



# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

### Mountain-Prairie Region

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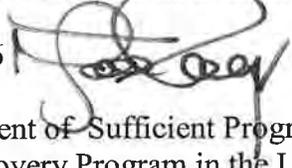
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OCT 7 2015

#### Memorandum

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

From: Regional Director, Region 6 

Subject: Draft 2014—2015 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

#### 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 2014—2015 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 24, 2015, assessment of accomplishments and shortcomings of the Recovery Program under the Recovery Implementation Program Recovery Action Plan (RIPRAP) from February 1, 2014, through January 31, 2015, is incorporated in the tables to the RIPRAP found at on the Recovery Program’s website (<http://www.coloradoriverrecovery.org/documents-publications/foundational-documents/recovery-action-plan.html>). Although this memo focuses on the RIPRAP assessment timeframe of February 1, 2014 - January 31, 2015, more recent information has been incorporated where warranted. 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 September 10, 2014.

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

In 2002, the Service developed Recovery Goals (USFWS 2002 a-d) to supplement the individual endangered species recovery plans. The Recovery Goals contain specific demographic criteria to maintain self-sustaining populations and recovery factor criteria that would indicate when threats to the species would be ameliorated. A minimum viable population is identified for each species as a gauge for recovery. In addition, key requirements of the population criteria include 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. Significant changes in the status of the four species generally are not detected on a year-to-year basis due to species' life history (i.e., recapture rates over long lifespan) as well as variable confidence intervals around population estimates and potential influence of sampling on capture probability.

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 (Figure 1). The Recovery Program has been implementing an 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. Stocked razorback sucker are reproducing and wild juvenile razorbacks are starting to be captured. Recaptures of stocked bonytail are rarer, and the Program has yet to document spawning in the wild. However, since 2009, increasing numbers of bonytail have been detected by stationary PIT-tag reading antennas and traditional sampling methods throughout the upper Colorado River basin. A more rigorous assessment of bonytail recapture information should be one of the first queries of the Recovery Program's new STReaMS database. Survival of stocked fish may be improving or the relatively new stationary antennas may be a better method of detecting stocked fish than other, ongoing active sampling methods. The stocking plan was revised to stock fewer and larger razorback sucker and more, larger bonytail (Integrated Stocking Plan Revision Committee 2015).

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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.



Figure 1. Map of the Upper Colorado River drainage.

### Colorado Pikeminnow

Wild populations of Colorado pikeminnow 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. Closed-population, multiple mark-recapture estimators are being used in the upper Colorado River basin to derive population point estimates for Colorado pikeminnow to track 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. Recovery goals for the Colorado pikeminnow 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 estimates described below as the best available information. However, the Service recognizes that trends for some of these populations have declined since the first estimates were made, and

that delisting would not occur until the demographic criteria are met and threats to the species are addressed to the point that the species is no longer threatened.

### *Colorado River Juveniles and Adults*

Population estimates for adult Colorado pikeminnow ( $\geq 450$  mm total length [TL]) began in 1992 on the Colorado River from the Price-Stubb Diversion to the confluence with the Green River (see Figure 2). Population estimates are conducted in three consecutive years followed by two years of no estimates. In their most recent summary of those data (Osmundson and White 2014) the principal investigators concluded:

*During the 19-year study period [1992-2010], the population remained self-sustaining. This was evidenced by: 1) annual abundance estimates of sub-adults (400–449 mm TL) about to recruit that indicated recruitment roughly balanced estimated adult mortality in years for which data were available, and 2) results of a weighted regression analysis of river-wide adult abundance estimates that indicated the intercept-only model as having the greatest weight, suggesting population stability. However, weighted regression of just the upper-reach adult population gave greatest weight to the quadratic model, suggesting the population increased and then later declined.*

The current downlisting demographic criteria for Colorado pikeminnow (USFWS 2002a) 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 3), naturally produced fish must equal or exceed mean adult annual mortality (estimated to be about 20%). The average of all adult estimates (1992 – 2014; estimates from 2013 and 2014 are considered preliminary) is 613. The average of the five most recent annual adult population estimates is 501. Osmundson and White (2014) determined that recruitment rates were less than annual adult mortality in six years and exceeded adult mortality in the other six years when sampling occurred. The estimated net gain for the 12 years studied was 32 fish  $\geq 450$  mm TL. Although the Colorado River population appears to meet the trend or ‘self-sustainability’ criterion, it has not met the abundance criteria of ‘at least 700 adults’ during the most recent five year period. The Service is reevaluating the demographic and threat removal criteria for Colorado pikeminnow through revision of the species’ recovery plan.

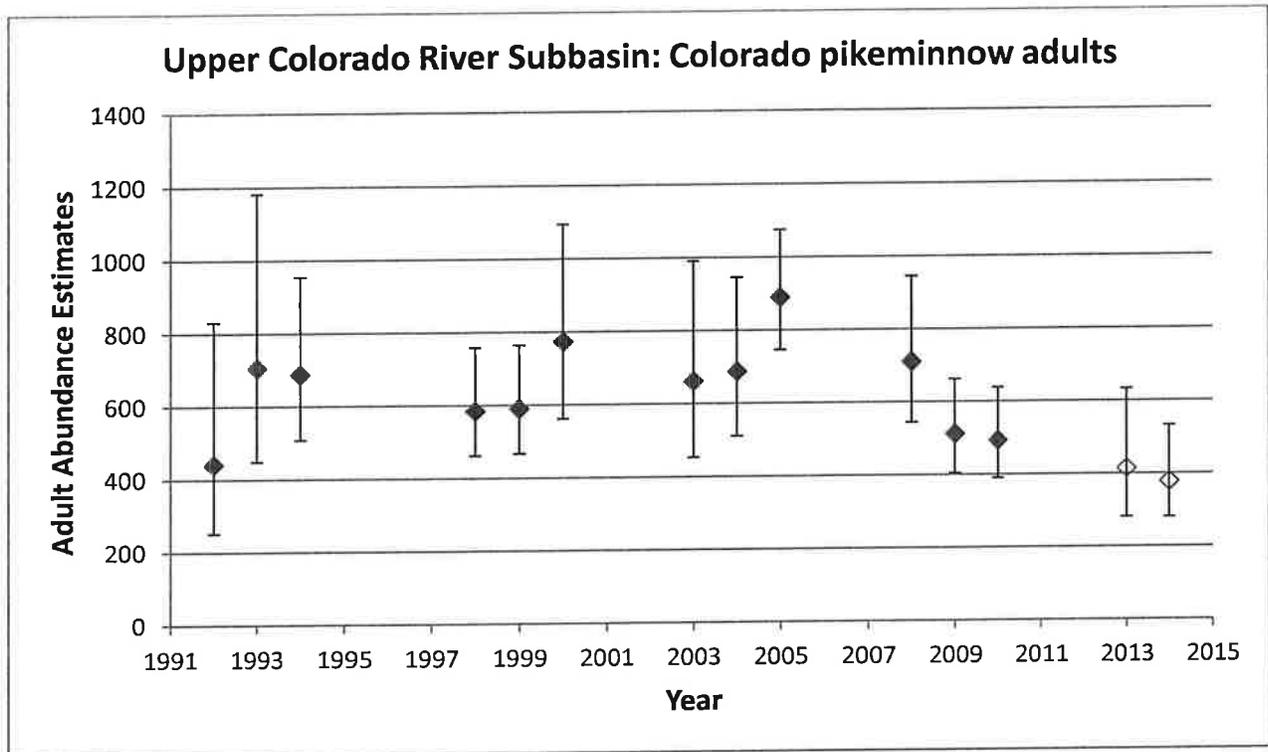


Figure 2. Adult Colorado pikeminnow population abundance estimates for the Colorado River (Osmundson and Burnham 1998; Osmundson and White 2009; 2014). Error bars represent the 95% confidence intervals. The 2013 and 2014 data are preliminary and represented by hollow data points.

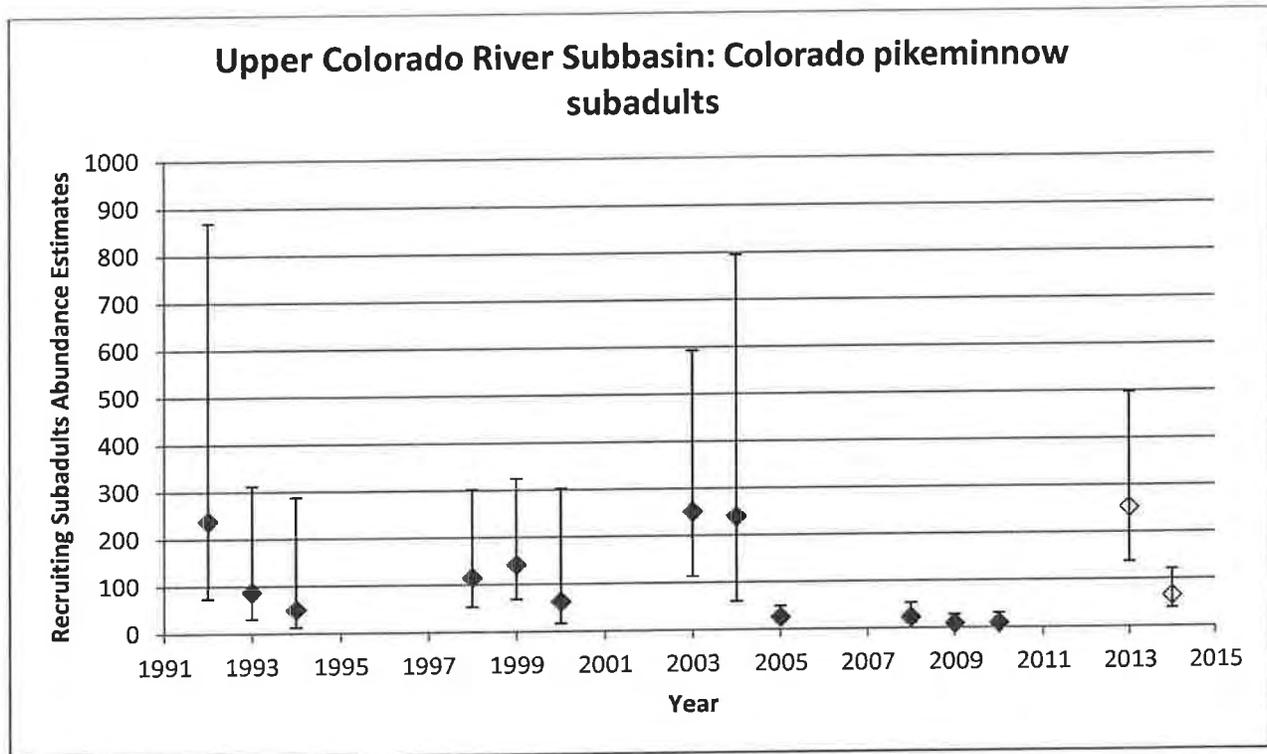


Figure 3. Colorado pikeminnow recruitment abundance estimates (calculated using the same mark recapture methodology as for the adults) for the Colorado River (Osmundson and White 2009; 2014). Recruits are age-6 (400-449mm TL). Error bars represent the 95% confidence intervals. The 2013 and 2014 data are preliminary and represented by hollow data points.

#### *Green River Juveniles and Adults*

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, estimates collected in 2006–2008 showed an increasing trend approaching the level of the estimate made in 2000 (Figure 4). The confidence intervals indicated 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 adults (estimated minimum viable population [MVP] number). The average of the first two sets of adult estimates was 3,020 (2000–2008). Despite a positive trend in the subbasin population from 2006–2008, Bestgen et al. (2010) expressed concern that adult Colorado pikeminnow numbers in the Yampa River remained low from 2006–2008. They suspected that nonnative northern pike may have been suppressing numbers of Colorado pikeminnow.

Data from the third round (2011–2013) of population estimates for the Green River Subbasin are still being analyzed (thus no confidence intervals are shown for the 2011–2013 estimates in Figure 4). Preliminary results from this analysis indicate adults and sub-adults are in decline throughout the entire Green River Subbasin. Preliminary results from 2011 - 2013 indicate that the Yampa River portion of the subbasin population remains low and may be in further decline (see Figure 6).

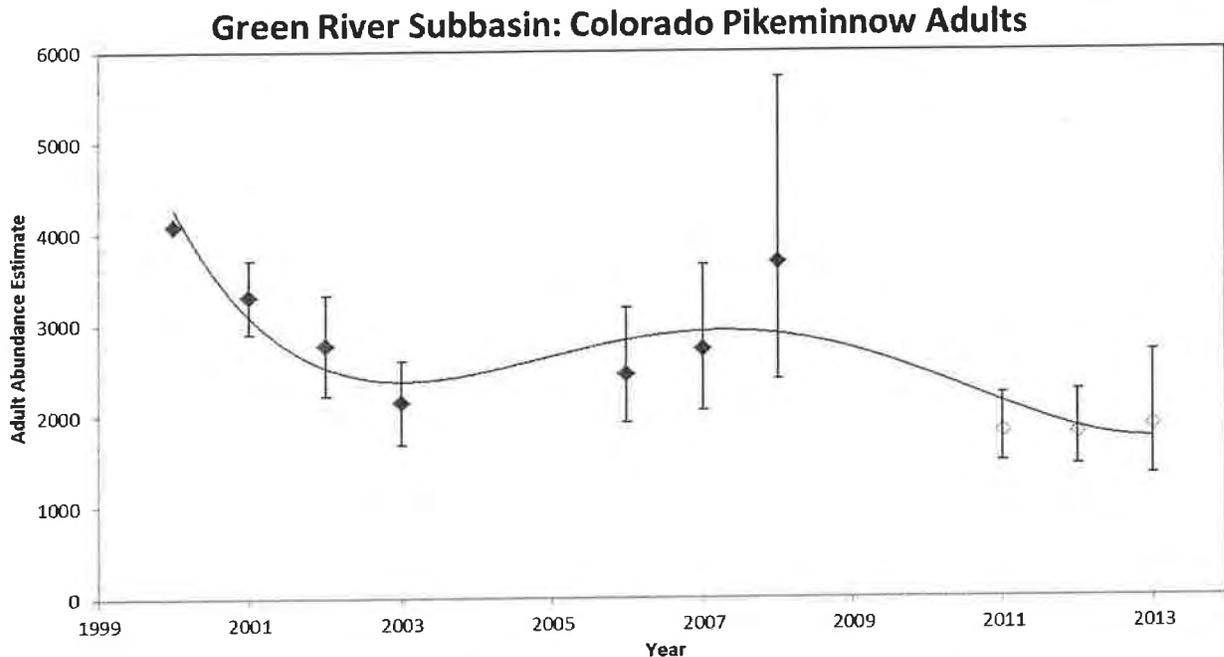


Figure 4. Adult Colorado pikeminnow population abundance estimates for the Green River (2000–2008 estimates from Bestgen et al. 2010; preliminary estimates from 2011–2013, Bestgen, personal communication). Error bars represent the 95% confidence intervals. In 2000, the lower Green River was not sampled. The data depicted for 2000 incorporates an extrapolated lower Green River contribution to the overall population estimate and therefore lacks a confidence interval.

Another demographic requirement in the 2002 Recovery Goals is that recruitment of age-6, naturally-produced fish must equal or exceed mean annual adult mortality. Estimates of recruitment age fish have averaged 1,455 since 2001, but have varied widely (Figure 5). Recruitment exceeded annual adult mortality only during the 2006 – 2008 period.

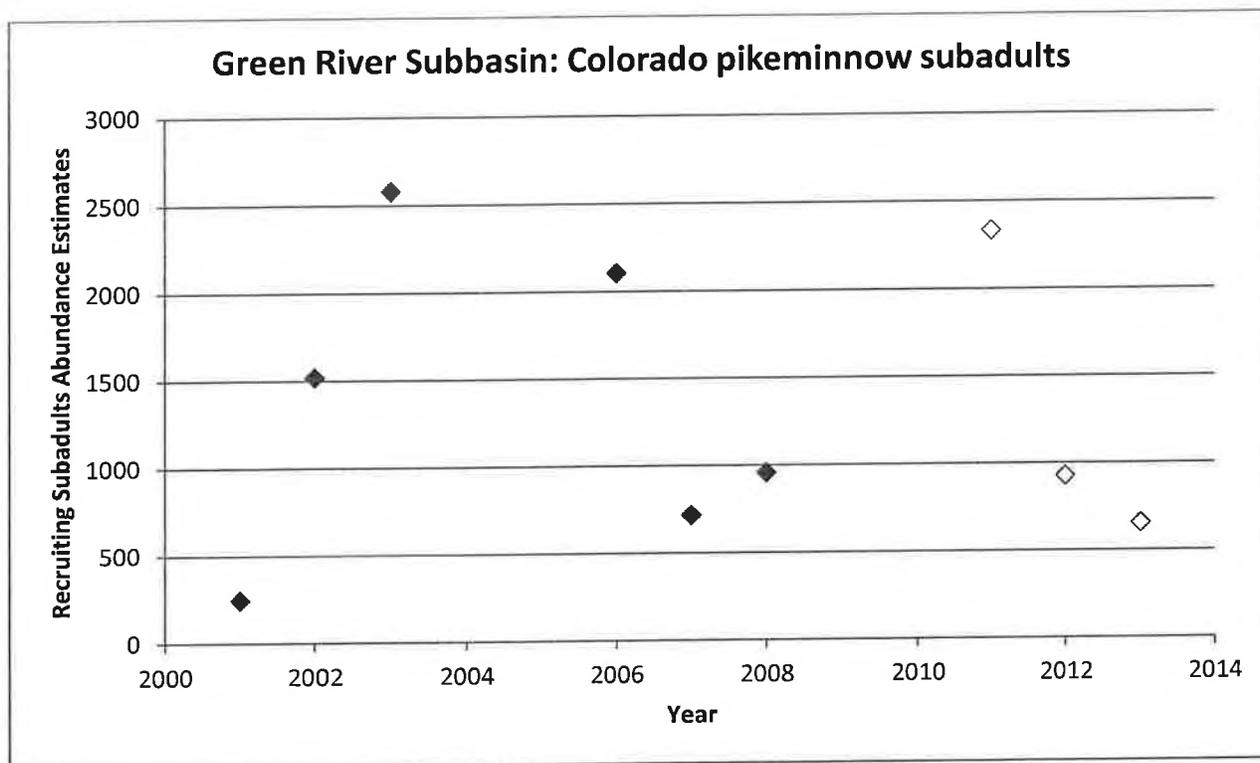


Figure 5. Estimated numbers of Colorado pikeminnow recruits (400–449 mm TL) in the Green River Subbasin (Yampa, White, Middle Green, Desolation-Gray Canyons, and Lower Green) for 2001–2013. Data from Bestgen et al. (2010; and personal communication). Estimates of recruitment for the most recent 2011–2013 sampling period are preliminary.

As part of the process of revising the 2002 Colorado Pikeminnow Recovery Goals into recovery plans, a recovery team for Colorado pikeminnow was assembled in late 2012 consisting of species and threat experts. During initial discussions in November 2012, the Recovery Team linked persistent low densities of adult Colorado pikeminnow in the Yampa River to persistent high densities of nonnative predators (e.g., smallmouth bass and northern pike; northern pike abundance shown in Figure 6). These estimates, which indicate that northern pike are outnumbering Colorado pikeminnow at least 3:1, point up the ongoing challenge of managing nonnative predators. Based on these data, the Recovery Team recommended that the Service postpone a change in listing status for Colorado pikeminnow until this threat, which was specifically identified in the 2002 Recovery Goals, has been more adequately addressed. The Recovery Program initiated a campaign to remove nonnative predators from the critical habitat reaches of the Yampa River in the early 2000s when it became apparent that smallmouth bass were decimating the native fish populations (Anderson 2005). Since that time removal efforts have increased both geographically (now encompassing ~ 170 miles of Yampa River + Catamount Reservoir) and in intensity (with some reaches receiving more than 10 removal passes per year).

