Stephen D. Guertin, Chairman
Implementation Committee

Upper Colorado River Endangered Fish Recovery Program

Thomas E. Chart, Director
Recovery Program

U.S. Fish and Wildlife Service•P.O. Box 25486•Denver Federal Center•Denver, CO 80225•(303) 969-7322•Fax (303) 969-7327

ES/CRRP
C6
Mail Stop 65115

JUL 16 2010

Memorandum

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

From: Deputy Regional Director, Region 6 Noreen E. Walsh

Subject: Final 2009—2010 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 2009—2010 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 April 4, 2010, assessment of accomplishments and shortcomings of the Recovery Program under the Recovery Implementation Program Recovery Action Plan (RIPRAP) from March 1, 2009 through February 1, 2010 is incorporated in the tables to the RIPRAP found at http://www.coloradoriverrecovery.org/documents-publications/foundational-documents/RIPRAP/RIPRAPapril7-10.pdf. Previous years' accomplishments and shortcomings are described in previous "sufficient progress" memoranda and outlined in the RIPRAP itself.

The Service issued its most recent sufficient progress memorandum on June 10, 2009.

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[1] 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. The Recovery Program implemented a revised, integrated stocking plan in 2003 with the goal of establishing self-sustaining populations of razorback sucker and bonytail by 2015. The Program has been largely successful in meeting the plan's stocking targets; however, survival of stocked razorback sucker has been greater than that of stocked bonytail. 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.

Evaluation of stocked razorback sucker and bonytail is ongoing, with an initial report provided in July 2006. A subsequent study was conducted to determine survival estimates of stocked razorback sucker to ascertain if changes in the stocking plan are warranted. A report from that study was accepted by the Program along with a request to extend the evaluation to razorback sucker data collected from 2004 through 2008. Many of the recommendations from that evaluation already are being implemented. A razorback sucker monitoring plan is being developed to identify sampling needed to estimate demographic parameters for small- and large-bodied razorback suckers in the Colorado and Green River sub-basins. Meanwhile, a pilot study to monitor juvenile and larval razorback was conducted in the lower Green River in 2009 and that work continues in 2010–2011.

To date, the Service has convened two formal 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

[1] To achieve naturally self-sustaining populations, adults must reproduce and recruitment of young fish into the adult population must occur at a rate to maintain the population at a minimum that meets the demographic criteria identified in the recovery goals.

and population dynamics. An *ad hoc* group of species experts reviewed information presented at the workshop and prepared a final report (with recommendations) that is being used to guide research and management. On June 15-16, 2009, researchers involved with humpback chub population estimation met in Grand Junction, Colorado, to review existing sampling protocols and current approaches to data analysis. Participants at that informal workshop considered declining trends in catch rates and recommended bringing some humpback chub from the Desolation Canyon population into captivity and conducting a more robust, combined analysis of data collected in Black Rocks and Westwater canyons.

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.

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 stocking efforts to reestablish a Colorado pikeminnow 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).

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 (Bestgen et al. 2005). A final report estimates the number of adults ranged from 2,400 individuals in 2006 to over 3,600 in 2008. Catch of age-0 Colorado pikeminnow in the middle Green River has been very low and of particular concern since the mid-1990s. Utah Division of Wildlife Resources (UDWR) reported captures of 325 age-0 Colorado pikeminnow from that reach in 2009; the highest catch since 1991. The lower Green River has produced more consistent catches in recent years. For example, 369 pikeminnow 182–399 mm TL were captured, tagged, and released in the lower Green River reach in 2006. Researchers were able to track those cohorts recruiting into the Green River adult population in 2007 and 2008.		Estimates of wild adults ranged from about 440 in 1992 to about 890 in 2005. The final report on 2003-2005 estimates of adult abundance including all estimates since 1991 was finalized in 2009. Sampling for the next 3-year set of estimates began in 2008 and will be completed in 2010.
	SAN JUAN: An estimate of about 20 wild adults was based on data collected in the early to mid-1990s. 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, 275,105 in 2008, and 476,942 in 2009. Catch rates of stocked Colorado pikeminnow collected during nonnative fish removal have increased from ~0.2 fish/hour in 2003 to well over 2.0 fish/hour since 2006. Captures of larvae document that some stocked fish are surviving to sexual maturity and reproducing, but adult numbers remain very low.		
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. Approximately 15 percent of the *Gila* spp. were humpback chub; the roundtail chub from Ouray have been retuned to the river in Dinosaur National Monument.	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. In a draft report on 2006–2007 estimates, researchers indicated that this population was trending downward and recommended representatives should be brought into captivity. In 2009, 25 adults were taken to Ouray National Fish Hatchery.	Black Rocks Canyon: Estimates of wild adults vary from about 800 in 1998, 900 in 1999, and 500 in 2000 and 2003. The most recent estimates, in 2007–2008 were 345 and 287, respectively. Westwater Canyon: Estimates of wild adults range from about 4,700 in 1998 to 2,500 in 1999, 2000, and 2003. The 2007–2008 estimate is pending in 2010. Cataract Canyon: Population is small, with an estimate of about 150 wild adults in 2003 to 66 in 2005. Estimates are difficult to obtain; therefore, CPUE has been determined to be an effective replacement (began in 2008 for 2 years on, 2 years off). In 2009, UDWR reports that the Cataract population appears to be stable.
	LOWER COLORADO, GRAND CANYON: The population associated with the Little Colorado River was probably stabilized at around 6,000 adults. In recent years, scientists also detected more juvenile and young-of-the-year fish.		

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).

	RIVER SYSTEM		
SPECIES	MIDDLE GREEN	LOWER GREEN	UPPER COLORADO
Razorback Sucker	Since implementation of the 2003 stocking plan, about 175,000 subadult razorback suckers have been stocked in the Green and upper Colorado River subbasins. Monitoring and evaluation of fish stocked in 2004–2008 is currently being accomplished through analysis of data collected in sampling conducted for other population estimates and nonnative fish management. About 1,400 recaptures of stocked razorback sucker were reported from the Green, Colorado, and Gunnison rivers in 1996–2006. A report on survival estimates of stocked razorback sucker was accepted and the evaluation is being extended to razorback sucker data collected from 2004 through 2008, specific to the current stocking plan.		
	Data from 1998–1999 suggested that about 100 wild adults remained at that time (Bestgen et al 2002), with an estimated annual survival rate of about 70 percent. 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. Numbers of larvae collected from the Green River in 2007 were the highest ever recorded (~2,200). Survival of larvae through the first year is evidenced by captures of juveniles (some of these may have been stocked larvae). In spring of 2009, researchers captured two adult razorback suckers in the Yampa River; the first seen in that river for nearly 30 years. These hatchery-raised fish were stocked in the middle Green River in 2004 and had traveled as much as 280 miles upstream over the course of the next 5 years.	Few wild adults have been captured in recent years. The population is being augmented through stocking. Larvae were collected below Green River, UT and 1+ year-old fish were collected in the lower Green River. A pilot study to collect larvae and juveniles was initiated in 2009. Light trapping captured 170 razorback sucker larvae; 1 juvenile was identified in 17 of 78 samples processed.	Few wild adults have been captured in recent years. The population is being augmented through stocking. Small numbers of 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). Larvae also were collected in the Colorado River between Palisade and Moab from 2004–2007 (at several locations between Grand Junction and Westwater from 2004–2007, and at two upstream locations between Palisade and Grand Junction in 2007). Running ripe female razorback sucker were captured between Loma and Moab in 2005 and 2008.
	SAN JUAN: A population estimate has not been made, but the number of razorback sucker captured in the San Juan River largely tracks the number of razorbacks stocked and the increase in catch rates demonstrates the success of the augmentation program. Stocking 1-year-old-plus fish (greater than 300 mm total length) is ongoing under the 2003 augmentation plan. Since 2003, about 1.7 million age-1 and 53,000 subadults and adults have been stocked. Reproduction by stocked fish at multiple locations has been documented through collection of larvae every year since 1998.		

