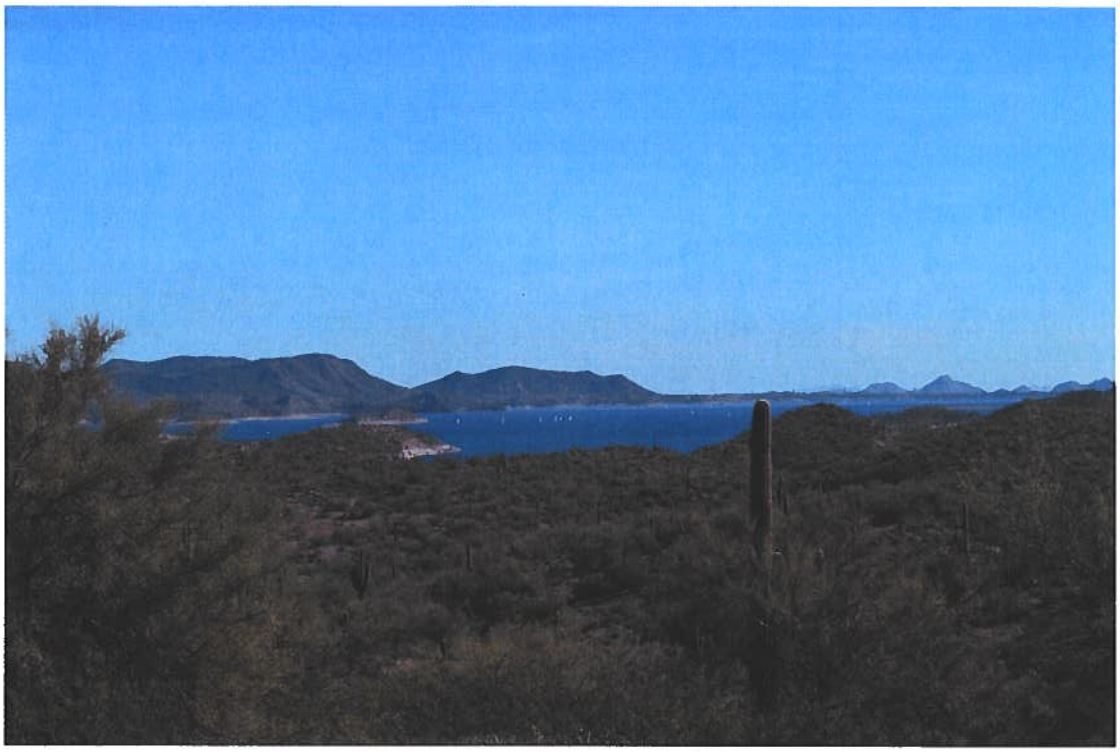

Lake Pleasant
Fisheries Management Plan
2019-2029

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Approved [X] by Chris Cantrell _____ Date: 6/29/19
Aquatic Wildlife Branch Chief

Location

Lake Pleasant is formed by the New Waddell Dam impounding the Agua Fria River approximately 31 miles northwest of Phoenix. Lake Pleasant can be reached from Carefree Highway/AZ-74 (Figure 1).

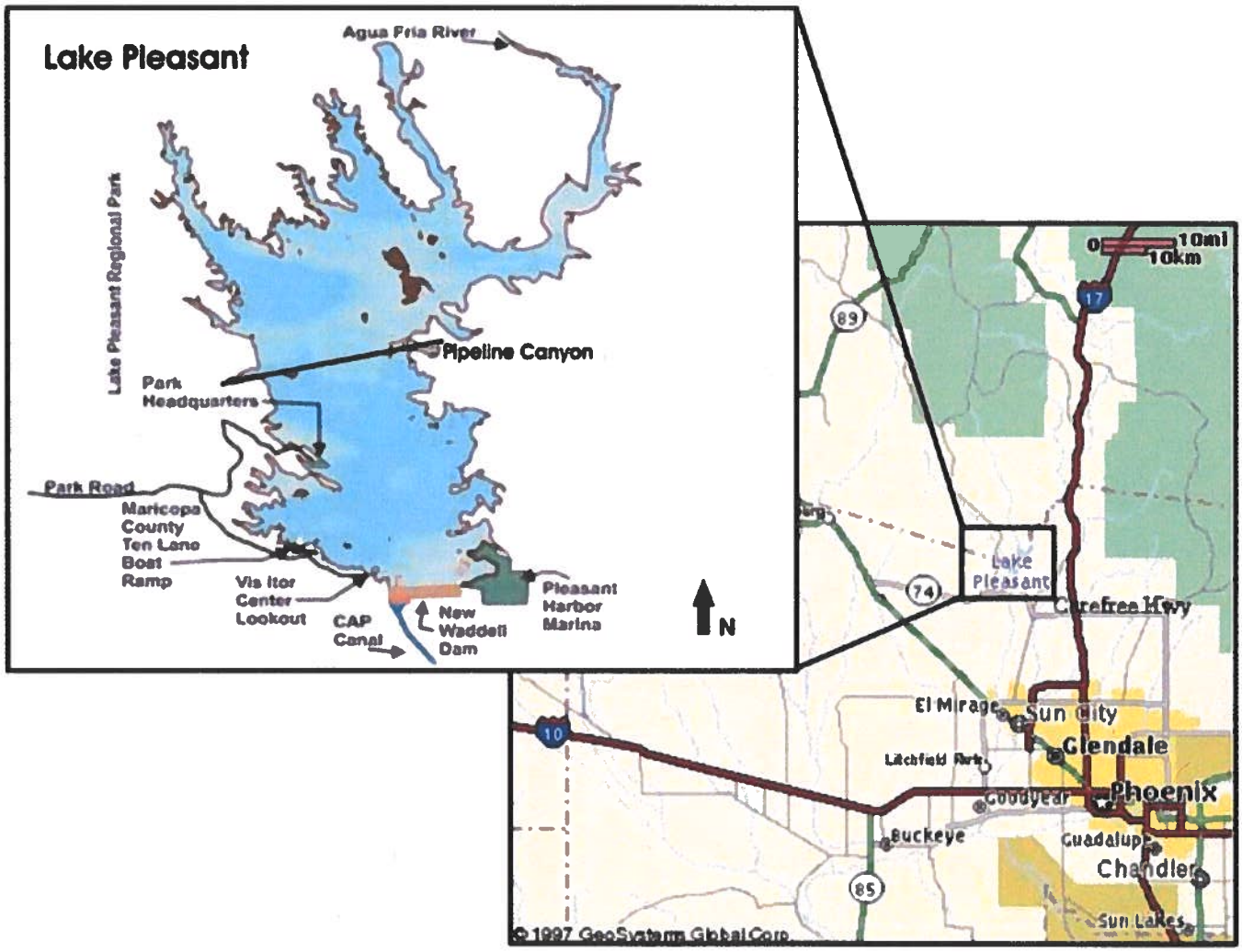

Figure 1. Location map of Lake Pleasant, Arizona.

