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Period: 01 April 2021
through
31 March 2022

ANNUAL PERFORMANCE REPORT

for

Statewide Fisheries Investigation Project

Part I of III

Subsection I: Stream Fisheries Investigation



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Department of Fish and Wildlife Resources

Fisheries Division



STATE: Kentucky

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GRANT TYPE: Research and Survey

GRANT TITLE: Statewide Fisheries Investigations

SUBSECTION I TITLE: Stream Fisheries Investigations

PERIOD COVERED: 1 April 2021 - 31 March 2022

Research and Survey Section

Subsection I

Project I: Ohio River Sport Fishery Survey

Project Objective: Develop and implement a monitoring program for selected sport fish populations and their fisheries.

A. ACTIVITY

General Sport Fish Assessments

Newburgh Pool

Tailwater—A total of 1.0 hour of nocturnal electrofishing was completed in the Cannelton Lock and Dam Tailwater (Newburgh Pool). Smallmouth bass was the most abundant species (12.0 fish/hr), followed by spotted bass (2.0 fish/hr) and white bass (2.0 fish/hr). All species captured were dominated by smaller fish (<10.0 in).

Smithland Pool

Embayments—A total of 7.0 hours of general sport fish electrofishing was conducted during October 2021 in embayments of the Smithland Pool of the Ohio River. Six embayments were sampled: Crooked Creek (1.0 hr), Hurricane Creek (0.75 hr), Deer Creek (1.5 hr), Buck Creek (1.25 hr), Phelps Creek (1.0 hr), and Bayou Creek (1.5 hr). Bluegill, redear sunfish, and largemouth bass were the most abundant species, but catch rates varied substantially among embayments.

Tailwater—A total of 1.0 hour of nocturnal electrofishing was completed in the JT Meyers Lock and Dam Tailwater (Smithland Pool). The catch rates in the tailwater varied between species with striped bass being the most abundant species (25.0 fish/hr), followed by white bass (7.0 fish/hr), followed by spotted bass (5.0 fish/hr) and hybrid striped bass (1.0/hr). Overall, the striped bass collected in the tailwater had quality size (>15.0 in) and all other species collected were dominated by smaller fish (<12.0 in).

Olmstead Pool

Tailwater—A total of 1.0 hour of nocturnal electrofishing was completed in the Smithland Lock and Dam Tailwater (Olmstead Pool). White bass was the most abundant species (10.0 fish/hr), followed by striped bass (8.0 fish/hr), followed by yellow bass (6.0 fish/hr) followed by hybrid striped bass (6.0/hr) followed by spotted bass (3.0/hr) and smallmouth bass (1.0/hr). Overall, most of the species collected were made up of smaller fish (<10.0 in).

Sander Surveys

Previous modeling of ORFMT data suggested that overfishing was occurring and that regulations should be implemented on the Ohio River sauger population. A 14.0-in minimum size limit with a 6-fish creel limit was passed by KDFWR and went into effect in January 2019. Illinois DNR, Indiana DNR, and Ohio DNR have all passed this same regulation on the Ohio River since then.

Six 10-minute transects were completed in the Markland Tailwater in 2021 for a total of 1.0 hr of effort. Cannelton and JT Myers tailwaters were unable to be sampled due to high water. A total of 104 sauger were collected with no walleye or saugeye present in the sample. This was the lowest catch rate in the Markland Tailwater since sampling resumed in 2014.

Otoliths were taken from a subsample of sauger to assess age structure and growth. Based on back calculated lengths at age, sauger growth was excellent with age-1 sauger averaging 9.0 in and age-2 sauger averaging 13.8 in. As in years past, very few age-2 and older fish were observed. No fish older than age-2 were collected.

B. TARGET DATES FOR ACHIEVEMENT AND ACCOMPLISHMENTS

Planned achievement date - 31 March 2022

Work accomplished - 31 March 2022

C. SIGNIFICANT DEVIATIONS

General Sport Fish Assessments

None

Sander Surveys

Tailwater *Sander* surveys in the Cannelton and J.T. Myers tailwaters were unable to be completed during the sampling window due to elevated water levels that made sampling unsafe.

D. REMARKS

General Sport Fish Assessments

None

Sander Surveys

None

E. RECOMMENDATIONS

General Sport Fish Assessments

General sport fish sampling/monitoring will continue in various pools along the Ohio River. The Meldahl and Markland pools will be sampled in 2022.

Sander Surveys

Sampling in conjunction with the ORFMT will continue.

Project II: Evaluation of new recreational and commercial regulations on catfish in the Ohio River

Project Objectives:

1. Determine abundance (CPUE), size structure, and condition of blue catfish, channel catfish, and flathead catfish in the Ohio River, and evaluate the effects of new regulations on blue, channel, and flathead catfish in the Ohio River, particularly trophy-size catfish.
2. Quantify age, growth, and mortality of the three species in each reach, and compare to previous data to determine if any changes have occurred over time.

A. ACTIVITY

The conflict between commercial fishermen and recreational catfish anglers on the Ohio River has been apparent for nearly a decade, with the main issue being a perceived switch from a harvest market predominantly for flesh to a market for sale of largely trophy fish to pay lakes. In 2013, KDFWR standardized its catfish data collection methods and began expanding the effort river-wide to more accurately estimate population dynamics of blue catfish, channel catfish, and flathead catfish. On December 1, 2014 the following regulation became law:

Recreational anglers on the main-stem Ohio River are allowed one blue catfish ≥ 35.0 in, one flathead catfish ≥ 35.0 in, and one channel catfish ≥ 28.0 in per day. Harvest of fish below their respective length limits is not regulated.

The majority of commercial fishers fishing in the legal waters of the Ohio River and its tributaries are allowed one blue catfish ≥ 35.0 in, one flathead catfish ≥ 35.0 in, and one channel catfish ≥ 28.0 in per day. However, up to 50 commercial fishers (this number was reduced to 15 commercial fishers in 2019) that harvested over 10,000 lbs of catfish in at least 2 of the last 3 years along with an additional six commercial fishers, who are chosen by a lottery drawing, are allowed a daily harvest of four (in aggregate) blue catfish and flathead catfish ≥ 40.0 in and channel catfish ≥ 30.0 inches in Kentucky's portion of the Ohio River and its tributaries open to commercial fishing below Cannelton Lock and Dam. Harvest of fish below their respective length limits is not regulated.

Accusations by recreational anglers that overharvest was still occurring on the Ohio River surfaced again in 2018. Multiple meetings were held with KDFWR staff, recreational anglers, commercial fishermen, and paylake owners to work towards another compromise. Several regulations were proposed and submitted for review. At the time of this report the following regulations have been made law:

The number of commercial fishers awarded trophy permits was reduced to 15 (previously 50).

There will be no more than two licensed commercial fisherman per boat. If more are present, they may only keep two limits of trophy catfish.

A possession limit (twice the daily limit) was placed on trophy catfish for commercial fishers. This applies when on the water and when trailering fish.

Hoop nets—Catch rate of channel catfish was 2.4 fish/net-night and has continually decreased since 2017. Flathead catfish CPUE was 0.8 fish/net night, a decrease from 1.8 fish/net-night in 2019. Water temperatures were below average during the hoop netting sampling period. Additionally, water levels were highly variable during sets. These factors may have had a negative impact on catch rates.

Electrofishing—Blue catfish CPUE (17.9 fish/hr) was the lowest since 2016 and decreased for the third straight year, but was still above the historical average (CPUE = 17.2 fish/hr). CPUE of flathead catfish was 41.7 fish/hr, which was a decrease from record highs in 2020 but still the third highest

catch rate since 2004.

B. TARGET DATES FOR ACHIEVEMENT AND ACCOMPLISHMENTS

Planned achievement date - 31 March 2022

Work accomplished - 31 March 2022

C. SIGNIFICANT DEVIATIONS

Trotlines—No trotline sampling was conducted due to above average river levels in July along with staff shortages throughout the sampling period.

D. REMARKS

Water temperatures were below average during the hoop netting sampling period. Additionally, water levels were highly variable during sets. These factors may have had a negative impact on catch rates.

E. RECOMMENDATIONS

Continue sampling blue catfish, channel catfish, and flathead catfish using approved methods.

Project III: Lake Sturgeon Restoration Study

Project Objective: To determine the movement patterns, habitat use, growth, and survival of lake sturgeon stocked into the upper Cumberland River.

A. ACTIVITY

In 2008, KDFWR, began reintroducing lake sturgeon into the Cumberland River and committed to a 20 year restoration effort. Eggs/fry are obtained annually from the Wisconsin Department of Natural Resources and hatched at Peter W. Pfeiffer Fish Hatchery in Frankfort, Kentucky. Young-of-year sturgeon are reared to a target length of 7.5 in and marked for year class identification by removing scutes prior to stocking. Since 2008, a total of 66,693 lake sturgeon fingerlings have been stocked.

During December 2021, a total of 36 trotlines, 24 in the Cumberland River and 12 in Big South Fork, baited with night crawlers and fished overnight were successfully set and retrieved. A total of 125 lake sturgeon were collected with a CPUE of 3.5 fish/line. One hundred one lake sturgeon were collected from the Cumberland River (CPUE=4.2 fish/line), and 24 fish were collected from the Big South Fork (CPUE=2.0 fish/line). Both were record highs. Mean fork-length at age of capture indicates that growth of stocked lake sturgeon appears to be good. On average, fish exceeded 20.0 in by age-3, and were near 40 in by age-12.

B. TARGET DATES FOR ACHIEVEMENT AND ACCOMPLISHMENTS

Planned achievement date – 31 March 2022

Work accomplished – 31 March 2022

C. SIGNIFICANT DEVIATIONS

Sampling was completed at three of four sampling locations. The fourth site was unable to be sampled as low lake levels rendered the boat ramp unusable.

D. REMARKS

Scute marks are becoming harder to see in larger/older fish (age-8+).

E. RECOMMENDATIONS

Continue sampling. Pectoral fin rays should be collected in the future to verify age rather than relying on scute marks alone.

Project IV: Warm Water Stream Sport Fish Surveys

Project Objective: To conduct general sport fish surveys on streams and rivers to determine relative abundance, size structure, growth rates and condition of these fisheries. This information will be used to promote these fisheries while providing anglers with accurate population assessments.

A. ACTIVITY

Spring sport fish electrofishing surveys were conducted in Elkhorn Creek, Kinniconick Creek, upper Cumberland River, Rockcastle River, and Licking River. Elkhorn Creek was sampled for black bass and rock bass. Smallmouth bass comprised 83% of the sample and received an “excellent” population assessment rating. In Kinniconick Creek, smallmouth bass were the predominant species making up 49% of the entire sample. Rock bass comprised 24% of the sample, and spotted bass comprised 16% of the sample. Spring population assessments for smallmouth bass and rock bass in Kinniconick Creek gave a “fair” rating, and spotted bass received a “poor” rating. Eleven different species of sport fish were sampled in upper Cumberland River. Channel catfish was the most dominant species comprising 47% of the sample. Black bass accounted for 34% of the sample. Population assessments in upper Cumberland River rated smallmouth bass “fair”, spotted bass “good”, and rock bass “poor.” Four species were sampled in Rockcastle River with smallmouth bass and rock bass making up 97% of the total sample. Population assessments for smallmouth bass and rock bass were “fair” while spotted bass received a “poor” rating. Eighteen species were sampled in the Licking River with bluegill (19% of sample), smallmouth bass (18% of sample), white crappie (17% of sample), and channel catfish (11% of sample) being the dominant species. The spring population assessment for smallmouth bass, rock bass, and spotted bass were “fair” and largemouth bass was “good.”

Fall sport fish surveys were conducted on Pool 5 of Green River, Little Sandy River, and lower Barren River. Ten species were sampled in Pool 5 of Green River with spotted bass (43% of sample) and bluegill (28% of sample) the dominant species. Numbers of smallmouth bass and rock bass continue to be low in this impounded portion of Green River. Twelve species were collected from Little Sandy River. Bluegill were the most abundant sport fish collected followed by channel catfish, and spotted bass. Natural reproduction of muskellunge was confirmed as an unclipped 7.2-in individual was captured with no stocking occurring in the previous two years. A total of fifteen sport fish species were collected in lower Barren River in 2021. Smallmouth bass and rock bass made up 45% of the overall catch. Annual sampling of two sites in the downstream-impounded portion of lower Barren River continued in 2021. Catch rates continued to be lower when compared to the unimpounded reaches.

Two new streams consisting of nine new public stream access sites were added to the Kentucky’s Stream Fisheries section of the KDFWR website. Additionally, eight other webpages in that sections were updated with the most current fisheries data on file. Twenty streams are currently available on the KDFWR departmental website providing detailed information on public access sites, water levels, stream mileages, interactive maps, fisheries, and photo gallery. This information provides Kentucky anglers with an increased awareness to the fishing and boating opportunities that exist in many of Kentucky’s rivers and streams.

B. TARGET DATES FOR ACHIEVEMENT AND ACCOMPLISHMENTS

Planned achievement date- 31 March 2022

Work accomplished- 31 March 2022

C. SIGNIFICANT DEVIATIONS

None

D. REMARKS

New locations will be sampled annually. Sites are scheduled to be sampled on a 3 to 5 year rotation to develop trend data that will be beneficial for future management decisions.

E. RECOMMENDATIONS

Continue stream sampling due to the current lack of continuous sport fish data on most streams.

Project V: Investigation of the Restoration of Native Walleye in the Upper Barren River

Project Objective: To determine if stocking native walleye fingerlings can result in the reestablishment of a self-sustaining native walleye population in the upper Barren River.

A. ACTIVITY

No field sampling was conducted, and work on a final report was initiated.

B. TARGET DATES FOR ACHIEVEMENT AND ACCOMPLISHMENTS

Planned achievement date - 31 March 2022

Work accomplished - 31 March 2022

C. SIGNIFICANT DEVIATIONS

No sampling was conducted due to frequent and heavy spring rainfall.

D. REMARKS

None

E. RECOMMENDATIONS

Field work has concluded for this project. A final report will be written with management recommendations.

Project VI: Post-stocking Movement of Muskellunge in the Kentucky River

Project Objectives:

1. Determine dispersal of muskellunge, with an emphasis on age-1 and age-2 fish, stocked into pools 11 -13 of the Kentucky River.
2. Utilize results of this project to develop muskellunge stocking recommendations for the Kentucky River.

A. ACTIVITY

Only one muskellunge was captured at a rate of 0.1 fish/hr in November 2021. No clipped fish were observed in the sample. An additional 10.25 hr of electrofishing was conducted (6.75 hr within the study pools and 3.5 hr below the study pools). Five fish were collected and implanted with PIT tags. No clipped fish or previously PIT tagged fish were observed. Thus far, only one clipped fish has been collected. That fish had travelled nearly 40 miles downriver from its stocking site at the time of capture.

B. TARGET DATES FOR ACHIEVEMENT AND ACCOMPLISHMENTS

Planned achievement date - 31 March 2022

Work accomplished - 31 March 2022

C. SIGNIFICANT DEVIATIONS

Additional effort to collect muskie was limited due to staffing shortages and time constraints.

D. REMARKS

Recapture rate has been less than expected, but it is likely due to a missed stocking in 2020 resulting from COVID-19 restrictions in the workplace as well as insufficient effort outside of standard sampling to collect fish.

E. RECOMMENDATIONS

Continue fall standard sampling and maximize effort along the Kentucky River to assess dispersal of stocked muskellunge

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Project I: Ohio River Sport Fishery Survey

FINDINGS

General Sport Fish Assessments

Newburgh Pool

Tailwater—The main channel of the Ohio River is typically the best area to target catfish, *Sander spp.*, *Morone spp.*, and smallmouth bass. Species specific samples for catfish and *Sander spp.* are already conducted annually, so only *Morone spp.*, spotted bass and smallmouth bass were target species during tailwater surveys. A total of 1.0 hour of nocturnal electrofishing was completed in the Cannelton Lock and Dam Tailwater (Newburgh Pool). Even though the catch rates in the tailwater were low, smallmouth bass was the most abundant species (12.0 fish/hr), followed by spotted bass (2.0 fish/hr) and white bass (2.0 fish/hr; Table 1). All species captured were dominated by smaller fish (<10.0 in). Contributing factors to this could be due to above average water temperatures and low flow during fall months.

Smithland Pool

Embayments—A total of 7.0 hours of general sport fish electrofishing was conducted during October 2021 in embayments of the Smithland Pool of the Ohio River. Six embayments were sampled: Crooked Creek (1.0 hr), Hurricane Creek (0.75 hr), Deer Creek (1.5 hr), Buck Creek (1.25 hr), Phelps Creek (1.0 hr), and Bayou Creek (1.5 hr). Bluegill, redear sunfish, and largemouth bass were the most abundant species, but catch rates varied substantially among embayments.

Total CPUE of largemouth bass was 4.6 fish/hr, and ranged from 2.0 fish/hr in Phelps Creek to 8.0 fish/hr in Deer Creek (Table 2). Lengths of largemouth bass ranged from 3.6 – 16.3 in with a mean length of 8.9 in. Spotted bass CPUE was 0.7 fish/hr and ranged from 0.0 fish/hr in Phelps Creek, Deer Creek, and Buck Creek to 3.0 fish/hr in Crooked Creek. Lengths of spotted bass ranged from 3.7 – 11.6 in with a mean length of 8.1 in. Size structure of largemouth bass and spotted bass varied between embayments. Catch rates for four different length groups of largemouth bass and spotted bass were examined and CPUE for largemouth bass and spotted bass had declined since the 2018 fall sample (Table 3). Relative weights of all length groups for both largemouth bass and spotted bass have increased since the 2018 fall sample with the weights increasing with size (Table 4).

Bluegill were the most abundant fish sampled in the Smithland Pool (CPUE=50.6 fish/hr; Table 5). Catch rates ranged from 6.0 fish/hr in Crooked Creek to 76.7 fish/hr in Bayou Creek. Lengths ranged from 1.0–7.6 in with a mean length of 3.5 in and only 10% of those fish were quality size (≥6.0 in). Overall catch rate of redear sunfish was 4.6 fish/hr. Catch rates ranged from 0.0 fish/hr in Hurricane Creek to 14.0 fish/hr in Phelps Creek. Lengths ranged from 2.0 – 10.7 in with a mean length of 6.5 in, and 59.3% of those fish were quality size (≥6.0 in). White crappie were collected at 1.6 fish/hr and ranged from 0.0 fish/hr in Hurricane Creek, Crooked Creek and Deer Creek to 9.0 fish/hr in Phelps Creek. Lengths ranged from 5.6 – 12.7 in with a mean length of 9.7 in. Black Crappie were collected at 2.0 fish/hr and ranged from 0.0 fish/hr in Hurricane Creek and Crooked Creek to 5.0 fish/hr in Phelps Creek. Lengths ranged from 6.4 – 13.7 in with a mean length of 9.2 in.

Catch rates of all species were considerably lower when compared to other pools previously sampled by KDFWR. Backwater habitat is similar to other pools in the Ohio River; however, Asian carp are much more abundant in the Smithland Pool compared to other pools sampled (Meldahl, Markland, McAlpine, Cannelton), and could have contributed to lower catch rates. The large volume of fish jumping made it difficult to see and dip sport fish. It is possible that Asian carp may be having an impact on the survival of sport fish in the Smithland Pool, and it is likely that large fish moving in schools could physically force sport fish out of their desired habitat.

Tailwater—A total of 1.0 hour of nocturnal electrofishing was completed in the JT Meyers Lock and Dam Tailwater (Smithland Pool). The catch rates in the tailwater varied between species with striped bass

being the most abundant species (25.0 fish/hr), followed by white bass (7.0 fish/hr), followed by spotted bass (5.0 fish/hr) and hybrid striped bass (1.0 fish/hr; Table 1). Overall, the striped bass collected in the tailwater had quality size (>15.0 in) and all other species collected were dominated by smaller fish (<12.0 in). Contributing factors to the number of smaller fish being collected could be due to above average water temperatures and low flow during fall months.

Olmstead Pool

Tailwater—A total of 1.0 hour of nocturnal electrofishing was completed in the Smithland Lock and Dam Tailwater (Olmstead Pool). Even though the catch rates in the tailwater were low, white bass was the most abundant species (10.0 fish/hr), followed by striped bass (8.0 fish/hr), followed by yellow bass (6.0 fish/hr) and hybrid striped bass (6.0 fish/hr), followed by spotted bass (3.0 fish/hr) and smallmouth bass (1.0 fish/hr; Table 1). Overall, most of the species collected were made up of smaller fish (<10.0 in) except for hybrid striped bass where 66% of fish collected were (>19.0 in). Contributing factors to the number of smaller fish being collected could be due to above average water temperatures and low flow during fall months.

Sander Surveys

The member agencies of the Ohio River Fish Management Team (ORFMT) had traditionally completed annual surveys of sauger and walleye in the Ohio River. Due to time and budget constraints, this cooperative effort stopped in 2007; however, recent concerns of a possibly declining fishery as well as threats from the expanding Asian carp population led biologists to reinstate these annual surveys in 2014. KDFWR, Ohio Department of Natural Resources, West Virginia Department of Natural Resources, Indiana Department of Natural Resources, and Illinois Department of Natural Resources all agreed to sample tailwaters of the Ohio River. KDFWR was tasked with sampling the Markland and Cannelton tailwaters. In 2017, JT Myers tailwater was added. After three years of sampling in late fall, all agencies reported lower catch rates than in the past and noted a lack of age 3+ sauger. Issues with timing of sampling were discussed in a meeting in January 2017. Although a late fall sample was likely underrepresenting larger fish and females (therefore inflating mortality estimates), the decision was made to keep sampling methods the same due to the unpredictably and unstable nature of water levels on the Ohio River during the preferred months of January – March.

