

## Work Task C26: Evaluation of Raceway Rearing of Razorback Sucker at Lake Mead Fish Hatchery

FY11 Estimate	FY11 Actual Obligations	Cumulative Expenditures Through FY11	FY12 Approved Estimate	FY13 Proposed Estimate	FY14 Proposed Estimate	FY15 Proposed Estimate
\$70,000	\$4,795.46	\$162,522.23	\$0	\$0	\$0	\$0

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**Start Date:** FY08

**Expected Duration:** FY11

**Long-term Goal:** Rear RASU of sufficient quantity and quality to accomplish the LCR MSCP Fish Augmentation and Species Research Programs.

**Conservation Measures:** RASU3, RASU4, and RASU8.

**Location:** Reach 1, Lake Mead, Boulder City, Nevada.

**Purpose:** Evaluate raceway rearing of RASU to improve physical conditioning prior to stocking.

**Connections with Other Work Tasks (past and future):** This research is complementary to work conducted under the Razorback Sucker Rearing Studies (C10). If successful (i.e., shows benefit to fish and is cost effective), this action may be included in the Fish Augmentation Program (Section B) in the future. Other rearing of RASU is being conducted at this facility under the Lake Mead Fish Hatchery Work Task (B6).

**Project Description:** This project will investigate and evaluate rearing of RASU in flowing raceways at Lake Mead SFH. The study will investigate ways to deliver food, efficiency of food conversion, feeding rate, growth of RASU, and physical condition of fish. End-of-year results will be compared with similar parameters for RASU being reared for the LCR MSCP under non-flowing conditions.

This research is designed to take advantage of a unique opportunity at Lake Mead SFH. Research previously completed at the Achii Hanyo Rearing Station (B3) by the USGS and USFWS showed that RASU acclimated to flow have improved swimming performance. This may improve post-stocking survival for fish released by the LCR MSCP. Currently, there are no facilities rearing fish for the LCR MSCP using flowing raceways. Due to current water elevations of Lake Mead, intake water temperatures at Lake Mead SFH are too warm for rearing rainbow trout (summer water temperatures in 2006 exceeded 75°F). The NDOW is waiting to acquire water from deeper, cooler areas of Lake Mead. In the meantime, all or parts of the Lake Mead SFH will be idle. This work proposes to use RASU from lakes Mead and Mohave to

examine and evaluate the practicality and cost effectiveness of feeding and growing RASU in flowing raceways at Lake Mead SFH.

**Previous Activities:** Reclamation, SNWA, and NDOW have been cooperatively rearing Lake Mead RASU at the Lake Mead State Fish Hatchery (B6) to support ongoing studies in Lake Mead. During FY09 the design for the flowing raceway test apparatus was finalized, and four large fiberglass raceways along with parts and equipment for construction of the inflow manifold were purchased. Construction of the inflow manifold was completed and the flowing raceway apparatus was tested and approved in early 2010. Rearing trials began in late May and concluded in the end of July while hatchery water temperatures were still favorable. Approximately 1,200 subadult RASU were weighed, measured for total length, individually marked with PIT tags, divided, and released into the three test raceways, and were exposed to flow velocities of 0, 23, or 36 centimeters per second (cm/s). A subset of the 1,200 unexercised RASU were also evaluated individually in a swim chamber to establish their pre-trial mean failure velocity (velocity at which fish could not maintain their position in the water column) for post-trial comparison. Post-trial analysis showed that growth, food conversion efficiency, and swimming performance were highest among fish that had been exposed to flowing water conditions. Furthermore, fish exposed to the highest average flow velocity (36 cm/s) performed better in each category tested while unexercised control fish (0 cm/s treatment) exhibited the worst growth, food conversion efficiency, and conditioning. Additional trials were planned for the following study year to help validate these findings and direct future research in this area.

**FY11 Accomplishments:** Rearing trials continued with minor modifications to the initial study design. Previously fish had been exposed to flowing conditions for twelve out of every twenty-four hours, but in the final study year one of the treatments from each trial increased flow to eighteen hours per day. Another change that occurred during the final study year was the inclusion of winter trials which aimed to evaluate the effect of water temperature on growth, food conversion efficiency, and swimming performance. Winter trials averaged 13°C for their duration while summer trials averaged around 20.5°C.

Results from the FY11 trials helped to validate the findings from the previous study year. Again RASU exposed to the highest velocity flows (38 and 39 cm/s) exhibited the most growth, highest food conversion efficiency, and best swimming performance when compared to lower flow and no flow treatments. Unexercised fish grew an average of 0.44 mm/day, while fish exercised for 12 and 18 hour periods grew an average of 0.85 mm/day and 0.94 mm/day respectively. It was also observed that growth rates were significantly lower during the winter trials. Food conversion rates showed a similar trend and were highest among fish exercised in the summer trials. RASU flow conditioned for 12 hour periods during the summer exhibited a 43% higher mean failure velocity than fish exercised for the same period in the winter. Similar results were observed for the 18 hour trials, where summer months produced a mean failure velocity that was 45% higher than the winter trials. These findings suggest that rearing RASU in flowing conditions for a period of 30 days has a positive effect on overall growth, food conversion efficiency, and swimming performance. Additional research evaluating optimal densities for rearing fish under these conditions as well as how improved swimming performance may enhance predator avoidance and survival may be explored in the future.

**FY12 Activities:** Closed in FY11.

**Proposed FY13 Activities:** Closed in FY11.

**Pertinent Reports:** The 2010 annual report titled, *Evaluation of Rearing Razorback Sucker (Xyrauchen texanus) in Flowing Raceways at Lake Mead Fish Hatchery*, and the final project report from 2011 titled, *Final Evaluation of Flow Conditioning Razorback Sucker (Xyrauchen texanus) in Flow-Through Raceways at Lake Mead Fish Hatchery* will be posted to the LCR MSCP website.