COLORADO RIVER RECOVERY PROGRAM **RECOVERY PROGRAM**
FY 2008 ANNUAL PROJECT REPORT **PROJECT NUMBER: RZ-RECR**

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

II. Principal Investigator(s):

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III. Project Summary:

Floodplain wetlands are presumed to be important rearing habitat for razorback sucker (*Xyrauchen texanus*) (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 currently 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: age-2 fish in June 2007 and age-1 fish in October 2007. These fish were PIT tagged for individual identification, stocked, and then monitored in the fall and spring. In May 2008, 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 (final year was originally intended to be FY 2009)

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 2008 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 done again between tasks 3 and 4. Spring and summer (potential to require pumping at other times of year as well)

The U.S. Fish and Wildlife Service (Program Director's Office and Ecological Services) completed the EA to do the work on Bureau of Land Management land in August 2007. The Division obtained a temporary water right and began pumping on 20 June 2007 with two Honda WT40X, 4" trash pumps; however, after a number of weeks pumping with the 4" pumps, it became clear that we were not going to increase the depth of the floodplain with these small pumps.

Pumping with a 6" trash pump began on 15 October and ended on 7 November 2007. Depth at this time was 4.5' and was determined to be sufficient to maintain fish overwinter.

Pumping occurred again in the early spring before connection with the river. Pumping was done using the 4" trash pumps and was only to provide an influx of riverine water that had higher DO levels than what was present in the Stirrup after ice-off. Pumping continued for two weeks.

Pumping after spring 2008 river connection was not necessary as water quality and overall depth remained adequate (see Task 3).

Task 2. Stock razorback sucker in the Stirrup floodplain

The Ouray National Fish Hatchery stocked age-1 and age-2 fish in the Stirrup in 2007. These were the fish we attempted to detect with the stationary PIT tag reader during connection in 2008.

During June 2008, after riverine an additional 1000 PIT-tagged, age-1 and 1000 PIT-tagged, age-2 razorback sucker were stocked. These fish were stocked on top of any survivors from the 2007 stocking that did not move out into the river during high flows in 2008.

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

The floodplain did not freeze solid this winter, however low dissolved oxygen was a problem due to poor light penetration. Testing on 31 January revealed 11" of ice under 7" of snow Dissolved oxygen readings taken on 14 February were less than 1.0 mg/L.

Sampling with fyke nets on 9, 10 April resulted in no fish captured. However, we did observe a number of razorback suckers and carp mortalities along the northeast shoreline. We presume a substantial fish kill occurred due to low dissolved oxygen overwinter. The depth in the floodplain made sampling efficiently with fyke nets difficult; we therefore sampled with trammel nets, electrofishing boats and a combination of the two to determine whether the fish kill was complete or not. These methods revealed few bullhead, catfish, and fathead minnows in the floodplain.

After spring connection, the Stirrup was completely full and held water quite well over the summer. Dissolved oxygen (DO) was measured on 5 August 2008. The measurement recorded was 12.29 mg/L at 17:14. DO was again measured on 28 August 2008. The measurement was taken at 15:20. Temperature was 21.42ºC and DO was 10.72 mg/L. DO tends to be highest around 23:00 in the Stirrup. These measurements are therefore more than adequate to maintain razorback sucker overwinter if the winter is not as harsh.

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

Our crew coordinated with researchers on the San Rafael and Provo Rivers to gain experience with the installation / operation of stationary PIT tag readers. Through this and speaking with representatives from Biomark, we decided to use the FS1001M Reader (MUX), which could monitor up to six antennas at once. This first year, we decided to begin with only one antenna; however, in the future, we will build more. Prior to runoff we estimated that a 10' x 3' antenna would adequately cover the breach at the Stirrup. However, with the flows experienced in 2008 a larger antenna would have been advantageous.

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

The Stirrup first connected to the floodplain on 11 May, 2008. This connection did not last long and since we were experiencing problems with the reader (see below), four trammel nets were set within the breach to prevent fish from moving into or out of the floodplain. These trammel nets were successful at restricting movement during the entire first connection, which only lasted one day. Four carp were captured attempting to move out of the floodplain (further evidence that the winter kill of 20-07-2008 was not complete) and one channel catfish was captured trying to move into the floodplain.

