Mittry Lake
Fisheries Management Plan
2019-2029

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Approved [X] by Chris Cantrell _____ Date 9/30/19
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Location

Mittry Lake is located in Yuma County, about 18 miles northeast of Yuma, Arizona, on the east side of the Colorado River between Laguna and Imperial Dams (Figure 1). Mittry Lake is located almost entirely within the Mittry Lake Wildlife Area, located on lands owned by the United States Department of the Interior (USDOI), acting by and through the Bureau of Reclamation (USBR) and the Bureau of Land Management (BLM).

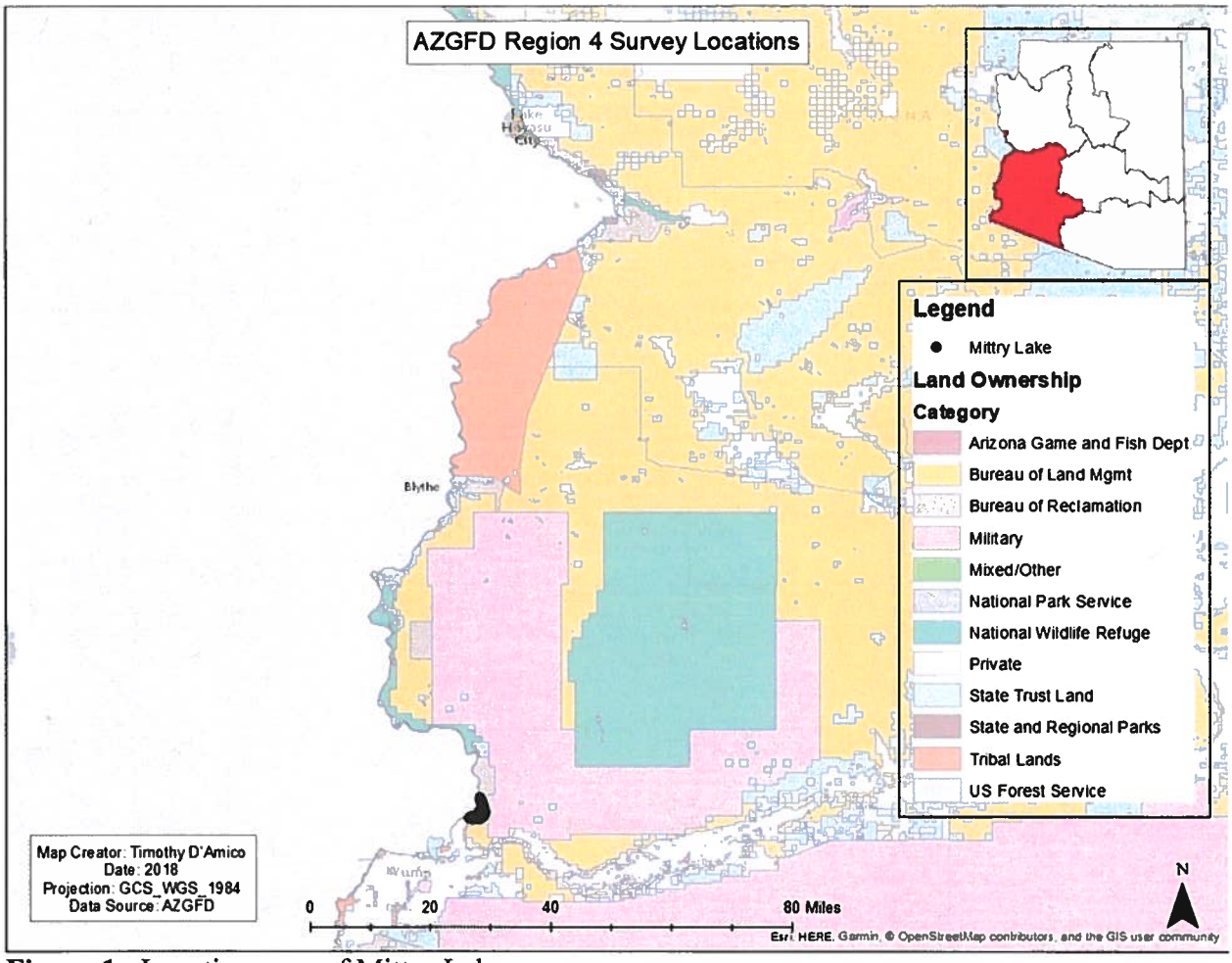

Figure 1. Location map of Mittry Lake.

Management Prescription

The Arizona Game and Fish Department (AGFD, Department) has developed concepts under a Strategic Vision Document (AGFD 2019) to help guide warmwater fisheries management in Arizona. Using these concepts, fisheries management on Mittry Lake will focus on trophy Largemouth Bass *Micropterus salmoides* and general opportunity Channel Catfish *Ictalurus punctatus* fisheries.

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

Objective 2: Maintain the Channel Catfish population to meet or exceed General Opportunity Concept standards.

Objective 3: Maintain angler satisfaction at 80%.

Monitoring activities to determine if management objectives are being met should include: annual fall community-wide electrofishing surveys in Mittry Lake; creel surveys every five years genetic surveys, water quality, and vegetation surveys. Management strategies to meet objectives are identified in Table 1.

Table 1. Mittry Lake Objectives and Adaptive Management Strategies.

