NEVADA DEPARTMENT OF WILDLIFE
STATEWIDE SPORT FISHERIES MANAGEMENT

FEDERAL AID JOB PROGRESS REPORT

F-20-48
2012

LAKE MEAD
SOUTHERN REGION

NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION
JOB PROGRESS REPORT

Table of Contents

Contents Page

SUMMARY 1

BACKGROUND 3

OBJECTIVES AND APPROACHES 4

PROCEDURES 5

- Creel Survey 5
- Black Bass Tournament Monitoring 5
- Gill Net and Trammel Net Surveys 5
- Electroshocking Surveys 6
- Summer Dive Surveys 6
- Shad Trawls 6
- Hoop Net Survey 6
- Striped Bass Telemetry Study 7

FINDINGS 7

- Creel Survey 7
- Black Bass Tournament Monitoring 10
- Summer Dive Surveys 10
- Electroshocking Surveys 11
- Gill Net Surveys 13
- Prey Base Studies 16
- Striped Bass Fisheries Assessment 17
- Black Bass Fisheries Assessment 20
- Black Crappie Assessment 21
- Salmonid Fisheries Assessment 22

GENERAL MANAGEMENT REVIEW 22

LAKE MEAD STRIPED BASS SONIC TELEMETRY STUDY 22

LAKE MEAD STRIPED BASS SONIC TELEMETRY STUDY REVIEW 25

RECOMMENDATIONS 25

REFERENCES 26

NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION
JOB PROGRESS REPORT

List of Tables

Number	Contents	Page
1	Summary of Docks Surveys for the 2012 Creel Survey	8
2	Lake Mead Angler Catch Rate by Month, 2002 to 2012	8
3	Composition of Catch by Species, 2002 to 2012	9
4	Lake Mead Angler Effort by Species or Preference, 2002 to 2012	9
5	Angler Origin by State of Residence, 2002 to 2012	10
6	Black Bass Dive Observations	11
7	Electroshocking Survey Sampling Summary	12
8	Electroshocking Catch Rates, 2008 to 2012	13
9	Gill Net Survey Summary, Lake Mead, 2012	14
10	Gill Net Average Condition Factor by Basin, Lake Mead, 2012	15
11	Average Fish/Net-Night, Fall Gill Net Surveys, 2002 to 2012	16
12	Lake Mead Average Threadfin Shad Production, 2002 to 2012	18
13	Striped Bass Tournament statistics, 2012	20
14	Lake Mead Striped Bass Ranked Stomach Content, 2007 to 2012	21

NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION
JOB PROGRESS REPORT

List of Figures

Number	Contents	Page
1	Black Bass Snorkel Observations, 2008 to 2012	11
2	Black Bass YOY Snorkel Observations, 2008 to 2012	11
3	Fall Electroshocking Survey CPUE, 2006 to 2012	12
4	Fall Gill Net Mean TL, 1993 to 2009	14
5	Fall Gill Net CPUE, 1996 to 2012	15
6	Gizzard Shad Length Frequency Distributions, 2010 to 2012	17
7	Gizzard Shad Body Types Observed in the Fall Gill Net Survey	17
8	Shad Densities During Peak Production Periods, 1988 to 2012	17
9	Striped Bass Proportional Stock Density, 1992 to 2012	19
10	Striped Bass Length Frequency Distribution, 2010 to 2012	19
11	Satellite Image of Lake Mead, NV/AZ	21
12	Map of Lake Mead Showing Sonic-tagged SB GPS Data Waypoints	24

NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION
ANNUAL PROGRESS REPORT

State: *Nevada*
Project title: *Statewide Fisheries Program*
Job title: *Lake Mead*
Period Covered: *January 1, 2012 to December 31, 2012*

SUMMARY

General Sport Fishing Evaluation

In 2012, 100 days were expended conducting creel surveys on Lake Mead. A total of 802 anglers were contacted whose catch totaled 4,273 fish of multiple species for a catch rate of 5.25 fish/day and averaged 1.15 fish/hr. The observed 2,833 fish harvested provided a harvest rate of 3.5 fish/day and an average 0.72 fish/hr.

During the fall, NDOW, Arizona Game and Fish Department (AGFD), and the US Bureau of Reclamation cooperatively completed electroshocking and gill net surveys. Electroshocking surveys were dominated by bluegill (*Lepomis macrochirus*) and green sunfish (*L. cyanellus*), while gill net surveys caught primarily gizzard shad (*Dorosoma cepedianum*), common carp (*Cyprinus carpio*), and striped bass (*Morone saxatilis*).

Striped Bass Assessment

Striped bass CPUE for the gill net survey slightly decreased from 2011 and angler interest in fishing for striped bass as a percentage of total angler preference increased from that observed in 2011. Harvested striped bass sampled during the creel survey averaged 16.0 in (in, 406 mm), TL, with an average weight of 1.6 pounds (lbs, 737 g), TL, with an average K-factor (FL) of 1.05 (down from last year's 1.15 K). From gill net sampling, striped bass averaged 15.9 in (404 mm), TL, weighed an average of 1.1 lbs (499 g), and had a K factor of 0.94. This is a 0.9 in (23 mm) increase in total length over last year and a 0.21 K decrease in condition factor. The decrease in condition is potentially due to the low shad production in 2012, which limited available forage.

Black Bass Fisheries Assessment

Gill net surveys revealed no change in abundance for either large- or smallmouth bass (*Micropterus salmoides* and *M. dolomieu*). Black bass harvest as a percentage of the total harvest decreased in 2012 to 0.64%. The percentage of angler preference for black bass increased to 11.2% of total angler preference, a level not seen since 2006. Samples taken from tournaments revealed little change from last year with largemouth bass having an average total length of 16.5 in (419 mm), an average weight of 2.3 lbs (1,043 g), and a K factor of 1.36. Smallmouth bass had an average total length of 15.8 in (401 mm), an average weight of 1.9 lbs (862 g) and a K factor of 1.28. Young-of-the-

year recruitment for both small and largemouth bass appeared to be poor in 2012. This may be a result of dropping lake elevations during the spawning period.

Black Crappie Assessment

No black crappie (*Pomoxis nigromaculatus*) was captured in hoop nets, gill nets, electroshocking, or creel surveys. The recent lack of black crappie observed in surveys suggests it has become rare.

Prey Base Studies

Threadfin shad (*D. petenense)* production was monitored during spring/summer from two basins in Lake Mead. A total of 30 standard transects were sampled in Overton Arm and Boulder Basin. The shad population exhibits a cyclical pattern with two to three years of poor production following a peak year in production. This year, shad production was low in both the Boulder Basin and Overton Arm. Average peak production in Boulder Basin was 4.1 shad/3,531 ft^3 (100 $meter^3$, m) and 32.5 shad/3,531 ft^3 (100 m^3) in Overton Arm. Overall, shad production averaged 18.3 shad/3,531 ft^3 (100 m^3).

Salmonid Fisheries Assessment

No rainbow trout (*Oncorhynchus mykiss*) were stocked in 2012.

Striped Bass Telemetry Study

The Lake Mead striped bass fishery has endured long-term drought conditions and recent invasions of quagga mussel (*Dreissena bugensis*) and gizzard shad. It is unclear how these stressors are affecting this fishery. The striped bass telemetry study will provide understanding on habitat use during changing lake ecology.

At the end of November, 2011, 20 striped bass were surgically implanted with sonic transmitter tags, Sonotronics CT-05-36-I. The fish averaged 18.4 in (467 mm) and had an average weight of 2.1 lbs. (971 g). The fish were released December 2, 2011.

General findings for all but one fish showed striped bass movement occurred from basin to basin by navigating the entire lake. Near shore habitat use was mostly seen at inflow areas of Las Vegas Bay, Muddy/Virgin Rivers, and the Colorado River. Fish were mostly associated with open-water and near points and were not found in coves. Migration to spawning sites in the Colorado River inflow area occurred as early as January and February. As summer approached, striped bass moved to deeper, cooler water between 55 ft (16.8 m) and120 ft (36.6 m) deep. Tracking striped bass will continue through to the end of FY2013.

BACKGROUND

Lake Mead was created by the completion of Hoover Dam in 1935. The newly formed impoundment was stocked with largemouth bass and sunfish and soon became known for its excellent bass fishery. In the 1940s, the bass fishery began to decline with reports of fish in poor condition. In 1954, through a tri-state agreement with the NDOW, AGFD, and California Department of Fish and Game, threadfin shad were introduced to Lake Mead to provide a forage fish for largemouth bass. Initially there was some improvement in largemouth bass condition, but this was short-lived.

In 1963, the construction of upstream impoundments further imperiled the black bass fishery with substantial reductions in flow with the filling of Lake Powell. This also changed historic water storage patterns to one of lower spring flows and higher winter flows which cause drawdown during the spawning season. Changes in temperature fluctuations and nutrient loading to Lake Mead were also noted after the construction of Lake Powell.