Management Prescription

The Arizona Game and Fish Department (Department) has developed concepts under a Strategic Vision Document (AGFD 2019) to help guide warmwater fisheries management in Arizona. Using these concepts, fisheries management at Lake Pleasant will focus primarily on a General Opportunity Largemouth Bass *Micropterus salmoides* fishery, secondarily for Striped Bass *Morone saxatilis* as a Featured Species and thirdly on a Fat Cat opportunity fishery for Flathead Catfish *Pylodictis olivaris.* The lake also supports self-sustaining, fishable populations of White Bass *Morone chrysops*, Channel Catfish *Ictalurus punctatus*, Black Crappie *Pomoxis nigromaculatus*, White Crappie *Pomoxis annularis*, and Bluegill *Lepomis macrochirus*.

Objective 1: Maintain the Largemouth Bass population to meet or exceed General Opportunity Concept standards.

Objective 2: Maintain the Striped Bass population to meet the Featured Species Concept standard.

Objective 3: Maintain the Flathead Catfish population to meet or exceed Fat Cat Concept standards.

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

Table 1. Lake Pleasant Objectives and Adaptive Management Strategies.

Objective 1: Maintain the Largemouth Bass population to meet or exceed General Opportunity Concept standards as listed in the Warmwater Sportfisheries Strategic Vision Document.			
Parameters	**Objective Guideline**	**Trigger point to address unmet objectives**	**Strategies if Objectives are not met**
Electrofishing Catch Rates	Spring electrofishing catch rates ≥ 50 fish per hour.	Mean CPUE drop below 50 fish per hour for three consecutive surveys. Mean CPUE drops below 10 fish per hour for a single sampling event.	• Reevaluate survey methods and equipment • Stocking • Regulation Changes

Size Structure	Multiple Age Classes	Three consecutive sampling events showing population below management guideline.	• Reevaluate survey methods and equipment • Stocking • Regulation Changes
Angler Catch Rates	Angler CPUE of no less than 1.0 fish per hour for anglers targeting Largemouth Bass.	Angler CPUE drops below 1.0 Largemouth Bass per hour for two consecutive creel surveys.	• Stocking • Regulation Changes • Outreach/Education
Objective 2: Maintain the Striped Bass population to meet Featured Species Concept standards as listed in the Warmwater Sportfisheries Strategic Vision Document.			
Size Structure	Multiple Age Classes	Three consecutive sampling events showing population below management guideline.	• Reevaluate survey methods and equipment • Regulation Changes
Objective 3: Maintain the Flathead Catfish population to meet or exceed Fat Cat Concept standards as listed in the Warmwater Sportfisheries Strategic Vision Document.			
Electrofishing Catch Rates	Fall electrofishing catch rates ≥ 10 fish/hour.	Three consecutive surveys with <10 fish/hour.	Consider bag or length limits changes for Flathead Catfish
Size Structure	Greater than 15% of the total catch of Flathead Catfish is greater than 34 inches.	Three consecutive sampling events showing population below management guideline.	• Reevaluate survey method and equipment • Stocking • Regulation Changes

Background

Lake Pleasant is a water storage reservoir located approximately 50 km (31 miles) northwest of Phoenix (Figure 1). The original dam was built in 1927 for the purpose of irrigation and water storage for Maricopa Water District. Increasing demands prompted the United States Congress to authorize the U. S. Bureau of Reclamation (USBR) to construct the Central Arizona Project (CAP) in 1968 (Public Law 90-537).

The purpose of the CAP is to transport water from the Colorado River to Central Arizona to meet increasing water demands. Since completion of New Waddell Dam (1992) and subsequent filling of Lake Pleasant in 1994, the reservoir has increased in size nearly three-fold; from 3,760 surface acres to 9,970 surface acres. The maximum storage capacity has increased from 157,600 acre-feet to over 1.1 million acre-feet (817,900 acre-feet at conservation pool). Shoreline distance increased from just over 50 miles to 114 miles. The original dam (Carl Pleasant Dam, and later named Waddell Dam) was once the largest multiple arch dam in the world, but is now dwarfed by the zoned earthfill New Waddell Dam that is nearly 1.4 km long and 134 m high.

Prior to construction of New Waddell Dam, the reservoir received the majority of its water input from the Agua Fria River and other small tributaries at the north end of the reservoir (Figure 2). Since becoming a regulatory storage reservoir, Lake Pleasant is now primarily filled by CAP water at the south end of the reservoir. Water is transported from the Colorado River (Lake Havasu) via the CAP Hayden-Rhodes aqueduct and Waddell Canal (Figure 3). A pumping-generating plant at the base of New Waddell Dam pumps water into Lake Pleasant during winter (November – April) and out of the reservoir during summer (June – October). The Agua Fria River and several other small tributaries continue to provide seasonal inflow in the upper portion of the reservoir, especially during spring runoff. Water levels are managed by CAP and are generally highest from January to March and lowest from August to October. The lowest water surface elevation was 1,633 feet in late September 2011 and highest in May 2005 at 1,702 feet. The planned elevation low water level for the next few years is approximately 1,653 feet depending on water demands and Colorado River shortages.

In 1983, a Fish and Wildlife Coordination Act Report (FWCA) was prepared for the construction and operation of New Waddell Dam at Lake Pleasant and submitted to the USBR in a letter dated December 9, 1983. This report identified specific drawdown recommendations to the USBR on operation of the reservoir. According to the report, the U.S. Fish and Wildlife Service (USFWS) recommended reservoir drawdown rates not to exceed 2 inches per day from April 1 through June 30. In response to receipt of the FWCA report, the USBR responded to the Regional Director of the USFWS with a letter dated Dec. 22, 1983. The letter identified the USBR mitigation commitments. They committed to reducing drawdown rates at New Waddell dam to 5 feet or less during March and the first two weeks of April. An evaluation of the reservoir operations since completion of construction indicates that the USBR has met their commitment in reducing drawdown to 5 feet or less in March and April (Figure 3). The reservoir has not declined more than 5 feet between March 1st and April 30th of any year (as indicated by the green triangles plotted on the secondary axis to the right) since this commitment was made. Maximum drawdown during this season has been 1.7 feet over the two months.

