

**COLORADO PIKEMINNOW PRODUCTION and RAZORBACK
SUCKER REARING at SOUTHWESTERN ARRC, Dexter, NM
San Juan River Recovery Implementation Program
April 01, 2020**

FY 2021 SOW

Submitted to
Bureau of Reclamation

From
Principal Investigator- William Knight
Southwestern Native Aquatic Resources and Recovery Center
U.S. Fish and Wildlife Service
P.O. Box 219, 7116 Hatchery Road
Dexter, NM 88230-0219

575-734-5910 ext-152 Work
575-734-6130 Fax
William_Knight@fws.gov

IA# R13PG0035

In October of 2012 Dexter National Fish Hatchery and Technology Center's name was officially changed to the Southwestern Native Aquatic Resources and Recovery Center (Southwestern ARRC). The facility is located in the Pecos River Valley of southeastern New Mexico, 200 miles southeast of Albuquerque, 20 miles south of Roswell, and one mile east of Dexter on State Road 190.

Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*), once common throughout the Colorado River Basin, have declined from historic levels and are now found primarily in the Upper basin of the Colorado River. Various factors have contributed to the decline of the species including alteration of natural stream flows and temperature regimes, loss of habitat and habitat fragmentation as a result of water development and the introduction of nonnative fish species.

The following scope of work identifies the facilities and methodologies that will be used to produce 12,000 150mm age-1 Colorado pikeminnow (CPM); and 11,000, 200mm razorback sucker (RBS) for use by the San Juan River Recovery Implementation Program (SJ RIP) to meet its augmentation objectives for the species in the San Juan River. The primary purpose of this work is the culture and distribution of CPM to the San Juan River and RBS to the Navajo Agricultural Products Industry (NAPI) grow-out ponds located on the Navajo Nation. Southwestern ARRC has developed production guides for both species based on historical growth rates and produces large numbers of each species for distribution throughout the upper and lower Colorado River Basin.

Relationship to Recovery Program Actions, Tasks and Goals

The main objective for the production and augmentation of CPM and RBS is to facilitate the establishment of self-sustaining populations of both species within the San Juan River, with the eventual goal of contributing to the recovery of the species (Ryden 1997, SJ RIP 2016). The SJ RIP Long-Range Plan (LRP) (SJ RIP 2016) identifies the need to implement and assess the augmentation of Colorado Pikeminnow and Razorback Sucker populations in the San Juan River Basin (Basin). Several documents provide the necessary guidance for the production and augmentation requirements for each species. The initial **Augmentation Plan for Colorado Pikeminnow in the San Juan River (Phase I)**, (Ryden 2003) called for annual stocking of age-0 fish over an eight year period (2002-2009). A modified work plan was developed and incorporated into the augmentation program in 2005. Under the amended plan; (Addendum #1 to Augmentation Plan for Colorado Pikeminnow in the San Juan River (Ryden 2005)), age-1 fish were produced at Dexter from 2006-2010 to augment the age-0 stockings in the San Juan River. The augmentation plan (**Phase I**) for age-0 and age-1+ Colorado pikeminnow ended in 2010. Augmentation efforts identified in the **Phase II (2010 – 2020) Augmentation Of Colorado Pikeminnow (*Ptychocheilus lucius*) In The San Juan River Plan**, (Furr 2009); focus primarily on culturing and stocking increased numbers of age-0 fish. Current facility and broodstock capabilities at Southwestern ARRC allow for age-0 and age-1 Colorado pikeminnow to be produced and stocked annually. In 2020 the SJ RIP requested Southwestern ARRC to shift Colorado Pikeminnow production/augmentation efforts from stocking ~400,000 age-0 fish to

~12,000 age-1 fish. The shift in production is based on several factors aimed at increasing CPM retention in the river, including: (1) A recent Kansas State University diet study that demonstrates that channel catfish predominantly consume prey <150mm TL. (2) a means to more rapidly increase the number of adult Colorado Pikeminnow in the San Juan River, (3) larger fish will be PIT tagged to distinguish captive produced from wild-spawned fish, and (4) the effort will allow for experimentation to improve the efficiency of future Colorado Pikeminnow stocking efforts through the initiation of hatchery enrichment methodologies such as flow conditioning, and prey and predator training.

In 2016 Southwestern ARRC staff began participating in fish collection efforts to augment the captive CPM broodstock with wild caught individuals from the Green and mainstem Colorado Rivers. This action was prompted due to declining wild populations of Colorado Pikeminnow in the Upper Colorado River Basin, and the genetic make up and ageing broodstock at Southwestern ARRC. This multi-agency effort includes partners from the Upper and Lower Colorado River Basin and San Juan Recovery Program. Age-0 CPM are to be collected from the Colorado and Green Rivers over a 5-6 year period, transported to Dexter and maintained until they are adults. To maximize genetic diversity of the future broodstocks: 1) collections will be conducted over several years (2016-2021), 2) collection localities in each river will vary, and 3) the overall target number per broodstock will aim to collect a total of 1,000 individuals per river (Green and Colorado) over the multi-year timeframe. If a broodstock is needed for each Program (Upper Basin and San Juan), then the maximum number will be 2,000 per river, half of which would stay at Southwestern ARRC and the other half transferred to Upper Basin facilities after an initial multi-year (3-5 years) grow-out at Southwestern ARRC. Progress to date includes the collection of 144 juveniles from the mainstem Colorado River near Moab, UT in 2016; no fish were collected in 2017; 12 fish from the Green River in 2018 and 185 fish from the Green River in 2019. A more concentrated collection effort is planned for 2020 and 2021.

