2021 Creel Survey Report

COOSA RIVERKEEPER®

KEEPING WATCH OVER OUR WATERS SINCE 2010

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Abstract

Fish consumption advisories in Alabama offer important public health information concerning known toxic contaminants found in fish; however, anglers are not adequately informed enough to protect themselves and their families from exposure. The Fish Guide program at Coosa Riverkeeper set out to determine this by interviewing anglers that frequent the Coosa River through the Creel Survey. The Creel Survey found that about one-third of Coosa anglers were unaware of fish consumption advisories and even less than half of anglers already aware of fish consumption advisories feel they know specifics about the advisories. Simply being aware of fish consumption advisories is not enough to be protective of the health of anglers and their families. Enhanced advisory outreach that is specific and easily accessible is necessary to push this vital public health information to the anglers that need it most.

Background

Fish Consumption Advisories

Americans are confronted with environmental contaminants or pollutants found in the fish they catch. Governmental public health agencies often undertake fish tissue testing and issue fish consumption advisories where there are fish with contaminated tissues. By setting consumption limits that are protective of human health, these public health measures aim to prevent long-term illnesses and maladies, like cancer and reproductive dysfunction, that result from consumption of contaminated fish over time.

Fish consumption advisories are recommendations from state agencies to the general public to limit or avoid consumption of specific types of fish at specific locations due to the presence of known contaminants in those fish. A complete advisory offers advice about how much to eat of a specific type of fish at a specific location based on fish tissue testing results from that particular testing location. These advisories do not create a legal requirement to avoid eating fish and no one is actually prevented from consuming any fish from public waterways. In Alabama, one region of the state is selected for fish tissue testing each fall, and fish consumption advisories are

updated and released annually. However, each region of the state is only guaranteed testing once every five years on a rotating basis, so some confusion is created for the public as to whether their regions have up-to-date fish consumption advisories or not.

For Alabama, the publication of fish consumption advisories is a joint effort between the Alabama Department of Public Health (ADPH) and the Alabama Department of Environmental Management (ADEM). ADEM is responsible for fish collection and laboratory testing of edible fish portions. To complete the advisory process, fish tissue laboratory results from ADEM are shared with ADPH's State Toxicologist. The Toxicologist analyzes the results, determines where advisories are necessary, and releases advisories to the public. The advisories themselves can be found online at ADPH's website as a PDF document. The main contaminants found in Alabama's waterways are mercury and polychlorinated biphenyls (PCBs), while testing for per- and polyfluoroalkyl substances (PFAS) in fish tissue is said to be starting soon.

The Coosa River

The Coosa Valley, rich in aquatic biodiversity and natural beauty, is one of the most developed rivers in Alabama – The River State. The Coosa River is 280 miles long, with 90% of its length in Alabama. From headwaters in Georgia and Tennessee, the Coosa flows to Alabama where a series of impoundments cover the magnificent shoals that so famously dominated the Coosa in the steamboat era. Those impoundments created six large lakes that are a major part of life on the Coosa and where tens of thousands of people live, fish, and swim. The river is the most aquatically biodiverse subwatershed of the Mobile River Basin, which is the fourth largest basin in the country for streamflow. The Coosa River, its lakes, and its tributaries deserve protection from a myriad of threats which could further degrade its remarkable character. *See Appendix 3 for a watershed map of the Coosa River.*

The Coosa River provides recreation, drinking water, and economic benefits to twelve counties and over 500,000 people in Alabama. In recent years, local municipalities and counties have noted an increase in tourist expenditures, job growth, and business dollars by making the

Coosa and its tributaries more accessible and highlighting the impact it has on their communities. Journeying down the Coosa River from beautiful Lookout Mountain, past Talladega National Forest, and beyond the "rumbling waters" of Wetumpka, the river takes on a new name at the confluence with the Tallapoosa River — The Alabama River. The Alabama River flows on to the Mobile Delta and Gulf of Mexico.

An angler goes to fish for dinner on the tailwaters of Logan Martin Dam. Photo credit to John Haley.

Eight hydropower dams along the Coosa River, built early in the last century, constitute the primary threat to the river's health today. The Center for Biological Diversity reported the Coosa River suffered the greatest modern extinction event in the history of North America as a result of the dams and their impoundments. Thirty-six species endemic to the Coosa River were forced into extinction when Alabama Power impounded the river for hydroelectric power in the early 20th century. In 2010, the national environmental group, American Rivers, rated the Coosa as the tenth most endangered river in the entire United States. Despite the alarming number of extinctions and ongoing threats to water quality, the Coosa River is a unique and valuable resource for individuals, municipalities, and commercial enterprises.

About Coosa Riverkeeper

Working in over 5,000 square miles with 220 miles of river, Coosa Riverkeeper works to protect, restore, and promote the Coosa River and its tributaries in Alabama. This is done by patrolling the waters, educating the public, and advocating for the river and those who use it. It is a citizen-based nonprofit organization working to improve water quality, protect valuable habitat, and promote recreation and public health through the three programs of Swim Guide, Fish Guide, and Riverkeeper Patrol. Coosa Riverkeeper monitors polluters, patrols the waterways, educates the public, and advocates on behalf of the river.

Coosa Riverkeeper was founded in 2010 when the Coosa River was named one of America's most endangered rivers by the environmental non-profit, American Rivers. Today, the organization has over 2,000 members and is governed by a diverse board of directors. Coosa Riverkeeper is a dues-paying member of the Waterkeeper Alliance and Waterkeepers Alabama.

Contaminants in the Coosa

When this survey was conducted in 2020 and 2021, there were 35 individual fish consumption advisories located throughout the Coosa River basin issued by ADPH. Of these 35 advisories, 83% are issued due to polychlorinated biphenyl (PCB) pollution and the remainder are due to mercury. These advisories form a confusing patchwork of where certain species of fish should or should not be eaten along the Coosa River, lakes, and tributaries. Testing for per- and polyfluoroalkyl substances (PFAS) has yet to be conducted for Coosa fish, but they have been found at local drinking water intakes over the EPA-recommended health advisory level. *See Appendix Table 1: Alabama Fish Consumption Advisories for the Coosa River for the full advisories*. More specifically, Lakes Weiss, Lay, and Logan Martin have fish consumption advisories while Lakes Neely Henry, Mitchell, and Jordan do not have any fish consumption advisories present. Species included in the Coosa River basin fish consumption advisories are largemouth bass, striped bass, spotted bass, channel catfish, blue catfish, crappie, and all species at certain locations (e.g. Choccolocco Creek) (ADPH, 2021).