Previous modeling of ORFMT data suggested that overfishing was occurring and that regulations should be implemented on the Ohio River sauger population. A 14.0-in minimum size limit with a 6-fish creel limit was passed by KDFWR and went into effect in January 2019. Illinois DNR, Indiana DNR, and Ohio DNR have all passed this same regulation on the Ohio River since then.

Six 10-minute transects were completed in the Markland tailwater in 2021. Due to high water the Cannelton and JT Myers tailwaters were unable to be sampled. A total of 104 sauger were collected with no walleye or saugeye present in the sample (Table 6). CPUE of sauger was 104.0 fish/hr, a decrease from 230.7 fish/hr in 2020. Lengths ranged from 5.9 – 17.0 in with a mean length of 9.8 in (Table 7). Catch rates were also calculated for four length groups of sauger. Overall catch rates of sauger in the Markland Tailwater (CPUE=104.0 fish/hr) were the lowest recorded since annual sampling resumed in 2014 and well below the historical average (CPUE=181.5 fish/hr; Table 8). Catch rates of sauger <8.0 in were at the highest level since 2018 and above the historical average. CPUE of sauger in the 8.0 – 11.9 in and 12.0 – 14.9 in groups were both record lows. The ≥15.0 in length groups was 3.0 fish/hr which was a drastic decrease from 18.0 fish/hr in 2020 (Markland tailwater).

Otoliths were taken from a subsample of sauger to assess age structure and growth. Based on back calculated lengths at age, sauger growth was excellent with age-1 sauger averaging 9.0 in and age-2 sauger averaging 13.8 in (Table 9). As in years past, very few age-2 and older fish were observed. No fish older than age-2 were collected so data analysis was limited (Table 10). Estimates for total annual mortality of sauger were lower than in 2019. Markland Tailwater annual mortality rate for 2021 was 65.5, but likely not the most accurate with the lack of older fish in the sample. Lack of older fish in the sample could be a result of sampling bias. Sampling occurred in December and many older mature fish may not

have migrated up to the tailwaters yet. It could also indicate poor year class survival from the 2018 – 2019 year classes. Additionally, while the 14.0-in minimum size limit and reduced creel limit have added protection to the population, it was apparent that many fish are growing through the size limit before they are sexually mature. It is likely that a portion of harvested fish have spawned only once or not at all.

Table 1. Length frequency, relative weight (Wr), and CPUE (fish/hr) of smallmouth bass, spotted bass, white bass, striped bass, hybrid striped bass and yellow bass collected during 3.0 hrs of electrofishing, 1.0 hr each in the Cannelton, JT Meyers and Smithland Lock and Dam tailwaters of the Ohio River in October 2021. Standard errors are in parentheses.

Tailwater	Species	Inch class																					Total	Wr	CPUE
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22			
Cannelton	Smallmouth bass						3	4		3	1	1											12	80	12.0 (5.2)
	Spotted bass			1					1														2	84	2.0 (2.0)
	White Bass					1	1																2	85	2.0 (2.0)
	Striped Bass																						0	0	0.0
	Hybrid Striped Bass																						0	0	0.0
	Yellow Bass																							0	0
JT Meyers	Smallmouth bass																						0	0	0.0
	Spotted bass							2		1	2												5	95	5.0 (3.8)
	White bass		2							2		2						1					7	79	7.0 (1.0)
	Hybrid striped bass										1												1	83	1.0 (1.0)
	Striped bass														1	2	2	10	7		2	1	25	99	25.0 (21.2)
	Yellow bass																						0	0	0.0
Smithland	Smallmouth bass													1									1	94	1.0 (1.0)
	Spotted bass									2		1											3	113	3.0 (1.0)
	White bass		1		2		1		2	1		1		1	1								10	82	10.0 (2.6)
	Striped Bass	3	2	1						1							1						8	88	8.0 (4.0)
	Hybrid striped bass		1				1												1	3			6	95	6.0 (2.9)
	Yellow bass					1	5																6		6.0 (2.9)

Table 2. Length-frequency and CPUE (fish/hr) of black bass collected during 7.0 hrs of electrofishing in embayments in the Smithland Pool of the Ohio River during October 2021. Standard errors are in parentheses.

Embayment	Species	Inch class														Total	CPUE
		3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Crooked Creek	Largemouth bass		1				1				1					3	3.0 (1.9)
	Spotted bass	1	1			1										3	3.0 (1.0)
Hurricane Creek	Largemouth bass											3				3	4.0 (2.3)
	Spotted bass								2							2	2.7 (2.7)
Deer Creek	Largemouth bass		7	3				1		1						12	8.0 (2.5)
	Spotted bass															0	0.0
Buck Creek	Largemouth bass	1		1				2		1				2	1	8	6.4 (3.0)
	Spotted bass															0	0.0
Phelps Creek	Largemouth bass											2				2	2.0 (2.0)
	Spotted bass															0	0.0
Bayou Creek	Largemouth bass		1			1			1		1					4	2.7 (1.7)
	Spotted bass									1						1	0.7 (0.7)
Total	Largemouth bass	1	9	4		1	1	3	1	2	2	5		2	1	32	4.6 (1.0)
	Spotted bass	1	1			1			2	1						6	0.7 (0.4)

Table 3. Fall electrofishing catch-per-unit-effort (fish/hr) for four length groups of black bass from the Smithland Pool of the Ohio River during October 2021. Standard errors are in parentheses.

Year	Length group				Total
	<8.0 in	8.0-11.9 in	12.0-14.9 in	≥15.0 in	
Largemouth bass					
2018	2.3 (0.8)	3.0 (1.4)	3.0 (0.9)	0.7 (0.4)	9.0 (2.3)
2021	2.1 (0.8)	1.0 (0.4)	1.0 (0.4)	0.4 (0.3)	4.6 (1.0)
Mean	2.2 (0.6)	2.0 (0.7)	2.0 (0.5)	0.6 (0.2)	6.8 (1.3)

Year	Length Group				Total
	<7.0 in	7.0-10.9 in	11.0-13.9 in	≥14.0 in	
<u>Spotted bass</u>					
2018	0.6 (0.3)	0.4 (0.3)	0.0	0.0	1.0 (0.5)
2021	0.3 (0.2)	0.4 (0.3)	0.1 (0.1)	0.0	0.7 (0.4)
Mean	0.4 (0.2)	0.4 (0.2)	0.1 (0.1)	0.0	0.9 (0.3)

Table 4. Relative weight (Wr) estimates by length group for each species of black bass collected from the Smithland Pool in the Ohio River during October 2021.

Largemouth bass relative weight (Wr)				
Year	length group			Overall
	8.0-11.9 in	12.0-14.9 in	≥15.0 in	
2018	99	94	92	96
2021	95	99	104	98
Mean	97	97	98	97

Spotted bass relative weight (Wr)				
Year	length group			Overall
	7.0-10.9 in	11.0-13.9 in	≥14.0 in	
2018	96			96
2021	109	112		110
Mean	103	112		103

Table 5. Length-frequency and CPUE (fish/hr) of selected sunfish species collected during 7.0 hrs of electrofishing in embayments in the Smithland Pool of the Ohio River during October 2021. Standard errors are in parentheses.

Smithland Pond on the Ohio River during October 2021. Standard errors are in parentheses.																	
Embayment	Species	Inch class												Total	CPUE		
		1	2	3	4	5	6	7	8	9	10	11	12			13	
Crooked Creek	Bluegill			2	3		1								6	6.0 (2.6)	
	Redear sunfish								1						1	1.0 (1.0)	
	White crappie														0	0.0	
	Black crappie														0	0.0	
Hurricane Creek	Bluegill		2	2			1	1							6	8.0 (2.3)	
	Redear sunfish														0	0.0	
	White crappie														0	0.0	
	Black crappie														0	0.0	
Deer Creek	Bluegill	11	18	26	14	7	6								82	54.7 (7.3)	
	Redear sunfish		2		1	1		1	1						6	4.0 (2.1)	
	White crappie														0	0.0	
	Black crappie							2	2	1					5	3.3 (2.2)	
Buck Creek	Bluegill	4	13	19	13	12	13	1							75	60.0 (15.6)	
	Redear sunfish			1			1		1						3	2.4 (1.6)	
	White crappie								1						1	0.8 (0.8)	
	Black crappie						1		1						2	1.6 (1.0)	
Phelps Creek	Bluegill	6	15	26	9	7	7								70	70.0 (21.7)	
	Redear sunfish		4		3	1	1	2		2	1				14	14.0 (3.8)	
	White crappie					2	1			1		2	3		9	9.0 (6.4)	
	Black crappie							1	1	1	1	1			5	5.0 (3.0)	
Bayou Creek	Bluegill	35	39	21	11	5	3	1							115	76.7 (36.27)	
	Redear sunfish							1	3	3	1				8	5.3 (2.0)	
	White crappie											1			1	0.7 (0.7)	
	Black crappie												1	1	2	1.3 (0.8)	
Total	Bluegill	56	87	96	50	31	31	3							354	50.6 (9.7)	
	Redear sunfish		6	1	4	2	2	4	6	5	2				32	4.6 (1.1)	
	White crappie					2	1	1	1		3	3			11	1.6 (1.0)	
	Black crappie						1	3	4	2	1	1	1	1	14	2.0 (0.7)	

Table 6. Electrofishing effort and CPUE (fish/hr) of *Sander spp.* collected during 1.0 hr of electrofishing in the Ohio River in December 2021. Standard errors are in parentheses.

Tailwater	No. of transects	Effort (hr)	No. of sauger	CPUE
Markland	6	1.0	104	104.0 (30.3)

Table 7. Length frequency, mean length, relative weight (Wr), and CPUE (fish/hr) of *sauger* collected during 1.0 hr of electrofishing in the Ohio River in December 2021. Standard errors are in parentheses.

Tailwater	Inch class													Total	Mean length (in)	Wr	CPUE
	5	6	7	8	9	10	11	12	13	14	15	16	17				
Markland	1	11	26	8	6	6	28	13	1	1	1	1	1	104	9.8	77	104.0 (30.3)

Table 8. Electrofishing catch-per-unit-effort (fish/hr) estimates for four length groups of sauger from the Ohio River from 2014 - 2021. Standard errors are in parentheses.

Markland tailwater					
Year	Length group				Total
	<8.0 in	8.0-11.9 in	12.0-14.9 in	≥15.0 in	
2014	25.0 (5.6)	235.0 (61.5)	44.0 (15.1)	4.0 (1.2)	308.0 (78.1)
2015	47.0 (10.0)	101.0 (36.0)	39.0 (7.6)	5.0 (2.8)	192.0 (40.9)
2016	2.0 (1.2)	121.0 (25.6)	32.0 (10.2)	1.0 (1.0)	156.0 (33.1)
2017	2.0 (1.2)	63.0 (16.1)	52.0 (8.0)	7.0 (4.7)	124.0 (19.7)
2018	50.0 (23.8)	106.0 (23.0)	39.0 (13.4)	10.0 (4.5)	205.0 (39.1)
2019	4.0 (2.5)	129.0 (34.6)	41.0 (17.4)	8.0 (4.5)	182.0 (53.1)
2020	1.0 (1.0)	137.0 (23.2)	25.0 (4.1)	18.0 (7.9)	181.0 (29.7)
2021	38.0 (9.8)	48.0 (15.6)	15.0 (7.6)	3.0 (1.3)	104.0 (30.3)
Mean	21.1 (4.4)	117.5 (13.06)	35.9 (4.0)	7.0 (1.5)	181.5 (16.5)

Cannelton tailwater					
	Length group				Total
	<8.0 in	8.0-11.9 in	12.0-14.9 in	≥15.0 in	
2014	3.0 (2.0)	150.0 (32.3)	60.0 (21.4)	26.0 (11.5)	239.0 (59.9)
2015	17.0 (7.0)	178.0 (24.8)	34.0 (7.4)	5.0 (2.4)	234.0 (21.5)
2016	1.0 (1.0)	279.0 (60.6)	141.0 (37.8)	2.0 (2.0)	423.0 (93.1)
2017	4.0 (2.5)	36.0 (11.0)	22.0 (7.2)	6.0 (4.8)	68.0 (15.3)
2018	29.0 (12.7)	24.0 (5.0)	12.0 (7.3)	11.0 (3.9)	76.0 (23.3)
2019	1.0 (1.0)	166.0 (48.6)	38.0 (25.0)	12.0 (6.4)	217.0 (72.7)
2020	0.0 (0.0)	277.0 (35.8)	49.0 (7.4)	16.0 (5.6)	342.0 (31.2)
Mean	7.9 (2.5)	158.8 (19.2)	50.9 (9.2)	11.1 (2.4)	228.4 (26.1)

JT Meyers tailwater					
	Length group				Total
	<8.0 in	8.0-11.9 in	12.0-14.9 in	≥15.0 in	
2017	0.0	9.0 (6.0)	13.0 (4.4)	12.0 (3.4)	34.0 (11.1)
2020	24.0 (19.0)	104.0 (70.9)	37.0 (8.0)	4.0 (3.0)	169.0 (92.4)
Mean	12.0 (10.0)	56.5 (36.7)	25.0 (5.6)	8.0 (2.4)	101.5 (48.6)

Table 9. Mean back calculated length at age and total annual mortality (A) of sauger collected from the Markland Tailwater of the Ohio River in December 2021.

Tailwater	Age				
	1	2	3	4	5
Markland	9.0	13.8			
					A
					65.5

Table 10. Age frequency and CPUE results for sauger collected in the Markland Tailwater of the Ohio River in December 2021. Standard errors are in parentheses.

Tailwater	Age	Inch class													Total	%	CPUE
		5	6	7	8	9	10	11	12	13	14	15	16	17			
Markland	0	1	11	26	8	6									52	50.0%	52.0 (13.1)
	1						6	28	13						47	45.2%	47.0 (16.5)
	2									1	1	1	1	1	5	4.8%	5.0 (2.1)
	Total	1	11	26	8	6	6	28	13	1	1	1	1	1	104	100%	104.0 (30.3)

Project II: Evaluation of new recreational and commercial regulations on catfish in the Ohio River

FINDINGS

Commercial fishing for catfish has long existed on the Ohio River; however, harvesting trophy-sized fish to sell to pay lake owners has become more prevalent while a market for flesh also remains popular. At the same time, catch and release trophy catfishing has become extremely popular for recreational anglers on the Ohio River. Different viewpoints on how the fishery should be managed has led to conflict between recreational anglers and commercial anglers. Recreational catfish anglers came to KDFWR asking for more stringent regulation for both recreational and commercial anglers, because of a perceived decline in trophy catfish numbers. KDFWR began looking at some basic population parameters of the three major catfish species (blue catfish, channel catfish, flathead catfish) in the Ohio River beginning in 2004. The study was initiated to obtain baseline information on length frequency, weight, and age profiles of these three species and determine methods to more effectively sample each of these species. The conflict was again brought up at a commission meeting in 2012 and it was decided that one additional year of intense sampling would be conducted before a decision on potential regulations was made. Data prior to 2013 was collected from different pools each year and lacked the consistency and standardization to effectively monitor trends of catfish populations in the Ohio River. In 2013 methods for all gear types were standardized and additional effort was put towards sampling to more accurately estimate population dynamics of blue catfish, channel catfish, and flathead catfish in the Ohio River.

A public meeting was held in October 2013 to present catfish data that had been gathered during this project and discuss potential regulations that may be put in place. Both recreational and commercial anglers were in attendance and given the opportunity to share their thoughts and suggestions. In November 2013, the following regulations designed to give some protection to trophy catfish were proposed to the Fisheries Committee:

Recreational anglers on the main-stem Ohio River will be allowed one blue catfish ≥ 35.0 in, one flathead catfish ≥ 35.0 in, and one channel catfish ≥ 28.0 in per day. Harvest of fish below their respective length limits will not be regulated.

The majority of commercial fishers fishing in the legal waters of the Ohio River and its tributaries will be allowed one blue catfish ≥ 35.0 in, one flathead catfish ≥ 35.0 in, and one channel catfish ≥ 28.0 in per day. However, 44 commercial fishers that harvested over 10,000 lbs of catfish in at least 2 of the last 3 years along with an additional six commercial fishers, who will be chosen by a lottery drawing, will be allowed a daily harvest of four (in aggregate) blue catfish and flathead catfish ≥ 40.0 in and channel catfish ≥ 30.0 inches in Kentucky's portion of the Ohio River and its tributaries open to commercial fishing below Cannelton Lock and Dam. Harvest of fish below their respective length limits will not be regulated.

After hearing comments from stakeholders in attendance and discussion with the Fisheries Division Director, the Fisheries Committee voted unanimously to pass the proposed regulations on to the full Commission. The regulations were passed by the full Commission at their meeting in December 2013. In June 2014, the regulation was made law; however, an injunction on the regulation was filed by commercial fishers shortly after its enactment and regulations on commercial fishers were not enforceable until December 1, 2014.

Accusations by recreational anglers that overharvest was still occurring on the Ohio River surfaced again in 2018. A working group comprised of the KDFWR Fisheries Committee, KDFWR Director of Fisheries and staff biologist, recreational anglers, commercial fishermen, and paylake owners was formed so that all parties were represented in discussions. Multiple workgroup meetings were held to work towards another compromise. Several regulations were proposed and submitted for review. At the time of this report the following regulations have been made law:

The number of commercial fishers awarded trophy permits is 15 (previously 50).

No more than two licensed commercial fisherman per boat. If more are present, they may only keep two limits of trophy catfish.

A possession limit (twice the daily limit) was placed on trophy catfish for commercial fishers. This applies when on the water and when trailering fish.

Hoop Net Surveys

Channel catfish hoop net surveys—Department hoop netting was conducted in the Meldahl, Cannelton, and Smithland pools to gather data from hoop net catch of channel catfish and flathead catfish. Single nets baited with ZOTE[®] soap were set overnight for three consecutive net nights in the main stem of the Ohio River. Hoop nets were fished for a total of 162 net-nights: 81 in Meldahl Pool, 54 in Cannelton Pool, and 27 in Smithland Pool (Table 1). Effort was less than the intended 90 net-nights per pool (incomplete sample) in the Cannelton and Smithland pools due to high water and dangerous sampling condition during the sampling window of April - June. Overall catch rate of channel catfish was 2.4 fish/net-night. This is a decrease from 4.5 fish/net-night in 2019 and below the historical average (4.4 fish/net-night; Table 2).

Lengths of channel catfish ranged from 4.5 – 27.4 in with a mean length of 16.0 in (Table 3). Hoop net catch rates were also examined for different size groups of channel catfish. Channel catfish catch rates decreased from 2019 catch rates for all size groups and were all below historical averages (Table 4).

Flathead catfish hoop net surveys—Netting was conducted simultaneously with baited channel catfish hoop nets in the Meldahl, Cannelton, and Smithland pools. Singles nets were set overnight for three consecutive nights in the main stem of the Ohio River. Hoop nets were fished for a total of 156 net-nights: 81 in the Meldahl Pool, 45 in the Cannelton Pool, and 30 in the Smithland Pool (Table 5). Overall CPUE of flathead catfish was 0.8 fish/net-night.

Lengths of flathead catfish ranged from 13.5 – 45.6 in with a mean length of 26.2 in (Table 6). Hoop net catch rates of different size groups were also examined, and all size groups were at or below 2019 catch rates (Table 7). Trophy flathead catfish (≥ 35.0 in) were captured at 0.1 fish/net-night, and were observed in all pools sampled.

Electrofishing Surveys

Low-pulse DC electrofishing was conducted in seven pools in June 2021: Meldahl, Markland, McAlpine, Cannelton, Newburgh, JT Myers, and Smithland. A total of 35.0 hr of electrofishing effort was conducted resulting in a total catch of 627 blue catfish and 1,460 flathead catfish (Table 8). Overall CPUE of blue catfish was 17.9 fish/hr and above the historical average of 17.2 fish/hr (Table 9). Overall flathead catfish CPUE was 41.7 fish/hr, and although below 2020 levels, was still above the historical average (35.7 fish/hr).

Blue catfish collected with electrofishing ranged from 3.2 – 45.8 in with a mean length of 16.3 in (Table 10). Electrofishing catch rates were also examined for different size groups of blue catfish. CPUE of <12.0 in fish increased and was the highest since 2013. CPUE of 12.0 – 19.9 in fish decreased for the third consecutive year while CPUE of 20.0 – 29.9 in fish and 30.0 – 34.9 in fish also saw decreased from 2020 catch rates. Trophy CPUE was 0.5 fish/hr as it has been for five of the last six years. (Table 11). Trophy blue catfish were observed in all pools except the McAlpine Pool.

Flathead catfish lengths ranged from 2.3 – 46.7 in with a mean length of 14.4 in (Table 10). Electrofishing CPUE for all size groups examined were above their historical averages; however, all size groups except that 12.0 – 19.9 in size group saw decreases from 2020 (Table 12). Trophy flathead catfish were observed in all pools sampled except the McAlpine Pool.

Relative Weight

Relative weight (Wr) was also calculated for each species of catfish. Fish collected from all sampling methods used in 2021 were combined to provide a more representative estimate for the entire population of each catfish species. Overall Wr of blue catfish (N=479) in 2021 was 112 (Table 13). Flathead catfish (N=1,069) overall relative weight was 114, and channel catfish (N=314) overall relative weight was 87. Overall, blue catfish and flathead catfish appear to be in great condition throughout the river as they both had record high Wr.