Bonytail	Since 1996, over 322,000 tagged bonytail subadults have been stocked in the Green and upper Colorado River subbasins. Of those, about 95,000 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 stocked bonytail has not been conducted because the numbers collected through other project sampling have been so low and until very recently, fish have not been found at large for more than a year. About 200 stocked bonytails were captured in 2004–2005, all within 1 year after stocking. J.W. Mumma Native Aquatic Species Restoration Facility has begun to expose their bonytail to flows in circular tanks for up to a month prior to their release in order to increase their fitness for the river. In addition, stocking sites have been changed from canyon-bound reaches to alluvial reaches, such as the Jensen to Ouray reach on the Green River with the objective of improving their survival. In 2009, over 40 bonytail were captured during nonnative fish removal and other species monitoring in the middle Green River.

B. Accomplishments and Concerns

Recovery Program participants accomplished several important objectives in 2009 and early 2010. These accomplishments, as well as concerns about ongoing/future recovery actions are outlined in brief in the table below. For more detail about these items, please see Section C, "Discussion of Recent Accomplishments and Concerns" below, as well as the final April 4, 2010 assessment of accomplishments and shortcomings of the Recovery Program under the Recovery Implementation Program Recovery Action Plan (RIPRAP) from March 1, 2009 through February 1, 2010, incorporated in the assessment column in the tables to the RIPRAP. **A**ction items recommended to address concerns/shortcomings follow in Section C.

Accomplishments	Concerns
General – Upper Basin-wide	
To increase effectiveness of smallmouth bass (SMB) removal and to disrupt spawning in light of the strong 2007 cohort reaching maturity in 2010, at the 2009 Nonnative Fish Workshop, project leaders adjusted their 2010 sampling schedules.	Research Framework (evaluating Program's approach to determining reasons for endangered fish recruitment failure) report far behind schedule.
States and the Service completed revisions to the "Procedures for Stocking Nonnative Fish in the Upper Colorado River Basin."	Declining humpback chub populations in Desolation Canyon (though 25 adults were captured and placed at Ouray National Fish Hatchery in October 2009). Yampa Canyon population very small, but researchers report positive signs of chub reproduction during the wetter hydrologies of 2008 and 2009. Most recent estimates of the Black Rocks (Colorado River) population also shows decline.
Continuation of good hatchery production and numbers of stocked bonytail and razorback sucker. Renovations on Grand Valley hatchery building completed; design for additional growout ponds for Grand Valley (at Horse Thief Canyon State Wildlife Area) completed (with construction expected to be complete by late spring/early summer 2011).	
CSU's analysis of the survival of stocked razorback sucker is guiding future stocking efforts.	
Increased sampling efficiency and minimized harm to native species by standardizing the hard-bottom boat electrofishing fleet. Inflatable boat standardization to begin in 2010.	
Green River	
Bureau of Reclamation's (Reclamation) operations at Flaming Gorge to meet the flow and temperature recommendations under the Record of Decision (ROD) & Biological Opinion (BO) are going well.	Utah has worked on flow protection, and is currently seeking alternatives to subordination (judged infeasible). Utah is developing a revised plan and schedule which is due for the Program's consideration September 30, 2010. Commitment from the State is strong, but concerns remain regarding putting flow protections in place in a timely fashion.
In 2009 1arge numbers of age-0 Colorado pikeminnow (CPM) detected in Reach 2 backwaters (greatest number since 1991); pilot study to remove nonnative cyprinids from backwaters began in 2009, refined for 2010.	Price River flow recommendations report is still incomplete.

Investigation of relationships between SMB spawning/recruitment and environmental conditions continues and will serve as the basis for a future flow manipulation study.	Determination of if and how the Tusher Wash diversions should be screened has been somewhat delayed.
Bonytail survival in Stewart Lake (n=42) and Stirrup Wetland (n=5) detected via stationary PIT antennas – strongest indication of overwinter survival to date.	
Colorado pikeminnow population estimate shows increasing trend 2006-2008 (see Table 1).	

Yampa River	
Successful flow augmentation from Elkhead Reservoir again in 2009. Minimum instream flow target increased from 93 cfs to 134 cfs with recognition that higher flows may be needed on an experimental basis. All 5,000 af of Program's 5,000 af pool released between August 13 and September 30.	
In 2009 adult SMB (>200mmTL) densities in Little Yampa Canyon and in Lily Park (historically the two highest density reaches in the Upper Basin) were at their lowest levels since intensive removal began in 2004. However, researchers caution that a strong juvenile cohort (spawned in 2007) will enter the adult size class in 2010.	Final Yampa River Aquatic Management Plan still not complete. Continued escapement documented of some nonnative fish translocated from the Yampa River to Elkhead Reservoir. Colorado Division of Wildlife (CDOW) reviewing recapture data in 2010; Colorado State University programmatic synthesis also will evaluate.
Two stocked razorback suckers were recaptured in the Yampa River in 2009 (one in Lily Park and one in Yampa Canyon, both originally stocked in the Green River in 2004). This is the first time razorbacks have been captured in the Yampa River in nearly 30 years.	
Duchesne River	
Rehabilitation of the Myton Diversion has enhanced the ability to meet target flows. The Duchesne River Work Group (DRWG) is still examining the feasibility of other options for obtaining water.	
White River	
	Revisions to flow recommendations still not completed.
Colorado River	
Successful base flow augmentation for the 15-Mile Reach in 2009. 2009 was one of 6 years out of the last 20 in which an attempt was made to meet the high flow target of 1,630 cfs.	Colorado flow recommendations not currently being fully met due to near 9-year drought; therefore, the Service remains concerned to what extent the OMID irrigation efficiency project may offset the loss of the 10,825 af from the Ruedi agreement which expires in 2012.

