

# Gila River Basin Native Fishes Conservation Program: Arizona Game and Fish Department Final Report for Agreement F15AC01193, ARCC Modernization

January 2018

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A Gila River Basin Native Fishes Conservation Program Final Report to U.S. Fish and Wildlife Service for Cooperative Agreement No. F15AC01193, ARCC Modernization. Arizona Game and Fish Department, Phoenix.



*Program  
Cooperators:*



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### **Acknowledgements**

The work described in this report was funded through Cooperative Agreements F14AC00148 and F15AC01193 with the U.S. Fish and Wildlife Service as part of the Central Arizona Project (CAP) Gila River Basin Native Fishes Conservation Program who's funds originate from U. S. Bureau of Reclamation as part of CAP mitigation. Individuals that participated in coordination and execution of this renovation project are too numerous to list, however the work could not have completed without their participation and involvement.

### **Recommended Citation:**

Mann, R. D. and J. Walters. 2018. Gila River Basin Native Fishes Conservation Program: Arizona Game and Fish Department final report for agreement and F15AC01193, ARCC Modernization. Gila River Basin Native Fishes Conservation Program Final Report to U.S. Fish and Wildlife Service for Cooperative Agreement No. F15AC01193. Arizona Game and Fish Department, Phoenix.

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**COOPERATIVE AGREEMENT TITLE:** CAP Gila River Native Fishes Conservation Program with AGFD, F15AC01193

**REPORT PERIOD:** September 21, 2012-September 30, 2017.

**OVERVIEW:**

The purpose of this agreement was to fund the renovation and modernization to the Aquatic Research and Conservation Center (ARCC; formerly known as Bubbling Ponds Native Fish Conservation Facility) operated by Arizona Game and Fish Department (Department). ARCC's development filled the need to acquire and hold samples of rare populations of Loach Minnow, Spikedace, and other native fishes of special concern for maintenance and propagation within a suitable facility. The facility is operated under the CAP Gila River Native Fishes Conservation Program. The facility was built incrementally with limited grant funding and has been largely built using military surplus shipping containers as tanks. While adequate for meeting the current demands of the facility (holding refuge populations and propagating endangered fish species), the existing systems are insufficient for future requirements and limits production levels and research. Thus, the primary components addressed by the renovation include expansion and improvement of holding and spawning capacity for fish, modernization of fish culture and hatchery infrastructure, construction of a new building, and increase in biosecurity.

**SPECIFIC RENOVATION ACTIVITIES:**

Funds for the initial renovation were distributed to the Department in 2014. The first years of the agreement were spent on renovation planning and environmental and cultural compliance in coordination with the Bureau of Reclamation (BOR) and the United States Fish and Wildlife Service (USFWS). Once initiated, renovation activities were divided into three main phases. The main components of Phase 1 consisted of the installation of new spawning raceways and upgrading the facilities water flow and discharge. Phase 2 included the construction of a retaining wall, pond installation, and various other infrastructure improvements. Phase 3 entailed the construction of a new multipurpose building. The majority of the activities for Phase 1 were completed under agreement F14AC00148 (Robinson et al. 2017), but are included within this report as it better

represents the modernization in its entirety and how components of each phase are related. Below summarizes our specific activities for each of the phases of the ARCC modernization.

### ***Phase 1***

As a result of previous incremental minimal funding, infrastructure remained as described in previous reports and consisted of small spawning streams located inside a fenced cage, 6-foot round tanks for holding, as well as surplus military shipping containers outside of the cage and existing concrete lined ponds for spawning and holding. Early renovation activities focused on updated spawning infrastructure for critical Spikedace and Loach Minnow lineages. This Phase 1 placed 20 new spawning raceways with individual collection sumps in order to allow for better collection of larvae once hatched. These raceways are located between the existing cage and the main building. Additionally, a centralized collection trough was added to deliver water to downstream fish storage similar to the existing cage outflow. This area was enclosed with 10' fencing. A main hatchery outflow sump (ZZ sump) was installed on the southeast edge of the facility. This sump will eventually allow water to be recirculated through the entire facility if needed and now provides a collection site at the downstream base of the facility. The entirety of the artesian outflow for the facility runs through ZZ sump. Pressure water run to the main building flows to the existing evapotranspiration bed on the west side of the facility. Construction for this phase was completed June 2016.

