# Upper Lake Mary
## Fisheries Management Plan
## 2020-2030


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## Location

Upper Lake Mary is located on Walnut Canyon about 10 miles southeast of the City of Flagstaff in Coconino County at UTM 451371, 3881947.

**Figure 1**. Aerial view of area south and east of Flagstaff including upper Lake Mary.

## Management Prescription

The Arizona Game and Fish Department developed approaches to guide warmwater species management in the Warmwater Sportfisheries Strategic Vision Document (AGFD 2019). The management of Upper Lake Mary will follow the concepts outlined in that strategic document. The primary management at this sportfishery will follow the General Opportunity approach for Yellow Perch *Perca flavescens*, Black Crappie *Pomoxis nigromaculatus* and Yellow Bass *Morone mississippiensis.* The secondary management approach will follow the Fat Cat Concept for Channel Catfish *Ictalurus punctatus*.

Although Northern Pike and Walleye dominate the fishery, no objectives will be utilized to manage them. These two species, while highly sought after in many places, are also well known problem species when they are introduced into southwestern aquatic systems (Finney and Haines 2008). Both species are highly fecund, very efficient predators that tend to over populate and stunt if predator/prey balance cannot be maintained. Water clarity, particularly turbidity, affects interactions between predator and prey in aquatic environments and also influences interactions between and within species thereby shaping fish communities (Snow et al. 2018). Upper Lake Mary is highly turbid. Due to the fact that the City of Flagstaff has little interest in addressing turbidity in this important municipal water source, there is a lack of productivity, food base and habitat necessary for a health predator prey relationship. Additionally, the abundance of illegally introduced Northern Pike make managing to meet population objectives in Upper Lake Mary very difficult. High mercury levels found in the flesh of Northern Pike, Walleye and other species are above consumption advisory standards. These high levels of mercury compound the problem by making harvest of these fish species unadvisable.

Management objectives and adaptive management strategies have been set under the Fat Cat and General Opportunity approaches. Monitoring activities, including community-wide or species-specific fish surveys and angler creel surveys will be used to determine if management objectives are being met. Guidelines to meet objectives are listed in Table 1 below.

Objective 1: Manage populations of Yellow Perch, Black Crappie and Yellow Bass to support General Opportunity standards.

Objective 2: Manage the Channel Catfish population to support Fat Cat standards.

Objective 3: Maintain angler satisfaction at 80%.

**Table 1**. Upper Lake Mary Objectives and Adaptive Management Strategies:

| **Parameters** | **Objective Guideline** | **Trigger point to address unmet objectives** | **Strategies if Objectives are not met** |
|---|---|---|---|
| ***Objective 1: Manage populations of Yellow Perch, Black Crappie and Yellow Bass to support General Opportunity standards.*** | | | |
| Angler Catch Rate | Angler catch rate averages 0.5 fish per hour during assessment of catch rates on a 10 year rotational basis through creel surveys. | Angler catch rate during creel census is less than 0.5 fish per hour. | ● Develop an angler outreach program to attempt to increase the angler's ability to catch fish on Upper Lake Mary.<br>● Place fish habitat (juniper trees) in the Narrows section of the lake and near the dam.<br>● Stocking<br>● Regulation Change |
| ***Objective 2: Manage the Channel Catfish population to support Fat Cat standards.*** | | | |
| Angler Catch Rates | Maintain an angler catch rate of 0.25 fish/hour. | Catch rates drop below 0.25 fish/hour. | ● Develop an angler outreach program to attempt to increase the angler's ability to catch fish on Upper Lake Mary<br>● Stocking<br>● Regulation Changes |
| **Parameters** | **Objective Guideline** | **Trigger point to address unmet objectives** | **Strategies if Objectives are not met** |
| Size of Catfish | 15% of Channel Catfish sampled are greater 28 inches. Sampling conducted every 5 years. | Less than 15% of the Channel Catfish Sampled are greater than 28 inches. | ● Place spawning structures (catfish houses) in lake to increase population.<br>● Regulation Changes |
| ***Objective 3: Maintain angler satisfaction at 80%.*** | | | |
| Angler Satisfaction | A minimum of 80% of angler's rate fishing as fair, good or excellent during creel census. | Creel Census shows less than 80% of the angler's rate fishing as fair, good or excellent. | • Develop an angler outreach program to attempt to increase the angler's ability to catch fish on Upper Lake Mary. |

## Background

Upper Lake Mary (ULM) is located on Walnut Canyon about 10 miles southeast of the City of Flagstaff (City) in Coconino County. The lake is managed by the Arizona Game and Fish Department (Department) and the Coconino National Forest Service for recreation. The lake is used by the City as a primary municipal water source. ULM was constructed by the damming of Walnut Canyon about 3.5 miles upstream of Lower Lake Mary Dam. The reservoir's spillway drains directly into Lower Lake Mary (LLM).

ULM was formed by an earthen dam constructed in 1941 by the City. In 1951, the City raised the crest of the dam approximately 10 feet to the current elevation of 6,835.5 feet above mean sea level and improved the spillway (Hornewer, 2008).

