COLORADO RIVER RECOVERY PROGRAM Project No.: C-6-rz-bt
FY-2004–2005 PROPOSED SCOPE OF WORK for:
(Larval razorback sucker and bonytail survival in Baeser)

Lead Agency: Utah Division of Wildlife Resources
Submitted by: Kevin Christopherson
Utah Division of Wildlife
Northeast Regional Office
152 East 100 North
Vernal, Utah 84078
435-789-3103/fax: 435-789-8343
E-mail: kevinchristopherson@utah.gov

Date: January 22, 2004 (2/9/04 by Pat Nelson)

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:

Evaluation of survival and growth of larval razorback sucker and bonytail stocked into floodplain depressions of the middle Green River.

II. Relationship to RIPRAP:

GREEN RIVER ACTION PLAN: MAINSTEM
II. Restore habitat.
II.A. Restore and manage flooded bottomland habitat.
II.A.3. Implement levee removal strategy at high-priority sites.
II.A.3.c. Evaluation.

III. Study Background/Rationale and Hypotheses:

Based on the assumption that floodplain wetlands provide critical rearing habitat for razorback sucker, the Recovery Program initiated an extensive floodplain habitat restoration program (Levee Removal Strategy) in 1996. The goal of the Levee Removal Strategy was to restore natural floodplain wetland habitats and functions that support the 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. As part of the Levee Removal Strategy, a study was designed to monitor native and nonnative fish utilization of floodplain wetlands. However, because there were very few razorback sucker reproducing in the system, answers to several important questions pertaining to razorback sucker utilization of the floodplain were not answered during the initial Levee

Removal studies. These questions were: 1) Can larval razorback sucker be entrained in the floodplain by lowering levees to improve the riverine-floodplain connection? 2) Can they be entrained at high enough numbers to ensure some survival from predation by nonnative fish and piscivorous insects? 3) Will razorback sucker survive, voluntarily migrate from the floodplain during high flows and recruit into the river population? 4) If so, what cues trigger migration from the floodplain? To help answer the latter three questions, a new scope-of-work was submitted and approved for fiscal years 1999–2001. The strategy for this study was to stock larval and juvenile razorback sucker into three floodplain depressions, then monitor growth, survival, and migration from the floodplain to the river.

During the first year of this study, 5,955 age-1 razorback sucker from the Ouray Hatchery were stocked into the Stirrup, Baeser Bend, and Above Brennan Levee-Removal sites (1,985 fish in each site). The Stirrup site also received 56,907 larval razorback sucker. During the first growing season in the floodplain, age-1 fish tripled in size (growing from 103 mm TL in April to 323 mm in October). Survival in October of the first year was estimated at 27 % in the Stirrup, 54 % in Baeser Bend, and 82 % in Above Brennan. In the spring of 2000, after one full year in the depressions, survival was estimated at 49 % in the Stirrup, 61 % in Baeser Bend, and 72 % in Above Brennan. However, survival of larval razorback sucker stocked in the Stirrup was not detected (UDWR work in progress).

On 12 April, 2000, an additional 2,511 age-1 razorback sucker were stocked into each of the three sites. No larval fish were received for stocking in 2000. Survival from this group of age-1 fish was not detected at Above Brennan and the Stirrup during late summer and fall sampling. In the Stirrup, age-1 fish that were stocked in 1999 appeared to have also died. Fish from the 1999 stocking were still alive in Above Brennan and they appeared quite healthy. Despite observance of a fish kill on 15 August at Baeser Bend, fish from both age groups were still present in the site. Because of deteriorating water quality conditions, the decision was made to move the fish from Baeser Bend to the river. A total of 514 fish was relocated to the river late in the summer of 2000 (UDWR work in progress). Razorback sucker in Above Brennan were left in the site and survived through the winter (2000–2001).

