
• KEEPING WATCH OVER OUR WATERS SINCE 2010 •



Fishing for Answers:

an analysis of data from anglers who consume fish from the
Coosa River based on the 2020 and 2021 Creel Survey

Report by

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PURPOSE OF THE REPORT

Responses from anglers that consume fish in the 2021 Creel Survey Report were analyzed to better understand the demographics, behaviors, and general understanding of fish consumption advisories held only by those anglers who answered “yes” to eating fish from the Coosa. 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, the main goal of this analysis was to discern whether or not survey participants who eat fish from the Coosa are adequately informed about fish consumption advisories enough to protect their health and their families.

Gaining a better understanding of this specific demographic, anglers that eat fish from the Coosa, was also an important factor as it could aid in improving fish consumption advisory outreach and the dissemination of information. Learning more about anglers’ specific eating and cooking habits is important to recognize how contaminants found in state-issued fish advisories are actually making their way into their bodies and their families.

METHODS

Methods used to survey anglers can be found in detail in the 2021 Creel Survey Report by Coosa Riverkeeper. A team of interviewers traveled around the Coosa watershed to popular boat ramps and fishing holes to meet and survey anglers found fishing there. In addition, an online survey was available for people to complete virtually distributed via email and social media. This subsequent report was created using the same data generated by the original Creel Survey project, but this is a new analysis of the data found to learn more about the Coosa fish eaters.

RESULTS

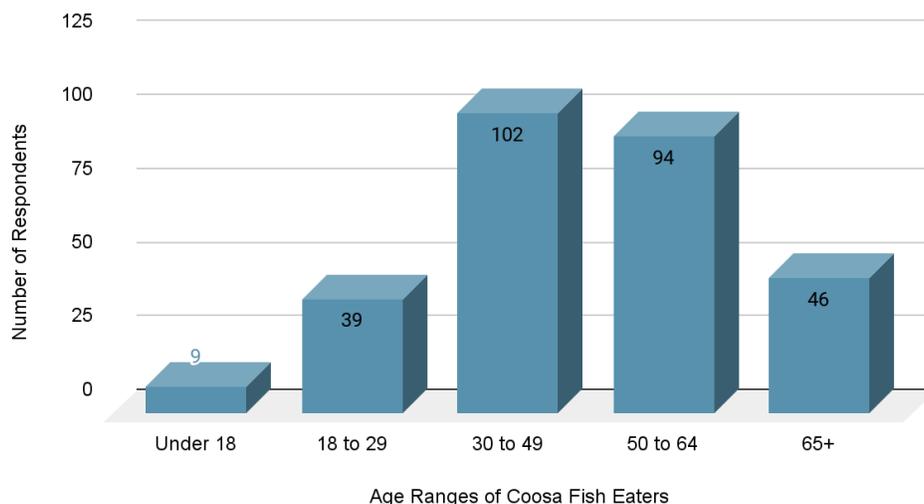
To answer the question of whether anglers who consume fish from the Coosa River are adequately informed about fish consumption advisories enough to protect themselves and their families from contaminated fish, Coosa Riverkeeper has selected a few survey questions to take into consideration from the overall surveying effort. The following results section below will compose of the 290 completed responses from anglers who indicated they consume fish, including those who wished to remain anonymous. This subgroup of Coosa River fish eaters

comprises 60.8% of the total cohort of anglers interviewed over the two years of the creel survey effort.

Demographics

Anglers surveyed were from 96 different Alabama postal ZIP codes represented from 29 different counties, along with 1 from Ohio, 1 from Tennessee, and 5 zip codes from Georgia. When asked to identify their home town or water body, 98% of anglers indicated they hail from ZIP codes within Alabama. The most popular lake in Coosa Riverkeeper's scope that anglers reported being from was Neely Henry Lake, with 76 anglers frequenting the area.

