

**Understanding Angler Preferences and Participation for Management of Alabama  
Recreational Fisheries**

by

Jessica Leigh Quintana

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Approved by

Wayde Morse, Chair, Associate Professor of Forestry and Wildlife Sciences  
Elise Irwin, Associate Professor of Fisheries, Aquaculture and Aquatic Sciences  
Terrill R. Hanson, Professor of Fisheries, Aquaculture, and Aquatic Science  
Todd Steury, Associate Professor of Forestry and Wildlife Sciences

## Abstract

Due to recent declines in the number of licensed freshwater anglers, there is an increasing demand to understand angler preferences and how that impacts participation. Incorporating angler characteristics into traditional fisheries management allows managers to better understand how a fishery is being utilized and how changes might impact those users. Key areas where anglers differ that impact participation rates are their motivations for fishing, their level of specialization as an angler, catch orientation, and their species and setting preferences for selecting where to fish. Despite extensive research on angler characteristics within the literature, state – wide surveys that include research on anglers and how they can influence management decisions has never been studied in Alabama. This paper address those research needs, demonstrating critical differences within the angler population, and how those differences can help inform management decisions to aid in angler recruitment and retention efforts.

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## List of Abbreviations

ADCNR Alabama Department of Conservation and Natural Resources

PCA Principal Component Analysis

TCM Travel cost method

WFF Wildlife and Freshwater Fisheries Division



## Chapter 1: Introduction and Methods

### **Introduction**

Management of recreational fishing resources demands not only an understanding of ecological processes, but also an understanding of the wants and needs of recreational anglers. Recreational angling is an important historic pastime such that in 2011, one in seven U.S. residents 16 years old and older went fishing and spent US\$41.8 billion in total expenditures, which includes equipment, licenses, and associated travel costs (U.S. Fish and Wildlife Service, 2012). Because state funded agencies rely on revenue from license sales and excise taxes from equipment for management of fishery resources, a comprehensive understanding of all aspects of management is required to meet the needs of anglers. Larry Nielson (1999) identified three essential principles to fisheries management: the organisms, their habitats, and humans that utilize both organism and habitat. By considering angler characteristics and preferences, fisheries managers can design best management practices that provide healthy ecological systems, while also creating an environment that attracts and satisfies anglers.

In Alabama alone, anglers spent US\$456 Million on fishing trip related expenditures in 2011 (U.S. Fish and Wildlife Service, 2012). However, consistent with national trends, sales in fishing licenses in Alabama have declined. In 2011, anglers spent US\$9.5 million on fishing licenses in the state as compared to 2012 where less than US\$8.9 million were spent. The best way to understand how to increase license sales is to evaluate those that purchase the licenses. The importance of understanding angler characteristics such as why people fish (motivations), how committed they are to the activity (specialization), and type of place they prefer when they go fishing (setting preferences) is the first step in evaluating use of a fishing resource and is

critical for developing management practices to increase recreational fishing activity throughout the state.

### *Motivations*

An aspect of management that has been long proposed evaluates user motivations. Motivations can help natural resource agencies design management interventions that will align recreation settings with anglers' desired outcomes from their recreation experience (Driver & Knopf, 1976). Also known as the Recreation Experience Preference (REP), managers can evaluate site specific participation by investigating differences in motivations of users (Manfredo et al., 1996). Many studies have found that anglers participate in recreational fishing for more reasons than to "just catch fish." Schramm et al. (2003) found motivations fall into activity specific and activity general categories. Activity specific motivations include catching trophy size fish to catching a lot of fish, or just catching fish to eat. The activity general category includes items such as outdoor and social experiences, personal challenge, competition, and escape. These findings have been consistent with previous studies conducted (Driver, 1985; Finn & Loomis, 2001).

Comparisons of motivation studies for fishing have yielded results that place motivations into five major categories: Psychological-Physiological, Natural Environment, Social, Fisheries Resource, and Skill and Equipment (Felder & Ditton, 1994). Psychological-Physiological motivations include relaxing and escaping daily routines; additional Natural Environment related motivations include being outdoors or experiencing natural surroundings. These two motivation categories have consistently remained as the top reasons across studies. Schramm and Gerard (2004) compared fishing motivations from surveys conducted in 1987 and 1997. In the ten year

lapse, “for relaxation” and “to be outdoors” ranked as the top two reasons for fishing among United States anglers. Additionally, a study was conducted comparing motivations of Texas anglers over 16 years, the exact same reasons, “to be outdoors” and “for relaxation” remained at the top in 1990 and in 2006 (Lu et al., 2009).

