

**COLORADO RIVER RECOVERY PROGRAM
FY 2006 ANNUAL REPORT**

**RECOVERY PROGRAM
PROJECT NUMBER: C-6 RZ-ENTR**

I. Project Title: Evaluation of larval razorback sucker drift and entrainment into depression floodplain wetlands of the middle Green River.

II. Principal Investigator(s):

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III. Project Summary:

Floodplain wetlands are presumed to be important rearing habitat for the endangered razorback sucker (Wydoski and Wick 1998; Muth et al. 1998; Lentsch et al. 1996). Reproduction by razorback suckers occurs in the spring during peak flows of the hydrograph when highly productive floodplain habitats are accessible (Muth et al. 1998). This seasonal timing of razorback sucker reproduction indicates possible adaptation for utilizing floodplain habitats (Muth et al. 1998).

Based on the assumption that floodplain wetlands provide critical rearing habitat for razorback suckers, the Recovery Program initiated an extensive floodplain habitat restoration program (Levee Removal). The goal of the Levee Removal Program was to restore natural floodplain wetland habitats and functions that support recovery of endangered fish (specifically the razorback sucker) (Lentsch et al. 1996). To accomplish this goal, levees at selected wetlands were lowered to increase the frequency of the riverine-floodplain connection to pre Flaming Gorge Dam levels.

Data collected during 2004 pilot studies and in 2005 were instructive in addressing hypotheses about razorback sucker early life history and to guide sampling in 2006. Valdez (2003)

developed a larval razorback sucker drift model to be used as a predictive tool for the number of floodplain acres and number of razorback larvae necessary to reach recovery goals. A hypothesis generated by the model was that abundance of razorback sucker larvae declined to near zero a short distance downstream from the spawning area they originated from, based on an exponential decay survival function. However, preliminary data gathered during 2004 and 2005 showed that near-neutrally buoyant beads and larvae were transported considerable distances downstream, and were entrained in flood plain wetlands near the spawning bar as well as 54 miles or more downstream. These data support the notion that a mosaic of flood plain wetland habitats dispersed up and down the river downstream from spawning areas may be an optimal management goal.

Results of 2004 and 2005 studies also suggested that flow-through floodplain sites were best at entraining beads (and larvae) because entrainment occurred at all flow levels sufficient to inundate breaches. Non-flow through sites that filled only from one breach entrained fewer beads and larvae, and in some cases, returned beads to the river as they drained. The 2004 and 2005 data also showed that beads (and larvae) were not mixed in the lateral dimension of the stream channel until well downstream, 10 miles or more. Rather, beads and larvae remained on the side of the river where they were released. The implication is that floodplain wetlands near the spawning areas require larvae produced on the same side of the channel, or the likelihood of entrainment will be low. Optimization of larval entrainment in the floodplain will be crucial for ensuring survival of larval razorback suckers, and ultimately recovery.

The goal of this year's study was to evaluate larval sucker entrainment patterns into Thunder Ranch, Stewart Lake, and Bonanza Bridge, and use the data to revise management of these middle Green River floodplains. Other goals of the study included evaluation of entrainment rates into these floodplain habitats and evaluation of breach configuration based on information gathered. The draft final report for this project is due Spring 2007.

IV. Study Schedule: Initial year - FY - 2004 Final year - FY 2007

V. Relationship to RIPRAP:

GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN

- II. Restore Habitat (Habitat development and maintenance)
- II.A. Restore flooded bottomland habitats.

GREEN RIVER ACTION PLAN: MAINSTEM

- II. Restore Habitat (Habitat development and maintenance)
- II.A. Restore flooded bottomland habitats.
- II.A.3. Implement levee removal strategy at high priority sites.
- II.A.3.d. Evaluation.

VI. Accomplishment of FY 2006 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1: Field Data Collection – Bead release and drift netting

Approximately 540,000 biodegradable gelatinous neutrally buoyant beads (beads) were released one mile above three different floodplains (Thunder Ranch, Stewart Lake, and Bonanza Bridge) on various dates between May 17 and May 30, 2006. There were only enough larvae available for release above one site, so Thunder Ranch was selected.

Thunder Ranch was sampled on four days: May 21st, 23rd, 24th, and 30th. See Table 1 for river flows and breach inflows on these dates. Connection to the river occurred sometime between May 18th and 21st when river flows were between 12,400cfs and 15,200cfs. From 2005 information, Thunder Ranch connected at around 14,200cfs. This year's information seems similar, though we were unable to confirm it exactly. Larval fish were released at Thunder Ranch on the 21st, 23rd, and 24th. Numbers ranged from 125,000 to 225,000 fish, depending on availability. These larvae were marked with tetracycline before release. Beads and larvae were released one mile above breach #3 at Thunder Ranch, which coincides with the location of the Escalante spawning bar. Four drift nets were set in breach #3, four in breach #5 (which has a slightly higher river connection flow than #3), and below breach #5 on the near shore. All drift nets were equipped with a General Oceanics flow meter suspended in the center of the net. If readings were obviously incorrect, crews noted the inaccuracy on the data sheet and changed out the flow meter. Flow measurements and a cross-sectional view of the breach were recorded to calculate the amount of flow through the breach during the sampling effort.

