SURVEY REPORT

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

FISH MANAGEMENT SURVEY AND RECOMMENDATIONS

FOR

LAKE ARCADIA

2024

SURVEY REPORT

State: Oklahoma

Project Title: Lake Arcadia Fish Management Survey Report

Period Covered: 2024

Prepared by: Oklahoma Fishery Reasearch Laboratory

Date Prepared: December 2024

Lake Arcadia

ABSTRACT

Lake Arcadia was surveyed by spring electrofishing and fall gill netting techniques in 2024 to monitor trends in fish populations. The fishery supports self-sustaining populations of Largemouth Bass, Channel, Blue, and Flathead Catfish, Black and White Crappie, White Bass, and a variety of Sunfish species. Hybrid Striped Bass and Saugeye are stocked on a biennial rotation (Hybrid Striped Bass one year, Saugeye the next) to provide additional angling opportunity. No regulation changes are recommended at this time.

INTRODUCTION

Lake Arcadia impounds the Deep Fork River and Spring Creek immediately East of Edmond in Oklahoma County, Oklahoma. It has a surface area of 1,676 acres, 26 miles of shoreline, a maximum depth of 48 feet, and was constructed in 1986 by the Army Corps of Engineers. The lake has a secchi disc visibility of around 20 inches and is considered hypereutrophic. The lake serves a multiuse purpose as water supply for the City of Edmond, flood control for the Deep Fork River basin, and recreational use including fishing, boating, and camping among other activities. Fish habitat consists of flooded timber, rocky main lake points, riprap, and natural and artificial brush piles (predominately cedar trees with a few PVC structures around fishing docks). Aquatic vegetation is limited (some water willow) and difficult to establish due to the flashy nature of the watershed (heavily urban/concrete). Primary forage species consist of Gizzard Shad and Inland Silversides.

Special regulations exist for Hybrid Striped Bass (5 per day of which only 2 can be 20 inches or longer) and fishing is not allowed on ponds or wetland areas adjacent to the lake. Otherwise, statewide regulations apply (Fishing Regulations | Oklahoma Department of Wildlife Conservation (wildlifedepartment.com)).

Fish attractor sites have been constructed of spider blocks and brush piles to improve angler success and are periodically refurbished. Fish attractor sites were most recently refurbished in 2022 (Fish Attractors Map (arcgis.com)).

Lake Arcadia has been previously surveyed by spring electrofishing (2002, 2010, 2011, 2019, 2024), fall nighttime electrofishing (2020, 2021), low-frequency electrofishing (2006, 2012, 2016, 2021), fall gill netting (2003, 2007, 2009, 2015, 2021, 2022, 2023, 2024), and fall trap netting (1993, 1995, 1999, 2002, 2005, 2016) techniques to monitor trends in fish populations. Hybrid Striped Bass and Saugeye fingerlings are stocked on a biennial rotation (Hybrid Striped Bass one year, Saugeye the next) to provide and maintain additional angling opportunity (Appendix 1).

Aquatic Nuisance Species

Zebra Mussels were confirmed to be present Lake Arcadia in 2022.

RESULTS

Fall Experimental Gill Net (Gear 23)

Overview

The lake was sampled using fall experimental gill nets (gear 23) from December 2-3, 2024. Ten randomly selected sites were sampled for a total of 214 units of effort. Mean water temperature was 11.4 C and pool elevation was normal at 306.6 m. A total of 532 fish were caught with 14 species represented. Gizzard Shad (n = 211), Channel Catfish (n = 77), Saugeye (n = 62), White Bass (n = 58), and White Crappie (n = 43) were the most commonly encountered species in the sample (Table 1).

Channel Catfish

Channel Catfish had a mean total length (TL) of 397 mm (range 224-596; Table 1). The length distrubution peaks at 360 mm TL and the majority of fish in the sample fall between 330 and 450 mm TL (Figure 1). Channel Catfish had a mean catch per unit effort (CPUE) of 8.62 (6.44-10.79 95% confidence interval (CI)) with a standard error (SE) of 1.11 (Table 2). The relative standard error (RSE) was 12.99. No preferred, memorable, or trophy sized fish were caught (Table 3). Substock, stock, and quality sized fish had mean CPUEs of 0.56, 4.60, and 3.46 respectively and SE ranged 0.38-0.79 (Table 3). Substock size fish had a RSE of 68.31 while stock and quality size fish had a RSE of 13.77 and 22.74 respectively (Table 3). The overall relative weight (Wr) was 90.02. Substock size fish had a Wr of 89.51 while stock and quality sized fish had a Wr of 88.75 and 91.77 respectively. The maximum weight for an individual in this sample was 2190 g and proportional size distribution of fish ≥ quality size (PSD-Q) was balanced at 43.