Age, Growth, and Mortality

In spring 2017, otoliths (up to 5 per inch class for fish <30.0 in and up to 3 per inch class for fish ≥30.0 in) were taken from blue catfish, channel catfish, and flathead catfish to assess growth rates for each species. Separate samples were taken from the upper and trophy permit sections. Von Bertalanffy growth equations were calculated for each species (Table 14). Male blue catfish seemed to grow faster in the upper section, but the opposite was observed in the trophy permit section. On average, it took blue catfish 17.7 years to reach trophy size (≥35.0 in; Table 15). Channel catfish exhibited slightly faster growth in the upper section of the Ohio River, but no large differences were seen in growth between sexes. Overall, channel catfish reached trophy size (28.0 in) at 20.0 years (Table 16). There was no noticeable difference in growth rates of flathead catfish between sexes; however, flathead catfish exhibited faster growth in the trophy permit section of the Ohio River. On average a flathead catfish in the upper section reached trophy size (35.0 in) at 20.6 years, while flathead catfish in the trophy permit section reached trophy size nearly three years quicker at 17.7 years. Overall, flathead catfish reached trophy size at 20.1 years (Table 17). Growth of all three species of catfish sampled was extremely variable, particularly as fish grew older and larger, with some fish growing much slower than the Von-Bertalanffy model described and some growing much faster.

Total annual mortality estimates were made on all three species of catfish based off length-at-age of capture data from otoliths and paired with unaged catfish collected with multiple sampling techniques in 2017. Length frequency data from 2021 was paired with the 2017 age-length key to provide mortality estimates for 2021. Using Fishery Analysis and Modeling Simulator (FAMS), a separate weighted catch-curve regression was run on each species of catfish for each sampling method to calculate a range of total annual mortality estimates. As a precautionary step, the highest mortality estimate calculated for each species is reported to avoid underestimates and potentially masking problems in the populations. In 2021, river-wide total annual mortality for blue catfish was 23.7%. Channel catfish total annual mortality was 20.7%, and flathead catfish total annual mortality was 19.8% (Table 18). This is highest estimate of flathead catfish mortality since the project began.

Commercial Fishing Industry

Commercial fishing for catfish has long been present in the Ohio River, but concerns of potential overharvest have warranted further investigations. Harvest of blue catfish began increasing from 2004 to 2005 and has remained near 200,000 – 250,000 lbs through 2018 with the exception of a large peak in 2012 (Figure 1). Record harvest of blue catfish (388,274 lbs) was observed in 2021. Channel catfish harvest has fluctuated, but generally increased from 2007 – 2013 then gradually declined from 2013 - 2019. Channel catfish harvest for 2021 was 127,166 lbs. Flathead catfish trends are similar to channel catfish; however, harvest has been slightly increasing since 2018. Unfortunately, commercial fish harvest reports do not include detailed information about gear (number of net nights, baited vs. unbaited, length of gillnet, etc.); however, the number of hooks fished for trotlines as well as number of hoop nets fished is required to be reported. Although trotline and hoop net harvest should not be considered indicative of the entire commercial catfish harvest, it is the best available method to analyze trends in commercial catfish harvest rates. Effort (number of hooks for trotlines and number of nets for hoop nets) and pounds harvested by method were examined to determine if harvest rates varied over the years. Trotlines are more effective at capturing blue catfish, while hoop nets are more effective when targeting flathead catfish

according to commercial harvest data. Channel catfish appear to be captured efficiently by both trotlines and hoop nets. Each species was examined according to the most effective gear. The harvest rate of blue catfish increased sharply from 2004 to 2005, then increased gradually from 2005 – 2019. Harvest rate reached an all-time high in 2019 and 2021 was the second highest recorded harvest rate (Figure 2). Recent decreases in total pounds of catfish harvested in 2013, 2014, and 2018 described above are likely not a result of decreased harvest rates, but rather a decrease in effort. Additionally, the harvest rate remaining high in 2021 indicates that the amount of fish harvested is not solely a result of increased effort. Channel catfish trotline harvest rates has been extremely consistent since 2004, but reached a historical high in 2020 and remained near those levels in 2021 (Figure 2). Channel catfish and flathead catfish harvest in commercial nets have both remained between 5 – 15 pounds/net; however, a drastic spike in harvest occurred in 2012 and 2013 (Figure 3). Reasons for this extreme peak in harvest are not known, but could be a result of prolonged favorable fishing conditions or demand for fish.

Table 1. CPUE (fish/net-night) of channel catfish collected during baited hoop net surveys in Meldahl, Cannelton, and Smithland pools of the Ohio River in spring 2021. Standard errors are in parentheses.

Pool	Effort (net nights)	No. of channel catfish	CPUE
Meldahl	81	264	3.3 (0.9)
Cannelton	54	104	1.9 (0.6)
Smithland	27	15	0.6 (0.2)
Total	162	383	2.4 (0.5)

Table 2. CPUE (fish/net-night) of channel catfish collected during baited hoop net surveys on the Ohio River in spring 2017 - 2021. Standard errors are in parentheses.

Year	CPUE
2017	8.0 (1.1)
2018	3.8 (0.5)
2019	4.5 (0.8)
2021	2.4 (0.5)
Mean	4.4 (0.5)

Table 3. Length frequency and CPUE (fish/net-night) of channel catfish collected during baited hoop net sampling in the Meldahl, Cannelton, and Smithland pools during spring 2021 on the Ohio River. Standard errors are in parentheses.

Pool	Inch class																											Total	CPUE
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27					
Meldahl			1	2	9	11	6	7	9	7	18	17	29	27	28	27	16	11	6	13	9	7	1	3	264	3.3 (0.9)			
Cannelton	1	2	1	2	9	13	14	15	9	4	3	4	6	10	5	2	1		1	1	1				104	1.9 (0.6)			
Smithland						1	1		2	2			1	1		2	3	1	1						15	0.6 (0.2)			
Total	1	2	2	4	18	25	21	22	20	13	21	21	36	38	33	31	20	12	8	14	10	7	1	3	383	2.4 (0.5)			

Table 4. CPUE (fish/net-night) by size group of channel catfish collected during baited hoop net surveys on the Ohio River in spring 2017 - 2021. Standard errors are in parentheses.

Year	Size group (in)				Total
	<12.0	12.0 - 19.9	20.0 - 27.9	≥28.0	
2017	1.5 (0.3)	4.5 (0.7)	1.0 (0.2)	<0.1 (<0.1)	7.0 (1.0)
2018	0.7 (0.1)	2.5 (0.4)	0.6 (0.1)	<0.1 (<0.1)	3.8 (0.5)
2019	0.8 (0.2)	2.6 (0.5)	1.0 (0.3)	<0.1 (<0.1)	4.5 (0.8)
2021	0.6 (0.1)	1.3 (0.4)	0.5 (0.1)	0.0	2.4 (0.5)
Mean	0.9 (0.1)	2.8 (0.3)	0.8 (0.1)	<0.1 (<0.1)	4.4 (0.5)

Table 5. CPUE (fish/net-night) of flathead catfish collected during unbaited hoop net surveys in Meldahl, Cannelton, and Smithland pools of the Ohio River in spring 2021. Standard errors are in parentheses.

Pool	Effort (net nights)	No. of Flathead Catfish	CPUE
Meldahl	81	59	0.7 (0.1)
Cannelton	45	52	1.2 (0.3)
Smithland	30	13	0.4 (0.2)
Total	156	124	0.8 (0.2)

Table 6. Length frequency and CPUE (fish/net/night) of flathead catfish collected during unbaited hoop net sampling in the Meldahl, Cannelton, and Smithland pools during spring 2021 on the Ohio River. Standard errors are in parentheses.

2021 on the Ohio River. Standard errors are in parentheses.																																															
Pool	Inch class																																													Total	CPUE
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45														
Meldahl					1	2	2	3	4	7	5	6	5	2	3	2	3	2	1	4	1	1	1	1	1				1		1							59	0.7 (0.1)								
Cannelton	1	1			1		1	3	6	2	3	8	8	2	1	3	1	1	1	2	1	2		1				1	1					1			52	1.2 (0.3)									
Smithland						1	1				5			2			1			1	1		1														13	0.4 (0.2)									
Total	1	1			2	3	4	6	10	14	8	14	13	6	4	5	5	3	2	7	3	3	2	2	1		1	2		1			1				124	0.8 (0.2)									

Table 7. CPUE (fish/net-night) by size group of flathead catfish collected during unbaited hoopnet surveys on the Ohio River in spring 2019 - 2021. Standard errors are in parentheses.

Year	Size group (in)					Total
	<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
2019	0.0	0.1 (<0.1)	1.1 (0.1)	0.3 (0.1)	0.2 (0.1)	1.8 (0.2)
2021	0.0	0.1 (<0.1)	0.5 (0.2)	0.1 (0.1)	0.1 (>0.1)	0.8 (0.2)
Mean	0.0	0.1 (<0.1)	0.8 (0.2)	0.2 (0.1)	0.2 (0.1)	1.3 (0.2)

Table 8. Effort and CPUE (fish/hr) of blue catfish and flathead catfish collected during electrofishing surveys on the Ohio River in June 2021. Standard errors are in parentheses.

Pool	No. of transects	Effort (hr)	No. of Blue		No. of Flathead	
			Catfish	CPUE	Catfish	CPUE
Meldahl	20	5.0	39	7.8 (1.7)	232	46.4 (5.9)
Markland	20	5.0	63	12.6 (4.3)	181	36.2 (6.0)
McAlpine	20	5.0	49	9.8 (4.0)	158	31.6 (4.3)
Cannelton	20	5.0	84	16.8 (6.7)	311	62.2 (5.8)
Newburgh	20	5.0	97	19.4 (3.0)	213	42.6 (5.4)
JT Myers	20	5.0	163	32.6 (7.3)	243	48.6 (5.5)
Smithland	20	5.0	132	26.4 (5.8)	122	24.4 (3.7)
Total	140	35.0	627	17.9 (2.0)	1460	41.7 (2.2)

Table 9. CPUE (fish/hr) of blue catfish and flathead catfish collected during electrofishing surveys on the Ohio River from 2004 - 2021. Standard errors are in parentheses.

Year	Species	
	Blue catfish	Flathead catfish
2004	0.0	14.5 (4.1)
2009	1.6 (0.8)	15.5 (4.1)
2010	11.9 (4.0)	17.1 (3.3)
2013	11.4 (4.8)	38.9 (5.1)
2014	19.3 (3.2)	32.8 (2.6)
2015	19.0 (3.8)	37.6 (3.6)
2016	17.5 (2.7)	35.5 (2.2)
2017	25.2 (2.7)	40.6 (2.1)
2018	39.8 (5.7)	54.0 (4.7)
2019*	22.2 (2.6)	40.2 (2.4)
2020	20.1 (2.4)	59.6 (3.0)
2021	17.9 (2.0)	41.7 (2.2)
Mean	17.2 (3.0)	35.7 (4.1)

*Incomplete sample due to high water

Table 10. Length frequency and CPUE (fish/hr) of blue catfish and flathead catfish collected during electrofishing surveys in June 2021 on the Ohio River. Standard errors are in parentheses.

		Inch class																																														CPUE
Pool	Species	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46		
Meldahl	Blue catfish		1				3	1	2				2	1		2	4	2	1		1	4	2	1	2	3	3	2						1		1										39	7.8 (1.7)	
	Flathead catfish		9	5	3	4	6	16	28	27	15	15	14	7	7	5	13	10	7	5	3	3	6	1	5	5	1	4	2	2			1	1	1	1										232	46.4 (5.9)	
Markland	Blue catfish		2	1	5	15	4	3	2			1	3	4	4		2	1	1	2	2		3	2	2		2								1										63	12.6 (4.3)		
	Flathead catfish		1	4	2		10	15	18	15	17	16	16	6	4	5	4	5	8	2	6	3	3	2	5	4	3	1	2			1	1						1							181	36.2 (6.0)	
McAlpine	Blue catfish			1		6	2	1		3	1	2	2	3		2	4	2	1	2	2	4	3	3	2		2								1											49	9.8 (4.0)	
	Flathead catfish	2	2			10	12	11	13	14	13	16	12	8	5	5	3	4	6	2	3	3	1	3	3	2		2		1				1												158	31.6 (4.3)	
Cannelton	Blue catfish			1	1	15	8	1	5	2	1	1	2	3	2	3	6	4	1	3	5	7	2	5	4								1													84	16.8 (6.7)	
	Flathead catfish		1		1	3	7	24	17	30	26	35	27	17	13	10	8	9	9	11	7	10	10	10	6	4	2	1	2	2	3	3	1				1									311	62.2 (5.8)	
Newburgh	Blue catfish			1	2	9	14	8	6	3	2	3	10	2	3	1	2	2	1	1	2	1	2	5	3	5	3	3				1	1					1								97	19.4 (3.0)	
	Flathead catfish	2	11	7	6	10	10	10	18	14	11	21	18	9	9	3	4	12	2	4	5	4	3	3	1	2	1	3	2	2				1	1				1	1	1	1				213	42.6 (5.4)	
JT Myers	Blue catfish		3	6	3	8	15	37	13	1	2	2	7	3	4	3	1	3	2	3	2	5	10	4	7	7	4	1	2	1					2	1			1							163	32.6 (7.3)	
	Flathead catfish		11	15	2	10	14	14	18	26	14	15	12	12	5	6	7	11	9	3	4	4	5	5	2	2	3				3	1	4	1		3		1							243	48.6 (5.5)		
Smithland	Blue catfish		1	3	1		2	7	5	4	3	3	4	6	1	1	2	7	8	9	8	12	5	5	7	2	5	6	4	1	1	2				1		2								132	26.4 (5.8)	
	Flathead catfish		4	1		6	6	12	2	3	6	3	4	2	4	10	3	9	5	5	7	5	2	4	3	4	2	2								1		2						1		122	24.4 (3.7)	
Total	Blue catfish		7	13	12	53	48	58	31	15	9	12	30	22	14	12	21	21	15	20	22	33	27	25	27	17	19	12	6	2	2	4		2	2	4		3	1		2	2	1		1		627	17.9 (2.0)
	Flathead catfish	4	39	32	14	43	65	102	114	129	102	121	103	61	47	44	42	60	46	32	35	32	30	28	25	23	12	13	9	11	6	8	4	2	6	1	2	2	3	2	1	2	2		1	1460	41.7 (2.2)	

Table 11. CPUE (fish/hr) by size group of blue catfish collected during electrofishing surveys on the Ohio River from 2004 - 2021. Standard errors are in parentheses.

Year	Size group (in)					Total
	<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
2004	0.0	0.0	0.0	0.0	0.0	0.0
2009	0.1 (<0.1)	1.0 (0.1)	0.4 (<0.1)	0.1 (<0.1)	0.0	1.6 (0.8)
2010	8.8 (2.3)	1.0 (0.1)	1.4 (0.1)	0.7 (<0.1)	0.0	11.9 (4.0)
2013	9.2 (2.5)	1.8 (0.9)	0.3 (0.1)	0.0	0.0	11.4 (4.8)
2014	6.8 (0.6)	10.1 (1.2)	2.1 (0.2)	0.2 (0.1)	0.1 (0.1)	19.3 (3.2)
2015	0.8 (0.4)	14.3 (3.0)	3.5 (0.5)	0.2 (<0.1)	0.2 (0.1)	19.0 (3.8)
2016	0.7 (0.4)	11.1 (2.8)	4.9 (0.9)	0.3 (0.1)	0.5 (0.2)	17.5 (2.7)
2017	3.5 (0.7)	12.8 (1.7)	7.8 (1.0)	0.5 (0.2)	0.5 (0.1)	25.2 (2.7)
2018	6.2 (1.8)	15.1 (3.4)	17.3 (6.8)	0.6 (0.2)	0.6 (0.2)	39.8 (5.7)
2019*	4.9 (1.0)	7.4 (1.0)	8.6 (1.3)	0.9 (0.2)	0.5 (0.1)	22.2 (2.6)
2020	2.9 (0.5)	4.6 (0.7)	11.4 (1.7)	0.7 (0.2)	0.5 (0.1)	20.1 (2.4)
2021	7.0 (1.2)	4.2 (0.5)	5.9 (0.8)	0.3 (0.1)	0.5 (0.1)	17.9 (2.0)
Mean	4.2 (1.0)	7.0 (1.6)	5.3 (1.5)	0.4 (0.1)	0.3 (0.1)	17.2 (3.1)

*Incomplete sample due to high water

Table 12. CPUE (fish/hr) by size group of flathead catfish collected during electrofishing surveys on the Ohio River from 2004 - 2021. Standard errors are in parentheses.

Year	Size group (in)					Total
	<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
2004	9.3 (4.2)	5.0 (1.1)	0.3 (0.3)	0.0	0.0	14.5 (4.1)
2009	8.4 (1.7)	4.3 (0.2)	2.6 (0.2)	0.0	0.3 (<0.1)	15.5 (4.1)
2010	8.8 (1.9)	6.0 (2.1)	2.1 (0.5)	0.2 (<0.1)	0.0	17.1 (3.3)
2013	14.9 (4.5)	17.2 (1.1)	6.3 (1.8)	0.3 (0.1)	0.2 (0.2)	38.9 (5.1)
2014	12.3 (2.6)	15.9 (3.7)	4.3 (0.2)	0.3 (0.1)	0.1 (<0.1)	32.8 (2.6)
2015	15.8 (2.1)	14.6 (4.2)	5.6 (0.9)	0.9 (0.4)	0.7 (0.3)	37.6 (3.6)
2016	10.9 (1.6)	16.0 (4.2)	7.2 (1.3)	0.8 (0.3)	0.6 (0.3)	35.5 (2.2)
2017	12.5 (1.1)	15.5 (1.0)	10.7 (0.9)	1.1 (0.2)	0.8 (0.2)	40.6 (2.1)
2018	22.0 (2.8)	15.3 (1.0)	13.5 (1.2)	1.9 (0.3)	1.2 (0.2)	54.0 (4.7)
2019*	15.0 (1.8)	12.9 (0.9)	10.1 (0.8)	1.4 (0.3)	0.8 (0.2)	40.2 (2.4)
2020	33.1 (2.4)	13.3 (0.9)	10.8 (0.8)	1.1 (0.2)	1.3 (0.2)	59.6 (3.0)
2021	18.4 (1.5)	15.0 (1.1)	6.8 (0.6)	0.9 (0.2)	0.6 (0.1)	41.7 (2.2)
Mean	15.1 (2.0)	12.6 (1.3)	6.7 (1.2)	0.7 (0.2)	0.6 (0.1)	35.7 (4.1)

*Incomplete sample due to high water

Table 13. Relative weight (Wr) of blue catfish, channel catfish, and flathead catfish collected from the Ohio River using trotlines, hoop nets, electrofishing and catfish tournaments from 2013 - 2021.

Year	Species		
	Blue catfish	Channel catfish	Flathead catfish
2013	112	100	99
2014	105	97	92
2015	109	100	98
2016	107	97	106
2017	106	89	107
2018	104	90	101
2019	99	86	99
2020	107		107
2021	112	87	114
Mean	106	93	102

Table 14. von Bertalanffy growth parameters used to estimate length-at age for blue catfish, channel catfish, and flathead catfish collected from the Ohio River in 2017 where L_{∞} =theoretical maximum length, K=body growth coefficient, and t_0 =time coefficient.

Parameter	Blue catfish	Channel catfish	Flathead catfish
L_{∞} (in)	55.0	35.0	55.0
K	0.051	0.074	0.040
t_0	-2.086	-1.783	-4.556

Table 15. Mean length (in) at age calculated with the von Bertalanffy growth equation based on otoliths taken from blue catfish from the Ohio River in spring and summer of 2017.

Section	Sex	Age																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Upper	Male	7.2	9.9	12.4	14.8	17.1	19.3	21.3	23.2	25.0	26.7	28.3	29.8	31.2	32.6	33.8	35.0	36.2	37.2	38.2	39.2
	Female	9.7	11.6	13.5	15.2	16.9	18.5	20.0	21.5	22.9	24.3	25.6	26.8	28.0	29.2	30.2	31.3	32.3	33.3	34.2	35.1
	Total	7.6	10.0	12.4	14.6	16.7	18.6	20.5	22.3	24.0	25.6	27.1	28.6	29.9	31.2	32.5	33.6	34.8	35.8	36.8	37.7
Trophy permit	Male	9.0	11.2	13.4	15.4	17.3	19.2	20.9	22.6	24.2	25.7	27.1	28.5	29.8	31.0	32.2	33.3	34.4	35.4	36.4	37.3
	Female	7.3	9.9	12.4	14.7	16.9	19.0	20.9	22.8	24.6	26.2	27.8	29.3	30.7	32.0	33.3	34.5	35.6	36.7	37.7	38.6
	Total	8.3	10.6	12.8	14.9	16.9	18.8	20.6	22.3	24.0	25.5	27.0	28.4	29.7	31.0	32.2	33.3	34.4	35.4	36.4	37.3
Overall	Male	8.7	11.1	13.3	15.4	17.4	19.4	21.2	22.9	24.5	26.1	27.5	28.9	30.3	31.5	32.7	33.9	34.9	36.0	36.9	37.9
	Female	11.9	13.4	15.0	16.4	17.8	19.2	20.5	21.7	23.0	24.1	25.3	26.3	27.4	28.4	29.4	30.3	31.2	32.1	32.9	33.7
	Total	8.0	10.4	12.6	14.7	16.7	18.6	20.4	22.2	23.8	25.4	26.8	28.2	29.6	30.9	32.1	33.2	34.3	35.3	36.3	37.2

Table 16. Mean length (in) at age calculated with the von Bertalanffy growth equation based on otoliths taken from channel catfish from the Ohio River in spring and summer of 2017.