ARCC staff finished installation and plumbed the 20 new spawning raceways with collection sumps. Raceways receive water from ARCC's artesian well, but can also be filled during an emergency or for cleaning using the pressure water system. Raceways were fitted with individual variable speed programmable recirculation pumps to create spawning flows and a regenerative blower to provide supplemental aeration. Water from the 20 new raceways is collected in the central trough and can be sent to downstream ponds and tanks, or through a bypass to ZZ sump. A new electrical breaker box was installed to accommodate the increased power drawn by the new pumps. These final

improvements for Phase 1 were completed in March 2017, and the new raceways were operational for the 2017 spawning season.

## ***Phase 2***

To increase holding capacity and research capabilities with future native fish conservation needs in mind, the special area of ARCC was expanded, and a retaining wall was designed in cooperation with the BOR engineers (Figure 1). This retaining wall effectively tiered the property providing level ground for fish holding structures such as lined ponds and tanks downstream of the existing cage and building, and also provided the foundation for a new multiuse building that will comprise Phase 3 of the renovation (Figure 2). Contractors were selected and construction on Phase 2 began in May 2017 after an extensive planning process. Coordination with USFWS and BOR on archaeological and Northern Mexican gartersnake monitoring occurred throughout clearing and the construction phase. Although some delays to the initial construction schedule occurred, the contractors were able to complete the project on time. The resulting retaining wall varies in height, but averages approximately six feet. The retaining wall was constructed with multiple locations for flow through piping to accommodate greater tank capacity in the future and increased flexibility in plumbing should tank systems need to be changed.

The retaining wall provided level space for other features that could then be installed on the resulting tier. These features installed during Phase 2 include two 30,000 gallon lined ponds with designated collection sumps (located below the retention wall) for easy gathering of fish when drained. Six 12' diameter by 5' deep round and eight 4' square fiberglass tanks were purchased to be installed on the pad next to the ponds. These tanks will be plumbed by Department staff. Contractors upgraded conduit throughout the facility to meet increased power demands and provide flexible wiring options for the future. The driveway was improved and expanded to accommodate the increased spatial extent of the facility, which now surrounded by 10' chain link fencing to increase security. Netted covering was installed over the Phase 1 caged area to deter predators.

Additionally, electrical wiring was added to the external fencing to aid in terrestrial predator deterrence (e.g. raccoons). We have not observed any mortality associated with predators since the upgrades.

Three 12' X 32' sheds in good working condition were obtained from Department surplus and added to the southwest corner of the upper tier of the facility. Some of the critical functions in the main building will be transferred to these sheds. These include temperature controlled feed storage, shop space, tool storage, and some quarantine functions. A 9kW generator was purchased to supply emergency power to the quarantine shed in the event of a power outage.

In order to meet power demands resulting from the new infrastructure, a new SES service panel was installed on the west side of the existing building, replacing the existing meter on the east side of the main building. This upgrade increased our electricity supply from 200 amps to 800 amps, accommodating any additional upgrades at the facility.

Activities associated with Phase 2 were completed in September 2017.