42,783 af released under coordinated reservoir operations (CROS) spring 2009 flow augmentation, the largest release since CROS began in 1997.	Implementation of Coordinated Facilities Operations Program (CFOPS) fell behind schedule due to work on the 10,825 alternative; new implementation schedule approved by Service on 10/27/09 calls for completion of a final (Phase III) CFOPS report by September 30, 2010.
Twice-yearly meetings continue 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.	Condition of fish once they have passed through the fish screen return pipes has never been evaluated. Biennial scopes of work and annual reports are needed from each fish screen/passage facility (Grand Valley Project, Grand Valley Irrigation Company and Redlands).
Permanent sources of 10,825 af from East and West slope water users (as called for in 15-Mile Reach Programmatic Biological Opinion (PBO) agreed to, National Environmental Policy Act in progress; interim agreements being extended to provide flows until 10,825 is in place. Agreement regarding permanent source pending.	
Evaluation of passive PIT monitoring feasibility at Price-Stubb passage completed in 2009; system to be installed in summer 2010.	
Grand Valley fish passage operated continuously from April 20 through October 15; 12,402 fish used the passage, including 11,286 native fishes. No endangered fishes used the passage in 2009.	
Adult and juvenile SMB densities remained low in 2009. Adult SMB catch rates in 2009 were ~85 percent lower than catch rates recorded in 2005 when the population peaked. Abundances of juvenile largemouth bass and some other species of sunfish remain a concern; however overwinter survival for these species appears to be low.	
Gunnison River	
Draft Aspinall Environmental Impact Statement (EIS) completed February 13, 2009 (final expected prior to 2011 spring runoff); PBO completed December 4, 2009.	Final EIS delayed; flow recommendations will not be implemented until EIS and ROD are finalized.
Redlands fish passage operated April 17 through October 15. 3,589 fish used the passage in 2009; of those 3,066 were native fishes, including two pikeminnow and one stocked razorback sucker. One hundred and four pikeminnow, 26 razorback sucker, and one bonytail have used the ladder since summer 2001.	

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

C. Discussion of Recent Accomplishments and Concerns

General (Upper Colorado River and Green River Subbasins)

- Over the past 10 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 and competition and achieve and maintain recovery of the endangered fishes. In 2009, the Program contracted with a team of researchers at Colorado State University to initiate a programmatic synthesis of the smallmouth bass removal data to evaluate the current approach. The December 2009 nonnative fish management workshop resulted in changes to nonnative fish management activities for 2010, including modified timing and increased intensity of smallmouth bass removal to target the large 2007 cohort in the Yampa and Green rivers. The States and the Service completed revisions to the Procedures for Stocking Nonnative Fish in the Upper Colorado River Basin which are intended to minimize threats to the endangered fish from the State's and the Service's sportfish management practices.

  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.

- 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 and to a lesser extent, early juvenile razorback continues to be encouraging. A loss of hatchery-reared bonytail from Wahweap hatchery (2010 year class lost to bird predation) is being addressed through a request of twice as many bonytail fry from Dexter this year, with the hopes of growing them to stocking size by 2010 through extra feeding, lower densities, and perhaps warming water through winter. Wahweap also is taking remedial measures (netting ponds, etc.) to prevent future bird predation.

- Previous population estimates had indicated downward trends in the abundance of Colorado pikeminnow in the Green River subbasin; however, results from the most recent estimate (2006-2008) show an increasing trend (researchers caution that Colorado pikeminnow populations can be expected to fluctuate, however). The 2003-2005 estimate of the Colorado pikeminnow population in the Colorado River also showed an increase over the previous estimate. Limited recruitment of early life stages of Colorado pikeminnow in the middle Green River was documented over the past decade, but large numbers of age-0 Colorado pikeminnow were detected in Green River Reach 2 backwaters in 2009. Humpback chub population estimates indicating downward trends in the abundance of several populations remain a concern. The Green River populations of Colorado pikeminnow and humpback chub are viewed as the foundations of recovery for both these species.

ACTION ITEM (2): A research framework project (building on results and recommendations of previous population estimate reports and information developed as a result of previous population estimate workshops) was initiated in 2005 to conduct 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 significantly behind schedule (originally due in 2007), but the Program Director's office is working with the principal investigators to get the draft report to the Biology Committee for review in the summer of 2010. Results will be used to refine hypotheses and direct management actions.

Green River Subbasin – Green River

- Operation of Flaming Gorge Dam under the Biological Opinion and ROD is going well. Bureau of Reclamation's (Reclamation) efforts to meet spring flow targets and recommended base flow temperatures in Reach 1 and at the confluence with the Yampa River is commended. In 2009, the request for spring peak flows was 15,000 cfs for 5 consecutive days. Reclamation's flow management resulted in 15 consecutive days above 15,000 cfs. The base flow target was defined as average (1,400 - 2,400 cfs). Reclamation met the Program's request to release flows higher than the base flow target of 2,000 cfs through September 30. The purpose of this base flow release pattern was to hinder nonnative species and create better habitat conditions for young pikeminnow. The average flow in August and September was 2442 cfs, which is the upper flow for the average range (See graph in the RIPRAP tables.) Temperature recommendations were met in Reaches 1 and at the Yampa River confluence for the baseflow period. The flow recommendations, Flaming Gorge BO & ROD, and Study Plan directed Reclamation to operate Flaming Gorge to meet flow targets in Reach 2, with the assumption that this would be sufficient to meet the flow targets for Reach 3. This assumption may not be true under all hydrologic conditions; the Service is evaluating this.

- In 2009, the State of Utah determined that the subordination method of legally protecting flows for the endangered fish may not be feasible. The Recovery Program's Water Acquisition Committee and the Utah's State Engineer's office formed a task force to develop other options for protecting fish flows on the Green River, and modeling and other work are moving forward. (See February 10, 2010, letter from Utah State Engineer, Kent Jones, to the Service, attached.) The task force is now focusing only on the technical aspects of this issue and Utah has established a separate group to address the policy considerations. Commitment from the State is strong, but concerns remain regarding putting flow protections in place in a timely fashion.

  ACTION ITEM (3): By September 30, 2010, the State of Utah will identify the legal and technical process and schedule to protect recommended year-round flows for the endangered fishes in the Utah.

