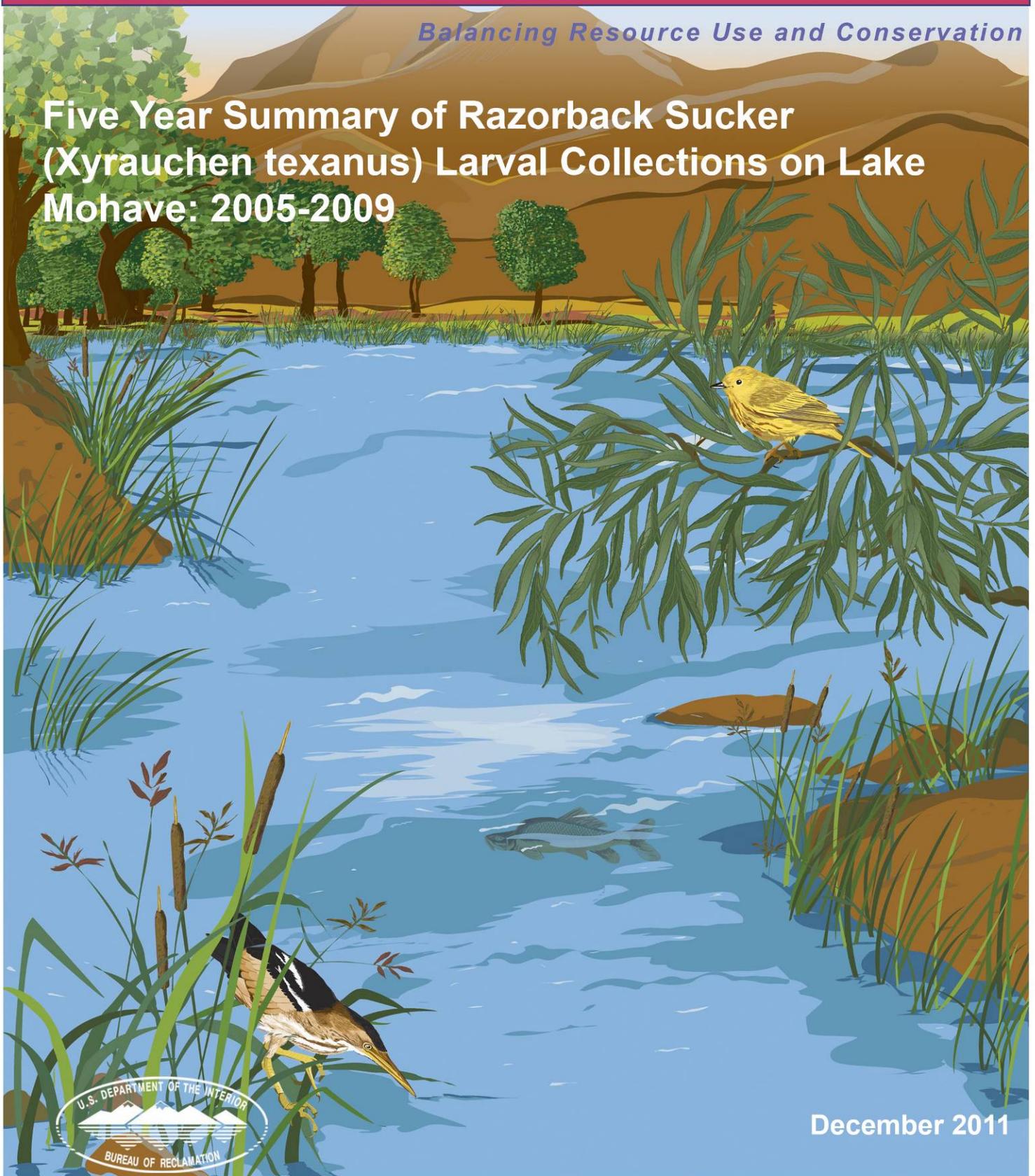




Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Five Year Summary of Razorback Sucker (*Xyrauchen texanus*) Larval Collections on Lake Mohave: 2005-2009



December 2011

Lower Colorado River Multi-Species Conservation Program Steering Committee Members