By 20 May, the beginning of the second connection, the reader was set up and functioning adequately. The first incident of noise was worked out (see description of problems with the plug or connector) and the reader was sampling the breach for at least the first 48 hours of connection as displayed by the capture of a test tag. On 22 May, we realized that we were going to have battery issues and were going to have to replace the batteries every day as the solar panel was not charging the batteries as it should (see description below). On 23 May, we moved the reader to higher ground as we underestimated the magnitude of flows and the MUX was now in danger of being swamped. When we got the MUX to higher ground and had everything running again, a serious level of noise (93%, the maximum noise reading) inhibited our ability to read tags until 1 June (see below for this explanation). We finally figured out the cause of this noise and had the reader running with no problems through 7 June. During this time, the MUX picked up 6 tags. On 8 June, we had low current readings from the antenna; the description of how this was fixed is included below. The antenna was back out and ready to go on 9 June. The MUX picked up two more tags on 10, 11 June. We had one more noise issue the evening of the 11th (see Dynamic Tuning description below) that we were able to correct, though we lost one more night due to this issue). The antenna was taken down on 14 June (Jensen gauge reading was 14,300 cfs and coming down) due to only a small amount of very clear water in the breach. No more tags were picked up, likely because the water in the breach was quite shallow and clear beginning on 11 June. Below is a list of difficulties experienced during 2008 high flows:

- Noise issues –
    - The antenna connects to the MUX with a large cable that has one black wire, one red wire, and a metal sheath around these two wires that is formed into a wire for the ground. Connector pins are soldered onto these wires, which are then inserted into a plastic connector or plug that tightens down onto one of the MUX antenna ports. It was very difficult to adequately solder and secure the pins, insert them into the plug or connector so each pin extended out of the plug the same distance, and ensure a solid connection without getting a high noise reading. We ended up scrapping the plastic connector and inserting the pins into the MUX antenna port without a plastic connector. Because the MUX (and therefore the end of the antenna cable) is secured within a metal enclosure, there was no real need for a connector. By scrapping the connector, we were able to reduce the noise (though it was not obvious, the wires must have been touching somewhere within this connector) and ensure a solid connection. This issue was resolved before connection occurred.

- Dynamic Tuning also created high noise levels. There are two different ways to tune the antenna; one requires dynamic tuning to be turned on and the other requires dynamic tuning to be turned off. Because the dynamic tuning feature is always on unless the user specifically turns it off, every time we went into the manual tune option (with a hyperlink between the MUX and a laptop), the dynamic tune option would turn back on and increase the noise level. It was actually quite some time before we realized this was the reason for our high noise levels. Before pinpointing this as the reason, we tried moving the antenna and removing every piece of metal near the antenna. We also tried using the solar panels without a regulator in case that was increasing the noise level. We replaced batteries and checked every connection. We inserted the antenna cable into a different port. We re-soldered the connector pins to the antenna cable wire a number of times as well. Throughout this entire ordeal, we were in close contact with the Division's Springville office and the USGS fisheries station in Klamath as both shops have used this technology and are familiar with many of the problems that can occur. They recommended a number of things, but it wasn't until someone suggested ensuring the Virtual Test Tag was off that we tried turning off the Dynamic Tune, which immediately resulted in a decrease in the noise level.

- Drained batteries –
  - We used two deep-cycle marine batteries to power the MUX. These batteries will continue to power the MUX with > 20V; however, even in direct sunlight, the solar panel was only re-charging the batteries for about 1.5 days. We were continually replacing batteries to keep the MUX going. By doing this, we didn't lose much sampling time to dead batteries; however, in the future, we will purchase marine deep cycle batteries with greater amp-hours in order to increase the time between battery replacements. The Division's Springville office ran their MUX on the same two batteries for nearly three months without having to replace them. We should therefore not have to replace the batteries at all for this project.