Section	Sex	Age																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Upper	Male	6.6	9.1	11.5	13.6	15.6	17.3	18.9	20.4	21.7	22.9	24.0	25.0	25.9	26.7	27.5	28.2	28.8	29.3	29.9	30.3
	Female	5.7	8.7	11.5	13.9	16.1	18.1	19.8	21.4	22.8	24.1	25.2	26.3	27.2	28.0	28.7	29.4	30.0	30.5	30.9	31.4
	Total	6.4	8.9	11.1	13.2	15.0	16.8	18.3	19.8	21.1	22.3	23.4	24.4	25.3	26.1	26.9	27.6	28.2	28.8	29.3	29.8
Trophy permit	Male	7.8	9.5	11.1	12.6	14.0	15.3	16.5	17.6	18.7	19.7	20.7	21.6	22.4	23.2	23.9	24.6	25.2	25.8	26.4	26.9
	Female	8.0	9.7	11.2	12.7	14.1	15.5	16.7	17.8	18.9	19.9	20.9	21.8	22.6	23.4	24.1	24.8	25.4	26.0	26.6	27.1
	Total	7.6	9.4	11.1	12.7	14.1	15.5	16.8	18.0	19.1	20.1	21.1	22.0	22.9	23.7	24.4	25.1	25.8	26.4	26.9	27.5
Overall	Male	7.4	9.5	11.4	13.2	14.9	16.4	17.8	19.1	20.3	21.4	22.5	23.4	24.3	25.1	25.9	26.6	27.2	27.8	28.3	28.8
	Female	7.8	9.6	11.3	12.9	14.4	15.8	17.1	18.3	19.4	20.5	21.5	22.4	23.2	24.0	24.8	25.5	26.1	26.7	27.3	27.8
	Total	6.5	8.5	10.4	12.2	13.8	15.3	16.7	18.0	19.2	20.4	21.4	22.4	23.3	24.1	24.9	25.6	26.3	26.9	27.5	28.0

Table 17. Mean length (in) at age calculated with von Bertalanffy growth equation based on otoliths taken from flathead catfish from the Ohio River in spring and summer of 2017.

Table 17: Mean length (in) at age calculated with von Bertalanffy growth equation based on otoliths taken from flathead catfish from the Ohio River in spring and summer of 2017.																																		
Section	Sex	Age																																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Upper	Male	9.4	11.3	13.0	14.7	16.3	17.9	19.4	20.8	22.2	23.5	24.8	26.0	27.2	28.3	29.4	30.4	31.4	32.4	33.3	34.2	35.0	35.8	36.6	37.3	38.0	38.7	39.4	40.0	40.6	41.2	41.8	42.3	42.8
	Female	11.3	13.1	14.8	16.4	18.0	19.5	20.9	22.3	23.6	24.9	26.1	27.2	28.4	29.4	30.5	31.5	32.4	33.3	34.2	35.0	35.8	36.6	37.4	38.1	38.8	39.4	40.0	40.6	41.2	41.8	42.3	42.8	43.3
	Total	11.0	12.7	14.4	16.0	17.5	19.0	20.4	21.8	23.1	24.3	25.5	26.7	27.8	28.9	29.9	30.9	31.8	32.8	33.6	34.5	35.3	36.1	36.8	37.5	38.2	38.9	39.5	40.1	40.7	41.3	41.8	42.3	42.8
Trophy permit	Male	5.7	8.3	10.8	13.1	15.3	17.4	19.4	21.3	23.1	24.7	26.3	27.8	29.3	30.6	31.9	33.1	34.3	35.4	36.4	37.4	38.3	39.2	40.1	40.9	41.6	42.3	43.0	43.6	44.2	44.8	45.3	45.9	46.3
	Female	5.2	7.8	10.4	12.8	15.0	17.2	19.2	21.1	22.9	24.7	26.3	27.8	29.3	30.7	32.0	33.2	34.4	35.5	36.6	37.5	38.5	39.4	40.2	41.0	41.8	42.5	43.2	43.8	44.4	45.0	45.5	46.0	46.5
	Total	5.6	8.2	10.7	13.0	15.2	17.3	19.3	21.2	23.0	24.7	26.3	27.8	29.2	30.6	31.9	33.1	34.2	35.3	36.4	37.4	38.3	39.2	40.0	40.8	41.6	42.3	43.0	43.6	44.2	44.8	45.3	45.8	46.3
Overall	Male	8.8	10.7	12.6	14.3	16.0	17.6	19.2	20.6	22.0	23.4	24.7	26.0	27.2	28.3	29.4	30.5	31.5	32.5	33.4	34.3	35.1	36.0	36.8	37.5	38.2	38.9	39.6	40.2	40.8	41.4	42.0	42.5	43.0
	Female	9.3	11.3	13.2	15.0	16.7	18.3	19.9	21.4	22.9	24.3	25.6	26.9	28.1	29.3	30.4	31.4	32.5	33.4	34.4	35.3	36.1	36.9	37.7	38.5	39.2	39.9	40.5	41.2	41.8	42.3	42.9	43.4	43.9
	Total	7.6	9.6	11.6	13.6	15.4	17.1	18.8	20.4	21.9	23.4	24.8	26.1	27.4	28.6	29.8	30.9	32.0	33.0	34.0	34.9	35.8	36.6	37.4	38.2	39.0	39.7	40.4	41.0	41.6	42.2	42.8	43.3	43.8

Table 18. Maximum total annual mortality rates of blue catfish, channel catfish, and flathead catfish collected from the Ohio River using trotlines, hoopnets, and electrofishing from 2013 - 2021.

Year	Species		
	Blue catfish	Channel catfish	Flathead catfish
2013	18.7	32.2	18.8
2014	24.7	26.8	18.7
2015	20.0	20.6	15.9
2016	17.4	16.8	16.0
2017	18.9	27.9	18.2
2018	19.8	28.0	18.0
2019	17.3	23.3	17.1
2020	26.6		19.5
2021	23.7	20.7	19.8
Mean	20.8	24.5	18.0

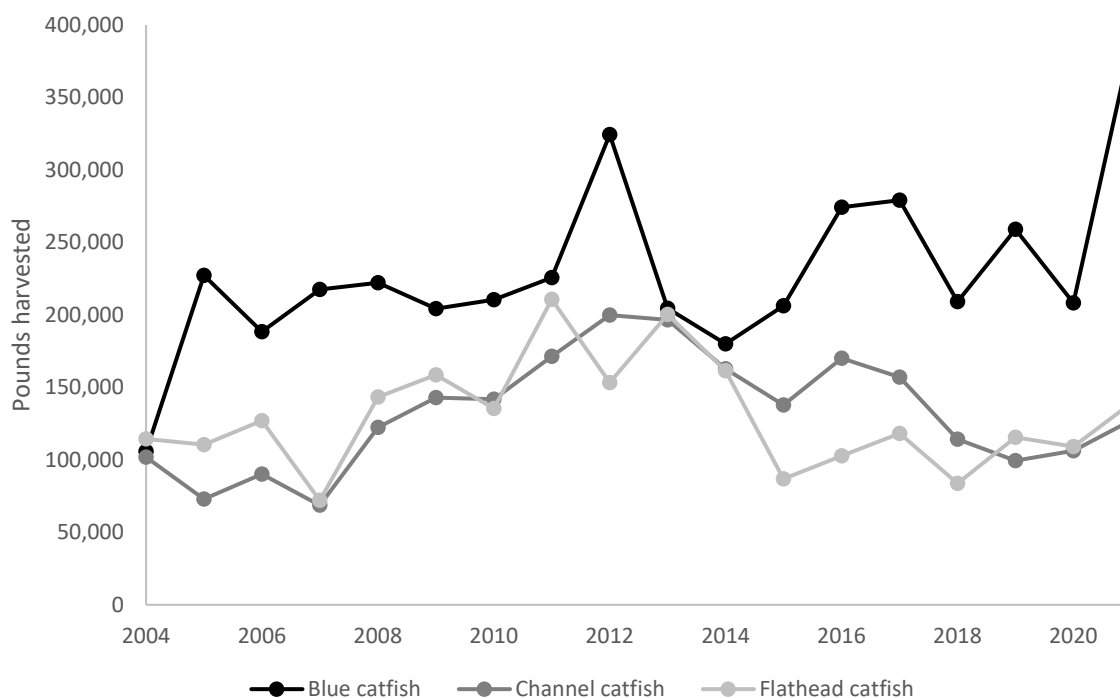


Figure 1. Total pounds of blue catfish, channel catfish, and flathead catfish harvested by commercial fishermen from the Ohio River from 2004 – 2021.

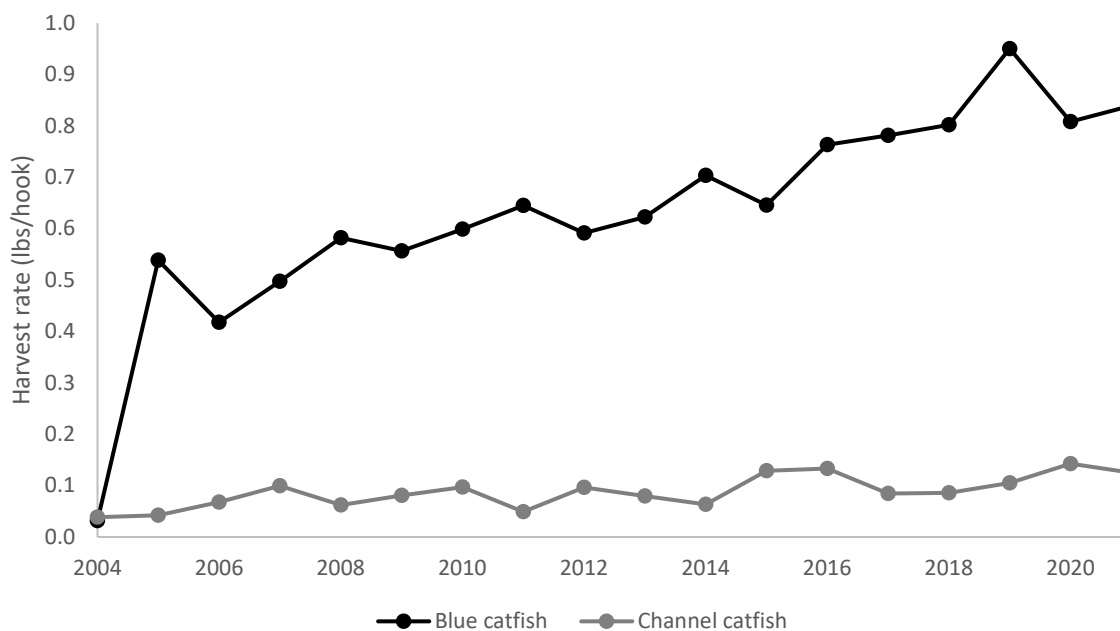


Figure 2. Harvest rate (lbs/hook) of blue catfish and channel catfish harvested with trotlines by commercial fishermen from the Ohio River from 2004 – 2021.

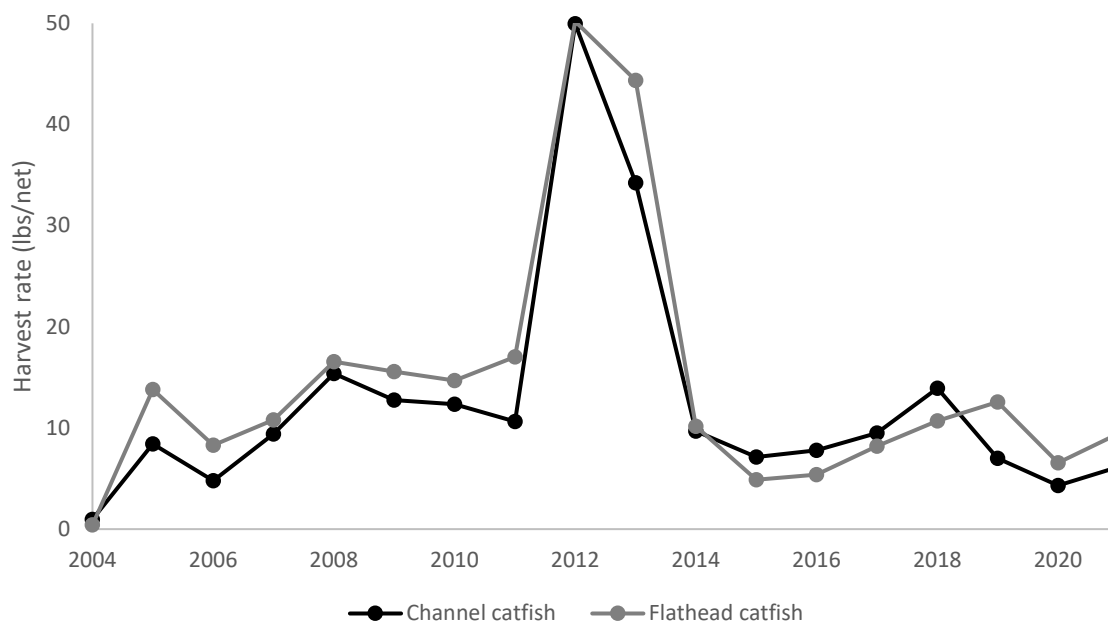


Figure 3. Harvest rate (lbs/net) of channel catfish and flathead catfish harvested with hoop nets by commercial fishermen from the Ohio River from 2004 – 2021.

Project III: Lake Sturgeon Restoration Evaluation

FINDINGS

In Kentucky, lake sturgeon were once native to the Mississippi, Ohio, and Cumberland River drainages, but have been extirpated from the Cumberland River since the 1950's. In 2008, KDFWR began reintroducing lake sturgeon into the Cumberland River and committed to a 20-year restoration program as part of a region-wide effort. In years past, eggs were obtained annually from the Wisconsin Department of Natural Resources and hatched at Peter W. Pfeiffer Fish Hatchery in Frankfort, Kentucky; however, fry were obtained through Warm Springs National Fish Hatchery (Wolf River, Wisconsin broodstock) in 2021. Young-of-year sturgeon are reared to a target length of about 7.5 in and marked for year class identification by removing scutes prior to stocking. Since 2008, a total of 66,693 lake sturgeon fingerlings have been stocked: 35,803 in the Cumberland River near Noe's Dock at the mouth of Laurel River and 30,890 in the Big South Fork of the Cumberland River at Alum Ford boat ramp (Table 1). No lake sturgeon fingerlings were stocked in 2012 or 2013 due to production issues; however, larger lake sturgeon (mean length = 22.0 in) implanted with acoustic transmitters were stocked into the Cumberland River (n=21) and Big South Fork (n=20) as part of a telemetry project in 2012. One major component to the success of reintroduction programs is to assess the survival of stocked sturgeon.

Lake sturgeon sampling is conducted annually using trotlines (250.0 ft long with 50 hooks baited with nightcrawlers). Prior to 2017, the Cumberland River and Big South Fork were sampled in alternating years. Sampling was increased in 2017 to include both rivers and additional sampling sites were added to collect additional data and attempt to decrease variability in catch rates. During December 2021 a total of 36 trotlines, 24 in the Cumberland River and 12 in Big South Fork, were successfully set and retrieved. A total of 125 lake sturgeon were collected with a CPUE of 3.5 fish/line. One hundred one lake sturgeon were collected from the Cumberland River (CPUE=4.2 fish/line), and 24 fish were collected from the Big South Fork (CPUE=2.0 fish/line; Table 2). Both of those catch rates were record highs. Sturgeon ranged from 16.4 – 42.7 in fork-length with a mean fork-length of 28.9 in in the Cumberland River, and ranged from 17.9 – 45.3 in fork-length with a mean fork-length of 35.1 in in the Big South Fork (Table 3). Fish at both sites were in great condition as relative weight in the Cumberland River and Big South Fork was 104 and 105, respectively.

Year class catch rates varied among sites in 2021, but the 2015 (age-6) year class was the most captured year class in both the Cumberland River and Big South Fork (Table 4). Ten of twelve possible year classes were captured in the Cumberland River, while seven of twelve possible year classes were captured in the Big South Fork. Of note is that a fish from the 2011 year class was captured in the Big South Fork. No fish were stocked in the Big South Fork in 2011, so this fish had travelled from the main-stem Cumberland River. No lake sturgeon were stocked in 2012, 2013, and 2020 and as a result, no fish from those year classes were present in the sample.

Mean fork-length at age of capture indicates that growth of stocked lake sturgeon appears to be good. On average, fish exceeded 20.0 in by age-3, and were near 40.0 in by age-10 to age-12 (Table 5). Mean fork-length at age of capture was consistently higher in Big South Fork. Reasons for differences in growth are not known but may be a result of lower relative abundance in the Big South Fork.

Table 1. Stocking months, numbers, and average length of lake sturgeon fingerlings stocked in Lake Cumberland from 2008 - 2021.

Site	Year	Month	Number fingerlings	Average length (in)	Scutes removed
Cumberland River	2008	April/September	973	7.3	Right 2,3/Left 2,3
	2009	October	1,973	7.5	Right 3,4
	2010	August/September	4,539	6.8	Left 3,4
	2011	October	2,150	8.5	Right 5,6
	2012*		0		
	2013		0		
	2014	October	2,966	8.0	Left 7,8
	2015	September	3,860	8.7	Right 7,8
	2016	August	4,744	7.6	Left 1,2
	2017	August	2,465	6.4	Right 1,2
	2018	August	4,343	5.8	Left 3,4
	2019	August	2,770	6.7	Right 5,6
	2020		0		
	2021	August	5,020	7.2	Right 1,2
	Total		35,803	7.3	
Big South Fork	2008	September	705	7.4	Left 2,3
	2009	October	2,004	7.5	Right 3,4
	2010	August/September	4,062	6.7	Left 3,4
	2011		0		
	2012*		0		
	2013		0		
	2014	September	2,766	8.0	Left 7,8
	2015	September	3,845	6.6	Right 7,8
	2016	August	3,225	7.6	Left 1,2
	2017	August	2,465	6.4	Right 1,2
	2018	August	4,122	5.8	Left 3,4
	2019	August	2,911	6.7	Right 5,6
	2020		0		
	2021	August	4,785	6.0	Right 1,2
	Total		30,890	6.9	

*Lake sturgeon with an average length of 22.0 in were implanted with acoustic transmitters and stocked into the Cumberland River (n=21) and the Big South Fork (n=20) as part of a telemetry project.

Table 2. Trotline CPUE (fish/line) of lake sturgeon collected from the Cumberland River and Big South Fork in December 2021. Standard errors are in parentheses.

Site	No. of trotlines	No. of lake sturgeon	CPUE
Cumberland River	24	101	4.2 (0.6)
Big South Fork	12	24	2.0 (0.7)
Total	36	125	3.5 (0.5)

Table 3. Length frequency, CPUE (fish/line), and mean fork-length of lake sturgeon collected from the Cumberland River and Big South Fork in December 2021. Standard errors are in parentheses.

Site	Inch class																																													Mean			
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	Total	length (in)	Wr	CPUE															
Cumberland River	2	6	2	3			1	3	5	5	11	4	8	8	3	12	5	4	4	1	1	2	4	3	3		1				101	28.9	104	4.2 (0.6)															
Big South Fork		1							1		1	2	2	1				1		2		2	3	2	2			1	2	1		24	35.1	105	2.0 (0.7)														
Total	2	7	2	3			1	3	6	5	12	6	10	9	3	12	5	5	4	3	1	4	7	5	5		1	1	2	1	125	30.1	104	3.5 (0.5)															

Table 4. CPUE (fish/line) by year class for lake sturgeon collected on trotlines in the Cumberland River and Big South Fork of the Cumberland River in winter 2014 - 2021. Standard errors are in parentheses.

Site	Year	Year Class															Total
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Cumberland River	2014	<0.1 (<0.1)	0.0	0.1 (0.1)	<0.1 (<0.1)	2.4 (0.9)	0.0	0.0	0.0								2.6 (0.7)
	2016	0.0	0.0	0.2 (0.1)	0.1 (0.1)	0.7 (0.2)	0.0	0.0	0.5 (0.2)	0.8 (0.4)	0.1 (<0.1)						2.2 (0.6)
	2017	0.1 (0.1)	<0.1 (<0.1)	0.1 (0.1)	<0.1 (<0.1)	0.3 (0.2)	0.0	0.0	0.4 (0.1)	1.2 (0.4)	0.1 (0.1)	0.0					2.2 (0.6)
	2019	0.0	0.0	0.1 (0.1)	0.1 (0.1)	0.4 (0.3)	0.0	0.0	0.8 (0.2)	0.9 (0.3)	0.0	0.3 (0.1)	0.0	0.0			2.6 (0.5)
	2021	<0.1 (<0.1)	0.0	0.1 (0.1)	0.1 (<0.1)	0.2 (0.1)	0.0	0.0	0.5 (0.1)	1.7 (0.3)	0.1 (<0.1)	0.7 (0.1)	0.3 (0.1)	0.5 (0.2)	0.0	0.0	4.2 (0.6)
	Mean	<0.1 (<0.1)	<0.1 (<0.1)	0.1 (<0.1)	0.1 (<0.1)	0.8 (0.4)	0.0	0.0	0.4 (0.1)	1.2 (0.2)	0.1 (<0.1)	0.3 (0.2)	0.2 (0.1)	0.3 (0.2)	0.0	0.0	2.9 (0.3)
Big South Fork	2015	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							0.0
	2017	0.0	0.0	0.3 (0.2)	0.1 (0.1)	0.0	0.0	0.0	0.1 (0.1)	0.2 (0.1)	0.0	0.0					0.8 (0.2)
	2018	0.0	0.0	0.1 (<0.1)	0.0	0.0	0.0	0.0	0.1 (<0.1)	0.1 (<0.1)	0.0	0.2 (0.1)	0.0				0.5 (0.2)
	2019	0.0	0.0	0.4 (0.2)	0.1 (0.1)	0.0	0.0	0.0	0.5 (0.2)	0.4 (0.2)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.0			1.7 (0.6)
	2021	0.0	<0.1 (<0.1)	0.3 (0.1)	0.0	0.1 (<0.1)	0.0	0.0	0.2 (<0.1)	0.6 (0.1)	0.0	0.4 (0.1)	0.5 (0.1)	0.2 (0.1)	0.0	0.0	2.0 (0.7)
	Mean	0.0	<0.1 (0.1)	0.2 (0.1)	0.1 (<0.1)	<0.1 (<0.1)	0.0	0.0	0.2 (0.1)	0.3 (0.1)	<0.1 (<0.1)	0.2 (0.1)	0.2 (0.1)	0.1 (<0.1)	0.0	0.0	1.0 (0.3)
Overall	2014	<0.1 (<0.1)	0.0	0.1 (0.1)	<0.1 (<0.1)	2.4 (0.9)	0.0	0.0	0.0								2.6 (0.7)
	2015	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							0.0
	2016	0.0	0.0	0.2 (0.1)	0.1 (0.1)	0.7 (0.2)	0.0	0.0	0.5 (0.2)	0.8 (0.4)	0.1 (<0.1)						2.2 (0.6)
	2017	<0.1 (<0.1)	<0.1 (<0.1)	0.2 (0.1)	0.1 (<0.1)	0.2 (0.1)	0.0	0.0	0.3 (0.1)	0.7 (0.3)	<0.1 (<0.1)	0.0					1.6 (0.3)
	2018	0.0	0.0	0.1 (<0.1)	0.0	0.0	0.0	0.0	0.1 (<0.1)	0.1 (<0.1)	0.0	0.2 (0.1)	0.0				0.5 (0.2)
	2019	0.0	0.0	0.3 (0.1)	0.1 (0.1)	0.1 (0.1)	0.0	0.0	0.6 (0.1)	0.6 (0.1)	0.1 (<0.1)	0.2 (0.1)	0.1 (0.1)	0.0			2.0 (0.4)
	2021	<0.1 (<0.1)	<0.1 (<0.1)	0.3 (0.1)	0.1 (<0.1)	0.2 (<0.1)	0.0	0.0	0.4 (0.1)	1.3 (0.2)	0.1 (<0.1)	0.6 (0.1)	0.3 (0.1)	0.3 (0.1)	0.0	0.0	3.5 (0.7)
	Mean	<0.1 (<0.1)	<0.1 (<0.1)	0.2 (<0.1)	0.1 (<0.1)	0.5 (0.2)	0.0	0.0	0.3 (0.1)	0.6 (0.2)	0.1 (<0.1)	0.3 (0.1)	0.2 (0.1)	0.2 (0.1)	0.0	0.0	1.9 (0.5)

Table 5. Mean fork-length at age of capture of lake sturgeon collected on trotlines from the Cumberland River and Big South Fork in winter 2014 - 2021.

