



## Apache Lake Fisheries Management Plan 2020-2030

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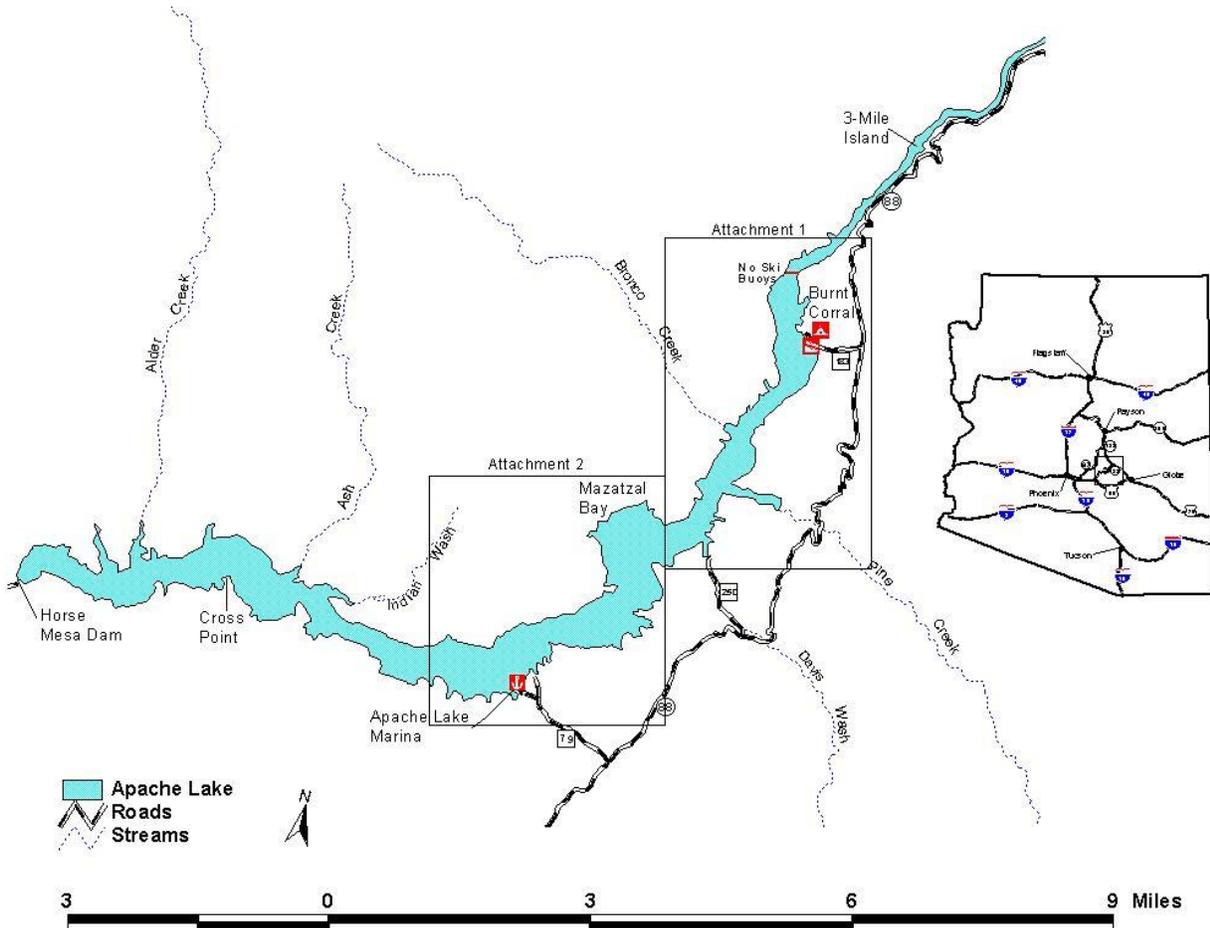
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Approved [  ] by Chris Cantrell *D. Andrew Clark* acting for Date: 9/1/2020  
Aquatic Wildlife Branch Chief

## Location

Apache Lake is located just below the Theodore Roosevelt Dam and is the second of four reservoirs on the Salt River. Apache Lake can be reached via State Route 88 (the Apache Trail) from State Route 188 near Roosevelt Dam.



**Figure 1.** Location map of Apache Lake in central Arizona.

## Management Prescription

The Arizona Game and Fish Department (Department) has developed approaches for coldwater and warmwater species management in Arizona under a Coldwater Strategic Vision Document (AGFD 2019a) and Warmwater Strategic Vision Document (AGFD 2019b). Using these approaches, fisheries management at Apache Lake will focus primarily on meeting Quality standards for Largemouth Bass *Micropterus salmoides* and secondarily to meeting Featured Species standards for Smallmouth Bass *Micropterus dolomieu* and Walleye *Sander vitreus*. Additionally, the lake will be managed for a seasonal Intensive Use Rainbow Trout fishery as described in the Department’s Coldwater Sportfisheries Strategic Vision Document.

Objective 1: Maintain a Largemouth Bass population to meet or exceed High Quality standards.

Objective 2: Maintain a Smallmouth Bass population to meet or exceed Featured Species standards.

Objective 3: Maintain a stocked Walleye fishery to meet or exceed Featured Species standards.

Objective 4: Maintain a seasonally (November to March) stocked Rainbow Trout fishery to meet or exceed the Intensive Use standards.

Objective 5: Maintain angler satisfaction at 80%.

Monitoring activities, including community-wide or species-specific electrofishing and gill net survey and angler creel surveys will be used to determine if aforementioned management objectives are being met. Guidelines to meet objectives are listed in Table 1 below.