The proposed work helps address specific actions, tasks and goal requirements of the augmentation program for the Basin's Colorado pikeminnow and razorback sucker populations as identified in the 2016 LRP:

- **Goal 1.1 - Establish a Genetically and Demographically Viable, Self-Sustaining CPM and RBS Populations.**
 - **Action 1.1.2** Produce, rear, and stock sufficient numbers of CPM to meet stocking goals of augmentation plan.
 - **Task 1.1.2.2** Stock at least 400,000 age-0 (50–55 mm TL) and age-1 CPM annually into the San Juan River.

- **Task 1.1.2.3** opportunistically stock available CPM in excess of those described above.
- **Action 1.1.3** Produce, rear, and stock sufficient numbers of RBS to meet stocking goals of augmentation plan.
 - **Task 1.1.3.2** Rear and stock hatchery-reared RBS into three NAPI grow-out ponds (3,000-3,500 fish per pond, > 200 mm TL).
 - **Task 1.1.3.4** Stock at least 91,200 RBS (> 300 mm TL) during eight year stocking period or 11,400 per year.
 - **Task 1.1.3.5** Opportunistically stock available RBS in excess of the 11,400 described above.
- **Goal 1.2 - Identify and Implement Strategies for Improving the RBS and CPM Augmentation Program and Genetic Integrity.**
 - **Action 1.2.1** Implement methods to evaluate status and success of stocked RBS and CPM.
 - **Task 1.2.1.2** Identify, describe, and implement strategies for improving survival and retention of stocked razorback sucker and Colorado pikeminnow, including acclimation prior to stocking, size of fish stocked, time and location of stocking, physiological conditioning, and predator avoidance.
- **Goal 1.3 - Support Operations and Maintenance of Facilities to Support RBS and CPM Stocking Programs.**
 - **Action 1.3.1.** Support production and grow-out facilities.
 - **Task 1.3.1.1** Support operation and maintenance of hatchery facilities at SNARRC for CPM and RBS production.
 - **Task 1.3.1.3** Support operation and maintenance of Navajo Agricultural Products Industry (NAPI) grow-out ponds for RBS production.

Facility Description:

The U.S. Fish and Wildlife Service (USFWS) has developed extensive infrastructure and expertise at Southwestern ARRC to successfully contribute to recovery programs. The facility

has been totally devoted to the maintenance, propagation and culture of threatened and endangered fish species for forty years. During that period it has successfully cultured razorback sucker, bonytail, humpback chub and Colorado pikeminnow of the Colorado River system and currently maintains large genetically diverse broodstocks. Over the years staff have developed successful spawning, culture and distribution methodologies for the species that are still used today. The facility utilizes an abundant water supply to produce over 1.5 million fish annually.

Facilities

Situated on the northern fringes of the Chihuahua Desert, the elevation at Dexter is 3,500 feet; average rainfall is 12 inches, and the growing season of 180-200 days. Station facilities include: Administration/Laboratory Building; Fish Culture Building; Isolation/Quarantine Building; Maintenance/Shop Building; Vehicle Storage Building; Equipment Storage Building; Feed Building; General Storage Building.; three government houses; one mobile home, two RVs and one RV space.

Fish culture facilities in operation consist of 76 earthen/lined ponds ranging in size from 0.1-1.0 acres, four (6' X 40') fiberglass raceways, four (8' X 40') concrete raceways, Twenty (2' X 12') rectangular fiberglass tanks, forty (4') fiberglass circular tanks, fifty (3') fiberglass circular tanks and 80 ten-gallon and 20 forty-gallon aquariums. The facility utilizes three water reuse systems in the fish culture building. Phase III Facility Improvement Project was completed on June 5, 2003.

Water

An abundant supply of fish culture water is supplied by five shallow aquifer wells (150 feet in depth) capable of pumping a combined 2,000+ gallons per minute. The well water is a constant 64^o F, pH of 7.5-8.5, total hardness of 2,100 ppm, and total dissolved solids of 3,500 ppm. Water rights, allocated through the New Mexico State Engineer's Office, total 2,185.5 acre-feet per annum or 10,927.5 acre-feet per five-year water period. Waste water from all fish culture operations collects in two sumps on the southeastern area of the facility and provides year round water to the wetlands.

I. Rearing Colorado Pikeminnow at Southwestern ARRC

Southwestern ARRC has been the leader in propagating and culturing CPM since 1981. The facility maintains several captive stocks as genetic reserves and has successfully produced fish for the Upper and Lower Colorado River Basin programs and the SJ RIP. The main emphasis has been on examining the reproductive biology of the species, broodstock development and culturing age-0, age-1 and adult fish. This work plan proposes the production of 12,000 age-1

fish (150 mm TL) annually for reintroduction in the San Juan River.

The funding requested also covers costs associated with proper care of the broodstock necessary to successfully carry out this project for future years and aide in restoration of the species. Stocking will require coordination with New Mexico Fish & Wildlife Conservation Office and Navajo Nation Department of Fish and Wildlife.