Figure 1: Age of Coosa Fish Eaters

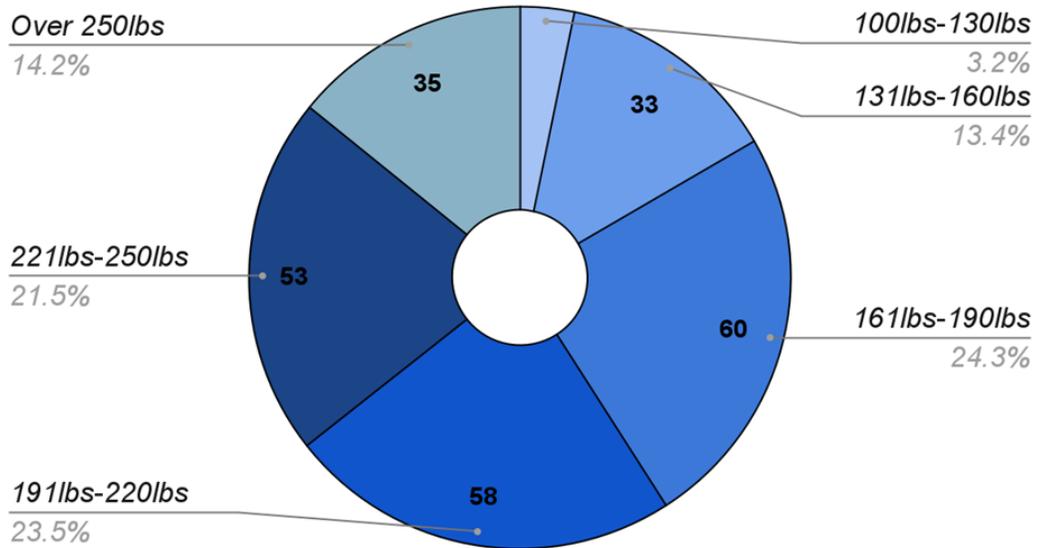


The age groups represented by Coosa River fish eaters ranged from under 18 to over 65. The largest portion of anglers were 30 to 49 years old (35.1%), closely followed by 50 to 64 years old (32.4%), over 65 years old (15.8%), 18 to 29 years old (13.4%), and under 18 years old (3.1%) (Figure 1). The gender of the survey participants analyzed was 240 men (82.7%) and 49 women (16.9%). Caucasians formed the largest ethnicity of Coosa River anglers surveyed (77.2%) while also present were African Americans (17.5%), Native Americans (0.7%), Asians (0.7%) Hispanic (0.7%), multiple ethnicities (2.1%), and those who prefer not to say (1%).

Anglers also were asked to provide their estimated body weight. 85.1% chose to provide an estimated weight while some (14.9%) chose not to answer the question or gave nonspecific answers. Anglers' body weight gathered in the survey ranged from 100lbs to 300 lbs with body weight being batched into 6 separate categories for ease of analysis. The most common weight

range represented was 161 lbs -190 lbs (24.2%), see Figure 2 for more details on common weight ranges represented by Coosa fish eaters.

