SURVEY REPORT
OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

FISH MANAGEMENT SURVEY AND RECOMMENDATIONS FOR SOONER LAKE 2024

SURVEY REPORT

State: Oklahoma
Project Title: Sooner Lake Fish Management Survey Report
Period Covered: This report discusses survey results from 2024.
Prepared by: Jeremy Duck
Date Prepared: January 2025

Sooner Lake

ABSTRACT

Sooner Lake was surveyed using experimental gillnets to determine the status of the Hybrid Striped Bass, Saugeye and White Perch populations during the 2024 fall sampling season. Data from the 2024 sample will be compared to previous standardized sampling efforts to monitor trends in catch per unit effort (CPUE) and population dynamics.

Recommendations include gillnetting fall of 2025 for Hybrid Striped Bass, Saugeye and White Perch. Maintaining the 5 Hybrid Striped Bass/acre stocking rate until after the creel is completed. Finish the creel survey in 2025, and evaluate Largemouth Bass DNA again in 2028 to look for changes.

Introduction

Background

Sooner Lake impounds Greasy Creek, 15 miles south of Ponca City in Noble and Pawnee Counties, Oklahoma. The Greasy Creek basin is a small, prairie grass watershed. The silt load is light and is trapped on the West side of Highway 177. Overall water quality is very high due to the small size and quality of the watershed which results in very stable water levels even during heavy spring rain events. Sooner Lake covers 5,400 surface acres and was constructed in 1976 by the Oklahoma Gas and Electric Company to serve as a cooling reservoir. The thermal impact of the plant is limited to the west side of the lake which only covers about 25 percent of the total area of the lake, so the main body of Sooner Lake is thermally unaffected. Sooner Lake is located close to the Arkansas River and was initially filled and by pumping water from the Arkansas. Water levels are now maintained in the same way. Sooner Lake has a mean depth of 28 feet and a maximum depth of 89 feet, a shoreline development ratio of 5.2, a very low water exchange rate of 0.05 (inflow/storage capacity) and a secchi disc visibility of around 70 inches in the main pool in August; turbidity is primarily from plankton.

Fish habitat consists primarily of aquatic vegetation, primarily pondweed, water milfoil and cattails. Due to stable water levels and clear water, aquatic vegetation covers most shorelines and extends out to a depth of six feet. Standing timber is restricted to several coves south of Highway 15 and is not accessible by boat from the main body of the lake. Rip-rap habitat originally covered 9.7, miles but the more exposed stretches were concreted in to prevent further wave erosion. The remaining rip-rap areas are located behind the north and central dykes and covers 4.1 miles of shoreline. Substrates are largely clay with some limited areas of sandstone rock. The surrounding topography is open tall grass prairie which leaves the lake open to the prevailing winds.

Current Management Practices

Evaluate and Maintain Stocked Moronid and Percid Fish Populations

Hybridized fish species like hybrid striped bass and saugeye do not have the capability to reproduce and sustain their populations as other game fish can. These put and take fisheries are subject to greater control by fisheries managers who must request annual introductions to maintain their abundances in satisfactory levels for the angling public. Populations must be monitored closely to ensure this limited resource is used most efficiently. The Sooner Lake hybrid fishery is high profile and utilized regularly by fishing guides. The saugeye fishery at Sooner Lake is currently being evaluated as a method to control invasive white perch. The maintenance of current data on these species is vital

to gauging success of these management strategies and communicating about them with constituents.

White Perch Monitoring and Research

The aquatic nuisance species White Perch was first documented in Sooner Reservoir in 2006. Following introduction, managers observed increasing numbers, negative impacts on sport fish, and angler dissatisfaction. A year-long diet study was conducted to determine if a viable candidate for biological control of White Perch was present in the current species assemblage. The 2016 completion of that study found the foraging success of Saugeye to be significantly higher than that of the other predator species examined. Stocking Saugeye to control White Perch in Oklahoma is novel and no standard protocol currently exists for stocking rates and length limit regulations. A five year evaluation of this concept began in 2019 following two seasons of collecting baseline data. The plan included Sooner Reservoir maintaining an 18 inch minimum length limit on Saugeye, doubling Saugeye stocking rates to 40 fish per acre, and halving Striped Bass x White Bass Hybrid stockings to 5 per acre.

Monitoring of Heavily Utilized Black Bass Populations

Largemouth bass was the most sought after species in Oklahoma according to the most recent angler survey. Sooner Lake has a high profile largemouth bass fishery that is utilized by both recreational and tournament anglers. The introduction of Florida Largemouth Bass genetics into largemouth bass populations can be a valuable management tool to improve growth rates. The warm-water discharge at Sooner Lake has provided an opportunity to utilize this management strategy at the northernmost border of its viability. This black bass population requires monitoring for constituent interaction, evaluation of recent regulation changes, and evaluation of genetic contribution of FLMB.

2024

Spring

Largemouth Bass:

Sooner Lake was sampled for Largemouth Bass using an ETS electrofishing boat during the spring of 2024. Sample sites were randomly selected around the lake edge for a total of 26 sites to be used for catch rate analysis. An additional 35 sites were selected

around the lake and sampled. Each site was electrofished for a total of 10 minutes. A total of 205 (70 random sites, 135 non-random sites) Largemouth Bass were collected, measured (mm) and weighed (g). Otoliths were collected from 190 (63 random, 127 non-random) LMB for aging and growth analysis. DNA samples were collected from 150 Largemouth Bass. Catch Per Unit Effort (CPUE) was 16.15± 6.45 with a C.V. of .20, a significant decrease from 2017 but an insignificant increase from 2020 (2017-CPUE = 52.00± 9.97, C.V. of .09, 2020-CPUE = 10.93± 8.25, C.V. of .38). Length frequencies indicate higher abundance of LMB above 300mm but size were more evenly distributed than in previous years (Figure 1). Proportional Size Distributions (PSD) did not significantly change compared to previous sampling years (Table 8). Relative weight (Wr) was significantly larger than surveys in 2020 but not significantly different from 2017 (2024 Wr = 91.31± 1.82, 2017 Wr = 90.54± 1.55, 2020 Wr = 85.12± 2.19). Age frequencies indicated two large year classes of LMB at age-1 and age-2, a stark difference from 2020 were a very large age-5 year class was present. The large age-5 year class in 2020 is still present in 2024 as a robust age-9 group (Figure 2). The only significant change in mean length at age was an increase at age-2 from 2020 to 2024 (Table 9).

Largemouth Bass in Sooner Lake had a lower catch rate than most of the other lakes in North Central Region, ranking in the lower 25% of lakes. PSDs were greater than 75% of lakes in the NCR for PSD, PSD-P, and PSD-M. Relative weights were below the 50% mark when compared to surrounding lakes. Mean length at age was above 75% compared to surrounding lakes for age-1, age-3, and age-4 bass while age-2 bass were above 95%. The lakes growth slowed down at age-5 ranking in the bottom half of lakes in the North Central Region. Overall Largemouth Bass in Sooner Lake are having great growth the first four years of life if this head start in growth continues for these year classes we may see increases in the size of age-5 and up. Forage has been a problem in Sooner Lake for a number of years and continued monitoring of LMB could help determine if forage limitations are an issue for LMB as they get larger and older. If the age-4 and younger year classes growth slows to resemble current age 5 fish then evaluating the diets and abundance of those items eaten maybe necessary to attempt increasing growth for the older fish. The abundant age-1 and age-2 year classes will continue to grow in the coming years replacing the now age-9 year class that has been dominate in Sooner Lake for many years. DNA collected from LMB found no fish were pure Florida Strain Largemouth Bass nor Northern Largemouth Bass. 70% of Largemouth Bass collected for DNA had 50% or greater Florida alleles. The stocking of Florida largemouth Bass has been effective at introducing these genetics into the LMB population in Sooner Lake. The last stockings of Certified Florida Largemouth Bass were in 2023 with 120,000 FLMB fingerlings being stocked.