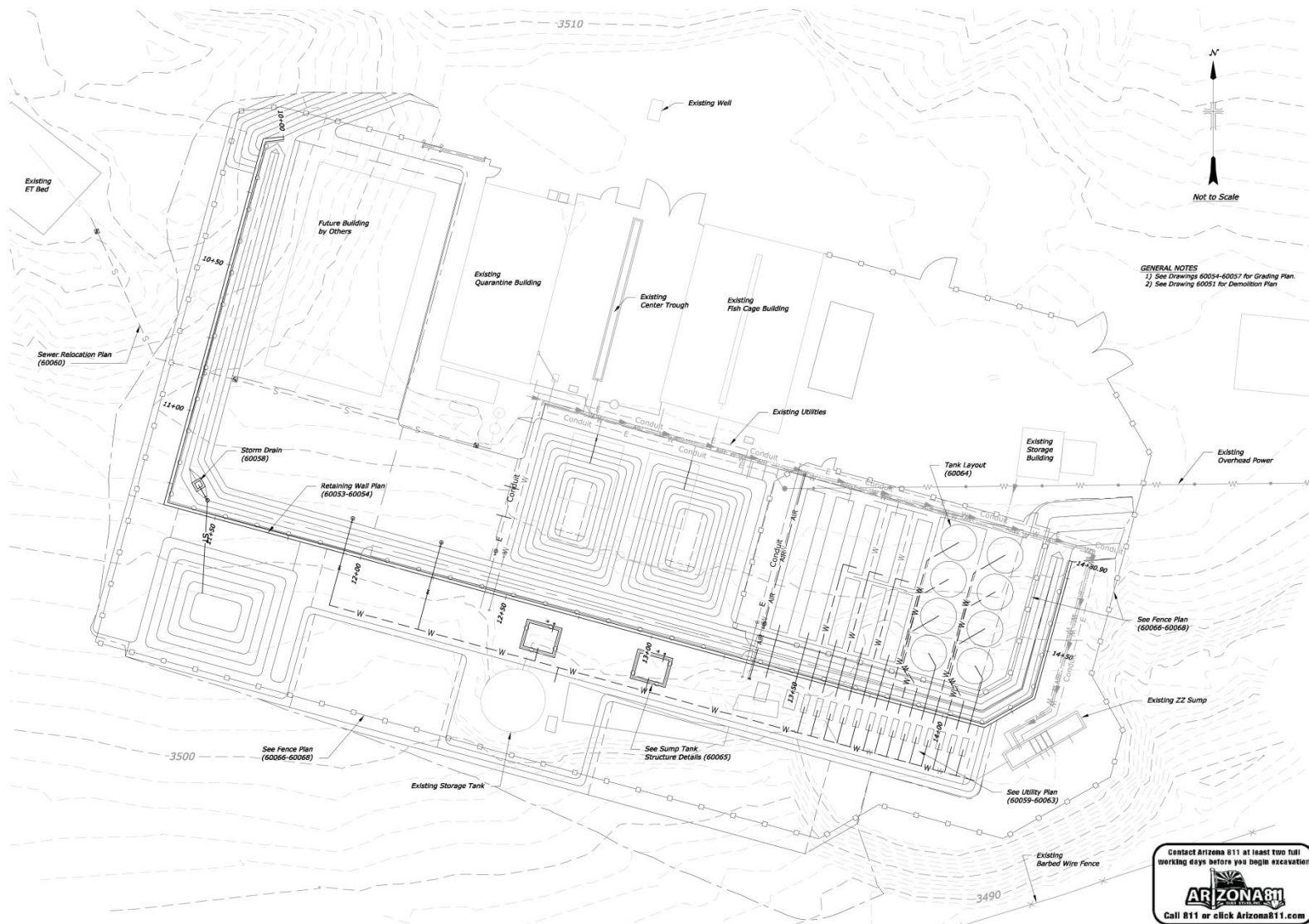


Figure 1: Construction Schematics. Note: the above plans may not fully represent actual construction layout as adjustments to the plans were needed during construction activities (e.g. current tank layout is different from the above).