Figure 2: Angler's Body Weight

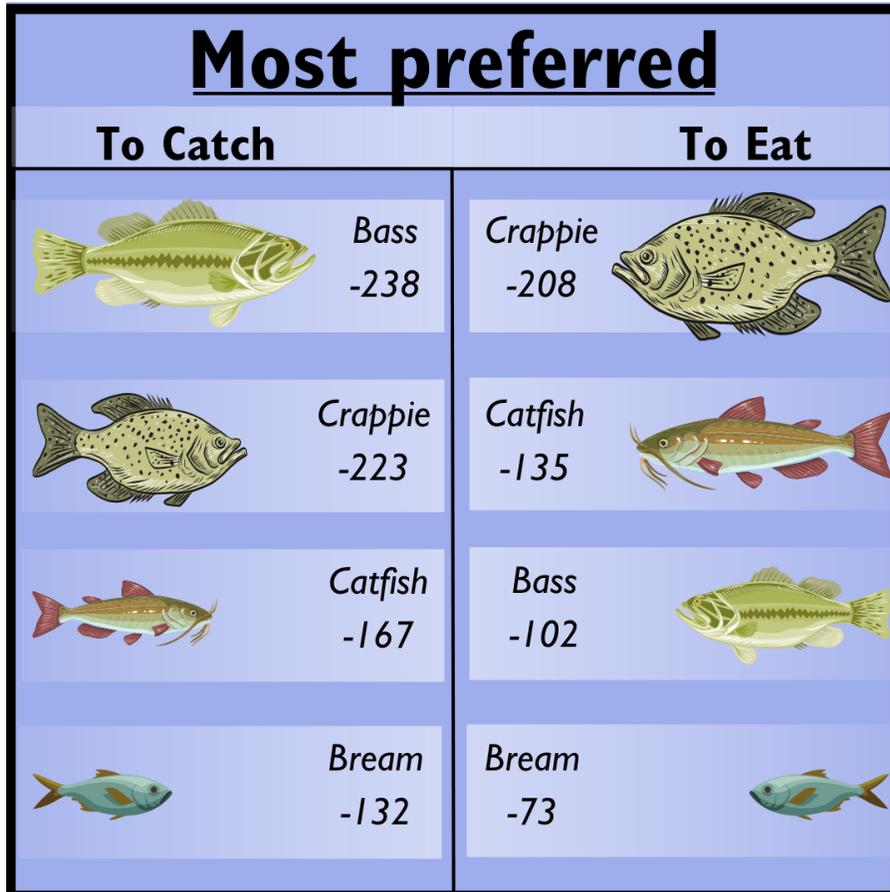


Fishing Habits on the Coosa

When asked how often they typically fish the Coosa, almost half of fish eaters find themselves fishing one to four times a week (45.8%), many fish a few times a month (36.5%), a few fish more than 5 times a week (8.9%), and finally the smallest group of fish eaters fish less than once a month (8.6%). Anglers were also asked how long they had been frequenting the Coosa watershed for fishing. The majority have been fishing the Coosa for more than 20 years (58.9%) while the remainder have been fishing for 5 to 20 years (28.2%) or less than 5 years (11.3%).

For recreational purposes alone, disregarding whether or not they eat it, anglers were asked what species of fish they target the most. The most popular response was bass from 82% of anglers, see Figure 3 for more details on popular fish choices. The survey also asked anglers to estimate the amount they spend on fishing annually, which should have included costs like fuel, travel, bait, tackle, ice, and any other equipment. Responses ranged from \$0 to \$50,000, but the average amount spent on fishing by Coosa fish eaters was \$2,521, the median amount was \$500, and the most frequent amount answered was \$100 (31 responses).