Objectives

- (1) Produce 12,000 age-1 fish (150 mm) for stocking in the San Juan River annually from 2021- 2025
- (2) PIT tag, transport and distribute 12,000 age-1 Colorado pikeminnow from Dexter, NM to the San Juan River.
- (3) Maintain 400 Colorado pikeminnow broodstock for recovery efforts. In addition, develop new broodstock derived from wild fish collections from the upper Colorado River basin from 2016 -2021.

Methods

Broodstock consists of 200 (F1) and 450 (F2) adults. These fish are 1999, 2004 and 2006 year-class (YC) progeny from wild adults collected from the Yampa, Green and Colorado Rivers, respectively. In 2021 a maximum of 50 paired matings (1 female X 1 male) will be spawned from the 1999 YC broodstock. Given the past history of hormonal induced ovulation, 38 females (75%) should produce viable eggs during a given year. All members of the broodstock are PIT tagged and records of spawning pairs are maintained at Southwestern ARRC.

Spawning

Broodfish will be harvested from the culture pond in early May, males and females sorted and held indoor for spawning. Ovulation will be induced with intraperitoneal injections of common carp pituitary (CCP) at the rate of 4 mg/kg of body weight. When eggs can be expelled using slight pressure, a female will be stripped and milt added from one male. Each individual egg lot will be enumerated, incubated and kept separate in Heath Trays until hatching occurs, approximately 96 hours following fertilization at a constant water temperature of 72°F.

Rearing Ponds

To meet the production goal of 12,000 age-1 (150mm) fish, rearing ponds will be stocked at the

following densities:

Age-1 Growth: (June thru October – 1.5 years - approx. 550 day growing period)

Pond 1A-	.73	Surface acre lined	@ 20,000 fry
Pond 6B-	.35	Surface acre lined	@ 3,000 fingerlings
Pond 7B-	.35	Surface acre lined	@ 3,000 fingerlings
Pond 6D-	.25	Surface acre lined	@ 3,000 fingerlings
Pond 7D-	.25	Surface acre lined	@ 3,000 fingerlings

Rubber and plastic lined ponds will be used for production. Fertilization and slow filling of ponds will start 10 to 14 days prior to stocking. Staff will ensure that water quality is monitored. Temperature, dissolved oxygen and pH readings will be taken twice daily at 7:00am and 3:00 pm at the deepest part of the pond.

If the dissolved oxygen drops to ≤ 3 mg/l, supplemental aeration will be started. All feeding, fertilization and chemical applications will be stopped till adequate oxygen levels are restored. Aerators will be run all night for several days till the oxygen is back up to acceptable levels, (5-7 mg/l). Staff will avoid handling fish for 7 -10 days following a stress related circumstance.

Zooplankton and invertebrate insect populations are cultured with the proper fertilization regime. Four types of fertilizer will be used:

- 1) Alfalfa meal
- 2) Alfalfa pellets
- 3) Cottonseed meal
- 4) Super phosphate

Initial fertilization rates for ponds are 100 lbs. of cottonseed meal, 100 lbs of alfalfa meal or pellets and 3 lbs of super phosphate. Follow up rates are administered on Monday and Thursday with 10 lbs cottonseed meal, and 10 lbs, alfalfa meal or pellets.

Water temperature, dissolved oxygen (DO) and pH readings will be taken in all rearing ponds daily. All readings will be recorded on record charts. If morning DO readings are below 3.0 or above 13.0 all fertilization will be stopped until DO's are brought back to accepted levels. If pH readings are greater than 9.5 fertilization will be terminated.

Feeding Schedule

Fish will be sampled at the end of every month. Size, weight and over all condition will be recorded. Feed amounts will be adjusted and projected for the upcoming month. Trout #1 and #2 crumble,

2.0, 3.0 and 4.0 mm feed will be used and purchased from SKRETTING (formerly Nelson and Sons, Silver Cup), Murray, Utah. Age-0 and age-1 fish will be fed three times daily at approximately 9:00am, 12:00noon and 3:00pm.

Feeding rates are based on water temperature and fish densities in the ponds and will be calculated as follows:

- Water temp >= 80 °F feed 3 % BW per day, Mon, Wed and Fri.
- Water temp 61-78 °F feed 2 % BW per day, Mon thru Fri.
- Water temp < 60 °F feed 1.5 % BW per day, Mon and Thurs.

Staff will use the following guide to determine the proper particle size to offer the fish. Feed sizes will be mixed at ½ rations of each size when making the transition to the next larger size feed.

<u>Fish Size</u>	<u>Particle Size</u>
Fry	Starter
20mm	#1 crum
40mm	#2 crum
70mm	2.0 mm
100mm	3.0mm
125-150mm	4.0mm

Schedule

Broodfish will be spawned in May 2020 and age-0 fish reared in rubber and plastic lined ponds from June - October 2020 brought indoor for enumeration and stocked back out from November 2020 to October 2021.

Projected Harvest Dates and Delivery Date

Age -1 fish will reach the target size of 150mm by the end of October of each year once the production cycle is established. The fish will be harvested from the ponds in early October, PIT tagged, hauled and distributed into the San Juan River the first full week in November of each year.