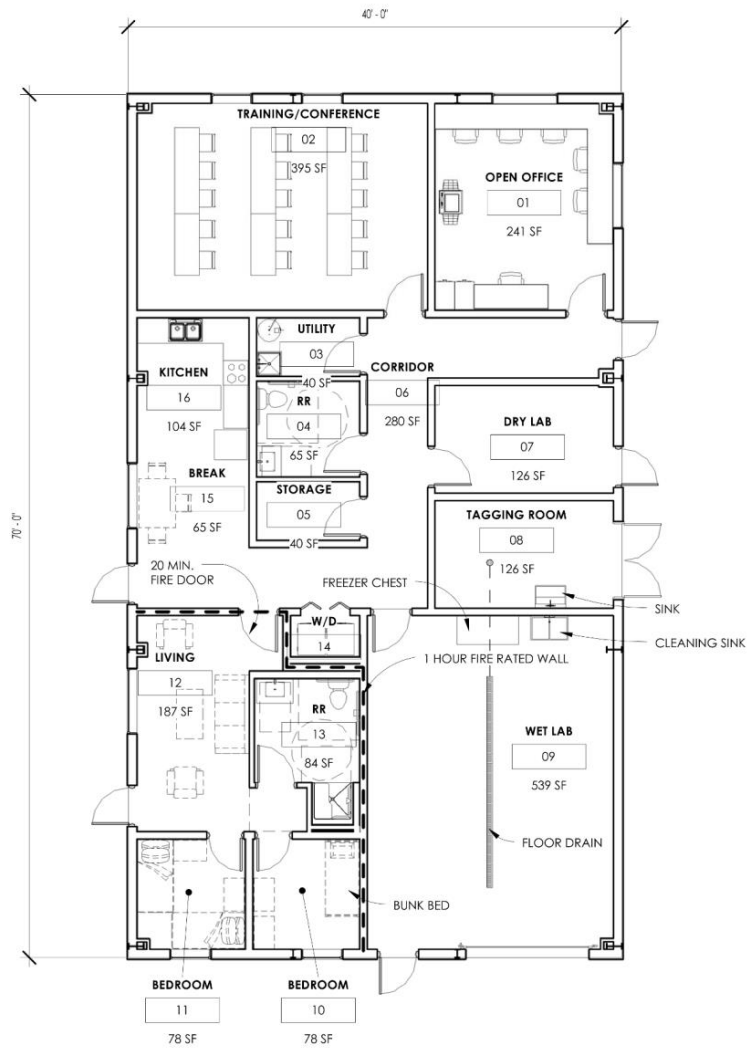




Figure 2: Overlay of construction drawings on aerial image of ARCC pre-renovation.

### ***Phase 3***

Excluding open covered structures, ARCC has always operated under a single open floor plan building, which has resulted in logistical and, occasionally, biosecurity issues. For example, fish quarantine needed to be conducted in the same building as other incompatible functions such as office space and feed storage. SPS+ Architects, LLC were contracted to design a new multiuse building under direction of AZGFD and BOR that will be placed west of the existing building. This building, which represents Phase 3 of the renovation, would support many missions of the native fish conservation program, such as education and research, while also supporting the fish care and production functions of ARCC. The building is purposed to provide office space, living facilities for visiting staff or researchers, classroom space, equipment storage and a wet lab for native fish research (Figure 3). Due to a prolonged planning, and environmental and cultural compliance period, and due to delays in completion of Phases 1 and 2, construction on the Phase 3 building was not initiated because it could not be completed within the performance period for BOR funding; however, we continue to coordinate with BOR on this final objective of the renovation and are taking steps to ensure completion in the near future. The remaining funds present at the end of the performance period represent those intended to be put toward construction of the Phase 3 building.



2A FLOOR PLAN 2A  
1/8" = 1'-0"

PRELIMINARY  
NOT FOR  
CONSTRUCTION

**SPS+ ARCHITECTS**  
 881 E. VIA DE NEGOCO  
 CONTIDALE, PAGE SPRINGS  
 TX 79572  
 TEL: 409.991.2800  
 FAX: 409.991.2823  
 SPPPLUSARCHITECTS.COM

AGFD PAGE SPRINGS  
 OPERATIONS BUILDING  
 FLOOR PLAN 2A

DATE:	6/20/17	JOB #:	1666
REVIEWED BY:	Checker	SHEET:	A1.0C
REVIEWED BY:	SW	REV:	

Figure 3: Architectural plans for Phase 3 building.

