

Upper Colorado River Endangered Fish Recovery Program

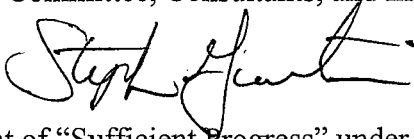
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Memorandum

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

From: Regional Director, Region 6 

Subject: Final 2010—2011 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 December 20, 1999, “15-Mile Reach” Programmatic Biological Opinion and December 4, 2009, “Gunnison River Basin Programmatic Biological Opinion”

“SUFFICIENT PROGRESS”

In accordance with the Section 7, Sufficient Progress, and Historic Projects Agreement, the U.S. Fish and Wildlife Service (Service) is reviewing 2010—2011 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 25, 2011, assessment of accomplishments and shortcomings of the Recovery Program under the Recovery Implementation Program Recovery Action Plan (RIPRAP) from March 1, 2010, through February 1, 2011, is incorporated in the tables to the RIPRAP found at <http://www.coloradoriverrecovery.org/documents-publications/foundational-documents/RIPRAP/RIPRAPmarch25-11.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 July 16, 2010.

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 populations¹ of razorback sucker in the upper Colorado and Green river systems 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 of population trends. The accuracy and precision of each point estimate is assessed by the Service in cooperation with the Recovery Program and in consultation with investigators developing the point estimates and 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 been declining 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 are 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 (draft report in review). Many of the recommendations from the first report already are being implemented. A [razorback sucker monitoring plan](#) is being developed to identify sampling needed to estimate demographic parameters for small- and large-bodied razorback suckers in the Colorado and Green River sub-basins. Meanwhile, a [pilot study to monitor juvenile and larval razorback](#) was conducted in the lower Green River in 2009 and that work continues in [2011](#).

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

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

(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 and conducting a more robust, combined analysis of data collected in Black Rocks and Westwater canyons. The Recovery Program will task an *ad hoc* group with making recommendations with regard to humpback chub populations, addressing potential hybridization, the need for captive populations, 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.

Colorado pikeminnow

Population estimates for adult (≥ 450 mm total length [TL]) Colorado pikeminnow were started in 1992 on the Colorado River from the Price-Stubbs 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 most are 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.

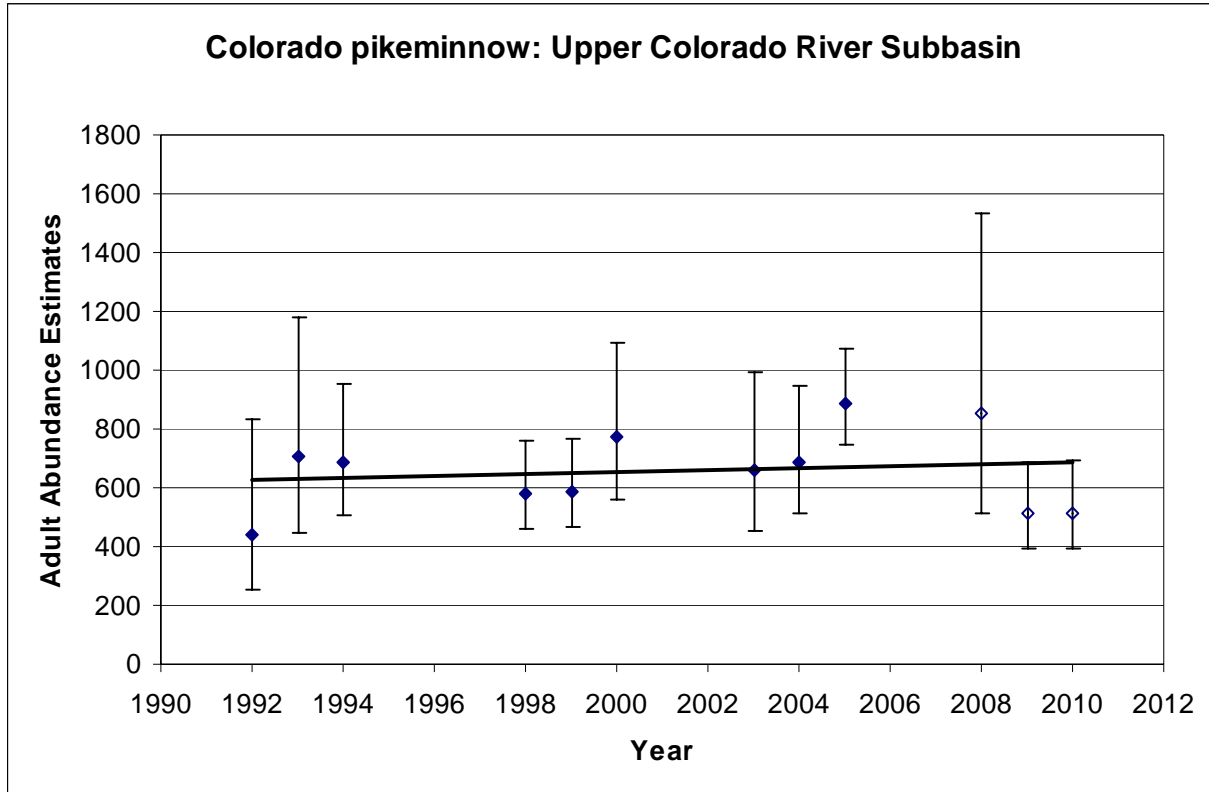


Figure 1. Adult Colorado pikeminnow population abundance estimates and trend for the Colorado River (Osmundson and Burnham 1998; Osmundson and White 2009; D. Osmundson, U.S. Fish and Wildlife Service, personal communication). Error bars represent the 95% confidence intervals. Estimates are preliminary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

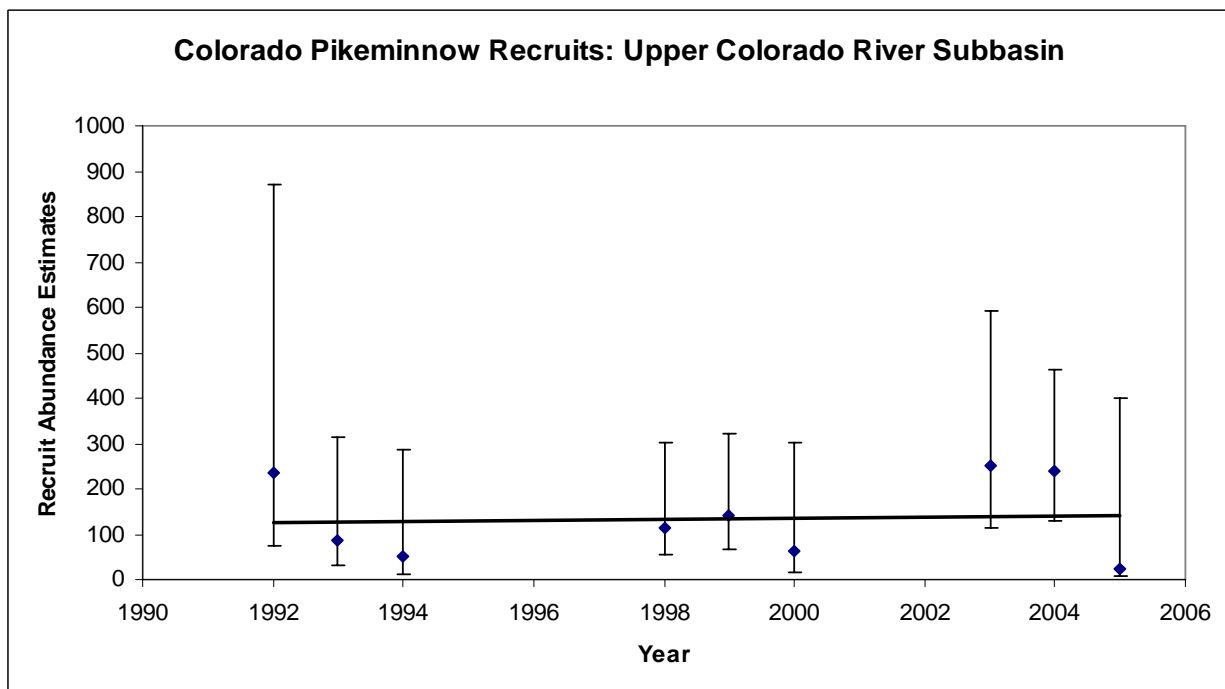


Figure 2. Colorado pikeminnow recruitment abundance estimates and trend for the Colorado River (Osmundson and White 2009). Error bars represent the 95% confidence intervals. The principal investigator had not calculated estimates of recruitment-sized fish for 2008-2010 at the time this memo was drafted.

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 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%.

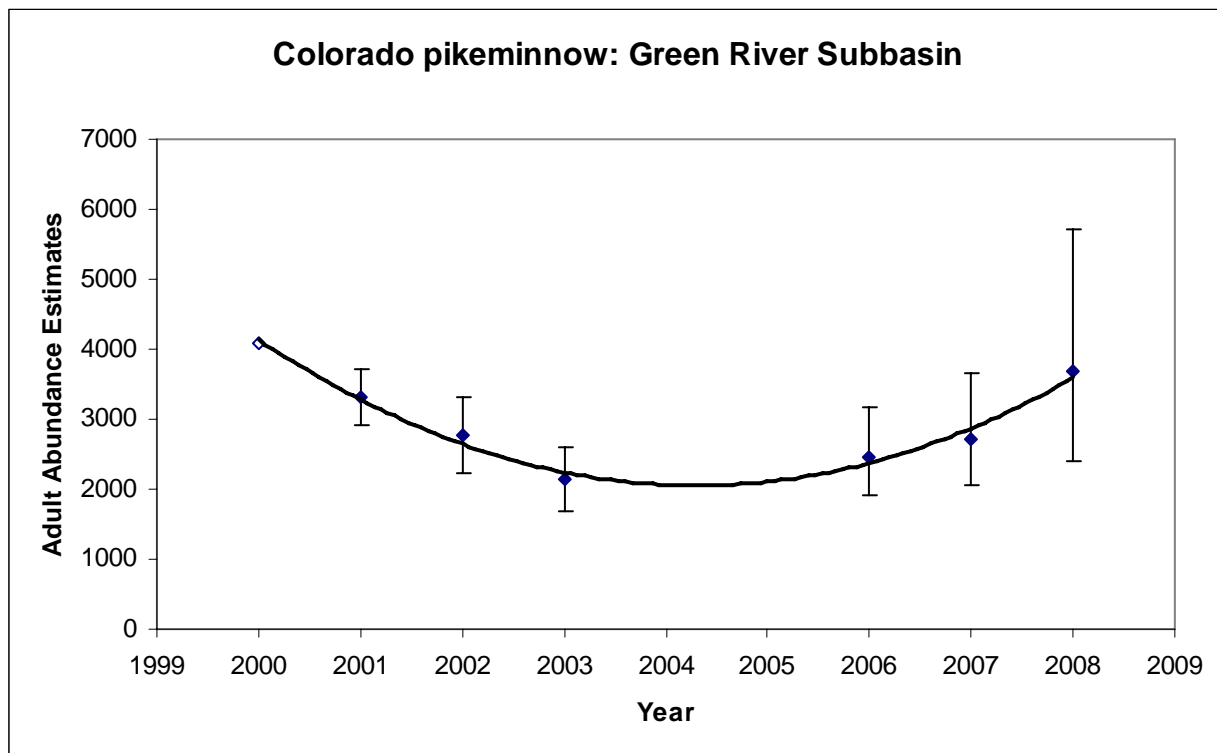


Figure 3. Adult Colorado pikeminnow population abundance estimates and trend for the Green River (Bestgen et al. 2007, 2010). Error bars represent the 95% confidence intervals. The estimate in 2000 was calculated differently because the lower Green River was not sampled that year, the number reflects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