Objective 1: Maintain the Largemouth Bass population to meet or exceed Hawg Bass 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**
Genetics	Genetic influence > 80% from Florida Bass	Three consecutive sampling events showing population below management guideline.	• Stocking of Florida Bass
Spring Electrofishing Catch Rates	CPUE ≥ 50 fish/hour	CPUE < 50 fish/hour for three consecutive samples.	• Re-evaluate survey method and/or equipment • Stocking • Regulation Changes
Proportional Size Distribution	50 < PSD < 80 30 < PSD-P < 60 10 < PSD-M < 25	Three consecutive sampling events showing population below management guideline.	• Stocking • Regulation Changes • Prey enhancement

Relative Weight (Wr)	95 < Wr < 105	Wr <95 for three consecutive samples.	• Prey Stocking • Regulation Changes
Angler Catch Rates	Angler CPUE ≥ 0.25 fish /hour for anglers targeting Largemouth Bass	Angler CPUE < 0.25 fish/hour for two consecutive creel surveys.	• Stocking • Regulation Changes • Outreach/Education

Objective 2: Maintain the Channel Catfish population to meet or exceed General Opportunity standards as listed in the Warmwater Sportfisheries Strategic Vision Document.			
Electrofishing Catch Rates	CPUE ≥ 50 fish/hour	CPUE < 50 fish /hour for three consecutive samples.	• Re-evaluate survey method and/or equipment • Stocking • Regulation Changes
Size Structure	Size Structure: multiple age classes	Three consecutive sampling events showing population below management guideline.	• Stocking • Regulation Changes • Outreach/Education
Angler Catch Rates	Angler CPUE ≥ 1 fish /hour for anglers targeting Channel Catfish	Angler CPUE < 1 fish/hour for two consecutive creel surveys.	• Stocking • Regulation Changes • Outreach/Education

Objective 3: Maintain an overall angler satisfaction at 80%.			
Angler Satisfaction	Angler satisfaction > 80%	Angler satisfaction < 80% for two consecutive creel surveys.	• Stocking • Regulation Changes • Outreach/Education

1 CPUE = Catch Per Unit Effort (fish per hour) 2 PSD = Proportional size distribution: S-Q=Stock to Quality, Q-P=Quality to Preferred, P-M=Preferred to Memorable, M-T=Memorable to Trophy

Background

Land, water, fish, and wildlife resources in, and around the lake are managed by multiple authorities. The lands surrounding Mittry Lake were withdrawn for reclamation purposes in 1902. Ultimate responsibility for these lands lies with the BLM, which is assigned full responsibility of

the implementation of the lower Colorado land use plan, including lands used for recreation or wildlife activities. The Arizona Game and Fish Department (AGFD, Department) has administrative authority for fish and wildlife conservation and management, and operates the wildlife area under a lease and cooperative agreement with USDOI as well as various other agreements/Memoranda of Understanding between AGFD, BLM, USBR, and Yuma County.

Mittry Lake was formed in a backwater area between the Colorado River channel and the Gila Gravity Canal by the construction of a weir in 1952. Mittry Lake is a shallow lake approximately 180 ha in size, reaching a maximum average depth of 3-4m, but is generally shallower. The lake is considered eutrophic and relatively turbid due to seasonal algal growth and very fine suspended silts. There is a relatively low flow of water through the system; the primary water source is Colorado River water, delivered through a concrete-lined canal at the north end of the lake. The delivery system originates at Imperial Dam. Flows normally supplied to the lake are approximately 12 to 13 cfs (0.34-0.37 m^3/s). An additional source of fresh water to the lake is from seepage from the Gila Gravity Main Canal, which is earth-lined, and borders the eastern side of Mittry Lake. Inflow from this source is difficult to quantify, but is likely a significant source of replenishing water. Water elevations typically fluctuate very little, probably no more than one foot. The maximum level of the lake is dictated by the height of the weir at the lower end of the lake. Water normally is near the top, or overflowing the weir, which is not adjustable.

Due to its proximity to Yuma, Mittry Lake receives significant recreational pressure, primarily from the angling public, but also sees significant use for wildlife viewing, waterfowl hunting and recreational boating.

Productivity/Water Quality

The Department takes semi-regular water quality measurements in Mittry Lake. There has been no indication of severe or chronic water quality issues in this waterbody to date. There have been no large-scale fish die-offs due to water quality issues over the last several years. The Department takes some basic water quality measurement prior to annual surveys in and November.

Water temperature in Mittry Lake in November is approximately 60 degrees. Dissolved oxygen varies between 6 and 10 parts per million, pH varies between 7.5 and 8.5, and conductivity varies between 1,000 and 1,300 microsiemens per centimeter. There is no indication of severe or chronic water quality issues in this stretch of the river at this time.

Very little is known about nutrient levels in Mittry Lake. A better understanding of nutrient inputs, specifically phosphorus and nitrogen, into the lake under different conditions and the corresponding changes in primary productivity of Mittry Lake could help managers understand trophic connections and the associated effect on sportfish populations. It is possible the other agencies already takes these measurements. If they do not take these measurements in their water quality surveys, the Department will attempt to begin this sampling in house as personnel time allows or contract out the sampling to an outside vendor.

Forage/Prey

Management of forage fishes in Mittry Lake should focus on maintaining a diverse forage base to support healthy predatory fish populations. Black Crappie *Pomoxis nigromaculatus*, tilapia *Oreochromis spp.*, Bluegill *Lepomis macrochirus*, Gizzard Shad, Redear Sunfish *Lepomis microlophus*, and Threadfin Shad *Dorosoma petenense* contribute the most to the forage base in Mittry Lake.

Surveys conducted prior to 2014 were species-specific surveys, primarily targeting Largemouth Bass. Community-wide surveys have been conducted since 2014 to collect data on species-specific abundance and relative species composition in the lake, which will help to better quantify forage fish abundance. Forage fish have comprised at least 50% of the total catch during fall electrofishing since complete surveys of the fish community began (Figure 3). In 2018, the Region 4 Aquatic Wildlife Program began to measure total length (mm) and wet weight (g) of Threadfin and Gizzard Shad sampled to gain a better understanding of the population. With additional community-wide surveys, managers hope to better understand the connection between the abundance of forage fishes, as well as lake conditions, both biotic and abiotic. If after several years of community-wide surveys, biologists are still unable to understand the connections between lake conditions and forage abundance, alternative survey methods may be required.

The Department is unaware of any data collected on non-fish forage sources (i.e. plankton, macrophytes, crayfish, invertebrates, etc.) in Mittry Lake. An increased understanding of the links between aforementioned forage sources could help better inform fisheries management in Mittry Lake.

