COLORADO RIVER RECOVERY PROGRAM
FY 2012 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: FR164

I. Project Title: Middle Green River floodplain sampling

II. Bureau of Reclamation Agreement Number(s): R12PG40023

Project/Grant Period:
Start date: 08/08/2012
End date: 12/30/2016
Reporting period end date: 09/30/2012
Is this the final report? Yes ____ No __X__

III. Principal Investigator(s):

Aaron Webber and Tildon Jones
U. S. Fish and Wildlife Service
Colorado River Fishery Project
1380 S. 2350 W.
Vernal, UT 84078
(435) 789-4078 ext 21
aaron_webber@fws.gov

IV. Abstract:

Endangered fish of the Colorado River use wetlands during various times to complete their life history. Although researchers in the Green River system spend considerable time sampling fish populations in the mainstem river, little work is conducted in the wetlands to document endangered fish. Razorback sucker, in particular, use floodplain wetlands throughout their lives, and specifically rely on these habitats during early development from larval to juvenile stages. Researchers have had little success documenting these life stages for wild-produced fish in recent years. In order to document recruitment of wild-spawned razorback sucker, wetland habitats need to be sampled, and this project is aimed at documenting endangered fish use of wetlands annually.

V. Study Schedule: *2012-?*

VI. Relationship to RIPRAP:
Green River Action Plan: Mainstem
I.A.3.d.1. Conduct real-time larval razorback and Colorado pikeminnow sampling to guide Flaming Gorge operations.
I.D.1.a. Evaluate survival of young …razorback suckers from floodplains
I.D.1.b. Evaluate recent peak flow studies related to floodplain inundation and entrainment of larval razorback sucker

VII. Accomplishment of FY 2012 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Johnson Bottoms--We conducted a population estimate on a cohort of 3,971 bonytail (*Gila elegans*) that was stocked into Johnson Bottoms on 11 October 2011 to evaluate over-winter survival. We set 23 fyke nets and 1 trammel net on 12 March 2012 and processed the catch each day afterwards until the morning of 16 March, when we pulled the nets. We used a john boat with motor to retrieve the nets and either worked the fish up in the boat or transported the fish to the shore. We did not mark the bonytail upon capture since they had been tagged at the Wahweap State Fish Hatchery prior to stocking with a 12.5 mm, 134.2 kHz ISO passive integrated transponder (PIT) tag. We therefore scanned each bonytail, measured it to the nearest mm total length (TL), weighed (g), and released it away from the nets, which were scattered throughout the wetland. Each day, we encountered numerous holes in most of our nets from muskrats and beavers, which were abundant in the wetland. Some nets were damaged above water line and upon our arrival each day, still held fish. Others were damaged such that no fish were present and the net was taken out of operation either for the remainder of the study or until we could repair it. Every attempt was made to ensure nets were working upon leaving by using zip ties and a net mending needle with heavy string to patch holes, but smaller holes were very difficult to see while wading in muddy conditions. Even though we thought nets were repaired, it is likely that some were not and thus did not operate as well as they would have without holes.

We captured 45, 37, 16, and 14 bonytail from 13-16 March respectively. During this sampling, we recaptured 13 bonytail, of which 3 were recaptured twice. We used program MARK to generate a population estimate of 218 individuals (95% CI 158-333), with a capture probability of 0.19 (95% CI 0.12-0.30).

After our population estimate, we experimented with a single passive instream flat plate antenna (PIA) from 8-29 June 2012. We used the PIA (13 x 27in.) in order to gather survival data during non-active sampling periods. The PIA was connected to a Biomark FS2001F-ISO Reader powered by one 12 V deep cycle battery, which was housed in a secured box on shore. We programmed the reader to record the time and date of each detection and exclude the same fish from detection twice within a 10 s period. We changed the battery powering the PIA once a week and we passed a wooden stake with an attached PIT tag over the PIA following a week long period with no detections to ensure that the PIA was functioning properly. We placed the PIA at a random location in the wetland approximately 30 ft. from the shore at an approximate depth of 3ft.

In order to evaluate potential water quality issues in the wetland, we deployed a dissolved oxygen-temperature logger (miniDO$_2$T manufactured by PME, Vista CA) in the wetland which was programmed to record a temperature and dissolved oxygen reading every 10 m. The logger was operational from 21 June-16 July 2012.

During our passive PIA sampling, we detected 4 bonytail and 3 razorback sucker (*Xyrauchen texanus*) (none of which were captured in nets during active sampling). The PIA was removed 29 June 2012 after we observed thousands of dead adult fish in the little remaining water in the wetland. The dissolved oxygen readings frequently fell below zero for several hours at a time, except for the first 3 days of use (Figure 1). The wetland dried completely in August.