Because of the declining largemouth bass fishery, introductions of coldwater fish were made in 1969 to enhance the fishery and to fill a vacant niche. These fish included: rainbow trout, cutthroat trout (*O. clarkii*), hybrid bowcutt trout (*O. mykiss* x *O. clarkii*), and silver salmon (*O. kisutch*). Striped bass were also stocked at this time and up until 1972, at which time they were found to be naturally reproducing and stocking was discontinued. At the time of these introductions, the threadfin shad population had grown to become an over-abundant pelagic biomass mostly unavailable to littoral species. After ten years, however, striped bass had become well established in Lake Mead and had depleted the threadfin shad population. Moreover, increasing evidence indicated that striped bass were negatively impacting the concurrently established salmonid fishery and contributing to the severe decline of the long established black crappie fishery. Trout stocking was discontinued in 1983 for a variety of reasons, including poor long-term returns and other demands on production capability. Poor condition factors persisted in both striped and black bass.

Since 2007, the management strategy for striped bass has been an attempt to manipulate the structure of the lake-wide population by encouraging anglers to harvest the large number of available fish in the smaller size ranges through increased possession limits. Increased harvest of the 12 to 15 in size cohort, primarily one and two year old fish, would decrease the impact on YOY shad, thus making more of the current shad production available to larger striped bass when they can feed upon them in late summer and early fall. Ideally, this should result in improved condition factors in larger fish. Similar regulations are now continuous throughout Lakes Powell, Mead, and Mohave, with an unlimited take of striped bass under 20 in and a 20 fish limit on striped bass over 20 in. Despite these regulation changes, abundant young cohorts of striped bass in Lake Mead are under-utilized because of many years of declining angler use.

Second to the popular striper fishery is the black bass fishery in Lake Mead. In recent years, largemouth bass have seen reductions in numbers, but still have provided very good recreational and tournament fisheries as shown by creel information.

Smallmouth bass, found first in the creel in 1999, are now a large part of the tournament catch and are found lake-wide in densities rivaling that of largemouth bass. The salmonid stocking program, reestablished in 1991, has been suspended as of March 2011, due to the Lake Mead Fish Hatchery closure.

The newest challenges to the Lake Mead fishery are invasive species. In 2007, two aquatic nuisance species (quagga mussel and gizzard shad) made their way to Lake Mead. The impact these species will have on Lake Mead fisheries is unknown at this time. So far, gizzard shad have been shown to provide additional forage for striped bass; however, they grow rapidly to a size most fish cannot consume and could become competitors for food resources. Another recent invader, the New Zealand mud snail (*Potamopyrgus antipodarum*), now inhabits the benthos with unknown effects to any fisheries. Despite these invasions, Lake Mead continues to support both warm- and coldwater fisheries and provides anglers with a variety of fishing opportunities.

OBJECTIVES AND APPROACHES

Objective: To monitor angler use, catch, and fish population dynamics of the Lake Mead fishery.

Approaches:

- Evaluate angler success through at least 100 days of contact creel surveys at five angler access points on Boulder Basin and Overton Arm.
- Collect angler catch data from black bass tournaments.
- Conduct gillnetting and trammel net surveys lake-wide once in the fall in cooperation with AGFD.
- Conduct fall electroshocking surveys in cooperation with AGFD to evaluate changes in littoral zone fish species.
- Conduct summer black bass dive transects to assess impacts of reduced and variable lake elevations on black bass spawning and recruitment.
- Complete weekly meter net trawls during peak threadfin shad production.
- Conduct quarterly stomach content analysis of a minimum of 200 tournament caught striped bass to detect changes in their diet.
- Assess black crappie population status through up to 50 net nights of seasonal hoop netting in Overton Arm.
- Utilize creel, tournament, and monitoring data to assess sport fishery performance and changes, and develop estimates of sport fish availability and condition to inform anglers.

Objective: Lake Mead striped bass sonic telemetry study to better identify habitat requirements, habitat use and seasonal distribution of striped bass in Lake Mead.

Approaches:

- Surgically implant sonic transmitters in up to 20 adult striped bass.
- Track location, temperature, and depth of tagged striped bass throughout the year on a semi-weekly basis by locating fish through triangulation of the signal.
- Record location information via GPS and integrate that data into a GIS database.
- Habitat type and use will be validated via underwater observation when practical through SCUBA.

PROCEDURES

Creel Survey

A systematic creel survey was conducted on 100 separate creel days. Boulder Basin was surveyed on a weekly basis and Callville Bay and Echo Bay were surveyed less frequently from zero to three times a month. Government Wash and Las Vegas Bay launch areas were surveyed due to low lake elevation closures since 2002. The Overton Marina has not been sampled since 2007 due to its closure owed to low lake elevations.

Angler contacts were made at boat landings on a scheduled basis starting during the morning hours. Surveys were conducted for a continuous period of time, and information collected included total catch, unit of effort, bait type, species caught, angler origin, species preference, and presence of tags or marks on fish. Subsamples of harvested fish were weighed and measured and lengths were obtained as total length unless otherwise stated.

Black Bass Tournament Monitoring

Major largemouth bass fishing tournaments were monitored to evaluate weigh-in procedures, obtain any tag return data, and insure that the proper release procedure was consistent with National Park Service (NPS) permitting. Additionally, from a subsample of the catch, species, length, and weight were measured at nine selected tournaments after weigh-in and placement in the live-release boat.

Gill Net Surveys

The gill net survey was carried out in the fall. Gill nets were set according to the NDOW's Sport Fish Sampling Guidelines for Lakes, Ponds, and Reservoirs for gillnetting warmwater species. An exception to this guideline was the use of

multifilament experimental gill nets that measured 150 ft (46 m) in length, with five 30-ft (9 m) panels typically ranging in mesh size from 0.75 in to 3 in (19 to 76 mm). Nets were set overnight and not deeper than 40 ft. Fish were identified to species, weighed, measured to total length, and released back to the lake.

Electroshocking Surveys

Sampling was done in the fall, during the evening hours using a boat equipped with Coffelt shocking equipment and a Smith Root Variable Voltage Pulsator Electrofisher Model VVP-15B using methodology described in the NDOW's Sport Fish Sampling Guidelines for Lakes, Ponds, and Reservoirs. Fish were identified to species, measured to total length, weighed, and released back to the lake.

Summer Dive Surveys

Dive counts were obtained by mask and snorkel. Observations were made at stratified random coves on the lake with cove selection dependent on visibility and clarity of water using methods described in the NDOW's Sport Fish Sampling Guidelines for Lakes, Ponds, and Reservoirs for snorkeling. Dive transects were timed counts where all species were counted or estimated (e.g. threadfin shad schools), and black bass were further categorized into fry, fingerling, juvenile, or adult size classes.

Shad Trawls

Weekly meter net trawls for shad were conducted from June 6 to July 5, 2012. Samples were taken in the Boulder Basin and Overton Arm using established transects and procedures in accordance with 1988 nutrient study protocols, but with reduced number of sample sites. The procedure for shad trawling consists of towing a cone-shaped net with an open end of 3.3 ft (1 m) in diameter and 0.06 in (1.6 mm) mesh screening. The net is 19.7 ft (6 m) in length, with a 10 in (25.4 cm) collecting cup. The net is towed approximately 65.6 ft (20 m) behind the boat. Triplicate site trawls last for 10 minutes each at a boat speed of 2 knots (1,000 rpm engine speed). A flow meter at the mouth records water movement through the net in order to calculate volume of water sampled. Fish are counted and abundance is converted to fish/3,531.5 ft^3 (100 m^3) of water. This technique is efficient for small fish up to 0.8 in (20 mm) as larger fish tend to avoid the net and, therefore, is an estimate of reproductive success and does not represent true recruitment. In 1997 after eight years of trend data, sampling was streamlined to concentrate on weekly surveys during peak shad production. Peak production values are calculated as an average of the highest four or five weeks of shad production.

Hoop Net Survey

Hoop nets were set from May 18-30 to assess the black crappie population. Three hoop nets at 4 ft (1.2 m) diameter and a 20 ft (6 m) leader with a float and lead line were used. The nets were set according to the NDOW's Sport Fish Sampling

Guidelines for Lakes, Ponds, and Reservoirs (see Frame Netting). Fish were identified to species, weighed and measured to total length and returned to the lake.

Striped Bass Telemetry Study

On November 21 and 29, 2011, striped bass were captured by hook and line in Las Vegas Bay with the assistance of a licensed fishing guide. Fish were transported to Lake Mead Fish Hatchery for implantation of sonic tags. On 29 November, sonic transmitters were surgically implanted into 20 striped bass by NDOW's veterinarian Dr. Peregrine Wolff and assistant Chris Morris. The fish were held for a three-day withdrawal period and then released to Lake Mead on December 2. Ten fish were released at Boulder Harbor in the Boulder Basin and nine fish were released at Echo Bay near the Overton Arm. There was one mortality at the hatchery. Bi-weekly tracking efforts began December 7, 2011, and continued through December 31, 2012. During June, July, and October, tracking efforts were postponed while general fisheries monitoring surveys were underway. Also, during times of windy weather, tracking effort was reduced.