- Completion of flow recommendations for the Price River has been delayed for several years. Work to identify the flow needs of endangered fish in the Price River was begun 1996 and 1997. Unfortunately, the gaging station at Woodside, Utah was inoperable

during 1996 and 1997 and therefore comparison between fish habitat use and flow was compromised. Utah Division of Wildlife Resources (UDWR) initiated a follow up study during 2004 and 2005 to strengthen the basis for a flow recommendation, however during those drier years only one pikeminnow was collected. Based on transect work at various riffles throughout the Price River, UDWR determined that a flow of 53 cfs would be required to allow unrestricted passage of adult Colorado pikeminnow. That metric served as the basis for a minimum flow recommendation presented in a draft report (Walker et al. 2006). The Program Director's office reviewed the draft in February 2007, it was discussed by the Biology Committee in April 2007, and a determination was made that sufficient data were lacking for a base flow recommendation. Utah Division of Wildlife Resources was asked to work with the Service to build a recommendation based on historical hydrological data from the Price River or a surrogate drainage. In August 2008, the Program Director's office proposed to complete this effort in the form of a position paper (or similar construct) on endangered fish flow requirements in the Price River. Good progress has been made on the position paper, but other priorities have so far prevented completion.

ACTION ITEM (4): The Program Director's office will complete the Price River position paper and submit it for Biology Committee review by September 1, 2010.

- Recovery Program participants are still investigating and discussing if and how the Tusher Wash diversions near Green River, Utah, should be screened to prevent endangered fish entrainment.

  ACTION ITEM (5): The Biology Committee (assisted by an ad hoc technical group) will analyze existing data to understand impacts and what could be gained by various screening options at Tusher Wash and make a final recommendation to the Management Committee by December 31, 2010.

<u>Green River Subbasin – Yampa River</u>

- Elkhead Reservoir stakeholders and managers worked together to release and carefully manage 5,000 af of water to help meet the Recovery Program's flow request for endangered fish from August 13 to September 30, 2009. Flows were maintained at an average of 199 cfs during the August 13 – September 30 release period as part of an experimental effort to benefit native fishes and hinder smallmouth bass recruitment. In 2009 adult smallmouth bass (>200mmTL) densities in Little Yampa Canyon and in Lily Park (historically the two highest density reaches in the Upper Basin) were at their lowest levels since intensive removal began in 2004.

- In 2008, the Colorado Division of Wildlife (CDOW) committed to complete an Upper Yampa River northern pike strategy by July 2008 and the Yampa River Aquatic Management Plan by May 2009 (still pending). An outline of the strategy was provided prior to 2009 annual researchers meeting and the full strategy will be made part of the Aquatic Management Plan. Meanwhile, Colorado continues to proactively manage problematic nonnative fishes in the Yampa River and is targeting northern pike sources

- Working with a Craig, Colorado landowner toward possible eradication of northern pike from two oxbow ponds that periodically connect with the Yampa River;
- Removal of northern pike from backwaters along the mainstem Yampa River in the Steamboat Springs area using gill nets (~100), Haymaker GC connected pond via electrofishing and gill nets (~150), and Yampa River backwaters via electric seine (~125);
- Construction of a barrier to preclude pike migration to/from off-channel waters during peak runoff events;
- Completion of habitat work on Phase II of the Chuck Lewis SWA River Reclamation Project (with Phase III in planning);
- Negotiations begun with private property owner to study and potentially remove a resident northern pike population from a 10-acre lake that connects to the Yampa River;
- Removal of ~2,170 northern pike from Lake Catamount;
- Although no pike removal efforts are planned for Stagecoach Reservoir, annual gill net surveys show a declining northern pike population and agreements are in place between CDOW and the Upper Yampa Water Conservancy District to minimize northern pike recruitment in and escapement from Stagecoach Reservoir;
- Annual fall monitoring of escapement of nonnative fishes from Elkhead Reservoir;
- Week-long tag and release effort for smallmouth bass and northern pike planned for Elkhead Reservoir in July 2010 to better evaluate "resident" abundance and escapment;
- Sampling of Loudy-Simpson Pond to evaluate northern pike reproduction and and overwinter survival (October 2009 and May 2010);
- Reclamation of Craig Justice Center Pond due to concerns regarding the smallmouth bass mercury fish consumption advisory.

The CDOW provided a courtesy copy of their draft Yampa River Aquatic Management Plan in Sept. 2009. Signatories to the Nonnative Fish Stocking Procedures and other Recovery Program partners provided comments to CDOW by December 1, 2009, but CDOW is still working on responding to those comments and finalizing the plan.

ACTION ITEM (6): The CDOW will complete the Yampa River Aquatic Management Plan (with an Upper Yampa River northern pike strategy) by July 31, 2010. The Program will use this strategy and available information to evaluate the need for additional northern pike control upstream of Hayden to Steamboat Springs.

- Researchers continue to recapture some nonnative fish which were translocated to Elkhead Reservoir as part of nonnative fish management efforts. The CDOW is reviewing the recapture data in 2010, and the smallmouth bass smallmouth bass population dynamics modeling (programmatic synthesis) being conducted by Colorado State University also will help evaluate this problem.

  ACTION ITEM (7): Based on their analysis of smallmouth bass recapture information, CDOW and the Recovery Program must decide, prior to the 2011 sampling season, if Elkhead Reservoir can continue to serve as a translocation site for smallmouth bass removed from the Yampa River.

Green River Subbasin – Duchesne River

- The Central Utah Water Conservancy District (CUWCD), the Duchesne Water Conservancy District and other water users (Duchesne River Work Group -- DRWG) continue to cooperate to provide and shepherd available water to meet the Duchesne flow recommendations. Rehabilitation of Myton Diversion, completed in early 2009, has enhanced the ability to meet target flows for endangered fish in the lower Duchesne River.

  ACTION ITEM (8): In cooperation with the Service, the CUWCD will draft a water management report (chronicling how flow recommendations have been met over the past 5 years, describing yearly efforts, available water and evolution of past operations [release triggers, etc.]) This report will replace the "water management plan" that the 2005 Biological Opinion called for by December 2009. A second or third draft will be presented at the fall 2010 DRWG meeting. The DRWG will continue to examine the feasibility of other options for obtaining water.

Green River Subbasin – White River

- Water depletions in the White River drainage are considered relatively minor, currently estimated to be 5 percent of the annual yield. The *White River Base Flow Study, Colorado and Utah, 1995-1996* was finalized in 2004 and identified three base flow requirements which corresponded to Colorado pikeminnow passage and riffle productivity. They determined: a) flows > 300 cfs were required to pass Colorado pikeminnow over all measured riffle transects; b) when flows dropped to 161 cfs 50 percent of riffle wetted perimeter is lost (productivity would be severely compromised); and c) at flows of 400-500 cfs, 95 percent of riffle wetted perimeter is available (near maximum productivity). The report identified uncertainties/shortcomings related to lack of variability in study flows (raising questions about habitat type estimates), use of habitat suitability curves developed on the Yampa, instead of the White River; and lack of year-round flow recommendations. In August 2008, the Program Director's Office agreed to: a) work with the Service and quickly provide the Biology Committee a draft addendum to the White River report presenting the measured flow requirements in a historical hydrologic perspective (to show that 300–400 cfs frequently is achievable and that the level of development in the White River drainage does not necessitate dropping to the lower target of 161 cfs); and b) research the status of the draft Schmidt and Orchard report on peak (channel maintenance) flows and recommend whether to have it reviewed by the geomorphology panel.