Fall

We sampled Sooner Lake using experimental gillnets. Gillnets were deployed around the lake at randomly selected sites perpendicular to the shore in a minimum of 6ft deep. A total of 26 net nights of sampling was completed. All fish were measured (mm) and weighed (g). Target species had their otoliths removed for aging (Hybrid Striped Bass, Saugeye, White Perch).

Hybrid Striped Bass:

A total of 111 Hybrid Striped Bass were collected. Catch Per Unit Effort (CPUE) was significantly lower than in 2022 and 2023 (Figure 3, Table 3). Proportional size distribution (PSD) significantly increased compared to all years except 2021 (Figure 5) while preferred sized fish did not significantly change from 2023 (PSD-P = 18± 9). Mean length at age was significantly higher compared to all previous years for age 1 and age 2 hybrids (Figure 4, Table 4). Length frequencies resemble that of 2023 with most hybrids ranging from 400mm (15.7in) to 499mm (19.6in) (Figure 12). Relaitive weight of hybrids was 83.96± 1.22 and was not significantly different from 2022 and 2023.

Overall Hybrid Stiped Bass had significant increases in growth for age 1 fish. The age 1, 2 and age 3-year cohorts are in the 75th percentile of hybrid fisheries statewide. PSD and PSD-P additionally ranked in the 75th percentile compared statewide fisheries. CPUE did significantly decrease and could make it more challenging for anglers to catch them. While abundance decreased continuing the current stocking rate of 5 fish/acre until the creel survey at Sooner Lake is over is warranted to best assess angler opinions of the fisheries in the lake. Continued monitoring using gillnets should be done to determine changes in the Sooner Lake fisheries as increased Saugeye stocking halt. Pending the results of the 2025 gill net sampling and creel survey stocking rates may return to 10hybrids/acre.

Saugeye:

A total of 367 Saugeye were collected, and otoliths removed for aging. Catch Per Unit Effort (CPUE) was 14.67 a significant increase against all years except 2020 (Figure 6, Table 5). Mean Length at Age (MLA) increased significantly for age 2 Saugeye from all years except 2017 while age 3 fish significantly decreased compared to 2023 (Figure 7, Table 6). Proportional Size Distribution (PSD) was 93 and was not significantly different from 2023 and the years before increased stockings (Figure 8). PSD – Preferred was 25 and not significantly different from 2023. Length frequencies indicate Sauge are most abundant in the 425mm (16.7) to 474mm (18.7in) (Figure 13). Relative weights significantly increased from 80.53± 1.03 in 2023 to 89.72± .73 in 2024.

Saugeye catch rates increased significantly over taking the previous peak in 2020. This puts Sooner Lake in the 95th percentile of Saugeye fisheries statewide for CPUE. While Mean Length at Age did significant increase for age 2 the significant decrease at age 3 could be due to the increasing amount of fish from multiple year classes creating more competition at that size. Growth slow drastically at age 3 where the next 2 years Saugeye are only growing 26mm more (about 1in) (Table 6). Saugeye are reaching harvestable size at age 4 and make up 25% of the catchable sized fish in Sooner Lake. This should alleviate some of the challenges anglers have faced trying to catch harvest sized Saugeye (18in). The increase in relative weights will also be a boon for anglers who catch keepable fish. 2025 will be the first year stocking rates return to historical levels (20 fish/acre). Continued monitoring over the next few years would allow managers to observe changes in the population as abundances decrease. In addition the Sooner Lake creel survey will complete in the fall of 2025. This data will be valuable in understanding anglers preferences when fishing at Sooner Lake. Pending the results of the 2025 gill netting and the creel survey fisheries staff my recommend changes to the length limit of Saugeye in Sooner Lake be reduced to the statewide size limit (14in).

White Perch:

A total of 70 White Perch were collected, and otoliths removed for aging. Catch Per Unit Effort (CPUE) was 2.83 a significant decrease from 2022 and 2023 (Figure 9, Table 7). Mean Length at Age (MLA) for age 1 White Perch had a significant decrease compared to 2021, 2022, and 2023. No significant changes were observed for age 2 and 3 (Figure 10, Table 9). White Perch were collected in lower numbers than in the previous year except for age 3 compared to 2023 (Table 9). Proportional Size Distributions (PSD) were not significantly different from any previous sample (Figure 11). PSD – Preferred was 40 and not significantly different from 2023. Length frequencies indicate a peak of White Perch at 225mm (8.8in) to 249mm (9.8in) while fish larger than that increased slightly and fish smaller decreased (Figure 14).

Catch rates continued to significantly decrease from there high in 2022 currently around the lowest point recorded during this study in 2020. Catch rates for White Perch and Saugeye have almost mirrored each other during this entire study (Figure 6, Figure 9). This trend will be interesting to monitor in the coming years to determine if it holds as Saugeye stockings return to previous levels. The significant decrease in MLA of age 1 White Perch would traditionally indicate a large year class competing for resources but combined with a significant decrease in catch rates of White Perch another factor appears to be in play. Potentially the increased amount of age 0 and age 1 Saugeye are out competing what younger White Perch are left. 2023 was supposed to be the last year for increased stockings of Saugeye, the state hatcheries had very high returns on all Saugeye

ponds and stocked Sooner Lake with the increased stocking rate again in 2024. 2025 will be the first year of the normal Saugeye stocking rate, continued monitoring is needed to see changes in White Perch and Saugeye populations as Saugeye abundances decrease.

Evaluation of Saugeye as a control for White Perch

Overall, White Perch abundance has significantly decreased each year over the last three years, in addition the 2024 sample is the first sample since increased stocking to has a significant decrease compared to any year before the increased stockings (Figure 9). Monitoring this trend over the next few year will be insightful as to how long it takes for increased stocking to effect White Perch populations.

There appears to be an inverse relationship between the abundance of White Perch and the abundance of Saugeye in Sooner Lake. This relationship has not been tested for significance, but is visible in CPUE trend data over the last eight sampling seasons. However, we cannot rule out that this relationship may be an artifact of catchability of each species under certain environmental conditions. It will be important to continue regular sampling to monitor this relationship.

It seems the effect of Saugeye on the White Perch population in Sooner Lake has been similar to what we see when using Saugeye to control stunted crappie populations. White Perch in their native range on the East Coast exhibit great reproductive potential that can cause overpopulation and stunting, similar to crappie in Oklahoma. In Maine, for example, for most waters the only management recommendation needed for white perch is unlimited harvest at current levels of fishing pressure.

If White Perch were not considered an invasive species, we would speak favorably of the White Perch population in Sooner Lake. Unlike other Oklahoma waters they have invaded, White Perch in Sooner regularly reach preferred, even memorable size. They are good table fare and customers of local fishing guides are requesting to target them on trips. Our 2024-2025 creel will help us to quantify angler preferences and dial in our management efforts surrounding these species going forward.