The drainage area for ULM is approximately 51 square miles. Inflow to the lake largely comes from spring snowmelt, however there are small contributions from rainfall and from ephemeral streams such as Babbitt Spring and Newman Canyon. Water losses from the lake include evaporation, leakage, water-supply withdrawals, and spillage (Blee, 1987).

At full pool (spillway elevation of 6,828.5 feet) ULM has a storage capacity of 16,300 acre-feet, a surface area of 939 acres, a mean depth of 17.4 feet, and a depth near the dam of 39 feet. It is 5.6 miles long and varies in width from 308 feet near the central, narrow portion of the lake to 2,630 feet in the southeast end.

## History

The Arizona Lumber and Timber Company filed a water right claim for LLM on December 3, 1903. The water from the resulting reservoir was to be transported via a pipeline to operate the company's lumber mill. Arizona Lumber and Timber Company (AL&T) never installed the pipeline to their mill and instead the lake was used as a recreational area.

Construction of LLM dam began in May 1904 and was completed by the end of summer. Shortly after the dam was completed, large sinkholes formed in the bottom of the reservoir. Seepage from the sinkholes has been estimated at 5-10 gallons per minute per sinkhole (7,200 –14,400 gallons a day), with most of the seepage occurring on the south side of LLM. Many attempts were made by the owners to plug the holes with rocks, brush, and dirt with little or no success.

In 1915, the land ownership was transferred from the Department of Interior to the U. S. Forest Service. In 1935, AL&T realizing they would have no use for the dam, relinquished their special-use permit and all rights to the dam. In 1940, the City acquired the water rights and applied for a special-use permit to install a 12-inch pipeline that would run from the dam to the water treatment plant. That same year the City also applied for a permit to construct the ULM dam. The ULM dam was constructed in 1941, in order to overcome loss of reservoir water to seepage on LLM.

On January 8, 1941, an agreement was signed stating that the City has the rights to one billion gallons of water per annum from both ULM and LLM. In order to stabilize water levels, water

was released into LLM from ULM for several of the early years. In 1947, the City connected ULM to the water plant by installing a 3.6 mile long pipeline underground to reduce the water loss problem caused by seepage in LLM.

## Productivity/Water Quality

The Department has not conducted water quality surveys on ULM in the past 20 years. The last consistent water quality surveys conducted by the Department were in the 1970s. During those surveys the pH ranged from 6.5 to 8.5 and the secchi depths ranged between 12 inches and 54 inches. Anecdotally, observations by Department staff have noticed an increase in the amount of turbidity from year to year.

According to Steve Flood, the Operations Supervisor for the Lake Mary Water Treatment Plant, the City conducts monitoring at least monthly at their inlet structure on the dam. According to the City's water quality profiles, the lake at the dam does not stratify in the summer, has acceptable dissolved oxygen levels and has a pH between 6.7 and 8 (Steve Flood pers com, 2018). The secchi depth measured by the city ranges from 2 feet to .5 feet further supporting observations by Department staff that turbidity has increased. Mr. Flood also indicated: We have actually found more turbid waters can actually be treated better at our surface water treatment plant than very low turbidity waters. The City has little interest in reducing the turbidity of ULM because increasing productivity is in conflict with municipal water needs.

In 2009, a study was conducted by the University of Arizona to look at the cause of odor and taste problems in the City's water supply from ULM along with possible remedies for the problems (Walker, 2009). The researchers collected water quality and phytoplankton samples from the inflow area, middle area and dam area of the lake. The water samples showed that the lake had high levels of phosphorus and nitrogen, especially in the inflow area. The study also showed the dominant phytoplankton source are cyanobacteria (blue green algae) which were the cause of the taste and odor problems for the City. The mean phosphorus level during the study was 1.24 mg/l and the mean nitrogen level was 1.25mg/l. These levels place ULM's trophic state as hyper-eutrophic for phosphorus and eutrophic for nitrogen according to Arizona Department of Environmental Quality standards. The study listed several possible remedies to reduce taste and odor problems caused by the cyanobacteria including treating the inflow area with alum (hydrated potassium aluminum sulfate) to tie up some of the phosphorus and thus reduce cyanobacteria growth. To date, no actions have been initiated by the City that were recommended by the report. We suspect that increases in turbidity over recent years have reduced productivity throughout the lake including cyanobacteria growth.

Improving the productivity of ULM would be difficult with high turbidity in the lake. Three possible ways to reduce the turbidity are:

1. Work with the Coconino National Forest to improve the conditions of the watersheds that feed ULM. Reduction of the amount of silt flowing into the lake would improve the conditions for fish by increasing the amount of aquatic vegetation in the lake improving cover.

2. Explore the possibility of seeding the lake bottom with grasses or sedges during low water level years. Grasses and sedges would tie up some of the sediment during years when the lake refills to reduce the erosion of the lake bottom, reducing the amount of suspended sediment in the lake.
3. Treating the inflow areas with alum to reduce the amount of available phosphorus for cyanobacteria was one recommendation made in the 2009 University of Arizona report. If the City decided to use alum treatments to reduce phosphorus, the treatment would also cause the suspended sediments to precipitate out reducing the turbidity.