Gizzard Shad

Gizzard Shad had a mean TL of 209 mm (range 130-375; Table 1). The length-frequency distribution for the sample peaks at 180 mm TL (Figure 1). Gizzard Shad had a mean CPUE 23.68 (11.43-35.92 95% CI) with a SE of 6.25 (Table 2). The RSE was 26.39. Substock, stock and quality size fish were caught, with mean CPUEs of 5.05, 16.83, and 1.79 respectively (Table 3). PSD-Q was low at 10 while PSD-S-Q was high at 90.

Hybrid Striped Bass

Hybrid Striped Bass were present in the sample. However, only two stockings have occurred thus far since re-stocking began in 2022 and only 13 fish were caught. As such, age-0 (n = 6) and age-2 (n = 7) fish were the only fish encountered. A limited amount of older, large fish are potentially still in the system but would be a minimum of eight years old (previous stocking ended in 2016) and are unlikely to be encountered with this gear type. Fish from this sample had a mean TL of 311 mm (range 136-474)

and CPUE was low at 1.45 (0.47-2.43 95% CI). As we move forward with continued stockings, additional information including age, growth, and mortality metrics will be added.

Saugeye

Saugeye sampled had a mean TL of 481 mm (range 342-610; Table 1). The length frequency distribution is bimodal with peaks at approximately 440 mm and 670 mm TL (Figure 1). Saugeye had an overall mean CPUE of 6.96 (4.89-9.04 95% CI) with a SE of 1.06 (Table 1). Mean CPUE decreased from 12.49 in 2023, which is expected now that an alternate year stocking schedule is established (Figure 2). The RSE was 15.22 (Table 1). No substock or trophy size fish were caught. However, this is not unexpected since Saugeye were not stocked this year (substock size fish are generally young of year) and trophy size fish are not likely to be caught in this gear type. Stock, quality, preferred, and memorable size fish CPUE and SE ranged 0.11-3.82 and 0.11-0.68 respectively. Quality size fish RSE = 17.72 while stock, preferred, and memorable size fish RSE > 25 (Table 1). The percentage of fish ≥ 356 mm TL increased from 90 % in 2023 to 98 % in 2024 (Figure 2). The overall mean relative weight (Wr) was 108.91. Stock, quality, preferred, and memorable size fish had a Wr $\geq$ 99. PSD, PSD-P, and PSD-M were high at 98, 44, and 26 respectively.

In total, 64 fish were aged with 35 age-1 fish, 16 age-3 fish, 10 age-5 fish, and 3 age-6 fish. The mean TL for age-1, -3, -5, and -6 fish was 419, 541, 578, and 542 mm respectively (Figure 3). von Bertalanffy growth metrics and mortality metrics were calculated and are reported below. However, due to small sample size, it is possible that this information misrepresents the Lake Arcadia Saugeye population. von Bertalanffy predicted growth parameters included a theoretical maximum length (L_∞) of 583 mm TL, a growth coefficient (K) of 0.69, and a t_0 of -0.84 (Figure 3). A catch-curve regression calculated an annual mortality (A) of 37.0 % and an instantaneous mortality (Z) of 0.46 (Figure 4).

White Bass

White bass sampled had a mean TL of 214 mm (range 140-384; Table 1). Roughly 78 % of the fish sampled were between 160-300 mm TL (Figure 1). White bass had a mean CPUE of 6.50 (3.20-9.79 95% CI) with a SE of 1.68 (Table 2). The RSE was 25.86. No preferred or trophy sized fish were caught (Table 3). Substock, stock, quality, and memorable sized fish had mean CPUEs ranging from 0.11-2.69 and SE ranging 0.11-0.73 (Table 3). Only quality size fish had a RSE ≤ 25 (Table 3). The overall Wr was moderate at 88.33. The maximum weight for this sample was 945 g. PSD was moderate at 49 and PSD-P was low at 2.

In total, 51 fish were aged with 21 age-0 fish, 23 age-1 fish, 5 age-2 fish, 1 age-3 fish, and 1 age-4 fish. The mean TL for age-0, -1, -2, -3, and -4 were 172, 238, 274, 257, and 384 mm TL respectively (Figure 3). von Bertalanffy growth metrics and mortality metrics were calculated and are reported below. However, due to small sample size, it is possible that this information misrepresents the Lake Arcadia White Bass population. von Bertalanffy predicted growth parameters included a theoretical maximum length (L_∞) of

370 mm TL, a growth coefficient (K) of 0.40, and a t_0 of -1.59 (Figure 3). A catch-curve regression calculated an annual mortality (A) of 64.8 % and an instantaneous mortality (Z) of 1.04 (Figure 4).

White Crappie

White Crappie sampled had a mean TL of 216 mm (range 135-345; Table 1). Roughly 47 % of the fish sampled were between 180-200 mm TL (Figure 1). White Crappie had a mean CPUE of 4.81 (2.27-7.35 95% CI) with a SE of 1.30 (Table 2). The RSE was 26.98. No trophy size fish were caught (Table 3). Substock, stock, quality, preferred, and memorable sized fish had mean CPUEs ranging from 0.22-2.57 and SE ranging 0.22-1.05 (Table 3). Quality size fish had a RSE = 24.96 and all other sizes had a RSE >25 (Table 3). The overall Wr was good at 94.81. The maximum weight for this sample was 680 g. PSD, PSD-P, and PSD-M were all balanced at 47, 28, and 5 respectively.

