NEVADA DEPARTMENT OF WILDLIFE
STATEWIDE FISHERIES MANAGEMENT

FEDERAL AID JOB PROGRESS REPORT
F-20-50
2014

LAKE MOHAVE
SOUTHERN REGION

NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION
JOB PROGRESS REPORT

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NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION
ANNUAL PROGRESS REPORT

State: *Nevada*
Project Title: *Statewide Fisheries Program*
Job Title: *Lake Mohave*
Period Covered: *January 1, 2014 through December 31, 2014*

SUMMARY

Angler Use and Harvest

Twenty-one creel days were spent on Lake Mohave, 10 at Cottonwood Cove, 10 at Willow Beach, and one at Katherine Landing. Twenty contact creel surveys were completed at Cottonwood Cove, 21 at Willow Beach, and three at Katherine Landing. One volunteer angler drop-box and signage was placed at Willow Beach.

Gill Netting

A cooperative effort between Nevada Department of Wildlife (NDOW), Arizona Game and Fish Department (AZGFD), and United States Bureau of Reclamation (USBR) completed 49 net-nights of gill netting in April 2014. This was the 11th year utilizing the AZGFD gill net and electroshocking protocols. Gill nets were set from Davis Dam north to mile 40. There were 138 fish captured and species composition included channel catfish *Ictalurus punctatus* (19.57%; *n* = 27), common carp *Cyprinus carpio* (17.39%; *n* = 24), striped bass *Morone saxatilis* (20.29%; *n* = 28), largemouth bass *Micropterus salmoides* (13.04%; *n* = 18), smallmouth bass *Micropterus dolomieu* (15.22%; *n* = 21), razorback sucker *Xyrauchen texanus* (7.25%; *n* = 10), yellow bullhead *Ameiurus natalis* (2.17%; *n* = 3), green sunfish *Lepomis cyanellus* (3.62%; *n* = 5), and bluegill *Lepomis macrochirus* (1.45%; *n* = 2). The striped bass catch rate of 0.57 fish per net-night (f/n-n) rebounded slightly from a low of 0.32 f/n-n in 2013, which was the lowest since the fishery emerged in the 1980s.

Electroshocking

In April 2014, 16 sites were sampled for 243 minutes (min) of electroshocking, averaging 15.19 min/site. Nine sites were sampled by NDOW and seven sites by AZGFD. The electroshocking survey was conducted in conjunction with the annual spring gill net survey. A total catch rate of 1.39 f/min was less than last year, which was historically the highest for spring surveying at 1.82 f/min. This was the third consecutive year that no striped bass were captured during spring electroshocking surveys.

Habitat Improvement

Three types of artificial habitat structures (16 PVC units, 19 poly shrubs, and 47 brush bundles) were constructed and deployed into Prospect, Shoshone, Princess, and Solicitor coves. Fifty-four SCUBA and 21 snorkel surveys were conducted in 2014 on

habitat and no habitat coves. Electroshocking surveys were conducted to evaluate the effectiveness of the habitat to attract fish at three habitat sites and two non-habitat sites in the fall 2014. Catch rates were the highest since electroshocking surveys began at habitat sites in 2009. This was also the first time that non-habitat sites showed a higher catch rate than habitat sites. Fish counts peaked in July as aquatic vegetation became abundant and high water levels flooded riparian vegetation. Additionally, fish reacted to these conditions by dispersing amongst seasonally created habitat. After vegetation died off, fish counts increased again in the fall because of the natural cover disappearing.

BACKGROUND

Sixty-seven miles downstream from Hoover Dam, the USBR constructed Davis Dam on the Colorado River in 1951. By May of that year, the new reservoir had backed up to the tailrace of Hoover Dam and was considered full. The purpose of the impoundment is to meet irrigation requirements, regulate erratic water releases from Hoover Dam, and produce hydroelectric power. The reservoir is subject to fluctuating water levels and exchange flows. The upper 20 miles of the reservoir is confined within the narrow walls of the Black Canyon and alternates between lotic or lentic environments depending on water elevations and Hoover Dam releases. The constant coldwater releases from Hoover Dam permit the upper regions of Lake Mohave to be managed as a year round coldwater fishery.

The Lake Mohave sport fishery is supported by striped bass, stocked rainbow trout, largemouth bass, smallmouth bass, bluegill, green sunfish, channel catfish, and yellow bullhead. Nongame species include threadfin shad *Dorosoma petenense*, gizzard shad *D. cepedianum*, common carp*,* razorback sucker, and bonytail chub *Gila elegans.*

The upper region of the lake was once stocked year round with catchable rainbow trout until hatchery issues halted stocking in October 2013. Striped bass were first documented in Lake Mohave in the early 1980s, moving downstream from Lake Mead, and have since become a major component of the sport fishery. Striped bass reproduce in the seasonally warm reaches of the reservoir and move to coldwater areas as they become larger and eventually prey on stocked rainbow trout. The impact striped bass has on the stocked rainbow trout fishery became significant in recent years and resulted in modifications in trout stocking. Striped bass major forage species, other than rainbow trout, include threadfin shad, gizzard shad, bluegill, green sunfish, and crayfish. Large striped bass are also known to prey on carp. Populations of forage species have remained fairly abundant with the exception of shad. Predation by striped bass, among other factors, reduced shad abundance to a point where shad were difficult to detect during standard sampling. However, in fall 2014, large schools of threadfin and gizzard shad were observed in the lake.

In January 2007, the invasive quagga mussel *Dreissena bugensis* was discovered in the lower Colorado River system including Lake Mohave. Subsequently

the Lake Mead Fish Hatchery was closed due not only to quagga mussel contamination but also to such a low lake level that cool water could not be delivered to the hatchery. The Lake Mead Fish Hatchery once provided a significant portion of rainbow trout to Lake Mohave. The changes this invasive species brought to Lake Mohave fisheries continue to evolve.

Razorback sucker and bonytail chub are native species that occur in Lake Mohave and are listed as endangered under the Endangered Species Act of 1973, as amended. Recently, the razorback sucker population was estimated at less than 5,000, which showed a significant decline from the previous estimate of 60,000 in the late 1980s. Once abundant throughout the Colorado River Basin, the species is now extirpated from much of its former range. Nonetheless, Lake Mohave contains one of the largest remaining populations of razorback suckers. Bonytail chub presently exists in low numbers in Lake Mohave. Efforts to insure that these species do not disappear from the reservoir precipitated the formation of the Native Fish Work Group. The Native Fish Work Group is an association of private, state, and federal biologists who have responsibilities for managing Lake Mohave and other main-stem Colorado River reservoirs. The Colorado pikeminnow *Ptychocheilus lucius* is another endangered species native to the historic Colorado River, including the stretch now inundated by Lake Mohave, but is now considered extirpated from the reservoir.

OBJECTIVES and APPROACHES

General Management

Objectives: To monitor angler use and catch rates, fish population dynamics, and maximize the availability and return of stocked rainbow trout to anglers for the Lake Mohave fisheries.

Approaches:

- Measure angler use and harvest by conducting a contact creel survey one day per month at Willow Beach and one day per month at Cottonwood Cove.
- Install and maintain up to two volunteer, angler survey boxes at Willow Beach.
- Monitor fish population dynamics through a minimum of 50 net-nights of gill net surveys in the spring implemented cooperatively with AZGFD.
- Monitor fish population dynamics through a minimum of five days of electroshocking in the spring along.
- Utilize creel survey and monitoring data to assess sport fishery performance and changes to estimate sport fish availability and condition.
- Coordinate with National Park Service (NPS), AZGFD and other cooperators on sport fish management needs and cooperative monitoring activities.

- Monitor rainbow trout stocking locations to avoid conflict with razorback suckers during late-winter and spring stocking period in conformance with the U.S. Fish and Wildlife Service's Biological Opinion.
- Cooperate with other agencies on implementing long-term monitoring of quagga mussel distribution.

Habitat Enhancement Study

Objectives: To increase fish abundance through the placement of constructed underwater habitat and to enhance angler success by providing areas of persistent underwater habitat that concentrate game fish species in locations accessible to anglers.

Approaches:

- Construct and install up to 100 underwater habitat structures at selected locations on Lake Mohave, including brush bundles, PVC structures, and poly shrubs.
- Coordinate with the NPS for harvest and use of shoreline invasive tamarisk used for the brush element of the habitat structures.
- Work with the NPS, AZGFD, and volunteers to assist with construction and placement of habitat structures.
- Utilize the NDOW fish habitat barge for habitat deployment.
- Survey habitat sites monthly using underwater SCUBA dive transects.
- Survey habitat sites annually by gill netting and electroshocking.
- Evaluate angler success and use at habitat improvements sites through data and questionnaires collected through the established general fisheries creel survey program.

PROCEDURES

Angler Use and Harvest

Angler survey activities were conducted opportunistically at Cottonwood Cove and Willow Beach, and through a volunteer angler box at Willow Beach. Information collected included hours fished, total anglers per party, angler preference, angler license origin (Nevada or Arizona), species caught, number, length and weight of catch, and number of successful anglers in the party.

Gill Netting

Sampling was completed with 150 ft x 8 ft six panel experimental gill nets. Nets were set in April at random sites selected by AZGFD personnel following their reservoir survey protocols.

Electroshocking

Shoreline areas were selected by AZGFD's survey protocols and were sampled using boat electroshocking units. The boat was equipped with a Coffelt VVP-15B voltage pulsator box with an electrode array. Fish captured were identified to species, counted, measured, weighed, and then released back to the lake. Total shocking time (actual time foot switch was depressed) was recorded.

Habitat Improvement

Several types of artificial fish habitat structures were constructed and deployed. They include structures constructed of brush and PVC pipe with snow fencing and plastic lattice. Tamarisk was used as the brush component and was cut on site. Habitat units were constructed on the deck of the NDOW habitat barge or on shore, weighted with sand bags, and then deployed above the 620 ft contour. Agencies involved with this project included USBR, NPS, AZGFD, NDOW, Arizona Department of Corrections, and multiple volunteers. Fish use of the habitat was monitored via SCUBA transects and electroshocking. SCUBA transects were conducted by circling habitat and counting all fish present. Divers recorded habitat type, survey time, depth, and species type.

FINDINGS

Angler Use and Harvest

Twenty-one creel days of angler surveys were conducted on Lake Mohave, 10 at Cottonwood Cove, 10 at Willow Beach, and once at Katherine Landing. Twenty angler party surveys were completed at Cottonwood Cove, 21 at Willow Beach, and three at Katherine Landing. One volunteer angler drop-box with signage was placed at Willow Beach and collected 11 surveys.

The 20 angler party surveys at Cottonwood Cove had a total of 37 anglers (27 from NV, seven from CA, one from ID, and two from HI). Sixty-two percent of the anglers found success (Figure 2), catching 18 largemouth bass, 51 smallmouth bass, 20 striped bass, and six channel catfish (Figure 3). At Cottonwood Cove, 51% of the anglers targeted black bass for 57 hours (hr), 41% targeted striped bass for 31.25 hr, and eight percent did not specifically target any species for six hours. Angler hours for 2014 totaled 94.25. The catch rate for anglers at Cottonwood Cove was one fish per hour (Figure 1).

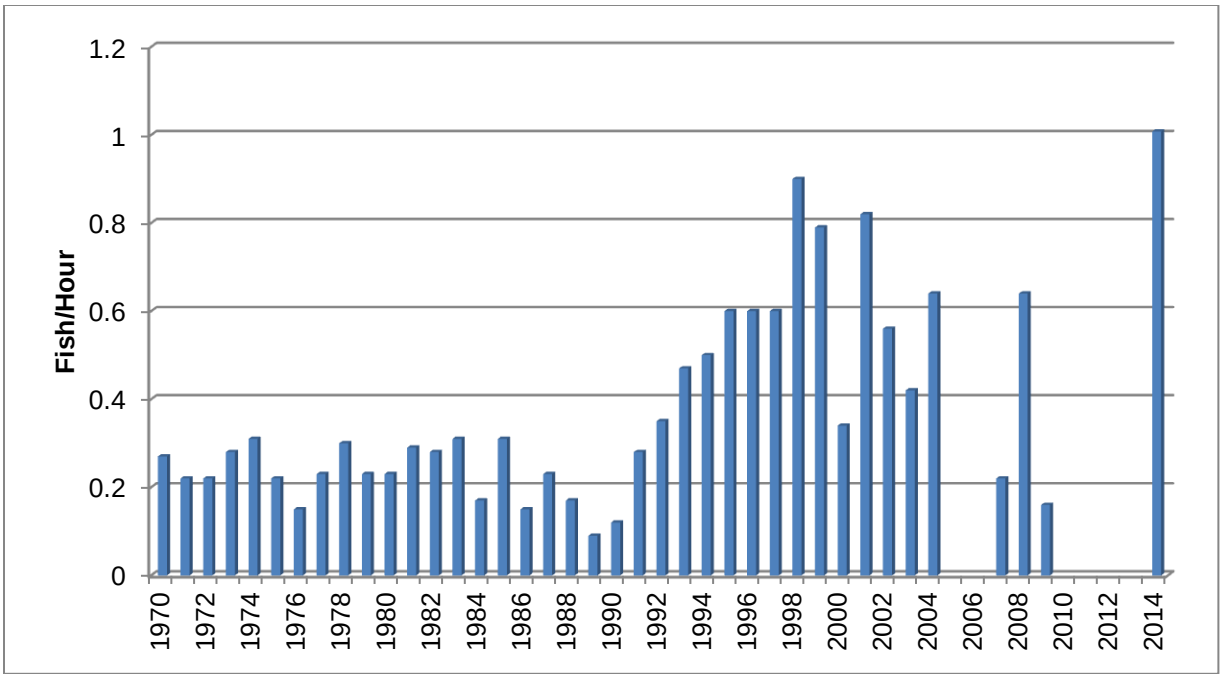


FIGURE 1. Angler catch rates (fish/hour) from contact creel surveys at Cottonwood Cove, Lake Mohave, 1970-2014.