## Forage/Prey

The primary prey species for Northern Pike and Walleye in ULM are crayfish, Golden Shiner *Notemigonus crysoleucas*, Fathead Minnow *Pimephales promelas*, Yellow Perch, Black Crappie, and Yellow Bass. During the 2014 gillnet survey 29 Golden Shiner, 2 Black Crappie, 2 Yellow Bass and one Green Sunfish were caught. No Yellow Perch were caught during the survey.

During 2001 and 2002 Jon Flinders, a graduate student at the University of Arizona looked at the abundance of pike along with their diet and used a bioenergetics model to estimate the potential predation impacts upon the prey base (Flinders, 2004). The prey items detected in the spring on ULM were primarily Black Crappie, Golden Shiner and crayfish. In the fall, the majority of the prey items were Rainbow Trout with a few Golden Shiner. During the winter, Rainbow Trout continued to make up the majority of the diet for Northern Pike along with Golden Shiner and Black Crappie. The bioenergetics model estimated that about 63% of the Rainbow Trout stocked were eaten by Northern Pike. It's important to note that 2002 was an extremely low water year throughout the region. Large fingerling (4-5 inch) Rainbow Trout were stocked in the fall because no other suitable stocking sites were available and the fish had to be moved from the hatchery to reduce crowding.

Increasing forage would be difficult under the current conditions in ULM. With current high turbidity, reduced productivity and lack of cover, the forage fish would have to be able to thrive under low visibility situations and be able to grow large enough to become invulnerable to predation.

## Habitat

There is very little fish habitat in ULM which is apparent when the lake is at low levels. A few Christmas trees were sunk by the Department near the Narrows Boat Ramp in 1996 and tires were sunk by the Department in 1982. The majority of the fish habitat available consists of rock and aquatic plants that occasionally grow along the shore of the lake. The introduction of fish habitat in the area of the Narrows may increase cover for forage fish.

To increase available habitat, juniper trees removed during thinning projects could be placed in the area around the Narrows boat ramp. This area is relatively steep sided and is in a no wake area which would reduce the chance of the sunken trees damaging watercraft during low water levels.

Channel Catfish numbers are relatively low in the lake. Placement of structures such as catfish houses in the narrows area to provide spawning habitat might improve angler catch rates for catfish.

## Species

ULM has a self-sustaining warmwater/coolwater species mix with the primary species being Walleye *Sander vitreus,* Northern Pike *Esox lucius*, Yellow Perch, Black Crappie, Yellow Bass, and Channel Catfish. Other species that are caught occasionally in the lake include, Bluegill *Lepomis macrochirus*, Green Sunfish *Lepomis cyanellus*, and Largemouth Bass *Micropterus salmoides.*

*Yellow Perch*

Yellow Perch are in the same family as Walleye and coexist with both pike and Walleye in other parts of the country. When productivity goes down in ULM, either from drought, turbidity or lack of cover (vegetation), the perch can't keep up with the predators. Interestingly, Yellow Perch were illegally stocked into ULM sometime in the 1990's. In 2009-2010 Yellow Perch were very common in the angler catches with perch up to 1 pound being caught (Table2) (Benedict 2010). Since the Yellow Perch boom in 2010, they have rarely been caught by anglers and were not caught during the 2014 gillnet sampling (Table 3, Table 4) (Benedict 2015).

*Black Crappie*

Black Crappie in ULM, as in many lakes across Northern Arizona, tend to stunt and struggle to reach larger size classes. Black Crappie do better in clear water, and need an available forage base to allow them to switch from invertebrates to fish at age 2-3. Neither of these factors are available in ULM. Black Crappie were also illegally stocked into ULM. Nonetheless, Black Crappie persist, are competitive and are popular with anglers. During the 2014 creel census Black Crappie were the second most common species sought by anglers, after Northern Pike (Benedict 2015). Crappie were also the second most common species caught by anglers in 2014 (Table 3).

*Yellow Bass*

Yellow Bass are related to Striped Bass, and can be very effective predators when the forage base is adequate. Like Striped Bass, Yellow Bass key on run-off or inflow areas in which to "run up" and spawn. During dry years, Yellow Bass may not spawn successfully in ULM again making it difficult to keep up with the predator demand. Yellow Bass were stocked into ULM by the Department in 1979. Yellow Bass are occasionally caught by anglers and were caught during the 2014 gill net survey (Table 3). The former inland state record Yellow Bass, 1 pound 15.8 ounces, was caught in ULM.

*Channel Catfish*

Channel Catfish were first stocked by the Department in ULM in 1968 and were last stocked in 2003. Channel Catfish were not caught during the 2014 gillnet survey, but are caught by anglers. Channel Catfish are probably the one species in ULM unaffected by high turbidity. Relatively low fishing pressure and the longevity of the species in cooler lakes makes this a great lake for large Channel Catfish. Numbers of Channel Catfish are not high, but the few that persist can reach large sizes. The inland water state record Channel Catfish, 33 pounds 5.76 ounces, was caught from ULM in 2017, by an angler fishing for Northern Pike using an anchovy for bait. Several other large Channel Catfish from ULM have been reported on angling webpages.

