Work Task C12: Demographics and Post-Stocking Survival of Repatriated Razorback Suckers in Lake Mohave

FY10 Estimates	FY10 Actual	Cumulative Accomplishment Through FY10	FY11 Approved Estimate	FY12 Proposed Estimate	FY13 Proposed Estimate	FY14 Proposed Estimate
$200,000	$216,432.73	$934,265.66	$200,000	$0	$0	$0

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Start Date: FY06

Expected Duration: FY11

Long-term Goal: Species research.

Conservation Measures: RASU5.

Location: Reach 2, Lake Mohave, Arizona/Nevada.

Purpose: Assess population for repatriated RASU, and develop a demographic model for predicting survival and replacement rates to maintain broodstock for the LCR MSCP.

Connections with Other Work Tasks (past and future): Data collected under this work task, and previously under Evaluation of Remote Sensing Techniques for PIT-Tagged Fish (C23, closed in FY09), are managed under Data Management (G1).

Project Description: This activity will support ongoing RASU conservation efforts at Lake Mohave to develop and maintain a population of adult RASU as a genetic refuge. More than 120,000 fish have been reared and repatriated to date, yet broodstock population estimates remain below 2,000 fish. The study will assess causes for poor survival of stocked RASU and make recommendations for corrective actions.

Previous Activities: Rearing, stocking, and recapture data for Lake Mohave were collated and reviewed. Field investigations were implemented during spawning and post-spawning seasons. Telemetry work was initiated to examine post-stocking dispersal, habitat selection, and short-term mortality, and to verify existing population models. A population model was refined to estimate abundance and to describe critical, dynamic life table features such as mortality rates. Data were acquired to assess fish predators as a mortality factor for stocked RASU.

Extensive radio and sonic tracking of fish were used to assess distribution and survival. Demographic modeling was used to assess population structure. The sonic telemetry study was designed as a multi-year iterative process, with each study year being considered a separate independent study. Observations and conclusions from previous

year activities provided direction for work in subsequent years. Initial findings during the 2007 study year showed that the 300-mm TL RASU that were released were being eaten by predators immediately after stocking, with less than 20% surviving the first 90 days. This prompted a need to evaluate stocking of adult size RASU (500 mm TL). Rearing of these larger fish took longer than expected. Only a few hundred fish were available for research subjects during 2007.

The second, six-month interval of sonic telemetry was completed during 2008. This work compared post-stocking survival of subadult (avg. TL 380 mm) and adult (avg. TL 500 mm) RASU repatriates. At the conclusion of the study year, 1 of 15 (7%) tagged subadult fish and 5 of 14 (36%) tagged adult fish remained active. For subadult fish in the telemetry study, first-week survivorship was estimated at 82%. For adult fish in the telemetry study, first-week survivorship was estimated at 95%. Mortality was likely due to predation by nonnative striped bass.

The third, six month sonic telemetry study was completed in FY09 and again evaluated the post-stocking survival of adult and subadult RASU. Twenty adult and 10 subadult razorback sucker were implanted with sonic transmitters and released at Fortune Cove (RM 17) on November 6, 2008. One fish was removed from analysis because it was contacted only once immediately after release. At the conclusion of the study year, 6 of 9 (67%) subadult and 16 of 20 (80%) adult razorback suckers remained active. Five transmitters were recovered from the bottom of the lake by a SCUBA diver. No fish remains were observed near any recovered transmitters.

Annual monitoring for repatriated and wild RASU continued. Capture data continued to show a decline of the original wild population that had existed prior to the repatriation program. The repatriate population maintained a low abundance but was stable despite only a small number of RASU repatriates (<1,000 individuals) being stocked during FY08.

Based on monitoring data from 2008 and 2009, the wild razorback sucker population in Lake Mohave was estimated at 70 fish. The repatriated razorback sucker population was estimated to number 1,502 with a 1% estimated survival of all repatriates released as of March 2008.

FY10 Accomplishments: The fourth, six-month interval of the sonic telemetry portion of this task was completed. This work compared post-stocking survival of Bubbling Ponds reared adult (avg. TL 530 mm) RASU repatriates stocked into Lake Mohave at the Willow Beach boat ramp and adult (avg. TL 610 mm) RASU captured and released near Hoover Dam. All study fish from both groups that survived the stocking and were contacted post-release remained active during the entire six-month period (100% survival). Approximately 60% of individuals from both groups of fish remained exclusively in the zone above Willow Beach where the highest concentration of contacts occurred. The four sonic telemetry studies completed under this work task have implicated predation as a major cause of post-stocking mortality, and have provided additional evidence that RASU size at release is strongly associated with post-stocking mortality. However, the studies have shown high annual variation in post-stocking

mortality which may be linked to the abundance of large (greater than 800 mm) striped bass.

Annual monitoring for repatriated and wild RASU continued with sampling trips in March and November 2010. Capture data as well as mark-recapture estimates of population size continued to show a decline in wild abundance. The repatriate population maintained a low abundance but remained relatively stable. Based on monitoring data from 2009 and 2010, the current wild razorback sucker population in Lake Mohave is estimated at 24 fish. The repatriated razorback sucker population is estimated to number 1439 with a 1% estimated survival of all repatriates released as of March 2009. The current total population estimate for razorback sucker in Lake Mohave is 1,463.

Remote sensing data obtained through Evaluation of Remote Sensing Techniques for PIT-Tagged Fish (C23-Closed FY09) was analyzed and compared to netting data. A total of 12,278 scanning contacts and 711 unique individuals were reported since remote sensing began in Lake Mohave in 2008; 1,733 from 2008, 3,083 from 2009 and 7,462 from 2010. In 2010 the number of unique remote scanning contacts with RASU exceeded the total RASU catch during the March roundup in 2010 (389 scans compared to 286 captured), but most fish were contacted only at one location; 5 of 18 fish were contacted in both Half Way Wash and Tequila sampling sites for RASU released prior to March 1, 2010 and 9 of 39 fish released after March 1, 2010. In addition, one fish released prior to March 1, 2010 and six fish released after March 1, 2010 were contacted at Half Way Wash and Yuma Cove.

FY11 Activities: Activities during FY11 will focus on remote PIT scanner deployments in the riverine portions of Lake Mohave downstream of Hoover Dam. This work will be coordinated with remote PIT scanning conducted by Reclamation personnel in the basin area of the lake. In addition, a website will be created to compile striped bass capture data from sport fishermen including stomach contents of large striped bass. These data will be used to determine the potential impact striped bass have on razorback sucker and bonytail stocking. Modeling of RASU population and demographics will continue as new data are made available.

Proposed FY12 Activities: Closed in FY11. Monitoring activities identified through this research will be implemented under Razorback Sucker and Bonytail Stock Assessment (D8).

Pertinent Reports: An annual report titled, *Demographics and Post-stocking Survival of Repatriated Razorback Sucker in Lake Mohave 2010 Final Report,* will be posted to the LCR MSCP website. The study plan is available upon request.