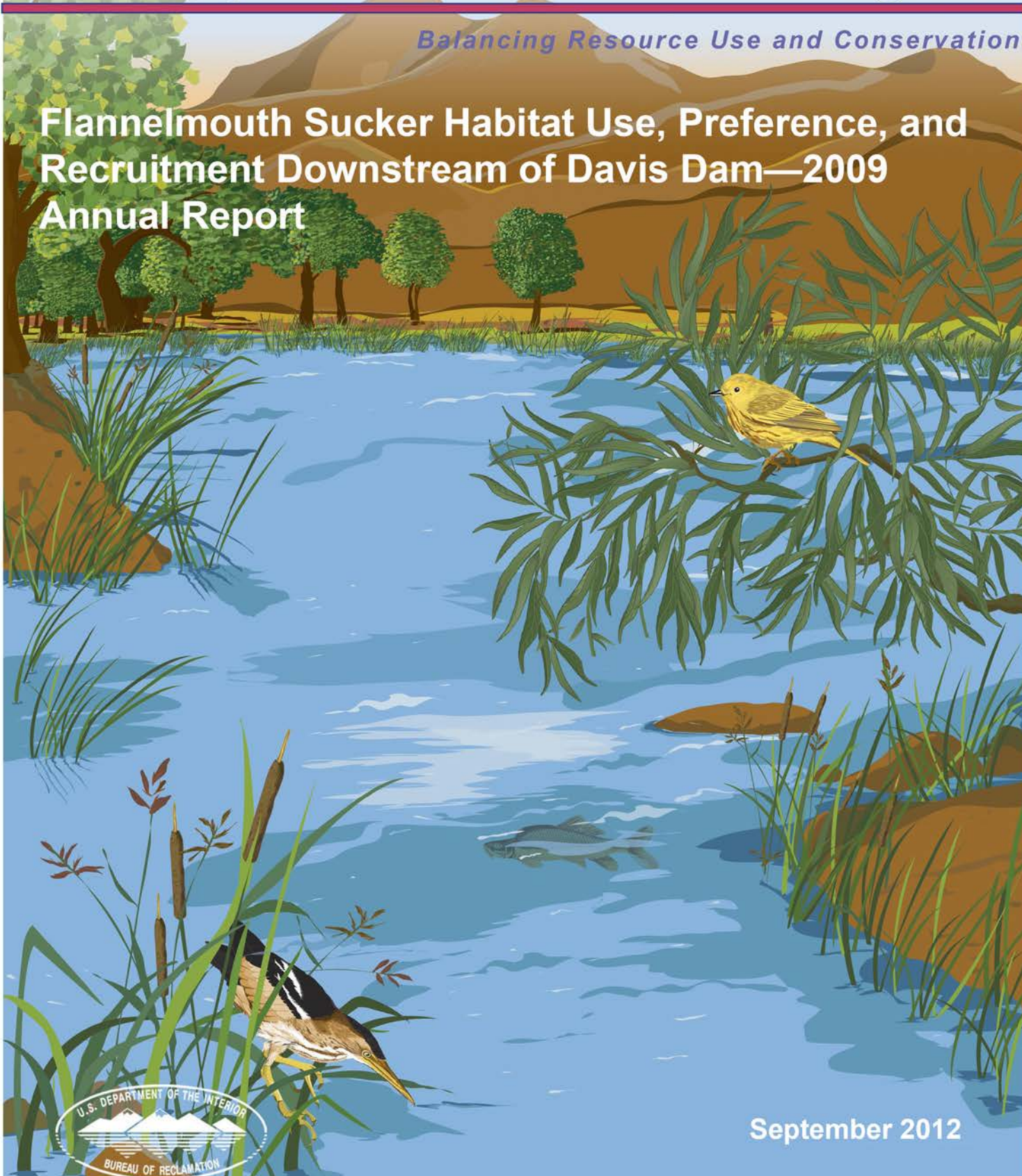




Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Flannelmouth Sucker Habitat Use, Preference, and Recruitment Downstream of Davis Dam—2009 Annual Report



September 2012

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Lower Colorado River Multi-Species Conservation Program

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Lower Colorado Region
Boulder City, Nevada
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September 2012

EXECUTIVE SUMMARY

This annual report concludes the fourth of a five-year study funded by the Lower Colorado River Multi-Species Conservation Program (MSCP). The study is focusing on describing the habitat use, preference, and recruitment of flannelmouth sucker (*Catostomus latipinnis*) below Davis Dam. Ultimately, this information will be used to develop a management needs and strategies plan for this species. Work accomplished in 2009 is representative of conservation measures FLSU-2 and FLSU-3 of the LCR MSCP Habitat Conservation Plan.

Larval and early juvenile (10-62 mm) life stages of flannelmouth suckers were captured and observed along shore in slackwater, eddy, and backwater habitats from April to June, 2009. Relative abundance larval surveys located 32 different areas of use from river mile (RM) 272 (near Harrah's casino Laughlin, NV) to RM 258.5 (Avi, CA boat ramp) in 2008. Surveys for 2009 were extended an additional 8.5 miles downstream to river mile 250 and early life stages were present throughout river mile 251.