Federal Participant Group

Bureau of Reclamation
U.S. Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

Arizona Participant Group

Arizona Department of Water Resources
Arizona Electric Power Cooperative, Inc.
Arizona Game and Fish Department
Arizona Power Authority
Central Arizona Water Conservation District
Cibola Valley Irrigation and Drainage District
City of Bullhead City
City of Lake Havasu City
City of Mesa
City of Somerton
City of Yuma
Electrical District No. 3, Pinal County, Arizona
Golden Shores Water Conservation District
Mohave County Water Authority
Mohave Valley Irrigation and Drainage District
Mohave Water Conservation District
North Gila Valley Irrigation and Drainage District
Town of Fredonia
Town of Thatcher
Town of Wickenburg
Salt River Project Agricultural Improvement and Power District
Unit "B" Irrigation and Drainage District
Wellton-Mohawk Irrigation and Drainage District
Yuma County Water Users' Association
Yuma Irrigation District
Yuma Mesa Irrigation and Drainage District

Other Interested Parties Participant Group

QuadState County Government Coalition
Desert Wildlife Unlimited

California Participant Group

California Department
City of Needles
Coachella Valley Water District
Colorado River Board of California
Bard Water District
Imperial Irrigation District
Los Angeles Department of Water and Power
Palo Verde Irrigation District
San Diego County Water Authority
Southern California Edison Company
Southern California Public Power Authority
The Metropolitan Water District of Southern California

Nevada Participant Group

Colorado River Commission of Nevada
Nevada Department of Wildlife
Southern Nevada Water Authority
Colorado River Commission Power Users
Basic Water Company

Native American Participant Group

Hualapai Tribe
Colorado River Indian Tribes
Chemehuevi Indian Tribe

Conservation Participant Group

Ducks Unlimited
Lower Colorado River RC&D Area, Inc.
The Nature Conservancy



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Lower Colorado River
Multi-Species Conservation Program
Bureau of Reclamation
Lower Colorado Region
Boulder City, Nevada
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December 2011

Introduction

The razorback sucker (*Xyrauchen texanus*) (RASU) is endemic to the Colorado River drainage. It is considered to be one of the four mainstem big river fishes found within this basin. Historically, population abundance in Lake Mohave was estimated to be in the hundreds of thousands. However, the population declined over the years to estimates of 44,000 in 1991, to fewer than 3,000 in 2001, and to a current population estimate of 1,741 fish (Marsh et al. 2003, Pacey pers. com.). In 1991, the razorback sucker became federally listed as endangered because the adult population was declining due to non-native fish predation on larvae and habitat alterations from regional water development (USFWS 1998).

Collections of wild-born RASU larvae on Lake Mohave began in 1989 by the Native Fish Work Group (NFWG). These larvae were used to help rebuild the existing adult population of RASU and also established fish as a brood stock for the Lake Mohave RASU recovery program. This brood stock represents the remaining genomes for RASU and provides a level of genetic diversity found nowhere else in the world (LCR MSCP Final Report 2008). A population goal of 50,000 adult RASU was set by the NFWG; it was felt that this number was high enough to allow the adult population to rebuild and sustain itself. By 1994, it was determined that to meet the program goals wild RASU larvae should be caught from Lake Mohave and reared in captivity at Willow Beach National Fish Hatchery (NFH) and other grow-out facilities, and eventually be repatriated back into the lake.

Larval collection is a joint effort between the Bureau of Reclamation, the Nevada Department of Wildlife, the Arizona Game and Fish Department, the National Park Service, the U.S. Fish and Wildlife Service, and Dr. Paul Marsh of Arizona State University (Marsh and Associates LLC); all agencies are members of the NFWG. Yearly collection goals are set by the NFWG at annual meetings held each January in Laughlin, Nevada. The goals of the NFWG have since been incorporated into the Lower Colorado River Multi-Species Conservation Program (LCR MSCP). The LCR MSCP has a specific work task identified for larval collections and fish augmentation in the lower Colorado River.

Methods

Wild caught larvae are collected in Lake Mohave (Reach 2 of the MSCP) beginning in late January through the end of April. Larvae are then delivered to Willow Beach NFH to be grown to target sizes. When the fish reach the target size they receive a passive integrated transponder (PIT) tag and are released back into the lake. Every other week an additional 25 larvae are collected from each zone, preserved in 100% ethanol, and sent to Arizona State University's genetics laboratory for analysis. These collections are intended to ensure that the adult population's genetic diversity is being maintained in Lake Mohave.

The lake is divided into four zones and larvae are collected along both the Nevada and Arizona shorelines. The four zones are Nine Mile (RM 11.5-19.25), Tequila (RM 19.25-23.75), Yuma (RM 23.75-29), and Above Owl Point (RM 29-42.75). In each zone, larval collections are spread out spatially and temporally to represent the genetic diversity of the adult population (Figure 1).