Habitat

Mittry Lake Wildlife Area comprises approximately 750 acres (300 ha), with much of the shoreline covered with cattails and bullrush *Monocotyledonous spp.* The Mittry Lake Wildlife Area offers a wide variety of habitats, from open lakes to cattail marshes and lake side woodlands, providing an equally wide opportunity for wildlife-based recreation. This combination of habitats provides abundant opportunities for fishing, wildlife watching, hiking, boating, and hunting. Mittry Lake has recently undergone rehabilitation work, including marsh dredging, revegetation and fish habitat improvement, making it an ideal location for small game hunting and sportfishing.

The amount and types of vegetation in Mittry Lake is currently a benefit to fish and wildlife currently. Should the Department determine there is a time when the amount of vegetation becomes a hindrance to the fish population or angler access, the Department will consider vegetation management. What methods will be used are unknown at this time, but the Department will keep all options open. The Department will work with all applicable parties to determine the best strategy for management of vegetation.

Species

Sportfish species

Fish species known to occur in Mittry Lake include Black Crappie, tilapia, Bluegill, Channel Catfish, Common Carp *Cyprinus carpio*, Flathead Catfish *Pylodictus olivarus*, Gizzard Shad,

Largemouth Bass, Redear Sunfish, Warmouth *Lepomis gulosus*, Threadfin Shad, and Yellow Bullhead *Ameiurus natalis*. Annual fall electrofishing surveys have been conducted for many years by AGFD. Prior to 2014, these surveys have primarily targeted Largemouth Bass.

The national standard for assessing Largemouth Bass populations call for spring nighttime electrofishing, so future population sampling may be changed to spring. However, fall sampling is still valuable and "spot-check" type surveys used to assess relative reproductive success of centrarchids may still be conducted in the fall.

Largemouth Bass:

Mittry Lake is managed as a Hawg Bass Largemouth Bass fishery, which has metrics for angler CPUE, genetics of the population, spring electrofishing CPUE, Wr, and PSD. Angler CPUE is currently being evaluated with a creel survey (see below). Mean CPUE for Largemouth Bass caught during fall electrofishing surveys in Mittry Lake from 2014 to 2018 was 35.9 fish per hour (Figure 6), which is below management objectives for trophy Largemouth Bass waters (CPUE $\geq$ 50 fish/hour). Since surveys are completed in the fall, fall electrofishing CPUE cannot be compared with spring electrofishing CPUE due to seasonal biases in fisheries data (Pope and Willis 1996). Additionally, centrarchids (e.g. Largemouth Bass) spawn in the spring by building and guarding nests in shallow water (Page and Burr 2011) where they are more susceptible to shoreline electrofishing, thus further seasonally biasing their estimated CPUE. Furthermore, aquatic vegetation varies seasonally, with increased growth throughout the summer, and stem density is well known to decrease capture probability (Chick et al. 1999). Finally, water conductivity in Mittry Lake is at the upper limits of the current sampling gear (Coffelt VVP-15) available to AGFD Region IV staff, which likely further limits capture probability. In the future, survey methods and equipment will be evaluated to attempt to gain a better understanding of the Largemouth Bass population.

The length frequency distribution for Largemouth Bass caught during the 2014 - 2018 surveys are shown in Figure 6. The 2018 distribution is similar to 2014 - 2017 and indicates multiple size classes in Largemouth Bass sampled from Mittry Lake. The 2018 distribution is similar to 2014 - 2017 and indicates multiple size classes in Largemouth Bass sampled from Mittry Lake. The PSD for Largemouth Bass caught during the 2018 survey was 61, PSD-P was 30, and PSD-M was 5 (Table 2). This meets management objective for PSD ($50 < PSD < 80$) and PSD-P ($30 < PSD\text{-}P < 60$), however is below management objective for PSD-M ($10 < PSD\text{-}M < 25$). The mean estimated Wr of Largemouth Bass caught during electrofishing surveys from 2014 to 2018 was 84 (Figure 8). This does not meet the management objectives ($95 < Wr < 105$). Mittry Lake has not met Wr management objectives for many years. Since multiple species and sizes of prey fish occur in Mittry, other reasons need to be investigated to reveal why the Largemouth Bass are not utilizing available prey to the fullest extent.

The recent invasion of Mittry Lake by Gizzard Shad may provide an additional forage source and subsequently improve Largemouth Bass body condition indices (i.e. Wr and PSD). However, if in the next three annual surveys, Largemouth Bass body condition indices have not increased, the Department may need to consider alternatives, including additional management of forage fishes.

In order to minimize unintended ecological consequences, augmenting populations of fishes currently occurring in Mittry Lake is favored over stocking additional species. As such, it is recommended that the Department consider stocking Threadfin Shad into Mittry Lake to attempt to raise the Largemouth Bass body condition indices and ultimately reach management objectives. Additional fish species may be considered depending on changes in lake condition or availability of species. As the Department is not able to stock Mittry Lake with any fish currently, the Department would either need to add Mittry Lake to stocked waters in the next consultation on the Department's stocking program or would need to write an EAC to cover this activity.

Channel Catfish:

Mittry Lake is also managed as a general opportunity Channel Catfish fishery, which has metrics for angler CPUE, size/age structure, and electrofishing CPUE. Angler CPUE is currently being evaluated with a creel survey (see below). Fall electrofishing surveys have not met electrofishing CPUE management objectives (Figure 7). However, fall electrofishing surveys have met management objectives for multiple size/age classes (Figure 8). Generally, our fall electrofishing protocols are not conducive to capturing catfishes, and in the future surveys or management objectives may need to be altered to accurately represent the Mittry Lake Channel Catfish population.