Early life stages of flannelmouth sucker were sampled using small-mesh (1/2 and 1 inch) trammel nets, seines and electrofishing gear in an attempt to contact juvenile life stages of flannelmouth suckers. Age-one to sub-adult (70-350 mm) juveniles have proven difficult to contact. Six fish have been captured over four years of setting trammel nets in backwaters. Thus far, seining and electrofishing of available habitats throughout our study reach have failed to locate any age-one juveniles to sub-adults. Year 2009 was the first year of our study where a juvenile life stage (200 mm) was captured in the mainstem river with electrofishing gear.

In 2008, 19 adult flannelmouth suckers were aged using non-lethal methods. Techniques were refined and an additional 121 fish were collected and aged in 2009. Individuals ranged in age from 2 to 24 years with an average age of 14 years.

A total of 35 flannelmouth suckers were surgically implanted with sonic transmitters. Fifteen males were implanted in 2006, and 10 males and 10 females were implanted in 2007. Five flannelmouth suckers still had active tags in 2009. The fish's movements were tracked in the Colorado River from Davis Dam to downstream of Needles, California. Movements varied according to individual and by sex. In 2009, three females ranged between 0.5 and 8 miles while the two males ranged between 7 and 9.5 miles.

Habitat data were collected when transmitter fish were located and when other flannelmouth suckers were observed during surveys. The majority of adult observations from 2006 thru 2009 during the non-reproductive season were between the Laughlin (RM 274.5) and Avi bridges (RM 258.5). Fish were located in areas of the river with cobble substrate, depths between 2.0 and 3.0 meters, and velocities between 0.5 and 1.0 m/s. Observed habitat use varied little when compared to the spawning season (March-May) with cobble substrates, depths between 1.0 and 2.0 meters, and velocities between 0.5 and 1.0 meters per second.

INTRODUCTION

Habitat degradation and the proliferation of nonnative fish species have resulted in the federal listing of seven of the nine Colorado River native species as endangered under the Endangered Species Act. Flannelmouth sucker (*Catostomus latipinnis*) is one of two native species not currently federally protected; however, it is a species of special concern to the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) and to the states of Nevada, California, and Arizona. Flannelmouth suckers were not historically common in the lower Colorado River below Davis Dam (Minckley 1973). In 1976, Arizona Game and Fish Department successfully captured 611 flannelmouth suckers at the confluence of the Colorado and Paria rivers at Lee's Ferry, Arizona. These fish were transferred to the Colorado River below Davis Dam, which led to their successful reintroduction (Mueller and Wydoski 2004). Mueller and Wydoski (2004) reported that flannelmouth suckers had established an impressive expanding community of more than 2,000 fish based on mark-recapture estimates. This is remarkable in view of the limited success of 25 years of stocking more than 2.1 million bonytail (*Gila elegans*) and 12 million razorback suckers (*Xyrauchen texanus*) into areas where these species were historically common (Minckley and Deacon 1991). Thus far, this population represents the most successful introduction of a native, mainstem fish species in the Lower Colorado River Basin.

The purpose of these investigations is to gather data and evaluate flannelmouth sucker habitat use, preference, and recruitment downstream of Davis Dam (Reach 3) as per conservation measures FLSU-2 and FLSU-3 of the Lower Colorado River Multi-Species Conservation Program, 2004. At the terminus of this work, a report that outlines recommendations and possible threats to the population in Reach 3 will be drafted. Our goals are to: 1) describe community structure, relative abundance, and distribution of flannelmouth sucker, 2) examine flannelmouth sucker seasonal movements and preferred habitats with the aid of sonic telemetry, and 3) examine physical and biological factors contributing to their success.

METHODS

Study Area. The study reach extends from Davis Dam (River Mile [RM] 276; Lujan, 1990) to the California, Arizona, and Nevada state line (RM 257.5; Figure 1). Flannelmouth suckers have unobstructed access to the Colorado River and Lake Havasu located between Davis and Parker dams; however, previous and ongoing studies show that flannelmouth sucker distribution is highly selective toward the upper river portion of that reach. Field activities have been focused on the reach between the state boundaries to Davis Dam in order to best utilize resources. Additional sampling on the lower reach of river has been conducted on a limited basis (fall and winter surveys) and is supplemented, in part, by the Lake Havasu Native Fish Roundup and other ongoing studies.

Sampling. Larval to adult life stages of flannelmouth sucker were sampled or observed using a variety of methods including trammel netting, seining, electrofishing, and dip-netting. For the purpose of this study, adults are described as individuals >350 mm; juveniles and sub-adults range from 70 to 350 mm, and life stages <70 mm were considered larvae and young juveniles.