RECOMMENDATIONS

1. Evaluate Hybrid Striped Bass, Saugeye and White Perch in 2025 using gill nets.

2. Continue stocking rates of 5 fish per acre for HSB.

3. Finish the creel survey of Sooner Lake to look at harvest pressure of Saugeye and Moronid Spp.

4. Survey the Largemouth Bass in Sooner Lake in 2028 collect DNA.

Figures and Tables

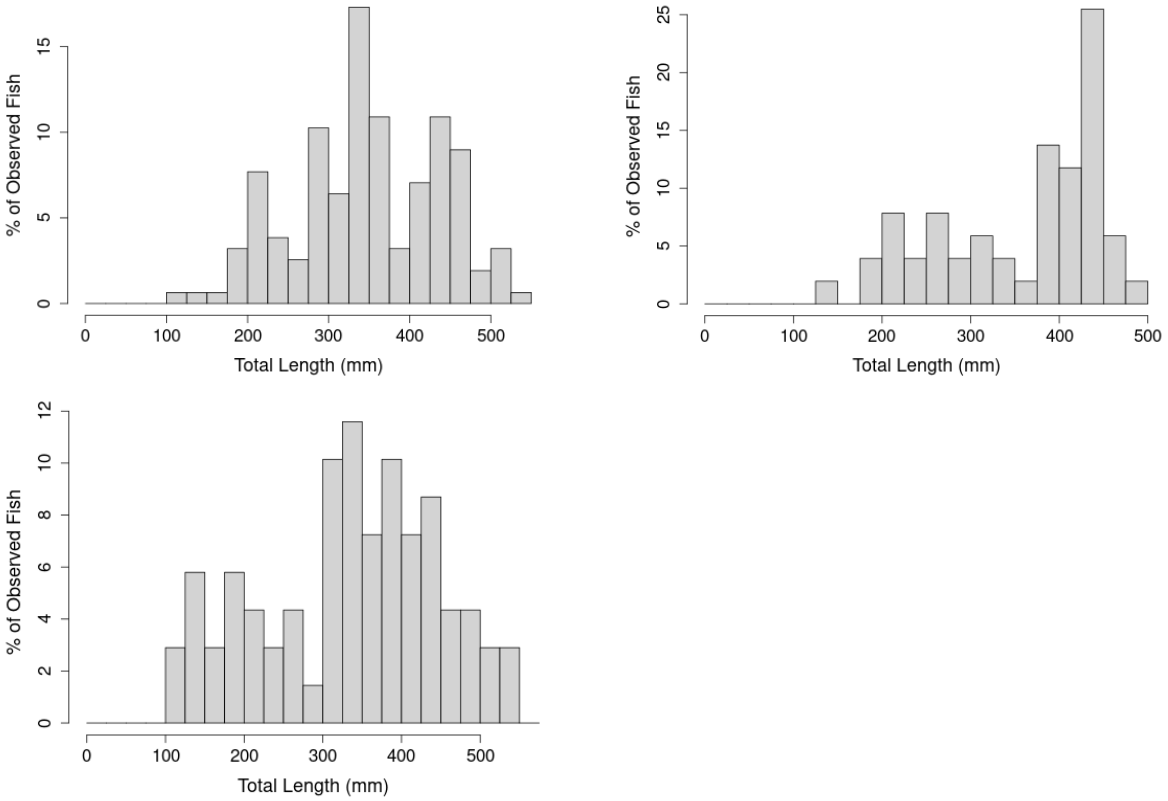


Figure 1. Length frequencies of Largemouth Bass in Sooner Lake from 2017 (Top Left), 2020 (Top Right), 2024 (Bottom Left).

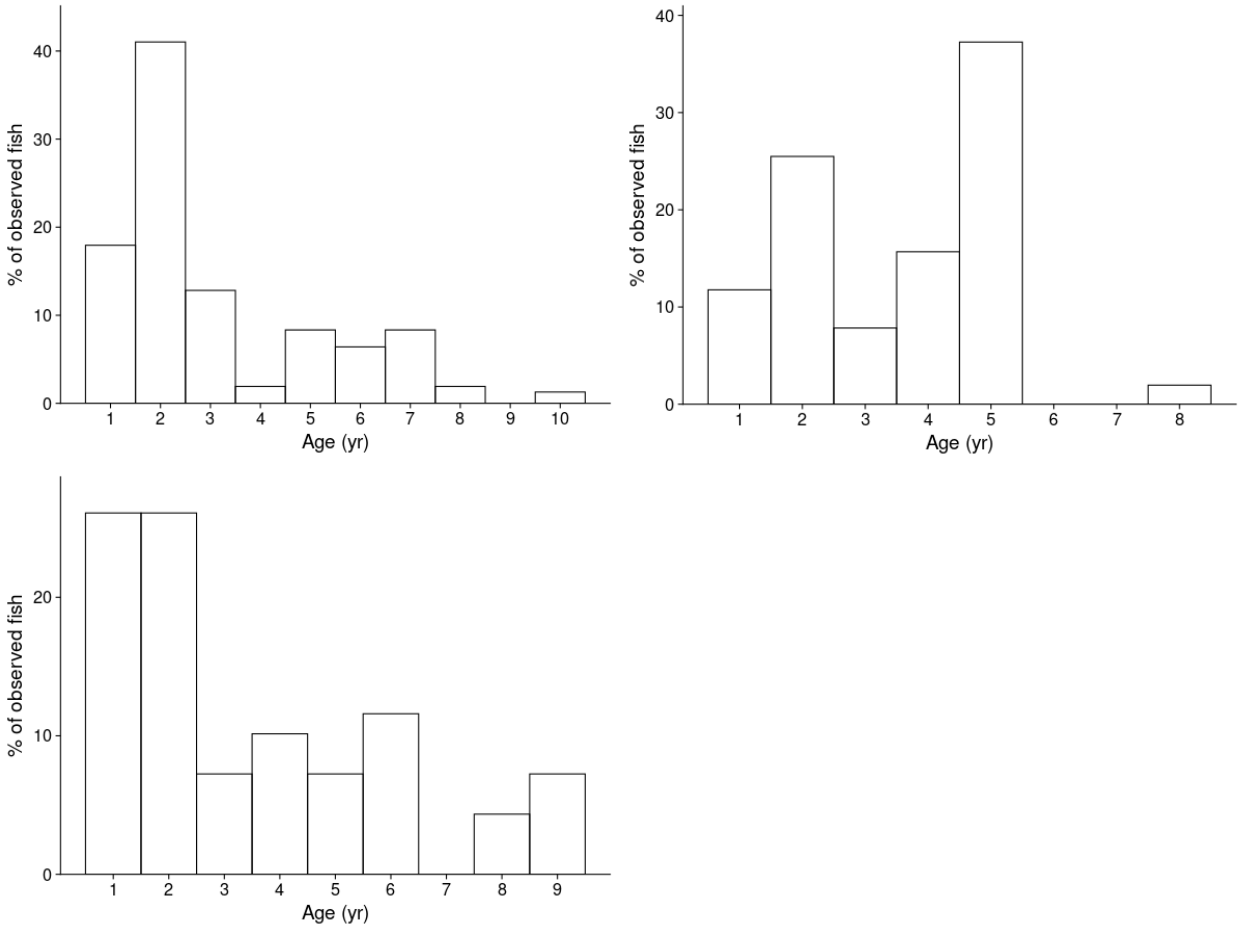


Figure 2. Age frequencies of Largemouth Bass in Sooner Lake 2017 (top left) and 2020 (top right) and 2024 (bottom left).