The greatest variations in motivations for fishing were found when comparisons were made among different angler groups. Felder and Ditton’s (1994) study analyzed 17 angler motivation studies and found the most significant difference among groups in the Fisheries Resources motivation category. This group includes reasons such as “to catch fish to eat”, which ranked with high importance to Texas charter anglers, conversely ranking as of little importance to the other angler groups. Similarly, tournament anglers placed higher importance on “for the challenge of catching fish” or “to catch a trophy size fish” than any other group of angler, which ranked these reasons as of little importance. Comparisons have also been made between genders (Schroeder et al., 2006) and found that women placed “to catch fish for food” as of higher importance as a motivation and that men placed greater importance on motivations involving “catching trophy size fish” or those related to skills and knowledge. Furthermore, the final motivation category, Skills and Equipment, also remained consistently as the least important reason as to why anglers fish. This motivation category, which includes reasons such as “to test my skills” or “to test my equipment” has been found to be the less important reason for participating in recreational fishing (Schroeder et al., 2008). Another method of grouping anglers includes identifying differences in their specialization levels. Chipman and Helfrich (1988) study on Virginia anglers identified differences between their six distinct angler types. Using specialization has frequently been used as a way to further highlight differences in motivations of anglers (Wilde et al., 1998; Hutt & Bettoli, 2007; Beardmore et al., 2011).

## *Specialization*

Within recreational groups, participants vary among attitude and behavior, which can lead to significant differences in not only motivations, but also setting preferences and experience satisfaction. The Specialization framework was an idea first developed regarding anglers (Bryan, 1977) and is defined as a multidimensional concept that includes cognitive elements (knowledge and skill level), psychological elements (centrality to lifestyle, commitment to activity), and behavioral dimensions (frequency of participation, equipment accumulated) (Beardmore et al., 2011). Hobson Bryan's (1977) study illustrated that as specialization from the novice occasional fisherman to the highly specialized "Bassmaster", the investment in fishing increased; whereas "Bassmaster" anglers spent more money, had more specialized equipment, and social groups were dependent on fishing. Conversely, the occasional angler illustrated low specialization by spending less time and money allotted toward fishing. Many studies have found that specialization directly relates to individual components of a recreational trip such as motivations and/or setting or environmental attributes (Hutt & Neal, 2010). Additionally, level of knowledge, level of commitment, and level of interest have all been found to have a positive influence on participation in angling (Kuehn et al., 2013).

Specialization studies have found that anglers that identify themselves as specialists are more likely to target a single species during their trips ( i.e. trout) than those anglers that identify themselves as occasional or generalist anglers (Hutt & Bettoli, 2007). More specialized anglers have also been found to have a direct effect on place identity, or identifying with a certain location more strongly, worded as "This water body means a lot to me or is a part of me" (Oh et al., 2012). This finding is consistent with Buchanan (1985) finding that a higher investment of time and economic resources increases the emotional or perceptual bond between an individual

and a recreation site, also known as place attachment. Additionally, anglers that identify themselves as advanced or committed anglers indicated the lowest sensitivity toward license costs or travel considerations and were more concerned with a target species and size of catch, versus number of fish caught which was more important to those anglers that identified themselves as casual anglers (Beardmore et al., 2013). Specialization has also been found to affect management preferences of sites and site selection substitutability. Oh and Ditton (2006) found that recreationalist anglers that were classified with having higher specialization, were more aware of resources changes and were in favor of more strict harvest regulations as compared to less specialized anglers. Furthermore, the level of indicated specialization revealed a negative relationship to substitutability, whereas more specialized anglers were less likely to identify a substitute site for their fishing experiences (Oh et al., 2013; Hyun & Ditton, 2006).

### *Setting Preference*

Preferred settings are the biophysical, social, and managerial environments in which people seek their desired experiences (Driver & Brown, 1978). Biophysical characteristics include species preferred, water type preferred (lake, river, pond, reservoir), fishing access (boat, shore, pier), and other factors including ease of access and location of the site. Social characteristics can include how crowded the site is and the environmental factors include the aesthetics of the site, and the safety and additional amenities offered at the site. Similar to motivations, setting preferences can vary among angler groups. When comparing angler characteristics, Schramm et al. (2003) found that eighteen of twenty correlations between motivations and site selection scales were statistically significant.

