

- I. Project Title: A Five-Year Experimental Stocking Plan to Evaluate Survival of Various Sizes of Razorback Sucker
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- III. Project Summary:

The study goal is to 1) evaluate the relation between survival of captive-reared razorback sucker and size at release into the river, and 2) reintroduce razorback sucker in the Gunnison River that will result in 10 adult fish per river mile in suitable riverine habitat. The target is re-establish a population of about 600 adult razorback sucker from Austin, Colorado, downstream 68 river miles to the confluence with the Colorado River. Specific objectives include determining 1) the relationship between various sizes (4-, 8-, and 12-inch) of razorback sucker stocked and their subsequent survival in the wild, and 2) dispersal of stocked fish following release over time. Ultimately, the optimum size(s) of razorback sucker to be stocked into Upper Colorado River Basin rivers will be recommended.

To date, 7,735 juvenile, sub-adult, and adult razorback sucker have been stocked into the Gunnison River between April 1994 and November 1999 and 3,518 juvenile and adult razorback sucker have been in the Upper Colorado River between April 1994 and October 1999.

To date, 65 razorback sucker stocked in the Gunnison and Colorado rivers have either been captured (59) from sampling or have been found dead (6) during other research sampling efforts. An additional 72 razorback sucker were found dead on the upstream trash grates at the Redlands Dam fish passageway in 1999. Fish dispersement following stocking has been predominantly downstream of the release site indicating that hatchery-produced razorback suckers are extremely susceptible to downstream drift.
- IV. Study Schedule:
 - a. initial year: 1996
 - b. final year: 2001
- V. Relationship to RIPRAP:
 - A. Colorado River Action Plan: Mainstem and Gunnison River:
 - IV.A.1.a. Develop experimental augmentation [stocking] plan and seek Program acceptance.
- VI. Accomplishment of FY 99 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

A. FY-99 Tasks and Deliverables: Tasks 1-3:

Task 1. Stock three groups of fish.

Task completed: three size groups stocked (8- to 12-inch razorback suckers).

Task 2. Sample Gunnison and Colorado rivers for stocked fish using various gear types.

Task completed.

Task 3. Analyze and evaluate data; prepare annual progress report.

Task completed.

B. Findings

1999--Stocking

A total of 30 F₁ broodfish razorback sucker were stocked in the Gunnison River (river mile 57) 10 May during 1999. An additional 2,742 juvenile razorback sucker were stocked on eight different dates between 3 August and 4 November. Three-thousand, four-hundred ninety-eight juvenile razorbacks were released on five different dates between 20 September and 29 October in the Upper Colorado River upstream from Parachute, Colorado, at river mile 227 (Table 1).

1999--Monitoring

Four days each were expended between 26 and 29 July and 13 and 14 September 1999 sampling the Gunnison River from Confluence Park (river mile 57) to Redlands Diversion Dam (river mile 3) with two electrofishing craft to locate razorback sucker that had been previously stocked in 1995, 1996, 1997, 1998, and May 1999. Four razorback sucker were found during these surveys. Three other stocked razorback sucker were captured alive during other survey during spring and early-summer--two in the Colorado River and one in the plunge pool of the Redlands Diversion Dam on the lower Gunnison River (Table 2). One razorback sucker was found dead by a Service contaminant biologist in the Colorado River at river mile 161 in June. Seventy-two razorback sucker were found either dead or dying on the upstream trash grates at the Redlands Dam fish passageway from 6 August to 5 October 1999. All of these fish were from the razorback sucker stocked during the five dates in August 1999 in the Gunnison River at river mile 57.

In the fall of 1999, 14 juvenile razorback sucker stocked in the Upper Colorado River upstream of Parachute, Colorado (river mile 227), were captured considerable distances downstream of the release point. Nine of these fish were captured in the 15-mile reach by personnel from the Colorado Division of Wildlife and Fish and Wildlife Service. Four razorback sucker were captured in the 18-mile reach and one fish about 1-mile upstream of Black Rocks in Ruby Canyon.

Table 1. Number and length and weight statistics of razorback sucker stocked into the Gunnison and Colorado rivers, May, August, September, October, and November 1999. Note: for juvenile fish stocked, all fish were measured for total length but only one out of every four fish were weighed.