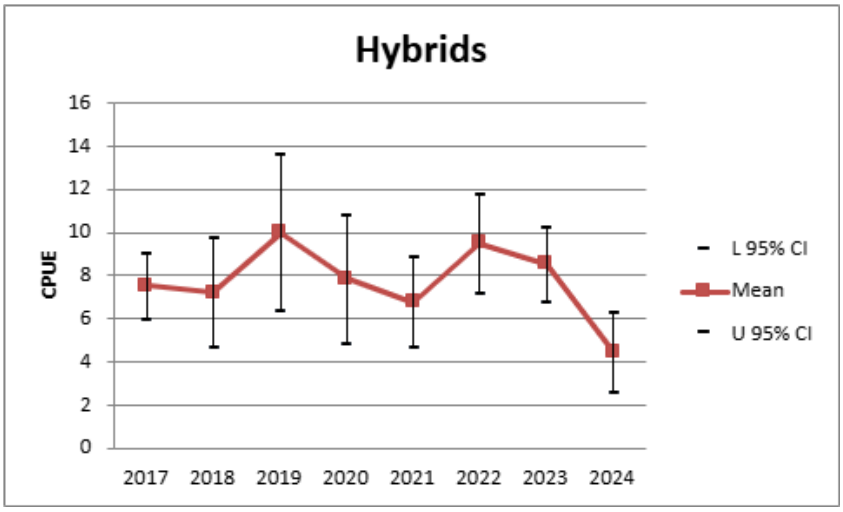
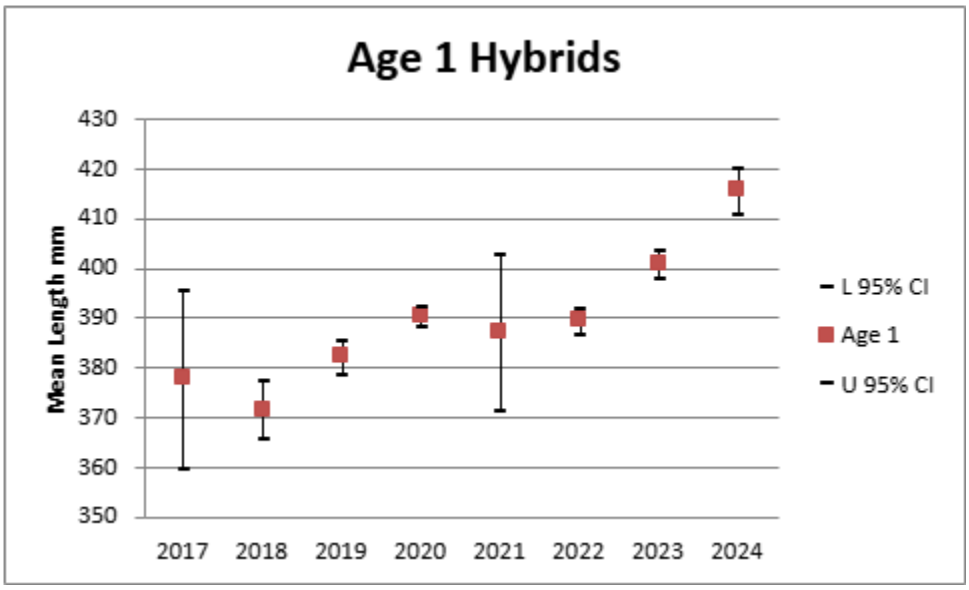
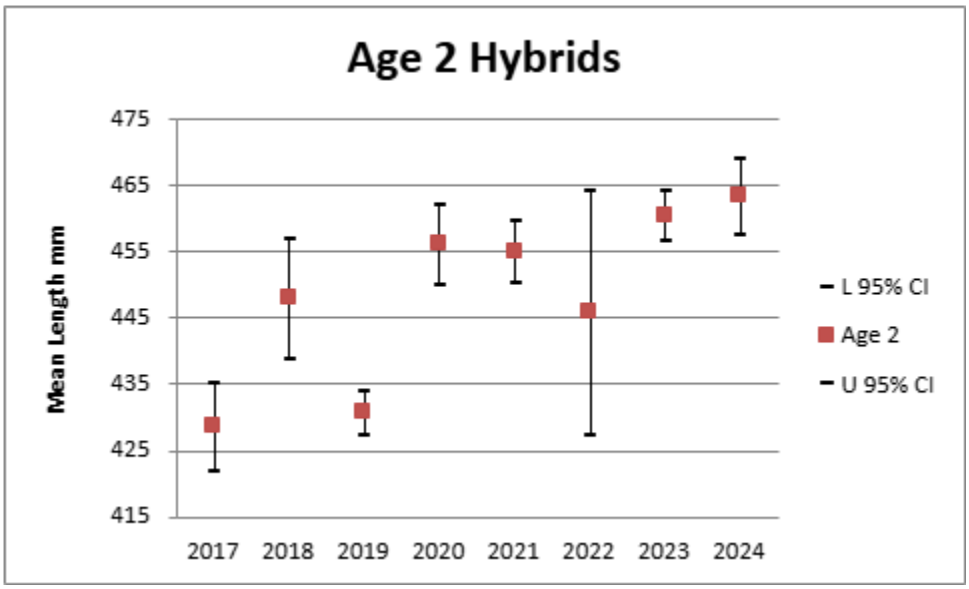


Figure 3. Catch Per Unit Effort of Hybrid Striped Bass in Sooner Lake.





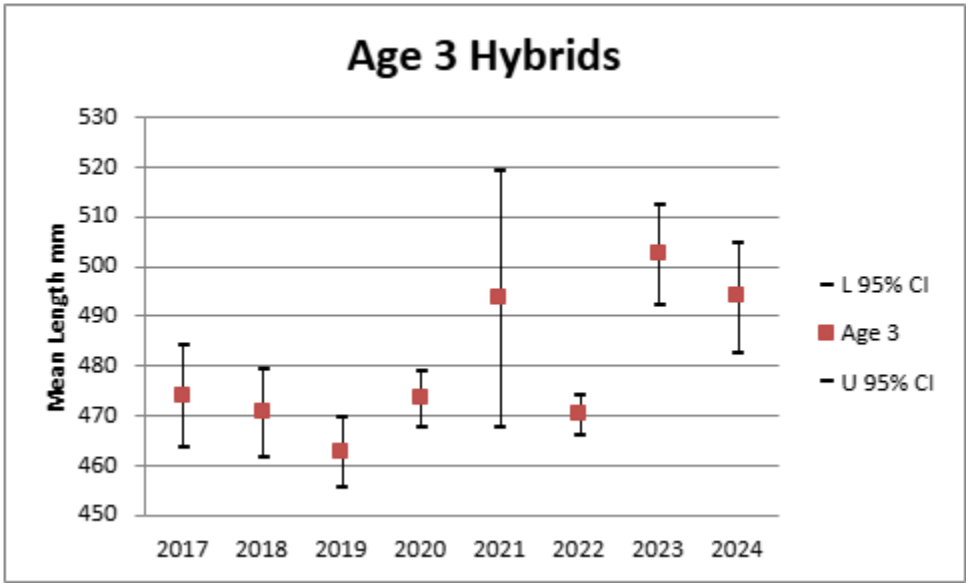


Figure 4. Mean Length at Age of Hybrid Striped Bass for age 1, 2, and 3 in Sooner Lake.

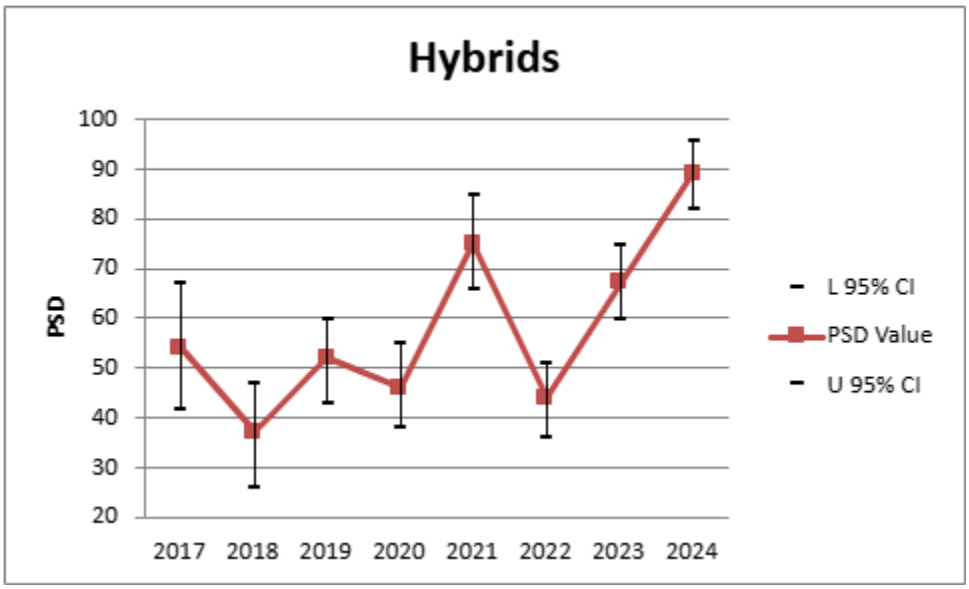


Figure 5. Proportional Size Distributions of Hybrid Striped Bass in Sooner Lake.