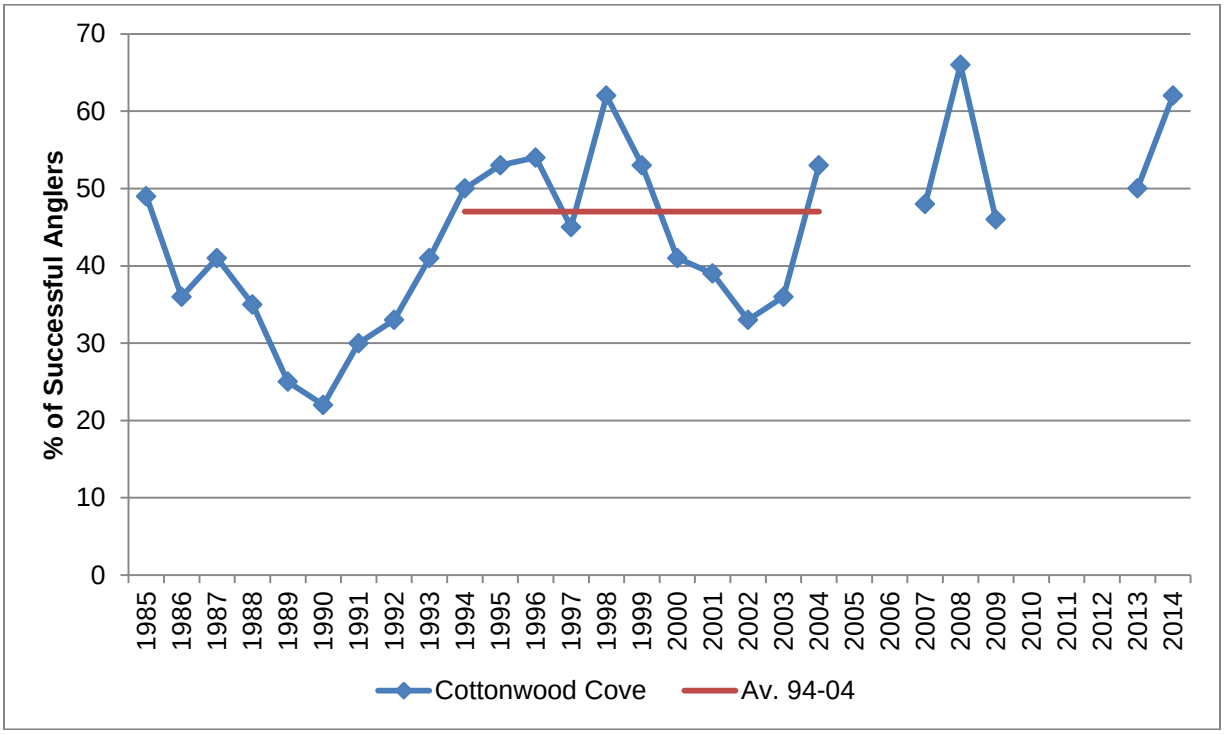
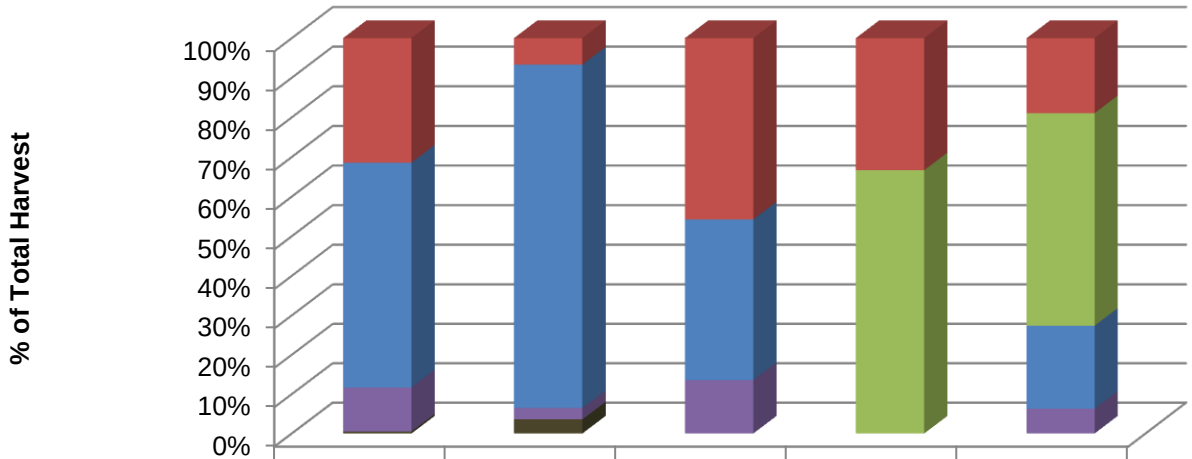


FIGURE 2. Successful anglers (% of all anglers) from contact creel surveys at Cottonwood Cove, Lake Mohave, 1985-2014.



	2007	2008	2009	2013	2014
Largemouth bass	132	142	135	4	18
Smallmouth bass	0	0	0	8	51
Striped bass	239	1844	120	0	20
Channel catfish	47	61	40	0	6
Other	2	76	0	0	0

FIGURE 3. Harvest composition (number of individuals of each species harvested) from contact creel surveys at Cottonwood Cove, Lake Mohave, 2007-2014.

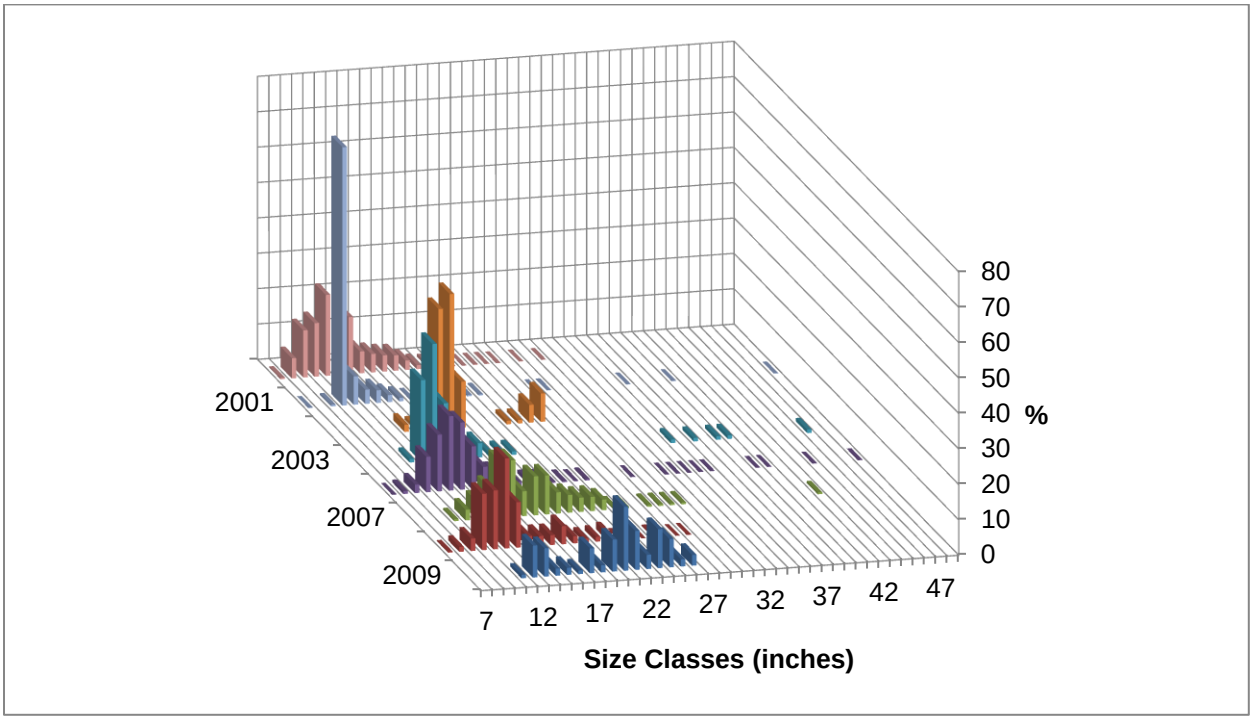


FIGURE 4. Striped bass length frequency data from contact creel surveys at Cottonwood Cove, Lake Mohave, 1999-2009.

The thirty-two angler party surveys from Willow Beach had 49 anglers (30 from NV, eight from AZ, four from CA, two from OR, three from ID, and two unknown). Eleven percent of the anglers who were contacted showed success (Figure 6), while 81% of anglers reported success from the volunteer, drop-box creel survey. The high success from the drop-box survey was likely a lack of reporting by unsuccessful anglers. Of the anglers contacted at Willow Beach, 18% targeted black bass for 20 hr, 50% targeted striped bass for 32.75 hr, 11% targeted rainbow trout for two hours, and the other 21% had no target species for 12 hr. Angler hours at Willow Beach in 2014 totaled 66.75 hours.

The catch rate averaged 0.07 fish/hr for contact creel surveys, 0.22 fish/hr for the volunteer, drop-box creel survey, and 0.15 fish/hr for all creel surveys combined (Figure 5). Catch rates in 2014 were low compared to many during previous years; however, previous catch rates were dominated by rainbow trout, which were not stocked in 2014. Striped bass catch rates from the limited available creel data have declined since 2009. This is presumably due to striped bass nearly decimating the entire shad population and causing a reduction in rainbow trout stocking.

Three contact creel surveys were conducted at Katherine Landing, contacting seven anglers from AZ. These anglers were unsuccessful and fished for a total of eight hours.

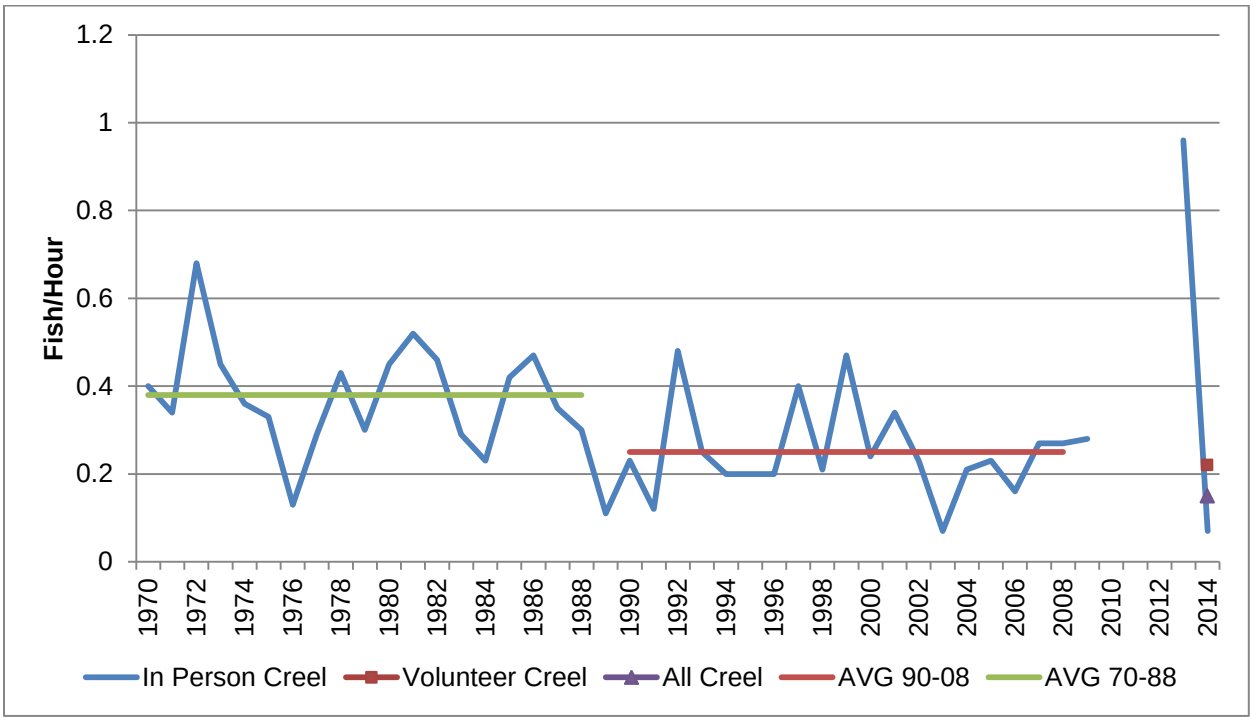


FIGURE 5. Angler catch rates contact and volunteer, drop-box creel surveys at Willow Beach, Lake Mohave, 1970-2014.

