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JUL 03 2008

Memorandum

To: Implementation/Management Committee, Consultants, and Interested Parties

From: Regional Director, Region 6

Subject: Final 2007—2008 Assessment of "Sufficient Progress" under the Upper Colorado River Endangered Fish Recovery Program in the Upper Colorado River Basin, and of Implementation of Action Items in the January 10, 2005, "Final Programmatic Biological Opinion on the Management Plan for Endangered Fishes in the Yampa River Basin."

I. "SUFFICIENT PROGRESS"

In accordance with the Section 7, Sufficient Progress, and Historic Projects Agreement, the U.S. Fish and Wildlife Service (Service) has reviewed 2007—2008 and cumulative accomplishments and shortcomings of the Upper Colorado River Endangered Fish Recovery Program (Recovery Program) in the Upper Colorado River Basin. Per that Agreement, the Service used the following criteria to evaluate whether the Recovery Program is making "sufficient progress" toward recovery of the four listed fish species:

- 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;
- status of the fish populations;
- adequacy of flows; and
- magnitude of the impact of projects.

The final May 8, 2008, assessment of accomplishments and shortcomings of the Recovery Program under the Recovery Implementation Program Recovery Action Plan (RIPRAP) from March 1, 2007 through February 1, 2008, is attached. Previous years' accomplishments and shortcomings are described in previous "sufficient progress" memoranda and outlined in the RIPRAP itself.

The Service issued its last sufficient progress memorandum on June 15, 2007.

A. Status of the Species

Wild populations of Colorado pikeminnow and humpback chub occur in the upper Colorado and Green River systems. These populations have been studied since the 1960s, and population dynamics and responses to management actions have been evaluated since the early 1980s. Hatchery-produced, stocked fish form the foundation for the reestablishment of naturally self-sustaining populations of razorback sucker in the upper Colorado, Green, and San Juan river systems; bonytail in the upper Colorado and Green river systems; and Colorado pikeminnow in the San Juan River. It is anticipated that self-sustaining populations of razorback sucker and bonytail will be reestablished in 2015; in the interim, population dynamics and responses to management actions will be evaluated. Regions 6 and 2 of the Service are collaborating to ensure a coordinated effort to achieve recovery in both the upper (including the San Juan River) and lower basins.

Significant changes in the status of the four species generally are not detected on a year-to-year basis. Closed-population, multiple mark-recapture estimators are being used (where possible) in the Upper Colorado River Basin to derive population point estimates for Colorado pikeminnow and humpback chub for tracking of population trends. The accuracy and precision of each point estimate is assessed by the Service in cooperation with the Recovery Program and in consultation with investigators developing the point estimates and qualified statisticians and population ecologists. Additionally, an evaluation of stocked razorback sucker and bonytail is ongoing, and an initial draft report was provided in July 2006. A study was then initiated to determine survival estimates of stocked razorback sucker to ascertain if changes in the stocking plan are warranted; a draft is expected in May 2008.

To date, the Service has convened two workshops on population estimates. The first workshop recommended changes in sampling methods to increase the reliability of population point estimates and identified numeric targets for capture probability and coefficients of variation to help evaluate confidence in the point estimates. The second workshop involved discussions on environmental variables and life-history traits influencing population estimates and population dynamics. An *ad hoc* group of species experts reviewed information presented at the workshop and prepared a final report (with recommendations) that will be used to guide future research and management.

Recovery goals for the endangered fishes identify site-specific management actions to minimize or remove threats and establish criteria for naturally self-sustaining populations. A key requirement of the population criteria is no net loss of fish over established monitoring periods. Downward trends in some wild populations of Colorado pikeminnow and humpback chub have been observed during dry weather and low river runoff conditions since 1999. Biologists believe that these declines are a result of reduced recruitment that can be largely attributed to increases in certain problematic nonnative fishes and habitat changes associated with the recent drought. The recovery programs are actively implementing and adaptively evaluating management actions to reduce these threats (e.g., increased nonnative fish control) and reverse the downward population

trends to achieve and maintain self-sustaining populations. Meanwhile, progress is being made to reestablish specific populations through stocking.

The most current estimates of the mean number of wild adult Colorado pikeminnow and humpback chub are shown in Table 1. Table 1 also provides a general overview of Colorado pikeminnow stocking in unoccupied reaches of the upper Colorado River subbasin, and stocking efforts to reestablish a population in the San Juan River. Table 2 provides a general overview of stocking efforts to reestablish razorback sucker and bonytail populations in the Upper Colorado River Basin (including razorback sucker in the San Juan River).

B. Accomplishments and Concerns

Recovery Program participants accomplished several important objectives in 2007 and early 2008, including:

- continued implementation of nonnative fish management activities and a successful nonnative fish management workshop;
- continued success of stocking efforts;
- continued operation of Flaming Gorge Dam under the Flaming Gorge Environmental Impact Statement (EIS) and Record of Decision (ROD) in providing flows and temperatures to benefit the endangered fish;
- release and careful management of 5,000 af from Elkhead Reservoir to augment flows for endangered fish in late summer/early fall;
- continued efforts by the Duchesne River Working Group to meet flow recommendations;
- continued augmentation of late summer flows in the 15-Mile Reach;
- completion of Phase II assessment report on 10,825 water supply alternatives;
- regular meetings to coordinate with Grand Valley irrigators and improve operational consistency of fish screen and passage facilities and the Grand Valley Water Management project; and
- completion of passage at the Price-Stubb diversion.

Although diligent efforts and some progress are underway, several concerns expressed in the Service's 2007 sufficient progress memorandum remain, including:

- abundant nonnative fish remain a concern, especially in the Yampa River, where native fish remain rare;
- recent apparent downward trends in some Colorado pikeminnow and humpback chub populations;
- research framework to determine impacts of management actions on each species and life stage and identify any information gaps is behind schedule; and
- a need for improved management of spring flows from the Aspinall Unit to benefit the endangered fish.

A discussion of these recent accomplishments and concerns follow, with action items needed to remedy areas of concern.

Table 1.—Summary of Colorado pikeminnow and humpback chub status (includes preliminary data and data in draft reports undergoing peer and Biology Committee review).

SPECIES	RIVER SYSTEM		
	MIDDLE GREEN	LOWER GREEN	UPPER COLORADO
Colorado Pikeminnow	Estimates of wild adults ranged from about 2,300 in 2003 to about 3,100 in 2001 (final report on the Green River subbasin population was approved by the Biology Committee in 2005). The next 3-year estimate of adult abundance will be completed in 2008. Catch rates for young Colorado pikeminnow in 2004 were the highest since 1996 in the Green River. Collections of larvae in 2006 indicate a strong reproductive year. It is anticipated that these strong year-classes will show up as subadult or adult fish in future estimates. For example, 369 pikeminnow 182-399 mm TL were captured, tagged, and released in the lower Green River reach in 2006. That number may be greater than the total number of fish in that size class present in all years of sampling the lower Green River from 2001-2003.		Estimates of wild adults ranged from about 450 in 1992 to about 870 in 2005. The final report on 2003-2005 estimates of adult abundance is pending; sampling for the next estimate begins in 2008. Under the 2003 integrated upper basin stocking plan (Nesler et al. 2003), 5,074 hatchery-produced subadults were stocked in 2003 and 2004 in unoccupied reaches (stocking subsequently discontinued due to downstream dispersal).
	SAN JUAN: An estimate of about 20 wild adults was based on data collected in the early to mid-1990's. Stocking of juvenile fish is ongoing under the 2003 augmentation plan. Over 668,000 juveniles were stocked in 2002–2004; about 300,000 juveniles were stocked in fall 2005; and more than 326,000 and 479,000 juveniles were stocked in 2006 and 2007, respectively. Catch per unit of effort of fish in the river for 1+ overwinter periods post-stocking has not changed significantly over the last 4 years.		
Humpback Chub	Yampa Canyon: Population is small, with an estimate of about 400 wild adults in 1998–2000. Sampling during 2003-2004 caught so few fish an estimate could not be made. In 2007 the Recovery Program brought 400 young-of-year *Gila* spp. caught in Yampa Canyon into captivity as a research activity to determine the best methods for capture, transportation, and holding at two different hatchery facilities.	Desolation/Gray Canyons: Estimates of wild adults vary from about 2,000 in 2001, 2,200 in 2002, and 1,000 in 2003. Sampling in 2001 and 2002 was conducted in summer, whereas sampling in 2003 was conducted in fall, which may account for reduced numbers. Final report on this population estimate was approved by the Biology Committee in July 2005. Draft report on 2006-2007 estimates pending in 2008.	Black Rocks Canyon: Estimates of wild adults vary from about 800 in 1998, 900 in 1999, and 500 in 2000 and 2003. 2007-2008 estimate underway. Westwater Canyon: Estimates of wild adults range from about 4,700 in 1998 to 2,500 in 1999, 2000, and 2003. 2007-2008 estimate underway. Cataract Canyon: Population is small, with an estimate of about 150 wild adults in 2003 to 66 in 2005.
	LOWER COLORADO, GRAND CANYON: Between 2001–2005, the number of adult fish appears to have stabilized at ~6,100 fish. In 2005, scientists also detected more juvenile and young-of-the-year fish than in previous years.		