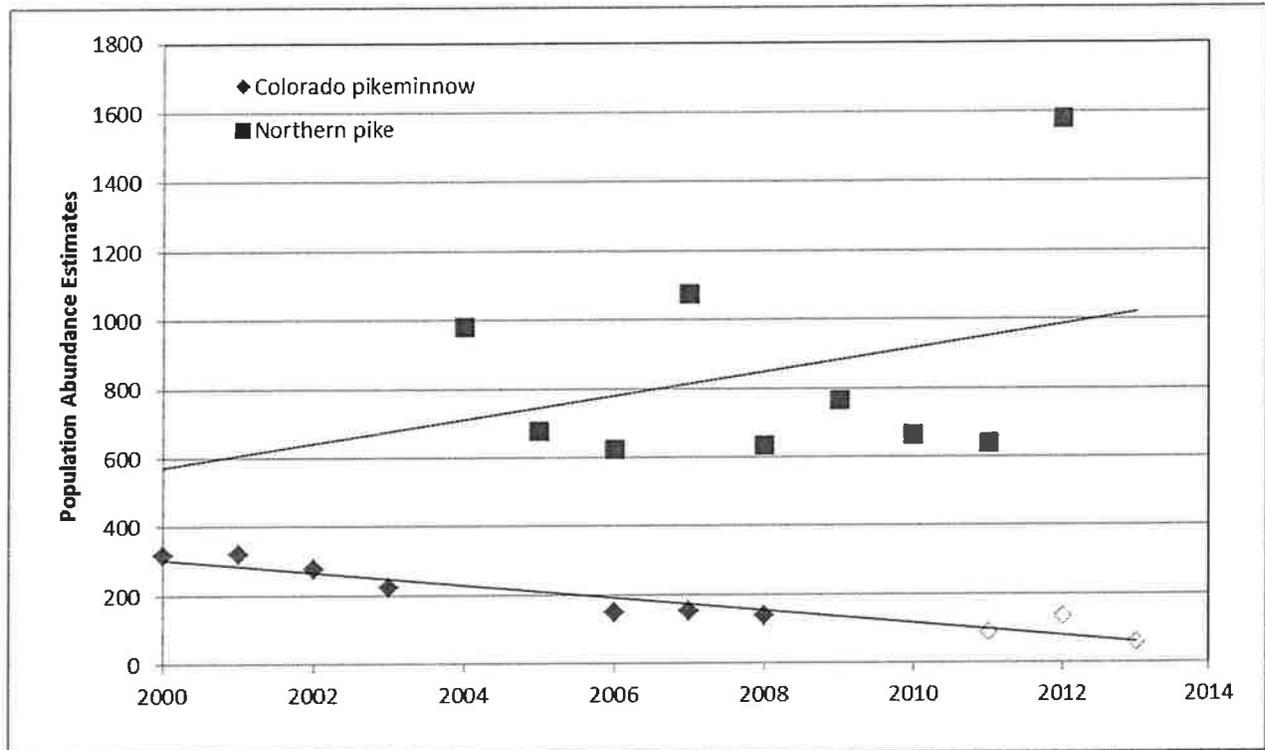


Figure 6. Comparison of Colorado pikeminnow population estimates (2000 – 2008 data from Bestgen et al. 2010) and northern pike (Battige 2012) in the middle Yampa River. The 2011-2013 data points for Colorado pikeminnow are preliminary. Northern pike population estimates were not conducted in 2013.

#### *Upper Basin Age-0*

Bestgen et al. 2010 recognized that the mechanism driving frequency and strength of recruitment events was likely the strength of age-0 Colorado pikeminnow production in backwater nursery habitats. Osmundson and White (2014) saw a similar relationship between a strong age-0 cohort in 1986 and subsequent recruitment of late juveniles five years later, but that relationship was more tenuous in later years. Researchers are particularly concerned with what appears to be very weak age-0 representation in the Middle Green reach (1999 thru 2008) and in the lower Colorado River (2001 thru 2008) (Figure 7). In some years, Reclamation has released higher summer base flows in the Green River based on the understanding that this may improve survival of young Colorado pikeminnow and disadvantage smallmouth bass.

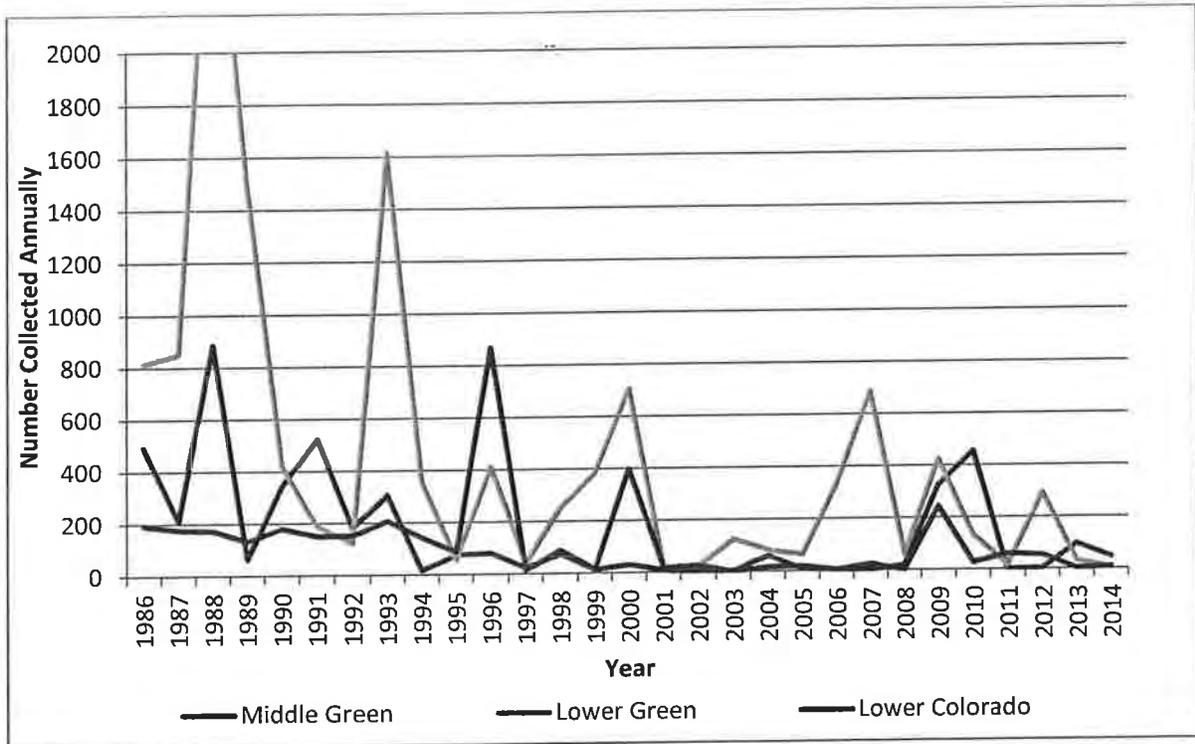


Figure 7. Numbers of age-0 Colorado pikeminnow collected each year from three different habitat reaches of river. A total of 2,892 age-0 fish were collected in the lower Green River in 1988; the significance of strong age-0 cohorts collected in the late 1980's was discussed in Bestgen et al. 2010. Data from Breen et al. 2014.

The Service's status review of Colorado pikeminnow was completed in 2011. Although a good portion of the recovery factor criteria (USFWS 2002a) are being addressed, nonnative fish species continue to be problematic and researchers now speculate that mercury may pose a more significant threat to Colorado pikeminnow populations of the upper Colorado River basin than previously recognized. Osmundson and Lusk (2012) recently reported elevated mercury concentrations in Colorado pikeminnow muscle tissue; the highest concentrations were from the largest adults collected from the Green and Colorado river subbasins. Mercury exposure has been reported to impair reproduction in fish (Batchelar et al. 2013; J. Lusk, U.S. Fish and Wildlife Service, personal communication). Laboratory experiments have shown diminished reproduction and endocrine impairment in fish exposed to dietary methyl mercury at environmentally relevant concentrations, with documented effects on production of sex hormones, gonadal development, egg production, spawning behavior, and spawning success. The San Juan River Recovery Implementation Program conducted a population viability analysis for Colorado pikeminnow to determine how impaired reproduction (caused by heavy metal or selenium contamination) would affect population dynamics and therefore, potentially influence adult demographic recovery criteria (Miller 2014). Under an assumed constant burden of mercury into the future, the PVA expected a 2% reduction in female reproductive success; as females age the reduction in reproductive success would increase to about a 5% maximum. Assuming an increasing mercury burden, the PVA estimated these reductions would increase to about 3.5% and 9%, respectively. The PVA estimated injury to adult survival would increase

from approximately 0.35% to 0.85% under a static mercury burden, and from approximately 0.65% to 1.5% if environmental mercury concentrations are assumed to increase over time. Conservation measures are being put in place to review the likelihood and pathways of effluent exposure, the concentrations of mercury and selenium necessary to protect endangered species in suitable habitats, and the results of a monitoring program to identify such concentrations in their habitats as a result of a Biological Opinion on the Four Corners Power Plant. Mercury is a global pollutant (International Conference on Mercury as a Global pollutant - <http://www.mercury2013.com/>); remediation is obviously beyond the scope of this Recovery Program.

### Humpback chub

Five populations of humpback chub exist in the upper Colorado River basin and one occurs in the lower Colorado River basin in canyon-bound reaches of the river system. Recovery goal downlisting demographic criteria (USFWS 2002b) for humpback chub require each of five populations in the upper Colorado River basin to be self-sustaining 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. In addition, 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 minimum viable population [MVP] number). (Note: data are not currently available to make reliable mark-recapture estimates of humpback chub recruitment; something the Service will need to address when revising the species' recovery plan). In UDWR's 2012 annual report, Brandon Gerig mentioned that *Gila* spp. (including native roundtail chub) recruitment appears strong in Westwater.

The Yampa River humpback chub 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 only 13 fish, too few to estimate population size. 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, transport, and holding at two different hatchery facilities. Approximately 15 percent of the *Gila* species were tentatively identified as humpback chub by physical characteristics (*Gila* identified as roundtail chub were returned to the river in Dinosaur National Monument [DNM]). Geneticists at Southwestern Native Aquatic Resources and Recovery Center (Southwestern ARRC), Dexter, NM, have since provided preliminary results indicating that the Yampa fish in captivity that were believed to be humpback chubs were hybrids between humpback chub and roundtail chub (Wade Wilson, U.S. Fish and Wildlife Service, personal communication). These fish were considered unsuitable for broodstock and were released into the Green River in DNM. Currently, it is not known if pure humpback chubs occur in Yampa Canyon. Researchers are taking fin clip samples from all suspected humpback chub for genetic analysis. Humpback chub genetics and population status will be discussed and reevaluated in the revised recovery plan.

The Desolation/Gray Canyons population of wild adults was estimated at 1,254 in 2001, 2,612 in 2002, and 937 in 2003 (Howard 2014). Sampling in 2001 and 2002 was conducted in summer, but shifted to fall beginning in 2003 to avoid capturing Colorado pikeminnow that use

Desolation Canyon for spawning. In a report on 2006–2007 estimates, researchers (Badame 2012; Figure 8) indicated that this population was trending downward. Badame (2012) linked declining catch of humpback chub in the upper portions of Desolation Canyon in the 2006–2007 estimates with increasing densities of nonnative smallmouth bass.

Table 1. A summary of population estimates and 95% confidence intervals (when available) for humpback chub in Desolation Canyon, Green River, Utah. \*No estimate was calculated for 2011 due to insufficient recaptures; therefore, the number of individuals captured is presented. Excerpted from UDWR’s Project 129 Annual Report for 2014 (Howard 2014).

<b>Year</b>	<b>N</b>	<b>95% CI</b>
2014	1,863	-
2011*	55	-
2010	1,625	1,023–5,465
2007	1,108	1,071–4,914
2006	2,578	1,151–9,736
2003	937	636–1,520
2002	2,612	1,477–8,509
2001	1,254	733–2,697

UDWR researchers recommended securing in captivity a representative sample of adults from Desolation Canyon. In 2009, 25 adults were taken to Ouray National Fish Hatchery, 12 remain. 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.

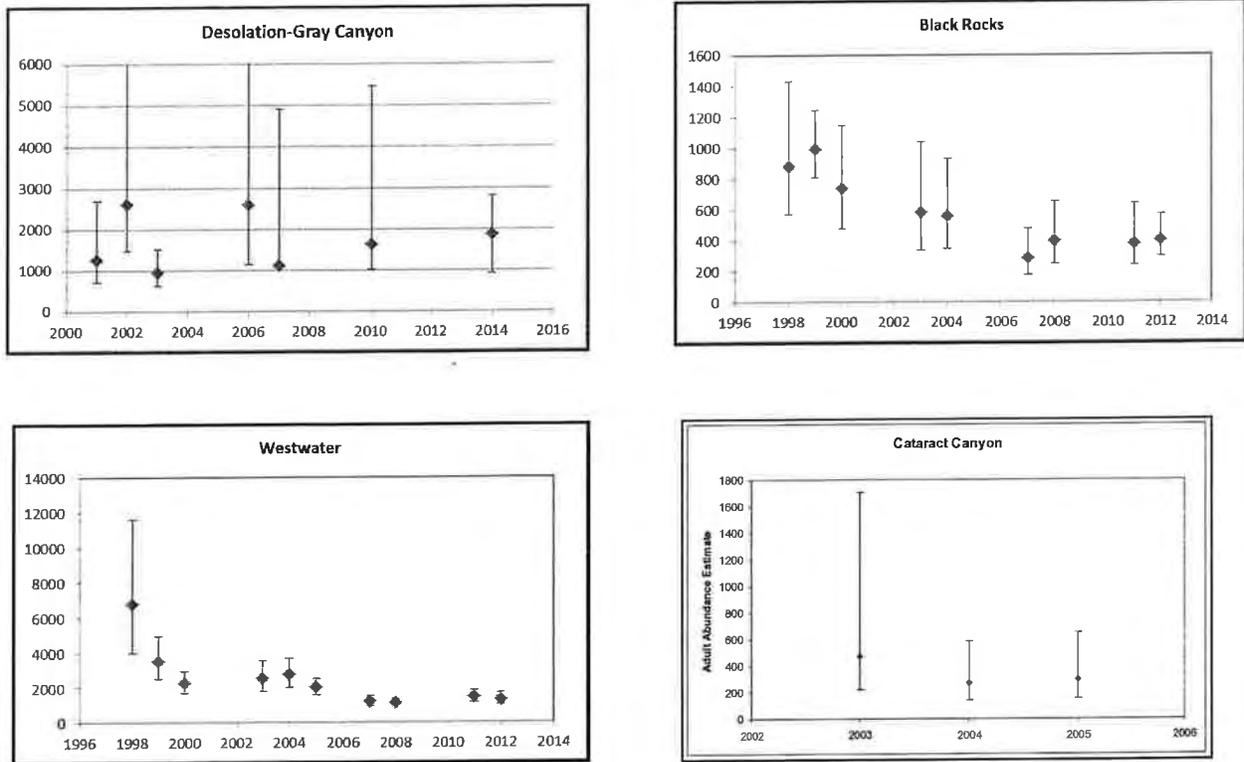


Figure 8. Adult humpback chub population estimates with confidence intervals for four populations in the upper Colorado River Basin (note that the scale differs among the graphs for the different populations). Clockwise from upper left: Desolation-Gray Canyons (from [Badame 2011, 2012](#); [Howard 2014](#)); 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 exchange of individuals that they are considered a single 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 8). The most recent estimates, in 2007–2008 were 345 and 287, respectively. During the fall of 2011 and 2012, 78 and 112 individual adult humpback chub were caught respectively - similar to the numbers caught in 2007 and 2008 (61 and 74, respectively). Population estimates for Black Rocks for 2011 and 2012 were 379 and 403, respectively. Researchers caution that 78 largemouth bass and the same number of gizzard shad were collected in Black Rocks in 2012. This represents a ten-fold increase over the 2011 catch. The Westwater Canyon estimates of wild adults range from about  $N = 4,700$  in 1998 to  $N = 2,500$  in 1999, 2000, to  $N = 1,525$  in 2007–2008. Although researchers link humpback chub declines in the upper portions of Desolation Canyon to increasing abundance of nonnative smallmouth bass there, a different mechanism appears to have impacted humpback chub in the Colorado River canyons. The large declines in humpback chub densities in both Black Rocks and Westwater Canyons occurred in the late 1990's prior to more recent increases of nonnative predators in the Colorado River.

In 2008, the core population (Black Rocks/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 1,467; however, UDWR reported 1,315 adults in 2012. The core population estimates in 2011 and 2012 were 1846 and 1718, respectively (Figure 9). 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. Colorado State University's recent robust population estimate analysis more clearly indicated that declines in the Westwater and Black Rock humpback chub populations are due to lapses in recruitment, because adult survival rates have remained stable. Principal investigators agree that reinitiating an age-0 monitoring component is advisable. It should be noted that whatever is affecting humpback chub recruitment has not affected sympatric populations of native roundtail chub (a Conservation Agreement species). Roundtail chub populations in both canyons have remained stable or have increased since population estimation started. In addition to the potential and recent negative interactions between humpback chub and nonnative predators discussed above, both the Westwater and Black Rocks populations are at risk of potential chemical contamination due to the proximity of a railroad located on the right bank of the Colorado River which at times transports toxic substances.

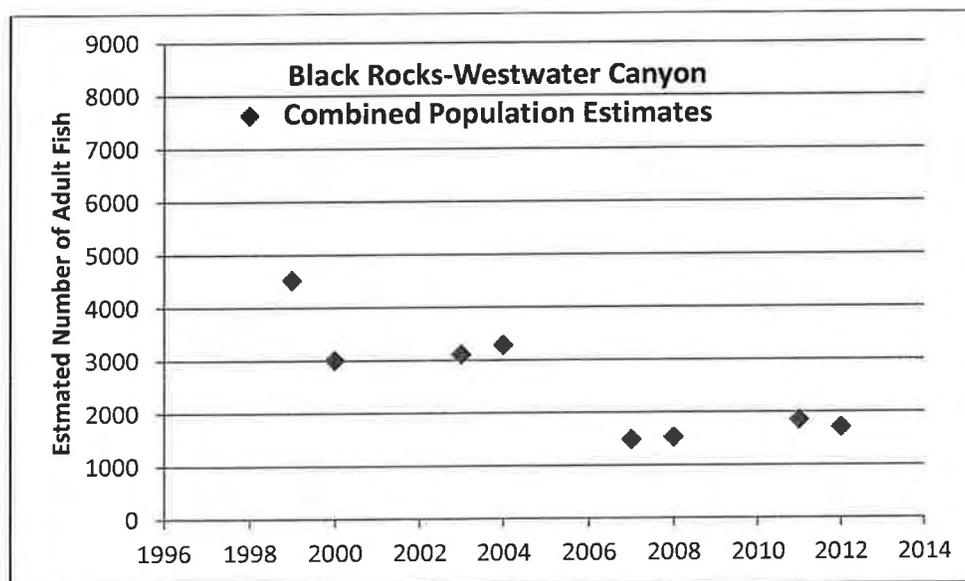


Figure 9. Combined population estimates for humpback chub in Black Rocks and Westwater Canyon based on a robust open model created by Dr.'s Bestgen and White, Colorado State University. The 2002 Recovery Goal downlist criteria for these combined ("core population") estimates is 2,100 adults.