Tracking was done both actively and passively. Active tracking was accomplished with a Sonotronics Ultrasonic Receiver Model USR-08 and directional hydrophone. Initially, tracking sites would start in the mid channel of an area and progress in one mile increments. If a tag was detected, efforts were made to pin point the location. Tag number, frequency, and code, certainty of signal, time of day, water depth, temperature, location, and GPS coordinates were recorded. Passive tracking was attained through the use of two submersible ultrasonic receiver (SUR) units. One was placed in Las Vegas Bay and one in Overton Arm at Black Ridge Point. Data was downloaded to a laptop computer in the field and SURs were reset.

FINDINGS

Creel Survey

A total of 100 days were expended conducting creel surveys on Lake Mead, contacting 802 anglers at four sites (Table 1). Anglers caught 4,273 fish of multiple species for a catch rate of 1.15 fish/angler-hour. Anglers caught 5.25 fish/angler-day, an increase of 1.25 fish/angler-day from that observed in 2011. Of the 4,273 fish caught, 2,833 were harvested. This resulted in a harvest rate of 0.72 fish/angler-hour and 3.5 fish/angler-day (compared to 0.59 and 2.9, respectively, in 2011). Angler catch rates were improved over that observed in 2011, especially during the summer (Table 2). Species composition of harvested fish was led by striped bass at 95.2%, followed by channel catfish (*Ictalurus punctatus*) (3.46%), black bass (0.64%), and bluegill (0.53%) (Table 3). Angling effort (angler preference) for striped bass as a percentage of the total angling effort in 2012 was 85%, with largemouth bass, the second most sought after, at 11% (Table 4). From samples of harvested fish, striped bass averaged 16.0 in (406 mm) and 1.6 lbs (737 g) and had an average condition factor of 1.05 K (FL), with 35% in poor condition.

Table 1. Summary of Docks Surveyed for the 2012 Creel Survey.

Dock (Marina)	Days
Echo Bay	10
Callville Bay	14
Hemenway Harbor	25
Boulder Harbor	51
Total	100

Table 2. Lake Mead Angler Catch Rate (fish/angler-hour) by Month, 2002-2012.

Month	Year										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
January	0.63	0.73	0.48	1.05	0.59	1.01	1.02	0.70	0.40	0.47	0.47
February	0.36	0.54	0.22	0.53	0.49	0.81	1.07	0.89	0.57	0.52	0.52
March	1.00	0.46	0.56	0.79	0.74	0.97	0.58	0.80	0.52	0.29	0.70
April	0.60	0.57	0.55	0.91	1.24	1.01	1.47	1.23	0.82	0.60	0.56
May	0.95	0.93	1.17	1.14	1.77	1.5	1.67	1.56	1.33	0.77	1.08
June	1.21	0.62	0.94	1.02	1.53	0.64	1.53	2.14	1.10	0.67	1.60
July	1.40	0.50	0.99	1.39	1.27	1.48	1.38	1.03	0.90	0.72	1.42
August	1.04	1.15	1.13	1.44	1.30	1.72	1.31	0.96	0.89	1.20	1.98
September	0.80	1.01	1.20	1.47	1.02	1.23	1.42	0.90	0.98	1.20	1.38
October	0.73	1.06	1.20	1.29	1.01	1.21	1.33	1.46	1.04	0.97	0.90
November	0.51	0.92	1.28	1.42	0.93	1.36	1.22	0.52	0.73	1.05	1.01
December	0.82	1.08	1.45	0.78	1.14	1.3	0.83	0.76	0.47	1.58	2.14
Average	0.84	0.80	0.93	1.10	1.08	1.19	1.24	1.08	0.81	0.84	1.15

Largemouth bass harvest remained low at 0.64% of the total harvest in 2012 (Table 3). This harvest represents only a portion of the angler use on Lake Mead for black bass because of the catch-and-release nature of this fishery. Preference largemouth bass anglers as a percentage of all anglers increased to 11.2% in 2012 (Table 4). Eight largemouth bass were sampled from the creel with an average total length of 17.4 in (442 mm) and an average weight of 2.9 lbs (1,324 g). Smallmouth bass are combined with and represented as largemouth bass in reporting the creel data in terms of harvest and preference (Tables 3 and 4).

Table 3. Composition of Catch by Species (percentage of total harvest), 2002-2012.

Species	YEAR										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Largemouth bass	0.6	0.57	0.99	0.55	0.47	0.24	0.28	0.72	0.43	0.98	0.64
Bluegill	0.14	0.20	0.03	0.19	0.14	0.11	0.06	0	0	0.78	0.53
Black crappie	0.97	0.22	0	0	0	0	0	0	0	0	0
Channel catfish	7.58	5.45	5.9	5.22	4.14	2.38	3.45	2.96	5.91	7.7	3.46
Rainbow trout	8.79	7.48	1.3	0.4	1.56	4.33	2.18	7.28	12.02	3.13	0
Striped bass	81.89	86.08	91.8	93.6	93.65	92.93	94.02	88.89	81.64	87.4	95.2

Channel catfish was the second most harvested fish on Lake Mead in 2012 with a harvest rate of 3.46% of the total harvest (Table 3). Interest for catfish has declined from that seen in 2011 and was only 0.75% of the surveyed angling effort (Table 4). Harvested catfish size was similar to that seen in 2011 with an average total length and weight of 14.2 in (361 mm) and 1.6 lbs. (712 g), respectively. A small number of bluegill was reported during the creel survey, making up 0.53% of the catch. Black crappie has not been observed during the creel survey for the past nine years.

Table 4. Lake Mead Angler Effort by Species Preference (percent of total angler use), 2002-2012.

Species	Year										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Largemouth bass	19.1	15.3	23.4	16.6	16.9	6.1	5.4	8.0	5.1	8.7	11.2
Bluegill	0.1	0	0.1	0.1	0	0	0	0	0	0	0
Black crappie	0.7	0.5	0	0.2	0	0	0	0	0	0	0
Channel catfish	1.4	2.0	1.0	0.7	0.8	0.6	0.7	1.1	1.0	1.8	0.75
Rainbow trout	7.9	14.7	1.2	1.0	2.12	5.4	5.9	7.0	11.1	3.9	0
Striped bass	63.1	61.0	63.6	69.2	65.4	84.2	85.1	75.2	75.8	78.7	84.8
Multiple or any	7.8	6.5	10.7	12.4	14.8	3.6	2.8	8.7	7.0	6.6	3.0

In 2012, the percentage of out of state anglers was low compared to 2005-2008. Nevada anglers made up 87%; California 1.4%; Arizona 0.6%; and anglers from other states made up 11% of angler use on Lake Mead. Angler use on Lake Mead in 2012 included anglers visiting Lake Mead from 26 states and 2 countries (Table 5).

Table 5. Angler Origin by State of Residence (percentage of total angler use), 2002-

2012.

STATE	Year										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Nevada	87.5	87.4	85.3	75.9	74.2	78.5	75.5	86.0	88.6	84.8	87.0
California	3.0	0.5	2.3	3.7	6.6	3.0	3.4	2.1	1.1	2.3	1.4
Arizona	1.2	1.9	0.3	1.7	2.1	0.6	1.4	0.6	0.1	0.2	0.6
Other	8.3	10.2	12.2	18.7	17.0	17.9	19.5	11.3	10.2	12.7	11.0

Black Bass Tournament Monitoring

There were a total of 30 black bass tournaments permitted through the NPS on Lake Mead in 2012. Nine tournaments were attended to monitor species, length, and weight data for investigating trends in the black bass fishery. From subsamples of the tournament weigh-in, a total of 151 largemouth and 179 smallmouth bass were measured. Largemouth bass averaged 16.5 in (419 mm) and weighed an average of 2.3 lb (1,043 g) with a K (FL) of 1.36. Smallmouth bass averaged 15.8 in (401 mm) and weighed an average of 1.9 lb (862 g) with a K (FL) of 1.28. These measurements show little change from last year. Additionally, the percentage of smallmouth bass from tournaments was similar to last year at 38%.

Summer Dive Surveys

Dive surveys were completed from July 10 to August 14. Snorkeling transects averaged 25 minutes/diver. From transects surveyed, a total of 498 bass were observed, of which 296 were largemouth bass and 202 were smallmouth bass. Both largemouth and smallmouth bass abundance decreased in 2012 (Figure 1). Largemouth bass, however, had a larger decrease than did smallmouth bass. YOY bass observations followed the same trend with fewer largemouth and smallmouth bass in 2012 than in 2011, despite similar high levels of aquatic vegetation in both 2011 and 2012 (Figure 2). Overall, the rate of observation was 23.9 bass observed/30 min dive transect compared to 57.8/30 min observed in 2011. The majority of largemouth bass (62.8%) were fingerling, 25.7% juvenile, and 19.6% adult. Similarly, 59.9% of smallmouth bass were fingerling, 33.7% juvenile, and 8.9% adult (Table 6). In 2011, the lake elevation increased nearly 50 feet inundating vegetation and providing much needed cover for bass. Lake elevation declined in 2012, yet some vegetation was still flooded providing cover for bass. Despite this available cover, YOY bass numbers were low.