In 2002, a cooperative study by UDWR and Vernal FWS was conducted at the Stirrup floodplain depression. The study evaluated growth and survival of larval razorback sucker and bonytail stocked into the Stirrup, which had been "reset" due to an extended drought and the subsequent drying of the floodplain depression. The approach of this study was to fill the Stirrup depression by pumping water into the site, constructing enclosures to maintain tighter control of the experiment, and stocking these enclosures with nonnative fish species at densities that have been demonstrated to be present during the natural connection of the river with the floodplain depression. Larval razorback sucker were then stocked into the enclosures to evaluate growth and survival in the presence of abundant nonnative fishes. These larval razorback sucker were stocked into two enclosures at different densities. The highest density enclosure was stocked at a rate of 1.8 million larvae/acre and the lower density enclosure was stocked at a rate of approximately 241,000 larvae/acre. The subsequent evaluation of larval survival and

growth revealed that several thousand larval razorback sucker survived in the presence of abundant nonnative species (Table 3.). Furthermore, growth rates of the surviving larvae were excellent, averaging 140 mm at the end of the first growing season.

To continue building on the successes of these studies, we propose evaluating survival at lower stocking densities to identify the lower stocking threshold needed to enable detection of surviving larvae; and to determine if larval survival and growth rates differ among sites (e.g. the Stirrup)**.** The results of this investigation will have site-management implications and will aid in identifying the number of spawning female razorback sucker needed in the middle Green River population to allow some level of survival and potential recruitment of naturally spawned larvae. We also propose evaluating the potential influences of stocking larval bonytail in conjunction with larval razorback sucker in an environment containing nonnative predators. This evaluation will take place in "reset" floodplain depressions and potentially with a natural connection and re-invasion of nonnative fishes. The drought has resulted in a complete fish kill in the Baeser floodplain depression. This has "reset" the site so that larval endangered fish stocked into the sites will not be faced with overwhelming populations of nonnative fish established in these sites. This should increase the chance of surviving predation.

Hypothesis statement:

Survival and growth of razorback sucker and bonytail larvae in the presence of nonnative predators following "reset"of floodplain depressions is density dependent.

IV. Study Goals, Objectives, End Product:

Study Goal

Provide an estimate of the density of larval razorback sucker and bonytail necessary to survive predation in a "reset" floodplain. Also, evaluate survival and growth of stocked larval razorback sucker and bonytail in "reset" floodplain depressions of the middle Green River.

Objectives:

1. Evaluate survival and growth of larval razorback sucker in the presence of nonnative predators by stocking larvae into experimental enclosures at four stocking densities.

2. Evaluate survival and growth of larval razorback sucker and bonytail in the presence of nonnative predators by stocking together at equal densities into experimental enclosures.

End Product

A report describing larval razorback sucker and bonytail growth and survival in "reset"

floodplain depressions when stocked at different densities. This information will assist in developing management actions to increase the number of razorback sucker larvae that can survive predation and ultimately lead to species recovery.

Draft report to coordinator 15 March 2005; to peer review and Biology Committee 15 April 2005; final draft to Biology Committee 1 July 2005.

V. Study area:

Baeser (RM 273.0) floodplain depression of the middle Green River.

VI. Study Methods/Approach:

Steps 1 & 2. Stock larval razorback sucker, bonytail, and nonnative fishes in selected floodplain depressions. (May 2003 and 2004)

Larval razorback sucker and bonytail will be stocked into the Baeser Bend floodplain depression. Razorback sucker larvae will be stocked into twelve enclosures within one week of hatching in order to match the size and age of larvae that would naturally be transported to the floodplain. Enclosures will be used to more tightly control the experiment, evaluate growth and survival at different stocking densities, and ensure a more complete sampling of the fish at the end of the study. The twelve enclosures will be approximately 1/8-acre each. Razorback sucker larvae will be stocked in the enclosures at four densities and there will be two replications of each density. Two enclosures will serve as controls and will be stocked at the lowest density of larval razorback sucker but will not be stocked with nonnative species. Two enclosures will be stocked with razorback sucker and bonytail larvae at a rate of 4,000 larvae/acre each. This will test possible interactions of stocking bonytail larvae in conjunction with razorback sucker larvae. If spring flows do not connect the river to the floodplain, water will be pumped into the site to simulate river connection.