Spring Bass Electrofishing (Gear 44)

Largemouth Bass (LMB) were surveyed in spring of 2024 by means of boat electrofishing. Sampling occurred in accordance with the Oklahoma Department of Wildlife Conservation's Standard Sampling Procedures (SSP). During sampling the water temperature was 20 C (68 F), and the lake was at normal pool level. Original effort included 19 randomly selected sites around the perimeter of Lake Arcadia on April 29th. An additional 18 randomly selected sites were sampled on May 2nd for a total of 37 units of effort, and a total of 86 Largemouth Bass were collected. After the random samples, we concluded that there were not enough fish for a proper age sample and continued sampling "bass habitat" and obtained a total of 106 fish.

Median TL of all LMB sampled was 402.5 mm with a minimum TL of 127 mm and a maximum TL of 570 mm (Figure 5). Mean CPUE of LMB was 13.95 (95% CI 9.02 -18.88) with a standard error (SE) of 2.52 and a relative standard error (RSE) of 18.04. Quality, preferred, and memorable size fish had CPUEs of 2.92, 6.81, and 1.46 respectively (Table 4).

A total of 106 LMB were aged; ages ranged from 1 to 10 years. von Bertanlanffy growth metrics predict a theoretical maximum length (L_∞) of 540 mm TL, a growth coefficient (K) of 0.42, and a t_0 of 0.02 (Figure 6). A catch-curve regression calculated an annual mortality (A) of 19 % and an instantaneous mortality (Z) of 0.21 (Figure 7).

RECOMENDATIONS

1. Continue to monitor Hybrid Striped Bass and Saugeye population dynamics and growth rates to evaluate stocking success.
2. Continue to monitor population dynamics for self-sustaining sportfish species (Largemouth Bass, Crappie spp., White Bass, Catfish spp.)
3. Continue to monitor Gizzard Shad abundance and size distribution to gauge forage availability.
4. No regulation changes are recommended at this time.

Table 1. Sample size, mean TL (mm), mean weight (g), and associated ranges for each species represented.

Species	Number	Mean TL (range)	Mean Weight (range)
Black Crappie	9	179 (163-193)	81 (65-100)
Blue Catfish	18	474 (316-805)	-
Bluegill Sunfish	4	165 (160-170)	88 (75-110)
Channel Catfish	77	397 (224-596)	609 (80-2190)
Common Carp	6	414 (332-473)	969 (545-1310)
Freshwater Drum	8	177 (135-240)	67 (25-155)
Gizzard Shad	211	209 (130-375)	-
Largemouth Bass	4	283 (157-406)	571 (45-1205)
River Carpsucker	12	388 (205-445)	938 (115-1450)
Saugeye	62	481 (342-610)	1410 (380-3005)
Smallmouth Buffalo	8	173 (136-217)	73 (25-195)
Striped Bass Hybrid	13	311 (136-474)	698 (30-1540)
White Bass	58	214 (140-384)	137 (30-945)
White Crappie	43	216 (135-345)	159 (25-680)

Table 2. Total catch per unit effort for each species sampled.

Species	Mean	Count	RSE	SE	L 95% CI	U 95% CI	N RSE = 12.5 (25% range)	N RSE = 20 (40% range)
Black Crappie	1.01	10	34.86	0.35	0.32	1.70	78	30
Blue Catfish	2.02	10	21.50	0.43	1.17	2.87	30	12
Bluegill Sunfish	0.45	10	55.28	0.25	-0.04	0.93	196	76
Channel Catfish	8.62	10	12.89	1.11	6.44	10.79	11	4
Common Carp	0.67	10	36.85	0.25	0.19	1.15	87	34
Freshwater Drum	0.90	10	66.67	0.60	-0.28	2.08	284	111
Gizzard Shad	23.68	10	26.39	6.25	11.43	35.92	45	17
Largemouth Bass	0.45	10	55.13	0.25	-0.04	0.93	195	76
River Carpsucker	1.34	10	20.73	0.28	0.80	1.89	28	11
Saugeye	6.96	10	15.22	1.06	4.89	9.04	15	6
Striped Bass Hybrid	0.90	10	66.67	0.60	-0.28	2.08	284	111
Smallmouth Buffalo	1.45	10	34.42	0.50	0.47	2.43	76	30
White Bass (Sand Bass)	6.50	10	25.86	1.68	3.20	9.79	43	17
White Crappie	4.81	10	26.98	1.30	2.27	7.35	47	18

Table 3. Catch per unit effort by size category.