Projected Duration Of Project:

This work is continuation of activities initiated in 2002 in support of the San Juan RIP Colorado pikeminnow augmentation effort (2002-2009) identified in the **Augmentation Plan for Colorado Pikeminnow (CPM) In the San Juan River**, (Ryden 2003). Current and future

augmentation targets for the species were listed in the Phase **II** Augmentation **Of Colorado Pikeminnow (*Ptychocheilus lucius*) In the San Juan River Plan**, (Furr 2009). Under Phase II, augmentation efforts focused on culturing and stocking $\geq 400,000$ age-0 Colorado pikeminnow annually from 2010-2020 or as directed by the San Juan Recovery Implementation Program. In 2020 the SJRIP requested a shift in Colorado Pikeminnow production from age-0 to age-1 for a five year period (2021-2025) in order to evaluate its effect at increasing the Colorado Pikeminnow population in the San Juan River.

II. Rearing Razorback Sucker at the Southwestern ARRC

Razorback sucker (RASU) have been maintained and cultured at Southwestern ARRC since 1981. The captive broodstock represent the Lake Mohave population. Three separate broodstocks are maintained; the 1981, Paired Mated (PM) and Wild Caught (WC) broodstocks. The PM stock is comprised of 90 unique family groups produced from paired matings of wild caught adults spawned at Willow Beach NFH from 1994 to 2004. The WC broodstock consists of six year classes of larvae and juvenile wild-caught fish from Lake Mohave from 2000 to 2005. These fish were captured as fry from eight locations throughout Lake Mohave and given the designation of (WC) future broodstock.

From 2001-2013 production of subadult razorbacks at Southwestern ARRC has yielded excellent survival and growth. The overall survival for razorback sucker grown to 450mm is 90.5%, while 85% of the fish achieved the target growout size in two years. Spawning and growing season consists of fish being spawned in the early spring and fry stocked in to earthen or lined ponds and grown out-door from April to October. Total dissolved oxygen and temperature are monitored daily and fish feed on phyto and zooplankton produced in fertilized ponds for approximately 45 days at which time they are offered a prepared razorback sucker diet. Fingerlings are routinely held and cultured in the Fish Culture building during the months of January - March to prevent mortalities associated with outdoor over wintering. In the fall of the year when the fish reach target size they are harvested from the ponds and transferred to the Fish Culture building for sorting and tagging. Following a 7 to 10 day rest and recovery period they are loaded into distribution trucks and hauled to their stocking locations. Southwestern ARRC staff have successfully hauled 300+mm razorbacks to the San Juan River and razorbacks and Bonytail to Lake Mohave, Arizona, in the lower Colorado River. The distribution trips to the San Juan average 400 miles (8 hours) and the trips to Lake Mohave average 660 miles (12 hours) of hauling time in one direction.

Objectives:

The main objective of this proposed work is to spawn razorback sucker adults and rear up to 11,000, 200mm fish annually and deliver them to existing grow-out ponds located on the Navajo Nation.

Additional objectives of the work include:

- (1) Improve, maintain and staff facilities at Southwestern ARRC to rear and distribute the target number of fish.
- (2) Passive Integrated Transponder (PIT) tag all fish prior to stocking into the NAPI ponds. PIT tags will be provided by the SJRIP.
- (3) Maintain razorback sucker captive broodstock for recovery efforts.

Methods

Captive propagation activities include spawning a minimum of 20 pairs of broodstock, incubating fertilized eggs, enumerating and stocking of swimup fry into rearing ponds, harvest of target sized fish from ponds, PIT tagging and distribution to the NAPI ponds near Farmington, NM on the Navajo Nation.

The project will utilize indoor and outdoor facilities. All spawning and incubation activities will be conducted indoor in the Fish Culture building. Razorback sucker will be initially reared in 2 earthen or lined ponds and in June of each year transferred to 3 ponds at surface acres of 0.79, 0.89 and 0.98.

Rearing Ponds

To meet the production goal of 11,000 (200mm) fish, rearing ponds will be stocked at the following densities:

Age 0 Growth: (April thru May - 60 day growing period)

Pond 1- .72 acre @ 12,000 fry

Pond 2- .79 acre @ 12,000 fry

Age I Growth: (June thru October - 150 day growing period)

Harvest Age I fish; enumerate and stock fingerlings into 3 ponds.

Pond 1- .79 acre @ 6,000 fingerlings

Pond 2- .89 acre @ 6,000 fingerlings

Pond 3- .98 acre @ 6,000 fingerlings

Earthen and lined ponds will be used for production. In earthen ponds the bottoms will be packed and graded prior to receiving fish. Non-level pond bottoms can hinder fish harvest and aquatic vegetation can entrap fish at harvest time. Fertilization and slow filling of ponds will start 10 to 14 days prior to stocking. Staff will ensure that water quality is monitored. Temperature, dissolved oxygen and pH readings will be taken twice daily at 7:00am and 3:00 pm at the deepest part of the pond.

If the dissolved oxygen drops to ≤ 3 mg/l, supplemental aeration will be started. All feeding, fertilization and chemical applications will be stopped till adequate oxygen levels are restored. Aerators will be run all night for several days till the oxygen is back up to acceptable levels, (5-7 mg/l). Staff will avoid handling fish for 7 -10 days following a stress related circumstance.