The land surrounding the lake is primarily managed by Maricopa County Parks and the Bureau of Land Management (BLM). Lake Pleasant Regional Park also increased in size with the creation of the larger reservoir. While the previous park had only one boat ramp, the new park has four multi-lane boat ramps. A full service marina, 675 picnic and camp sites, and a multitude of other amenities help make Lake Pleasant Regional Park one of the most visited parks in Arizona. The large, deep reservoir provides opportunities for water sports enthusiasts that were not previously available. The enlargement of the reservoir also increased the angling opportunities for the public by inundating vegetation and other structures, increasing the number of coves, and enhancing habitat.

The Department manages the fish species that occur in the lake. From December 15th to June 15th, an eagle closure prohibits boaters from reaching the upper end of the Agua Fria River via the main lake. The area above the closure provides prime spawning grounds for Striped Bass. Striped Bass tend to congregate in the Aqua Fria River arm during the closure. The Department in coordination with USBR and the BLM have worked to get more angler access without causing a negative effect to bald eagles. The joint effort has resulted in reopening the access road off of Table Mesa Road and constructing a primitive boat launch area that is open for a brief time period each spring allowing access to Lake Pleasant above the eagle closure.

In 2013, Lake Pleasant supported 349,144 angler use days (AUD) and ranked #2 among the most fished lakes in Arizona according to results reported to the Department from an angler opinion survey (Duda et al. 2014). The Departments intends that this Lake Pleasant Fisheries Management Plan becomes a living document that is used to guide future lake planning processes and decisions related to management of Lake Pleasant.

Productivity/Water Quality

Water quality as it relates to nutrients, oxygen, pH, clarity and many other parameters form the backbone to any fishery. Periodic measurements should be taken to ensure all parts of the food web from phytoplankton/zooplankton to the biggest fish all have what they need to flourish.

The water quality staff in the Aquatic Wildlife Branch collects water quality data at Regional reservoirs such as Lake Pleasant. Parameters such as conductivity, pH, secchi depth, and chlorophyll-a are measured (Table 2).

In addition, Stewart et al. (2007) did a detailed survey of water quality parameters in 2005 and 2006 as part of a broader study involving Striped Bass impacts to the Largemouth Bass fishery. A YSI 6920 Sonde and YSI 610 Display/Logger (YSI Yellow Springs, OH) was used to measure and record depth, temperature (°C), specific conductance ($\mu S \cdot cm^{-1}$), dissolved oxygen ($mg \cdot l^{-}1$), and pH at1-meter intervals at four different sites throughout the reservoir (Figure 5).

Thermal Stratification

Results indicated lake levels were generally highest from January to March and lowest from August to October. Surface temperatures varied dramatically from fall/spring to summer months during the study. Mean surface temperatures from the four water quality sites ranged from 12.04°C in January 2006 to 29.85°C in July 2005. A thermocline typically developed in April and would

remain stratified until October. Thermocline depths ranged from 6 m (19 feet) in April 2005 to 16 m (52 feet) in September 2006.

Dissolved oxygen levels at the surface were highest during March in both 2005 and 2006, 11.04 $mg \cdot l^{-1}$ and 12.30 $mg \cdot l^{-1}$ respectively. Dissolved oxygen levels were lowest during summer with July 2005 being the lowest at 6.56 $mg \cdot l^{-1}$. Average summer surface dissolve oxygen levels were significantly lower than fall and spring dissolved oxygen levels.

Conductivity

Surface conductivity ranged from a low of 0.561 $\mu S \cdot cm^{-1}$ in March 2005 to a high of 1.018 $S \cdot cm^{-1}$ in August 2004. In spring 2005, conductivity was lower than all other months during this study, likely due to heavy precipitation during that time period. Average conductivity since 2009 was 1,068umhos.

pH and Secchi Depth

Average surface pH levels ranged from a minimum of 7.63 in May 2005 to a maximum of 8.80 in March of 2006. Secchi disc depth ranged from 0.88 m in spring 2005 (Agua Fria River) to 10.50 m (Max's Point) in spring 2004. In 2005, Secchi depth was lower than that of 2004 and 2006. Mean Secchi depth in 2005 was 2.32 m (SE = 0.29) with March 2005 having the lowest Secchi depth of 1.38 m (SE = 0.29). The Water Quality Program has taken water quality periodically since 1998 and the average pH is 8.29 with a Secchi depth average of 4.0 meters.

Chlorophyll

Chlorophyll level ranged from 0.70 mg/l (fall 2006, Max's Point) to 13.04 mg/l (spring 2005, Agua Fria River mouth). Between years, 2005 mean chlorophyll levels (5.07 mg/l, SE = 0.84) were higher than 2004 (2.12 mg/l, SE = 0.42) and 2006 (1.98 mg/l, SE = 0.41). Chlorophyll values have not been above 4.0 ug/l since 2000.

Turbidity

Turbidity levels ranged from 0.45 Nephelometric Turbidity Unit (NTU) in spring 2004 (Waddell Dam) to 7.71 NTU in spring 2005 (Agua Fria River mouth). Turbidity levels in fall 2004 (4.63 NTU, SE = 0.96) and spring 2005 surveys (6.24 NTU, SE = 0.79) were higher than any other survey from August 2004 to November 2006.

Results of Striped Bass Water Quality Study

Striped Bass prefer water temperatures less than 25°C and dissolved oxygen levels greater than 2.5 mg/l. At site 4 (Agua Fria River), the number of meters within the water column that met the Striped Bass preferred water quality dropped considerably in summer with only 7 m (23 feet) of preferred water quality in June, 3 m (9 feet) in July, and 0 m in August. In addition, site 3 (Agua Fria River mouth) had 0 m of preferred water quality in August.

This survey has served as a baseline for water quality measurements directly tied to fish. A large need exists for the Department to more closely monitor water quality parameters at Lake Pleasant. The Department is currently exploring ways to repeat the measurements taken in this research study to monitor what has occurred over the last 10 years and determine the effects of Quagga Mussel *Dreissena bugensis* on water quality.

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. In 1975, the U. S. Environmental Protection Agency (EPA) classified the lake as eutrophic, nutrient rich and highly productive. Currently the lake is classified as oligotrophic based on the low nutrient (Phosphorus and Nitrogen) and chlorophyll levels. The invasion of Quagga Mussel into Lake Pleasant in the mid 2000's has without a doubt impacted productivity.