One opportunity to expand angling opportunities on Mittry Lake would be to create a winter trout fishery as the Department currently creates at Apache, Canyon, and Saguaro Lakes. The Yuma area draws tens of thousands of non-resident visitors each winter with a large number that are anglers. These anglers comment on how poor their fishing experience is on the local area lakes for warm water fish, largely due to low water temperatures that can make angling for warm water fish difficult. Many of these same anglers comment on how much they enjoy fishing the local Yuma area Community Fishing Waters for Rainbow Trout due to the easy access and high catch rates. Similarly, local anglers have difficulty catching warm water fish during the winter and also enjoy fishing the Yuma area community fishing waters. Mittry Lake is close to the city of Yuma and shares the characteristic of the local community fishing waters of easy access due to the abundance of fishing jetties on the lake. If Mittry Lake were stocked effectively the Department could create a popular fishery that could help mitigate for the poor fishing for warmwater fish during the winter months and possibly draw more anglers to Mittry Lake.
Obviously, two large logistical issues that need to be solved prior to the creation of this winter trout fishery. As with the possible stocking of Threadfin Shad, Mittry Lake is not currently included in the waters the Department can stock with any fish so it would be necessary to either add Mittry Lake to stocked waters in the next consultation on the Department's stocking program or create an EAC to cover this activity. Next, acquiring enough Rainbow Trout from our hatcheries may be difficult due to high demand for those fish in many places statewide. It is possible that the Department may be able to lower stocking rates in other Region IV waters to attempt to stock fish into Mittry Lake, but it is unlikely that we could stock enough fish using this method to create a fishery with high catch rates. If the Department acquires other hatcheries or the existing hatcheries find a way to increase production the Region IV aquatic wildlife program recommends the creation of a winter Rainbow Trout fishery on Mittry Lake.

Invasive/ undesirable species

Quagga Mussels *Dreissena bugensis*, Asian Clam *Corbicula fluminea*, Bullfrog *Lithobates catesbeiana,* Northern Crayfish *Orconectes virilis,* Southern Banded Water Snake *Nerodia fasciata,* Gizzard Shad *Dorosoma cepedianum,* Curly Pondweed *Potamogeton crispus,* and Eurasian Watermilfoil *Myriophyllum spicatum* have all been documented in Mittry Lake and Apple Snails *Pomocea* spp. occur in the vicinity. The other species are either very localized or rarely occur. Gizzard Shad is the most recent species to invade Mittry Lake and its full impacts are not yet known. The Department will continue to work with partner agencies to maintain and enhance monitoring and participate in control efforts when needed.

Access

Mittry Lake is located in Yuma County, about 18 miles northeast of Yuma, Arizona, on the east side of the Colorado River between Laguna and Imperial Dams. There is a three-lane boat launch ramp for motorized boating on Mittry Lake. There are a number of improvements, including a concrete boat ramp, ramada and picnic area, vault restroom facilities, an ADA compliant fishing dock, a paved parking lot, ten gravel and rock fishing jetties, and a gravel boat ramp, parking lot and courtesy fishing dock at an old dredge launch area. There is limited shoreline access on parts of Mittry Lake due to the dense shoreline vegetation.

Catch & Satisfaction

The Department is currently conducting a creel survey at Mittry Lake. Results will be added to the next iteration of the Mittry Lake Management Plan and will be used to adaptively manage the fishery resources at Mittry Lake.

Literature Cited

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Tables and Figures

Table 2: Proportional stock densities (PSD) of Largemouth Bass sampled during fall Mittry Lake electrofishing surveys (2014-2018).

Year	n	Stock Size[a]	PSD [b]	PSD S-Q[c]	PSD Q-P[c]	PSD P-M[c]	PSD M-T[c]	PSD T[c]
2018	137	111	61	39	27	30	5	0
2017	147	102	64	36	29	34	0	0
2016	132	98	77	23	39	30	8	0
2015	144	117	66	34	38	23	5	0
2014	150	138	56	44	32	19	5	0

[a] Stock-size Fish = Largemouth Bass >199 mm.
[b] PSD = Percent of stock-size fish: Largemouth Bass >299 mm.
[c] PSD = Proportional stock density: S-Q=Stock to Quality, Q-P=Quality to Preferred, P-M=Preferred to Memorable, M-T=Memorable to Trophy