Larval fishes were detected and attracted with underwater lights at night and were collected by two people using small meshed aquarium dip-nets (Burke 1995). A representative sample (10%) was preserved in 70% isopropyl to later confirm identification.

Water clarity allowed for visual surface surveys as a method to determine presence and relative abundance. Visual surveys were conducted during the day as biologists walked the shoreline of the river and backwaters looking for schools of juveniles and estimating their numbers. Sites were randomly selected and initially encompassed several shoreline habitats including riprap and those with a sweeping laminar flow. If fish were not readily observed in a suspect habitat then a seine was employed to confirm presence or absence. Fish were measured (total length mm) and species recorded. In addition, general habitat characteristics, flow level, and GPS location were recorded.

We used small mesh (2 m × 22 m × 1.2 cm or 2.5 cm center panel) trammel nets to target juvenile and sub-adult (70-350 mm) flannelmouth suckers. These nets were set in backwaters, along shore, and in slackwater found downstream of jetties. Nets were set in the evening and retrieved the following morning.

Adults were also sampled using a boat-mounted Smith-Root GPP-7.5 electrofisher. Electroshocking was conducted after dark with a crew of two netters and a boat operator. The majority of fish were sampled along shore, shocking with flow (downstream). All flannelmouth suckers were measured (mm; total length [TL]), weighed (g), and fish >200 mm were injected with a passive integrated transponder (PIT) (134 kHz). In addition, a section of pectoral fin ray from flannelmouth suckers was collected for age analysis. Flannelmouth suckers were anesthetized in an MS-222 solution until docile and a pair of clipping pliers designed by BIO-WEST was used to remove a small section (1/4 inch) of the left secondary pectoral fin ray. The wound was then disinfected and the fish placed in

fresh river water to recover. A more detailed description of the techniques used can be found in Albrecht et al. (2008).

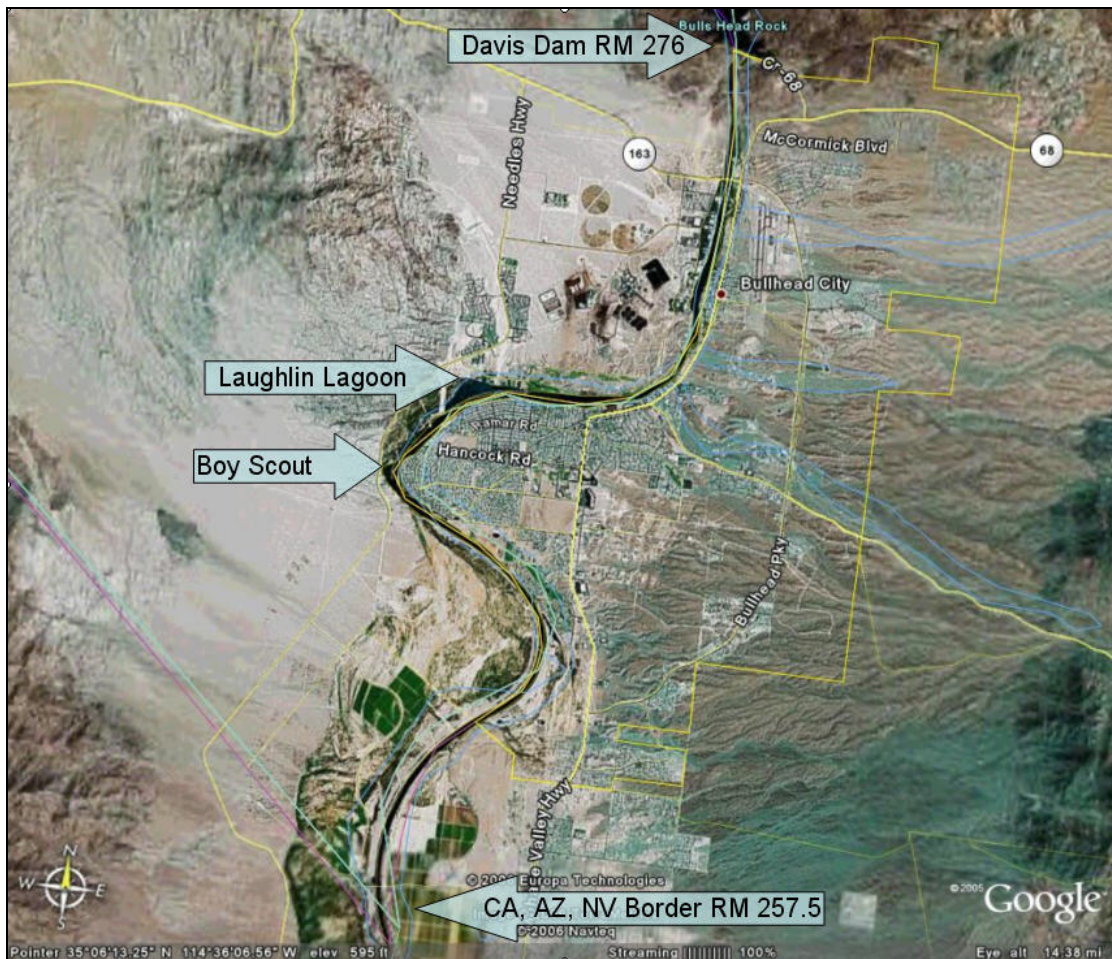


Figure 1. Aerial image of the study area showing the lower Colorado River between Davis Dam and the state line (AZ-CA-NV).

