

NEVADA DEPARTMENT OF WILDLIFE
STATEWIDE FISHERIES MANAGEMENT



FEDERAL AID JOB PROGRESS REPORTS

F-20-48
2012

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, 2012 through December 31, 2012

SUMMARY

Angler Use and Harvest

No creel data was collected in 2012.

Gill Netting

A total of 50 net-nights of effort were completed in April 2012. This was the ninth year utilizing the Arizona Game and Fish Department's (AGFD) gill net and electroshocking protocols. Gill nets were set from Davis Dam to upstream at mile 46. A total of 383 fish was sampled and species composition included striped bass (*Morone saxatilis*) at 5% (n=21), common carp (*Cyprinus carpio*) at 58% (n=58), channel catfish (*Ictalurus punctatus*) at 17% (n=64), razorback suckers (*Xyrauchen texanus*) at 3% (n=12), largemouth bass (*Micropterus salmoides*) at 6% (n=27), green sunfish (*Lepomis cyanellus*) at 4% (n=16), yellow bullhead (*Ameiurus natalis*) at 1% (n=4), smallmouth bass (*Micropterus dolomieu*) at 3% (n=14), and bluegill (*L. macrochirus*) at 3% (n=1). The striped bass catch rate was 0.42 fish per net-night (f/n-n), down slightly from 2011 surveys of 0.45 f/n-n. This is higher than the 0.38 f/n-n of 2010, which was the lowest since this fishery began emerging in the late 1980's.

Electroshocking

In April of 2012, 14 sites were sampled. A total of 216 min of electroshocking was expended, averaging 15.4 min per site. Six sites were sampled by NDOW and eight by AGFD. Electroshocking was conducted along with annual spring gill net surveys.

Habitat Improvement

Three types of habitat were constructed and deployed into Bass, Box, and Princess Coves, which included 17 pallet structures, 12 PVC units, and three brush bundles. The total amount of habitat placed to date included: 88 pallet and brush A-frames, 51 PVC and snow fence structures, 99 assorted brush bundles and mixtures of brush and pallets, 20 pallets structures, and 25 barge loads of Christmas trees comprising approximately 625 trees

No SCUBA surveys were conducted in 2012. Divers spent time repairing broken habitat structures and moving structures from shallower water to deeper water.

Electroshocking surveys were used to evaluate the effectiveness of habitat to attract fish compared with fish presence at untreated sites. Survey results showed lower use in 2012, but this is because surveys were conducted in the spring. Past spring survey results showed that catch rates were lower than in the fall. Fish habitat appeared to peak in July and August as aquatic vegetation became abundant and high water levels flooded riparian vegetation. Fish reacted to this by dispersing amongst this seasonally created habitat.

BACKGROUND

Sixty-two miles downstream from Hoover Dam, the United States Bureau of Reclamation (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 is alternately a lotic or lentic environment 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. This region is stocked year round with catchable rainbow trout (*Oncorhynchus mykiss*). Striped Bass were first documented in Lake Mohave in the early 1980's and have since become the major component of the sport fishery. Striped bass reproduce in the seasonally warm reaches of the reservoir and move into the coldwater areas as they become larger and eventually prey on stocked rainbow trout. The impact striped bass have on the stocked rainbow trout fishery has become significant in recent years and has resulted in some modifications of the rainbow trout stocking program. Largemouth bass, smallmouth bass (more recent), channel catfish, and sunfish provide the remaining portion of the Lake Mohave sport fishery. The major forage species present in Lake Mohave, other than rainbow trout are threadfin shad (*Dorosoma petenense*), bluegill, green sunfish, and crayfish. Large striped bass are also known to prey on carp. Populations of all the forage species have remained fairly abundant with the exception of threadfin shad. Predation by striped bass, among other factors, has reduced the threadfin shad population to a point where they are now difficult to detect.

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 to quagga mussel contamination. The Lake Mead Fish Hatchery provided a significant portion of the rainbow trout stocked into Lake Mohave. The changes this invasive species brings to the Lake Mohave fishery continue to evolve.

Native fish now presently occurring within Lake Mohave are razorback sucker and bonytail chub (*Gila elegans*). The razorback sucker population has most recently been estimated at less than 10,000 fish, which is a significant decline from previous estimates of 60,000 in the late 1980's. Once abundant throughout the Colorado River

basin, Lake Mohave now contains the largest remaining population of razorback suckers. It has been extirpated from much of its former range and is listed under the Endangered Species Act as an endangered. The bonytail chub is also listed as endangered and presently exists in low numbers in Lake Mohave. Efforts to insure that these species do not disappear from Lake Mohave precipitated the formation of the Native Fish Work Group (NFWG). The NFWG is an association of private, state, and federal biologists who have management responsibilities in Lake Mohave and other main stem Colorado River reservoirs. Another endangered species native to the historic Colorado River, including the stretch now inundated by the lake, is Colorado River pikeminnow (*Ptychocheilus lucius*), considered extirpated in Lake Mohave.

Below Davis Dam, approximately 12 miles of the Colorado River forms the boundary between Arizona and Nevada. The river is characteristically swift, cool, and has a highly variable flow. The river bottom is composed of rubble, gravel, and sand. Several backwater lagoons were created on the Nevada side through the construction of training dikes. These dikes line almost the entire length of the river in Nevada. The Colorado River fishery is supported by striped bass, stocked rainbow trout, and, to a lesser extent, largemouth bass, bluegill, green sunfish, channel catfish, and yellow bullhead. Threadfin shad and carp also occur. Razorback sucker and flannelmouth sucker (*Catostomus latipinnis*) (flannelmouth suckers are felt to have been introduced to this section of the Colorado River, but are known to be native to upstream sections of the Colorado River and its tributaries) can also be found here. The Colorado River pikeminnow and bonytail chub are not known to exist in this section of the river at this time. Striped bass and rainbow trout are the most sought after species by anglers. In the spring and early summer, striped bass migrate upstream from Lake Havasu to spawn. Concentrations of striped bass can be found at that time of year in the tailrace of Davis Dam where their upstream migration is stopped. Striped bass in excess of 20 pounds were common in the late 1970's, but now are rare. Rainbow trout are stocked by the Willow Beach National Fish Hatchery.

OBJECTIVES AND APPROACHES

General Management

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

Approaches:

- To measure angler use and harvest by conducting a contact creel survey one day a week at Willow Beach and two days a week at Cottonwood Cove.
- To install and maintain up to three volunteer angler survey boxes at access locations on the Colorado River below Davis Dam.

- To monitor fish population dynamics through a minimum of 50 net-nights of gill net surveys in the spring implemented cooperatively with AGFD.
- To monitor fish population dynamics through a minimum of five days of electroshocking in the fall as water levels at that time of year allow for more effective sampling of littoral-zone sport fish species.
- To utilize creel survey and monitoring data to assess sport fishery performance and changes to estimate sport fish availability and condition.
- To coordinate with the National Park Service (NPS), AGFD and other cooperators on sport fish management needs and cooperative monitoring activities.
- To develop recommendations and coordinate the number of rainbow trout stocked to meet management objectives.
- To pre-monitor trout stocking locations to avoid conflict with razorback suckers during the late-winter/spring stocking period in conformance with the FWS Biological Opinion.
- To 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:

- To construct and install up to 100 underwater habitat structures at selected locations on Lake Mohave including brush bundles, combinations of brush and wooden pallets, plain pallet structures, PVC structures, and Christmas trees.
- To coordinate with the NPS for harvest and use of shoreline invasive tamarisk used for the brush element of the habitat structures.
- Have the NPS, AGFD and volunteers assist with construction and placement of habitat structures.
- To use the NDOW fish habitat barge for habitat deployment.
- To survey habitat sites quarterly using underwater SCUBA dive transects with assistance from the AGFD.
- To survey habitat sites annually by gill netting and electro-shocking.
- To evaluate angler success and use at habitat improvements sites through data and questionnaires collected through the established general fisheries creel survey program.

Striped Bass Young-of-Year, Quagga Mussel Diet Study

Objectives: To determine the diet of young-of-year (YOY) striped bass in Lake Mohave and to determine the diet of shallow water (< 30feet (ft).) quagga mussels in Lake Mohave.

Approaches:

- Contract the University of Nevada at Las Vegas (UNLV) for sample collection and analysis.
- Provide boat transport and assistance to the UNLV for field collections.

PROCEDURES

Angler Use and Harvest

Angler survey activities are conducted two days a week at Cottonwood Cove, one day a week at Willow Beach, and through volunteer angler boxes along the Colorado River below Davis Dam. Information collected included hours fished, total anglers per party, angler preference, angler license origin (Nevada or Arizona), species and number caught, length, and weight of catch, and number of 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 AGFD personnel following their reservoir survey protocols.

Electroshocking

Shoreline areas were sampled using boat electroshocking units. The boat was equipped with a Coffelt VP-15 box with an electrode array. Fish collected were 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 fish habitat were constructed and deployed. They include structures constructed of pallets, brush, and PVC pipe with snow fencing and plastic lattice. Tamarisk (*Tamarix* spp.) was used for the brush component of the habitat and was cut on site. Habitat structures were constructed on the deck of the habitat barge or on shore, weighted with sand bags, and then deployed above the 620 ft contour. Agencies involved included the USBR, NPS, AGFD, NDOW, and angler volunteers. Fish use of the habitat was monitored via SCUBA transects and electroshocking.

Striped Bass Young-of-Year, Quagga Mussel Diet Study

Beach seining or electroshocking was used to collect YOY striped bass at or near the same sites as quagga mussel sampling. Adult quagga mussels were collected by SCUBA divers.

FINDINGS

Angler Use and Harvest

No angler contact creel data is available for Cottonwood Cove or Willow Beach in 2012. Historic data is provided for reference in Figures 1 through 9. One angler drop-box and signage was constructed and placed at Big Bend State Park.

Figure 1. Cottonwood Cove Catch Rates, 1970-2009.

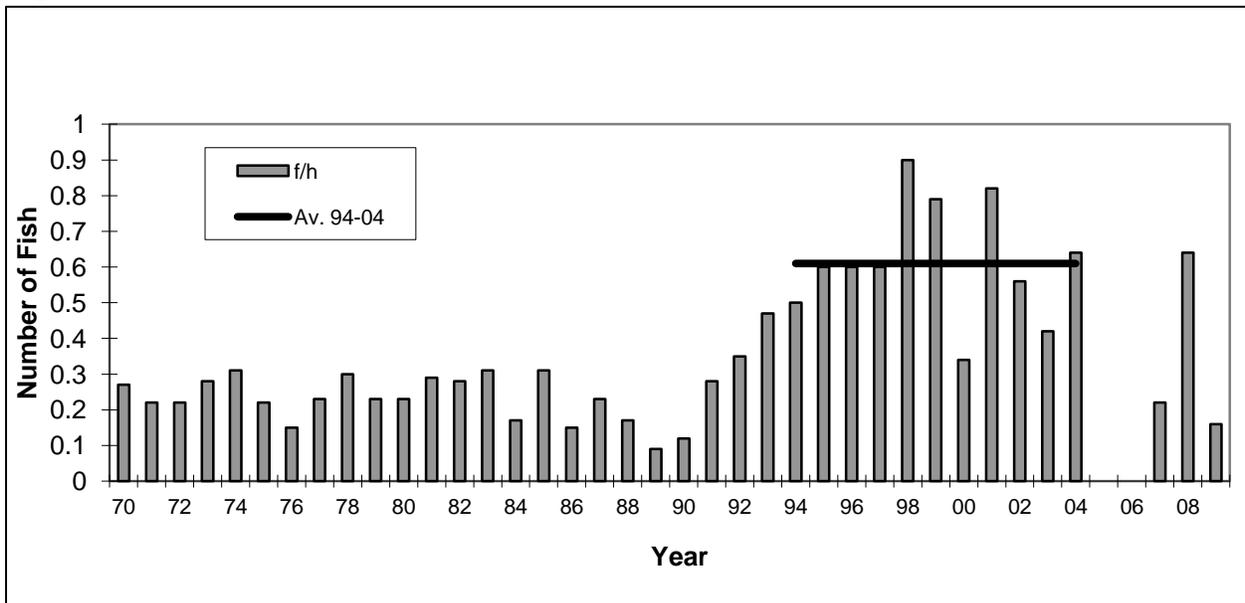


Figure 2. Cottonwood Cove Percent Successful Anglers.