  ACTION ITEM (9): The Program Director's office will complete the addendum to the White River report and provide a status update and recommendation on the draft Schmidt and Orchard report on peak (channel maintenance) flows for Biology Committee review by December 31, 2010.

Upper Colorado River Subbasin – Colorado River

- Recovery Program participants continue to successfully coordinate releases and augment peak and base flows for the endangered fish in the Grand Valley area through coordinated reservoir operations and management of the Historic User Pool. For peak flow augmentation, 42,783 af was released, which was the largest release since Coordinated Reservoir Operations (CROS) began in 1997. A total of 106,022 af was added to baseflow in water year 2009: 56,290 af from Green Mountain (including Grand Valley Water Management); 20,822 af from Ruedi Reservoir, 5,411 af from Williams Fork Reservoir, 8,747 af from Wolford Mountain Reservoir, and 11,607 af from the Palisade Bypass Pipeline. 2009 was one of 6 years out of the last 20 in which an attempt was made to meet the base flow high flow target of 1,630 cfs.

- East slope and west slope water users cooperatively analyzed and compared a wide range of alternatives to meet their obligations to provide 10,825 af of water to the 15-Mile Reach on a permanent basis. After reviewing 25 alternatives, east and west slope water users reached consensus on the "Lake Granby-Ruedi" alternative. A National Environmental Policy Act process has been initiated by Reclamation with water user participation and support; expected completion is early 2011. Interim agreements to continue delivery of the 10825 water will be extended to allow time for implementation of the permanent sources. Agreements to provide the permanent sources are pending.

- Despite these accomplishments, Colorado River flow recommendations are not currently being fully met due to the near 9-year drought. Even with the prospect of future water savings via the Orchard Mesa Irrigation efficiency project, the Service believes the loss of 10,825 af from Ruedi Reservoir (under the agreement which expires in 2012) is a concern for the Recovery Program.

  ACTION ITEM (10): Implementation of CROS provided good peak flow augmentation in 2009; however, some constraints on operations due to flooding concerns may remain. The CROS working group will consider Cameo flood guidance to maximize benefits of CROS operations for endangered fish habitat.

  ACTION ITEM (11): Work on CFOPS has resumed and the Phase III CFOPS report will be completed by September 30, 2010.

  ACTION ITEM (12): Close 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 (13): The 15-Mile Reach PBO requires agreement(s) for permanent sources of the “10,825” water by June 30, 2010. Water users will extend existing interim agreements through 2013 (and another 2 years, if necessary) until the permanent water is

in place. They also are preparing permanent agreements (were due June 30, 2010), which propose to provide water from Ruedi and Granby reservoirs (contingent upon the various steps that still need to occur). The water users will provide water from interim sources until that time. The permanent agreements currently are in draft and being reviewed by the Service. Work will continue on the National Environmental Policy Act process for the permanent water from Ruedi and Granby reservoirs to be completed in early 2011.

- Fish passages and screen operation are going well and Reclamation and facility operators continue to address problems as they arise. An evaluation of the feasibility of installing passive PIT-tag monitoring at the Price-Stubb passage evaluation was completed in 2009 and a system will be installed in 2010 to remotely track tagged fish using the passage.

  ACTION ITEM (14): Condition of fish passing through the return pipes in the Grand Valley area fish screens has never been evaluated. The Program Director's Office will work with the Service and Reclamation to prepare a white paper on this issue and work with the Biology Committee to develop recommendations for conducting an evaluation in Fiscal Year 11 or 12.

  ACTION ITEM (15): Biennial scopes of work and annual reports are needed from *each* fish screen/passage facility (Grand Valley Project, Grand Valley Irrigation Company and Redlands). The Program Director's Office will work with Reclamation and the projects' operators to make sure these are submitted in a timely fashion (each November for annual reports and April in odd years for 2-year scopes of work).

Upper Colorado River Subbasin – Gunnison River

- The programmatic biological opinion (PBO) for the Gunnison basin and draft Environmental Impact Statement (EIS) for Aspinall operations have been completed. The final EIS and ROD are behind schedule and the flow recommendations won't be implemented until they are finalized; however, the final EIS and ROD are expected before 2011 spring runoff. The PBO calls for a Study Plan to evaluate the effects of the proposed operations of the Aspinall Unit and how it improves habitat and thereby contributes to recovery. The Study Plan is to be completed by December 2010 and should focus on previously identified uncertainties related to geomorphic processes, floodplain inundation, and temperatures (as described in the "Uncertainties" section of the PBO). The Study Plan also should include an evaluation of the effects of reoperation on critical habitat in the Colorado River from the Gunnison River confluence to Lake Powell. It will identify Program responsibilities for the PBO conservation recommendation that the Recovery Program initiate investigations to determine appropriate levels of selenium to insure recovery of Colorado pikeminnow and razorback sucker.

  ACTION ITEM (16): The Program Director's Office will work with the Biology Committee to craft a timeline/process for developing the Study Plan and to form a subcommittee to prepare the plan (similar to the plan developed for the Green River in 2007). The plan will be completed by December 2010.

D. Conclusion ("Sufficient Progress")

Recovery Program participants need to actively pursue completion of the aforementioned action items. The Service requests that responsibilities and timeframes be identified for each action item and regular progress reports be provided to the Management Committee on these action items and their effect on meeting RIPRAP schedules. 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 when implemented as Conservation Measures (i.e. part of the proposed action), the Recovery Program is making sufficient progress to continue avoiding the likelihood of jeopardy resulting from depletion impacts of new projects that have an annual depletion of up to 4,500 acre feet[2]. Projects exceeding 4,500 acre feet or that have direct or indirect effects in addition to water depletions will be evaluated to determine if they jeopardize the species' continued existence on a case by case basis.

The Service views the following as significant accomplishments: a) recent increases in the Green River adult pikeminnow population; b) the strong cohort of age-0 pikeminnow produced in the middle Green River in 2009; c) recent decreases in catch of smallmouth bass in many locations and their diminished reproduction over the course of the past 2 years; d) continued cooperation to manage spring and base flows throughout the basin; e) meeting razorback sucker and bonytail stocking targets; and f) successful razorback sucker spawning. However, the Service remains very concerned about recent downward trends in humpback chub populations in Desolation Canyon on the Green River, and now in Black Rocks on the Colorado River. The lack of progress on completion of the Research Framework and flow recommendations for the White and Price rivers as well as the extensive delay in establishing flow protection in the Green River by the State of Utah also are concerns.