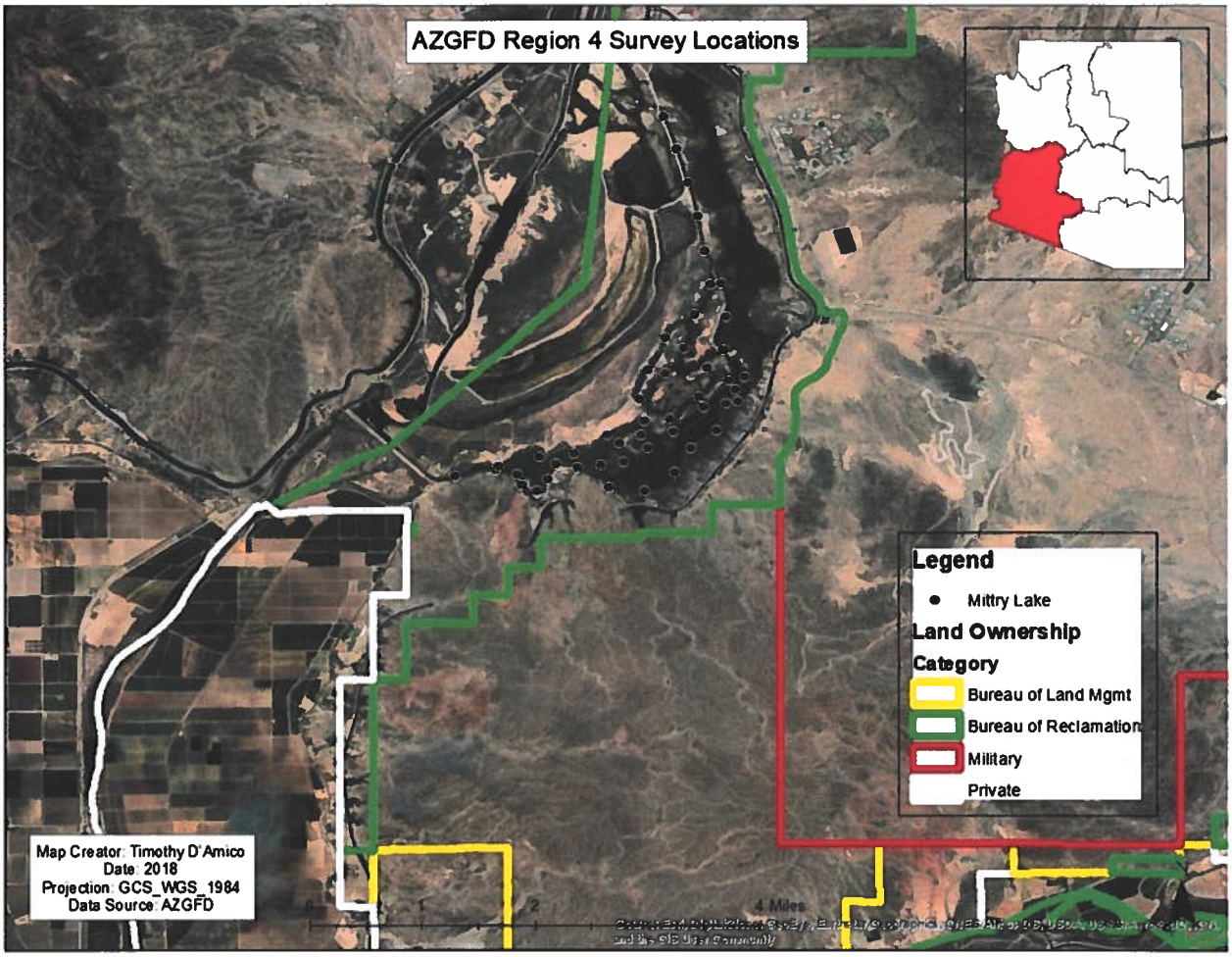

Figure 2. Land ownership of Mittry Lake.

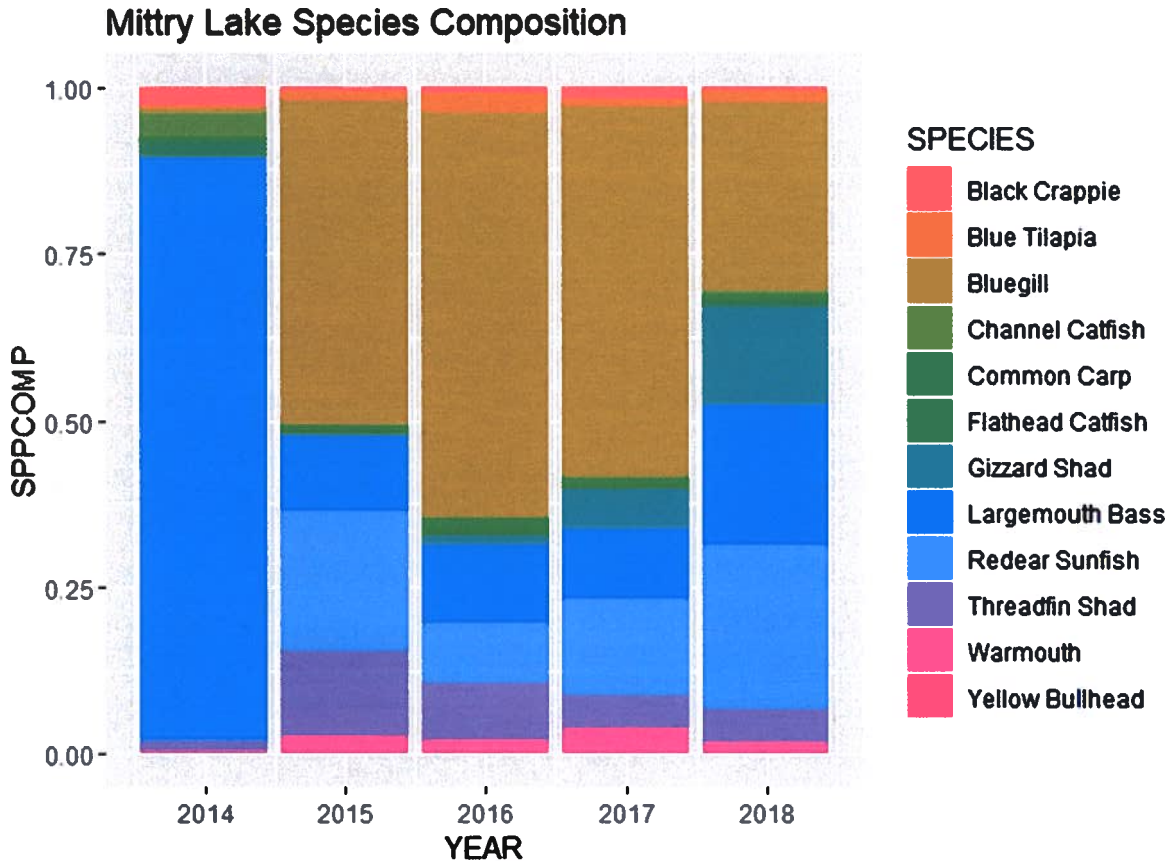

Figure 3. Relative species composition of fish captured during fall electrofishing surveys at Mittry Lake (2014-2018).