Sonic Telemetry. In 2006, 15 adult male flannelmouth suckers were surgically implanted with Sonotronics sonic tags. An additional 10 adult-males and 10 adult-females were surgically implanted in 2007. Detailed information on telemetry equipment, survey, and monitoring techniques are described in Best and Lantow 2007.

Habitat data were collected each time a flannelmouth sucker was located (either with the aid of telemetry or chance observation). Habitat data forms included: date, time, waypoint, number of fish observed, substrate composition, depth, and velocity. Current velocities and depth were taken with a Marsh-McBirney flow meter with a top set wading rod when circumstances allowed but were estimated in most cases.

In March, we utilized a Biosonics DTX-6000 with 430 kHz, split beam echo sounder, combined with a Garmin Etrex Vista GPS unit. Data transects were collected in five parallel boat passes down the river at one-second intervals for a total of over 56,000 data points. Data were collected from the Davis Dam buoy line (river mile 276) to below the Arizona, California, and Nevada state lines (river mile 257). Readings included the lat/long location, depth to river bottom, and date/time of collection, and were combined into an Excel spreadsheet format. These spreadsheet values were imported into ArcMap using the Add XY Data tool, creating a geodatabase. These were then converted into a point shapefile showing depth to river bottom, in preparation for subsequent use by AutoCAD. It was necessary to correct each depth point for actual water surface elevation, owing to each point being collected at a different time, and thus subject to fluctuating water surface elevations related to varying water releases at Davis Dam.

Data were processed by The Lower Colorado Regional Office Geographic Information Systems Group. Three GIS layers were provided: a GIS layer showing 1-meter depth contours along the subject stretch of river, a GIS layer illustrating the difference in the wetted perimeter between high and low flow river levels for the month of April, and a layer showing general substrate distribution within the reach.

RESULTS

During the 2009 (October 2008-September 2009) sample season, a single trip was performed for bathymetry in March. Fish sampling was conducted in April, May, and June near Laughlin, and in October 2008 and January 2009 near Needles, California. Five radio-tagged flannelmouth suckers remained active in 2009. Seven telemetry surveys were conducted between January and September 2009.

Sampling. We collected 624 larval and young juvenile flannelmouth suckers (<70mm TL) at 22 of 54 sampled locations from April thru June employing the use of underwater lights and seines. In April and May, we collected 71 larvae and young juveniles with underwater lights for an average of 6.5 fish/15 minutes. In May and June, we collected 553 flannelmouth sucker larvae and young juveniles employing the use of seines. Flannelmouth sucker numbers per seine haul ranged in number from 0 to 314 individuals per 10-meter seine haul. In 2009, relative abundance surveys were extended an additional 8.5 miles downstream of the Avi Casino boat ramp (RM 258.5), which was the ending point for surveys in 2008. We surveyed 22 sites within this reach of which nine had flannelmouth larvae and young juveniles (Figure 2). Larvae and young juveniles averaged 15.9 mm (range 10-20 mm) in April, 22.8 mm (range 16-33 mm) in May, and 46.1 mm (range 25-62 mm) in June. Figure 1 shows abundance and locations of larval and young juvenile flannelmouth suckers in 2009.

Juvenile flannelmouth suckers proved to be rare in collections again this sample season, as we only collected two. The first fish was 148 mm total length and was collected in a trammel net in the Big Bend State Park lagoon and boat ramp at river mile 267. The second fish was a 200 mm juvenile that was collected on January 28, 2010 during boat electrofishing surveys near the California, Arizona, and Nevada state lines. Before this

year's field season, seining and electrofishing of available habitats throughout our study reach failed to locate any age-one juveniles to sub-adults (70-350 mm). Year 2009 represents the first year of our study where a juvenile life stage was captured in the mainstem river.