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 to

[2] 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. The Gunnison River PBO covers all existing water depletions in the Gunnison River Basin (estimated annual average of 602,700 acre-feet/year) and future depletions up to 3,500 AF basinwide as well as future depletions up to 22,200 AF in the upper Gunnison Basin in accordance with the Upper Gunnison Basin Subordination Agreement and 12,200 AF in the Dallas Creek Project which has been contracted for but is not used at this time.

continue to aggressively pursue management actions to alleviate threats to the species, including: a) providing and protecting necessary flow and habitat conditions (including evaluation of flow recommendations); and b) reducing the abundance of problematic nonnative fishes so these downward trends are reversed. Finally, we encourage the Recovery Program to be an active participant in the development and implementation of the Southern Rockies Landscape Conservation Cooperative (co-led by the Service and Reclamation), which will attempt to address impacts of climate change throughout the Colorado River basin.

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)", this document 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 states: "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 (2010) 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 states: "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 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

GARY R. HERBERT
Governor
GREG BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Water Rights
KENT L. JONES, P.E.
State Engineer/Division Director

February 10, 2010

Julie Lyke
Deputy Assistant Regional Director
Ecological Services U.S. Fish & Wildlife Service
P.O. Box 25486, DFC,
Denver CO 80225-0486

Subject: Assessment of "Sufficient Progress" 2009—2010 on the Green River in the Upper Colorado River Endangered Fish Recovery Program.

Dear Ms. Lyke,

In the 2008-2009 "Sufficient Progress" letter (Green River sub-basin section) Action Item (4), the US Fish and Wildlife Service (Service) noted that the Utah's State Engineer's office was slightly behind schedule in legally protecting year-round flows for endangered fish recovery in the Green River. Utah has been working diligently to address this issue. In the fall of 2009 we hosted public meetings in Vernal, Price, Green River and Moab. The Fish and Wildlife Service, the State Engineer and several Utah water rights experts gave presentations. Feedback received indicated that year-round subordination of water rights was not acceptable to the public.

Although the State Engineer was able to accomplish this important objective by policy adoption in a rather uncontroversial Green River reach in 1994, without public support the state engineer would struggle to enforce the policy restriction requested for the remainder of the Green River under his existing administrative authority. Rather than have a legislative confrontation, the state engineer is seeking further clarification of exactly what conditions need to be protected as well as increased participation by the Recovery Program to do more than identify the water that it wishes to be protected but to participate in actions which would facilitate acquisition of a right to water under existing Utah law, so the state engineer can extend the legal protection anticipated.

Several factors influence Utah's ability to legally protect flows for the endangered fish in the Green River as requested. Concern over impact to existing undeveloped rights to the use of water under Utah's allocation in the Colorado River and the Recovery Program demands for protection of such a wide range of instream flows are fundamental issues. Uncertainty around water contract sales from Flaming Gorge Reservoir, considering the fact depletive uses were separated from the Flaming Gorge water right several years ago and have been re-allocated to other parties, also needs to be resolved. It is anticipated most existing, undeveloped rights will require change applications as they move toward development and new conditions for fish flow, imposed as a condition of approval, may severely limit flexibility as these rights move toward development. The fundamental premise, under which support from Utah for the recovery program was based, is cooperation to jointly work toward recovery of the fish and, at the same time, allow the states to pursue development of their compact

1594 West North Temple, Suite 220, PO Box 146300, Salt Lake City, UT 84114-6300
telephone (801) 538-7240 • facsimile (801) 538-7467 • TTY (801) 538-7458 • *www.waterrights.utah.gov*

allocation of the Colorado River. The current public perception that the Recovery Program now seeks to diminish that objective, notwithstanding the significant amount of water that must pass through the state without development (more than 8 million ac-ft, as compared to Utah's limited 1.4 million ac-ft Colorado River allocation) is complicating meaningful progress on the issues.

In November 2009, Utah Assistant State Engineer, Matt Lindon, formed a task force of stakeholders and experts (listed below) to identify alternative approaches to protecting flows for endangered fish in the Green River while respecting existing State water law and allowing for further development of Utah's entitlement of the Colorado Compact waters on Utah rivers.

Green River Utah Water Acquisition Team Members include:

Matt Lindon, Utah Assistant State Engineer, SLC, Team Leader
Boyd Clayton, Utah Deputy State Engineer
Robert Leake, Utah Regional Water Rights Engineer, Vernal
Gertrudys Adkins, PhD, Water Rights Engineer
Jana Mohrman, USFWS, Denver
Gene Shawcroft/ Jared Hansen, CUWCD, SLC
Robert King, Utah Division of Water Resources, SLC
Paul Abate/Larry Crist, Kevin McAbee, USFWS, SLC
Rob Harris, Western Resource Advocate
Mike Roberts/Robert Wiggington, The Nature Conservancy, SLC/Boulder CO
Ed Vidmar, Malcolm Wilson, Heather Patno, USBOR, SLC, Curt Pledger USBOR, Provo

The purpose of this Team of experienced, professionals and stakeholders is to propose, consider, prioritize and present all feasible options available to protect flows for endangered fish. Solutions implemented in other states, programs, drainages and rivers will all be considered and physical water sources will be evaluated. Physical, legal, local and political barriers will also be discussed. Sources of potential contract water and storage will be identified as well as potential funding sources. All technical tools and solutions will be consulted and considered including hydrologic river models, water right models, economic and environmental evaluations as well as present and future atmospheric considerations.

Alternatives to analyze:

Determine volume of water needed to provide for the full range of flows.
Determine flow and volume of water available on a statistical basis
Determine approved and unapproved water right commitments
Model supply and demand scenarios on the river with fish flows and water rights demands
Quantify full measure of Colorado Compact Entitlements for future demands
Demonstrate systems natural ability to deliver high flushing flows on the prescribed basis
Consider potential limitation of upstream transfers of unperfected rights
Consider potential limitation of new storage projects in basin
Review abandonment rule for 50 years of unperfected claims
Coordinate use of contract water from Flaming Gorge with various entities such as the Lake Powell - St George Pipeline water.

The Utah State Engineer currently has four tools to protect instream flows. The declarative method relies on "instream flow" being considered as the purpose of use in a perfected water right change application approved by the Utah State Engineer, providing a legal basis for the flow as a characteristic of the water right. Secondly, the restraint method assumes that water must pass through a section of stream to satisfy obligations downstream. The third mechanism is agreement among water users to allow an instream flow to occur, often supported by an appropriation policy declaration from the State Engineer. The fourth is a finding that granting a water right application would unreasonably affect the natural stream environment and/or be detrimental to public welfare. It is assumed a combination of solutions within this framework will be necessary to accomplish the stated objective. Kent Jones, the Utah State Engineer, will present selected solutions for public input as they are identified.

