

AUGMENTATION OF THE SAN JUAN RIVER RAZORBACK SUCKER POPULATION: 2008

Interim Progress Final Report



Photo by Ferlin Begaye, NNDFW

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EXECUTIVE SUMMARY

- 58,916 razorback sucker stocked into the San Juan River from 1994-2008
 - 41,629 (70.6%) of these stocked in 2006 and 2007

- 4,444 were stocked in 2008 (7.5% of total stocked, 1994-2008)
 - 39% of 2008 stocking request for 11,400 razorback met
 - 2,393 fish harvested from Hidden Pond
 - 558 stocked at Shiprock Bridge August 19-22 (Passive Harvest)
 - Mean TL = 287 mm (range 225-390 mm)
 - 1,835 stocked at river mile 166.6 on November 13 (Active Harvest)
 - Mean TL = 307 mm (range 236-388 mm)
 - 68% return from original 3,500 stocked
 - 2,051 fish stocked from Dexter NFH&TC
 - Stocked at river mile 158.6 on October 9
 - Fish originally intended for West Avocet
 - Target stocking size of = 300 mm total length
 - East and West Avocet not used for grow-out in 2008

- Uvalde NFH unable to deliver 11,400 razorback sucker requested in 2008
 - 2007 Largemouth Bass Virus (LMBV) detected in Guadalupe bass
 - not found in any other species held on station
 - Station depopulated of Guadalupe bass February 8, 2008
 - 2008 negative for LMBV; if negative in 2009, Uvalde NFH re-certified Class A

- 2009
 - Uvalde NFH to deliver 11,400 razorback to meet fall 2009 SJRIP stocking request
 - Dexter NFH&TC to stock Hidden Pond, East and West Avocet with approximately 10,500 200 mm razorback sucker in spring
 - Fish harvested from ponds in fall will compliment 11,400 stocking target
 - First year with new production/stocking protocols in full operation
 - Suggested beginning of 8 year augmentation effort

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INTRODUCTION

Razorback sucker (*Xyrauchen texanus*), is one of three San Juan River native fish species, along with the Colorado pikeminnow (*Ptychocheilus lucius*) and the roundtail chub (*Gila robusta*), that have become greatly reduced in numbers and range since the mid 1900's (Bestgen 1990, Minckley 1973). Physical alterations of riverine habitats, water impoundment in the form of Navajo Reservoir and Lake Powell and their associated effects on flow and thermal regimes, introduction of non-native fish species, and contaminants may have contributed to the decline of these native species (Platania 1990, Brooks et al. 1993, Ryden and Pfeifer 1994a). Razorback sucker was listed as endangered under Endangered Species Act on November 22, 1991 due to diminished numbers and lack of recruitment of this species in the wild (U.S. Fish and Wildlife Service {USFWS} 1991). The razorback sucker is currently protected by state laws in Arizona, California, Colorado, Nevada, New Mexico, Utah, and by the Navajo Nation.

One of the two goals of the San Juan River Recovery Implementation Program (SJRIP) is to protect and recover endangered fishes in the San Juan River Basin with the ultimate goal of establishing self-sustaining populations of razorback sucker and Colorado pikeminnow (SJRIP 1995). Due to the paucity of historic collections of this species, including the failure to collect any wild razorback sucker during three years (1991-1993) of intensive studies on all life stages of the San Juan River fish community (Buntjer et al. 1993, 1994, Lashmett 1993, 1994, Ryden and Pfeifer 1993, 1994b, Gido and Propst 1994) the SJRIP's Biology Committee (BC) initiated an experimental stocking program for razorback sucker in the San Juan River (Ryden and Pfeifer 1994a). Experimental stocking was implemented to provide needed insight about recovery potential and habitat suitability for the razorback sucker in the San Juan River between river mile (RM) 158.6 at the Hogback Diversion structure, NM and Lake Powell, UT (i.e., the area designated as Critical Habitat for razorback sucker) (Maddux et al. 1993, USFWS 1994).

Between March 1994 and October 1996, 942 razorback sucker were stocked into the San Juan River at four stocking sites (RM 158.6, 136.6, 117.5, and 79.6). Data gathered on these fish identified habitat types being used year-round by razorback sucker in the San Juan River, and

provided information on movements, survival, and growth rates. Based on the successes of the experimental stocking study, a full-scale augmentation effort for razorback sucker in the San Juan River was initiated by the SJRIP in 1997 (Ryden 2003b).