Mercury

Atmospheric deposition of mercury is a major cause of fish tissue contamination on the Coosa River and every river in Alabama. When fossil fuels are burned, mercury is released into the atmosphere, then falls with rain/dust, and settles onto land and into waterways. Some mercury is naturally occurring in the atmosphere as a result of volcanic, natural decay, or forest fire activity. Mercury is converted to methylmercury by aquatic microorganisms, which builds up within the organism over time as they encounter more (bioaccumulation) and makes its way up the food chain as organisms are consumed (biomagnification). Nearly all mercury exposures in the United States occur through eating fish and shellfish that contain elevated levels of methylmercury (EPA, How People are Exposed to Mercury, 2021).

In the human body, mercury can cause damage to your nervous system, renal system, and contribute to the development of heart disease. Women who consume fish containing mercury during and prior to pregnancy increase their risk for developmental issues in their children. Infants are most susceptible to mercury in the womb and exposure results in lifelong developmental and neurological effects. There is not much individuals can do to reduce their exposure except to follow fish consumption advisories themselves while adhering to the recommended portions and meal frequencies issued by ADPH.

Polychlorinated Biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) refer to a group of 209 individual chlorinated compounds produced for industry during the twentieth century. PCBs were used as an industrial lubricant in heavy machinery and were banned by 1979. They entered the air, water, and soil during their manufacture, use, and disposal, as well as through accidental leaks or spills during transport. Today, PCBs are released into the environment through improper disposal, dumping, and leaking; however, most human exposure comes from ingesting contaminated food such as fish and crops (EPA, Learn about Polychlorinated Biphenyls (PCBs), 2021).

The Coosa River has a long history with PCBs. In the 1930s, electrical appliances were growing in popularity across the nation, which increased the need for PCB manufacturing. In 1935,

Monsanto purchased the Swann Chemical Company in Anniston, Alabama. This Monsanto plant was the first place in the United States to commercially manufacture PCBs. During its forty years of manufacturing, the Monsanto Company flushed an estimated 1.8 million pounds of PCBs into nearby creeks, specifically tributaries of Choccolocco Creek. In 1966, they invited a wildlife biologist who noted concerns for the health of the fishery and those eating fish. They continued producing PCBs at the Anniston plant until 1971, eight years before PCBs were banned by the federal government. This was prior to the enactment of the Clean Water Act in 1972, which has since helped tackle pollution cases like these by giving citizens power to take legal action. Choccolocco Creek has had a "Do Not Eat Any" fish consumption advisory due to PCBs ever since (ADPH, 2021). Today, the Anniston PCB site is owned by Solutia Chemical Company and managed through the Superfund Alternative Process.

A postcard of Monsanto Chemical Company found in Asselin's *Monsanto: A Photographic Investigation.* Photo credits to Mathieu Asselin.

PCBs cause a myriad of adverse health impacts in humans. They have been found to impact function of the immune system, nervous system, reproductive system, and endocrine system. Studies conducted in the late 1970s have provided conclusive evidence that PCBs cause cancer in animals, and further studies done on humans strongly suggest PCBs are carcinogenic (EPA, Learning about Polychlorinated Biphenyls (PCBs), 2021). PCB can be passed through breast milk, and children of women exposed to PCBs have shown decreased birth weight. Even post-exposure, the effects of PCBs on child development cause lifelong neurological deficits to learning and short-term memory. People with PCB-exposure have shown decreased thyroid and endocrine function, which is critical for normal growth and development.

PCBs are found in the fatty tissue of the fish (ADPH, 2021). In an attempt to reduce PCB exposure, anglers should clean and fillet fish to remove all skin and fat, which is where PCBs concentrate. Because PCBs are fat-soluble, it is imperative that contaminated fish be cooked in a way that will allow fat to drain away. These methods remove a portion of the PCBs found in fish tissue and reduce exposure. For those who consume wild caught fish as a significant source of protein in areas impacted by PCBs, this information is important for long term harm reduction.

Coosa River Fish Guide

Coosa Riverkeeper's Fish Guide is designed to engage and educate anglers about current fish consumption advisories as determined by ADPH and offer a variety of informational resources to help all types of anglers reel in game fish on the Coosa. Fish Guide seeks to answer the question, "Are fish safe to eat?"

A young angler and his grandfather fish for dinner at Pell City Lakeside Park. Photo credit to Chad Hoffman.

The program offers interactive citizen science programs, online maps, infographics, and videos. A major tenet of the program is the creel survey, where anglers share their understanding of fish consumption advisories, fishing habits, and pollution impacts in the Coosa River watershed.

In 2014, Coosa Riverkeeper surveyed anglers across the Coosa River basin for the "Healthy Fish, Healthy Communities Survey Report." This initiative was funded by the Alabama Chapter of the Sierra Club. The original survey used in the 2014 Healthy Fish, Healthy Communities Report served as the starting point for the survey used in this report as well. In creating the survey, multiple iterations were made to improve survey flow and increase focus on fish consumption advisory awareness. The survey itself was peer-reviewed by veteran Coosa River anglers and academic researchers for clarity and relevance during development.

Purpose of this Report

Coosa Riverkeeper's Creel Survey was conducted to bring awareness to Coosa River anglers and their understanding of the Alabama fish consumption advisories. Survey questions asked general information about anglers' demographics, frequency of fishing, frequency of fish consumption, cooking habits, preparation methods, and awareness of contaminants. While a broad picture of Coosa River anglers' habits was gathered, this survey's main goal was to discern whether anglers were adequately informed about fish consumption advisories in order to protect themselves and their families from contaminated fish.