By the end of 2010, we hope to have proposals for protection of instream flows necessary for the recovery of endangered fish. We do not know at this time the scope of actions which will be required to secure the protection requested. While it would be convenient if something as simple as an administrative order would secure the rights for such protection we note that has not been the case in our sister states and likely will not be the totality of the solution in Utah. Depending on the acquisition constraints implementation could come by the end of 2011 but could continue into at least 2012. We will be working closely with the Recovery Program Director's office and the Green River Utah Water Acquisition Team to recommend changes reflecting this process in the Green River flow protection portion of the RIPRAP so that the Recovery Program can consider these recommended changes in its upcoming RIPRAP review/revision.

We hope this update will be helpful as you assess progress of the recovery program as measured by accomplishing RIPRAP goals. We note that although there have been disappointments with the protection effort the reality is flows for the fish have been and are in the river. We anticipate continued cooperation among the water users, state and local government to see that flows for the fish continue even as we work to legally protect them. This is a complicated endeavor and we appreciate your support and assistance. Please do not hesitate to call Matt Lindon or myself at 801-538-7481 for further information or discussion on this topic.

Sincerely,

Kent Jones, PE
State Engineer

Cc: Jana Mohrman, USFWS

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. Colorado is nearing completion of their revised Yampa River Aquatic Management Plan. SOW #140 to evaluate response of native fishes is ongoing, with sampling broadened to in anticipation that larger scale removals and environmental effects such as higher water or lower temperatures may lower predator abundance in the study reach and elicit a native fish response.	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)	The PBO brackets Elkhead releases between 78-138 cfs for July-Oct and 109-169 cfs for Nov-Feb. In 2009, the target was 134 cfs to recognize the variability in the Modde et al. 1999 datasets. Furthermore, the Recovery Program and the District recognized the need to experiment with higher baseflow targets to assist with native fish recruitment and to hinder nonnative species. All 5,000 af of Program's 5,000 af pool released between August 13 and September 30. For experimental purposes, flows averaged 199 cfs in order to benefit native fishes and hinder smallmouth bass recruitment. 2008: Minimum instream flow target increased from 93 cfs to 134 cfs. Release of all 5,000 af of our 5,000 af pool between August 22 and October 10. For experimental purposes, flows were kept above 200 cfs, with an average of 293 cfs in order to disadvantage smallmouth bass recruitment. CWCB & USGS transit loss study report (to improve river administration) due in 2010.	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 2008 or 2009.	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

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
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. WY to submit their depletions memo to the Pgm before July 1. CO will complete a Watershed Flow Evaluation Tool analysis for the Yampa-White Basin in Jan 2011. CO plans to use StateCU to estimate 1975–2009 annual consumptive use (depletions). Due to changes in state data sets and models, CO expects numbers to change from the Yampa Mgmt. Plan. Therefore, CO will create a Consumptive Uses & Losses Report for 1975-2009, compare those to the old 1975-1998 numbers, and compare their new estimates for 1975–1998 to 1999–2009. CO not currently planning to use StateMod (Apx. E text suggests either model can be used, but then the numbered points in the back suggest both are needed). Yampa StateMod goes through 2006 & won't be updated until CRWAS Phase II (on hold due to budget conditions). CWCB can update StateCU and complete depletion accounting by 7/1/10. As more depletions occur, there will be greater reason to use StateMod, but at this point, CWCB believes StateCU is adequate.	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 revised April 2009).	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.	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)	Outlet tower screens up to 540 cfs of spring runoff to reduce nonnative fish escapement from the reservoir.	CM: 14
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 occuring and will be evaluated through the CSU programmatic smallmouth bass synthesis.	CM: 14

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
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	NP through '07 shifted the size to smaller individuals; in '08 and '09 the overall abundance in critical habitat was near its lowest level (see graph). CDOW provided a NP management strategy outline prior to '09 researchers meeting. SMB removal now occurs throughout critical habitat. In '09 adult SMB densities in Little Yampa Canyon and in Lilly Park (historically the two highest density reaches in the Upper Basin) were at their lowest levels since intensive removal began in '04; however, substantial reproduction occurred in '07. Changes for '10: 1) Intensive sampling during SMB spawning to target '07 cohort reaching maturity; and 2) identifaction of distribution and relative abundance of YOY SMB in Middle Yampa River (to help evaluate effectiveness at nest disruption & identify other possible spawning concentrations). 2003-2007 Yampa SMB synthesis report completed Feb '09 (Hawkins et al); northern pike report pending. Average flows in '08 and '09 in the Yampa, Green, and Colorado rivers appear to have negatively affected SMB reproduction.	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	Removal efforts shifted primarily towards bass in 2007. Large catfish (<400 mm TL) also are being removed since studies have found increased piscivory in channel catfish at mean total lengths >~400mm. SMB population estimate declined from 2008. 2009 SMB removal resulted in a 30% exploitation rate for subadults and 37% for adults; adding removed bass to the estimates result in a 40% subadult; 51% adult exploitation rate. 2010 priority is to remove as many spawning adult SMB as possible given the large '07 cohort of SMB recruiting to spawning size. 2001-2006 synthesis report completed March 2009 (Fuller).	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. The Recovery Program prepared and implemented a comprehensive communications plan to raise public awareness of the purpose and nature of nonnative fish management. After deliberation with the Colorado Division of Wildlife, it was determined that public meetings were not needed in 2009. In 2010, a concerted effort will be made to raise awareness about the Recovery Program in the Yampa River Basin through activities such as: exhibits with an aquarium at the Routt and Moffatt county fairs; participating in or providing materials for the Community Ag Alliance tour; and more. The Recovery Program has been working with the River 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 and will be installed in the summer of 2010.	T&C 5: 70

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
		Green River (includes Yampa River) pikeminnow population estimate report (Bestgen et al 2010) completed. Increasing trend detected in Green River 2006-2008, but researchers caution that populations fluctuate. Abundance of adult Colorado pikeminnow was stable and low in the Yampa River specifically during the 2006 to 2008 period, but populations showed continued decline since 2003. Refuge plan developed for Yampa humpback currently in captivity. Ouray NFH currently maintaining 21 humpback; humpback from *Gila* being held at Mumma facility to be moved to Ouray as soon as they are large enough to positively identify. Capture of addiitional age-0 *Gila* from the Yampa River is on hold pending NEPA compliance.	RPM: 68
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 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	Researchers report a small positive response by native fishes in 2008 and 2009 (see graph on next worksheet). Reach-wide response likely due to flow/temp benefit; higher treatment reach response likely due to nonnative fish removals. Report on 2003-2009 results due 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	Green River (includes Yampa River) pikeminnow population estimate report (Bestgen et al 2010) completed (see above). Two stocked razorback suckers were recaptured in the Yampa River in 2009 (one in Lily Park and one in Yampa Canyon, both originally stocked in the Green River in 2004). This is the first time razorback have been captured in the Yampa River in nearly 30 years. Stocked razorback evaluation report completed April '09 (Zelasko et al); results being used to guide future stocking efforts. Analysis showed that first-year survival is increased by stocking razorback >12" in fall through spring. Further analysis of 4 years of data of fish stocked under the Integrated Stocking Plan is underway.	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 (see graph).	T&C 6.d: 70
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	UDWR captured 325 Age-0 CPM via standardized monitoring throughout 110 miles of the Middle Green River - the greatest number captured since 1991. An additional 316 age-0 CPM were captured during native fish response sampling).	T&C 6.e: 70