Phytoplankton

Phytoplankton (microscopic plant) resources in Lake Pleasant have been poorly documented over the years. EPA conducted a survey in 1975 and results indicated that out of three surveys (March, June, and November) November had the highest phytoplankton counts. Studies indicate Phosphorus is the limiting nutrient in the lake (EPA 1975 and Sawyer 2011). Sawyer's results also indicated phytoplankton abundance and biomass was low. The study identified that the community varied throughout the year and consisted of diatoms, euglenopids, cryptophytes, filamentous cyanobacteria and prymnesiophytes (Sawyer 2011). The study also noted that the appearance of pyrmnesiophytes in July and a corresponding decreased abundance of zooplankton (Sawyer 2011).

Zooplankton

The zooplankton (microscopic animal) resources at Lake Pleasant have not been well documented either. The most recent known study looked at zooplankton from March 2005 to May 2005 and showed the highest concentration (~15,000/m^3) in March and lowest concentration (~1,000/m^3) in May (Stewart et al. 2008). Sawyer (2011) found Lake Pleasant has a high zooplankton abundance and biomass that varied throughout the year. The Region VI Aquatic Wildlife Program will work with the Department's Water Quality Program to develop a protocol for monitoring phytoplankton and zooplankton resources. It will be important to begin to understand how Gizzard Shad and quagga mussel may be affecting the foundation of the food web and any potential related impacts to sportfish populations.

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

Forage/Prey

Threadfin Shad *Dorsoma petenense* are the primary forage fish in Lake Pleasant. Threadfin Shad adults are small, rarely exceeding 6 inches in length, making them ideal prey for predatory species like Largemouth Bass. Threadfin are temperature sensitive and stress at temperatures below 45°F. Temperatures in the upper water column have not been documented to ever fall below 45°F in Lake Pleasant. Threadfin Shad catch rates have been variable over recent surveys. Mean fall 2010, 2012, and 2014 electrofishing catch rates were 56.97, 173.07, and 32.99 respectively. This variation in catch rates is not surprising as shad school in large balls and electrofishing may or may not effectively sample these schools. Stewart et al 2008 calculated the mean energy densities for

four prey species using data from literature reviews (Table 3). This table again reinforces the importance of Threadfin Shad as a prey species.

Gizzard Shad *Dorosoma cepedianum* were first documented in Lake Pleasant in 2016. Studies have shown that Gizzard Shad have effects on sportfish populations through direct competition at the larval stage and through a reduction in prey as they quickly outgrow the gape size of most sportfish and lock up nutrients in unavailable biomass (Sublett et all 1990, Garvey and Stein 1998, DeVries and Stein 1992). The Department will continue to monitor Gizzard Shad in Lake Pleasant and document any effects on sportfish communities.

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

Habitat

Natural fish habitat consists of rock points, rock, coarse gravel, and mud or sand flats. Aquatic vegetation is minimal in the lake. The most recent habitat enhancement project was conducted in 1986 (Warnecke 1986). Habitat enhancement consisted of 10-15 Christmas trees bundled with 29 gauge strand galvanized barbless barbwire anchored with cements and/or cinder blocks. A total of 4,380 Christmas trees were placed in the lake at four different sites (Warnecke 1986). Lake Pleasant is an aging reservoir that has been impounded for over 90 years and over 20 years since it was expanded. 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 Lake Pleasant. Future habitat enhancement would be beneficial and the Department is working on getting compliance completed to install artificial structures into the lake. Currently there is no timeline set for installing additional structures.

Species

The fish species present in Lake Pleasant include Largemouth Bass, Flathead Catfish, Channel Catfish, Common Carp *Cyprinus carpio*, White Bass, Striped Bass, Threadfin Shad, Gizzard Shad, Green Sunfish *Lepomis cyanellus*, Bluegill, Redear Sunfish *Lepomis microlophus*, Tilapia *Tilapia spp.*, Golden Shiner *Notemigonus crysoleucas*, Red Shiner *Cyprinella lutrensis*, White Crappie, and Black Crappie.

There is currently one special regulation at Lake Pleasant that provides an unlimited take for Striped Bass. All other species are managed using statewide general daily bag limits.

<u>Black Bass and Temperate Bass</u>

Lake Pleasant contains one species of black bass and two temperate bass species; Largemouth Bass, Striped Bass, and White Bass, respectively. Due to the proximity to the valley, Lake Pleasant bass fisheries are very popular. In 2013, Lake Pleasant supported 349,144 angler use days (AUD) and ranked as the #2 most fished lake in Arizona according to results reported to the Department from an angler opinion survey (Duda et al. 2014).

Fishing regulations are one tool to manage for healthy fish populations, including bass. Prior to the CAP and introduction of Striped Bass, Lake Pleasant supported a premier Largemouth Bass fishery. Fisheries managers have been concerned that the Striped Bass population will eliminate the primary prey source for Largemouth Bass. Recommendations from the 2008 Striped Bass research study included promoting the Striped and White Bass fisheries and continual monitoring of the bass populations (Stewart et al. 2008).

Largemouth Bass:

Largemouth Bass were first stocked into Lake Pleasant in 1941. Three fall electrofishing surveys have been completed in the last 10 years. Catch rates ranged between 37 and 87 fish per hour (Figure 6). Mean relative weights have fluctuated between 85 and 92 (Dickens 2014). A healthy population will have a relative weight above 100 (Wege and Anderson 1978). Since surveys at this lake have been conducted in the fall it could explain the lower than average relative weight. Future Largemouth Bass electrofishing surveys will be conducted in the spring to more easily compare to regional, state, and national electrofishing data.

The Department will manage the Largemouth Bass fishery in Lake Pleasant under a General Opportunity Concept. This concept calls for spring electrofishing catch rates of $\geq$ 50 fish/hour and angler catch rates of 1.0 fish per hour for those anglers targeting Largemouth Bass. The most recent fall 2014 electrofishing survey produced a CPUE of 47.1 fish/hour, just under this target (Dickens 2014). However, this was a fall survey and future surveys will be in the spring.

The most recent creel survey was conducted at Lake Pleasant in 2015/2016 (Jones 2018). Under the General Opportunity concept we are targeting angler catch rates of 1.0 fish/hour for those anglers targeting Largemouth Bass. The most recent creel survey results showed an angler catch rate of 0.06 fish/hour, well below this target.