Species	Size Category	Mean	RSE	SE	L 95% CI	U 95% CI	N RSE = 12.5 (25% range)	N RSE = 20 (40% range)
Channel Catfish	substock	0.56	68.31	0.38	-0.19	1.31	299	117
Channel Catfish	stock	4.60	13.77	0.63	3.35	5.84	12	5
Channel Catfish	quality	3.46	22.74	0.79	1.92	5.01	33	13
Gizzard Shad	substock	5.05	41.47	2.09	0.94	9.15	110	43
Gizzard Shad	stock	16.83	30.81	5.19	6.67	27.00	61	24
Gizzard Shad	quality	1.79	38.47	0.69	0.44	3.15	95	37
Saugeye	substock	0.19	66.68	0.13	-0.06	0.43	285	111
Saugeye	stock	0.11	100.00	0.11	-0.11	0.33	640	250
Saugeye	quality	3.82	17.72	0.68	2.49	5.14	20	8
Saugeye	preferred	1.24	34.48	0.43	0.40	2.08	76	30
Saugeye	memorable	1.80	31.05	0.56	0.70	2.89	62	24
Striped Bass Hybrid	substock	0.67	44.44	0.30	0.09	1.25	126	49
Striped Bass Hybrid	quality	0.78	56.38	0.44	-0.08	1.65	203	79
White Bass	substock	1.23	54.80	0.68	-0.09	2.56	192	75
White Bass	stock	2.69	27.10	0.73	1.26	4.11	47	18
White Bass	quality	2.46	20.10	0.50	1.49	3.43	26	10
White Bass	memorable	0.11	100.00	0.11	-0.11	0.33	640	250
White Crappie	stock	2.57	40.96	1.05	0.51	4.63	107	42
White Crappie	quality	0.90	24.96	0.22	0.46	1.33	40	16
White Crappie	preferred	1.12	33.18	0.37	0.39	1.85	70	28
White Crappie	memorable	0.22	66.67	0.15	-0.07	0.51	284	111

Table 4. Catch per unit effort of Largemouth Bass in Arcadia by size category.

Species	Size Category	Mean	RSE	SE	L 95% CI	U 95% CI	N RSE = 12.5 (25% range)	N RSE = 20 (40% range)
LMB	sub stock	1.78	28.75	0.51	0.78	2.79	196	76
LMB	stock	0.97	44.79	0.44	0.12	1.83	475	186
LMB	quality	2.92	30.46	0.89	1.18	4.66	220	86
LMB	preferred	6.81	23.93	1.63	3.62	10.01	136	53
LMB	memorable	1.46	29.40	0.43	0.62	2.30	205	80

