,855
2009	3,144	56,290	18,302	20,822	5,411			8,747	112,716
2010	992	57,813	20,617	20,825	5,113		893	8,413	114,666
2011		37,132	20,466	15,251	5,412			8,413	86,674
2012		-	14,616	20,596	5,412			5,320	45,944
2013	5,412	2,514	15,937	10,412				1,501	35,776
2014	5,413	59,342	19,317	15,413				3,000	102,485
2015	5,415	54,610	8,162	24,412	1,289*			4,712	97,311
2016	5,413	55,390	12,210	27,413	234*			5,766	106,192
2017	5,409	46,216	20,272	21,413	139*			6,000	99,310
Sum	58,961	710,545	232,344	377,857	64,131	649	1,657	107,449	1,553,592

* Denotes water exchanged from Granby into Willow Creek Reservoir temporarily; these numbers are not additive to the total volume released for flow augmentation.



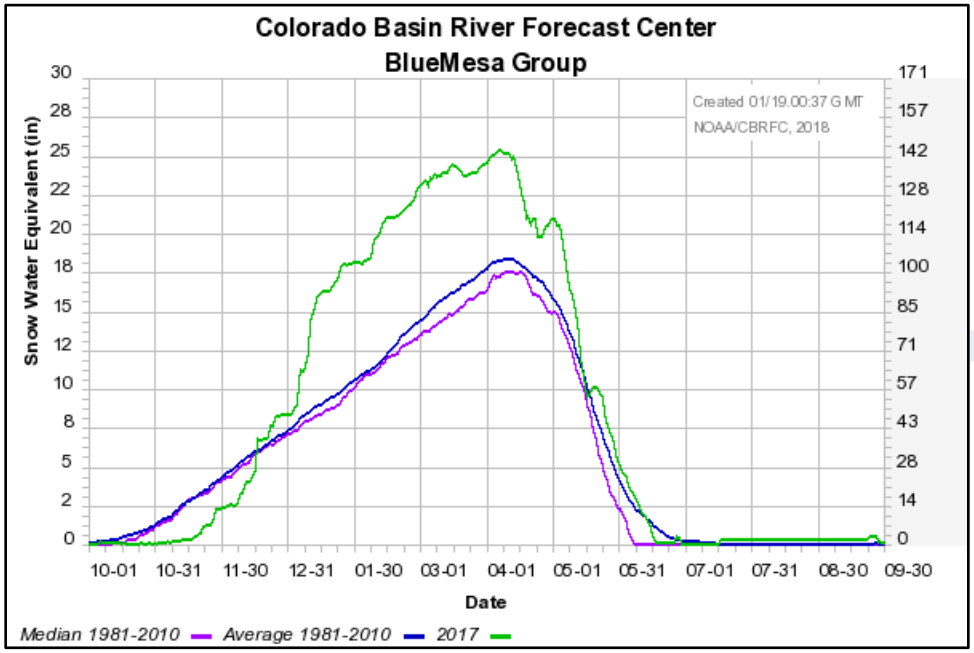
Source	AF
Green Mtn Reservoir	14,410
Ruedi Reservoir	4,502
Williams Fork Reservoir	3,293
Willow Creek Reservoir	7,206
Wolford Mtn Reservoir	4,245
Moffat Tunnel	2,079



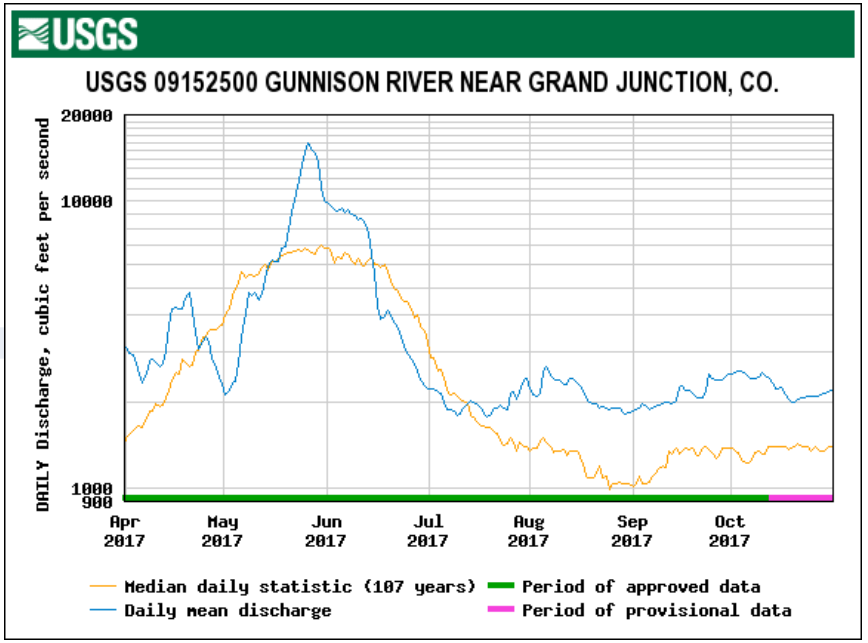
Source	Total AF Released for 15MR Base Flows
Green Mountain Reservoir	46,216
Ruedi Reservoir	21,413
Palisade Bypass	20,272
Wolford Mountain Reservoir	6,000
Lake Granby	5,409