Stewart Lake was sampled on four days: May 17th, 18th, 21st, and 24th. See Table 1 for river flows and breach inflows on these dates. Connection at Stewart Lake occurs at very low flow (estimated at 8,000cfs, though this was not confirmed during the study). Beads were released one mile above this site. Four drift nets were set within the one inlet and two were set downstream of the inlet on the near shore. If readings were obviously incorrect, crews noted the inaccuracy on the data sheet and changed out the flow meter. Flow measurements and a cross-sectional view of the breach were recorded to calculate the amount of flow through the breach during the sampling effort.

Bonanza Bridge was sampled on only three days due to its higher flow requirement for connection to the river: May 23rd, 25th, and 27th. See Table 1 for river flows and breach inflows on these dates. Connection at Bonanza Bridge occurred on the 22nd, when river flows reached 16,000cfs; however, the inflow into breach #2 (the largest breach) was only 3.9cfs, thus the site was not sampled until the following day. Beads were released one mile above the site. Breach #1 did not connect to the river, even at the peak flow. Three or four drift nets (this was dependent upon space available and increased over time) were set within breach #2, two in

breach #3, and two below breach #3 on the near shore. If readings were obviously incorrect, crews noted the inaccuracy on the data sheet and changed out the flow meter. Flow measurements and a cross-sectional view of the breach were recorded to calculate the amount of flow through the breach during the sampling effort. Something that will likely affect our results at Bonanza Bridge is the presence of a sandbar around each of the breaches. Upon early examination it appears to have affected collection of beads in the near shore nets and in the third breach, though it doesn't seem to have affected the second breach as much (this may change as we analyze the data).

Table 1. Jensen flows and breach inflows at 2006 sampling sites for all dates sampled.

Thunder Ranch			
		Breach Inflow (cfs)	
<i>Date</i>	<i>Jensen flows (kcfs)</i>	<i>Breach 3</i>	<i>Breach 5</i>
21-May	15.2	33.6 - 35.2	8
23-May	16.7 - 16.9	79.4 - 98.1	40.1 - 70.7
24-May	18.5 - 18.7	145.3 - 171.2	115.4 - 130.2
30-May	14.3 - 14.7	42.4 - 51.7	4.4 - 5.5
Stewart Lake			
<i>Date</i>	<i>Jensen flows (kcfs)</i>	<i>Breach 1</i>	
17-May	11.2 - 11.8	19 - 25	
18-May	12.2	29.3	
21-May	15.1	67	
24-May	18.2	140.6	
Bonanza Bridge			
<i>Date</i>	<i>Jensen flows (kcfs)</i>	<i>Breach 2</i>	<i>Breach 3</i>
23-May	17.0 - 17.2	21 - 25	5.1
25-May	18.5 - 18.9	27 - 31*	3.4 - 6.1*
27-May	15.9 - 16.0	11 - 13	1.4
*Each of these measurements is suspect and will have to be further studied to determine accuracy.			

Task 2: Drift Net Sample Processing

Drift net samples were examined for beads following the day of collection. Samples collected from Thunder Ranch on May 21st, 23rd, and 24th were then examined for larval suckers. This work was completed on Nov 6th and samples were dropped off to the Larval Fish Lab (LFL) on the 9th, thus, these results are still pending as not enough time was allowed for LFL to process the samples before the report submission deadline.

Task 3: Data Management

All information collected at Bonanza Bridge and Stewart Lake has been entered into a spreadsheet for analysis. Flow information and drift net set times have been entered for Thunder Ranch; however, some bead and larval fish information has not been entered due to the large amount of time required to process these samples. This information will be assimilated as soon as possible and analyzed for the final report.

Task 4: Report Preparation

Annual RIP Report (Nov 9, 2006) complete
Final report: Draft Final Report (March 2007)

VII. Recommendations:

- Release larger batches of larvae, preferably in equal numbers to beads released for any subsequent sampling effort (if possible)
- Evaluate breach connections and entrainment rates with releases one mile above other floodplains for razorback recovery (and make improvements to floodplains or breaches where necessary)
- Test entrainment during a longer duration peak flow (flow amounts would depend on the water year)
- Continue larval light trapping so we can eventually match the natural drift with entrainment studies/ideal flows
- Sample wetlands with drift nets and light traps to assess relative entrainment (ongoing as separate scope of work)
- Evaluate razorback sucker survival in the floodplains in the fall and subsequent spring (ongoing as separate scope of work)

VIII. Project Status:

On track and ongoing

IX. FY 2006 Budget Status

- A. Funds Provided: \$105,564
- B. Funds Expended: \$100,164
- C. Difference: \$5400
- D. Percent of the FY 2006 work completed, and projected costs to complete: 95%, \$5400
- E. Recovery Program funds spent for publication charges: \$ 0

X. Status of Data Submission: Data will be submitted at the completion of the study.

XI. Signed: Trina Hedrick 11/7/2006
Principal Investigator Date