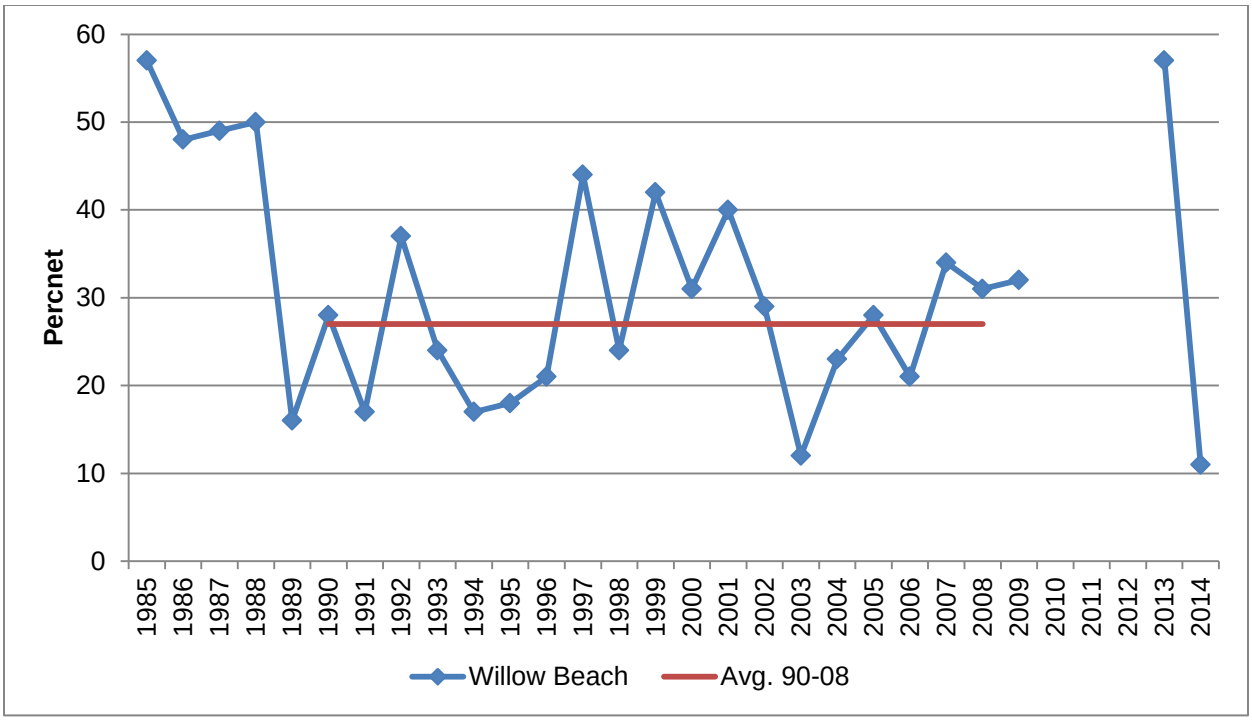
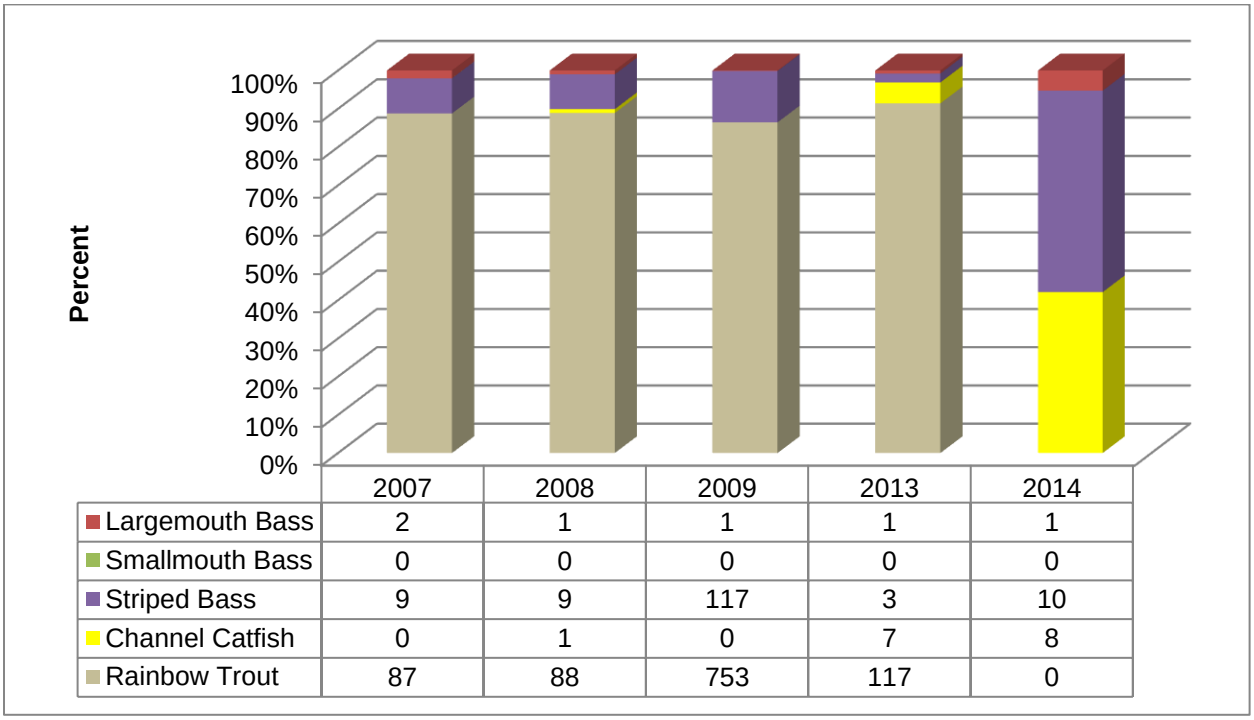


FIGURE 6. Percent of successful anglers from contact and volunteer, drop-box surveys at Willow Beach, Lake Mohave, 1985-2014.



	2007	2008	2009	2013	2014
Largemouth Bass	2	1	1	1	1
Smallmouth Bass	0	0	0	0	0
Striped Bass	9	9	117	3	10
Channel Catfish	0	1	0	7	8
Rainbow Trout	87	88	753	117	0

FIGURE 7. Harvest composition (number of individuals of each species harvested) from contact and volunteer, drop-box creel surveys at Willow Beach, Lake Mohave, 2007-2014. Note: 2007 and 2008 numbers in the table are percentages, not numbers of fish caught.

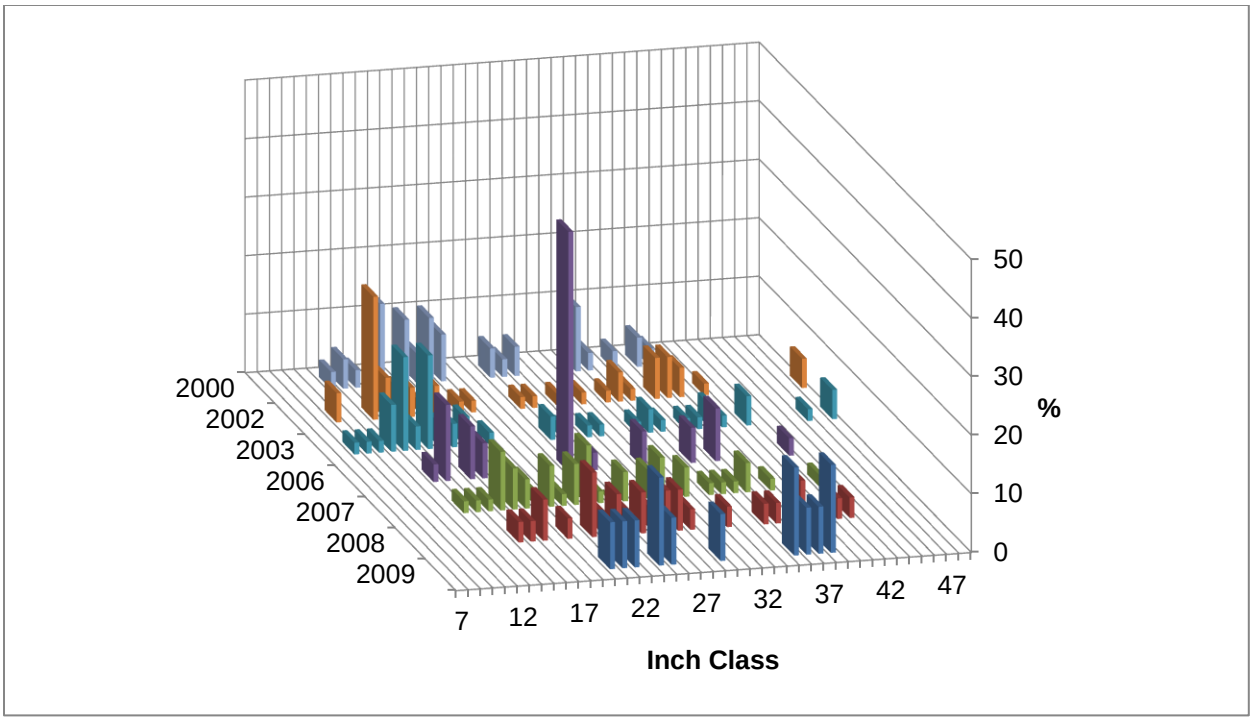


FIGURE 8. Striped bass length frequency data from contact creel surveys at Willow Beach, Lake Mohave, 1999-2009.

Gill Netting

Gill-net surveys captured 138 fish: 27 channel catfish (19.57%), 24 common carp (17.39%), 28 striped bass (20.29%), 18 largemouth bass (13.04%), 21 smallmouth bass (15.22%), 10 razorback suckers (7.25%), three yellow bullhead (2.17%), five green sunfish (3.62%), and two bluegill (1.45%). Total species catch rates continued a downward trend for the second consecutive year (Figure 9). The 2014 survey showed the third lowest catch rate in the last 20 years. Catch rates for largemouth bass and channel catfish, however, have been trending upward since catch rates for striped bass began declining sharply in 2006 (Figures 9, 10, and 11).

The striped bass catch rate was 0.57 f/n-n, up slightly from previous years (Figure 10). The average striped bass catch rate for the previous 10 years was 1.22 f/n-n. This is well below some of the historical high peaks of 10.88 f/n-n, 7.67 f/n-n, and 7.94 f/n-n in 1994, 1998, and 2002, respectively. The average catch rate since striped bass have been observed in the lake is 2.93 f/n-n. In January 2007, invasive quagga mussels were discovered in Lake Mohave and the lower Colorado River system. The invasion of quagga mussels is coincidental to the observed declining striped bass numbers; however, this relationship is not fully understood and additional investigations are ongoing to identify if the quagga mussel infestation is contributing to the decline.

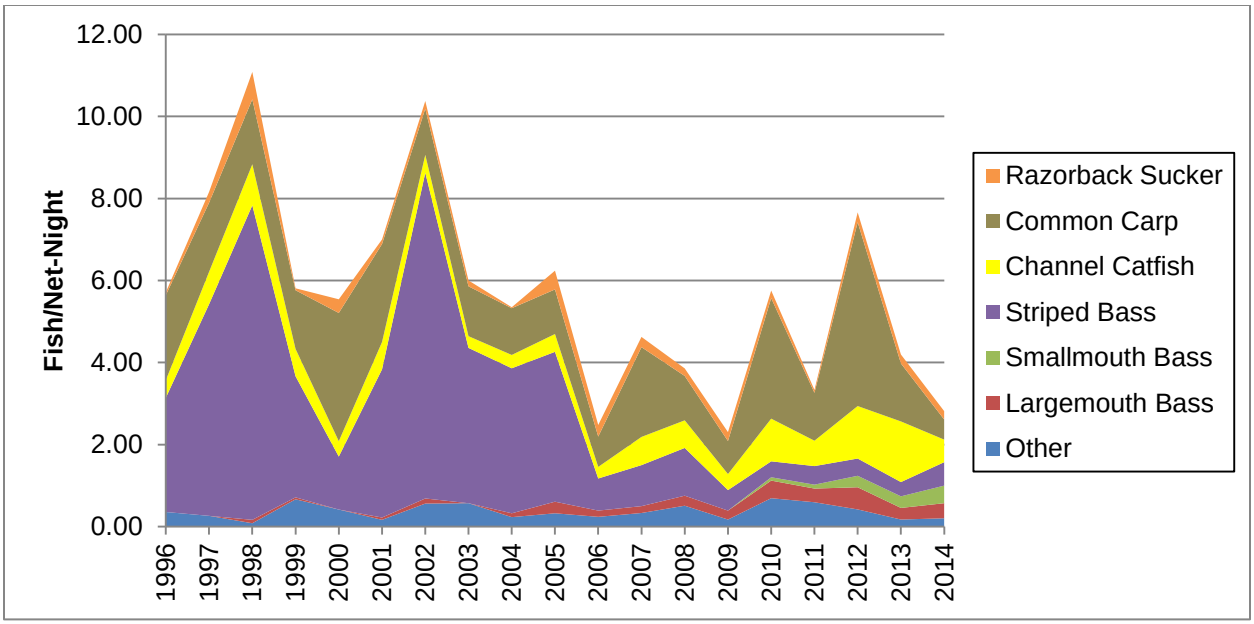


FIGURE 9. Total catch rates from gill–net surveys on Lake Mohave, 1996-2014.