## **CONSERVATION AND MANAGEMENT IMPLICATIONS:**

The modernization of the ARCC completed through this performance period has vastly enhanced the facility's ability to support native fish conservation. The facility's operations have previously been restricted due to limited or outdated tank infrastructure to support fish holding and production. This renovation has vastly increased the facility's capacity and performance. Although current fish holding capacity has remained similar, spawning capacity increased with the purchase of the new longitudinal raceways. With the completion of the Phase 2 retaining wall, we have also established additional areas with plumbing infrastructure established, in which tanks can be added in the future to significantly expand overall capacity. These could be useful if we observe an increase in production from refining spawning techniques, or the need to take on new refuge lineages or species at the facility due to changes in wild populations.

Aside from capacity, improvements in functionality have been gained. The flow through spawning raceways have both increased our production abilities, but also improved survival. Spawning tanks are no longer connected in series which limited the number of unique lineages we could spawn at one time. Due to separate collection sumps for each raceway, larval fish can be easily removed from tanks limiting mortality associated with handling and predation by adults. We anticipate this greatly improving spawning success and overall production particularly in Spikedace and Loach Minnow lineages, providing a greater number of fish for research and repatriation efforts.

Biosecurity has increased significantly as a result of the modernization. One of the greatest improvements to biosecurity is the development of designated fish quarantine areas outside of the existing office space. Previously, quarantine functions occurred within areas that were also utilized for office space, feed storage, and research activities. Staff now have the ability to completely isolate new fish coming into the facility to treat for pathogens, and limits potential exposure from daily operations. This change reduces potential vectors for disease transmission to the refuge populations outside and increases control options should a pathogen be detected. The perimeter fence also limits

unintended human transfer of disease throughout the facility. Increase tank space also allows lineages to be separated more strategically, limiting the potential of a disease outbreak affecting entire lineages.

Predator management is a concern for every aquaculture facility. The majority of predation we have observed at ARCC historically is from raccoons, otters, and to a lesser extent birds. Although rare lineages have always been sheltered from predation after the construction of the cage in 2007, control for outside tanks was focused at the tank level with screens placed over tanks, with little protection for old ponds. The renovation has added fencing and electrical wiring to control terrestrial predators from gaining access to the facility as a whole, which should increase security substantially.

Although construction of Phase 3 could not be completed within the performance period, the majority of the planning, design and logistical concerns were completed, we are excited about what the building would provide to the facility and to native fish conservation. The wet lab facilities would be utilized for research purposes. This includes enhancing spawning investigations and predator recognition work already being conducted on Razorback Sucker and Bonytail Chub at ARCC, but also the potential for collaborative investigations with outside researchers, or other new research avenues important for native fish conservation in the Southwest, such as invasive species control.

Outreach and education is an important aspect of ARCC's mission and is vital to any conservation program. ARCC staff frequently host tours or attend outreach events providing information on the native fish housed at the facility. This provides opportunities to educate the public about the importance of native fish conservation and display these unique species more regularly. The classroom would enhance these outreach opportunities, and would greatly improve other educational functions, such as the Department's fish identification course held at ARCC.

## LITERATURE CITED

Robinson, A. T., K. Mosher, J. Walters, and R. Mann. 2017. Gila River Basin Native Fishes Conservation Program: Arizona Game and Fish Department final report for agreement F14AC000148. A Gila River Basin Native Fishes Conservation Program Final Report to U.S. Fish and Wildlife Service for Cooperative Agreement No. F14AC000148. Arizona Game and Fish Department, Phoenix.

**APPENDIX:**



Figure A: Pouring concrete for the central trough of the Phase 1 raceways. Old ponds and tanks can be seen on the right side of the picture.



Figure B: Plumbing of new Phase 1 raceway, with collection sump on left.





Figure C: ZZ Sump, located on the southeast, downstream area of the facility.



Figure D: Lined pond with 30,000 gallon capacity installed on the upper tier created by the Phase 2 retaining wall.



Figure E: Completed Phase 2 retaining wall. Collection sumps for the lined ponds are shown on the right side of the picture.