Table 2. General overview of stocking efforts to reestablish razorback sucker and bonytail populations in the Upper Colorado River Basin (including the San Juan River for razorback sucker).

SPECIES	RIVER SYSTEM		
	MIDDLE GREEN	LOWER GREEN	UPPER COLORADO
Razorback Sucker	Since 1995, about 148,200 PIT-tagged razorback sucker subadults have been stocked in the Green and upper Colorado River subbasins. Of those, 86,194 were stocked under the 2003 integrated upper basin stocking plan (Nesler et al. 2003). Monitoring and evaluation of fish stocked in 2003–2006 is currently being accomplished through analysis of data collected in sampling conducted for other population estimates and nonnative fish management. About 2,550 recaptures of stocked razorback sucker were reported from the Green, Colorado, and Gunnison rivers in 2000–2005. A study has been initiated to determine survival estimates of stocked razorback sucker to ascertain if changes in the stocking plan are warranted.		
	Data from 1998–1999 suggested that about 100 wild adults remained at that time, with an estimated annual survival rate of about 70%. The population is being augmented through stocking, which has been expanded with excess fish stocked into selected floodplain depressions. Stocked fish in reproductive condition have been captured at spawning sites, and captures of larvae demonstrate that these fish are reproducing. Initial reports indicate that numbers of larvae collected from the Green River in 2007 were the highest ever recorded. Survival of larvae through the first year is evidenced by captures of juveniles (some of these may have been stocked larvae).	Few wild adults have been captured in recent years. The population is being augmented through stocking.	Few wild adults have been captured in recent years. The population is being augmented through stocking. Larvae were collected in the Gunnison River in 2002–2006, demonstrating reproduction by stocked fish. The detection of larvae is a direct result of spawning razorback sucker that have been stocked in the Gunnison River or have moved into the Gunnison using the Redlands Fish ladder. Survival of larvae through the first year is evidenced by captures of juveniles (some of these may have been stocked larvae).
	SAN JUAN: No estimate of adults is available. Stocking 1-year-old-plus fish (greater than 300 mm total length) is ongoing under the 2003 augmentation plan. Since 1994, about 34,300 subadults and adults have been stocked. Reproduction by stocked fish at separate locations has been documented through collection of larvae every year since 1998, and juveniles were found in 2002–2005.		
Bonytail	Since 1996, 271,500 tagged bonytail subadults have been stocked in the Green and upper Colorado River subbasins. Of those, over 44,000 were stocked under the 2003 integrated upper basin stocking plan. Stocked bonytail have been recaptured at several locations throughout the upper basin. During September–November 2003, 16 stocked bonytail were recaptured in Cataract Canyon after about 1 year post stocking. Monitoring and evaluation of fish stocked in 2003–2004 is currently being accomplished through analysis of data collected in sampling conducted for other population estimates and nonnative fish control. About 200 stocked bonytails were captured in 2004–2005, all within 1 year after stocking. The Recovery Program is changing some stocking locations and is flow-conditioning some fish prior to stocking.		

C. Discussion of Recent Accomplishments and Concerns

General (Upper Colorado River and Green River Subbasins)

- Over the past 6 years, progress has been made in reducing the abundance of some of the target nonnative fish species in certain rivers of the Upper Colorado River Basin. However, a great deal of work remains to identify the methods and levels of management needed to minimize the threat of nonnative fish predation or competition and achieve and maintain recovery of the endangered fishes. The fall 2007 nonnative fish management workshop resulted in some changes to nonnative fish management activities for 2008. Also as of 2008, the Utah Division of Wildlife Resources fishing proclamation requires anglers to keep and kill any smallmouth bass they catch in the Green River (and burbot caught in Flaming Gorge).

  ACTION ITEM (1): The Service will continue to closely follow the effectiveness of nonnative fish management actions and the responses of the endangered and other native fishes. Data should continue to be reported annually, and necessary changes to nonnative fish management actions should be made in a timely fashion. The Program needs to initiate second-level synthesis of nonnative fish removal data beginning in 2008.

- Numbers of fish to be stocked as identified in the Program's Integrated Stocking Plan are generally being met. Recapture of stocked razorback sucker and detection of larval razorback continues to be encouraging. Stocked bonytail are being recaptured throughout the upper basin; however, few of these recaptures have been at large for more than a year. A Bonytail Ad Hoc Group was formed to address this concern and its recommendations to change stocking locations and to flow-condition some stocked fish are being implemented.

  ACTION ITEM (2): The Program Director's office will coordinate with the Wahweap hatchery to ensure that the middle Green River bonytail are stocked near Jensen (in the alluvial reach) rather than at Island Park. The Mumma hatchery will continue to expose bonytail to flows for as long as two weeks prior to stocking.

- Initial population estimates indicate downward trends in the abundance of Colorado pikeminnow in the Green River subbasin and in the abundance of humpback chub in Black Rocks, Westwater Canyon, Desolation/Gray Canyons, Yampa Canyon, and Cataract Canyon. These populations are viewed as the foundations for recovery of the species.

  ACTION ITEM (3): Principal investigators and the Program Director's Office should meet to further scrutinize initial population estimates, techniques, and environmental influences (at least for humpback chub in 2008). A research framework project (building on results and recommendations of previous population estimates and information developed as a result of previous population estimate workshops) is conducting additional data analyses to further understand environmental variables and life-history traits

influencing the dynamics of Colorado pikeminnow and humpback chub populations. The draft research framework report is expected in August 2008. Results will be used to refine hypotheses and direct management actions.

Green River Subbasin – Green River

- Operation of Flaming Gorge Dam under the ROD and Biological Opinion is going well. Reclamation's efforts to meet spring flow targets and recommended base flow temperatures in Reach 1 and at the confluence with the Yampa River should be commended. Cooperators learned during the fall and winter, 2006/2007 that greater diligence was required to manage operations to meet base flow targets and variability. Base-flow operations during 2007/2008 went well. Research projects identified in the February 2007 Study Plan for the Implementation and Evaluation of Flow and Temperature Recommendations for Endangered Fishes in the Green River Downstream of Flaming Gorge Dam were initiated or continued.

  ACTION ITEM (4): The Flaming Gorge Technical Work Group (Reclamation, the Service, and Western) needs to continue to provide brief updates on current and projected Flaming Gorge operations at each Biology Committee meeting. In 2008, the Program will initiate a Request for Proposal to synthesize the physical and biological information on backwater nursery habitats.

  ACTION ITEM (5): The Recovery Program and the Utah's State Engineer's office will work on mechanisms (extending the existing subordination) to protect year-round flows in the Green River below the Duchesne River to the Colorado River confluence.

Green River Subbasin – Yampa River

- Elkhead Reservoir stakeholders and managers worked together to release 5,000 af of water to augment flows for endangered fish in late summer and early fall 2007, and in doing so making the water right absolute.

- In 2006, the Implementation Committee directed a thorough assessment of Yampa River nonnative fish control efforts and development of a stronger adaptive management framework to identify nonnative fish management actions of sufficient scale and intensity to achieve measurable native fish population responses in the shortest possible timeframe. In response to that directive, a Yampa River Nonnative Fish Management Strategy has been developed.

  ACTION ITEM (6): The Program's Yampa nonnative fish management program needs to be modified in 2009 to match the Yampa River Nonnative Fish Management Strategy. In particular, northern pike removal efforts need to focus on reproduction/recruitment sources and the Program needs to take advantage of every opportunity to remove smallmouth bass (e.g., remove smallmouth bass wherever northern pike removal occurs).

Also, the Colorado Department of Wildlife has committed to complete the Yampa River Aquatic Management Plan by May 2009 and produce an Upper Yampa River strategy by the end of July 2008 to assist the Program in prioritization of 2009 field activities. The Program will use this strategy and available information to evaluate the need to expand northern pike removal efforts upstream of Hayden to Steamboat Springs.

Green River Subbasin – Duchesne River

- Over the past three years, the Central Utah Water Conservancy District, the Duchesne Water Conservancy District and other water users (Duchesne Work Group) have cooperated to provide and shepherd available water to meet flow recommendations. The rehabilitation of Myton Diversion, scheduled for FY 09 (through funding from the Upper Colorado River Implementation Program and a Water 2025 Grant), will greatly enhance the ability to meet target flows for endangered fish in the lower Duchesne River.

  ACTION ITEM (7): Following completion of the Myton Diversion rehabilitation, the Program, Service, and Duchesne Work Group will work together to determine changes in ongoing monitoring efforts necessary to further evaluate the flow recommendations.

Green River Subbasin – White River

- Program review and finalization of White River Flow recommendations has been delayed. Meanwhile, increased oil and gas development may create increased water demand on the White River.

  ACTION ITEM (8): The Service and the Program Director's Office will revise and finalize flow recommendations for the White River. The program should emphasize timely completion of the flow recommendations and work with Colorado to protect the recommended flows.

Upper Colorado River Subbasin – Colorado River

- Recovery Program participants continue to have success coordinating releases and providing flows for the endangered fish in the Grand Valley area. For example, in summer 2007, damage to Xcel Energy's Shoshone Power Plant threatened to interrupt downstream deliveries of water. The State of Colorado, reservoir operators, and private irrigation companies worked to quickly implement actions to meet all water users' and endangered fish needs.