In 1997 a *Five-Year Augmentation Plan For Razorback Sucker In The San Juan River* was completed (Ryden 1997). This plan identified a target population of 15,900 razorback sucker in the San Juan River between Hogback Diversion (RM 158.6) and Lake Powell (RM 0.0). In order to meet this target population, it was estimated that 73,482 razorback sucker would have to be stocked between 1997 and 2001. To meet that objective stocking of razorback sucker began in September 1997. Between September 1997 and November 2001, a total of 5,890 razorback sucker were stocked into the San Juan River, with all stockings taking place at RM 158.6. This represented a 92.0% shortfall ($n = 67,592$ fish) compared to the target stocking numbers specified in the 1997 augmentation plan.

Despite this shortfall, useful recapture data was collected on the relatively low numbers of razorback sucker stocked. First, razorback sucker were recaptured during every spring and fall fish community monitoring trip from 1997-2001 (Ryden 2001). Second, aggregations of spawning adults were collected in the spring of 1997, 1999, and 2001 at RM 100.2 (McElmo Creek) just downstream of Aneth, UT (Ryden 2001, 2003a). Lastly, larval razorback sucker have been collected every year since 1998 (Brandenburg and Farrington 2008, H. Brandenburg and M. Farrington pers. comm.). Although larval razorback sucker have been collected for the last 11 years, documented recruitment to juvenile life stages has been limited (Ryden 2008).

Based on these observations, the SJRIP-BC extended the augmentation effort for razorback sucker. *An Augmentation Plan For Razorback Sucker In The San Juan River: An addendum to the five-year augmentation plan for razorback sucker in the San Juan River* was completed in February 2003 (Ryden 2003b). This addendum outlines an additional eight-year augmentation period for razorback sucker. This eight-year augmentation period was scheduled to begin in 2004 and continue through 2011. Between 2004 and 2007, 46,613 razorback sucker were stocked with 41,629 (89.3%) of those stocked in 2006 and 2007. The large number of fish stocked in those years was attributable to the harvest of all razorback sucker from the Navajo

Agricultural Products Industry (NAPI) ponds in preparation for the ponds referred to as the “Six-Pack ponds” being taken out of production and for the institution of a single cohort strategy in East Avocet, West Avocet, and Hidden Pond. Many of the fish were under the target size of =300 mm (2006 mean TL = 265 mm (range of 68-537 mm), 2007 mean TL = 268 mm (range of 110-573 mm) and due to complicating factors during harvesting roughly 25% of those fish were stocked without PIT tags.

In response to challenges and changes in the augmentation strategy and several other mitigating circumstances, the timeline for beginning the eight-year augmentation effort has not been clearly defined (Ryden 2005). In lieu of this ambiguity, the razorback sucker stocking and augmentation efforts that occurred 2002-2008, for the purposes of this report, will be considered as interim efforts until consensus of the SJRIP-BC delineates the starting point of the eight year augmentation effort. This report provides an overview of the 2008 razorback sucker augmentation in the San Juan River.

Relationship To The Recovery Program

The main objective for augmentation was to restore a wild population of razorback sucker to appropriate historic habitat, with the eventual goal of recovering this species in the San Juan River (Ryden 1997, SJRIP 2008). Augmentation increases overall population numbers, provides opportunities for research (i.e., movement studies, habitat and spawning site preferences), adds genetic diversity to the existing gene pool, and continues the persistence of a spawning adult population. Subsequent data collection may identify factors limiting successful recruitment of this species in the San Juan River.

The San Juan River Long Range Plan (SJRIP 2008) identifies the need to assess the feasibility and implementation of razorback sucker augmentation. The revised augmentation plan (Ryden 2003b) and stocking plan and protocols for the NAPI ponds (Furr and Davis 2009) provides the necessary guidance for those efforts to fulfill Action 2.2.2 of the Long Range Plan. The requirements to artificially augment the San Juan River's razorback sucker population are specified in tasks 2.2.2.1-7 of the Long Range Plan (SJRIP 2008).

In February 2007, the SJRIP-BC mandated a switch in rearing strategies and management at the NAPI grow-out ponds, contracted Uvalde National Fish Hatchery (Uvalde NFH) to meet the yearly stocking requests of the SJRIP, and charged the USFWS's New Mexico Fish & Wildlife Conservation Office (NMFWCO) with San Juan River augmentation oversight.