To aid in larval collections, biweekly helicopter surveys are done along both the Arizona and Nevada shorelines from Hoover Dam to Davis Dam. These surveys are conducted from the last week of January to mid-April to aid in finding spawning aggregations of RASU. Time of day, physical location, GPS location, and number of fish viewed are all recorded along with photo documentation (Figure 2). To verify spawning aggregations sighted during the helicopter surveys, boat surveys are also conducted with the same data being recorded.

Prior to the beginning of larval collections, equipment is brought to the field station at Cottonwood Cove Marina in Searchlight, Nevada. The equipment needed for collection includes a 12-volt battery, a 12v50w Brinkman Q-Beam Starfire II larval light, a flashlight, an aquarium dip net with wooden dowel attached, a collection tub, buckets/lids, and larval data tags. An hour before sunset crews of two meet at the field station and gather the equipment needed before traveling by boat to the spawning grounds. Once there, a number of larval lights are hung off the back of boat and submerged in the water; collection begins when the first larvae appears.

Larvae display positive phototaxis, meaning they are drawn to a light source, allowing easy capture using a small dip net (Figure 3). They are dip-netted one at a time, counted, and placed in a collection tub (Figure 4). Once 250 larvae are captured, they are transferred to a 5-gallon bucket. The bucket is then labeled with the following information: agency, zone, location, number of larvae, number of lights used, total collection time, and the project (either NFWG or genetics).

At the end of the evening, larvae are taken back to the field station and placed on air stones in order to maintain the oxygen levels in the bucket. The next day the buckets are transported to Willow Beach NFH by either vehicle or boat. Larvae collections occur 4-5 hours per night for 3-5 nights per week.

In the Nine Mile, Tequila, and Yuma zones, larvae are typically collected on or near the spawning grounds. In contrast, Above Owl Point (AOP) zone spawning aggregations are not as visible. Therefore, beginning in 2007 a fair amount of effort was spent searching for larval presence. In 2008, this effort paid off with 26 new larval locations being discovered.

Larval collections begin the last week of January, although at times collections did not occur in certain zones, such as in 2005 and 2009 at Tequila, and in 2006 at Nine Mile. In 2007 and 2008, scheduling conflicts resulted in the postponement of larval collection to the first week of February and a couple of days in May. In February of 2007, Nine Mile

numbers were low because there were only three nights of effort as opposed to seven nights in 2008. Numbers were also low because the collection did not begin until the second week of February, whereas for the other two zones collection began in the first week.

The tables show no effort in the AOP zone for the first two months of collection because the fish in that area do not begin to spawn until March. In 2006, larval numbers in the AOP area were low because the fish had moved off the traditional spawning grounds and were not located again until 2007. In 2007 at AOP, there were 14 sites where larvae were collected with 9 new sites being found in April. This larval search effort continued into 2008 and by the end of the collection season 17 new sites were determined for a total of 26 new sites over the two years, which increased the quota for that zone.

By locating these new sites during different times of the spawning season, it has allowed for the opportunity to further secure the genetic diversity of the adult RASU population. In May of 2008, collection in AOP occurred for one evening in order to reach the yearly quota for that zone.

Results

Since larval collection began in 1994, 700,016 larvae have been captured from Lake Mohave. From the inception of the LCR MSCP (2005), 207,237 larvae have been captured and reared at Willow Beach NFH and Bubbling Ponds Fish Hatchery in Page Springs, Arizona. Over the years, the larvae yearly goal numbers have been adjusted for a number of different reasons. One reason is that the invasive quagga mussel was detected in Lake Mohave in January 2007. This prohibited the transfer of young larval fish to Bubbling Ponds Fish Hatchery. Bubbling Ponds cannot accept the larval fish because the water they are transported in contains potential veligers (mussel larvae) and the hatchery staff did not want to risk contaminating the hatchery water supply, and potentially further spreading this invasive species. Also, the release target size for adult RASU in Reach 2 has increased, which requires that these fish be held at the hatchery for a longer period, occupying space that was once used for larval fish. Finally, adult fish have moved from traditional spawning grounds to new locations, requiring an increased effort in locating the spawning aggregations.