Thirty samples of Largemouth Bass collected from Lake Pleasant were submitted to the A. E. Wood Laboratory in San Marcos, Texas in 2013 to determine the extent of introgression between Northern Largemouth Bass (LB) and Florida Largemouth Bass (FB). The results showed 68% of the alleles and 10% and the genotypes were derived from the FB linage. It is not fully understood why Florida bass alleles are that prevalent in the population. But it could partially explain why bass are a little harder to catch in Lake Pleasant. Pure Florida bass are known to be more selective in how they select food, and may not be as susceptible to angling with plastic baits. The Department will continue to consider the feasibility of stocking more Largemouth Bass into Lake Pleasant with the goal of improving angler catch rates.

Striped Bass:

Striped Bass were introduced into the lake after the completion of the CAP canal in 1992. Between 2004 and 2006 Striped Bass catch rates ranged between 0 and slightly below 0.6 fish per hour (Stewart et al. 2008). Recent surveys indicate catch rates for pelagic nets ranged between 0.36 to 1.01 fish per hour while electrofishing catch rates ranged between 11.53 to 20.22 fish per hour (Figure 7, Dickens 2014).

The Department will manage the lake for a Featured Species concept for Striped Bass to support recreational fishing. The goal is to maintain a Striped Bass fishery with multiple age classes of fish. The most recent survey conducted in fall 2014 indicated that the Striped Bass consisted of at least for age classes of fish (Dickens 2014). Lake Pleasant currently meets our management objective for Striped Bass.

White Bass:

White Bass were first stocked into the lake in 1960. Very few White Bass have been caught during the fall pelagic net and electrofishing surveys over the last 10 years. During the Striped Bass research project 2004 to 2006 White Bass catch rates ranged between 0.2 and 0.6 fish per hour (Stewart et al. 2008). Surveys were completed in August, November, and February. Current surveys lack the necessary information to evaluate the White Bass fishery at Lake Pleasant. Future surveys should target White Bass using boat electrofishing in the Agua Fria arm during spawning in the spring.

Sunfish

There are five sunfish species in Lake Pleasant including; Black Crappie, White Crappie, Bluegill, Green Sunfish, and Redear Sunfish. Bluegill is currently the most abundant sunfish species whereas Black Crappie have the highest harvest rates (Jones et al. 2018 in draft).

Bluegill:

Bluegill were first stocked into the lake in 1941. Recent surveys have shown an increase in catch rates since 2010 (Figure 8, Dickens 2014). Surveys have shown an increase in the number of stock Bluegill, however there are very few Bluegill in the quality and above size (Dickens 2014). Future surveys should continue to monitor the Bluegill population. Habitat improvement projects will also be implemented, pending environmental compliance, to potentially increase the number of Bluegill in the quality and above size range.

Black Crappie:

Black Crappie were first stocked into the lake in 1965. The most recent surveys in the fall of 2010, 2012, and 2014 caught few Black Crappie in pelagic nets or electrofishing (Dickens 2014). Both survey methods are not very effective at capturing Black Crappie. The latest creel survey in 2015/2016 indicated Black Crappie comprised less than 1% of the total species caught (Jones et al. 2018 in draft). Future surveys using trap nets to target Black Crappie should be conducted in the fall in conjunction with the Flathead Catfish surveys.

White Crappie:

Prior surveys in the 1960's classified species as Crappie without distinguishing between Black Crappie and White Crappie. Most likely, White Crappie were stocked in the late 1960's with Black Crappie. Historical data from electrofishing surveys in 1975-1976 caught 2 White Crappie (Grabowski et al. 1984). Surveys conducted in the last 20 years have indicated very few White

Crappie (Stewart et al. 2008 and Dickens 2014). This could be due to inappropriate gear type to target crappie species or misidentification with Black Crappie. Future surveys should be conducted with trap nets in the fall to better understand the White Crappie population in the lake.

Redear Sunfish:

Redear Sunfish were most likely first stocked into the lake in 1948 when the Department stocked sunfish hybrids. Current surveys in the fall of 2010, 2012, and 2014 indicate a fluctuating population with electrofishing catch rates ranging between 1.72 and 5.97 fish per hour (Dickens 2014). The 2015/2016 Lake Pleasant creel survey indicated only one person caught a Redear Sunfish and they did not harvest it. This is most likely an under estimation of the number caught due to common misidentification. With the introduction of the invasive Quagga Mussels, there is a potential to see an increase in the number of Redear Sunfish along with an increase in the size of Redear Sunfish. Future surveys will monitor any trends through fish surveys and creel.

Catfish

Flathead Catfish:

The Department does not have a record of when Flathead Catfish were first stocked into the lake. Recently the Department has started to survey for Flathead Catfish in the fall to better understand the population and detect changes over time. Fall surveys were conducted in 2015 and 2016 and indicate a healthy population with catch rates of 28.2 to 95.5 fish per hour respectively (Dickens 2016). Flathead Catfish proportional stock density for preferred and greater was 21% in 2015 and 6% in 2016. The Department will manage the Flathead Catfish population at Lake Pleasant under the Fat Cat concept. Under this concept there is a target of 10 fish/hour of electrofishing. During fall surveys in 2015, 2016, and 2018 catch rates were 28.2, 95.5, and 65.9 fish/hour respectively. A second target under the Fat Cat concept is 15% of the electrofishing catch should be greater than 34 inches. During the 2015, 2016, and 2018 surveys 7.0%, 1.7%, and 2.9% of the Flathead Catfish collected were greater than 34 inches. While electrofishing CPUE has well exceeded the management target, the percentage of the catch greater than 34 inches falls well below the management target. Creating an upper slot limit to protect larger fish while allowing for the harvest of smaller fish may increase this percentage and help us achieve this target.

Channel Catfish:

Channel Catfish were first stocked into the lake in 1941. The most recent surveys in the fall of 2010, 2012, and 2014 caught few Channel Catfish in pelagic nets or electrofishing (Dickens 2014). Neither survey method is very effective at capturing Channel Catfish however. The latest creel survey in 2015/2016 indicated Channel Catfish comprised 3.8% of the total species caught and of those caught 40% were harvested. Overall, Channel Catfish are self-sustaining and there is no management recommendations at this time.

Undesirable or Invasive Species:

Adult Quagga mussels were discovered in Lake Pleasant in 2007. Inoculation of this aquatic

invasive species is assumed to have occurred in 2003 or 2004 as the age of the adults were somewhere between 3 and 4 years old. The effects of Quagga Mussels have not been adequately studied or measured to date, but the Department commits a large amount of resources into outreach and decontamination efforts to contain and prevent the spread of Quagga Mussels into other Arizona waters.