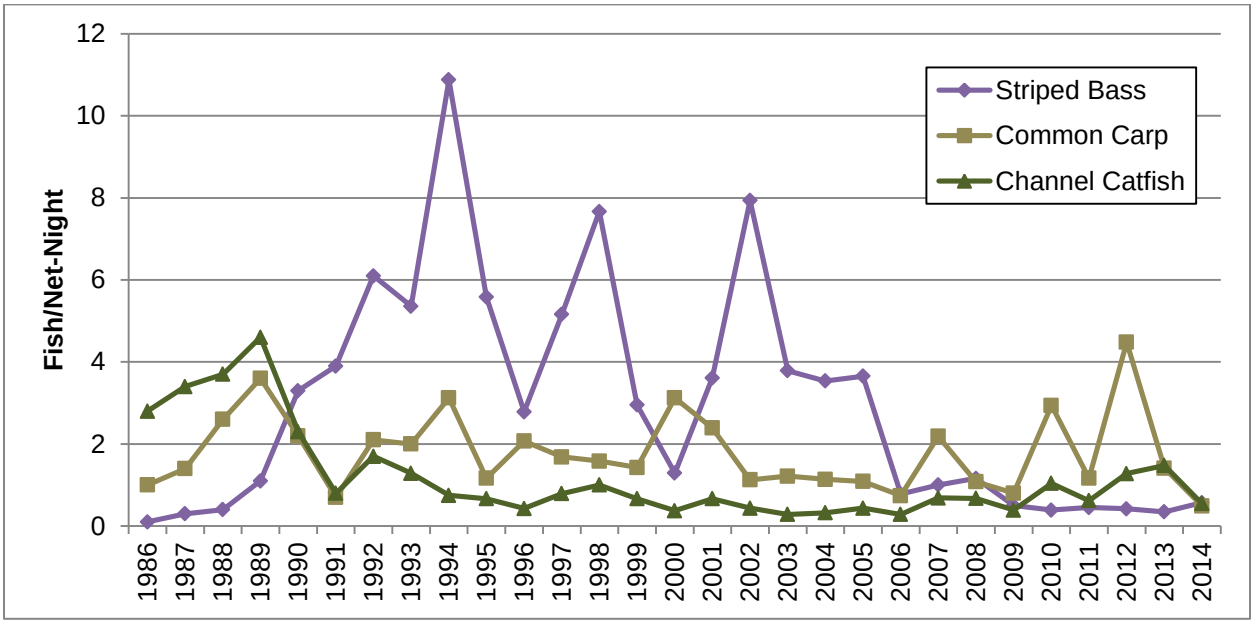


FIGURE 10. Total catch rates for striped bass, common carp, and channel catfish from gill-net surveys on Lake Mohave, 1986-2014.

Channel catfish and common carp catch rates declined from 2013. In 2014, the channel catfish catch rate of 0.55 f/n-n approached the long-term (since 1990) average of 0.79 f/n-n . The 2014 common carp catch rate was an all-time low of 0.49 f/n-n. With the decline in striped bass, common carp catch rates experienced a boom and bust cycle every few years, whereas before there was little documented fluctuation.

Black bass catch rates (Figure 11) increased in 2014. This was the first year that more smallmouth bass were caught than largemouth bass. The largemouth bass catch rate was 0.37 f/n-n, which was well above the long-term average. Smallmouth bass, while still fairly new to Lake Mohave (they were initially caught during surveys in 2010), continued to increase in abundance with a 2014 catch rate of 0.43 f/n-n. Future surveys will indicate whether smallmouth bass become the dominant black bass species. Razorback sucker catch rates averaged 0.20 f/n-n in 2014, which was below the long-term mean of 0.32 f/n-n. Sunfish numbers increased from a low in 2013 and appeared to naturally fluctuate over the years.

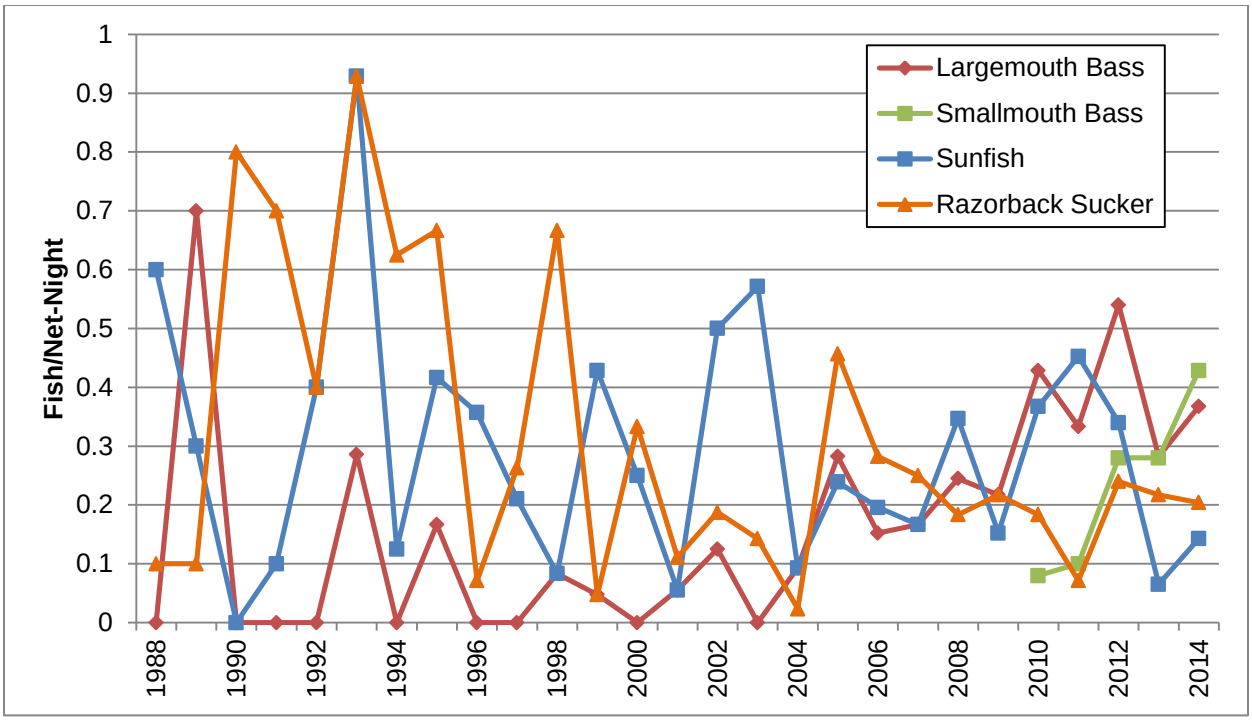


FIGURE 11. Catch rates for largemouth bass, smallmouth bass, razorback sucker, and sunfish from gill-net surveys on Lake Mohave, 1988-2014.

Striped bass comprised 14.5% of the biomass in 2014, up from 10% in 2013 and the highest from the last 5 years. Common carp continued to account for the most biomass at 37%. Channel catfish accounted for 18% of the biomass, which was about equal to the long-term mean of 17.9%. Razorback sucker biomass was at 10%, which was within the normal historical range.

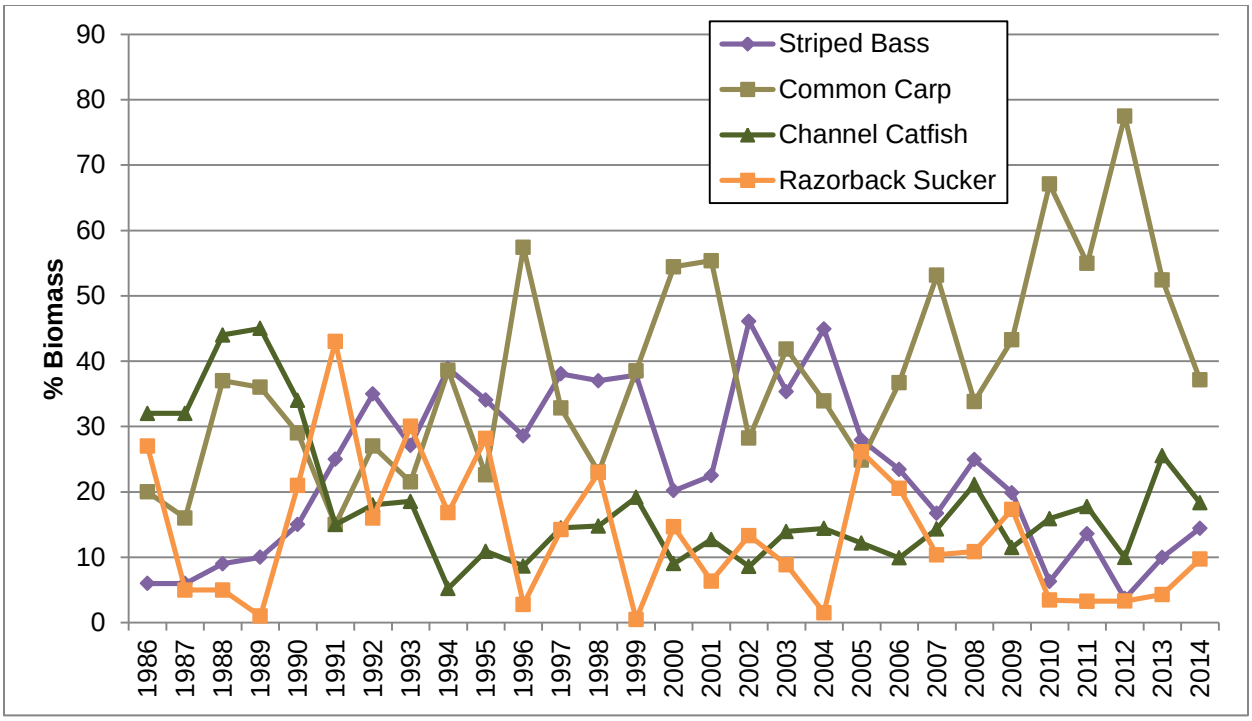


FIGURE 12. Percent of biomass by species captured during gill–net surveys on Lake Mohave, 1986-2014.

The percentage of striped bass greater than or equal to 15 in (in, 381 millimeters [mm]) total length (TL) was 64% in 2014 (Figure 13). The percentage of striped bass greater than 15 in drastically increased in 2006 and has stayed high since. In 2014, this was the second lowest percentage of striped bass greater than 15 in since the increase in 2006. A reduction in average size suggests there was successful striped bass recruitment in recent years, but larger fish still made up the majority of the population.

The 2014 mean total length for striped bass was 434 mm (17 in), which was 176 mm (seven inches) longer than in 2013. Striped bass ranged from 233 mm (9.2 in) to 793 mm (31.2 in) (Figure 14).

The proportional stock density (PSD) trend for striped bass (Figure 15) showed an increase in 2007 to 15, in 2008 to 38, and in 2009 to 43. In 2010, PSD reached the maximum of 100. In 2011, it dropped back to 37, which was more in line with 2008 and 2009 values. In 2012, PSD jumped back up to 77 and to 88 in 2013. PSD declined in 2014 to 38.1, which was lower than in recent years but still within the range since the initial 2008 spike. A higher PSD is indicative of a population with a growing percentage of larger fish and declining in recruitment. It is encouraging to see PSD decrease rather than remain high, as it indicates a successfully recruiting population. This is supported also by the slight decline seen in average size of striped bass found in 2014.

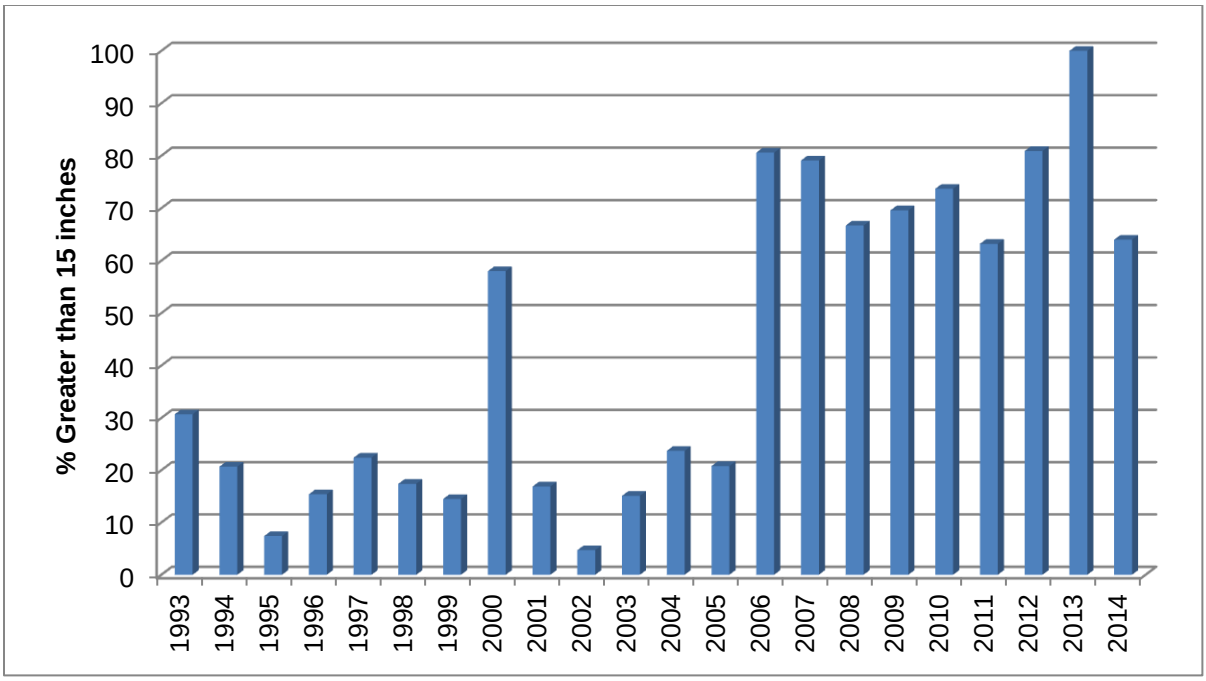


FIGURE 13. Percent of striped bass captured during Lake Mohave gill-net surveys that were 15 inches or larger, 1993 -2014.