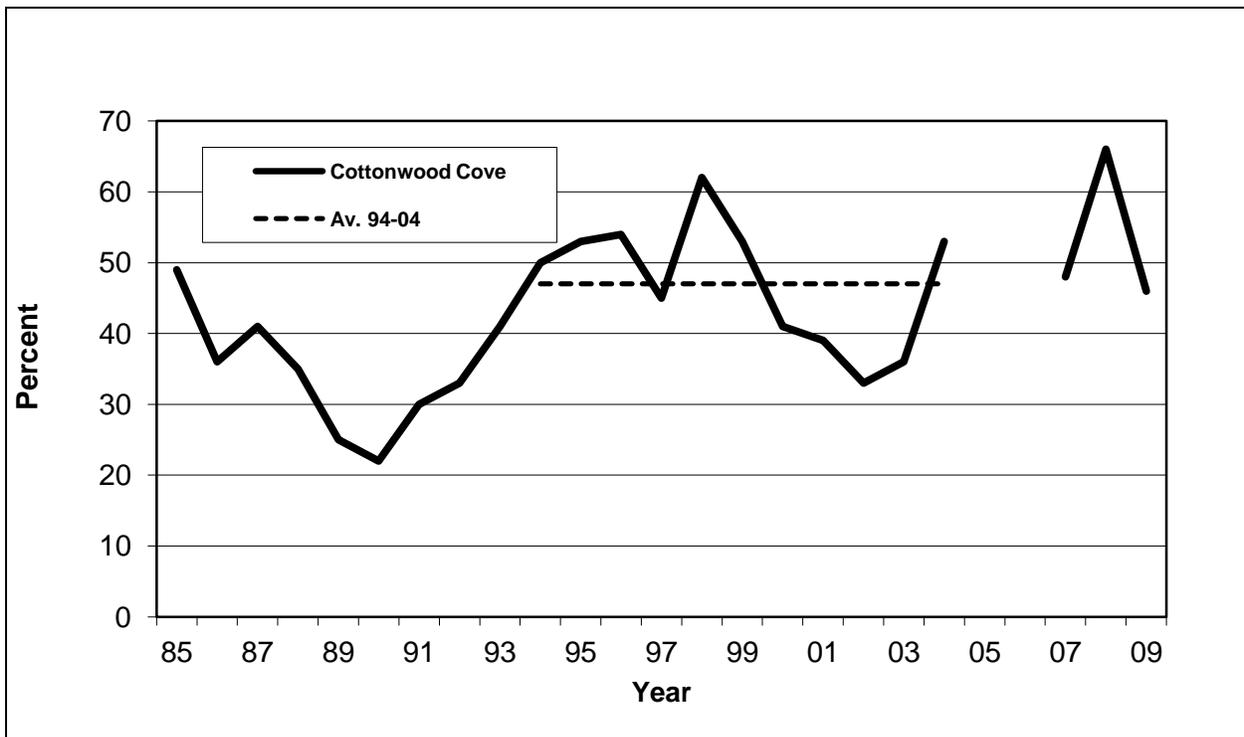


Figure 3. Cottonwood Cove Harvest Composition.

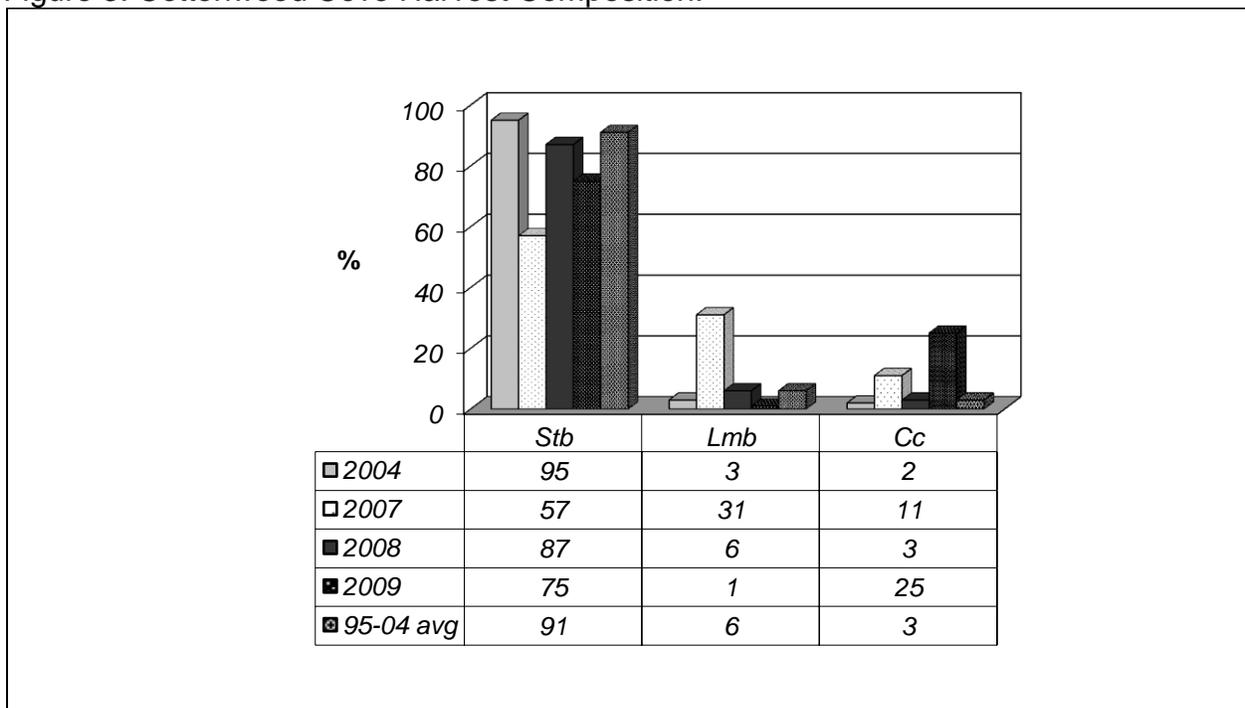


Figure 4. Cottonwood Cove Striped Bass Length Frequencies.

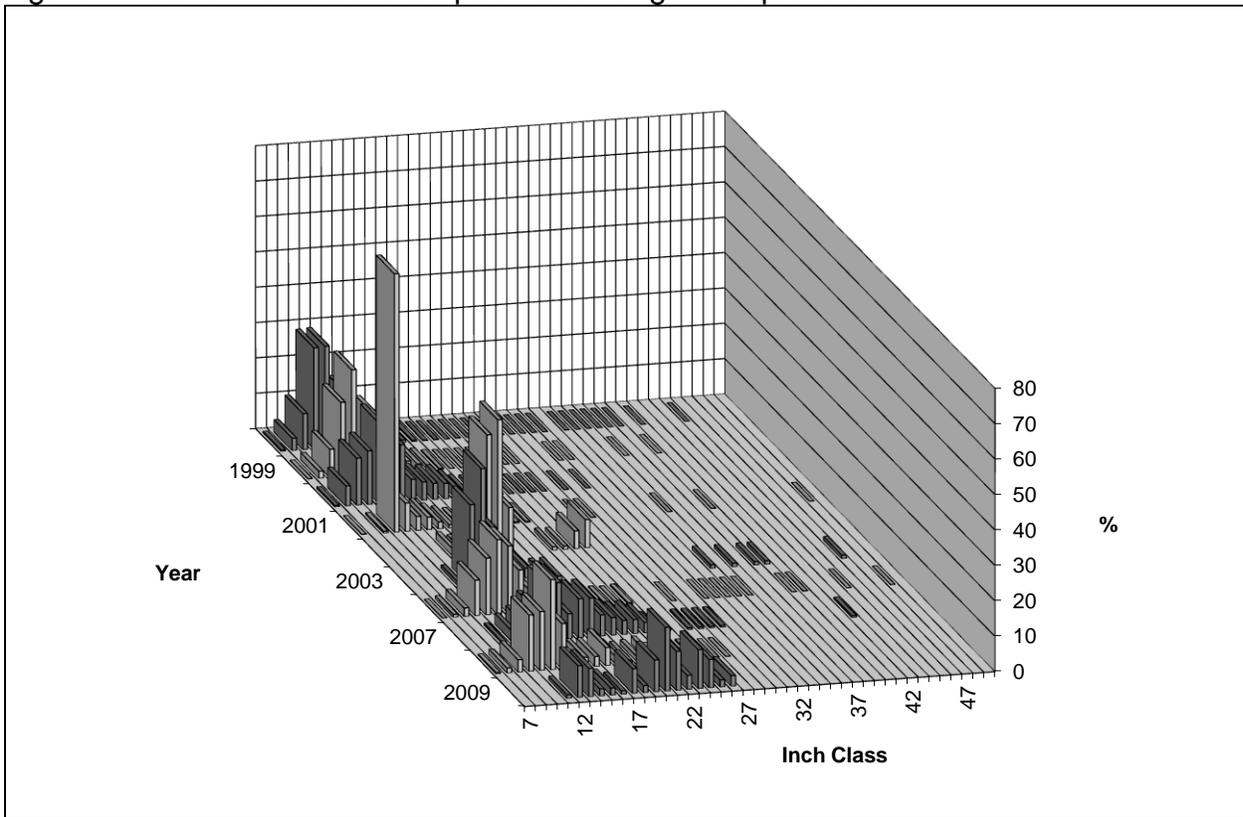


Figure 5. Willow Beach Catch Rates, 1970-2009.