Site	Year	Age														
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Cumberland River	2014				21.3	25.9	27.4		34.9							
	2016	12.8	13.1	18.3			28.7	32.0	37.3							
	2017		14.2	16.9	19.8			31.3	38.5	37.1	36.6	39.7				
	2019			17.3		24.6	25.7			34.5	38.1	41.7				
	2021			17.9	23.8	26.6	22.6	30.3	32.0			39.5	39.9	39.9		40.9
	Mean	12.8	13.7	17.7	21.8	25.7	26.9	31.2	35.7	35.8	37.4	40.3	39.9	39.9		40.9
Big South Fork	2015															
	2017			16.4	23.6				32.6	38.9						
	2018		12.8		21.0	20.2					29.9					
	2019		14.9	19.7	22.3	28.4	34.5				39.4	40.4				
	2021			17.9	25.4	27.9		34.9	38.4			38.5		42.0	45.3	
	Mean		13.9	17.9	23.1	25.5	34.5	34.9	35.5	38.9	34.7	39.5		42.0	45.3	
Overall	2014				21.3	25.9	27.4		34.9							
	2015															
	2016	12.8	13.1	18.3			28.7	32.0	37.3							
	2017		14.2	16.8	20.4			31.3	34.1	38.4	36.6	39.7				
	2018		12.8	20.2	21	20.2					29.9					
	2019		14.9	18.5	22.3	26.3	30.3			34.5	39.1	40.5				
	2021			17.9	24.1	26.8	22.6	30.9	33.2			39.3	39.9	41.5	45.3	40.9
	Mean	12.8	13.8	18.3	22.0	24.8	27.3	31.4	34.9	36.5	35.2	39.8	39.9	41.5	45.3	40.9

Project IV: Warm Water Stream Sport Fish Surveys

FINDINGS

Warm water stream sport fish surveys were completed on various streams during 2021. Species collected during general sport fish surveys include largemouth bass, smallmouth bass, spotted bass, rock bass, bluegill, redear sunfish, white crappie, black crappie, muskellunge, walleye, sauger, white bass, blue catfish, channel catfish, and flathead catfish. Sampling seasons and sites for each stream are kept consistent to standardize the data for comparative purposes. A single standardized sampling run consists of one 15-minute electrofishing run that covers all useable habitat types in a transect area. River and stream sampling sites and conditions are summarized in Table 1 and Figure 1.

Elkhorn Creek

A black bass and rock bass sample was conducted on Elkhorn Creek in Franklin County during March 2021 at three sites using boat-mounted electrofishing for a total of 4.25 hrs (15-minute transects). Smallmouth bass were the most abundant species collected (107.3 fish/hr) and ranged from the 2.0 – 19.0 in classes (Table 2). Overall, 19.1% of smallmouth bass sampled were above quality size (≥ 12.0 in) with 5.5% being above preferred size (≥ 14.0 in). The smallmouth bass fishery received an assessment score of 20, representing an “excellent” rating (Table 3). Additional data on historic catch rates and trends can be found in the 2021 F-50 annual performance report (Central Fisheries District Project 2a). Otoliths were taken from a subsample of the total catch of smallmouth bass to create an age/growth data set. A minimum of five fish of each inch class was preferred, but not always achieved. Smallmouth bass ages in Elkhorn Creek ranged from 1-13 years (Table 4). A von Bertalanffy growth curve indicated that smallmouth bass are reaching the 12.0 in minimum statewide size limit at age-5+ and 15.0 in at age-7+ (Table 5). Total annual mortality of age-2+ fish was estimated at 34.8% (Table 6).

Rock bass CPUE was 13.2 fish/hr. Rock bass were collected from the 2.0-9.0 in size classes, with 80.3% of the sample consisting of quality size (≥ 6.0) fish and 30.4% of the sample ≥ 8.0 in (preferred size; Table 2). The rock bass fishery received an assessment score of 7, representing a “fair” rating (Table 7).

Largemouth bass ranged in size from the 4.0-14.0 in size classes and were collected at a rate of 8.2 fish/hr (Table 2). The largemouth bass fishery received an assessment score of 8, representing a “fair” rating (Table 8).

Kinniconick Creek

A general sport fish survey was conducted on Kinniconick Creek in Lewis County during April 2021 at six sites using boat-mounted electrofishing for a total effort of 4.5 hrs (15-minute transects). Smallmouth bass (10.9 fish/hr) were the most abundant sport fish collected followed by rock bass (5.3 fish/hr) and spotted bass (3.6 fish/hr; Table 9).

Smallmouth bass ranged from the 4.0-20.0 in size classes. Overall, 30.6% of smallmouth bass sampled were above quality size (≥ 12.0 in) with 16.3% being above preferred size (≥ 14.0 in). Compared to the previous sample in 2016, smallmouth bass catch rates were slightly higher overall (Table 10). The smallmouth bass fishery received an assessment score of 8, representing a “fair” rating (Table 11). Otoliths were taken from a subsample of the total catch of smallmouth bass to create an age/growth data set. A minimum of five fish was preferred for each inch class, but not always achieved. Smallmouth bass ages in Kinniconick Creek ranged from 1-11 years (Table 12). A von Bertalanffy growth curve indicated that smallmouth bass are reaching the 12.0 in minimum statewide size limit at age-5 and 15.0 in at age-7+ (Table 5). Total annual mortality of age-2+ fish was estimated at 26.7% (Table 6).

Rock bass were collected from the 1.0-8.0 in size classes, with 20.8% of the sample consisting of quality size (≥ 6.0 in) fish and 8.3% of the sample ≥ 8.0 in (preferred size; Table 9). The rock bass fishery

received an assessment score of 7, representing a “fair” rating (Table 13). Compared to the previous sample in 2016, rock bass catch rates increased slightly from a total CPUE of 4.7 fish/hr in 2016 to 5.3 fish/hr in 2020 (Table 14).

Spotted bass were the third most abundant species collected. Spotted bass ranged in size from the 4.0-13.0 in size classes and were collected at a rate of 3.6 fish/hr (Table 9). The spotted bass fishery received an assessment score of 5, representing a “poor” rating (Table 15). The overall CPUE of spotted bass was identical to the 2016 sample; however, small differences were observed across length groups (Table 16).

Additional sport fish species were present in South Fork Kentucky River but found in lower densities. Muskellunge (CPUE=1.3 fish/hr) were collected from the 20.0 – 33.0 in size classes. Bluegill, channel catfish, and largemouth bass were also collected (Table 9).

Upper Cumberland River

Sport fish sampling with boat-mounted electrofishing was conducted on upper Cumberland River in Bell, Knox, and Whitley counties during April 2021. Eleven species were collected at six different sites with a total effort of 5.75 hours (15-minute transects). Channel catfish (25.7 fish/hr) were the most abundant sport fish collected followed by spotted bass (11.1 fish/hr), smallmouth bass (7.0 fish/hr), and rock bass (4.9 fish/hr; Table 17).

Smallmouth bass were collected from the 2.0-19.0 in size classes. The smallmouth bass fishery received an assessment score of 7, representing a “fair” rating (Table 18). Compared to a previous sample in 2017 (CPUE=5.4 fish/hr), catch rate of smallmouth bass in 2021 was slightly higher (CPUE=7.0 fish/hr; Table 19). Otoliths were taken from a subsample of the total catch of smallmouth bass to create an age/growth data set. A minimum of five fish was preferred for each inch class, but was not always attainable. Smallmouth bass ages ranged from 1-11 years (Table 20). A von Bertalanffy growth curve indicated that smallmouth bass are reaching the 12.0-in minimum statewide size limit at age-3+ and 15.0 in at age-8+ (Table 5). Total annual mortality of age-2+ fish was estimated at 36.8% (Table 6).

Rock bass ranged from the 4.0-10.0 in size classes (Table 17). Overall, 82.1% of rock bass sampled were quality size (≥ 6.0 in) or greater, and 67.9% were above preferred size (≥ 8.0 in). Overall catch rates were low, and the rock bass fishery received an assessment score of 4, representing a “poor” rating (Table 21). Although numbers were low, CPUE in 2021 was over double that of the 2017 sample (Table 22).

Spotted bass were collected at a rate of 11.1 fish/hr and ranged in size from the 2.0-13.0 in size classes (Table 17). The spotted bass fishery received an assessment score of 14 representing a “good” rating (Table 23). Compared to the last sample conducted in 2017, spotted bass catch rates declined from 17.7 fish/hr to 11.1 fish/hr (Table 24). Declines were seen in all sizes with exception of the <4.0-in length group.

Additional sport fish species were sampled in the upper Cumberland River but found in consistently lower densities than the aforementioned species. Bluegill (2.6 fish/hr), flathead catfish (1.2 fish/hr), walleye (0.9 fish/hr), black crappie (0.7 fish/hr), largemouth bass (0.4 fish/hr), white crappie (0.2 fish/hr), and redear sunfish (0.2 fish/hr) were also collected (Table 17).

Rockcastle River

During April 2021, three sites on Rockcastle River in Laurel and Rockcastle counties were sampled with boat-mounted electrofishing for a total effort of 3.0 hrs (15-minute transects). Four species were collected, with smallmouth bass (17.0 fish/hr) being the most abundant, followed by rock bass (12.3 fish/hr), spotted bass (0.7 fish/hr), and walleye (0.3 fish/hr; Table 25).

Smallmouth bass were collected at 17.0 fish/hr from the 3.0-18.0 in size classes (Table 25) with 19.6% of the sample consisting of quality size (≥ 12.0 in) fish, but just 5.9% being preferred size (≥ 14.0 in). This population received an assessment score of 10 representing a “fair” rating (Table 26). During this spring sample, otoliths were taken from a subsample of the total catch of smallmouth bass to create an age/growth data set. A minimum of five fish was preferred for each inch class, but that number was not always attainable. Smallmouth bass ages ranged from 1-11 years (Table 27). A von Bertalanffy growth curve indicated that smallmouth bass are reaching the 12.0-in minimum statewide size limit at age-6+ and 15.0 in at age-10+ (Table 5). Growth rates were by far the slowest of any waterbody examined in the past three years. Total annual mortality of age-2+ fish was estimated at 19.5% (Table 6).

Rock bass were collected from the 3.0-9.0 in size classes. Seventy-eight percent of rock bass were quality size (≥ 6.0 in), and fish in the ≥ 8.0 in size class made up 10.8%. The rock bass fishery received an assessment score of 5, a rating of “fair” (Table 28).

Licking River

During May 2021, the Licking River was sampled at six sites in Bath, Fleming, Harrison, Nicholas, Pendleton, Robertson, and Rowan counties for a total sampling effort of 5.0 hrs. Bluegill (24.0 fish/hr) were the most abundant sport fish collected followed by smallmouth bass (23.0 fish/hr), white crappie (22.6 fish/hr), channel catfish (13.8 fish/hr), and largemouth bass (12.0 fish/hr; Table 29). Bluegill ranged from the 2.0-8.0 in size classes and 47.5% of the sample was ≥ 6.0 in.

Smallmouth bass were collected up to the 20.0 in size class, but only three of the 115 individuals (2.6%) were above quality size (12.0 in). Overall smallmouth bass CPUE increased from the previous sample in 2012 (Table 30). The increase in catch rates was in large part due to an apparently strong spawn in 2020 as CPUE of <4.0 in fish was high. This population received an assessment score of 9, representing a “fair” rating (Table 31). During this spring sample, otoliths were taken from a subsample of the total catch of smallmouth bass to create an age/growth data set. A minimum of five fish was preferred for each inch class, but that number was not always attainable. Bass ages ranged from 1-9 years, but several year classes were not present (Table 32). A von Bertalanffy growth curve indicated that smallmouth bass are reaching the 12.0 in minimum statewide size limit at age-3+ and 15.0 in at age-5+ (Table 5). Total annual mortality was unable to be calculated due gaps in year classes and low sample size of fish age-3 and older.

Rock bass (6.6 fish/hr) collected ranged from the 1.0-10.0 in size classes (Table 29). Total catch rates of rock bass decreased from 2012 levels (14.4 fish/hr; Table 33). Decreased catch rates were observed in all length groups examined except the <4.0 in length group. The rock bass fishery in Licking River received a population assessment score of 8, indicating a “fair” rating (Table 34).

The largemouth bass catch rate was 12.0 fish/hr and sizes ranged from the 5.0 – 19.0 in classes (Table 29). Largemouth bass catch rates in all length groups examined saw increases from the 2012 sample, and overall CPUE was considerably higher than 2012 (2.9 fish/hr; Table 35). Recruitment appeared to be low, but the largemouth bass fishery received an assessment score of 13, representing a “good” rating (Table 36).

Spotted bass were collected at a rate of 3.4 fish/hr and ranged in size from the 1.0-13.0 in size classes (Table 29). Compared to the last sample conducted in 2012, spotted bass catch rates declined from 5.1 fish/hr to 3.4 fish/hr (Table 37). The spotted bass fishery received an assessment score of 6, representing a “fair” rating (Table 38).

Additional fish populations are also present in Licking River but found in lower densities. Of note is that redbreast sunfish and grass pickerel were present and provide an interesting opportunity for anglers that cannot be found statewide (Table 29).

Green River Pool 5

The removal of Lock and Dam 6 on the Green River was initiated in late March/early April 2017. This was the result of a breach that formed in the dam in late November 2016 causing the structure to become a major safety hazard. Lock and Dam 6 was completely removed in the several months following initiation of the project. Removal of Lock and Dam 5 was initiated in summer 2021 and will be completed in 2022. Annual fall sampling to collect general sport fish will continue on Pool 5 for up to five years post removal.

In September 2021, a general sport fish survey using boat-mounted electrofishing was conducted on the upper and lower sections of Pool 5 of the Green River in Edmonson County. Ten different species were collected during 3.0 hrs (15-minute transects) of electrofishing. Spotted bass were the most abundant species collected (12.3 fish/hr) and ranged from the 3.0-13.0 in size classes (Table 39). CPUE was higher than in 2020 (5.7 fish/hr) and above the historical average of 11.6 fish/hr (Table 40). Relative weight values were acceptable for the 7.0-10.9 in (94) and 11.0-13.9 in (92) size groups. Overall condition of these fish was good (Wr= 94; Table 41).

Largemouth bass were collected at a rate of 1.3 fish/hr ranging from the 7.0-17.0 in size classes (Table 39). CPUE of largemouth bass continues to be low and was the second lowest recorded since 2012 (Table 42). Due to a small sample size, relative weight was not calculated for largemouth bass.

Smallmouth bass and rock bass were sampled at rates of 1.0 and 1.3 fish/hr, respectively. Smallmouth bass ranged in size from the 6.0-15.0 in size classes, while rock bass ranged in size from the 3.0-8.0 in classes (Table 39). Sampling for smallmouth bass and rock bass in Pool 5 of the Green River has never been highly productive. Catch per unit effort for smallmouth bass was similar to samples from 2012-2020, but slightly below the historical CPUE (1.9 fish/hr; Table 43). Rock bass CPUE was also similar (0.7 fish/hr) to samples from 2012-2020 (Table 44).

Little Sandy River

A general sport fish survey was conducted at three sites on the Little Sandy River, Greenup County, using boat-mounted electrofishing during October 2021 for a total of 5.0 hrs. Bluegill (10.6 fish/hr) were the most abundant sport fish collected followed by channel catfish (5.4 fish/hr), and spotted bass (5.0 fish/hr; Table 45). Bluegill ranged from the 1.0-6.0 in size classes, and did not provide much opportunity for harvest as 92.4% of the sample was ≤6.0 in.

Largemouth bass ranged from the 3.0-17.0 in size classes. Overall CPUE of largemouth bass was down from the 2016 sample (6.0 fish/hr; Table 46). Catch rates for all size groups examined decreased from 2016 with the exception of the ≥15.0 in size group. Overall condition of largemouth bass was good (Wr=94; Table 47).

Spotted bass CPUE (5.0 fish/hr) increased slightly from 2016 (2.6 fish/hr; Table 48). This increase occurred predominately in fish <11.0 in. Overall condition of spotted bass was excellent (Wr=101; Table 47).

Additional fish populations present in low densities were white crappie (2.0 fish/hr), redear sunfish (0.8 fish/hr), flathead catfish (0.6 fish/hr), black crappie (0.6 fish/hr), muskellunge (0.6 fish/hr), white bass (0.2 fish/hr), and walleye (0.2 fish/hr). Of the muskellunge collected, one was 7.2 in. This fish is believed to be a naturally produced fish as it was not clipped (Cave Run escapee) and the Little Sandy River had not received stocked fish since 2019. Fish stocked in 2019 should be >20.0 in.

Lower Barren River

Unimpounded

A general sport fish survey was conducted on the lower Barren River in Allen and Warren counties during

October 2021 at six sites using boat-mounted electrofishing for a total effort of 8.0 hrs (15-minute transects). Smallmouth bass (7.7 fish/hr) were the most abundant sport fish collected followed by spotted bass (3.7 fish/hr), and rock bass (3.1 fish/hr; Table 49). Smallmouth bass were collected from the 3.0-18.0 in size classes. Overall, 55.4% of the sample was above the 12.0-in statewide minimum size limit and 33.8% was of preferred size ≥ 14.0 in. Catch rates decreased slightly from the previous year (9.3 fish/hr) and are still below the historical average (15.3 fish/hr; Table 50). Relative weight values observed for smallmouth bass were fair but decreased as fish grew larger. Condition was good (87) for the 7.0-10.9 in size group, poor (79) for the 11.0-13.9 in size group, and poor (79) for the ≥ 14.0 in size group (Table 51).

Rock Bass sampled in the lower Barren River ranged from the 4.0-9.0 in size classes (Table 49), with quality size (≥ 6.0 in) fish representing 92.3% of the sample. Overall CPUE decreased from 2021 and was the lowest recorded catch rate dating back to 2007 (Table 52). This decline was observed across all length groups. Relative weight values for rock bass were good for all length groups and had an overall Wr of 98 (Table 51).

Spotted bass were collected from the 2.0-13.0 in size classes at a rate of 3.7 fish/hr (Table 49). This rate was the second lowest observed dating back to 2007 and well below the historical average (11.1 fish/hr; Table 53). Relative weight values for spotted bass were good (96) for the 7.0-10.9 in and fair (84) for the 11.0-13.9 in length group. The overall condition (94) for this population was good (Table 50).

Additional sport fish populations were sampled in lower Barren River but found in lower densities. Channel catfish (2.7 fish/hr) were present up to the 28.0 in size class. Walleye (likely native strain) were captured at 1.2 fish/hr. All other species captured were observed at rates < 1.0 fish/hr (Table 49).

Impounded

Sampling in 2021 continued to include several transects in the downstream-impounded portion of Pool 1 of lower Barren River. The primary focus of sampling these sites is to collect community sportfish data prior to the possible failure and/or removal of Lock and Dam 1 for future comparison to post-dam removal sampling. A general sport fish survey was conducted at two sites for a total effort of 3.0 hrs (15-minute transects) during October 2021. Sampling in this reach produced fewer sport fish species (six; Table 54), compared to upstream sections that produced fifteen species. The three most abundant species observed were bluegill (4.7 fish/hr), largemouth bass (3.0 fish/hr), and spotted bass (2.7 fish/hr). Smallmouth bass and rock bass, two species typical of riffle-pool environments, were captured at relatively lower rates in the impounded section than the unimpounded section.