Pond Vegetation Control and Fertilization

Sonar, Diuron or Barrier will be used in earthen ponds to control rooted aquatic vegetation. Staff will use granular form when possible and broadcast the entire pond bottom at the recommended rates.

Diuron – 2.0 lbs. per acre (dry broadcast)

Barrier- 100 lbs. per acre (dry broadcast)

Copper sulfate (CUSo₄) will be used to control floating filamentous algae blooms. Treatments will began approximately 45 days after fish are stocked into the ponds and repeated every 30 days. Application rates in ponds are 5 to 8 lbs per acre. A secondary benefit derived from using CUSo₄ is its effectiveness in controlling external parasites.

Zooplankton and invertebrate insect populations are cultured with the proper fertilization regime. Four types of fertilizer will be used:

- 1) Alfalfa meal
- 2) Alfalfa pellets
- 3) Cottonseed meal
- 4) Super phosphate

Initial fertilization rates for earthen ponds are 100 lbs of cottonseed meal, 100 lbs of alfalfa meal or pellets and 3 lbs of super phosphate. Follow up rates are administered on Monday and Thursday with 10 lbs cottonseed meal, and 10 lbs, alfalfa meal or pellets.

Water temperature, dissolved oxygen (DO) and pH readings will be taken in all rearing ponds daily. All readings will be recorded on record charts. If morning DO readings are below 3.0 or above 13.0 all fertilization will be stopped until DO's are brought back to accepted levels. If pH readings are greater than 9.5 fertilization will be terminated.

Feeding Schedule

Fish will be sampled at the end of every month. Size, weight and over all condition will be recorded. Feed amounts will be adjusted and projected for the upcoming month. A prepared feed will be purchased from SKRETTING (formerly Nelson and Sons, Silver Cup), Murray, and Utah. Fish will be fed twice daily, once at 9:00am and at 2:00pm.

Feeding rates are based on water temperature and fish densities in the ponds and will be calculated as follows:

- Water temp \geq 80 °F feed 3 % BW per day, Mon, Wed and Fri.
- Water temp 61-78 °F feed 2 % BW per day, Mon thru Fri.
- Water temp $<$ 60 °F feed 1.5 % BW per day, Mon and Thur.

Staff will use the following guide to determine the proper particle size to offer the fish. Feed sizes will be mixed at ½ rations of each size when making the transition to the next larger size feed.

<u>Fish Size</u>	<u>Particle Size</u>
2-3"	1.0 mm
4-6"	2.0 mm
6-8"	3.0 mm

Schedule

Broodfish will be spawned in March and the fish reared in earthen ponds for their first growing season (April – October); held indoor during winter (November - March) and stocked into the NAPI ponds in April of 2021. Target sized fish are available for distribution in spring and fall of each year.

Projected Harvest Dates and Delivery Date

Year 2021 marks the sixteenth year of razorback production at Southwestern ARRC for distribution to the NAPI ponds. In 2007 a new single cohort fish rearing strategy was adopted by the San Juan RIP for the NAPI ponds. Since 2006, staff have stocked a total of 110,442 razorback's averaging 225mm in length into East and West Avocet and Hidden ponds and in 2012, 2016, 2017, 2018, 2019 and 2020 stocked an additional 1,000+ target sized RBS into the

San Juan River annually. An additional 11,000 fish will be stocked into the NAPI ponds in April 2021. Based on historical growth rates for razorback at Dexter, the production target of 11,000, 200mm fish will require a fifteen month growout period. Fish delivery will be in the spring of each year based on the new rotational production plan (single cohort). Approximately 11,000 fish will be stocked each trip and Dexter staff will coordinate the deliveries with the Navajo Nation Department of Fish and Wildlife, BIA and USFWS FWCO personnel. The estimated duration of the program is scheduled for a total of 18 years (2005- 2023).

PIT Tagging

Starting in 2012 all fish stocked from Dexter into the San Juan River and NAPI ponds are PIT tagged prior to stocking. The fish will be graded and sorted approximately 6 to 8 weeks before the scheduled stocking date. Fish that average 200mm will be PIT tagged and allowed to recover for a minimum of 10 to 14 days after each handling. The PIT tagged fish will be scanned for tag retention and any fish that lost a tag will be retagged prior to shipping.

Projected Duration Of Project:

This project was initiated in January 2005 in support of the SJRIP razorback augmentation effort (2004-2011) identified in the **Five-Year Augmentation Plan for Razorback Sucker in the San Juan River** (Ryden 1997, 2003). Current and future augmentation targets for the species are listed in the “draft” **Augmentation Plan for Razorback Sucker in the San Juan River Basin**, (Furr 2016). The rearing of razorback sucker subadults at Southwestern ARRC could potentially continue till 2023 (BOR RFP 04-SF-40-2250). Under the new plan, augmentation efforts focus on culturing and providing 11,000, 200mm sized razorback sucker to the Navajo Nation, NAPI ponds fish rearing project annually from 2016-2023 or as directed by the San Juan Recovery Implementation Program.

General Fish Husbandry Requirements and Conditions

Predator Control

Historically, Southwestern ARRC has not experienced excessive avian or mammal predation on fish stocks. Salamander, crayfish, frog and turtle infestation of ponds are nonexistent. On an annual basis specific ponds are covered with bird netting during the winter months to eliminate predation by migrating birds. An additional strategy employed by the staff is the harvest and holding of stocks of fish indoor during the winter months of November to March. Razorback suckers reared for this project will be maintained indoor in two 40,000 gallon systems during the winter months. These systems contain biofiltration, supplemental aeration, temperature control and alarm systems.