**Table 1.** Apache Lake Objectives and Adaptive Management Strategies

Parameters	Objective Guideline	Trigger point to address unmet Objectives	Strategies if Objectives are not met
<b><i>Objective 1: Maintain the Largemouth Bass population to meet or exceed High Quality Concept standards as listed in the Warmwater Sportfisheries Strategic Vision Document.</i></b>			
Electrofishing Catch Rates	Spring electrofishing CPUE <sup>1</sup> ≥ 100 fish per hour.	Mean CPUE drops below 100 fish/hour for three consecutive surveys.  Mean CPUE drops below 10 fish/hour for a single sampling event.	<ul style="list-style-type: none"> <li>• Re-evaluate survey methods and equipment</li> <li>• Stocking</li> <li>• Regulation Changes</li> <li>• Re-evaluate Objective</li> </ul>

<b>Parameters</b>	<b>Objective Guideline</b>	<b>Trigger point to address unmet Objectives</b>	<b>Strategies if Objectives are not met</b>
Size Structure	PSD <sup>2</sup> between 40-70, PSD-P <sup>3</sup> between 10-40.	Three consecutive sampling events showing population below management guideline.	<ul style="list-style-type: none"> <li>• Re-evaluate survey methods and equipment</li> <li>• Stocking</li> <li>• Regulation Changes</li> </ul>
Angler Catch Rates	Angler CPUE <sup>1</sup> of no less than 0.5 fish per hour for anglers targeting Largemouth Bass.	Angler CPUE drops below 0.5 Largemouth Bass per hour for two consecutive creel surveys.	<ul style="list-style-type: none"> <li>• Stocking</li> <li>• Regulation Changes</li> <li>• Outreach/Education</li> </ul>
<b><i>Objective 2: Maintain a Smallmouth Bass population to meet Featured Species Concept standards as listed in the Warmwater Sportfisheries Strategic Vision Document.</i></b>			
Size Structure	Multiple age classes  PSD <sup>2</sup> between 30-60, PSD-P <sup>3</sup> > 10.	Three consecutive sampling events showing population below management guideline.	<ul style="list-style-type: none"> <li>• Re-evaluate survey methods and equipment</li> <li>• Regulation Changes</li> <li>• Stocking</li> </ul>
<b><i>Objective 3: Maintain a stocked Walleye Bass population to meet Featured Species Concept standards as listed in the Warmwater Sportfisheries Strategic Vision Document.</i></b>			
Size Structure	Multiple age classes	Three consecutive sampling events showing population below management guideline.	<ul style="list-style-type: none"> <li>• Re-evaluate survey method and equipment</li> <li>• Stocking</li> <li>• Regulation Changes</li> </ul>
<b><i>Objective 4: Maintain a seasonally (November to March) stocked Rainbow Trout fishery to meet or exceed the Intensive Use standards as listed in the Coldwater Sportfisheries Strategic Vision Document.</i></b>			
Angler Catch Rates	Angler CPUE <sup>1</sup> no less than 0.5 fish per hour for anglers targeting Rainbow Trout.	Angler catch rate drop below 0.5 fish per hour.	<ul style="list-style-type: none"> <li>• Adjust stocking rates</li> <li>• Regulation changes</li> <li>• Re-evaluate Objective</li> </ul>

<b>Objective 5: Maintain angler satisfaction at 80%.</b>			
Angler Satisfaction	Angler satisfaction in creel surveys >80%.	Angler satisfaction drops below 80% for two consecutive creel surveys.	<ul style="list-style-type: none"> <li>• Supplemental stocking</li> <li>• Adjust stocking rates/frequency</li> <li>• Habitat improvement</li> <li>• Outreach/Education</li> </ul>

<sup>1</sup> CPUE=Catch Per Unit Effort <sup>2</sup> PSD=Proportional Size Distribution <sup>3</sup> PSD-P = Proportional Size Distribution – Preferred

## Background

Apache Lake is located just below the Theodore Roosevelt Dam and is the second largest reservoir on the Salt River chain (Figure 1). Apache Lake was formed in 1927 by Horse Mesa Dam and is located 100 kilometers northeast of Phoenix. At full capacity, Apache Lake is approximately 27 kilometers long and has 67 kilometers of shoreline. The mean depth is 73 meters and has a maximum depth of 81 meters (Table 2). The land surrounding Apache Lake is managed by the Tonto National Forest and the aquatic species within the lake are managed by the Department.

Apache Lake is managed as a self-sustaining warmwater fishery with the primary emphasis on black bass, both Largemouth Bass *Micropterus salmoides*, and Smallmouth Bass *Micropterus dolomieu*. The lake also supports self-sustaining, fishable populations of Channel Catfish *Ictalurus punctatus*, Flathead Catfish *Pylodictis olivaris*, Yellow bass *Morone mississippiensis*, and Bluegill *Lepomis macrochirus*. Apache Lake also supports a seasonal put-and-take fishery for Rainbow Trout *Oncorhynchus mykiss* as well as a put-grow-and-take Walleye *Sander vitreus* fishery. In 2013, Apache Lake supported 128,295 angler use days (AUD) and ranked as the #9 most fished lake in Arizona according to results reported to the Department from an angler opinion survey (Fisheries Branch 2015).

## Productivity/Water Quality

The Department’s Aquatic Wildlife Branch water quality staff collects water quality data at Regional reservoirs. Parameter such as conductivity, sodium concentration, pH, secchi depth, and chlorophyll-a are measured.

