



Tempe Town Lake 2007 Spring Survey Results

Introduction and Methods:

Tempe Town Lake is an important recreational sport-fish fishery centrally located in the greater Phoenix metropolitan area. The Lake is located within the Salt River flood plain and was filled in June 1999. Rainbow trout are stocked from Game and Fish hatcheries November - February to support a popular winter fishery, Israeli carp are stocked by the city of Tempe for insect control. All other fish species found in the lake entered the lake via canals, or flood events (Appendix A, species list). These warm-water fish species have become established and naturally reproduce in the lake.

The Arizona Game and Fish Department have been conducting annual fish surveys since 2000 at Tempe Town Lake and began using a Standardized Sampling in the spring of 2004 where an 80/20 (% random/fixed) trend survey method was implemented. During the winter of 2004-2005 a large flood event occurred, both dams were lowered and the normally impounded lake returned to a riverine environment for several months. Data analysis from the 2005 spring survey resulted in an approximate 50% loss of the overall fish population that either migrated up or downstream with the flow. The lake remained impounded in 2006 and 2007. The objective of the 2007 survey was to compare changes and trends in the fishery over the last 2-3 years. Important comparisons such as catch rates, relative abundance, age distribution, species composition, and health indicators for many important fish species are examined over time. Of note during the 2007 survey was the discovery of the inland silverside minnow, *Menidia beryllina* (20 collected), a new species in Town Lake that was first detected in Arizona at Lake Pleasant in 2006.

Methods:

On March 20 and 21, 2007, Arizona Game and Fish Department (AGFD) biologists conducted the annual Tempe Town Lake fish population survey. This year 15 students enrolled in the Biology 410 class from Arizona State University assisted us with the survey.

Twelve 150 x 6 foot experimental gill nets were deployed the evening of March 20th. The nets are composed of five 30-foot sections/panels of various mesh sizes ranging from ¼ inch mesh to 2-½ inch mesh. Nets were retrieved the morning of March 21st. The Catch Per Unit Effort (CPUE) for gill netting was calculated from net hours (NNU = net night unit = 12 hour period of set time). See map for sample sites.



ASU students display gill net loaded with threadfin shad

Electrofishing was conducted the night of March 20th at six sites for an average of 900 seconds per site. CPUE for electrofishing is calculated as (EFU = electrofishing unit = 900 seconds). Electricity was delivered from a 6K watt generator through a model 15B Smith-Root VBP. The Region VI shocking boat is outfitted with two adjustable anode arrays mounted on booms and a cathode "cable whisker" array mounted on the bow. All fish captured were identified to species, counted, measured (TL \pm 1

mm), weighed (± 10 g), and examined externally for general health and condition. After a reasonable sub-sample was acquired, some fish species (i.e. threadfin shad) were only counted. See map for sample sites.

Results:

A total of 4,328 fish were collected during the 2007 survey representing 13 species. Two years after the flooding of 2005 Town Lake continues to experience a “new lake effect”, as noted by the abundance of threadfin shad and young bluegill collected in 2007. Our overall Catch Per Unit Effort (CPUE) during gill netting was 196 fish/net night unit (NNU) compared to 240 fish/NNU in 2006, and 36 fish/NNU in 2005. For electrofishing our CPUE was 170 fish/electrofishing unit (EFU) compared to 240 fish/EFU in 2006 and 36 fish/EFU in 2005 (Table 1). Catch rates remain relatively high due to continued successful reproductive year from threadfin shad and bluegill.

Fish Presence, Abundance and Discussion:

(Refer to Tables 2 and 3)

Largemouth bass (abundant) - Largemouth bass were the most abundant sport species collected (excluding forage and prey base species such as threadfin shad and bluegill) and represented 23% of the total catch. During the 2007 survey, we captured 234 bass; the average fish was between 300-450 mm (12-17 inches) in length and weighed between 2 – 3 pounds. Based on length categories (Figure 1) the bass population appears to be well balanced with a good distribution of size and year classes. The largest bass of the survey was 21 inches (520 mm) and weighed 5.3 pounds. Current bag limits for largemouth bass at Town Lake are four fish per day with a 13-inch minimum length restriction.