Stocking of fish reared at USFWS hatcheries in the Southwest Region are subject to Regional Policy No. 03-06, "Stocking of fish and other aquatic species". This policy applies to production, transport, and stocking for USFWS hatchery production and incorporates guidance and requirements from USFWS Fish Health Policy (713 FWM 1-5), Policy for Controlled Propagation of Species Listed under the Endangered Species Act (Federal Register 65:183), and goals and objectives of the USFWS's Strategic Plan for the Fisheries Program. The USFWS's Fish and Wildlife Conservation Offices are the primary conduit for satisfaction of policy requirements and ensure compliance with needs relative to fish health, stocking requests and priorities, deviation from approved stocking requests, pre-stocking treatments (e.g. nonnative fish removal from stocking sites), and applicable environmental regulation. New Mexico FWCO is the pertinent field office for processing of SJRIP stocking requests.

In 2008, the stocking target of 11,400 =300 millimeter (mm) total length (TL) razorback sucker was to be met by Uvalde NFH. Fish harvested from 10,500 razorback sucker stocked by Dexter National Fish Hatchery & Technology Center (Dexter NFH&TC) into three NAPI grow out ponds would compliment this target. Due to the fish health certification process, Uvalde NFH was unable to move fish off station in 2008, and could not provide the 11,400 =300 mm razorback sucker requested. The NAPI pond East Avocet was scheduled for reconstruction projects and was not used in 2008. A seepage problem with West Avocet kept that NAPI pond out of production also. Dexter NFH&TC held the razorback sucker slated for grow-out in West Avocet on station for stocking directly into the San Juan River in fall 2008. Hidden Pond was the only NAPI grow-out pond utilized in 2008 and was stocked with 3,500 approximately 180 mm TL razorback sucker. Subsequent harvest and stocking of fish from Hidden Pond coupled with the stocking of the West Avocet fish held on station by Dexter NFH&TC constitute the entirety of razorback sucker stocked into the San Juan River in 2008.

Objectives for Augmentation Fiscal Year 2008

- 1) Obtain, rear, harvest, and stock razorback sucker in order to fulfill the tasks and objectives outlined in the current version of the razorback sucker augmentation plan addendum (*Ryden 2003b final*)
- 2) Create stocking plan and protocols for NAPI ponds (Furr and Davis 2009)

METHODS

Once water deliveries were available from NAPI canals, Hidden Pond was filled to capacity and allowed 3-4 weeks to establish phytoplankton productivity. Daily water quality was monitored by personnel from Navajo Nation Department of Fish and Wildlife (NNDFW) and NMFWCO. Aerators were run 24 hours/day to minimize dissolved oxygen concentration fluctuations. On April 30 Dexter NFH&TC stocked 3,500 approximately 180 mm TL razorback sucker into Hidden Pond. Water temperature was measured on pond transects bi-weekly to detect if a thermocline developed. Monthly sampling was conducted to calculate growth. Four to five fyke nets were set perpendicular to shoreline to capture a sample set of 50 razorback sucker. Water quality and temperature data along with growth measurements was analyzed to adjust feeding rates as follows:

- water temp = 70 F feed 3% Body Weight per day, Mon thru Fri
- water temp 60-69 F feed 2% Body Weight per day, Mon thru Fri
- water temp < 60 F feed 1.5% Body Weight per day, Mon thru Fri

Fish were fed Silver Cup Razorback grower 0301. Fish were not fed this supplemental diet for up to two weeks prior to any harvesting.

After 4 ½ months of grow-out passive harvest was conducted to collect, process, and stock as many fish as possible prior to the final draw down and active harvest. Fish were collected by fyke nets, placed in live wells, and transported to shore for processing. All fish were measured

for TL and implanted with a 134.2 kHz Passive Integrated Transponder (PIT) tag. A sub-set of 25-50 fish each day were also measured for weight (WT) to the nearest gram (g). Fish were transported in live hauling tanks provided by NNDFW and stocked in the San Juan River. Passively harvested fish were stocked at RM 147.9, immediately downstream of Shiprock Bridge. Passive harvest was conducted for as long as capture rates justified the effort involved.

Prior to active harvest, Hidden Pond was drained using its existing siphon until the only remaining water was in the kettle area. Further draw down of the kettle area was accomplished by use of a gas powered pump. Razorback sucker were collected by seine and transported via water-filled buckets to a 1,000 gallon portable holding tank oxygenated by airstones and compressed oxygen. Due to the number of fish collected and the limited amount of daylight, TL was measured for the first 381 fish processed. Fifty fish were also weighed to the nearest gram. All fish were implanted with a 134.2 kHz PIT tag, transported in live hauling tanks provided by NNDFW, and stocked in the San Juan River. Actively harvested fish were stocked at RM 166.6, immediately downstream of the Nenahnezad Fish Passage inlet channel. Passive and active harvest was a concerted effort between NNDFW, and the USFWS's Colorado River Fishery Project-Grand Junction and NMFWCO.