Stocking River	Location River Mile	Date Stocked; Source	Number of Fish Stocked	Total Length (mm)		Weight (g)		
				Mean	Range	Mean	Range	
Gunnison	57	10 May	30	---	---	985	600-1,300	
		3 August	289	190	127-271	61	29- 125	
		4 August	150	196	153-275	69	34- 181	
		5 August	703	174	128-275	50	20- 180	
		6 August	322	173	145-246	50	26- 136	
		10 August	268	172	146-235	48	26- 123	
		8 September	224	185	136-278	63	23- 121	
		9 September	211	178	134-251	51	25- 137	
		10 September	120	173	132-247	51	27- 147	
		4 November						
			Clymer's Pond	455	211	29-282	93	21- 203
		subtotal		2,772	---	---	--	---
		Colorado	227	20,22 September	1,539	169	111-283	44
24 September	430			200	117-310	79	16- 263	
Colorado	227	26 October						
		29 Rd Pond	707	174	117-246	52	23- 122	
		Clymer's Pond	53	210	148-281	88	48- 143	
		29 October						
	Dike Rd Pond	723	154	106-286	36	13- 202		
	Clymer's Pond	46	211	156-265	110	60- 179		
subtotal		3,498	---	---	--	---		
1999 TOTALS		6,270	---	---	--	---		

Past Years Stocking

A total of 316, 4-6-inch pond-reared razorback sucker was stocked on 13 October 1995 at river mile 59.3 in the Gunnison River. In October 1996, a total of 282, 11-16-inch razorback sucker was stocked 4 October 1996 at river mile 57.0 in the Gunnison River. In 1997, a total of 3,732 razorback sucker was stocked in the Gunnison River at river mile 57 on nine different dates from three different sources between 12 September and 14 October. The total number, size, and number of lots of razorback sucker stocked from each of these sources were: 24-Road Hatchery (2,147 4-12-inch; 7 lots), Clymer's Pond (1,294, 4-13-inch; 6 lots), and Wahweap Pond near Wahweap, Utah (291, 15-inch; 14 lots).

In 1998, 608 juvenile and sub-adult razorback sucker were stocked in the Gunnison River near Delta, Colorado.

To date, 7,735 juvenile, sub-adult, and adult razorback sucker have been stocked into the Gunnison River between April 1994 and November 1999 (Table 3). In September and October 1999, 3,498 juvenile razorback sucker were stocked in the Upper Colorado River upstream from Parachute, Colorado (river mile 227). In addition to 20 adult razorback suckers that were stocked in the Upper Colorado River in April 1994, this marks the first juvenile

Table 2. Summary statistics of razorback sucker stocked in the Gunnison River, 1996, 1997, 1998, and 1999 and Upper Colorado River, 1999, that were subsequently captured

during 1999. Note: RM=river miles.

Month/Year Stocked	Year Class & Lot No.	Total Length (mm)		River	Capture		Displacement (RM) From Stocking Site	
		@ Release	@ Capture		RM	Date	Upstream	Downstream
10/96	95-2A	377	416	CO	168.0	990330		60.
09/97	9520	399	420	GU	2.9	990510		54.
09/97	9601A	327	368	CO	161.0	990610		67.
10/98	9519	440	457	CO	152.7	990713		75.
10/98	9511	453	455	GU	53.1	990726		3.
10/98	9520	417	439	GU	27.9	990914		29.
10/98	9511	412	405	GU	6.8	990916		50.
10/98	9513	439	453	GU	4.9	990916		52.
09/99	9803/9804	174	176	CO	175.6	991019		51.
09/99	9803/9804	150	156	CO	179.1	991020		47.
09/99	9803/9804	204	214	CO	158.3	991021		68.
09/99	9803/9804	174	182	CO	153.5	991025		73.
09/99	9803/9804	137	174	CO	154.3	991026		72.
09/99	9803/9804	163	162	CO	154.3	991026		72.
09/99	9803/9804	158	167	CO	138.9	991029		88.
09/99	9803/9804	???	165	CO	175.5	991005		51.
09/99	9803/9804	174	174	CO	175.2	991008		51.
09/09	9803/9804	147	150	CO	176.2	991006		51.
09/09	9803/9804	179	178	CO	175.5	991008		51.
09/09	9803/9804	184	185	CO	175.5	991008		51.
09/09	9803/9804	165	170	CO	175.5	991008		51.
09/09	9803/9804	???	202	CO	175.5	991008		51.

^a Mortality: found by federal sampling crews

razorback sucker stocked in this stream reach. All razorback suckers stocked in both rivers were PIT tagged (Table 3).