  Significant progress has been made by east slope and west slope water users to cooperatively analyze and compare a wide range of alternatives that would meet their obligations to provide 10,825 af of water to the 15-Mile Reach on a permanent basis. The summary of the second phase of an assessment that evaluates these alternatives was provided to the Management Committee in a January 2008 report.

ACTION ITEM (9): Closer coordination will be maintained by meeting twice a year with Grand Valley water users and conducting conference calls as needed to discuss river conditions prior to the weekly Historic User Pool calls. The focus should be on taking full advantage of water savings brought about by operation of the Grand Valley Water Management project for late summer flow augmentation.

ACTION ITEM (10): The goal of the 10,825 Project is to have agreements signed with the Service prior to December 2009 committing east slope and west slope water users to permanent sources of Ruedi replacement water, as required by the Colorado River programmatic biological opinion.

- Regular meetings with Grand Valley irrigators, Reclamation, and Recovery Program staff have been very helpful forums for discussing operations of Grand Valley fish screens and passages, identifying problems and solutions, and documenting operational expectations.

- Reclamation worked through the myriad of obstacles to complete construction of passage at the Price-Stubb Diversion Dam. Completion of this last passage facility on the Colorado River provides endangered fish with access to 50 miles of historic habitat above the major irrigation diversions.

- The Grand Valley Project fish screen was completed in 2007. Lack of an Operations and Maintenance contract prevented operation during the 2007 irrigation season, but that contract has now been completed.

Upper Colorado River Subbasin – Gunnison River

- Spring flows from the Aspinall Unit are not being managed to benefit the endangered fish.

ACTION ITEM (11): Pending completion of the Aspinall EIS (and while continuing to emphasize timely completion of the EIS), Reclamation, the Service, and Western Area Power Administration and other cooperators need to determine how they can better manage Aspinall spring flows to meet endangered fish needs within existing operational procedures.

D. Conclusion ("Sufficient Progress")

Recovery Program participants need to actively pursue resolution of the aforementioned concerns. The Service requests that regular progress reports on action items and their effect on meeting RIPRAP schedules be provided to the Management Committee. In order to support appropriate inclusion of recommended activities in annual Program budgets, the Service will make every attempt to continue to provide the sufficient progress assessment in the early spring of each year.

The Service is confident that with continued cooperation by all Recovery Program participants, the Recovery Program will continue to make significant strides toward recovery of the four endangered fishes. Based on evaluation of the status of the fish, provision of flows during drought periods, magnitude of depletion impacts, and cumulative Recovery Program accomplishments and shortcomings, the Service concludes that progress in the Recovery Program is sufficient to continue to provide the reasonable and prudent alternative which avoids the likelihood of jeopardy resulting from depletion impacts of new projects that have an annual depletion of up to 4,500 acre feet[1].

Despite significant Recovery Program accomplishments, the Service is very concerned about recent downward trends in endangered fish populations. Accordingly, the Service strongly encourages all Recovery Program participants to remain attentive to the impacts of drought conditions and nonnative fishes on recovery of the endangered fishes, and continue to aggressively pursue management actions to alleviate threats to the species, including providing and protecting the necessary flow and habitat conditions (including evaluation of flow recommendations), and reducing the abundance of problematic nonnative fishes so these downward trends are reversed.

II. IMPLEMENTATION OF ITEMS IN THE YAMPA RIVER BASIN PROGRAMMATIC BIOLOGICAL OPINION

On January 10, 2005, the Service issued a final programmatic biological opinion on the *Management Plan for Endangered Fishes in the Yampa River Basin.* Known as the "Yampa River Programmatic Biological Opinion (PBO)", the PBO determined that implementation of the *Management Plan for Endangered Fishes in the Yampa River Basin* would not likely jeopardize the continued existence of the endangered fishes. The PBO cites action items in the Program's Recovery Action Plan (RIPRAP) and charges the Recovery Program with the responsibility to ensure that these action items are completed and/or implemented. Page 74 of the PBO says: "In 2006 and every 2 years thereafter, for the life of the Recovery Program, the Service and Recovery Program will review implementation of the Recovery Action Plan actions to determine timely compliance with applicable schedules." The Service recently conducted this review (2008) in consultation with Recovery Program partners (see attached status report) and concluded that the Recovery Program is making sufficient progress in accomplishing most of the action items listed in the PBO. Although the schedule for some tasks has slipped, the PBO recognized this might happen. Page 73 of the PBO says: "The Recovery Action Plan is an adaptive management plan because additional information, changing priorities, and the development of the States' entitlement may require modification of the Recovery Action Plan. Therefore, the Recovery Action Plan is reviewed annually and updated and changed when necessary and the required time frames include changes in timing approved by means of the normal procedures of the Recovery

[1] The 15-Mile Reach programmatic biological opinion covers an average depletion of up to 1 million acre-feet per year of existing depletions (through September 30, 1995) and up to 120,000 acre-feet of new depletions (since September 30, 1995) in the Colorado River above the confluence with the Gunnison River. The Yampa River programmatic biological opinion covers an average depletion of up to 168,000 acre-feet per year of existing depletions and up to 53,000 acre-feet per year of new depletions.

Program, as explained in the description of the proposed action." If the circumstances surrounding changes in the Recovery Action Plan impact the listed species in a manner(s) not previously considered, reinitiation of the PBO may be needed.

The PBO review (see attached spreadsheet) identified no issues not already addressed under Sufficient Progress (section I of this memo).

Attachments

cc: Regional Director, Region 2

May 8, 2008

2007-2008 FINAL RIPRAP ASSESSMENT

Significant accomplishments (*!*) and shortcomings (*X*) are flagged.

This assessment of accomplishments and shortcomings under the Recovery Program's Recovery Action Plan (RIPRAP) focuses primarily on the period from March 1, 2007 - February 1, 2008. The RIPRAP page and item numbers in this final assessment refer to the RIPRAP as it has now been revised for 2008.

PAGE/ITEM #	STATUS ASSESSMENT

GENERAL RECOVERY ACTION PLAN

24 IA4a&b Concluding Report on Real-Time Sediment Monitoring in the Green and Gunnison Rivers 2008 thru 2009:

Early in FY 2009, the USGS will provide an official publication for the suspended-sediment data collected from April 2005-October 2007 at two USGS stream flow-gauging stations (Gunnison River near Grand Junction, CO; and Green River near Jensen, UT). This report will include Daily Mean Suspended-Sediment Concentration, Daily-Mean Suspended-Sediment Load, Daily-Mean Stream flow, and the 'raw' and 'corrected' point and cross-sectional samples for each site. It may also include the available bed-elevation and water-surface elevation data that was collected as part of the Multi-Dimensional Surface-Water Modeling System (MD-SWMS) work done on the Green River around the Jensen razorback spawning bar (or these data will be in the scientific investigations report). The reporting schedule has been delayed slightly (from FY2008 to early in FY2009) to incorporate sediment monitoring data collected in the Duchesne River (2006-2008) under Project 8b (refer to the Duchesne River section of this assessment).

Later in FY 2009 there will be a scientific investigations report to provide the interpretive analysis/characterization of the sediment transport at the gage sites on the Gunnison R. near Grand Junction, CO; and Green R. near Jensen, UT as well as four additional sites (Colorado R. near Cameo, CO; Colorado R. near Colorado-Utah state line; Colorado R. near Cisco, UT; and Green R. at Green River, UT). The report will include interpretation of the suspended-sediment transport equations (regression equations) derived from available data acquired during the retrospective assessment concluded and presented in March 2005; analysis of available daily-suspended sediment records (at the two real-time sites only), estimates of bedload (at the two real-time sites only), a case study of sediment transport using MD-SWMS (Green R. near Jensen, UT, only); and evaluation of incipient motion/entrainment potential in the Gunnison River at Delta.

		The goal of the sediment monitoring program is to provide information with which to evaluate changes in the magnitude, timing, and size distribution of sediment delivery to the Gunnison and Green River systems and their potential effects on the riverine ecosystem, specifically as they relate to recovery of the endangered fishes. The primary objective of this sediment-monitoring project is to address key uncertainties in priority reaches of the Colorado, Gunnison and Green Rivers relevant to the role of streamflow and sediment transport on the formation and maintenance of backwater habitats and spawning bars. A secondary objective is to collect necessary sediment data to aid in the evaluation of Service flow recommendations for the Gunnison, Green, and Duchesne rivers.
> 24	IIB2,2a IIB3	An annual report on contaminants activities is needed from FWS ES.
>*25	IIIA1c&1	White sucker are being removed from the Green River (this began in 2007). Native sucker hybrids are identified and enumerated to evaluate levels of hybridization. The Program cannot fully evaluate hybridization between razorback and white suckers until more razorback suckers are reproducing in the system.
>*25	IIIA2c	Results of the 2007 nonnative fish management projects were integrated into cohesive (population-based) data presentations at the nonnative fish workshop. Focus of the December 2007 workshop was program evaluation. Recommendations from the workshop are shown in Attachment 1. Program participants continue to adjust nonnative fish control activities in response to previous years' results; many of the workshop recommendations are being implemented in the 2008 field season. Over the past 6 years, progress has been made in reducing the abundance of some of the target nonnative fish species in certain rivers of the Upper Colorado River Basin. However, a great deal of work remains to identify the methods and levels of management needed to minimize the threat of nonnative fish predation or competition and achieve and maintain recovery of the endangered fishes. It is expected that the increased nonnative fish management efforts will have the desired effect of reducing the abundance of problematic nonnative fishes while bringing about positive responses in populations of endangered and other native fishes. Information and education efforts continue and focus on press releases, communicating with elected officials, and coordinating public outreach with partner agencies.
25	IIIA2c1	Seven of nine synthesis reports (summarizing data collection from 2004-2006) were submitted in 2007. *(The remaining two reports were submitted in 2008 and are undergoing review and revision.)*

25 IIIA2c2 ***X*** Late submission of two synthesis reports (as noted above, #125 by John Hawkins, CSU Larval Fish Laboratory and #98a by Lori Martin, CDOW) hampered workshop discussions.