Bonytail survival was low at 0.05% from initial stocking to ice-off in March. Possible explanations include bird predation, nonnative fish predation, and water quality and temperature issues.

Bird predation potentially was a significant factor that influenced bonytail survival. We observed 4 known fish-eating bird species at Johnson Bottoms during our sampling: American white pelican (*Pelecanus erythrorhynchos*), common merganser (*Mergus* ***merganser***), double-crested cormorant (*Phalacrocorax auritus*), and great blue heron (*Ardea herodias*). During a site visit to Johnson Bottoms in June 2012, we estimated 150 American white pelicans, 50 double-crested cormorants, and 15 great blue herons at one time. These birds congregated on several small islands that appeared as water levels dropped. We suspected these birds were consuming the bonytail. After the wetland dried up completely, we took a hand-held PIT tag reader to the observed islands and scanned dried bird feces found there. We found 3 PIT tags in the feces: two were from razorback sucker and one was from a bonytail. While conducting the population estimate, in four days we recovered seven bonytail mortalities we suspect were from bird predation. We found these bonytail (in addition to other fishes) remains on top of our fyke nets, in varying states of disorder. Pelicans typically swallow fish of this size (i.e., 215 mm TL) whole, so we suspect the other three observed bird species as the culprits for these bonytail mortalities. Nonetheless, we conclude that bird predation on bonytail did occur during our study, and potentially occurred from when the bonytail were stocked until ice on (approximately 2 months), and in-between when the ice melted off the wetland and our sampling (approximately 3 days).

Nonnative fish predation is a possible factor in the low observed bonytail survival. During our sampling, we encountered the following nonnative species: black bullhead (*Ameiurus melas*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), channel catfish (*Ictalurus punctatus*), common carp (*Cyprinus carpio*), green sunfish (*Lepomis cyanellus*), fathead minnow (*Pimephales promelas*), red shiner (*Cyprinella lutrensis*), and sand shiner (*Notropis stramineus*). Of these, only about 20 channel catfish were large enough to consume bonytail, which averaged 215 mm TL. Thus, channel catfish predation could have played a role in low survival of bonytail from October 2011 – March 2012. We examined the stomach contents of several of the larger catfish but found no evidence of bonytail.

Temperature and dissolved oxygen deficiencies potentially were factors in low observed bonytail survival. Fish were stocked 11 October 2011 at 14.8 ºC. Kappenman et al. (2012) found that no growth occurs in bonytail below 14.2 ºC. With stocking at a temperature so close to this threshold, and so late in the year, bonytail might not have had time to acclimate to conditions, and entered the winter in poor condition. Water quality was certainly a factor in fish survival during the summer. We estimated over 2,000 dead adult fish during a site visit 29 June indicating at least a partial fish kill had occurred. These dead fish were in varying states of decay. This observation is confirmed by dissolved oxygen data gathered (Figure 1). Dissolved oxygen levels fell below 0 mg/l for several hours at a time during the night almost daily from 24 June – 16 July. Obviously as the wetland went dry, there was no survival of fish. It is possible that there was dissolved oxygen deficiency at Johnson Bottoms during the winter, but this scenario is doubtful given the abundance of fish in the spring. We also walked approximately 0.25 miles of the shore line as ice melted on 9 March, and did not observe any dead fish. On the same day at Old Charley and Wyasket Lake (wetlands within 10 miles of Johnson Bottoms), which were at the same stage of melting, we observed hundreds of dead fish that appeared to have died under the ice. These wetlands did not have 100% fish kills because sampling later in that month produced live fish.

Wyasket Lake--Since we documented young of year razorback sucker in both Wyasket Lake and Leota 4 in October 2011, verifying over-winter survival was important to potentially track this cohort of wild-spawned fish. We visited Wyasket Lake on 5 March 2012 and observed approximately 200 dead carp which appeared to have died under the ice during the winter. We set a trammel net and two fyke nets in Wyasket Lake on 19 March and captured only carp and bullhead catfish. Wyasket Lake dried completely in June 2012, without ever connecting to the Green River during high water. Thus we can assume that all young of year razorback sucker spawned in 2011that were present in Wyasket Lake died.

Leota 4--We set 2 trammel and 4 fyke nets in Leota 4 on 10 May 2012 and pulled them the following day. We captured 11 wild-spawned razorback sucker (137-195 mm TL) from 2011 and 4 razorback sucker (298-320 mm TL) that we assume came from the untagged fingerlings stocked into Leota 4 in October 2010. None of these were tagged, so we tagged the 5 that were large enough to tag (>150 mm TL), and released all the razorback sucker back into Leota 4. As with most of the wetlands in the middle Green River, Leota 4 dried up during summer 2012. Before it did, however, and since we had PIT tagged and released razorback sucker previously, we attempted to document survival with the use of two PIAs from 8-22 August. We did not detect any PIT tags using this method. We deployed a miniDO$_2$T logger at this site during the summer, but since the wetland dried up, the data gathered will not be reported since its purpose was to potentially correlate fish kills with dissolved oxygen and water temperature.