*Walleye*

Walleye were first stocked in ULM in 1975 with the last stocking in 1990. During the mid 1990's Department hatchery personnel collected eggs and milt from Walleye in Upper Lake Mary to provide Walleye for stocking in other lakes around the state.

Walleye were the most common species caught during the 2014 gill net survey (Table 3). The Walleye ranged in total length from 247 mm to 614 mm in length (9 to 24 inches) with a mean of 457.7 mm (18 inches) (Table 5.). One hundred six (106) of the 107 Walleye caught were of stock size, 94% were between quality and preferred length (380 mm - 510 mm) and 25% were greater than preferred length (510 mm or 20 inches)) (Table 6) (Figure 2). The average relative weight of the Walleye caught was 87.5 and ranged from 71 to 118.7 (Figure 3).

Currently the Arizona Department of Environmental Quality (ADEQ) has issued a do not consume advisory for Walleye on ULM due to the amount of mercury detected in Walleye samples. The advisory recommends no Walleye be eaten due to mercury levels being above guidelines for consumption. An additional advisory recommends no more than one 8 ounce meal per month should be eaten for the other species in the lake. Walleye do not have management objectives because of this advisory.

*Northern Pike*

In the 1950's and early 1960's ULM was stocked with fingerling trout and it was managed as a basic yield trout lake. During this time, the Department noted that a large population of illegally stocked Bullhead Catfish *Ameiurus sp*. and Green Sunfish were competing with and preying on the stocked fingerling trout. At that time, the lake was used as a municipal water supply for the City of Flagstaff and the use of rotenone to remove the Green Sunfish was problematic. Northern Pike were first stocked in October of 1968 to control the Green Sunfish and improve the trout fishing. Northern Pike were last stocked in ULM in 1980.

ULM is a destination for anglers to catch Northern Pike. During both the 2010 Creel Census and the 2014 creel census the most common targeted species for anglers who indicated a species preference was for Northern Pike (Table 2, Table 3). Northern Pike were also the most common

species caught by anglers during the 2014 creel census and the second most common species caught by anglers in 2010.

Northern Pike were the second most common species caught during the 2014 gillnet survey. The Northern Pike lengths ranged from 348 mm to 697 mm (13 to 27 inches) with a mean of 548.3 mm (21.5 inches). The average relative weight of the Northern Pike caught was 84.6 and ranged between 74.2 and 96.3 (Figure 4).

Currently ADEQ has issued a mercury advisory for Northern Pike on ULM due to the amount of mercury detected in samples from the lake. Northern Pike do not have management objectives because of this advisory. The advisory recommends no more than one 8 ounce meal per month should be eaten for the other species in the lake.

*Other species stocked*

The following species have been stocked by the Department into ULM, Bluegill 1936-1951, Redear Sunfish *Lepomis microlophus* 1951, Smallmouth Bass *Micropterus dolomieu* 1942, Largemouth Bass 1935-1951, Fathead Minnow 1987, Rainbow Trout *Oncorhynchus mykiss* 1947-2018, Cutthroat Trout *Oncorhynchus clarkii* 1966-1967, Brown Trout *Salmo trutta* 1949-1974, Kokanee *Oncorhynchus nerka* 1962, and Coho Salmon *Oncorhynchus kisutch* 1973. Recent stockings of Rainbow Trout have consisted of surplus fingerlings that were stocked to allow the hatchery to reduce crowding in its raceways. No trout from these stockings have been reported as being caught by anglers or during the 2014 gillnet survey.

## Access

Upper Lake Mary is located on the Flagstaff District of the Coconino National Forest. The lake has 3 boat ramps with 2 being located next to each other about ½ mile southeast of the dam and 1 located at the Narrows near the midpoint of the lake. During the summer months there is a fee to use the ramps or park in the developed parking areas of the lake. There are numerous pull-offs along Lake Mary road where the lake can be accessed without paying the use fees.

## Catch

Currently the fishery has high turbidity reducing productivity and making angling difficult. The average catch rate during a 2014 creel census was 0.04 fish per hour. Turbidity will likely increase in the future because a large logging and thinning project (Flagstaff Watershed Protection Project) is currently occurring throughout ULM's watershed.

Creel census surveys were conducted on ULM in 2010 and 2014. The differences between the 2 surveys are remarkable.

In 2010, the lake was full most of the year and the fishing was good (Benedict 2011). ULM had an estimated 31,384 angler use days between April and December of 2010 (Table 7). A total of 65,245 fish were caught and 17,544 were harvested with the majority being Yellow Perch and

Northern Pike (Table 2). Only 34% of the anglers reported they had caught fish. A little more than half of the anglers, 50.2%, were fishing for anything that would bite. Northern Pike was the species that was targeted by the most anglers at 36.4%.