RESULTS

Monthly sampling to determine growth indicated that razorback sucker in Hidden Pond were approaching the target of ≈ 300 mm TL by early August and acquired a mean TL of 302 mm two months before active harvest was implemented (Table 1).

Table 1. Growth monitoring sampling results

Date	# Sampled	Range TL mm	Mean TL mm
May 28, 2008	47	140-250	185
June 12, 2008	50	180-270	226
July 9, 2008	50	190-300	238
July 25, 2008	50	220-310	261
August 8, 2008	50	230-330	285
September 10, 2008	28	250-385	294
September 11, 2008	14	257-332	302
October 10, 2008	34	244-351	306
October 24, 2008	30	240-365	301

Hidden Pond was passively harvested August 18-22, 2008. Over the course of four nights, 558 razorback sucker were collected by fyke nets. Numbers of fish declined with each subsequent night of sampling (Table 2). Mean TL of harvested fish was 287mm (range 225-390 mm) and mean WT was 232g (range 95-485g).

Table 2. Number of razorback sucker collected over the four net nights.

Date	# of razorback sucker	Mean TL	Range
August 18-19	220	288 mm	227-350 mm
August 19-20	146	289 mm	230-352 mm
August 20-21	124	290 mm	225-390 mm
August 21-22	68	288 mm	238-340 mm
TOTAL	558	287 mm	225-390 mm

Final harvest of Hidden Pond occurred on November 13, 2008. A total of 381 razorback sucker were measured for TL, 50 were also weighed. Mean TL was 307 mm (range 236-388 mm) and mean WT was 286g (range 140-450g). A total of 1,835 razorback sucker were harvested, all fish received a 134.2 kHz PIT tag. Twenty fish rejected the implanted PIT tag and could not be re-tagged. The final number of fish with PIT tags entered into the database was 1,815.

A total of 2,393 razorback sucker were stocked from Hidden Pond in the San Juan River in 2008. This constitutes a 68% return from the original 3,500 fish stocked into the pond. The razorback sucker passively harvested at 4 ½ months, 23.3% of total fish from Hidden Pond, averaged 287 mm TL. Fish actively harvested at 6 ½ months, 76.7% of total fish from Hidden Pond, averaged 307 mm TL. This represents an average total length increase of 20 mm in two months between passive and active harvest efforts. During passive harvest 34% of fish stocked met the target size of =300 mm TL (46.8% measured =290 mm); 58% of fish stocked from active harvest met the target size of =300 mm TL (75.8% measured =290 mm).

On October 9, Dexter NFH&TC personnel stocked 2,051 razorback sucker at RM 158.6, immediately downstream of the Hogback irrigation diversion in the return channel. These fish were to have been stocked in spring into West Avocet but remained on station after it was decided that pond would not be used for grow-out in 2008. Hatchery records indicate that fish were 298 mm TL, 1.82 fish/lb, and a total of 1,127 lbs stocked. All fish were implanted with a 134.2 kHz PIT tag.

A total of 4,444 razorback sucker were stocked into the San Juan River in 2008. The combined stockings from NAPI's Hidden Pond and Dexter NFH&TC resulted in a 61% shortfall for the 2008 stocking target. Three stocking localities were utilized for stockings in 2008.

DISCUSSION

Razorback sucker augmentation in the San Juan River for 2008 fell short of the 11,400 razorback sucker annual stocking target by 6,956 fish. However, with only a third of the NAPI ponds in use, 2,051 fish from Dexter NFH&TC, and none of the 11,400 fish from Uvalde NFH available, the SJRIP was still able to meet 39% of its stocking numbers goal.

It is expected that 2009 will meet or exceed the target of 11,400 =300 mm TL razorback sucker. Uvalde NFH is scheduled to undergo its annual fish health inspection in July 2009. Barring complications, they will provide in the fall 11,400 =300 mm TL razorback sucker needed to meet the 2009 stocking target. Moreover, any fish harvested from the ~10,500 razorback sucker

stocked into the NAPI ponds for grow-out will compliment the yearly stocking target. This being the case, it would be reasonable to designate 2009 as the beginning of the 8 year augmentation effort. This would carry the augmentation program through the year 2016.

With operation and management responsibilities for the NAPI ponds and augmentation oversight responsibilities changing hands, 2008 provided an excellent opportunity to develop the protocols for the single cohort grow-out strategy adopted by the SJRIP-BC. Once these protocols, as defined in Furr and Davis (2009), are finalized and accepted by the SJRIP they will be applied to all three NAPI ponds.

