COLORADO RIVER RECOVERY PROGRAM **RECOVERY PROGRAM**
FY 2009 ANNUAL PROJECT REPORT **PROJECT NUMBER: RZ-RECR**

I. Project Title: Razorback emigration from the Stirrup floodplain (RM 275.7)

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III. Project Summary:

Important rearing habitat for razorback sucker (*Xyrauchen texanus*) is thought to be floodplain wetlands (Wydoski and Wick 1998; Muth et al. 1998; Lentsch et al. 1996; Modde 1996; Tyus and Karp 1990). Reproduction by razorback suckers occurs on the ascending limb of the spring hydrograph allowing enough time between hatching and swim up for larvae to enter the system when highly productive floodplain habitats are accessible (Muth et al. 1998). This seasonal timing of razorback sucker reproduction indicates possible adaptation for using floodplain habitats for rearing purposes (Muth et al. 1998). It is unclear, however, how long young razorback sucker tend to stay in the floodplain before moving back out into the river.

The Green River Floodplain Management Plan (2003) identifies the Stirrup floodplain as a high priority habitat for recovery of the endangered razorback sucker, bonytail (*Gila elegans*), and Colorado pikeminnow (*Ptychocheilus lucius*). The natural levee surrounding the Stirrup was breached at the downstream end in March 1997 in an effort to increase the frequency of connectivity of the floodplain to the river. The floodplain now connects at around 14,000 cfs and can fill to approximately 20 acres during spring peak flows (Birchell and Christopherson 2004).

Though it is not extremely large, it is one of the few floodplain habitats in the middle Green River that retains enough water and overall depth to over-winter fish, thus making it ideal when maintaining razorback sucker over multiple years. Because of its potential to overwinter fish and because it only has one breach, this site was chosen for a study to research the timing of razorback sucker emigration from highly productive floodplain habitats to the river. Surplus razorback sucker were identified from normal operations at the Ouray National Fish Hatchery and were held at the hatchery site until they were stocked into the Stirrup floodplain. Fish were stocked into the floodplain in 2007, 2008, and 2009 (after connection). These fish were PIT tagged for individual identification, stocked, and monitored for survival. In May 2009, during spring peak flows, a stationary PIT tag reader was set up to monitor tagged fish movement into and out of the floodplain.

IV. Study Schedule: Initial year - FY - 2007 Final year - FY 2010

V. Relationship to RIPRAP:

GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN
II. Restore habitat (habitat development and maintenance)
II.A. Restore flooded bottomland habitats
II.A.1. Conduct inventory of flooded bottomlands habitat for potential restoration

GREEN RIVER ACTION PLAN: MAINSTEM
II. Restore habitat (habitat development and maintenance)
II.A. Restore and manage flooded bottomland habitat
II.A.1. Conduct site restoration
II.A.2. Acquire interest in high-priority flooded bottomland habitats between Ouray NWR and Jensen to benefit endangered fish
II.A.2.a. Identify and evaluate sites
IV. Manage genetic integrity and augment or restore populations (stocking endangered fishes)

VI. Accomplishment of FY 2009 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1. **Pump water from the river into the Stirrup floodplain. This includes preparation of compliance documents for both the BLM and Utah Division of Water Rights. This may also be conducted again between tasks 3 and 4.**

The U.S. Fish and Wildlife Service (Program Director's Office and Ecological Services) completed the Environmental Assessment to do the work on Bureau of Land Management land in August 2007. Utah Division Wildlife Resources (Division) obtained a temporary water right to pump in 2007; however, due to adequate connection in 2008, pumping was not necessary to maintain an overall depth greater than four feet in the floodplain, even into the spring of 2009.

We did not pump water into the Stirrup prior to the 2009 spring flows. The river connected to the floodplain on May 14 at an estimated flow (considering a 24 hour travel time from the USGS gage near Jensen, Utah) of 14,000 cfs (Figures 1-3). Unfortunately, it took eight days of river connection to fill the floodplain to a point that sufficient depth (determined to be >20cm) occurred throughout the breach to allow native fish movement.

Had the floodplain been full at the beginning of riverine connection, fish would have been able to move in or out over a longer period of time. Two bonytail and one Colorado pikeminnow attempted multiple times to enter the floodplain; however, they were unable to move from the breach into the floodplain as they were recorded passing through the antennas in both directions or hanging around the two inside antennas for extended time periods after entering the breach.