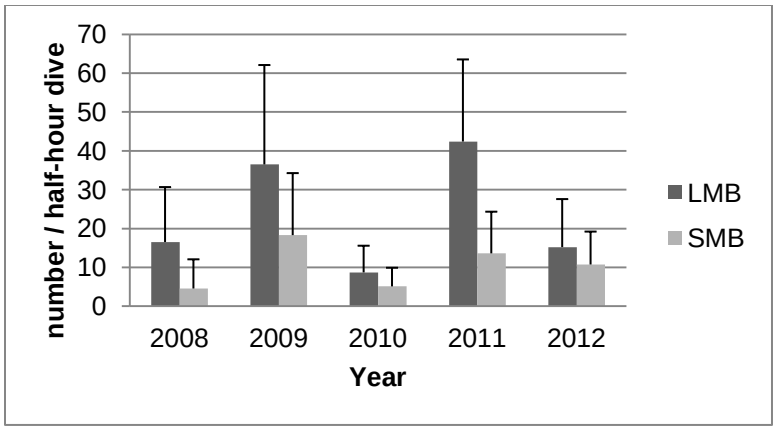

Figure 1. Largemouth (LMB) and smallmouth (SMB) bass/30 min dive, 2008 to 2012.

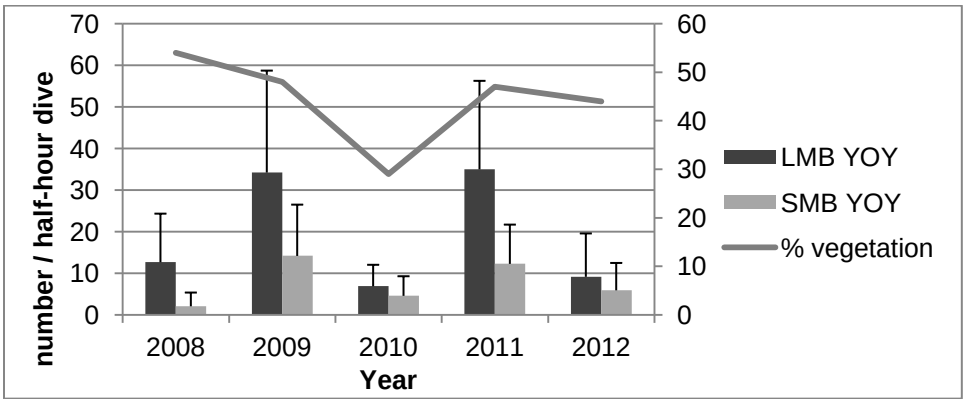

Figure 2. Largemouth (LMB) and smallmouth (SMB) young of year (YOY) and percent vegetative cover, 2012.

Table 6. Black Bass Dive Observations by Percentage of Age Class, 2012.

Species	Class			
	Fry	Fingerling	Juvenile	Adult
Largemouth bass	0%	62.8%	25.7%	19.6%
Smallmouth bass	0%	59.9%	33.7%	8.9%

Electroshocking Surveys

The electroshocking survey was conducted during the time period of October 4 through 26 in conjunction with the gill net survey. A total of 28 electroshocking sites were sampled (nine of those sites were sampled by NDOW) for a total of 433.5 min of effort and a yield of 1,007 fish of 13 species. Bluegill and green sunfish were the most numerous followed by threadfin shad, largemouth bass, and carp (Table 7).

A large increase in the number of bluegill was observed, likely due to an increase in lake elevation and production of aquatic vegetation from 2011. Conversely, green sunfish abundance was lower this year, also likely due to increased vegetation with a decrease in rocky substrate habitat. Striped bass CPUE remained low for the fourth

year, and largemouth bass CPUE has been low for two years (Figure 3, Table 8). Reasons for their decline are unknown

Table 7. Lake Mead Electroshocking Survey Sampling Summary, 2012.

Species	Number of Fish	CPUE[a]	Percent Composition	Average TL in (mm)	Average Weight lbs (g)	Percent Biomass
Bluegill	585	20.2	58.1	2.2 (57)	0.02 (7)	3.8
Bullhead catfish[b]	1	0.03	0.1	4.1 (105)	0.02 (11)	0.01
Carp	38	1.3	3.8	21.9 (557)	5.4 (2427)	84.7
Channel catfish	2	0.07	0.2	12.1 (307)	0.65 (297)	0.6
Green sunfish	204	7.1	20.3	2.7 (69)	0.02 (8)	1.6
Largemouth bass	58	2.0	5.8	5.6 (142)	0.12 (55)	3.2
Striped bass	23	0.8	2.3	5.0 (126)	0.09 (39)	0.9
Smallmouth bass	8	0.28	0.8	5.0 (128)	0.13 (61)	0.5
Threadfin shad	72	2.49	7.1	1.8 (46)	0.003 (1.4)	0.1
Gizzard shad	7	0.24	0.7	12.9 (328)	1.4 (619)	4.3
Blue tilapia[c]	2	0.07	0.2	7.1 (181)	0.31 (141)	0.3
Red shiner	5	0.17	0.5	1.3 (33)	0.002 (1)	0.0
Totals	1007	34.8	100			100

[a]units in number of fish caught during 15 min of electroshocking (f/15 min)
[b]*Ameiurus* sp.
[c]*Oreochromis aureus*
[d]*Cyprinella lutrensis*

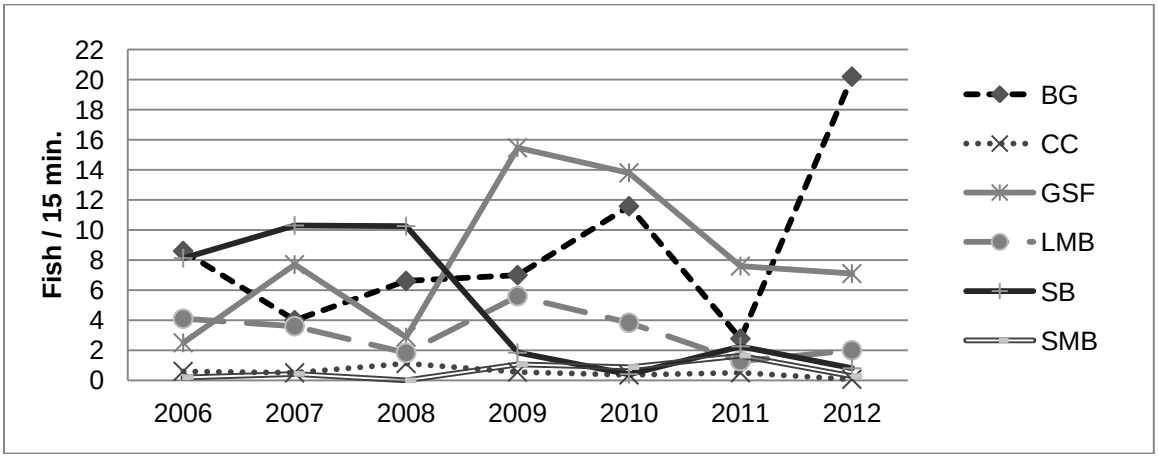

Figure 3. Lake Mead Fall Electroshocking Survey CPUE, 2006 to 2012. (BG=bluegill, CC=channel catfish, GSF=greensunfish, LMB=largemouth bass, SB=striped bass, and SMB=smallmouth bass).

Table 8. Lake Mead Electroshocking Catch Rates (f/15-min), 2008-2012.

Species	Year.				
	2008	2009	2010	2011	2012
Black crappie	0.14	0	0	0.3	0
Bluegill sunfish	6.61	7.00	11.58	2.77	20.2
Bullhead catfish	0	0	0.05	0	0.03
Carp	3.37	1.18	1.03	0.36	1.3
Channel catfish	1.12	0.55	0.36	0.51	0.07
Gizzard shad	0.07	1.92	1.96	0.62	0.24
Green sunfish	2.88	15.47	13.81	7.6	7.1
Largemouth bass	1.83	5.60	3.83	1.28	2.0
Red shiner	0	0.66	1.55	0	0.17
Smallmouth bass	0	1.07	0.98	1.64	0.28
Striped bass	10.26	1.84	0.41	2.26	0.8
Threadfin shad	2.53	0.07	3.62	1.18	2.49
Blue tilapia	0.07	0.99	0.57	0.1	0.07
Totals	28.89	36.35	39.66	18.43	34.8

Gill Net Survey

The annual fall gill net survey was conducted from October 4 to 30. Random sites were selected by AGFD. A total of 77 nets were set for an average of 17.4 hrs each, totaling 111 net-nights of effort (NDOW's effort was 27 nets). A total of 1,528 fish were captured for a catch rate of 13.7 fish/net-night (Table 9). The most numerous fish captured was gizzard shad at 51.3% of the catch, followed by carp (12%), striped bass (10.1%), and largemouth bass (7.8%). Gizzard shad also comprised the majority of the biomass at 49.6%, followed by common carp (31%) and striped bass (7.0%).