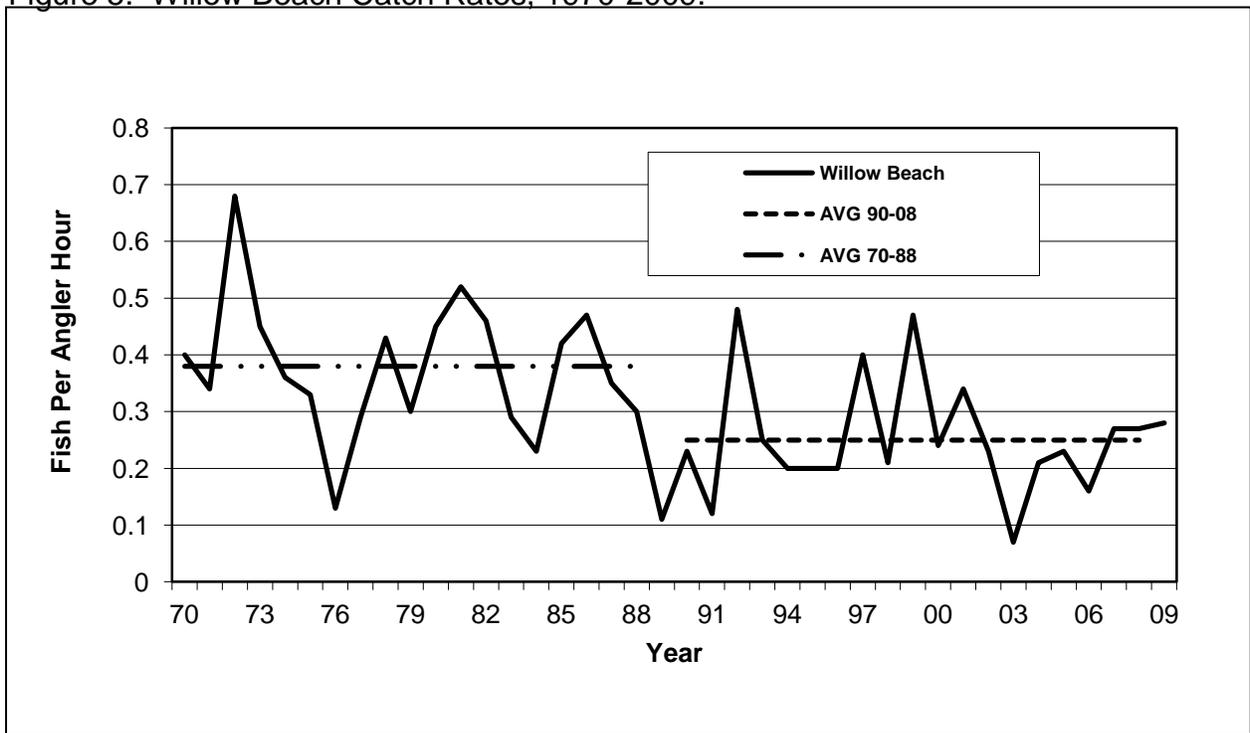


Figure 6. Willow Beach Percent Successful Anglers.

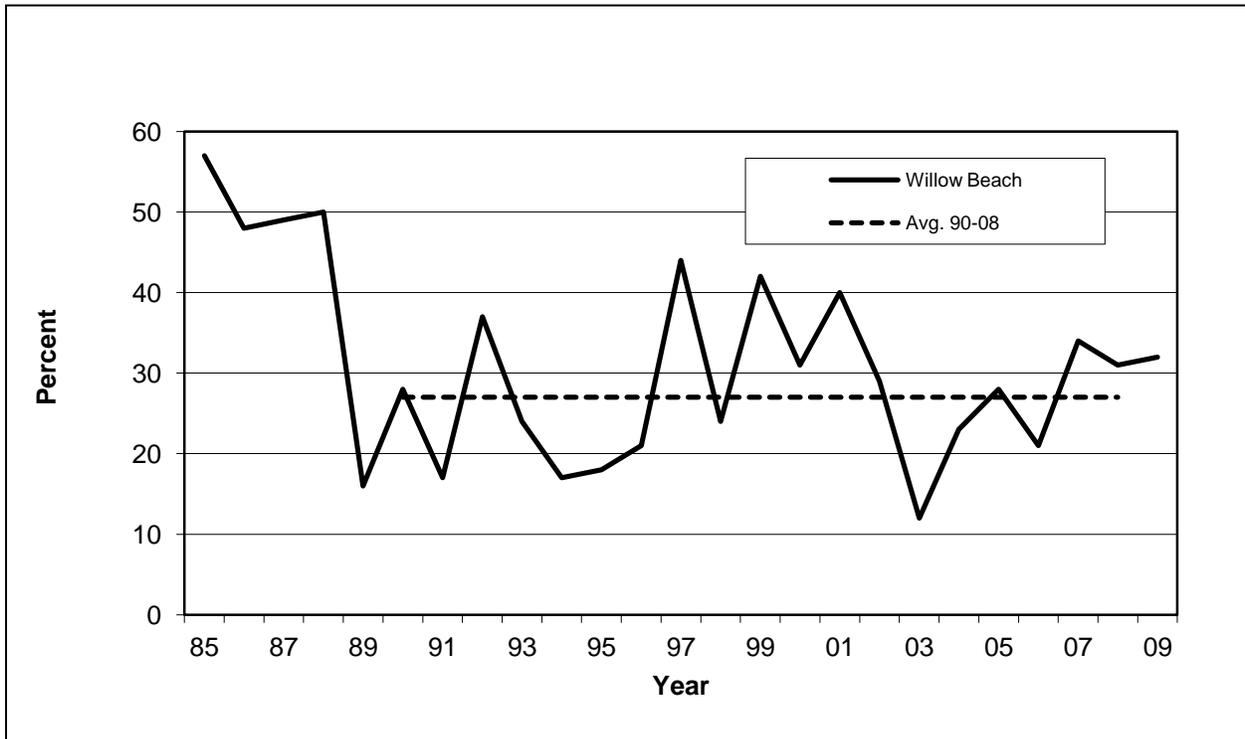


Figure 7. Willow Beach Harvest Composition.

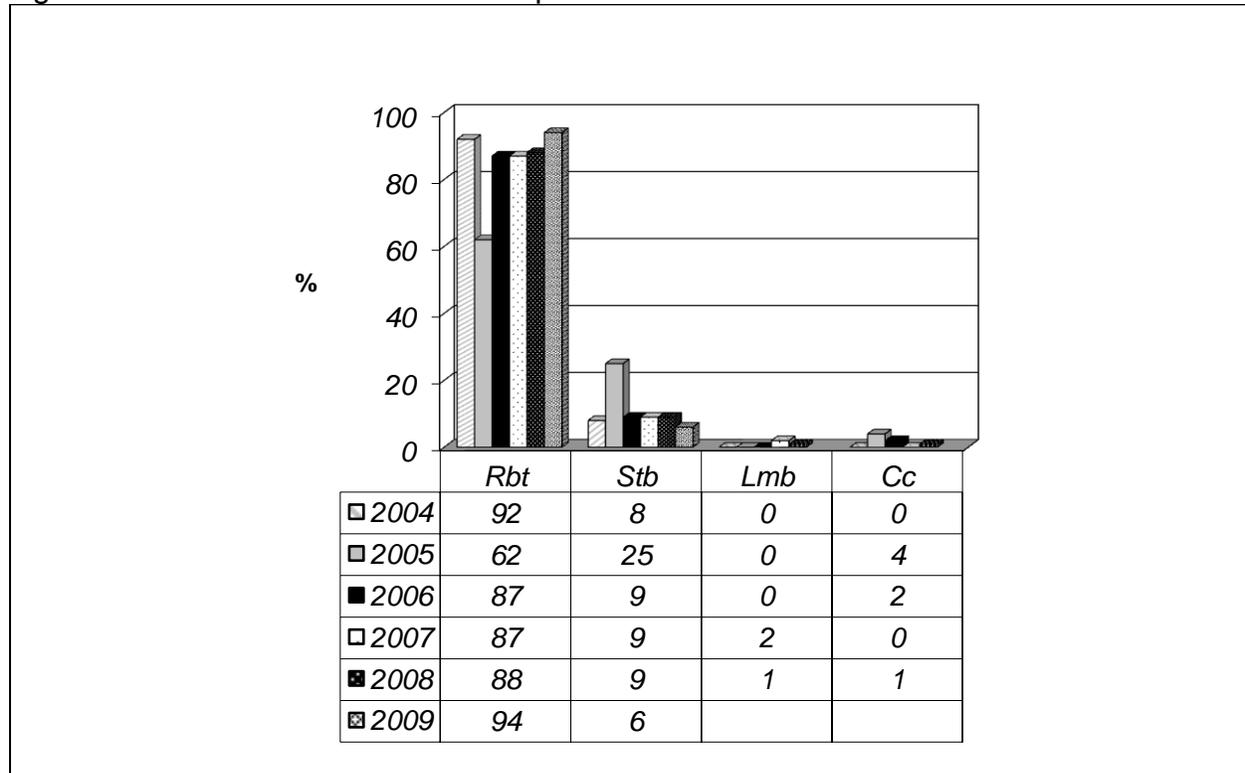


Figure 8. Willow Beach Striped Bass Length Frequencies.

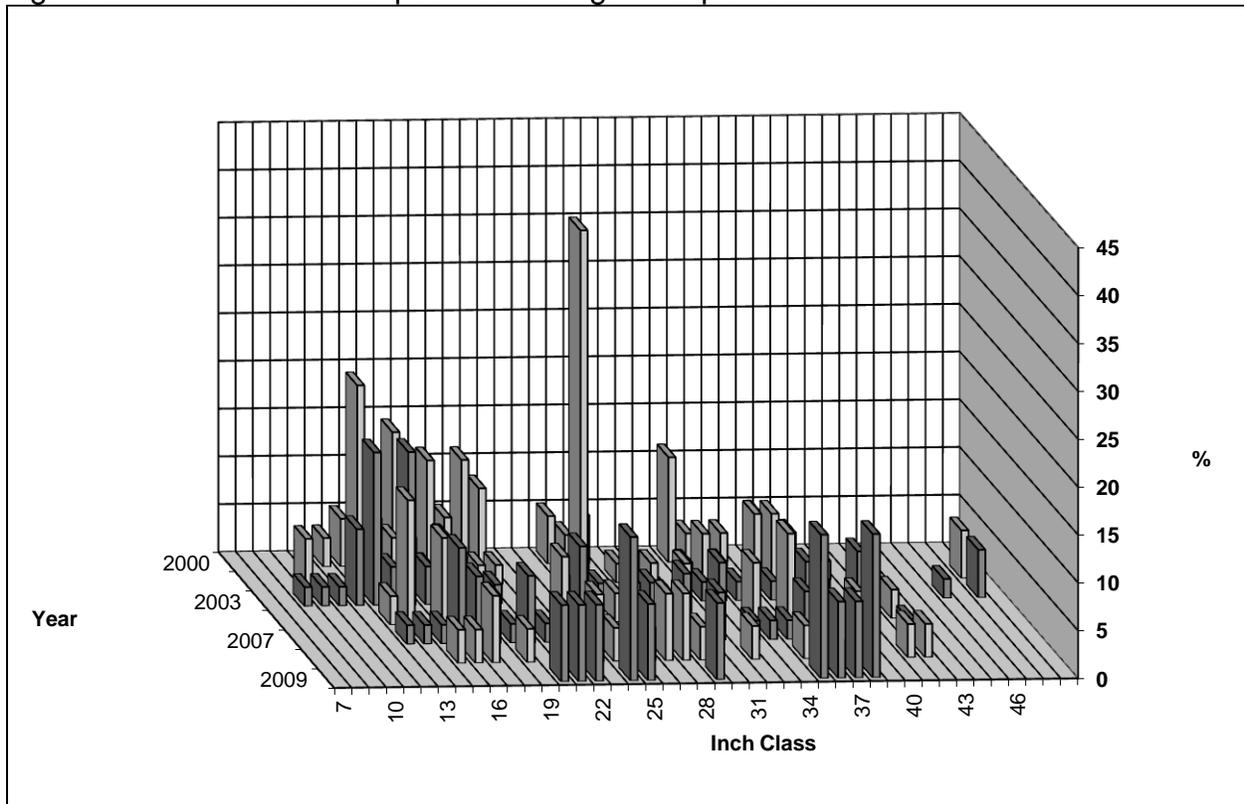
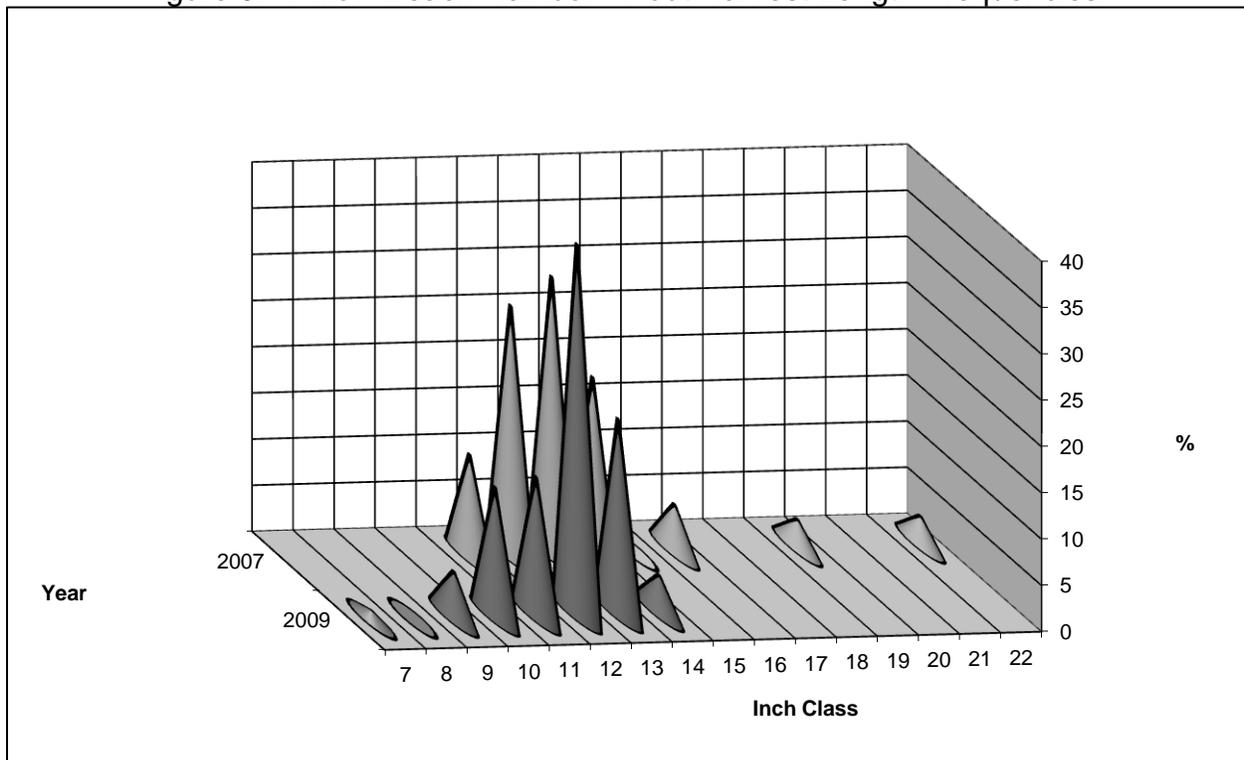