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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.		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 smallmouth 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 rows 22 and 23, above. Data are reviewed annually in nonnative fish workshop. All but one synthesis report complete. Next round of synthesis reports (through 2010) to be prepared in 2011. A programmatic synthesis / evaluation of the Recovery Program's approach to smallmouth bass control was contracted with CSU in 2009; preliminary results expected in 2010.	T&C 6.a: 70
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; new Ouray NWR manager improving landowner contacts.	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

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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	Report on 2007-2008 Maybell Ditch entrainment investigations completed, but results somewhat inconclusive. Based on BC recommendations, PD's office has recommended installing a PIT-tag reader in the Ditch. PD's office will coordinate with FWS and Ditch owners on next steps.	CM: 16; RPM: 68; T&C 2: 69
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 further 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	The Recovery Program continues to stock tagged bonytail subadults in the Green and upper Colorado River subbasins (see graphs). During 2009, CDOW stocked 451 (60.1/lb and 3.81") 199 (9.9/lb and 6.94") 913 (2.56/lb and 10.91") bonytail into Butch Craig Pond, 2,707 (3.76/lb and 9.6") into Echo Park, 1,576 (2.76/lb and 10.64") were stocked into Colorado River site #1 and 1,000 (2.95and 10.41") into Colorado River site #2 on 11/5/09 making the grand total of 6,846 stocked by CDOW in 2009.	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	The Recovery Program continues to stock tagged razorback sucker (see graphs). Two stocked razorback suckers were recaptured in the Yampa River in 2009 (one in Lily Park and one in Yampa Canyon, both originally stocked in the Green River in 2004). This is the first time razorback have been captured in the Yampa River in nearly 30 years. Stocked razorback evaluation report completed April '09 (Zelasko et al); results being used to guide future stocking efforts. Analysis showed that first-year survival is increased by stocking razorback >12" in fall through spring. Further analysis of 4 years of data of fish stocked under the Integrated Stocking Plan is underway.	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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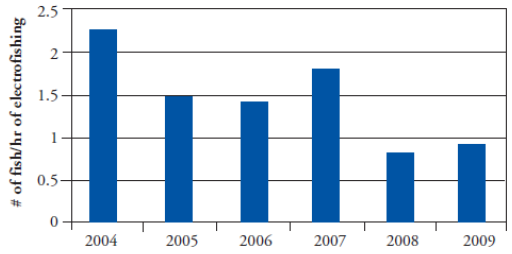
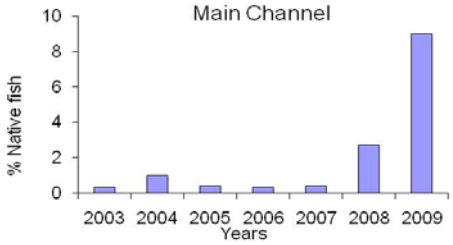
The Recovery Program will coordinate with the U.S. Geological Survey (USGS) to review and compile past data at the priority sites and begin collection of suspended sediment data at USGS stream flow gages on the Green River at Jensen, Utah, and on the Gunnison River at Whitewater, Colorado. Other sediment 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 was completed in 2008 and the technical series report is in review with a final report to be completed in early 2011.	CM: 18

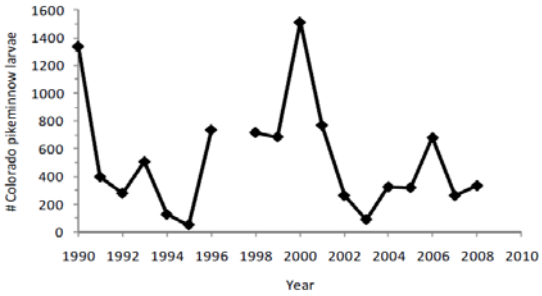
Northern Pike Catch Rates, Yampa River



A declining catch rate for adult, nonnative northern pike (larger than 12 inches) in a 70-mile reach of the Yampa River, Colorado.



Percent native fishes, main channel, Yampa River, 2003-2009



Colorado pikeminnow larvae captured 1990 - 2008 (no sampling in 1997) in the lower Yampa River

Program's Performance to Meet Annual Bonytail Stocking Goals (%)

	Green River		Colorado/Gunnison Rivers
	Middle	Lower	
2005	112	58[1]	114
2006	95	61	104
2007	101	101	105
2008	143	100	111
2009	101	100	95

Shaded cells indicate years when stocking goal was not met (i.e., <100%)
[1] Fish were stocked in other locations.

Facility	River	Taget	Stocked	Percent
Wahweap	Middle Green	2,665	2,696	101%
	Lower Green	5,330	5,347	100%
	Colorado	2,665	1,596	60%
Ouray	Middle Green	2,665	2,707	102%
	Colorado	2,665	3,489	131%

Programs' Performance to Meet Annual Razorback Sucker Stocking Goals (%)

	Green River		Colorado/Gunnison Rivers	San Juan River
	Middle	Lower		
2005	49[1]	43[1]	117	18[2]
2006	102	104	116	164
2007	111	86	102	203
2008	118	102	130	39[3]
2009	151	51[1]	181[4]	135

Shaded cells indicate years when stocking goal was not met (i.e., <100%)
[1] Bird predation at ponds reduced production.
[2] Inclement weather impeded pond harvest.
[3] The additional fish to meet the annual river target were held over at Uvalde National Fish Hatchery. These fish will be stocked in the San Juan River in 2009 and 2010 to study survival rates of larger stocked fish.
[4] Permit not in place for Grand Valley to stock at Green River, Utah; therefore fish were stocked into Colorado and Gunnison rivers.

Razorback sucker stocked by River 2009

Facility	River	Taget	Stocked	Percent	
Grand Vall	Upper Colorado	6,620	13,914	210%	
	Gunnison	3,310	4,061	123%	
	Lower Green	4,965	0	0%	(Fish stocked into Upper Colorado, instead)
Ouray	Middle Green	9,930	13,256	133%	
	Lower Green	4,965	5,017	101%	