Handling and Transport Protocol

Transport of all fish will follow guidelines described in the USFWS Protocols for Biological Investigations developed by Dr. Gary Carmichael, retired U.S. Fish & Wildlife Service employee. The protocol is as follows:

1. When Colorado pikeminnow and razorback fingerlings, subadults and broodfish are handled they will be placed in a .5% salt bath to help in osmoregulation and reduce the effects of handling stress.
2. Temperature should be 5 degrees Fahrenheit lower in the hauling truck than in the river.
3. Drivers must be informed of and follow a specified route.
4. Transport water will contain 0.5 percent NaCl (18.9 grams per gallon).
5. Oxygen levels will be greater than 6.0 mg/L as determined with an oxygen meter.
6. Nets must be functional. Aeration equipment must be in place and must be used. A fish holding container will be a minimum of 5 gallons in size and fish densities will not exceed 1 lb of fish per gallon of water. Small delta mesh (1/8") will be present to transfer the fish from one container to another, although it is preferred to have water to water transfer. Oxygenation/aeration equipment will be in place and working.
7. Prior to transfer and after the fish are concentrated, they should be quickly placed in the transport tank. When using nets to place fish in transfer buckets or tanks, nets should not be overloaded. The fish on the bottom will be crushed. Using a wet transfer with buckets is preferable. When emptying the nets and buckets, care will be taken to avoid adding algae and mud to the transport tank. Before loading, dissolved oxygen levels should be at saturation.
8. Immediately after loading, all equipment on the transport vehicle should be re-checked and the vehicle should depart. Oxygen concentrations and temperatures should be monitored at a minimum of every hour.
9. During unloading tempering water should be present and functional, and thermometers should be used to match water temperatures. Hauling water temperatures should be equal to receiving water temperature.

***Acclimatizing the fish to the receiving water temperature will be conducted in increments of 2° F or (1°C) towards equalizing per 30 minutes time. Due to the high alkalinity and TDS of Southwestern**

Native ARRC water, staff will temper and acclimate the transported fish to the receiving water quality for a minimum of 1 hour prior to release. This process will allow sufficient time for the fish to osmoregulate to the receiving water quality. Tempering can be accomplished in the shipping tank by adding receiving water to the tank at given intervals.

Fish Health Monitoring Protocols

All fish should be handled with the best animal husbandry practices available. A feeding schedule will be developed and followed daily. All tanks will be cleaned of uneaten food and feces daily. A daily log recording times of feeding, water temperature and comments on fish health will be maintained. If fish are maintained in a re-circulating system, all filters and pumps will be routinely cleaned and monitored. If fish are held in ponds O2 levels will be closely monitored. At least once a year, a fish health inspection will be conducted to examine fish for bacterial, viral and parasitic infections. Normally 60 fish per lot are sacrificed for an adequate sample. However, in the case of endangered or rare fish of genetic importance, numbers sampled may be less, depending upon availability. Non-lethal methods, if available, will be employed to obtain samples. Condition factors will be calculated on an annual basis and data added to a RBS database. Wet mounts will be examined for parasites and bacteria. Routine condition exams will be conducted and an examination will be conducted on all lots one month prior to delivery to the San Juan River and NAPI ponds on the Navajo Nation. Brood and refuge stock will have health checks annually and only when needed to minimize handling stress.

The U.S. Fish and Wildlife Service, Dexter Fish Health Program will provide bacterial and viral testing for razorback propagation and rearing activities. Treatment of disease will be the responsibility of the Southwestern ARRC fish culture staff. Fish health experts are available to advise on proper treatment, and to examine fish for infection.

Disposition of Fish

All fish propagated and cultured for this project are made available to the SJRIP for stocking and meeting augmentation requirements identified in the Phase II (2010 – 2020) **Augmentation Of Colorado Pikeminnow (*Ptychocheilus lucius*) In The San Juan River Plan**, (Furr 2009) and the “draft” (2016-2023) **Augmentation Plan For Razorback Sucker In The San Juan River** (Furr 2016). In the case of catastrophic loss (>25% of the stock) at Southwestern Native ARRC, up to 1,000 individuals will be collected for testing and diagnosis to determine (if possible) reason for loss. A written statement describing the loss will be provided immediately to the US Fish and Wildlife Service (Service) Fisheries Division and the SJRIP Coordinator, Albuquerque, NM; followed by a detailed report of the diagnosis once results are available. Excluded from these reporting requirements are gametes and fish lost to natural attrition, including but not limited to non-viable eggs prior to hatch and incidental predation mortalities. As per the guidelines identified in the 2003 Memorandum of Understanding between the Service

and University of New Mexico, Division of Fishes, Museum of Southwestern Biology (MSB), fish carcasses (specimens) will be provided to the MSB who serves as the repository for vouchered specimens of native fishes. Any additional mortalities above the 1,000 mark will be recorded in the annual Threatened and Endangered Species report and disposed of by burial onsite or at a local land fill.