Figure 9. Willow Beach Rainbow Trout Harvest Length Frequencies.

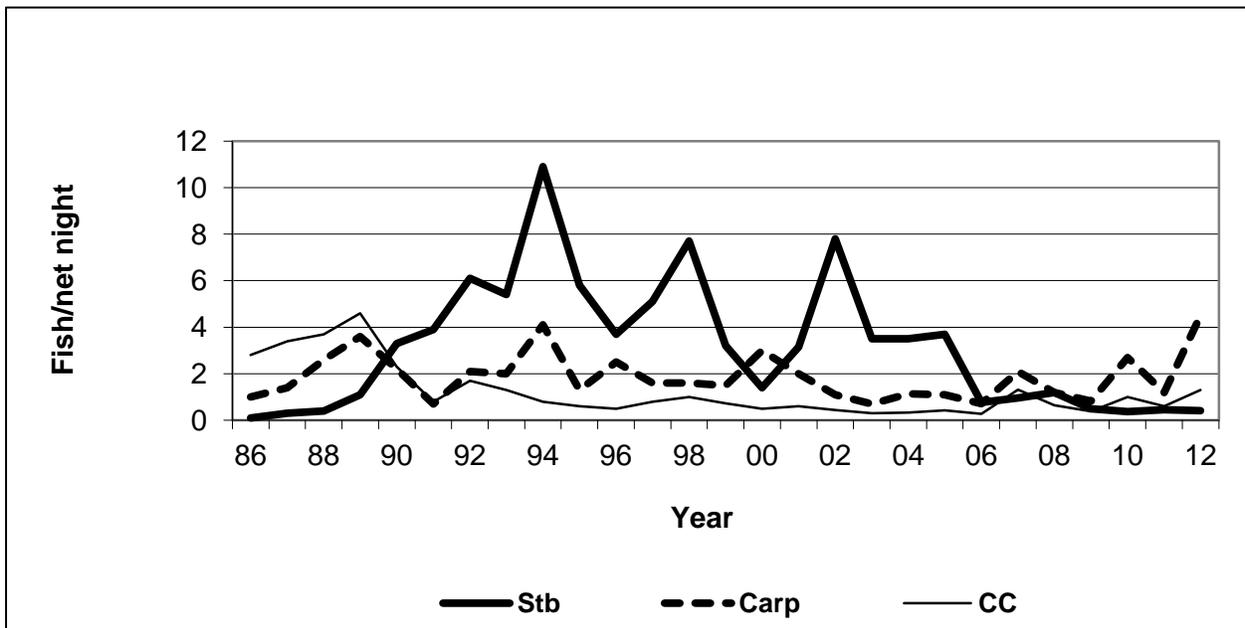


Gill Netting

A total of 50 net-nights of gill netting were completed in April 2012. This was the ninth year utilizing AGFD gill net and electroshocking protocols. NDOW, with the assistance of the NPS and the USBR, sampled the reservoir from approximately mile 19 north to mile 46, while AGFD sampled from mile 16 south to Davis Dam.

A total of 383 fish were sampled. Species composition included: striped bass at 5% (n=21), common carp at 58% (n=58), channel catfish at 17% (n=64), razorback suckers at 3% (n=12), largemouth bass at 6% (n=27), green sunfish at 4% (n=16), yellow bullhead at 1% (n=4), smallmouth bass at 3% (n=14), and bluegill at 0.3% (n=1). Striped bass catch rate was 0.42 f/n-n, down slightly from 2011 at 0.45 f/n-n (Figure 10). This is well below the long term mean (1990-2005) of 4.88 f/n-n. In January 2007, quagga mussel was discovered along the Colorado River system beginning at Lake Mead and including Lake Mohave. The invasion of quagga mussel is coincidental to the observed declining striped bass numbers; although this relationship is not fully understood, additional investigations are ongoing to identify if mussel infestation is contributing to their decline (i.e., there is a striped bass young-of-year food habits study).

Figure 10. Gill Netting Fish per Net Night.



The most abundant species sampled in 2012 was common carp at 4.5 f/n-n. Channel catfish catch rate was 1.3 f/n-n, which was above the long term mean of 0.82 f/n-n. Largemouth bass catch rate (Figure 11) was 0.54 f/n-n, which was well above the long term mean of 142 f/n-n. The razorback sucker catch rate was 0.24 f/n-n, which was below the long term mean of 0.38 f/n-n. The smallmouth bass catch rate was the highest at 0.28 f/n-n.

Figure 11. Gill Netting Fish per Net Night.

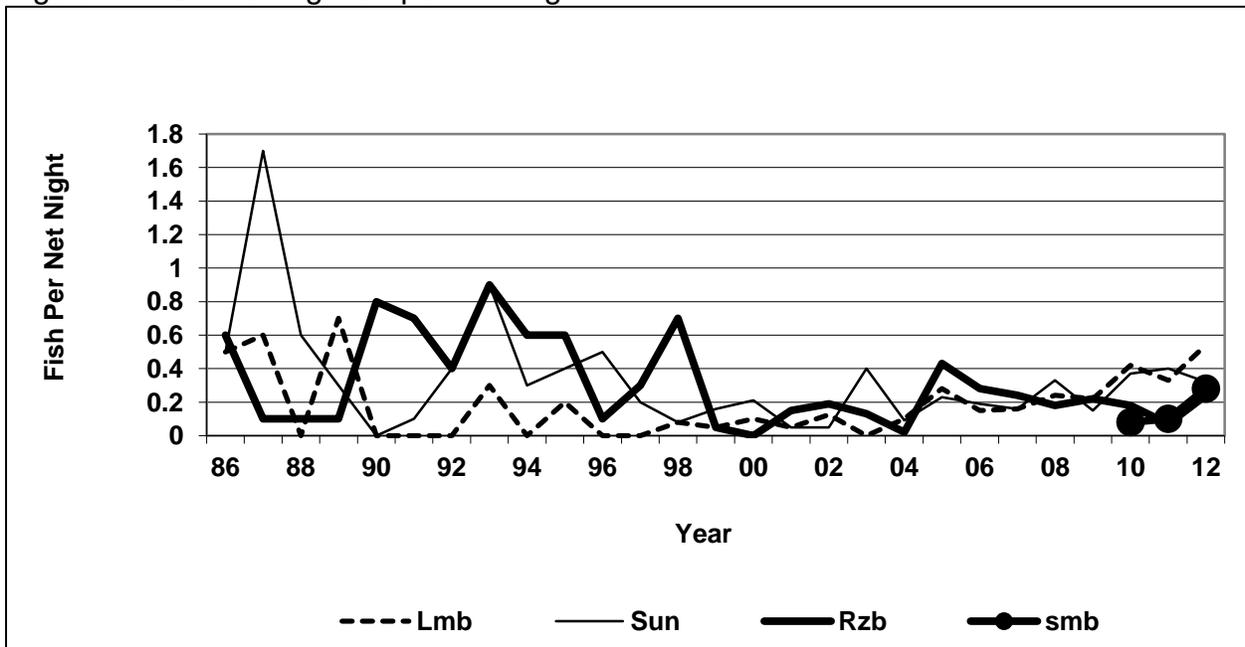
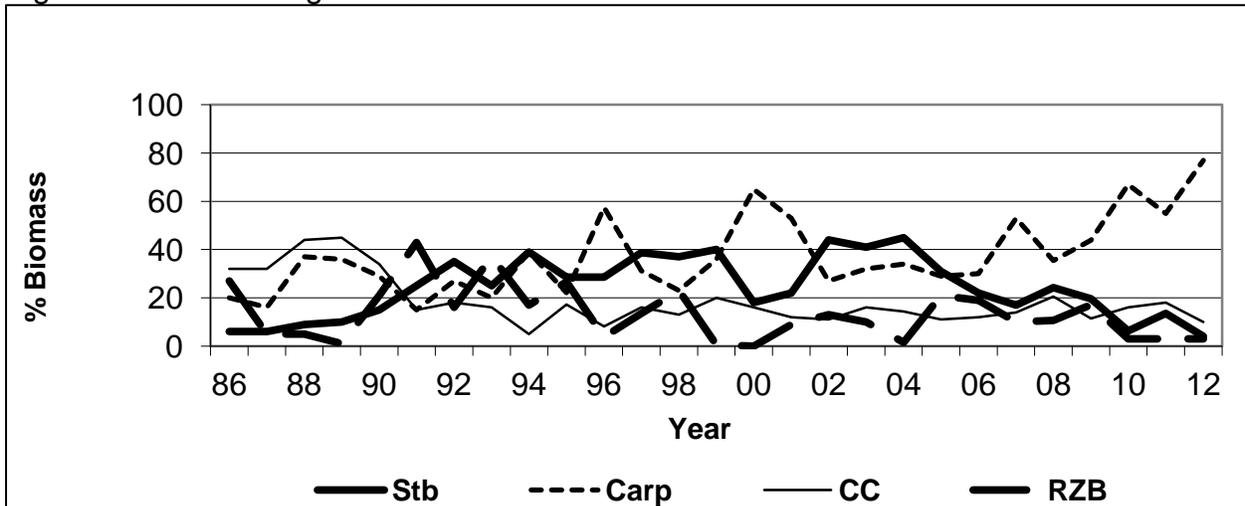