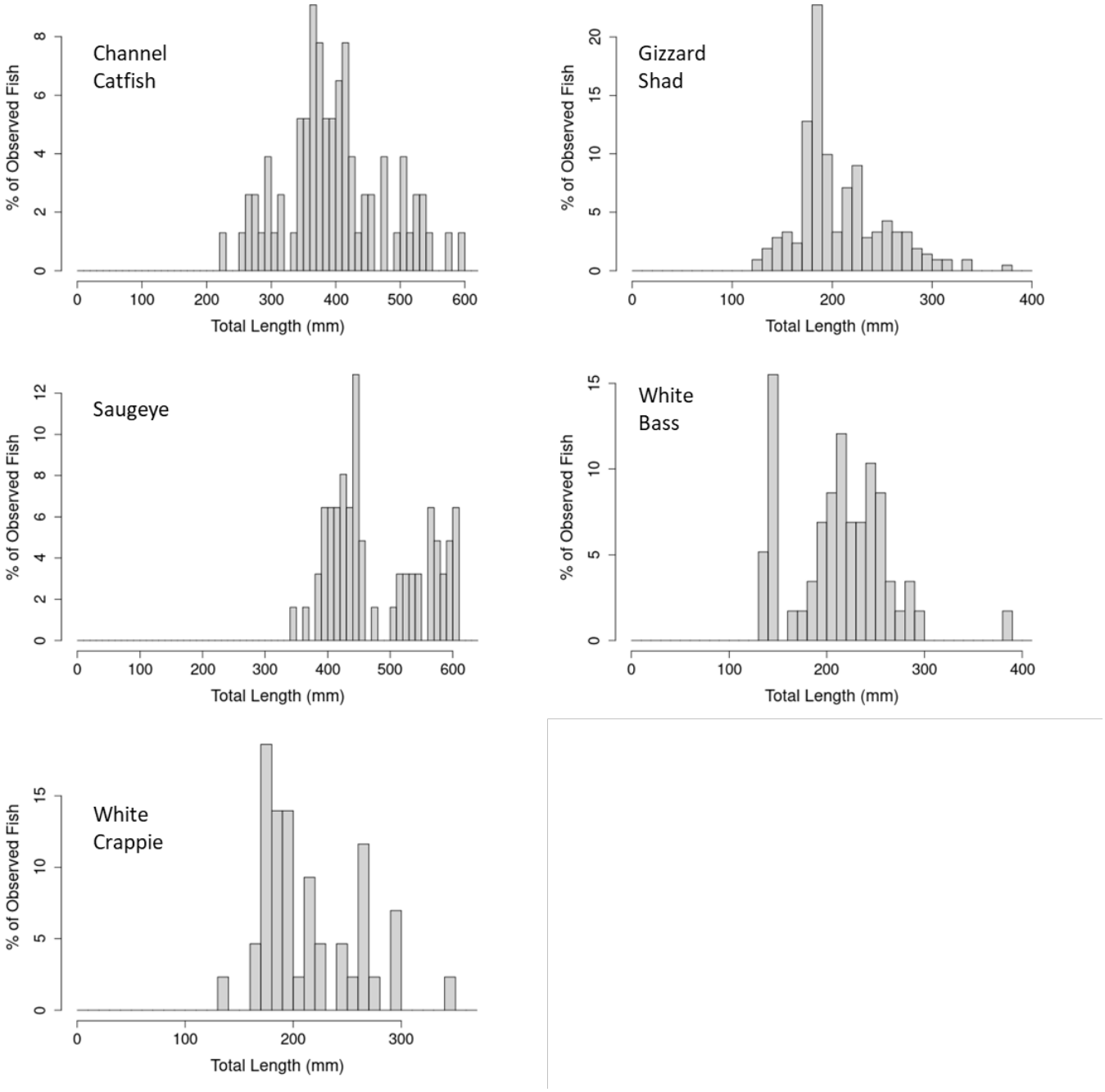

Figure 1. Length-frequency distributions for five fish species from Lake Arcadia.

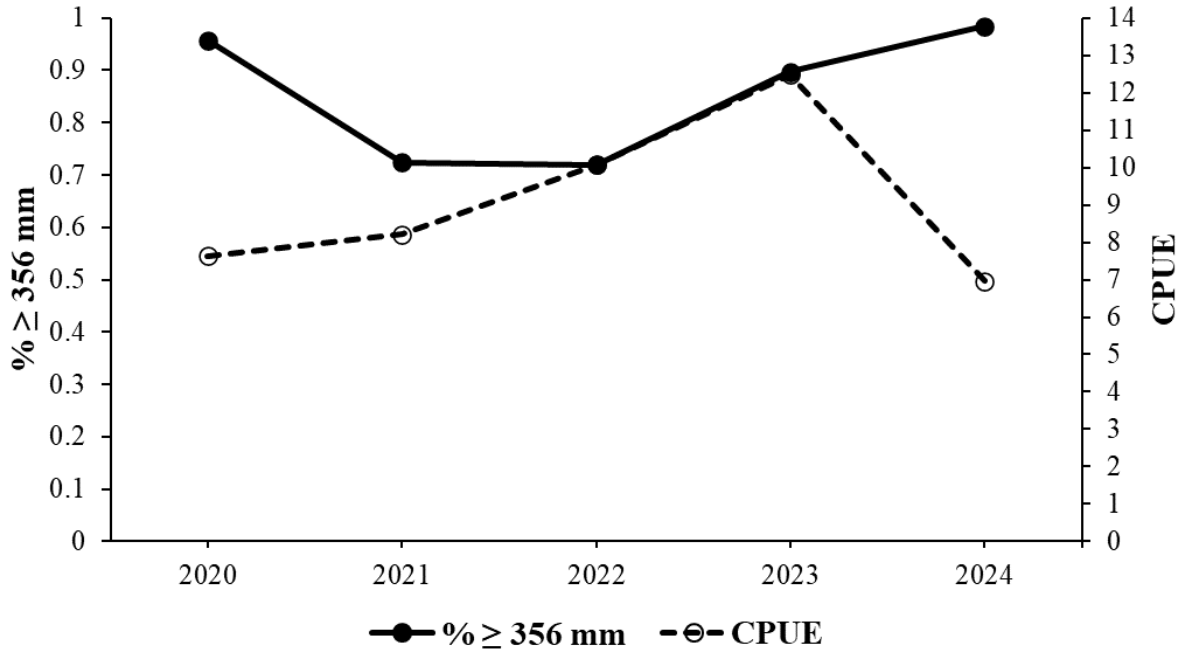

Figure 2. Percentage of Saugeye sampled greater than or equal to the minimum size limit (356 mm TL/14 inches) and catch per unit effort (CPUE) through time for Lake Arcadia.