Methods

Coosa Riverkeeper's Creel Survey was conducted over the course of two survey efforts that spanned approximately two months each and gathered a total of 477 responses. The first survey effort took place during late summer 2020 and the second survey effort took place during spring 2021. The survey was adapted from year one to year two to improve the survey flow while still capturing valuable qualitative responses. Year one of the survey took place from June 30 to

September 1, 2020 and resulted in 236 individual responses. Year two of the survey took place from April 2 to May 31, 2021 and resulted in 241 individual responses.

The Creel Survey was offered simultaneously online through Google Forms and in person through volunteer-led interview sessions at public access points to the Coosa River. This Q&A-style survey has both multiple choice and open response questions pertaining to demographics, fishing habits, fish eating habits, knowledge of fish consumption advisories, and knowledge of contaminants. Most questions were specific to that angler's knowledge and experiences within the Coosa River watershed. Anglers were asked if they previously completed the survey online prior to being interviewed in person to avoid duplicate responses. *See Appendices 1 & 2 for a copy of survey questions from both years.* For cohesive data management, all survey responses were inputted using Google Forms while data storage and analysis was managed through a linked Google Sheet.

When given at a conversational pace, the Creel Survey was designed to take approximately 20 minutes to complete. Incentives were offered both online and in person to encourage public participation in the survey. In both years, each respondent that completed the survey and left contact information was entered into a random giveaway of fishing gear drawn after the survey effort was completed. Additionally, a fishing lure was offered to those completing the survey in person as thanks, as well as an entry to the giveaway. Lures, donated by PRADCO Outdoor Brands, were the perfect incentive as they were useful for anglers.

Online

The creel survey was accessible online 24 hours a day during the approximate two month period it was open in both 2020 and 2021. Respondents digitally indicated their informed consent to participate in the survey following a disclaimer. The survey platform was Google Forms, which worked well and was of no cost to the organization. However, Google Forms experienced a technical issue with a few responses being submitted twice, and those duplicate responses were deleted prior to analysis.

The survey was advertised on Coosa Riverkeeper's social media platforms Twitter, Facebook, and Instagram, on CoosaRiver.org, and on membership emails. Social media posts included a link to the survey and a description of the giveaway available to those who complete the survey and leave contact information. Business cards featuring a link to the survey were given out to interested parties that were not willing to participate in person at that time.

In Person

In person Creel Survey sessions were led by Coosa Riverkeeper's staff, interns, or volunteers on random days of the week. Surveying took place at public access locations at each of the five lakes in Coosa Riverkeeper's scope: Neely Henry Lake, Logan Martin Lake, Lay Lake, Mitchell Lake, and Jordan Lake. Creel Surveys were also conducted in the free-flowing section of the Coosa River south of Jordan Dam. Survey locations were selected based on local knowledge that they were publicly accessible and known to be frequented by anglers. Upon arriving at each survey location, the interviewers approached anyone with fishing equipment or a boat to inquire if they would be interested in participating. The survey was issued out loud, following verbal consent, and responses were written down to be digitally inputted later that day. Each response was recorded individually, and surveying concluded after attempting to survey everyone at that location.

During year one, a total of 12 survey sessions collected 37 responses in person. During year two, a total of 19 survey sessions collected 129 responses in person. Not every survey session was successful. The seasonality of fishing most likely attributed to more anglers being encountered during year two's spring surveying rather than year one's fall surveying. The use of interns to conduct surveys was invaluable to the surveying effort. *See Appendix 4: Map of Creel Survey Locations for more details.*

Results

To answer the question of whether Coosa River anglers are adequately informed about fish consumption advisories in order to protect themselves and their families from contaminated fish, a select few survey questions were taken into consideration. Full survey results are available to review upon request.

Anglers were surveyed about their awareness of fish consumption advisories. Based on all of the survey responses gathered, two-thirds of anglers (67.5%) are aware of fish consumption advisories and one-third of anglers lack awareness (32.5%). From year one's survey results, 175 anglers (74.2%) indicated they were aware of advisories and 61 anglers (25.8%) indicated they were not sure or not aware. From year two's survey results, 147 anglers (61.0%) had heard of advisories and 94 anglers (39.0%) indicated they were not sure or not aware.

In year two, anglers who were previously aware of fish consumption advisories prior to the survey were asked to identify the level of government responsible for creating and issuing fish consumption advisories. This was a multiple choice question that also included the option to respond with don't know or other. Of those anglers already aware of advisories, 53 anglers (36.1%) answered correctly that the state is responsible while 94 anglers (63.9%) answered incorrectly or did not know what level of government makes fish consumption advisories.

Anglers already aware of the advisories were also surveyed about their specific knowledge about the fish consumption advisories for the Coosa. Responses could be in affirmation (i.e. "Yes, I know specifically what the advisories say") or in denial (i.e. "No, I do not know what the advisories say" or "I'm not sure"). Based on all of the survey responses gathered, slightly less than half of anglers (47%) felt they know specifically what fish consumption advisories say. From year one's survey, 93 anglers (43.3%) affirmed they know specifically what the fish consumption advisories say while 122 anglers (56.7%) denied they know specifics. From year two's survey, 74 anglers (50.3%) affirmed they know specifics while 73 anglers (49.7%) denied they know specifics about the fish consumption advisories. In year two, respondents were also asked to provide an example of an advisory if they felt they knew specifics. Despite already knowing about the advisories and feeling

informed, only 35 anglers (23.8%) provided specific knowledge about the advisories such as that they must have a location, fish, and quantity to eat or that advisories may indicate specific locations to avoid entirely.

Near the end of the Creel Survey, anglers were surveyed about their awareness of health effects from consuming contaminated fish. This could be answered with a simple yes or no, but those who answered yes were asked if they had heard of anything specific. Based on all of the survey responses gathered, 56.1% of anglers indicated they are aware of, or have heard of, health effects from eating contaminated fish while 43.9% had not heard of health effects, or were unaware. In year one's survey, anglers were asked if they were aware of health effects from consuming contaminated fish. 48 anglers (20.4%) were not aware of health effects while 187 anglers (79.6%) were aware of health effects from consuming contaminated fish. In year two's survey, anglers were asked if they had ever heard about any health effects from consuming contaminated fish. 161 anglers (66.8%) have never heard of health affects while 80 anglers (33.2%) have heard of health affects.