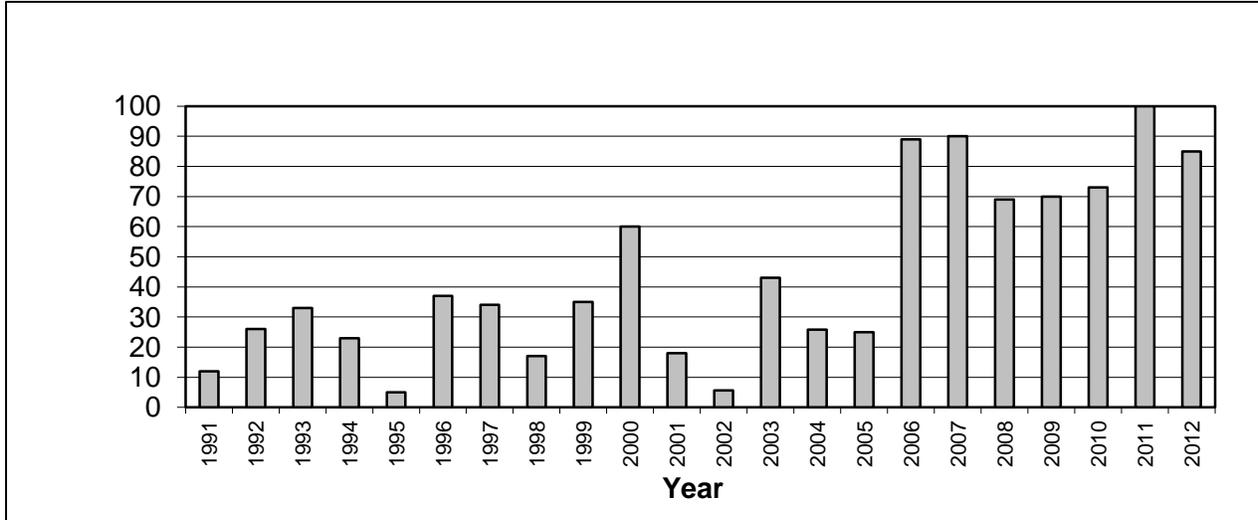
Figure 12 summarizes percent biomass for striped bass, carp, channel catfish, and razorback sucker since 1986. Striped bass comprised 4% of the biomass, down from 13.6% from 2011. Four percent biomass was the lowest since striped bass began expanding in Lake Mohave in the late 1980's. The long-term striped bass mean biomass (1990 through 2005) comprised 32% of the fish caught. Carp formed the largest portion of the biomass at 77%, which is up from 55% last year. This is the highest percentage recorded during the history of the gill net survey. Channel catfish accounted for 10% of the biomass, which was below the long term mean of 15.5%. Razorback sucker biomass remained at 3%, which was well below 10 to 20 percent found from 2005-2009.

Figure 12. Gill Netting Biomass.



The percentage of striped bass greater than or equal to 14 inches (in) was 85% in 2012 (Figure 13). This was similar to the data going back to 2006, but well above the percentage from 1991 to 2005.

Figure 13. Percent Striped Bass that are 14 inches or Larger.



The 2012 mean total length (TL) for striped bass was 513 mm (20.2 in), which was 33 mm (1.3 in) longer than 2011. Striped bass ranged from 266 mm (10.5 in) to 786 mm (30.9 in). Graphic representation of striped bass length frequencies from 2005 through 2012 are shown in Figure 14.

The trend in proportional stock density (PSD) for striped bass showed an increase in 2007 to 15, in 2008 to 38, and in 2009 to 43 (Figure 15). In 2010 the PSD reached the maximum of 100. In 2011, the PSD dropped back to 37, which was more in line with the values from 2008 and 2009. In 2012 the PSD jumped back up to 77. An increasing PSD is indicative of a population with a growing percentage of larger fish and declining recruitment.

Figure 14. Striped Bass Percent Length Frequency.

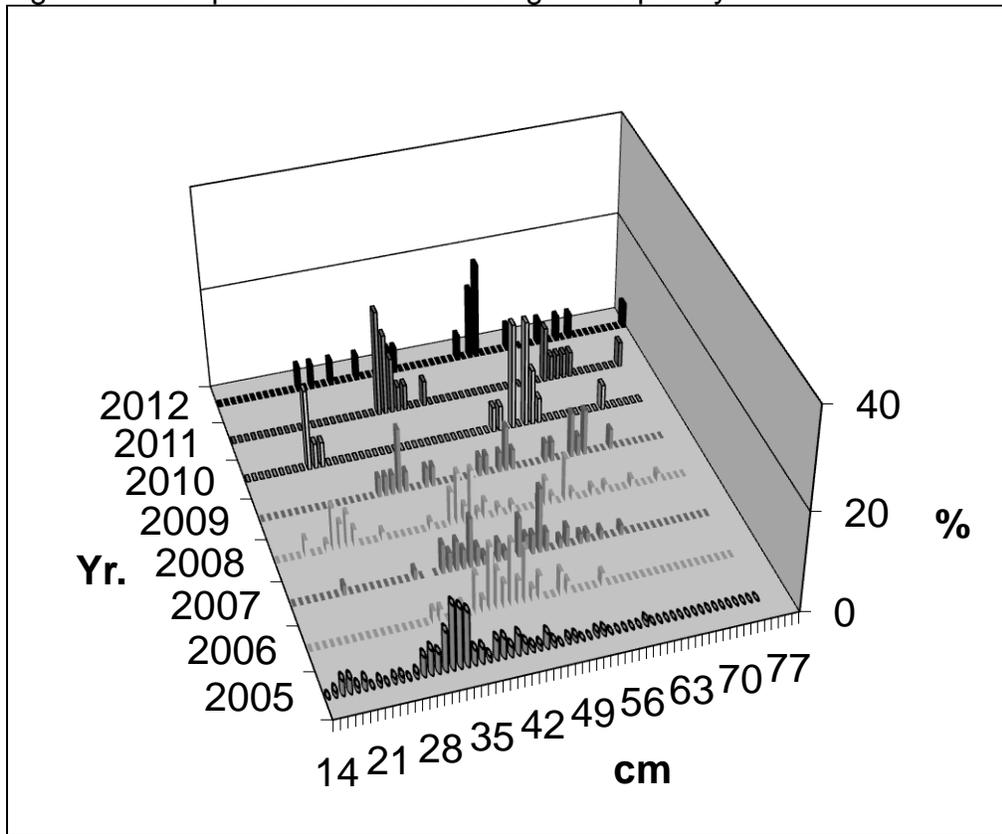
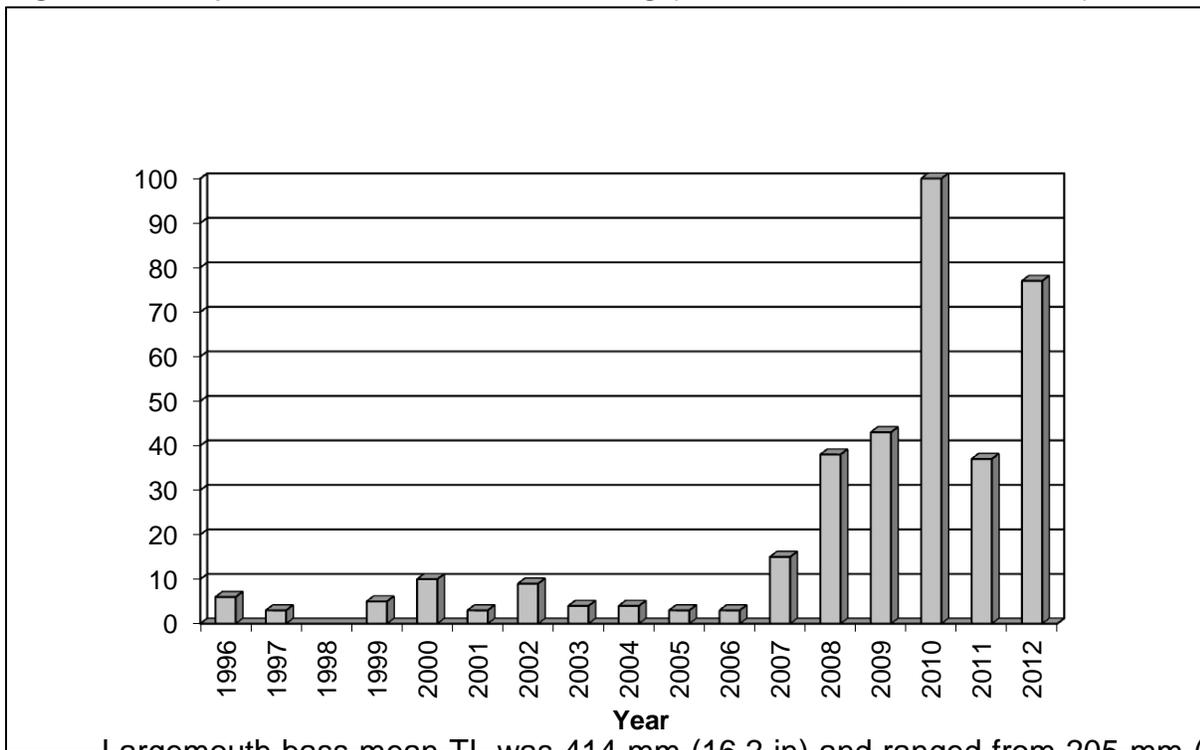


Figure 15. Striped Bass PSD from Gill Netting (stock size 13 in, Q size 20 in).



Largemouth bass mean TL was 414 mm (16.2 in) and ranged from 205 mm (8.0

in) – 553 mm (21.8 in). Smallmouth bass mean TL was 373 mm (14.7 in) and ranged from 295mm (11.6 in) – 452 mm (17.8 in). Channel catfish mean TL was 490 mm TL (19.2 in), which was 48 mm (1.9 in) more than 2011. Channel catfish lengths ranged between 365 mm (14.4 in) and 665 mm (26.2 in) TL. The common carp mean TL was 561 mm (22.1 in), which is almost 5 in more than 2011.

Electroshocking

There were 14 sites (six conducted by NDOW and eight by AGFD) electroshocked in April of 2012, which coincided with the spring gill net surveys as dictated by the AGFD sampling protocols. Catch rates dropped in 2012 compared to the last three years, presumptively due to sampling occurring in the fall of those years. Figure 16 shows the 2012 catch rates in fish/min for several species and compares them to previous years. From 1998 to 2002 and 2009 to 2011 electroshocking surveys were conducted in the fall, while from 2004-2007 they were conducted in the spring. Catch rates this year were similar to other catch rates in the spring. This was the first year that smallmouth bass showed up in electroshocking surveys, with 0.11 fish/min and almost equal to largemouth bass. Striped bass were not caught during the survey. A total of 216 min of electroshocking was expended, averaging 15.4 min/site.