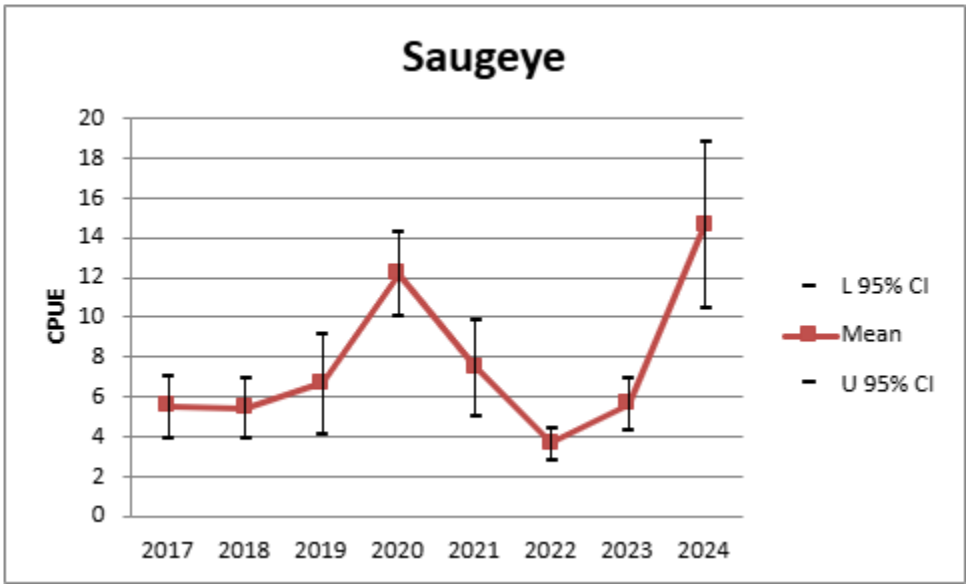
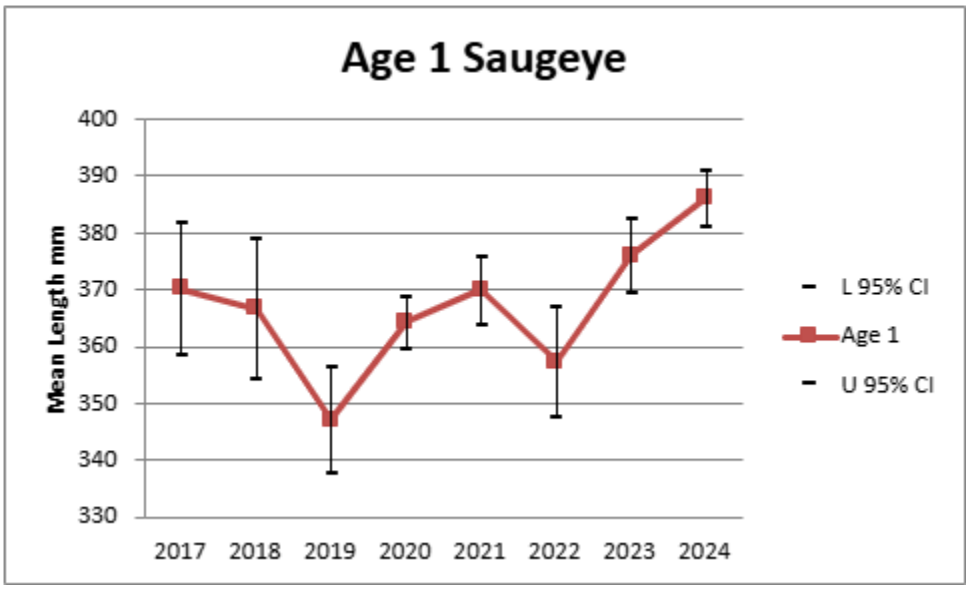
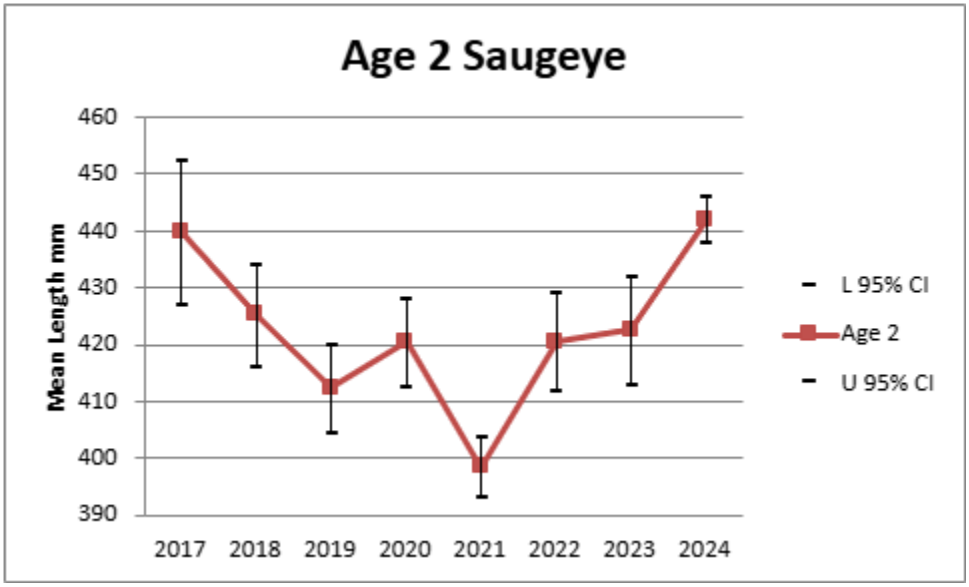


Figure 6. Catch Per Unit Effort of Saugeye in Sooner Lake.


Age 1 Saugeye
Mean Length mm
400
390
380
370
360
350
340
330
2017
2018
2019
2020
2021
2022
2023
2024
L 95% CI
Age 1
U 95% CI


Age 2 Saugeye
Mean Length mm
460
450
440
430
420
410
400
390
2017
2018
2019
2020
2021
2022
2023
2024
L 95% CI
Age 2
U 95% CI

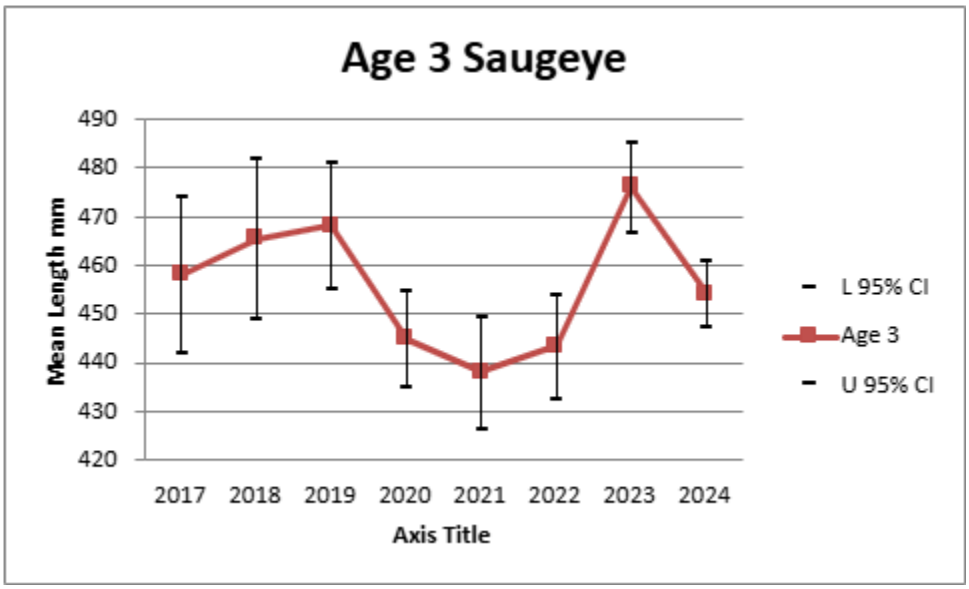


Figure 7. Mean Length at Age of Saugeye for age 1, 2, and 3 in Sooner Lake.