ASU student shows off a largemouth bass prior to release

A calculated relative weight index (W_r , or a measure of fish population condition) of 107 suggests above average robustness of the bass sampled this year. Again the bass population continues to maintain excellent health compared to conditions of 108 in 2006 and 87 in 2005 (Table 4). The bass catch per unit effort during electrofishing (method that collected 77% of all largemouth bass) slightly decreased from last years' survey of 35.8 fish/EFU (2006) to 29.2 fish/EFU (2007) surpassing the flood year low of 11.8 fish/EFU in 2005 (Graph 1). Bass should continue to grow quickly due to the abundant prey base. Dominant length frequencies of 350 – 400 mm (14 – 16 inches) from the 2007 survey indicate a grow-out of the dominant age class from 2006 of bass 250 – 299 mm (10 – 12 inches).

Proportional stock density measurements (relative number of adult fish recruiting into the overall population) further indicates a dynamic bass population of 90 compared with 47 in 2006 and 42 in 2005. Quality and Preferred size fish from 12 – 15 inches (300 – 380 mm) dominate the population, 90 and 42 respectively compared to the previous year (47 and 18 in 2006- see Table 5).

Israeli carp (stocked/abundant) – This species has been stocked intermittently over the past 5 years by the City of Tempe to provide control of nuisance aquatic insects such as mosquitoes and midge flies. Fish are planted at 3 inches in size during the summer months. These fish, also known as “mirror” carp, accounted for 16% of the fish collected and were the second most

abundant sportfish sampled this year (167 collected, 96 measured). Size ranges collected during the survey were 350 to 449 mm (14 to 18 inches) and probably represent the growout of 30,000 fish stocked during June 2004. The largest Israeli carp weighed 5 lbs and measured over 21 inches (530 mm) in length. These fish represent fantastic angling opportunities for anglers looking to fight and land large fish.



Two Israeli carp collected during gill netting

Trout (stocked) –Seventy-six rainbow trout were collected during the survey and averaged between 200 and 300 mm (8-11 inches). Rainbow trout are the only species that the Arizona Game and Fish Department stocks to establish a winter put-and-take trout fishery at Town Lake. From November 2005 to March 2006 at season total of 29,800 rainbow trout were planted biweekly. As water temperatures rise through the spring, most trout are expected to be harvested by anglers or will succumb to the warming water.

Channel catfish (occasional) - This popular sportfish has decreased in number in Town Lake. This year we caught 19 catfish compared to 66 caught in 2006. Gear selectivity or placement of the gill nets may have influenced catch numbers. A majority of the fish caught were in the 1-2 pound range and measured 12-18 inches (300 - 450 mm). The largest catfish measured 21 inches (540 mm) and weighed over 4.5 pounds. Look for these fish to grow and hopefully reproduce under the right conditions over the next few years and provide another great angling opportunity.

Threadfin shad (prolific) – Shad were the most abundant fish species collected (estimated more than 3,300, 161 randomly measured). By taking advantage of nutrients supplied during the 2005 flood, the population has continued to grow through 2006 and into 2007. Most fish were in the 100 – 150 mm (4 – 5 inch) range representing a strong year class from the 2005 spawn. Shad abundance indicates continued reproduction in the lake, thus providing a forage base for predators like the largemouth and yellow bass, larger trout, and catfish.

Bluegill (prolific) – Bluegill were the second most abundant fish species collected (355 collected, 83 randomly measured). A majority of these were caught electrofishing (52.7 fish/EFU) and averaged 125 mm (5 inches) in length. Only 10 fish (12% of sample) would be considered adults (>150 mm or 6 inches). This species appear to be stunting, probably due to an overabundance of shad that creates competition for food with young bluegill and lack of predation by largemouth bass. However, as other predators compete for the available shad and young bluegill over time, bluegill sunfish sizes may increase.

Yellow bass (common) – Yellow bass from 100 – 150 mm (4 – 6 inches) were relatively abundant. We caught 10 adult fish measuring 10 inches on average. Generally yellow bass do not grow over 1 pound or 11 inches in length in most reservoirs, and appear to have a majority of the population within the 4 – 6 inch size in Town Lake. Looking at length frequencies in 2006, the yellow bass had a successful spawn as indicated by more than 500 young-of-the-year (class 0) fish collected that were collected. That strong recruiting class of fish is now the 4 – 6 inch size. There is ample prey base and these fish prefer open water in the middle of the lake and tend to school. The outlook for this species is to persist in the lake and provide a good angling opportunity for those anglers just trying to catch fish using mealworms and night crawlers.

Common carp (occasional) – A total of 14 common carp were collected (12 measured). The largest carp was also the big fish of the survey, 720 mm (28 inches) in length weighing 10

pounds. Although not apparently reproducing to a significant degree, these fish should continue to grow in the lake system and provide “big fish” sporting opportunities for anglers.