Figure 3: Angler's Favorite Fish to Catch vs to Eat



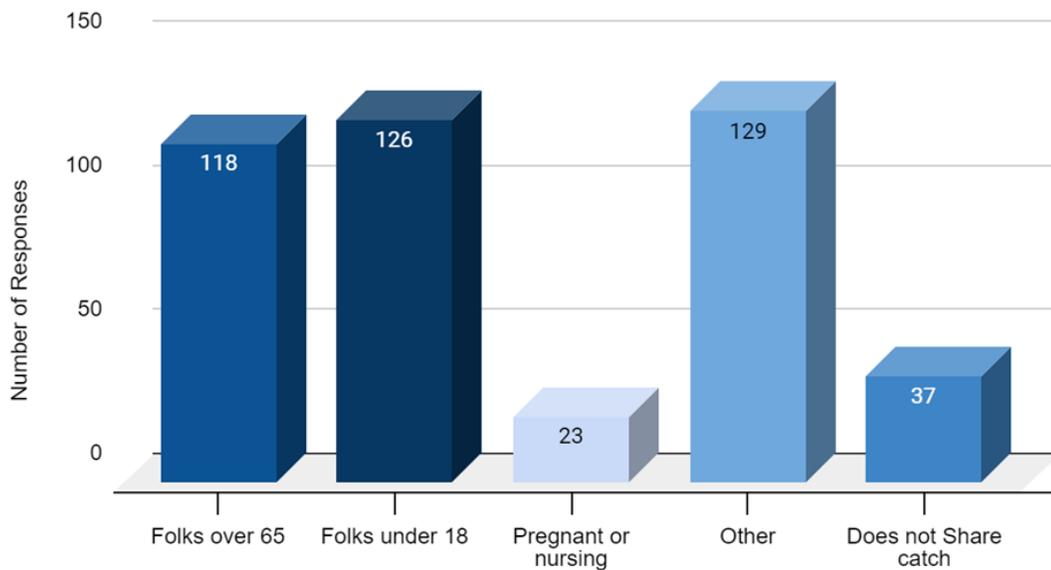
Eating & Cooking Habits

The surveyors felt it was critical to gather information about anglers' eating and cooking habits of Coosa catch in order to gain better understanding of how fish eaters might be ingesting contaminants found in state-issued fish advisories. Coosa River fish eaters were asked to indicate their preferred species when targeting fish for dinner. Crappie was the most popular choice for eating as stated by 71.7% of anglers. See Figure 3 to compare popular fish for catching versus popular fish for eating. Frequency of fish eating was also obtained in the survey. The most common response indicated many anglers are eating fish a few times a year (44.2%) The second most popular response, "once weekly," was volunteered by 21.8% of anglers, "once yearly or less" was chosen by 14.8%, "once monthly" was chosen by 10.3%, and eating fish "two or more times weekly" was indicated by 8.6% of the Coosa fish eater cohort.

Coosa surveyors also collected information about anglers’ cooking habits, such as how Coosa caught fish are prepared and eaten. Prior to cooking, the majority of anglers (87.5%) preferred to filet their catch entirely, removing skin and belly fat. Other anglers preferred to filet their catch but leave the skin on (5.6%) or cook the fish whole (5.2%) and a few just could not choose only one filet method (1.7%). In regards to how individuals cooked their fish, most (63.7%) preferred to deep fry, while 22.2% preferred to pan fry, 8.3% stated they grilled, 3.5% baked, 0.7% smoked their catch, and 1.7% of anglers simply could not choose only one cooking method. Due to the popularity of frying fish, the survey also asked anglers about their reuse of cooking oil. Half of the fish eating anglers did not reuse cooking oil while 39.9% reused their oil just once or twice and 9.4% reuse their cooking oil more than 3 times.

Due to the cultural popularity of sharing fresh catch in the South, the survey also asked anglers about who they might share their Coosa catch with. Multiple answers were allowed to be selected for this question, but overall 87.6% of fish eaters shared their catch with another person. See Figure 4 for more details about who else eats Coosa catch once it leaves the river.

Figure 4: Who Else Eats Coosa River Fish



Knowledge of Pollutants, Harms, and Advisories

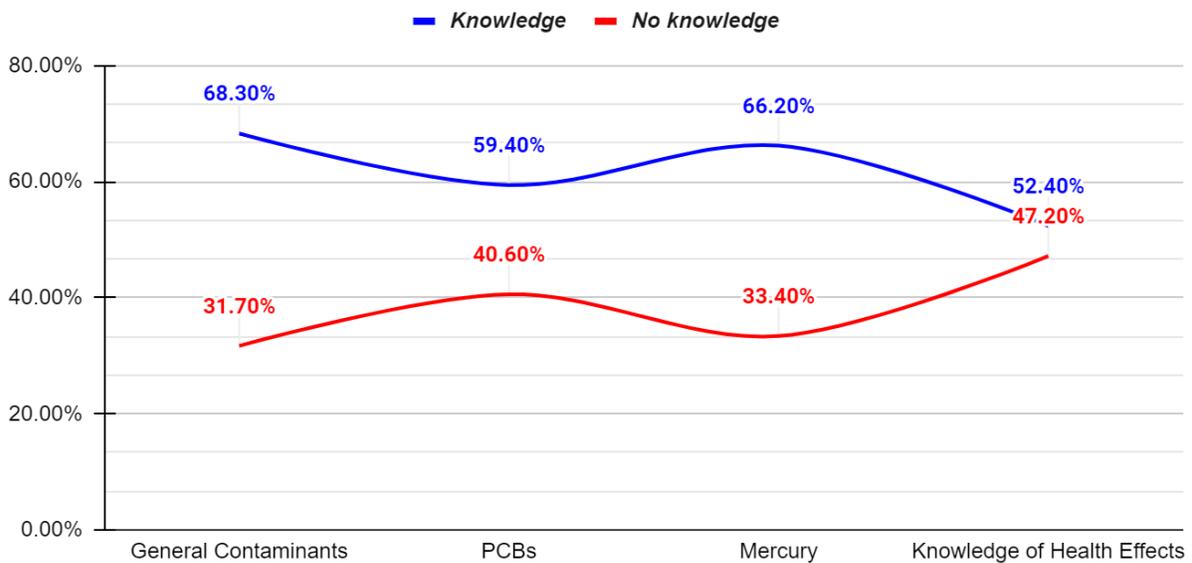
Awareness of state-issued fish consumption advisories held by anglers that eat fish from the Coosa was analyzed. Based on all of the survey responses gathered, slightly more half of fish consumers (56.9%) were already aware of fish consumption advisories, a few (14.1%) had some knowledge, and the remainder (29%) were completely unaware of fish advisories. Immediately