25 IIIB6 The Program Director's office and the signatories to the "Cooperative Agreement for Implementation of Procedures for Stocking of Nonnative Fish Species in the Upper Colorado River Basin" are revising the Stocking Procedures document and will seek to renew the Cooperative Agreement in FY 08.

26 IIIC ***X*** The nonnative fish isotope project (C-18/19) has been delayed by the graduate student quitting; new graduate students will be hired, this work will include a reservoir operations risk assessment, and will be completed by 2011 (with a final report on reservoir operations risk assessment in 2009).

26 IVA4c4 ***!*** In response to a potentially dwindling Yampa Canyon humpback chub population, a survival study is being conducted on transport and hatchery rearing of young-of-the-year Gila species from the Yampa River in Dinosaur National Monument in northwestern Colorado. With significant agency and landowner cooperation, biologists successfully captured more than a sufficient number of young-of-year chubs that are surviving well in two hatchery facilities.

26 IVB&C ***!*** Hatchery production under the 2003 integrated stocking plan:

Fish produced and stocked by facility in 2007:

Facility	Species	Target	Stocked	Percent
Grand Valley	Razorback sucker	14,895	13,636	92 %
Ouray	Razorback sucker	14,895	16,015	108 %
Wahweap	Bonytail	10,660	10,753	101 %
Mumma	Bonytail	5,330	5,630	106 %

Razorback sucker stocked by river:

Facility	River	Target	Stocked	Percent
Grand Valley	Upper Colorado	6,620	7,650	116 %
	Gunnison	3,310	2,448	74 %
	Lower Green	4,965	3,538	71 %
Ouray	Middle Green	9,930	11,014	111 %
	Lower Green	4,965	5,001	101 %

Bonytail stocked by river:

Facility	River	Target	Stocked	Percent
Wahweap	Middle Green	2,665	2,679	101 %
	Lower Green	5,330	5,404	101 %
	Colorado	2,665	2,670	100 %
Mumma	Middle Green	2,665	2,730*	102 %

		Colorado	2,665	2,900	102 %

*Bonytail were flow-conditioned in circular tanks for at least 2 weeks prior to stocking.

26	IVD2b	*!* Flood damage at the Wahweap hatchery was repaired in 2007.
27	IVE1&2	Analyses are underway to determine survival estimates of stocked razorback sucker and should be completed by May 2008.
27	VB2	*X* A two-phase "Research framework" study was begun in 2005 to determine impacts of management actions on each species and life stage and identify any information gaps. Phase I report is in draft and Phase II has begun, but is behind schedule. Completion is anticipated in June 2008.
27	VD2	*!* Draft sampling and handling protocols have been developed and will be finalized in spring 2008 and provided to sampling crews. In addition, electrofishing equipment has been surveyed and tested and operational standards will be incorporated in the sampling protocol. Additional testing of electrofishing equipment is planned, and may be expanded to raft-based equipment.
28	VI.F.	*!* Produced the first issue of the Swimming Upstream newsletter that includes content for the San Juan River Basin Recovery Implementation Program as part of efforts to integrate certain outreach projects.
28	VIIA5e	The recovery goals have been revised based on Service review and drafts are expected to go out for stakeholder review in June 2008. The Service anticipates publishing a Federal Register notice announcing that the revised goals are available for public review by summer 2008.
28	VIIB1	The draft report to Congress entitled "Utilization of Power Revenues for Annual Base Funding of the Upper Colorado River and San Juan River Basin Recovery Implementation Programs" was transmitted from Steve Guertin (Regional Director, Region 6, U.S. Fish and Wildlife Service) to Bryan Arroyo (Assistant Director, Endangered Species, U.S. Fish and Wildlife Service, bryan_arroyo@fws.gov) on January 7, 2008.

GREEN RIVER ACTION PLAN

>*29	IA3d	*!* Operation of Flaming Gorge Dam to provide flows and meet temperature requirements pursuant to the new biological opinion began in 2006 and continued in 2007. The 2007 annual Flaming Gorge operations report was submitted on October 18.
>*29	IA4b(1-3)	In 1994 the State Engineer signed the policy that subordinates future water

		filings on the Green River down to the confluence with the Duchesne River (Jensen gage) to the summer and fall endangered species fish flow targets. On April 3, 2008, Boyd Clayton indicated that the Utah State Engineer's office is willing to pursue protection of flows for the endangered fish by expanding the original subordination for filings post 1994 to year-round. Boyd indicated that this should be completed by December 31, 2008.
>*29	IB3a-c	In 2009, the Recovery Program and Utah's State Engineer's office will work on mechanisms to protect year-round flows to the Colorado River confluence. This will remain a high-priority item.
29	IC2	***X*** The Price River flow recommendations report still needs to be revised. The report was submitted on 10-31-06. The Program Director's staff is revising the flow recommendations (by December 31, 2008) based on historic hydrology.
30	ID1d	The proposed Green River backwater development, sediment availability and peak flows in Reach 2 synthesis is being deferred until 2009. The Program will put ~$10K toward Argonne's completion of backwater topography work in FY 08 which will feed into the backwater development work which will be combined with the backwater biology work (ID1e4) and begin in FY 09. Deferring the project also allows USGS to finish their sediment monitoring work at the Jensen Gage.
30	IE1	Utah's State Water Plan for the Western Colorado River Basin (2000) may provide information that could be used as a demand study for a Tributary Management Plan for the San Rafael River. (Note: USU's 3-species study captured both an adult pikeminnow and adult razorback in the San Rafael close to the confluence; and a 53mm YOY pikeminnow was captured just downstream of the 24 bridge.) Utah has secured funding for San Rafael restoration under their three species conservation agreement and strategy.
30	IIB2b	Tusher Wash fish screen design will continue in 2008 with construction scheduled in 2010. Reclamation recommends moving forward with design and construction based on current estimates of remaining capital funds. Remaining capital funds will not allow for screening water that is diverted for hydroelectric generation. Section 7 consultation for the project will need to address potential take issues associated with the hydroelectric generation. Monitor the progress and potential likelihood of obtaining additional capital construction cost ceiling. Water users are discussing raising the diversion dam; this may affect plans/schedule for screen construction.
31	IIIA	*!* UDWR's 2008 fishing proclamation requires anglers to kill any bass caught in the Green River.
>*31	IIIA4a	*!* In 2007, 92% (492) of the estimated 533 adult smallmouth bass were

>*31	IIIA4b2	removed during 14 sampling trips in the Echo Park to Split Mountain reach of the Green River. This demonstrates that the Program can achieve an annual target of 65% reduction in portions of the smallmouth bass range. Catch rates of northern pike in the Uintah Basin have remained low since 2001, indicating the effectiveness of removal efforts for this species.
31,32	IVA1d, VD	! Stocked razorback sucker have been recaptured or observed in reproductive condition at spawning sites in the Green River. Numbers of larvae collected from the Green River in 2007 were the highest ever recorded. Analyses are underway to determine survival estimates of stocked razorback sucker and a report should be completed by August 2008. May need to develop a monitoring plan for razorback sucker in 2009 based in part, on recommendations from the evaluation of stocked razorback report.