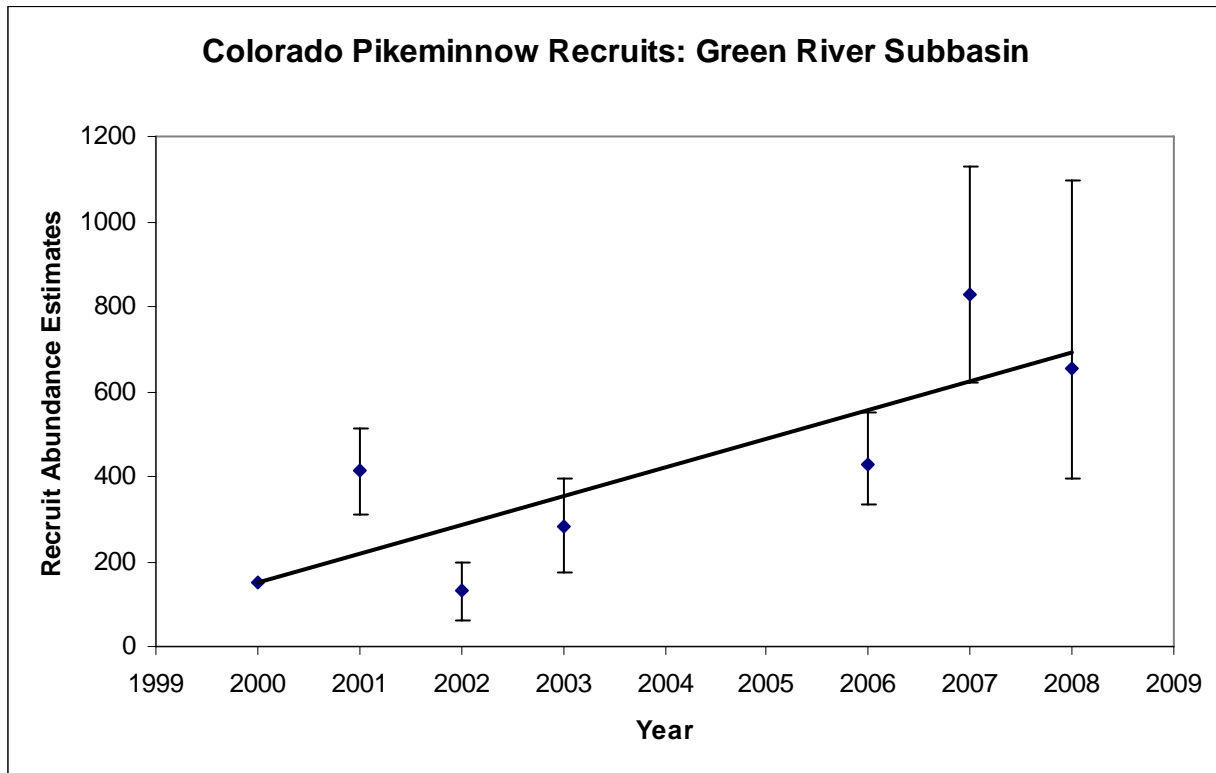


Figure 4. Estimated numbers of Colorado pikeminnow recruits (400-449 mm TL) in the Green River subbasin (Yampa, White, Middle Green, Desolation-Gray Canyons, and Lower Green) for 2001–2003 and 2006–2008. Error bars represent the 95% confidence intervals. Data from Bestgen et al. (2010).

Reproduction in Colorado pikeminnow as reflected through young of year abundance can often identify strong year classes. Numbers were lowest from 2001 through 2008 (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

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 adult (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 identified as humpback chub by physical characteristics; the roundtail chub from Ouray have been returned to the river in Dinosaur National Monument. Geneticists at Dexter National Fish Hatchery and Technology Center have since determined these Yampa fish in captivity are hybrids between humpback chub and roundtail chub (Wade Wilson, U.S. Fish and Wildlife Service, personal communication).

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 draft report on 2006–2007 estimates (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 2010, five small sites throughout Desolation Canyon were monitored for adults, those estimates ranged from 8–41 adults.

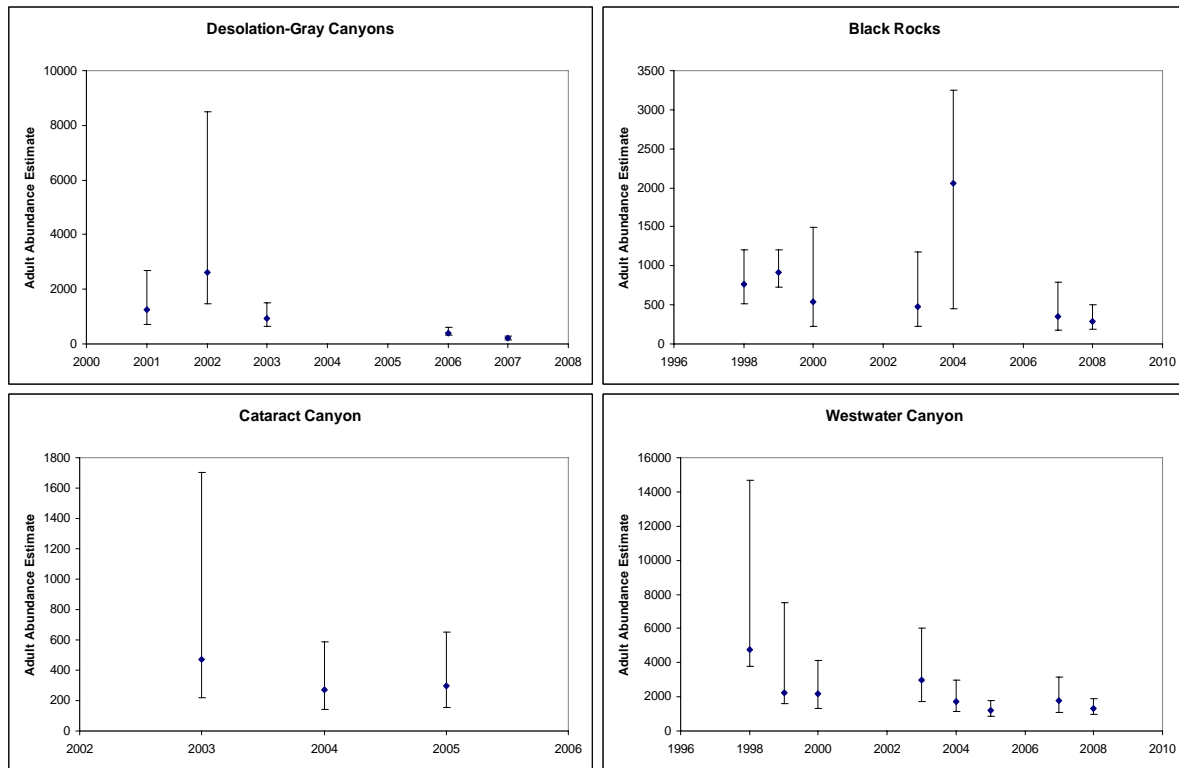


Figure 5. Adult population estimates with confidence intervals for four populations in upper Colorado River Basin. Clockwise from upper left: Desolation-Gray Canyons; Black Rocks (from Francis and McAda 2010); Westwater Canyon (from Jackson 2010); and Cataract Canyon (from [Badame 2008](#)).

On the Colorado River of the upper Colorado River Basin, three 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. 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. These numbers have been declining since the estimates were begun, and if Black Rocks and Westwater are summed together, the last estimate in 2008 is at 1,602, which is below the 2,100 MVP number. The Cataract Canyon 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 regime). In 2009, Utah Division of Wildlife Resources (UDWR) reported that the Cataract population appears to be stable.

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, but that level has not yet been reached. Many stocked razorback sucker are being recaptured as part of other studies (Table 2). Razorback sucker stocked in the Green and Colorado rivers (Table 3) 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 [in draft] 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 (Figure 6).

Table 2. Number of razorback sucker recaptured per year and river basin, 1997–2008 (modified after Zelasko et al. 2009, Zelasko unpublished data); recapture numbers in 2007–2008 were conservative as they represent only fish released since 2004. The arrow between 2003 and 2004 represents the time when a revised stocking plan was implemented that recommended stocking larger razorback sucker (≥ 300 mm total length). Shaded numbers are years when population estimates for Colorado pikeminnow were occurring, i.e., years when sampling effort was substantially greater.

River Basin	Year ↓											
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Colorado	0	1	0	24	31	3	157	121	361	15	32	314
Green	3	0	31	10	41	20	13	32	101	412	225	330

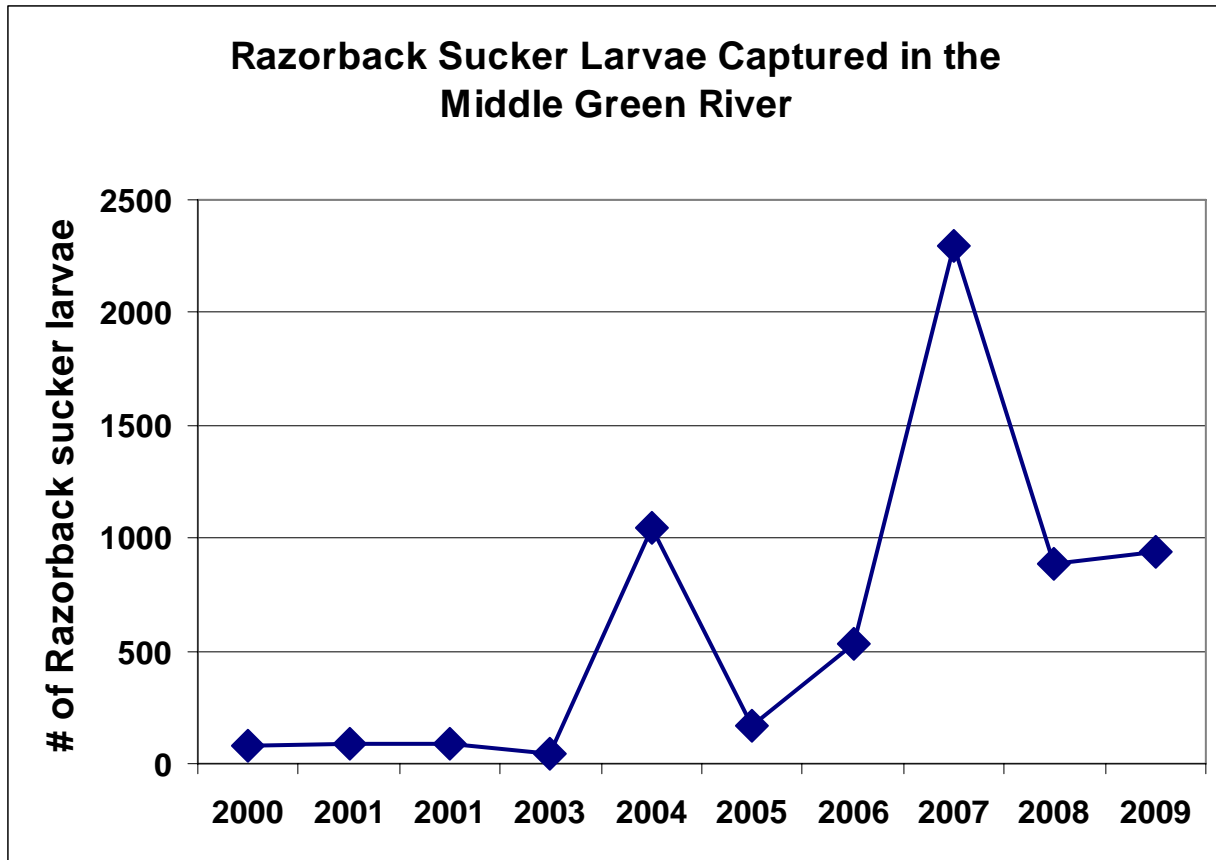


Figure 6. Numbers of razorback sucker larvae collected in light traps since 2000.