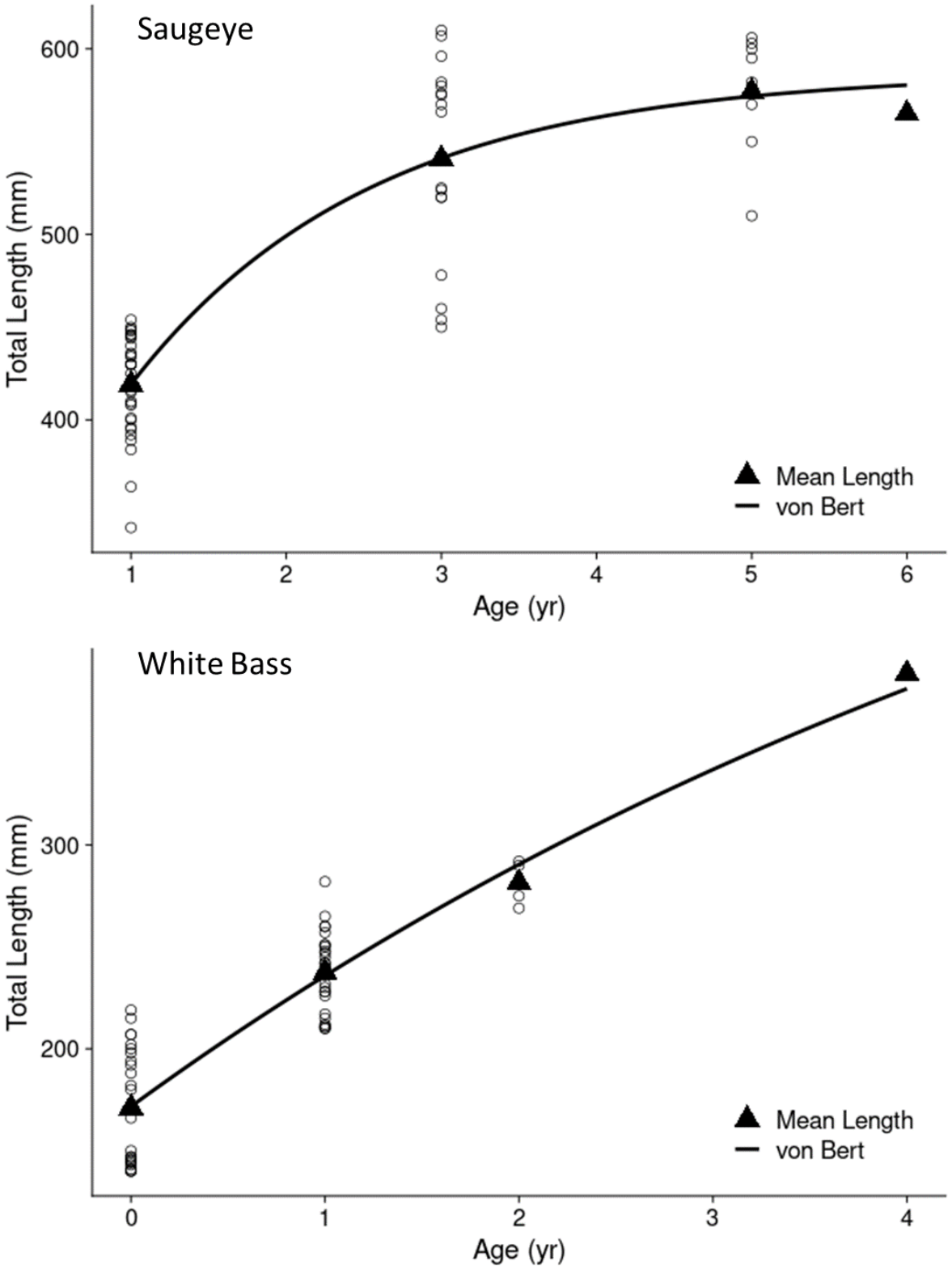

Figure 3. vonBertalnffy growth curve for Saugeye and White Bass collected from Lake Arcadia. Circles depict individual lengths at age.

