



# Upper Colorado River Endangered Fish Recovery Program

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## Memorandum

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

From: Regional Director, Region 6 

Subject: Final 2011—2012 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) is reviewing 2011—2012 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 uses 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 March 21, 2012, assessment of accomplishments and shortcomings of the Recovery Program under the Recovery Implementation Program Recovery Action Plan (RIPRAP) from March 1, 2011, through February 1, 2012, is incorporated in the tables to the RIPRAP found at <http://www.coloradoriverrecovery.org/documents-publications/foundational-documents/RIPRAP/RIPRAP03-21-12.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 13, 2011.

**A. Status of the Species in the Upper Basin**

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<sup>1</sup> of razorback sucker and bonytail in the upper Colorado and Green river systems. The Recovery Program implemented a revised, integrated stocking plan ([Nesler et al. 2003](#)) with the goal of establishing self-sustaining populations of razorback sucker and bonytail in the Upper Colorado River Basin 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. 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 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 with qualified statisticians and population ecologists. Draft revised recovery goals for the Colorado pikeminnow and humpback chub require the Service to evaluate annual point estimates for each population in order to determine if the estimates are accurate, precise, and reliable. The Service accepts the Colorado pikeminnow and humpback chub estimates described below as the best available information. However, we recognize that trends for some of these populations have declined since the first estimates were made, and that downlisting does not occur until the demographic criteria are met.

A draft report summarizing razorback sucker and bonytail stocking and recapture data was 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 were warranted. A report from that study was accepted by the Program ([Zelasko et al. 2009](#)) along with a request to extend the evaluation to razorback sucker data collected from 2004 through 2008 (Zelasko et al. 2011). The 2011 report had similar results, including a recommendation not to stock during the summer and stock larger sized fish to increase chances of survival. Many of the recommendations from these two reports are being implemented. A [razorback sucker monitoring plan](#) has been drafted 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 initiated in the lower Green River in 2009.

Recaptures of stocked bonytail have been too few to date to support a similar analysis of their survival (Bestgen et al. 2008). The Program is experimenting with alternative stocking locations

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<sup>1</sup> 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](#).

(primarily floodplain habitats) and is considering alternative hatchery techniques (e.g., pre-release conditioning, larger stock size) to improve bonytail survival.

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 and population dynamics. An *ad hoc* group of species experts reviewed information presented at the workshop and prepared a final report (with recommendations; [UCREFRP 2006](#)) 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 in order to maintain their genetic material and potentially develop broodstock should stocking be needed to achieve recovery, and conducting a more robust, combined analysis of data collected in Black Rocks and Westwater Canyon. The Recovery Program has tasked an *ad hoc* group with making recommendations with regard to humpback chub populations, addressing potential hybridization, the need for broodstock, and alternative hypotheses for each life stage.

Recovery goals contain specific demographic criteria to maintain self-sustaining populations and recovery factor criteria to minimize/remove threats to the species. A minimum viable population is identified for each species as a gauge for recovery. In addition, key requirements of the population criteria are no net loss of fish over established monitoring periods, and recruitment of young fish into the adult population must occur at a rate to maintain the population.

As result of a Conservation Measure included in the Service's 2011 Biological Opinion on Glen Canyon Dam Operations (USFWS 2011), Reclamation has entered into an agreement with geneticists at Dexter National Fish Hatchery and Technology Center (DNFHTC) to genotype the humpback chub refuge population held at DNFHTC. Their objectives include estimating a genetic effective population size ( $N_e$ ) and effective/census size ( $N_e/N$ ) ratio. As these metrics serve as the basis for calculation of minimum viable population size included in the recovery goals, the results of this genetic work could have bearing on those demographic criteria.

### Colorado pikeminnow

Population estimates for adult ( $\geq 450$  mm total length [TL]) Colorado pikeminnow were started in 1992 on the Colorado River from the Price-Stubb Diversion to the confluence with the Green River, with a regime of three years of estimates and two years of no estimates. Those estimates have generally been increasing (Figure 1), although the overall trend is not statistically significant. The downlisting demographic criteria for Colorado pikeminnow in the Upper Colorado River Subbasin is a self-sustaining population of at least 700 adults maintained over a 5-year period, with a trend in adult point estimates that does not decline significantly. Secondly, recruitment of age-6 (400–449 mm TL; Figure 2) naturally-produced fish must equal or exceed mean adult annual mortality (estimated to be about 20%). In order to maintain

an adult population of 700 it would require on average 140 age-6 fish to be recruiting to the adult life stage. The averages of adult and recruitment-age estimates are 658 and 134 respectively. Trends in both adults and recruits are positive, and this population has been relatively stable since monitoring began.

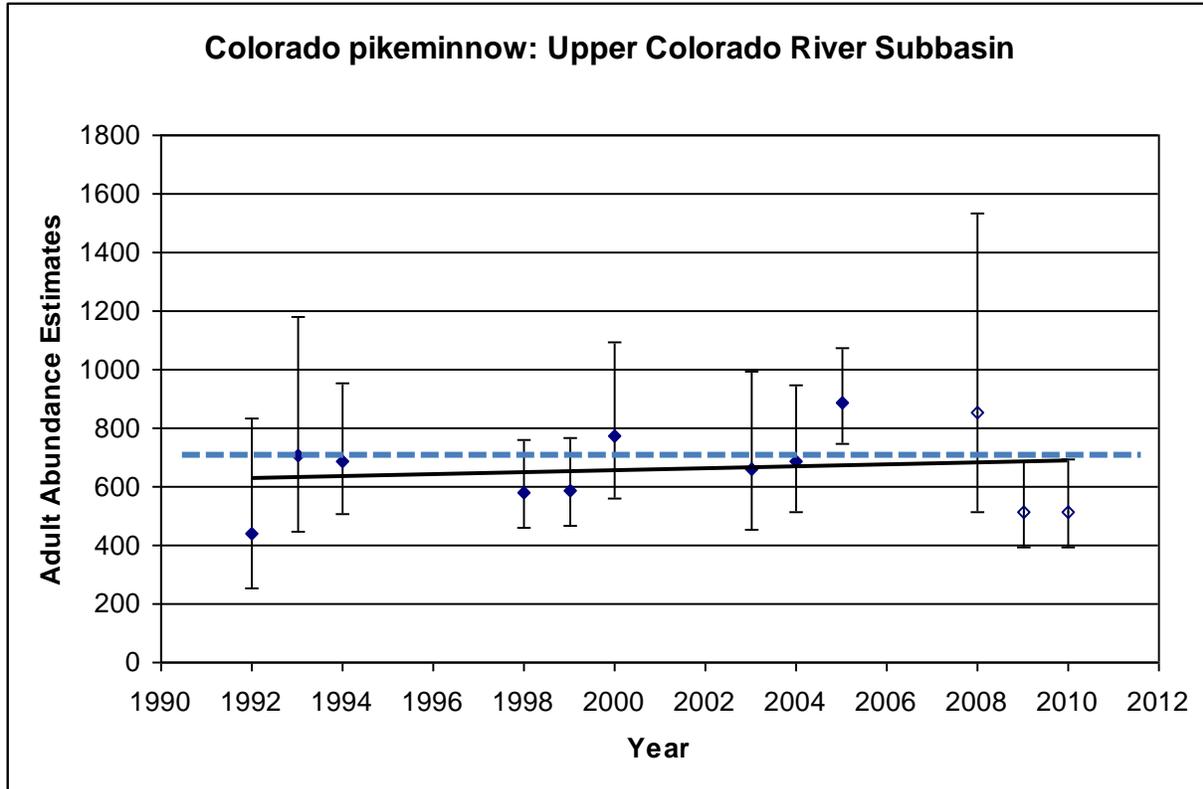


Figure 1. Adult Colorado pikeminnow population abundance estimates and trend for the Colorado River (Osmundson and Burnham 1998; [Osmundson and White 2009](#); D. Osmundson, U.S. Fish and Wildlife Service, personal communication). Error bars represent the 95% confidence intervals. Estimates are preliminary for the last three years (2008–2010). Dashed horizontal line represents the current population size downlist criterion.

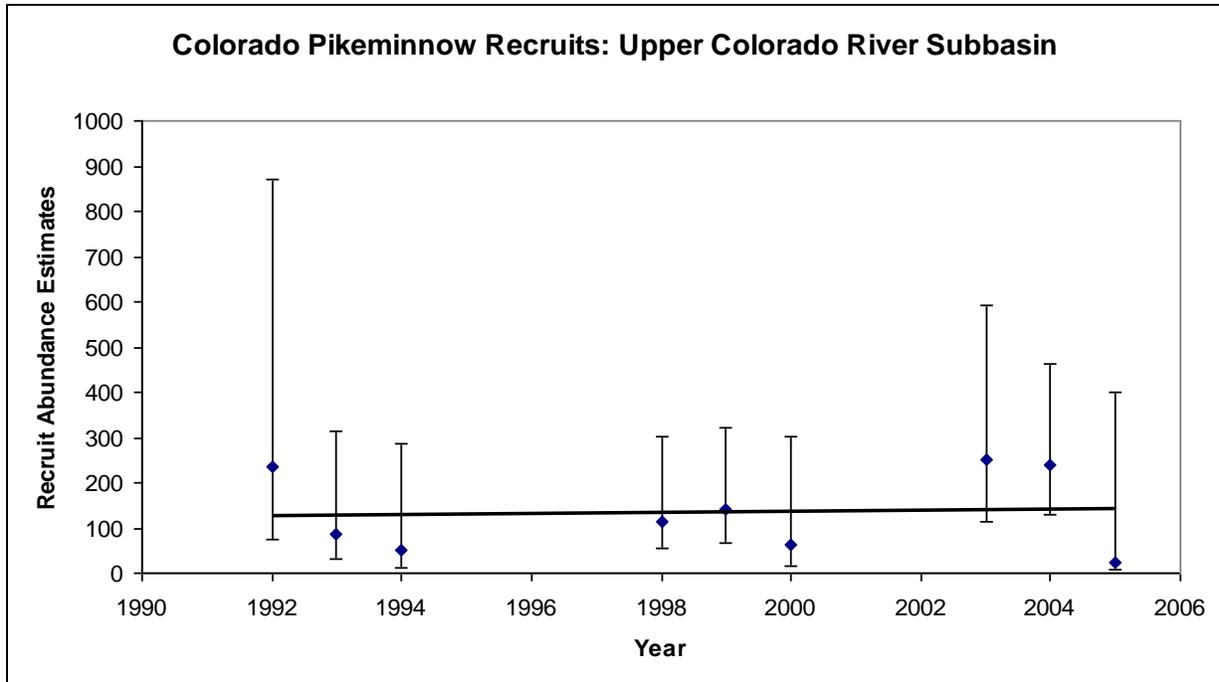


Figure 2. Colorado pikeminnow recruitment abundance estimates and trend for the Colorado River (Osmundson and White 2009). Error bars represent the 95% confidence intervals. The principal investigator had not calculated estimates of recruitment-sized fish for 2008-2010 at the time this memo was drafted.