Striped bass captured in this year's survey averaged 15.9 in (404 mm) and1.1 lb (499 g). Compared to last year, striped bass average total length increased 1 in (25.4 mm) (Figure 4); however, the average weight was the same. Striped bass were in poor condition with K (FL) factors averaging 0.94 (Table 10), 59% having a K factor less than 1.0. Striped bass CPUE decreased this year and continued to remain below 2 fish/net-night for the fourth year, a rate not seen since 2002 (Table 11, Figure 5).

The largemouth bass catch rate was essentially the same as last year with a CPUE of 1.07fish/net-night (Table 11, Figure 5). Mean total length was 10.0 in (255 mm), also consistent with last year and the year before (Figure 4). The average condition factor K was 1.24. Smallmouth bass CPUE was also unchanged from last

year at 0.59 fish/net-night. Their average size, however, dropped 1.4 in (36 mm) to 10.8 in (274 mm). Smallmouth bass condition factor averaged 1.22K (FL) (Table 10).

Table 9. Data Summary for 2012 Fall Lake Mead Gill Net Sampling

Species	Number of Fish	Fish / Net Night	Percent Composition	Average TL	Average Weight	Percent Biomass
Black crappie	0	0.0	0		0.17 (77)	
Blue tilapia	61	0.55	4.0	9.3 (236)	0.7 (318)	1.75
Bluegill	11	0.10	0.7	6.0 (152)	0.17 (77)	0.07
Bullhead catfish	7	0.06	0.5	9.8 (249)	0.43 (195)	0.12
Carp	183	1.64	12	20.5 (521)	4.3 (1950)	31.04
Channel catfish	84	0.75	5.5	16.4 (417)	1.5 (680)	4.89
Flannelmouth sucker[a]	4	0.04	0.3	13.9 (353)	0.8 (363)	0.13
Gizzard shad	784	7.03	51.3	14.9 (378)	1.6 (726)	49.6
Green sunfish	15	0.13	1.0	6.0 (152)	0.23 (104)	0.14
Largemouth bass	119	1.07	7.8	10.0 (255)	0.6 (272)	2.84
Razorback sucker[b]	3	0.03	0.2	22.5 (572)	4.7 (2132)	0.56
Smallmouth bass	66	0.59	4.3	10.8 (274)	0.7 (318)	1.8
Striped bass	154	1.38	10.1	15.9 (404)	1.1 (499)	7.0
Threadfin shad	37	0.33	2.4	4.7 (119)	0.03 (13.6)	0.04
Totals	1528	13.72	100.0			100.0

[a]*Catostomus latipinnis*
[b]*Xyrauchen texanus*

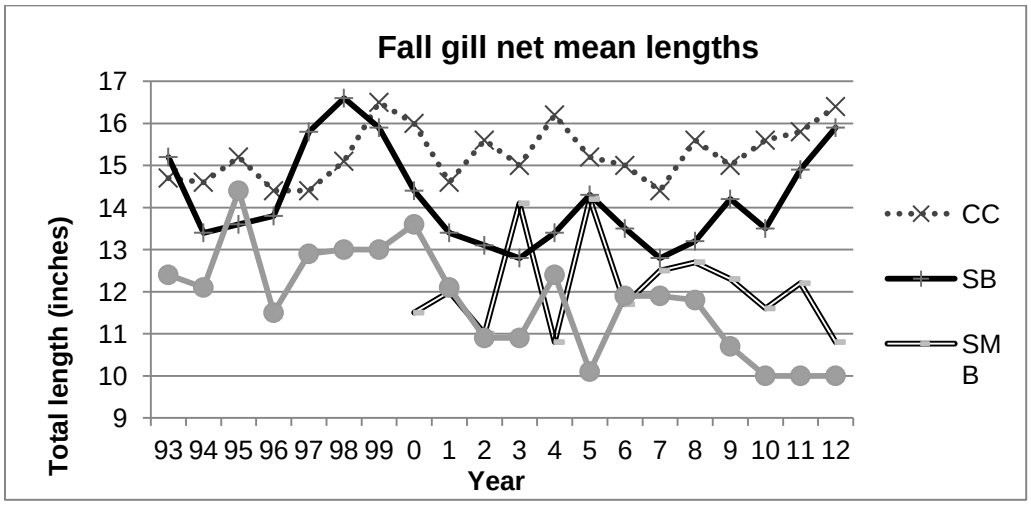

Figure 4. Fall Gill Net Mean TL (in), 1993-2012. (CC=channel catfish, SB=striped bass, SMB=smallmouth bass, and LMB=largemouth bass)

Table 10. Gill Net Average Condition Factor (K) by basin, 2012.

	LMB[a]	SMB[b]	CC[c]	SB[d]	SB % in poor condition
Boulder Basin	1.23	1.31	0.84	0.98	53
Overton Arm	1.34	1.33	0.76	1.0	50
Virgin Basin	1.21	1.16	0.83	0.90	68
Greggs Basin	1.37	1.20	0.74	0.91	62
Overall	1.24	1.22	0.79	0.94	59

[a]LMB = largemouth bass
[b]SMB = smallmouth bass
[c]CC = channel catfish
[d]SB = striped bass

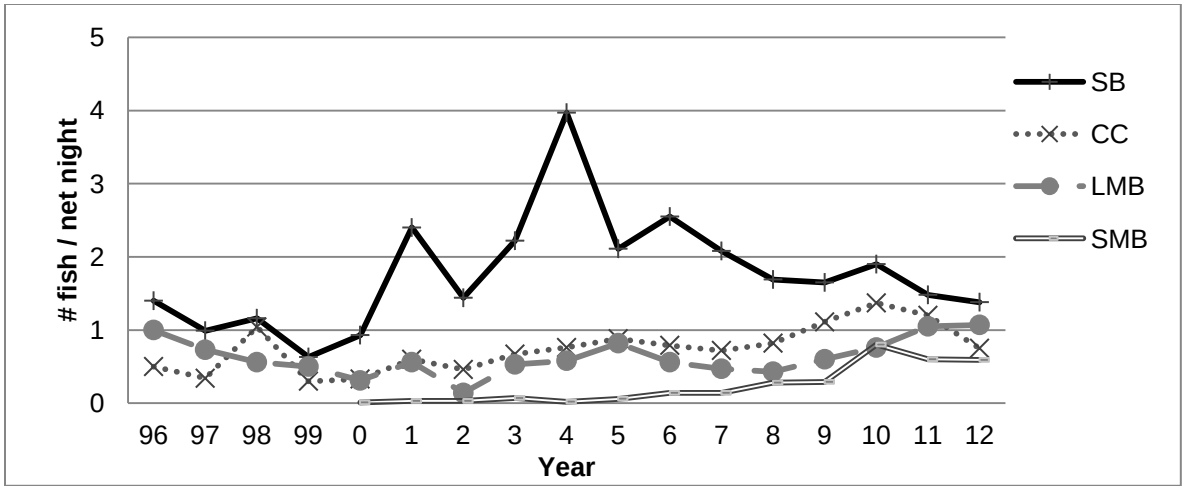

Figure 5. Fall Gill Net CPUE, 1996-2012.(SB=striped bass; CC=channel catfish; LMB=largemouth bass; and SMB=smallmouth bass)

Channel catfish abundance dropped to levels seen in 2004 to 2008 at 0.75 fish/net-night (Table 11, Figure 5). This year, the average channel catfish length was up slightly to 16.4 in (417 mm) (Figure 4). Condition factor for catfish ranged from 0.74 to 0.84 K, with Boulder Basin having the “best” condition catfish at 0.84 K and Gregg’s Basin having the lowest condition factor for catfish at 0.74 K (Table 10).

Gizzard shad became well established in Lake Mead reaching maximum CPUE in 2010 at 11.25 fish/net-night. For the past two years, gizzard shad abundance has dropped in the gill net survey down to 7.03 fish/net-night in 2012. While its abundance has declined, it did continue to be the most numerous fish in the survey. As its population ages, the length frequency distribution has changed to show a greater number of older, larger individuals and fewer young fish (Figure 6). Another change observed in gizzard shad is a small number had a different shape, being deeper bodied especially anterior to the dorsal fin (Figure 7, top photo).

Table 11. Average Fish/Net-Night, Lake Mead Fall Gill Net Surveys, 2002-2012.