FLOW MANAGEMENT ASSESSMENT GRAPHICS

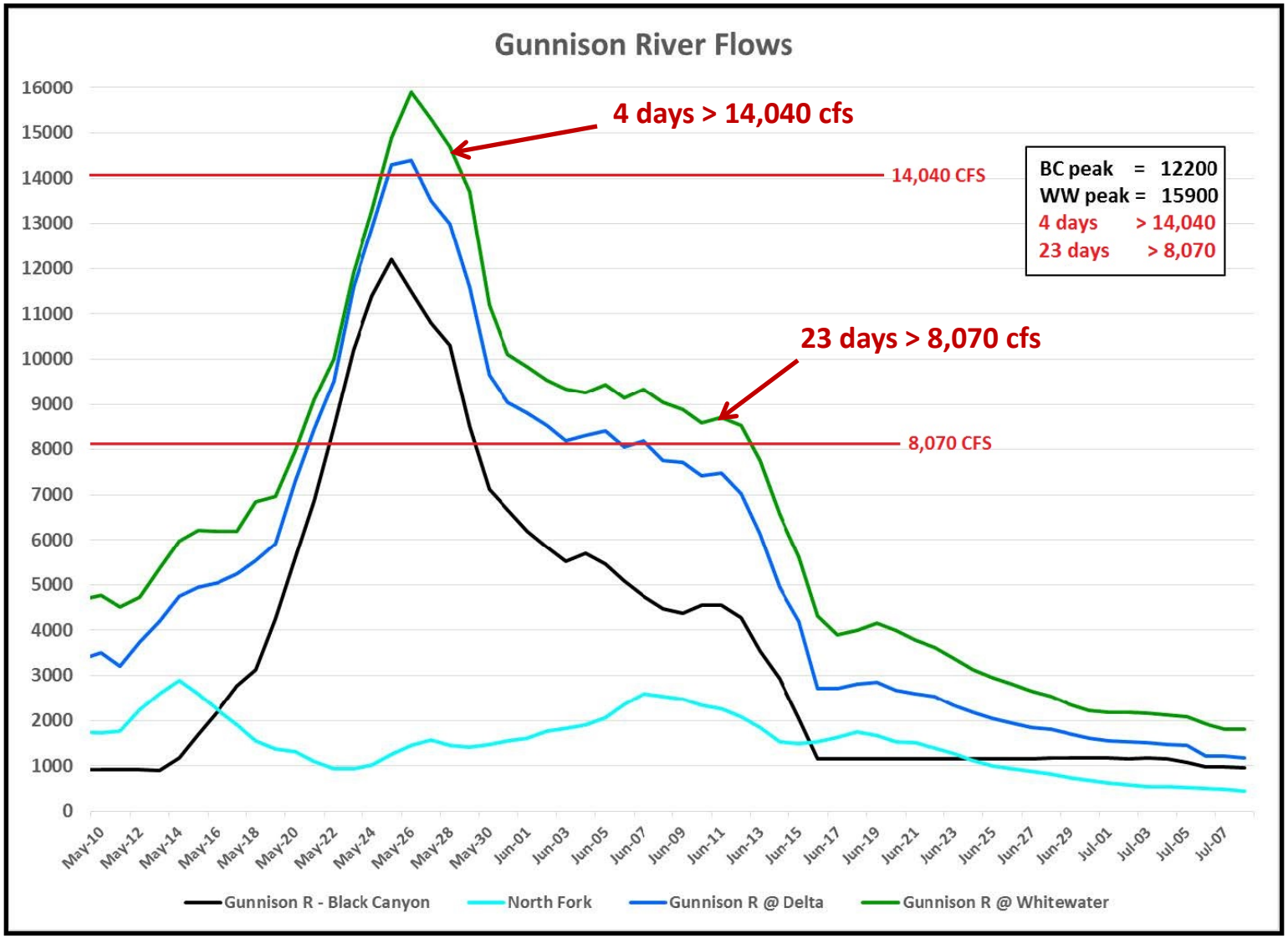
Snow accumulation in the Gunnison River basin was well above-average throughout the snow accumulation season, with rapid melting in May:



April through October Hydrograph:



As per its ROD, the Bureau of Reclamation released water from the Aspinall Unit to coincide with natural peak flows in the North Fork Gunnison River and boost the spring peak in the Gunnison River near Grand Junction ("Whitewater" gage). This year's hydrologic condition set a target of a minimum 2 days at 14,040 cfs, and 20 days at 8,070 cfs. Both targets were met and exceeded in 2017.



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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.