Gizzard Shad were first reported in the lake in 2015 and the Department first documented them in the lake in 2016 with a total of 99 Gizzard Shad captured with a mean gill net catch rate of 0.99 fish per hour. The most likely source of the introduced Gizzard Shad is the CAP canal due to the known population in Lake Havasu. The effects of Gizzard Shad have not been adequately studied or measured to date.

Access

Lake Pleasant is only accessible via Carefree Highway (AZ-74) or seasonally via Table Mesa Road, however it is very close to north Phoenix Metro area. The lake has three public boat ramps (Ten Lane, Castle Creek Arm, and a primitive ramp off of Table Mesa Road) and two private boat ramps. Shoreline access is good for a portion of the lake especially if you have a 4-wheel drive vehicle.

Catch

A recent comprehensive Creel Survey was done from June 2015 and continued through May 2016. The results can be found in Jones (2018).

Satisfaction

An angler satisfaction of 70% is the established goal for this fishery. The most recent creel survey conducted in 2015-2016 (Jones et al. 2018 in draft) indicated 66% of the anglers surveyed were satisfied with their fishing experience. A total of 1,400 surveys were conducted. The overall satisfaction is slightly lower than the goal of 70%; yet, still close enough that no management actions need to be taken at this time. The next angler survey in January 2021 should include angler satisfaction to indicate whether management actions should be taken. The survey should also include additional questions to evaluate what management actions would increase angler satisfaction.

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Tables and Figures

Table 2. Physical and chemical characteristics of Lake Pleasant.

Management Agencies: Water Storage/Power production Land Management Aquatic Species Management	Central Arizona Project (CAP) Maricopa County Arizona Game and Fish Department
Impoundment Date	1927
Surface Area	7,500 acres
Mean Depth	21 meters
Surface Elevation	520 meters
Secchi Depth Average	4.0 meters
pH Average	8.29 standard units
Conductivity Average	1068 µmhos
Chlorophyll-a	<3.0

Table 3. Mean energy densities for four prey species taken from literature (Stewart et al. 2008).

Prey	Mean Energy Density	Source
Threadfin Shad	5,450 J/g	Eggleton and Schramm 2002
Crayfish	3,529 J/g	Roell and Orth 1993, Kelso 1973, Eglleton and Schramm 2002
Invertebrates	2,944 J/g	Cummins and Wuychuck 1971
Other Fish	4,766 J/g	Miranda and Muncy 1991, Bryan et al 1996

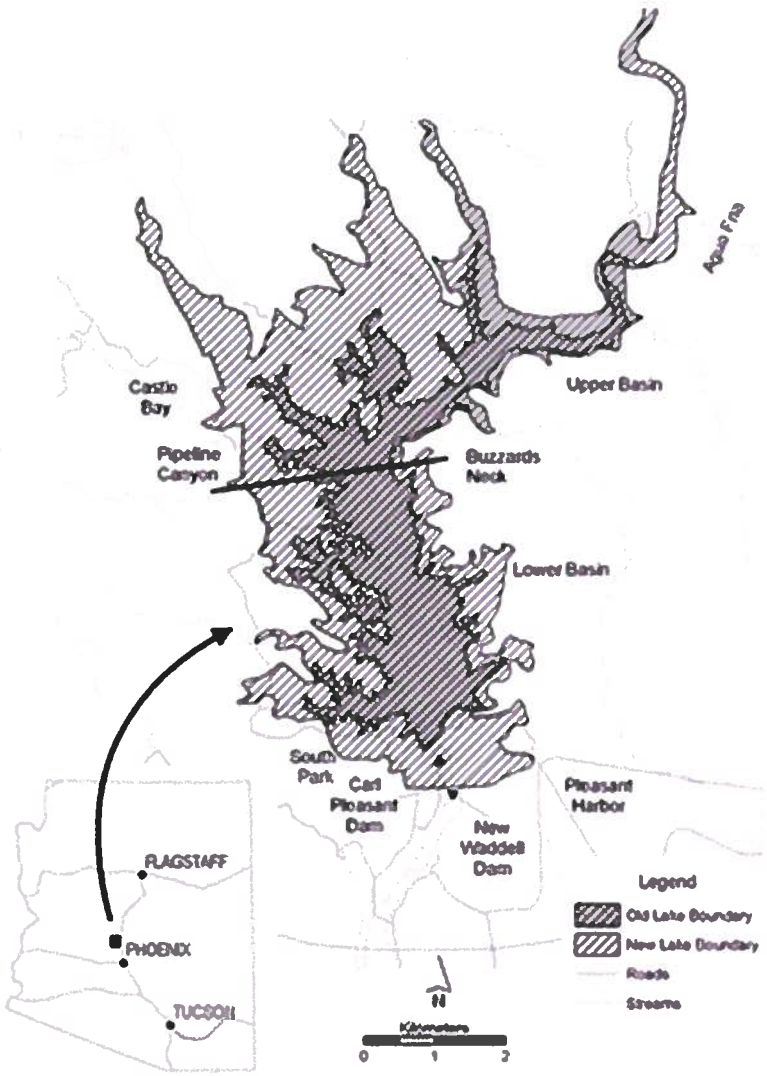

Figure 2. Map of Lake Pleasant before and after the construction of New Waddell Dam. The line from Pipeline Canyon to Buzzards Neck divides the upper and lower basin.

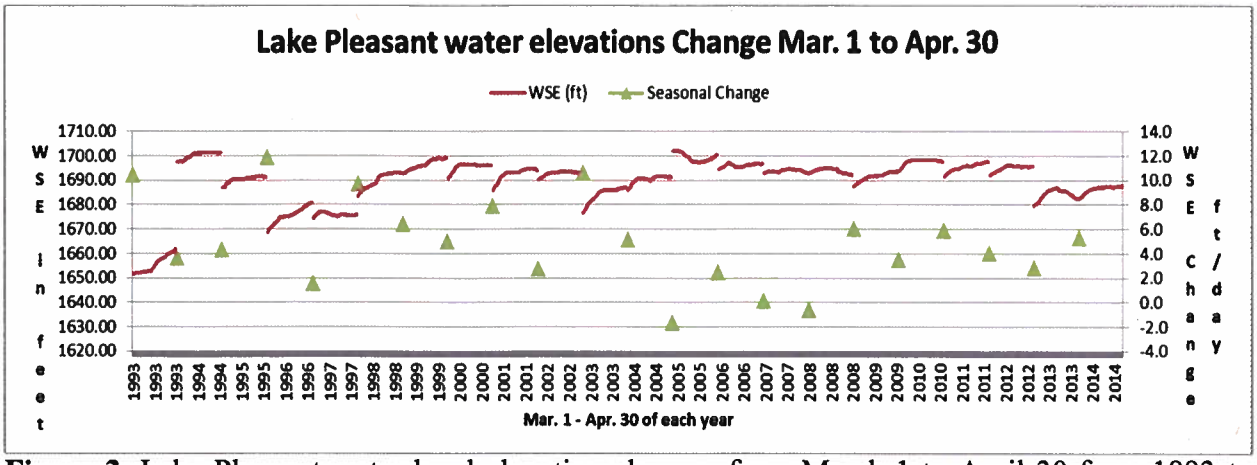

Figure 3. Lake Pleasant water level elevation changes from March 1 to April 30 from 1993 to 2014. Water level in feet is indicated by a red line with seasonal change indicated by a green triangle.