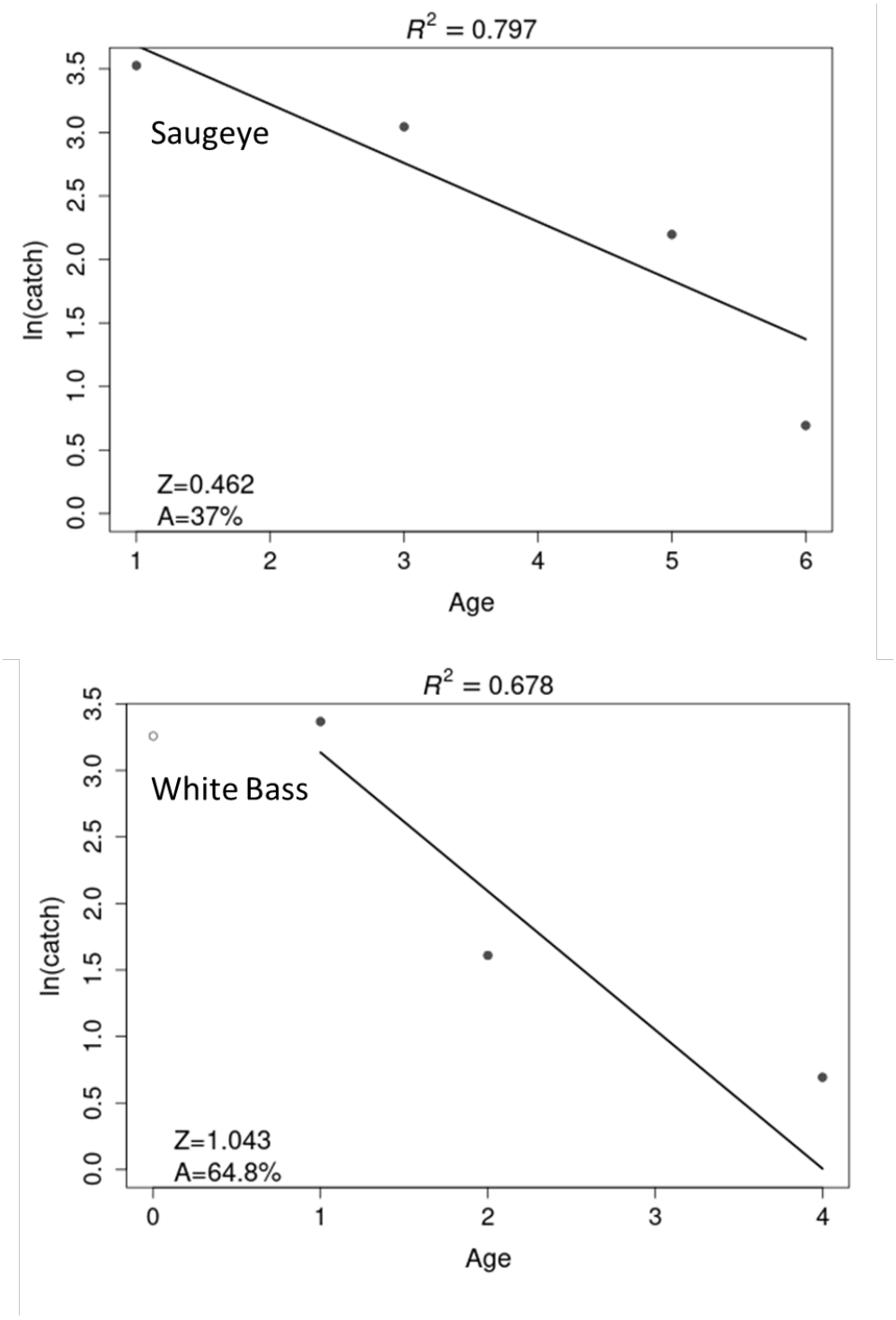

Figure 4. Catch-curves, instantaneous mortality (Z), and annual mortality (A) for Saugeye and White Bass collected from Lake Arcadia.

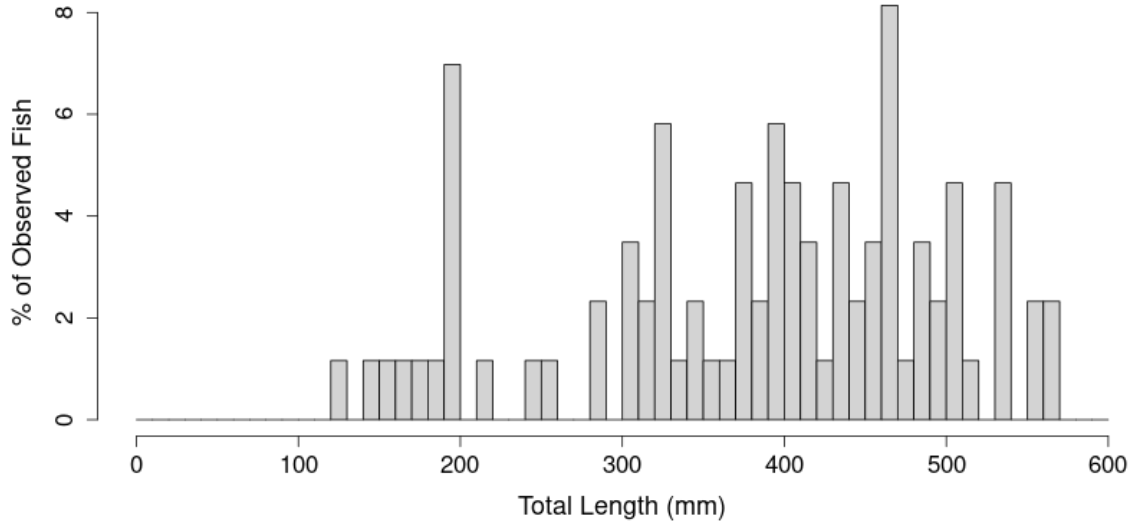

Figure 5. Length-frequency distribution of Largemouth Bass in Arcadia.