The Cataract Canyon humpback chub population is small, with estimates of about 150 wild adults in 2003 and 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, UDWR reported that the Cataract population appears to be stable with CPUE ranging between 0.010 and 0.035 fish/net-hour. In 2011 and 2012, sampling was reinitiated below the Big Drop rapids after a sampling hiatus in this reach since 2008. Biologists were interested in returning to this area because riverine habitat was being exposed with dropping Lake Powell surface elevation. No additional humpback chub were

encountered in the new riverine habitat. Due to high site fidelity often observed in humpback chub, it is likely that re-colonization of this recently created habitat would be slow (Howard 2013).

As part of a conservation measure included in the Service's 2011 Biological Opinion on Glen Canyon Dam Operations (USFWS 2011), Reclamation entered into an agreement with geneticists at Southwestern ARRC in late 2012 to genotype the humpback chub refuge population held at SNARRC. Results showed humpback chub in the lower basin are genetically diverse with insignificant inbreeding coefficients, high heterozygosity, and high allelic diversity (Wilson 2014). The average estimated genetic effective population size ( $N_e$ ) varied between 899 and 1,437 depending on the survival rate. With the Grand Canyon adult humpback chub population estimated at 9,000–12,000, the analysis showed that about one tenth of the adult population contributes genetic information to the next generation (Wilson 2014).

The Service's status review of humpback chub completed in 2011 reported that 60% of the downlisting recovery factor criteria (USFWS 2002b) have been addressed to varying degrees; however, nonnative fish species and issues dealing with the potential chemical contamination of the river from spills and pipelines continue to be problematic.

#### Razorback sucker

The Recovery Program is rebuilding razorback sucker populations with hatchery stocks. As populations increase, the Program is beginning to generate mark-recapture population estimates on adult razorback sucker. Many stocked razorback sucker are being recaptured as part of other studies. Razorback sucker stocked in the Green and Colorado rivers have been recaptured in reproductive condition and often in spawning groups. Larval captures in the Green, Gunnison, and Colorado rivers document reproduction. Survival of larvae through their first year remains rare, largely due to a decrease in the availability of warm, food-rich floodplain areas and predation by a suite of nonnatives when the flood plain nursery habitats are available (Bestgen et al. 2011). However, occasional captures of juveniles (just over age-1) in the Green and Colorado rivers suggest that survival of early life stages is occurring. Collections of larvae by light trap in the middle Green River have generally been increasing since 2003; in 2013, the largest collection of light trapped larvae occurred (7,376; Figure 10). In 2011, researchers documented spawning by razorback sucker in the White River for the first time.

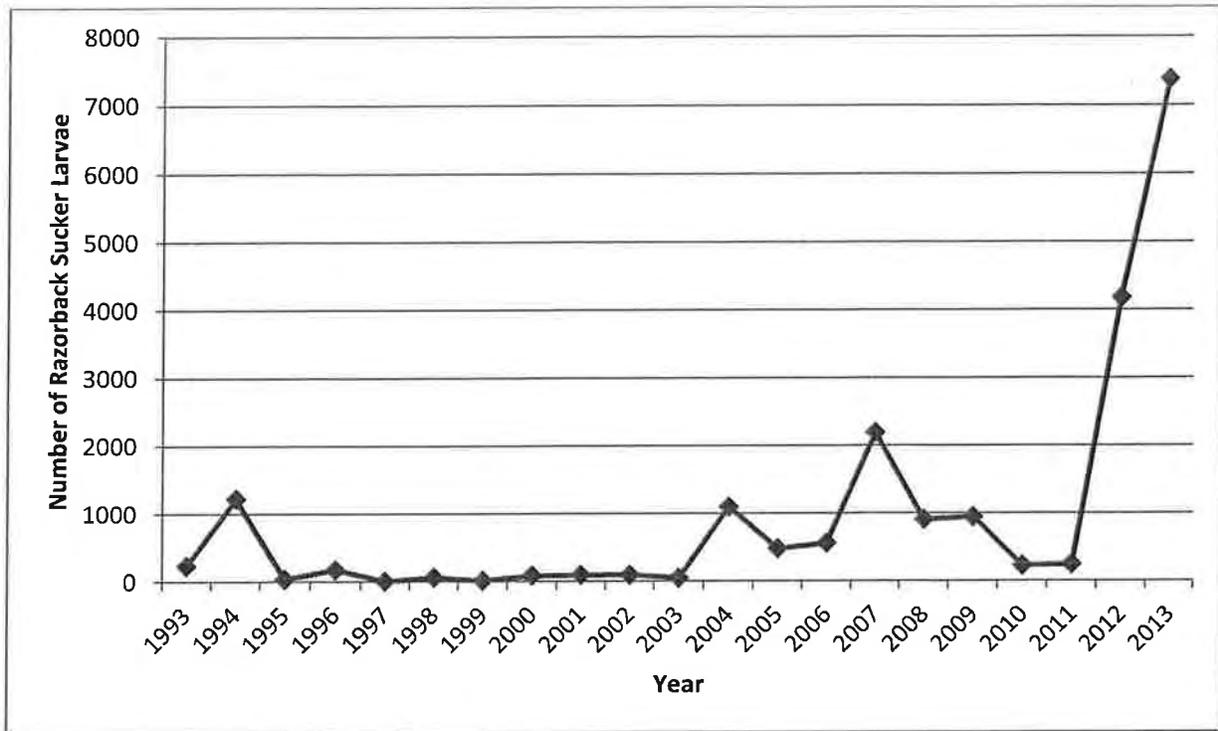


Figure 10. Numbers of razorback sucker larvae collected in light traps in the middle Green River since 1993.

Since 1995, over 375,000 subadult razorback suckers have been stocked in the Green and upper Colorado River subbasins. Two reports on survival estimates of stocked razorback sucker recommended stocking larger fish during spring, fall and winter (Zelasko et al. 2004; 2008). From 2004–2007 approximately 96,400 fish were stocked and 1,511 recapture events from 1,470 unique individuals were encountered from 2005–2008. In 2012, tag-reading antennas were placed on a spawning bar in the middle Green River near Dinosaur National Monument in northeast Utah. Fifty-two unique razorback sucker stocked between 2004 and 2010 were detected, 88% of which had not been seen since stocking. During sampling for Colorado pikeminnow estimates, 938 and 765 razorback sucker were captured in 2011 and 2012, respectively, for the Ouray to Green River, Utah reach of the main channel of the Green River. In the razorback sucker monitoring plan (Bestgen et al. 2012), 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 provide further confirmation that stocked fish are surviving in the wild. Preliminary population estimates were generated for razorback sucker in the Colorado River as a whole (from Palisade, CO downstream to its confluence with the Green River), for adult fish >400 mm TL. Data used to generate these razorback sucker population estimates was obtained during the Colorado pikeminnow population estimate studies done in 2005 and 2008–2010 (Figure 11). The recently revised integrated stocking plan (Integrated Stocking Plan Revision Committee 2015) has essentially been being implemented since 2013, stocking fewer but larger razorback sucker.

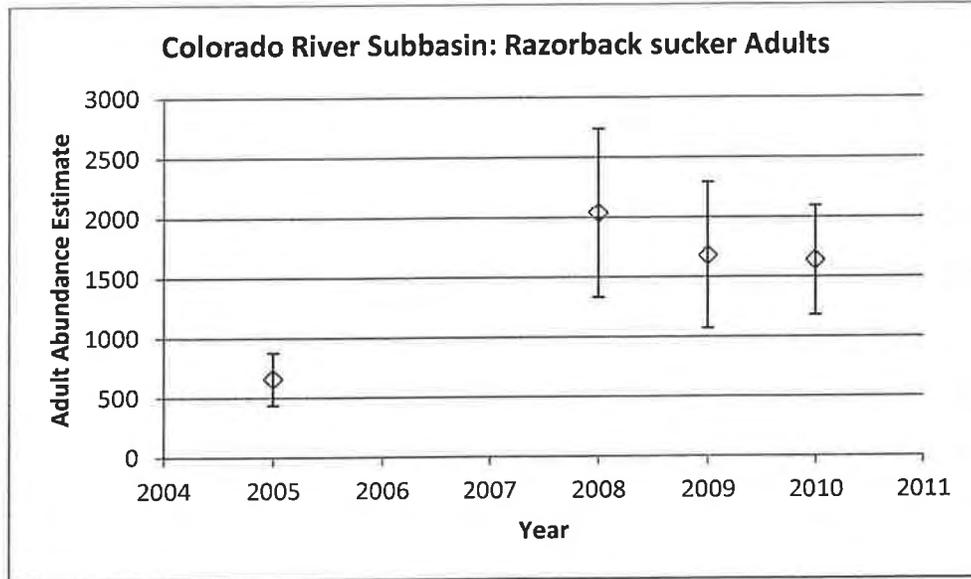


Figure 11. Preliminary population estimates of the adult razorback sucker in the Colorado River (Palisade, CO to the confluence of the Green River). Error bars represent the 95% confidence intervals.

Three razorback sucker stocked in the San Juan River near Farmington, NM, for the San Juan Recovery Program were captured between Moab, UT and the state line with Colorado in 2008. This demonstrates that exchange of stocked razorback sucker between the San Juan River and the Upper Colorado River is certain, and may have ramifications for recovery criteria. Researchers have confirmed that hundreds of razorback sucker are using both transitional inflow areas and fully lacustrine (lake-like) habitats in Lake Powell. Razorback sucker are spawning in the lake and biologists have evidence that recruitment may be occurring.

The Service's status review of razorback sucker completed in 2012 reported that 85% of the downlisting recovery factor criteria (USFWS 2002c) have been addressed to varying degrees; however, nonnative fish species continue to be problematic.

### Bonytail

Since 1996, over 450,000 tagged bonytail subadults have been stocked in the Green and upper Colorado River subbasins. Stocking continues in an effort to reestablish populations in the upper Colorado River basin. Until recently, very few of these stocked fish have been recaptured, most of those were captured shortly after they were stocked and in poor condition (Bestgen et al. 2008). The bonytail reintroduction effort in the upper Colorado River basin has not been nearly as successful as the razorback sucker reintroduction efforts in the Upper Colorado and San Juan river basins. The recently revised integrated stocking plan (Integrated Stocking Plan Revision Committee 2015), has essentially been implemented since 2013 stocking far greater (about 35,000) and larger bonytail (averaging 250 millimeters total length).

When the Recovery Program began, the bonytail had essentially disappeared and little was known about its habitat requirements. Hatchery personnel continue to experiment with: 1)

improving fitness of hatchery fish prior to stocking; 2) stocking sites (e.g., floodplain habitats as opposed to the main channel); and 3) stocking times (e.g., recent research suggests that stocking when the river has warmed to bonytail spawning temperature could be advantageous). The changes in hatchery protocols have been captured in a revised Integrated Stocking Plan (Integrated Stocking Plan Revision Committee 2015). In recent years, researchers have begun to see some encouraging results. All stocked fish 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. During high spring flows in 2011, more than 1,100 bonytail (16.6% of the 6,804 stocked in early April of that year) were detected by antenna arrays in the breach of the Stirrup floodplain on the Green River. The Price-Stubb antenna array on the Colorado River detected 356 individual bonytail between November 2010 and September 2014. The fish detected in fall 2011 had been stocked above Price-Stubb in Debeque Canyon, but in spring 2012, some of those fish were moving upstream through the fish passage. In 2014, fewer than 10 were moving upstream, the majority were either downstream or the direction could not be determined (Francis and Ryden 2014)

The Service's status review of bonytail completed in 2012 reported that 72% of the downlisting recovery factor criteria (USFWS 2002d) have been addressed to varying degrees.

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

Recovery Program participants accomplished a number of important objectives in 2014 and early 2015. These accomplishments are described in Table 2 below. Following that is Table 3, which describes Service concerns about shortcomings in the progress of some ongoing and future recovery actions and outlines action items recommended by the Service to address those concerns/shortcomings. 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 water projects.

More detail about Program accomplishments and shortcomings can be found in the final March 24, 2015, assessment of accomplishments and shortcomings of the Recovery Program under the Recovery Implementation Program Recovery Action Plan (RIPRAP) from February 1, 2014, through January 31, 2015 (see assessment column in the tables to the RIPRAP).

**Table 2. SIGNIFICANT ACCOMPLISHMENTS**  
(February 1, 2014, through January 31, 2015)

Accomplishment	Sufficient Progress Criteria Affected
<b>General – Upper Basin-wide</b>	
<p>Program participants (UDWR, CPW, CSU, FWS) continued removing nonnative fish and disrupting spawning in riverine habitats under <u>2014 nonnative fish management projects</u>. Electrofishing crews exploited smallmouth bass in post-peak flows on the Yampa, and focused additional removal on northern pike in the Colorado River near Rifle Creek and on smallmouth bass in the White River. Colorado successfully removed pre-spawning northern pike in Yampa River backwaters via netting and expanded this work in 2015. Additional walleye removal passes were conducted on the lower and middle Green and Colorado rivers in 2014 and continue in 2015.</p>	<p>1 – Reduce threat of extinction by removing more nonnative fishes.</p>
<p>Management Committee and Service representatives met with Wyoming, Utah and Colorado's oil and gas representatives to discuss concerns about regulations and spills in priority (spawning) areas. The Program is working with EPA to prepare an updated GIS map layer of endangered fish spawning sites and other important habitats to assist States in identifying sensitive areas.</p>	<p>1 – Reduce threat of extinction by reducing risks of hazardous spills in endangered fish spawning habitat.</p>
<p>The Program's hatchery program continues to incorporate new information (e.g. stocking fish near their preferred spawning temperature presumed to be physiologically optimal) on survival of stocked fish and meet or exceed most of its targets for producing and stocking bonytail and razorback sucker.</p>	<p>2 – Improving status of fish populations through stocking.</p>
<p>Antennas that detect PIT tags implanted in endangered fish have been placed in several locations throughout the upper basin, increasing tag detections significantly. Researchers are incorporating some of these data into demographic analyses (though not all antenna data are suitable for use in population abundance estimates).</p>	<p>2 – Improving ability to detect status of fish populations.</p>

Accomplishment	Sufficient Progress Criteria Affected
Working with the Upper Colorado and San Juan Programs, Reclamation contracted with Colorado Natural Heritage Program to develop a basin-wide online data system of fish capture and detection records. The conceptual design for the database, now named Species Tagging, Research and Monitoring System (STRaMS), was shared at the January 2015 Researchers Meeting and a beta version was released in March.	2 – Improving ability to detect status of fish populations.
<b>Green River</b>	
<p>2014 was characterized as an average runoff year for inflows to Flaming Gorge Reservoir. Reclamation operated Flaming Gorge Dam under the ROD and Biological Opinion to meet or exceed a target of 18,600 cfs at Jensen, Utah. This was the third year of operating under the Larval Trigger Study Plan [LTSP] for peak releases. During larval razorback sucker presence, flows were above 18,600 cfs for 4 days and above 14,000 cfs for another 20 days, providing possible larval access to the Stewart Lake, Above Brennan, Old Charley Wash, Thunder Ranch, Bonanza Bridge, Johnson Bottom, Stirrup, and Leota 7 wetlands. The Recovery Program detected wild-produced razorback sucker larvae on May 28, 2014 (Bestgen et al. 2014). Reclamation began their ramp-up to bypass flows on May 30, 2014, achieving a peak release of 8,600 cfs, and initiated ramp down to base flows 15 days later when Yampa River flows no longer supported meaningful floodplain connection in Reach 2.</p> <p>The Green River at the town of Green River did not meet the average peak flow of 22,000 in 2014, but peaked at 20,600 due in part to low snowpack in the Duchesne and Price River tributaries. Baseflows met average-wet categories for reach 2 and 3.</p>	1 – Improve habitat and reduce threat of extinction; 3 – Improve flows; 4 – Reduce magnitude of project impact.
UDWR biologists used floodgate structures to control flows and picket weirs to exclude large-bodied nonnative fishes at Stewart Lake. Stewart filled to capacity during the larval drift period and then was drained in September 2014, beginning 92 days post-initial connection. A total of 749 razorback suckers were sampled returning to the river during drawdown of the wetland. Razorback larvae or young-of-year were confirmed in all monitored wetlands connected via LTSP releases in 2014, indicating successful entrainment of larvae to all floodplain sites of interest. Specifically, light traps confirmed razorback larvae in above Brennan, Escalante Ranch, Stewart Lake, Leota 7 and the Stirrup. At the actively managed wetland Stewart Lake, UDWR provided adequate habitat for razorback throughout the summer. When Stewart was drained in September, although nonnative fish made up the majority of biomass (110,299 mostly small-bodied fish), UDWR collected 749 razorback suckers during sampling (only a portion of drainage flows were sampled). The fish released back to the Green River had a mean length of 97mm TL, with some fish reaching lengths of 160+mm, indicating substantial growth while in Stewart and improving these individuals' chances of overwinter survival. Later that fall, UDWR collected age-0 razorback in in-channel habitats, documenting that the species was residing in the river. More importantly, in spring 2015, UDWR collected healthy age-1 razorback – representing the first wild age-1 fish in decades! For the second consecutive year, Stewart Lake has demonstrated the enormous potential of managed wetlands for razorback sucker recovery under the Larval Trigger Study Plan.	1 – Improve habitat and reduce threat of extinction; 2 – Improve status of fish population.
To further improve razorback sucker recruitment, the Service funded improvements to the Johnson Bottom floodplain on the Ouray National Wildlife Refuge so it can be operated similar to Stewart Lake. Construction was completed in spring 2015.	1 – Improve habitat and reduce threat of extinction; 2 – Improve status of fish population.
UDWR continued work to reduce nonnative fish escaping from Starvation and Red Fleet reservoirs. A temporary screen was installed at Starvation in 2014 and maintained in 2015 with permanent screen construction planned for 2016.	1 – Reduce threat of extinction by preventing escapement of nonnative fishes.

Accomplishment	Sufficient Progress Criteria Affected
UDWR is working with stakeholders to develop a lake management plan for Red Fleet and plans to rotenone this reservoir in 2015.	
<b>Yampa River</b>	
The 2014 water supply forecast for May - July was 129% of average for the Yampa River at Maybell and flows peaked at 13,100 cfs. With an average flow August through October of 506 cfs, the Program only called for release of 1,578 af from Elkhead Reservoir (July 20 -23) to facilitate a final nonnative fish removal trip. With the 200 cfs flow target being met at Maybell, the Recovery Program did not need additional water, thus, 4,361 af was left in Elkhead for recreation.	1 – Improve habitat through augmented flows; reduce threat of extinction by hindering smallmouth bass recruitment and removing nonnative fishes.
Program participants discussed chemical reclamation of Elkhead Reservoir, but based on public concerns and the need for a permanent solution to nonnative fish escapement, have approved screening the reservoir. Chemical reclamation is an option if screening is not effective. Colorado and the Program have committed funds for screening, and Colorado hopes to install the net prior to spring runoff in 2016. Colorado also is revising the Elkhead Lake Management Plan to establish a fishery compatible with endangered fish recovery.	1 – Reduce threat of extinction by preventing escapement of nonnative fishes.
The Service urged Colorado to develop and implement a comprehensive suite of nonnative fish management actions (as an alternative to must-kill regulations, which Colorado has not wanted to pursue). CPW convened a working group of stakeholders in November 2014 and additional meetings in 2015. This group has suggested a comprehensive suite of actions that will be submitted to CPW Director Bob Broscheid.	1 – Reduce threat of extinction by reducing nonnative fishes.
<b>Duchesne River</b>	
DOI has a lease for up to 1,500 af of water in Big Sand Wash to support base flows; lease exercised for the third year in a row in 2014 (979 af released). Flows from Daniels Diversion continue to be delivered.	1 – Improve habitat through augmented flows; 3 – Improve flows.
The Service, UDWR, and local water users completed a Candidate Conservation Agreement with Assurances (CCAA) and Safe Harbor Agreement (SHA) for the water users between Knight Diversion, Starvation Dam and the Myton Diversion. These agreements formalize the process for protecting flows released in support of base flows and protect water users from potential take of endangered fish that use the newly constructed fish passage at the Myton Diversion.	1 – Improve habitat through augmented flows; 3 – Improve flows.
<b>Colorado River</b>	
With a 2014 snowpack of 132% of average, the peak flow target was in the wet category in the 15-Mile Reach. Coordinated Reservoir Operations was not conducted due to concern for flooding in Grand Junction. The peak target was 23,500 cfs and the actual peak was 25,300 cfs. The 2014 baseflow target was 1,630 cfs and the average flow for August – October was 1,852 cfs. A total of 94,655 af was provided for baseflow augmentation in 2014.	3 – Improve flows; 4 – Reduce magnitude of project impact.
Reclamation and the municipalities of Grand Junction, Palisade, and Fruita have had municipal-recreation agreements in place that allow the State Engineer to protect deliveries of additional Orchard Mesa Check Settlement water and Grand Valley Water Management Plan water from Green Mountain Reservoir since 2001. In early 2015, Reclamation and the municipalities signed a 40-year agreement to accommodate as much as 66,000 af (the entire Green Mountain HUP pool). Under the previous agreements, Reclamation delivered as much as 61,433 af/year (55,594 delivered in 2014).	3 – Improve flows; 4 – Reduce magnitude of project impact.