Figure 1. Four larval collection zones on Lake Mohave

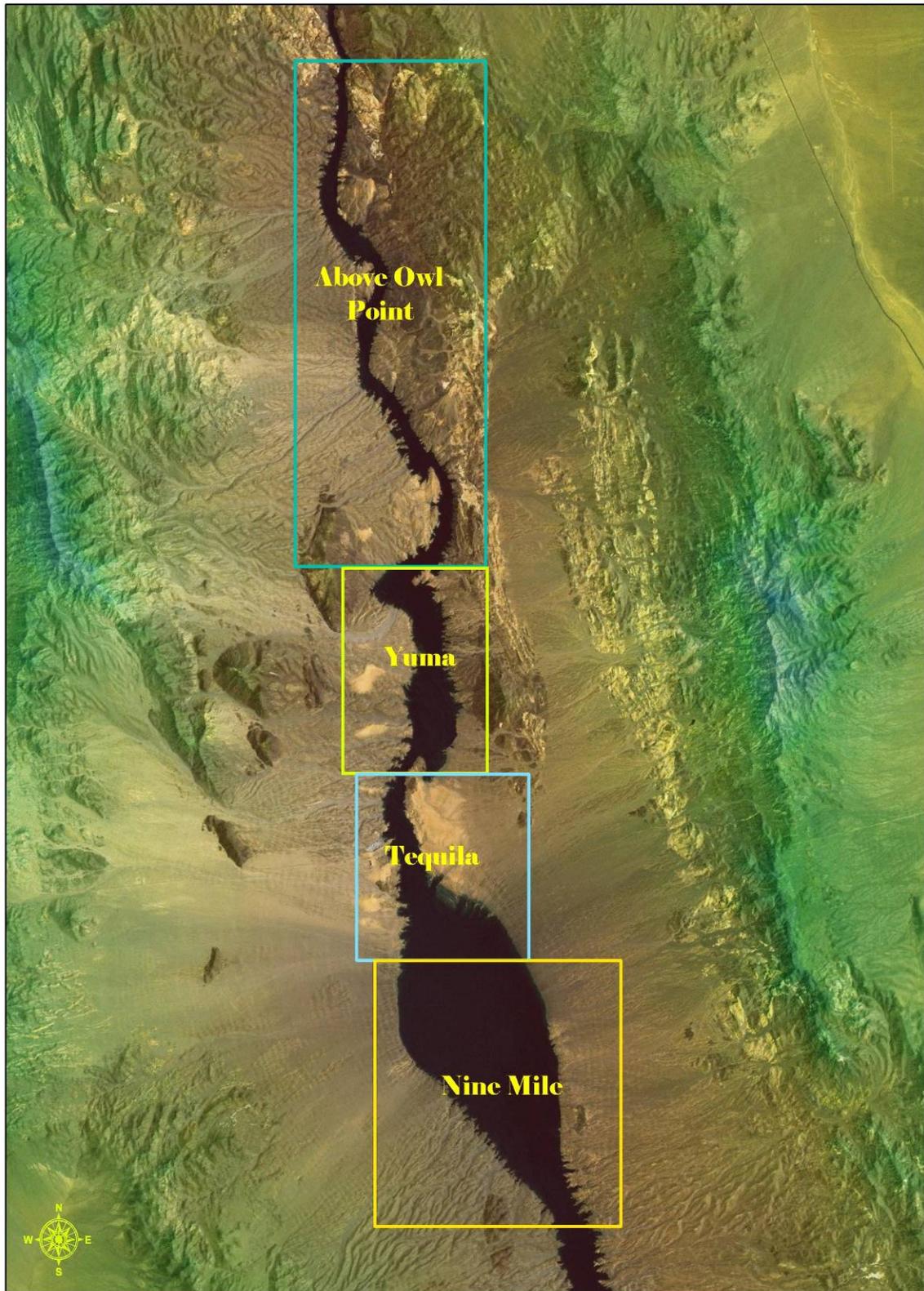


Figure 2. Spawning aggregation at Tequila Cove



Figure 3. Light attracting larvae (11-12 mm slivers)