Numerous tactics have been used to group anglers to investigate the difference between site preferences. Schuett and Pierskalla (2007) used a cluster analysis to cluster survey respondents of their study into “Active Anglers” and “Family Time Anglers” at fee-fishing sites. Their results indicate that “active anglers” were consistent in catching one target species, whereas “Family Time Anglers” did not show a significant difference in preferred species. Other key differences included a greater importance placed on bait and tackle sales, vehicle access, overnight accommodations, and available staff on site for “Active Anglers”. However, both groups placed high importance on clean restrooms, benches, helpful road signs, and overall well-kept grounds. Previously, studies have grouped anglers based on whether they go alone or with family/friends (Hunt & Ditton, 1997) and if they hold urban or rural residency (Hutt & Neal 2010). Preference differences were consistent among groups, finding anglers that fished alone placed high importance on sites closer to their work and people that fished with family/friends placed higher importance on social and managerial attributes such as preferring areas with boat launches, campsites, and areas where the whole family enjoys recreating (Hunt & Ditton, 1997). When comparing urban and rural anglers, Hutt and Neal (2010) found nine out of 15 significant differences including ones as rural anglers being more interested in sites with scenic beauty, with less crowding, or the presence of traffic. Among the studies that investigated angler site preferences, the greatest differences were found in the biophysical attributes, specifically the species preferred or the number of fish or size of fish being preferred (Connelly et.al., 2013; Schroeder & Fulton, 2013). Carlin et al. (2012) found that site preference increased 20 – 40% for different lakes among walleye anglers when indicating an increase in bag limits.

## **Rationale and Significance**

One of the most important recreational fishing opportunities in Alabama is provided by state managed county public lakes. With over 1,900 surface acres, these lakes provide ample recreational fishing opportunities throughout the state. The Wildlife and Freshwater Fisheries Division (WFF) of Alabama's Department of Conservation and Natural Resources (ADCNR) has expressed a strong desire to understand best management practices that can increase use of these lakes. The Alabama State Lakes program was established in the 1950s to provide local, low cost opportunities to anglers where few opportunities exist. The WFF currently manages twenty public state fishing lakes throughout the state (Figure 1.1); however, use of these lakes has declined in recent years.

Currently, there are no data on state lakes users or preferences and attitudes toward the state lakes since their construction. Statewide angler surveys have been conducted, the most recent in 2002 (ADCNR, 2003), and the survey results yield that the most targeted species is Largemouth bass, which is consistent with the previous statewide survey conducted in 1987. However, a shift from reservoirs to rivers and streams as preferred fishing site, and an increase in catch and release attitude were major changes when comparing results of the two surveys. In the 2002 survey, the county lakes program was ranked as one of the top 5 most important activities performed by Alabama WFF in terms of state-wide freshwater fisheries resources. However, in 2002, only 50% of the survey respondents indicated they were aware of the public state lakes program. Additionally, suggestions from the 2002 survey indicate a need for surveys to be conducted more often to eliminate bias and gather more comprehensive knowledge of the diversity and desires of Alabama's anglers. By asking similar questions from previous surveys, we can identify any trends in freshwater fishing behavior of licensed anglers in Alabama. Also,

by asking questions regarding motivations and preferences, we can better explain responses to our survey results and identify differences between anglers or angler groups..

By targeting the main components of angler attitude, motivation, setting preference and specialization, our study will be able to gather data on anglers and why they do or why they do not utilize the state freshwater fishing resources. We can then use this data to make recommendations for increasing recruitment and retention of anglers in Alabama. Additionally, the information gathered from this study will provide pertinent information toward the expectations and preferences for the public state lakes. With that information, managers and WFF biologists will be able to design management plans for the state lakes. By identifying angler specializations and associated differences in motivations and preferences, management plans can target specific groups of anglers to best meet the needs of those individuals.

#### *Objectives of the study*

In order to understand what changes need to be made to the state lakes and what would increase use of the state lakes; this study has three main objectives:

1. Identify desired expectations and experiences for recreational fishing in Alabama
2. Understand motivations and management preference for current state lakes users
3. Develop best management strategies to meet user expectations to attract new users to the lakes



## **Methods**

### *Data Collection*

In order to meet the objectives of this study, a mixed-distribution approach was implemented to acquire the data. A comprehensive survey was designed in spring of 2014 (Appendix I) and was distributed in two ways: mail-out and hand-out. The mail-out survey was distributed following the Dillman et al. (2009) methods with modifications. The recipients for the mail-out survey were randomly selected from of a list of 2013-2014 Alabama Fishing License holders provided by the Alabama WFF in March, 2014. The agency provided two lists, one of annual licenses sold up to that date and Lifetime licenses holders sold up to that date. We limited our random selection of recipients to resident annual license holders and resident lifetime license holders only to be consistent with previous state-wide administered surveys. From the time of acquiring the license lists, we randomly sampled proportional to the total of lifetime and annual licenses to reach a sample size of 3000. Of that sample size, 1710 or 57% recipients were Annual license holders and 1290 or 43% were Lifetime license holders.