afterwards, anglers were also asked to describe whether they felt they knew specifically what fish advisories say. Almost half (49.3%) stated they do know what the advisories say while 50.7% of the fish eating cohort were less confident.

Anglers were also asked about ease of access to fish advisory information. When asked whether or not having easier access to fish consumption advisories would motivate them to follow them more, the vast majority of anglers (79%) said that it would. A smaller percentage (16.8%) stated no due to personal opinions or trust in visual inspections, and 4.2% said that it might motivate them further.

Awareness of contaminants being present within the Coosa River was also asked. When asked if they had heard of pollution or contamination existing in the Coosa River or its fish, 68.3% of the fish eating anglers had, while 31.7% were unaware. Immediately afterward, anglers were then asked if they had heard of PCBs and mercury contamination in the Coosa. Despite the overwhelming presence of PCB contamination causing fish advisories on the Coosa River, more anglers in the fish eating cohort of anglers were aware of mercury than PCBs. See Figure 5 to breakdown which contaminants respondents were aware of in the Coosa River before taking this creel survey.

Figure 5: Angler's Prior Knowledge of Contaminants and Health Effects



Near the end of the survey, anglers were surveyed about their awareness of health effects from consuming contaminated fish. This could be answered with a simple yes or no, and no specific health effect was inquired about. Based on all of the survey responses gathered, 52.6% of anglers indicated they are aware of, or have heard of, health effects from eating

contaminated fish while 47.4% had not heard of health effects, or were unaware. Revisit Figure 5 to see how this data stacks up with angler's knowledge about contaminants.

Individuals who were previously aware of fish consumption advisories prior to the survey were asked where they had first encountered information regarding fish consumption advisories. This was an open ended question that allowed a large variety of answers. Of that variety, answers were clumped into broad categories based on the information they provided. Most respondents (222) chose to answer this question and the largest group of fish eaters, 117, stated that Outdoor Alabama (online and social media branch of Alabama's Department of Conservation and Natural Resources) was their source for fish consumption information. 96 used the internet or some form of social media, 51 learned from Alabama Department of Public Health (ADPH), 39 respondents heard about advisories from local news stations. 23 respondents used fish consumption signage, 21 respondents heard through word of mouth, and 29 stated a mix between television, radio, and Coosa Riverkeeper.

DISCUSSION

Isolating and analyzing the data set provided by the fish eating cohort of Coosa River anglers from the Creel Survey was a necessary, crucial method in determining suggestions to most effectively provide fish consumption advisory information for those that need it the most - the anglers and their families that eat fish. 290 responses collected over two years of survey data from only those who eat Coosa River fish were analyzed to learn more about the demographics, fishing habits, eating habits, and attitudes of anglers who are most relevant to fish consumption advisories. Learning more about the anglers who consume fish and their families allows for the development of strategies for improving the fish consumption advisory and outreach programs that take the attitudes and beliefs of the anglers most relevant into account. This section will highlight a few significant demographics found in the fish eating cohort of anglers; their preferred fish and cooking methods and its significance to the fish advisories; their prior knowledge of advisories, contaminants, and their health effects; and the impacts of fish beyond the docks on others who consume fish and how anglers suggest improving the advisories.