### Conductivity

Specific conductivity at Apache Lake averages 1,400 µS/cm (Table 2). Typically, conductivities are lower in year with high runoff from the Salt River and higher in years with low runoff. Over the last few years, conductivities in the reservoir have averaged closer to 1,800 µS/cm during spring sampling due to poor winter precipitation and reduced runoff. During our most recent survey in April 2015, conductivity was measured to be 1885 µS/cm. These values are similar to

other lakes on the Salt River chain, but significantly higher than those of other lakes in the Region.

#### Sodium Concentration

Sodium concentration values averaged 210 mg/l.

#### pH

The pH values typically range from 8.2 to 8.4 representing an alkaline system. During our most recent survey in April 2015 pH was measured to be 8.45.

#### Thermal Stratification

Apache Lake exhibits thermal stratification during summer months. Depth of the thermocline varies between years, but typically occurs at a depth of around 25 – 30 feet. Dissolved oxygen levels below this depth are generally below 3.0 mg/L.

#### Productivity

A trophic state index (TSI), developed by Carlson (1977), was calculated to measure the lake's productivity. The TSI uses chlorophyll-a, total phosphorus, and secchi depth values to provide a single quantitative index for the purpose of classifying and ranking lakes. Trophic state index scores range from 0 for highly oligotrophic lakes to 100 for hypereutrophic lakes. Historical average data collected from Apache Lake produced a TSI value of 54. This classifies the lake as mesotrophic (Table 2).

#### Phytoplankton

Phytoplankton resources in Apache Lake have been poorly documented over the years. However, golden alga was first discovered in Arizona in 2005 and has since been identified in all four reservoirs along the Salt River on the Tonto National Forest. Golden alga has been documented to be the cause of several fish kills that have occurred in these reservoirs including Apache Lake. Under certain environmental stresses, golden algae produce a toxin that negatively affects gill-breathing species such as fish, mollusks, arthropods, and the gill-breathing stage of amphibians (Stewart et al. 2013). Fish kills linked to golden algae seem to increase as the measured conductivity rises above 1,500  $\mu\text{S}/\text{cm}$ . As stated above, conductivities are averaging 1,800  $\mu\text{S}/\text{cm}$  over the last 5 years suggesting management of this fishery will need to heavily consider golden algae. The Department continues to monitor all infected reservoirs, including Apache Lake, for the presence and concentration of golden alga, especially following any reported fish kill.

There is a fish consumption advisory for Largemouth Bass caught at Apache Lake. This advisory is the result of elevated levels of mercury found in the flesh of this species. Details of the advisory can be found in the Arizona Fishing Regulations booklet or at <https://azdeq.gov/fca>.

## **Forage/Prey**

#### Bluegill

Bluegill *Lepomis macrochirus* sunfish provide recreational angling opportunities and are an important forage fish for littoral predators at Apache Lake. Catch rates and length ranges for Bluegill are included in the species discussion later in the document.

## Shad

Apache Lake contains both Gizzard Shad *Dorosoma cepedianum* and Threadfin Shad *Dorosoma petenense*. Adult Gizzard Shad are able to reach large sizes and can outgrow gape limits of many predators. Threadfin Shad *Dorosoma petenense* adults are considerably smaller, rarely exceeding 6 inches in length. Threadfin are temperature sensitive and stress at temperatures below 45°F.

Gizzard Shad were first documented in Roosevelt Lake in 2007 and since have expanded their numbers to the point of having one of the highest densities of any fish species in that lake. Gizzard Shad were first detected in Apache Lake in April 2012, when 39 were collected between electrofishing and gill netting at a rate of 0.3 fish per hour and 0.1 fish per hour respectively (Jaeger 2012). In 2015, one Gizzard Shad was collected during electrofishing (0.2 fish per hour) and 95 during gill netting (0.44 fish per hour). Gizzard Shad had the highest catch per unit effort of any fish species caught in gill nets, slightly higher than the 0.38 fish per hour for Largemouth Bass (Dickens 2015). Monitoring will continue with gill nets to track changes in the population of Gizzard Shad and note any effects on sportfish communities in the lake.

## Zooplankton

The zooplankton resources at Apache have not been well documented. The most recent known study that looked at zooplankton resources in any fashion was conducted as part of a study to determine the limiting factors to crappie populations in the Salt River chain of lakes (Horton 1997). Horton (1997) noted that Apache Lake contained zooplankton that were larger than those in Saguaro and Canyon lakes but smaller than zooplankton in Roosevelt Lake. However, this study is 20 years old and Gizzard Shad are now present in Apache Lake. Zooplankton species composition, size, and density may have changed considerably since then. We should work with the Department's water quality program to develop a protocol for monitoring zooplankton resources to get a feel for how Gizzard Shad may be affecting them and any potential related impacts to sportfish populations.

## **Habitat**

Natural fish habitat consists of rock points, rock, coarse gravel, and mud or sand flats. Aquatic vegetation is severely limited in Apache Lake due to the steep sided nature of the reservoir, although aquatic macrophytes and cattails are present in some coves. Additional habitat includes man-made structures such as "Pisces Pyramids", "Catfish Houses" and old tires.

Apache Lake is an aging reservoir that has been impounded for almost 90 years. Much of the large woody debris has broken down and siltation has covered much of the substrate near the inflow areas of the reservoir. Artificial habitat would be beneficial to the sportfish populations in Apache Lake. The last habitat enhancement occurred in Apache Lake in November/December 2006. This project consisted of the building a total of 401 structures (pisces pyramids) made of 3 pallets formed into pyramid and weighted with concrete block or local rock (Warnecke 2007). Brush from a juniper thinning project was tied to the outside of the pyramid using zip ties to create more cover. This project is now almost 15 years old. No SCUBA surveys have been conducted to determine the status of these structures but should be considered. Future habitat enhancements are planned at all regional reservoirs and SCUBA surveys would help to prioritize where Apache Lake should be ranked in the list.