Bonytail

Stocking continues in an effort to reestablish populations in the Upper Colorado River Basin (Table 3). When the Upper Colorado Program was established, the bonytail had essentially disappeared and little was known about its habitat requirements. Key to bonytail recovery is 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. In 2009 and 2010, an increasing number of bonytail were detected at several locations throughout the Upper Colorado River Basin where stationary tag reading antennas are used.

Table 3. General overview of stocking efforts to reestablish razorback sucker and bonytail populations in the Upper Colorado River Basin (including the San Juan River for razorback sucker).

SPECIES	RIVER SYSTEM		
	MIDDLE GREEN	LOWER GREEN	UPPER COLORADO
Razorback Sucker	<p>Since 1995, over 217,000 subadult razorback suckers have been stocked in the Green and upper Colorado River subbasins. A draft report on survival estimates of stocked razorback sucker was accepted and the evaluation is being extended to razorback sucker data collected from 2004 through 2008, specific to the current stocking plan. From 2004–2007 more than 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 (Bestgen et al 2002), with an estimated annual survival rate of about 70 percent. The population is being augmented through stocking, which has been expanded with excess fish stocked into selected floodplain depressions. Stocked fish in reproductive condition have been captured at spawning sites, and captures of larvae demonstrate that these fish are reproducing. Numbers of larvae collected from the Green River in 2007 were the highest ever recorded (~2,200). Survival of larvae through the first year is evidenced by captures of juveniles (some of these may have been stocked larvae). In spring of 2009, researchers captured two adult razorback suckers in the Yampa River; the first seen in that river for nearly 30 years. These hatchery-raised fish were stocked in the middle Green River in 2004 and had traveled as much as 280 miles upstream over the course of the next 5 years.</p>	<p>Few wild adults have been captured in recent years. 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>Few wild adults have been captured in recent years. The population is being augmented through stocking. Small numbers of larvae were collected in the Gunnison River in 2002–2006, demonstrating reproduction by stocked fish. The detection of larvae is a direct result of spawning razorback sucker that have been stocked in the Gunnison River or have moved into the Gunnison using the Redlands fish ladder. Survival of larvae through the first year is evidenced by captures of juveniles (some of these may have been stocked larvae). Larvae also were collected in the Colorado River between Palisade and Moab from 2004–2007 (at several locations between Grand Junction and Westwater from 2004–2007, and at two upstream locations between Palisade and Grand Junction in 2007). Running ripe female razorback sucker were captured between Loma and Moab in 2005 and 2008.</p>
Bonytail	<p>Since 1996, over 332,000 tagged bonytail subadults have been stocked in the Green and upper Colorado River subbasins. Of those, about 112,000 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. In 2009 and 2010, bonytail with Passive Integrated Transponder tags have been detected at the Stirrup floodplain passing through a remote stationary antenna.</p>		

B. Program Accomplishments, Areas of Concern, and Recommended Action Items

Recovery Program participants accomplished a number of important objectives in 2010 and early 2011. These accomplishments, as well as concerns about ongoing/future recovery actions are reviewed in the two tables below. The second column in these tables identifies how the Program is or is not meeting the criteria used by the Service to evaluate whether the Recovery Program is making “sufficient progress” toward recovery:

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 these accomplishments and concerns can be found in the final March 25, 2011, assessment of accomplishments and shortcomings of the Recovery Program under the Recovery Implementation Program Recovery Action Plan (RIPRAP) from March 1, 2010, through February 1, 2011, which is incorporated in the 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.

ACCOMPLISHMENTS

Accomplishment	Criteria
General – Upper Basin-wide	
2010 nonnative fish management actions were accelerated to increase removal / disruption further into the smallmouth bass (SMB) spawning period to address the strong 2007 SMB cohort.	1 – Reduce threat of extinction by removing more nonnative fishes.
Wyoming implemented stricter penalties for "stocking fish without consent" beginning in 2010. Colorado implemented a policy prohibiting live transport of crayfish on the west slope. (Utah already has policy preventing live transport of fish and crayfish.)	1 – Reduce threat of extinction by reducing risk of additional nonnative species introductions.
Targets for hatchery production and stocking of endangered fish were largely met.	2 – Improving status of fish populations through stocking.
2011 Colorado Division of Wildlife (CDOW) fishing regulation changes lifted bag and possession limits on many nonnative fishes in several reaches ² .	1 – Reduce threat of extinction by removing more nonnative fishes.

² Green River in Moffat County; Yampa River from headwaters to Green River confluence in Moffat and Routt counties; White River from the confluence of the North and South Forks of the White River downstream to Kenney Reservoir, and from 400 yards below Taylor Draw Dam downstream to the stateline in Rio Blanco County; Colorado River in Garfield, Eagle, Grand and Mesa counties, from the confluence with the Eagle River downstream to the stateline; Eagle River in Eagle County from the I-70 EXIT 147 bridge in Eagle downstream to the confluence with the Colorado River; North Fork Gunnison River from the confluence with Anthracite Creek downstream to the confluence with the Gunnison River, in the Uncompahgre River from Ridgeway Dam downstream to the confluence with the Gunnison River, and in the Gunnison River from the confluence with the Smith Fork downstream to the confluence with the Colorado River, in Delta, Gunnison, Montrose and Ouray counties; San Miguel River from the Colo. 90 bridge at Pinion downstream to the confluence with the Dolores River, and in the Dolores River from McPhee dam downstream to the stateline in Dolores, Mesa, Montezuma, Montrose, and San Miguel counties.

Electrofishing equipment and techniques were standardized for hard-bottom boats in 2010. Standardizing inflatable boats was begun in 2010.	1 – Reduce threat of extinction by improving efficiency of nonnative fish removal and minimizing harm to native species.
Green River	
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. In 2010, the request for spring peak flows was 15,000 cfs for 5 consecutive days, there were 18 consecutive days above 15,000 cfs. Reclamation met the Program's base flow request of 2,100 cfs from July 15 to October 1st. The purpose of this base flow release pattern was to disadvantage nonnative species and create better habitat conditions for young pikeminnow. The average flow from July 15 to September 30 was 2292 cfs. Argonne's backwater survey below Jensen showed the 2010's requested base flow of 2100 cfs translated into greater surface area in 5 of 6 habitats.	1 – Improve habitat and reduce threat of extinction; 3 – Improve flows; 4 – Reduce magnitude of project impact.
Utah's Green River Utah Water Acquisition Team (GRUWAT) provided a work plan to develop options for protecting flows for the endangered fishes on the Green River. The work plan identified issues, concerns and a timeframe. Currently in progress are prioritizing potential methods and criteria, amalgamating technical information needed to model and resolve modeling issues, and developing a model to analyze historic and future conditions.	1 – Maintain habitat through protected flows.
The remote PIT-tag antennae deployed in the Stirrup floodplain detected bonytail (11 2007-2009, 5 in 2010), razorback sucker (15 2007-2009, 31 in 2010), and Colorado pikeminnow (13 2007-2009, 6 in 2010). A total of 490 razorback sucker (TL=252mm) from Baeser Bend were stocked into Green River in 2010; The Baeser floodplain will be reset to eliminate nonnatives in 2011 (after one more capture effort).	1 – Measurable population response of stocked and wild fish to improved habitat; reduced threat of extinction by removing more nonnative fishes. 2 – Improve status of fish populations by stocking razorback sucker.
In response to first detection of burbot in the Green River below Flaming Gorge (Split Mountain Canyon), the UDWR immediately extended their must-kill policy to burbot and instituted a week-long burbot derby in Flaming Gorge in January 2011.	1 – Reduce threat of extinction by removing more nonnative fishes.
The Green River 2006-2008 Colorado pikeminnow (CPM) population estimate report (Bestgen et al 2010) was completed. Although populations fluctuate, an increasing trend was detected. UDWR captured 454 age-0 CPM in backwaters throughout 104 miles of the Middle Green River (highest number since 1991) and an additional 54 age-0 CPM as part of the native fish response study.	1 – Measurable population response; 2 – improved status of fish populations.
Yampa River	
Late summer flows in the Yampa River were augmented for the fourth year using releases from Elkhead Reservoir. Minimum instream flow target increased from 93 cfs to 134 cfs. All 5,000 af of Program's 5,000 af pool were 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.	1 – Improve habitat through augmented flows; reduce threat of extinction by hindering smallmouth bass recruitment; 3 – Improve flows.
The CDOW completed the Yampa River Basin Aquatic Wildlife Management Plan in October (CDOW 2010). The plan characterizes the middle and lower Yampa River as a priority management area for native fish.	1 – Reduce threat of extinction by reducing risk of additional nonnative fish introductions.
Based on review of previous years' data, translocation of smallmouth bass to Elkhead Reservoir was ceased for 2011 and the mark and release sampling pass for northern pike within the Yampa buffer zone (Hayden to Craig) was discontinued.	1 – Reduce threat of extinction by removing more nonnative fish.