Demographics & Fishing Habits

It is important to highlight once again that the majority (60.8%) of the total anglers encountered by the survey have eaten Coosa catch and the vast majority (87.1%) of those fish-eaters have been frequenting the Coosa for at least 5 years. This suggests the Coosa River is a favorite place to return for fishing over and over again for locals as nearly all anglers that eat Coosa catch reside in the state. Given that the average angler surveyed finds themselves fishing at least once a week, if not more, it is safe to say the Coosa River is a very popular fishing destination for those consuming fish.

The purpose of much of the demographic information gathered was simply to further characterize the subset of anglers consuming Coosa River fish for Coosa Riverkeeper. Figure 1 shows the average fish eating angler is middle aged, but the survey did encounter youth and elderly anglers that also eat fish. Similarly with gender and race, the average angler surveyed was male and Caucasian, but the survey also encountered fish-eating anglers that were female (16.9%) and people of color (21.7%). Fishing has been gaining popularity across the board since the COVID-19 pandemic, so it was important to this survey to gather some perspectives from a range of demographics. Speaking to the community benefits from fishing, this survey found that each angler generates an average of \$2,521 of economic activity through fishing activity each year, which undoubtedly contributes to the local economy around the Coosa River.

Asking anglers about their average body weight was a sticky question for some, but most anglers were happy to provide their weight once the reasoning behind the question was further explained. In Alabama, the state-issued fish consumption advisory advice is calculated with an assumed subject of an adult male of 155 lbs in order to decide the appropriate level of consumption. As Figure 2 demonstrates, most Coosa River fish eaters fall above or below the assumed weight that fish advisories are written for. While the public is generally appreciative that fish consumption advisories are issued at all, several anglers anecdotally told the interviewers that the advice should be tailored for a range of body sizes. A better solution would be for the state to offer varied fish consumption advice for a variety of adult body weights with special advice for women and children.

Fish Selection & Cooking Methods

Interestingly, anglers' preferred type of fish to catch casually versus their favorite to catch for eating varied slightly. As shown in Figure 3, it seems the fish-eating anglers' tastes change when targeting fish for eating instead of fishing for fun. Bass are by far the most popular

catch; however, when anglers were searching for fish to eat, crappie is undoubtedly the most popular choice. The fish tissue monitoring program in Alabama does not focus on testing crappie beyond the Coosa region despite its apparent popularity among anglers. Typically, fish advisories are issued based on which fish the state agencies are able to locate and catch when conducting sampling, and there are a lot of bass and catfish fish consumption advisories. Figure 3 demonstrates that anglers prefer different types of fish other than those most commonly tested. Perhaps the state should strive to catch, test, and offer fish consumption advice for crappie more often as it is the crowd favorite to consume.

Not just being aware, but understanding fish consumption advisory information is an important step for safely eating fish from the Coosa. The way in which caught fish are prepared and cooked is important to acknowledge in understanding how much contamination might be consumed by anglers and whoever else they share fish with. PCBs and some PFAS compounds accumulate within the fatty tissue of fish; therefore, preparation methods that physically remove the fatty tissue from fish reduce exposure to the health-hazardous chemicals. Preparing a fish in a way that removes PCB exposure involves fileting the fish completely, by removing the fatty tissue, guts and removing the skin. Fortunately, most anglers surveyed already do this to prepare their catch for dinner. It is unknown if this method is preferred to prevent contamination, if it is simply how they like to eat their catch, or both. However, it is logical to assume that this method is simply how people like to eat their fish, but they will still benefit from the reduction in contaminants all the same.

