COLORADO RIVER RECOVERY PROGRAM Project#: RZ-RECR
FY 2009 PROPOSED SCOPE OF WORK for:

Razorback emigration from the Stirrup floodplain

Lead Agency: Utah Division of Wildlife Resources

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Category:
__Ongoing project
_X_Ongoing-revised project
__Requested new project
__Unsolicited proposal

Expected Funding Source:
X Annual funds
__Capital funds
__Other (explain)

I. Title of Proposal:

Razorback emigration from the Stirrup floodplain

II. 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)

III. Study Background/Rationale and Hypotheses:

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 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 (Birchell and Christopherson 2004) during spring peak flows. Though it is not extremely large, it is one of the few floodplain habitats in the middle Green River that retains enough water to over-winter fish, thus making it ideal for 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. Age-1 and age-2 surplus razorback sucker were identified from normal operations at the Ouray National Fish Hatchery and were stocked in the Stirrup in June 2008. These fish were all PIT tagged for individual identification before being stocked into the floodplain. In spring of 2009 and 2010, these fish will be monitored for whether they choose to remain in the floodplain or return to the river. The information gathered during this study will help in identifying and revising management considerations for the Stirrup floodplain and for other floodplains in the middle Green River.

IV. Study Goals, Objectives, End Product:

Goal: Characterize emigration of razorback sucker from floodplain wetlands to the Green River.

Objectives:

1. Maintain multiple year-classes of razorback sucker in the Stirrup floodplain throughout the study (stock razorback sucker and maintain sufficient water quality).

2. Determine the average length of time (via age class and size) that razorback sucker stay within the floodplain before migrating to the river by installing and maintaining appropriate technology within the breach of the floodplain.

End Products:

- A final report describing the project and its findings.
- Recommendations focusing on how to incorporate the findings into management of the Stirrup and other floodplains in the middle Green River.

V. Study Area:

The study area is limited to the Stirrup floodplain habitat (RM 276), which is approximately 20 acres in size when flows at Jensen gauge on the Green River are 14,000 cfs.

VI. Study Methods/Approach:

Razorback sucker become entrained into floodplains as larvae. It is currently thought that razorback sucker will stay within the floodplain for two winters and enter the river during spring high flows as age-2 fish (K. Christopherson, Utah Division of Wildlife Resources, pers. comm.). However, this information was collected through other studies and has not been verified with a valid sampling design specifically planned to answer this question. The proposed study design is therefore intended to fill in this information gap and determine the average age class of razorback sucker that tend to move from the floodplain to the river. To this end, excess (fish not needed to meet the stocking goals for the Green River) PIT tagged, age-1 and age-2 razorback sucker have been stocked from the Ouray National Fish Hatchery into the Stirrup (completed in June 2008). If excess fish are again available in 2009, similar numbers will be stocked into the Stirrup sometime during the summer so that 2009 results can be verified with sampling in 2010.

Water quality in the Stirrup will be sampled near the beginning of each month over summer 2008 and 2009 to ensure proper depth and dissolved oxygen for maintaining razorback sucker throughout the summer and over winter as well. The floodplain completely filled due to high flows in spring 2008; however, if during any of these sampling occasions, the dissolved oxygen falls below 3.5 mg/l or the depth falls below 4.0 feet, we will pump water into the floodplain using 4” trash pumps. If pumping with 4” trash pumps fails to affect dissolved oxygen readings or increase the depth of the floodplain to >4.5 feet within a two-week period, we will rent a 6” trash pump, which has a significantly higher pumping capacity. We will attempt to sample the site to see whether razorback sucker have survived the summer at least once sometime during the months of October or November and then again after ice off, which will likely occur in February or March. If time allows, we will mark and release captured fish and resample during the same week to attempt a population estimate. Sampling this floodplain has proven difficult in the past due to overall depth and low conductivities; however, multiple gear types will be used in an effort to contact these fish again. Most razorback suckers stocked into the floodplain in 2007 are not thought to have survived the winter of 2008 due to 11” thick ice and an additional 7” of snow on top of the ice. It is therefore possible that many of the fish stocked in 2008 may not last through the winter; however, spring sampling with multiple gear types should answer any questions of overwinter survival.

To monitor fish movement out of (and into) the Stirrup, the Recovery Program has already purchased a Digital Angel FS1001M Reader (MUX), which is essentially a stationary PIT tag reader. The MUX can run up to six antennas at one time; however, we had only one antenna running in 2008. After many difficulties (outlined below), we finally had the MUX, antenna, and power system working well (see Annual Report for 2008 results). Given everything learned in 2008, we will build two additional antennas for a total of three in the Stirrup breach in 2009. Multiple antennas allow for determination of direction and a probability of detection, and also ensure that nearly all of the tags passing through the antenna are read. If a fish sits too near to an antenna, the antenna cannot read another tag until the first fish has moved out of the read range of the antenna. If there are many fish moving through the antenna at the same time, there is a much greater chance that all fish will be picked up with multiple opportunities (antennas) for the tag to be read.

The antenna built over winter 2008 was a 10’ x 3’ antenna. We will build one additional 10’ x 3’ antenna and one 15’ x 3’ antenna to install within a wider portion of the breach. Flows will be watched closely during the month of May so that we can install the system three to five days before the floodplain is expected to connect. This should give plenty of time to resolve any last minute difficulties such as the ones experienced in 2008:

- 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 an 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 noise 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.