Duchesne River	
2,900 af of water per year has been made available from the Daniels Diversion; formal agreements to protect these flows may not be necessary as the Duchesne River Working Group is working to meet the flow recommendations with voluntary participation. Initial analysis shows that efforts to meet the flow recommendations have been successful.	1 – Improve habitat through augmented flows; 3 – Improve flows.
An additional 1,500 af/year from Big Sand Wash has been made available for five years beginning in 2011 to assist in meeting target flows (water users and the Department of Interior could choose to extend this in 5-year increments, depending on other demands).	1 – Improve habitat through augmented flows; 3 – Improve flows.
White River	
In January 2011, Utah conditioned a new 800af water right application to protect endangered fish baseflows by limiting diversions to times when flows at the U.S. Geological Survey (USGS) White River Watson gage are at least 161 cfs.	1 – Legal protection of flows; 4 – Reduce magnitude of project impact.
Colorado River	
2010 base flow augmentation for the 15-Mile Reach began on July 21, with the average flow target of 1,240 cfs; by mid-August the target was dropped to 1000 cfs. A total of 104,716 af was added to baseflow in water year 2010, including 52,032 af from Green Mountain (assisted by Grand Valley Water Management), 19,263 af from Ruedi, 4,872 af from Williams Fork, 7,572 af from Wolford Mountain Reservoir, and 20,617 af from the Palisade Bypass Pipeline.	1 – Improve habitat through augmented flows; 3 – Improve flows.
Existing 10-year (interim) agreements for a permanent 10,825 af of water from the East and West Slope water users that expired July 1, 2010 were extended in July of 2010 through 2013 (with option for 2 more years until the permanent 10,825 agreements are finalized). Delivery of the permanent 10,825 af may occur as early as summer 2013.	1 – Improve habitat through augmented flows; 3 – Improve flows.
Due to rapid snowmelt, spring 2010 saw the highest coordinated peak flow release (73,971 af) since 1997 when Coordinated Reservoir Operations (CROS) began. The coordinate release CROS for the 2010 spring peak in the 15-mile reach increased the peak by 2,500 cfs: from 21,800 cfs to 24,300 cfs.	1 – Improve habitat through augmented flows; 3 – Improve flows.
The Grand Valley Water Management Project reduced irrigation diversions by 24,001 af in water year 2010. In addition to this amount, 20,617 af were returned through Palisade pipeline to the 15-Mile Reach.	1 – Improve habitat through augmented flows; 3 – Improve flows; 4 – Reduce magnitude of project impact.
A re-regulating reservoir site was secured for the Orchard Mesa Irrigation District Canal Automation Project (OMID). The Colorado Water Conservation Board, River District and Reclamation are nearing a final draft of the cost-share agreement for O&M of this project.	OMID will: 1 – Improve habitat through augmented flows; 3 – Improve flows; 4 – Reduce magnitude of project impact.
A passive PIT-tag monitoring system was installed in the Price-Stubb fish passage in 2010. Through 2010, eighty unique fish had used the passage (2 Colorado pikeminnow [all Grand Valley], 6 roundtail chub [all Black Rocks], 72 razorback sucker [stocked at Hoagland]). Most fish movement has been downstream.	1 – Measurable population response of stocked and wild fish to habitat restored through fish passage.
The Government Highline (Grand Valley Project) passage operated continuously April 16 to October 15, 2010. In that time, 18,390 fish used the passage, including 16,358 native fishes. No endangered fishes used the passage in 2010.	1 – Measurable population response of stocked and wild fish to habitat restored through fish passage.
The Colorado Division of State Parks (CDOP) has been diligent in monitoring and cleaning the Highline net. In 2011, CDOW removed harvest limits on unauthorized smallmouth bass in Highline Reservoir.	1 – Reduce threat of extinction by reducing risk of nonnative fish escapement to critical habitat.

Gunnison River	
The Aspinall study plan has been approved by the Biology and Management committees. CDOW has monitored the Gunnison River fish community since 2008; discussions are underway for larval community monitoring and potentially additional adult/juvenile community monitoring beginning in 2011.	4 – Reduce magnitude of project impact.
The Redlands fish ladder was operated April 16 through October 15, 2010. 6,708 fish used the ladder in 2010; of those 5,805 were native fishes, including 4 pikeminnow and one stocked razorback sucker and 1 humpback chub from Westwater. One hundred and eight pikeminnow, 27 razorback sucker, one bonytail, and now 1 humpback chub have used the ladder since summer 1996.	1 – Measurable population response of stocked and wild fish to habitat restored through fish passage.
In 2011, CDOW removed harvest limits on illegally-introduced northern pike in Crawford Reservoir.	1 – Reduce threat of extinction by reducing risk of nonnative fish escapement to critical habitat.
CDOW is operating a fish screen on Juniata Reservoir which drains into a tributary to the Gunnison River.	1 – Reduce threat of extinction by reducing risk of nonnative fish escapement to critical habitat.
Dolores River	
In 2011, CDOW removed harvest limits on illegally-introduced walleye in McPhee.	1 – Reduce threat of extinction by reducing risk of nonnative fish escapement to critical habitat.

CONCERNS

Concern	Criteria	Recommended Action Items
General – Upper Basin-wide		
The report characterizing the magnitude, timing, and size distribution of sediment transport in the Colorado, Gunnison, and Green Rivers is behind schedule. A webinar to review the draft was held March 4, 2011, and final Biology Committee/Water Acquisition Committee (BC/WAC) comments submitted April 1. Cory Williams is revising the draft, it will then go to USGS editorial review (30 days), and then to final Program (WAC/BC) review.	May hamper ability to 1 – Improve habitat through augmented flows; and 3 – Improve flows.	Cory Williams to send revised draft to USGS editorial by June 1, then revise & send to BC/WAC for final approval by August 1.
Illicit introduction of nonnative aquatic species continues in the upper basin, posing significant risk to endangered fishes. Some progress has been made (e.g., Wyoming's 2010 implementation of stricter penalties for "stocking fish without consent" and Utah's swift implementation of must-kill policies when new nonnative species have been introduced); however, the Service believes efforts throughout the upper basin need to be further increased to reduce/remediate illicit introductions through education, disincentives, enforcement, and/or penalties.	1 – Increases threat of extinction by increasing numbers and species of nonnative fish in critical habitat.	The Program Director's office will work with the signatories to the Nonnative Fish Stocking Policy to develop a Nonnative Fish Strategy that squarely addresses the issue of illicit stocking (draft due 9/1/11).
A monitoring plan for razorback sucker is behind schedule, but anticipated in 2011.	Hampers ability to: 1 – Measure population response to stocking efforts.	The Larval Fish Lab is scheduled to submit the draft razorback monitoring plan by May 31, 2011.
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, in prep.).	2 – Declining status of fish populations.	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 will convene 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.

Green River		
Nonnative burbot were found for the first time in the Green River below Flaming Gorge this year in Split Mountain Canyon. Gizzard shad have been found in lower Green River backwaters 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.	1 – Increases threat of extinction by increasing numbers and species of nonnative fish in critical habitat.	The Program Director's Office will provide a draft Upper Basin Nonnative Fish Strategy for Program review by September 1, 2011. This strategy will identify actions needed to prevent introduction of new invasive species and also identify actions to eliminate newly-emerging invasives such as burbot and gizzard shad.
The draft position paper "Role of the Price River in Recovery of Endangered Fish and the Need for Flow Management" is behind schedule, but now in final revision.	May hamper ability to 1 – Improve habitat through augmented flows; and 3 – Improve flows.	The Program Director's Office will provide a final draft for Program review by July 1.
The Recovery Program still needs to determine whether a screen is needed to prevent entrainment of endangered fish at the Tusher Wash Diversion. In 2010, Dr. Kevin Bestgen Colorado State University (CSU) modeled estimated adult/sub-adult Colorado pikeminnow mortality under different screening options at various flow levels. A literature review of lowhead diversions and screening is needed in 2011. Water users are still discussing raising the diversion dam, which would affect plans, design, and schedule/funding sources for screen construction.	May contribute to 2 – Declining status of fish populations.	The Tusher Wash Ad Hoc Group is gathering information (literature review to be completed in summer 2011, and a potential mortality study, if needed and funding available). to develop a screening recommendation
Yampa River		
The Yampa Programmatic Biological Opinion (PBO) calls for a review of progress under the PBO every 5 years to determine if instream flow filings are necessary.	Hampers ability to 3 – Determine adequacy of flows.	The Water Acquisition Committee will review mechanisms of current flow protection under the PBO's for both the Yampa and Colorado rivers to determine if additional mechanisms or instream flow filings are needed at this time (this will be reviewed every 5 years). As part of this review, the Committee will discuss the need for peak flow protection (which would require a peak flow recommendation).
A depletion accounting report as outlined in the Yampa River PBO, including calculation of new depletions every 5 years as a 10-year moving average as determined by Colorado Water Conservation Board (CWCB) and reported to the Service and the Recovery Program was due in 2010. The State of Wyoming has submitted an assessment of depletions.	Hampers ability to 3 – Determine adequacy of flows.	CWCB will create a Consumptive Uses & Losses Report for 1975-2009, compare those to the old 1975-1998 numbers, and compare their new estimates for 1975-1998 to 1999-2009. The StateCU model will be completed by June 1, 2011; Subsequently, meetings will be held with TNC to discuss StateMOD. CWCB, the Service, and the Water Acquisition Committee also should discuss whether

		we are able to adequately document depletions.
Researchers reported continued escapement of nonnative fish from the enlarged Elkhead Reservoir. (Based on the 2010 Nonnative Fish Workshop discussions of escapement and source and propagule concerns, the Recovery Program recommended and CDOW agreed to cease translocation of smallmouth bass removed from the Yampa River to Elkhead Reservoir.)	1 – Increases threat of extinction by increasing numbers of nonnative fish in critical habitat.	CSU will complete the programmatic synthesis of smallmouth bass removal efforts (2012) which will provide a comprehensive evaluation of the Program’s removal efforts as well as a thorough assessment of escapement.
Ongoing northern pike (NP) control efforts have shifted the population size structure to smaller individuals throughout critical habitat on the Yampa River, but the population remains fairly stable. The current density is 21 NP/mile (Craig to Hayden) and 7.9 NP/mile in critical habitat. The interim target for critical habitat is 3 NP/mile (or current pikeminnow density [1.9 pikeminnow/mile in 2008], whichever is lower). CDOW has continued efforts to remove NP from Catamount Reservoir and the upper Yampa River mainstem, but so far this work has not reduced downstream pike abundance. The final Yampa Aquatic Management Plan did not offer specific management actions or timeframes for controlling pike as the Service recommended in their 2010 sufficient progress letter and comments on the draft Yampa Aquatic Management Plan.	Hampers ability to 1 – Reduce threat of extinction by decrease numbers of northern pike in critical habitat.	CSU will conduct a programmatic synthesis of northern pike removal efforts (2011-2012) which will evaluate current removal efforts in the context of northern pike life history throughout the Yampa River drainage. The Service supports the Program Director's Office recommendation that there be additional emphasis on northern pike control above Hayden.
Duchesne River (none)		
White River		
Final flow recommendations for the White River are still incomplete.	Hampers ability to 1 – Improve habitat through augmented flows; and 3 – Improve flows.	The Program Director’s Office will submit a draft report to BC/WAC by July 1, 2011. Program participants have initiated efforts to develop a White River Management Plan that likely will lead to a programmatic biological opinion.