Figure 1. Channel between breach and Stirrup floodplain on 14 May, 2009.

Figure 2. Channel between breach and Stirrup floodplain 16 May, 2009. Breach is immediately to right.

Figure 3. Channel between breach and Stirrup floodplain 19 May, 2009.

Task 2. Stock razorback sucker in the Stirrup floodplain.

The Ouray National Fish Hatchery stocked approximately 1600 age-1 (October 2007) and 1600 age-2 (June 2007) razorback sucker in the Stirrup in 2007. After connection with the river in 2008, they stocked an additional 1000 PIT-tagged, age-2 razorback sucker in June 2008 and 1000 PIT-tagged, YOY razorback sucker in October 2008. These fish were stocked in addition to

any survivors from the 2007 stocking that did not move out into the river during high flows in 2008. Approximately 1725 age-2 razorback sucker were stocked in June 2009 (post run-off), again in addition to any fish remaining in the floodplain from the 2007 or 2008 stockings.

Task 3. Monitor water quality and species assemblage in Stirrup floodplain.

The winter of 2008 - 2009 was not as harsh as the previous winter. We did not receive as much snowfall and therefore we were not as concerned with monitoring the floodplain overwinter as in the previous year. However, we did attempt to monitor water quality in the floodplain on 6 January, 2009. Snow depth was only 7 cm on top of the 20 cm of ice. Unfortunately, the hydrolab used for sampling water quality lost battery power and did not accept the programming command at this time. We thus did not get a measurement for dissolved oxygen over the 2008-2009 winter. However, compared with the previous winter when dissolved oxygen dropped to lethal amounts, snow on top of the ice was 10.7 cm deeper in the 2007-2008 winter, and the ice was 7.9 cm deeper in the 2007-2008 winter.

We returned to the floodplain in April 2009 to sample the fish. This sampling was more extensive than in previous years, both during the April sampling (before connection) and the June sampling (after connection). The entire flooded bottomland was sampled multiple times during the week of 13 April with both fyke nets and a boat electrofisher. Sampling in June was done solely with the boat electrofisher due to higher catch rates from electrofishing in April. We had intended to obtain a population estimate while sampling in April, but were unable to recapture enough individuals to accomplish this.

Electrofishing on 13 April resulted in the capture of 12 razorback sucker, nine age-3 fish (mean TL = 328.9 mm) and three age-1 fish (mean TL = 117.7 mm). Capture rates for each age class were 7.8 fish/hour and 2.6 fish/hour on this first day. Only age-3 fish (n = 5; mean TL = 334.4 mm) were captured during electrofishing on 14 April. The catch rate on this day was lower: 5.6 fish/hour. On 15 April, we changed gear types and set out eight fyke nets over two nights. This resulted in the capture of 17 age-3 fish (mean TL = 325.7 mm) and 14 age-1 fish (mean TL = 128.5 mm) for catch rates of 1.1 fish/fyke-net night and 0.9 fish/fyke-net night, for each age class respectively. Average growth of the age-3 fish was 18.1 mm from stocking (June 2008) to recapture. Age-1 fish were not individually measured upon stocking so no growth information is available.

All age-3 individuals captured during the sampling effort in April were stocked into the floodplain in July 2008. All age-1 individuals captured were stocked into the floodplain in October 2008. No fish stocked in 2007 were captured during this sampling effort or detected with the stationary PIT tag reader. One fish sampled in April moved out of the floodplain during peak flows; however, the remaining fish sampled in April stayed in the floodplain.

Electrofishing occurred again, after high flows, on 9 June. The portable PIT tag reader used during the June sampling was not functioning correctly at the time; therefore, no fish were tracked to stocking year for the June sampling. During this sampling, 10 razorback suckers were

captured, eight were age-3 fish (mean TL = 370 mm) and two were age-1 (mean TL = 191 mm) fish. Catch rates for this sampling occasion were 4.9 age-3 fish/hour and 1.2 age-1 fish/hour.

We again visited the floodplain on 6 August to sample water quality. We were there around 16:00, a time with neither the highest nor lowest dissolved oxygen (DO) over the course of a day (according to previous sampling efforts, DO is highest in the Stirrup around 23:00 and lowest around 11:00). However, DO was around 6.0 mg/l for each of six measurements taken, suggesting that DO should be adequate over the entire day, even when it is lowest, to maintain the fish. Water quality was again monitored in November (Hydrolab was malfunctioning and required maintenance so again not DO reading; however, water depth was 1.2 m and considered adequate going into winter) and will be monitored over-winter at least once and twice or more if snowfall conditions are as severe as in 2007.

