

Work Task E2: Beal Lake Native Fish

FY05 Estimate	FY05 Actual	Cumulative Accomplishment Through FY05	FY06 Approved Estimate	FY07 Proposed Estimate	FY08 Proposed Estimate	FY09 Proposed Estimate
\$250,000	\$214,572	\$214,572	\$210,000	\$100,000	\$50,000	\$50,000

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Start Date: FY05 **Expected Duration:** FY55

Long-term Goal: Habitat Creation

Conservation Measures: BONY2 and RASU2

Location: Reach 3, Arizona, Havasu NWR, ½ mile east of River Mile 237

Purpose: Reclamation intends to maintain the backwater created for native fishes under the 1997 BO. Reclamation is simultaneously making improvements to the backwater and conducting restoration research at the site to advance knowledge in backwater habitat function and maintenance requirements. Information from this research will be used to adaptively manage the backwater and will be used to increase efficiency and effectiveness in future backwater habitat creation projects.

Connections with Other Work Tasks (past and future): This Work Task was previously included in the Draft FY05 Work Tasks as a portion of Beal Lake, Havasu National Wildlife Refuge (E1). Monitoring of native fish is being addressed under F5.

Project Description: A substantial investment was made in the restoration of Beal Lake prior to the implementation of the LCR MSCP. Located on Havasu NWR, Beal Lake was approximately 225 acres of shallow, low-quality aquatic habitat that was dredged to deepen it, beginning in 2001, to create a functioning backwater dedicated to native fish. The Beal Lake restoration project is a continuation of the commitment to construct protected native fish habitat first agreed to as a portion of the BO. The obligation for the continued maintenance and management of Beal Lake as well as current and future research and development of the backwater as native fish habitat have been included in LCR MSCP activities.

A component of the restoration research and management of Beal Lake included the installation of a cylindrical wedge wire screen system. As the preferred alternative for backwater habitat creation, Beal Lake was initially isolated from Topock Marsh with a passive rock filtration system. After several months of poor performance (specifically, inability to keep up with evaporative losses in Beal Lake), Reclamation decided to test a new technology that would supplement water flow into Beal Lake and would continue to be effective in excluding all life stages of non-native fishes. A cylindrical wedge-wire screen system was selected because of several advantages in terms of ease of maintenance and long-term performance. Because cylindrical wedge-wire screen technology had never been used in this particular application,

information was needed to estimate the hydraulic capacity of the system and its true exclusion capabilities. A two-phase investigation, including in situ hydraulic testing and a laboratory exclusion evaluation, was contracted to provide these data. Results from these studies will provide a clearer picture of the appropriateness of this technology in this situation and for future applications.

To be more efficient, a number of the existing water control structures at Beal Lake were replaced during the screen system installation. These features operated poorly and were not sized adequately to supply the necessary water volume to the irrigation pump or to Beal Lake.

Additional improvements have been proposed to allow for more effective management of water in Beal Lake. A water management system that would enable large-scale water removal, water level control for fisheries management, and large scale-water circulation capabilities is preferred. The system would consist of a permanent platform, ramp, and discharge pipe that allow for the intermittent deployment of various pumps, depending on the specific management need. Specifically, the water management system will be used to assist the irrigation pump in lowering the water level in Beal Lake for lake renovation (this process includes pre-treatment fish salvage, chemical treatment of the water to kill remaining non-native fish, post detoxification sampling, and restocking with native fish). In addition, it will be used as a regular management tool to circulate water from the south end of Beal Lake and induce freshening flows into Beal Lake from Topock Marsh to maintain adequate levels of water quality to support native fish. Without the ability to provide water exchange, native fish populations and their associated biological communities in Beal Lake may be impacted. In order to maintain adequate water quality in Beal Lake over the long-term, there must be a mechanism for large-scale water circulation.

Previous Activities: The costs of initial backwater creation, including dredging and isolating the backwater with a semi-permeable rock structure prior to FY05, were incurred prior to the LCR MSCP.

FY05 Accomplishments: Improvements to the water management system were completed and included the replacement of stop-log water control structures between Topock Marsh and the irrigation pump bay with a series of 18” gated culverts to provide adequate water volume for the irrigation pump, and to maintain Beal Lake.