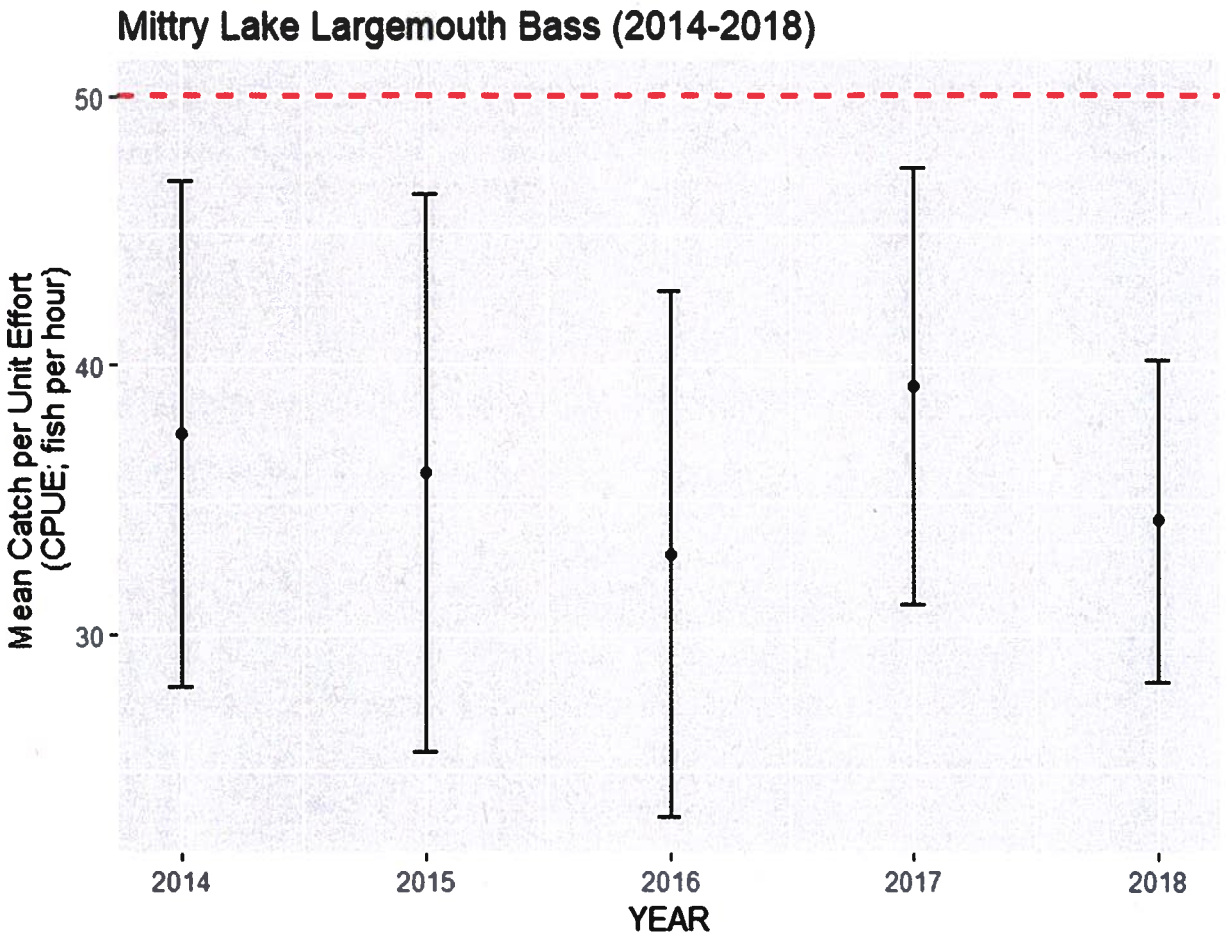

Figure 4. Annual mean catch per unit effort (CPUE) and associated 95% confidence intervals for Largemouth Bass captured during fall electrofishing surveys at Mittry Lake (2014-2018). AGFD Warmwater Vision management objectives are shown with dashed red line.

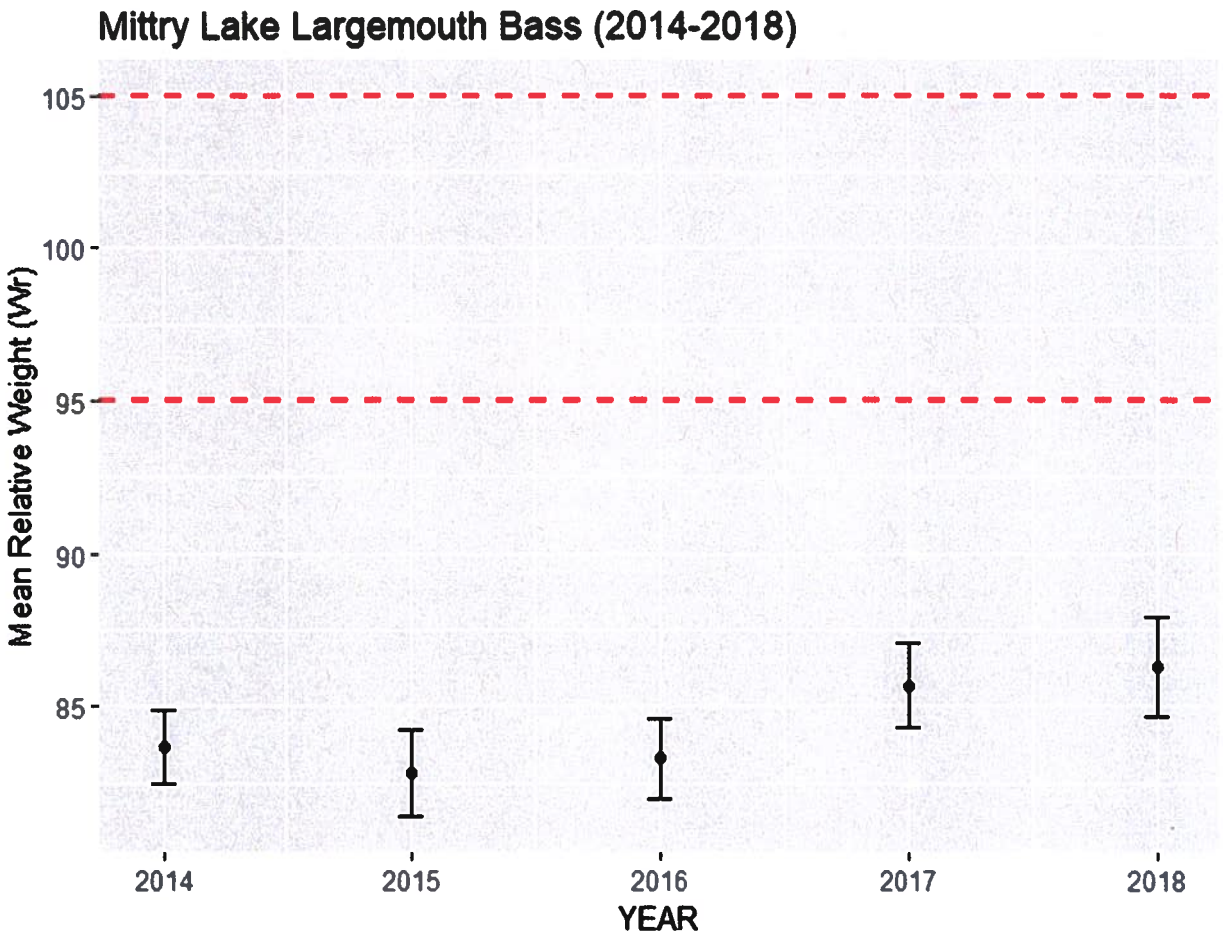

Figure 5. Annual mean relative weight (Wr) and associated 95% confidence intervals for Largemouth Bass captured during fall electrofishing surveys at Mittry Lake (2014-2018). AGFD Warmwater Vision management objectives are shown with dashed red line.