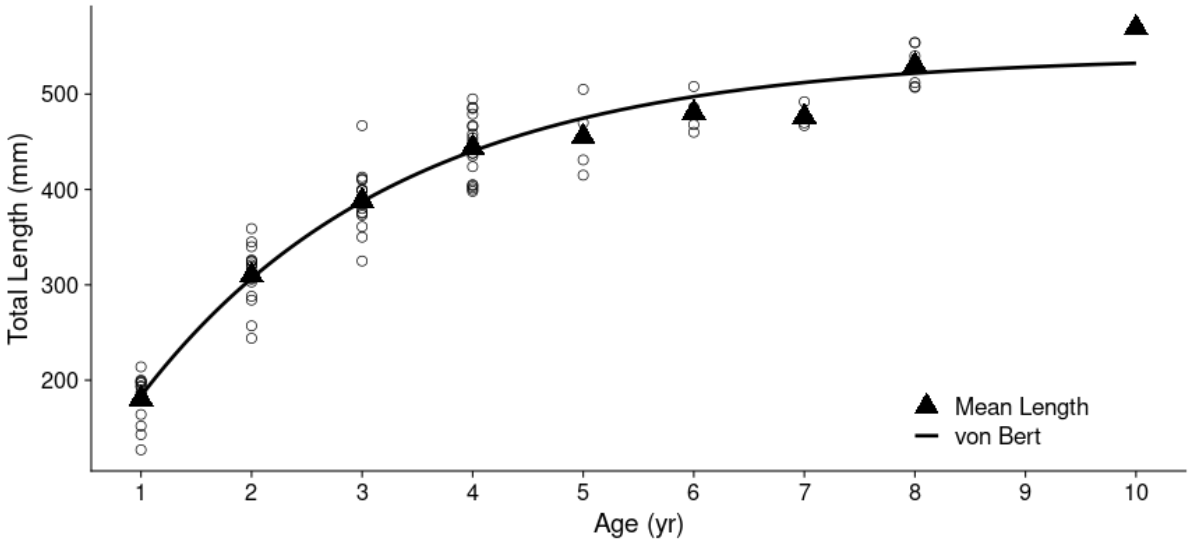

Figure 6. von Bertalanffy growth curve for Largemouth Bass in Arcadia.

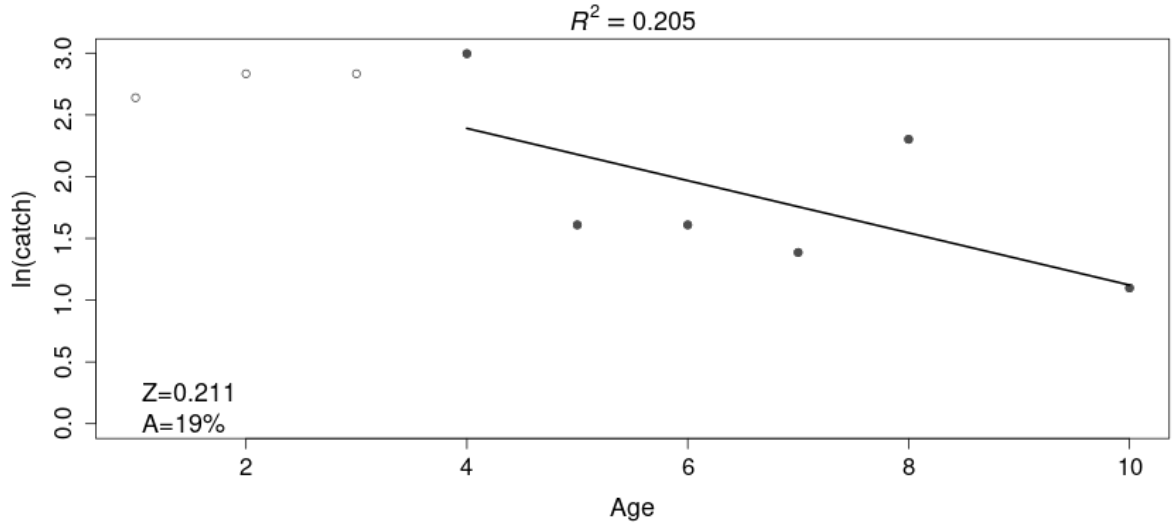

Figure 7. Catch curve for Largemouth Bass in Arcadia.

Appendix 1. Species, number, and size of fish stocked in Lake Arcadia since 2012.

Date	Species	Number	Size (inches)
2012	Hybrid Striped Bass	9100	1.5
2013	Hybrid Striped Bass	9100	1.5
2014	Hybrid Striped Bass	9100	1.5
2014	Hybrid Striped Bass	9,250	2
2014	Channel Catfish	100	11
2015	Hybrid Striped Bass	9,100	1.5
2015	Hybrid Striped Bass	9,108	1.5
2016	Hybrid Striped Bass	9,100	1.5
2016	Hybrid Striped Bass	9130	1.5
2017	Saugeye	36,400	3
2017	Saugeye	38,110	1.5
2018	Saugeye	146,086	fry
2018	Hybrid Sunfish	200	6
2019	Saugeye	36,520	1.5
2021	Saugeye	37,095	1.5
2022	Hybrid Striped Bass	170,000	fry
2023	Saugeye	37,420	1.5
2024	Hybrid Striped Bass	13,870	1.5