a. During 2004, razorback sucker larvae will be stocked into eight treatment enclosures at rates of 800/acre; 1,600/acre; 4,000/acre; and 32,000/acre (Table 2).

b. Stock razorback sucker larvae into two control enclosures at a rate of 4,000/acre.

c. Stock razorback sucker and bonytail larvae together into two treatment enclosures at a rate of 4,000/acre for each species.

d. Nonnative fishes will be introduced into the ten treatment enclosures (including the two razorback sucker/bonytail enclosures) at densities and species assemblages consistent with adult assemblages found during spring 1999 Levee Removal studies (Tables 2 and 3). Nonnative fishes will not be introduced into the two control enclosures.

Step 3. Monitor stocked fish (May–October 2004)

Growth and survival of stocked larval razorback sucker and bonytail will be monitored monthly, as will the relative abundance of sympatric species.

a. Water quality at the site will be monitored in 24-hour blocks, one or two times per week. Parameters to be checked include temperature, D.O., pH, depth, and water clarity. If water quality degrades, fresh water will be pumped into the site from the river.

b. Zooplankton samples will be collected weekly both within and outside of the enclosures.

c. Fish will be visually monitored at least two times a week.

d. Evaluation of growth and survival of stocked larvae will be completed by the end of July. Depletion estimation, using fyke nets set over night, will be used to estimate survival of stocked larvae and evaluate relative densities of sympatric species. Razorback sucker and bonytail will then be moved out of the enclosures and released into the main wetland.

e. Additional sampling will be conducted in the main wetland in early October to determine average growth of razorback sucker and bonytail during the first growing season. This sampling will also serve to continue survival estimates.

VII. Task Description and Schedule:

Task 1: Construct and install enclosures

April 2004 (maintenance)

Task 2: Stock razorback sucker and bonytail larvae and nonnative fishes into enclosures

May 2004

Task 3: Field Data Collection

May–October 2004

Task 4: Data entry and analysis

October–November 2004

Task 5: Report Preparation

Annual RIP Report (November 2004)
Draft report to coordinator 15 March 2005; to peer review and Biology Committee 15 April 2005; final draft to Biology Committee 1 July 2005.

VIII FY-2004 Work

1. Deliverables/due dates: Annual Report November 2004
2. Budget:

Task 1: Maintenance of enclosures (April)

Labor-	Work days	Cost
Project Leader ($405/day)	1	405
Biologist ($315/day)	1	315
Technician ($180/day)	15	2,700
Travel ($35/day/truck)	5	175
Materials (canvas dam tarp, lath and rebar; see Table1)[a]		2,200
Equipment (tools and maintenance)[b]		200
Task Subtotal		5,995

[a] Tarp is attached to the fence and is destroyed each season when removed to allow water exchange. New lath and additional rebar is needed to fasten and anchor tarp.

[b] Maintenance, repair, and or replacement as needed for existing equipment (e.g. power tools, power equipment, etc.)

Table 1. Description, quantity, and cost of materials needed for maintenance of 12 - 1/8 acre enclosures in 2004.

Description	Quantity	Cost
4' Lath ($16.20/40)	1200	500
canvas dam tarp	4800'	1,500
re-bar anchor	1000'	200
misc. fasteners (hog rings, staples, tie wire etc.)		200
Total		2,400

Task 2: Stock larval and nonnative fish: (May)

Labor-	Work days	Cost
Project Leader (405/day)	2	810
Biologist (315/day)	3	945
Technician (180/day)	3	540
Travel ($35/day/truck)	3	105
Task Subtotal		2,400

Task 3: Field Data Collection (May - October)

Note: For justification of cost see “step 3 monitoring stocked fish” on page 5.

Labor-	Work days	Cost
Project Leader (405/day)	10	4,050
Biologist (315/day)	50	15,750
Technician (180/day)	100	18,000
Travel ($35/day/truck)	60	2,100
Equipment & materials [a]		3,500
Task Subtotal		43,400

[a] Maintenance, repair, and/or replacement of several fyke nets, dip nets etc.