Angler's choice in cooking methods appears based on the tradition of a family fish fry as is represented by their preferred cooking methods for Coosa-caught fish. Most anglers prefer to deep fry or pan fry their Coosa catch. Choice in cooking methods matters especially in receiving the health benefits from consuming fish, a healthy protein low in fat. Certain cooking methods are better at drawing fatty tissue away from the fish versus others, such as grilling, baking, steaming, boiling, or broiling, and are ideal for consuming fish leanly. However, when it comes to PCB contamination, deep frying fish is actually the superior method for removing as much PCB contamination as possible and reducing the risk of exposure for those consuming contaminated fish. Frying appears to remove more than 50% of the PCBs while other methods such as baking, broiling, microwave cooking, poaching, and roasting remove approximately 20 to 30% of the PCBs (Sherer and Price, 1993).

It is difficult for the interviewers to suggest the best cooking methods for Coosa caught fish as the traditional, healthiest cooking methods do not remove PCBs as effectively. Expanding upon the popularity of frying fish, reuse of cooking oil was also very popular. While frying

PCB-contaminated fish in oil will reduce the overall concentration of PCBs, danger arises when that cooking oil is reused repeatedly and becomes laden with PCBs. Given that frying fish is the most popular way to cook caught fish on the Coosa, it is critical to take oil reuse into account when providing anglers with fishing advice and education. At the very least, if we cannot prevent the majority of people from frying fish, the next best approach involves educating the 39.3% of individuals that reuse cooking oil once or twice and the 9.3% who reuse oil more than three times about the harms associated with doing so and to encourage the habit of discarding frying oil after use.

Knowledge of Advisories, Contaminants, and Health Impacts

Taking into consideration that around 87% of anglers have been fishing and eating from the Coosa for more than 5 years, it was alarming that only 60% of anglers were previously aware of fish consumption advisories before encountering this survey. Nearly all of those that were unaware of fish consumption advisories have been fishing on the Coosa for longer than 20 years. In essence, this means that a significant amount of anglers have been fishing for food on the Coosa for years without ever hearing about fish consumption advisories. The interviewers made sure that every angler spoken to walked away with more knowledge about fish consumption advisories and how to protect their families from exposure; however, they were shocked to learn just how many anglers have not encountered fish consumption advice despite fishing the area for decades.

It was encouraging to see that over half of the anglers who eat fish from the Coosa have heard of the existence of fish consumption advisories. However, when asked further about if they know specifically what advice those advisories have to say for the Coosa, only about a third stated they felt they had sufficient knowledge of what those advisories said. This means that roughly 3 quarters of anglers do not feel confident in what fish advisories specifically say, such as specific locations and fish to limit eating. There is something missing from fish advisory education that prevents these anglers from feeling confident about their choice in selecting fish to consume, even if they are aware that advisories exist.

Figure 5 displays the slight differences in angler's knowledge of contaminants, health effects, and specific contaminants like PCBs and mercury. While it is heartening that nearly 70% of anglers were already aware that pollution exists in the Coosa River, it is concerning that those percentages of awareness drop when anglers were asked about specific contaminants that have been found in the Coosa, like PCBs and mercury, and their associated health impacts. This

is a concerning figure as the majority of fish consumption advisories listed for the Coosa in 2022 are due to PCB contamination. Awareness is the first step in fish consumption advisory education, but this further indicates that simply being aware of contaminants does not translate to deeper knowledge about specific contaminants and measures to take on how to protect themselves and their families.

Only about half of the consumers were previously aware that health effects could even come from eating contaminated fish over time, as shown in Figure 5. There appears to be a disconnect between making the public aware of fish consumption advisories and making those advisories easy to understand and apply to fishing and eating habits. Ensuring that the individuals that consume fish from the Coosa are safe and knowledgeable about what they are eating will take a multi-pronged approach, and part of that approach involves cooking and fish preparation education. There are cooking methods that can reduce the amount of pollutant that is ultimately consumed, and the Coosa River anglers that consume fish need to know this information. Of course, this is even further substantiated by the fact that the vast majority of anglers would choose to follow fish consumption advisory advice if they had easier access to the information.