Colorado River		
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 EA and agreements.
Completion of Coordinated Facility Operations (CFOPS) Phase III, to provide additional peak flows to the 15-Mile Reach, has been on hold, waiting for 2008-2009 annual CROS reports (anticipated March 31, 2011). If the reports are not provided, the CFOPS project will be completed without them.	Hampers ability to 1 – Improve habitat through augmented flows; and 3 – Improve flows.	Recovery Program participants will complete the final CFOPS report by September 30, 2011.
The condition of fish once they have passed through the fish screen return pipes has never been evaluated.	May contribute to 2 – Declining status of fish populations.	The Service will document condition of a surrogate species (white sucker) below the Grand Valley Irrigation Company return pipe (begins July 2011).
In recent years, annual unscreened outlet releases from Highline Reservoir occurred when oxygen levels would allow potential escapement/entrainment of nonnative fishes.	1 – Increases threat of extinction by potentially increasing numbers of nonnative fish in critical habitat.	CDOW and the Recovery Program have coordinated with Parks so that the 2011 unscreened outlet release will be scheduled in the summer when oxygen is depleted at depth to prevent fish escapement. The Recovery Program also will coordinate with Parks to revise the scope of work accordingly (to assure that unscreened outlet releases only occur when oxygen levels are ≤ 2 mg/l).
Gunnison River		
The PBO was completed in December 2009. The Aspinall Study Plan required by the PBO has been approved and is being finalized. The final Environmental Impact Statement (EIS) for reoperation of the Aspinall Unit is behind schedule.	May hamper ability to 1 – Improve habitat through augmented flows; and 3 – Improve flows.	The Aspinall Study Plan will begin to be implemented in FY11. Reclamation will complete the final Aspinall Environmental Impact Statement by December 31, 2011.
Dolores River (none)		

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 feet³. Projects exceeding 4,500 acre feet or that have direct or indirect effects in addition to water depletions will be evaluated to determine if they jeopardize the species’ continued existence on a case by case basis.

The Service views the following as significant accomplishments: a) recent increases in the Green River adult pikeminnow population; b) the strong cohort of age-0 pikeminnow produced in the middle Green River in 2009 and 2010; c) continued cooperation to manage spring and base flows throughout the basin; d) continued emphasis on nonnative fish management; e) meeting razorback sucker and bonytail stocking targets; and f) successful razorback sucker spawning. However, the Service remains very concerned about recent downward trends in humpback chub populations in Desolation Canyon on the Green River, and now in Black Rocks on the Colorado River.”

The Service strongly encourages all Recovery Program participants to remain attentive to the lingering impacts of drought conditions which have exacerbated human-caused threats such as the negative effects of nonnative fishes on recovery of the endangered fishes and to continue to aggressively pursue management actions to alleviate threats to the species, including: a) providing and protecting necessary flow and habitat conditions (including completion of the Aspinall Environmental Impact Statement and Record of Decision); and b) preventing additional

³ 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.

introductions and expansion of problematic nonnative aquatic species. In addition, the Service acknowledges and strongly encourages Program participants' efforts to ensure that the Program can continue to implement recovery actions at existing levels in light of current funding authorization. Finally, we encourage the Recovery Program to be an active participant in the development and implementation of the Southern Rockies Landscape Conservation Cooperative (co-led by the Service and Reclamation), which will attempt to address impacts of climate change throughout the Colorado River basin."

II. IMPLEMENTATION OF ITEMS IN THE 15-MILE REACH AND GUNNISON RIVER BASIN PROGRAMMATIC BIOLOGICAL OPINIONS

A. 15-Mile Reach

On December 20, 1999, the Service issued a final programmatic biological opinion for the Bureau of Reclamation's operations and depletions, other depletions, and funding and implementation of Recovery Program actions in the upper Colorado River upstream from the Gunnison River confluence. Known as the "15-Mile Reach Programmatic Biological Opinion (PBO)", the PBO determined that implementation of recovery actions and continued water depletions in the Colorado River would not likely jeopardize the continued existence of the endangered fishes. The PBO cites action items in the RIPRAP and charges the Recovery Program with the responsibility to ensure that these action items are completed and/or implemented. Page 74 of the PBO says: "In 2003 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 PBO review (see attached spreadsheet) identified no issues not already addressed under Sufficient Progress (section I of this memo).

B. Gunnison River Basin

On December 4, 2009, the Service issued a final programmatic biological opinion for the Gunnison River Basin and the operation of the Wayne N. Aspinall Unit and the reconsultation for the Dallas Creek and Dolores Projects and their effects on the endangered fishes. Known as the "Gunnison River Basin Programmatic Biological Opinion (PBO)", the PBO determined that the proposed action (reoperation of the Aspinall Unit, existing water depletions in the Gunnison River basin, new depletions up to 3,500 af/yr, new depletions associated with the Upper Gunnison Subordination up to 22,200 af/yr., continuation of the operation of other Reclamation Projects in the Gunnison Basin, and other Federal, private, local, and State water projects and water uses in the Gunnison Basin) is not likely to jeopardize the continued existence of endangered fish and is not likely to destroy or adversely modify designated critical habitat. Page 83 of the PBO says: "Every 2 years, for the life of the Recovery Program, the Service and Recovery Program will review implementation of the Recovery Action Plan actions that

are included in this biological opinion to determine timely compliance with applicable schedules.”

Reviewing the PBO, the Service recognizes that Reclamation is moving forward with the Selenium Management Plan and the Recovery Program is providing necessary tissue samples for analysis. The Aspinall Study Plan is being finalized and fish community studies are being implemented in 2011. However, as discussed under Sufficient Progress (Section I of this memo), the final Aspinall Environmental Impact Statement and Record of Decision are behind schedule. This delayed implementation of the proposed action in the Gunnison River PBO raises concern about the appropriateness of subsequent coverage of consultations for water users in the Gunnison Basin under the Gunnison River PBO.

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Recovery Actions in 15-Mile Reach PBO	RIPRAP Item #	Status	PBO Page #
Define Existing Depletions/Calculate New Depletions			
a). Develop consumptive use and losses report with CRDSS model to verify level of depletions.	Colorado: IA3b	CWCB completed depletion accounting report in 2008.	Apx. B, #6
b). Calculate new depletions as a 10-year moving average as determined by CWCB and reported to FWS & CRRIP every 5 years.	Colorado: IA3c	Reporting of depletions as a 10-year moving average begins in 2011. CWCB/WAC did not prepare plan to accomplish this by October 1, 2010 as agreed upon; CWCB will provide to WAC for review in April 2011. Review needs to include what are new vs. historic depletions.	7
Habitat Protection Element			
General Protection			
Enforcement Agreement between FWS and CWCB.	General: IC1	Completed in 1993.	8
Late Summer and Fall Base-Flow Period Augmentation			
See also "Flow graphs" and "Flow tables" worksheets.			
a). Instream flow decree for 581 cfs in 15-mile reach during July, August, and September.	Colorado: IA4c1	Completed in 1997.	8
b). 300 cfs instream flow right for water accretions in 15-mile reach.	Colorado: IA4c2	Completed in 1997.	8
c). 5,000 acre-feet (af) annually + 5,000 af 4 out of 5 years from Ruedi.	Colorado: IA5a	Ongoing since 1989 (except second 5,000 af was not available in 2002).	8
d). 21,650 af/year split evenly between Ruedi and water users.	Colorado: IA5b,c,d	Ongoing since 1997. Ruedi long-term agreement for 10,825 af through 2012 signed in June 2003. 5,412.5 af from Williams Fork for east slope water users commitment and 5,412.5 af from Wolford for west slope water users commitment through 2010 (extendable for an additional 5 years). *Note: due to drought conditions, little water was available from Wolford in 2002-2004 (1,000 af was provided in 2005), and only 70% of the Williams Fork water was available in 2003-2004. The River District secured a 5,000 af contract for water from Ruedi as a backup to Wolford water (signed December 28, 2007). 2010 base flow augmentation began July 21, with the average flow target of 1,240 cfs, by mid August the target dropped to 1000 cfs. A total of 102,994 af was added to baseflow in water year 2010: 52,032 af from Green Mountain (assisted by Grand Valley Water Management), 19,263 af from Ruedi, 4,872 af from Williams Fork, 7,572 af from Wolford Mountain Reservoir, and 13,760 af from the Palisade Bypass Pipeline (see Flow tables worksheet). Program still struggles to meet flow recommendations in drought years; Recovery Program participants will consider options and opportunities for meeting flow recommendations on a more consistent basis after completion of the 10,825 EA and agreements.	8
e). After 2009, the water users must have agreements with the Service to provide a permanent source of the 10,825 af (divided equally between east and west slope).	Colorado: IA5e3	In January 2007, Colorado River water users initiated a study of water supply alternatives to provide a permanent source of water to replace the Ruedi 10,825 AF/year. After reviewing 25 alternatives, consensus was reached on the "Lake Granby-Ruedi" alternative. Existing 10-year (interim) agreements that expired July 1, 2010 were extended in July of 2010 through 2013 (with option for 2 more years until permanent 10825 is finalized). Delivery of permanent 10825 may occur as early as summer 2013.	8-9
f). 6,000 af from Wolford.	Colorado: IA5h	Ongoing since 1996 (actual amount of water available each year is based on 10% of the storable inflow to Wolford, up to 6,000 af). 6,000 af provided in 2000; 3,078a f in 2001; 300 af in 2002; 286 af in 2003; 0 af in 2004 and 2005 (to allow the reservoir to recover from the 2002 drought), and 5,233 af in 2006; 0 af in 2007; 3,190 af in 2008; 3,490 in 2009 and 3,000 in 2010.	10