<p>Thirty-three canal check structures were constructed on the Orchard Mesa Irrigation District (OMID) in 2014, resulting in saved water beginning in 2014. The canal automation regulating reservoir construction is scheduled to be completed in 2017. The saved water will be delivered to the 15-Mile Reach of the Colorado River.</p>	<p>3 – Improve flows; 4 – Reduce magnitude of project impact.</p>
<p>Initial population estimates of razorback sucker &gt;400mm TL from the Colorado River indicate that the population ranged between 656 and 2,035 from 2005-2010. A total of 661 unique razorbacks were captured in the Colorado River in 2013 and 835 were captured in 2014 during Colorado pikeminnow population estimates. The Program will conduct a species status assessment to be completed in 2016 to determine if the species is eligible for downlisting.</p>	<p>2 – Status of fish populations improved.</p>

**Table 3. SERVICE CONCERNS AND RECOMMENDATIONS** (focused on February 1, 2014, through January 31, 2015)

<b>Service Concern</b>	<b>Sufficient Progress Criteria Affected</b>	<b>Recommended Action Items</b> (see also Appendix table of nonnative fish management actions)
<b>General – Upper Basin-wide</b>		
<p>Preliminary results from the most recent rotation (2011-2014) of Colorado pikeminnow population estimates indicate adults and sub-adults are in decline throughout the entire Upper Colorado River basin, especially in the Yampa and Colorado rivers. Catch of sub-adults and adults in the Colorado River in 2013 and 2014 were near lowest observed in the history of this project. Decline of Colorado pikeminnow in the Yampa and Colorado rivers has been linked to the persistence of nonnative predators. Large-bodied predatory species of concern also appear to be expanding in other segments of critical habitat, and illegal introductions of nonnative species continues to expand. In 2012, the Colorado Pikeminnow Recovery Team was convened to review new information for Recovery Plan revisions. The team’s preliminary assessment indicated that persistent low numbers of adult Colorado pikeminnow in the Yampa River may be caused by unacceptable densities of nonnative predators and that more effective management of nonnative fishes must occur before downlisting can be considered. The Service concurred.</p>	<p>1– Increases threat of extinction; 2 – Declining status of fish populations.</p>	<p>The persistent and prolonged threat of expanding nonnative fish populations needs to be ameliorated. The Recovery Program needs to fully implement the comprehensive <i>Upper Colorado River Basin Nonnative and Invasive Aquatic Species Prevention and Control Strategy</i> and continue work with the States to implement the specific, tangible actions added to the RIPRAP in 2013 (see Appendix table), which in the aggregate have a high likelihood of stopping the expansion of invasive species and of reducing existing concentrations. Reductions in nonnative fish populations should allow expansion of the range of Colorado pikeminnow, increase survival of pikeminnow of all age classes, and reduce competition for forage for pikeminnow.</p>
<p>Downward trends in some humpback chub populations (particularly Yampa Canyon and in Desolation Canyon of the Green River) have been attributed to increased nonnative fish abundance and habitat changes associated with dry weather and low river flows. Declines in adult humpback chub catch rates for sites in the upper 45 miles of Desolation Canyon correlate strongly to the appearance and persistence of a smallmouth bass population and recent increases in number of walleye. Declines in the proportion of first year adults (200–220 mm TL) support the idea that smallmouth bass and walleye predation may be suppressing the smaller <i>Gila</i>.</p>	<p>2 – Declining status of fish populations.</p>	<p>The Recovery Program has committed to reducing nonnative impacts to the humpback chub population in Yampa Canyon since 2001. In 2004, the Recovery Program transitioned Project 110 from a nonnative catfish control effort in Yampa Canyon to smallmouth bass removal. That effort is ongoing and is complemented by similar efforts both upstream (Projects 125, 98a, and 98b) and downstream (project 123a). In Desolation Canyon, smallmouth bass, walleye, and other nonnative species are removed during Colorado pikeminnow population estimates (Project 128) and during specific nonnative control trips conducted under Project 123b. The Program should complete recommendations for and implement humpback chub broodstock development.</p>

<p>In 2008, the largest humpback chub population in the UCRB, the Black Rocks/Westwater core population for the first time dropped below the population size downlist criterion (MVP = 2,100 adults). In 2011, some recovery was seen with an adult population estimate of 2,157 in Westwater Canyon; however, UDWR reported a decline to 1,507 adults in 2012. The most recent Black Rocks adult population estimates in 2007–2008 were 345 and 287, respectively. During the fall of 2011, 78 individual adult humpback chub were caught in Black Rocks and 112 in 2012, similar to the numbers caught in 2007 and 2008. CSU recently conducted a robust population analysis using Program MARK to generate population and survival estimates and capture probabilities for adult humpback chub captured for Westwater Canyon and Black Rocks combined from 1998 – 2012. These core population estimates were 1,846 and 1,718 for 2011 and 2012, respectively. CSU’s analysis more clearly indicated that declines in the Westwater and Black Rock humpback chub populations are due to lapses in recruitment (i.e., adult survival rates have remained stable). PIs agree that reinitiating an age-0 monitoring component is advisable.</p>	<p>2 – Declining status of fish populations.</p>	<p>The Program needs to determine how to investigate age-0 and age-1 humpback chub mortality (especially in Black Rocks/Westwater and Desolation canyons) as recommended in the Research Framework. The difficulty in working with these size classes is they can't be identified to species. The Program should develop a scope of work to investigate age-0 and age-1 humpback chub mortality. The Service recognizes that a first step in such investigations will be to test and refine as needed age-0 sampling techniques that were effective in the 1990’s when young chub were more plentiful. As conditions allow, 200 age-0 <i>Gila</i> will be brought into captivity from Black Rocks/Westwater to develop a humpback chub broodstock.</p>
<p>Despite the Recovery Program’s extensive removal efforts, nonnative aquatic invasive species continue to threaten survival and recovery of the endangered fishes in the upper Colorado River basin. Basin-wide, weak year classes of smallmouth bass were produced in 2014, a result of average to above-average flows. However, crews still removed large numbers of smallmouth that were produced in the strong year classes of 2012 and 2013 (lower water years). Collections of adult smallmouth bass were very high in canyon habitats in 2014, potentially representing a range expansion of adult fish. Northern pike numbers have been largely uncontrolled, and strong year classes, such as 2011, have saturated ecosystems. Crews are now removing pre-spawn fish in the densest portions of the Yampa to control riverine reproduction. Catches of walleye have increased in the lower Green and lower Colorado over the past decade. Catch locations overlap with nursery areas for endangered fish, representing a potential impairment to recruitment. Crews documented</p>		<p>The Service agrees that the impacts of non-native fish on recovery of the listed species must be controlled. Northern pike and smallmouth bass removal evaluations were completed in 2014. Both final reports indicate the focus of removal should be on preventing reproduction and immigration. Therefore, in-river removal now focuses on smallmouth bass spawning areas once rivers reach adequate temperatures and on removing a large number of pre-spawn northern pike via nets (before flows allow for boat access). To combat immigration from reservoir sources, Program Partners are implementing the comprehensive <i>Upper Colorado River Basin Nonnative and Invasive Aquatic Species Prevention and Control Strategy</i>. Adequate progress has been made to control nonnative predator escapement from Elkhead, Rifle Gap, Red Fleet, and Starvation Reservoirs. Utah and Wyoming have implemented must-kill policies</p>

<p>walleye predation on two juvenile pikeminnow in 2014. Spring 2014 light trap samples from the lower Green River documented two larval walleye, likely representing the first documented instance of successful in-river reproduction. Escapement from reservoirs has been deemed adequate to overcompensate for in-river removal efforts. Therefore, the Program is investigating the feasibility of screening many reservoirs with populations of problematic species and working with state partners to revise lake management plans for fisheries to replace the problematic species.</p>		<p>to support nonnative predator removal. However, CPW believes this is not appropriate in Colorado. If CPW is unwilling to pursue must-kill regulations throughout the Upper Basin in Colorado, we urge the state to pursue a comprehensive suite of alternative actions, in concert with Program partners, to achieve the necessary biological outcome. In November 2014, CPW convened a NNF Management Work Group to start developing that suite of actions – meetings continued in 2015 and the group has recommended a comprehensive suite of actions for submittal to CPW Director Broscheid.</p>
<b>Green River</b>		
<p>Delays in development of Reclamation's revised Green River hydrology model caused Utah to revise the Green River Flow Protection schedule last year. In 2014, Utah's Green River Utah Water Acquisition Team (GRUWAT) completed the combination of the Bureau of Reclamation's Flaming Gorge Operations Riverware model (monthly timestep) with Utah's MODSIM model (daily timestep) and moved Green River flow protection to a policy committee within the State.</p>	<p>Delays 1 – Legal protection of flows needed for recovery.</p>	<p>Maintain revised schedule to implement flow protection in FY 16-17.</p>
<p>Old Charley Wash, an important 'dry year' sampling site identified in the Larval Trigger Study Plan is currently unavailable as the Service has as of yet been unable to renew lease with Northern Ute Tribe.</p>	<p>Hampers ability to 1 – Improve habitat through augmented flows</p>	<p>Service will continue to pursue government-to-government consultation with Northern Ute Tribe and request that the lease be renewed.</p>
<p>Walleye captures have increased in middle and lower Green River. An illegal population of walleye in Red Fleet Reservoir is a problematic source of this species entering the Green River. Smallmouth bass catch rates in Desolation Canyon were the highest ever recorded in 2014. A source of white sucker was discovered at Browns Park WMA in 2014 and should eventually be eradicated. .</p>	<p>1 – Increases threat of extinction.</p>	<p>Red Fleet Reservoir has been recommended for reclamation (rotenone) and a new Lake Management Plan is being drafted. UDWR adjusted work to add spring and fall passes for walleye and gizzard shad removal in the lower Green River in years when Colorado pikeminnow population estimates are not conducted. UDWR added passes for walleye in the middle Green River in the spring. UDWR will pursue an eradication plan for white sucker at Browns Park. UDWR will continue to remove smallmouth bass in Desolation Canyon and monitor the population.</p>
<b>Yampa River</b>		
<p>CWCB still needs to provide the accounting of past depletions for the Yampa River due in 2010; a back-casted baseline of current depletions; and a recommendation and justification addressing projected future depletions and whether or not</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 (Due date from YPBO - 1<sup>st</sup> report July 1, 2010; 2<sup>nd</sup> report July 1, 2015). The depletion accounting report will include a discussion</p>

<p>additional instream flow filings or other flow protections mechanisms should be considered.</p>		<p>of the need for flow protection (which would require a peak flow recommendation). The irrigated acreage assessment was completed. Another contract was awarded to update the dataset. The models will be updated through at least 2012. Colorado has placed a high priority on the Yampa and Colorado river basins portion of this work.</p>
<p>Efforts to reduce densities of smallmouth bass in Little Yampa Canyon and other reaches of the Yampa River appear to be hampered by the immigration of smallmouth bass adults and recruits from adjacent reaches, particularly upstream sources that sustain propagule pressure and the proliferative/invasive capacity of this species. Escapement of adult smallmouth bass from Elkhead Reservoir remains problematic. A weak year class of smallmouth bass was produced in 2014, a result of average to above-average flows. However, crews still removed large numbers of smallmouth that were produced in the strong year classes of 2012 and 2013 (lower water years). Collections of adult smallmouth bass were very high in Yampa Canyon 2014, potentially representing a range expansion of adult fish.</p>	<p>Hampers ability to 1 – Reduce threat of extinction by decreasing numbers of nonnative fish.</p>	<p>CSU completed the <u>programmatic synthesis of smallmouth bass removal efforts</u>, providing a comprehensive evaluation of the Program’s removal efforts. The expanded Yampa River “surge” effort to target smallmouth bass was continued in 2013 and 2014. The Service recommends that CPW and the Recovery Program eliminate the release of nonnative predators over the Elkhead Reservoir spillway and that CPW revise the lake management plan to transition to a compatible reservoir sportfishery. Although a brief unscreened spill occurred at Elkhead Reservoir during the above average runoff of 2014, the CRWCD has done an excellent job of managing reservoir elevations to avoid spills in recent years.</p>
<p>Efforts to reduce densities of northern pike in the Yampa River appear to be hampered by immigration from upstream sources (Catamount, Elkhead, and the upper river) and ongoing in-river reproduction.</p>	<p>Hampers ability to 1 – Reduce threat of extinction by decreasing numbers of nonnative fish</p>	<p>The Service recognizes that pike removal was expanded up to Steamboat Springs in 2014. CSU completed a <u>programmatic synthesis of northern pike removal efforts</u> (2004-2010) to evaluate current removal efforts in the context of northern pike life history throughout the Yampa River drainage. Spring netting of connected backwaters in 2014 proved an effective method for removing pre-spawn adults. The Service recommends that such netting efforts be continued and expanded in 2015. The Service agrees that Program partners’ focus on controlling escapement of nonnative predators from Elkhead Reservoir and CPW’s revision of their lake management plan to transition to compatible sportfishery are appropriate recovery actions. CPW should continue to undertake the pike removal project at Catamount and should remove any pike from Stagecoach during their standard sampling (i.e. discontinue tagging). CPW has committed to these actions.</p>

<b>Duchesne River</b>		
Extent of contribution of smallmouth bass or walleye produced in the Duchesne River below Starvation and entering Green River remains unknown. Nonnative fish are not currently being monitored or removed from the Duchesne River due to access issues.	1 – Increases threat of extinction.	The Service supports efforts to maintain a temporary screen below the Starvation spillway until a permanent screen can be installed (projected for 2016). The Service will continue to pursue government-to-government consultation with Northern Ute Tribe so that in-river removal nonnative control can be resumed
<b>White River</b>		
The schedule outlined in the approved scope of work for developing the White River Management Plan has slipped.	Hampers ability to 1 – Improve habitat through protected/augmented flows; and 3 – Inadequacy of flows.	The Service strongly encourages better progress on the development of this management plan. We recommend that the PDO work with CWCB to track progress more closely. We appreciate that CWCB has secured \$250,000 from their Species Conservation Trust Fund to help with modelling, writing, and presentations of the management plan and continues to work on contracting. Previously established due dates were model completion fall 2014; plan completion winter 2015; and PBO summer 2015. Dates should be revised with contractor.
Smallmouth bass abundance has increased in the White River. Sampling in 2012 indicated that bass densities are highest in the uppermost section below Taylor Draw Dam and tapered off to relatively low densities approximately 20 miles downstream. Sampling in 2013 shows that fish spawned in 2012 in the White River were captured further downstream into Utah, resulting in a large increase in fish captured in that reach during 2013. A weak year class of smallmouth bass was produced in 2014, a result of average to above-average flows. However, crews still removed large numbers of smallmouth that were produced in the strong year classes of 2012 and 2013 (lower water years). Efforts to reduce the abundance of smallmouth bass through electrofishing were as high as the Program budget allowed in 2013 and 2014.	1 – Increases threat of extinction.	Efforts to reduce the abundance of smallmouth bass were intensified in 2013 and again in 2014 with increased effort by both the Service and CPW in the Taylor Draw to Douglas Creek reach in 2014. <i>See recommended action item identified for General Concern #1.</i> The Recovery Program continues to support and encourage the multi-agency effort to designate the 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.	The Program is working to improve the overall strategy for flow augmentation in the 15-Mile Reach to be considered each spring and adjusted as the year progresses, addressing all possible sources of water, priorities, antecedent conditions, projected flows and supplies, including OMID, Grand Valley Project, CFOPS, etc. In 2015, Ute Water Conservancy District proposed leasing up to 12,000 af of water to CWCB for an instream flow. In addition, the OMID Canal Automation Project is expected to provide about 17,000 af of water in most years. The check structures in the OMID project are complete and partial water savings became available in the 2014 (current) irrigation season. The project will be fully implemented in 2016.
CWCB still needs to provide the depletion accounting report that was due July 1, 2010.	Hampers ability to 3 – Determine adequacy of flows.	<i>See first item under Yampa River.</i> The Service recommends that CWCB provide a depletion accounting progress report to be included in the 2015 review of the 15-Mile Reach PBO. Completion date for the 2015 review is Dec.31, 2015.
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.	CFOPS Phase III draft report distributed April 2, 2014 and comments received; revised draft most recently due December 31, 2014 (final by March 2015), but pending hiring contractor to complete in fall 2015. CFOPS report should be included in the 2015 review of the 15-Mile Reach PBO (see above row).
Walleye captures in the Colorado River went from being ‘rare’ during 2003-2009 to ‘common’ in 2010, and then increased dramatically in 2013 and 2014. Distribution within the lower reach in 2010 appeared to be restricted below RM 80; however, by 2013 and 2014, captures extended upstream to RM 112, indicating an upstream range expansion. Unlike smallmouth and largemouth bass, whose primary distribution is in the upper reach, walleye directly overlap in habitat with small size classes of both Colorado pikeminnow and razorback sucker. In fact, crews documented walleye predation on two juvenile pikeminnow in 2014.	1 – Increases threat of extinction.	The Service agrees with the additional effort to target walleye expended in the lower Colorado in 2014 and with similar or greater efforts in 2015.

<b>Gunnison River</b>		
<p>The high density northern pike source population in Crawford Reservoir remains of extreme concern due to its invasive potential in the Gunnison River.</p>	<p>1 – Increases threat of extinction.</p>	<p>The Service supports CPW initiation of mechanical removal of northern pike from Crawford in 2014, which removed an estimated 74% of the adult population. The Service recommends continued removal in 2015. Crawford Reservoir does not connect unless it spills. Every effort should be made to ensure that the Gunnison River remains a native fish stronghold.</p>
<p>Illegal introduction of smallmouth bass in Ridgway Reservoir was confirmed in 2013. Sampling demonstrated multiple size classes, but low densities of adult fish, indicating the population may be expanding from initial introduction. Densities of smallmouth bass near the spillway were high, indicating a high risk of escarpment from reservoir spilling.</p>	<p>1 – Increases threat of extinction.</p>	<p>The Service applauds the efforts of Tri-County Water Conservancy District (which successfully avoided a spill in 2014 and so far in 2015) and recommends spills continue to be avoided in the future. The Service supports CPW regulatory actions to implement unlimited bag and possession limits for smallmouth bass at Ridgway and added information concerning the illegal introduction and its effects to the <u>2015 Fishing Guidebook</u>. Long-term solutions will be addressed in the report of the CPW Nonnative Fish Workgroup due in 2015.</p>

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.