## Species

The major sportfish in Apache Lake include Largemouth Bass, Smallmouth Bass, Bluegill, Flathead Catfish, Channel Catfish, Yellow Bass, Walleye, and Rainbow Trout (seasonally). The primary forage species include Threadfin Shad, Gizzard Shad, and several species of sunfish *Lepomis* spp. Other species found in the lake include Bigmouth Buffalo *Ictiobus cyprinellus*, Smallmouth Buffalo *I. bubalus*, Black Buffalo *I. niger*, and Common Carp *Cyprinus carpio*.

The only special fishing regulation which applies to Apache Lake is:

Channel and/or Flathead Catfish: 5 combined per day, when taken by bow and arrow.

All other species in Apache Lake are managed under statewide regulations.

### Black Bass

Apache Lake contains two species of black bass: Largemouth Bass and Smallmouth Bass. Apache is one of the more popular black bass lakes in the region. In 2013, Apache Lake supported 128,295 angler use days (AUD's) and ranked as the #9 most fished lake in Arizona according to results reported to the Department from an angler opinion survey (Fisheries Branch 2015). Of the AUD's reported at Apache Lake, 103,496 were for warmwater species such as bass.

Fishing regulations are applied as one tool to manage for healthy fish populations, including black bass. The populations Largemouth Bass was severely reduced following golden alga related kills in the mid 2000's, while the Smallmouth Bass population was basically eliminated. Following the kill, supplemental stocking of both bass species occurred and a protective slot was placed on bass within Apache Lake starting January 1, 2009 to help aid recovery. The protective slot ranges were between 330 (13 inches) and 406 mm (16 inches), with a limit of harvesting one Largemouth/Smallmouth Bass within the slot and five fish outside the slot. The slot was left on for the remainder of the regulation cycle and was removed December 31, 2010 because the populations of both species had showed signs of recovery. Creel data collected concurrently with population sampling suggested that exploitation of bass was low. Currently, the statewide limit of six bass, either Smallmouth or Largemouth, in any combination, is the only regulations applied for bass on Apache Lake.

### *Largemouth Bass:*

Largemouth Bass is the dominant black bass species in Apache Lake. Apache Lake was first stocked with Largemouth Bass in 1941 and has been stocked periodically since then (Appendix A). Apache Lake has usually produced numerous stock size and preferred size Largemouth Bass over the past decades. However, declines in the Largemouth Bass population following golden alga related kills degraded the fishery in the late 2000's but have since shown a rebound. The Department collected DNA samples from Largemouth Bass in 2014 that indicated that 0% were pure Florida strain, 17 % were F<sub>1</sub>, 83 % were F<sub>x</sub>, and 0% were northern strain bass. Additionally, it was determined that 57% of the alleles were from Florida strain and 43% were from northern strain Largemouth Bass.

Electrofishing catch rates for Largemouth Bass declined greatly following golden alga related fish kills in 2004 and 2005. Spring electrofishing catch rates began to increase again following supplemental stockings between May 2008 and June 2009, with catch rates increasing each year between 2008 and 2012. Catch rates (fish per hour) were 7.5 in 2008, 14.7 in 2009, 26.2 in 2010, and 129.0 in 2012. However, electrofishing CPUE has declined since the peak in 2012 with catch rates of 33.7 in 2015, 62.3 in 2017, and 23.0 in 2018. Smaller golden algae related fish kills have been occurring each year since about 2015 which may explain the variable CPUE during sampling. The Department will continue to use electrofishing as the primary tool for monitoring the Largemouth Bass population. The mean relative weight ( $W_r$ ) of Largemouth Bass from electrofishing declined slightly from 102.0 in 2008 to 98.1 in 2012 (Table 3). The 2015 survey noted another slight decrease in  $W_r$  to 90.7 but our most recent survey in 2018 noted an increase to 97.0 (Table 3). However, mean relative weights from gill netting have been greater than 98 over the last 5 surveys (Table 3). Current relative weights do not suggest a problem with available forage for Largemouth Bass.

The Department will manage the Largemouth Bass fishery in Apache Lake under a High Quality approach as outlined in the Departments Warmwater Strategic Vision Document (AGFD 2019b). This concept strives to achieve spring electrofishing catch rates of >100 fish per hour. The approach also strives to meet a PSD between 40-70 and a PSD-P between 10-40 recommended by Gabelhouse (1984).

The previous three electrofishing surveys have all been below the target for catch rates for Largemouth Bass, triggering the stocking of roughly half a million sac fry in 2019 and a planned fingerling stocking in the spring of 2020. The most recent spring 2018 electrofishing survey produced a PSD of 96.7, a RSD-P of 37.7 with PSD being well over target but RSD-P being in the recommended range. The supplemental stockings of Largemouth Bass should help bring the PSD back to within target.

#### *Smallmouth Bass:*

Smallmouth bass were first stocked in Apache Lake in 2007 (Appendix A) with the original population likely resulting from dispersal from Roosevelt Lake. The population is self-sustaining and has rebounded well following golden algae related kills. Sampling data from electrofishing is limited for Smallmouth Bass given their preference for deeper, rock and bolder type habitat. For this reason, future surveys will continue to use both electrofishing and gill nets to sample the population.

