

Work Task E2: Beal Lake Native Fish

FY06 Estimates	FY06 Actual	Cumulative Accomplishment Through FY06	FY07 Approved Estimate	FY08 Proposed Estimate	FY09 Proposed Estimate	FY10 Proposed Estimate
\$210,000	\$270,840	\$485,412	\$100,000	\$50,000	\$70,000	\$70,000

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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, one-half 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. Information from this research will be used to adaptively manage the backwater and increase efficiency and effectiveness in future backwater habitat creation projects.

Connections with Other Work Tasks (past and future): Monitoring of native fish is being addressed under F5.

Project Description: Beal Lake was approximately 225 acres of shallow, low-quality aquatic habitat that was dredged, 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 habitat for protected native fish under the 1997 BO. Continued maintenance and management of Beal Lake and research and development of the backwater as native fish habitat have been included in LCR MSCP activities.

The restoration research and management of Beal Lake included the installation of a cylindrical wedge wire screen system. Beal Lake was initially isolated from Topock Marsh with a passive rock filtration system. After the filtration system performed poorly for several months (the system was unable 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 be effective in excluding all life stages of non-native fishes. A cylindrical wedge-wire screen system was selected because of ease of maintenance and long-term performance. Because cylindrical wedge-wire screen technology had never been used for this 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 increase efficiency, a number of the existing water control structures at Beal Lake were replaced during the screen system installation. The existing features performed poorly and were not adequately sized 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. 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, the system 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. 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 were incurred prior to FY05 and implementation of the LCR MSCP.

FY06 Accomplishments: In March 2006, a water management system was constructed on the south end of Beal Lake and a 50-cfs hydraulic pump was deployed. Due to successful installation and testing of the water management system, promising performance of the screen system (previously installed at Beal Lake), and availability of native fish for stocking, renovation plans for Beal Lake were accelerated under the direction of the USFWS. Immediately after installation, the water management system was used to lower water levels in Beal Lake in preparation for renovation. A salvage effort was led by USFWS to remove any remaining RASU and significant game species and was conducted prior to renovation with cooperators from AGFD, USFWS, and Reclamation.

In two treatment events on April 6 and April 20, rotenone was applied to Beal Lake by helicopter. The two applications were performed to increase the likelihood of complete removal of nonnative fish. The treatments appeared to be effective; immediately after the first treatment, cooperating agencies patrolled the entire lake surface (areas accessible by boat) and collected any affected remaining native or game species. No native fishes were observed. All live game species were returned to Topock Marsh. Immediately after the second treatment, cooperating agencies thoroughly searched the entire lake surface (areas accessible by boat) to determine if any additional fish were killed by the treatment. No additional native or nonnative fishes were observed alive or dead in Beal Lake during the second treatment.

Prior to stocking, USFWS conducted sampling to ensure that nonnative fishes were not present in Beal Lake, post-renovation. On June 14, 2006, approximately 1,844 untagged bonytail were stocked into Beal Lake by USFWS. On June 15, 69 razorback sucker were transferred by USFWS to Beal Lake. During razorback stocking, USFWS and Reclamation personnel observed approximately 30 largemouth bass ranging from 25 to 75 mm in length. This was the first observation of nonnative fish presence in Beal Lake since renovation in April.

Additional schools of nonnative fishes were observed near the rock structure and near the water management system ramp on June 19. On June 16, a USFWS refuge employee identified an area of flow on the south (Beal Lake) side of the rock structure that appeared to have water moving from the Topock side of the rock structure into the Beal Lake side of the structure. No breach could be found on the Topock Marsh side of the rock structure; however, the structure has been identified as a possible vector for invasion of Beal Lake by nonnative fishes.

During winter 2006-2007, the USFWS surveyed the entire lake to assess native and nonnative species composition. The USFWS is currently monitoring for water quality and fisheries at Beal Lake.

During FY06, biological evaluations of the screen system at Beal Lake were conducted. These biological evaluations included:

1. Determining if there were differences in bio-fouling/bio-accumulation in two screen materials: 304 stainless steel (304 SS) and Z-Alloy.
2. Determining the effectiveness of the screen system in excluding small life stages (eggs and larvae) of selected species of nonnative fishes.

Screen material evaluations were conducted in-situ at two sites on the LCR and screen exclusion trials were conducted in a laboratory setting. For the evaluations that compared screen materials, the Z-Alloy samples had much less biofouling than was observed on the 304 SS samples. This suggests that the Z-alloy screen material would be superior to 304 SS in terms of lower maintenance for long-term deployment at these sites. A final report is posted on the LCR MSCP Web site.

The screen system was effective in excluding the eggs and larvae of fathead minnow, smallmouth bass, and blue catfish at all of the velocities tested during laboratory trials. A portion of the gizzard shad eggs and larvae were entrained during the testing. It was concluded that the screen system was not effective in excluding gizzard shad eggs and larvae and that this type of screen system would also not be effective in excluding 100% of threadfin shad eggs and larvae in situ. Presence of threadfin shad is not considered to have a major impact on native fishes. Shad are not a predatory species and in their small life stages may provide forage for bonytail. These preliminary results suggest that screen systems with these slot sizes can, however, effectively exclude all life stages of nonnative fishes that are larger than the representative species successfully tested in this study. These results also suggest that these types of screen systems may be an effective means of protecting backwaters for native fishes in future projects.

FY07 Activities: No major construction projects are anticipated for Beal Lake in FY07. Activities covered under this work task in FY07 will be limited to continued coordination with USFWS regarding future construction (including rehabilitation of the rock structure) and maintenance of the features in place at Beal Lake. Other expenditures in FY07 will include continuation of the restoration research component at Beal Lake. Funding in FY07 will allow for upgrading and maintaining the water level sensors at Beal Lake and for the preparation and submission of a manuscript on the screen system research to a peer-reviewed journal for publication.

Proposed FY08 Activities: Coordination with resource agencies will continue to determine future operations and maintenance of existing features at Beal Lake. Long-term monitoring of the screen system's hydraulic performance will continue using the installed water level sensor system. Real-time data will be transmitted from the remote data loggers and is expected to be available on a Web site by summer of FY07. This work task also covers the routine maintenance of the screen system and water level sensors. This work will include regular flushing and manual cleaning of the screen system and periodic calibration and maintenance of the sensor system. Water quality and fisheries monitoring activities will be coordinated with USFWS and are covered under F5.

Pertinent Reports: *Evaluation of a Cylindrical Wedge-Wire Screen System at Beal Lake, Arizona, 2005*; and *Evaluation of a Cylindrical Wedge-Wire Screen System at Beal Lake, Arizona, 2006 Phase II Testing* is posted on the LCR MSCP Web site.