Population estimates for adult Colorado pikeminnow in the Green River subbasin began in 2000. Sampling occurs on the mainstem Green River from the Yampa confluence to the confluence with the Colorado River and includes the Yampa and White Rivers. The initial year of sampling did not include the lower Green River (near the confluence of the White River to the confluence with the Colorado River). Beginning in 2001, the sampling regime has consisted of three years of estimates followed by two years of no estimates. The first set of estimates showed a declining trend; however, more recent estimates have shown an increasing trend approaching the level of the estimate made in 2000 (Figure 3). The confidence intervals indicate no statistically significant difference among the estimates. The downlisting demographic criteria for Colorado pikeminnow in the Green River Subbasin require that separate adult point estimates for the middle Green River and lower Green River do not decline significantly over a 5-year period, and each estimate for the Green River subbasin exceeds 2,600 adult (estimated minimum viable population [MVP] number). The average of the adult estimates is 3,020. In addition, the recruitment of age-6 naturally-produced fish must equal or exceed mean annual adult mortality. In general, the estimates of recruitment age fish has been an average of 455 fish and has had a positive trend (Figure 4) with the more recent information exceeding the annual adult mortality of about 20%.

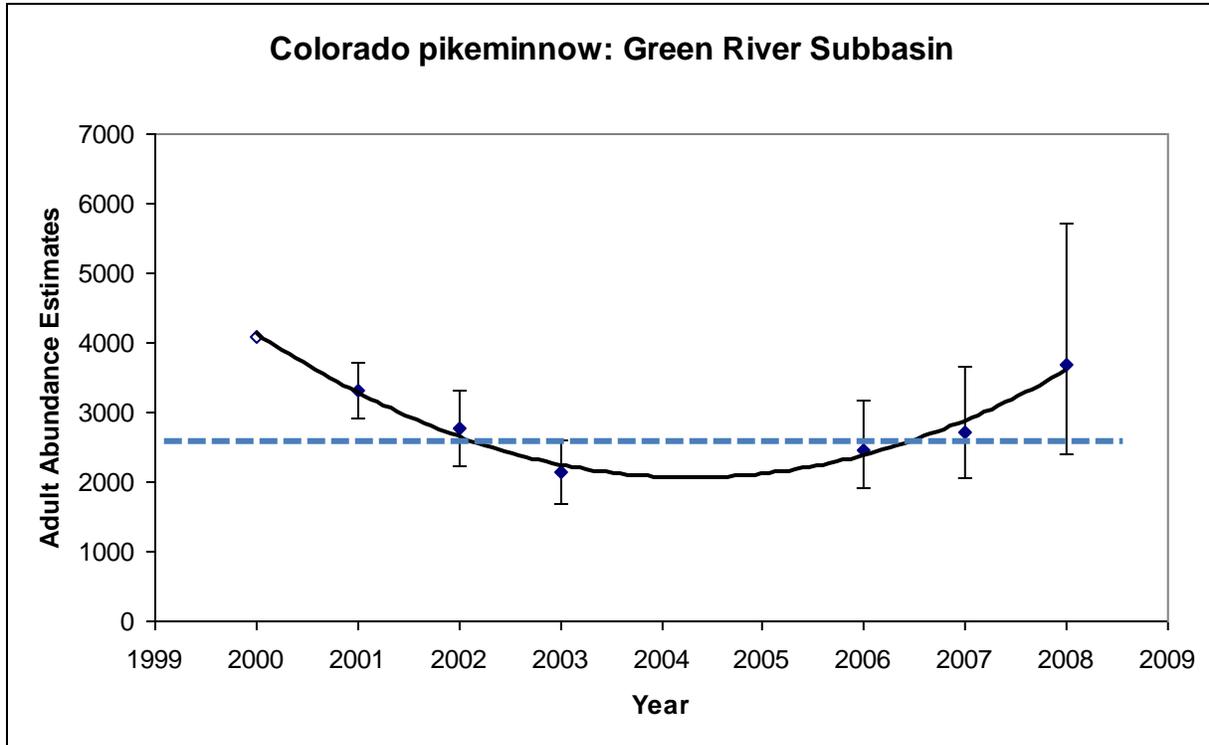


Figure 3. Adult Colorado pikeminnow population abundance estimates and trend for the Green River (Bestgen et al. 2007, 2010). Error bars represent the 95% confidence intervals. The estimate in 2000 was calculated differently because the lower Green River was not sampled that year, the number reflects what it might have been had the lower Green been sampled. Dashed horizontal line represents the current population size downlist criterion.

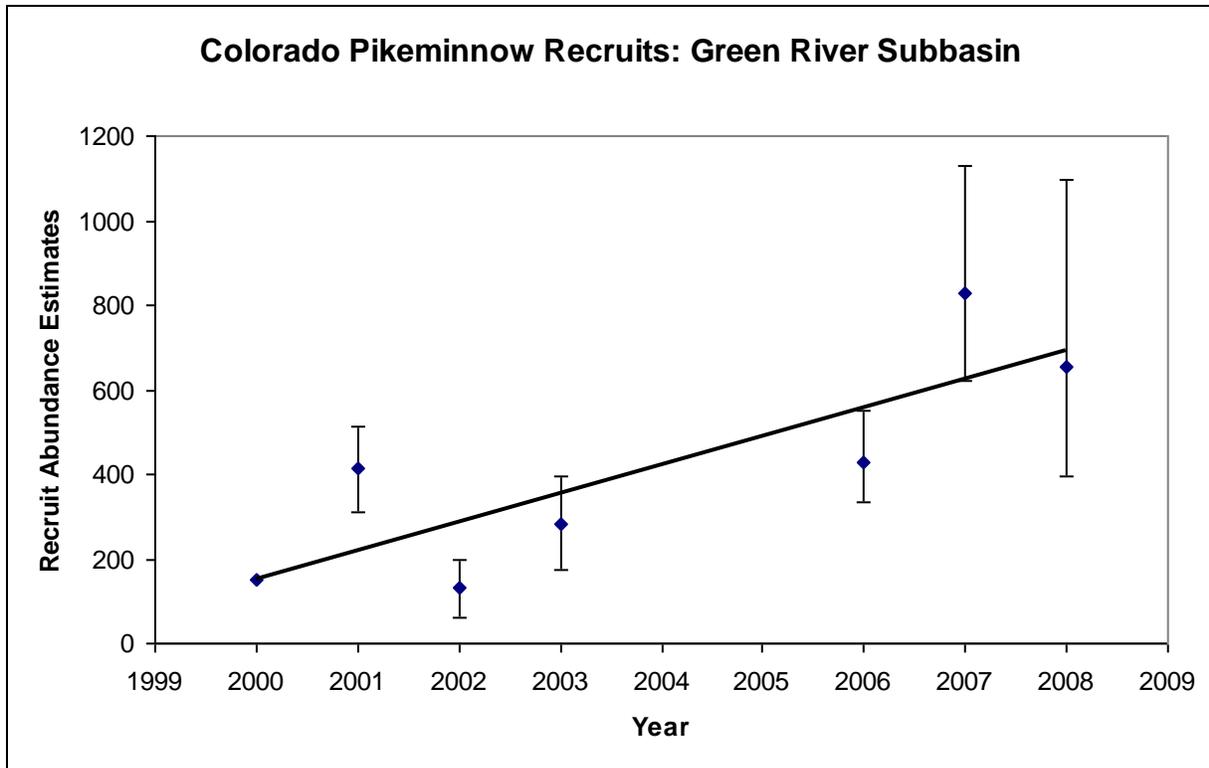


Figure 4. Estimated numbers of Colorado pikeminnow recruits (400-449 mm TL) in the Green River subbasin (Yampa, White, Middle Green, Desolation-Gray Canyons, and Lower Green) for 2001–2003 and 2006–2008. Error bars represent the 95% confidence intervals. Data from Bestgen et al. (2010).

Reproduction in Colorado pikeminnow as reflected through young of year abundance can often identify strong year classes. Numbers were lowest from 2001 through 2008, and again in 2011 (Table 1).

Table 1. Numbers of young of year Colorado pikeminnow collected each year from three different habitat reaches of river. Data from [Badame et al. 2010](#).

Year	Middle Green River	Lower Green River	Lower Colorado River
1986	492	813	192
1987	209	849	176
1988	885	2892	172
1989	62	1494	132
1990	341	418	179
1991	524	186	150
1992	183	122	151
1993	305	1616	206
1994	15	354	142
1995	75	56	85
1996	79	410	866

1997	22	39	12
1998	73	252	88
1999	12	384	13
2000	31	705	398
2001	8	17	17
2002	0	22	25
2003	2	124	0
2004	60	80	16
2005	8	63	19
2006	5	331	4
2007	3	686	24
2008	18	60	0
2009	325	423	243
2010	454	131	27
2011	0	17	59

### Humpback chub

Five populations of humpback chub exist in the upper Colorado River basin and one in the lower Colorado River basin in canyon-bound reaches of the river system. Recovery goal downlist demographic criteria for humpback chub require each of five populations in the Upper Colorado River Basin to be a self-sustaining population over a 5-year period, with a trend in adult point estimates that does not decline significantly. Secondly, recruitment of age-3 (150–199 mm TL) naturally-produced fish must equal or exceed mean adult annual mortality. And one of the five populations (e.g., Black Rocks/Westwater Canyon or Desolation/Gray Canyons) must be maintained as a core population such that each estimate exceeds 2,100 adults (estimated MVP number). (Note: data are not currently available to make mark-recapture estimates of humpback chub recruitment.)

The Yampa River population exists in the lower Yampa River Canyon and into the Green River through Split Mountain Canyon. This population is small, with an estimate of about 400 wild adults in 1998-2000. Sampling during 2003–2004 caught so few fish that 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* species were tentatively identified as humpback chub by physical characteristics; the roundtail chub have been returned to the river in Dinosaur National Monument. Geneticists at Dexter National Fish Hatchery and Technology Center have since provided preliminary results indicating that these Yampa fish in captivity are hybrids between humpback chub and roundtail chub (Wade Wilson, U.S. Fish and Wildlife Service, personal communication). Currently, it is not known if pure humpback chubs also occur in Yampa Canyon. Researchers are taking fin clip samples from all humpback chub populations for potential genetic analysis. Humpback chub genetics and population status will be discussed in the revised recovery goals, which will be discussed with Recovery Program participants.

The Desolation/Gray Canyons population of wild adults was estimated to vary from about 1,300 in 2001, 2,200 in 2002, and 940 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. A final report on this population estimate was approved by the Biology Committee in July 2005 ([Jackson and Hudson 2005](#)). In a report on 2006–2007 estimates ([Badame 2012](#); Figure 5), 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. In 2011, six sites throughout Desolation Canyon were monitored for adults, 55 individual adults were encountered, but recaptures were too few to calculate a population estimate.