### **C. Conclusion on Sufficient Progress**

The Service recognizes significant accomplishments have occurred over the course of the past year, including:

- 1) Continued cooperation to manage spring (particularly Larval Trigger Study Plan operations at Flaming Gorge Dam) and base flows throughout the basin;
- 2) Reclamation's efforts to meet endangered fish flow targets under their 2012 Aspinall ROD;
- 3) Continued attention to addressing off-channel sources of nonnative predators (e.g., reaching agreement with communities in northwestern Colorado to screen the spillway at Elkhead Reservoir and shift the reservoir fishery to a more compatible species assemblage; continued efforts to contain nonnative escapement at Starvation Reservoir until a permanent solution can be constructed; development of a compatible management plan for Red Fleet Reservoir including nonnative eradication and stocking of compatible species; coordination with water users at Ridgway Reservoir to contain spring spills and implementation of a fishing tournament that removed large numbers of smallmouth bass; and increased northern pike removal efforts at Stagecoach Reservoir);
- 4) Meeting razorback sucker and bonytail stocking targets; and
- 5) Continued encouraging reports of an expanding population of razorback sucker throughout the Upper Basin, including reports of 729 wild-produced young that were entrained and reared in Stewart Lake in spring 2014 and released to the Green River.

The Service also recognizes the efforts of Program partners to augment the 2014 Work Plan, including: a) Reclamation's contributions to endangered fish investigations in Lake Powell which continue to produce encouraging information about the expanding Upper Basin razorback sucker population; b) CWCB's contributions from their Species Conservation Trust Fund to supplement nonnative fish control; and c) the Service's contribution via their Cooperative Recovery Initiative to improve nursery habitat for the endangered fish at Johnson Bottom on the Ouray National Wildlife Refuge.

Despite good cooperation among Program partners and a comprehensive suite of recovery actions, the Service remains concerned with recent reports of low densities of Colorado pikeminnow in the Green and Colorado River subbasins. And we remain concerned over low numbers of humpback chub in many Upper Basin locations. We believe several specific recovery actions should receive greater attention in the coming year. We categorize those actions under: 1) nonnative fish management; 2) flow management; and 3) reducing endangered fish entrainment in irrigation canals, as follows.

### *Nonnative Fish Management*

Overall, the Service is very pleased with the Program's progress on the action items developed during our review last year. We applaud Colorado Parks and Wildlife (CPW) for convening a Nonnative Fish Management Work Group to discuss and develop public outreach strategies to communicate the importance of compatible sport fisheries. The group met for the first time in November 2014 and eventually focused on submitting necessary changes in fishing regulations to the Colorado Wildlife Commission and developing a harvest incentive strategy to reduce the worst-of-the-worst nonnative predators. Both of these actions have been implemented and we now await the Wildlife Commission's decision on harvest regulations. The Work Group also recommended and CPW effectively implemented a smallmouth bass tournament at Ridgway Reservoir. We encourage CPW to follow through on the group's effort by submitting final recommendations to the CPW director in 2015. We also encourage Program partners to follow through on the extensive coordination that occurred in 2014 and which led to a decision to install a net on the Elkhead Reservoir spillway to further reduce escapement of nonnative northern pike and smallmouth bass. We understand that a net will be installed prior to spring runoff in 2016.

### *Flow Management*

As was the case in our 2014 Sufficient Progress review, the Service remains concerned that the timeline for development of a White River management plan continues to slip. We appreciate CWCB's contributions from their Species Conservation Trust Fund to eventually contract a consultant to lead this effort. And we fully understand that considerable effort has been expended over the course of the past year to secure that contract, but nevertheless a contractor has not yet been retained. It is of critical importance that a contractor be hired and that the necessary hydrologic modelling be started by our next sufficient progress review. Such a plan will provide the Service and water users with clear definition of a level of future water development that can rely on the Recovery Program for ESA compliance. Further, that management plan will be the mechanism through which endangered fish flow recommendations can finally be approved for this important tributary to the Green River.

We also encourage Program partners to continue to pursue protection of endangered fish flows in the Green River now that the Green River Utah Water Acquisition Team's modeling efforts are complete. Finally, we ask that Program partners to continue to explore flexibility in operations and storage throughout the upper Colorado River drainage, particularly during dry years and with respect to priorities and antecedent conditions, to reduce the amount of time flows drop below 810cfs in the 15-Mile Reach.

### *Endangered fish entrainment at irrigation canals*

The number of endangered fish detected in the Green River irrigation canal (Tusher Wash Diversion) in 2013 was astonishing. We understand that detections of endangered fish were fewer during the higher flows experienced in 2014 and that the Recovery

Program funded an important canal salvage effort following the 2014 irrigation season, which yielded only one Colorado pikeminnow. The Service applauds the Biology Committee on their important decision this past winter to endorse a weir-wall type solution for the Green River canal, which is similar to the solution implemented by the San Juan River Recovery Program at the Hogback Diversion. We agree that prior to construction at the Green River canal, the San Juan project should provide proof of concept, but we encourage the Upper Colorado Program to act as quickly as reasonably possible.

The Service shares the Recovery Program's concern about the number of native and endangered fish salvaged each year from Grand Valley canals following the irrigation season. We don't know if the screens at the GVIC, GVP, and Redlands diversions can be operated more frequently, but we implore Program partners to thoroughly investigate this issue to determine if and how the Recovery Program can assist the irrigation companies to further reduce entrainment.

The Recovery Program has made strong progress in protecting flows and restoring habitat and has demonstrated strong resolve to manage nonnative fishes in recent years. Four of the 18 accomplishments listed in the table above relate to nonnative fishes, as do 11 of the 19 concerns. As recognized for several years, the Service senses that 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. The Service will assist and support the Program by identifying accomplishments and important recovery actions that remain as we revise the Colorado River endangered fish recovery plans.

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, the focus on nonnative threats, 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>. And,

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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.

continued avoidance of jeopardy for the water projects and depletions currently provided with ESA compliance by the Program, i.e., 2,037 projects depleting 2.86 million AF/YR. 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.

This concludes the Service's 2014-2015 assessment of progress. Specific questions about sufficient progress should be directed to Tom Chart, Recovery Program Director, 303-236-9885, tom\_chart@fws.gov or Angela Kantola, Deputy Director, 303-236-9882, angela\_kantola@fws.gov.

## **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."

Also as per the PBO, in 2015, the Service is scheduled to review the status of the endangered fishes and determine if the positive population response criteria have been met. As stated in the Reinitiation Notice, the Service will provide information on the status of the species and recommendations for improving population numbers to the Recovery Program as part of their evaluation of the reinitiation criteria. The Service's Western Colorado Ecological Services Office compiled the following preview of priority issues related to that pending 2015 PBO review. (Supporting information is found in attachment entitled: 2015 15-MR PBO Review.)

The Service recognizes the following significant recovery accomplishments that have occurred since 1999:

1. Fish passage at the Grand Valley Project and Price-Stubbs diversions;
2. Constructing and collaborating with local water users to operate fish screens in the Grand Valley Project and Grand Valley Irrigation Company canals;

3. Implementing irrigation efficiency in the Grand Valley project canal with saved water improving flows in the 15-Mile Reach;
4. Building the Horsethief Hatchery ponds for successful propagation efforts with respect to razorback sucker reintroduction.
5. Efforts to combat nonnative fish.
6. The voluntary efforts of West and East slope water users and Reclamation to assist in meeting the recommended endangered fish flows in the 15-Mile Reach.
7. Construction of the Orchard Mesa Irrigation District Improvement Project that will contribute to flow augmentation in the 15-Mile Reach.

While recognizing these accomplishments, the Service recommends that the Recovery Program build on its history of cooperation to improve in three specific recovery areas: 1) low flow management in the 15-Mile Reach during dry years; 2) achieve greater success controlling expanding populations of nonnative predators, particularly the recent increase in abundance and distribution of nonnative walleye; and 3) identify and correct factors limiting wild populations of humpback chub and successful reintroduction of bonytail. The concerns raised here are specific to the Upper Colorado River, but are consistent with those raised in the Regional Director's overarching review of the Recovery Program's progress.

Low flow Management in the 15-Mile Reach:

In the 15-Mile Reach PBO the Service states that implementation of recovery action items, with future depletions will provide flows that meet the flow recommendations during August, September, and October. The table below presents actual average monthly flows for five 'dry' years (2002, 2003, 2004, 2012, and 2013), when the Service's recommended average monthly flow was 810 cfs.

	<b>Colorado River Below the Grand Valley Diversion</b>		
	<b>Average Monthly Flow</b>		
	<b>August</b>	<b>September</b>	<b>October</b>
<b>2002</b>	115.4	240.9	526.2
<b>2003</b>	611.2	1,088	1,078
<b>2004</b>	497.6	830.3	1,078
<b>2012</b>	454.1	371.7	528.6
<b>2013</b>	727.4	1,272	1,288

The Service understands that without the commitments from Reclamation and the voluntary cooperation of water users, the observed monthly averages would have been lower, and in some instances drastically so. However, when flows drop below 810 cfs researchers believe that habitat becomes compromised to the point that adult pikeminnow

likely vacate the 15-Mile Reach to points downstream where flows increase either due to tributary input from the Gunnison River or irrigation return flow.

The Service recognizes that the Orchard Mesa Irrigation District (OMID) Canal System Improvement Project has already started to assist in flow management. When fully complete, the project will provide approximately 17,000 acre-feet to the 15-Mile Reach, except during extremely dry conditions. We understand that this will result in approximately 30 cfs increase in flow in the 15-Mile Reach during irrigation season. We also applaud the CWCB for leasing additional Ruedi water from the Ute Water Conservancy District to augment base flows.

The 2013 spring and summer hydrology presented unprecedented flow conditions that were not fully considered in the 15-Mile Reach PBO. A very unusual set of circumstances occurred in April 2013 when air temperatures cooled, reducing mid- and high elevation runoff at the same time the irrigation season began. Flows measured at the Palisade gage then dropped below 400 cfs for 24 days and instantaneous flow dropped below 60 cfs on April 12 and April 27. The Service's recommended average monthly flow for April is 1,860 cfs. Irrigation diverters in the 15-Mile Reach are aware of this previously unexperienced situation and have identified mitigation measures to avoid it in the future. In July 2013, flows were 'flashy' due to summer storms. However, during a five day period (July 22-26), flows dropped below 400 cfs with an instantaneous low flow of 100 cfs recorded on July 24. The recommended endangered fish flow for July is 1,480 cfs. This situation will likely be avoided in the future with pro-active measures by the Program, including use of fish pool releases.

The 2014 spring and summer hydrology provided excellent habitat conditions in the 15-Mile Reach.

### Nonnative Predatory Fish

As mentioned earlier, the threat to endangered fish recovery posed by nonnative predatory fishes (e.g., smallmouth bass and northern pike) is of serious concern. In fact, the threat from nonnative fish predation is currently compromising the progress the Recovery Program has made toward recovery (including progress in flow management).

As it relates specifically to the PBO, the Service is most concerned with:

1. An expanding population of northern pike (likely source – Rifle Gap Reservoir) in the Colorado River upstream of the Grand Valley Project diversion;
2. Persistent densities of smallmouth and largemouth bass in the 15-Mile Reach and downstream;
3. An emerging population of walleye in the lower Colorado River in Utah.

The Service recommends that Recovery Program partners fully engage the battle against these nonnative predators. The Service commits to joining its partners in support of Colorado Parks and Wildlife and Utah Division of Wildlife Resources as they explore new nonnative fish management options and develop policy and regulation changes

needed to control predators and clearly communicate to the public that the nonnative threat is compromising species recovery, Section 7 compliance for Colorado River water projects, and threatens other native species.

Identify / Rectify Factors Limiting Wild Populations of Humpback Chub and Bonytail Reintroduction

The Service remains concerned that wild populations of humpback chub in Black Rocks and Westwater Canyon of the Colorado River (near the Colorado-Utah state line) have not recovered from declines detected in the late 1990's. The reason for those population declines is uncertain. Researchers caution that 78 largemouth bass and the same number of gizzard shad were collected in Black Rocks in 2012. This represents a ten-fold increase over the 2011 catch. The Westwater Canyon estimates of wild adults range from about N = 4,700 in 1998 to N = 2,500 in 1999, 2000, to N = 1,525 in and 2003. The 2007–2008 estimates were about 1,750 and 1,300. Although researchers link humpback chub declines in the upper portions of Desolation Canyon to increasing abundance of nonnative smallmouth bass there, a different mechanism appears to have impacted humpback chub in the Colorado River canyons. The large declines in humpback chub densities in both Black Rocks and Westwater Canyons occurred in the late 1990's prior to more recent increases of nonnative predators in the Colorado River. Ongoing flow management in the 15-Mile Reach and now in the Gunnison River is, in part, intended to provide habitat needed to assist in the recovery of the humpback chub, but preferred habitat for humpback chub is not well understood. We recommend that the Recovery Program investigate the factors limiting a positive response in these humpback chub populations and then implement the necessary recovery actions.

Recent reported declines in the Colorado River adult Colorado pikeminnow population are cause for great concern. Researchers caution that the distribution of the nonnative walleye in the lower portion of the Colorado (and Green) River now present a predatory threat in an important Colorado pikeminnow nursery area and could explain the recent declines in the endangered fish. We recommend that Recovery Program partners continue to focus control efforts on this relatively new invasive species to the system.

The Service also is concerned that despite a concerted propagation effort to reintroduce bonytail in the Colorado River, results to date are not encouraging. We recommend that the Recovery Program identify the factors limiting the successful reintroduction of this endangered species.

A more detailed status review of 15-Mile Reach PBO action items is found in the attached spreadsheet.

**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 respective 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.” A detailed status review of Gunnison PBO action items is found in the attachment entitled “2015 Gunnison PBO Review.”

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**Appendix Table**  
**Upper Colorado River Endangered Fish Recovery Program**  
**Nonnative Fish Management Actions: an Addendum to the Recovery Action Plan**  
**March 2015 Update on Progress**

River / Action	Responsible Entity(s)	New RIPRAP#	2013	2014	2015	Out years	PDO/MC update 3/2015
<b>General ( in addition to ongoing projects / actions)</b>							
Finalize the UCR Basin Nonnative and Invasive Aquatic Species Prevention and Control Strategy (Basinwide Strategy).	Program Director's Office (PDO)	III.D.	X				<i>Complete; Feb, 2014.</i>
Cease translocation of all nonnative predators to any fishery within the UCR.	States / Program	III.E.		X	X	X	<i>Implemented 2014 field season and beyond.</i>
The States will commit to remove northern pike and / or replace them with a Compatible (compatible with recovery) species (as identified in the Basinwide Strategy) throughout the UCR Basin. Specific waters will be targeted based on risk of escapement, opportunity and available resources.	States / Program	III.F.		States will convey this message in their Fishing Brochure / Guidebook starting in 2014			<i>CPW treated Paonia Resv. and held must kill fishing derby at Stagecoach. Good progress being made to address Elkhead; Program has approved recommendation to screen first. CPW began removing pike from Crawford in 2014 (~74% of the adult population removed). UDWR treated Stewart prior to inundation. Yampa pike removal expanded up to Steamboat in 2014. CSU programmatic synthesis of northern pike removal efforts (January 2015) demonstrated current removal efforts are inadequate to permanently reduce pike abundance in the Yampa River.</i>
Implement 'must kill' regulations for northern pike throughout the UCR basin (exceptions may	WY and UT	III.F.1.		X	X	X	<i>Done in WY (must-kill and nongame fish designation).</i>

River / Action	Responsible Entity(s)	New RIPRAP#	2013	2014	2015	Out years	PDO/MC update 3/2015
include waters where northern pike are being replaced by tiger muskie).							<i>Done in UT.</i>
Continue discussions concerning "must kill" regulations on northern pike throughout the UCR Basin to develop a proposal supported by law enforcement for regulatory consideration.	CO	III.F.2.	X	X	X	X	<i>If Colorado is unwilling to pursue must-kill regulations throughout the UCR basin in Colorado, then the State is urged to pursue a comprehensive suite of alternative actions, in concert with Program partners, to achieve the necessary biological outcome. CPW convened a group of Program stakeholders to develop new nonnative fish management actions; Four meetings held (first on 11/04/14; last on June 1, 2015). In-lieu of must kill, the group suggested a comprehensive suite of actions that await submittal to Director Broscheid.</i>

<p>Remove smallmouth bass and / or replace them with a Compatible species (as identified in the Basinwide Strategy) everywhere they occur throughout the UCRB (exceptions = McPhee Res., Lake Powell Res., and upstream of Flaming Gorge Dam; and 'containment' may prove to be a viable management option for smallmouth bass at Starvation Res.). Specific waters will be targeted based on risk of escapement, opportunity and available resources.</p>	States / Program	III.G.	States will convey this message in their Fishing Brochure / Guidebook starting in 2014				<p><i>CPW treated Miramonte. Good progress being made to address Elkhead; Program has approved recommendation to screen first. Program partners working on a response to smallmouth at Ridgway. Tri-County operating reservoir to prevent spilling, CPW considering regulations, screening, and harvest incentives.</i></p>
<p>Implement 'must kill' regulations for smallmouth bass throughout the UCR basin (see exceptions above).</p>	WY and UT	III.G.1.	X	X	X	X	<p><i>UT implemented in the Green River downstream of Flaming Gorge Dam. All WY bass populations currently above Flaming Gorge Dam; will add regulations if show up elsewhere.</i></p>
<p>Continue discussions concerning "must kill" regulations on smallmouth bass throughout the UCR Basin to develop a proposal supported by law enforcement for regulatory consideration.</p>	CO	III.G.2.	X	X	X	X	<p><i>See northern pike (page 2, second item)</i></p>
<p>The States are dedicated to reducing burbot numbers through all means practicable (including targeted removal) throughout the UCR Basin. Current management practices (e.g., 'must kill' regulations; fishing derbies at Flaming Gorge) considered adequate.</p>	States / USFWS	III.H.	States will convey this message in their Fishing Brochure / Guidebook starting in 2014				
<p>Implement 'must kill' regulations for burbot throughout the UCR basin. Done in WY and UT. Wyoming and Utah implementing burbot bash; WY research projects.</p>	WY and UT	III.H.1.	X	X	X	X	<p><i>Done in WY and UT. WY and UT implementing burbot bash; WY research projects.</i></p>
<p>Continue discussions concerning "must kill" regulations on burbot (as a preemptive measure)</p>	CO	III.H.2.	X	X	X	X	<p><i>See northern pike (page 2, second item)</i></p>

throughout the UCR Basin to develop a proposal supported by law enforcement for regulatory consideration.							
Promote increased production of sterile gamefish (e.g., hybrids, triploids), as Compatible sport fish.	Service / States / Program	III.I.	X	X	X	X	<i>In discussions in WY, UT&amp;CO. Sterile walleye planned for stocking at Red Fleet Reservoir and Rifle Gap Reservoir under newly approved lake management plans.</i>
Work with State Wildlife agencies and water user groups to increase awareness amongst States' legislatures and the courts of the ecological and financial ramifications of illicit introductions.	States and PDO via the Implementation Committee	III.J.	X	X	X	X	<i>Ongoing in all states. (WY reg changes (leg)); PDO spoke to Judicial College in Reno; raised at IC meeting Sep 2013.</i>
<b>Yampa River (in addition to ongoing projects)</b>							
Elkhead Reservoir – establish a compatible sport fishery		III.B.1.a .2)(a)					<i>Ongoing – Program has approved process that involves screening as part of the future management. Lake Management Plan and regulation changes are required under screening agreement. CO will cover \$500K toward screen from SCF, Program to pay the remainder.</i>
Coordinate / schedule drawdown with Colorado River Water Conservation District (CRWCD)	CPW / Program / CRWCD	III.B.1.a .2)(a)(i)	X				<i>Drawdown to support screen installation planned for fall 2015.</i>
Develop / Implement Communications Plan	CPW / Program	III.B.1.a .2)(a)(ii)	X				<i>Implementing. Working group met with stakeholders in Sep 2014, local government in December and held public meeting in February 2015.</i>
Complete necessary environmental compliance	CPW / CRWCD	III.B.1.a .2)(a)(ii)	X	X			

		i)					
Identify and secure sources of replacement compatible sport fish.	CPW	III.B.1.a . (2)(a)(i v)	X	X			<i>CPW drafted revised LMP and submitted to other states and Service in summer 2015.</i>
Treat reservoir and necessary habitats in the upper Elkhead Creek drainage.	CPW / Program / CRWCD	III.B.1.a . (2)(a)(v )		X			<i>Deferred in favor of screening first.</i>
Stock compatible sport fish	CPW	III.B.1.a . (2)(a)(v i)			X		<i>CPW drafted revised LMP and submitted to other states and Service in summer 2015.</i>
Evaluate / treat if necessary	CPW / Program / CRWCD	III.B.1.a . (2)(a)(v ii)				X	<i>Success of screen in limiting escapement to be monitored</i>
<b>Walton Creek confluence area</b>							
Evaluate feasibility of habitat modification to eliminate / reduce northern pike spawning habitat.	CPW / Program / BOR	III.B.1.d . (1)(b)(i)	X	X			<i>\$500K secured for modification from SCTF. Program contributed \$30K Section 7 funds to feasibility / design. Draft feasibility report submitted by contractors.</i>
Modify habitat as indicated through feasibility investigations.	CPW / Program / BOR	III.B.1.d . (1)(b)(ii )		X	X	?	<i>Very encouraging – TNC may have been a major player in making this happen. CPW working with local stakeholders and all seem supportive.</i>
<b>Upper River (upstream of Hayden, CO)</b>							
Increase mechanical removal of northern pike in main channel and floodplain habitats as directed by Colorado Parks and Wildlife.	CPW / Program	III.B.2.d . (1)		X	X	X	<i>CPW and CSU reinitiated removal in this reach in 2014. Flows made work difficult to complete. Undertaken in 2015.</i>
<b>Stagecoach Reservoir.</b>							
Convert and extend the ongoing northern pike escapement study to a removal effort (will require an addendum to existing FERC Biological Opinion).	CPW / potentially Program in outyears	III.B.1.f.		X	X	X	<i>Stakeholders agreed to end the tagging portion of the escapement study (recaptures downstream will continue).</i>