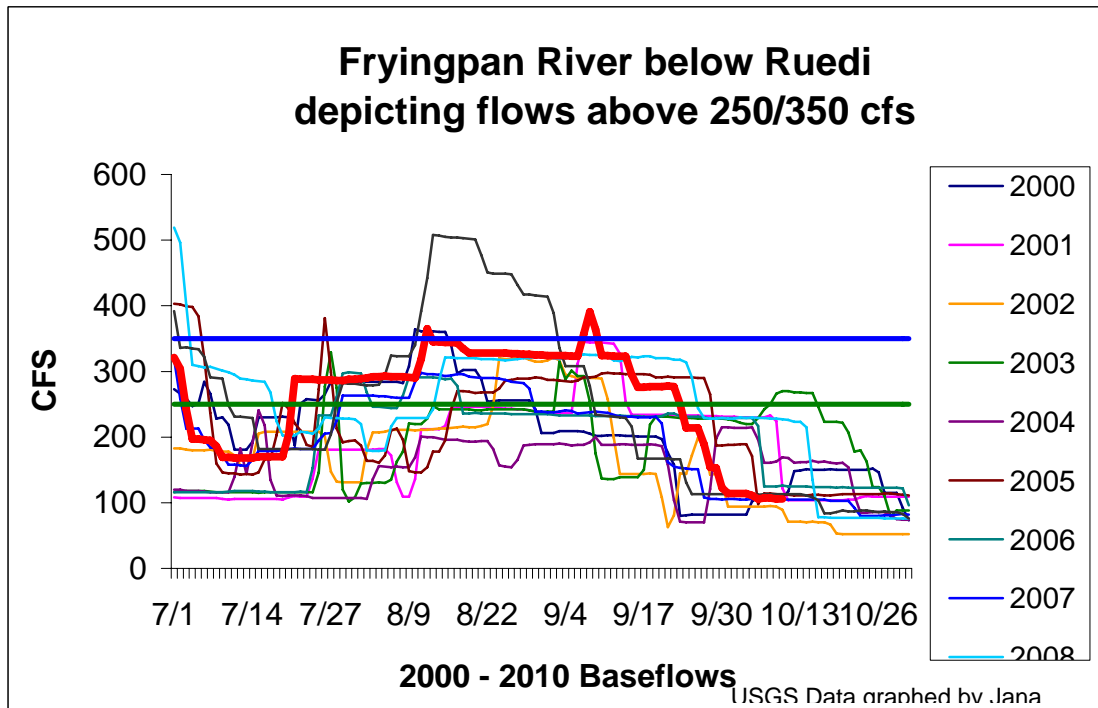
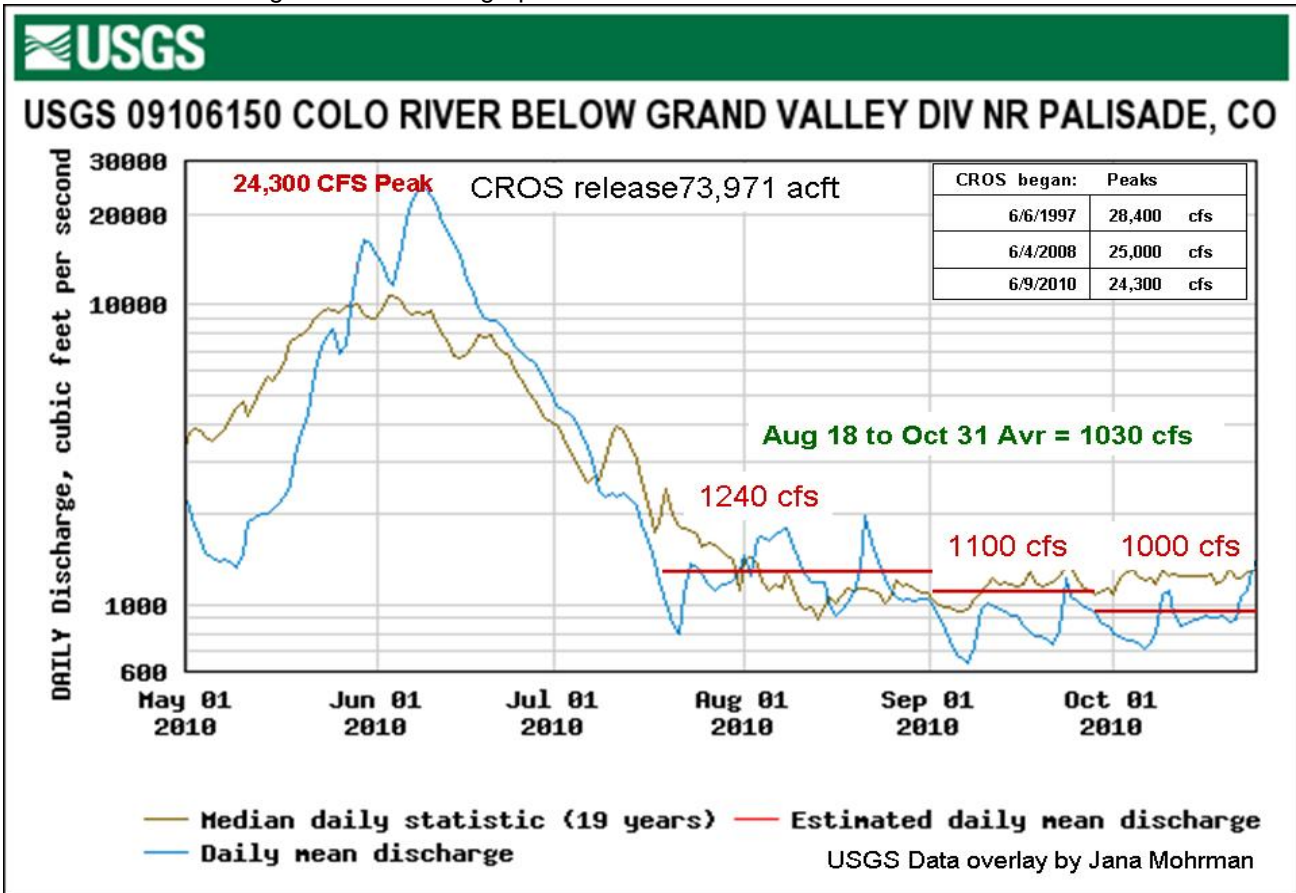
Recovery Actions in 15-Mile Reach PBO	RIPRAP Item #	Status	PBO Page #
<p>g). Grand Valley Water Management - Study of canal operations showed spills from the Government Highline Canal averaged 31,400 (Aug-Oct) from 1992-1994. GVWM will reduce canal spills by 19,400 af and ~9,000 af will be returned to the Colorado River through Palisade Pipeline.</p>	<p>Colorado: IA5I</p>	<p>Construction and automation of check structures and Palisade pipeline and Highline Lake pump station complete and operational. With water saved from efficiencies, fewer canal spills, return from pipeline (irrigation season Mar-Oct) and water from the HUP pool in Green Mt reservoir (July-Oct), savings have been better than projected (> 19,400 + 9,000 af = 28,400 af). Water provided for fish from Green Mtn. Reservoir (including GVWM): 2000 - 42,468 af; 2001 - 31,118 af; 2002 -44,793 af; 2003 - 85,863 af; 2004 -42,689 af; 2005 - 81,122 af; 2006 - 40,858 af; 2007 - 79,385 af; 2008 - 117,451 af; 2009 - 147,200 af; and 2010 96,650 af. The Municipal/Recreation contract for Green Mountain Reservoir water was originally signed in 2002 and renewed on 8/29/07 through 12/31/12.</p>	<p>10</p>
<p>Spring Peak Enhancement</p>			
<p>See also "Flow graphs" and "Flow tables" worksheets.</p>			
<p>a). Coordinated Reservoir Operations - in all but extremely dry or wet years.</p>	<p>Colorado: IA5i2</p>	<p>Ongoing since 1997. Spring peak flows were augmented in 1997, 1998, 1999, 2006, 2008, 2009 and 2010. Spring peak flows in 2000, 2001, 2002, and 2004 were below the 12,900 cfs threshold for implementing coordinated reservoir operations under CROS. Spring peak flows in 2003 and 2005 exceeded the 12,900 cfs threshold, but other CROS operating criteria were not met and therefore flows were not augmented. CROS implementation plan completed 2/28/06 in advance of 2006 runoff season. Due to rapid snowmelt, spring 2010 saw the highest coordinated peak flow release (73,971 af) since 1997 when CROS began. The coordinate release (CROS) for the 2010 spring peak in the 15-mile reach increased the peak by 2,500 cfs: from 21,800 cfs to 24,300 cfs. 2011 is shaping up very wet; therefor the potential to augment the peak is currently questionable, but peak may be broadened by augmenting the shoulder periods.</p>	<p>11</p>
<p>b). Coordinated Facilities Operations Program - provide up to 20,000 af.</p>	<p>Colorado: IA5m2</p>	<p>Phase II report & recommendations of the Executive Committee completed in 2003, but no additional water provided under CFOPS. Implementation linked to CROS (see above). With assistance of the State Engineer's Office, CWCB, and reservoir owners, FWS identified reservoirs that could participate in CFOPS. The amount of water that could be released depends on the size of an insurance pool that would be designated by FWS ~May 5 of each year from existing base flow environmental pools in Ruedi and the water users' 10,825 pool. In years where augmentation could be expanded through use of CFOPS, Service will review antecedent conditions, determine if additional augmentation is needed, and level of augmentation based on the size of the "insurance pool." Completion of CFOPS Phase III on hold, waiting for 2008-2009 annual CROS reports (anticipated March 31, 2011). Anticipate final CFOPS report by September 30, 2011.</p>	<p>11</p>
<p>Habitat Development and Maintenance Element</p>			
<p>Floodplain Restoration and Selenium Remediation</p>			
<p>Colorado subbasin floodplain management plan completed 3/06.</p>			
<p>a). Gardner Pond (29-5/8 Road Gravel Pit).</p>	<p>IIA1</p>	<p>Construction complete; Beswick pond used as a growout pond in 2010 & 2011. Restoration of this "Hot Spot Complex" on hold pending completion of new Horsethief ponds. Once new Horsethief ponds are complete, restoration should be revisited.</p>	
<p>b). Jarvis.</p>	<p>None</p>	<p>Construction complete; operation ongoing. Program removed sediment build-up at the Jarvis pond inlet/outlet structure in fall 2010 (same as work performed in October 2003).</p>	<p>12</p>

Recovery Actions in 15-Mile Reach PBO	RIPRAP Item #	Status	PBO Page #
c). Adobe Creek.	IIA2	Construction for the research study complete, but no funding available through NIWQP to complete selenium remediation. The need to pursue restoration of this site for razorback sucker recovery should be revisited. Dikes placed for research study in tertiary channel should be removed.	13
d). Walter Walker.	IIA3	Construction complete; operation ongoing. More levee was removed in 2004. Habitat enhancements at the Audubon and Walter Walker sites were evaluated over a range of flows during 2006 spring runoff and performed well (i.e., as per design and construction). CDOW actively managing WW and encouraging waterfowl hunting there.	13
e). Land acquisition and levee removal.	IIA4&IIA5	PBO estimate of acquiring interest in up to 3,500 acres in the Grand Valley and along the Gunnison was quite high based on landowner response. Restoration more expensive than anticipated; few landowners willing to participate. Program acquired 592 acres of floodplain/wetland habitat in the upper Colorado River subbasin (393.5 acres along the Colorado River and 198.2 acres along the Gunnison River), and is working to best manage the floodplain currently available. Restoration completed at Butch Craig property & Escalante SWA on the Gunnison, and the Audubon property on the Colorado. Until it is determined that there is enough habitat to support a self-sustaining population of razorback sucker in the upper Colorado River subbasin, Program participants will continue to consider using additional Federal, State, and other parcels for this purpose when additional areas become accessible following restoration of passage at Price-Stubbs. Grand Junction Pipe site (Program property) will be sampled in 2011 to determine densities of nonnative fishes. (Might be reset with rotenone prior to levee breaching, if needed.) Service and Program coordinated with landowner at Soaring Eagle Gravel Pit to determine best method for reconnection (at landowner's cost, per biological opinion) in light of potential nonnative fish invasion.	13
Fish Passageways			
a). PBO states passage to be completed at Price-Stubbs in 2000 (or 2002 if dam removal alternative selected).	Colorado: IIB2a3&4	Completed in April 2008. Passive PIT-tag monitoring station installed in 2010.	13
b). GVIC fish passage.	Colorado: IIB1a3&4	Completed in 1998, and operated annually. Obermeyer gate installed in 2006; and raised when flows are low.	13
c). Grand Valley Project (Government Highline) fish passage.	Colorado: IIB3a3	Completed in 2004 (construction was delayed due to regulatory and landowner issues and overall budget/construction priorities). Trial operations conducted in 2005 & 2006 and continued in 2006. Full operation began in 2008 (with completion of Price-Stubbs passage). Passage operated continuously April 16 to October 15, 2010; 18,390 fish used the passage, including 16,358 native fishes. No endangered fishes used the passage in 2010.	13
Native Fish Stocking Element		See also "Stocking" worksheet	