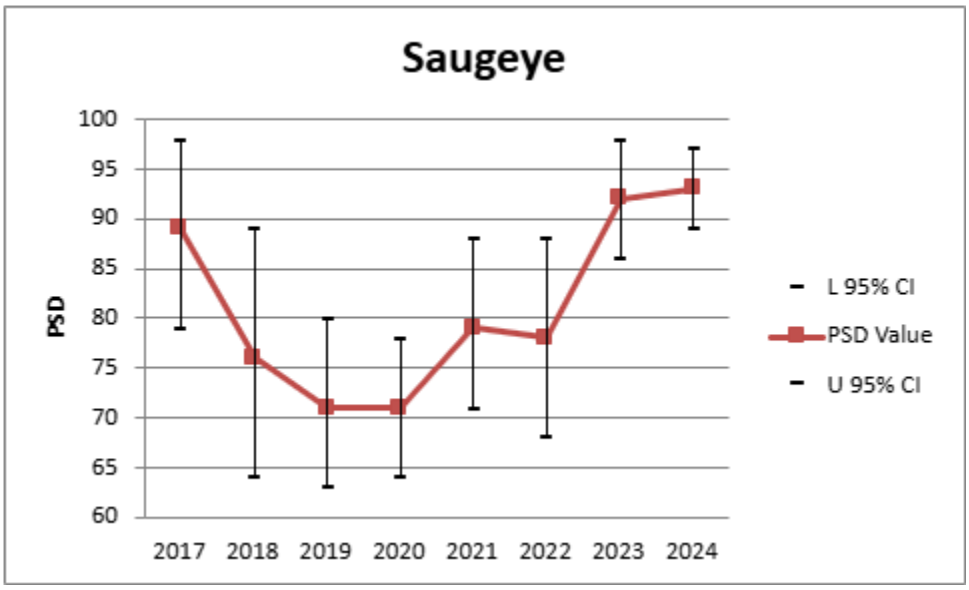


Figure 8. Proportional Size Distributions of Saugeye in Sooner Lake.

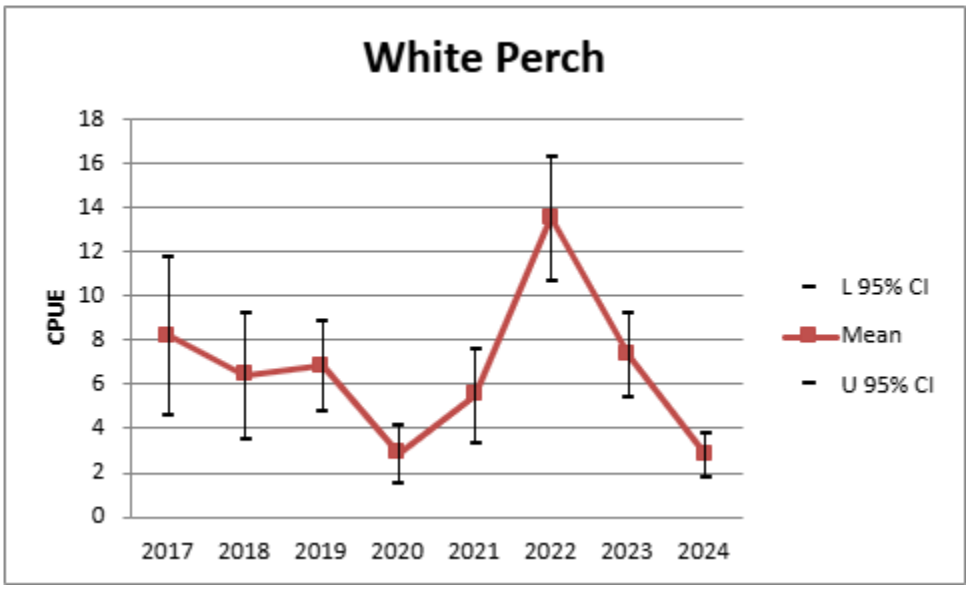
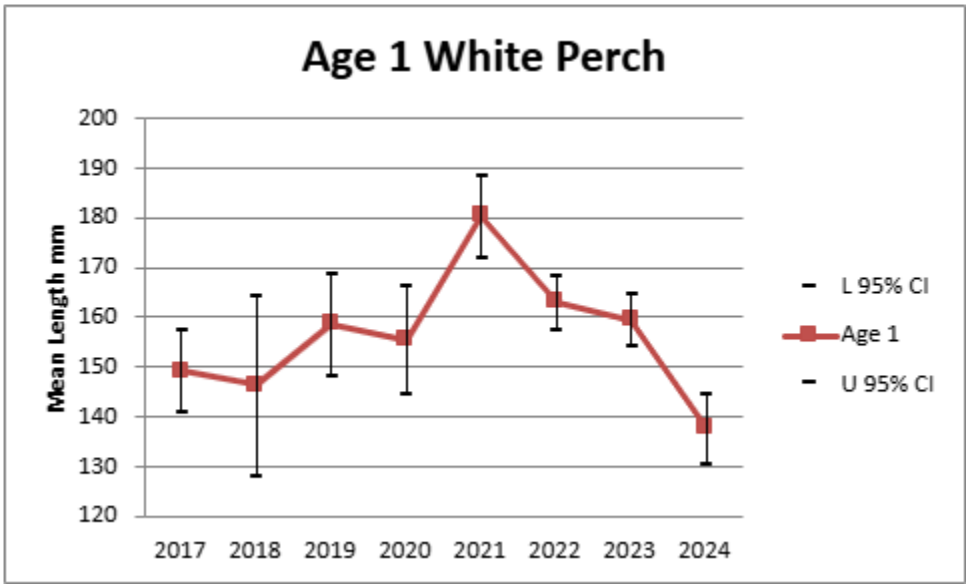
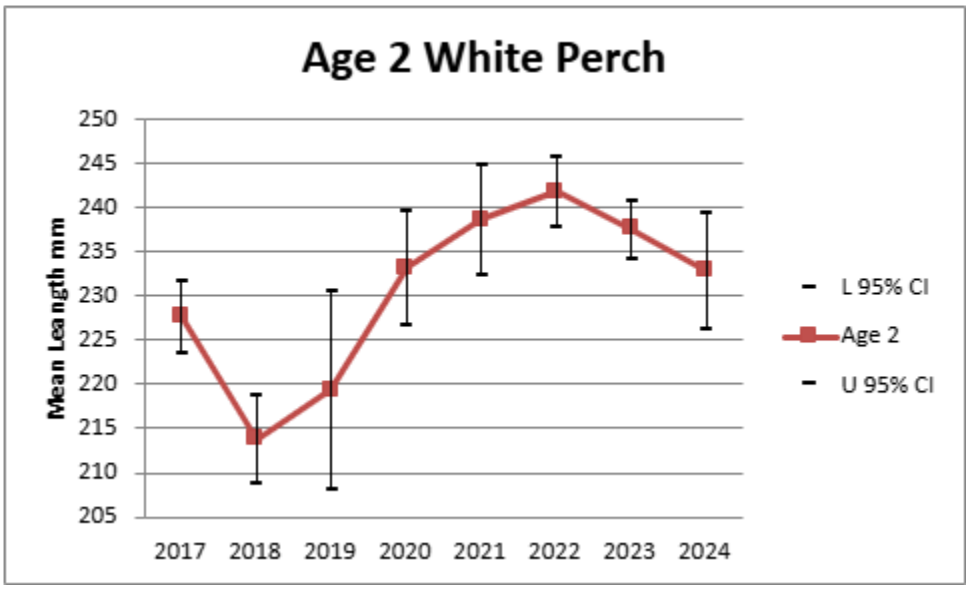


Figure 9. Catch Per Unit Effort of White Perch in Sooner Lake.