YAMPA/LITTLE SNAKE RIVERS

33	IB2a2aiii	! Elkhead enlargement is complete. The entire fish pool (5000 af) was
>*	IB2a2b	delivered in the late summer of 2007. A cursory transit loss study was conducted with plans for a more detailed analysis by USGS. This was the first time the state administered the Yampa River. Water users will be required to install measuring devices on diversions.
34	IC2b	Little Snake flow recommendations are complete (contained in Yampa Management Plan, Roehm 2004).
34	IIA2a	An initial survey was completed in 2007 to evaluate entrainment in the first ~1.8 miles of the Maybell irrigation ditch. This portion of the ditch is on land owned by BLM. Follow-up sampling is recommended in 2008 during June and July, the Colorado pikeminnow migration period.
34	IIIA1	*X* Colorado has not yet revised the Aquatic Wildlife Management Plan for the Yampa River Basin. Colorado's new completion date is May 1, 2009. In the interim, CDOW will produce an Upper Yampa River strategy to assist the Program in prioritizing 2009 field activities. This strategy could be incorporated into the Aquatic Wildlife Management Plan for the Yampa River Basin.
34	IIIA2	! A nonnative fish management strategy for the Yampa River was drafted in April 2007, revised in November 2007, approved by the Biology Committee, and awaits Management Committee approval in June 2008. Strategies also will be initiated for the Green and Colorado rivers in FY 08.
>*35	IIIB	Northern pike sampling in 2007 indicated that the population had increased, but the average size of individuals has been reduced. Biologists considered this a typical, compensatory population response to the removal efforts, i.e. we are having an effect. Exploitation targets (65% removal annually) for

		smallmouth bass (>150mmTL) were achieved in Lilly Park, but not in Little Yampa Canyon nor in the South Beach reach. Biologists recommend a continuation of the current approach (increasing passes in South Beach and Lilly Park), but remain uncertain as to its effectiveness.
35	IVA1b	Because the humpback chub population in Yampa Canyon appears to have declined, the Recovery Program began researching the survivability of young-of-year *Gila* species in transport and hatcheries in 2007.
35	VA	CPUE information is being obtained for humpback chub in Yampa Canyon during nonnative fish removal passes.

DUCHESNE RIVER

>*36	ID2, IE	! The Duchesne River Work Group continues to pursue options for providing water to meet flow recommendations. Meanwhile, water is being released from storage (~5,000 af in 2007).
36 >*	IB2, IC1a IC2b,	! In compliance with the amended 2005 Biological Opinion, the Duchesne River Work Group partners have identified water available on a temporary basis to run test flows for the past three years in the Duchesne River and measure results at the Randlette USGS gage. The Department of the Interior and Mitigation Commission have dedicated available water and the Central Utah Conservancy District has managed and measured this water from Starvation Reservoir to the Randlette gage. Assistance in "shepherding" this water over approximately 70 miles has been provided through a cooperative effort between Central Utah Water Conservancy District, the Duchesne Water Conservancy District and other water users along the Duchesne River. The ability to measure these augmented flows and guarantee that they reach the Randlette gage is the main challenge in this effort of meeting target flows identified in the amended Biological Opinion. For the past three years, this cooperation has been successful. The rehabilitation of Myton Diversion, scheduled for FY 09 (through funding from UCRIP and a Water 2025 Grant), will greatly enhance the ability to meet target flows for endangered fish in the lower Duchesne River. The previous 12/07 deadline came from the BO which said it would take 3- 5 years to coordinate agreements for water delivery. 2007 would have been 3 years. The work group wants it extended to the full 5 years.
>* 36	ID2a	! The funding mechanism for the Myton Townsite Diversion Dam Rehabilitation has been established. The Bureau of Reclamation plans to complete the design work by the spring of 2008. Once the design is completed materials will be stockpiled for construction at the end of the irrigation season fall of 2008. Completion is estimated at 60 to 90 days.
36	1G	Suspended sediment monitoring began in the spring of 2006 at the Randlette gage; the data will be used to evaluate the Duchesne River flow

		recommendations. Early in FY 2009, USGS will summarize the data and provide the Recovery Program with a Digital-Data/Data Series Report (data report) with tables containing available daily mean suspended-sediment load and concentration, concentration and particle-size data from periodic and point suspended-sediment samples, as well as bed-material size information.
>*36	IIIA3c	Nonnative fish removal from the Duchesne River will resume in 2008.

WHITE RIVER

37	IB2	Program Director's staff is reviewing the White River flow recommendations (Irving et al, 2004).
37	ID1	Reviewing the scientific basis of the flow recommendations is on hold and will be initiated as part of discussions associated with identifying elements of conservation plans necessary for downlisting.

COLORADO RIVER ACTION PLAN

38	IA3b&c	**X** The depletion accounting report required in the 15-Mile Reach PBO is overdue. The final report is expected by June 1, 2008.
38	IA4a3&b3	Until the CWCB and Recovery Program can agree on a standard, quantifiable and scientifically sound method to determine flow protection needs for endangered fish and their habitat, the CWCB will not further pursue instream flow water rights, but will continue to work with the Recovery Program on other acceptable alternatives such as Coordinated Reservoir Operations and Coordinated Facilities Operations.
>*38	IA5	*!* June 27, 2007, the Service set the mean monthly target flow for the 15-Mile Reach at 1,050 cfs, about midway between the "dry year" and "average year" targets. However, the Service recognized that with the Shoshone maintenance issues and lack of a Shoshone call that the targets would have to be reconsidered later on. By August 1, the target was revised to the" dry year" target of 810 cfs. On September 5, the target was increased to 860 cfs. By the beginning of October, wetter conditions prevailed in the basin, the Service increased the target to 1,240 cfs, where it remained for the rest of the irrigation year. A total of 53,884 af of water was released to support these target flows. The total included 32,749 af from Green Mountain, 14,273 af from Ruedi, 2,523 af from Williams Fork and 4,339 af from Wolford Mountain reservoir.
38	IA5c1	*!* Contract signed December 28, 2007 to provide up to 5,000 af of back-up water from Ruedi when not available from Wolford due to shortage criteria signed December 28, 2007.

38,9	IA5e1&2	! In 2007, east and west slope water users initiated a study to identify sources of replacement water for 10,825 af of Ruedi water committed to endangered fish. On January 23, 2008, eleven detailed water supply alternatives were presented to a water users working group. These alternatives are comprised of nine different facilities or components to address the water source for the east and west slope portions of the combined 10,825 af commitment. The Colorado Water Conservation Board provided a $200,000 grant for conducting this portion of the assessment. Additional funds have been provided by east slope and west slope water users. The goal is to have agreements signed with the Service prior to December 2009 committing east slope and west slope water users to permanent sources of Ruedi replacement water, as required by the Colorado River programmatic biological opinion.
39	IA5i2	While April 2007 precipitation over the basin was near average, temperatures soared during the end of April, causing significant snowmelt and resulting in the basin's May 1 snowpack being just 71% of average. Even with the declining snowpack, the May 1 streamflow forecasts for the basin continued to be between 80 and 90% for most of the sub-basins. Warm and dry conditions persisted throughout the basin during May, with precipitation being just 70% of average during the month. The basin's snowpack dropped to just 34% of average by June 1 and stream flow projections for the remainder of the runoff season dropped to well below average. The 2006-2007 carryover storage in the basin's reservoirs was slightly above average. With the relatively flat runoff pattern during May and June, the spring peak flow rate in the 15-Mile Reach was projected to be well below the endangered fish enhancement trigger flow of approximately 12,000 cfs. As a result, it was decided that the Coordinated Reservoir Operations program would not be conducted in 2007. The group should be commended for trying very hard to make the process work.
39	IA5l5	! Municipal-recreation contract renewed in 2007.
>*39	IA5m2	In years when implementation of CROS is possible, efforts need to be made to expand augmentation of spring peak flows through CFOPS. This was the principal recommendation of the CFOPS Executive Committee. A detailed feasibility assessment was initiated in late 2007 and is expected to be completed in 2008. The ability of certain reservoirs to bypass storage as a means of enhancing spring peaks, with subsequent payback from USFWS pools, is being identified. The assessment will include legal and institutional review by the State Engineer and Colorado Water Conservation Board. Issues being addressed include potential for downstream flooding and the related liability of releasing storage during high flows; and analysis of exchange possibilities.
39	IB3a	Reviewing the scientific basis of the flow recommendations is on hold and will be initiated as part of discussions associated with identifying elements

		of conservation plans necessary for downlisting.
40	ID1&2	The Service still needs to determine if combination of Colorado and Green River flows below the confluence are adequate for recovery (pending completion of Aspinall biological opinion).
41	IIB	! Meetings were held in May and December 2007 with Grand Valley irrigators, Reclamation, and Recovery Program staff to discuss operations of Grand Valley fish screens and passages, identify problems and solutions, and document operational expectations and plans. These biannual meetings will continue indefinitely.
>*41	IIB1b3	! GVIC screens were operated through most of the 2007 irrigation season. Fish were salvaged from the canal by USFWS in November 2007.
>*41	IIB2a3	! Price-Stubb fish passage construction is underway *(and was substantially completed in April 2008 prior to spring peak flows).*
>*41	IIB3a3&4	*X* The O&M contract covering the Grand Valley Project fish passage and screen has not yet been executed. Execution of this contract needs to be accomplished prior to the 2008 irrigation season.
42	IIIA6	Smallmouth bass (≥100mm TL) densities in the Colorado River declined from ~ 70 per mile in 2006 to ~40 per mile in 2007. Removal efforts were increased in 2007, but biologists believe that environmental factors played a role in the decline as well. Unfortunately, largemouth bass catch rates have increased steadily over the past four years.
>42	IVA3b	! Stocked razorback sucker have been recaptured or observed in reproductive condition at spawning sites in the Colorado River.
43	VC3	Program Director's office will provide guidance on frequency of humpback chub sampling in Cataract Canyon in July 2008.