Mean spring electrofishing catch rates (fish per hour) for Smallmouth Bass were 3.44 in 2008, 1.45 in 2009, 0.28 in 2010, and 5.50 in 2015, 6.05 in 2017, and 0.18 in 2018. Similar results were noted for gill net catch rates (fish per hour) with rates of 0.05 in 2008, 0.01 in 2009, and 0.03 in 2010 increasing to 0.10 in 2012 and 0.13 in 2015, and then declining to 0.05 in 2017. These data suggest that the Smallmouth Bass population had rebounded, at least somewhat, following golden alga related fish kills. However, electrofishing catch rates declined sharply in 2018 following the most recent golden algae kills.

Mean relative weights for Smallmouth Bass were greater than 90 from both electrofishing and gill netting between 2008 and 2012 (Table 3). Relative weights from electrofishing and gill netting dropped to 89.7 and 88.9 respectively during the 2015 survey and were not calculated in 2018 due to too few fish being collected. We will continue to monitor the relative weights of Smallmouth Bass to see whether increasing numbers of Gizzard Shad may be contributing to any future declines.

#### *Rainbow Trout:*

Rainbow trout are stocked between November and March at Apache Lake to create a seasonal fishery for this popular species. Due to the difficulty in accessing Apache Lake, it is only stocked on a monthly basis. Although they are only stocked seasonally, they account for 35% of the sportfish harvest (Stewart et al. 2013). Additionally, a report compiled for Fisheries Branch (2015) estimated Apache Lake supported 24,799 AUD's from trout fishing. We recommend continuing season stocking of Rainbow Trout and managing for an angler catch rate of 0.5 fish per hour for anglers targeting Rainbow Trout. However, this target may be difficult to obtain due to the infrequency of stocking and the relative lack of trout available from state hatcheries during winter months.

#### *Walleye:*

Walleye are a popular sportfish that are stocked opportunistically at Apache Lake. The Department receives excess Walleye sac fry from other state agencies when available and stocks them to create a put-grow-and-take fishery. Walleye have come from Colorado, Kansas, and most recently Utah. However, availability has been sporadic and as such so have the catch rates for Walleye. Monitoring for Walleye occurs in the springtime using gill nets. Catch rates for Walleye are variable (Figure 2) and are usually higher 3 years post stocking when Walleye become susceptible to gill nets. Recently the Department has only received Walleye an average of every three years. However, 2016 was the first year that we were able to obtain Walleye from the Utah Division of Wildlife Resources. Discussions with staff at the Springville Hatchery indicate that Utah may become a more reliable source of Walleye for Apache Lake. Currently, we are able to stock up to 2.6 million sac fry annually but have not exceeded 1.5 million. Regular stocking of Walleye would provide anglers more consistent catch rates and allow for the Department to collect more reliable data on angler catch and harvest to better managing Walleye stocking in the future.

#### *Yellow Bass:*

Yellow Bass are present in high densities at Apache Lake and could contribute more to the recreational fishery if anglers would target them. Catch rates for Yellow Bass have been increasing since golden alga related fish kills in the mid 2000's. Gill net catch per unit effort increased each year since 2008, peaking in 2012, and then showing a slight decline in 2015 (Figure 3). Gill net catch rates for Yellow Bass are the highest of any species in Apache Lake. In addition, Yellow Bass attain large sizes in Apache Lake. The PSD from our 2015 survey was 97.0, while the RSD-P was 88.2 and the PSD-M was 30.0. Although no trophy size Yellow Bass were collected the total number of memorable size fish in Apache Lake is impressive. Although Yellow Bass accounted for 23.9% of the fish harvested at Apache Lake during a recent creel census, only 2.9%

of the anglers stated that they were specifically targeting Yellow Bass (Stewart et al. 2013). The Department should do more to highlight this outstanding fishery.

### Catfish

Apache Lake contains two species of catfish: Flathead Catfish and Channel Catfish. Although popular recreational sportfish in Arizona we are not proposing any management objectives for catfish in Apache Lake at this time. The Region is currently focusing on four other reservoirs as High Quality or Fat Cat waters and does not have the resources to monitor any other reservoirs for catfish at current staffing levels.

#### *Flathead Catfish:*

Flathead Catfish are a popular recreational sportfish in Apache Lake. Recently the new state record Flathead Catfish, weighing over 76 pounds, was caught in Bartlett Lake. This has put Arizona in the National spotlight as a destination for Flathead Catfish angling.

Flathead Catfish data collected at Apache Lake are secondary to data collected during surveys primarily focused on Largemouth Bass. Catch rates for Flathead catfish vary between years but are typically low. Our most recent survey in spring 2018 collected 19 (3.4 fish per hour) Flathead Catfish via electrofishing. Too few Flathead Catfish were collected to merit running anything other than catch per unit effort for the species.

#### *Channel Catfish:*

Channel Catfish are omnivorous, feeding on a wide variety of organic matter, dead and alive. Some of the more common foods are fish, mussels, snails, insects and crayfish. Electrofishing catch rates for channel catfish have remained inconsistent over the last five surveys. In 2018, we only captured one Channel Catfish in 5.6 hours of electrofishing effort. Therefore, no statistics were calculated for Channel Catfish in 2018.

#### *Bluegill:*

Bluegill are an important prey species in Apache Lake and also contribute to the recreational fishery. Catch rates for Bluegill remained stable between 2008 and 2009, showed a decline in 2010, and then increased dramatically between 2012 and 2017 (Figure 4). During the 2018 spring electrofishing survey 211 Bluegill were sampled at a rate of 37.9 fish per hour which was a sharp decline from the previous year but still the third highest over the last 10 years. While Bluegill catch rates were still relatively high, most of the Bluegill were less than 150 mm (6 inches) long (Figure 5), and would not be of harvestable size for the typical angler but would be forage for predatory sportfish. We are not proposing any management objectives for Bluegill at this time.