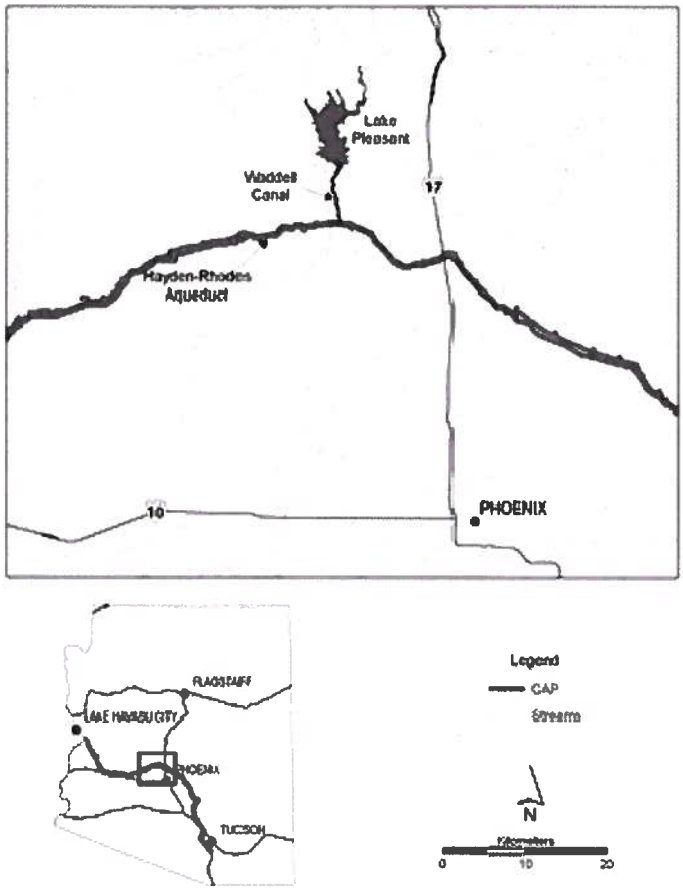

Figure 4. Map of the CAP canal system, including the Regulatory Storage Unit, Lake Pleasant.

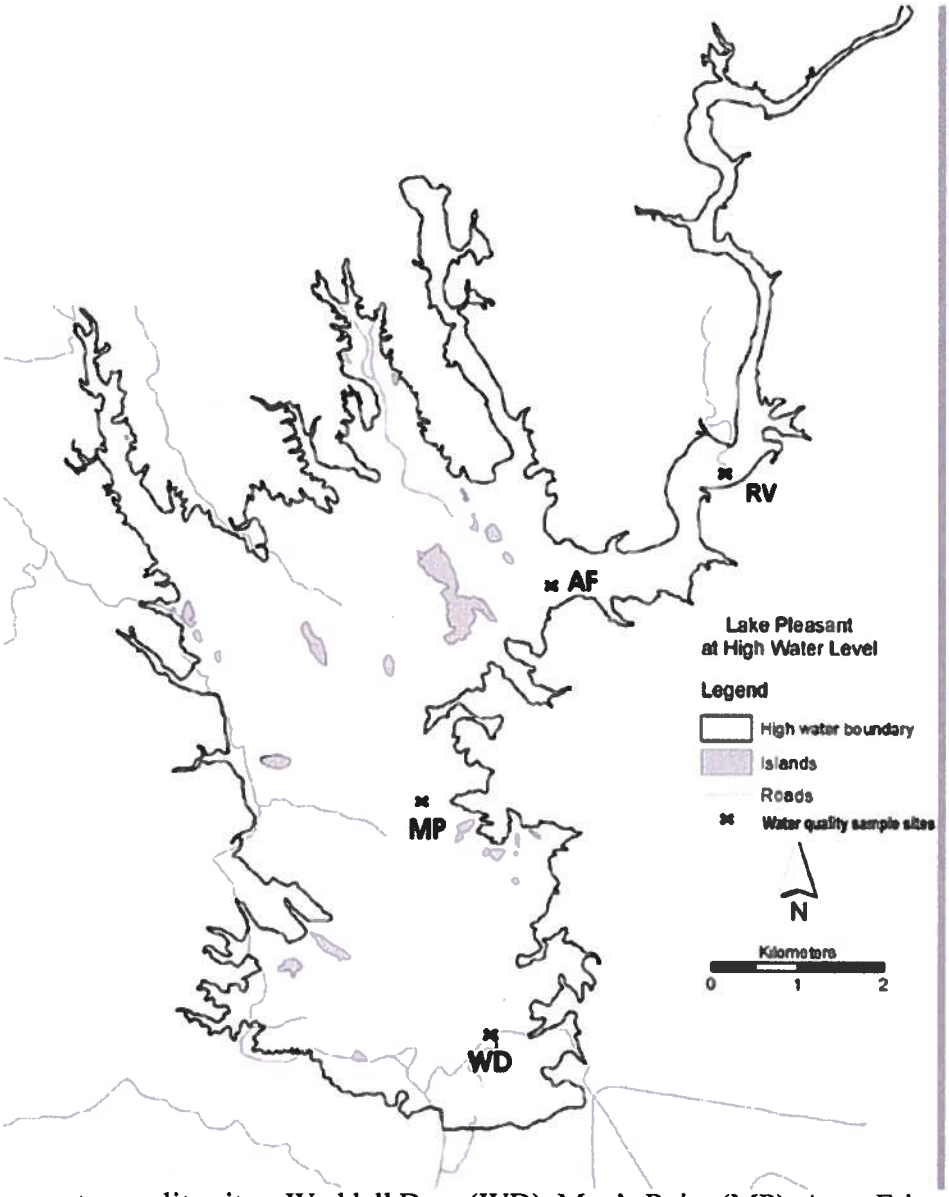

Figure 5. Four water quality sites: Waddell Dam (WD), Max's Point (MP), Agua Fria mouth (AF), and Agua Fria River (RV).