The lake was lower and extremely turbid in 2014. During the creel census very few anglers were fishing ULM with only 477 angler days being recorded (Table 8) (Benedict, 2015). Because of the low number of anglers encountered, the creel census was only conducted between April 1 and June 30. Fishing was very poor with the overall catch rate being .043 fish per hour (Table 8). The primary species caught was Northern Pike followed by Black Crappie and Walleye (Table 3). For the same 3 month period in 2010, the creel census data estimated that 35,534 angler hours were expended with the catch rate being .378 fish per hour. The primary species caught in 2010 was Yellow Perch followed by Northern Pike, Black Crappie and Walleye. Yellow Perch appear to have disappeared from the angler catch in 2014.

## Satisfaction

While population objectives for Northern Pike and Walleye are not set, certainly the opportunity to catch these species drives satisfaction of anglers fishing ULM.

In 2010, 38% percent of the anglers surveyed rated the fishing poor or very poor while 29% rated it as good to excellent (Table 10). Eighty-two percent (82%) of the anglers rated their overall experience as good to excellent.

In 2014, 7% of the anglers surveyed rated the fishing as good while 65.8% rated it poor. Even with the poor fishing, 92% of the anglers rated their overall fishing experience as good or excellent. Fish density and quality will need to be improved in order to achieve the goal 80% positive reporting of fishing experience (Table 11).

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## Tables and Figures

**Table 2**. Upper Lake Mary 2010 Creel Census Estimated Fish Caught and Harvested by Species.

| Species | Species Preference | Percent | Catch | Harvest |
|---|---|---|---|---|
| Northern Pike | 182 | 36.4% | 25,097 | 7,948 |
| Yellow Perch | 21 | 4.2% | 35,269 | 8,405 |
| Walleye | 5 | 1% | 601 | 93 |
| Black Crappie | 10 | 2% | 1,461 | 686 |
| Channel Catfish | 20 | 4% | 542 | 320 |
| Yellow Bass | | | 164 | |
| Green Sunfish | | | 1,407 | |
| Bluegill | | | 704 | 92 |
| Rainbow Trout | 11 | 2.2% | | |
| Any | 251 | 50.2% | | |

**Table 3.** 2014 Upper Lake Mary Creel Census Angler Species Preference and Reported Fish Caught and Kept.

| Species | Species Preference | Percent | Caught | Harvest | % of Catch | % of Harvest |
|---|---|---|---|---|---|---|
| Northern Pike | 28 | 24.6% | 51 | 22 | 70 | 66.6 |
| Black Crappie | 12 | 10.5% | 15 | 6 | 20 | 16.7 |
| Walleye | 5 | 4.4% | 8 | 6 | 10 | 16.7 |
| Rainbow Trout | 5 | 4.4% | | | | |
| Any | 64 | 56.1% | | | | |

**Table 4**. Percent of Catch and Catch per Net Night for Fish Species Caught During Gill Net Surveys on Upper Lake Mary October 20-22 2014.

| Species | Number | % of Catch | Fish per Net Night |
|---|---|---|---|
| Walleye | 107 | 66.5 | 6.7 |
| Northern Pike | 20 | 12.5 | 1.3 |
| Golden Shiner | 29 | 18 | 1.8 |
| Black Crappie | 2 | 1.2 | .13 |
| Yellow Bass | 2 | 1.2 | .13 |
| Green Sunfish | 1 | .6 | .06 |

**Table 5**. Mean Lengths and Maximum Lengths (in Millimeters) and Weights (in Grams) for Fish Caught and Measured During Gillnet Surveys on Upper Lake Mary October 20-22, 2014 (* Not All Black Crappie Were Large Enough to Weigh).

| Species | Mean Length | Maximum Length | Minimum Length | Mean Weight | Maximum Weight |
|---|---|---|---|---|---|
| Walleye | 457.7 | 614 | 247 | 932.1 | 2035 |
| Northern Pike | 548.3 | 697 | 349 | 1052.7 | 1202 |
| Golden Shiner | 107.1 | 120 | 101 | NA | |
| Black Crappie | 175 | 279 | 71 | * | 472 |
| Yellow Bass | 271 | 273 | 269 | 374.5 | 397 |
| Green Sunfish | NA | 186 | NA | NA | 152 |

**Table 6**. Proportional Stock Density (PSD) and Relative Stock Density (RSD) for Walleye Caught During Gillnetting on Upper Lake Mary October 20-22, 2014.

| PSD (95% Confidence Interval) | RSD Quality-Preferred Length (95% Confidence Interval) | RSD Preferred – Memorable Length (95% Confidence Interval) |
|---|---|---|
| 94% (89% - 99%) | 94% (89%-99%) | 25% (20%-30%) |

**Table 7**. 2010 Upper Lake Mary Monthly Creel Census Expanded Totals. Catch and Harvest rates were calculated using reported Catch, Harvest, and Angler Hours and may not match expanded totals.