#### *Undesirable or Invasive Species:*

Quagga mussels *Dreissena bugensis* were first detected in central Arizona in Lake Pleasant in 2008. Since that time, adult quagga mussels have become widespread throughout small ponds and lakes in the Phoenix metro area and have adults have been recently documented in the Canyon

Lake. Apache Lake has tested positive for quagga mussels but adults have not yet been documented. Due to the popularity of Apache Lake and the other infected lakes, and their close proximity to each other, it is not surprising that quagga mussels have made it into Apache Lake. However, Apache Lake also has a pump back system from Saguaro Lake for power generation. This may also be a potential source for quagga mussel transfer. The Department has already taken on an aggressive campaign to prevent the spread of quagga mussels. The Region should work closely with AIS program to monitor Apache Lake for the detection of adult quagga mussels and any effects on fish populations.

### *Largemouth Bass Virus:*

Largemouth Bass Virus (LMBV) is the only virus known to cause a newly recognized lethal disease of wild Largemouth Bass. The disease usually occurs during the summer and typically affects adult fish (Grizzle and Brunner 2003). In largemouth bass signs of the disease may include increased blood flow and darkened skin, distended abdomen, bloated swim bladder, lesions in the membrane lining the body cavity, necrosis (burst cells resulting in inflammation) of gastrointestinal mucosa, pale liver, red spleen, red intestinal caeca, infected gills, lethargic swimming, decreased responsiveness, swimming at the surface and/or in circles, and difficulty remaining upright. Sores or lesions on the outside of the body are secondary and not caused by the actual viral infection (Kipp 2012). Apache Lake tested positive for LMBV in 2011. Although no declines have been directly attributed to LMBV the virus has been shown to cause mortalities in other states.

### **Access**

Apache Lake is accessible only by State Route 88. Until recently, access was either from Apache Junction or from State Route 188 near Roosevelt Dam. However, post fire flooding created large mudslides and boulder falls to occur on the section of road between Tortilla Flat and Apache Lake Marina forcing it to be closed. At this time it is unknown when that section of the road might reopen and access is now only possible via State Route 188 near Roosevelt Dam. Boat ramps are available at the Apache Lake Marina and Resort or at Burnt Corral. Apache Lake Marina and Resort (Resort) operates the boat ramp under a special use permit with the U.S. Forest Service Tonto National Forest (TNF) and charges a fee for access. The Burnt Corral boat ramp is managed by the TNF and requires a Tonto Pass to access. Shoreline access is limited but can be found at some of the washes between the Marina and Roosevelt Lake. These areas are also open to dispersed camping and provide access at no fee unless facilities are provided.

### **Catch**

The Department is proposing to manage Apache Lake under a High Quality concept for Largemouth Bass with an objective angler catch rate of 0.5 fish per hour when anglers are specifically targeting those species. Seasonally stocked Rainbow Trout will be managed under an Intensive Use concept for a catch rate of 0.5 fish per hour, but due to the infrequency of stockings this objective may be difficult to attain. The put-grow-and-take Walleye fishery and the Smallmouth Bass population will be managed under the Featured Species concept to provide fish of multiple size classes for anglers to catch. The most recent creel survey at Apache Lake (Stewart

et al. 2013) did not report angler catch rates so these data will need to be collected during our next creel survey.

## **Satisfaction**

An angler satisfaction of 80% is the established goal for this fishery. The most recent creel survey at Apache Lake (Stewart et al. 2013) did not report angler satisfaction. Angler satisfaction will need to be collected during our next scheduled creel survey.

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## Tables and Figures

**Table 2.** Physical and chemical characteristics of Apache Lake.

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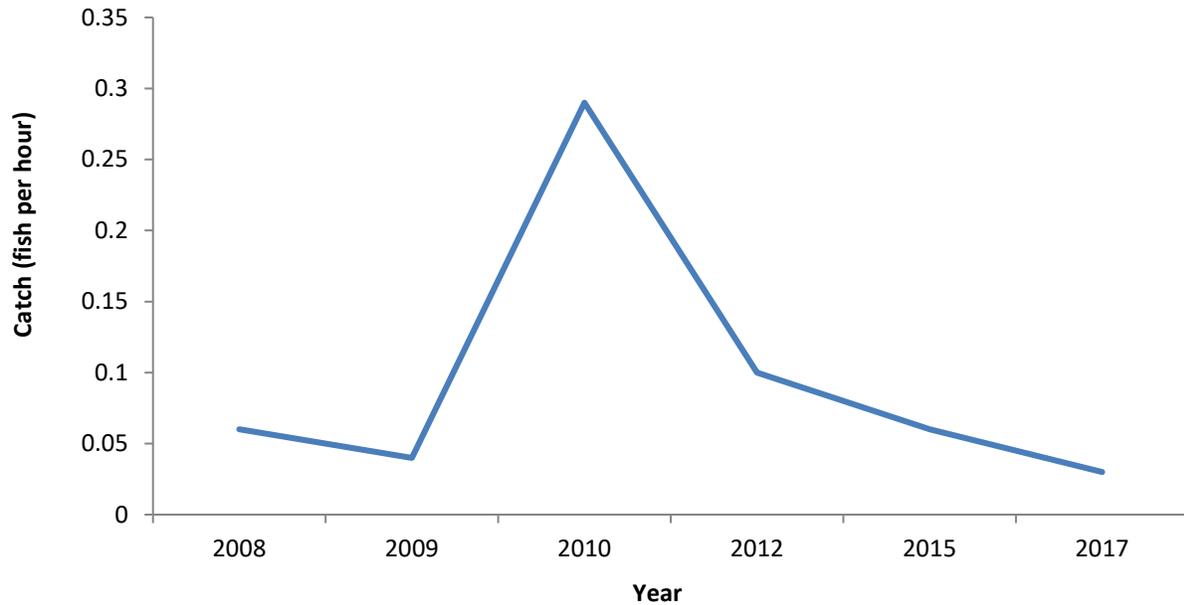
Management Agencies:	
Water Storage/Power production	Salt River Project (SRP)
Land Management	U.S. Forest Svc. – Tonto Natl. Forest
Aquatic Species Management	Arizona Game and Fish Department
Impoundment Date	1927
Watershed (main drainages)	
Salt River	11,152 square kilometers
Surface Area	1,039 ha
Length	27 kilometers
Shoreline	67 kilometers
Mean Depth	73 meters
Maximum Depth	81 meters
Secchi Depth Average	1.5 meters
pH Range	8.2 – 8.6 standard units
Conductivity Average	1400 $\mu$ mhos
Sodium Concentration Average	210 mg/l
Chl-a Average	11.1 $\mu$ g/l
Trophic Class	Mesotrophic