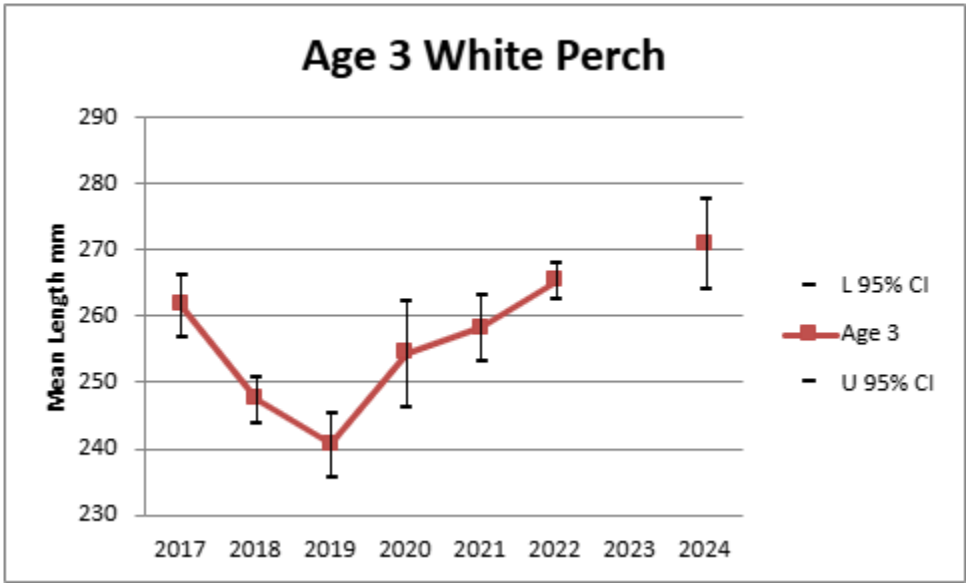


Figure 10. Mean Length at Age of White Perch for age 1, 2, and 3 in Sooner Lake.

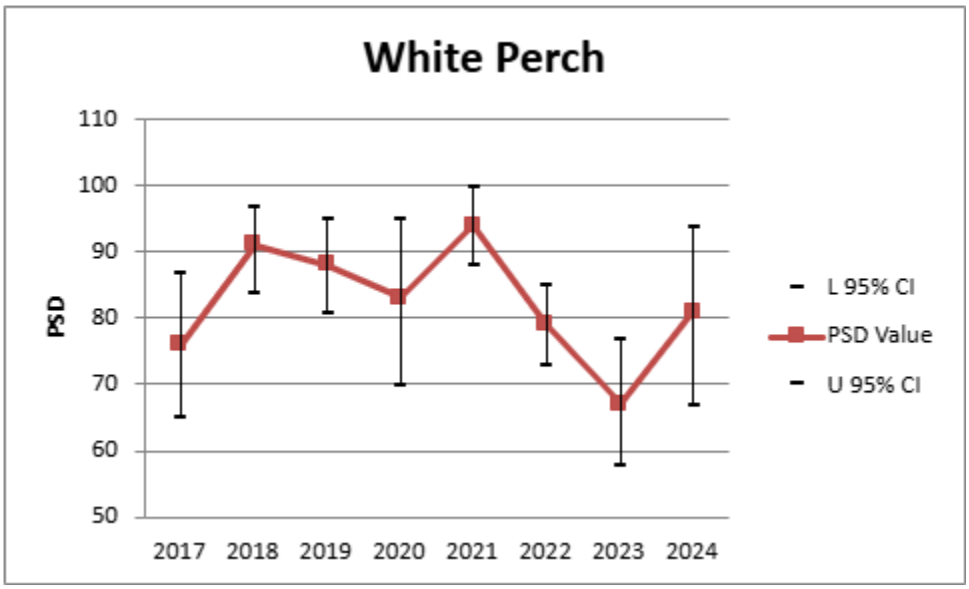


Figure 11. Proportional Size Distributions of White Perch in Sooner Lake.

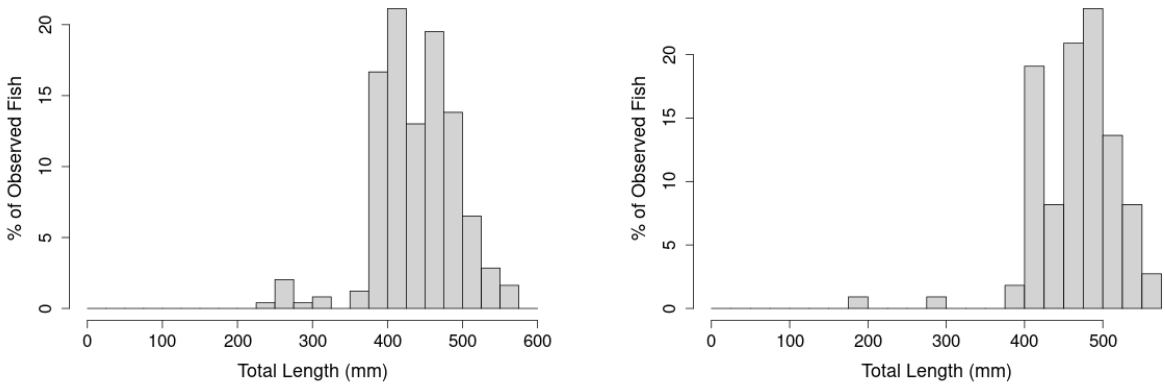


Figure 12. Length frequencies of Hybrid Striped Bass in Sooner Lake 2023 (left) and 2024 (right).

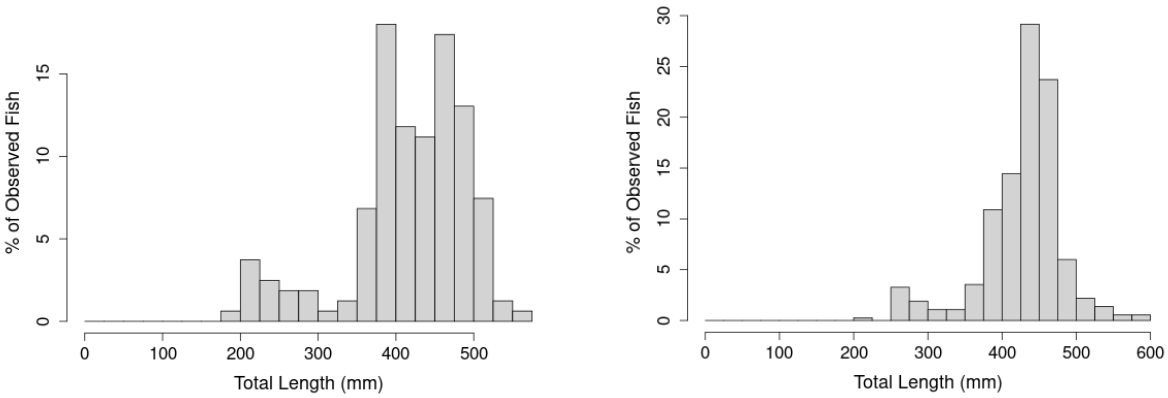


Figure 13. Length frequencies of Saugeye in Sooner Lake 2023 (left) and 2024 (right).