| Month | Angler Days Using 5.5 Hours Statewide length of angler day | Angler Days Using 3.3 Hours ULM Mean Length of Angler Day | Angler Hours | Catch (Catch Rate in Fish/Angler Hour) | Harvest (Harvest Rate in Fish/Angler Hour) | % Anglers who Caught Fish |
|---|---|---|---|---|---|---|
| April | 756 | 1,259 | 4,155 | 1,435(.35) | 491(.12) | 34 |
| May | 2,911 | 4,851 | 16,008 | 6,973(.44) | 3,182(.2) | 29 |
| June | 2,795 | 4,658 | 15,371 | 5,029(.33) | 1,574(.10) | 25 |
| July | 5,142 | 8,569 | 28,276 | 22,016(.78) | 4,417(.16) | 35 |
| August | 3,757 | 6,261 | 20,659 | 18,615(.90) | 3,463(.17) | 51 |
| September | 1,975 | 3,291 | 10,857 | 4,565(.42) | 921(.08) | 39 |
| October | 811 | 1,350 | 4,456 | 6,090(1.37) | 3,243(.73) | 43 |
| November | 453 | 754 | 2,487 | 542(.22) | 229(.09) | 28 |
| December | 235 | 391 | 1,288 | 26(.02) | 26(.02) | 8 |
| Total | 18,835 | 31,384 | 103,557 | 65,291(.63) | 17,546(.17) | 34 |

**Table 8**. 2014 Upper Lake Mary Monthly Creel Census Expanded Totals. Catch and Harvest rates were calculated using reported Catch, Harvest, and Angler Hours and may not match expanded totals.

| Month | Angler Days | Angler Hours | Catch (Catch Rate in Fish/Hour) | Harvest (Harvest Rate in Fish/Hour) | % Anglers who Caught Fish |
|---|---|---|---|---|---|
| April | 90 | 494 | 6 (.04) | | 5.9% |
| May | 136 | 743 | 42 (.056) | 21 (.045) | 6.7% |
| June | 251 | 1,380 | 26 (.033) | 13 (.016) | 7.7% |
| Total | 477 | 2,617 | 74 (.043) | 34 (.026) | 7.0% |

**Table 9**. 2014 Upper Lake Mary Creel Census Angler Species Preference and Reported Fish Caught and Kept.

| Species | Species Preference | Percent | Caught | Harvest | % of Catch | % of Harvest |
|---|---|---|---|---|---|---|
| Northern Pike | 28 | 24.6 | 51 | 22 | 70 | 66.6 |
| Black Crappie | 12 | 10.5 | 15 | 6 | 20 | 16.7 |
| Walleye | 5 | 4.4 | 8 | 6 | 10 | 16.7 |
| Rainbow Trout | 5 | 4.4 | | | | |
| Any | 64 | 56.1 | | | | |

**Table 10**. 2010 Upper Lake Mary Creel Census Angler Satisfaction Questions.

| Question | Very Poor | Poor | Fair | Good | Excellent |
|---|---|---|---|---|---|
| How Would You Rate Today's Fishing? | 99(18%) | 111 (20%) | 182 (33%) | 94 (17%) | 63(12%) |
| How Would You Rate Today's Visit? | 11 (2%) | 16 (3%) | 74 (13%) | 146 (26%) | 306 (56%) |

**Table 11**. 2014 Upper Lake Mary Creel Census Angler Satisfaction Questions.

| Question | Very Poor | Poor | Fair | Good | Excellent |
|---|---|---|---|---|---|
| How Would You Rate Today's Fishing? | 0 | 75 (65.8%) | 31 (27.2%) | 8 (7%) | 0 |
| How Would You Rate Today's Visit? | 3 (2.6%) | 0 | 6 (5.3%) | 45 (39.5%) | 60 (52.6%) |