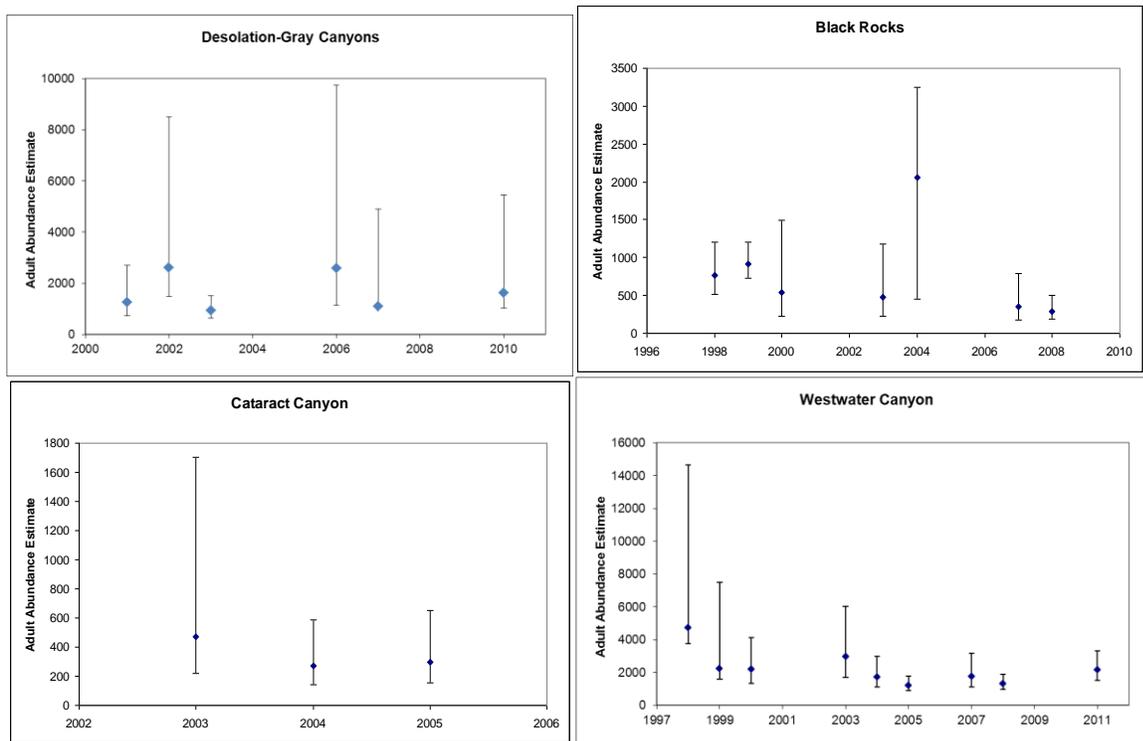


Figure 5. Adult humpback chub population estimates with confidence intervals for four populations in upper Colorado River Basin. Clockwise from upper left: Desolation-Gray Canyons (from [Badame 2011, 2012](#)); Black Rocks (from Francis and McAda 2011); Westwater Canyon (from [Elverud 2011](#)); and Cataract Canyon (from [Badame 2008](#)).

On the Colorado River of the upper Colorado River basin, three humpback chub populations are recognized. Black Rocks and Westwater Canyon have enough individuals that move between the two that they are considered a core population. In Black Rocks, estimates of wild adults have varied from about 800 in 1998, 900 in 1999, and 500 in 2000 and 2003 (Figure 5). The most recent estimates, in 2007–2008 were 345 and 287, respectively. During the fall of 2011, 78 individual adult humpback chub were caught in Black Rocks which is similar to the numbers caught in 2007 and 2008 (61 and 74, respectively). The Westwater Canyon estimates of wild adults range from about 4,700 in 1998 to 2,500 in 1999, 2000, and 2003. The 2007–2008 estimates were about 1,750 and 1,300. In 2008, this core population (Black Rock / Westwater combined) dropped below the population size downlist criterion ( $MVP = 2,100$  adults) for the

first time. In 2011, we saw some recovery in those populations where the estimate for adults in Westwater Canyon alone was 2,157. Population estimates in both Black Rocks and Westwater canyons declined dramatically during the first population estimation rotation in the late 1990s, but have remained relatively stable since that time. It should be noted that populations of native roundtail chub, a conservation agreement species that coexists with humpback chub in Black Rocks and Westwater canyons, have greatly increased through this period of monitoring. The Cataract Canyon humpback chub population is small, with an estimate of about 150 wild adults in 2003 to 66 in 2005. Estimates are difficult to obtain in Cataract; therefore, catch-per-unit-effort (CPUE) has been determined to be an effective replacement (began in 2008 on a 2-years-on, 2-years-off sampling regime). In 2011, Utah Division of Wildlife Resources (UDWR) reported that the Cataract population appears to be stable with CPUE ranging between 0.010 and 0.035.

### Razorback sucker

The Recovery Program is rebuilding razorback sucker populations with hatchery stocks. As populations increase, the Program expects to gather monitoring data comparable to Colorado pikeminnow and humpback chub. Many stocked razorback sucker are being recaptured as part of other studies. Razorback sucker stocked in the Green and Colorado rivers (Table 2) have been recaptured in reproductive condition and often in spawning groups. Captures of larvae in the Green, Gunnison, and Colorado rivers document reproduction. Survival of larvae through their first year remains rare, but occurs as evidenced by occasional captures of juveniles (just over age-1) in the Green and Gunnison rivers. A synthesis of floodplain information (Bestgen et al. 2011) in the Upper Colorado Program indicates releases from Flaming Gorge Dam can be timed better to assist in razorback sucker recovery in the Green River. Collections of larvae by light trap in the middle Green River have been generally increasing since 2003 (Figure 6). In 2011, during Colorado pikeminnow population estimate sampling in the White River, razorback sucker were collected in spawning condition. This led to deploying a few light traps downstream and several larvae were collected, which documented spawning by razorback sucker in the White River for the first time.

In a draft monitoring plan (Bestgen et al. 2012; *in draft*), estimates of large juvenile to adult razorback sucker in three reaches of the Green River ranged from 474 to over 5,000 within a reach. Although these estimates are highly imprecise, they do indicate that stocked fish are surviving in the wild.

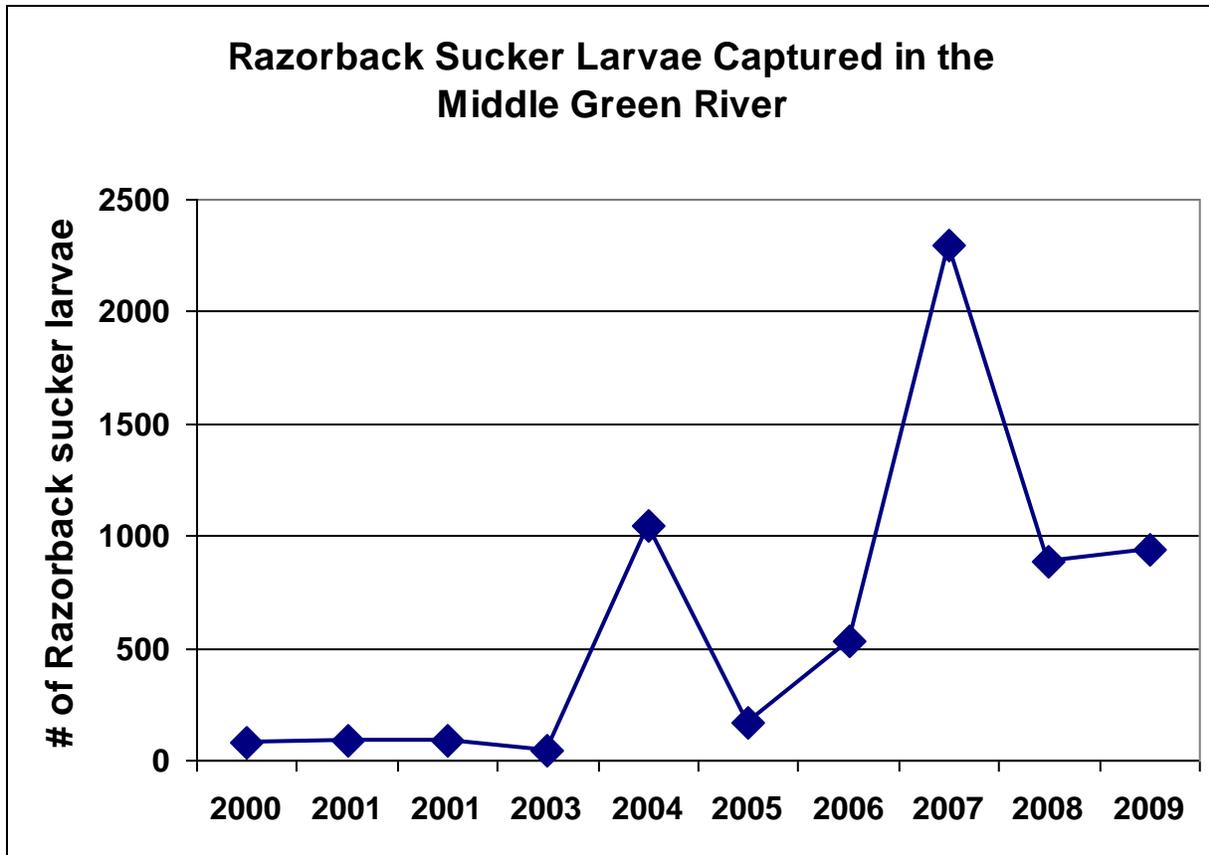


Figure 6. Numbers of razorback sucker larvae collected in light traps since 2000.

### Bonytail

Stocking continues in an effort to reestablish populations in the Upper Colorado River Basin (Table 2). When the Recovery Program was established, the bonytail had essentially disappeared and little was known about its habitat requirements. Key to bonytail recovery is stocking to restore this species and research and monitoring of stocked fish to determine life history needs. To date, proportionately fewer stocked bonytail have been recaptured compared to the number of stocked razorback suckers recaptured. Researchers continue to experiment with pre-release conditioning as well as exploring alternative release sites to improve their survival. All stocked fish species receive an internal microchip tag before being released in the wild. Since 2009, an increasing number of bonytail have been detected at several locations throughout the Upper Colorado River Basin where stationary tag reading antennas are used.

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
<b>Razorback Sucker</b>	<p>Since 1995, over 312,000 subadult razorback suckers have been stocked in the Green and upper Colorado River subbasins. Two reports on survival estimates of stocked razorback sucker have been accepted recommending stocking larger fish only during spring, fall and winter. From 2004–2007 approximately 96,400 fish were stocked and 1,511 recapture events from 1,470 unique individuals were encountered from 2005–2008.</p>		
	<p>Data from 1998–1999 suggested that about 100 wild adults remained at that time (<a href="#">Bestgen et al 2002</a>), 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. In 2011, researchers documented razorback sucker spawning in the lower portion of the White River in Utah for the first time. Also in the fall of 2011, wild produced Age-0 razorback sucker (size range: 80-161 mm TL) were collected in Green River floodplain habitats. The last time oversummer survival was detected for this species, in this portion of the river, was 1996.</p>	<p>The population is being augmented through stocking. Larvae were collected below Green River, Utah 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 (just over Age-1) was identified in 17 of 78 samples processed.</p>	<p>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.</p>

<b>Bonytail</b>	<p>Since 1996, over 362,000 tagged bonytail subadults have been stocked in the Green and upper Colorado River subbasins. Of those, about 142,000 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 bonytail 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 as they left the Stewart Lake on the middle Green River. Utah Division of Wildlife Resources Vernal office crews installed a stationary PIT tag reader at the outflow, after high flows had receded, and the bonytail were detected as they left Stewart Lake. In 2010, 16 bonytail were captured during nonnative fish removal and other species monitoring in the middle Green River. Since 2009, bonytail tagged with Passive Integrated Transponders have been detected at the Stirrup floodplain passing through a remote stationary antenna. Similar detections occur at the Price-Stubbs antenna on the Colorado River after stocking occurs above the structure.</p>
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## B. Program Accomplishments, Areas of Concern, and Recommended Action Items

Recovery Program participants accomplished a number of important objectives in 2011 and early 2012. These accomplishments are described in Table 3 below. Following that is Table 4, which describes Service concerns about shortcomings in the progress of some ongoing and future recovery actions. The second column in both of these tables identifies *how* Program accomplishments are meeting or falling short of the criteria used by the Service to evaluate whether the Recovery Program is making “sufficient progress” toward recovery. Those criteria are:

1. 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;
2. status of the fish populations;
3. adequacy of flows; and
4. magnitude of the impact of projects.