Average size of inland silverside minnow collected

Inland silverside minnow (new- uncommon) – There were 20 of this small forage fish averaging 2 inches (< 99 mm) that were collected during the 2007 survey. Generally adults seldom exceed 4 inches and are native to the mid-west portion of the United States where they are simply another prey species for resident fish predators. The first occurrence of the species in Arizona was from upper Lake Pleasant in 2006 and sources of the introduction remain indefinite. Impacts from this new species found in Town Lake are unknown at this point, but may be benign within the dynamics of overall fishery.

The following species were also sampled, but in low numbers: Redear sunfish- 7, Flathead catfish – 1, Goldfish – 1, Tilapia -1.

The following species were not sampled in this 2006 survey but have been present during fish surveys conducted 2001-2006:

Sonora sucker, Razorback sucker, Black Crappie, Green sunfish, Fathead minnow, Red shiner, Roundtail chub

Recommendations:

- 1) Continue to monitor fish populations at Tempe Town Lake through spring surveys to determine species occurrence, species abundance, fish community composition, recruitment, and fish health.
- 2) Re-install fish habitat structures to build populations of largemouth bass and channel catfish by providing hiding cover, spawning cavities for catfish, juvenile fish grow-out areas and feed zones for predators.
- 3) Continue stocking rainbow trout each winter from November through early March at biweekly intervals for a seasonal total of 20,000 fish (minimum). The trout collected indicate that this cold water species can survive well in Town Lake on a seasonal basis and will provide a popular and well-used recreational fishery for anglers of all ages.
- 4) Promote angling for available, but underutilized, species including bluegill, yellow bass and carp.
- 5) Continue to provide fishing information and promotional products and activities in cooperation with the City of Tempe to encourage fishing recreation at Tempe Town Lake.

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Appendix A. Species List. Common name, scientific name and species code, and Occurrence for fish species sampled, Tempe Town Lake 1999-2007.

Common Name	Scientific Name	Species Code Name*	Occurrence
Yellow bullhead	<i>Ameiurus natalis</i>	AMNA	Uncommon
Sonora Sucker	<i>Catostomus insignis</i>	CAIN	Uncommon
Goldfish	<i>Carassius auratus</i>	CAAU	Uncommon
Common carp	<i>Cyprinus carpio</i>	CYCA	Common
Israeli carp	<i>Cyprinus carpio</i>	CYCAIS	Abundant
Red Shiner	<i>Cyprinella lutrensis</i>	CYLU	Occasional
Threadfin shad	<i>Dorosoma petenense</i>	DOPE	Abundant
Mosquito fish	<i>Gambusia affinis</i>	GAAF	Occasional
Channel catfish	<i>Ictalurus punctatus</i>	ICPU	Common
Green sunfish	<i>Lepomis cyanellus</i>	LECY	Occasional
Hybrid sunfish	<i>Lepomis sp.</i>	LEHY	Occasional
Bluegill	<i>Lepomis macrochirus</i>	LEMA	Abundant
Redear sunfish	<i>Lepomis microlophus</i>	LEMI	Occasional
Inland silverside minnow	<i>Menidia beryllina</i>	MEBE	Uncommon
Largemouth bass	<i>Micropterus salmoides</i>	MISA	Abundant
Yellow bass	<i>Morone mississippiensis</i>	MOMI	Common
Rainbow trout	<i>Onchorynchus mykiss</i>	ONMY	Seasonally Abundant
Fathead minnow	<i>Pimephales promelas</i>	PIPR	Common
Black crappie	<i>Pomoxis nigromaculatus</i>	PONI	Occasional
Flathead catfish	<i>Pylodictis olivaris</i>	PYOL	Occasional
Tilapia (sp.)	<i>Tilapia spp.</i>	TISP	Occasional
Razorback sucker	<i>Xyrauchen texanus</i>	XYTE	Uncommon

* Species Code Name is derived from combining the first two letters of the genus name and the first two letters of the species name. Example - Common name: largemouth bass, Scientific name: **M**icropterus **s**almoides, Species Code Name: MISA.

Table 1. Town Lake March 2007 electrofishing and gill netting survey results by species, frequency and CPUE (catch per unit effort).