- Reduced antenna current –
  - To pick up a tag, the antenna current must be between 3.0 and 6.0 amps. After we figured out the noise issue and realized we were going to have to replace the batteries every day, the next problem was a low antenna current warning. We removed the antenna from the breach, brought it back to the shop, and opened the end cap. Water had been seeping in very slowly, but it was wet enough inside to inhibit the current output. We let the antenna dry out, resealed it with glue (we had used thread seal before) and replaced it in the breach.

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

The list of fish picked up with the MUX is as follows:

A razorback sucker (3D9.1BF18DFC0A) was first detected in the breach on 2 June at 14:21 and again at 16:01. This fish was contacted again on 3 Juneat 03:24, 03:45, and at 10:48. This fish was 425mm when we originally tagged it above the Jensen Bridge in 2007 (near river mile (RM) 301.8). We did not detect an old tag in this fish.

A bonytail (3D9.257C669F5B) was first detected at 02:17 on 3 June. This fish was 206mm when stocked by Wahweap hatchery personnel in 2007 at Red Wash (RM 298.1) in the middle Green River.

A Colorado pikeminnow (3D9.1BF18E65F7) was first detected at 12:51 on 3 June, and and again at 14:15 the same day; and at 10:52, 11:33, 14:19, and 15:47 on 04 June. This fish was 460mm TL when originally tagged at Green River mile 275.6 during the Colorado pikeminnow abundance estimates.

A Colorado pikeminnow (3D9.1BF234E6B0) was first detected in the breach at 00:11 on 4 June. This fish was 517mm when originally tagged in 2007 just below the Stirrup breach. No old PIT tag was detected.

A razorback sucker (3D9.1BF18CF5F7) was detected in the breach on 5 June at 04:02, 05:53, 06:22, 11:56, and 15:38. This fish (TL= 445mm) was originally tagged in 2005 during northern pike removal efforts near the Razorback Bar (RM 311.0).

A Colorado pikeminnow (3D9.257C66D4FE) was first detected going into the floodplain at 00:17 on 7 June. This fish was originally tagged by a UDWR crew last May at Green River mile 74.5. It was 435mm at the time of tagging.

A roundtail chub (3D9.1BF1FF6409) was detected sometime between 18:00 on 10 June and 09:45 on 11 June (the batteries had died previous to this and we had forgotten to reset the date/time feature). This fish was originally tagged this year during the Colorado pikeminnow abundance estimates at RM 275.1. It was 378mm at the time of tagging.

A razorback sucker (3D9.257C698F18) was captured leaving the floodplain on 11 June at 22:23. This was an age-1 fish stocked into the Stirrup in October 2007 specifically for this study. This was the only fish stocked into the floodplain that was detected moving out during high flows.

Task 7. Summarize results/findings

Annual report submitted November 2008.

VII. Recommendations:

- Use 6” trash pumps (minimum size) when trying to add substantial depth to and improve water quality of the floodplain. If necessary, consider the use of smaller pumps when “topping off” the weland or for emergency water quality

improvement.

- Be flexible on the sampling methods chosen for the Stirrup. For example, before connection with the river, electrofishing may not be effective due to low conductivity; however, this may be a more effective method than fyke netting or trammel netting after connection occurs.
- Build two more antennas for the breach to be able to determine directionality and probability of detection for each antenna.
- Continue to use deep cycle marine batteries, but purchase batteries with more amp hours than those that were used this year.
- Explore different means of securing the antenna in the breach. Metal objects can create noise in the antenna. The bottom of the breach is also quite sandy, which made securing the antenna difficult with other means. However, due to read range, we need to have the antenna upright so we need to have more and better options available to next year.
- Extensively trouble shoot and modify as needed the stationary PIT tag reading system prior to April 1. Set up the MUX in the Stirrup breach one week before an expected connection in order to address any remaining technical difficulties (batteries, etc.).

VIII. Project Status:

Ongoing

IX. FY 2008 Budget Status

A. Funds Provided: $36,126
B. Funds Expended: $36,126
C. Difference: $0
D. Percent of the FY 2008 work completed, and projected costs to complete: 100%
E. Recovery Program funds spent for publication charges: $0

XI. Signed: Trina Hedrick 10/31/08
Principal Investigator Date

XII. Literature Cited

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