Figure 16. Electroshocking Catch Rates for Largemouth Bass, Striped Bass, and Smallmouth Bass (2004-2007, 2012 in spring other years in fall).

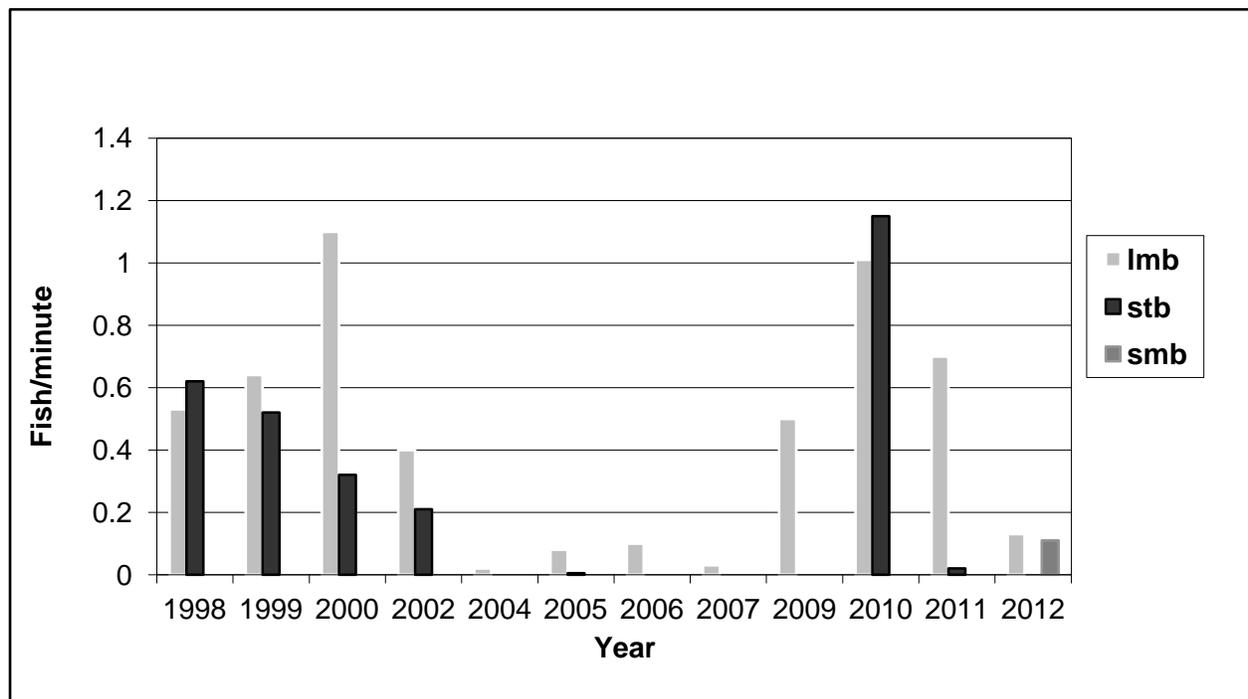
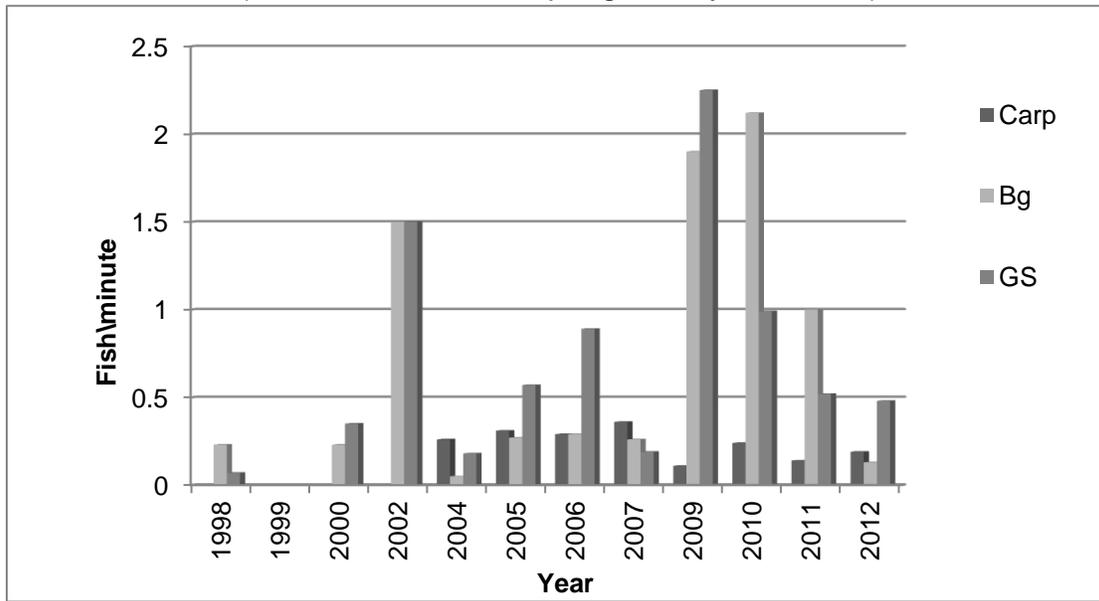


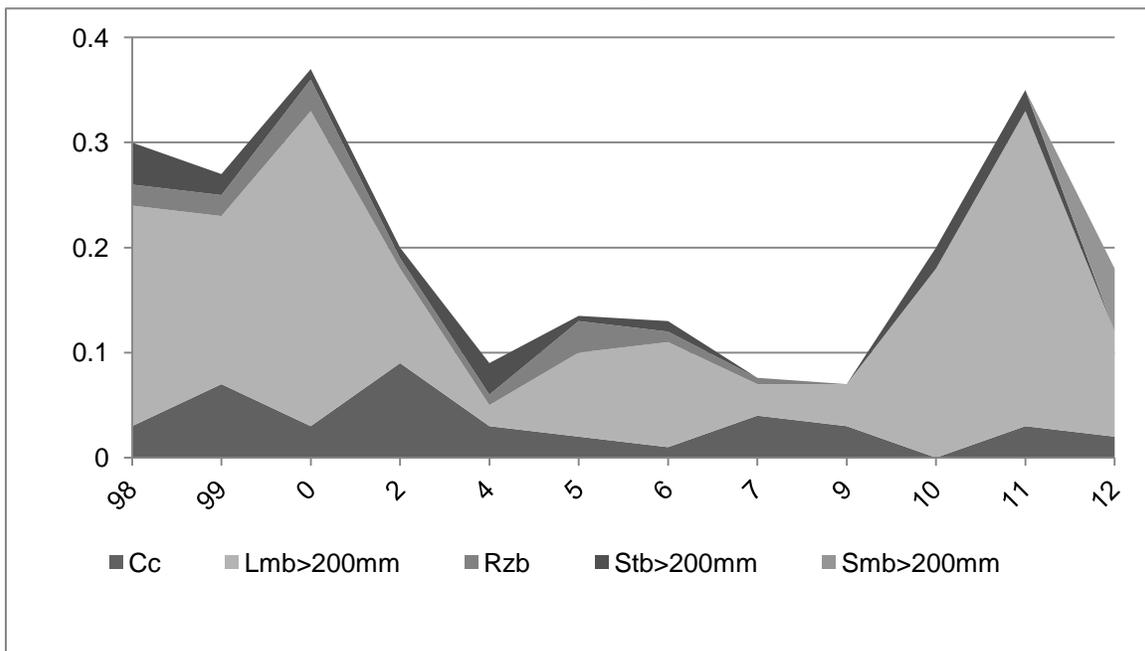
Figure 17. Electroshocking Catch Rates for Common Carp, Bluegill and Green Sunfish

(2004-2007, 2012 in spring other years in fall).



Comparisons of catch rates for largemouth and striped bass greater than 200 mm can be seen in Figure 18. The 2012 catch rate for largemouth bass that size or larger was comparable to other spring surveys, however, combined with smallmouth bass numbers for fish this size; total black bass density was much higher than other spring surveys. Striped bass were not collected during the 2012 survey, which was similar to 2007 and 2009.

Figure 18. Electroshocking Catch Rates for Fish Larger than 200 mm TL (2004-2007, 2012 in spring, other years in fall).



Habitat Improvement

Three types of habitats were constructed and deployed into Bass, Box, and Princess Coves, which included 17 pallet structures, 12 PVC units, and three brush bundles in 2012. The pallet structures consisted of pallets spaced out along eight ft 2x4's, weighted with sand bags, and enhanced with brush. The PVC units were constructed from 1.5 in PVC. The basic unit was a 4 ft x 4 ft cube. The cubes were then attached together with heavy-duty (175 lb. test) zip ties. Most of the PVC units deployed were made of 8 cubes. Snow fencing, plastic lattice, and brush were attached to each unit. Brush bundles were constructed of brush, weighted with sand bags (4 to 10 bags, depending on the size of the bundle) and bound with natural fiber rope. Some brush bundles were constructed with a base of pallets. The structures were placed between the 620 ft and 630 ft elevation contours. Tamarisk was cut on site by NPS crews and used as the brush component of the structures. By the end of 2012, the total amount of habitat placed out included:

- 88 pallet and brush A-frames
- 51 PVC and snow fence structures.
- 99 assorted brush bundles and mixtures of brush and pallets
- 20 pallet structures
- 25 barge loads of Christmas trees, approx. 625 trees

Habitat Effectiveness Evaluation – SCUBA Monitoring

No SCUBA diving transects were conducted in 2012.

Habitat Effectiveness Evaluation - Electroshocking Comparison

Additional assessment of constructed habitat use by sport fish was completed with an electroshocking survey that provided more quantitative data regarding use by species. Figure 19 compares the biomass of the fish community collected at electroshocking transects. Cottonwood Island Cove is a control site (no added habitat). Carp Cove and Box Cove were enhanced with constructed habitat. Normally, findings showed a significant difference between Cottonwood Island and Carp coves, but less of a difference for Box Cove. In 2012, however, Cottonwood Island Cove supported greater fish biomass than either Box or Carp coves. Electroshocking was conducted during the spring compared in 2012 compared to fall sampling in past years.

Figure 20 compares largemouth bass sampled during the electroshocking survey. Carp and Cottonwood Island coves showed no difference, which was not much higher than Box Cove where none were found. Figure 21 illustrates monitoring data for smallmouth bass, which is a species recently observed in Lake Mohave and is becoming an important component of the black bass fishery. Cottonwood Island and Carp coves catch rates were very low compared to previous years. This may result from the time of year that surveys were conducted.

Figure 19. Biomass/15 min. of Electroshocking Time.