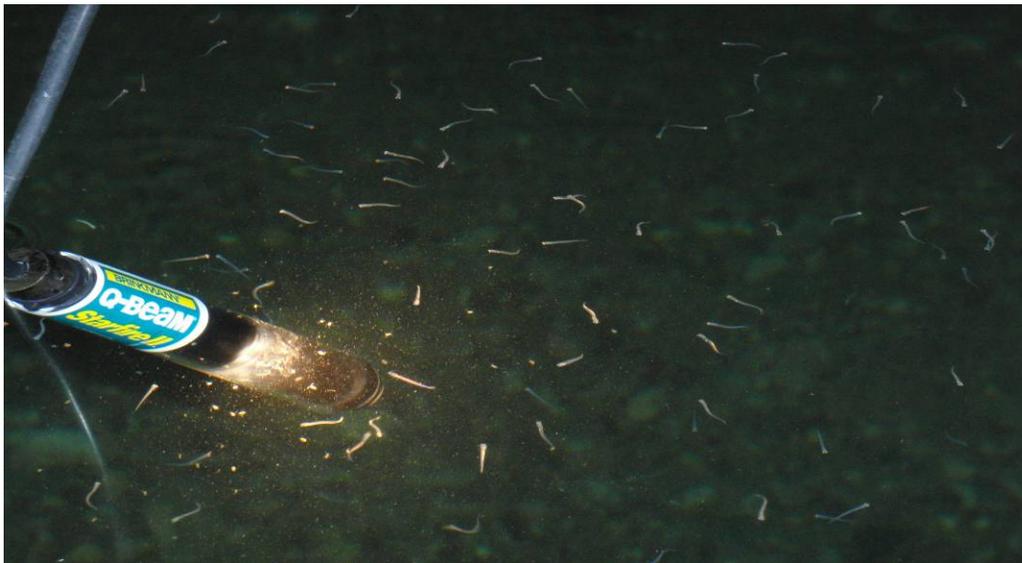


Figure 4. Collection tub



Below are tables that represent the total number of larvae collected from the beginning of the LCR MSCP in 2005 through 2009, along with each year broken down to number of larvae caught each month per zone (Tables 1-6).

Table 1: 2005-2009 Larvae Collection Totals Per Zone

Zone	2005	2006	2007	2008	2009	Total
Nine Mile	18,104	5,949	4,987	7,031	6,025	42,096
Tequila	27,052	35,400	6,010	9,016	8,490	85,968
Yuma	14,835	21,729	7,875	9,850	8,985	63,274
Above Owl Point	521	897	1,696	3,871	4,012	10,997
Total	65,414	63,975	20,568	29,768	27,512	207,237
Yearly Goals	65,000	60,000	20,000	31,000	27,500	203,500

In 2005 there were 4,902 larvae collected from Lake Mead for a total of 65,414. These larvae were collected to assist NDOW with their quota.

Table 2: 2005 Larvae Collections by Month per Zone

Zone	January	February	March	April	Total
Nine Mile	1,100	2,979	12,775	1,250	18,104
Tequila	0	8257	14000	4795	27052
Yuma	100	7,824	6,824	87	14,835
Above Owl Point	0	0	9	512	521
Total	1,200	19,060	33,608	6,644	60,512

The yearly goal was 65,000 larvae. An additional 4,902 larvae were collected from Lake Mead.

Table 3: 2006 Larvae Collections by Month per Zone

Zone	January	February	March	April	Total
Nine Mile	0	1,620	4,329	0	5,949
Tequila	30	13,814	19,606	1,950	35,400
Yuma	1,060	6,815	8,291	5,563	21,729
Above Owl Point	0	0	525	372	897
Total	1,090	22,249	32,751	7,885	63,975

The yearly goal was 60,000 larvae.

Table 4: 2007 Larvae Collections by Month per Zone

Zone	January	February	March	April	Total
Nine Mile	0	790	4,197	0	4,987
Tequila	0	3,760	2,250	0	6,010
Yuma	0	4,625	3,250	0	7,875
Above Owl Point	0	0	373	1,323	1,696
Total	0	9,175	10,070	1,323	20,568

The yearly goal was 20,000 larvae.

Table 5: 2008 Larvae Collections by Month per Zone

Zone	February	March	April	May	Total
Nine Mile	2,870	3,691	470	0	7,031
Tequila	3,015	4,250	1,751	0	9,016
Yuma	4,050	3,275	2,525	0	9,850
Above Owl Point	0	532	3,109	230	3,871
Total	9,935	11,748	7,855	230	29,768

The yearly goal was 31,000 larvae.

Table 6: 2009 Larvae Collections by Month per Zone

Zone	January	February	March	April	Total
Nine Mile	183	2,912	2,930	0	6,025
Tequila	0	2,205	5,000	1,285	8,490
Yuma	217	3,000	4,133	1,635	8,985
Above Owl Point	0	0	570	3,442	4,012
Total	400	8,117	12,633	6,362	27,512

The yearly goal was 27,500.

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