A cylindrical wedge-wire screen system was installed in spring 2005. The system consists of three 18” diameter PVC pipes installed through the existing rock structure with cylindrical wedge-wire screens installed on each end of the pipes using standard flange connections. An additional 18” pipe was installed which could be screened at a later date if capacity was deemed insufficient. This essentially means that each pipe and screen combination will represent an independent system. An in-line valve was installed in each pipe to allow the pipe to be closed when necessary (i.e., repair or replacement of screens, etc.).

The screens were custom fabricated and purchased from Johnson Screens. The screens are approximately three feet in diameter and approximately three feet long. They are constructed of Z-Alloy, an anti-biofouling nickel-copper alloy developed by Johnson Screens, and are equipped

with an internal diffuser and 3" air backwash system. The screen slot size is 0.6 mm and each screen has a capacity of 1,500 gallons per minute.

The screen system was evaluated after installation to determine the effectiveness and efficiency of the system with respect to screening capabilities, hydraulic performance, and maintenance requirements. This also included a test of the screens' internal backwash systems. The testing involved three independent sampling events during different seasonal conditions and over a number of different flow scenarios. In addition, continuously sampling water level sensors were installed to provide remotely accessible data to assess future screen performance.

Results indicate that the screen system is more than adequate to provide water to balance evaporative losses in Beal Lake. Results also suggest that the system has relatively low maintenance requirements, best handled through regular low-tech cleaning of the screens. Based on the exceptional performance of the contracted services for these evaluations, Phase 2, evaluation of the screen system's biological exclusion capabilities, would be funded in FY06.

Actual expenditures in FY05 were less than projected because the installation of the water management system was rescheduled for FY06 to allow adequate time for compliance permitting; however, preliminary designs and permitting activities were initiated in FY05.

FY06 Activities: In March FY06, a water management system was constructed on the south end of Beal Lake and a 50 cubic feet per second hydraulic pump was deployed. Due to successful installation and testing of the water management system, promising performance of the screen system, and availability of native fish for stocking, renovation plans for Beal Lake were accelerated with cooperation from the FWS. Immediately after installation, the water management system was used to lower water levels in Beal Lake in preparation for renovation. A salvage effort was conducted prior to renovation with cooperators from AGFD, FWS, and Reclamation to remove any remaining razorback suckers and significant game species. Beal Lake was then treated with a new formulation of rotenone, called CFT legumine. This formulation of rotenone uses a plant-based carrier (surfactant), rather than a petroleum distillate carrier, and has a reported lower toxicity to periphery habitats. This treatment also represents the first large-scale use of this product in the United States. The rotenone was applied to the surface of the lake by helicopter in two treatment events in April 2006 to increase the likelihood of complete removal of non-native fish. If post-renovation surveys and sampling indicate that the renovation was successful, subsequent native fish species stocking will be coordinated with the FWS.

Phase 2 of the screen system evaluation is currently ongoing. Larval stages of threadfin shad and two other non-native species (or appropriate surrogates) are being introduced into the vicinity of a scale model screen system in a laboratory setting. Samples from the downstream end of the screens will be examined to determine the percent exclusion and condition. Study results will be made available on the LCR MSCP website.

Proposed FY07 Activities: Major improvements to isolate and renovate the backwater are anticipated to be complete prior to FY07. A post renovation assessment will be made to determine if the facilities present at Beal Lake are functioning properly. Future work may

include upgrades to improve the integrity of the rock structure and/or the installation of additional screens to increase flow capacity. The budget estimate for FY07 allows for continued project coordination with the Havasu NWR and FWS fisheries resource office, as well as, the operation, maintenance and management of the backwater for native fish. Part of the operation and maintenance funding would support on-site staff to conduct regular maintenance activities including, inspection and routine cleaning, monitoring, evaluation, and repair (if necessary) of the wedge-wire fish screens, and related water control structures, as well as regular inspection of the rock structure. In addition, part of the FY07 proposed budget will cover regular calibration/maintenance of the water level sensors and data loggers at Beal Lake, as well as follow-up research reporting.

Pertinent Reports: *Evaluation of a Cylindrical Wedge-Wire Screen System at Beal Lake, Arizona, 2005* is posted on the LCR MSCP website.



Figure E2a: Assembling the wedge-wire fish screen system.



Figure E2b: In situ hydraulic testing of the wedge-wire screens.



Figure E2c: Installation of the wedge-wire fish screen system.