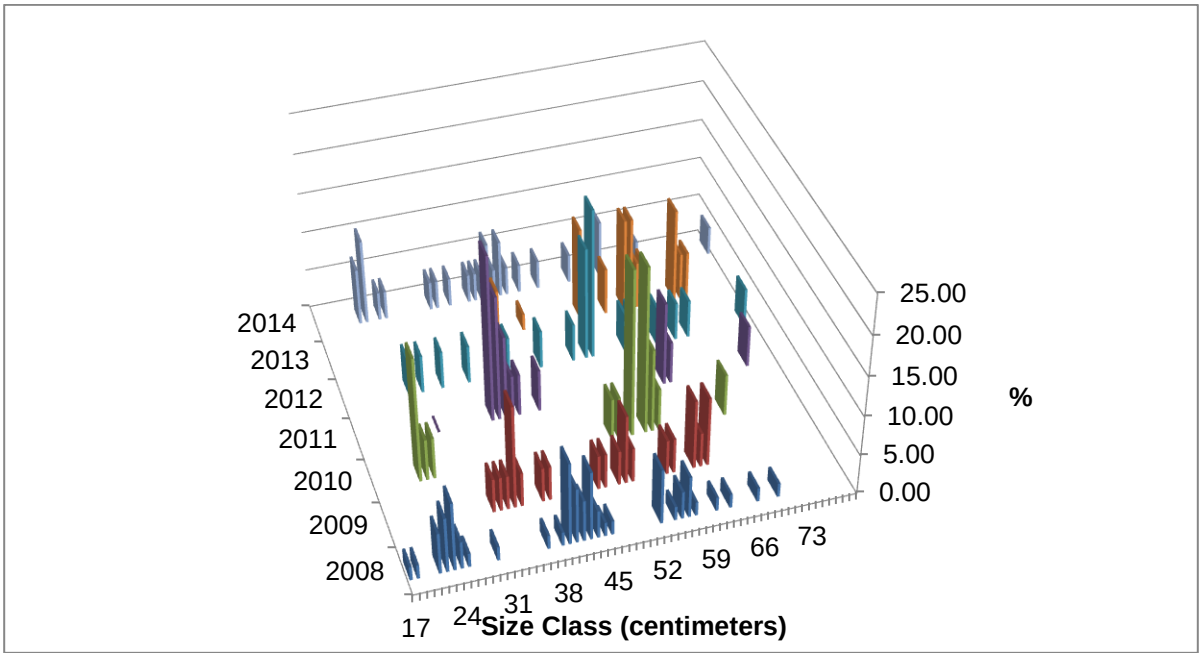


FIGURE 14. Striped bass length frequency data from gill-net surveys on Lake Mohave, 2008-2014.

Largemouth bass mean total length was 417 mm (16.4 in) and ranged between 175 mm (6.9 in) and 510 mm (20 in). Smallmouth bass mean total length was 413 mm (16.3 in) and ranged between 290 mm (11.4 in) and 454 mm (17.9 in). Channel catfish mean total length was 511 mm (20.1 in) and ranged between 350 mm (13.8 in) and 625 mm (24.6 in). Common carp mean total length was 605 mm (23.8 in).

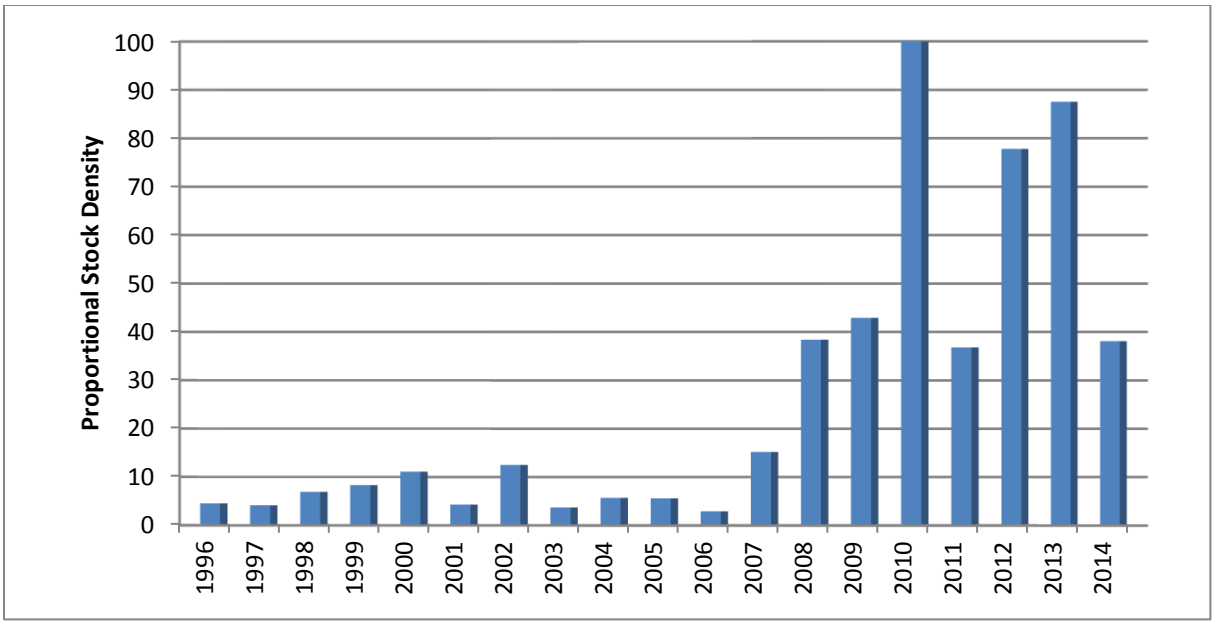


FIGURE 15. Striped bass PSD from gill–net surveys on Lake Mohave, 1996-2014.

Electroshocking Surveys

There were 16 sites electroshocked (nine conducted by NDOW and seven conducted by AZGFD) in April 2014, which coincided with the spring gill-net survey as dictated by AZGFD's sampling protocols. Fall electroshocking surveys were conducted from 1998 to 2002 and 2009 to 2011, while spring surveys were conducted from 2004 to 2007 and 2012 to 2014. The 2014 catch rates for largemouth bass were similar to other spring sampling years (Figure 16). Smallmouth bass were first captured in the 2009 survey. The first three years of detection were during fall surveys in coves with and without artificial habitat. Generally, fall surveys are conducted when water levels are lower and closer to the level of aquatic vegetation and habitat structures. Spring catch rates in 2014 were similar to the past two years. Striped bass were not captured during the 2014 electroshocking survey. Bluegill and common carp catch rates were similar to previous spring surveys, while green sunfish catch rates declined. Green sunfish was still the most abundant species captured this year (Figure 17). A total of 243 min of electroshocking time was expended, averaging 15.2 min/site.

The 2014 catch rate for largemouth bass greater than 200 mm (7.9 in) TL was similar to other spring surveys. The number of smallmouth bass of this size has been increasing since first captured in 2009. Striped bass of this size were not captured during the 2014 electroshocking survey, which also occurred in 2004, 2009, and 2013 (Figure 18).

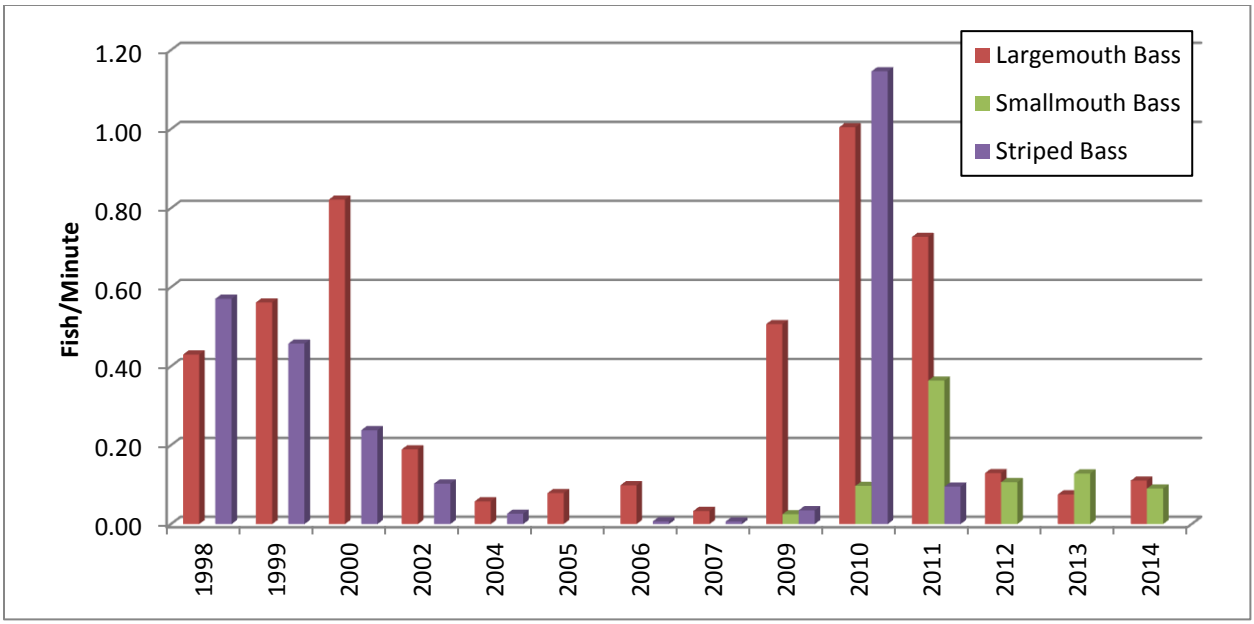


FIGURE 16. Catch rates (fish/minute of electroshocking) for largemouth bass, striped bass, and smallmouth bass from electroshocking surveys on Lake Mohave, 1998-2014. Note: 2004 to 2007 and 2012 to 2014 were spring survey events. All other years were fall sampling events.

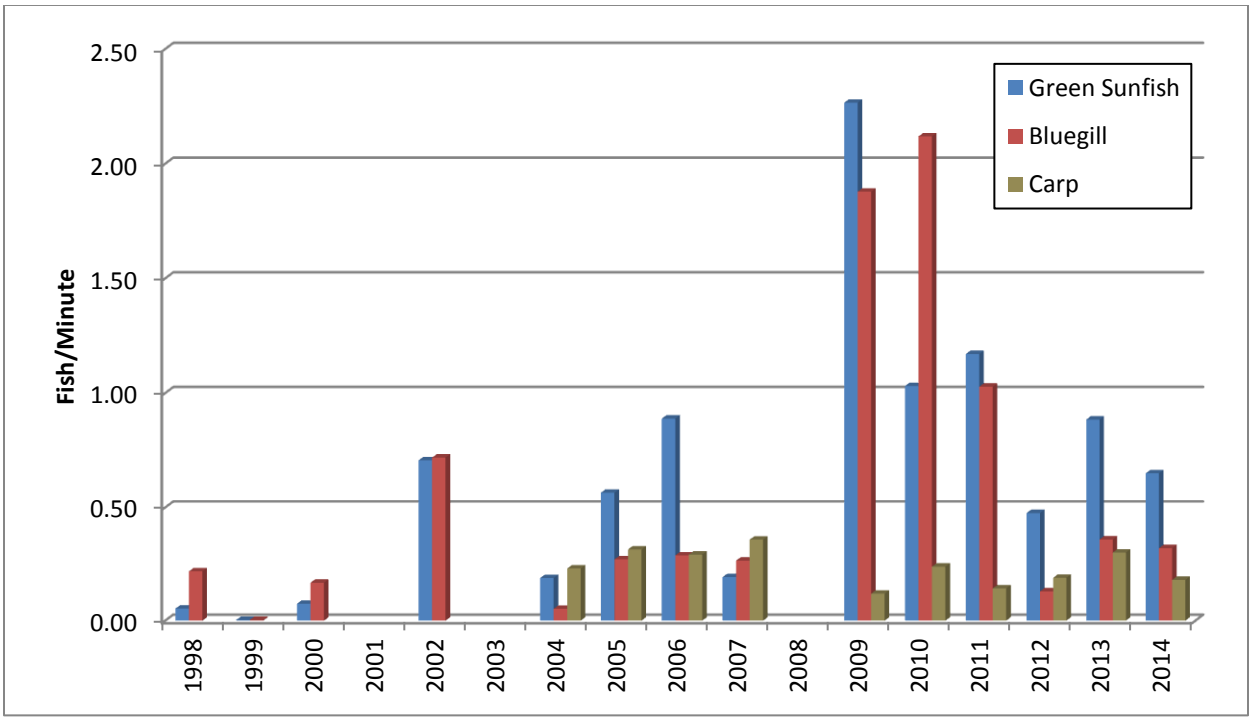


FIGURE 17. Catch rates for common carp, bluegill, and green sunfish captured during electroshocking surveys on Lake Mohave, 1998-2014. Note: 2004 to 2007 and 2012 to 2014 were spring survey events. All other years were fall sampling events.