More detail about Program accomplishments and shortcomings can be found in the final March 21, 2012, assessment of accomplishments and shortcomings of the Recovery Program under the Recovery Implementation Program Recovery Action Plan (RIPRAP) from March 1, 2011, through February 1, 2012 (see assessment column in the tables to the [RIPRAP](#)).

Action items recommended to address concerns/shortcomings are shown in the third column of the Concerns table.

**Table 3 ACCOMPLISHMENTS** (March 1, 2011, through February 1, 2012)

Accomplishment	Criteria Affected
<b>General – Upper Basin-wide</b>	
<a href="#">2011 nonnative fish management projects</a> modified to expand efforts to increase removal / disruption further into the smallmouth bass (SMB) spawning period (e.g., sampling schedules extended to exploit SMB in post-peak flows on the Yampa). A similar level of work continues in 2012.	1 – Reduce threat of extinction by removing more nonnative fishes.
As recommended in the Service’s 2011 sufficient progress memo, the Program Director’s office has worked with the Nonnative Fish Subcommittee and signatories to the Nonnative Fish Stocking Policy to develop a draft Nonnative Fish Strategy squarely addressing the issue of illicit stocking. The very comprehensive draft <i>Upper Colorado River Basin Nonnative and Invasive Aquatic Species Prevention and Control Strategy</i> was sent to the Biology Committee on August 29, 2011. Comments on the draft are being addressed in 2012.	The strategy, when implemented, will 1 – Reduce the threat of extinction by reducing risk of additional nonnative species introductions and improving effectiveness of nonnative fish control activities.
Most targets for hatchery production and stocking of endangered fish were met or exceeded.	2 – Improving status of fish populations through stocking.
<a href="#">Standardization of electrofishing equipment</a> and techniques for inflatable boats was begun in 2010 and is nearly complete.	1 – Reduce threat of extinction by improving efficiency of nonnative fish removal and minimizing harm to native species.

<b>Green River</b>	
Flaming Gorge Dam was operated to meet spring flow targets and recommended base flow temperatures in Reach 1 and at the confluence with the Yampa River. 2011 runoff was 145 percent of average. The wet year floodplain inundation threshold of 22,700cfs was exceeded for 35 days (flow recommendations call for two weeks or more). The Recovery Program's 2011 Spring Flow Request was tiered to forecasted hydrologies, but the 'wet' condition scenario asked for 18,600cfs or greater for two weeks or more in Reach 2 after razorback sucker larvae were detected. Larvae were detected in the Green river on June 23, flows were above 18,600 cfs at Jensen for nearly 3 weeks after larvae were detected. Base flows were >3,000 cfs from July 15 to October 1st. Research is underway to determine the effect of moving more larvae on the floodplain and whether higher base flows may disadvantage nonnative species.	1 – Improve habitat and reduce threat of extinction; 3 – Improve flows; 4 – Reduce magnitude of project impact.
A Larval Trigger Study Plan (LTSP) was submitted to Reclamation on March 26, 2012, which describes experimental conditions and studies needed to build on recommendations from the recently approved floodplain synthesis (Bestgen et al. 2011); namely to time releases from Flaming Gorge Dam to provide floodplain connection in Reach 2 of the Green River coincident with the presence of wild produced larval razorback sucker.	Will lead to 1 – improving floodplain habitat.
Utah's Green River Utah Water Acquisition Team (GRUWAT) is reviewing a draft flow model of the Green River at town of Green River to evaluate current and full compact water use. More model runs will be requested.	Part of a work plan leading to flow protection mechanism(s) to 1 – Maintain habitat through protected flows.
High spring flows in 2011 provided for significant floodplain connection (40 days > 18,600 cfs; 19 of those days occurred after razorback larvae were detected) throughout Reach 2 of the Green River. <a href="#">Wild-produced RBS were captured in two middle Green River floodplain habitats (Wyasket lake and Leota 4) in the fall - the first collection of wild-produced RBS since 1996.</a>	1 – Measurable population response of stocked and wild fish to improved habitat.
<i>Upper Colorado River Endangered Fish Recovery Program's Position on the Role of the Price River in Recovery of Endangered Fish and the Need for Minimum Flow Management</i> report was provided for review in 2011, revised in 2012, and accepted by the Biology Committee on May 4 and the Management Committee on June 26.	May help to 1 – Improve habitat through augmented flows; and 3 – Improve flows.
UDWR continued their must-kill policy for burbot and the week-long burbot "round-up" in Flaming Gorge (January 2012).	1 – Reduce threat of extinction by removing more nonnative fishes.
CSU drafted the Elkhead Reservoir Escapement component of their larger smallmouth bass synthesis project (see also CONCERNS table). CSU's LFL researchers also continue to investigate relationships between smallmouth bass spawning/recruitment and environmental conditions to serve as the basis for a future flow manipulation study (likely targeting the Green River below Flaming Gorge Dam).	Provides scientific basis for management decisions that can 1 – Reduce threat of extinction by providing information needed to improve nonnative fish management.
<b>Yampa River</b>	
An experimental release of 300cfs from the Elkhead Reservoir Fish Pool to benefit native and endangered fish and assist in late season nonnative fish removal in the Yampa River mainstem near Maybell, Colorado was coordinated in late August 2011, by the Colorado River Water Conservation District, USFWS, and the Program Director's office.	1 – Improve habitat through augmented flows; reduce threat of extinction by hindering smallmouth bass recruitment.
<a href="#">A remote PIT-tag reader was installed in the Maybell Ditch to evaluate entrainment in 2011 (no fish were detected)</a> and 2012.	Will 4 – help determine magnitude of project impact.
Based on <a href="#">2010 Nonnative Fish Workshop</a> discussions, the Recovery Program recommended, and CDOW agreed, to cease translocation of smallmouth bass and discontinuing the mark and release pass within the Yampa buffer zone (Hayden to Craig) in 2011.	1 – Reduce threat of extinction by removing more nonnative fishes.

<b>Duchesne River</b>	
Flow recommendations met in 2011 for an Extremely Wet Year. In 2011, the Duchesne River at Randlett peaked at 8,450 cfs, which exceeded the 'extremely wet year' instantaneous peak flow recommendation of 8,400 cfs. During spring runoff there were 41 days above 4000 cfs and no days below the 115 cfs target during baseflows.	1 – Improve habitat through augmented flows; 3 – Improve flows.
<b>White River</b>	
Researchers documented <a href="#">razorback suckers spawning in the White River</a> for the first time.	1 – Measurable population response of stocked and wild fish to improved habitat.
<b>Colorado River</b>	
A total of 78,896 af was added to baseflow in water year 2011; this included 31,880 af from Green Mountain (assisted by Grand Valley Water Management), 20,466 af from Ruedi, 4871 af from Williams Fork, 7,572 af from Wolford Mountain Reservoir, and 20,466 af from the Palisade Bypass Pipeline (see Assmt-CR worksheets). Coordination consists of meeting twice a year with Grand Valley water users, twice a year with the town of Basalt and a meeting with the HUP group in Glenwood Springs, Colorado in addition to conducting conference calls as needed to discuss river conditions prior to the weekly HUP calls.	3 – Improve flows; 4 – Reduce magnitude of project impact.
The final EA/FONSI for a permanent 10,825 af of water from the East and West Slope water users has completed. Reclamation and water users will begin negotiation of the six contracts needed to implement the 10,825 in 2012. Delivery of the permanent 10,825 may occur as early as summer 2013.	Provides mechanisms to 3 – Improve flows; 4 – Reduce magnitude of project impact.
The Grand Valley Water Management Project diverted 10,370 af more than 1998 benchmark; however, Palisade pipeline return flows of 20,466 resulted in total potential benefit to 15-Mile reach of 10,096 af. The Program was able to maintain the wet-year flow targets for the endangered fish.	3 – Improve flows; 4 – Reduce magnitude of project impact.
OMID, CWCB, the River District and Reclamation are working out final payment details for cost-share agreement on the OMID irrigation efficiency project. This is a little behind schedule, but construction completion is expected in 2015.	3 – Improve flows; 4 – Reduce magnitude of project impact.
Between October 2010 and September 2011, 117 individual fish were detected in the Price-Stubbs fish passage: 81 razorback sucker, 16 bonytail, 1 Colorado pikeminnow, 17 roundtail chub, 1 flannelmouth sucker, and 1 unknown.	1 – Measurable population response of stocked and wild fish to habitat restored through fish passage.
<a href="#">Government Highline (aka Grand Valley Project) fish passage</a> operated continuously April 19 to October 14 in 2011; three humpback chub and 22 bonytail were collected. To date, 2 razorback sucker, 6 humpback chub, and 22 bonytail used the passage.	1 – Measurable population response of stocked and wild fish to habitat restored through fish passage.
Colorado Parks and Wildlife prepared a design for a fish screen on Rifle Creek; screen design was reviewed and commented on by independent reviewers. (Due to funding delays, construction scheduled for FY13.)	1 – Reduce threat of extinction by reducing risk of nonnative fish escapement to critical habitat.
Colorado Parks and Wildlife incorporated guidelines for unscreened Highline Reservoir outlet releases into the <a href="#">Highline Net O&amp;M scope of work</a> .	1 – Reduce threat of extinction by reducing risk of nonnative fish escapement to critical habitat.