	Year										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
# of nets	50	97	78	91	93	94	95	91	87	93	77
Net Nights	94.3	176.3	123.6	170.4	140.3	133.6	145.3	140.4	136.1	140.4	111.4
Species											
Carp	0.46	1.1	1.47	1.13	1.93	1.2	1.76	1.30	1.42	0.98	1.64
Channel catfish	0.46	0.67	0.76	0.88	0.79	0.72	0.82	1.11	1.37	1.20	0.75
Black crappie	0.02	0.02			0.01	0.01	0.02	0.13	0.01	0.08	
Bullhead catfish		0.02		0.01	0.01			0.01	0.4	0.21	0.06
Largemouth bass	0.14	0.53	0.58	0.82	0.56	0.47	0.43	0.60	0.76	1.05	1.07
Smallmouth bass	0.03	0.07	0.02	0.06	0.14	0.14	0.28	0.29	0.80	0.60	0.59
Striped bass	1.44	2.22	3.97	2.11	2.55	2.08	1.69	1.65	1.90	1.48	1.38
Northern walleye[a]											
Threadfin shad		0.64	0.82	0.25	1.05	1.47	0.78	0.98	1.51	0.43	0.33
Rainbow trout											
Razorback sucker			0.02				0.02	0.03	0.04	0.01	0.03
Flannelmouth sucker					0.01				0.01		0.04
Blue tilapia	0.06	0.2	0.06	0.70	0.19	0.31	0.25	0.83	0.20	0.32	0.55
Bluegill Sunfish	0.03	0.01	0.02	0.11			0.06	0.09	0.02	0.04	0.10
Green Sunfish	0.02	0.04	0.07	0.05	0.04	0.02	0.05	0.06	0.17	0.05	0.13
Gizzard shad						0.08	0.73	5.17	11.25	8.29	7.03
Total	2.66	5.52	7.78	6.12	7.27	6.53	6.89	12.24	19.5	14.75	13.72

[a]*Sander vitreus*

Prey Base Studies

Recruitment from threadfin shad reproduction was monitored during the month of June in two basins of Lake Mead. A total of 30 separate standard transects were taken in the Overton Arm and the Boulder Basin (including Las Vegas Bay). The 2012 lake-wide larval shad production estimate (peak values) on Lake Mead was below average at 18.3 fish/3,531 ft^3 (100 m^3) (historical average = 69.57 fish/3,531 ft^3 (100 m^3)) (Figure 8, Table 12). This year, Boulder Basin and Overton Arm had low shad production at 4 and 32.5 shad/3,531 ft^3 (100 m^3), respectively (Table 12). This is the second poor shad year for Boulder Basin and the third poor shad year for Overton Arm. Two or three

years of low shad production followed by a year of peak production is the typical pattern observed on Lake Mead (Figure 8).

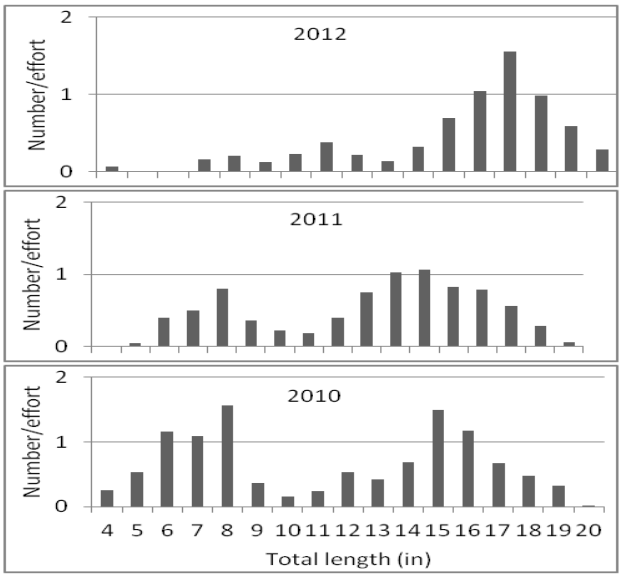

Figure 6. Gizzard Shad Length Frequency Distributions from Fall Gill Net Surveys, 2010-2012.

Figure 7. Two Body Shapes of Gizzard Shad Observed in the 2012 Lake Mead Fall Gill Net Sample.

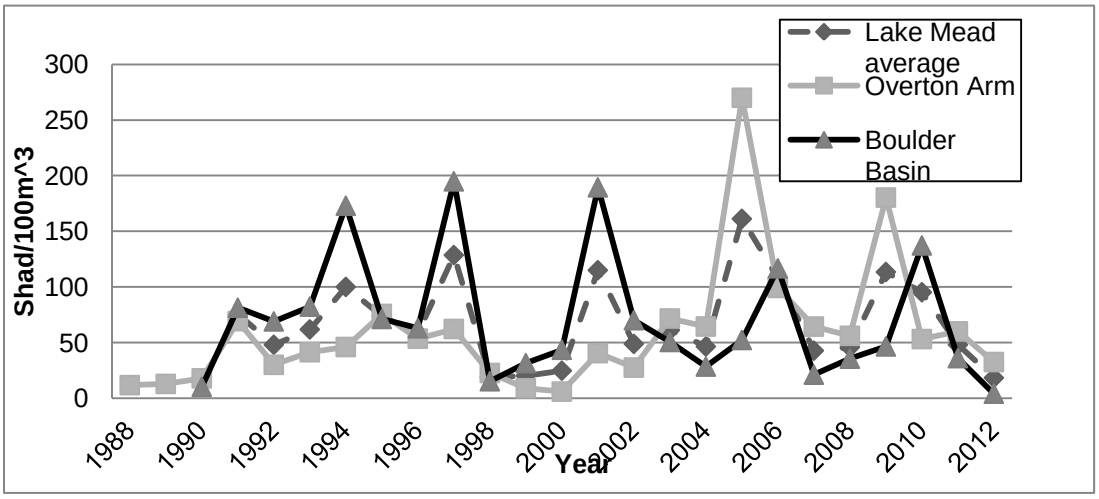

Figure 8. Shad Densities During Peak Production Periods, 1988-2012.

Striped Bass Fisheries Assessment:

Harvested striped bass were slightly smaller this year, averaging 15.9 in (405 mm) and 1.6 lbs (737 g). Their average condition factor was 1.05 K (FL), a drop from 2011 (1.15 K (FL)). Of the 518 striped bass sampled in the creel data, 183 (35.4%) had a condition factor less than 1.0 K (FL) (a value considered to represent poor condition). Angling pressure for striped bass increased in 2012 to 84.8% (up from 78.7% last year). The increase in pressure may be due to trout anglers shifting to striped bass, or because trout anglers were not factored into the figures due to no trout stocked in 2012.

The harvest rate improved to 0.84 fish/hour compared to 0.60 fish/hour over last year for successful striped bass preference anglers. The striped bass percent of total observed harvest also increased to 95.2% over the 78.7% observed last year and remains the most harvested fish on Lake Mead. This increase may also be due to the fact that no trout were stocked in 2012.

Table 12. Lake Mead Average Peak Shad Production, 2002-2012.

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Period covered	5/25-6/15	5/21-6/26	5/13-6/23	5/17-6/23	5/23-5/29	5/9-7/2	6/10-6/26	6/02-7/1	6/02-7/7	5/24-7/5	6/6-7/5
Number of weeks	4	4/5	4/5	4/5	4/5	6/7	2/3	5	5/4	4/5	5/4
Overton Arm stations											
M-1	6.9	5.59	25.1	218	17.4	24.3	Dry	Dry	Dry	Dry	Dry
F-1	13.7	62.5	64.9	333	59.5	83.2	6.3	199.3	0.9	36.7	2.9
F-2	42.7	136.6	138.1	265	132.8	131.8	38.8	294.5	131.2	64.9	56.6
F-3	39.1	80.4	76.3	290	145.1	66.6	83.9	119.8	48.0	76.9	44.6
F-4	35.2	73.0	17.8	244	140.7	15.7	95.2	107.7	32.4	61.5	25.8
Overton Arm average	27.5	71.6	64.4	270	99.1	64.3	56.1	180.3	58.1	60	32.5
Las Vegas Bay and Boulder Basin Stations											
ILVB	186.5	61.2	49.7	75	238.3	25.9	44.2	83.67	118.5	11.7	2.0
MLVB	21.8	68.6	27.9	56	89.4	31.7	56.4	38.03	281.4	83.1	8.5
BB	2.05	21.8	7.55	26	22.4	5.9	5.9	17.79	12.0	13.2	1.6
Boulder Basin average	70.1	50.5	28.4	52.3	116.7	21.1	35.5	46.50	137.3	36.0	4.1
Lake wide average	48.8	61.1	46.4	161.2	107.9	42.7	45.8	113.4	95.2	48.0	18.3

In the fall gill net sample, a total of 154 striped bass were caught averaging 15.9 in (405 mm), and weighed on average 1.1 lbs (499 g), with an average condition factor of 0.94 K (FL), a drop from the 1.13 K (FL) observed in 2011. Length increased by 1.0 in (25.4 mm) compared to 2011. CPUE from the gill net survey decreased slightly for striped bass from 1.48 fish/net-night in 2011 to 1.38 in 2012 (Table 11). Striped bass proportional stock density (PSD) from the gill net survey showed a gradual increase over the past six years after a sharp decline in 2006 (Figure 9). While there was an increase in the numbers of larger fish, PSD was below that observed for some of the

previous years. This same trend occurred in length frequency distributions from 2010 to 2012, with fewer young striped bass in the 8-10 in (203-254 mm) size class and more 16 in (406 mm) fish (Figure 10).