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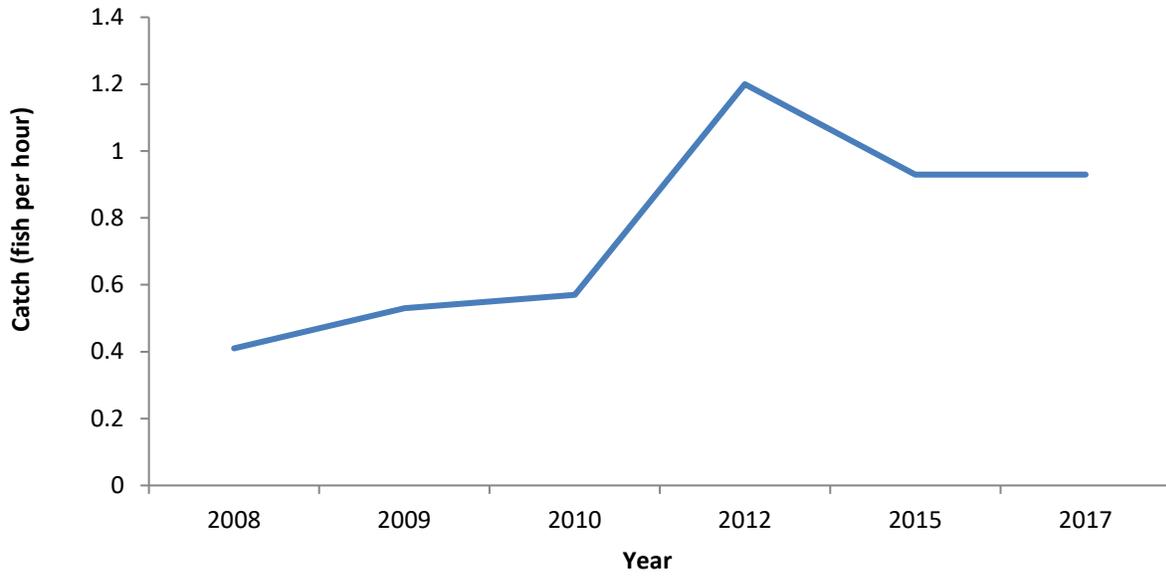
**Table 3.** Relative weights (Wr) for Smallmouth Bass and Largemouth Bass collected from Apache Lake between 2008 and 2018.

Year	Electrofishing				Gill Netting			
	Smallmouth Bass		Largemouth Bass		Smallmouth Bass		Largemouth Bass	
	Mean Wr	(N)						
2008	110.6	104	102	155	109.8	25	105.3	26
2009	108.8	38	97.4	410	94.3	13	106.7	42
2010	90.8	16	94.2	771	92.8	12	98.3	97
2012	95.8	63	98.1	952	99.5	23	103	123
2015	89.7	25	90.7	152	88.9	29	98.6	83
2017	a	20	86.4	245	a	12	a	44
2018	a	1	97.0	129	b	b	b	b