							<p><i>CPW will remove all pike encountered under standard sampling (including tagged fish), but doesn't have resources to implement a Catamount style pike removal project (removal from Catamount being the higher priority).</i></p> <p><i>CPW continues to remove pike from Catamount and also has plans to eradicate the illegally established population of northern pike in Chapman Res.</i></p>
<b>White River</b>							
Determine and implement an adequate level of mechanical removal to reduce smallmouth bass.	CPW / Program	III.B.2. a.	X	X	X	X	<p><i>Program implementing as much mechanical removal as possible below Kenney; new techniques in discussion. Recovery Program continues to support and encourage a multi-agency effort to designate White River as a native fish conservation area. Utah continues to discuss.</i></p>
Develop a measure of successful suppression of SMB	Program	General :III.B.2. a.(1)		X			<p><i>Pending. Sampling crews continue to remove as many fish as possible.</i></p>
<b>Green River (in addition to ongoing projects)</b>							
Direct new (or shift existing) nonnative fish removal efforts to address increasing numbers of walleye.	Program	III.A.4. d.	X	X	X	X	<p><i>Walleye captures have increased in upper and lower Green River; gizzard shad have been found in lower GR backwaters since 2007 and increased markedly over the</i></p>

						<p><i>past few years in lower Colo. River backwaters. Gizzard shad could significantly affect food web ecology in backwaters and mainstem.</i></p> <p><i>Illegal population of walleye in Red Fleet Reservoir is problematic source. UDWR finalized a Lake Mgmt. Plan in order for reclamation to occur (rotenone). UDWR plans to rotenone in October 2015 and then develop a compatible sportfishery and install a screen.</i></p> <p><i>UDWR adjusted work to add spring and fall passes for walleye and gizzard shad removal in lower Green River in years when pikeminnow population estimates not conducted. 4 2014 spring sampling trips in lower Green yielded 149 walleye. UDWR also added one spring pass for walleye in the middle Green. Work will continue in 2015 (deferring humpback chub population estimates by one year to better time those estimates in the future and to provide additional capacity to focus on walleye in 2015).</i></p>
<p>Develop a management strategy to address escapement of walleye (and smallmouth bass) from</p>	<p>UDWR</p>	<p>III.A.4. e.</p>	<p>Dec.</p>			<p><i>UDWR produced a timely feasibility report; installed a</i></p>

Starvation Reservoir.			2013				<i>temporary screen in spill channel during spring 2014 runoff; will install more robust temporary screen in 2015 and is pursuing a permanent solution (but expected to seek funding assistance from Program).</i>
Implement recommendations from the management strategy.	UDWR / Program	III.A.4. e.(1)		X	X	X	<i>Pending.</i>
<b>Colorado River ( in addition to ongoing projects)</b>							
Upstream of Grand Valley Project dam: Determine and implement an adequate level of mechanical removal in the main channel. More importantly, use all techniques available to eradicate northern pike (and other nonnative species of concern) from floodplain habitats.	CPW / Program	III.A.9.	X	X	X	X	<i>CPW: a) implemented significant mechanical removal; b) coordinating with USBR on future levee work at LaFarge Pond.</i>
Develop a measure(s) of successful suppressions of northern pike (and other nonnative species of concern).	Program			X			<i>Pending.</i>
Direct new (or shift existing) nonnative fish removal efforts to address increasing numbers of walleye in the lower river.	Program	III.A.8.	X	X	X	X	<i>2 additional removal passes added from Cisco to Dewey Bridge and one pass was added from Dewey Bridge to Potash in 2013. Service added 2014 fall passes to remove walleye in lower Colorado reaches (Cisco to Potash) and UDWR added removal passes for the Lower Green. FWS removed 109 walleye (346 - 600 mm TL,) during 2014 CPM pop estimate trips from RM 108 (just downstream of Cisco) to RM 3.5 (just above</i>

							<i>the confluence). With regard to escapement of fish from Lake Powell, a management plan is being developed and upper basin will be involved in review (Dale Ryden representing).</i>
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Recovery Actions in 15-Mile Reach PBO	RIPRAP Item #	Status	PBO Page #
<b>Define Existing Depletions/Calculate New Depletions</b>			
a). Develop consumptive use and losses report with CRDSS model to verify level of depletions.	Colorado: IA3b	CWCB completed depletion accounting report in 2008; next report overdue; however, the irrigated acreage assessment was completed and contract awarded to update the dataset. Models will be updated through at least 2012. Colorado has placed a high priority on the Yampa and Colorado river basins portion of this work.	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 was to begin in 2011. See above.	7
<b>Habitat Protection Element</b>			
<b>General Protection</b>			
Enforcement Agreement between FWS and CWCB.	General: IC1	Completed in 1993.	8
<b>Late Summer and Fall Base-Flow Period Augmentation</b>			
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 and 2012).	8
d). 21,650 af/year split evenly between Ruedi and water users.	Colorado: IA5b,c,d	Ongoing since 1997. See tables. 2014: Baseflow target 1,630 cfs; average flow August – October 1,852 cfs. 2013: In April (not a baseflow month), flows at Palisade dropped below 100 cfs for 5 days and were below 200 cfs for 11 days creating an "April Hole." Possible contributing factors included: 1) cold weather shut off mid-elevation runoff; 2) irrigation season starts; 3) Shoshone call 'relaxation'; 4) low storage in upstream reservoirs causing conservative reservoir release management. CWCB reviewed hydrology and characterized "April Holes" of this magnitude as very rare. Dry year baseflow target 810 cfs; average flows in July and August were 734 cfs and the minimum was 161 cfs recorded in late July. Flows at Palisade dropped below CWCB's instream flow of 581 cfs on 17 days in July and August, although a call for that flow was not placed. To help better meet flow targets, in 2015, the CWCB Board approved pursuing renewable 1-year lease of up to 12,000 af of water in Ruedi from Ute Water; contract to be finalized for use in the 2015 baseflow season (with the potential to consider early spring augmentation in the future). OMID Canal Automation also has begun providing some additional baseflows; project completion expected in 2016 or 2017. The saved water will be delivered to the 15-Mile Reach of the Colorado River.	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	Completed in 2014.	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). See tables. 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; 3,000 in 2010; 7,572 in 2011; 5,079 in 2012; 1,501 in 2013 and 3,000 in 2014.	10

Recovery Actions in 15-Mile Reach PBO	RIPRAP Item #	Status	PBO Page #
g). Grand Valley Water Management - Study of canal operations showed spills from the Government Highline Canal averaged 31,400 af (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.	Colorado: IA5l	Complete. See tables. The Municipal/Recreation contract for Green Mountain Reservoir water was originally signed in 2002, renewed on 8/29/07 through 12/31/12, and 40-year contract completed in April 2015.	10
Spring Peak Enhancement		See also "Flow graphs" and "Flow tables" worksheets.	
a). Coordinated Reservoir Operations - in all but extremely dry or wet years.	Colorado: IA5i2	Ongoing since 1997. Spring peak flows were augmented in 1997, 1998, 1999, 2006, 2008, 2009, 2010, and 2015. Spring peak flows in 2000, 2001, 2002, 2004, 2012, and 2013 were below the 12,900 cfs threshold for implementing coordinated reservoir operations under CROS. Spring peak flows in 2003, 2005, and 2011 exceeded the 12,900 cfs threshold (forecasted flow at Cameo), but other CROS operating criteria (e.g. avoid downstream flooding) 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. 2014 - snowpack 132% of average, peak flow target in "wet" category. Concern for flooding in Grand Junction cancelled coordinated reservoir operations. Peak target 23,500 cfs; actual peak 25,300 cfs.	11
b). Coordinated Facilities Operations Program - provide up to 20,000 af.	Colorado: IA5m2	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." CFOPS Phase III draft report distributed April 2, 2014 and comments received; revised draft most recently due December 31, 2014 (final by March 2015), but pending hiring contractor to complete in fall 2015. CFOPS report should be included in the 2015 review of the	11
Habitat Development and Maintenance Element		Operation, maintenance and evaluation of sites incorporated into Colorado River Subbasin Floodplain Management Plan (Valdez and Nelson 2006).	
Floodplain Restoration and Selenium Remediation			
a). Gardner Pond (29-5/8 Road Gravel Pit).	IIA1	Construction complete; Beswick pond used as a growout pond in 2010 & 2011. Restoration of this "Hot Spot Complex" was on hold pending completion of new Horsethief ponds, which is now done, but Service no longer recommends reconnecting gravel pits due to nonnative fish concerns.	
b). Jarvis.	None	Construction complete; operation ongoing. Program removed sediment build-up at the Jarvis pond inlet/outlet structure in 2012 (same as work performed in 2010 and 2003).	12

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). CPW actively manages 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 were 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; however Service no longer recommends reconnecting gravel pits upon completion of operation due to nonnative fish concerns. 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. Grand Junction Pipe site (Program property) was reclaimed (rotenone) in March 2012 prior to levee breaching (construction completed by private industry as per project Section 7 consultation)	13
<b>Fish Passageways</b>			
a). PBO states passage to be completed at Price-Stubb in 2000 (or 2002 if dam removal alternative selected).	Colorado: IIB2a3&4	Completed in April 2008. Passive PIT-tag monitoring station installed in 2010. 2011 high-flow damage repaired in 2012.	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 (operated intermittently [due to low flows] in 2012).	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-Stubb passage). 2013: 2 razorback sucker were collected in the passage. 2014: a record-setting 25 razorback, 14 bonytail, and the first Colorado pikeminnow made passage. From 2005 through the 2014 season, 29 razorback sucker, 6 humpback chub, 36 bonytail, and 85,675 other native fishes (mostly flannelmouth sucker, bluehead sucker, and roundtail chub) have used the passage.	13
<b>Native Fish Stocking Element</b>		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 (see "Stocking" tab). The integrated stocking plan for the Upper Colorado River Basin was completed in March 2003 and revised in 2015. Annual stocking targets for subadults in the upper Colorado River subbasin are being met.	14
<b>Nonnative Fish Control Element Regulations and Agreements</b>			
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
<b>Removal Efforts</b>			
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. CPW and Program discussing how to control nonnative fishes in LaFarge Ponds (which may require chemical reclamation since notch was specifically engineered to maintain equilibrium between the ponds and the river during runoff). In the interim CPW installed a Merwin fish trap in 2015. The Program Director's office will work with CPW to develop a plan to inventory ponds were permitted with notches, identify how many have nonnative fish, and determine solutions.	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. CSU investigations have resulted in otolith markers for water chemistry for reservoirs throughout the basin (Johnson et al. 2014)	16

Recovery Actions in 15-Mile Reach PBO	RIPRAP Item #	Status	PBO Page #
c). Management of nonnative fish populations	Colorado: IIIA5&6	<p>Management of bass and other centrarchids in the Colorado River ongoing since 2004; Channel catfish management on hold pending development of effective techniques. Centrarchid removal efforts increased beginning in 2007. Goal is to remove as many smallmouth as possible from: 1) a 66-mile reach from between the Grand Valley Project dam in CO downstream to the Westwater boat landing in eastern UT; and 2) a 45-mile reach between Rifle and Beavertail Mountain in CO. Goal is 8 removal passes/year; in 2014, crews completed up to 11 passes in some reaches. 2014 removals: 1,120 smallmouth bass, 1,394 largemouth bass, 107 walleye. Age-0 smallmouth bass catch indicated a weak year class; catch rate for juvenile smallmouth declined precipitously (80%) from 2013. 2013 &amp; 2014 largemouth bass catches suggest relatively low juvenile survival. Walleye captures in the Colorado River went from being 'rare' during 2003-2009 to 'common' in 2010, and then increased dramatically by 2013. Walleye distribution in the lower reach in 2010 appeared to be restricted to the lowest 80 miles of the study area (ending at the Green River confluence); however, by 2013, captures extended upstream to RM 112 at the top of the lower reach, indicating upstream range expansion. Unlike smallmouth and largemouth bass, whose primary distribution is in the upper reach, walleye directly overlap with small size classes of both Colorado pikeminnow and razorback sucker. 2014 experimental walleye removal demonstrated higher catches in the fall than the spring. All walleye captured were adults. In 2013, additional nonnative fish removal passes were added in the Silt to Beavertail reach to remove invading northern pike, focusing on backwaters and floodplain ponds; CPW continues reconnaissance in floodplain and canal habitats to identify potential sources of this species. Highline Lake spillway barrier net replaced in March 2014. 2013 outlet testing at Highline resulted in uncontrolled releases; CPW purchased tube nets to be used to prevent fish escapement in future annual outlet testing. Screen constructed on Rifle Gap Reservoir in 2013 and fish escapement past the screen will be evaluated for a period five years (per biological opinion). Screen was demonstrated to exclude a broad range of fish sizes (e.g., northern pike smaller than 20mm and larger than 500mm) and no pike were detected below the screen in 2014. The Service and the Program promote the use of sterile hybrid sportfish in the future. CPW is revising the lake management plan for Rifle Gap and propose to manage sterile walleye as their top predatory sportfish. CPW has removed all bag and possession limits for problematic nonnative fishes in the warmwater reaches of the Green, Yampa, White, Colorado, and Gunnison rivers on the western slope in Colorado. Colorado's Nonnative Fish Management Work group has evaluated options for increasing effectiveness of nonnative fish control (e.g., expanding I&amp;E and public</p>	16
Research, Monitoring, and Data Management Element			

Recovery Actions in 15-Mile Reach PBO	RIPRAP Item #	Status	PBO Page #
<p>a). Population estimates will be used to determine if Recovery Actions result in a positive population response.</p>	<p>Colorado: VB; VB3</p>	<p>The current downlisting demographic criteria for Colorado pikeminnow (USFWS 2002a) 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 3), naturally produced fish must equal or exceed mean adult annual mortality (estimated to be about 20%). The average of all adult estimates (1992 – 2014; estimates from 2013 and 2014 are considered preliminary) is 613. The average of the five most recent annual adult population estimates is 501. Osmundson and White (2014) determined that recruitment rates were less than annual adult mortality in six years and exceeded adult mortality in the other six years when sampling occurred. The estimated net gain for the 12 years studied was 32 fish &gt; 450 mm TL. Whereas the Colorado River population appears to meet the trend or 'self-sustainability' criterion, it has not met the abundance criteria of 'at least 700 adults' during the most recent five year period. The Service is reevaluating the demographic and threat removal criteria for Colorado pikeminnow through revision of the species' recovery plan. The Service's status review of Colorado pikeminnow was completed in 2011. Although a good portion of the recovery factor criteria (USFWS 2002a) are being addressed, nonnative fish species continue to be problematic and researchers now speculate that mercury may pose a more significant threat to Colorado pikeminnow populations of the upper Colorado River basin than previously recognized (see discussion in sufficient progress assessment). The most recent adult humpback chub population estimates in Black Rocks are as follows: 2007–2008 adult estimates were 345 and 287, respectively; 2011-2012 were 379 and 403, respectively. Researchers caution that 78 largemouth bass and the same number of gizzard shad were collected in Black Rocks in 2012. This represents a ten-fold increase over the 2011 catch. The Westwater Canyon estimates of wild adults range from about 4,700 in 1998 to 2,500 in 1999, 2000, and 2003. Researchers caution that 78 largemouth bass and the same number of gizzard shad were collected in Black Rocks in 2012. This represents a ten-fold increase over the 2011 catch. The Westwater Canyon estimates of wild adults range from about N = 4,700 in 1998 to N = 2,500 in 1999, 2000, to N = 1,525 in 2007–2008. Although researchers link humpback chub declines in the upper portions of Desolation Canyon to increasing abundance of nonnative smallmouth bass there, a different mechanism appears to have impacted humpback chub in the Colorado River canyons. The large declines in humpback chub densities in both Black Rocks and Westwater Canyons occurred in the late 1990's prior to more recent increases of nonnative predators in the Colorado River. In 2008, the core population (Black Rocks/Westwater combined) dropped</p>	<p>16</p>
<p>b). Recovery goal development. If population meets or exceeds recovery or Apx. D goals, it will be considered to exhibit a positive population response.</p>	<p>General: VIIA5d</p>	<p>Recovery goals complete. Revision underway for Colorado pikeminnow (draft version shared with the Recovery Programs in December 2014; completion paused to conduct PVA). The Service has convened a humpback chub recovery team to revise that species plan - letters of appointment were mailed to prospective team members in spring 2015. Species status assessment for razorback sucker will begin in 2015.</p>	<p>16-17</p>
<p>Long-term Funding and Annual Appropriations.</p>	<p>General: VIIB</p>	<p>Complete and ongoing.</p>	<p>17</p>
<p>Recovery Agreements</p>			
<p>a). With consultations.</p>	<p>N/A</p>	<p>Ongoing</p>	<p>18</p>
<p>b). By water users controlling a majority of existing depletions above the Gunnison River.</p>	<p>N/A</p>	<p>Complete</p>	<p>18</p>
<p>Depletion Charges on New Depletions</p>	<p>N/A</p>	<p>Ongoing</p>	<p>19</p>
<p>Incidental Take</p>			

Recovery Actions in 15-Mile Reach PBO	RIPRAP Item #	Status	PBO Page #
a). Develop plan to monitor incidental take of endangered fish in diversion structures.	Colorado: VB4a	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). "Plan" complete in that fish are retrieved from canals (annually) whenever canal screens cannot be fully operated. 9,737 native fish were salvaged and relocated from the GVIC and GVP canals following the 2013 irrigation season. The overwhelming majority of these fish were native species (predominantly flannelmouth sucker and roundtail chub). Fourteen endangered fish were also salvaged: (3) razorback sucker and (11) bonytail. 17,865 native fish were salvaged and relocated after the 2012 irrigation season, including 3 razorback sucker and 4 bonytail.	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 endangered and other native fish.	71
<b>Fish Screens (Reasonable &amp; Prudent Measures)</b>			
a). GVIC.	Colorado: IIB1b	Complete. 2014: Operations intermittent through irrigation season due to high flows and various mechanical issues; screen was operational 139 days (64%) of the irrigation season; non-operational for 79 days (36%). 2013: Operations intermittent through irrigation season due to storm events and various mechanical issues; screen was operational 127 days (59%) of the irrigation season; non-operational for 89 days (41%). GVIC was not taking its full allotment of water during the 'April Hole' (when flows dropped below 100cfs at the Palisade gage). The fish passage canal was closed (i.e. the Obermeyer gate was in the raised position) 43% of days during the 2013 irrigation season. Some retrofits under consideration. ** Evaluation of condition of surrogate species (white sucker) below return pipe deferred due to flow conditions since 2011.	71
b). Grand Valley Project Gov't Highline.	Colorado: IIB3b	Complete. Screen operated through most of season in 2011. Screen operated when conditions allowed in 2012; accumulated sediment removed.	71
<b>Reinitiation</b>			
a). Review RIPRAP implementation.	Colorado: IA6	This is it (begun in 2003 and done every 2 years thereafter).	p.74, c.