To date, 65 razorback sucker stocked in the Gunnison and Colorado rivers have either been captured (59) from sampling or have been found dead (6) during other research sampling efforts. In 1999, 22 razorback sucker stocked in the Gunnison and Colorado rivers were either captured (21) or were found dead (1). An additional 72 razorback sucker were found dead on the trash grates at the Redlands fish passageway in 1999. Fish dispersment following stocking has been predominantly downstream of the release site. In 1999, the furthest downstream dispersment by a stocked razorback sucker was 88 miles from the stocking point. This fish was found in the Colorado River at river mile 138.9 in late-October.

Four recaptured razorback sucker have been from lots produced in 1992, 23 from lots in 1995, 14 from lots in 1996, 4 from 1997, and 15 from 1998. A total of eight razorback sucker have been positively sighted but not netted, three in 1996, four in 1997, and one in 1998. None of the 316, 4- to 6-inch, juvenile razorback sucker stocked in 1995 or 2,287 juvenile razorback sucker stocked in the Gunnison River during August and September 1999. Table 3. Projected number of fish by size group needed to evaluate the relation between survival of razorback sucker and size at release into the river, FY96 through FY2000 and actual

numbers of razorback sucker stocked, 1996 through 1999 in the Gunnison and Colorado rivers, Colorado.

Year	Stocking Location	Mean Size of Fish	Number of Fish ^a	Actual Number of Fish Stocked
Prior to FY96	Gunnison River	18-21-inch	---	25
	Colorado River	18-21-inch	---	20
FY96	Gunnison River near Delta	4-inch ^b	10,000 ^c	316
		8-inch	2,500	
		12-inch	600	
FY97	Gunnison River near Delta	4-inch	10,000	3,732
		8-inch	2,500	
		12-inch	600	
FY98 ^d	Gunnison River near Delta	4-inch	20,000	608
		8-inch	5,000	
		12-inch	1,200	
FY99	Gunnison River near Delta	4-inch	30,000	2,742
		8-inch	7,500	
		12-inch	1,800	
FY99	Colorado River near Parachute	4-inch	30,000	3,498
		8-inch	7,500	
		12-inch	1,800	
FY2000	Gunnison River near Delta	4-inch	40,000	
		8-inch	10,000	
		12-inch	2,400	

^a Number of fish may have to be adjusted depending upon the number of fish produced from pair matings, survival to stocking, and available rearing space

^b Minimum size of razorback sucker that can be safely PIT tagged

^c Numbers determined from a 75:20:5 ratio

^d Additional propagation facilities available in FY98 allowed increased production

1999 have subsequently been collected alive during followup monitoring during other sampling programs in the Upper Colorado or Gunnison rivers.

For razorback sucker that have been at large at least six months following stocking, the 250-499 mm size class represents the majority (40; 89%) of razorback sucker recaptured alive (Table 4). Fish between 350 and 450 represent 53% of these razorback sucker recaptured. At release, 78% of these same fish were represented from the 300-449 mm size class; 18% were from the 200-299 class and 11% from the 400-499 size class. Thirty-seven percent of the total number of razorback sucker stocked in the Gunnison and Colorado rivers from April 1994 to October 1998 were represented from the 250-499 mm size class. These numbers include the 45 razorback suckers collected from Etter Pond, implanted with radiotransmitters, and stocked in the Gunnison and Upper Colorado rivers in April 1994.

Although data has not been examined to determine if stocking date (i. e., spring vs. summer vs. fall), influences post-stocking survival, preliminary results from razorback sucker captured in the Upper Colorado and Gunnison rivers following stocking

strongly suggest that survival is related to the size of fish stocked. Razorback sucker stocked at sizes greater than 250-300 mm appear to have better short-term survival following release in the river than smaller fish stocked (< 250 mm).

For comparison, similar results have been obtained in the San Juan River where various sizes of razorback sucker have also been stocked. The 300-450 mm size class represented 88% of the total number of stocked razorback sucker recaptured. This is even more significant when only 11% of the total number of razorback sucker stocked (5,103) prior to June 1999 were represented by this 300-450 mm size class (personal communication, Dale Ryden).

Table 4. Number and percentage of stocked razorback sucker by size classes (total length, mm) that have been at large for at least six months following release in the Gunnison and Colorado rivers and were captured alive. Note: the 1999 stocking of razorback suckers in the Upper Colorado and Gunnison rivers are not included below.