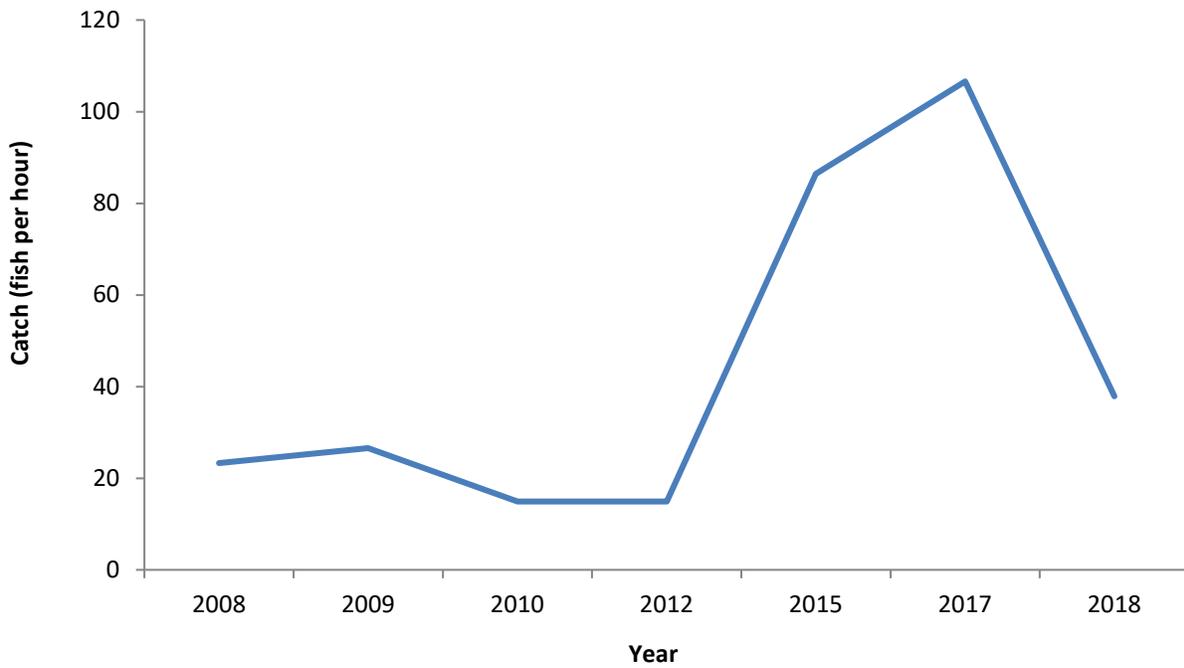
<sup>a</sup> = Not calculated for this survey <sup>b</sup> = Gear type not used for this survey.



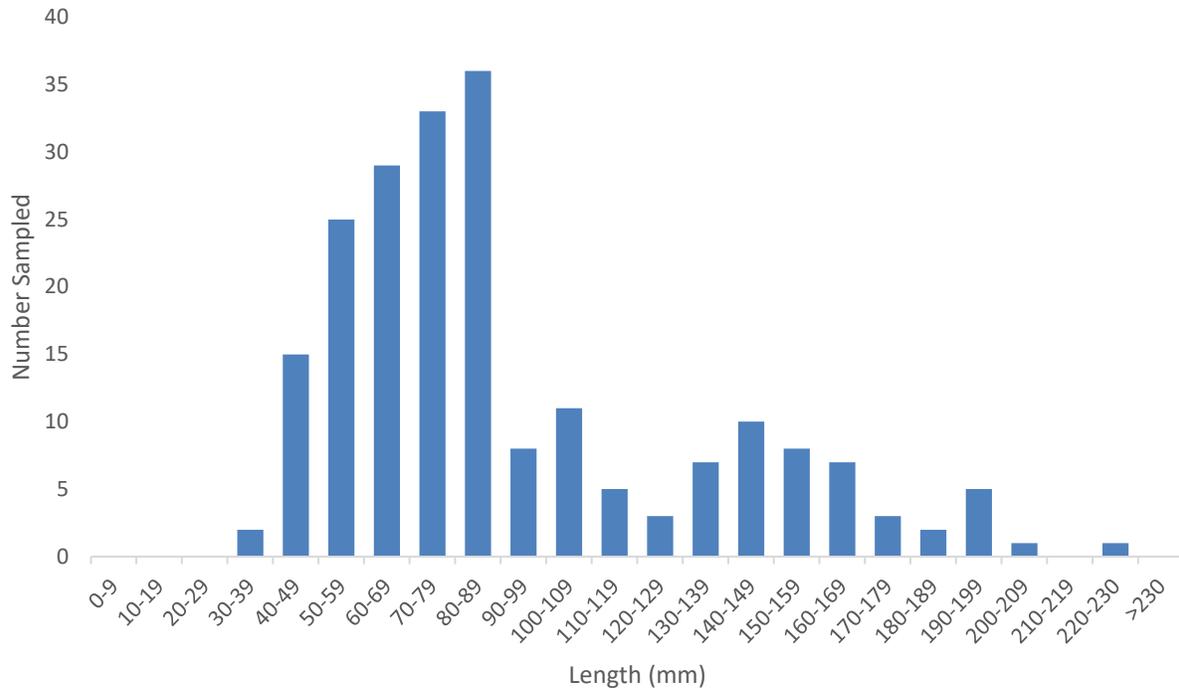
**Figure 2.** Spring gill net catch rates at Apache Lake for Walleye between 2008 and 2017.



**Figure 3.** Spring gill net catch rates at Apache Lake for Yellow Bass between 2008 and 2015.



**Figure 4.** Spring electrofishing catch rates at Apache Lake for Bluegill between 2008 and 2018.



**Figure 5.** Length frequency for Bluegill caught at Apache Lake in spring 2018.

## Appendices

**Appendix A.** Species, first and last year stocked, size (if known), number of stockings, and total number of fish stocked in Apache Lake from 1935 to 2014.

Species	1 <sup>st</sup> Year	Last Year	Size	# of Stockings	Total # Stocked
Black Crappie	1935	1935		1	300
Bluegill	1935	1954		13	321,050
Coho Salmon	1972	1972		1	25,000
Largemouth Bass	1935	2009	Fingerling/Subadult	33	408,574
Rainbow Trout		2014	Fingerling/Catchable	108	1,057,069
Redear Sunfish	1947	1953		2	36,900
Smallmouth Bass	2007	2008		4	8,726
Threadfin Shad	1957	1957		1	3,000
Walleye	1972	2014	Fry/Fingerling	26	8,342,931
Yellow Perch	1953	1953		1	5,824