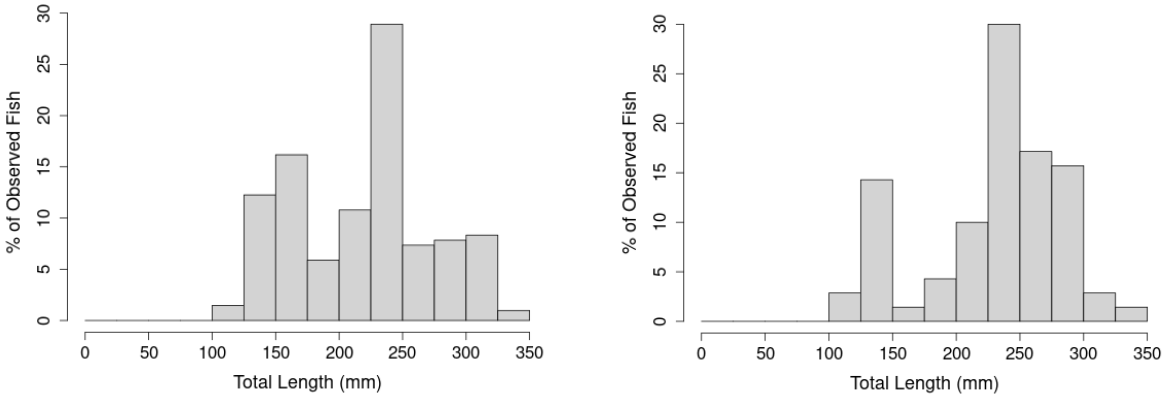


Figure 14. Length frequencies of White Perch in Sooner Lake 2023 (left) and 2024 (right).

Table 1. Proportional Size Distributions for Largemouth Bass in Sooner Lake.

	PSD	PSD-PREFERRED	PSD-MEMORABLE
2017	74± 10	36± 11	3± 4
2020	75± 15	62± 17	
2024	84± 13	47± 18	4± 6

Table 2. Mean length at age of Largemouth Bass in Sooner Lake. All values had at least 5 individuals in the year class.

	AGE-1	AGE-2	AGE-3	AGE-4	AGE-5	AGE-6	AGE-7	AGE-8	AGE-9
2017	209.71± 11.79	322.78± 6.54	385.00± 10.06	-	445.54± 16.32	449.60± 7.86	472.38± 17.37	-	-
2020	189.00± 23.74	278.62± 19.11	-	417.25± 20.78	432.79± 9.51	-	-	-	-
2024	179.90± 20.08	319.72± 12.02	378.00± 2.97	392.29± 18.53	412.40± 29.57	448.62± 18.80	-	-	513.20± 22.70

Table 3. Catch per Unit Effort of Hybrid Striped Bass on Sooner Lake sampled with gillnets.

Lake	Year	Sample Size	Species	L 95% CI	CPUE	U 95% CI
Sooner	2017	15	Hybrid Striped Bass	5.99	7.52	9.05
Sooner	2018	19	Hybrid Striped Bass	4.68	7.21	9.75
Sooner	2019	25	Hybrid Striped Bass	6.38	10	13.61
Sooner	2020	29	Hybrid Striped Bass	4.85	7.83	10.81
Sooner	2021	20	Hybrid Striped Bass	4.66	6.77	8.87
Sooner	2022	30	Hybrid Striped Bass	7.19	9.49	11.79
Sooner	2023	30	Hybrid Striped Bass	6.81	8.53	10.26
Sooner	2024	26	Hybrid Striped Bass	2.56	4.45	6.33

Table 4. Mean length at age of Hybrid Striped Bass in Sooner Lake collected using gillnets over multiple years.

Lake	Species	Sample Size (N)	Age (0)	Age-1	Age-2	Age-3	Age-4
2017	Hybrid Striped Bass	119	246.8	377.7	428.6	474	499
2018	Hybrid Striped Bass	132	252.08	372.29	453.00	472.88	450.67
2019	Hybrid Striped Bass	243	254.5	382.97	430.81	461.88	488.67
2020	Hybrid Striped Bass	194	-	390.68	456.17	472.87	508.30
2021	Hybrid Striped Bass	134	245.2	386.9	455	493.5	487.1
2022	Hybrid Striped Bass	259	254.8	389.5	445.8	470.4	492.5
2023	Hybrid Striped Bass	246	269.33	400.85	460.46	502.43	496.61
2024	Hybrid Striped Bass	111	-	415.62	463.44	493.82	-

Table 5. Catch per Unit Effort of Saugeye on Sooner Lake sampled with gillnets.

Lake	Year	Sample Size	Species	L 95% CI	CPUE	U 95% CI
Sooner	2017	15	Saugeye	3.93	5.52	7.11
Sooner	2018	19	Saugeye	3.94	5.45	6.97
Sooner	2019	25	Saugeye	4.14	6.68	9.22
Sooner	2020	29	Saugeye	10.06	12.19	14.31
Sooner	2021	20	Saugeye	5.04	7.48	9.92
Sooner	2022	30	Saugeye	2.86	3.67	4.48
Sooner	2023	30	Saugeye	4.32	5.64	6.97
Sooner	2024	26	Saugeye	10.48	14.67	18.87

Table 6. Mean length at age of Saugeye in Sooner Lake over multiple years.

Lake	Species	Sample Size (N)	Age (0)	Age-1	Age-2	Age-3	Age-4	Age-5
2018	Saugeye	97	258.75	369.89	424.28	466.30	507.4	-
2019	Saugeye	160	265.53	344.63	410.56	465.26	465.25	-
2020	Saugeye	315	272.54	363.44	416.09	443.97	467.94	519.55
2021	Saugeye	141	265.6	369.9	398.5	438.2	-	-
2022	Saugeye	102	262.6	357.3	420.5	443.5	-	-
2023	Saugeye	161	240.47	375.97	422.62	476.09	472.29	-
2024	Saugeye	367	281.08	386.13	441.91	454.13	467.64	476.57

Table 7. Catch Per Unit Effort of White Perch in Sooner Lake over multiple years collected using gillnets.

Lake	Year	Sample Size	Species	L 95% CI	CPUE	U 95% CI

Sooner	2017	15	White Perch	4.6	8.19	11.78
Sooner	2018	19	White Perch	3.59	6.42	9.26
Sooner	2019	25	White Perch	4.83	6.84	8.86
Sooner	2020	29	White Perch	1.57	2.88	4.2
Sooner	2021	20	White Perch	3.38	5.5	7.63
Sooner	2022	30	White Perch	10.74	13.54	16.33
Sooner	2023	30	White Perch	5.46	7.34	9.22
Sooner	2024	26	White Perch	1.80	2.83	3.85

Table 8. Sooner Lake White Perch sampled by age.

Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
2013		1	3	18	10	4								
2014		2	3	4	7	2								
2017	3	56	38	14	2		2	5	2	2				
2018		3	48	47	8		2	3	7					
2019		19	16	42	58	17		2	1	2	5			
2020		12	35	6	6	11		1						
2021		6	32	39	6	7	9	3		1				
2022		91	47	57	83	12	35	21	14		1			
2023		78	92	2	9	6	5	7	3				2	1
2024		14	34	16		2	2	2						

Table 9. Mean Length at Age of White Perch in Sooner Lake over multiple years.

Gear	**Year**	**(n)**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Gill Net	2013	36	---	132	210	207	246	268	---	---	---	---	---
Gill Net	2014	18	---	163	213	219	238	250	---	---	---	---	---
Multiple	2017	124	107.8	148.4	218.2	263.8	279.5	---	274.5	284.5	299.5	304.5	---
Gill Net	2018	118	---	146.3	214.3	246.2	263.0	---	284	278.3	279.9	---	---
Gill Net	2019	163	---	161.7	220.9	241.9	263.2	279	---	290	280	299	294
Gill Net	2020	71	---	155.1	233.5	244.8	261.7	290.8	---	304	---	---	---
Gill Net	2021	104	---	180.3	238.6	258.3	273.8	284.7	287.6	307.7	---	---	---
Gill Net	2022	361	---	163	241.8	265.3	277.3	277.3	285.2	296.1	307.7	---	---
Gill Net	2023	212	---	159	236.9	---	294	295.2	308.2	313	318	---	---
Gill Net	2024	70	---	137.6	232.9	270.9	---	298	314	298			