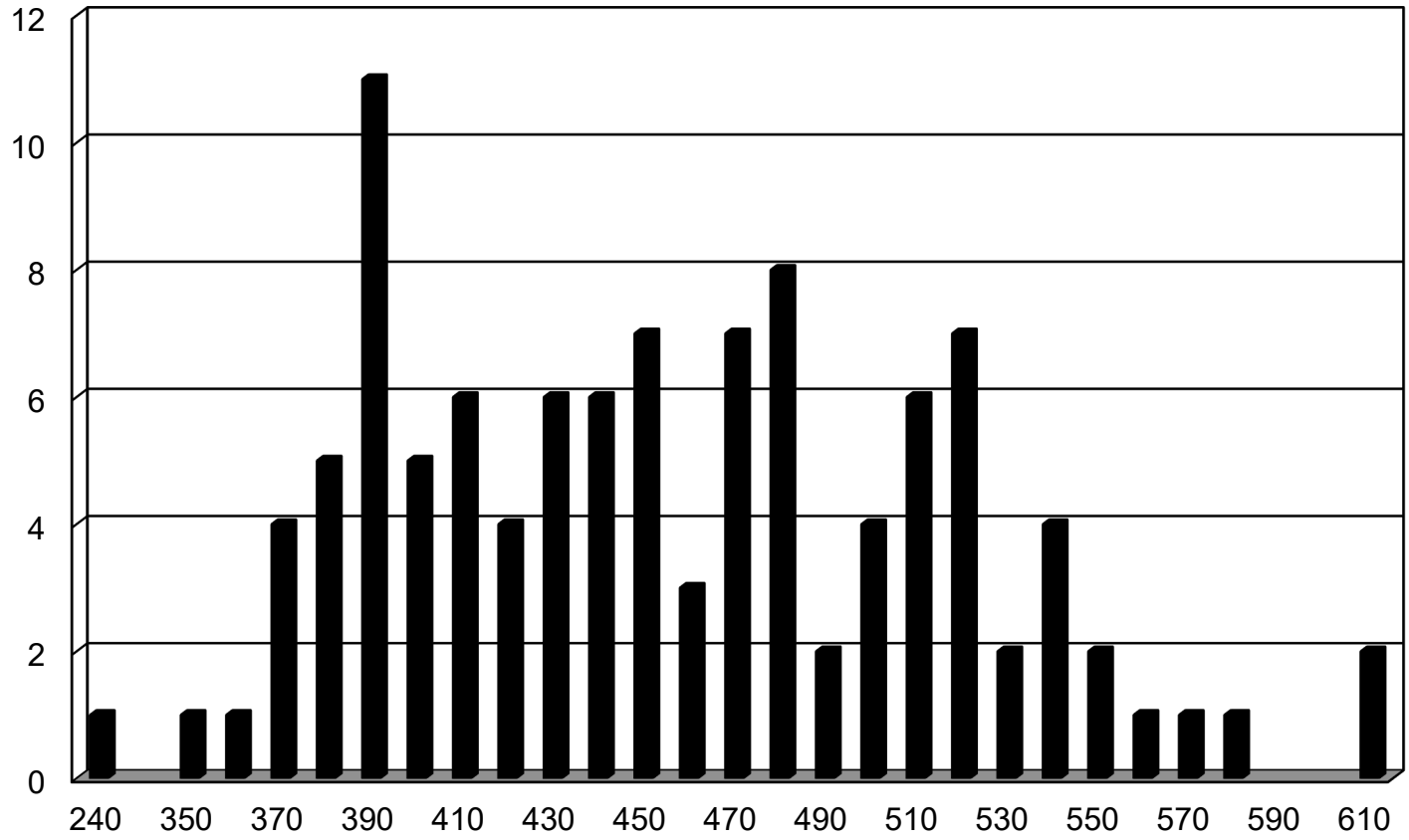


**Figure 2**. 10 mm Length Frequency for Walleye Caught by Gillnets on Upper Lake Mary October 2014.

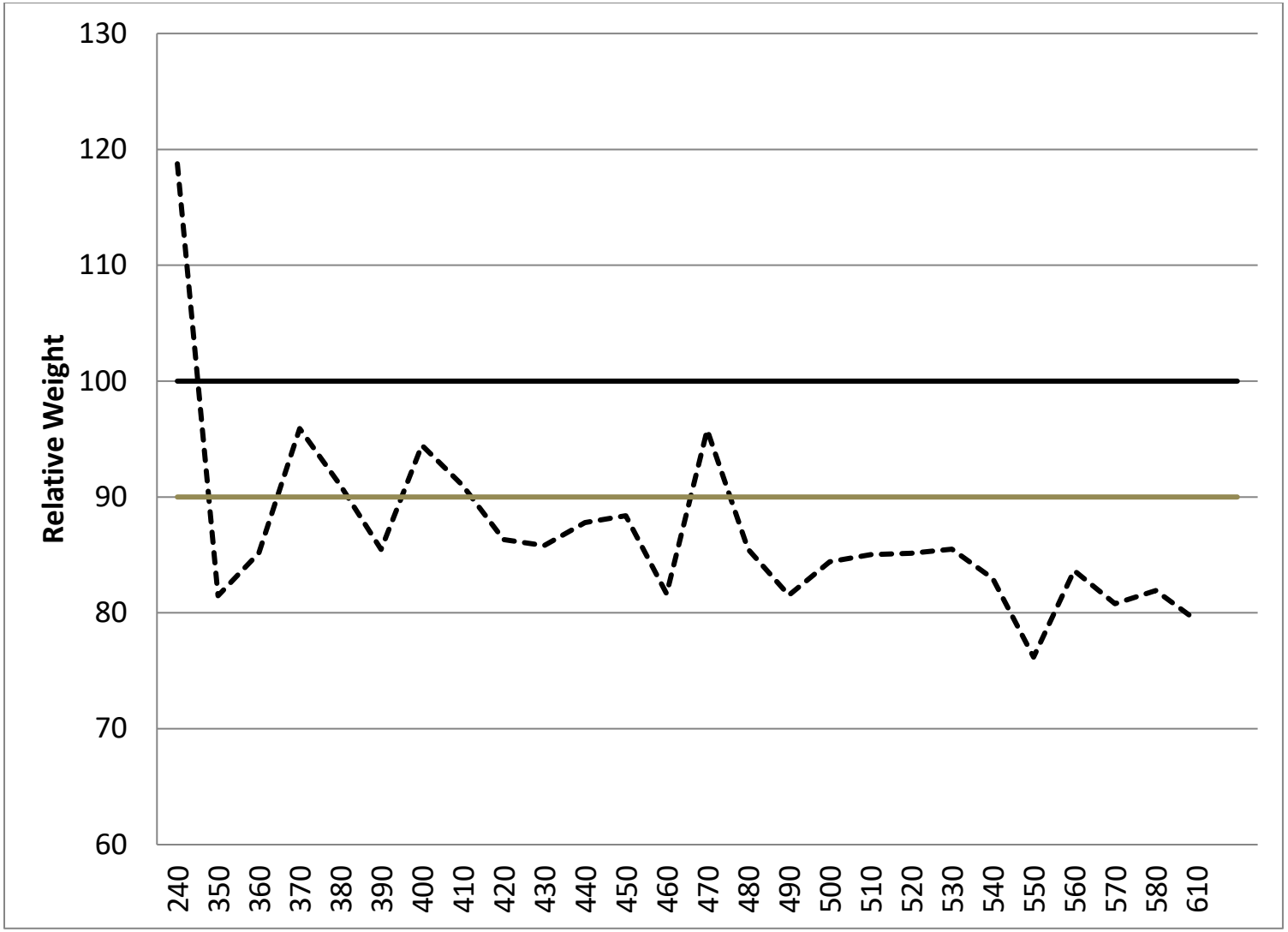


**Figure 3**. Relative Weight by 10 mm Length Class