Discussion

The Creel Survey found that the majority of anglers (83%) surveyed have been fishing the Coosa River for longer than five years. However, only two-thirds of those anglers were aware that the Coosa River currently has more than 30 active fish consumption advisories. One-third of anglers that frequent the Coosa River were simply unaware that fish consumption advisories exist where they fish and take fish home to their families. This group of anglers cannot make health conscious decisions about consuming fish because they are unaware fish are contaminated where they are fishing. It is alarming that one-third of anglers have likely been frequenting the Coosa for years without encountering any meaningful information about fish consumption advisories. Increasing angler's knowledge of fish consumption advisories was a goal of this survey, so the interviewers would take the opportunity to educate those unaware about fish consumption advisories, provide them with literature about the Coosa River, and offer a point of contact at

Coosa Riverkeeper for questions about the advisories. Awareness is the first step to fully comprehending how fish consumption advisories can impact not just an individual's health, but the health of their family and anyone else that eats wild catch.

Simply being aware that fish consumption advisories exist in an area is not enough to be protective of health! As defined in a case study of Environmental Justice and PCB contamination in the Coosa River watershed, awareness is "knowing that an issue exists, without necessarily having detailed information or clear understanding of the issue" while being informed is "having some specific information about an issue beyond being aware of its existence" (Burgess et al, 2014). To expand on the idea that Coosa River anglers are aware but not adequately informed, anglers who stated they were previously aware of fish consumption advisories were asked to answer a multiple choice question selecting the level of government responsible for issuing fish consumption advisories to gauge whether they are informed. Despite having some knowledge about the advisories, less than 40% of anglers were able to correctly identify the correct level of government that issues them. Only 53 of the 241 surveyed in year two were aware that fish consumption advisories are issued at the state level. Misinformation is likely not an issue as almost half of previously-aware anglers simply do not know who or how the advisories are issued. Because these anglers are not familiar with the authority issuing fish consumption advisory information, they have limited options to learn more and ask questions about what the advisories mean for their health or their families. While awareness of the advisories could be improved overall, the Creel Survey also found that even previously-aware anglers are not adequately informed about the fish consumption advisories.

Despite two-thirds of Coosa River anglers already being aware of fish consumption advisories, less than half of that previously-aware group felt they know specifically what those advisories recommend, indicating they are aware but not informed. By their own admission, the anglers that feel they know specifics about fish consumption advisories only comprise one-third of total anglers surveyed in 2021. One fish consumption advisory offers four key pieces of information like which specific fish to avoid at a specific location based off of a recommended meal

frequency and size, so we feel the pool of anglers that know specifics would shrink if fact-checked. The majority of Coosa River anglers are simply not informed enough to make health-conscious decisions about consuming contaminated fish.

It is not our goal for every angler to arm themselves with pages of information every time they go fish. Our goal is to make fish consumption advisory information more widely accessible and easily understandable for those fishing for food. Alabama's fish consumption advisories fail to adequately inform anglers on how to protect themselves due to the difficulty anglers experience with information about the advisories themselves or the agencies responsible for issuing them. Several anglers mentioned to the interviewers that they did not understand what the advisories meant even when they took the time to go locate and download them online. To be more adequately informed, Alabama's anglers need to be able to form working partnerships with the state agencies in charge of issuing advisory information, so anglers will feel encouraged to check the advisories frequently and comprehend what advisories mean for their health or their families. Examples of ways to achieve this could be through an increased social media presence discussing fish consumption advisories or by utilizing public service announcements to spread this vital public health information through diverse forms of media like television, radio, and the internet.

Fish consumption advisories are issued with the intention of being protective of long term health and preventing illness. For an advisory to be issued, there must be a clearly established link between the contaminant found in fish at a particular location and a bad health outcome. The Creel Survey found that slightly less than half of anglers surveyed (209 out of 477) were not previously aware of possible health effects from consuming contaminated fish. Over two-hundred anglers were not even aware that eating fish listed under a fish consumption advisory could be harmful to their health and might be taking undue risks because of information they do not have. This demonstrates a clear failure of the fish consumption advisory program to be protective of public health. Anglers must both know that the advisories exist and believe that it could impact health to be effective at preventing illness.

With strong traditions of the community fish fry, most Coosa River anglers are feeding the whole family or neighborhood with their fresh catch. Averaged over the two years of the survey, 87% of anglers share their catch with others such as their children or elderly family members. Fish consumption advisories are even more vital to these "at-risk" groups such as those who are or might want to get pregnant, children, and the elderly. These vulnerable groups are more susceptible to adverse health effects due to a decreased capacity to flush out contaminants. Many anglers interviewed also spoke about the necessity of the river in their diet and to put food on the table for their families. An angler that is not aware of the advisories, does not know what they say specifically, or does not know contaminated fish could impact their health are all likely to feed fish to family members and their community.

All of the gaps in angler knowledge about fish consumption advisories highlighted here are not intended to place blame or responsibility on anglers. These gaps we found reveal how inaccessible this information is for the average angler. Currently, Alabama's fish consumption advisories are not protective of public health because anglers are not adequately informed enough about the advisories themselves, the potential health impacts from consuming contaminated fish, and the four specific components necessary to compose each advisory. We believe these issues have more to do with a failure at the state level to promote the advisories and poor outreach to local fishing communities rather than a failure in the fish consumption advisories program to be protective of public health. While there are many issues with the current system for fish tissue monitoring, fish consumption advisories are vitally important to the long term health of our river dwelling communities. Our state agencies must do a better job of promoting these existing advisories and commit to improving them in the future. Additionally, concentrated effort and outreach should be made to protect more susceptible groups like children, pregnant women, elderly, and subsistence anglers depending on the river for food.

Survey Limitations

Because the survey itself is a living document that is updated with each new survey effort, it was difficult to compare survey answers to the previous year. A constantly evolving survey means we are able to get to know Coosa River anglers better, but for data analysis it would be more consistent if the survey was identical from year one to year two. There are extremely valuable questions that were added to the second year of the year that we wish were included in both years, such as that angler's personal belief in fish consumption advisories or knowledge check questions. To prevent low-effort or blank survey responses, online respondents should be required to answer almost every survey question or provide a certain number of characters for valid submission.