If any concerns are identified leading to potential questions about stocking of fish, in the instance of fish having cleared the Service’s fish health testing for reportable pathogens and other agents of concern using established Fish Health Center SOPs and those of the American Fisheries Society – Fish Health Section Blue Book, the SJRIP has 30 days to formally respond with recommendations on the disposition of the fish. After 30 days, if no response is provided, in writing, the disposition action for the fish will be at the discretion of the Service.

Reporting

A draft annual progress report detailing fish culture and distribution activities will be completed and provided to the SJRIP by January 31, 2022.

Budget

RE: Colorado Pikeminnow Age-1 Production and Razorback Sucker Rearing of Adults and Subadults at the Southwestern ARRC, Dexter, NM. The following costs are associated with producing and stocking 12,000 age-1 CPM and 11,000, 200 mm subadults into the NAPI ponds on the Navajo Nation and the San Juan River in 2021. Identified costs also include maintaining CPM and RBS broodstock for recovery efforts.

Budget -Detailed Spending Plan 2021

I. Colorado Pikeminnow Fingerling Production

O&M Labor Costs

The labor costs identified for 2021 are broken down as follows, and include fringe benefits and payroll additives for each position identified:

Southwestern Native Aquatic Resources and Recovery Center

(1) Fish Biologist (1,280 hours -16pay periods) - GS 482-9 @ \$36.38/hr. = \$46,566
 * Supervision, spawning, fish health and water quality monitoring, feeding, harvest and prep for distribution.

(1) Admin. Officer (240 hours- 3pay periods) - GS 341-9 @ \$35.59/hr. =\$ 8,542
 * Budget tracking, purchasing, data base management & reporting.

Subtotal = \$55,108

Equipment and Supplies:

Liquid oxygen and compressed oxygen 12 cylinders @ \$91.60 Airgas	\$ 1,099
Spawning Supplies Hormones (CCP 5 vials @ \$220.18 per 10ml/vial)	\$ 1,101
Fish health sampling prior to stocking Lab supplies for bacti, viral and parasite testing.	\$ 2,375
Culture equipment (nets, seines, screens, etc.) Eager, Memphis Net & Twine	\$ 2,422
Pond management supplies, Barrier \$307.43/50# bag (20 bags) Van Diest	\$ 6,149
Fish feed, 1.85/lb., 6,000 lbs. SKRETTING	\$11,100
Cyclical Maintenance costs for: Tractors, mowers, gators, sweepers used in pond maintenance	\$ 1,738
Subtotal	\$ 25,984

Utilities:

Pumping costs Electrical 200,257 kwh @ .10568	\$21,163
Heating water for hatching eggs to swim-up Natural gas 1,525 ccf @ 1.112	\$ 1,696
Subtotal	\$22,859

Reintroduction Costs:

Salaries	
GS-9 Fish Biologist 24 hrs. @ \$36.38	\$ 873
GS-7 Fish Biologist 24 hrs. @ \$27.04	\$ 649
WG-7 Maintenance Worker 24 hrs. @ \$24.64	\$ 591
WG-5 Bio Science technician 24 hrs. @ \$18.44	\$ 443

Lodging & Per Diem \$126/day (Dexter to Farmington, NM and return) \$126.00/trip x 2 trips x 4 employees =	\$1,008
Fuel costs and truck maintenance 1200 miles @ \$6.130	\$7,357
Subtotal	\$10,921

Annual subtotal (CPM)
(O & M Direct Costs) **\$ 114,872**

II. Rearing Razorback Sucker at the Southwestern ARRC

O&M Labor Costs

The labor costs identified in the 2021 Scope of Work are broken down as follows, and include fringe benefits and payroll additives for each position identified:

Southwestern Native Aquatic Resources and Recovery Center

(1) Fish Biologist (1,040 hours -13pay periods) - GS 482-9 @\$36.38/hr. = \$ 37,835 * Supervision, spawning, fish health and water quality monitoring, feeding, harvest and distribution.	
(1) Administrative Officer (160 hours- 2pay periods) - GS 341-9@\$35.59/hr. = <u>\$ 5,694</u> * Budget tracking, purchasing, data base management & reporting.	
Subtotal =	\$43,529

Materials and Supplies

Cost based on SNARRC's historical purchases:

Fish Health

Fish health sampling prior to stocking	
Lab supplies for bacti, viral and parasite testing.	\$ 1,371

Fish Culture Supplies	
Nets, seines, tubs, screens.	\$ 2,318
Wet lab supplies (pipets, petri dishes, slides, probes, markers)	\$ 308
Theriputents- salt, Oxytetracycline, formalin, MS-222, stress coat	\$ 737
Liquid and compressed oxygen for fish distribution	\$ 246
Feed	
Fish feed from Skretting (2.0 tons) 4,000 lbs. \$ 1.85 per lb.	\$ 7,400
Spawning Supplies	
Hormones (HCG 10 vials @ \$ 61.41 per 10ml/vial)	\$ 614
Fertilizer	
Alfalfa pellets (1,000 lbs.) .314/lb.	\$ 314
Inorganic - Super Phosphate (10 bags) 9.18/bag	\$ 92
Chemicals- Aquatic Vegetation Control	
Barrier- (6 bags) \$307.43/bag	\$ 1,845
Diuron - (2 bags) \$ 93.98/bag	\$ 188
Subtotal = \$15,433	
Services	
Utilities & Equipment Maintenance	
* Electrical, fuel and phone	\$ 5,464
* Boiler system, heat exchanger maintenance	\$ 1,229
*#1 well and water tower and pumping station maintenance	\$15,162
Subtotal = \$ 21,855	
<u>Travel</u>	
- Fish stocking/distribution.	
Dexter to Farmington (NAPI) & return- (1640 miles @ 6.314 per mile DX truck) =	\$10,355
Fuel and routine vehicle maintenance.	
Perdiem- \$126per day X 2 trips X 2 individuals. =	\$ 504
Subtotal = \$10,859	
Annual subtotal (RBS)	
O&M DIRECT COSTS	\$91,676