Task 4. Research stationary PIT tag readers and determine the appropriate set up for the Stirrup floodplain.

Two additional antennas were installed in the Stirrup breach in 2009, to determine directionality. While all three antennas functioned adequately throughout the study period, detection efficiencies were less than 100% for two of the three antennas. Tuning was done regularly until antennas were nearly submerged under water within the breach. Better tuning ability may improve the read rates for each antenna, although 82.5% of all fish detected were picked up by all three antennas. Rates for each antenna will be quantified each year for the final report; however, preliminary estimates conducted with very basic assumptions suggest that detection efficiencies were 66.7% for the outer antenna, 71.4% for the middle antenna , and 100% for the inner antenna. These efficiencies were derived entirely from razorback suckers directly leaving the floodplain as some of the fish (of all species) spent a great deal of time within the breach without a definitive direction. This made it difficult to know whether a “miss” was truly a miss or the fish not being within read range before turning back to the previous antenna. In addition, these efficiencies assume that no fish was missed on all three antennas.

Batteries were an issue again, although much less time was lost to lack of power this year (16 hours between 27 May and 28 May and 22.5 hours between 29 May and 30 May). While it is likely that fish moved out during this time, there is no reason to expect that a mass migration was missed. In fact, most razorback suckers moved out upon initial (adequate) connection on 22 and 23 May. Only one razorback sucker was captured moving out of the floodplain in the 24 hours before the reader quit working on 27 May. Two razorback suckers moved out between these down times and no razorback suckers moved out after the final downtime. Other fish were moving into the floodplain (bonytail and Colorado pikeminnow) and it is likely that movements from some of these fish were missed.

To correct the power issue, we attempted to find batteries with more amp hours than those used in 2008 and while we did better and lost much less time to a downed multiplexing unit (MUX), we were still changing batteries every day to ensure that no time was missed. After connection, we began talking to experts and most suggested using two solar panels and batteries that were specifically designed for use with solar panels. We purchased these items and powered the MUX

at Stewart Lake continuously for 17 days. We feel that we now have the power issue worked out for weather scenarios we would expect to experience during spring peak flows.

Task 5. Set up stationary PIT tag reader during spring peak flows.

The Stirrup first connected to the floodplain on 14 May, 2009. This connection was not adequate for native fish to move out; however, carp (*Cyprinus carpio*) were moving both into and out of the floodplain, even through very shallow water where the floodplain and breach meet. Many carp but *no* native fish were observed dead in this shallow area. Based on these observations and the fact that we did not detect PIT tagged fish before 22 May, we can be confident that native fish require greater than 20 cm of water depth to comfortably move through an area (even with high turbidity).

Overall, 40 individuals and three different species (bonytail, Colorado pikeminnow, razorback sucker) were captured in the MUX over 16 days of adequate connection. Of the 40 fish, 31 were razorback sucker; 28 of these were age-3 fish and three were age-1 fish. All were stocked into the Stirrup in 2008, except one currently unknown tag. The search continues for a record of this tag, although it was likely a razorback sucker stocked into the Stirrup due to its direction of movement through the antennas. Five of the fish recorded were bonytail stocked into the middle Green River by the Wahweap Hatchery in 2008 and four were Colorado pikeminnow tagged in the middle Green River by the Division of Wildlife's Vernal crew in either 2007 or 2008. All of these fish were within 20-30 miles of the previous capture location.

Individual Behavior:

- The first fish, a bonytail, moved into the breach on 14 May. This fish moved in overnight, was "captured[1]" again at the inside antenna the next morning and then was not detected again. It is likely still in the Stirrup, unless it moved out while the MUX was down.
- Another bonytail moved into the breach on 15 May in the early morning. This fish tried a number of times to enter the floodplain (as evidenced by his movement from the middle antenna to the inside antenna about 20 times) until finally giving up and leaving the breach on 16 May.
- The first Colorado pikeminnow showed up on 18 May, moved around within the breach over that night and into the morning, and left early on 19 May. It returned and left multiple times over the next two days, then again on 24 May and on 28 May, at which time it stayed in the floodplain for two nights. This fish consistently moved into the floodplain in the late evening (22:00) and left in the early morning (02:00 or so).
- The first razorback sucker to leave did so on 22 May in the early morning. It moved straight out from floodplain to the river and did not stay within the breach. Twenty other razorback suckers behaved in similar fashion.
- The second Colorado pikeminnow to enter the breach showed up on 22 May. It moved into the breach in the late morning and moved around within the breach between 10:00