<b>Gunnison River</b>	
Reclamation filed the final EIS on Aspinall operations on February 27, 2012 and EPA filed the notice on March 9. The draft ROD was sent to cooperating agencies on February 3 and to the Recovery Program's Management Committee on February 5. The EIS and ROD are the last steps before modification of Aspinall operations. The ROD was signed on May 3, 2012.	Modification of Aspinall operation will 1 – Improve habitat through augmented flows; 3 – Improve flows; and 4 – Reduce magnitude of project impact.
<a href="#">Multi-life stage fish community monitoring on the Gunnison River mainstem and in the 18-mile Reach of the Colorado River</a> was begun. This Recovery Program project is complemented by CPW's ongoing 3-Species sampling in the Gunnison River.	Will 1 – Measure population response to recovery actions.
Redlands fish ladder operated April 16 through October 15. 8,705 fish used the ladder in 2011; of those 7,087 were native fishes, including 2 pikeminnow and one stocked razorback sucker, 0 humpback chub, and 7 bonytail. Since 1996, 110 Colorado pikeminnow, 28 razorback sucker, 8 bonytail, and 1 humpback chub have used the ladder.	1 – Measurable population response of stocked and wild fish to habitat restored through fish passage.
Outside of the Recovery Program, USFWS worked with Painted Sky Resource Conservation and Development Council to construct <a href="#">Hartland Diversion Dam fish passage</a> (completed March 2012).	1 – Measurable improvement in habitat.
<b>Dolores River (none)</b>	

**Table 4 SERVICE CONCERNS** (March 1, 2011, through February 1, 2012)

<b>Concern</b>	<b>Criteria Affected</b>	<b>Recommended Action Items</b>
<b>General – Upper Basin-wide</b>		
<p>Not all petroleum product pipelines undergo Section 7 consultation and thereby may not be required to install emergency shutoff valves to protect the endangered fishes. Also, staffing constraints have precluded the Service from identifying the location of all existing petroleum product pipelines to determine if they have shutoff valves. Threat of extinction is increased by failing to reduce threat of potential petroleum spills.</p>	<p>May: 1 – Increase threat of extinction.</p>	<p>The Service will make a recommendation for how to ensure that all new petroleum pipelines have emergency shutoff valves and will investigate the use of the <a href="#">Pipeline Integrity Management Mapping Application</a> (PIMMA) to address existing pipelines potentially needing shutoff valves (e.g., pipelines upstream of or near critical or other important habitat)</p>
<p>Review of extent of illegal fish introductions demonstrates an existing, expanding problem and need for urgent response by States to curb the problem in the UCRB. Increases threat of extinction by increasing numbers and species of nonnative fish in critical habitat.</p>	<p>May: 1 – Increase threat of extinction.</p>	<p>The Program Director’s office is working with the Nonnative Fish Subcommittee and signatories to the <a href="#">Nonnative Fish Stocking Procedures</a> to address comments on the draft <i>Upper Colorado River Basin Nonnative and Invasive Aquatic Species Prevention and Control Strategy</i>. Following “internal” review by the Recovery Program’s Biology and Management committees, the Program will seek external peer review prior to accepting the <i>Strategy</i> as final.</p>
<p>In the NNF Stocking Procedures (revised in 2009), the Service recognized that using screens to contain undesirable nonnative sport fish in off-channel impoundments can be an important component of an effective nonnative fish management strategy. However, as time goes on we gain a better understanding of the actual costs associated with maintaining these engineered containment devices (e.g., recurring screen repair costs at the Elkhead Reservoir outlets), which reiterates the importance of a multi-faceted strategy including managing reservoir sport fisheries that are compatible with endangered fish recovery.</p>	<p>Escapement of problematic nonnative fishes 1 – increases threat of extinction.</p>	<p>The Service recommends that the Recovery Program carefully review the applicability of proposed screens on a case by case basis and scrutinize screen designs, including projected operation and maintenance costs in the future. And, that the Recovery Program fully recognizes that screens are only a component of a multi-faceted nonnative fish control strategy (e.g., one that adheres to the NNF Stocking Procedures, promotes compatible sportfisheries, and prevents new nonnative fish threats).</p>
<p>A revised <a href="#">integrated stocking plan</a> is behind schedule, but anticipated in 2012.</p>	<p>Hampers ability to: 1 – further improve status of fish populations through stocking.</p>	<p>Draft revised ISP sent to <i>ad hoc</i> group on April 13, 2012.</p>

<p>The humpback chub population in Desolation Canyon has been declining (25 adults were captured and placed at Ouray National Fish Hatchery in October 2009). The Yampa Canyon humpback chub population is very small, but researchers report positive signs of chub reproduction during the wetter hydrologies of 2008 and 2009. The number of adult humpback chub in Black Rocks continued to decline through 2008 (Francis and McAda, 2011).</p>	<p>2 – Declining status of fish populations.</p>	<p>The Program Director’s Office will monitor results from ongoing humpback chub population estimates (Deso-Gray 2010-2011; Black Rocks and Westwater 2011-2012 and monitoring (Cataract Canyon annual CPUE; Yampa River information gathered through nonnative fish management projects). The Program Director’s Office convened a panel to discuss humpback chub genetics and captivity and identify actions necessary to ensure the survival and recovery of humpback chub and an implementation plan for those actions in 2011. 200 age-0 Gila will be brought into captivity from Black Rocks/Westwater in 2012 (relates to broodstock development once fish are determined to be humpback chub).</p>
<b>Green River</b>		
<p>Resolution of endangered fish entrainment in the Tusher Wash diversion is behind schedule. The Recovery Program needs to determine if some sort of screen is needed (and, if so, move forward with design and construction).</p>	<p>May contribute to 2 – Declining status of fish populations.</p>	<p>An RFP for a 2012-2013 mortality study and literature review is anticipated in April 2012. Meanwhile, Program participants are investigating the potential for an electrical barrier at the head of the canal as one option to reduce or eliminate entrainment (and thus, “take”) of fish in the canal.</p>
<p>Walleye captures have increased in upper and lower Green River; gizzard shad have been found in lower Green River backwaters since 2007 and have increased markedly over the past few years in lower Colorado River backwaters. Gizzard shad have the potential to significantly affect food web ecology in backwaters and the mainstem. An illegal population of walleye in Red Fleet Reservoir is also believed to be a problematic source of this species entering the Green River. Increases threat of extinction by increasing numbers and species of nonnative fish in critical habitat.</p>	<p>1 – Increases threat of extinction.</p>	<p>Red Fleet Reservoir has been recommended for reclamation (rotenone). A microchemical analysis of otoliths from both the reservoir and the river is underway to better understand the contribution of walleye to critical habitat from this potential source population.</p>
<b>Yampa River</b>		
<p>CWCB still needs to provide accounting of past depletions for the Yampa River; a back-casted baseline of current depletions; and a recommendation and justification addressing projected future depletions and whether or not additional instream flow filings or other flow protections mechanisms should be considered.</p>	<p>Hampers ability to 3 – Determine adequacy of flows.</p>	<p>CWCB is scheduled to complete accounting of past depletions using the StateCU model by the spring of 2012. The depletion accounting report will include a discussion of the need for flow protection (which would require a peak flow recommendation). The Water Acquisition Committee will continue to discuss the need for a peak flow recommendation.</p>

<p>CSU's completed draft report containing a conservative estimate of escaped tagged smallmouth bass translocated into Elkhead Reservoir from the Yampa River indicates high escapement rates both pre- and post- reservoir enlargement (report in review). This estimate does not include un-tagged resident smallmouth bass which are presumed to escape at a similar rate. The high risk to endangered fish indicated by this analysis mandates an adaptive management response from the Recovery Program (e.g., reclamation [rotenone] and renovation [restocking] of the existing reservoir fish population and replacement with a sport fishery compatible with efforts to recover endangered fishes; or, in the near-term, mechanical removal of problematic smallmouth bass and northern pike from the reservoir to suppress their density). Escapement of tagged northern pike from Elkhead Reservoir has occurred and an estimate of northern pike abundance in 2011 indicates a high density population of this species in the reservoir. Increases threat of extinction by increasing numbers of nonnative fish in critical habitat.</p>	<p>1 – Increases threat of extinction.</p>	<p>CSU will complete the <a href="#">programmatic synthesis of smallmouth bass removal efforts</a>, providing a comprehensive evaluation of the Program's removal efforts as well as a thorough assessment of escapement from Elkhead Reservoir (draft final report due to Recovery Program 8/31/2012). The Recovery Program will review the final report on escapement from Elkhead Reservoir and determine appropriate adaptive-management response. CSU also is conducting a <a href="#">programmatic synthesis of northern pike removal efforts</a> (2011-2012) to evaluate current removal efforts in the context of northern pike life history throughout the Yampa River drainage (draft final report due to Recovery Program 6/30/13).</p>
<p>No action to date on the evaluating the concept of designating the Yampa River downstream of Craig, Colorado, as a native fish conservation area. (The RIPRAP calls for evaluating this concept in the Yampa River specifically, which has not yet been done; however, the concept is being evaluated as part of the broader draft Nonnative Fish Strategy.)</p>	<p>1 – Increases threat of extinction.</p>	<p>Native fish conservation areas are being evaluated as part of the draft basinwide nonnative fish strategy. Subsequently, applicability to the Yampa River will be evaluated.</p>
<p>The Recovery Program and Colorado Parks and Wildlife need to develop a drainage-wide action plan and timeline to address Yampa River northern pike management</p>	<p>Hampers ability to 1 – Reduce threat of extinction by decreasing numbers of northern pike.</p>	<p>CPW has detailed its ongoing and anticipated pike management actions throughout the drainage in its 2010 'Yampa River Basin Aquatic Wildlife Management Plan (CDOW 2010).' CPW will tabulate these activities for the Program Director's Office and, based upon Program Office feedback, will provide management objectives and actions for any waters within the drainage that CPW and the Program Office mutually agree are inadequately addressed by the 2010 Plan.</p>
<p><b>Duchesne River (none)</b></p>		

<b>White River</b>		
Revised White River flow recommendations overdue.	Hampers ability to 1 – Improve habitat through augmented flows; and 3 – Improve flows.	A working draft <i>Flow Recommendations for the Endangered Fish of the White River, Colorado and Utah</i> was sent to the Biology and Water Acquisition committees and GRUWAT on July 1, 2011. Conflicting comments were received. A revised draft is expected by midsummer 2012. Work on a PBO is anticipated subsequent to report approval.
At the 2011 Nonnative Fish Workshop, researchers reported increasing abundance of smallmouth bass in the White River.	1 – Increases threat of extinction.	Program scheduled to begin specific effort to remove smallmouth bass in 2012. CPW will propose plans to removing bag limit for smallmouth bass (and possibly other nonnative sport fishes) in the 400 yards below Kenney Reservoir that still has limits in 2013. Recovery Program supports multi-agency effort to designate White River as native fish conservation area.
<b>Colorado River</b>		
The Recovery Program still struggles to meet flow recommendations in drought years. The Service emphasizes the importance of meeting the flow recommendation.	Hampers ability to 1 – Improve habitat through augmented flows; and 3 – Inadequacy of flows.	Recovery Program participants will consider options and opportunities for meeting flow recommendations on a more consistent basis after completion of 10,825 agreements.
CWCB still needs to provide the depletion accounting report.	Hampers ability to 3 – Determine adequacy of flows.	The CWCB will provide the depletion accounting for 2006-2010 for the Upper Colorado River using State CU in the spring of 2012. If the amount of consumptive use, location of use, and timing of use is not the same as in the past, they would then put that information into StateMod to show how those changes affect the river.
CFOPs report (evaluation of options for providing and protecting additional peak flows to the 15-Mile Reach) overdue.	Hampers ability to 1 – Improve habitat through augmented flows; and 3 – Improve flows.	Completion of CFOPS Phase III should be out in draft in August 2012 and report completion anticipated by September 30, 2012.
In 2011, researchers captured nine adult northern pike just below the confluence of Rifle Creek, one at the head of the Grand Valley, and one in the Redlands Fish Ladder. Analyses of microchemical markers in the otoliths of ten of these specimens indicated that three originated in reservoirs: two from Rifle Gap Reservoir (one collected in the Colorado River near Rifle Creek, the other in the Grand Valley); the origin of the third collected in the Redlands Fish Ladder remains uncertain at this time.	1 – Increases threat of extinction.	In 2012, additional passes will be devoted in the reach of the Colorado River from Rifle to the Beavertail to remove invading northern pike. CPW will conduct a reconnaissance in floodplain & canal habitats to identify potential sources of this species. Sampling will also be conducted from Silt to Rifle to remove northern pike.