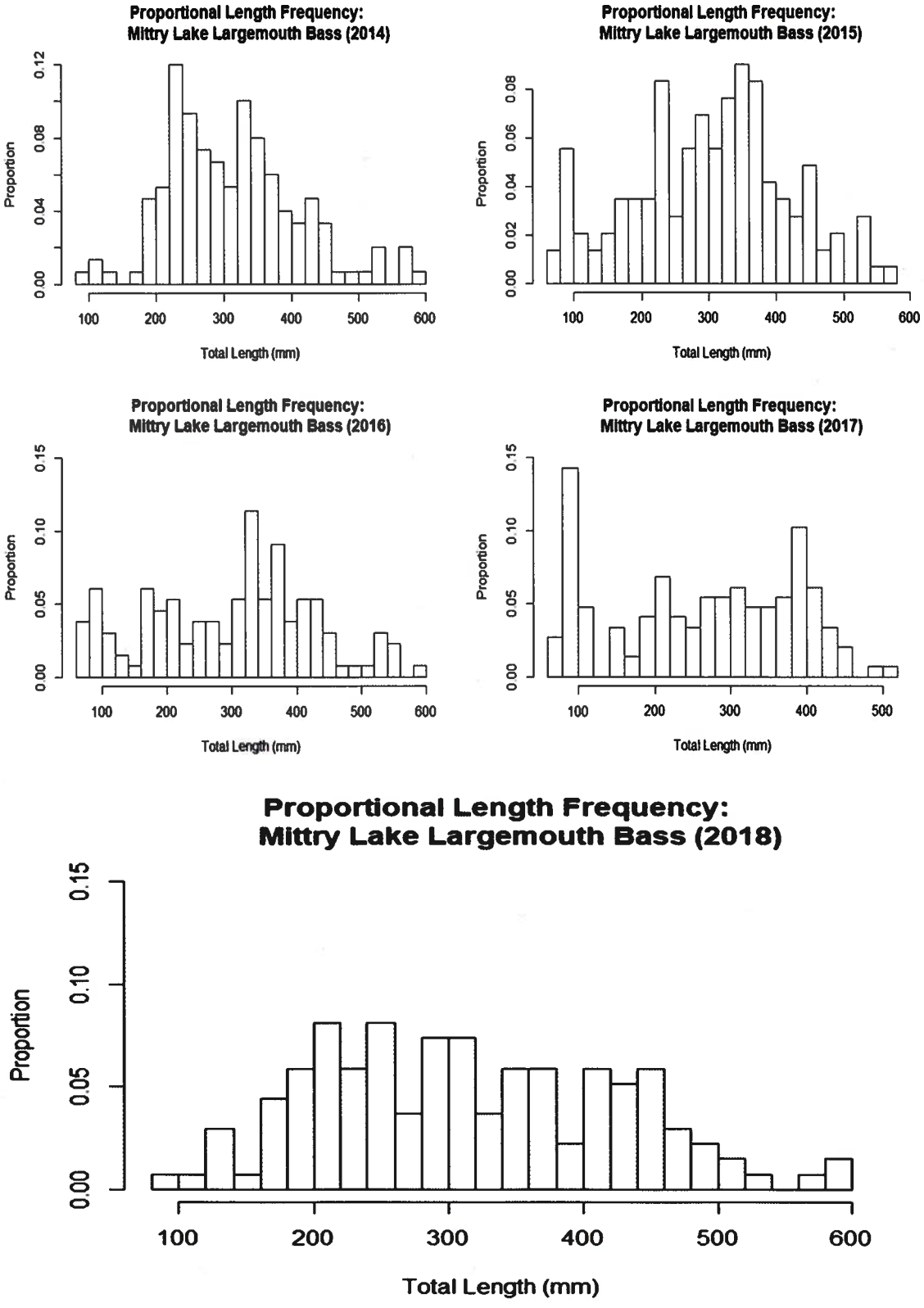

Figure 6. Proportional length-frequency distribution for Largemouth Bass captured during fall electrofishing surveys at Mittry Lake (2014-2018).