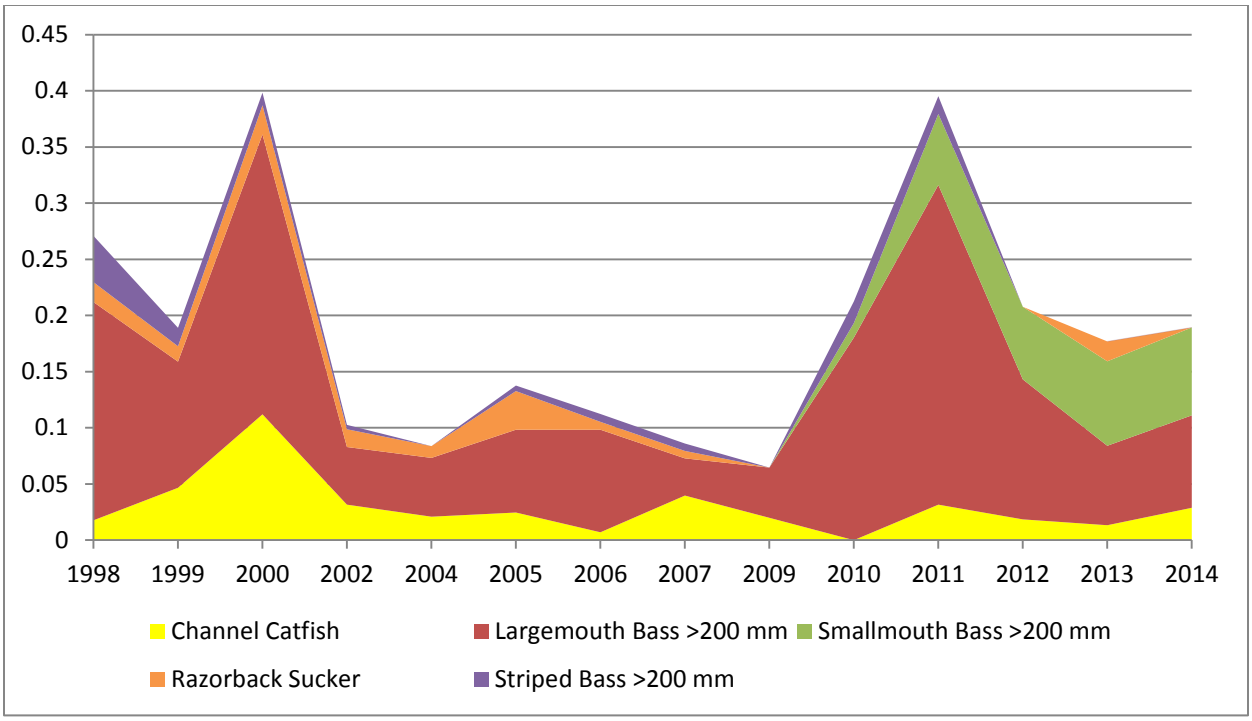


FIGURE 18. Catch rates for channel catfish, largemouth bass, razorback suckers, and striped bass larger than 200 mm (7.9 in) total length captured during electroshocking surveys on Lake Mohave, 1998-2014. Note: 2004 to 2007 and 2012 to 2014 were spring survey events. All other sampling years were conducted in the fall.

Habitat Improvement

Three types of artificial habitat structures were constructed (16 PVC units, 19 poly shrubs, and 47 brush bundles) and deployed into Prospect, Shoshone, Princess, and Solicitor coves. The PVC structures were constructed from 1.5 in PVC. The basic unit was a 5 ft x 5 ft cube and, typically, three cubes were fastened together with heavy-duty (175 pound test) zip ties. Snow fencing, plastic lattice, and brush were attached to each unit. Brush bundles were constructed primarily from salt cedar bushes (tamarisk), weighted with sand bags (six to eight bags, depending on the size of the bundle), and bound with natural fiber rope. The structures were placed between the 620 ft and 630 ft elevation contour. Tamarisk was cut on site by NPS crews or NDOW, and used as the brush component of the structures. The total amount of habitat placed to date include:

- 96 PVC and snow fence structures;
- 200 assorted brush bundles;
- 24 poly shrubs;
- 88 pallet and brush A-frames;
- 24 pallet structures; and
- 25 barge loads of Christmas trees, approximately 625 trees

Habitat Effectiveness Evaluation – SCUBA Monitoring

Fifty-four SCUBA and 21 snorkel surveys were conducted in 2014 at habitat and no habitat coves. SCUBA surveys were used to evaluate the effectiveness of the habitat project sites compared with untreated sites. Habitat project coves continued to have higher fish abundance in 2014 than coves without habitat (Figure 19).

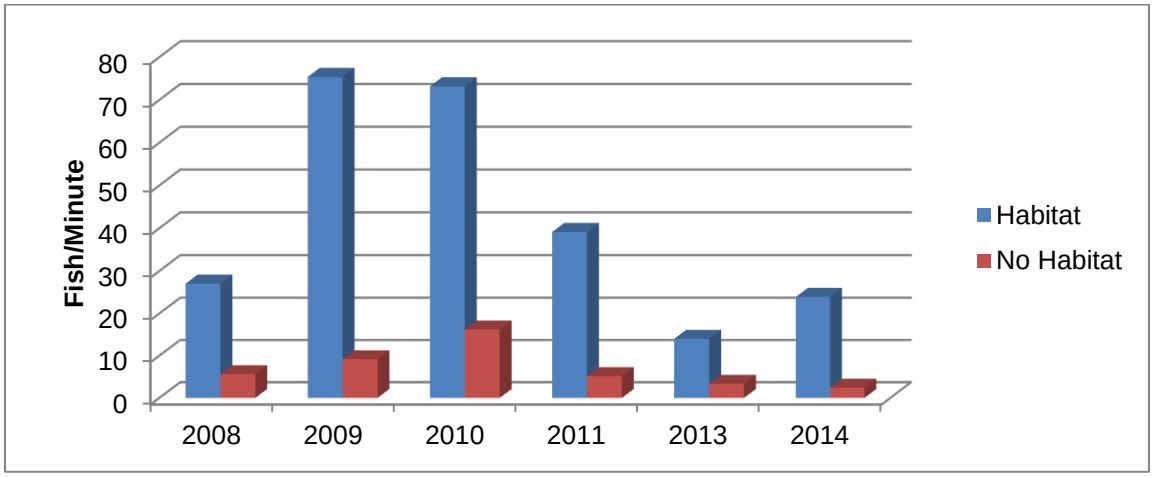


FIGURE 19. Comparison of counts in habitat and non-habitat coves from SCUBA surveys on Lake Mohave. Note: includes all species except threadfin shad, 2008-2014.

Sunfish, particularly bluegill, were the most abundant species attracted to habitat structures, followed by largemouth bass (Figure 20). Use of habitat by sunfish increased in 2014, while black bass use stayed the same as previous years.

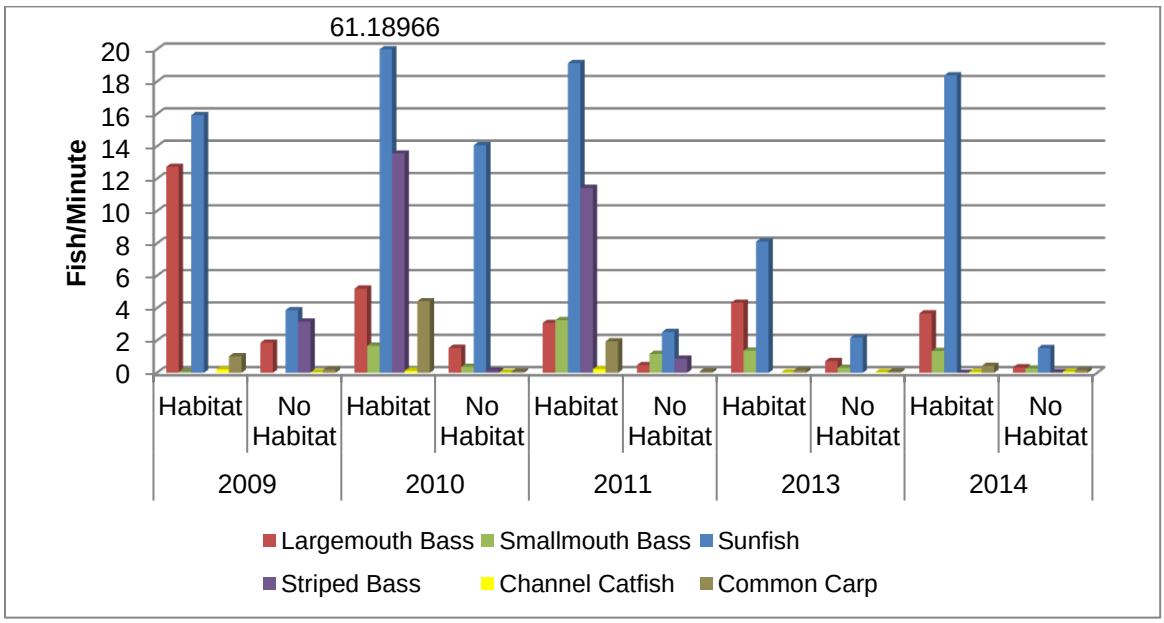


FIGURE 20. Comparison of species in habitat and non-habitat coves from SCUBA surveys on Lake Mohave, 2009-2014.

Largemouth and smallmouth bass do not show a major preference over one habitat type or another (Figure 21). Largemouth bass were seen around PVC more than pallets or brush in 2014, but during other years they were attracted to pallets or brush. Smallmouth bass were drawn more on pallet structures in 2014. Sunfish seem to prefer PVC and brush bundles over pallet structures (Figure 22).

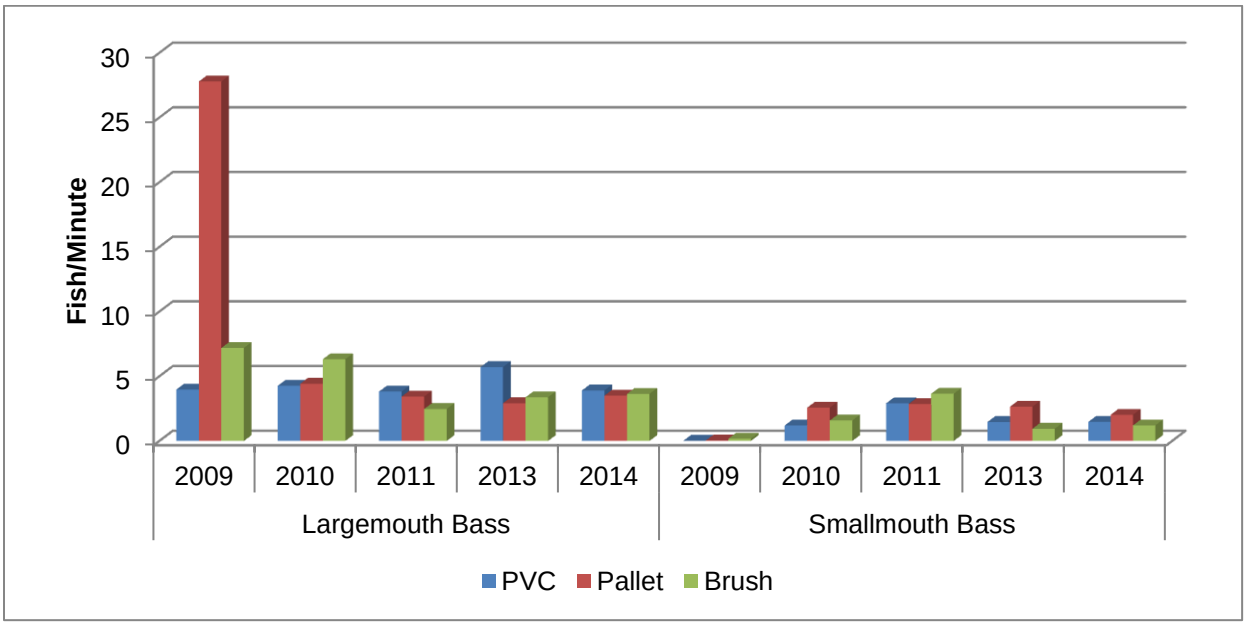


FIGURE 21. Counts of largemouth and smallmouth bass by habitat type from SCUBA surveys in Lake Mohave, 2009-2014.

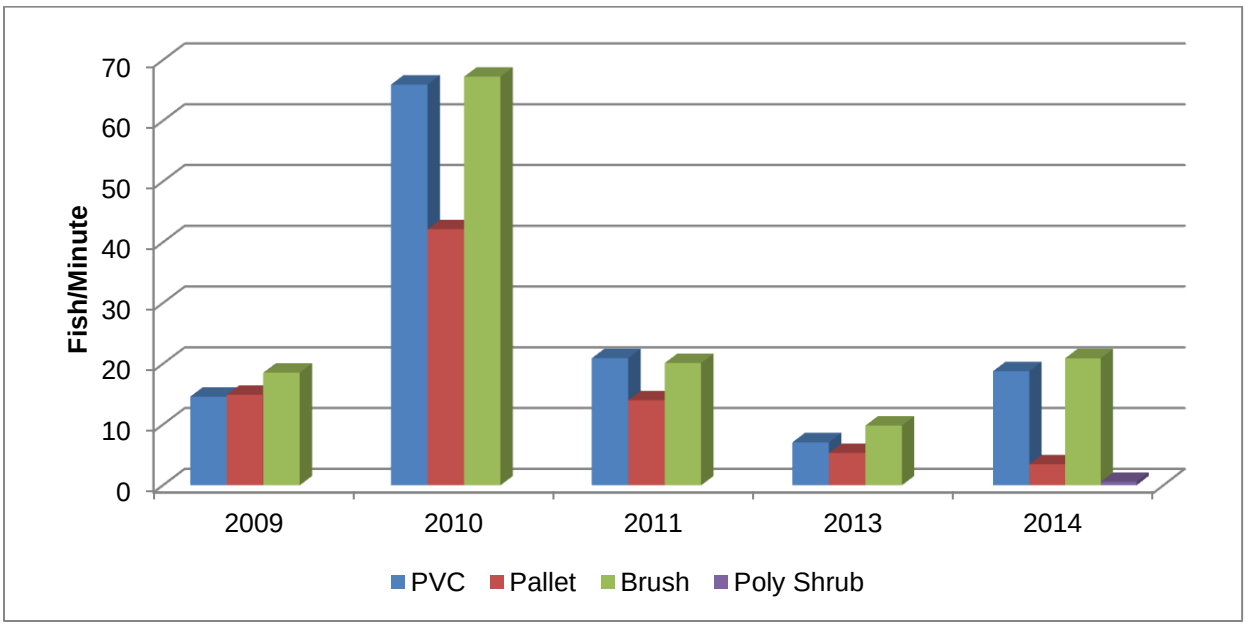


FIGURE 22. Counts of sunfish by habitat type from SCUBA surveys in Lake Mohave, 2009-2014.