We also found that altering the semantics of a question can drastically change the responses you receive. For example, in year one we asked anglers if they were aware of health effects from consuming contaminated fish, and in year two we asked anglers if they had heard about health effects from consuming contaminated fish. While this can perhaps be attributed to the phenomenon of confirmation bias, the semantics and wording of a question can definitely impact the responses we receive and the updated word choice typically leads to more clear and defined responses.

Suggestions & Future Work

Future versions of the creel survey at Coosa Riverkeeper should continue to be offered both online and in-person to encourage survey participation at the angler's convenience. Those depending on the river for a significant protein source for themselves or their families are often found in person at public access points to the river. However, to learn more about the anglers that depend on the river for nutrition and subsistence, future surveys and analysis should separate out anglers found at public access points for additional study. More popular fishing spots, times of day, and fishing seasons should be explored to reach more anglers.

While two-thirds of anglers are aware of the fish consumption advisories being issued for the Coosa River, large knowledge gaps exist between knowing the advisories exist and being informed on how to protect one's self or family from contaminated fish. There is a profound need for improved fish consumption advisory communication and outreach to the public in state, county, and local governments. A persistent one-third of anglers are missing from awareness about the advisories completely, and slightly less than half of anglers do not even know that eating fish under an advisory could impact health. The advisories themselves could be improved by increased testing frequency and locations sampled, greater fish species being tested, and creating advisories inclusive of a wider range of weights, ages, and genders. Several state agencies work together to make the fish consumption advisory program possible, but there is no codification of this process into law nor a concerted statewide effort to increase public awareness and understanding. Anglers in Alabama deserve the right to know when and where the fish are not safe to eat.

References

Alabama Department of Public Health (ADPH). Alabama Fish Consumption Advisories 2021. July 2021. Available at https://www.alabamapublichealth.gov/tox/assets/al-fish-advisory-2021.pdf

Burgess, L. D., Johnson, G. S., & Washington, S. C. (2014). An African American Community and The PCB Contamination In Anniston, Alabama: An Environmental Justice Case Study. Race, Gender & Class, 21(1/2), 334–361. Available at http://www.jstor.org/stable/43496977

Environmental Protection Agency (EPA). How People are Exposed to Mercury. 2021. Available at https://www.epa.gov/mercury/how-people-are-exposed-mercury

Environmental Protection Agency (EPA). Learn about Polychlorinated Biphenyls (PCBs). 2021 Available at https://www.epa.gov/pcbs/learn-about-polychlorinated-biphenyls-pcbs.

Haley, J. (2020) *A Fisher's Right to Know* film [Still]. Southern Exposure Film Fellowship. Available at https://www.southernexposurefilms.org/films/a-fishers-right-to-know

Asselin, M. (2017) *Monsanto: A Photographic Investigation* [Postcard]. Kettler Verlag. Available at https://www.theguardian.com/artanddesign/2018/apr/20/mathieu-asselin-monsanto-deutsche-borse-anniston-alabama

Hoffman, C. (2021) *Photo of Young Angler and Grandfather* [Photograph]. Coosa Riverkeeper.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015 – 2020 Dietary Guidelines for Americans. 8th Edition. December 2015. Available at https://health.gov/our-work/food-nutrition/previous-dietary-guidelines/2015

Appendix

Appendix 1: 2021 Coosa Riverkeeper Creel Survey

Appendix 2: 2020 Creel Survey of Coosa River Community Anglers

Appendix Table 1: Alabama Fish Consumption Advisories 2020 & 2021 for the Coosa River.

Appendix 3: Map of the Coosa Valley

Appendix 4: Map of Creel Survey Locations.

Appendix 1: 2021 Coosa Riverkeeper Creel Survey

Respondent's Name (optional): _____
Respondent's Contact Info (optional): _____
Respondent's Zip Code: _____ **Hometown:** _____
Surveyor's Name: _____
Survey Date & Time: _____
Location of Survey: _____

Demographic Info:
Age: U-18, 18-29, 30-49, 50-64, 65+
Gender: M/F/Other: _____
Ethnicity: Caucasian, African-American, Hispanic, Asian, Native American
Estimated Weight: _____ lbs
Language at Home: _____

2021 COOSA RIVERKEEPER CREEL SURVEY

1. How often do you fish on the Coosa River or its lakes & creeks during peak season?
   a) 5+ times a week b) 1-4 times a week c) A few times a month d) Less than once a month
2. How long have you been fishing on the Coosa River?
   a) More than 20 years b) 5-20 years c) Less than 5 years
3. What is your main reason for fishing?

4. What kind of fish do you try to catch on the Coosa? Circle all that apply.
   a) Bass b) Catfish c) Crappie d) Bream e) Other: _____
5. How much a year do you estimate you spend on fishing? Including ice, bait, tackle, gear, boats, and any other equipment? Ballpark? $_____
6. Do you keep any of the fish you catch? a) No b) Yes - If Yes, what purpose do you keep fish for?
   a) Eat b) Bait c) Throw Away d) Fertilizer e) Give away f) Other: _____
7. Have you eaten fish caught from the Coosa River? a) Yes **(Continue to #8)** b) No **(Skip to #16)**

ABOUT YOUR EATING HABITS

8. How often do you eat fish caught from the Coosa? Select one.
   a) Two+ times weekly b) Once weekly c) Once monthly d) Few times yearly e) Once yearly or less
9. How many meals with Coosa fish do you eat in a month on average? #: _____
10. What kinds of fish do you prefer to eat from the Coosa? Star first choice but select as many as apply.
    a) Bass b) Catfish c) Crappie d) Bream e) Other: _____
11. How do you judge if the fish you catch are safe to eat?