August 28, 2015

## 2015 Gunnison PBO Review of Action Items Status

In the December 4, 2009 final Gunnison River Basin Programmatic Biological Opinion (PBO), the Service determined that the proposed reoperation of the Aspinall Unit, the proposed Selenium Management Program, and the remaining Recovery Action Plan items are sufficient to avoid the likelihood of jeopardy and/or adverse modification of critical habitat from the impacts for existing depletions (estimated average annual 602,700 af/year) and future depletions (37,900 af/year), as defined in the proposed action. 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.” A review of action items from the PBO follows below, with status updates in italics.

### CONSERVATION MEASURES (From pages 17-18 of PBO)

Monitoring of Endangered Fish Populations 1 - The Recovery Program is responsible for monitoring endangered fish populations. The Recovery Program monitors Colorado pikeminnow populations and is developing a basin-wide razorback sucker monitoring program that will include monitoring of multiple life stages. Design of the monitoring program is expected to be completed in fiscal year 2010. Implementation will begin in 2010. It will include multi-life stage monitoring on the lower Gunnison River. Density estimates will be developed for Colorado pikeminnow and razorback sucker in the lower Gunnison River. Monitoring the endangered fish populations will help determine the status of the species before and after the SMP is implemented.

*A long-term, multi-life-stage, monitoring program for Colorado pikeminnow and razorback sucker was started in FY11 in the Gunnison and Colorado rivers whereby population responses can be used to evaluate the effectiveness of implementation of Aspinall re-operation and the Selenium Management Program (SMP). Evaluation of effects of reoperation on critical habitat in the Colorado River from the Gunnison River confluence to Lake Powell will occur after the flow recommendations above the Gunnison River have been evaluated. Draft fish community monitoring report including adult, age-0, and larval sampling due August 30, 2015. The first contaminants report was finalized in November 2013; the next is scheduled for late 2020.*

Conservation Measures (continued) - During fish community monitoring in the lower Gunnison River, tissue samples will be collected from razorback suckers, as well as a chosen surrogate species, to determine selenium concentrations. These samples will be collected at intervals to assess reduction in selenium contamination from implementation of the SMP. *Since FY11, researchers with the USFWS – CRFP Grand Junction (conducting the fish community monitoring on the Gunnison and Colorado rivers) have coordinated with USFWS - Ecological Services contaminant biologists to collect appropriate tissues samples.*

### TERMS AND CONDITIONS (From pages 80 – 81 of PBO)

1. Reclamation will work through the Recovery Program technical committees to develop a Study Plan to evaluate the effects of the proposed operations of the Aspinall Unit and how it improves

habitat and thereby contributes to recovery. The Study Plan should be completed within one year of the finalization of this biological opinion and should focus on previously identified uncertainties related to geomorphic processes, floodplain inundation, and temperatures (see Uncertainties section). The Study Plan should also include an evaluation of the effects of reoperation on critical habitat in the Colorado River from the Gunnison River confluence to Lake Powell.

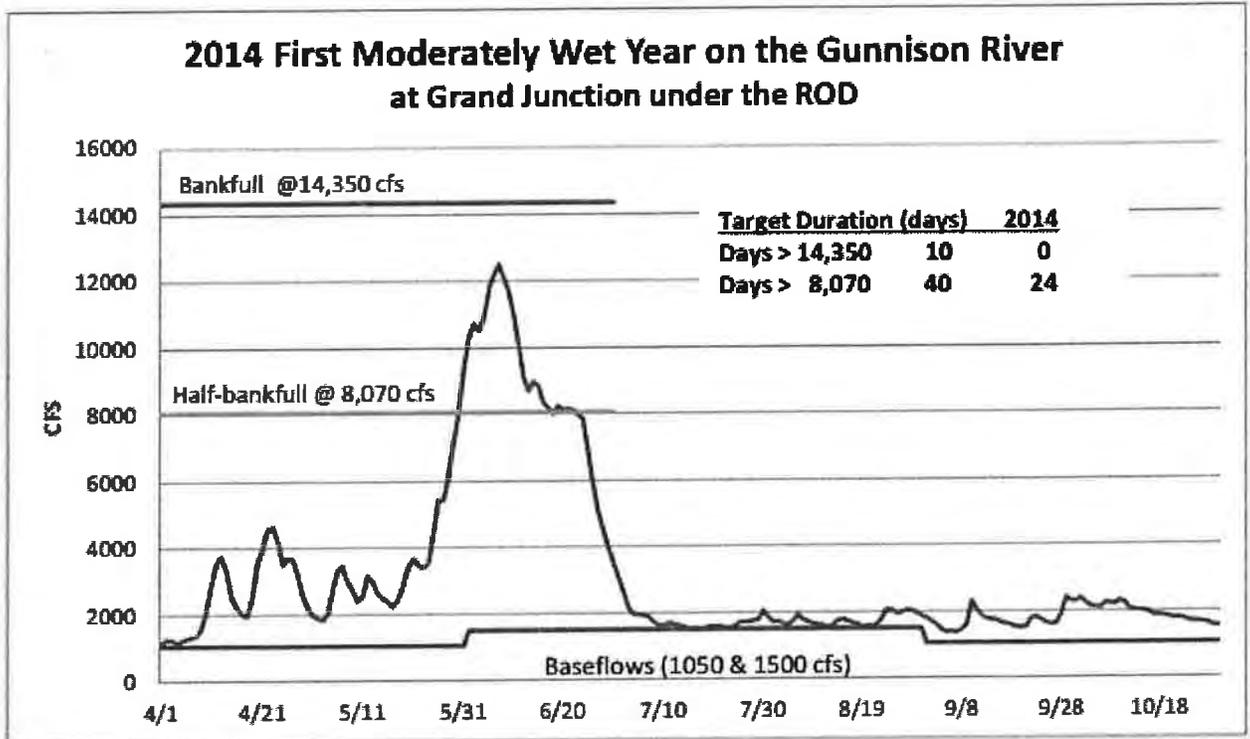
*Study plan completed in May 2011; implementation in progress with fish community monitoring begun in FY11.*

2. Reclamation will provide to the Service and Recovery Program a concise annual operations report by December 31 of each year. The primary purpose of the annual report is to provide an assessment of how well operations of the Aspinall Unit contributed to meeting target flows in the Gunnison and Colorado Rivers. The report should include information on the planned operations based on the forecast and the actual operations; flows provided at Whitewater and below the Redlands; the Colorado River at the Colorado/Utah state line and at the Cisco gage; and any operational issues (spillway inspections, etc.).

*Annual reports provided (2014 in Attachment 1).*

*Drier than average hydrology in 2012 left reservoirs at low levels leading into the 2013 water year. The May 1, 2013 April-July inflow forecast for Blue Mesa was 335,000 af. The actual 2013 April-July inflow to Blue Mesa Reservoir was 346,000 af, the fifth lowest since 1937 and categorized as a "Dry Year" exceeded 93% of the time. The April-July runoff at the Whitewater gage near Grand Junction was only 22 percent of average. Under these hydrologic conditions, the ROD requires 900 cfs peak and 900 cfs baseflow at the USGS gage at Whitewater which were met. Precipitation in the Gunnison Basin in June, 2013 was well below average, very similar to 2012; monsoonal flow developed in July and precipitation was over 130% of average. August precipitation was below average in the northwest portion of the basin and above average in the south.*

*In 2014, the Gunnison River at Grand Junction water supply forecast for May - July was 111% of average. The Blue Mesa Reservoir water supply forecast for May - July was 120% of average. The runoff target was a (borderline) moderately wet year for 10 days at bankfull (14,350 cfs) and 40 days at half bankfull ( 8,070 cfs). Because the main tributaries had below average snowpack and complications with potential flooding in the Grand Valley, the achieved peak was 12,700 cfs with 24 days at half bankfull.*



**Table. A summary of 2014 peak and base flow targets and actual flows (CFS)**

Red is a target not met

2014 (% snowpack)	Peak Target	2014 Peak	2014 (% snowpack)	Base Flow Target	2014 Aug-Oct AVG	% Avg	2014 Min.
Gunnison R. at Grand Junction (100%)	Mod Wet 14,350	12,700	Gunnison R. at Grand Junction (100%)	Mod Wet 1,500	1,806	120	1,370

3. Eight months after the final PBO is issued Reclamation will complete a MOA or similar mechanism, with appropriate parties, to develop the Selenium Management Program. *Reclamation led this effort and the Selenium Management Program was established in 2011 with substantial local support and participation.*

4. Six months after the final PBO is issued, and every 6 months thereafter, Reclamation will provide an update to the Service on the status of the development of Selenium Management Program. *Reclamation led this effort; Selenium Management Program established in 2011.*

5. Eighteen months after the final PBO is issued, Reclamation will provide the draft Selenium Management Program document, and a final document with associated agreements with key cooperators to the Service within 24 months.

*Selenium Program Formulation Document was developed by the Selenium Management Program (SMP) Workgroup and finalized in December 2011*

6. Implementation of the initial components of the SMP not already underway will begin within 5 years of issuance of this opinion.

*SMP implementation begun in January 2012. The SMP Workgroup meets on a quarterly basis or more frequently as needed. The SMP continues to work to reduce existing selenium loads and prevent/minimize/mitigate new selenium loading. Highlights are shown below; full report available at <http://www.usbr.gov/uc/wcao/progact/smp/docs/SMP-2014AnnualRep.pdf>.*

*Off-farm projects completed or underway: – In late 2012, Reclamation issued a Funding Opportunity Announcement (FOA) for Salinity Control Projects above Hoover Dam. Within the Lower Gunnison Basin, a total of 7 new salinity projects were selected for funding totaling about \$14.3 million (A.1.15 to A.1.22). In total, these new projects will line with pipe approximately 38.33 miles of earthen canals and laterals and is predicted to reduce salt loading by an additional 12,281 tons as measured at the Whitewater gage. As of January 2015, construction was underway on six of the seven projects. The next Reclamation FOA will occur in FY15, providing an estimated \$25 – \$35 million in funding, with application selection and awards are planned for August 2015.*

*Off-farm-Future Projects – Planning efforts continued in FY14 supporting the Uncompahgre Eastside Optimization Study (A.2.5.2). A final report entitled UVWUA Integrated Assessment, Comprehensive Implementation Planning, and System Optimization Analysis prepared by Irrigation Training and Research Center was submitted in July 2014. Uncompahgre Valley Water Users, Reclamation and ITRC continue to refine concepts and continue advance planning efforts. In FY14, the SMP determined that including the west side of the Uncompahgre Project would be beneficial to selenium reduction efforts. West Side – Uncompahgre Project Optimization Planning at this time includes SCADA analysis (A.2.5.3). Two in-canal headgate automation and SCADA projects were completed on the west side by the UVWUA.*

*On-farm – Underway and Future Projects – Through the Colorado River Basin Salinity Control Program, a Lower Gunnison Comprehensive Planning effort continued with Basin States funds (A.4.1). The purpose of the study is to identify and prioritize cost effective salinity control opportunities, identify impediments to these opportunities, and to describe how a variety of control measures might be best implemented in a coordinated manner to maximize local and basin-wide benefits in cooperation with other potential funding partners in the Upper Colorado River Basin. The study addresses both on-farm and off-farm. While this study focuses on reducing salinity in the Lower Gunnison Basin, there exists the potential for Selenium reduction through the salinity control efforts (USGS 2014). A draft findings and strategies report dated September 2013 prepared by URS Corporation and presented to the study team and the Salinity Control Workgroup in the fall of 2013. A final report, dated February 2014, was presented at a presentation of findings held in Grand Junction.*

*Identify and Prioritize Target Areas and Potential Projects – The SMP Workgroup continued working with sub-basin level data developed by USGS to determine where to encourage/support projects that accomplish selenium reduction goals (A.2.4).*

*Encourage/Facilitate Remaining Phases of Piping/Lining East Side Uncompahgre Project Laterals – Through Phase 8, approximately 50.3% of the East Side Laterals (ESL) Project has been completed or is under contract as shown in Appendix A, A.1.2 - A.1.9 and A.1.17. An additional 14.0 miles of*

*pipng of eastside laterals is planned for Phase 8. It is anticipated that the remainder of Phase 7 and Phase 8 will be constructed in the fall of 2015. A total of \$5 million from the Colorado River Storage Project Memorandum of Agreement (CRSP MOA) funding has been committed for piping and/or lining additional East Side Canals and Laterals (see Appendix A, A.1.14). These funds have been reserved from FY2012 and FY2013 CRSP power revenues.*

7. Reclamation will provide annual water quality summary reports to the Service by December 31 of each year.

*“Selenium Management Program Gunnison River Basin, Colorado Annual Progress Report 2014”  
Prepared by Selenium Management Program Workgroup, Compiled by Bureau of Reclamation.*

8. Reclamation will provide a report on biological monitoring (including fish monitoring in the Gunnison and Colorado Rivers) to the Service by December 31 in years when monitoring is conducted.

*“Selenium Management Program Gunnison River Basin, Colorado Annual Progress Report 2014 also summarized biological and water quality data collected during the previous year.*

#### CONSERVATION RECOMMENDATIONS (From pages 81 – 82 of PBO)

##### Dolores River

1. The Service recommends that Reclamation continue support efforts of the three species conservation strategy (UDWR 2006) on a range-wide basis, including conservation efforts on the Dolores River.

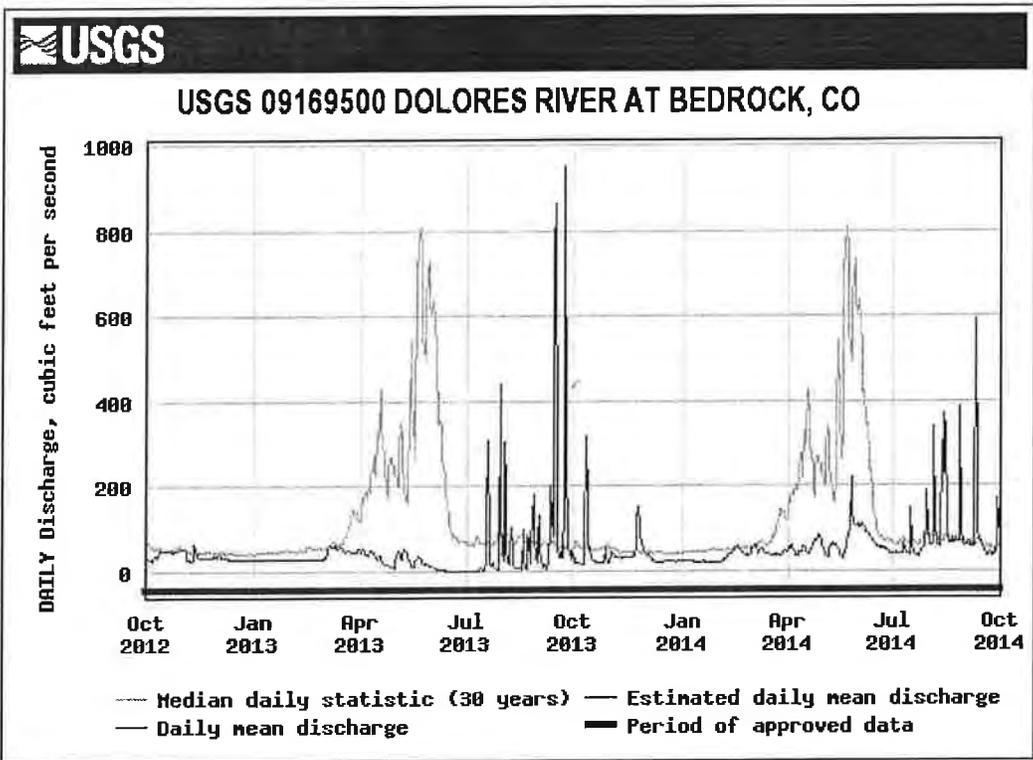
*The Bureau of Reclamation has been an active participant of the Dolores River Dialogue since its inception in 2004, and is currently active in the Implementation Team efforts to manage downstream releases to the lower Dolores River (from McPhee Dam to the confluence of the San Juan Miguel River) for the Native fishes and rafting. Reclamation has: set up a pit-tag array upstream of Disappointment Creek to monitor the movement of native fishes in the Dolores River, established early water temperature suppression criteria to prevent premature spawning before a large controlled release from McPhee Dam, developed release ramping criteria that will perform sediment movement and channel maintenance while achieving boater goals for rafting.*

*Installation of two PIT antennas in the Dolores River near Disappointment Creek and upstream of confluence with the Colorado River to monitor native fishes completed in 2014. UDWR completed surveys in 2013: high abundance of 3-species, 1 adult Colorado pikeminnow (observed), and 3 smallmouth bass.*

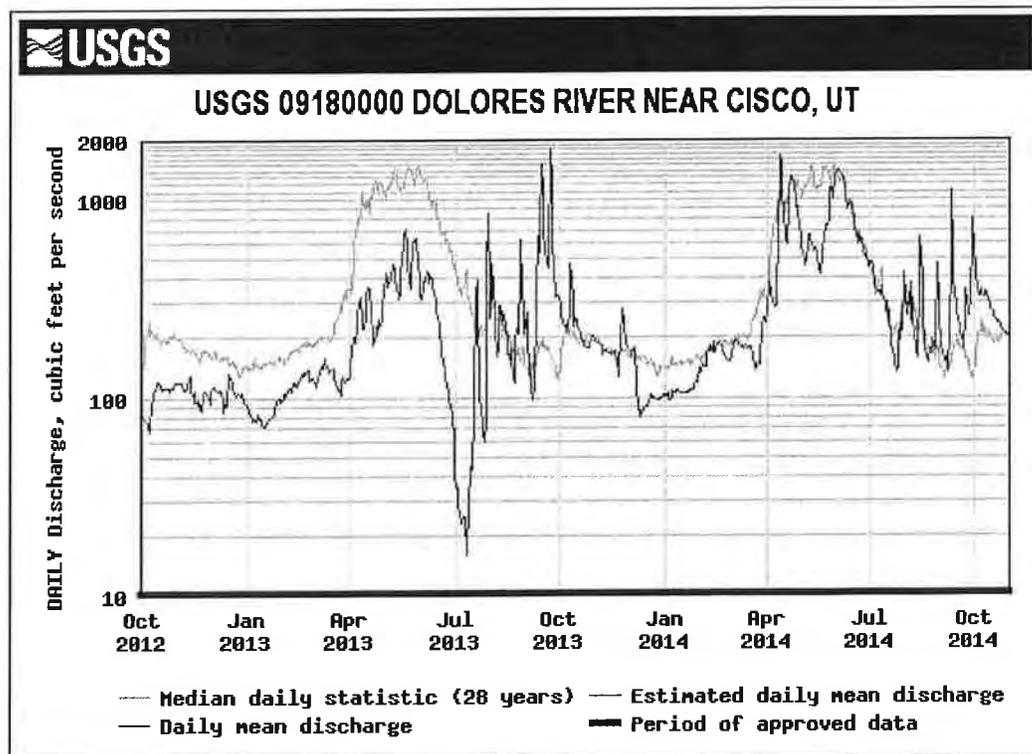
2. The Service recommends that Reclamation continue to work with the Dolores Project Biology Committee to consider spill and flow management options to benefit the native fishery in the middle and lower Dolores River while continuing to honor commitments related to downstream rafting.