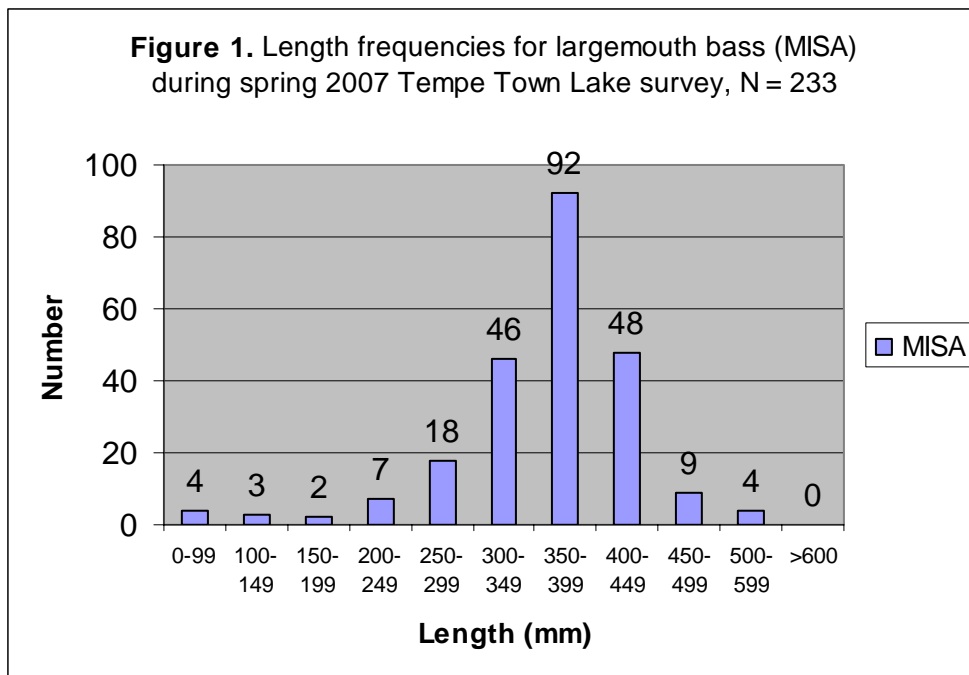
Species	Frequency (electrofishing)	CPUE total effort = 6.13 EFU	Frequency		CPUE total effort	
			(gillnetting)		= 16.69 NNU	
CAAU	1	0.2	-	-	-	-
CYCA	5	0.8	9		0.5	
CYCAIS	86	14.0	81		4.9	
DOPE	336	54.8	2,971		178.0	
LEMA	323	52.7	32		1.9	
LEMI	11	1.8	7		0.4	
ICPU	1	0.2	18		1.1	
MEBE	30	4.9	-		-	
MISA	179	29.2	55		3.3	
MOMI	69	11.3	30		1.8	
ONMY	-	-	82		4.9	
PYOL	-	-	1		0.1	
TISP	1	0.2	-		-	
TOTAL	1,042	170	3,286		196	

Table 2. Species, frequency and relative abundance of fish collected at Town Lake, March, 2007.

Species	Frequency	Relative Abundance (%)	
		Not including TFS	Including TFS
CAAU	1	< 1	<1
CYCA	14	1	<1
CYCAIS	167	16	4
DOPE	3,307	-	76
LEMA	355	35	8
LEMI	18	2	<1
ICPU	19	2	<1
MEBE	30	3	1
MISA	234	23	5
MOMI	99	10	2
ONMY	82	8	2
PYOL	1	<1	<1
TISP	1	<1	<1
TOTAL	4,328	100	100

Table 3. Length frequencies for fish measured spring 2007, Tempe Town Lake.

Length mm	CYCA	CYCAIS	DOPE	ICPU	LEMA	MISA	MOMI	ONMY
0-99			103		8	4		
100-149			55		65	3	47	
150-199			3		10	2		
200-249				1		7	3	22
250-299						18	5	51
300-349		2		7		46	2	2
350-399	1	46		3		92		1
400-449	3	41		6		48		
450-499	3	5				9		
500-599	4	1		1		4		
> 600	1	1		1				
Totals	12	96	161	19	83	233		



Graph 1. Catch per unit effort for largemouth bass during electrofishing 2004 – 2007 at Town Lake.