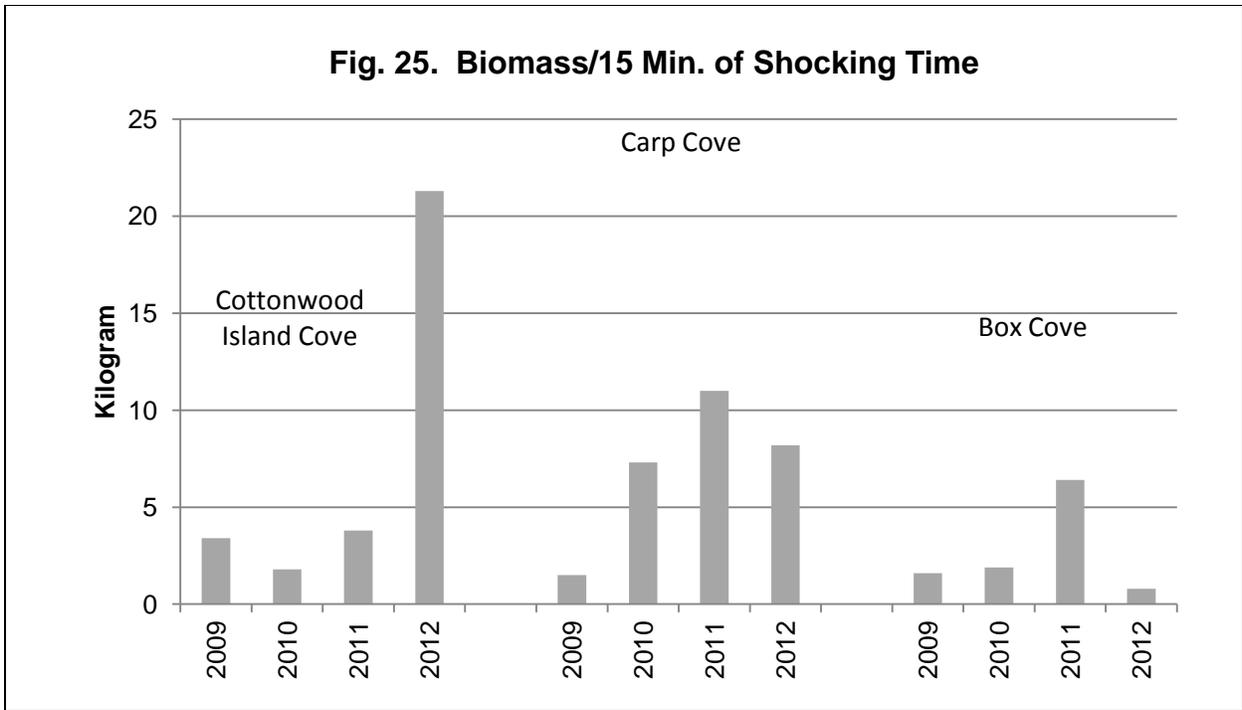


Figure 20. Largemouth Bass Electroshocking Comparison.

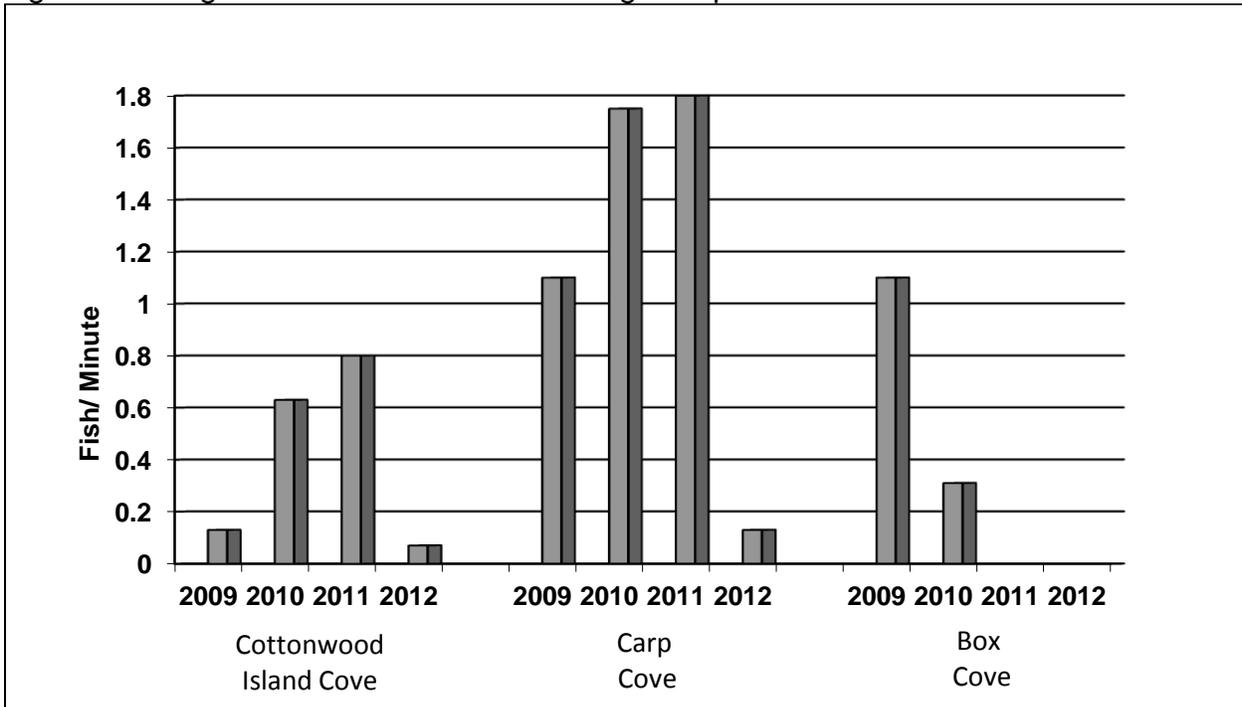


Figure 21. Smallmouth Bass Electroshocking Comparison.

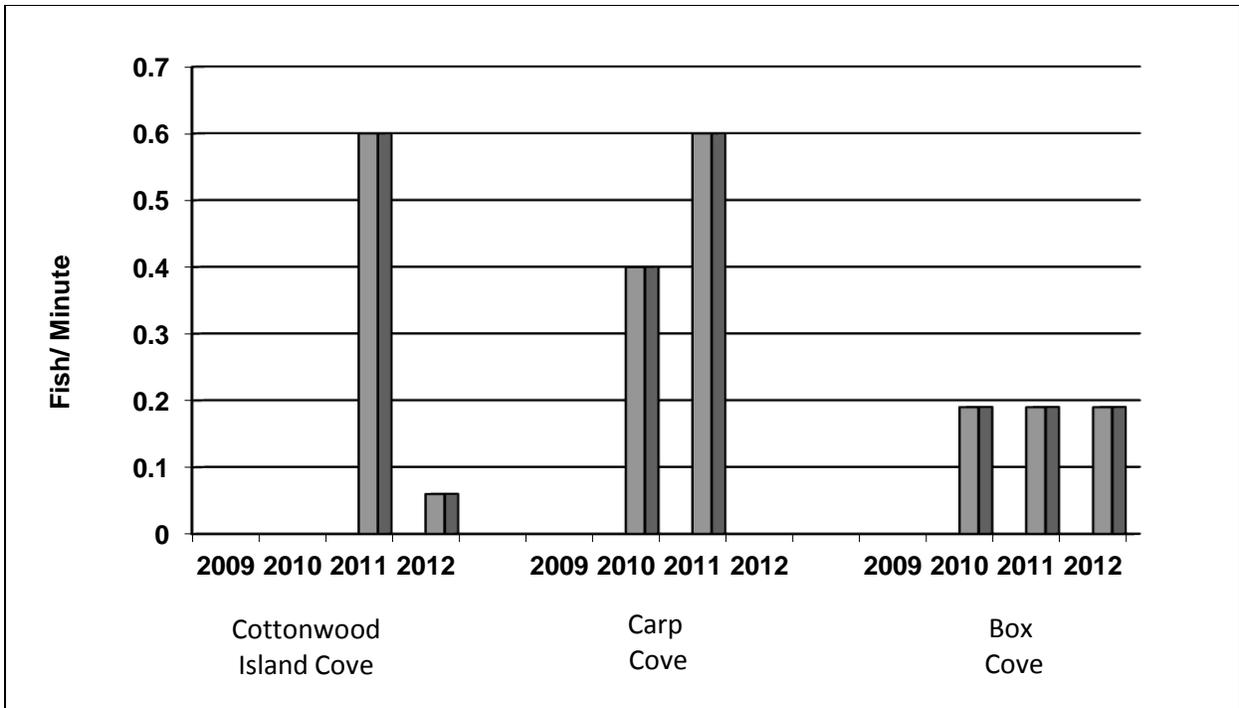


Figure 22 shows a similar trend with use by bluegill on constructed habitat. Differences in use are not as drastic as in previous years, most likely because spring sampling yielded fewer fish. Figure 23 illustrates once again that lower catch rate during the spring does not show an obvious difference between the constructed habitat and use by green sunfish, which are more of a generalist in their habitat preference.

Figure 22. Bluegill Electroshocking Comparison.

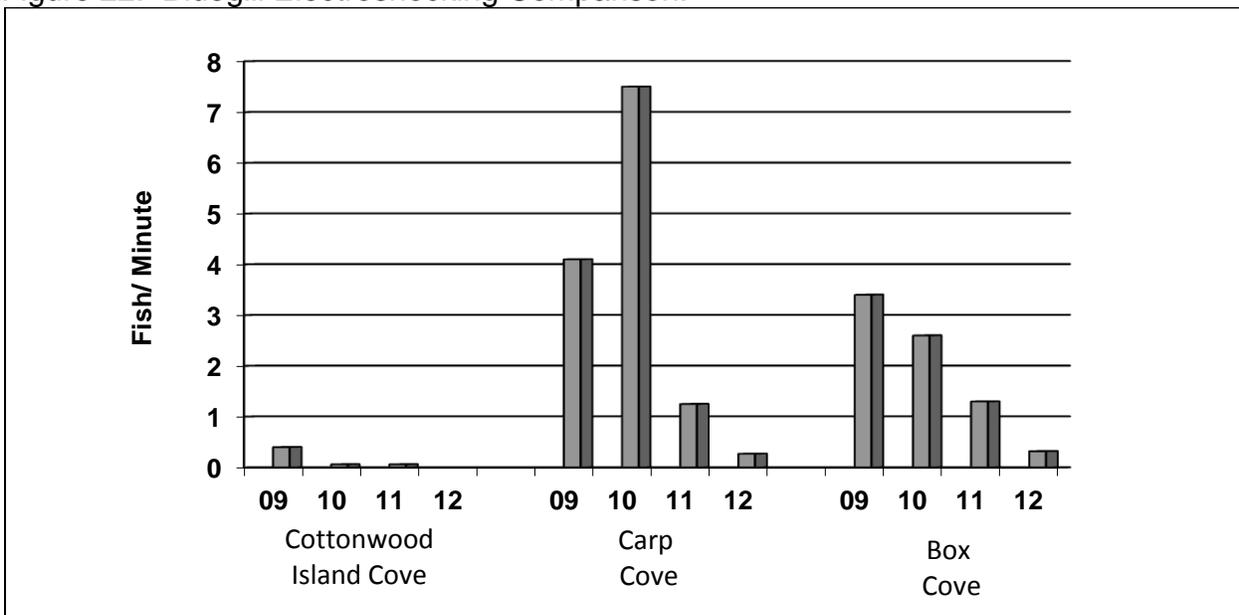


Figure 23. Green Sunfish Electroshocking Comparison.