for Walleye Captured Using Gill Nets on Upper Lake Mary October 2014.

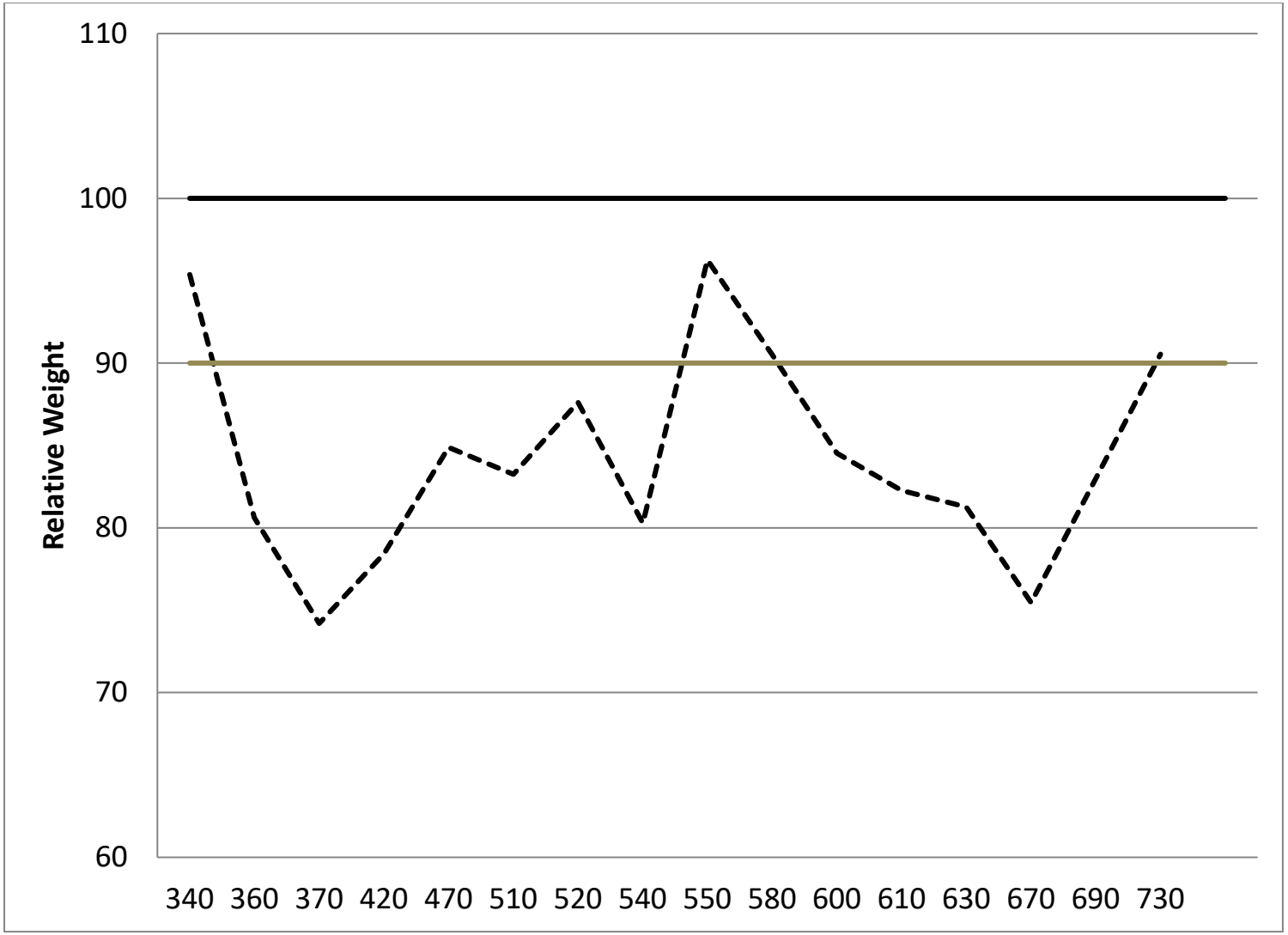


**Figure 4**. Relative Weight by 10 mm Length Class for Northern Pike Captured Using Gill Nets on Upper Lake Mary October 2014.