Black bass counts were lower in the earlier months of the year than later months (Figure 23). Fingerlings were not seen using the habitat until May, and then their use increased as young-of-year grew into this size class. Abundance of juveniles and adults slowly increased throughout the year except for having a slight decrease in July and August. It is hypothesized this decrease occurs due to fish dispersing into natural vegetation that is present in the lake during that time of year.

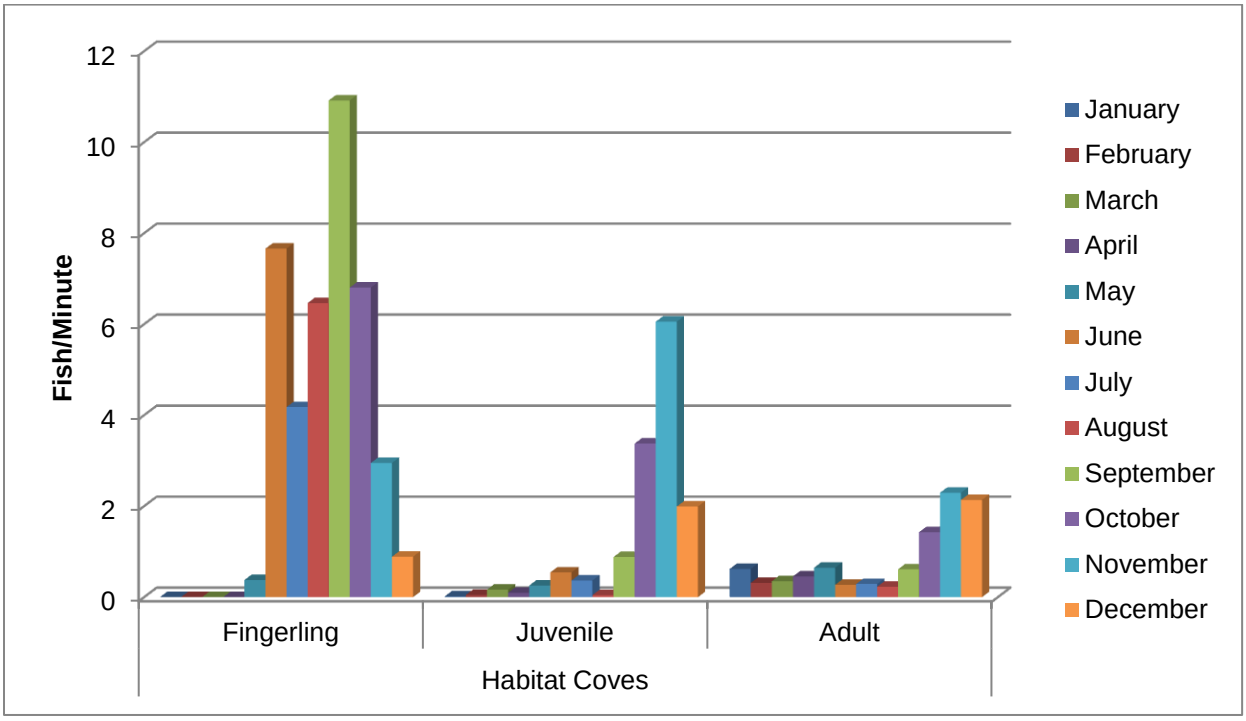


FIGURE 23. Counts of black bass in habitat coves by month from 2014 SCUBA surveys in Lake Mohave.

Non-habitat coves maintained a fairly stable number of black bass throughout the year. A small bump in July suggests the opposite in non-habitat coves (Figure 24). Sunfish showed similar trends as fingerling black bass, where they were absent during colder months and abundant the rest of the year (Figure 25).

Channel catfish counts were similar in 2014 to 2013 and showed no strong preference of any particular structure (Figure 26). Common carp use of habitat increased in 2014 (Figure 27). Poly shrub was a new structure type used in 2014 and were preferred and only used by common carp.

Snorkel surveys were utilized for the first time in 2014 to evaluate fish abundance in shoreline areas of coves simultaneously being surveyed by SCUBA. Snorkel survey results were the same as SCUBA surveys for largemouth bass and sunfish, with more fish utilizing habitat coves than non-habitat coves (Figure 28). However, smallmouth bass counts were higher in coves without habitat.

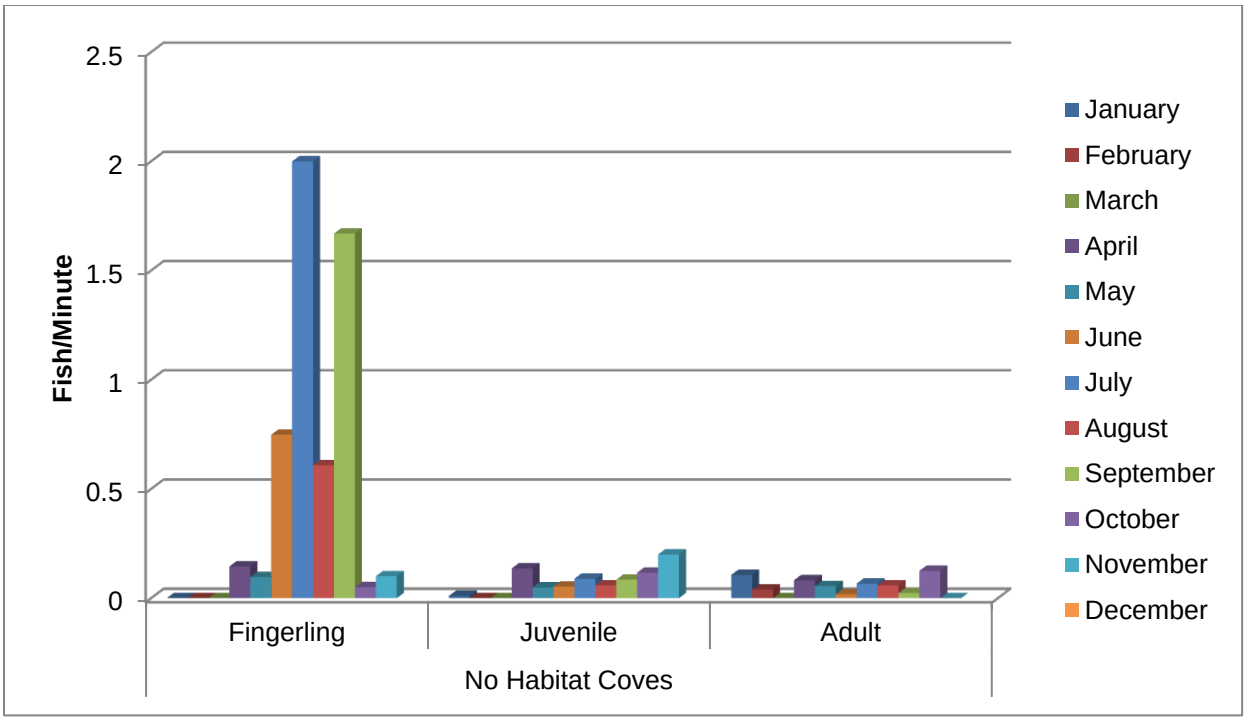


FIGURE 24. Counts for black bass in non-habitat coves by month from 2014 SCUBA surveys in Lake Mohave.

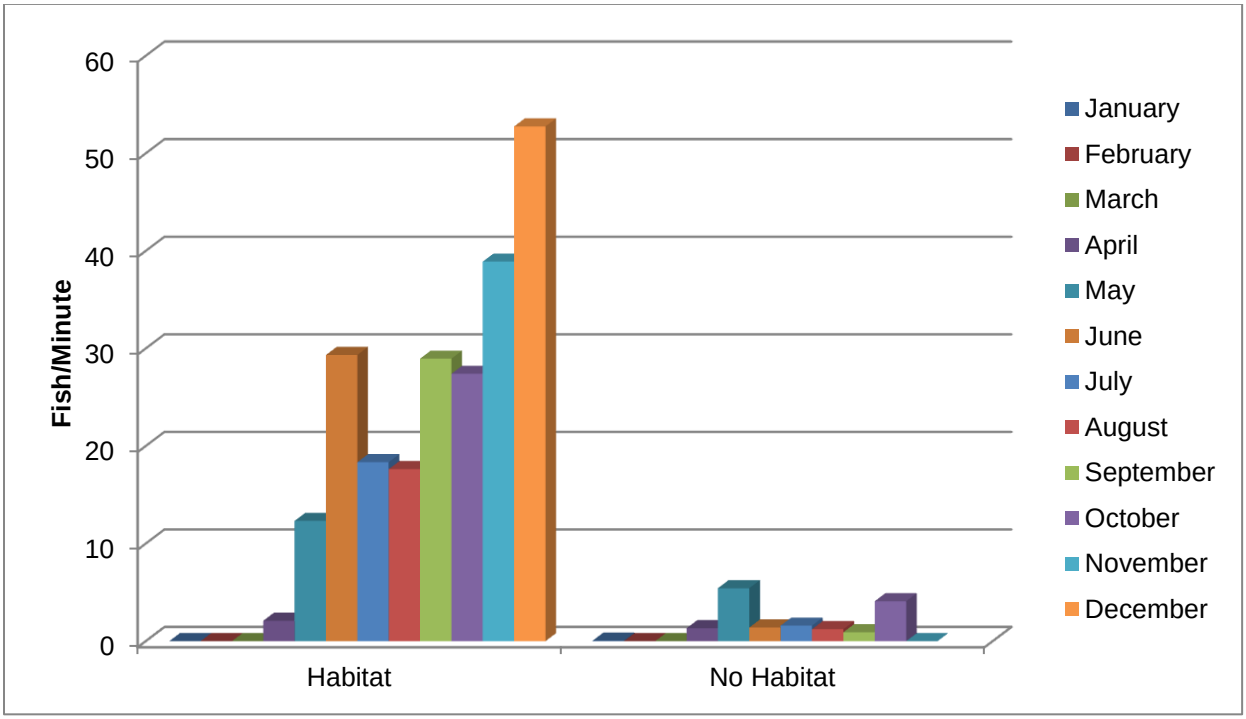


FIGURE 25. Comparison of counts for sunfish in habitat and non-habitat coves by month from 2014 SCUBA surveys in Lake Mohave.

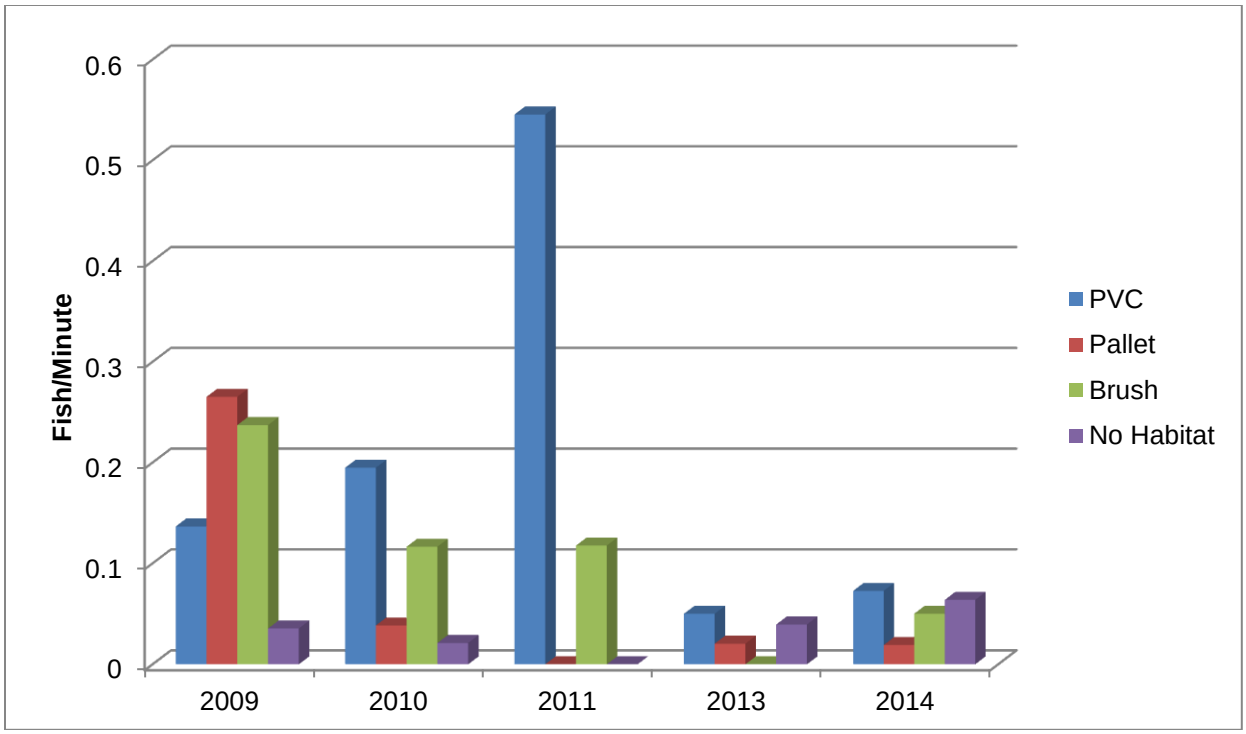


FIGURE 26. Counts of channel catfish by habitat type from SCUBA surveys in Lake Mohave, 2009-2014.

