

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

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FY 2022 SOW

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Bureau of Reclamation

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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 (SJRIP) 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, SJRIP 2016). The SJRIP Long-Range Plan (LRP) (SJRIP 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 SJRIP 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.

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 64⁰ 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.

Maintain 400 Colorado pikeminnow broodstock for recovery efforts. In addition, maintain new broodstock derived from wild fish collections from the Green and 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 2022 a minimum of 30 paired matings (1 female X 1 male) will be spawned.

Given the past history of hormonal induced ovulation, 22 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. Three types of fertilizer will be used:

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

Initial fertilization rates for ponds are 100 lbs of alfalfa meal and pellets and 3 lbs of super

phosphate. Follow up rates are administered on Monday and Thursday with 10 lbs, alfalfa meal and 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, UT and RANGEN Inc, Buhl, ID. 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/June of 2021 and age-0 fish reared in rubber and plastic lined ponds from June - October 2021 brought indoor for enumeration and stocked back out from November 2021 to October 2022.

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 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 (RBS diet) will be purchased from RANGEN Inc. Buhl, ID. 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 > = 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 2022. Target sized fish are available for distribution in spring and fall of each year.

Projected Harvest Dates and Delivery Date

Year 2022 marks the seventeenth 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 120,442 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. Approximately 11,000 fish will be stocked into the NAPI ponds in April 2022. 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 are 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 are scanned for tag retention, length and weight recorded and any fish that lost a tag is 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, 2023.

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 2022. Identified costs also include maintaining CPM and RBS broodstock for recovery efforts.

Budget -Detailed Spending Plan 2022

I. Colorado Pikeminnow Fingerling Production

O&M Labor Costs

The labor costs identified for 2022 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 @ \$37.47/hr. = \$47,961
 * Supervision, spawning, fish health and water quality monitoring, feeding, harvest and prep for distribution.

(1) Admin. Officer (240 hours- 3pay periods) - GS 341-9 @ \$36.65/hr. = \$ 8,796
 * Budget tracking, purchasing, data base management & reporting.

Subtotal = \$56,757

Equipment and Supplies:

Liquid oxygen and compressed oxygen 12 cylinders @ \$94.25	\$ 1,131
Airgas	
Spawning Supplies	\$ 1,134
Hormones (CCP 5 vials @ \$226.79 per 10ml/vial)	
Fish health sampling prior to stocking	\$ 2,446
Lab supplies for bacti, viral and parasite testing.	
Culture equipment (nets, seines, screens, etc.)	\$ 2,495
Eager, Memphis Net & Twine	
Pond management supplies, Barrier \$316.65/50# bag (20 bags)	\$ 6,333
Van Diest	
Fish feed, 1.91/lb., 6,000 lbs.	\$11,460
Rangen	
Cyclical Maintenance costs for:	\$ 1,790
Tractors, mowers, gators, sweepers used in pond maintenance	
Subtotal	\$ 26,789

Utilities:

Pumping costs	
Electrical 200,257 kwh @ .108850	\$21,798
Heating water for hatching eggs to swim-up	
Natural gas 1,525 ccf @ 1.145	\$ 1,746
Subtotal	\$23,544

Reintroduction Costs:

Salaries	
GS-9 Fish Biologist	
24 hrs. @ \$37.47	\$ 899
GS-7 Fish Biologist	
24 hrs. @ \$27.85	\$ 668

WG-7 Maintenance Worker	
24 hrs. @ \$25.38	\$ 609
WG-5 Bio Science technician	
24 hrs. @ \$18.99	\$ 456
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	\$10,997
<u>Annual subtotal (CPM)</u>	
<u>(O & M Direct Costs)</u>	<u>\$ 118,087</u>

II. Rearing Razorback Sucker at Southwestern ARRC

O&M Labor Costs

The labor costs identified in the 2022 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 @\$37.47/hr. = \$ 38,969

* Supervision, spawning, fish health and water quality monitoring, feeding, harvest and distribution.

(1) Administrative Officer (160 hours- 2pay periods) - GS 341-9@\$36.65/hr. = \$ 5,864

* Budget tracking, purchasing, data base management & reporting.

Subtotal = \$44,833

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. \$ 1,412

Fish Culture Supplies

Nets, seines, tubs, screens. \$ 2,387
 Wet lab supplies (pipets, petri dishes, slides, probes, markers) \$ 317
 Theriputents- salt, Oxytetracycline, formalin, MS-222, stress coat \$ 759
 Liquid and compressed oxygen for fish distribution \$ 253

Feed

Fish feed from Rangen (2.0 tons) 4,000 lbs. \$ 1.91 per lb. \$ 7,640

Spawning Supplies

Hormones (HCG 10 vials @ \$ 63.50 per 10ml/vial) \$ 635

Fertilizer

Alfalfa pellets (1,000 lbs.) .323/lb. \$ 323
 Inorganic - Super Phosphate (10 bags) 9.46/bag \$ 95

Chemicals- Aquatic Vegetation Control

Barrier- (6 bags) \$316.65/bag \$ 1,900
 Diuron - (2 bags) \$ 96.80/bag \$ 193

Subtotal = \$15,914

Services

Utilities & Equipment Maintenance
 * Electrical, fuel and phone \$ 5,628
 * Boiler system, heat exchanger maintenance \$ 1,266
 *#1 well and water tower and pumping station maintenance \$15,616

Subtotal = \$ 22,510

Travel

- Fish stocking/distribution.

Dexter to Farmington (NAPI) & return- (1640 miles @ 6.130 per mile
 DX truck) = \$10,053

Fuel and routine vehicle maintenance.

Perdiem- \$126per day X 2 trips X 2 individuals. = \$ 504

	FY2022 – SOW 9 & 10
Subtotal =	\$10,557
Annual subtotal (RBS)	
O&M DIRECT COSTS	\$93,814
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I. Colorado Pikeminnow Age-1 Production	\$118,087
II. Rearing Razorback Sucker Subadults at the Southwestern ARRC	\$93,814
Annual total:	\$211,901
3 % Administrative Overhead	\$ 6,357
TOTAL REQUESTED FOR 2022	\$ 218,258

Projected out year funding request:

FY 2023 - \$224,806

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