In general, species composition and overall number of fish sampled between the unimpounded and impounded sections of lower Barren River were very different. The difference in fish species composition between these two sections can largely be attributed to the differences found in the habitat types and structure found within each section. The unimpounded section of lower Barren River consists of riffle, run and pool habitats and access to the flood plain, which provides more natural and complex stream type ecosystems that allows for a greater diversity of fish species to flourish in these areas. The unimpounded section of the lower Barren River also includes a greater amount of large woody debris and rocky outcroppings that can provide refuge to smaller fish and invertebrates. The impounded section of lower Barren River is formed by Lock and Dam 1 and primarily consists of pool habitat. The habitat and structure found in this section is very limited, which makes this area of slow-moving water more suitable to generalist fish species.

Stream Fisheries Webpage Activity

Kentucky statewide stream sampling has provided biologists with a wealth of information in regards to overall stream health and fish community structure. To further educate and inform the public of our findings, the department has maintained and is consistently updating the stream fisheries webpage

(<http://fw.ky.gov/Fish/Pages/Kentucky's-Stream-Fisheries.aspx>). Pages for upper Salt River and Russell Creek were added in 2021, eight other stream pages were updated with current fisheries data. Other streams will be added as they are routinely sampled throughout the upcoming years.

Individual stream webpages provide an abundance of information to the public. Each page begins with a brief summary stating where the stream reach begins, ends and what counties encompass the stream, followed by sport fish species they may encounter (Figure 2). An interactive map is also included that allows users to click on the names of access points to get directions to those locations as well as latitude and longitude points. For more in-depth information on access points, we have added individual access site descriptions for each stream, which includes additional information and directions specific to each site, as well as site photos of each ramp or access point (Figure 3). River information is also included for each waterbody that provides users with site-to-site mileages as well as information on recommended river levels to safely access individual streams.

Two more sections (Fishing Tips and a Fisheries Overview) are provided specifically for anglers for each individual stream. The Fishing Tips section gives anglers information on where to target the most abundant fish species sampled and what tackle may be best used for catching those species. The Fisheries Overview section provides anglers with length frequency tables that are representative of the most abundant sport fish species sampled (Figure 4).

Table 1. Summary of 2021 boat electrofishing sampling sites by waterbody, river mile, date, and conditions.

Waterbody	River mile	Species	Date	Water temp.	Water level (USGS gauge station)	Secchi (inches)	Comments
Elkhorn Creek- Pfeiffer Hatchery Access	3.7 - 4.6	Sport Fish	3/23/2021	55.9	3.83 ft, 775 cfs @ Frankfort, KY	68	good level
Elkhorn Creek- Sullivan Lane Bridge Access	5.4 - 6.5	Sport Fish	3/23/2021	56.6	3.83 ft, 775 cfs @ Frankfort, KY	68	good level
Elkhorn Creek- Larrimore Property	7.7 - 8.9	Sport Fish	3/23/2021	55.0	3.83 ft, 775 cfs @ Frankfort, KY	clear	good level
Kinniconick Creek- Harrison Hole	37.1 - 38.3	Sport Fish	4/5/2021	51.6	3.84 ft, 312 cfs @ Greenup, KY	64	good level
Kinniconick Creek- Chinn Farm Rd Access	34.7 - 35.3	Sport Fish	4/5/2021	55.0	3.84 ft, 312 cfs @ Greenup, KY	64	good level
Kinniconick Creek- Virgil Cole Property	16.2 - 17.4	Sport Fish	4/6/2021	54.1	3.70 ft, 263 cfs @ Greenup, KY	79	good level
Kinniconick Creek- Old Kinniconick VPA Site	13.1 - 14.2	Sport Fish	4/5/2021	---	3.84 ft, 312 cfs @ Greenup, KY	64	good level
Kinniconick Creek- Lewis Co. Park @ McDowells Creek	4.6 - 5.1	Sport Fish	4/6/2021	55.6	3.70 ft, 263 cfs @ Greenup, KY	---	good level
Kinniconick Creek- Lewis Co. Park @ Skidmore Rd	3.4 - 3.9	Sport Fish	4/6/2021	55.4	3.70 ft, 263 cfs @ Greenup, KY	---	good level
Upper Cumberland River- Varilla Ramp	656.7 - 657.0	Sport Fish	4/12/2021	58.6	3.46 ft, 1020 cfs @ Harlan, KY	20	good level
Upper Cumberland River- 4 Mile Ramp	643.0 - 646.5	Sport Fish	4/22/2021	52.3	2.48 ft, 375 cfs @ Harlan, KY	96	low level, no lower
Upper Cumberland River- Barbourville Ramp	627.6 - 628.0	Sport Fish	4/20/2021	57.4	3.28 ft @ Barbourville, KY	48	good level
Upper Cumberland River- Hwy 296 Bridge Ramp	581.7 - 582.2	Sport Fish	4/20/2021	59.9	3.28 ft @ Barbourville, KY	---	good level
Upper Cumberland River- Croley Bend Road Ramp	578.1 - 579.6	Sport Fish	4/19/2021	58.6	3.34 ft @ Barbourville, KY	---	good level
Upper Cumberland River- Hwy 458 / Redbird Ramp	568.8 - 572.7	Sport Fish	4/19/2021	58.0	5.15 ft, 1630 cfs @ Williamsburg, KY	51	good level
Rockcastle River- Livingston Ramp	42.1 - 48.2	Sport Fish	4/21/2021	55.7	3.24 ft, 485 cfs @ Billows, KY	48	ideal level
Rockcastle River- US-25 / Upper River Road Ramp	37.5 - 41.6	Sport Fish	4/21/2021	55.3	3.24 ft, 485 cfs @ Billows, KY	48	ideal level
Rockcastle River- I-75 / Lower River Road Ramp	35.8 - 37.4	Sport Fish	4/21/2021	55.9	3.24 ft, 485 cfs @ Billows, KY	48	ideal level
Licking River- Cave Run Lake Tailwater	178.2 - 179.2	Sport Fish	5/10/2021	---	9.83 ft, 2550 cfs @ Blue Lick Springs, KY	---	good level
Licking River- Mouth of Triplett Creek	174.2 - 174.7	Sport Fish	5/10/2021	---	9.83 ft, 2550 cfs @ Blue Lick Springs, KY	---	good level
Licking River- Clay WMA Ramp	113.9 - 117.1	Sport Fish	5/13/2021	58.7	7.37 ft, 1080 cfs @ Blue Lick Springs, KY	32	good level
Licking River- Blue Licks State Park Ramp	99.1 - 102.0	Sport Fish	5/13/2021	59.6	7.37 ft, 1080 cfs @ Blue Lick Springs, KY	32	good level
Licking River- Claysville	77.6 - 79.7	Sport Fish	5/12/2021	---	7.57 ft, 1190 cfs @ Blue Lick Springs, KY	---	good level
Licking River- Falmouth	51.1 - 54.6	Sport Fish	5/12/2021	58.2	7.57 ft, 1190 cfs @ Blue Lick Springs, KY	---	good level
Green River Pool 5- Brownsville	180.7 - 183.8	Sport Fish	9/14/2021	75.6	26.5 ft @ Brownsville Water Plant	34	good level
Green River Pool 5- Alexander Creek	170.1 - 177.6	Sport Fish	9/14/2021	74.5	26.5 ft @ Brownsville Water Plant	40	good level
Little Sandy River- Hidden Hollow Rd Ramp	10.1 - 12.7	Sport Fish	10/13/2021	67.8	4.0 ft, 43 cfs @ Grayson, KY	26	good level
Little Sandy River- Raccoon Valley Ramp	4.7 - 9.1	Sport Fish	10/13/2021	68.7	4.0 ft, 43 cfs @ Grayson, KY	28	good level
Little Sandy River- Greenup Ramp	0.1 - 3.8	Sport Fish	10/4/2021	66.4	4.36 ft, 74.5 cfs @ Grayson, KY	32	good level
Barren River- Hwy 101 Bridge	62.8 - 66.4	Sport Fish	10/11/2021	68.0	78.0 ft @ Finney, KY	56	ideal level
Barren River- Martinsville Ford	57.5 - 62.5	Sport Fish	10/11/2021	68.0	78.0 ft @ Finney, KY	56	ideal level
Barren River- Weldon Peete Boat Ramp	44.0 - 47.8	Sport Fish	10/13/2021	66.0	78.0 ft @ Finney, KY	60	good level
Barren River- State Street	36.9 - 37.9	Sport Fish	10/13/2021	68.0	5.10 ft, 651 cfs @ Bowling Green, KY	32	good level
Barren River- Above Boat Landing Ramp	30.5 - 35.2	Sport Fish	10/12/2021	65.0	5.08 ft, 635 cfs @ Bowling Green, KY	32	good level
Barren River- Greencastle Ramp	13.5 - 15.1	Sport Fish	10/12/2021	67.0	5.08 ft, 635 cfs @ Bowling Green, KY	---	good level
Lower Barren River- Below Boat Landing Ramp	24.9 - 30.3	Sport Fish	10/12/2021	68.6	5.08 ft, 635 cfs @ Bowling Green, KY	33	good level
Lower Barren River- Lonnie White Ramp	16.0 - 23.4	Sport Fish	10/12/2021	69.9	5.08 ft, 635 cfs @ Bowling Green, KY	31	good level

Table 2. Length-frequency and CPUE (fish/hr) of selected sport fish collected during 4.25 hrs of electrofishing (15-minute transects) at three sites on Elkhorn Creek during March 2021; standard error is in parentheses.

Species	Inch class																		Total	CPUE
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
Smallmouth bass	1	19	11	11	75	74	56	31	40	51	34	28	9	6	5	2	1	2	456	107.3 (14.0)
Largemouth bass			1	1	1	6	5	6	5	4	2	1	3						35	8.2 (2.5)
Rock bass	1		2	8	14	14	15	2											56	13.2 (3.0)

Table 3. Population assessment of smallmouth bass collected from Elkhorn Creek in March 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	4.7	4
Intermediate density (CPUE 4.0-8.9 in)	53.4	4
Adult density (CPUE ≥9.0 in)	49.2	4
Quality density (CPUE ≥12.0 in)	20.5	4
Preferred density (CPUE ≥14.0 in)	5.9	4
Total score		20
Assessment rating		Excellent

Table 4. Age-frequency and CPUE (fish/hr) of smallmouth bass collected during 4.25 hrs of electrofishing (15-minute transects) at three sites on Elkhorn Creek during March 2021. Standard errors are in parentheses.

Age	Inch Class																	Total	%	CPUE
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19			
1	19	11																30	6.6	6.7 (2.2)
2			11	75	74	49	5											214	47.0	47.59 (10.4)
3						7	10	4										21	4.6	4.7 (0.8)
4							16	35	26	4	5							86	18.9	19.1 (2.8)
5									13	8		2						23	5.1	5.0 (0.8)
6									13	15	14	2	1					45	9.9	10.1 (1.6)
7										4		2						6	1.3	1.3 (0.3)
8													2					2	<0.1	0.5 (0.2)
9											5	2	1	2	2			12	2.6	2.6 (0.5)
10										4	4		1	2		1		12	2.6	2.7 (0.5)
11														2				2	<0.1	0.4 (0.1)
12																	1	1	<0.1	0.2 (0.2)
13																	1	1	<0.1	0.2 (0.2)
Total	19	11	11	75	74	56	31	40	51	34	28	9	6	5	2	1	2	455	100%	107.3 (14.0)

Table 5. Mean length (in) at age calculated with the von Bertalanffy growth equation based on otoliths taken from smallmouth bass from select waterbodies in 2020 and 2021.

Waterbody	Year	Length at age (in)												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Eagle Creek	2020	5.6	8.5	10.8	12.5	13.8	14.8	15.6	16.1	16.6	16.9			
North Fork Elkhorn Creek	2020	3.8	6.3	8.3	9.9	11.3	12.4	13.3	14.1	14.7	15.2	15.6	15.9	16.2
North Fork Kentucky River	2020	7.1	9.1	10.9	12.4	13.7	14.8	15.8	16.7	17.4	18.0	18.6		
South Fork Kentucky River	2020	4.1	6.5	8.6	10.5	12.2	13.7	15.0	16.2	17.3	18.2	19.1		
South Fork Licking River	2020	7.0	9.1	10.9	12.3	13.5	14.5	15.4	16.1	16.6	17.1	17.5		
Elkhorn Creek	2021	4.9	6.9	8.7	10.3	11.8	13.0	14.2	15.2	16.1	16.9	17.6	18.2	18.8
Kinniconick Creek	2021	3.8	6.5	8.7	10.5	12.0	13.3	14.3	15.1	15.8	16.4	16.9		
Upper Cumberland River	2021	4.7	7.3	9.3	11.0	12.3	13.4	14.2	14.9	15.4	15.9	16.2		
Rockcastle River	2021	3.5	5.4	7.1	8.6	9.9	11.1	12.1	13.0	13.8	14.5	15.1		
Licking River	2021	3.7	7.6	10.6	12.9	14.8	16.2	17.2	18.1	18.7	19.2	19.6		

Table 6. Asymptotic length (L_{∞}), growth coefficient (K), time at size 0 (t_0), theoretical max age, and age 2+ total annual mortality (A) of smallmouth bass populations in select waterbodies sampled in 2020 and 2021.

Waterbody	Year	L_{∞}	K	t_0	Max age	A
Eagle Creek	2020	455 mm (17.9 in)	0.278	-0.333	10.3	0.282
North Fork Elkhorn Creek	2020	444 mm (17.5 in)	0.199	-0.235	13.4	0.305
North Fork Kentucky River	2020	564 mm (22.2 in)	0.143	-1.702	N/A	N/A
South Fork Kentucky River	2020	668 mm (26.3 in)	0.112	-0.538	11.9	0.377
South Fork Licking River	2020	493 mm (19.4 in)	0.187	-1.399	11.7	0.280
Elkhorn Creek	2021	591 mm (23.2 in)	0.117	-1.017	13.0	0.348
Kinniconick Creek	2021	484 mm (19.1 in)	0.194	-0.141	10.0	0.267
Upper Cumberland River	2021	448 mm (17.6 in)	0.221	-0.408	10.2	0.368
Rockcastle River	2021	497 mm (19.6 in)	0.128	-0.525	14.1	0.195
Licking River	2021	533 mm (21.0 in)	0.151	-0.129	N/A	N/A

Table 7. Population assessment of rock bass collected from Elkhorn Creek in March 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	0.2	1
Intermediate density (CPUE 4.0-5.9 in)	2.4	2
Quality density (CPUE ≥6.0 in)	10.6	2
Preferred density (CPUE ≥8.0 in)	4.0	2
Total score		7
Assessment rating		Fair

Table 8. Population assessment of largemouth bass collected from Elkhorn Creek in March 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	0.0	0
Intermediate density (CPUE 4.0-8.9 in)	3.3	3
Adult density (CPUE ≥9.0 in)	4.9	3
Quality density (CPUE ≥12.0 in)	1.4	2
Preferred density (CPUE ≥15.0 in)	0.0	0
Total score		8
Assessment rating		Fair

Table 9. Length-frequency and CPUE (fish/hr) of selected sport fish collected during 4.5 hrs of electrofishing (15-minute transects) at six sites on Kinniconick Creek during April 2021; standard error is in parentheses.

Species	Inch class																											Total	CPUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	30	32	33				
Smallmouth bass				2	10	3	6	2	4	3	4	3	4	1	4			2		1							49	10.9 (2.1)	
Largemouth bass													1														1	0.2 (0.2)	
Spotted bass				2		2	1	1	3	4		1	2														16	3.6 (1.0)	
Rock bass	1		11	4	1	2	3	2																			24	5.3 (2.4)	
Bluegill	1			1																							2	0.4 (0.4)	
Channel catfish																1				1							2	0.4 (0.3)	
Muskellunge																				1		1	1	2	1		6	1.3 (0.7)	

Table 10. Smallmouth bass electrofishing CPUE (fish/hr) from each length group collected during spring sampling from Kinniconick Creek in 2016 and 2021. Number of sites and effort have varied across years; standard error is in parentheses.

Year	Length group (in)					Total
	<4.0	4.0-8.9	9.0-11.9	12.0-13.9	≥14.0	
2016	0.3	3.2	4.1	1.7	0.9	9.9 (1.9)
2021	0.0	5.1	2.4	1.6	1.8	10.9 (2.1)
Mean	0.2	3.8	3.4	1.6	1.2	10.3 (1.4)

Table 11. Population assessment of smallmouth bass collected from Kinniconick Creek in April 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	0.0	0
Intermediate density (CPUE 4.0-8.9 in)	5.1	2
Adult density (CPUE ≥9.0 in)	5.8	2
Quality density (CPUE ≥12.0 in)	3.3	2
Preferred density (CPUE ≥14.0 in)	1.8	2
Total score		8
Assessment rating		Fair

Table 12. Age-frequency and CPUE (fish/hr) of smallmouth bass collected during 4.5 hrs of electrofishing (15-minute transects) at six sites on Kinniconick Creek during April 2021. Standard errors are in parentheses.

Age	Inch Class																				Total	%	CPUE
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20						
1	1																			1	2.1	0.2 (0.1)	
2	1	10	2	4																17	34.9	3.5 (1.1)	
3			1	2	2	1		1												7	14.3	1.6 (0.6)	
4						3	3	1												7	14.3	1.5 (0.6)	
5									2	2										4	8.2	0.8 (0.3)	
6								2	1	1										4	8.2	0.8 (0.3)	
7											1	1								2	4.1	0.5 (0.4)	
8												1		1						1	2.8	0.3 (0.2)	
9												1								1	2.8	0.3 (0.2)	
10										1						2				3	6.3	0.6 (0.3)	
11																		1		1	2.1	0.2 (0.2)	
Total	2	10	3	6	2	4	3	4	3	4	1	4			2		1	49	100%		10.9 (2.1)		

Table 13. Population assessment of rock bass collected from Kinniconick Creek in April 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	2.7	4
Intermediate density (CPUE 4.0-5.9 in)	1.1	1
Quality density (CPUE ≥6.0 in)	1.6	1
Preferred density (CPUE ≥8.0 in)	0.4	1
Total score		7
Assessment rating		Fair

Table 14. Rock bass electrofishing CPUE (fish/hr) from each length group collected during spring sampling from Kinniconick Creek in 2016 and 2021. Number of sites and effort have varied across years; standard error is in parentheses.

Year	Length group (in)				Total
	<4.0	4.0-5.9	6.0-7.9	≥8.0	
2016	0.8	1.1	2.5	0.4	4.7 (1.5)
2021	2.7	1.1	1.1	0.4	5.3 (2.4)
Mean	1.5	1.1	2.0	0.4	4.9 (1.3)

Table 15. Population assessment of spotted bass collected from Kinniconick Creek in April 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	0.0	0
Intermediate density (CPUE 4.0-7.9 in)	1.1	1
Adult density (CPUE ≥8.0 in)	2.4	2
Quality density (CPUE ≥11.0 in)	0.7	1
Preferred density (CPUE ≥13.0 in)	0.4	1
Total score		5
Assessment rating		Poor

Table 16. Spotted bass electrofishing CPUE (fish/hr) from each length group collected during sampling from upper Cumberland River in 2017 and 2021. Number of sites and effort have varied across years; standard error is in parentheses.

Year	Length group (in)					Total
	<4.0	4.0-7.9	8.0-10.9	11.0-12.9	≥13.0	
2016	0.9	1.8	0.7	0.1	0.1	3.6 (1.0)
2021	0.0	1.1	1.8	0.2	0.4	3.6 (1.0)
Mean	0.6	1.6	1.1	0.2	0.2	3.6 (0.7)

Table 17. Length-frequency and CPUE (fish/hr) of selected sport fish collected during 5.75 hrs of electrofishing (15 minute transects) at six sites on the upper Cumberland River during April 2021; standard error is in parentheses.

Species	Inch class																							Total	CPUE
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23			
Smallmouth bass	1	1	1	1	7	7	3	4	4	4	2	3	1					1					40	7.0 (1.8)	
Largemouth bass									1			1											2	0.4 (0.2)	
Spotted bass	3	8	3		12	7	9	6	5	2	4	5											64	11.1 (2.7)	
Rock bass				4	1	2	2	8	8	3													28	4.9 (1.6)	
Bluegill		1	6	3	4	1																	15	2.6 (1.0)	
Redear sunfish						1																	1	0.2 (0.2)	
Channel catfish									1	4	7	8	25	29	24	15	11	11	5	5	1	2	148	25.7 (4.9)	
Flathead catfish						2		1		1							1	1		1			7	1.2 (0.8)	
Black crappie			1		1	1	1																4	0.7 (0.3)	
White crappie									1														1	0.2 (0.2)	
Walleye									1			1				1	1		1				5	0.9 (0.4)	

Table 18. Population assessment of smallmouth bass collected from upper Cumberland River in April 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	0.3	1
Intermediate density (CPUE 4.0-8.9 in)	3.3	2
Adult density (CPUE ≥9.0 in)	3.3	2
Quality density (CPUE ≥12.0 in)	1.2	1
Preferred density (CPUE ≥14.0 in)	0.3	1
Total score		7
Assessment rating		Fair

Table 19. Smallmouth bass electrofishing CPUE (fish/hr) from each length group collected during sampling from upper Cumberland River in 2017 and 2021. Number of sites and effort have varied across years; standard error is in parentheses.

Year	Length group (in)					Total
	<4.0	4.0-8.9	9.0-11.9	12.0-13.9	≥14.0	
2017	0.0	1.2	2.8	0.7	0.7	5.4 (2.0)
2021*	0.3	3.3	2.1	0.9	0.4	7.0 (1.8)
Mean	0.2	2.4	2.4	0.8	0.5	6.3 (1.3)

* CPUE data was collected during the spring

Table 20. Age-frequency and CPUE (fish/hr) of smallmouth bass collected during 5.75 hrs of electrofishing (15-minute transects) at six sites on upper Cumberland River during April 2021. Standard errors are in parentheses.