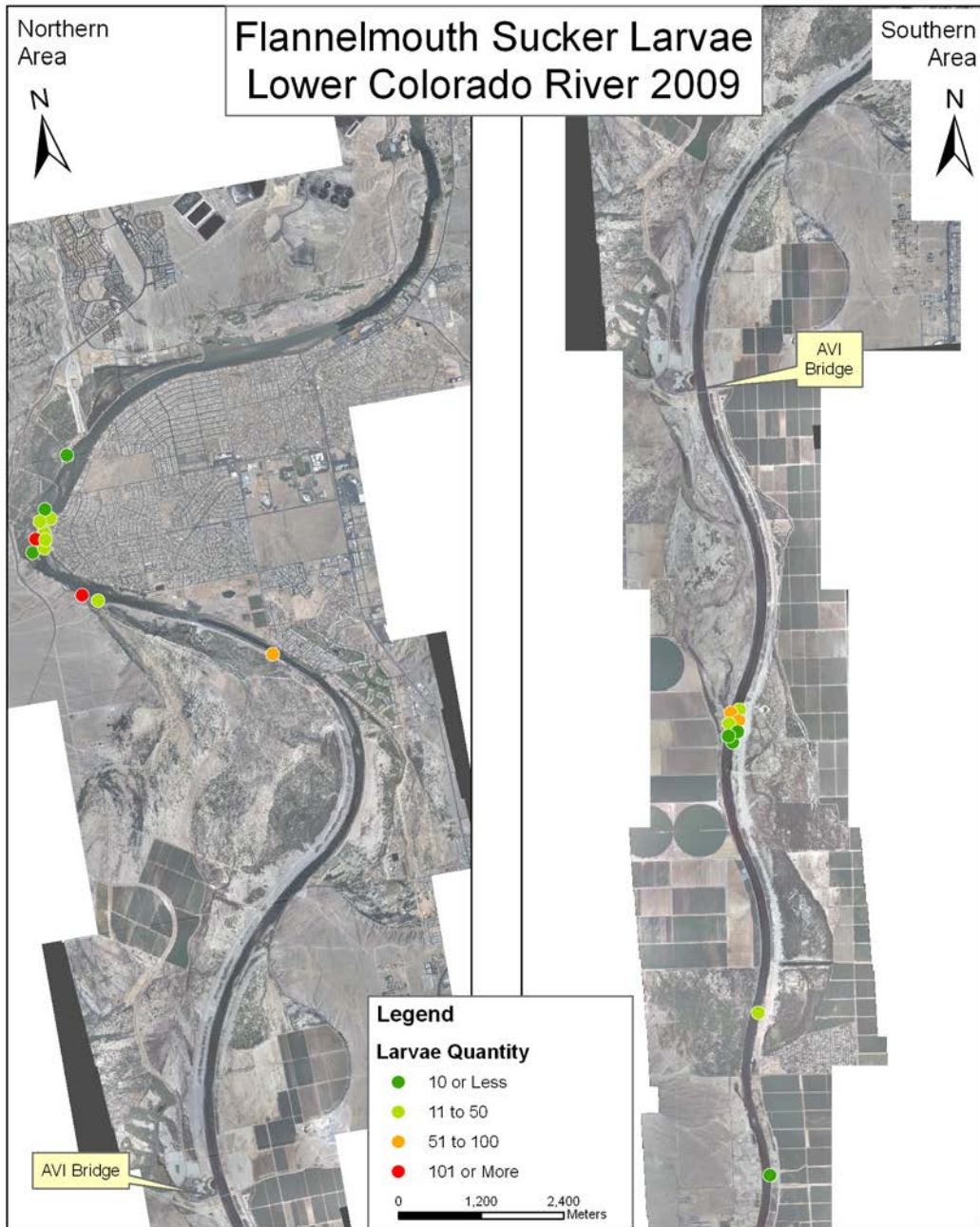


Figure 2. Locations of flannelmouth sucker larvae on the lower Colorado River 2009.

Adults ($n = 151$) were collected with electrofishing gear in the river and with trammel nets in backwaters. Adults averaged 576 mm (range 371-673 mm TL) and 2.369 kilograms (range 1.249-3.475 kg).

The trammel net effort consisted of a total of 82 sets; 32 net sets were located near Laughlin, Nevada and 50 were set from Park Moabi downstream to Clear Bay in Topock Gorge. The Laughlin sets yielded 256 fish representing 12 species, which included 10 adult flannelmouth suckers. Fifty overnight trammel nets set from Park Moabi to Clear Bay in Topock Gorge yielded 562 fish representing 15 species. While we contacted 69 razorback suckers during our sampling of this lower reach, no flannelmouth suckers were contacted with trammel nets.

Boat electrofishing was conducted on three evenings near Laughlin in January, April, and June. Generator seconds for sampling in January are not available due to an equipment malfunction. Electrofishing in May was not conducted due to boat repairs. January efforts produced 77 flannelmouth suckers near Laughlin. In April, 3,548 generator seconds produced 34 flannelmouth suckers. June sampling consisted of 7,550 generator seconds and the capture of 35 flannelmouth suckers.

Electrofishing near Needles took place in October 2008, and January and February of 2009. In October, we sampled for 2,336 generator seconds in Park Moabi and Golden Shores backwaters and no flannelmouth suckers were contacted. January sampling took place in the river from Willow Valley Estates (RM 251.5) to the Needles Bridge (RM 246) and five flannelmouth sucker adults were contacted. February sampling consisted of 913 generator seconds in Blankenship Bend backwater, 550 generator seconds at Pulpit Rock backwater, and 951 generator seconds at Park Moabi backwater and no flannelmouth suckers were contacted.