I. Colorado Pikeminnow Age-1 Production	\$114,872
II. Rearing Razorback Sucker Subadults at the Southwestern ARRC	\$91,676
Annual total:	\$206,548
3 % Administrative Overhead	\$ 6,196
TOTAL REQUESTED FOR 2021	\$ 212,744

Projected out year funding request:

FY 2022 - \$219,126

Literature Cited:

Furr, W. D. 2009. Augmentation Plan, Augmentation of Colorado Pikeminnow (*Ptychocheilus lucius*) In the San Juan River, Phase II 2010-2020. U. S. Fish and Wildlife Service, Albuquerque, NM. 15 pages.

Furr, W. D. 2016. Augmentation Plan For Razorback Sucker In The San Juan River Basin 2016-2023. U. S. Fish and Wildlife Service, Albuquerque, NM. 16 pages.

Hamman, R. 1985. Induced spawning of hatchery -reared razorback sucker. Prog. Fish-Cult.. 47(3): 187-189

Ryden, D. W. 2003. An Augmentation Plan For Colorado Pikeminnow In The San Juan River. U. S. Fish and Wildlife Service, Grand Junction , Co. 63 pp. + appendices.

Ryden, D. W. 2003. 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 (Ryden 1997). U. S. Fish and Wildlife Service, Grand Junction, CO. 32 pp.

Ryden, D. W. 2005. *Draft* Addendum #1, Stocking Age-1 Fish To Supplement Ongoing Augmentation Efforts. An Augmentation Plan For Colorado Pikeminnow In The San Juan River. U. S. Fish and Wildlife Service, Grand Junction , Co. 3 pages.

Response to comments:

<p>9 & 10</p>	<p>SOWs-9&10-Colorado Pikeminnow Production and Razorback Sucker Rearing at Southwestern ARRC</p>	<p>Knight; Dexter ARRC</p>
<p>Comment : <i>How can the technical aspects of this SOW be improved?</i> I know that cannibalism is a big problem, and that grading CPM is expensive in time and dollars. Are there any other hatchery techniques that could increase the number of CPM?</p> <p>Response: Southwestern ARRC staff continue to examine methods to meet fish request targets. Adjustments are made on an annual basis to achieve consistent production results. Producing Age-1 fish will receive a similar process; adaptive management strategies are employed over time.</p> <p>Comment: <i>How can the technical aspects of this SOW be improved?</i> The SJRRIP is anticipating the stocking size to shift from Age 0 to Age 1 Colorado Pikeminnow in 2021. Some initial work has shown that prey trained Colorado Pikeminnow appear to have better retention than the pellet fed fish. Is there an opportunity to have some of these Age 1 fish prey trained?</p> <p>Response: Not at this time. Southwestern ARRC is not set up to do this. Facilities and forage needs to conduct large scale prey trained fish production will be determined and provided to the Program Office once the final analysis of previously released prey trained fish is completed and definitive results provide direction.</p> <p>Comment: <i>How can the technical aspects of this SOW be improved?</i> I would suggest that half of the produced Colorado Pikeminnow be prey trained each year. This would allow the Program to assess the efficacy of prey training Colorado Pikeminnow as a hatchery enrichment protocol.</p> <p>Response: Currently Southwestern ARRC is not set up to do large scale prey training of age-1 CPM. It is not part of the existing 2021 SOW. The additional facility and forage needs can be determined in the near future and provided to the SJRRIP for review and consideration for funding.</p>		

Comment:

How can the technical aspects of this SOW be improved?

One objective for Colorado Pikeminnow production is development of a new broodstock between 2017 and 2021. It would be good for the proponents to describe in the SOW progress to date and activities planned for broodstock development in FY 2021. This aspect of work at SNARRC has been neglected in the SOW.

Planned production and rearing of Razorback Sucker at SNARRC during FY 2021 are well documented in the SOW.

Response: Information on the development of CPM broodstock from wild fish collections was added to the SOW.

Comment:

How can the technical aspects of this SOW be improved?

I have no suggestions for improvement. The document is highly detailed and thorough. Minor typos (highlighted text) lines 63 – 67

Response: There is no highlighted text on lines 63-67 of the SOW. The entire paragraph was reviewed by Southwestern ARRC staff for typos.

Comment:

How can the technical aspects of this SOW be improved?

Line 81: "...the effort will allow for experimentation to improve the efficiency of future Colorado Pikeminnow stocking efforts". Perhaps the author could provide some examples of experiments or factors to assess? Prey training? Rearing habitats with more structural heterogeneity?

Response: Information on hatchery enrichment of age-1 CPM prior to release was added to the SOW.