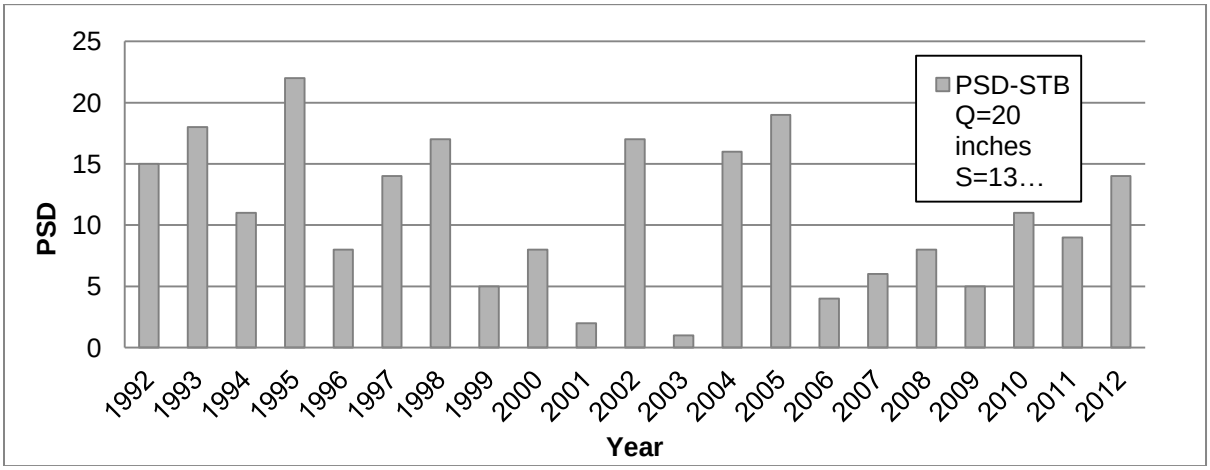

Figure 9. Striped Bass Proportional Stock Density (PSD) from Lake Mead Gill Net Surveys, 1992-2012.

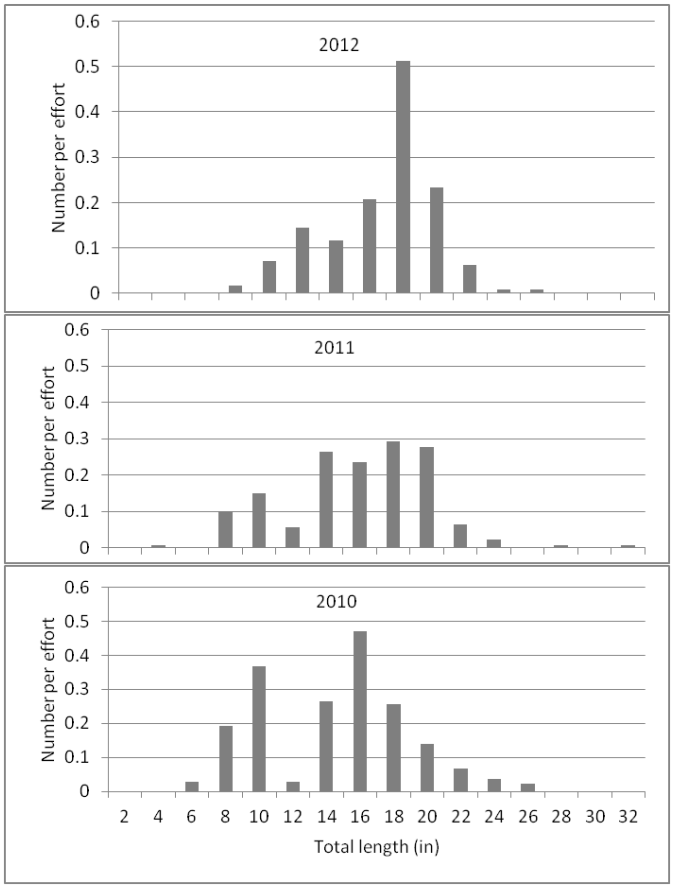

Figure 10. Striped Bass Length Frequency Distribution, Lake Mead Fall Gill Net Surveys, 2010-2012.

In addition to NDOW surveys, striped bass data was volunteered from four striped bass tournaments held by the Nevada Striper Club in 2012 (March 11, May 13, September 16, and December 16). A total of 373 striped bass were sampled during these events, averaging 19.8 in (502.9 mm) and 2.5 lbs (1,116 g) (Table 13). Stomach samples were visually analyzed, noting number of stomachs having specific items, as shown in Table 14. The 2012 catch information showed similarly sized fish compared to those sampled in 2011 (19.7 in (501 mm)). The average condition factor K (FL) decreased to 1.06 from a K-factor of 1.14 observed in 2011, but was consistent with that seen in the general creel harvest (K (FL)=1.05) in 2012.

Table 13. Striped Bass Tournament Data Summary, 2012.

Date		Avg TL in (mm)	Avg weight lbs. (g)	Avg K (FL)	% in poor condition (K (FL)=<1.0)
3/11/2012	n=127	19.9 (506)	2.66 (1,207)	1.10	20.9
5/13/2012	n=123	20.2 (514.1)	2.68 (1,216)	1.08	23.6
9/16/2012	n=60	19.7(499.3)	1.98 (898)	0.90	73.3
12/16/2012	n=63	18.8 (478.3)	2.09 (948)	1.05	27.0
Overall Average		19.8 (502.9)	2.46 (1,116)	1.06	31.2

The analysis of gut samples has been reduced to a cursory inspection to note occurrence of major food items by season. This will be used to provide a baseline for striped bass food habits by noting shifts in content composition or the use of sub-standard prey items. Because the inspection is of tournament caught fish, there are inherent biases with much of the stomach content reflecting what the fishermen used as bait. Table 14 summarizes data for the 2007 through 2012. Threadfin shad, the preferred food item for striped bass was ranked 6, due to the low production of threadfin shad in 2012. The majority of stomach contents were empty, anchovies, unidentified fish mass, crayfish, or corn (Table 14).

Black Bass Fisheries Assessment:

The black bass fishery was monitored through a variety of survey methods including general creel surveys, limited spring or summer dive surveys, gill netting, electroshocking, and creel data collection at professional bass tournaments. Data from creel surveys show the harvest of largemouth bass in 2012 dropped to 0.64% of the total reported harvest, and angling effort or percent of angler preference for largemouth bass increased to 11.2% of the total. This appears to mark a renewed interest in black bass fishing, considering that between 2007 and 2011, angler interest in largemouth bass has been less than 10% of the total angler preference. While harvest figures remain low, under 1%, it is not surprising given the largemouth bass fishery is primarily catch-and-release for many anglers.

Summer dive surveys showed decreases in abundance for both small and largemouth bass YOY. The decrease may be due to dropping lake elevations, especially during the spawning period. The lake-wide gill net survey showed no change

in abundance for both small and largemouth bass from 2011. Electroshocking surveys found a slight decrease in CPUE for smallmouth bass, but a slight increase for largemouth bass.

Table 14. Lake Mead Striped Bass Ranked Stomach Content, 2007-2012.

Food item	2007		2008		2009		2010		2011		2012	
	#	Rank	#	Rank	#	Rank	#	Rank	#	Rank	#	Rank
Empty	128	1	140	1	65	1	163	1	87	1	183	1
Crayfish	3	6	23	4	22	3	10	5	11	5	23	4
Corn	11	5	14	5	14	4	4	6	2		21	5
Shad	13	4	40	3	11	5	47	3	62	2	19	6
Plant matter												
Striped bass	1		1						1		1	
Shad as bait	2		1				4	6	6	5	8	
Unidentified fish	0		5		1		13	4	27	4	25	3
Anchovy	55	2	81	2	65	2	81	2	28	3	99	2
Trout	41	3	10	6								
Clams	1		2		2	6	2		1		3	
Quagga mussel	1		1		1		1				3	
Gizzard Shad									5	6	9	
Gizzard shad as bait											10	
Rock	5		3		1		1		1		11	
n(total)	255		286		149		324		230		372	

Over the past 12 years, smallmouth bass has become well established in Lake Mead. Since its discovery during fishing tournaments in 1999, smallmouth bass abundance continues to grow and for the past four years has made up an average of 37% of tournament catches. Samples taken from fishing tournaments revealed largemouth bass averaged 16.5 in (419 mm), 2.3 lbs. (1,043 g), and a condition factor K of 1.36. Smallmouth bass averaged 15.8 in (401 mm), 1.9 lb. (862 g), and a condition factor K of 1.29.

Black Crappie Fisheries Assessment:

A total of six hoop nets were set between May 14 and May 30. One group of three nets was set for three days for a total of nine net nights of effort. No crappie were captured, but species captured included carp (7), striped bass (1), and channel catfish (1). The second set of 3 hoop nets were set on May 18 and pulled May 30. They were supposed to be pulled a week earlier, but stormy conditions would not allow. When

retrieved all nets were windblown, collapsed or buried in sediment, and no fish were captured.