One hundred and twenty-one flannelmouth suckers (including two juveniles) were fin clipped for aging analysis by BIO-WEST. Figure 3 shows age frequency of flannelmouth suckers clipped in 2009. Overall fish averaged 15 years of age with a range of 2 to 24 years. Female flannelmouth sucker adults ($n = 91$) averaged 15 years and ranged from 5 to 24 years of age and adult males ($n = 27$) averaged 13 years and ranged from 6 to 23 years of age. A table of clipped flannelmouth sucker information can be viewed in Appendix A.

Sonic Telemetry. Five radio tagged flannelmouth suckers remained active in 2009. Seven telemetry surveys were conducted between January and September 2009. Telemetry surveys produced 24 detections during the 2009 field season (Table 1). An additional 18 detections were logged by three submersible ultrasonic receivers placed at river miles 266.5 near Boy Scout Lagoon, river mile 268 near Laughlin Lagoon, and river mile 261 above the confluence of the California, Arizona, and Nevada state lines.

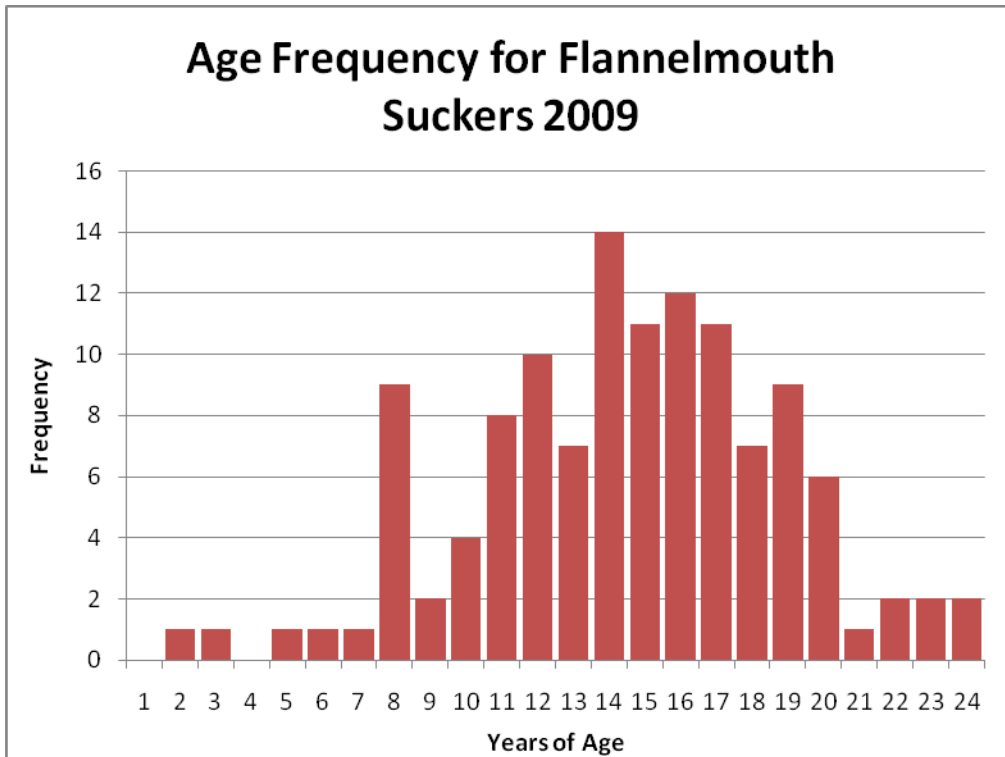


Figure 3. 2009 age frequency of flannelmouth suckers below Davis Dam, Colorado River, Arizona.

Three tagged females in 2009 ranged between 0.5 and 8 miles while the two males ranged 7 and 9.5 miles. Graphs of flannelmouth sucker movements from fish detected in 2009 are in Appendix B and include all years' data.

Table 1. General tracking data for sonic-tagged flannelmouth suckers detected in 2009.

Code	Sex	PIT tag	Date tagged	*General capture location	*Release location	Total length	Weight
4748	M	257C60CA2D	12/21/06	Avi	Avi	555	2505
5767	M	257C6097AD	2/1/07	Avi	BB	537	1964
3366	F	257C60ED34	1/31/07	BB	BB	589	2333
3437	F	257C618046	2/1/07	LB	BB	609	2665
3475	F	257C60BF4E	1/31/07	BB	BB	595	2463

* LB = Laughlin Bridge RM 274, BB = Big Bend boat ramp RM 267, Avi = RM 258.

DISCUSSION

Sampling and tracking during the 2009 field season has added to our database with regards to larval, early juvenile, and adult habitat use, as well as larval and early juvenile abundance. Age-one to sub-adult (70-350 mm) juveniles continue to be rare in collections. Fin clips collected in 2008 and 2009 provided insight on population age structure of the flannelmouth sucker.