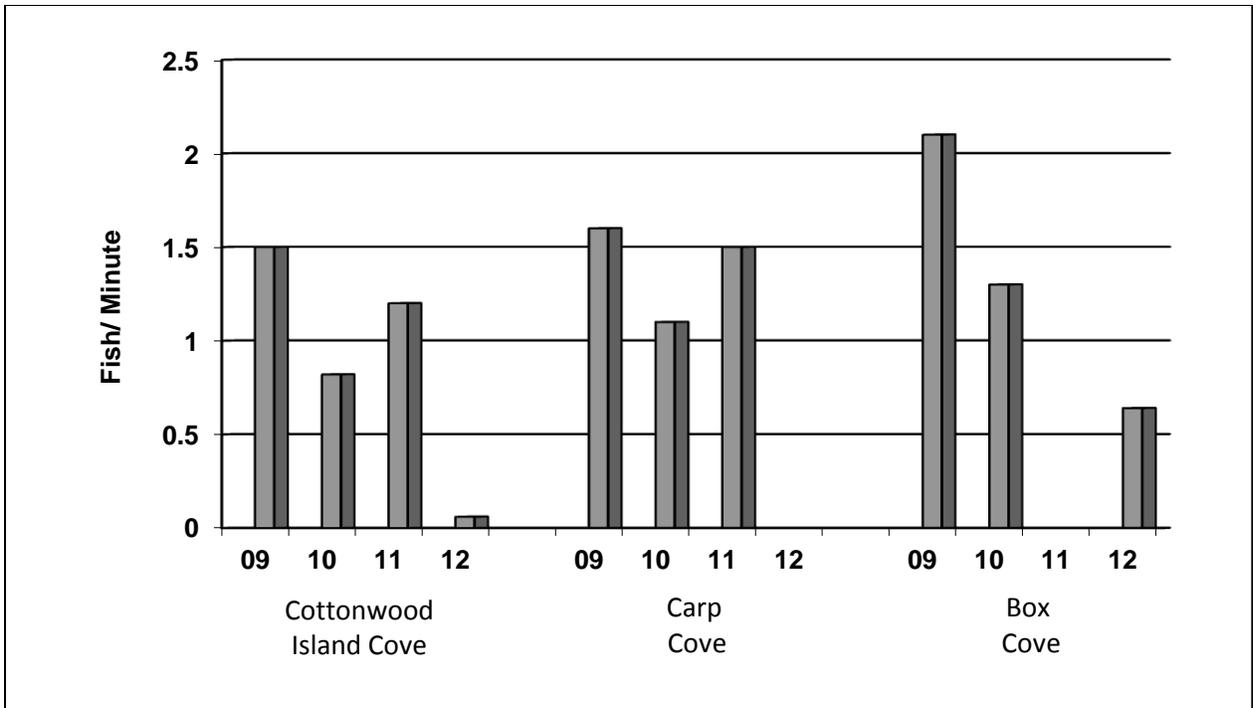


Figure 24 illustrates that common carp are found more often on constructed habitat than in non treated areas. Striped bass however, showed no real preference for the constructed habitat (Figure 25).

Figure 24. Carp Electroshocking Comparison.

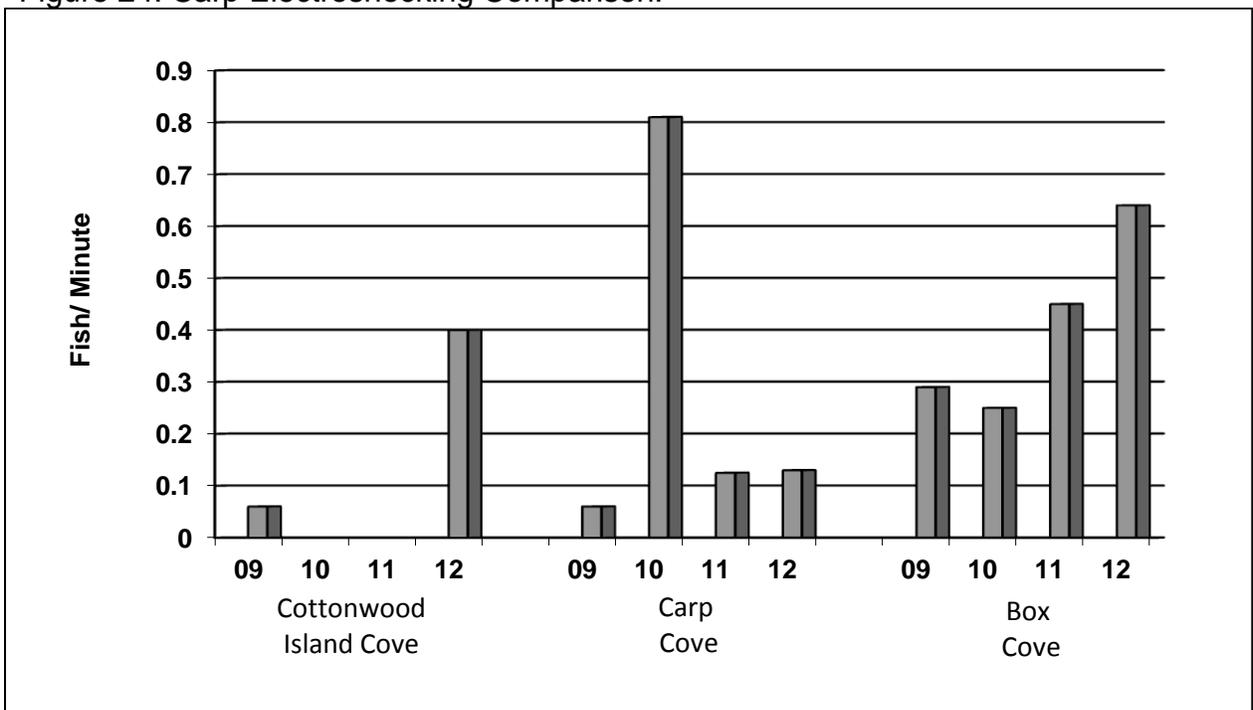
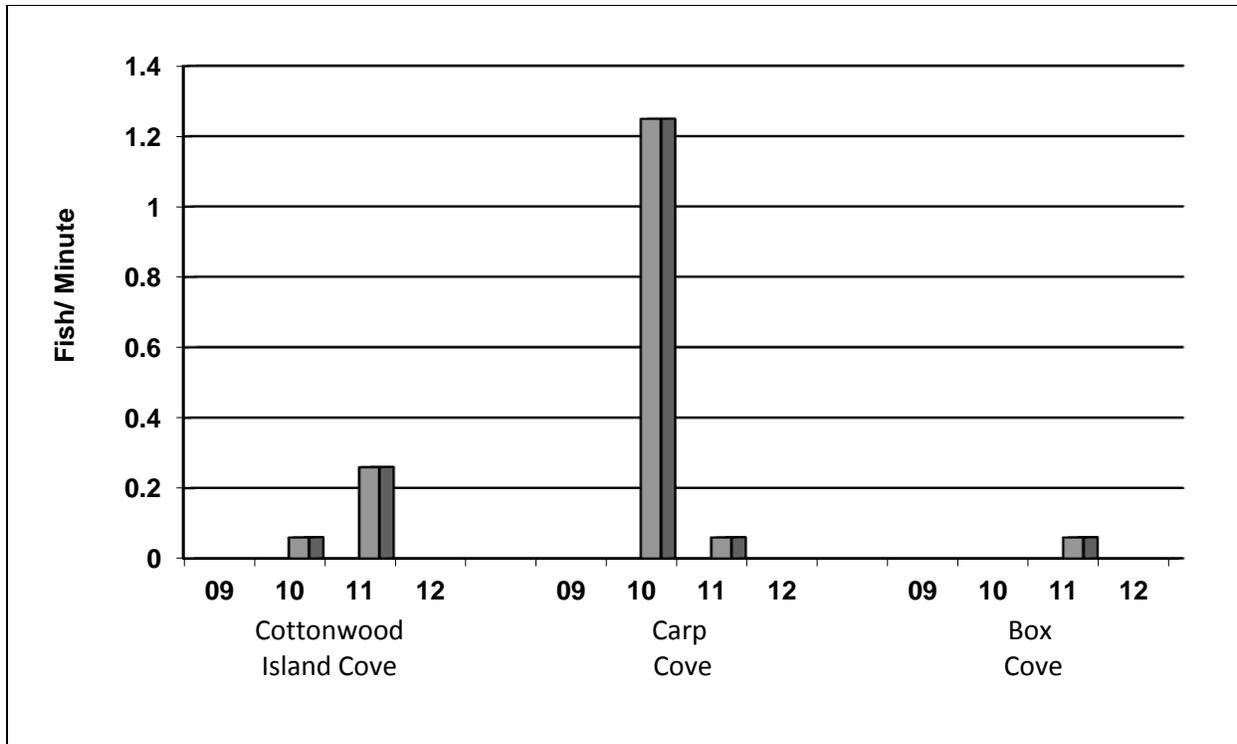


Figure 25. Striped Bass Electroshocking Comparison.



This habitat enhancement project will be continued in 2013. Four new coves have been approved by NPS to include constructed habitat.

Striped Bass Young-of-Year, Quagga Mussel Diet Study

Young-of-year striped bass and quagga mussels were collected at three sites on Lake Mohave: Orion Cove, Golden Door Cove, and Cottonwood Island Cove. Quagga mussels were collected via SCUBA in February and April. Attempts were made to collect striped bass YOY via electroshocking, but none were caught.

STUDY/MANAGEMENT REVIEW

The decline in the Lake Mohave striped bass fishery continued in 2012. Data from fish population surveys have indicated poor year class recruitment since 2006. The cause is not fully understood, however, the change is coincidental to the infestation of quagga mussels into Lake Mohave. As UNLV is able to complete analysis of striped bass food habits study, it may suggest the causal factors affecting striped bass recruitment. Quagga mussels are known to negatively affect fish that are dependent on plankton as forage and they may be affecting young-of-year striped bass. Striped bass less than 13 inches are known to utilize plankton. It is speculated that quagga mussels are removing too much of their food source.

Lake Mohave remains a reservoir known for trophy striped bass. This trophy fishery was built on limited striped bass abundance at younger stages, permitting greater recruitment into larger size classes. Abundant recruitment of younger fish would

quickly eliminate the limited forage base and result in even fewer, if any, trophy fish.

The habitat project continues in Lake Mohave. Largemouth bass, smallmouth bass, bluegill, green sunfish, channel catfish, common carp, and, to date, one razorback sucker utilize these structures. Densities of most fish species are generally higher on the constructed habitat compared to untreated sites. The exception is during mid-summer when natural aquatic vegetation growth peaks. During this time of year, fish spread out, utilizing all habitats and resulting in similar fish densities on constructed habitat and natural aquatic vegetation.

A final report on the analysis of the quagga mussel and young-of-year striped bass food habits by UNLV has not been received. The contract was extended to June 30, 2013. UNLV will provide NDOW with a final report prior to that date.

RECOMMENDATIONS

- Maintain present regulations.
- Consider revamping the present creel survey system so that the Willow Beach creel position is included in the present Lake Mead full and part time positions. This will alleviate the problem with trying to find a person willing to work just one day a week or maybe put up volunteer creel boxes with the approval of NPS.
- Continue fish population surveys through gill netting, electroshocking, snorkeling, and SCUBA. Conduct electroshocking surveys in the fall when water levels are lower and fish concentrations are denser near constructed habitat.
- Continue participation with the Lake Mead National Recreation Area Fisheries Management Team.
- Continue developing and implementing the Lake Mohave habitat project.
- Continue to participate as a member of the Lake Mohave Native Fish Work Group and the associated native fish restoration projects.
- Continue and expand the investigation of possible causes for the decline in striped bass recruitment based on finding of the research study by UNLV.

Prepared by: Mitch Urban
Biologist III, Southern Region

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