<b>Gunnison River</b>		
Northern pike and smallmouth bass remain of extreme concern due to their demonstrated invasive potential in UCRB rivers and their potential to establish invasive populations of these species. The high density northern pike source population in Crawford Reservoir remains of extreme concern due to its invasive potential. Increases threat of extinction by potentially increasing numbers of nonnative fish in critical habitat.	1 – Increases threat of extinction.	Every effort should be made to ensure that the Gunnison River remains a native fish stronghold. The topic of precluding new species introductions also will be addressed in the draft Nonnative Fish Strategy.
<b>Dolores River</b>		
Establishment of smallmouth bass in the Dolores River raises concern that it may become an additional source for this invasive species in the Colorado River. Walleye have recently been illegally introduced and also have the potential to escape the reservoir (though CPW has not captured walleye in the Dolores River to date). Increases threat of extinction by potentially increasing numbers of nonnative fish in critical habitat.	1 – Increases threat of extinction.	The Nonnative Fish Subcommittee will review response options and propose action item(s) to be reviewed with the Dolores River Dialogue and Lower Dolores Working Group and potentially added to the RIPRAP in 2013.

### C. 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<sup>2</sup>. 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) continued cooperation to manage spring and base flows throughout the basin; b) completion of the Aspinall ROD; c) a continued push forward on nonnative fish management; d) meeting razorback sucker and bonytail stocking targets; and e) successful razorback sucker spawning, continued increases in captures of stocked razorback suckers, capture of wild-produced razorback sucker in Green River floodplains, and the first-ever documented spawning of razorback sucker in the White River. However, the Service remains very concerned about continued low population levels of humpback chub, especially in the Black Rocks/Westwater complex.

The Service strongly encourages all Recovery Program participants to: 1) remain attentive to the lingering impacts of past drought conditions (and impending impacts of a very dry 2012 water year) which exacerbate human-caused threats such as the negative effects of nonnative fishes on recovery of the endangered fishes; and 2) continue to aggressively pursue management actions to alleviate threats to the species, including providing and protecting necessary flow and habitat conditions and preventing additional introductions and expansion of problematic nonnative

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<sup>2</sup> 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.

aquatic species. The Recovery Program has made strong progress in protecting flows and restoring habitat and, more recently, has been making progress to manage nonnative fishes. Eight of the 27 accomplishments listed in the table above relate to nonnative fishes, as do 10 of the 19 concerns. The Service believes the Recovery Program is at a critical juncture in its nonnative fish management activities and must build on recent momentum to insure significant progress on this front. Therefore, the Service strongly encourages Program participants to push hard to implement the actions needed to manage problematic nonnative fishes and prevent new problematic species and any resurgence of existing problematic nonnative fishes. Finally, we encourage the Recovery Program to continue active participation 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 landscape-level habitat changes, including those related to 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 (2012) 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).

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Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
<b>LEGEND: Items in red are part of the Terms &amp; Conditions in the PBO.</b> 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
<p>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.</p>	General: VIIA7, IIIA2c; Yampa: IIIA1	<p>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 completed their revised Yampa River Aquatic Management Plan in 2010 (see <a href="http://www.coloradoriverrecovery.org/general-information/program-elements/nna/YampaBasinPlan10262010.pdf">http://www.coloradoriverrecovery.org/general-information/program-elements/nna/YampaBasinPlan10262010.pdf</a>). A very comprehensive draft Upper Colorado River Basin Nonnative and Invasive Aquatic Species Prevention and Control Strategy, which recommends focusing on prevention, eradication and swift control of problematic species, was sent to the Biology Committee on August 29, 2011. Comments on the draft are being addressed in 2012. SOW #140 to evaluate response of native fishes is ongoing, with a positive native fish response detected in 4 consecutive years, 2008-2011 (a reach-wide response to flow/temp and a higher treatment reach response to nonnative fish removal efforts).</p>	T&C 7: 70
Provide and Protect Instream Flows			

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
<p>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).</p>	<p>Yampa: IB2a(2)(b)</p>	<p>The PBO brackets Elkhead releases between 78-138 cfs for July-Oct and 109-169 cfs for Nov-Feb. Recently, the minimum target has been set at 134 cfs to recognize the variability in the Modde et al. 1999 datasets and to experiment with higher baseflow targets to assist with native fish recruitment and to hinder nonnative species. In 2010, all 5,000 af of the Program's 5,000 af pool was released between Sept 1 to Oct 17 at a constant rate of 50 cfs. For experimental purposes, flows averaged 254 cfs (Aug 1 to Oct 31) in order to benefit native fishes and hinder smallmouth bass recruitment. When things looked fairly dry at the beginning of the 2010 runoff season (May), the Program exercised it's option to lease an additional 500 af of water from Elkhead. This water was not needed and was carried into 2011. Also in 2010, the Elkhead Creek transit study was completed and can be found at: <a href="http://pubs.usgs.gov/sir/2010/5198/">http://pubs.usgs.gov/sir/2010/5198/</a>. 2011 brought record high flows. In late August, 2011, the Colorado River Water Conservation District, USFWS, and the Recovery Program coordinated an experimental release of 300cfs from the Elkhead Reservoir Fish Pool to benefit native and endangered fish and assist in late season nonnative fish removal in the Yampa River mainstem near Maybell, CO. Releases from the 5000 af + 500 af (leased in 2010) pool totaled 1,820 af from August 18 – 22, with a peak of 901 cfs on Aug 21st. In scheduling this release, biologists worked closely with local farmers who cross the Yampa to access their fields. 3,680 af of the 5000 af + 500 af pool was left in the reservoir due to high flows in August through October averaging 634 cfs. Flows reached a low of only 312 cfs on October 4 at Maybell.</p>	<p>CM: 8</p>
<p>The Service will notify CRWCD of its intent to lease water in accordance with a three-tiered schedule</p>	<p>Yampa: IB2a(2)(b)</p>	<p>500 af leased in 2010, but flows came up and leased water wasn't needed, so it was carried forward to 2011 (see above).</p>	<p>CM: 10</p>
<p>The Recovery Program will monitor all new water depletion projects over 100 AF/year to determine impacts to peak flows on the Yampa River.</p>	<p>See next row.</p>	<p>See next row.</p>	<p>RPM: 68</p>

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
<p>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.</p>	Yampa: IB3d	<p>Wyoming submitted the Little Snake River Depletions Accounting Report 8/19/10. TNC updated the PBO baseline, 1975–1998, to Colorado's StateMOD. CWCB is working on a Consumptive Uses &amp; Losses Report for 1975-2009, and will compare those to the old 1975–1998 numbers, and also compare their new estimates for 1975–1998 to 1999–2009. The StateCU model was to be completed by June 1, 2011 and subsequent meetings held with TNC to discuss StateMOD. CWCB now plans to provide a depletion accounting report as outlined in the PBO in the spring of 2012. The report is to include: 1) calculation of past depletions every 5 years as a 10-year moving average as determined by CWCB and reported to the Service and Recovery Program; 2) a back casted baseline of current depletions that can be used in projecting the impact of significant new depletions; and 3) a recommendation and justification that addresses projected future depletions regarding whether or not additional instream flow filings or other flow protection mechanisms should be considered. The Program will revisit the need for instream flow filings or other flow protection mechanisms at least every 5 years.</p>	T&C 1: 69
<p>Manage Nonnative Fish Populations</p>			
<p>The Recovery Program will continue efforts to minimize the impacts of nonnative fishes on the four listed fish species.</p>	See below.	See below.	RPM: 68
<p>Implement the Nonnative Fish Stocking Procedures</p>	Yampa: IIIB2	Ongoing (and Procedures revised April 2009).	CM: 12
<p>The Recovery Program will screen Elkhead Reservoir to minimize escapement of nonnative fishes.</p>	Yampa: IIIA1a(2)	<p>Screens were constructed on the outlet towers when reservoir enlargement was completed. The fish screen on the bottom outlet has a liftable screen that can be bypassed if needed to drain the reservoir. In 2010 the one large nut which holds the 6000 pound, 7 foot diameter liftable fish screen on the 100 foot long stem fell off and divers installed two new jam nuts. In 2012, the anchors for the guides which the fish screen travels on are being repaired/replaced. The initial expense of this screen and need for ongoing maintenance demonstrate how fallible screens are and emphasize the point that no screen is a substitute for limiting stocking to species compatible with endangered fish recovery.</p>	CM: 12
<p>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.</p>	Yampa: IIIA1a(2)	Done.	CM: 14
<p>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.</p>	Yampa: IIIA1a(2)	A screen was installed in 2005, but it failed; nonnative fish removal was expanded in 2006 to compensate.	CM: 14

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
<p>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.</p>	<p>Yampa: IIIA1a(2)</p>	<p>Outlet tower screens up to 540 cfs of spring runoff to reduce nonnative fish escapement from the reservoir. Immediately following reservoir enlargement, the River District had a conflicting mitigation responsibility (wetland establishment) that precluded their ability to draw the reservoir down prior to spring runoff. However, in reality, the effectiveness of pre-spring releases to reduce spills are very limited in this system due to the capacity of Elkhead Reservoir relative to the size of the Elkhead Creek drainage.</p>	<p>CM: 14</p>
<p>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.</p>	<p>Yampa: IIIA1a(1)</p>	<p>Specific criteria not developed, but escapement is occurring and is being evaluated through the CSU programmatic smallmouth bass synthesis. The draft report's conservative estimate of escaped tagged smallmouth bass translocated into Elkhead Reservoir from the Yampa River indicates high escapement rates both pre- and post-reservoir enlargement. The estimate does not include un-tagged resident smallmouth bass which are presumed to escape at a similar rate. The high risk to endangered fish indicated by this analysis mandates an adaptive management response from the Recovery Program (e.g., reclamation [rotenone] and renovation [restocking] of the existing reservoir fish. Also, escapement of tagged northern pike from Elkhead Reservoir has occurred and an estimate of northern pike abundance in 2011 indicates a high density population of this species in the reservoir.</p>	<p>CM: 14</p>
<p>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.</p>	<p>Yampa: IIIA1a(2)</p>	<p>The enlarged Elkhead Reservoir and screens were fully operational beginning with spring runoff 2007.</p>	<p>CM: 14</p>
<p>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.</p>	<p>Yampa: IIIA1a(2)</p>	<p>Anchors were installed.</p>	<p>CM: 14</p>
<p>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.</p>	<p>General: IIIB2</p>	<p>No new water storage projects formally proposed at this point.</p>	<p>CM: 12</p>
<p>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.</p>	<p>Yampa: IIIA1e</p>	<p>Complete</p>	<p>CM: 12</p>