[1] This was not a true capture as the fish was never "in hand." It refers to the capture of the tag on the stationary PIT tag reader as the fish swam through the antenna.

and 20:00. After 20:00 it was not detected again until the following morning, at which time it was recorded at the outside antenna moving into the breach. It left shortly thereafter and did not return until 28 May. Again, it moved around within the breach for a few hours and then left. Given the times between being picked up on the last antenna, it was not staying in the floodplain very long (i.e., 3-20 minutes, depending on the date).

- Another Colorado pikeminnow moved into the floodplain stayed for only six minutes (six minutes between first hit on inside antenna and last hit on inside antenna) and moved out again. This fish came back on 28 May around the same time (late morning). This time there were seven hours between the first hit on the inside antenna and the last hit on the inside antenna, implying that it stayed within the floodplain for seven hours and moved back out to the river around 17:00.
- Another Colorado pikeminnow moved into the breach and into the floodplain around midnight on 24 May. He stayed until about 05:00. The same fish returned that night, stayed again for a few hours and then left again. It repeated this behavior again the following night, but did not return until 29 May. It is likely that this fish made additional movements when the MUX was not operational, thus it may have spent longer in the floodplain between 26 May and 29 May than detected.
- Three more bonytails moved into/out of the Stirrup towards the end of the sampling period (25-30 May). Bonytails were not recorded between 15 and 25 May. The first moved into the breach on 25 May, stayed there for one day and left at the same time the following evening. The next moved into the floodplain on 26 May around 22:00, stayed in the floodplain until around midnight, then seemed to move around the breach until 04:00. It was picked up again in the evening of the following day, stayed for about seven hours, moved around the breach again, left and was not picked up again. The last one was recorded entering the breach on 27 May. We cannot be sure of its movements as the MUX was down between this and the next time he was detected entering the breach again on 28 May around 20:00. It seemed to stay in the floodplain for two nights and then leave; however, the MUX was down again between 29 and 30 May so it may have left during this time.
- For those razorback suckers that did not immediately leave the floodplain and breach, their behavior was varied.
    - One individual seemed to attempt to leave on 22 May and thought better of it, only to leave around the same time the following evening.
    - Another individual did nearly the same thing, only its indecision was short-lived. It left the breach to the river within minutes of turning around.
    - Another razorback sucker turned around and was last detected on the middle antenna. We therefore cannot say whether it left or remained within the floodplain.
    - The next razorback sucker to attempt to leave changed its mind. It stayed within the breach for about an hour before finally heading back towards the floodplain around midnight.
    - Five more razorback suckers displayed this same behavior and did not actually leave the breach to the river.
    - The next one to leave also had some indecision, but did decide to leave. This was an age-1 fish.

Of the 31 razorback suckers picked up by the MUX during this sampling, only 25 actually left the breach. Two of the three age-1 fish left.

Task 6. Download PIT tag data and monitor PIT tag array

The stationary PIT tag reader was monitored on a daily basis throughout the 2009 high flow period from 22 May through 9 June; long after the last tag was detected.

Task 7. Summarize results/findings

Annual report submitted November 2009.

VII. Recommendations:

- Fill floodplain in spring before connection using a 6" (or larger) trash pump.
- Provide funding for an antenna "expert" to monitor system for a day and help pinpoint tuning issues (i.e., Peter MacKinnon from USU).
- Obtaining catch rates for different size classes before and after connection helped to clarify PIT tag results. We should attempt this effort again while remaining flexible on the sampling methods chosen for the Stirrup.
- Continue project as long as there are adequate numbers of razorback sucker available for stocking each year.

VIII. Project Status:

Ongoing

IX. FY 2009 Budget Status

A. Funds Provided: $19,419
B. Funds Expended: $19,419
C. Difference: $0
D. Percent of the FY 2009 work completed, and projected costs to complete: 100%
E. Recovery Program funds spent for publication charges: $0

XI. Signed: Trina Hedrick 10/29/09
Principal Investigator Date

XII. Literature Cited

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