Recovery Actions in 15-Mile Reach PBO	RIPRAP Item #	Status	PBO Page #
Raising native fish in hatcheries and grow out ponds, and stocking them in the riverine habitat.	Colorado: IVA3, IVA4, IVA5	Ongoing. The integrated stocking plan for the Upper Colorado River Basin was completed in March 2003. Annual stocking targets for subadults in the upper Colorado River subbasin are being met. Under the 2003 integrated upper basin stocking plan (Nesler et al. 2003), 5,074 hatchery-produced subadult Colorado pikeminnow were stocked in 2003 and 2004 in unoccupied reaches above diversions.	14
Nonnative Fish Control Element Regulations and Agreements			
a). 1996 Nonnative Stocking Procedures.	General: IIIB3	Complete; revised in 2009.	15
b). 1999 Restriction of stocking of private ponds in Colorado.	General: IIIB4	Complete; report on evaluation of Colorado's nonnative fish stocking regulations completed in July 2004.	15
c). Bag limits removed for nonnative warm-water sportfishes in critical habitat in Colorado.	Colorado: IIIB2	Complete.	15
d). Close river reaches to angling where and when angling mortality determined to be significant to native fish.	General: IIIA2d	CDOW agreed to do when and where necessary (to date, not deemed necessary).	15
e). CDOW Colorado River fisheries management plan.	Colorado: IIIB4	Plan completed in 2005.	16
Removal Efforts			
a). Pond Reclamation.	Colorado: IIIA2	Pond reclamation accomplished, but proved ineffective. Research initiated to document sources of nonnative fish so Program can determine if they can be controlled at the source. Final report completed February 2004.	15
b). Removal of nonnative fishes from back waters.	Colorado: IIIA3	Pilot program to remove small cyprinids and centrarchids complete; techniques and level of effort produced some short-term depletions, but provided no solutions to long-term control. Final reports completed in 2002 and 2003. Preliminary results of research on sources of nonnative fish (which may provide another avenue of control) indicate most younger centrarchids (age-0 to age-3) were produced in main channel habitats, as opposed to having escaped from floodplain ponds. However, almost 50% of age-4+ centrarchids escaped from ponds, likely during years when higher flows connected the ponds with the river. Additional isotope studies to determine if basin reservoirs are sources of problematic nonnative fishes are being conducted through FY 11.	16
c). Management of nonnative fish populations	Colorado: IIIA5&6	Management of bass and other centrarchids in the Colorado River ongoing since 2004; management of channel catfish on hold pending development of effective management techniques. Centrarchid removal efforts were increased beginning in 2007; Smallmouth bass catch rates have been dropping since 2005; however catch rates for other centrarchids, including largemouth bass, have increased. Targeted control of smallmouth bass 2007 year-class continues. Adult smallmouth bass densities remained low in 2010; however capture of age-0 and age-1 smallmouth bass increased about tenfold. Largemouth bass reproduction remains a concern, but so far, these fish do not appear to be recruiting. In 2011, most effort will be redirected from upstream reaches (Rifle to Beavertail) to high smallmouth bass concentration areas in the 15- and 18-Mile reaches. Screen planned for Rifle Gap Reservoir. CDOW removed harvest limits on smallmouth bass in Highline Reservoir in 2011 (and in several other areas).	16

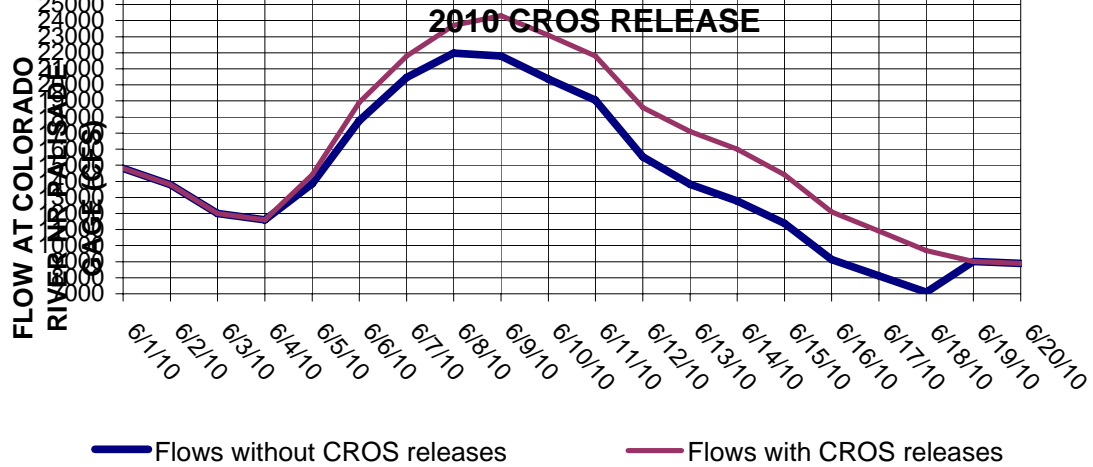
Recovery Actions in 15-Mile Reach PBO	RIPRAP Item #	Status	PBO Page #
Research, Monitoring, and Data Management Element			
a). Population estimates will be used to determine if Recovery Actions result in a positive population response.	Colorado: VB; VB3	Wild adult Colorado pikeminnow estimates ranged from ~440 in 1992 to ~890 in 2005 (draft report on '08-'10 estimates due in August 2011). Humpback chub in Black Rocks and Westwater canyons declined ~10 years ago and have remained relatively stable since that time. Stocking of razorback sucker and bonytail continues. Evaluation of stocked razorback sucker indicates that autumn is the best time of year to stock and that hatchery-produced fish should be at least 12" in before release. Evaluation extended to razorback sucker data collected from 2004 through 2008; report in review. Captures of razorback larvae in the Gunnison and Colorado rivers document reproduction; survival of larvae through their first year remains rare, but juveniles have been captured in the Gunnison River. In 2009 and 2010, an increasing number of bonytail have been detected where stationary tag-reading antennas are used.	16
b). Recovery goal development. If population meets or exceeds recovery or Apx. D goals, it will be considered to exhibit a positive population response.	General: VIIA5d	Recovery goals complete. Revision underway.	16-17
Long-term Funding and Annual Appropriations.	General: VIIB	Complete and ongoing.	17
Recovery Agreements			
a). With consultations.	N/A	Ongoing	18
b). By water users controlling a majority of existing depletions above the Gunnison River.	N/A	Complete	18
Depletion Charges on New Depletions	N/A	Ongoing	19
Incidental Take			
a). Develop plan to monitor incidental take of endangered fish in diversion structures.	Colorado: VB4a	"Plan" complete in that fish are retrieved from canals whenever canal screens cannot be fully operated. 3/32" mesh screens on Grand Valley Project, and GVIC diversion dams prevent entrainment of adult, subadult, and juvenile fish (preventing entrainment of adult and subadult fish required is by recovery goals).	71
b). Estimate amount of incidental take of young razorback and pikeminnow in the 15-Mile Reach.	Colorado: VB4b	Service believes screening of diversion structures has resolved entrainment issues; anytime screens are not fully operationed, the Service conducts fall sampling in the canals to retrieve any endangered fish (and very few have been found under these circumstances).	71
Fish Screens (Reasonable & Prudent Measures)			
a). GVIC.	Colorado: IIB1b	Complete. Screen operated 139 days (68%); off 65 days (32%) in 2010. \$400K retrofit planned for FY 2014. Evaluation of condition of surrogate species (white sucker) below return pipe begins July 2011.	71
b). Grand Valley Project Gov't Highline.	Colorado: IIB3b	Complete. Screen operated from May 6 to November 4, 2010, bypassing the screen only a couple of days during that period.	71
Reinitiation			
a). Review RIPRAP implementation.	Colorado: IA6	This is it (begun in 2003 and done every 2 years thereafter).	p.74, c.

Please scroll down and right to see all four graphs on this tab.



IMPACT OF EARLY SEASON RESERVOIR RELEASES IN THE GRAND VALLEY

(As Measured at the Colorado River near Palisade Gage)



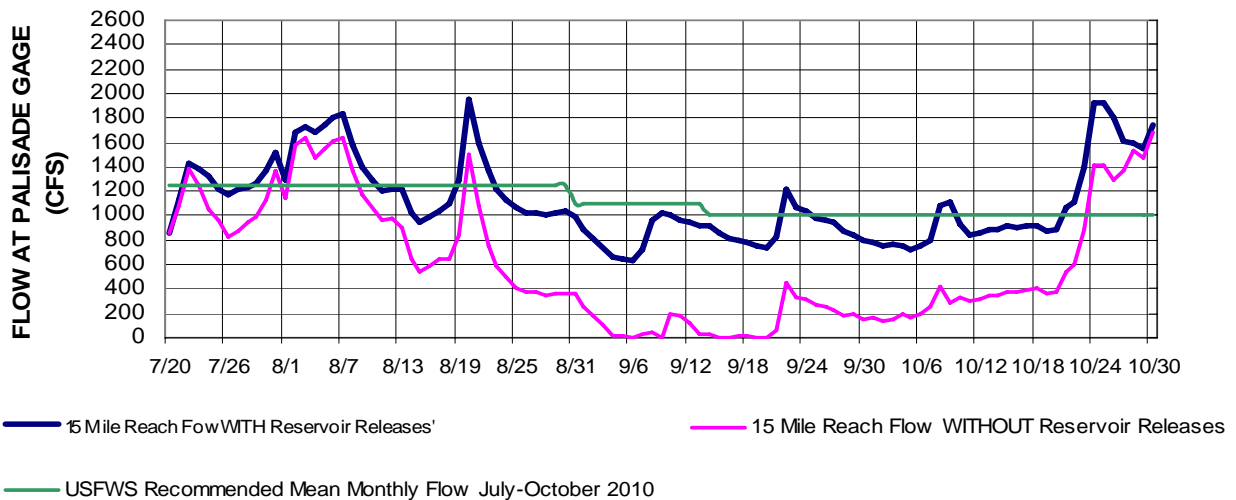
By Judy Sappington, Water Rights Specialist, DWR, Division 5

The coordinated release for the 15-mile reach increased the peak by 2,500 cfs, from 21,800 cfs to 24,300 cfs.