12. How do you prepare your fish prior to cooking? Select one.
    a) Fillet b) Fillet, but leave the skin c) Whole fish d) Other: _____
13. How do you usually cook your catch? Select one.
    a) Deep fry b) Pan fry c) Bake d) Grill e) Other: _____
14. If you cook your fish using cooking oil, do you reuse your cooking oil?
    a) No b) Yes - If Yes, how many times do you reuse the oil? _____
15. Do you feed fish you catch from the Coosa to other people (friends and family)? a) No b) Yes
    If Yes, how many people do you feed your fish to? _____
    If Yes, who eats your Coosa caught fish? Circle all that apply.
    a) Elderly over 65 b) Youth under 18 c) Women who are pregnant, nursing, or may become pregnant

ABOUT THE FISH CONSUMPTION ADVISORIES

16. Have your heard about fish consumption advisories on the Coosa River?
    a) Yes **(Continue to #17)** b) No/IDK **(Skip to #21)**

FOR THOSE AWARE OF FISH CONSUMPTION ADVISORIES

17. Do you happen to know who is responsible for making the fish consumption advisories?
    a) Federal government b) State c) County d) Local town e) Don't know f) Other: _____
18. How did you originally find out about the advisories? Select as many as apply.
    a) ADPH b) Outdoor AL c) News d) Radio e) TV f) Internet g) Signs h) Other:_____
19. Do you know specifically what the advisories say?
    a) No b) Yes - If Yes, can you tell me an example?_____
20. Since learning about fish consumption advisories, did you change your fishing or eating habits?

FOR EVERYONE, ABOUT THE ADVISORIES

21. There are 35 existing fish consumption advisories on the Coosa River as issued by ADPH in 2020. What do you think could be done to better inform the public about this?

22. Where would you like to see fish consumption advisories information displayed?

23. Do you think eating fish under a fish consumption advisory could impact your health? Why or why not?

24. If you had easier access to information about fish consumption advisories, would you follow them?
    a) Yes b) No, Why? _____

ABOUT THE CONTAMINANTS

25. Have you ever heard anything about contaminants or pollutants in the Coosa River or its fish?
    a) No b) Yes, what kinds? _____
26. Have you heard of PCBs (poly-chlorinated biphenyls) being in the Coosa River or its fish?
    a) No b) Yes
    Have you heard of mercury, or methyl-mercury, being in the Coosa River or its fish?
    a) No b) Yes
27. Have you heard about any heath effects from eating contaminated fish?
    a) No b) Yes - If Yes, what health effects have you heard about?

28. What do you think are the main sources of pollution or contamination in the Coosa River and its fish?

29. Would you like to receive more information about Coosa Riverkeeper?
    a) No b) Yes, email: _____
30. Would you like to receive water quality alerts from popular spots along the Coosa River?
    a) No b) Yes, phone number: _____

Appendix 2: 2020 Creel Survey of Coosa River Community Anglers

Respondent's Name (optional): _____
Respondent's Contact Info (optional): _____
Respondent's Zip Code: _____ **Home town:** _____
Surveyor's Name: _____
Survey Date & Time: _____
Location of Survey: _____

Demographic Info:
Age: U-18, 18-29, 30-49, 50-64, 65+
Gender: M/F/Other: _____
Ethnicity: Caucasian, African-American, Hispanic, Asian, Native American
Estimated Weight: _____ lbs
Language at Home: _____

2020 CREEL SURVEY OF COOSA RIVER COMMUNITY ANGLERS

1. How often do you fish on the Coosa River or any of it's feeder creeks like Choccolocco Creek?
   a) 5+ times a week b) 1-4 times a week c) A few times a month d) Less than once a month
2. How long have you been fishing on the Coosa River?
   a) More than 20 years b) 5-20 years c) Less than 5 years
3. What kind of angler would you consider yourself? Select as many as apply, but put a star by the one that most describes you the best.
   a) Hobby c) Sport/Tournament e) Kayak
   b) Dinner/Subsistence d) Fly f) Other: _____
4. What kind of fish do you try to catch on the Coosa (circle all)?
   a) Bass b) Catfish c) Crappie d) Bream e) Other: _____
5. How much a year do you estimate you spend on fishing? Including ice, bait, tackle, gear, boats, and any other equipment? Ballpark? $_____
6. Do you have internet access at home or a smartphone?
   a) Yes, internet and smartphone b) Yes, internet c) Yes, smartphone d) No
7. Do you eat the fish you catch from the Coosa? a) Yes b) Sometimes c) No. (Skip to #14)

ABOUT YOUR EATING HABITS

8. How often do you eat fish you catch from the Coosa?
   a) Two+ times weekly b) Once weekly c) Once monthly d) Few times yearly e) Once yearly or less
9. What kinds of fish do you eat from the Coosa?
   a) Bass b) Catfish c) Crappie d) Bream e) Other: _____
10. How do you cook your catch?
    a) Deep fry b) Pan fry c) Bake d) Grill e) Other: _____
11. How do you prepare your fish prior to cooking?
    a) Fillet b) Fillet, but leave the skin c) Whole fish d) Other: _____
12. If you cook your fish using cooking oil, do you reuse your cooking oil?
    a) No b) Yes. If Yes, how many times do you reuse the oil? _____
13. Do you feed fish you catch from the Coosa to other people (friends and family)? Select as many as apply.
    a) People over age 65 b) Pregnant or nursing women c) Spouse/Significant other
    d) Children age 15 to 18 e) Infants and children 14 and under f) Other friends and family
    g) Other: _____ h) I do not feed fish to other people

ABOUT THE FISH CONSUMPTION ADVISORIES

14. Are you aware of fish consumption advisories issued by ADPH in Alabama? a) Yes b) No (Skip #19)

FOR THOSE AWARE OF FISH CONSUMPTION ADVISORIES

15. Do you know specifically what those advisories say?
    a) Yes b) Sort of / Kind of / Have some vague idea c) No

16. On a scale from 1 to 10, 10 being an expert and 1 being completely unaware, how much would you say you know & understand about Alabama fish consumption advisories in general? _____ (1-10)
    a) What about fish consumption advisories specific to the Coosa River? _____ (1-10)
17. How did you find out about those advisories? Select as many as apply.
    a) ADPH b) Outdoor AL c) News d) Radio e) TV f) Internet g) Signs f) Other:_____
18. Do you think the advisories are clear and easy to understand? If not, how could they be made better?

FOR EVERYONE

19. There are 34 existing fish consumption advisories on the Coosa River as of 2019. What do you think could be done to better inform the public about these advisories and the contaminants in our river?