No black crappie was captured during hoop netting, gill netting, electroshocking, and angler creel surveys. In prior years, black crappie would show up in gill netting or electroshocking surveys indicating the existence of a small population. However, a recent lack of black crappie in the surveys suggests this species has become rare.

Salmonid Fisheries Assessment:

No trout were stocked in 2012.

GENERAL MANAGEMENT REVIEW

The approaches for the general management objective were completed. The objectives were met through creel surveys, tournament data collection, gillnetting, electrofishing, dive surveys, shad trawls, hoop netting, and striped bass stomach content analysis.

LAKE MEAD STRIPED BASS SONIC TELEMETRY STUDY

Introduction

Striped bass are the most common, most harvested, and most sought after sport fish in Lake Mead. It is subject to multiple stressors including a continually moving and changing habitat and habitat quality from long-term lake level declines and recent invasion of quagga mussel and gizzard shad. There is limited information concerning recent environmental and biological changes affecting the striped bass fishery. Most importantly, declines in angler use and harvest have corresponded with these changes. Better information is needed regarding seasonal movement and habitat use of striped bass in order to help anglers better utilize this fishery. The objective of this study is to better identify habitat requirements, habitat use, and seasonal distribution of striped bass in Lake Mead through sonic telemetry.

Study Area

Lake Mead is located in southern Nevada and northern Arizona and lies along the border between the two states (Figure 11). Study fish were released at Echo Bay and Boulder Harbor. Initial tracking efforts were directed to the Las Vegas Bay, Boulder Basin, and Overton Arm. As fish were found to utilize the entire lake, areas in the Virgin Basin and Gregg Basin were occasionally sampled. Some data was received from BIO-WEST, Inc. who was tracking razorback suckers in the Colorado River inflow, Las Vegas Bay, and Overton Arm areas of the lake.

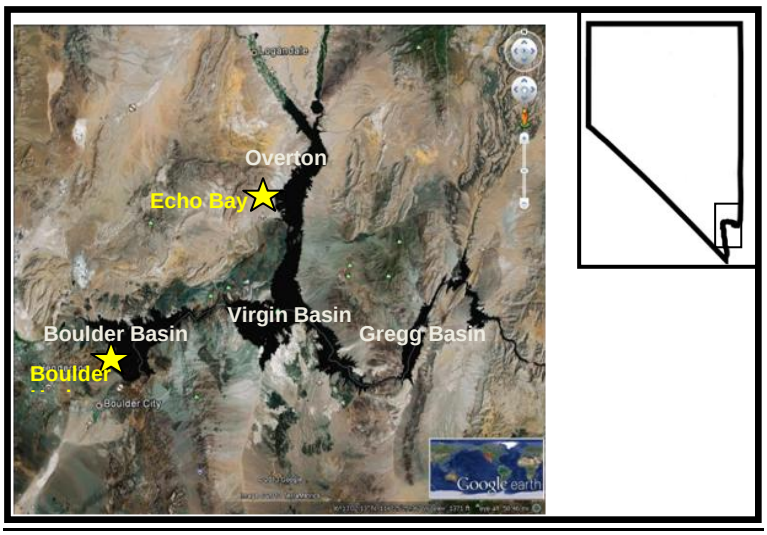

Figure 11. Satellite Image of Lake Mead, NV/AZ. Google Earth. Accessed 02/26/13.

Findings to Date

Manual tracking began after fish were released at Boulder Harbor and Echo Bay (Figure 11). The beginning of the study was marked by a high level of mortality. One fish died post operatively at the hatchery, and in December five other tagged striped bass were found throughout the lake exhibiting no movement and later presumed dead. Another fish found in January had no movement on subsequent detections, and one was never found. From the tag numbers of the dead fish, it was determined that these fish were from the group that were captured on the same day as their tag implantation surgery. In the group that was captured one week prior to surgery, approximately 40% died during the week prior to surgery. It is thought that during this week-long waiting period, the weaker fish died, leaving the stronger fish to be tagged. It is this group that had the highest survival. With 8 fish dead by January 2012, there were 12 tagged fish left to track.

Movement

Early into the study five tagged striped bass were found to travel large expanses of the lake. By February 2012, three fish released from Boulder Harbor and two fish released from Echo Bay had found their way approximately 40 mi upstream to the Colorado River inflow area. Two additional fish moved to the inflow area by March and April. By April, no striped bass remained in the Overton Arm. This corresponded to the spawning period for striped bass, with water temperatures on the rise. At the upper Overton Arm (1/26/12) the water temperature was 11.02-12.15°C (51.8-53.9°F) and in Las Vegas Bay (2/21/12) the water temperature was 13.73-14.31°C (56.7-57.8°F). The Colorado River inflow area provided the needed flow to suspend striped bass eggs (Allan and Roden and references therein, 1978). By April, three of the fish that went to the Colorado River inflow had returned to Las Vegas Bay. Two of these fish were Echo Bay releases.

During the late spring and summer, seven fish used the Las Vegas Bay and Boulder Basin area. These fish were most often found through SUR tracking and not active tracking. Fish using the Las Vegas Bay were found to be in deeper water than where they were found in the winter months. In late May as the thermocline was developing, striped bass were often tracked to areas where the water was 55-120 ft (16.8-36.6 m) deep. Fish in Boulder Basin were found in somewhat shallower water during this time period. Two fish were tracked to the Las Vegas Boat Harbor with one under the tire wall (40 ft (12.2 m)) and one located under the floating restaurant (29 ft (8.8 m)). The fish tracked to the tire wall was harvested by an angler on 4/23/2012. The tag tracked to the restaurant (9/20/12) was later tracked to a cove near Beehive Island. Tag movement has been inactive since 12/4/2012 and the fish is presumed dead. Another fish detected in the Boulder Basin was captured by an angler and thrown back dead near Boulder Harbor. By December 2012, only one fish was detected in active or SUR tracking. Eleven of the fish are known to be dead. While it is doubtful that eight fish remain alive, some of these fish may have travelled upstream and took refuge in cold water during the summer and have not yet returned to the lake. However, it is possible that many of these fish were captured and harvested and anglers did not report catching them.

General findings to date are that except for one fish, all fish moved from basin to basin traversing the entire lake. While the fish moved throughout the entire lake, most habitat use has been recorded at inflows (Figure 12). Fish were mostly associated with open-water areas and near points and were not found in coves. Migration to spawning sites in the Colorado River inflow area may occur as early as January and February. No tagged fish remained in the Overton Arm after March 2012. It is not clear if it was because they were originally captured in the Las Vegas Bay, if there was poor food availability, or for other reasons. It was found that as summer approaches, striped bass move to deeper, cooler water between 55 ft (16.8 m) and120 ft (36.6 m) deep. Tracking of striped bass will continue through to the end of FY2013.

Figure 12. Map of Lake Mead Showing Sonic-Tagged Striped Bass GPS Data Waypoints.

LAKE MEAD STRIPED BASS SONIC TELEMETRY STUDY REVIEW

The objective was to identify habitat use and seasonal distribution of striped bass. The approaches for the Striped bass sonic telemetry study objective were completed. The objectives were met through active and passive tracking of sonic tagged striped bass. Depth, water temperature, and GPS coordinates were collected. No underwater observations were made through SCUBA diving due to the turbidity and depth of the water in which the striped bass were utilizing.

RECOMMENDATIONS

- The creel survey program should continue under the present format to track trends in angler use of game species.
- At least 100 days of creel surveys should be conducted at angler access points.
- Seasonal gill netting surveys and summer dive investigations should be continued.
- Continue collecting black bass biological data at fishing tournaments to track trends in the black bass fishery.
- Continue with assigned electroshocking transects in all basins during the fall.
- Continue checking stomach samples of striped bass at fishing tournaments to detect changes in diet.
- Continue weekly meter shad trawl transects.
- Discontinue hoop net surveys for black crappie.
- Conduct a study to determine if supplemental stocking of threadfin shad in low production years, prior to the spawning season, would benefit the sport fishery by increasing shad production in non-peak years to provide a more balanced forage base for improved striped bass condition.
- Consider a study to determine the feasibility of rearing threadfin shad on station at the Lake Mead Hatchery using methods similar to Ellison, et al (1983) to accomplish above study.

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REFERENCES

Allan. R. C. and D. L. Roden. 1978. Fish of Lake Mead and Lake Mohave: Base fisheries data Boulder Canyon to Davis Dam. Nevada Department of Wildlife, Biological Bulletin No. 7. Water and Power Resources Service, Contract No. 14-06-300-2705.

Ellison, D. G., J. A. Gleim, and D. Kapke. 1983. Overwintering threadfin shad through intensive culture. Prog. Fish-Cult. 45(2).

Google Earth. Satellite image of Lake Mead, NV/AZ. Accessed on 2/26/2013.