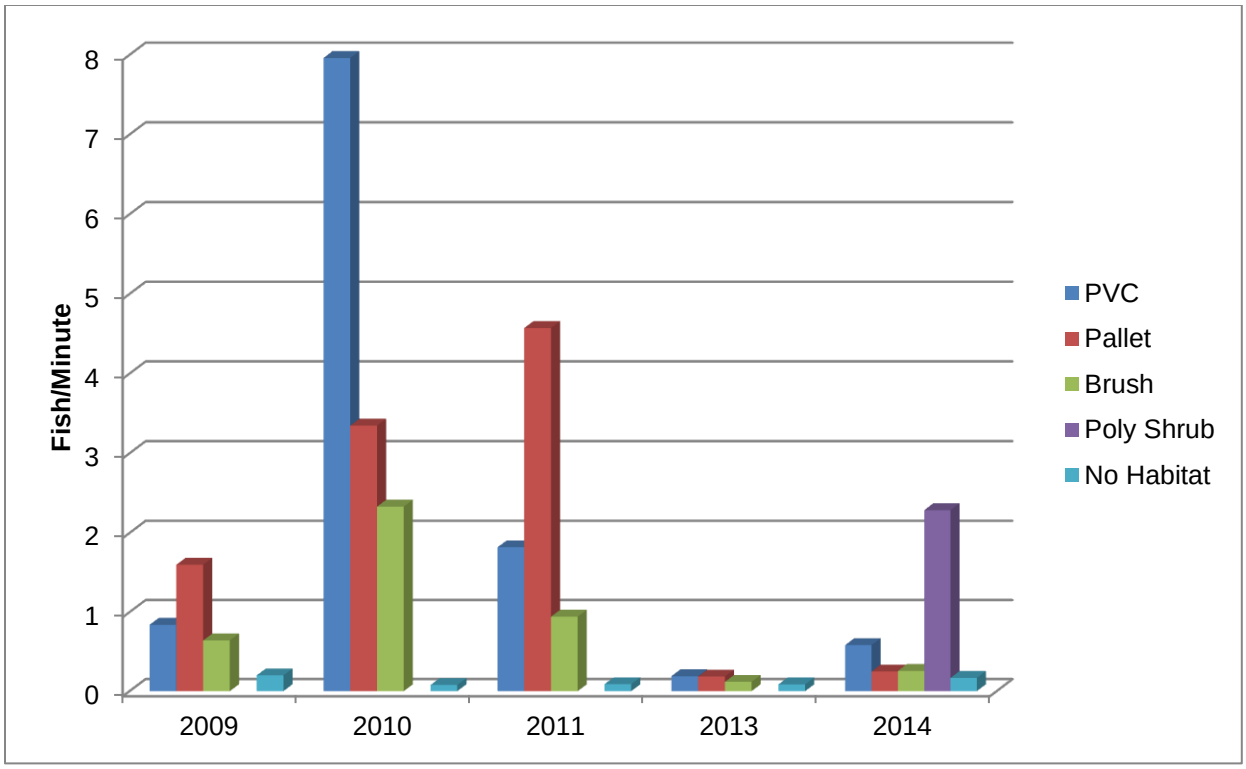


FIGURE 27. Counts of common carp by habitat type from SCUBA surveys in Lake Mohave, 2009-2014.

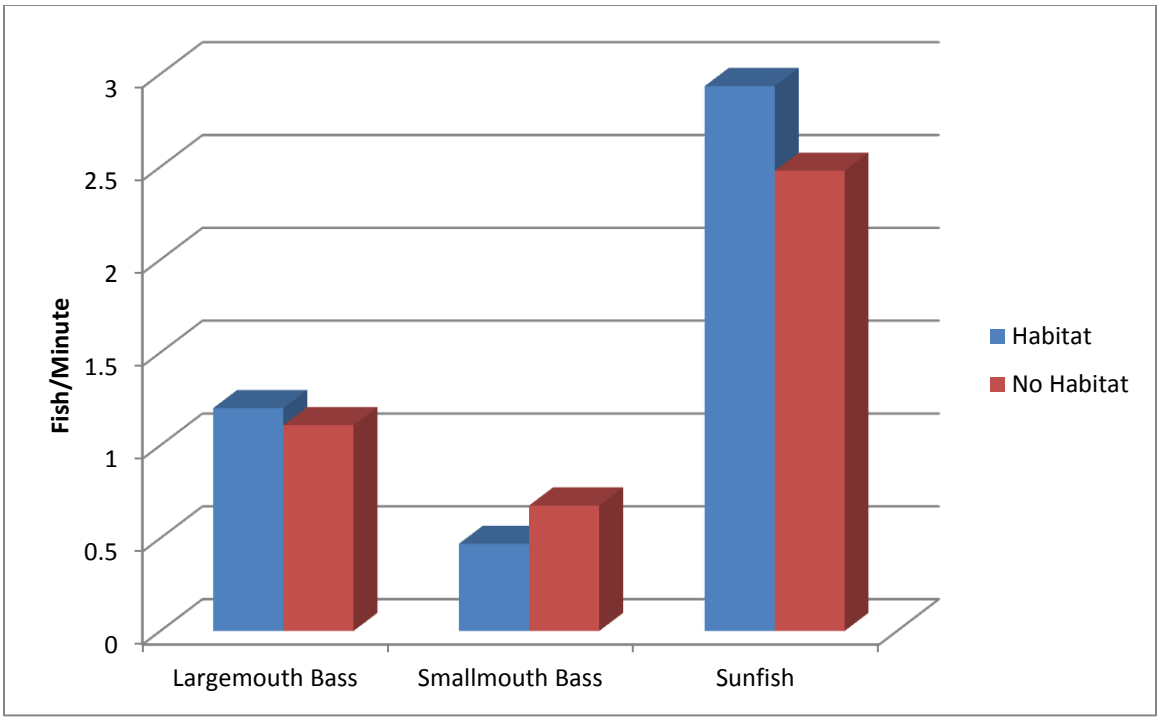


FIGURE 28. Counts for largemouth bass, smallmouth bass, and sunfish in shoreline areas of habitat coves and non-habitat coves from 2014 snorkel surveys in Lake Mohave.

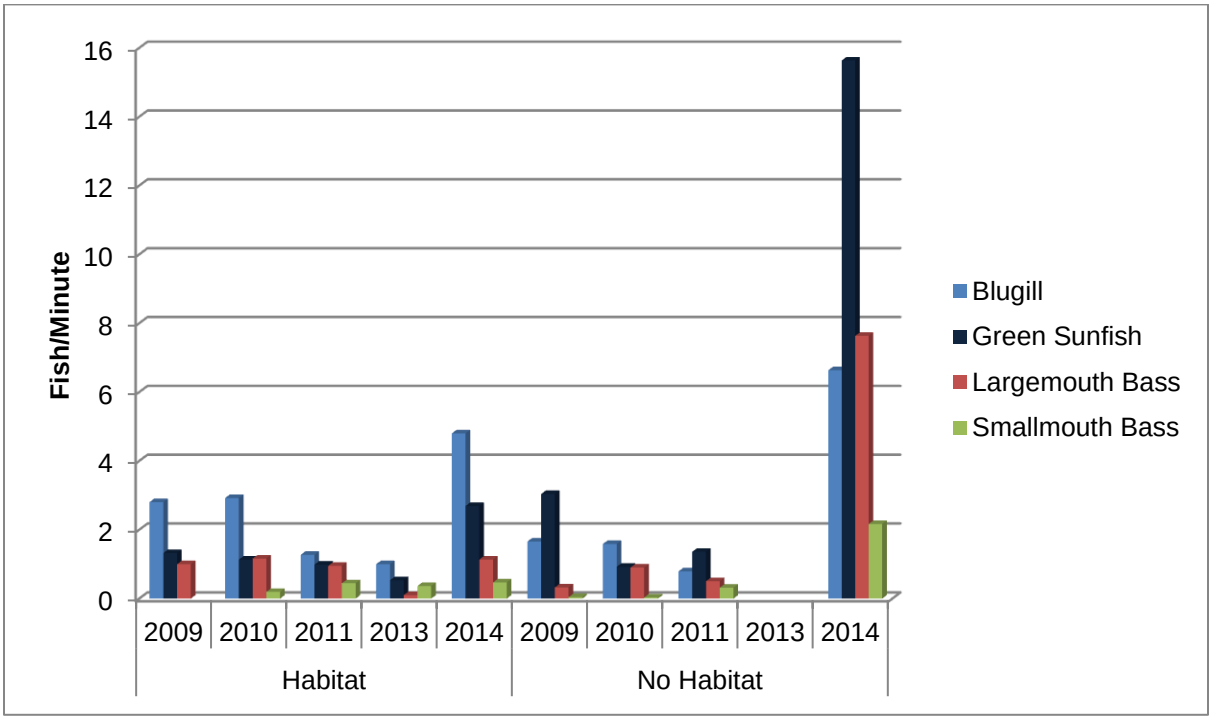


FIGURE 29. Comparison of catch rates in habitat and non-habitat coves from fall electroshocking surveys on Lake Mohave, 2009-2014.

Habitat Effectiveness Evaluation - Electroshocking Comparison

Electroshocking surveys were conducted at three habitat sites and two non-habitat sites in fall 2014 to evaluate the effectiveness of habitat structures to attract fish. Catch rates were the highest recorded since electroshocking habitat sites began in 2009 (Figure 29). This was also the first time that non-habitat sites had a higher catch rate than habitat sites. Counts from SCUBA surveys appeared to peak in July as aquatic vegetation became abundant and the high water level flooded riparian vegetation. Fish react seasonally different and disperse within the natural vegetation during summer. After vegetation dies in fall, counts in the artificial habitat increase again.

MANAGEMENT REVIEW

The decline in the Lake Mohave striped bass fishery continued in 2014. Data from fish population surveys indicated there has been poor year-class recruitment since 2006. The cause of the decline is not fully understood, however, the change is coincidental to the infestation of quagga mussels in Lake Mohave. As agencies collect more water quality data, a better understanding of the Lake Mohave ecosystem may help explain the decline in the striped bass fishery. After striped bass diminished the shad population to nearly nothing, they became overly reliant on the put-and-take rainbow trout fishery for forage. Rainbow trout stocking was discontinued in October 2013, which further influenced striped bass population abundance. However, large groups of threadfin and gizzard shad were documented throughout the lake in 2014. Furthermore, stomach content analysis conducted on larger striped bass (7-19 lbs) in creel surveys showed striped bass were almost exclusively feeding on shad. The rebound of shad was likely due to the decline in striped bass and the unusual increase in the amount of algae and plankton occurring in the lake during 2014. The increase in shad may only be a short-term benefit if striped bass numbers increase again to eradicate shad. The return of shad cannot entirely solve problems within the striped bass fishery since young-of-year recruitment in recent years has been low. Early life–stages of striped bass rely more on zooplankton and aquatic insects, therefore, productivity of the reservoir needs to increase.

Lake Mohave remains a reservoir known for trophy striped bass. This fishery was built on limited juvenile striped bass abundance, which greatly influenced the amount recruitment into the larger size classes. Otherwise, abundant recruitment leading to a sudden increase in the striped bass population would quickly decimate the limited forage base, resulting in even fewer, if any, trophy fish. There are still trophy sized striped bass in Lake Mohave, however, the traditional “hot spot” locations for striped bass have changed as rainbow trout are no longer stocked, forcing striped bass to disperse in search of other prey.

The habitat enhancement project will continue on into the foreseeable future. Largemouth bass, smallmouth bass, bluegill, channel catfish, common carp, and to date, four razorback suckers have utilized these structures. Abundance of most fish

species is generally higher on the constructed habitat compared to non-habitat coves. During cold, winter months, fish use of habitat structures is much lower than during warmer months.

RECOMMENDATIONS

- Maintain present regulations.
- Consider revising the present creel survey program so that Willow Beach is included when Lake Mead is sampled. This will alleviate the problem with trying to find personnel willing to work one day a week. Install a volunteer creel box at Cottonwood Cove, with the approval by NPS.
- Continue fish population surveys through gill netting, electroshocking, snorkeling, and SCUBA. Conduct electroshocking surveys in the fall when the water level is lower and fish concentrations are concentrated near constructed habitat.
- Use Floy-tags on black bass to monitor movements if fish are caught again during electroshocking or observed during SCUBA surveys.
- Continue participation with the Lake Mead National Recreation Area Fisheries Management Team.
- Continue developing and implementing the Lake Mohave Habitat Enhancement project.
- Continue to participate as a member of the Lake Mohave Native Fish Work Group and associated native fish restoration projects.

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