20. Rate how much you would agree with the following tactics to increase public awareness of fish consumption advisories:
    (Strongly Disagree > Disagree > Neutral > Agree > Strongly Agree or No Opinion)
    _____ a) display information at commercial places: fill stations, bait and tackle shops, marinas,
    _____ b) display information in the form of signage at public access areas to the river like popular fishing piers, boat ramps, and public beaches.
    _____ c) sending emails or mailers to fishing license holders informing them of how to access the fish consumption advisory information
    _____ d) public service announcements and awareness campaigns through social media
    _____ e) insert fish consumption advisory information on fishing & boating licenses
21. If you have easier access to information about fish consumption advisories, would you heed them?
    a) Yes b) No, Why? _____

ABOUT THE CONTAMINANTS

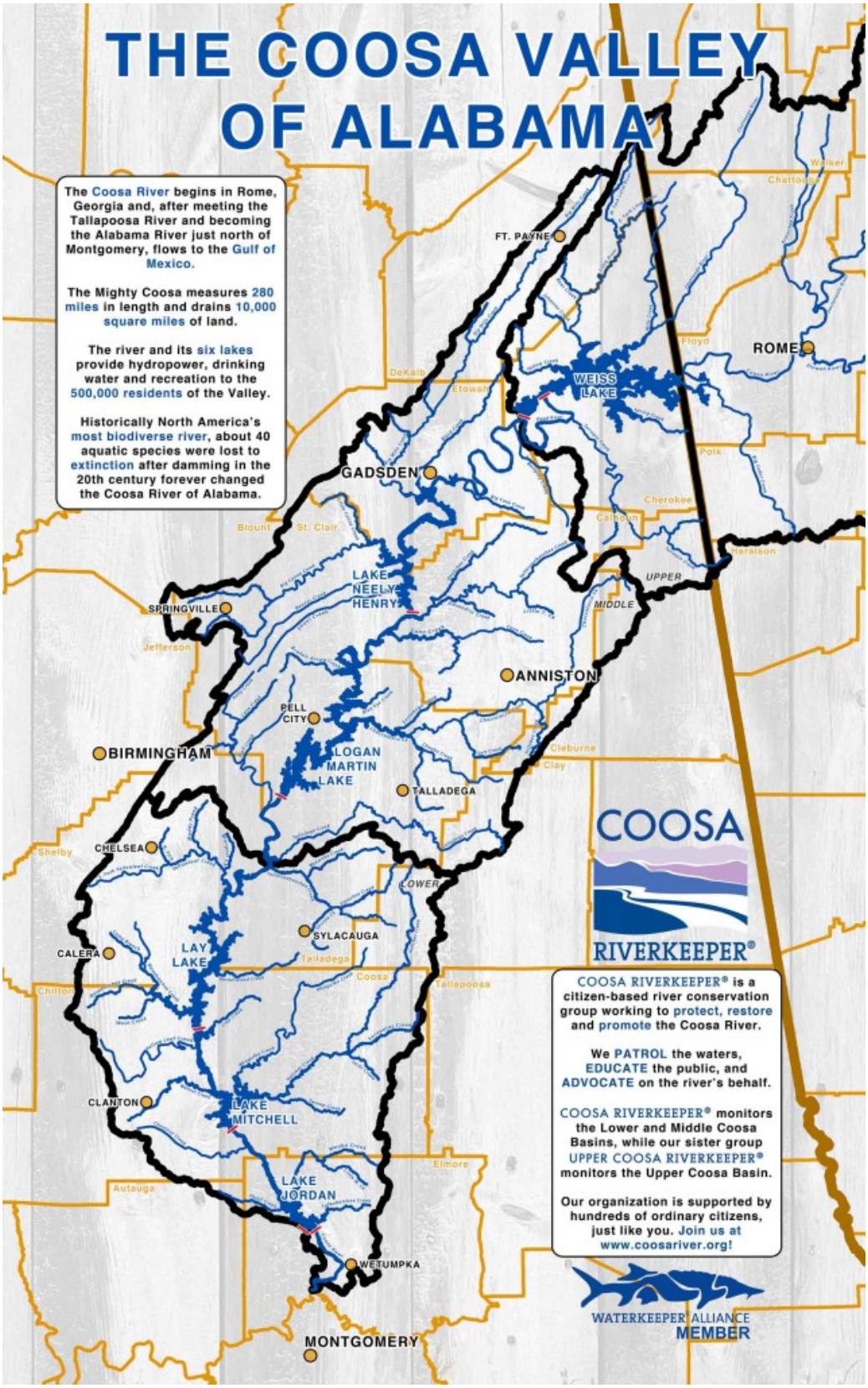
22. (1) Have you heard anything about contaminants or pollutants in the Coosa River?
    a) No b) Yes, what kinds? _____
    (2) Have you heard of PCBs (poly-chlorinated biphenyls) being in the Coosa River?
    a) Yes b) No
    (3) Have you heard of mercury, or methyl-mercury, being in the Coosa River?
    a) Yes b) No
23. Are you aware of any heath effects of eating contaminated fish?
    a) Yes, both PCBs and mercury b) Yes, PCBs c) Yes, mercury b) No
24. Do you know how to reduce your exposure to PCBs by filleting the fat away from your catch & cooking in a way that allows fat to drain away?
    a) Yes, I was aware & I do this b) Yes, I was aware, but I don't do this c) No, I was not aware
    d) Other?_____
25. What do you think would be the best way to educate people about these advisories and the safest way to prepare fish?

26. Would you like to receive more information on Coosa Riverkeeper? a) Yes b) No
27. Would you like to be entered in our gift set giveaway? b) No a) Yes, phone number: _____