Impacts of Fish Advisories Beyond the Docks

In conducting this survey, it became apparent to Coosa Riverkeeper that the impact of fish consumption advisories are felt far beyond the docks or banks of the Coosa River. Once fresh catch leaves the Coosa, most anglers surveyed (87.6%) tend to share their fish freely and widely with their families and community. As further described in Figure 4, anglers commonly share their fish with elderly over the age of 65 and youth under the age of 18. These sub-groups are important to highlight as fish eaters that are impacted by fish consumption advisories because they are at a higher risk of health effects due to consuming fish. Children and elderly tend to have smaller body weights than the advisories are calculated to be protective of, and therefore should probably eat less than the advisory amount of fish to be safe. Additionally, some anglers shared their catch with women who may be pregnant, nursing, or wish to become pregnant. Pregnant women are at a particularly higher risk of health impacts from fish advisories as mercury has been proven to be detrimental to fetal development, newborn cognition, fertility, and many more adverse maternal outcomes. It is likely that the proportion of children, elderly, and reproductive women who consume Coosa River catch would be higher if those

who cook at family gatherings were also interviewed. Fish consumption advisory education strategies should take into account that fish are shared widely once they leave the river.

While anglers' macro view that fish consumption advisories exist is present, knowledge about the specifics of what those advisories actually mean appears to be muddled at best. The data analyzed supports the idea that the majority of people do not understand the specifics of advisories, but it should be stated that this is not entirely unexpected. The information that fish consumption advisories are designed to get across are very specific to certain anglers across multiple Alabama watersheds due to the fact that advisories provide advice for specific locations. Anglers who eat fish from the Coosa would most likely only be interested in those that pertain to their favorite fishing spots. Additionally, some anglers trust a visual inspection over a fish consumption advisory, which can possibly be attributed to similar reasons. If an individual has grown up using visual inspections as a way to distinguish "good" fish from "bad" fish and has never witnessed any negative health reactions, then it's logical to conclude that some will trust their own judgment concerning fish selection. Ideally, it should be a goal to reach every individual that eats fish from our watershed with fish consumption information to ensure safe nourishment. However, this is understandably not possible with the understanding that some individuals, though a small portion, simply do not care to follow them. This does however support the idea that we need to not only make fish consumption advisory information more accessible, but we need to also expand upon the public's perception of its significance to their long term health.

Providing cooking education, or at least stressing the importance of proper cooking methods, can act as a secondary filter towards healthier eating and a healthier population. For those individuals that cannot be reached with the traditional publishing of fish advisories, for instance those that seem not to trust fish advisory information, may be more inclined to follow cooking/preparation directions that are designed to limit the amount of exposure to contaminants. Additionally, the sources of fish consumption advisory information that originally informed the anglers about the existence of advisories should be used for education as well. Outdoor Alabama, or the Alabama Department of Conservation & Natural Resources, is a popular source of information that anglers heard of advisories from. However, their popular mobile app includes no mention that fish consumption advisories even exist in the sections providing information about freshwater fishing.

CONCLUSION

This survey allowed Coosa Riverkeeper to learn significantly more information about the fish eating population that frequents the Coosa River watershed. Separating out this information specific to those who eat fish has been beneficial for developing strategies to improve the existing fish consumption advisory program and outreach. So many factors impact how folks in Alabama consume fish such as who anglers share with, how fish are prepared and cooked, how much gets eaten, and a plethora when preparing educational strategies. It is impossible to reach all of them with a singular approach, so in order to reach as many people as possible, multiple approaches may be necessary: advisory education, toxin education, and cooking education are just a few examples.

Comparatively to the whole cohort of Coosa anglers encountered by this survey, it was disheartening to discover that the fish eating anglers were generally slightly less aware and educated about fish consumption advisories, health impacts, and pollution. However, Coosa Riverkeeper is thankful for the opportunity to interview those anglers who eat fish because they are most pertinent to fish consumption advisories and our efforts to improve education and outreach. We will be taking the findings of this report and previous into consideration when developing suggestions for improving the fish consumption advisory program and associated public outreach.

References

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**Want to tell us about your fishing experiences on the Coosa?
Fill out our 2022 Creel Survey [HERE!](#)**

Attachment I: Heat Map of Coosa River fish consumers.