GUNNISON RIVER

44	IB1	Reviewing the scientific basis of the flow recommendations is on hold and will be initiated as part of discussions associated with identifying elements of conservation plans necessary for downlisting.
>*45	IIB1c	! 102 Colorado pikeminnow, 24 razorback sucker, and 1 bonytail have used the Redlands passageway between 1996 and 2007.
46	IVA2c	! Larvae of stocked razorback are potentially surviving through the first year in the Gunnison River. Juveniles captured at Redlands were either produced in the wild or were stocked as larvae into Butch Craig.

46	VA3	FY 07 annual report for 121b serves as final report. Work to survey endangered fish in the Gunnison scaled back to focus on smallmouth bass removal. The Program Director's office will consider the need for additional endangered fish surveys in the Gunnison River in the future.

Attachment 1

Recommendations from the 2007 Nonnative Fish Management Workshop

Recommendation	Responsibility
Nonnative Fish	
1. Level I Synthesis Reports.—Complete the 2007 Level I synthesis reports (synthesizing data on each species/river nonnative fish control effort and concomitant native fish response).	1. Individual PIs.
2. Level II Synthesis Reports.—Develop an outline and approach for developing the Level II synthesis reports (assimilating Level 1 syntheses into a basinwide and population scale analyses of effectiveness of nonnative fish management.).	2. Recovery Program Office will develop outline and strategy for Level II Synthesis Reports.
3. Assimilate Database.—Develop an assimilated database of nonnative fish control and management activities.	3. Individual PIs will clean their respective datasets and insure consistent codes, field widths, length range metrics, etc.; Further assimilation will occur to develop Level II Synthesis Reports.
4. Nonnative Fish Management Committee.—Establish a standing Nonnative Fish Management Committee to insure implementation of recommendations and follow-up on issues of importance.	4. Recovery Program and Biology Committee will take recommendation under advisement.
5. Standardize Metrics.—Establish and standard system of metrics including lengths for juveniles and adults; size for marking fish.	5. Individual PIs will insure consistent system of metrics for field measurements, data entry, data analysis, and reporting.
6. Reliable Marking System.—Establish and implement a reliable marking system for nonnative fish; Floy tag FD-67 tag losses are 27% and introduce error into abundance estimates; Floy loop tags may be best alternative.	6. The Recovery Program with assistance from the PIs will investigate and evaluate new marking system for use in 2008.
7. Continue Northern Pike Removal.—Continue to implement northern pike removal and monitor response of fish abundance and size.	7. PIs and Biology Committee will insure consistent removal efforts unless otherwise specified in SOW modifications.
8. Cost-Benefit Analysis To Reallocate Effort.—Conduct cost-benefit analysis for reallocating increased effort on the Yampa River upstream of Craig.	8. PIs will evaluate cost-benefit of effort reallocation.
9. Continue Mark-Recapture Estimates.—Continue to use first pass of year as a mark occasion, second pass as a recapture and removal occasion, and subsequent passes as removal occasions.	9. PIs and Biology Committee will insure consistent mark-recapture estimates unless otherwise specified in SOW modifications.
10. Sample When Fish Are Vulnerable.—Conduct removal trips when fish are most vulnerable and susceptible; e.g., sample smallmouth bass in April-June.	10. Individual PIs will examine their data and assess if their sampling is at best time; if changes are needed, they will be made through the SOW process and approval from the BC.
11. Adjust For Movement.—Use movement data to adjust for mark-recapture population estimates.	11. PIs will use movement data where possible to adjust mark-recapture estimates of nonnative fish.
12. Exploitation Rate As Metric.—Use exploitation rate (tags captured/total tags released) as metric for evaluating efficiency of nonnative fish removal. Smallmouth bass exploitation rate should be 60-85%; highest present rate is about 56%.	12. PIs will determine exploitation rates for northern pike and smallmouth bass to assess necessary effort to achieve 60-85% exploitation rates.
13. CDOW Continue Efforts Upstream of Craig.—CDOW should continue to target northern pike sources upstream of Craig, especially removal of northern pike from Catamount Lake, reconstruction of Chuck Lewis State Wildlife Area.	13. CDOW will continue efforts to minimize northern pike escapement upstream of Craig.

Recommendation	Responsibility
14. Secure Translocation Sites.—Sites used to translocate northern pike need to be secured to prevent subsequent escape of translocated fish; the berm at Lowry State Wildlife Area should be elevated to prevent overbanking.	14. Recovery Program will estimate cost of berms for consideration by BC.
15. Reservoir escapement / risk assessment. —BC discussed separate SOW on reservoir operations and escapement potential. There is a need to assess risk of other nonnative species including illicitly introduced fish. Program needs to acknowledge illicit stocking, pursue appropriate regulations, and educate anglers of the consequences (e.g. CO/WY AFS resolution).	15. Recovery Program office will work with partners (perhaps via a Nonnative Fish Management Committee, if enacted) to follow up on these recommendations.
16. Vulnerability of Smallmouth Bass.—Investigate the life history of the smallmouth bass to better understand timing and location of spawning, nursery, movements, and vulnerability.	16. For consideration by BC.
Recommendation	Responsibility
Native Fish Response	
1. Causes for Colorado Pikeminnow Recruitment Failure.—Further investigate causes for lack of Colorado pikeminnow recruitment; reproduction is occurring, larvae are detected drifting from Yampa River into Green River, and backwaters are available, but there is little survival of young pikeminnow in their first year.	1. Part of ongoing Research Framework Project.
2. Native Fish Response.—Continue to investigate native fish response.	2. Ongoing investigations.

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
LEGEND: Items in red are part of the Terms & Conditions in the PBO. RPM = Reasonable and prudent measure; CM = Conservation measure; T&C = Terms & conditions.			
The Recovery Program will provide an annual assessment of Yampa River recovery actions.	General: VIIA7	Done annually as part of RIPRAP assessment	RPM: 68
The Recovery Program shall provide an annual report on the status of recovery actions in the Green and Yampa River Basins. This will include a report on nonnative fish removal, its impact on the status of the four listed fish and plans for future management. Based on these annual reports, the Recovery Program will continue native fish monitoring in accordance with Colorado's Aquatic Management Plan and determine a native fish response. Non-endangered native fishes serve as a surrogate for endangered fishes as an indicator of aquatic ecosystem health.	General: VIIA7, IIIA2c; Yampa: IIIA1	The Recovery Program's annual report of recovery actions takes the form of the annual RIPRAP assessment, which feeds into the Service's review of sufficient progress. Nonnative fish removal is reviewed annually in a December workshop and then the next season's nonnative fish management actions are modified, as needed. SOW #140 to evaluate response of native fishes is ongoing; 4-year data summary and evaluation (Bestgen et al.2007) completed in March 2007.; C25	T&C 7: 70
Provide and Protect Instream Flows			
Implement a base-flow augmentation plan on the Yampa River. (Implement augmentation protocol to meet flow recommendations through 5,000 af "Permanent Water Supply," and 2,000 af lease ["Shortterm Water Supply"] from enlarged Elkhead Reservoir).	Yampa: IB2a(2)(b)	5,000 af provided in 2007, following completion of Elkhead Reservoir.	CM: 8
The Service will notify CRWCD of its intent to lease water in accordance with a three-tiered schedule	Yampa: IB2a(2)(b)	Leased water not needed in 2007.	CM: 10
The Recovery Program will monitor all new water depletion projects over 100 AF/year to determine impacts to peak flows on the Yampa River.	See next row.	See next row.	RPM: 68
The Recovery Program will use the CRDSS hydrologic model to track and analyze all new water depletion projects over 100 AF/year to determine impacts to peak flows on the Yampa River in critical habitat. The Recovery Program will provide the results of the analysis to the Service.	Yampa: IB3d	First 5-year periodic review scheduled for FY 09-10.	T&C 1: 69
Manage Nonnative Fish Populations			
The Recovery Program will continue efforts to minimize the impacts of nonnative fishes on the four listed fish species.	See below.	See below.	RPM: 68
Implement the Nonnative Fish Stocking Procedures	Yampa: IIIB2	Ongoing (and Procedures being revised).	CM: 12
The Recovery Program will screen Elkhead Reservoir to minimize escapement of nonnative fishes.	Yampa: IIIA1a(2)	Screens have been constructed on the outlet towers. A portion of the 2006 and 2007 runoff was screened.	CM: 12
Prior to construction drawdown, screen existing outlet to prevent escapement of nonnatives through the outlet during draw-downs following spring runoff in 2005 and 2006. Divers will install rigid, wedge-wire screens with ¼-inch openings on the existing outlet prior to drawing down the reservoir.	Yampa: IIIA1a(2)	Done.	CM: 14
Prior to 2005 spring runoff, the existing spillway will be partially removed, effectively lowering the spillway crest elevation by about 19 feet. To prevent escapement of adult and subadult nonnative fishes, an 8-foot high, 85-foot long, ¼-inch mesh screen will be installed in the excavated channel leading to the spillway notch.	Yampa: IIIA1a(2)	A screen was installed in 2005, but it failed; nonnative fish removal was expanded in 2006 to compensate.	CM: 14
Following construction, operate controlled outlets in a manner which minimizes releases over the spillway. Up to 540 cfs will be discharged through the tower (450cfs) outlet and service outlet (90 cfs) during spring runoff. Flows over the spillway will occur only when inflows exceed 540 cfs.	Yampa: IIIA1a(2)	Installation of fish screens on the outlet tower allows screening up to 540 cfs of spring runoff to reduce nonnative fish escapement from the reservoir.	CM: 14