In addition to these activities, we conducted a fish salvage in Leota 5 from 16-18 July. The Ouray National Wildlife Refuge needed to repair culverts on the dikes of some of the wetlands in Leota Bottoms which would require them to drain Leota 5. We used an 8” trash pump to help pump water from Leota 5 to Leota 6, and carefully monitored the fish population as the water receded. We sorted through thousands of nonnative fish (mostly carp, bullhead catfish, and fathead minnow), but did not encounter native fish.

We did not sample any wetlands in the fall, because most were completely dry, and the remainder with puddles left will likely freeze solid over winter. This could be promising for endangered fishes in 2013, however, because the wetlands will be reset and this is thought to be favorable for survival of young endangered fishes.

VIII. Recommendations:

As per the Larval Trigger Study Plan, we will use data collected from project 22F (larval fish monitoring in the middle Green River) during spring 2013 to focus our summer / fall floodplain sampling. Resources permitting, we will also sample floodplains that connected to the river when larvae were present, but where larval entrainment was not documented.

Although there was a complete fish kill due to drought in Johnson Bottoms, we still believe this wetland is a good candidate for over-wintering endangered fishes. We recommend using Johnson Bottoms as a location for stocking bonytail and or razorback sucker in the future. In past years, we have found evidence of this wetland overwintering fish, but 2012 was an unusual drought year that resulted in the majority of wetlands in the middle Green River drying up. We recommend research focused on factors causing mortality in bonytail in wetlands, and if bonytail are stocked into wetlands, we recommend stocking at a temperature above 20 ºC to promote growth and survival (Kappenman et al., 2012).

IX. Project Status: on track and ongoing

X. FY 2012 Budget Status

A. Funds Provided: $39,222.20
B. Funds Expended: $39,222.20
C. Difference: 0
D. Percent of the FY 2012 work completed, and projected costs to complete:100%
E. Recovery Program funds spent for publication charges:0

XI. Status of Data Submission: Data will be submitted to Travis Francis by December 2012

XII. Signed: Aaron Webber (Principal Investigator) — October 18, 2012 (Date)

References:

KAPPENMAN, K. M., E. S. CURETON, J. ILGEN, M. TONER, W. C. FRASER, AND G. A. KINDSCHI. 2012. Thermal requirements of the bonytail (*Gila elegans*): application to propagation and thermal-regime management of rivers of the Colorado River Basin. Southwestern Naturalist in press.

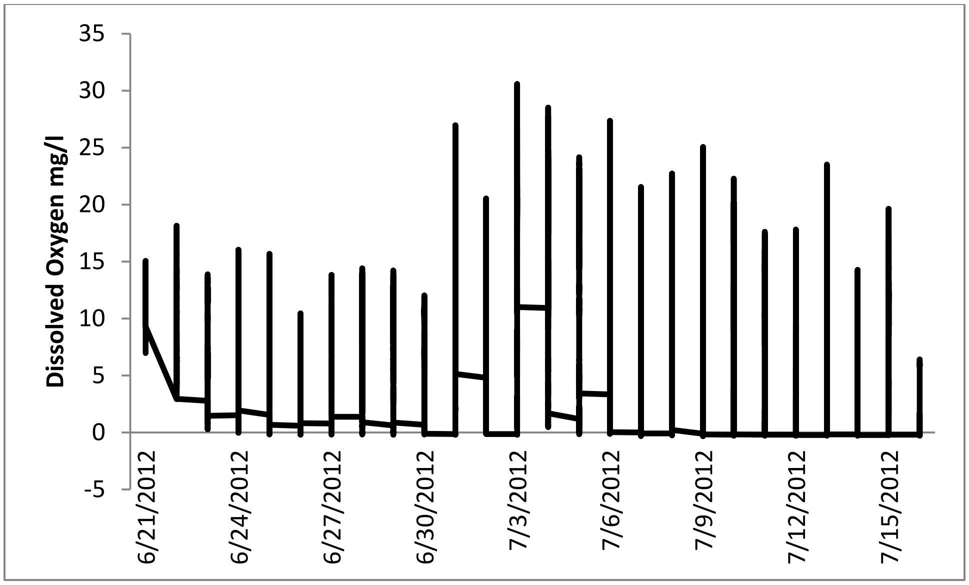

Figure 1. Dissolved oxygen readings taken every 10 m at Johnson Bottoms wetland from 6 June 2012-16 July 2012 with a miniDO$_2$T logger (PME, Vista CA).