Age	Inch Class																			Total	%	CPUE
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19				
1	1	1	1		3														6	15.0	1.0 (0.4)	
2				1	4	6		1											12	30.0	2.0 (0.8)	
3						1	3	3	3										10	25.0	1.7 (0.6)	
4									1	2									3	7.5	0.5 (0.2)	
5										2		2							4	10.0	0.7 (0.3)	
6											2								2	5.0	0.3 (0.2)	
7													1						1	2.5	0.2 (0.2)	
8												1							1	2.5	0.2 (0.1)	
9																			0	0.0	0.0	
10																			0	0.0	0.0	
11																		1	1	2.5	0.2 (0.2)	
Total	1	1	1	1	7	7	3	4	4	4	2	3	1					1	40	100%	7.0 (1.8)	

Table 21. Population assessment of rock bass collected from upper Cumberland River in April 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	0.0	0
Intermediate density (CPUE 4.0-5.9 in)	0.9	1
Quality density (CPUE ≥6.0 in)	4.0	1
Preferred density (CPUE ≥8.0 in)	3.3	2
Total score		4
Assessment rating		Poor

Table 22. Rock bass electrofishing CPUE (fish/hr) from each length group collected during sampling from upper Cumberland River in 2017 and 2021. Number of sites and effort have varied across years; standard error is in parentheses.

Year	Length group (in)				Total
	<4.0	4.0-5.9	6.0-7.9	≥8.0	
2017	0.0	0.0	0.7	1.4	2.1 (1.1)
2021*	0.0	0.9	0.7	3.3	4.9 (1.6)
Mean	0.0	0.5	1.0	2.2	3.7 (1.1)

* CPUE data was collected during the spring

Table 23. Population assessment of spotted bass collected from upper Cumberland River in April 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	1.9	3
Intermediate density (CPUE 4.0-7.9 in)	3.8	3
Adult density (CPUE ≥8.0 in)	5.4	3
Quality density (CPUE ≥11.0 in)	1.9	3
Preferred density (CPUE ≥13.0 in)	0.9	2
Total score		14
Assessment rating		Good

Table 24. Spotted bass electrofishing CPUE (fish/hr) from each length group collected during sampling from upper Cumberland River in 2017 and 2021. Number of sites and effort have varied across years; standard error is in parentheses.

Year	Length group (in)					Total
	<4.0	4.0-7.9	8.0-10.9	11.0-12.9	≥13.0	
2017	0.0	8.7	5.9	1.9	1.2	17.7 (5.4)
2021*	1.9	3.8	3.5	1.0	0.9	11.1 (2.7)
Mean	1.1	5.9	4.5	1.4	1	13.9 (2.8)

* CPUE data was collected during the spring

Table 25. Length-frequency and CPUE (fish/hr) of selected sport fish collected during 3.0 hrs of electrofishing (15-minute transects) at three sites on Rockcastle River during April 2021; standard error is in parentheses.

	Inch Class																		
Species	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total	CPUE	
Smallmouth bass	3	1	3	4		3	10	12	5	3	4	1			1	1	51	17.0 (3.7)	
Spotted bass				1			1										2	0.7 (0.5)	
Rock bass	2	1	5	12	13	3	1										37	12.3 (2.4)	
Walleye									1								1	0.3 (0.3)	

Table 26. Population assessment of smallmouth bass collected from Rockcastle River in April 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	1.0	2
Intermediate density (CPUE 4.0-8.9 in)	3.7	2
Adult density (CPUE ≥9.0 in)	12.3	3
Quality density (CPUE ≥12.0 in)	3.3	2
Preferred density (CPUE ≥14.0 in)	1.0	1
Total score		10
Assessment rating		Fair

Table 27. Age-frequency and CPUE (fish/hr) of smallmouth bass collected during 3.0 hrs of electrofishing (15-minute transects) at three sites on upper Rockcastle River during April 2021. Standard errors are in parentheses.

Age	Inch Class																		Total	%	CPUE
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18					
1	3																	3	5.9	1.0 (0.5)	
2		1	2	2														5	9.8	1.7 (0.6)	
3			1	2		3												6	11.8	2.0 (0.6)	
4							2											2	3.9	0.7 (0.2)	
5							6	2	1									9	17.6	3.0 (0.8)	
6									2	2								4	7.8	1.3 (0.9)	
7																		0	0.0	0.0	
8							2	10	1		3							16	31.4	5.3 (1.3)	
9									1	1	1	1			1			5	9.8	1.7 (0.8)	
10																		0	0.0	0.0	
11																1		1	2.0	0.3 (0.3)	
Total	3	1	3	4		3	10	12	5	3	4	1			1	1		51	100%	17.0 (3.7)	

Table 28. Population assessment of rock bass collected from Rockcastle River in April 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	0.7	1
Intermediate density (CPUE 4.0-5.9 in)	2.0	1
Quality density (CPUE ≥6.0 in)	9.7	2
Preferred density (CPUE ≥8.0 in)	1.3	1
Total score		5
Assessment rating		Fair

Table 29. Length-frequency and CPUE (fish/hr) of selected sport fish collected during 5.0 hrs of electrofishing (15-minute transects) at six sites on Licking River during May 2021; standard errors are in parentheses.

Species	Inch class																																				Total	CPUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	...	34	36	39	40							
Smallmouth bass	1	35	40	16	1	2	11	2	1	3			1	1						1													115	23.0 (7.8)				
Largemouth bass					2	2	3	3	2	12	9	9	6	5	3		1	1	2														60	12.0 (8.7)				
Spotted bass	1	1	1	5	1	2	1		2	1		1	1																				17	3.4 (1.4)				
Rock bass	4	13			3	3	2	3	4	1																							33	6.6 (2.5)				
Bluegill		1	6	17	39	39	12	6																									120	24.0 (16.6)				
Redear sunfish						6																											6	1.2 (1.0)				
Redbreast sunfish					2	5	3	1	1																								12	2.4 (1.8)				
White bass							2																										2	0.4 (0.3)				
Hybrid striped bass									1																								1	0.2 (0.2)				
Channel catfish									1	1	3	3	3	5	3	5	10	4	7	9	4	4	1	3	1	2							69	13.8 (3.9)				
Flathead catfish											1	2		1																			4	0.8 (0.5)				
Black crappie						5	20	6	1																								32	6.4 (6.4)				
White crappie			2	2	3	29	37	32	5	2	1																						113	22.6 (21.8)				
Rainbow trout							2	2	4	7	1																						16	3.2 (2.6)				
Sauger									1		2	9	4	1	1				1														19	3.8 (3.0)				
Walleye									1							2	1	1															5	1.0 (0.5)				
Muskellunge																						1						1	1	1	1		5	1.0 (0.6)				
Grass pickerel								1																									1	0.2 (0.2)				

Table 30. Smallmouth bass electrofishing CPUE (fish/hr) from each length group collected during sampling from Licking River in 2012 and 2021. Number of sites and effort have varied across years; standard error is in parentheses.

Year	Length group (in)					Total
	<4.0	4.0-8.9	9.0-11.9	12.0-13.9	≥14.0	
2012	0.9	5.3	4.4	2.7	0.4	13.8 (4.3)
2021	15.2	6.4	0.8	0.2	0.4	23.0 (7.8)
Mean	8.4	5.9	2.5	1.4	0.4	18.6 (4.6)

Table 31. Population assessment of smallmouth bass collected from Licking River in May 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	15.2	4
Intermediate density (CPUE 4.0-8.9 in)	6.4	2
Adult density (CPUE ≥9.0 in)	1.4	1
Quality density (CPUE ≥12.0 in)	0.6	1
Preferred density (CPUE ≥14.0 in)	0.4	1
Total score		9
Assessment rating		Fair

Table 32. Age-frequency and CPUE (fish/hr) of smallmouth bass collected during 5.0 hrs of electrofishing (15-minute transects) at six sites on Licking River during May 2021. Standard errors are in parentheses.

Age	Inch Class																				Total	%	CPUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
1	1	35	40	16	1	1															94	81.7	18.8 (7.1)
2						1	9	1	1	2											14	12.2	2.8 (1.1)
3							2	1		1			1								5	4.3	1.0 (0.4)
4																					0	0.0	0.0
5														1							1	0.9	0.2 (0.2)
6																					0	0.0	0.0
7																					0	0.0	0.0
8																					0	0.0	0.0
9																				1	1	0.9	0.2 (0.2)
Total	1	35	40	16	1	2	11	2	1	3			1	1						1	115	100%	23.0 (7.8)

Table 33. Rock bass electrofishing CPUE (fish/hr) from each length group collected during sampling from Licking River in 2012 and 2021. Number of sites and effort have varied across years; standard error is in parentheses.

Year	Length group (in)				Total
	<4.0	4.0-5.9	6.0-7.9	≥8.0	
2012	1.8	1.8	8.4	2.4	14.4 (4.2)
2021	3.4	0.6	1.0	1.6	6.6 (2.5)
Mean	2.6	1.2	4.5	2.0	10.3 (2.4)

Table 34. Population assessment of rock bass collected from Licking River in May 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	3.4	4
Intermediate density (CPUE 4.0-5.9 in)	0.6	1
Quality density (CPUE ≥6.0 in)	2.6	1
Preferred density (CPUE ≥8.0 in)	1.6	2
Total score		8
Assessment rating		Fair

Table 35. Largemouth bass electrofishing CPUE (fish/hr) from each length group collected during sampling from Licking River in 2012 and 2021. Number of sites, effort, and sampling period have varied across years; standard error is in parentheses.

Year	Length group (in)				Total
	<8.0	8.0-11.9	12.0-14.9	≥15.0	
2012	1.3	1.1	0.4	0.0	2.9 (0.8)
2021	1.4	5.2	4.0	1.4	12.0 (8.7)
Mean	1.4	3.3	2.3	0.7	7.7 (4.6)

Table 36. Population assessment of largemouth bass collected from Licking River in May 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	0.0	0
Intermediate density (CPUE 4.0-8.9 in)	2.0	2
Adult density (CPUE ≥9.0 in)	10.0	4
Quality density (CPUE ≥12.0 in)	5.4	4
Preferred density (CPUE ≥15.0 in)	1.4	3
Total score		13
Assessment rating		Good

Table 37. Spotted bass electrofishing CPUE (fish/hr) from each length group collected during sampling from Licking River in 2012 and 2021. Number of sites and effort have varied across years; standard error is in parentheses.

Year	Length group (in)					Total
	<4.0	4.0-7.9	8.0-10.9	11.0-12.9	≥13.0	
2012	0.7	3.3	0.9	0.2	0.0	5.1 (1.2)
2021	0.6	1.8	0.6	0.2	0.2	3.4 (1.4)
Mean	0.6	2.5	0.7	0.2	0.1	4.2 (0.9)

Table 38. Population assessment of spotted bass collected from Licking River in May 2021.

Parameter	Actual value	Assessment score
Recruitment (CPUE <4.0 in)	0.6	1
Intermediate density (CPUE 4.0-7.9 in)	1.8	2
Adult density (CPUE ≥8.0 in)	1.0	1
Quality density (CPUE ≥11.0 in)	0.4	1
Preferred density (CPUE ≥13.0 in)	0.2	1
Total score		6
Assessment rating		Fair

Table 39. Length-frequency and CPUE (fish/hr) of selected sport fish collected during 3.0 hrs of electrofishing (15-minute transects) at two sites in Pool 5 of the Green River during September 2021; standard errors are in parentheses.

Species	Inch class																Total	CPUE	
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	25			46
Smallmouth bass					1	1								1				3	1.0 (0.7)
Largemouth bass						1					1			1	1			4	1.3 (0.6)
Spotted bass		1	6	1	3	6	5	5	2	3	4	1						37	12.3 (3.3)
Rock bass		1				2	1											4	1.3 (0.9)
Bluegill	1	2	4	10	4	3												24	8.0 (1.6)
Redear sunfish		1		1	2	2	2											8	2.7 (1.3)
Black crappie				1					1									2	0.7 (0.5)
Channel catfish																1		1	0.3 (0.3)
Flathead catfish													1					1	0.3 (0.3)
Muskellunge																	1	1	0.3 (0.3)

Table 40. Spotted bass electrofishing CPUE (fish/hr) from each length group collected during sampling on Pool 5 of the Green River from 2012-2021. Number of sites and effort have varied across years; standard errors are in parentheses.

Year	Length group (in)					Total
	<4.0	4.0-7.9	8.0-10.9	11.0-12.9	≥13.0	
2012	2.3	7.3	11.7	2.0	0.0	23.3 (3.3)
2013	0.3	3.3	9.0	0.7	0.3	13.7 (3.1)
2014	2.7	2.7	7.7	1.0	0.3	14.3 (3.6)
2015	0.3	1.0	6.0	3.0	0.0	10.3 (3.1)
2016	0.2	0.8	0.9	0.4	0.0	2.3 (0.5)
2017	1.3	4.3	2.7	0.3	0.0	8.7 (2.4)
2018	0.3	1.3	2.0	1.0	0.0	4.7 (1.8)
2019	0.0	7.7	5.0	0.7	0.3	13.7 (3.7)
2020	0.3	1.7	2.7	0.3	0.7	5.7 (1.7)
2021	0.3	5.3	4.0	2.3	0.3	12.3 (3.3)
Mean	0.9	3.8	5.4	1.3	0.2	11.6 (1.0)

Table 41. Number of fish and the relative weight (Wr) for each length group of largemouth bass and spotted bass collected in Pool 5 of the Green River during September 2021.

Collected in F-301-3 of the Green River during September 2021.								
Species	Length group (in)						Total	
	8.0-11.9		12.0-14.9		≥15.0			
	No.	Wr	No.	Wr	No.	Wr	No.	Wr
Largemouth bass	0	0	1	96	2	88	3	91

Spotted bass	7.0-10.9		11.0-13.9		≥14.0		Total	
	No.	Wr	No.	Wr	No.	Wr	No.	Wr
	18	94	8	92	0	0	26	94

Table 42. Largemouth bass electrofishing CPUE (fish/hr) from each length group collected during sampling on Pool 5 of the Green River from 2012-2021. Number of sites and effort have varied across years; standard errors are in parentheses.

Year	Length group (in)				Total
	<8.0	8.0-11.9	12.0-14.9	≥15.0	
2012	1.7	4.3	2	0.3	8.3 (2.1)
2013	2	4.7	3.3	0.7	10.7 (3.9)
2014	0.3	3.3	0.0	0.7	4.3 (1.3)
2015	0.7	3.7	4.0	1.3	9.7 (4.5)
2016	0.2	0.6	0.4	0.1	1.6 (0.5)
2017	1.7	0.7	1.0	0.7	4.0 (1.2)
2018	0.0	0.0	0.0	0.0	0.0
2019	3.7	0.3	0.0	0.7	4.7 (1.1)
2020	1.7	1.0	1.0	0.3	4.0 (2.0)
2021	0.3	0.0	0.3	0.7	1.3 (0.6)
Mean	1.3	2.0	1.3	0.6	5.2 (0.8)

Table 43. Smallmouth bass electrofishing CPUE (fish/hr) from each length group collected during sampling on Pool 5 of the Green River from 2012-2021. Number of sites and effort have varied across years; standard errors are in parentheses.

Year	Length group (in)					Total
	<4.0	4.0-8.9	9.0-11.9	12.0-13.9	≥14.0	
2012	1	1.3	0.3	0.0	0.0	2.7 (0.9)
2013	0.3	1.3	0.3	0.0	0.0	2.0 (0.9)
2014	0.0	0.7	0.3	0.0	0.0	1.0 (0.7)
2015	1.0	0.7	0.3	0.0	0.0	2.0 (1.4)
2016	0.0	0.5	0.1	0.2	0.0	0.8 (0.4)
2017	0.0	0.7	0.3	0.0	0.0	1.0 (0.7)
2018	0.3	0.7	0.3	0.0	0.0	1.3 (1.0)
2019	4.0	0.0	0.0	0.0	0.0	4.0 (1.2)
2020	0.0	1.0	0.0	0.3	0.0	1.3 (0.9)
2021	0.0	0.7	0.0	0.0	0.3	1.0 (0.7)
Mean	0.7	0.8	0.2	0.2	0.0	1.9 (0.3)

Table 44. Rock bass electrofishing CPUE (fish/hr) from each length group collected during sampling on Pool 5 of the Green River from 2012-2021. Number of sites and effort have varied across years; standard errors are in parentheses.

Year	Length group (in)				Total
	<4.0	4.0-5.9	6.0-7.9	≥8.0	
2012	0.0	0.0	1.3	0.7	2.0 (1.1)
2013	0.0	0.7	0.3	0.3	1.3 (0.9)
2014	0.7	0.0	1.3	0.3	2.3 (1.3)
2015	0.0	0.0	0.3	0.0	0.3 (0.3)
2016	0.0	0.0	0.3	0.0	0.3 (0.2)
2017	0.0	0.0	0.3	0.3	0.7 (0.7)
2018	0.0	0.0	0.0	0.0	0.0 (0.0)
2019	0.7	0.3	1.7	0.7	3.3 (3.3)
2020	0.0	0.0	0.7	0.0	0.7 (0.5)
2021	0.3	0.0	0.7	0.3	1.3 (0.9)
Mean	0.2	0.1	0.8	0.3	1.3 (0.4)

Table 45. Length-frequency and CPUE (fish/hr) of selected sport fish collected during 5.0 hrs of electrofishing (15-minute transects) at three sites on the Little Sandy River during October 2021; standard error is in parentheses.

	Inch class																									Total	CPUE
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	23	36	45			
Largemouth bass			1	1			1	2		2	1	1	1		1	1	1								13	2.6 (1.1)	
Spotted bass			3	6	3	3	4	3	2		1														25	5.0 (0.9)	
Bluegill	1	17	8	16	7	4																			53	10.6 (3.9)	
Redear sunfish		1	1			1	1																		4	0.8 (0.6)	
Black crappie							1		1	1															3	0.6 (0.3)	
White crappie								5	3	2															10	2.0 (0.9)	
Channel catfish							1		1	1	2	1	3	4	1	3	5	1	1		2	1			27	5.4 (1.3)	
Flathead catfish									1		1									1					3	0.6 (0.3)	
White bass						1																			1	0.2 (0.2)	
Muskellunge							1																1	1	3	0.6 (0.3)	
Sauger													1							1					2	0.4 (0.3)	
Walleye																	1								1	0.2 (0.2)	

Table 46. Largemouth bass electrofishing CPUE (fish/hr) from each length group collected during sampling on Little Sandy River from 2016 and 2021. Number of sites and effort have varied across years; standard errors are in parentheses.

Year	Length group (in)				Total
	<8.0	8.0-11.9	12.0-14.9	≥15.0	
2016	2.0	2.2	1.8	0.0	6.0 (2.6)
2021	0.6	1.0	0.4	0.6	2.6 (1.1)
Mean	1.3	1.6	1.1	0.3	4.3 (1.4)

Table 47. Number of fish and the relative weight (Wr) for each length group of black bass collected on the Little Sandy River during October 2021.

Sandy River during October 2021.

Species	Length group (in)						Total	
	8.0-11.9		12.0-14.9		≥15.0			
	No.	Wr	No.	Wr	No.	Wr	No.	Wr
Largemouth bass	5	92	2	86	3	103	10	94

Species	7.0-10.9		11.0-13.9		≥14.0		Total	
	No.	Wr	No.	Wr	No.	Wr	No.	Wr
	No.	Wr	No.	Wr	No.	Wr	No.	Wr
Spotted bass	9	103	1	90	0	0	10	101

Table 48. Spotted bass electrofishing CPUE (fish/hr) from each length group collected during sampling on Little Sandy River from 2016 and 2021. Number of sites and effort have varied across years; standard errors are in parentheses.

Year	Length group (in)					Total
	<4.0	4.0-7.9	8.0-10.9	11.0-12.9	≥13.0	
2016	0.2	1.6	0.4	0.2	0.2	2.6 (0.7)
2021	0.6	3.2	1.0	0.2	0.0	5.0 (0.9)
Mean	0.4	2.4	0.7	0.2	0.1	3.8 (0.6)

Table 49. Length-frequency and CPUE (fish/hr) of selected sport fish collected during 8.0 hrs of electrofishing (15-minute transects) at six unimpounded sites in lower Barren River during October 2021; standard errors are in parentheses.

Species	Inch class																															Total	CPUE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	41				
Smallmouth bass			2		1	1	1	6	5	5	8	8	6	7	5	2	5	3													65	7.7 (1.5)	
Largemouth bass											1	1	1	2																	5	0.6 (0.3)	
Spotted bass		1	4	1	1	2	5	7	3	4	2		1																		31	3.7 (0.7)	
Rock bass				1	1	6	8	8	2																							26	3.1 (0.9)
Bluegill	1		1	2	10	3																										17	2.0 (0.7)
Redear sunfish					2																											2	0.2 (0.2)
Channel catfish																		3	2	1	2	2	2	5	2	2	1	1				23	2.7 (0.9)
Flathead catfish								1		1	2	1	1			1																7	0.8 (0.3)
Blue catfish																										1						1	0.1 (0.1)
Black crappie					1	2	1	1	1																							6	0.7 (0.4)
White crappie							6																									6	0.7 (0.4)
White bass										1																						1	0.1 (0.1)
Hybrid bass																						1										1	0.1 (0.1)
Muskellunge																												1				1	0.1 (0.1)
Walleye														3	2	1	2	2														10	1.2 (0.4)

Table 50. Smallmouth bass electrofishing CPUE (fish/hr) from each length group collected during sampling at six unimpounded sites of lower Barren River during 2007, 2010, and 2012-2021 and for comparison two sites on the impounded section of Pool 1 of lower Barren River in 2017-2021.

Standard errors are in parentheses.