Task 4: Data Entry and Analysis (October - November)

Labor-	Work days	Cost
Project Leader (405/day)	5	2,025
Biologist (315/day)	10	3,150
Technician (180/day)	10	1,800
Task Subtotal		6,975

Task 5: Report Preparation (November)

Labor-	Work days	Cost
Project Leader (405/day)	3	1,215
Biologist (315/day)	4	1,260
Technician (180/day)		0
Task Subtotal		2,475
FY 2004 Total		61,245

FY - 2005 Work:

1. Deliverables/due dates: Draft report to coordinator 15 March 2005; to peer review and Biology Committee 15 April 2005; final draft to Biology Committee 1 July 2005.

2. Budget:

Task 1: Report Preparation (February - July)

Labor-	Work days	Cost
Project Leader (405/day)	20	8,100
Biologist (315/day)	10	3,150
Technician (180/day)		0
Travel		600
Materials		100
Task Subtotal		11,950
FY 2005 Total		11,950

IX. Budget Summary

FY-2004	61,245
FY-2005	11,950
Total	73,195

X. Reviewers - Biology Committee

Table 2. Number of larval razorback sucker, bonytail, and nonnative species to be stocked into 1/8-acre enclosures in 2003.

	Stocking Rate (1/8 acre enclosures)							
Number to Stock	**Control 4k/acre**	**RZ/BT 4k/acre**	**4k /acre**	**8k /acre**	**16k /acre**	**32k /acre**	**Total**	**Total w/ replication**
Razorback sucker	500	500	500	1,000	2,000	4,000	8,500	17,000
Bonytail		500					500	1,000
Total	500	1,000	500	1,000	2,000	4,000	9,000	18,000
Nonnative Predators								
Fathead minnow	none	38	38	38	38	38	190	380
Red shiner	none	21	21	21	21	21	105	210
Black bullhead	none	8	8	8	8	8	40	80
Green sunfish	none	12	12	12	12	12	60	120
Carp	none	2	2	2	2	2	10	20
Total	none	81	81	81	81	81	405	810

Table 3. Summary of stocking and capture data for larval razorback suckers and bonytail stocked into the Stirrup site during spring 2002.

Number of fish stocked	Low Density[a]	High Density[b]	Control	Outside
Razorback sucker	60,373	457,193	1,000	0
Bonytail	21,250	45,000	5,250	0
Total	81,623	502,193	6,250	0
Fathead minnow	75	81	0	0
Red shiner	42	37	0	0
Black bullhead	16	15	0	0
Green sunfish	12	18	0	0
Carp	4	3	0	0
Total	149	154	0	0
Native fish capture data				
# razorbacks captured	359	1,709	118	268
Population estimate (#)	403	1,622	118	1,363
95 % confidence (#)	+137	+ 445	N.A.	± 884
Average length (mm)	69.5	58	68.7	90.4
Length Range (mm)	43 – 106	36 – 83	34 – 115	70 – 105
Nonnative capture data				
Grams captured	25,059	20,350	N.A.	34,960
Population estimate (g)	28,396	19,954	N.A.	Unavailable
95 % confidence (g)	± 1,374	+ 5,041	N.A.	Unavailable
Number Captured				
Green Sunfish	18,419	14,909	54	3,478
Fathead minnow	11,939	7,779	22	6,080
Black bullhead	3,425	4,000	0	1,677
Red shiners	91	75	4	13
Total	33,874	26,763	80	11,248

[a] Low density stocking rate of razorback sucker larvae was 241,492 larvae/acre and the bonytail larvae stocking rate was 85,000 larvae/acre.

[b] High density stocking rate of razorback sucker larvae was 1.8 million larvae/acre and the bonytail larvae stocking rate was 180,000 larvae/acre.

XI. References

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

Utah Division of Wildlife Resources. 2003. Investigation of larval and juvenile razorback sucker survival to recruitment in floodplain depressions in the presence of non-native fishes. Draft report of Utah Division of Wildlife Resources to Upper Colorado River Endangered Fish Recovery Program, Denver, CO.