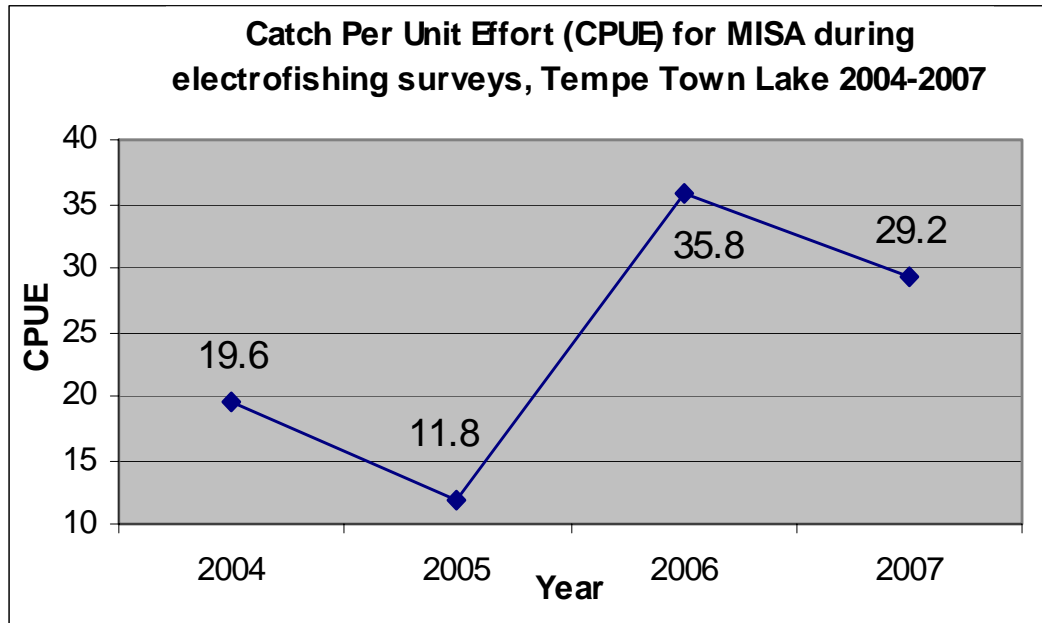


Table 4. Relative weights (W_r) for largemouth bass from electrofishing and gill netting surveys 2004 – 2007 at Town Lake.

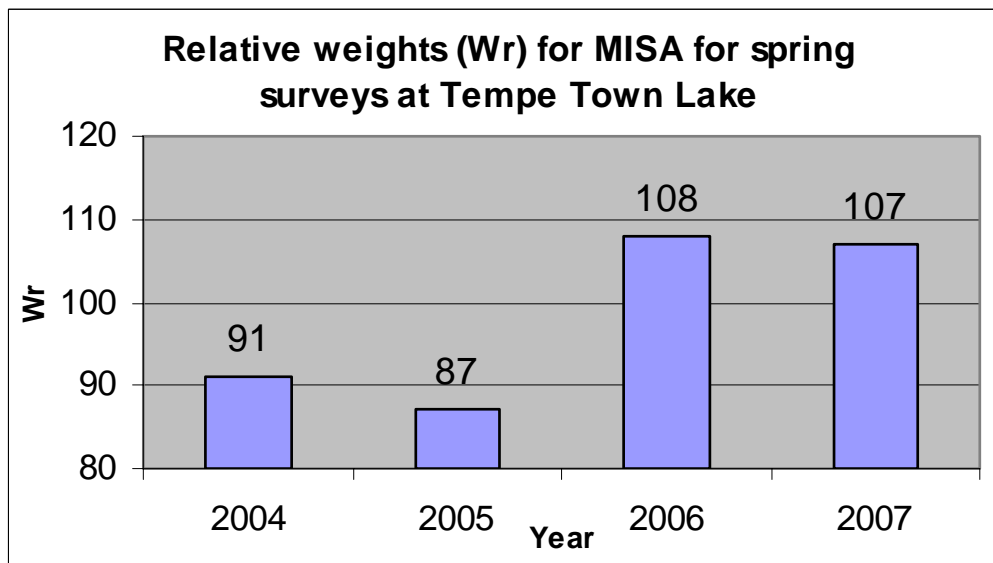


Table 5. Relative Stock Densities (RSD) for largemouth bass from electrofishing and gill netting surveys from 2004- 2007 at Town Lake. Value (Number measured)

	2004	2005	2006	2007
Stock ≥ 200 mm (8")	92 (184)	91 (71)	83 (204)	96 (221)
Quality ≥ 300 mm (12")	44 (81)	42 (30)	47 (96)	90 (198)
Preferred ≥ 380 mm (15")	22 (41)	21 (15)	18 (37)	42 (92)
Memorable ≥ 510 mm (20")	1 (1)	0	0	1 (1)

$$\text{RSD (\%)} = \frac{\text{\#fish} \geq x \text{ (mm)}}{\text{\#fish} \geq 200 \text{ mm (stock size)}} \times 100$$