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
The Recovery Program will continue to monitor the escapement of fish from the spillway. The Biology Committee will develop criteria for an escapement threshold that would trigger a decision to screen the spillway and/or curtail stocking into Elkhead Reservoir.	Yampa: IIIA1a(1)	Specific criteria not developed, but escapement is monitored via tagging all nonnative fish placed in Elkhead.	CM: 14
All controlled releases of water will be screened. This will include installation of ¼-inch wedge-wire screens on all three of the tower intakes and the service intake.	Yampa: IIIA1a(2)	The enlarged Elkhead Reservoir and screens were fully operational beginning with spring runoff 2007.	CM: 14
Anchors for a spillway net will be installed while the reservoir is drawn down for construction. Future installation of a spillway net will be considered based on results of spillway escapement monitoring and nonnative fish control efforts in the Yampa River.	Yampa: IIIA1a(2)	Anchors were installed.	CM: 14
New water storage projects that have a sport fisheries component will comply with the NNSP (e.g., screening to prevent escapement and/or stocking restrictions) in the project design and specifications, if these measures are warranted based upon location and connectivity with the river.	General: IIIB2	No new water storage projects currently proposed.	CM: 12
The Colorado Wildlife Commission approved removing bag and possession limits for northern pike statewide, and channel catfish , black bullhead (Ameiurus melas), walleye (Stizostedion vitreum), smallmouth bass, largemouth bass (Micropterus salmoides), green sunfish (Lepomis cyanellus), bluegill (L. macrochirus) and black crappie (Pomoxis nigromaculatus) in the Yampa and Green rivers in Colorado.	Yampa: IIIA1e	Complete	CM: 12
Remove and translocate northern pike and smallmouth bass	Yampa: IIIA1b&d	Northern pike sampling in 2007 indicated that the population had increased, but the average size of individuals has been reduced. Exploitation targets (65% removal annually) for smallmouth bass (>150mmTL) were achieved in Lilly Park, but not in Little Yampa Canyon nor in the South Beach reach. Biologists recommend a continuation of the current approach (increasing passes in South Beach and Lilly Park), but remain uncertain as to its effectiveness. Synthesis reports in draft. Nonnative fish management strategy approved for the Yampa River. CDOW will produce an Upper Yampa River strategy to assist the Program in prioritizing 2009 field activities.	CM: 13-15

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
Lethal removal of channel catfish and smallmouth bass from Yampa Canyon	Yampa: IIIA1c(1)&d	Ongoing. The population estimate for smallmouth bass in 2005 was ~25,000; for channel catfish ~86,000. To remove more fish from the river, population estimates (i.e., mark and release passes) were discontinued in 2006. Catch rates (or some other metric) will be used to monitor and evaluate removal efficacy. 2001-2006 synthesis report approved pending final revisions. Year to year reductions in channel catfish were not shown. For smallmouth bass >100 mm TL, CPE showed a decrease each year, especially in downstream reaches with CPE progressively decreasing as sampling advanced toward the Green River. However, smallmouth bas depletions by removal were not considered sufficient to negatively impact (reduce) their population.	CM: 13-15
The Recovery Program will continue to coordinate a targeted public outreach program to inform local stakeholders of the nonnative fish management activities and to educate anglers.	See below	See below	RPM: 68
The Recovery Program will strategically place and maintain signs and implement public outreach on the following: how to identify the endangered fishes; proper handling prior to and during release back to the river; and the legal ramifications for failing to exercise due caution and care with respect to these species. The Recovery Program will maintain an active public outreach program to inform local stakeholders of Recovery Program activities in the Yampa River basin.	General: VIC	Signs targeting anglers posted at key locations along the Yampa include drawings of the fish & info. about returning them to the river alive. In 2007, the Recovery Program continued outreach efforts by disseminating updated fact sheets and questions/answers to news media and Congressionals, county commissioners and sheriffs, members of the Yampa River Basin partnership, and to staff and volunteers associated with agencies conducting the nonnative fish management research. In addition, the Recovery Program continued to work with Dinosaur National Monument staff to distribute a bookmark-size handout with boat permits that explains the nature of the work and provides contact information. Fish and Wildlife Service and Monument staff report improved relationships with boaters as a result of this now-ongoing effort. In 2008, the Recovery Program is working with the Colorado River Water Conservation District to produce and install interpretive signs at the recently enlarged Elkhead Reservoir. The signs will contain information about nonnative fish management and other recovery efforts.	T&C 5: 70

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
Within one year of the issuance of this biological opinion (that is, by Jan. 10, 2006), the Recovery Program will develop criteria to determine positive or negative population responses for Colorado pikeminnow. When population estimates for wild humpback chub are finalized, they will be used to determine population response. These two species will serve as surrogates for bonytail and razorback sucker until population estimates for those species are possible.	Green: VC1&2; Green: VB1; Yampa: VA;Green: IVA1d; Yampa: IVA1b	The next 3-year estimate of adult abundance will be completed in 2008. The Yampa Canyon humpback chub population is small, with an estimate of about 400 wild adults in 1998–2000. Sampling during 2003-2004 caught so few fish an estimate could not be made. In 2007 the Recovery Program brought 400 young-of-year Gila spp. caught in Yampa Canyon into captivity as a research activity to determine the best methods for capture, transportation, and holding at two different hatchery facilities. A research framework project (building on results and recommendations of previous population estimates and information developed as a result of previous population estimate workshops) is conducting additional data analyses to further understand environmental variables and life-history traits influencing the dynamics of Colorado pikeminnow and humpback chub populations. The draft research framework report is expected in August 2008. Results will be used to refine hypotheses and direct management actions.	RPM: 68
The Yampa River has seen recent declines in populations of all native fish species. In 2006, the Recovery Program will examine the results of the ongoing native fish population response study and determine if there has been an increase or decrease in native fish populations in the Yampa River associated with ongoing nonnative fish control actions.	General: IIIA2c	Bestgen et. al. 2007 confirmed decline of native fishes in the Yampa River; additional 3-year field evaluation underway followed by a portion of the following year for data analysis and reporting in 2010.	T&C 6.b: 70
The Recovery Program is conducting pikeminnow population estimates for 2000–2003 for the Green River subbasin. This includes population estimates for the Lower Green, Middle Green, White and Yampa rivers. These estimates will be used to determine existing conditions for the purposes of a population response. The Program is also conducting estimates of the Desolation-Gray and Yampa Canyon populations of humpback in the Green River subbasin. The next estimate will be conducted for the years 2006–2008. The population response criteria will use these population estimates to determine a positive response or a significant decline. Evaluations of stocked razorback and bonytail will be used to develop population criteria for these species.	Green: VC1&2; Green: VB1; Yampa: VA;Green: IVA1d; Yampa: IVA1b	Final report on the Green River subbasin Colorado pikeminnow population approved by the Biology Committee in 2005 (Bestgen et al): estimates of wild adults ranged from ~2,300 in 2003 to ~3,100 in 2001. However, catch rates for young pikeminnow in 2004 were the highest since 1996 in the Green River. It is anticipated that this strong year-class will show up as subadult or adult fish in future estimates. Sampling for the next estimate began in 2006 and will be completed in 2008. First draft of stocked razorback evaluation submitted to Biology Committee in July 2006; draft report on additional data analysis expected in August 2008.	T&C 6.c: 70
The Yampa River contains one of two major spawning areas for the Colorado pikeminnow documented by collection of larval fish. Any indication that reproduction has ceased to occur or has been significantly diminished in the Yampa River would be a factor in determining population response.	Green: VC1&2	Larval reproduction has been documented every year and sampling continues.	T&C 6.d: 70

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Recruitment to the adult population is an important factor in determining population trends. Therefore, recruitment rates will be incorporated into the population response criteria.	Green: VC1&2	Bestgen et al (2005) suggested recruitment rates in the Green River subbasin pikeminnow population may not be sufficient to offset mortality rates of adults and that reduced abundance of recruit-sized Colorado pikeminnow may be due to weak year-classes of age-0 pikeminnow produced in nursery areas of the middle and lower Green River. However, catch rates for young pikeminnow in 2004 were the highest since 1996 in the Green River. 2006 larval collections also indicated a strong reproductive year. It is anticipated that these strong year-classes will show up as subadult or adult fish in future estimates. For example, 369 pikeminnow 182-399 mm TL were captured, tagged, and released in the lower Green River reach in 2006. That number may be greater than the total number of fish in that size class present in all years of sampling the lower Green River from 2001-2003.	T&C 6.e: 70
In addition, the status of nonnative fish populations will be used to assess the effectiveness of nonnative fish control activities in reducing the abundance of nonnative fishes, and the status of native fish populations will be used to assess any response of the native fish community to reductions in the abundance of nonnative fishes.	See below.	On October 6, 2006, the Implementation Committee issued a directive to thoroughly assess Yampa River nonnative fish control efforts and develop a stronger adaptive management framework to identify nonnative fish management actions of sufficient scale and intensity to achieve measurable native fish population responses in the shortest possible timeframe. A Yampa Nonnative Fish Management Strategy was approved by the Management Committee in June 2008.	RPM: 68
One major element of the proposed action is to implement nonnative fish control measures in the Yampa River. Therefore the Service is anticipating a significant reduction in the nonnative fishes in the Yampa River, especially small mouth bass and northern pike. Data from the nonnative control program will be examined annually with the first data synthesis expected in 2006 to determine if there has been a depletive effect in nonnative fish populations in the Yampa River.	General: IIA2c1&2	See also rows 22 and 23, above. Data are reviewed annually in nonnative fish workshop. Draft synthesis reports are in review. The Program's Yampa nonnative fish management program needs to be modified in 2009 to match the Yampa River Nonnative Fish Management Strategy. In particular, northern pike removal efforts need to focus on reproduction/recruitment sources and the Program needs to take advantage of every opportunity to remove smallmouth bass (e.g., remove smallmouth bass wherever northern pike removal occur. CDOW will produce an Upper Yampa River strategy to assist the Program in prioritizing 2009 field activities. The Program will use this strategy and available information to evaluate the need to expand northern pike removal efforts upstream of Hayden to Steamboat Springs.	T&C 6.a: 70