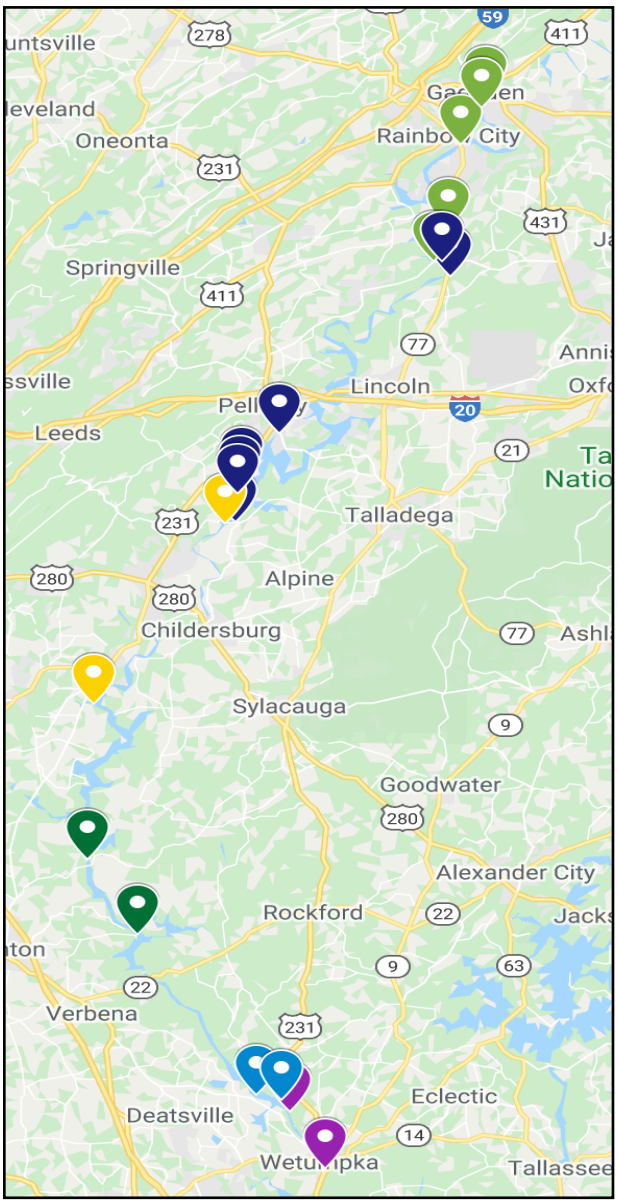
Appendix Table 1: Alabama Fish Consumption Advisories 2020 & 2021 for the Coosa River.

Waterbody	Location	Species of Fish	Advisory
Choccolocco Creek	In the vicinity of Boiling Springs Road bridge crossing (Calhoun County)	Spotted bass	2 meals/month (Mercury)
	Entire length of creek from south of Oxford to Logan Martin Reservoir. (Calhoun, Talladega Counties)	All species	Do Not Eat Any (PCBs)
	In the vicinity of County Road 399 bridge (Talladega County)	All species	Do Not Eat Any (PCBs, Mercury)
	Choccolocco Creek embayment, approximately 1.0 mile upstream of lake confluence. (Talladega County)	All species	Do Not Eat Any (PCBs)
Coosa River	Between Riverside and Logan Martin Dam. (St. Clair, Talladega Counties)	Striped bass	Do Not Eat Any (PCBs)
	Between Logan Martin Dam and the railroad tracks crossing the Coosa near Vincent. (Shelby, St. Clair, Talladega Counties)	Striped bass	1 meal/month (PCBs)
	Lay Reservoir between Logan Martin Dam and Lay Dam (Chilton, Coosa, Shelby, St. Clair, Talladega Counties)	Striped bass	1 meal/month (PCBs)
Lay Reservoir	Lower reservoir, dam forebay. (Chilton County)	Largemouth bass	1 meal/month (PCBs)
		Striped bass	1 meal/month (PCBs)
	Approximately 1.5 miles downstream of US Hwy 280 bridge. Vicinity of Coosa River mile 444.0 (Shelby County)	Channel catfish	2 meals/month (Mercury)
		Largemouth bass	1 meal/month (PCBs)
	Two miles downstream of Logan Martin Dam and 0.5 miles downstream of Kelly Creek/Coosa River confluence. Vicinity of Ratcliff/ Elliot Island (St. Clair County)	Channel catfish	1 meal/month (Mercury)
		Spotted bass	Do Not Eat Any (Mercury)
		Striped bass	1 meal/month (PCBs)
Logan Martin Reservoir	Lower reservoir, dam forebay (St. Clair, Talladega Counties)	Striped bass	Do Not Eat Any (PCBs)
	Approximately Logan Martin Reservoir at Riverside near the confluence of Blue Eye Creek. Alabama Power reservoir mile 20.0 (vicinity of Interstate 20 bridge). (St. Clair County)	Blue catfish	1 meal/month (PCBs)
		Channel catfish	1 meal/month (PCBs)
		Spotted bass	1 meal/month (PCBs)
		Striped bass	Do Not Eat Any (PCBs)
	At Ragland near the confluence of Aker Creek, Alabama Power Reservoir mile 40.0 (St. Clair County)	Blue catfish	1 meal/month (PCBs)
		Striped bass	Do Not Eat Any (PCBs)
Weiss Reservoir	Lower reservoir, power dam forebay. (Cherokee County)	Black crappie	1 meal/week (PCBs)
		Blue catfish	1 meal/month (PCBs)
		Channel catfish	1 meal/month (PCBs)
		Largemouth bass	1 meal/month (PCBs)
		Striped bass	1 meal/month (PCBs)
	Mid reservoir, immediately upstream of causeway at Cedar Bluff. (Cherokee County)	Black crappie	1 meal/week (PCBs)
		Blue catfish	1 meal/month (PCBs)
		Channel catfish	1 meal/month (PCBs)
		Largemouth bass	1 meal/month (PCBs)
		Striped bass	1 meal/month (PCBs)
	AL/GA state line. (Cherokee County)	Black crappie	1 meal/week (PCBs)
		Blue catfish	1 meal/month (PCBs)
		Largemouth bass	1 meal/month (PCBs)

Appendix 3: Map of the Coosa Valley



Appendix 4: Map of Creel Survey Locations.



2020 Creel Survey Location Key:
5 Neely Henry Lake: Light Green
7 Logan Martin Lake: Navy Blue
2 Lay Lake: Yellow
2 Mitchell Lake: Dark Green
2 Jordan Lake: Light Blue
2 Coosa River Tailwaters: Purple

20 Creel Surveying Efforts

2021 Creel Survey Location Key:
9 Neely Henry Lake: Light Green
6 Logan Martin Lake: Navy Blue
6 Lay Lake: Yellow
2 Mitchell Lake: Dark Green
2 Jordan Lake: Light Blue
3 Coosa River Tailwaters: Purple

28 Creel Surveying Efforts