Surveys were conducted in 2008 and 2009 for larvae and young juvenile life stages of flannelmouth suckers. Over 30 rearing areas were located between river mile 251 and 272. As we sampled at varying water levels in 2008 it became apparent that we were consistently locating fish in areas that appeared to have a jetty or structural element that allowed for a habitat to remain a slackwater regardless of river elevation. Photos taken throughout the day of a shoreline slackwater habitat that harbored young juvenile flannelmouth suckers can be viewed in Appendix E of the 2008 annual report. By employing an echo sounder and using Arc GIS we were able to plot out estimated wetted perimeter of shorelines to show approximately how much shoreline is exposed during low flows on an average day during the irrigation season. Surface area measurements of the river during the average daily peak discharge for April were taken and showed a surface area of 1,246 acres between river miles 257 and 276 compared to a surface area of 1078 acres when calculating average daily base flows for April. This represents a difference in surface area of 168 acres (roughly 9 acres/mile) that is dewatered on a daily basis. When looking at maps depicting the wetted perimeter (Figure 4) we see that narrow bands of wetted perimeter are characteristic of steep banks, while wider bands represent gently sloping banks. While it may seem intuitive that habitats experiencing little shoreline displacement would be of greater habitat value to young fish, it appears that larval and young juveniles prefer gently sloping banks that allow for a gradual elevation change that may not be experienced with steeper banks.

Age-one to sub-adult (70-350 mm) juveniles have proven difficult to contact. We have captured six fish over four years of setting trammel nets in backwaters. Thus far, seining and electrofishing of available habitats throughout our study reach have failed to locate any age-one juveniles or sub-adults. Year 2009 represents the first year a juvenile fish was captured in the channel. The fish was located below the state line and captured with electrofishing gear in late January in a shallow (<1 m) riffle habitat after dark. The fish was 200 mm long and was aged by Bio-West as a three-year-old fish. However, as we continue to sample available habitats with different techniques, there is growing evidence that they may simply not be in numbers sufficient to provide meaningful information.

This population of flannelmouth sucker has certainly expanded since its reintroduction in 1976. The size distribution of this population has shown a similar trend since 1999 that is characterized by a relatively large adult population and few juveniles and subadults (Appendix C). Years 2002 and 2003 are the exception when we observed a relatively strong cohort of young adults. Similarly, when we look at aging data (Figure 2) we see a strong cohort of fish estimated at eight years of age. It appears that the longevity of this