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
Remove and translocate northern pike and smallmouth bass	Yampa: IIIA1b&d	Based on 2010 Nonnative Fish Workshop discussions, the Recovery Program recommended, and CDOW agreed, to cease translocation of smallmouth bass and discontinuing the mark and release pass within the Yampa buffer zone (Hayden to Craig) in 2011. Based on the 2011 Nonnative Fish Workshop discussions, FWS will focus removal efforts above Craig immediately pre- and post-runoff. The Recovery Program has recommended the resurrection of elements of Project 98c to provide removal/reconnaissance of northern pike densities/habitats above Hayden/"buffer zone" to facilitate northern pike suppression and the reduction of their density in critical habitat. At minimum, CPW will conduct a couple of removal passes within the critical upper portion of 98c reach. CPW has continued work at Catamount Reservoir to reduce northern pike and rusty crayfish numbers. CPW also has plans to eradicate the illegally-established population of northern pike in Chapman Reservoir.	CM: 13-15
Lethal removal of channel catfish and smallmouth bass from Yampa Canyon	Yampa: IIIA1c(1)&d	Yampa Canyon appears to have a continuing downward trend of smallmouth bass for the last few years, but efforts appear to be hampered by the immigration of smallmouth bass from upstream sources sustaining propagule pressure and proliferative/invasive capacity of this species. Adult numbers appear to continue to decline in the Lily Park and Echo-Split reaches (see graphs). 2011 and 2012 work revised to increase removal / disruption further into the smallmouth bass spawning period (e.g., sampling schedules extended to exploit smallmouth bass in post-peak flows on the Yampa).	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
<p>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.</p>	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 is implementing a comprehensive communications plan to raise public awareness of the purpose and nature of nonnative fish management. Also, the I&E Committee has helped draft an outreach section in the draft Upper Colorado River Basin Nonnative and Invasive Aquatic Species Prevention and Control Strategy. The Recovery Program worked with the River District to produce and install interpretive signs at Elkhead Reservoir.	T&C 5: 70

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
<p>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.</p>	<p>Green: VC1&amp;2; Green: VB1; Yampa: VA;Green: IVA1d; Yampa: IVA1b</p>	<p>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. 3-year Green River population estimates resumed in 2011. Refuge plan developed for Yampa humpback currently in captivity (24 humpback chub from Yampa Canyon are being held at Ouray NFH - Randlett); however, geneticists have provided preliminary results indicating that these Yampa fish in captivity are hybrids between humpback chub and roundtail chub. Researchers recommend continuing monitoring and tagging Yampa Canyon humpback chub. Recaptured fish are becoming more common from previous tagging, and fish from the Green River have been captured. Fin clips are being taken from all humpback captured in the wild for genetic analysis to determine level of genetic introgression. 2011 chub monitoring documented a bonytail in the Yampa River that had survived from the 2010 Echo Park stocking in September.</p>	<p>RPM: 68</p>
<p>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.</p>	<p>General: IIIA2c</p>	<p>Researchers report continued positive response by native fishes in 2010 and 2011 (see graph on next worksheet). Reach-wide response likely due to flow/temp benefit; higher treatment reach response likely due to nonnative fish removals.</p>	<p>T&amp;C 6.b: 70</p>

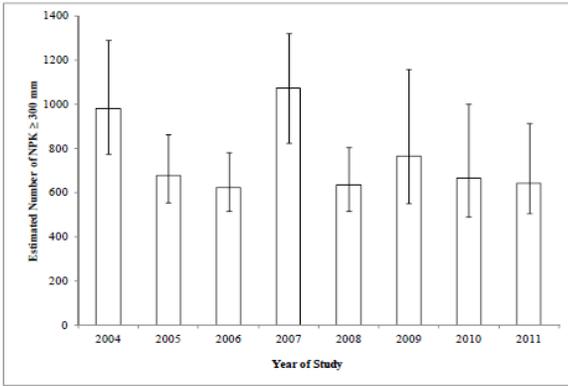
Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
<p>The Recovery Program is conducting pikeminnow population estimates for 2000–2003 for the Green River subbasin. This includes population estimates for the Lower Green, Middle Green, White and Yampa rivers. These estimates will 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.</p>	<p>Green: VC1&amp;2; Green: VB1; Yampa: VA;Green: IVA1d; Yampa: IVA1b</p>	<p>Green River (includes Yampa River) pikeminnow population estimate report (Bestgen et al 2010) completed (see above) and another 3-year sampling period began in 2011. Evaluation of stocked razorback sucker has been completed (Zelasko et al 2011) and a draft razorback monitoring plan is in review. Badame 2012 reported trends observed in Desolation-Gray humpback chub total population estimates (2001–03 and 2006–07) which indicated declines from 2003 to 2006 and through 2007. An apparent decline in early adult humpback chub recruits coincides with the timing of smallmouth bass establishment in Desolation-Gray, and may be attributed to predation. Badame concluded that adult estimates were below the minimum viable adult population size of 2,100 adults, as set forth in the 2002 Recovery Goals document (USFWS 2002) and the proportion of first year adult humpback chubs had declined. Yampa Canyon humpback chub monitoring is now done via CPUE during nonnative fish removal efforts. Recaptured fish are becoming more common from previous tagging, and fish from the Green River have been captured. Humpback chub from both the Desolation-Gray and Yampa Canyon populations have been brought into the hatchery system to ensure that genetic diversity is preserved. However, geneticists have provided preliminary results indicating that the Yampa fish in captivity are hybrids between humpback chub and roundtail chub.</p>	<p>T&amp;C 6.c: 70</p>
<p>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.</p>	<p>Green: VC1&amp;2</p>	<p>Larval reproduction has been documented every year and sampling continues (see graph).</p>	<p>T&amp;C 6.d: 70</p>
<p>Recruitment to the adult population is an important factor in determining population trends. Therefore, recruitment rates will be incorporated into the population response criteria.</p>	<p>Green: VC1&amp;2</p>	<p>3-year Green River population estimates resumed in 2011; age-0 captures low (as expected under high baseflow conditions). Although researchers track recruitment, no estimate has been made for the Yampa River population due to poor catch rates of fish ≤450mm. Larval razorbacks also are being monitored; juvenile razorback found in Green River floodplains in 2011.</p>	<p>T&amp;C 6.e: 70</p>
<p>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.</p>	<p>See below.</p>		<p>RPM: 68</p>

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
<p>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.</p>	<p>General: IIA2c1&amp;2</p>	<p>See rows 22 and 23, above. Data are reviewed annually in nonnative fish workshop. Two programmatic syntheses / evaluation of the Recovery Program's approach to nonnative fish control (one for smallmouth bass and one for northern pike) are underway.</p>	<p>T&amp;C 6.a: 70</p>
<p>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.</p>			<p>T&amp;C 4: 69</p>
<p>Restore Habitat</p>			
<p>Acquire and enhance floodplain habitats along the Green River</p>		<p>Ongoing; high spring flows in 2011 provided for significant floodplain connection (40 days &gt; 18,600 cfs; 19 of those days occurred after RBS larvae were detected) throughout Reach 2 of the Green River. C6 RZ / RECR (Stirrup floodplain) - 6,804 Age-2 bonytail (2009 age class; 205 mm average when tagged previous fall) were stocked by Wahweap Fish Hatchery on 4/7/2011. During the extensive period of riverine connection (96 days; site connects at ~15,000cfs) at the Stirrup a total of 1,216 unique fish were detected (1,129 recently stocked bonytail; 63 RBS; and 13 CPM; and one fish unaccounted for); another unmarked CPM was collected later in the year in the floodplain while netting. Wild-produced RBS were captured in two floodplain habitats (Wyasket lake and Leota 4) in the fall - the first collection of wild produced RBS since 1996. The Recovery Program acquired six floodplain sites totalling 1008.1 acres and has breached levees at 8 sites, accessing 274 acres. Levee removal was completed and operation, maintenance and evaluation of sites incorporated into the Green River Subbasin Floodplain Management Plan (Valdez and Nelson 2004a) (IIA4). See also Birchell et al. 2002.</p>	<p>CM: 15</p>
<p>Restore/maintain native fish passage at diversion structures</p>		<p>No remedial action is required to facilitate fish passage at any existing diversion structures, as currently constructed and operated.</p>	<p>CM: 16</p>
<p>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.</p>	<p>NA</p>	<p>Service needs to develop guidelines (using thresholds for passage as identified in Yampa Management Plan). Currently, no new/modified diversions proposed.</p>	<p>CM: 16</p>

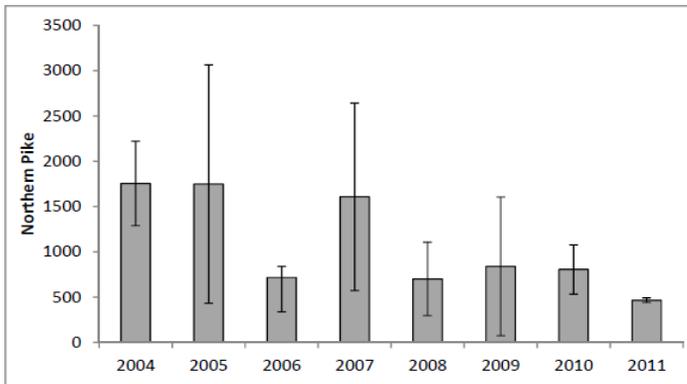
Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
Evaluate/remediate entrainment of endangered fishes by diversion structures	See below.	See below.	CM: 16
<p>CM: Develop plan to evaluate CPM entrainment in existing diversion canals. Plan will evaluate &amp; minimize potential incidental 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&amp;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 &gt;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.</p>	Yampa: IIA2a	<p>Hawkins (Hawkins, J.A. 2009. An evaluation of fish entrainment into the Maybell Ditch on the Yampa River, Colorado, 2007 and 2008. Project No. 146 Final Report for the Upper Colorado River Endangered Fish Recovery Program. Contribution 151 of the Larval Fish Laboratory, Colorado State University, Fort Collins, Colorado.) work recommended sampling incoming ditch flow for entrained large-bodied fish during the Colorado pikeminnow migration period A PIT-tag reader installed in the Maybell Ditch in 2011 (no fish detected), and will operate again in 2012.</p>	CM: 16; RPM: 68; T&C 2: 69
<p>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&amp;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 (&gt;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.</p>	Yampa: IIA2b	Pending results of further evaluation via PIT-tag reader.	CM: 16; RPM: 68; T&C 3: 69
Manage genetic diversity/augment or restore populations			

Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
<p>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).</p>	<p>Yampa: IVA1a1; Green: IVA1c</p>	<p>The Recovery Program continues to stock tagged bonytail subadults in the Green and upper Colorado River subbasins (see graphs).</p>	<p>CM: 17</p>
<p>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.</p>	<p>Green: IVA1c</p>	<p>The Recovery Program continues to stock tagged razorback sucker (see graphs).</p>	<p>CM: 17</p>
<p><b>Monitor Populations and Habitat</b></p>			
<p>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.</p>	<p>See above.</p>	<p>See monitoring under nonnative fish management, in rows 28-29, above.</p>	<p>CM: 17</p>
<p>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.</p>	<p>See above.</p>	<p>See monitoring activities discussed under nonnative fish management, in rows 27-29, above.</p>	<p>CM: 17-18</p>