IMPACT OF LATE IRRIGATION SEASON RESERVOIR RELEASES IN THE 15 MILE REACH

(As Measured at the Colorado River at Palisade Gage)

2010 LATE SUMMER/FALL



Coordinated Reservoir Operations

Peak Flows

	1997	1998	1999	2006	2008	2009	2010	
Green Mtn	3568	12482	11010	6788	2101	14113	34666	
Ruedi	693	5106	3602	6297	4848	5858	10050	
Williams Fork	946	1672	1543	6625		5044	19982	
Granby			8515					
Windy Gap						2061		
Willow Creek			6631			2638		
Wolford	10635	4431	8555	9007		13069	9273	
Total Ac-Ft	15841	23691	31301	28717	6949	42783	73971	Total 223253
								Avr 31893

Historic Users Pools

Base Flows

Source	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Ruedi	18722	18376	17158	19210	9877	18901	14782	15876	18204	13203	18892	19261	19263
Wolford Mtn	10364	4445	9965	7719	277	257		900	9580	6155	9389	7873	7572
Williams Fork		1642	3472	4832	3381	3381	2410	3433	4871	2155	9340	4870	4872
Willow Creek		584											
Windy Gap											764		893
Granby		24223										2574	4602
Green Mtn	28562	32008	42468	31118	0	42774	107	28080	22822	29470	55290	50661	52032
Palisade Bypass					2235	6609	7043	10076	0	8944	12000	11905	13760
Sum acft	57648	81278	73063	62879	15770	71922	24342	58365	55477	59927	105674	97143	102994
			Avr = 66653 acft			Total = 866483 acft							

By Jana Mohrman (FWS) and Ron Thomasson (BOR)

GRAND VALLEY WATER MANAGEMENT PROJECT RESULTS

	1998 1/ Acre-Feet	Water Year										Average Acre-Feet
		2002 Acre-Feet	2003 Acre-Feet	2004 Acre-Feet	2005 Acre-Feet	2006 Acre-Feet	2007 Acre-Feet	2008 Acre-Feet	2009 Acre-Feet	2010 Acre-Feet		
Irrigation Diversion (Mar-Oct)	285,217	240,424	252,289	256,289	249,318	277,994	245,927	249,223	206,105	261,216	248,754	
Reduced Diversion (Mar-Oct) as Compared to 1998 (Pre-Project)	0	44,793	32,928	28,928	35,899	7,223	39,290	35,994	79,112	24,001	36,463	
Palisade Pipeline (Mar-Oct)	0	2,053	10,161	13,654	19,143	10,812	10,625	15,997	18,302	20,617	13,485	
Total Potential Benefit to 15-Mile Reach Flows (Mar-Oct)	0	46,846	43,089	42,582	55,042	18,035	49,915	51,991	97,414	44,618	49,948	
HUP Surplus Water Deliveries to the 15 Mile Reach (Jul-Oct)	NA	0	47,525	0	31,200	22,822	32,743	61,433	56,290	61,002	34,779	

1/ The 1998 water year was chosen to represent preproject baseline conditions as all Salinity Control Program improvements were in place and a full water supply was available to the Grand Valley Water Users Association.

2/ From Division 5 State Engineers Office

Capital Cost = \$7,988,000

Capitalized Annual Cost = \$1,250,000

Total = \$9,238,000

Assume 50 year life cycle and 6 percent interest rate

Average Unit annual cost (per acre foot of potential benefit) =

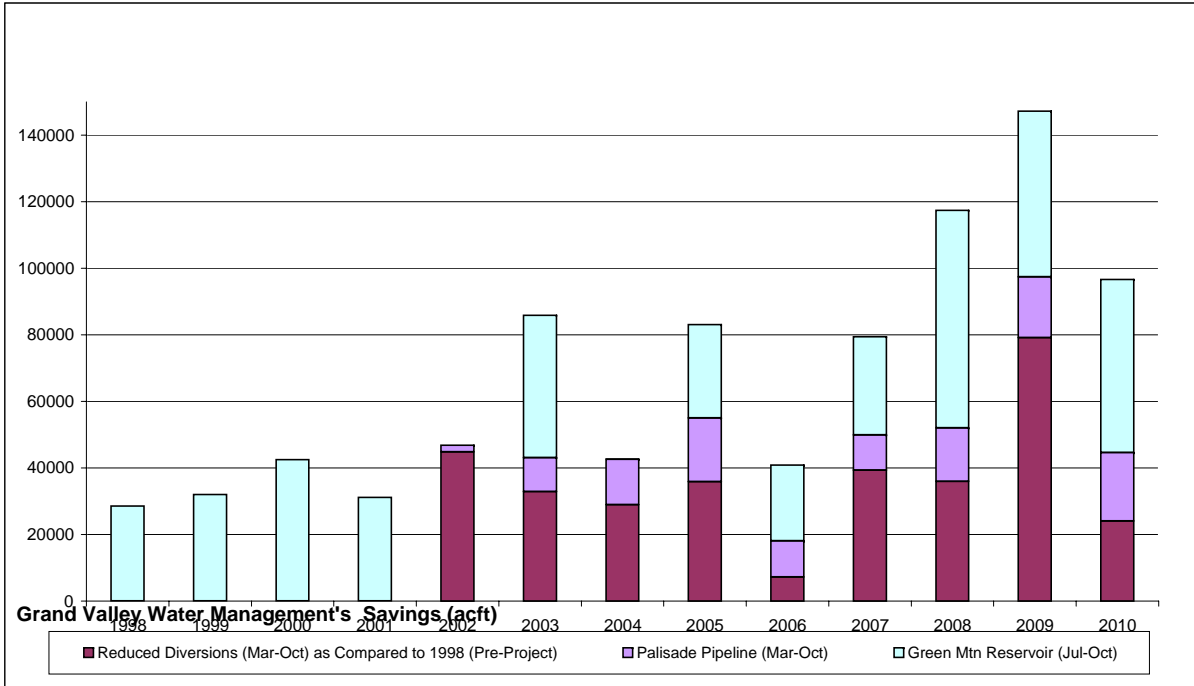
\$11.73 per acre-foot per year

Average Unit annual cost (per acre foot of Green Mountain surplus) =

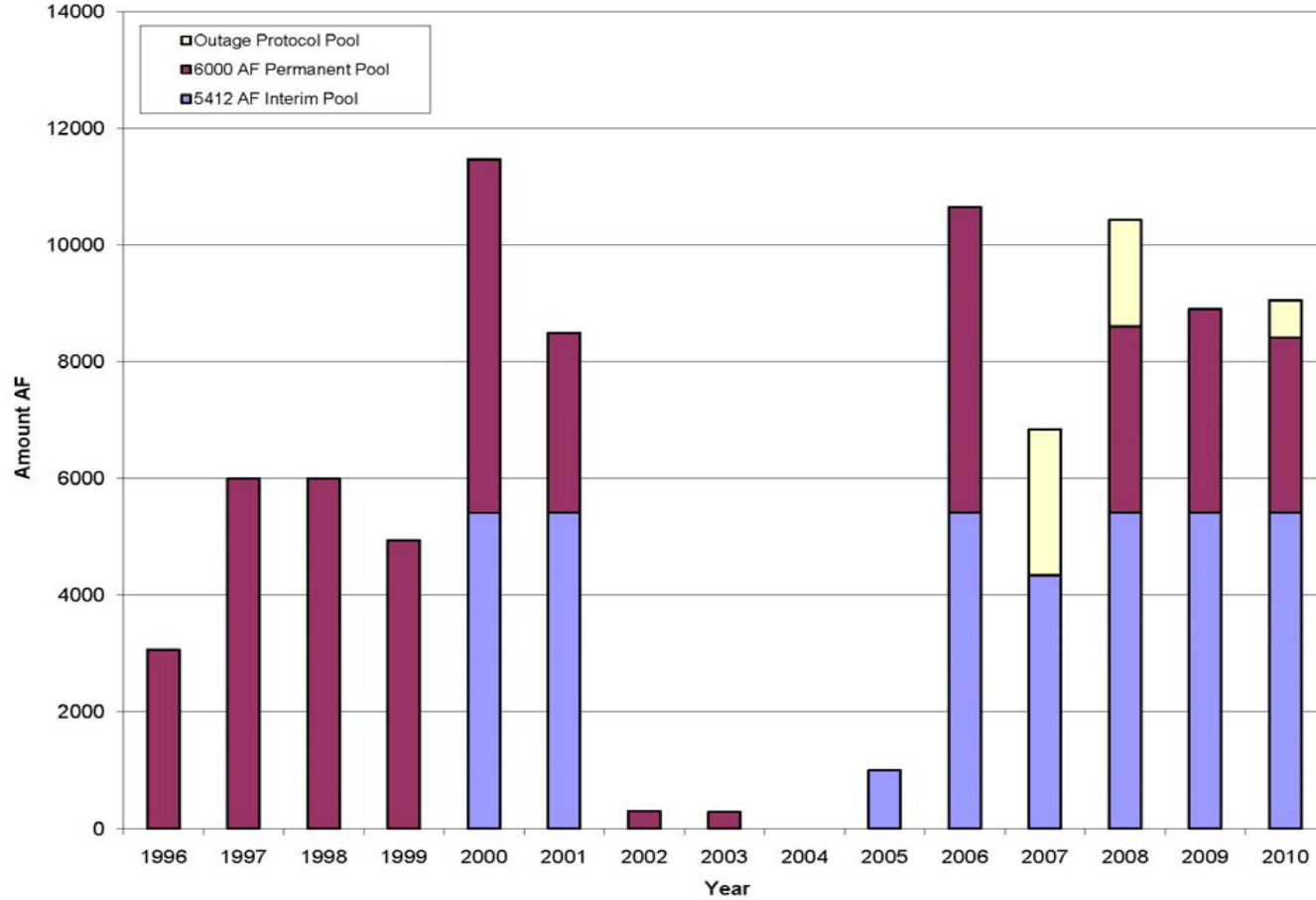
\$16.85 per acre-foot per year

GRAND VALLEY WATER MANAGEMENT PROJECT RESULTS

SOURCE	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Reduced Diversions (Mar-Oct) as Compared to 1998 (Pre-Project)	Baseline				44,793	32,928	28,928	35,899	7,223	39,290	35,994	79,112	24,001
Palisade Pipeline (Mar-Oct)	0	0	0	0	2,053	10,161	13,654	19,143	10,812	10,625	15,997	18,302	20,617
Green Mtn Reservoir (Jul-Oct)	28,562	32,008	42,468	31,118	0	42,774	107	28,080	22,822	29,470	65,460	49,786	52,032
Sum	28,562	32,008	42,468	31,118	46,846	85,863	42,689	83,122	40,858	79,385	117,451	147,200	96,650



Wolford Mountain Reservoir Fish Releases



<i>Wolford Fish Pools</i>	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
5412 AF Interim Pool	0.0	0.0	0.0	0.0	5409.0	5413.0	0.0	0.0	0.0	1000.0	5412.5	4339.1	5413.0	5413.0	5412.5
6000 AF Permanent Pool	3063.9	6000.1	6000.1	4938.9	6055.6	3077.6	299.5	285.6	0.0	0.0	5232.6	0.0	3188.9	3487.2	3000.0
Outage Protocol Pool												2500.0	1829.4		638.7
TOTAL AF	3063.9	6000.1	6000.1	4938.9	11464.6	8490.5	299.5	285.6	0.0	1000.0	10645.1	6839.1	10431.2	8900.1	9051.3

Fish produced and stocked by facility in 2010

Facility	Species	Target	Stocked	Percent
Grand Valley	Razorback	14,895	19,966	134%
Ouray	Razorback	14,895	16,125	108%
Wahweap	Bonytail	10,660	6,780	64%
Mumma	Bonytail	5,330	3,830	72%

Razorback sucker stocked by River

Facility	River	Target	Stocked	Percent
Grand Valley	Upper Colc	6,620	6,784	102%
	Gunnison	3,310	3,142	95%

Bonytail stocked by River

Facility	River	Target	Stocked	Percent
*Wahweap	Colorado	2,665	1,433	54%
Ouray	Colorado	2,665	1,017	38%

*Testing due to largemouth bass virus at Dexter delayed stocking; Wahweap is "clean" and these fish will be stocked Spring 2011.