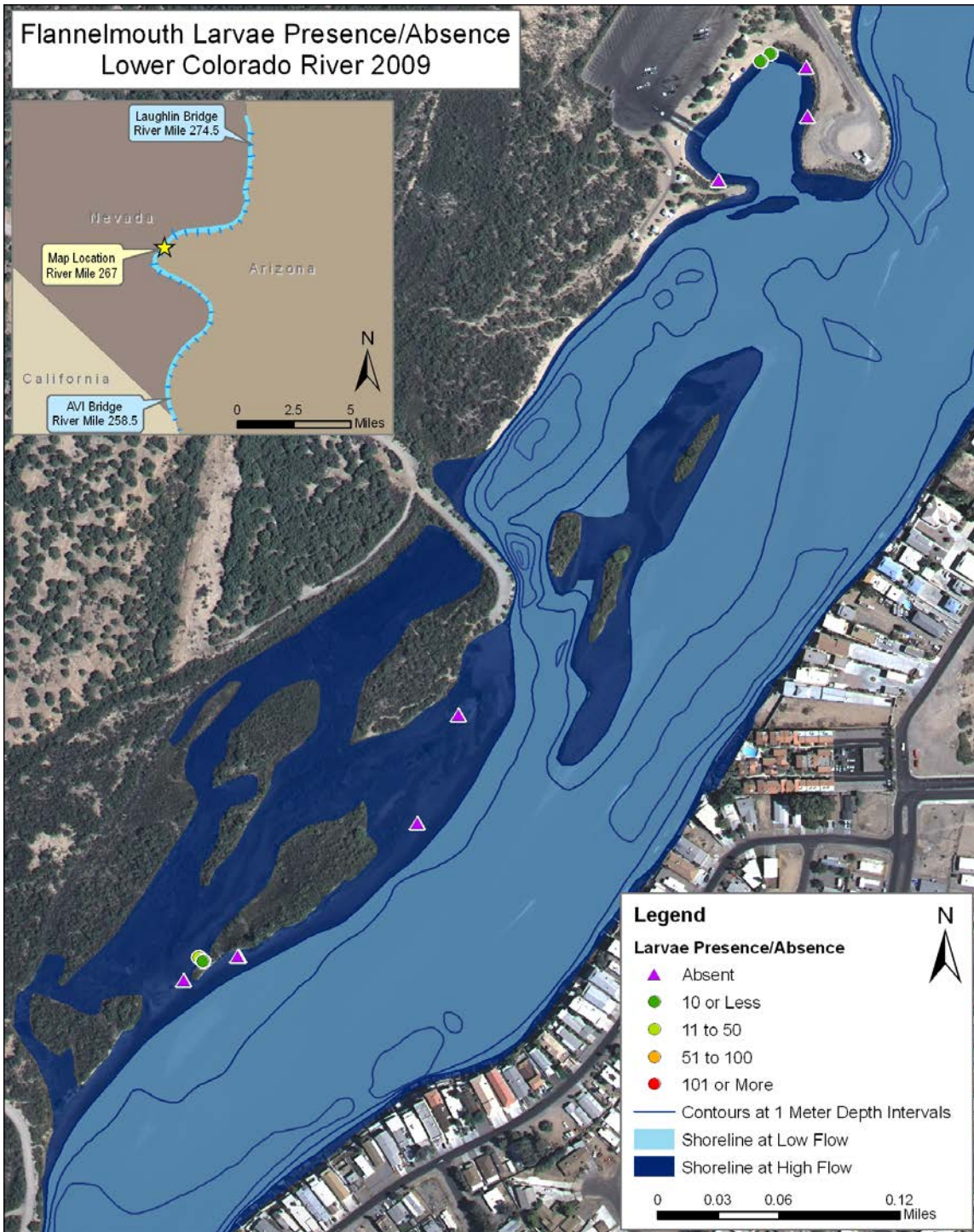


Figure 4. 2009 larval presence/absence data and modeled wetted perimeter at RM 267.

species allows for a few strong year classes to rejuvenate an aging population and therefore, the population persists. It has proven difficult to pin down conditions of past years to determine what favorable conditions have promoted a strong year class. Possible

limitations of aging techniques and specific environmental factors that may have played a role for a small window of time are simply variables that we cannot control or have little detailed knowledge of. For example, a spring season with above average rainfall downstream of Davis Dam may cause a decrease in the need for high flows to be released from the dam. This may provide a large amount of shoreline slackwater habitat for young flannelmouth suckers during a critical time when flows are typically fluctuating greatly. The results of these conditions are detected four or five years later as we begin detecting greater numbers of a similar age class in our samples.

Our population of flannelmouth suckers averages 15 years of age. Length at age data shows how our fish grow quickly until age 5 (Appendix D) when lengths begin to plateau. This is a similar trend that is seen in other systems where aging studies have been conducted (Carlson et al. 1979, McAda 1977, McDonald and Dotson 1960, Sweet et al. 2009). Our population deviates from the others as our average length of adults is much larger than those at similar ages in different systems. This may be attributed to several factors, including, but not limited to, the temperate climate experienced at this southernmost extent of this population's range and/or the productivity that is often associated with tailwater systems. Appendix E shows graphs of the temperatures experienced in the Laughlin Lagoon backwater at river mile 268 and the river channel at river mile 264.

Our sonic tracking data provided us with some interesting information on flannelmouth sucker habits. As noted last season, adult flannelmouth suckers in our study reach have notable schools or congregations. Many of these congregations are found year-round. These preferred habitats are characteristic of channel habitats with current velocities greater than 0.5 m/s, depths ranging from 2 to 3 m, and substrates composed primarily of cobble. Appendix E shows a map of 14 of our tagged fish that had multiple detections in 2009. We noted that the majority of our detections are found in these common areas and that adults appear to migrate between schools where they spend most of their time.

Movements of individual fish are difficult to pattern. Appendix B depicts graphs of individual fish movements over a three-year period. Flannelmouth sucker movements are highly individual. Some fish appear to show a strong fidelity to seasonal locations while others do not, regardless of sex. The data hints at seasonal trends in upstream and downstream movement at varying degrees; most notable are the larger movements observed in the spring.

Habitat use of flannelmouth sucker is within the range reported by Beyers et al. (2001) in the Colorado River near Grand Junction, Colorado, although they found the majority of their fish at depths of 1.5 m. Frequency curves of habitat utilization can be viewed in Appendix F. We have also included curves that encompass the spawning season (March-May). Our habitat data show that a majority of our flannelmouth suckers utilize cobble substrate, depths between 2.0 and 3.0 m, and velocities between 0.5 and 1.0 m/s. Observed habitat use varied little when compared to the spawning season (March-May) with cobble substrates, depths between 1.0 and 2.0 meters and velocities between 0.5 and 1.0 m/s.

FUTURE WORK

Proposed activities for 2010 include a ranking of backwaters based on catch per unit effort of all life stages, to assist in determining which characteristics of a backwater are favorable to flannelmouth suckers and assist with criteria for constructing backwaters. We will delineate our study area into reaches, define habitats inhabited with fish, and determine shortcomings of each reach, and will make recommendations as how to best utilize habitat creation goals per reach in an attempt to offset life stage scarcity. Continuation of sampling is planned, using beach seines and light collection techniques to further assess numbers and distribution of larvae and young juvenile life stages. A significant electrofishing effort will be conducted to obtain a good population estimate using mark-recapture techniques.

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