Despite a partial winter fish kill and all of the problems with the PIT tag reader, we did pick up one bonytail, three razorback suckers, three pikeminnow, and one roundtail chub moving into or out of the breach during connection (see annual report for more details). It is likely that even in 2009 and 2010, we will run into issues with the reader; however with the experience gained from 2008 sampling, additional assistance from USGS Klamath field station and the Division's Springville office, and with two additional antennas, many of the problems experienced in 2008 should either not occur or should be easy to pinpoint and remedy.

To attempt to replicate results from 2009, this study will be repeated in 2010. This would require stocking additional fish into the floodplain after spring peak flows in 2009 as previously mentioned, additional monitoring (and potentially pumping), and reinstallation of the PIT tag reader and antenna during 2010 peak flows. The final report will be written after data is collected in 2010.

VII. Task Description and Schedule:

Task 1. Pump water from the river into the Stirrup floodplain. This includes preparation of compliance documents for the Utah Division of Water Rights (the EA for work on BLM property was finalized in 2007). Pumping may not be necessary, but is included here in case depths in the floodplain fall below 4.0 feet.

Spring, summer, and/or fall 2009, 2010

Task 2. Stock razorback sucker in the Stirrup floodplain

The Ouray National Fish Hatchery stocked age-1 and age-2 razorback sucker in the Stirrup in June 2008. Stocking should occur again after peak flows in 2009.

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

January, March, July, August, September, and October 2009 and January and March in 2010

Task 4. Build two additional antennas for installation in the breach
December 2008 – February 2009

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

May – June 2009, 2010

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

May – June 2009, 2010

Task 7. Summarize results/findings

June - December 2010

VIII. FY 2009 – 2010 Work

Deliverable/Due Dates:

Recovery Program annual progress report: November 2009, 2010
Summary report and recommendations due to Program December 2010.

Budget:

FY09

Task 1: Pumping	**Work days**	**Cost**
Labor		
Leader ($438/day)	2	$876
Tech ($195/day)	7	$1,365
Travel		
Mileage (1 truck)	14	$587
Supplies		
Gas, etc.		$1,260
Equipment		
Pump rental	14	$2,000
TOTAL		**$6,088**

Mileage includes $10/day rental plus $.42/mile (76 miles to Stirrup round-trip)
Gas for pump assumes 20 gallons/day at $4.50/gallon
Labor and equipment days do not match because it only takes one half-day to fill the pumps.

Task 2: Stocking (no funding necessary to UDWR)

Task 3: Monitor/sampling	**Work days**	**Cost**
Labor		
Leader ($438/day)	3	$1,314
Tech ($195/day)	3	$585
Travel		
Mileage (1 truck)	6	$252
Supplies		
Gas, etc.		
Equipment		
Pump rental		
TOTAL		**$2,151**

Mileage includes $10/day rental plus $.42/mile (76 miles to Stirrup round-trip)
Labor and mileage days do not match because sampling is done in half-day increments, but mileage assumes a full day.

Task 4: Build antennas	**Work days**	**Cost**
Labor		
Leader ($438/day)	3	$1,314
Tech ($195/day)	12	$2,340
Travel		
Mileage (1 truck)		
Supplies		
Gas, etc. (antenna equipment)		$1,500
Equipment		
Pump rental		

TOTAL		$5,154

Supplies needed to build an antenna include PVC piping, wiring, plastic backing, waterproof connectors, capacitors, etc.

Task 5: Reader installation	Work days	Cost
Labor		
Leader ($438/day)	2	$876
Tech ($195/day)	2	$390
Travel		
Mileage (1 truck)	2	$84
Supplies		
Gas, etc.		
Equipment		
Pump rental		
TOTAL		**$1,350**

Mileage includes $10/day rental plus $.42/mile (76 miles to Stirrup round-trip)

Task 6: Monitor reader	Work days	Cost
Labor		
Leader ($438/day)	7	$3,066
Tech ($195/day)	2	$390
Travel		
Mileage (1 truck)	14	$587
Supplies		
Gas, etc.		$633
Equipment		
Pump rental		
TOTAL		**$4,676**

Mileage includes $10/day rental plus $.42/mile (76 miles to Stirrup round-trip)
Labor and mileage days do not match because checking the reader is done in half-day increments.

Task 7: Summarize results (no funding necessary in FY09)

Grand Total **$19,419**

IX. Budget Summary

FY 2009	$19,419

X. Reviewers:

XI. Works Cited:

Birchell, G.J. and K. Christopherson. 2004. Survival, growth, and recruitment of larval and juveniles razorback sucker (*Xyrauchen texanus*) introduced into floodplain depressions of the Green River, Utah. Utah Division of Wildlife Resources, publication no. 04-15, Salt Lake City, Utah.

Christopherson, K. Native Aquatics Project Leader, Utah Division of Wildlife Resources, Northeastern Region, 1998-2006.

Valdez, R.A. and P. Nelson. 2003. Green River Subbasin Floodplain Management Plan. Biology Committee Review Draft, R.A. Valdez & Associates, Inc., Upper Colorado River Endangered Fish Recovery Program, Denver, CO.

Lentsch, L., T. Crowl, P. Nelson, and T. Modde. 1996. Levee removal strategic plan. Utah Division of Wildlife Resources, Salt Lake City, UT. 21 pp.

Modde, T. 1996. Juvenile razorback sucker (*Xyrauchen texanus*) in a managed wetland adjacent of the Green River. Great Basin Naturalist 56:375-376.6

Muth, R.T., G.B. Haines, S.M. Meismer, E.J. Wick, T.E. Chart, D.E. Snyder, and J.M. Bundy. 1998. Reproduction and early life history of razorback sucker in the Green River, Utah and Colorado, 1992 – 1996. Final Report submitted to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO. 62 pp.