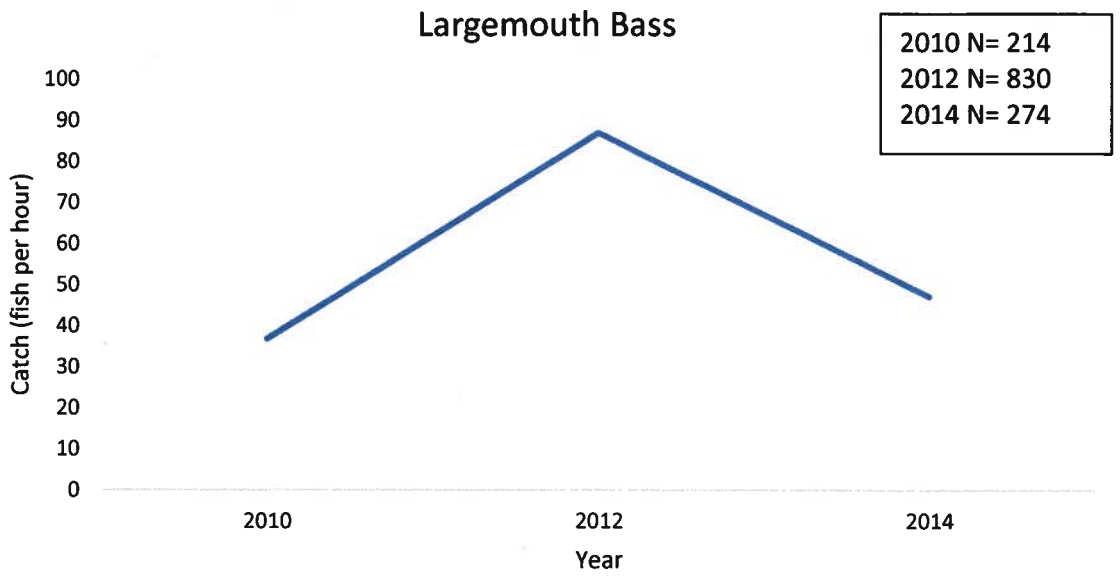

Figure 6. Largemouth Bass mean electrofishing catch rates in Lake Pleasant during fall 2010, 2012, and 2014 surveys. N is sample size.

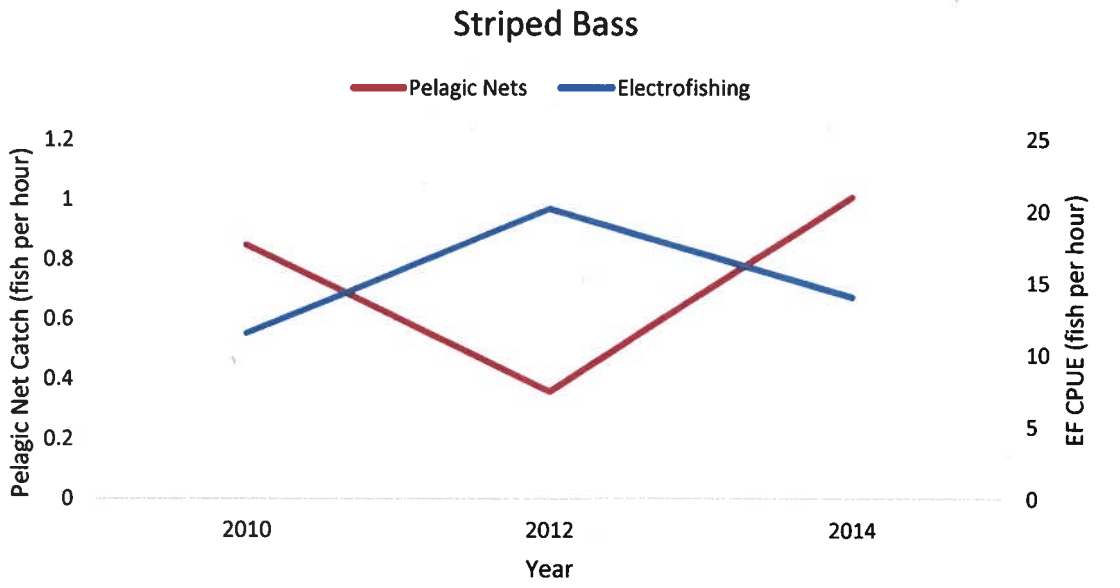

Figure 7. Striped Bass mean catch rates for pelagic nets (red line) and electrofishing (blue line) during fall 2010, 2012, and 2014 surveys.

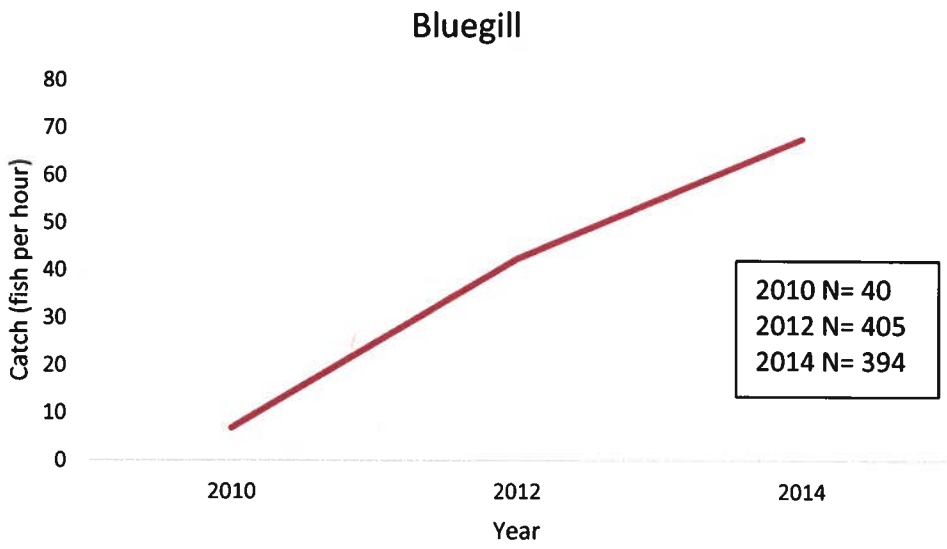

Figure 8. Bluegill mean electrofishing catch rates in Lake Pleasant during fall 2010, 2012, and 2014 surveys. N is sample size.