Size Class Total Length (mm)	Percent of the Total Number of Fish Stocked Apr. 1994-Oct. 1998	Of 45 RZ's Stocked and Later Recaptured			
		Size at Release		Size at Capture	
		Number	Percentage	Number	Percent
< 100	3.6	0	0.0	0	0.0
100-149	10.8	0	0.0	0	0.0
150-199	25.2	1	2.2	1	2.2
200-249	23.2	5	11.1	3	6.7
250-299	11.2	3	6.7	5	11.1
300-349	8.9	11	24.4	7	15.6
350-399	12.9	20	44.4	12	26.7
400-449	2.5	4	8.9	12	26.7
450-499 ^a	1.1	1	2.2	4	8.9
500-549 ^a	0.6	0	0.0	1	2.2
550-599	0.0	0	0.0	0	0.0
> 600	0.0	0	0.0	0	0.0
Total	100.0	45	100.0	45	100.0

^a includes fish collected from Etter Pond in April 1994, implanted with radiotransmitters and stocked into the Upper Colorado and Gunnison rivers.

This 5-year monitoring study is nearly complete and the data collected to date strongly suggest that stocking razorback sucker smaller than 250 mm may be futile because their post-release survival in the river has been poor. In light of these new data the strategy may be to not stock razorback sucker in the river until they reach a minimum size of 250-300 mm.

Continued followup sampling to monitor the movement and long-term survival of stocked razorback sucker is critical to formulating sound recommendations to assist recovery of this species and providing direction and guidance for future propagation and stocking programs in the Upper Basin. Post-stocking sampling and monitoring will continue to collect data on dispersal and size of captured razorback suckers. These data will provide information for determining the relation between long-term survival of captive-reared razorback sucker and size at release into the river. This will ultimately help recommend the optimum size(s) of razorback sucker to be stocked into Upper Colorado River Basin.

rivers.

VII. Recommendations:

- A. During the summer and early fall of FY2000, continue to sample in the Gunnison and Colorado rivers for razorback sucker stocked from 1995 to 1999 and any razorback sucker stocked in 2000. Document all recaptures of stocked razorback sucker collected during other river studies.
- B. Stock razorback sucker in the river at a minimum of 250-300 mm.

VIII. Project Status:

- A. Juvenile and sub-adult razorback sucker were stocked during October 1995 and 1996, September and October 1997, June and September 1998, August, September, October, and November 1999 in the Gunnison River, respectively. Adult-size razorback sucker were stocked in the Gunnison River late-October 1998 and May 1999. Juvenile razorback sucker were stocked in the Upper Colorado River in September and October 1999. Monitoring to determine immediate and long-term dispersal of fish following stocking was conducted during the fall of 1995 and 1996, spring of 1996, and summer and fall of both 1997, 1998, and 1999.
- B. Project is ongoing and is "on-track".

IX. FY 99 Budget

- A. Funds Provided: \$47,000
- B. Funds Expended: \$47,000
- C. Difference: \$ 0
- D. Status of Work--Percent of Work Completed (if BR-funded project)
100% Completed.
- E. Publication Costs: \$ 0

X. Status of Data Submission:

Records of all PIT-tagged razorback sucker stocked in 1995, 1996, 1997, 1998, and 1999 have been computerized and are available from the UCRB database manager in Grand Junction, Colorado. Records of stocked razorback sucker that have been subsequently captured during followup monitoring have also been computerized.

XI. Signed: Bob D. Burdick
Principal Investigator

99/12/03
Date

APPENDIX:

- A. More comprehensive/final project reports. If distributed previously, simply reference the document or report.

Burdick, B. D., R. S. Wydoski, and C. W. McAda. 1995. Stocking plan for razorback sucker in the Upper Colorado and Gunnison rivers. Final report prepared for the Recovery Implementation Program for the Endangered Fishes of the Upper Colorado River Basin, U. S. Fish and Wildlife Service. Denver, Colorado. 13 pp.

Burdick, B. D., and R. B. Bonar. 1997. Experimental stocking of adult razorback sucker in the Upper Colorado and Gunnison rivers. Final Report prepared for the Recovery Implementation Program for the Endangered Fishes of the Upper Colorado River Basin, U. S. Fish and Wildlife Service. Denver, Colorado. 28 pp. + Appendices.

Prepared and compiled by Bob D. Burdick, 99/12/03
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