Section	Year	Length group (in)					Total
		<4.0	4.0-8.9	9.0-11.9	12.0-13.9	≥14.0	
Unimpounded	2007	3.1	28.7	19.2	4.6	4.3	59.9 (14.6)
	2010	1.6	9.6	10.9	3.8	2.7	28.4 (4.8)
	2012*	4.3	8.0	2.4	0.7	2.0	17.4 (3.2)
	2013	0.3	10.0	2.1	1.5	2.3	16.1 (3.3)
	2014	0.5	5.7	6.3	1.3	2.1	15.9 (2.8)
	2015	0.5	4.7	5.8	1.8	1.5	14.2 (2.2)
	2016	0.1	2.1	2.4	2.9	4.0	11.5 (2.3)
	2017	0.0	2.7	2.4	2.0	1.6	8.7 (2.5)
	2018	0.1	2.9	3.1	1.3	4.1	11.5 (2.1)
	2019	0.0	3.0	2.1	0.9	2.0	8.0 (1.4)
	2020	0.1	3.1	2.4	1.5	2.1	9.3 (1.8)
	2021	0.2	1.1	2.1	1.7	2.6	7.7 (1.5)
	Mean	0.8	5.9	4.3	1.8	2.5	15.3 (1.1)
*2012 CPUE data was collected during the spring							
Impounded	2017	0.0	0.3	0.0	0.0	0.0	0.3 (0.3)
	2018	0.0	1.0	0.0	0.0	0.0	1.0 (0.7)
	2019	0.3	0.7	0.3	0.0	0.7	2.0 (1.4)
	2020	0.0	1.7	0.0	0.0	0.0	1.7 (0.8)
	2021	0.0	0.7	0.3	0.0	0.3	1.3 (0.6)
	Mean	0.1	0.9	0.1	0.0	0.2	1.3 (0.4)

Table 51. Number of fish and the relative weight (Wr) for each length group of black bass and rock bass collected at six unimpounded sites in the lower Barren River during October 2021.

Species	Length group (in)						Total	
	7.0-10.9		11.0-13.9		≥14.0		Total	
	No.	Wr	No.	Wr	No.	Wr	No.	Wr
Smallmouth bass	17	87	22	79	22	79	61	81
Spotted bass	19	96	3	84	0	0	22	94
Rock bass	4.0-5.9		6.0-7.9		≥8.0		Total	
	No.	Wr	No.	Wr	No.	Wr	No.	Wr
	1	95	14	100	10	95	25	98

Table 52. Rock bass electrofishing CPUE (fish/hr) from each length group collected during sampling at six unimpounded sites of lower Barren River during 2007, 2010, and 2012-2021 and for comparison two sites on the impounded section of Pool 1 of lower Barren River in 2017-2021. Standard errors are in parentheses.

Section	Year	Length group (in)				Total
		<4.0	4.0-5.9	6.0-7.9	≥8.0	
Unimpounded	2007	1.3	15.2	19.4	7.4	43.3 (18.6)
	2010	0.0	2.9	7.3	0.7	10.9 (1.8)
	2012*	1.0	1.7	8.3	2.9	13.9 (3.1)
	2013	1.7	3.5	5.6	3.3	14.1 (4.1)
	2014	0.2	5.0	4.6	2.9	12.8 (3.5)
	2015	1.7	4.5	13.4	2.2	21.8 (4.9)
	2016	0.0	0.7	3.1	0.1	3.9 (1.3)
	2017	0.0	2.6	7.0	2.6	12.1 (4.0)
	2018	0.5	1.1	5.9	0.8	8.2 (2.1)
	2019	0.0	0.5	3.5	1.8	5.8 (1.7)
	2020	0.0	0.8	3.9	1.8	6.4 (1.7)
	2021	0.0	0.2	1.7	1.2	3.1 (0.9)
	Mean	0.6	2.8	6.7	2.2	12.2 (1.3)
*2012 CPUE data was collected during the spring						
Impounded	2017	0.0	0.3	2.0	0.3	2.7 (1.6)
	2018	0.0	0.0	0.0	0.0	0.0
	2019	0.0	0.0	2.0	0.0	2.0 (1.4)
	2020	0.0	0.7	2.0	1.0	3.7 (1.5)
	2021	0.0	0.0	0.7	0.3	1.0 (0.5)
	Mean	0.0	0.2	1.3	0.3	1.9 (0.5)

Table 53. Spotted bass electrofishing CPUE (fish/hr) from each length group collected during sampling at six unimpounded sites of lower Barren River from 2007, 2010, and 2012-2021 and for comparison two sites on the impounded section of Pool 1 of lower Barren River from 2017-2021. Standard errors are in parentheses.

Section	Year	Length group (in)					Total
		<4.0	4.0-7.9	8.0-10.9	11.0-12.9	≥13.0	
Unimpounded	2007	3.0	11.6	11.1	1.5	0.2	27.4 (5.6)
	2010	2.4	4.0	2.7	1.1	0.0	10.2 (2.5)
	2012*	4.0	7.4	6.0	1.4	0.9	19.8 (2.0)
	2013	0.8	6.7	8.3	2.3	0.0	18.0 (2.8)
	2014	2.1	2.6	3.4	0.9	0.1	9.1 (1.8)
	2015	0.1	11.4	8.6	3.9	1.2	25.2 (5.0)
	2016	0.0	0.7	1.3	1.3	0.4	3.7 (1.0)
	2017	0.0	1.3	2.4	1.0	0.3	5.0 (1.2)
	2018	0.2	0.7	0.8	0.5	0.4	2.6 (0.6)
	2019	0.0	1.3	2.8	0.9	0.6	5.5 (1.1)
	2020	0.0	1.6	1.3	1.0	0.3	4.1 (0.9)
	2021	0.6	1.1	1.7	0.2	0.1	3.7 (0.7)
	Mean	1.0	4.1	4.1	1.4	0.4	11.1 (0.9)
*2012 CPUE data was collected during the spring							
Impounded	2017	0.0	1.3	3.7	0.0	0.0	5.0 (1.5)
	2018	0.0	1.0	2.3	0.3	0.0	3.7 (2.0)
	2019	0.0	3.3	5.7	0.0	0.0	9.0 (3.0)
	2020	0.0	8.7	4.0	1.0	0.3	14.0 (3.4)
	2021	0.3	0.0	2.0	0.3	0.0	2.7 (0.9)
	Mean	0.1	2.9	3.5	0.3	0.1	6.9 (1.2)

Table 54. Length-frequency and CPUE (fish/hr) of selected sport fish collected during 3.0 hrs of electrofishing (15-minute transects) at two sites on the impounded section of Pool 1 of lower Barren River during October 2021; standard errors are in parentheses.

Species	Inch class												Total	CPUE
	3	4	5	6	7	8	9	10	11	12	15	19		
Smallmouth bass				1		1	1				1		4	1.3 (0.6)
Largemouth bass			2	2			1	1		1	1	1	9	3.0 (1.1)
Spotted bass	1					3	2	1	1				8	2.7 (0.9)
Rock bass				1	1	1							3	1.0 (0.5)
Bluegill	3	6	2	2	1								14	4.7 (1.8)
Black crappie					1								1	0.3 (0.3)

Warm Water Stream Sport Fish Survey Locations



Legend

- Streams sampled in 2021
- Streams sampled between 2012 and 2020

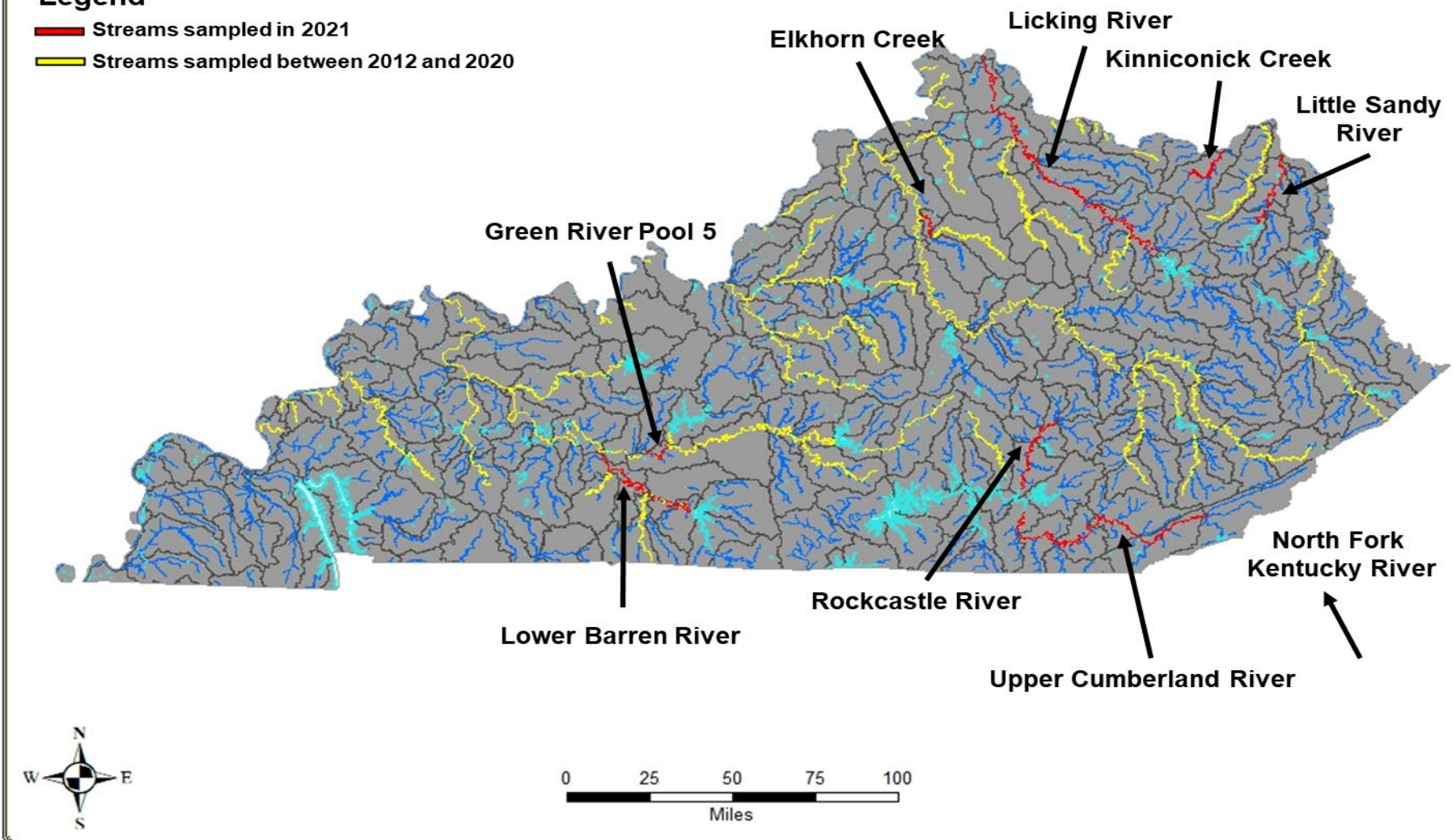


Figure 1. Map depicting warm water stream sport fish survey locations conducted by the Streams Investigations Branch and assisting crews for the current year (red outline/labeled) and previously sampled years from 2012 through 2020 (yellow outline).

South Fork Kentucky River

South Fork Kentucky River begins at the confluence of Red Bird River, Goose Creek, and Bullskin Creek in Clay County and flows North through Owsley County to its confluence with the North and Middle Forks of the Kentucky River in Lee County. From its origin, the South Fork Kentucky River flows downstream through the communities of Oneida, Booneville, and Beattyville, KY. Overall, South Fork Kentucky River is relatively broad in width with shallow to medium depths and is characterized by mud banks, rock bars, and occasional riffles. The South Fork Kentucky River provides anglers with the opportunity to fish for a wide variety of species that include: smallmouth bass, spotted bass, rock bass, channel catfish and muskellunge.

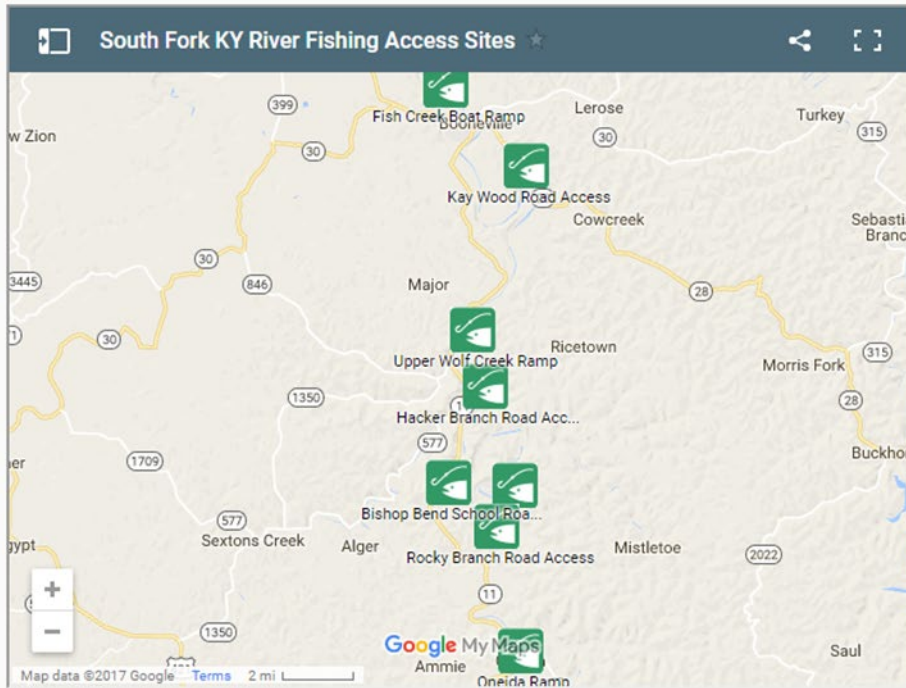


Figure 2. Example of the beginning of a stream webpage showing a brief summary stating starting/ending locations, what counties encompass the stream, and sport fish that may be encountered. Also included is the interactive map, which indicates access points that are designated with the fishing symbol.

South Fork Kentucky River Public Access Site Descriptions

Oneida Ramp: [\(Additional Information/Directions\)](#)



A single lane, concrete boat ramp is located directly north of the Oneida Elementary School off of Newfound-Oneida Road. A large, paved parking area is available at the top of the ramp with no other amenities available. The section of river at this site is best suited for canoes, kayaks, and small john boats.

Rocky Branch Road Access: [\(Additional Information/Directions\)](#)



This gravel/dirt access is situated next to the Rocky Branch road bridge crossing. It is located 1.5 miles off of KY-11 and is 5.0 miles north of Oneida and 16.0 miles south of Booneville. Parking is limited at this site. This site is suitable for canoes and kayaks. There are no other amenities at this location.

Figure 3. Examples of individual access site descriptions detailing additional information, directions and site photos of each specific ramp or access point.

Fisheries Overview

The following length frequencies are representative of the top 4 species sampled in South Fork Kentucky River.

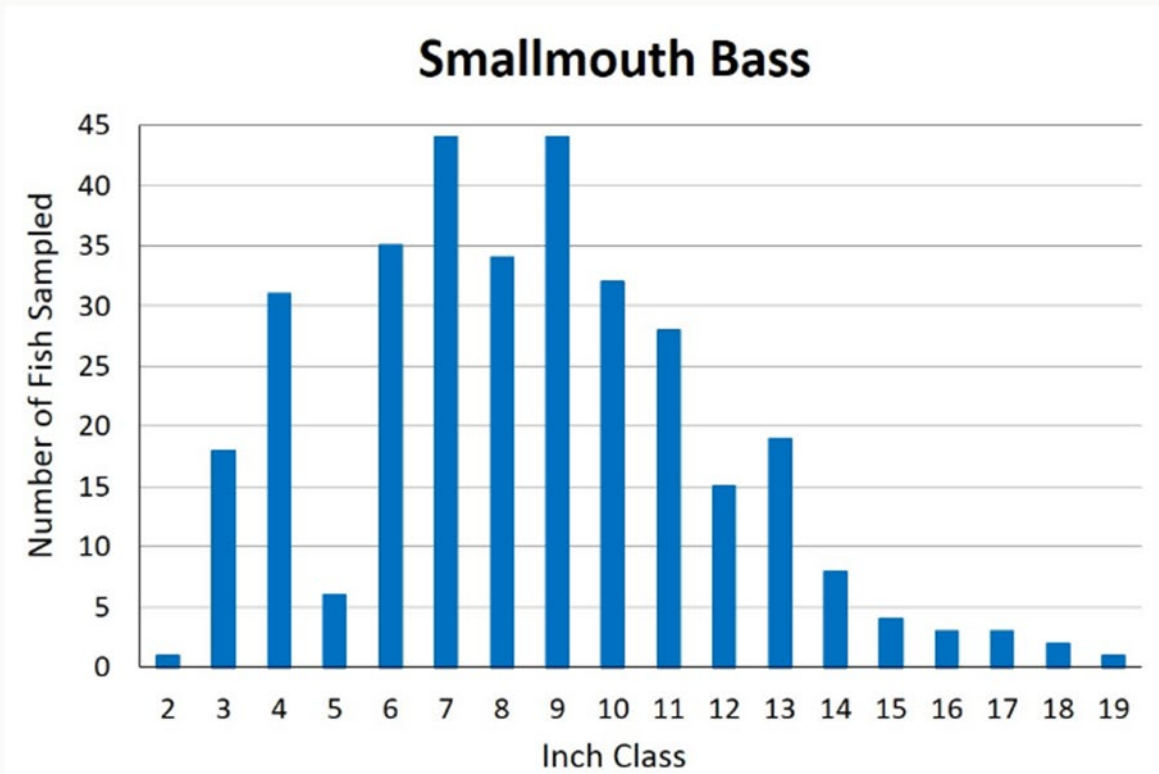


Figure 4. Example of a length frequency table found in the fisheries overview section detailing one of the most abundantly sampled sport fish species found in South Fork Kentucky River.

Project VI: Post-stocking Movement of Muskellunge in the Kentucky River

FINDINGS

Previous stockings of muskellunge throughout Kentucky have resulted in some of the state's premier fisheries such as Cave Run Lake and Green River Lake. On the Kentucky River, muskellunge stockings have historically been infrequent and at low numbers (typically ≤ 15 fish/mile)—only occurring when hatcheries have excess production.

From 2014 - 2017, increased stockings of 9.0 in and 13.0 in muskellunge were assessed in Pools 2 and 3 of the Kentucky River. CPUE of muskellunge were consistently low, and very few fished stocked during that study were present in spring and fall samples. Throughout that study, multiple cases of downriver movement were documented where fish traveled over 100 miles from their stocking site. Movement of stocked fish can play a critical role in stocking success making this evaluation of post-stocking dispersal critical in determining future stocking strategies for lotic waters in Kentucky. This project aims to determine dispersal of stocked muskellunge with an emphasis on age-1 and age-2 fish. Results can then be used to help develop muskellunge stocking recommendations for the Kentucky River and similar waterbodies in Kentucky.

No muskellunge fingerlings were stocked into the study site in 2020 due to COVID-19 workplace restrictions that prevented hatchery culture. In 2021, muskellunge were produced at Minor E. Clark State Fish Hatchery in Morehead, KY. Fish received stocking site (pool) specific fin clips and were stocked into pools 11 – 13 of the Kentucky River in July 2021 (Table 1). A total of 960 fingerlings (mean length = 8.3 in) were stocked in the three pools at a rate of 20 fish/mile.

Standardized spring sampling was abandoned for the project since many of the ramps become useable due to high water depositing mud and silt on most ramps. Standardized fall sampling was conducted as normal in November 2021. Twenty-eight 15-minute electrofishing transects were completed for a total of 7 hours of effort (Table 2). Only one muskellunge (35.0 in) was captured at a rate of 0.1 fish/hr. No clipped fish were observed in the sample.

Additional effort (March – October) was made to collect stocked and PIT tagged fish; however, that effort was less than desired due to staff shortages (Table 3). A total of 10.25 hr of effort was expended (6.75 hr within the study pools and 3.5 hr below the study pools). Five fish were collected and implanted with PIT tags. No clipped fish or previously PIT tagged fish were observed. Thus far, only one clipped fish has been collected. That fish had travelled nearly 40 miles downriver from its stocking site at the time of capture (Table 4).

Table 1. Stocking locations, number, rate, and average length of advance fingerling muskellunge stocked in pools 11 - 13 of the Kentucky River in July 2021.

Pool	Site	No. of fingerlings	Stocking rate (fish/mile)	Average length (in)	Fin clip location
11	Irvine Ramp	398	20	8.3	Left pectoral
12	Lock and Dam 13 TW Ramp	380	20	8.3	Right pectoral
13	Sturgeon Creek Ramp	182	20	8.3	Left pelvic
Total		960			
Mean			20	8.3	

Table 2. Effort and CPUE (fish/hr) of muskellunge captured during electrofishing surveys in the Kentucky River in November 2021. Standard errors are in parentheses.

Pool	No. of transects	Effort (hr)	No. of muskellunge	CPUE
8	5	1.25	0	0.0
9	4	1.00	0	0.0
10	8	2.00	0	0.0
11	6	1.50	1	0.7 (0.7)
12	2	0.50	0	0.0
13	3	0.75	0	0.0
Total	28	7.00	1	0.1 (0.1)

Table 3. Additional effort, fish observed/recaptured during supplemental sampling efforts on the Kentucky River in March - October 2021.

Pool	Effort (hr)	No. of muskellunge	Recaptures	
			Clipped	PIT tagged
1	2	0	0	0
3	1.5	1	0	0
8	1.5	1	0	0
11	3.75	3	0	0
12	1.5	0	0	0
Total	10.25	5	0	0

Table 4. Number of clipped muskellunge sampled from each stocking site and average distance from stocking site captured in Pools 11 - 13 of the Kentucky River.

Stocking site	No. of Individuals sampled from stocking site	Average distance from stocking site*
Pool 11	0	N/A
Pool 12	1	-39.7
Pool 13	0	N/A

*Positive values indicate upriver movements, and negative values indicate downriver movement.