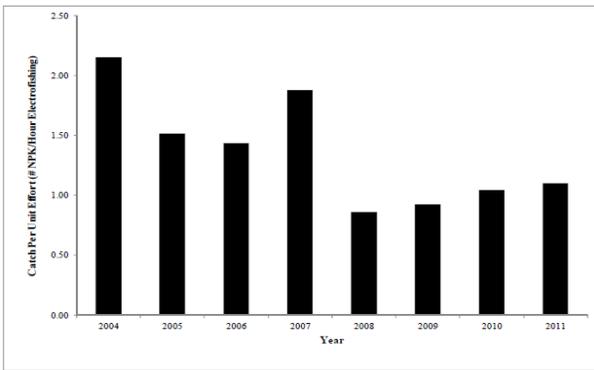
Recovery Actions in Yampa Mgmt. Plan PBO	RIPRAP Item #	Status	PBO Page #
<p>The Recovery Program will coordinate with the U.S. Geological Survey (USGS) to review and compile past data at the priority sites and begin collection of suspended sediment data at USGS stream flow gages on the Green River at 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.</p>	<p>General: IA4b; Green: ID</p>	<p>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 were 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 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 draft technical series report completed in 2011 (final pending). Pending: The PD's office will convene fish biologists involved in developing flow recommendations and geomorphologists (e.g., John Pitlick and Cory Williams) to identify logical next-steps (e.g., is MD-SWMS modeling the best way to proceed) to evaluate flow recommendations, particularly on (but not limited to) the Gunnison where sediment transport is so important.</p>	<p>CM: 18</p>



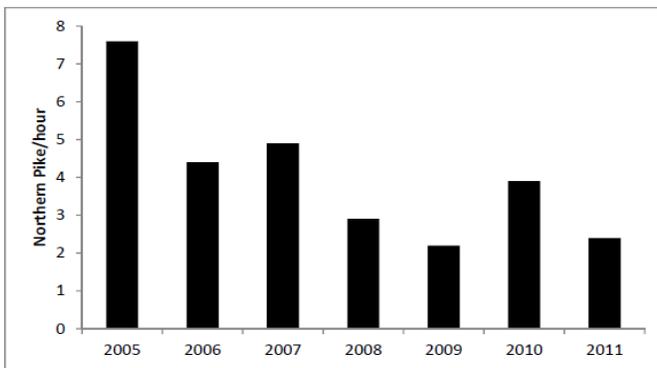
Yampa RM 134.2-50.5 northern pike estimates and 95% CI's 2004-2011 (#98a annual report).



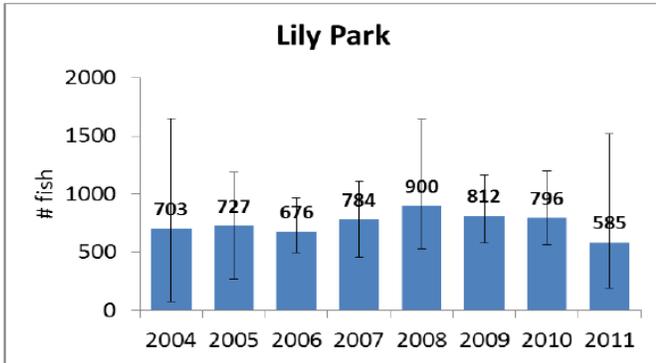
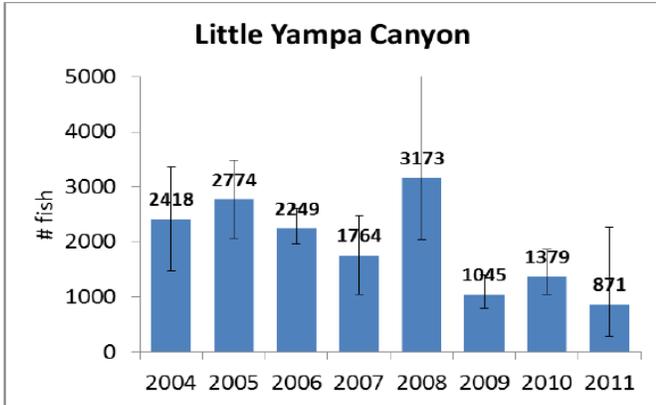
Yampa RM 171.5 - 134.5 northern pike estimates and 95% CI's 2004-2011 (#98b annual report).



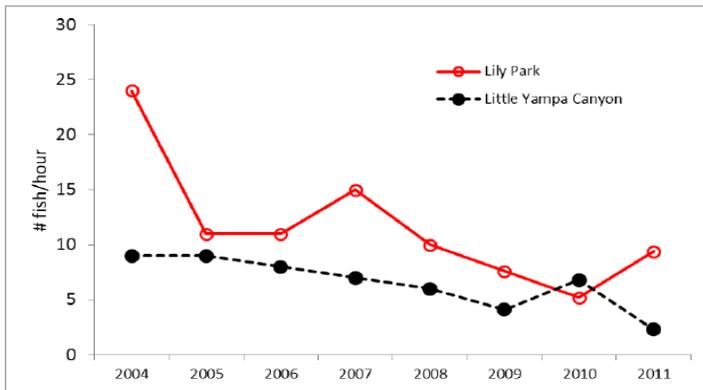
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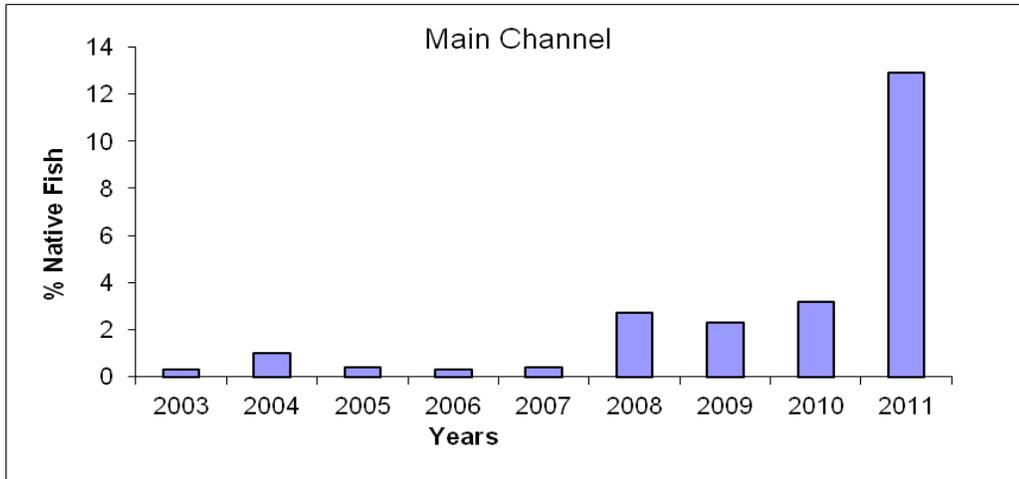
Yampa RM 171.5 - 134.5 northern pike CPUE 2005-2011 (#98b annual report).



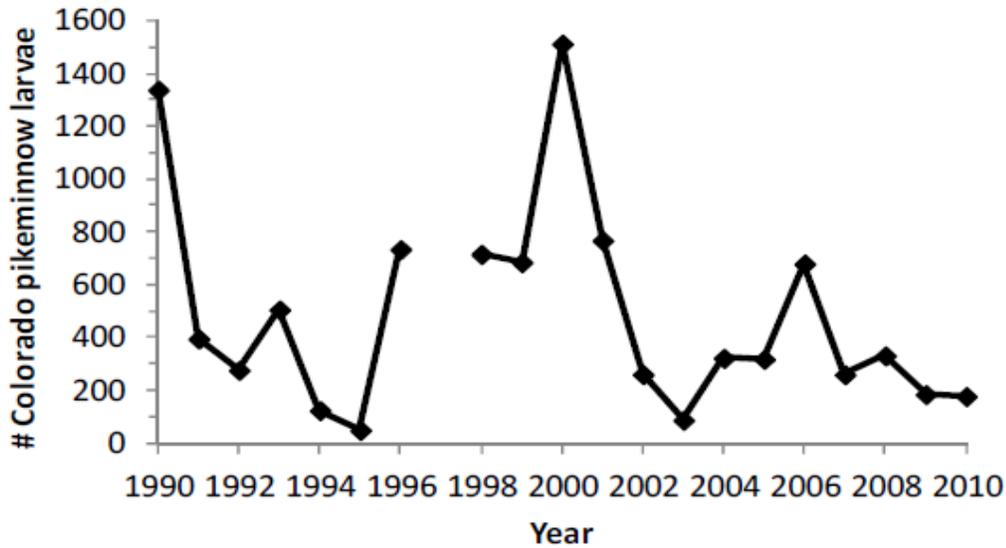
Estimated abundance of adult smallmouth bass ( $\geq 200$  mm) in two reaches of the Yampa River, 2004--2011 (#125 annual report).



Number of adult ( $\geq 200$  mm) smallmouth bass captured per hour of boat electrofishing in two reaches of the Yampa River, 2004-2011 (#125 annual report).



Percent native fishes, main channel, Yampa River, 2003-2011 (from Kevin Bestgen's presentation at 2012 Researchers Meeting)



Number of Colorado pikeminnow larvae captured from 1990 to 2010 (no sampling in 1997, includes specimens from all diel samples, 2011 sample identification is underway) in the lower Yampa River, Colorado, in drift nets. (Project 22F annual report)

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

	Green River		Colorado River
	Middle	Lower	
2007	101	101	105
2008	143	100	111
2009	101	100	95
2010	53 <sup>1</sup>	100	46 <sup>1</sup>
2011 <sup>2</sup>	255	147	161

Shaded cells indicate years when the stocking goal was not met (i.e., <100%).

<sup>1</sup> Approximately half of these bonytail scheduled for stocking in 2010 were held in the hatchery to ensure they were disease-free. Subsequent testing cleared these fish for release in 2011.

<sup>2</sup> Percentages in 2011 are considerably higher as a result of the fish held over from 2010.

**Bonytail stocked by river, 2011**

Facility	River	Target	Stocked	Percent	
Wahweap	Middle Gre	2,665	10,751	403%	Percentages in 2011 are considerably larger as a result of the fish held over from 2010 due to largemouth bass virus outbreak at Dexter NFH.
	Lower Gre	5,330	7,854	147%	
Mumma	Colorado	2,665	4,180	157%	See above.
	Middle Gre	2,665	2,833	106%	
	Colorado	2,665	4,404	165%	See above.

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

	Green River		Colorado/Gunnison Rivers	San Juan River
	Middle	Lower		
2007	111	86	102	203
2008	118	102	130	39 <sup>1</sup>
2009	151	51 <sup>2</sup>	181 <sup>2</sup>	74 <sup>3</sup>
2010	110	101	100	250
2011	91	126	121	165

Shaded cells indicate years when stocking goal was not met (i.e., <100%)

<sup>1</sup>A portion of these fish were held over at Uvalde National Fish Hatchery to determine if survival could be improved by stocking larger fish in 2009 and 2010.

<sup>2</sup>Permit not in place for Grand Valley to stock at Green River, Utah; therefore, fish were stocked into Colorado and Gunnison rivers.

<sup>3</sup>4,021 razorback suckers from this year class were held in the hatchery and stocked in 2010 to experiment with alternative stocking seasons.

**Razorback sucker stocked by river, 2011**

Facility	River	Target	Stocked	Percent
Grand Valley	Upper Colc	6,620	8,688	131%
	Gunnison	3,310	3,331	101%
	Lower Gre	4,965	7,022	141%
Ouray	Middle Gre	9,930	9,036	91%
	Lower Gre	4,965	5,474	110%