*The Biology committee was setup as an advisory committee for fishery pool management only. Reclamation and the Dolores Water Conservancy District are actively involved with the DRD and IT in performing spill management.*

*Reclamation takes an active role with the Biology Committee in identifying base needs and possibilities. Annual base release budgets are agreed upon by all members.*



*In 2013, the Dolores River gage at Bedrock, CO dried up (0 cfs) for almost a month from mid-June to mid-July. Of 29 years of record, when the river is in the lowest 5% percentile, the flows are below 1 cfs 23% of the time in June, and 16% of the time in July. Flows in the Dolores River downstream in Utah at the Cisco gage (see below) did not go completely dry and were much better in 2014.*



*Downstream on the Dolores River gage at Cisco, UT in water year 2013 the peak runoff period was below normal and for 16 days in July was well below the 5<sup>th</sup> percentile with a two days of a minimum of ~17 cfs , Both years experienced big monsoonal events in late summer.*

3. The Service recommends that Reclamation continue to take an active role in the Dolores River Dialogue, in particular activities related to native fish.

*A final "Way Forward" report presented nine potential management opportunities that may assist with the improvement of the native fish: spill management, base flow management, sediment transport flows, habitat maintenance flows, thermal regime modification, reducing the effects of introduced coldwater species, reducing the effects of introduced warm water species, and supplementing native fishes.*

*Upon completion of the A Way Forward final report, an Implementation Team (IT) consisting of water managers, NGOs, and State and Federal Agencies was formed to find ways to implement the nine recommendations. The IT, with financial assistance of the Colorado Water Conservation Board, completed its first iteration of "The Lower Dolores River Implementation Monitoring and Evaluation Plan for Native Fish" dated August 2012. Public comments to the plan were received, and the second iteration was published in June 2014. An electronic version of this plan and appendices can be obtained from the Dolores River Dialogue website: <http://ocs.fortlewis.edu/drd/implementationTeamReports.htm>*

#### Selenium

1. We recommend that the Recovery Program initiate investigations to determine appropriate levels of selenium to insure recovery of Colorado pikeminnow and razorback sucker. We recognize any new studies would follow established Recovery Program protocol for priority and funding.

*The Recovery Program has not funded any new selenium investigations, but does collect tissues from endangered fish / surrogate species as part of Gunnison River fish community monitoring. Muscle plugs continue to be collected from endangered fish and surrogate species (evaluation funded outside of Program). Results from this selenium study will be used in the Selenium Management Program (SMP) to determine baseline selenium concentrations and evaluate effectiveness of selenium remediation efforts.*

### Aspinall Unit Operations for Calendar Year 2014 under the Gunnison River PBO

In water year 2014, Western Colorado experienced a return to moderately wet conditions. With the Record of Decision for the Final Aspinall Unit Operations EIS that was signed on May 3, 2012, peak and base flow targets were established for the Whitewater gage near Grand Junction, Colorado to aid in the recovery of four endangered fish; the Humpback Chub, Bonytail Chub, Razorback Sucker, and the Pikeminnow. This report will assess how well the 2014 operations of the Aspinall Unit provided sufficient releases of water at critical times and quantities necessary to avoid unnecessary harm to the endangered fish species and their essential habitat while continuing to meet the authorized purposes of the Aspinall Unit.

**Peak Flows** As mentioned previously, 2014 was considered a moderately wet year. Year type is determined by the forecasted April through July inflow volume to Blue Mesa Reservoir. Moderately wet years are defined as years where the forecasted inflow volume is greater than 831,000 acre-feet and less than 1,123,000 acre-feet. The April 1<sup>st</sup> issue of the runoff forecast predicted 850,000 acre-feet of inflow to Blue Mesa Reservoir. The actual April through July inflow volume for 2014 totaled 849,000 acre-feet. The May 1 runoff forecast placed 2014 into a moderately wet year category with a peak flow target of 14,350 cfs at the Whitewater gage.

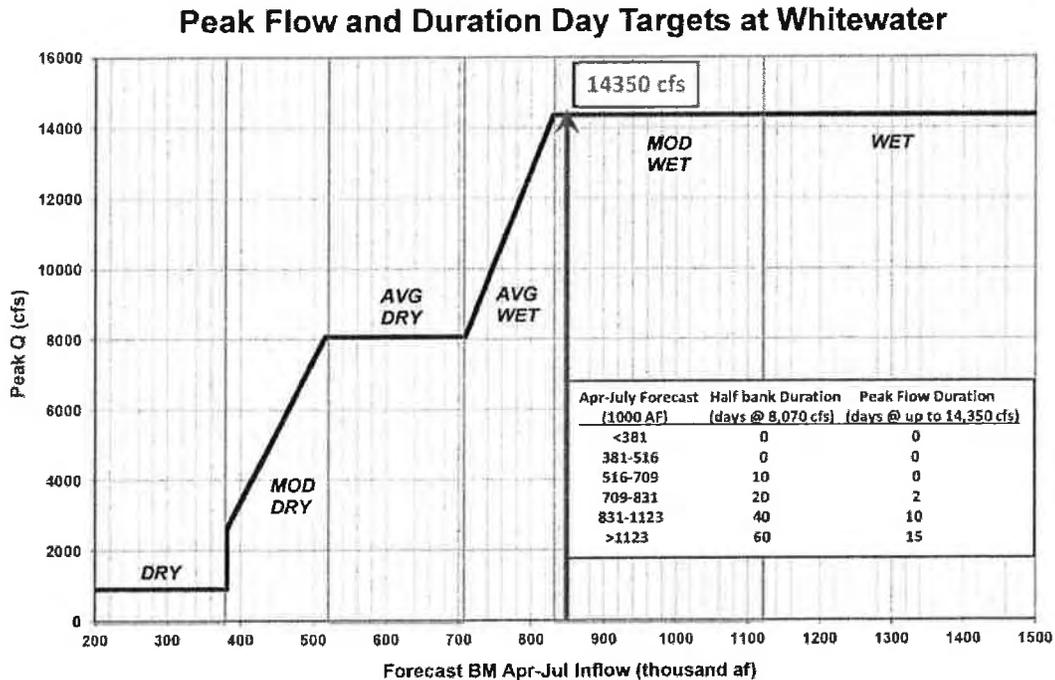


Figure 1. Peak flow and duration day targets at the Whitewater gage as determined by April-July Forecasted Inflow.

The 14,350 cfs peak target flow was not met in 2014. While spillway releases at the Aspinall Unit were in excess of 2,000 cfs and flows in the Gunnison River through the Black Canyon exceeded 9,000 cfs,

contributing flows from the North Fork of the Gunnison River and other smaller tributaries resulted in a peak on the Gunnison River at the Whitewater gage that only reached 12,500 cfs.

**Half Bank and Peak Flow Duration** The recommended duration days at half-bankfull flows and at the peak flow are also dependent on the forecasted inflow volume to Blue Mesa Reservoir. The table insert in Figure 1 shows the recommended duration of days at peak flow and half bank capacity flows for ranges of forecasted inflow volume to Blue Mesa Reservoir. With the forecasted runoff to Blue Mesa Reservoir setting the year type as moderately wet, the peak flow duration target was 10 days at 14,350 cfs and the half bankfull target was 40 days at 8,070 cfs. The peak flow on the Gunnison River at the Whitewater gage only reached 12,500 cfs and there were 3 days of flows over 12,000 cfs during the time of the peak. Half bankfull flows of 8,070 cfs were achieved for 22 days, short of the 40 day target as tributary flows from the North Fork of the Gunnison River dropped off towards summertime baseflow levels near the end of June.

**Base Flows** Base flow recommendations were determined by a study conducted by the Fish and Wildlife Service (Figure 2). Year type for base flow is also determined by the April-July forecasted inflow volume to Blue Mesa Reservoir, so 2014 followed the targets for a moderately wet year. Since 2013 was considered a dry year, the dry year baseflow targets are carried over for the January-March time period as the hydrology of these months is more dependent on the previous year's hydrology than the current year.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Wet</b>	1050	1050	1050	1050	1050	1500	1500	1500	1050	1050	1050	1050
<b>Mod Wet</b>	1050	1050	1050	1050	1050	1500	1500	1500	1050	1050	1050	1050
<b>Avg Wet</b>	1050	1050	1050	1050	1050	1500	1500	1050	1050	1050	1050	1050
<b>Avg Dry</b>	1050	1050	1050	1050	1050	1500	1500	1050	1050	1050	1050	1050
<b>Mod Dry*</b>	750	750	750/790	750/890	750/890	1050	1050	1050	750/890	750/790	750/790	750
<b>Dry*</b>	750	750	750/790	750/890	750/890	1050	1050	750/890	750/890	750/790	750/790	750

\*During March through November in Moderately Dry and Dry type years, additional releases will be made as necessary to provide flows above the 750 cfs anticipated to be diverted by the Redlands Water and Power Company, for the fish ladder and fish screen as shown.

Figure 2. Base flow recommendations to support critical flows and habitat for the endangered fish.

Baseflow targets were exceeded throughout 2014 with the exception of 12 days during the early winter months when the Whitewater gage data was unavailable due to icing impacts. Flows were later estimated to be in the 730 to 740 cfs range, just below the baseflow target of 750 cfs.

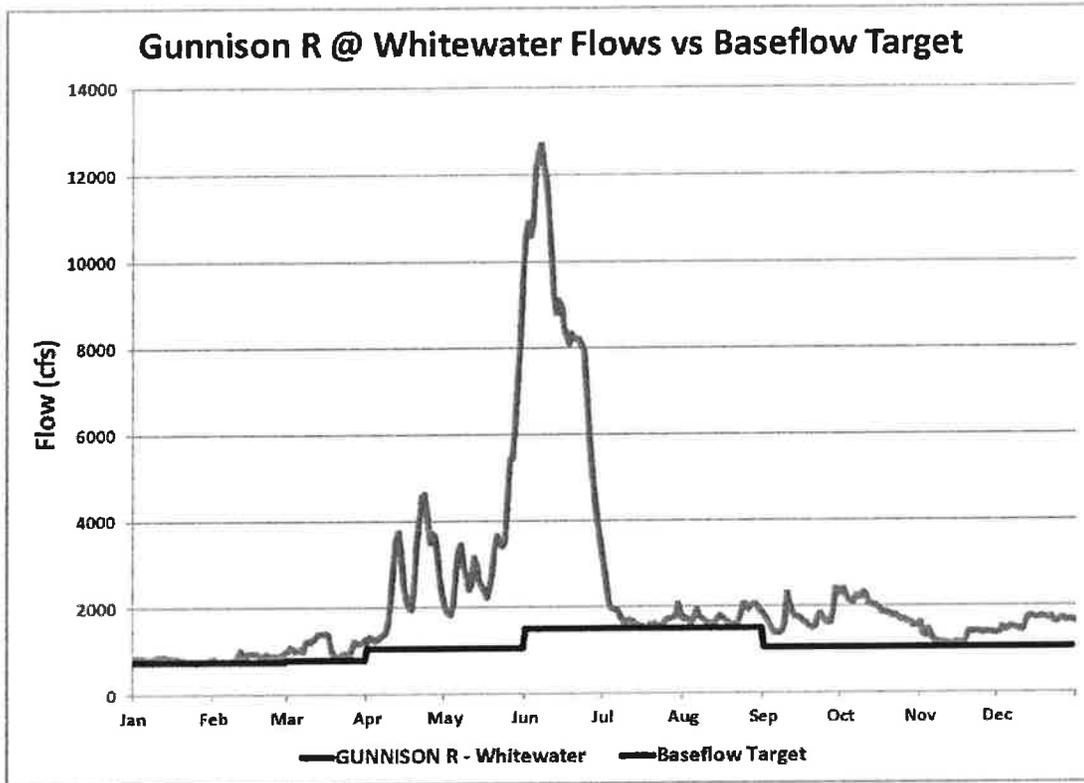


Figure 3. 2014 Base Flow Target vs. Actual Flows at Whitewater Gage.

Gunnison River Flow differences between the Gunnison River at Whitewater and the Gunnison River below the Redlands Diversion Dam are primarily due to the diversion of water to the Redlands Canal. As 2014 was a moderately wet year with more than sufficient streamflow, there were no issues with providing enough water to the Redlands fish ladder and screen during the months of their operation. Figure 4 shows the fluctuations in flow between the Gunnison River at the Whitewater gage and the Gunnison River below the Redlands Diversion Dam.

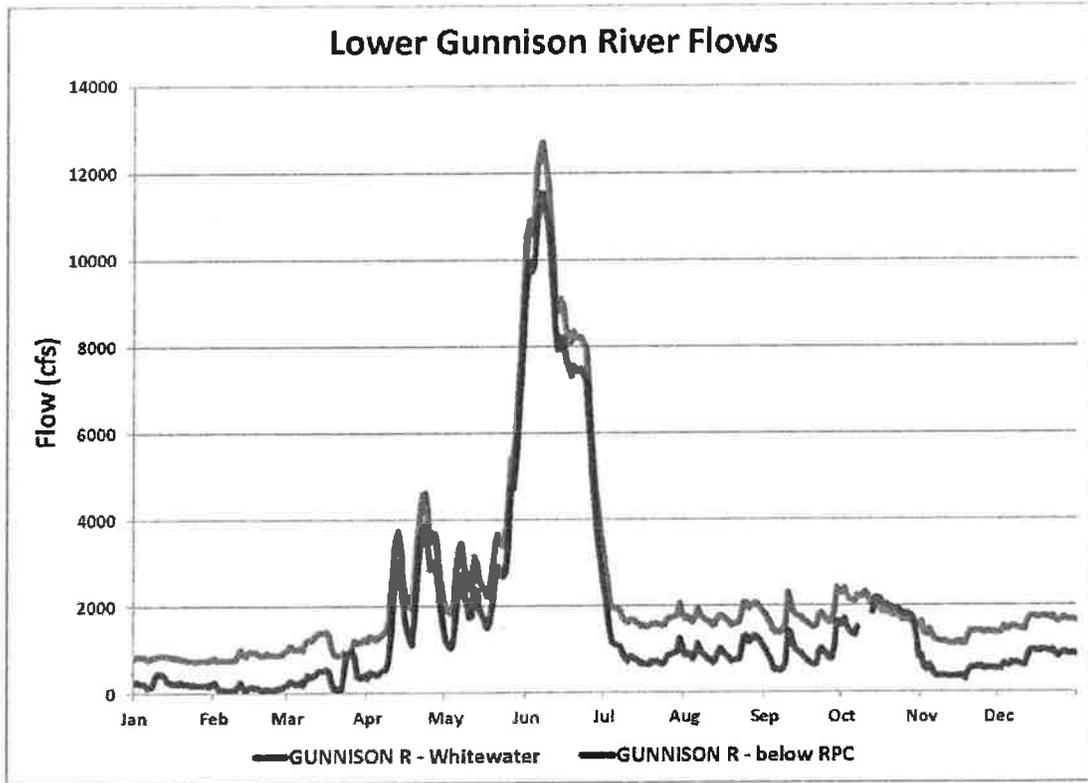


Figure 4. Gunnison River flows as measured at Whitewater and below the Redlands Diversion Dam.

Colorado River Flows at the Colorado/Utah Stateline closely matched the flows at the Cisco, UT gage. Flows tended to range from 2500 cfs up to 37,000 cfs, with both gages experiencing a peak of over 37,000 cfs in the beginning of June. Figure 5 shows the river flows at the Colorado/Utah Stateline gage and the Cisco, UT gage.

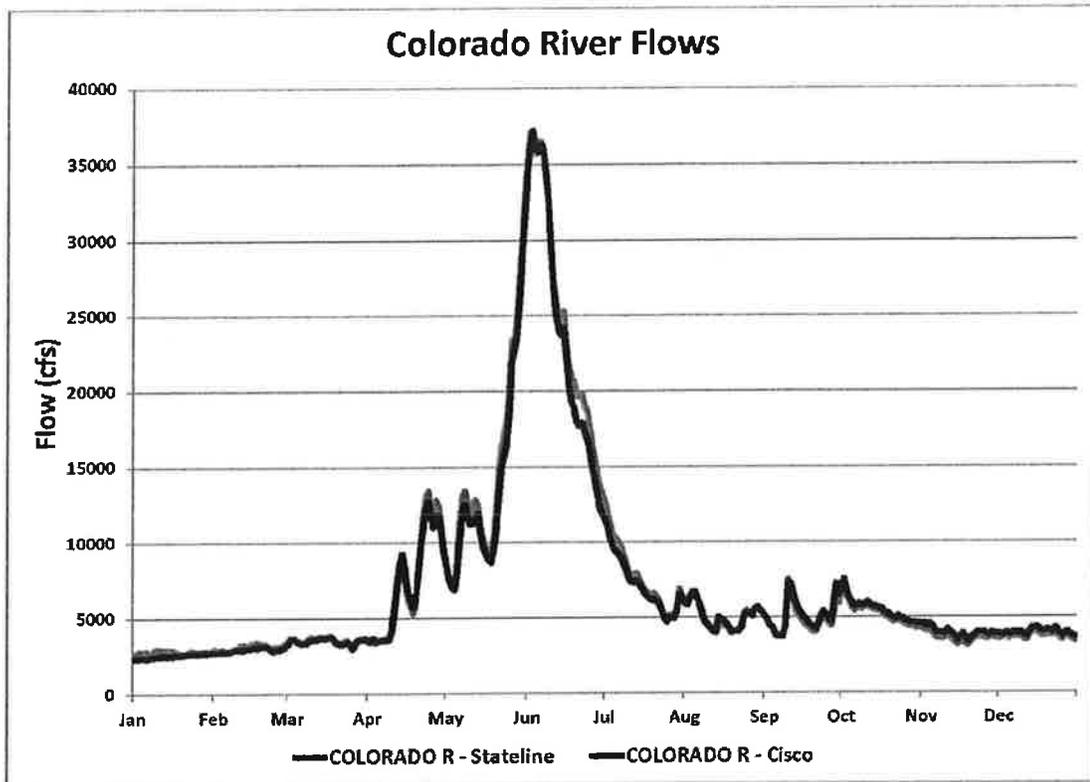


Figure 5. Colorado River flows at the Colorado/Utah Stateline gage and the Cisco, UT gage.

**Operational Issues** There were no operational issues that impeded flows from the Aspinall Unit to the Whitewater gage during the 2014 water year.

**Summary** In 2014, hydrologic conditions turned to moderately wet after two consecutive dry years. In an attempt to reach the peak flow and peak duration targets at the Whitewater gage, releases from the Aspinall Unit included a combination of power plants, bypasses and spillways at all three dams. However, declining tributary flows, mainly from the North Fork of the Gunnison River, resulted in the actual peak flow and peak duration falling short of the targets. During this operation the Black Canyon water right peak flow target was met. Baseflow targets were achieved throughout the year with the exception of a short period in early winter when the Whitewater gage was not reading correctly due to icing impacts.