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CDOW is in the process of developing a Lake Management Plan for Elkhead Reservoir. The Recovery Program will ensure completion of a Final Lake Management Plan for Elkhead Reservoir, that has been approved by the Service, prior to stocking fish in the reservoir.	NA	Complete.	T&C 4: 69
Restore Habitat			
Acquire and enhance floodplain habitats along the Green River		Ongoing.	CM: 15
Restore/maintain native fish passage at diversion structures		No remedial action is required to facilitate fish passage at any existing diversion structures, as currently constructed and operated.	CM: 16
Recovery Program will provide written guidelines for construction of any new/modified diversions and other structures in critical habitat on the Yampa River to facilitate fish passage and to minimize impacts inherent to their routine maintenance. Guidelines will describe specific parameters for fish passage, such as minimum depth and maximum slope/rise and velocity. The incremental construction cost, if any, will be borne by the Recovery Program if structures were in service on or before January 22, 1988, regardless of whether such modifications allow diversion of more water than they had historically. If structures were placed into service after January 22, 1988, the incremental costs of passage would have to be borne by the project proponents.	NA	Service needs to develop guidelines (using thresholds for passage as identified in Yampa Management Plan). Currently, no new/modified diversions proposed.	CM: 16
Evaluate/remediate entrainment of endangered fishes by diversion structures	See below.	See below.	CM: 16
CM: Develop plan to evaluate CPM entrainment in existing diversion canals. Plan will evaluate & minimize potential incidental take due to entrainment. RPM: Program will eval. level of incidental take due to entrainment of CPM by diversion canals within critical habitat on the Yampa. T&C: Program will develop plan to monitor the amount of take by 12/31/05, and add it to the RIPRAP. Specific implementation elements and timing will be determined in the plan. At minimum, and as an initial effort, assessment will involve survey of Maybell Canal, after the end of the irrigation season. Survey will evaluate take and, if any endangered fishes found, salvage surviving individuals and returning them to the river alive. Because endangered fishes are rare upstream from Yampa Canyon, other native species >300 mm in length may serve as surrogates. Rate of entrainment would be determined based on the number of individuals of endangered or surrogate species recovered from the canal versus an estimate of population densities in the river. Evaluation of take will include recommendations for minimizing take at diversion canals in critical habitat.	Yampa: IIA2a	An initial survey of Maybell Ditch was completed in 2007 to evaluate entrainment in the first ~1.8 miles of the Maybell irrigation ditch. This portion of the ditch is on land owned by BLM. Follow-up sampling is recommended in 2008 during June and July, the Colorado pikeminnow migration period.	CM: 16; RPM: 68; T&C 2: 69

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CM: If native fish are found to enter irrigation canals or other diversion structures, the Recovery Program initially will salvage any native fish found alive and return them to the river. Unless initial investigations establish that endangered fish do not enter the canals or enter only with very low frequency, the Program will develop a plan to remediate this potential problem, which could include annual fish salvage operations or installation of fish preclusion devices on the problem structure(s). RPM: If found appropriate in the evaluation, the Recovery Program will implement measures to reduce take at diversion canals within critical habitat on the Yampa River. T&C: If found appropriate in the evaluation and after approval by the Service, the Recovery Program will implement one or both of the following: i. Design and construct fish preclusion devices to prevent or reduce adult and subadult fish (>300 mm TL) from entering diversion canal(s).ii. Undertake annual fish salvage activities to recover any endangered fish that may be trapped in diversion canals and return these fish to the river alive.	Yampa: IIA2b	Pending results of evaluation.	CM: 16; RPM: 68; T&C 3: 69
Manage genetic diversity/augment or restore populations			
CDOW developed a plan to stock bonytail in the Yampa and Green rivers in Colorado. This stocking plan was revised in 2001 (CDOW 2001). Restoring bonytail through stocking above Lodore Canyon on the Green River and within the lower reaches of the Yampa is a high priority for the CDOW. Stocking began in 2000, with a total of 23,000 juvenile bonytail stocked to date in the Green River near Brown's Park, Colorado, and in the Yampa River near its confluence with the Green River at Echo Park. Both sites are within Dinosaur National Monument (DNM), and stocking is carried out by the CDOW with the cooperation of the National Park Service (NPS).	Yampa: IVA1a1; Green: IVA1c	Since 1996, 271,500 tagged bonytail subadults have been stocked in the Green and upper Colorado River subbasins. Of those, over 44,000 were stocked under the 2003 integrated upper basin stocking plan. Stocked bonytail have been recaptured at several locations throughout the upper basin. During September–November 2003, 16 stocked bonytail were recaptured in Cataract Canyon after about 1 year post stocking. Monitoring and evaluation of fish stocked in 2003–2004 is currently being accomplished through analysis of data collected in sampling conducted for other population estimates and nonnative fish control. About 200 stocked bonytails were captured in 2004–2005, all within 1 year after stocking. The Recovery Program is changing some stocking locations and is flow-conditioning some fish prior to stocking.	CM: 17

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The State of Utah stocks razorback sucker to the Green River below Split Mountain to supplement the Middle Green/Yampa population. This activity also is a high priority for the Recovery Program.	Green: IVA1c	Since 1995, about 148,200 PIT-tagged razorback sucker subadults have been stocked in the Green and upper Colorado River subbasins. Of those, 86,194 were stocked under the 2003 integrated upper basin stocking plan (Nesler et al. 2003). Monitoring and evaluation of fish stocked in 2003–2006 is currently being accomplished through analysis of data collected in sampling conducted for other population estimates and nonnative fish management. About 2,550 recaptures of stocked razorback sucker were reported from the Green, Colorado, and Gunnison rivers in 2000–2005. A study has been initiated to determine survival estimates of stocked razorback sucker to ascertain if changes in the stocking plan are warranted.	CM: 17
Monitor Populations and Habitat			
The Recovery Program will monitor adult pikeminnow, razorback and humpback populations to ascertain the status of these populations (e.g., numerical abundance, age-class structure, evidence of recruitment), using standardized protocols. Larval sampling will determine whether and to what extent these populations are spawning. Survival of stocked fish also will be assessed. Endangered fish population data will be collected fortuitously during nonnative fish management activities; conversely, the status of nonnative fish populations also can be monitored in conjunction with endangered fish population surveys to make the most efficient use of the Recovery Program's limited resources.	See above.	See monitoring under nonnative fish management, in rows 28-29, above.	CM: 17
A substantial decline in numbers of nonnatives fishes is presumptive evidence of a benefit to the endangered fishes; however, to confirm that nonnative fish management has, in fact, achieved the desired benefits for native species, it will be necessary to examine populations of the endangered fishes, and/or surrogate native species, such as roundtail chub and flannelmouth sucker, which suffer similar impacts due to competition and predation by nonnatives. An increase in their overall abundance, especially younger, smaller life stages, would be indicative of reproduction, larval survival, and potential recruitment into the adult populations, thereby allowing the endangered fish populations to become self-sustaining.	See above.	See monitoring activities discussed under nonnative fish management, in rows 27-29, above.	CM: 17-18

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The Recovery Program will coordinate with the U.S. Geological Survey (USGS) to review and compile past data at the priority sites and begin collection of suspended sediment data at USGS stream flow gages on the Green River at Jensen, Utah, and on the Gunnison River at Whitewater, Colorado. Other sediment sampling stations will be added as additional funding becomes available. Based on the results of the USGS data the Recovery Program will design and implement a long-term basinwide habitat monitoring program.	General: IA4b; Green: ID	Sediment monitoring work began in 2005. A retrospective analysis of historic data was done for key sites on the Colorado, Gunnison, and Green River near Green River. Automated suspended-sediment samplers have been installed at the Whitewater gage on the Gunnison River and at the Green River near Jensen. In FY 06, USGS began developing a topological dataset and water-level elevation dataset sufficient for input into the Surface Water Modeling System (SWMS). USGS has completed a sediment mobility model solution to help FWS evaluate flow recommendations for Flaming Gorge. The data summary report will be completed in 2008 and the technical series report will be completed in 2009.	CM: 18