Passively harvesting fish reduces the overall number of fish that will have to be handled and processed during active harvest. This creates more manageable numbers of fish processed during the single day of active harvest and alleviates some of the fish stress by reducing time between collection, holding, processing, and stocking into the river. Future passive harvests will begin after approximately 5 ½ months of grow-out so fish can grow to the suggested =300 mm TL. If monthly growth monitoring determines fish are approaching a mean TL of 300 mm then passive harvest may begin earlier. Passive harvests will be conducted for longer lengths of time so a greater percentage of fish can be stocked out prior to active harvest.

Razorback sucker exhibit some degree of site fidelity (Davis and Furr 2007, 2008). Except for spawning associated movement, adult razorback sucker tend to be predominantly sedentary (Tyus 1987; Tyus and Karp 1990). Previous augmentation efforts routinely stocked fish at RM 158.6 (Hogback Diversion), the upper-most boundary of critical habitat. Data indicates that a majority of razorback sucker recaptures have occurred ± 10 miles of RM 158.6 (Davis and Furr 2007, 2008). If it is decided the eight year augmentation effort will occur between 2009 and 2016, continuing to only stock at RM 158.6 would result in over 91,200 razorback sucker stocked at a single location. We suggest that multiple stocking locations be utilized to reduce overcrowding and intraspecific competition within specific geomorphic reaches of the San Juan River.

As the affects of augmentation on the razorback sucker population, and on the San Juan River fish community as a whole, are better understood management decisions will invariably be reconfigured to address these new data. Due to the stochastic nature of the San Juan River an adaptive management approach can best respond to the myriad of issues that may arise over the next years of augmentation effort. We recommend that stocking protocols be evaluated annually and changes made to subsequent stockings and production protocols.

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Appendix A. Razorback sucker stocked into the San Juan River in 2008

<u>Date</u>	<u>Species</u>	<u>Year Class</u>	<u># of Fish</u>	<u>Mean TL mm</u>	<u># Tagged</u>	<u>Tag type</u>	<u>Location</u>	<u>Release Type</u>	<u>Source/Age</u>
8/19/2008	RBS	2006	220	287	220	PIT	147.9	Hard	NAPI age-2+
8/20/2008	RBS	2006	146	287	146	PIT	147.9	Hard	NAPI age-2+
8/21/2008	RBS	2006	124	287	124	PIT	147.9	Hard	NAPI age-2+
8/22/2008	RBS	2006	68	287	68	PIT	147.9	Hard	NAPI age-2+
10/9/2008	RBS	2006	2,051	298	2,051	PIT	158.6	Hard	Dexter age-2+
11/13/2008	RBS	2006	1,835	304	1,815*	PIT	166.6	Hard	NAPI age-2+
2008 RBS Totals:			=	4,444					

* 20 PIT tags were rejected, fish could not be re-tagged. Total PIT tag numbers enter into database was 1,815.

Appendix B. Year by year summary of razorback sucker stocked into the San Juan River, 1994-2008

Year	Total number of razorback sucker stocked (Sizes of fish stocked)
Experimental Stocking Study: 1994-1996 (n= 942 fish stocked)	
1994	688 (Mean TL =251 mm; Range = 100-446 mm TL)
1995	16 (Mean TL = 424 mm; Range = 397-482 mm TL)
1996	238 (Mean TL = 336 mm; Range = 204-434 mm TL)
Five-Year Augmentation Effort: 1997-2001 (n=5,890 fish stocked)	
1997	2,883 (Mean TL = 192 mm; Range = 104-412 mm TL)
1998	1,275 (Mean TL = 250 mm; Range = 185-470 mm TL)
1999	0 N/A
2000	1,044 (Mean TL = 214 mm; Range = 111-523 mm TL)
2001	688 (Mean TL = 410 mm; Range = 288-560 mm TL)
Interim Stocking Years: 2002-2008 (n=52,084 fish stocked)	
2002	140 (Mean TL = 319 mm; Range = 110-470 mm TL)
2003	887 (Mean TL = 327 mm; Range = 100-495 mm TL)
2004	2,988 (Mean TL = 353 mm; Range = 225-559 mm TL)
2005	1,996 (Mean TL = 355 mm; Range = 223-534 mm TL)
2006	18,793 (Mean TL = 265 mm; Range = 68-537 mm TL)
2007	22,836 (Mean TL = 268 mm; Range = 110-573 mm TL)
2008	4,444 (Mean TL = 297 mm; Range = 225-390 mm TL) *Mean TL calculation uses 298 mm TL for the 2,051 razorback sucker stocked by Dexter NFH&TC (Mean TL = 307 mm; Range = 225-390 mm TL) *Mean TL and Range for just fish stocked from NAPI
TOTAL: 1994-2008	58,916