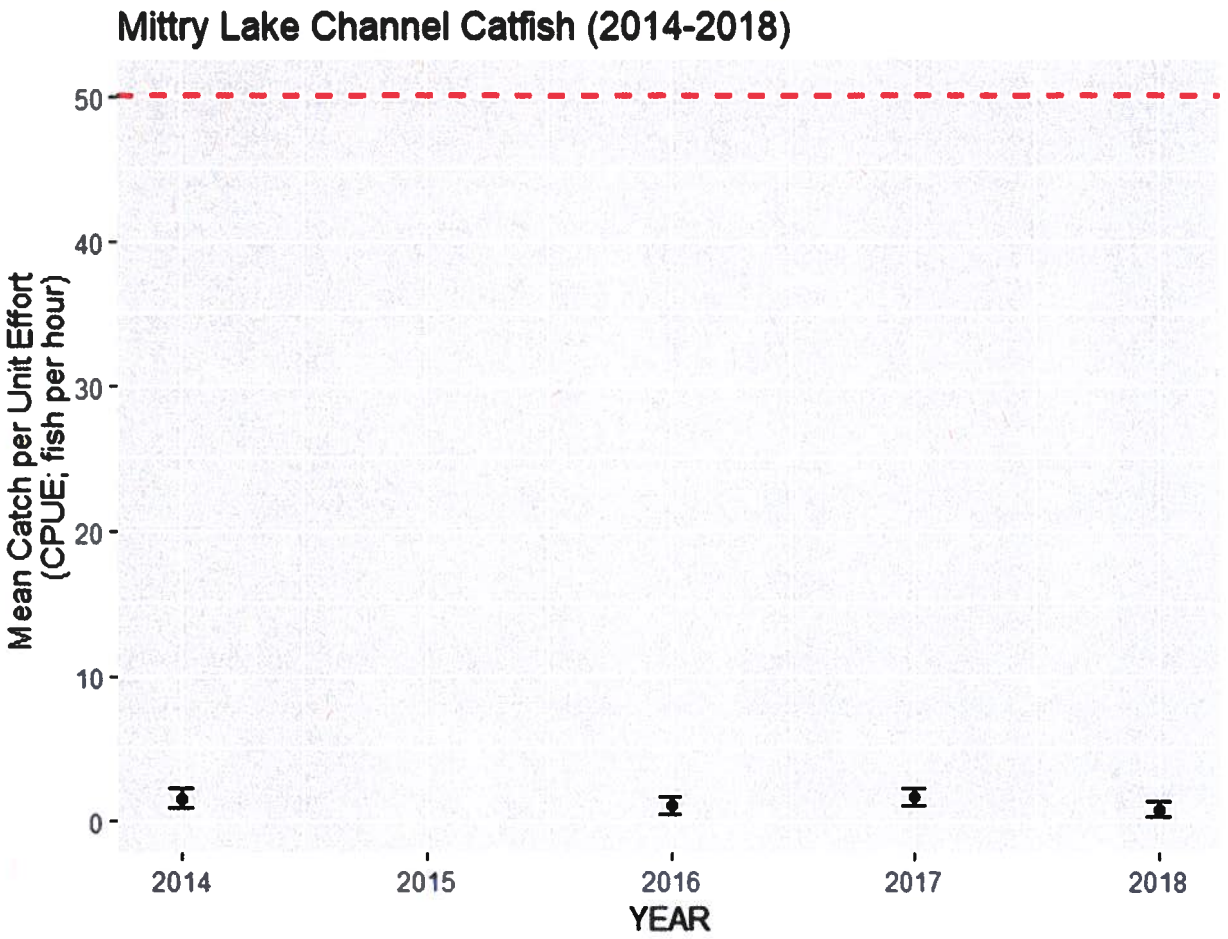

Figure 7. Annual mean catch per unit effort (CPUE) and associated 95% confidence intervals for Channel Catfish captured during fall electrofishing surveys at Mittry Lake (2014-2018). AGFD Warmwater Vision management objectives are shown with dashed red line.

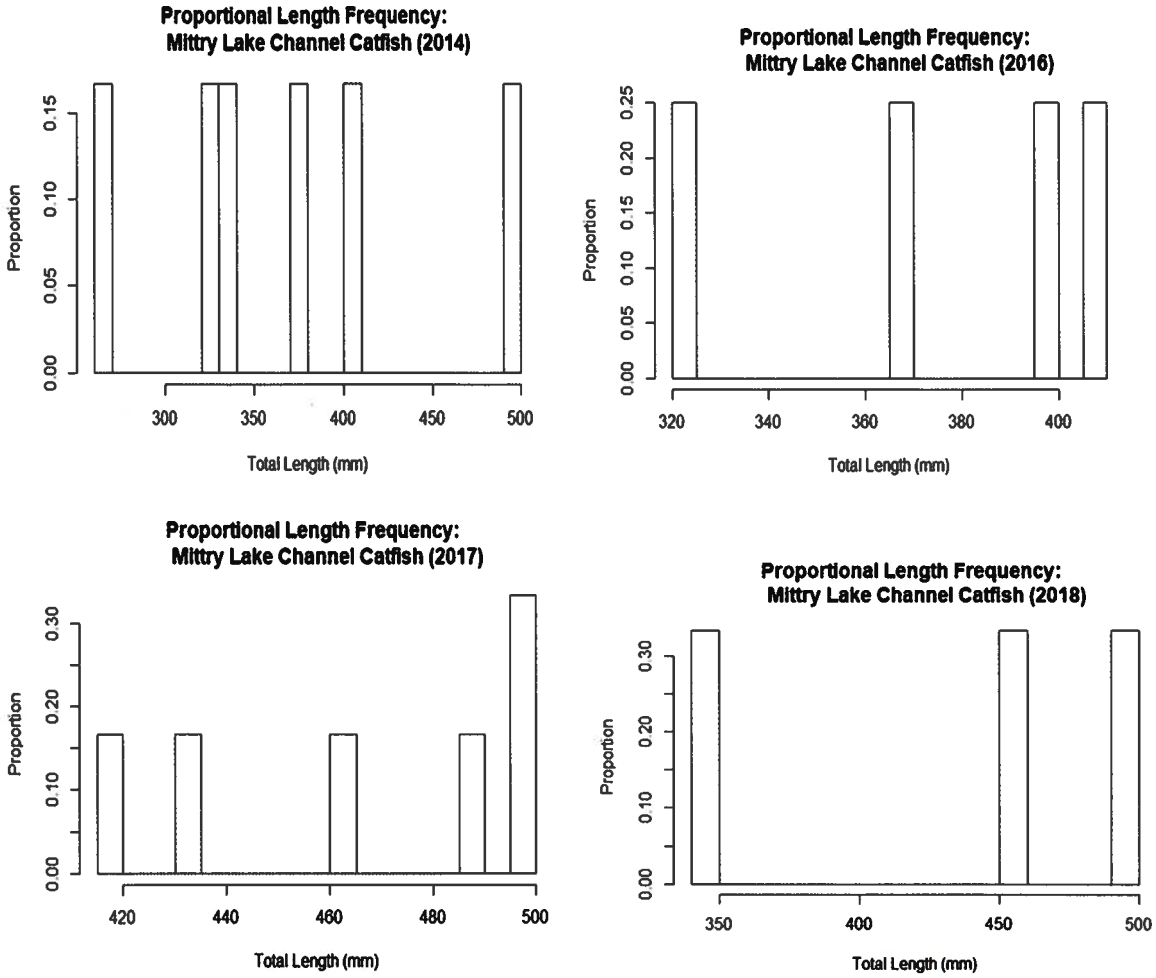

Figure 8. Proportional length-frequency distribution for Channel Catfish captured during fall electrofishing surveys at Mittry Lake (2014-2018).