The Dillman (2009) method for survey implementation initially follows a four contact mailing design; however, this method was modified for our study. The first contact includes a pre-notice post card informing the recipient of their selection of participation in the study and informs the recipient that a survey packet will be mailed to the address for completion. Approximately 10 days after the first mailing, the second contact was mailed to the recipients. This mailing included the survey packet which contained a cover letter explaining the projects objectives and the rights of the participants as approved by the Auburn University Internal Review Board, the survey, a printed complimentary map of the state lakes, and a stamped and addressed return envelope for the completed survey. Approximately 14 days after that mailing

and correcting the mailing list for returned surveys or survey packets returned with insufficient addresses, the third contact was sent. This mailing was a reminder post-card that reminds the recipient of being mailed the survey packet and requests their completion of the survey. After approximately 10 days, the fourth contact was mailed. This mailing included a final reminder letter strongly encouraging their participation in the study. However, we modified this contact to also include a step-by-step instruction sheet that allows the participant to complete the survey online provided by Qualtrics Surveys, a free online survey tool available at Auburn University.

Additionally, we included a fifth contact with the recipients. After adjusting the mailing list for returned surveys or insufficient addresses, we selected a sample of recipients to receive a full survey packet with a new letter. The new letter reminded the recipient of previously receiving the survey packet and strongly encouraged participation. At the time of fifth mailing, the response rate was 21.7% after adjusting for insufficient addresses and incomplete surveys. The first mailing began in June, 2014 which correlates with peak summer vacation times, therefore a fifth mailing was included in September, 2014 to target potential respondents that did not respond during the summer months.

The second method of the mix-method approach was the hand-out survey. Using the same survey as the mail-out, I hand delivered surveys at five selected state lakes, Madison County Public Lake, Bibb County Public Lake, Lee County Public Lake, Barbour County Public Lake, and Dale County Public Lake (e.g. Ed Lisenby Lake). The lakes were chosen by Alabama WFF and were selected based on daily permit sales at the lake and lake location. We set a goal to hand-out 100 surveys at each location, sampling each lake both weekend and week days beginning May, 2014 and continuing into July. The surveys were numerically coded per lake for analysis purposes. At the lakes, I approached anglers at the main office on site and explained

the purpose of the project and asked for their participation. If they agreed, I recorded their name and mailing address upon giving them the survey packet. The survey packet was similar to the mail-out but did not include an extra stamped envelope; the participant was instructed to use the one the survey was in to return the survey. Following a period of two weeks, I mailed the participants who did not return the survey a reminder post-card to their given addresses. The script was slightly different from the mail-out by indicating they received the survey on site.

After the completion of the first spring sampling season, a combined response rate for all the lakes was 39.6%. However, our target of 100 surveys at each lake was not achieved; therefore beginning in April, 2015 another spring sample at all the lakes was conducted. Keeping similar to methods of the previous year sampling, each lake was visited a minimum of 3 days, incorporating at least one weekday and a weekend. After the second spring sample, a combined response rate for the five lakes was 35.1%, for a total of 117 useable surveys for both sampling years. It was very difficult to meet the 100 surveys per lake goal with the varying degree of visitation at the lakes.

### *Survey Design*

The survey was designed to identify angler motivations, setting preferences, and fishing trip related factors across the state and at the state lakes. By using a mixed method implementation approach, non-state lake users and current state-lake users were targeted for comparison. Additionally, the survey was designed to ask similar questions as previously administered state-wide surveys by the Alabama WFF regarding species and site preferences.

The first part of the survey contained 13 questions with 24 items asking about general freshwater fishing in Alabama. Multiple item questions are more informative than single-item

questions because they allow survey respondents to indicate their preferences while also indicated feelings toward less preferred items (Vaske, 2008). Participants were asked how long they fished in the state and their frequency of fishing. Additionally, the participants were asked to rate their preferred method of fishing, their preferred species to fish for, and their preferred type of freshwater setting to fish with a Likert scale with (1) being “Do not prefer”, (3) being “Prefer”, and (5) being “Strongly Prefer”. These questions were very similar to previous state-wide fishing surveys and provide an introduction to the survey and encourage the participant to complete the remainder of the survey.

The second section of the survey focused on the participants fishing experience during the 2013-2014 year. This section consisted of 13 questions with 71 items. In this section, participants are asked to rate their level of agreement on a Likert scale with (1) being “Strongly Disagree”, (3) being “Neither agree nor disagree”, and (5) being “Strongly agree” regarding their motivation for fishing in the previous year and their level of commitment. Three of these, with 11 items were used to determine specialization of the respondent and included centrality to lifestyle, behavioral commitment, and knowledge level (Beardmore et al., 2013). Additionally, 4 questions asked respondents to rank their level of importance on a Likert scale with (1) being “Not at all important”, (3) being “Important”, and (5) being “Very important” for selecting a lake to fish. These questions were crucial to undersetting setting preferences and included items related to biological, environmental, managerial, and facility-related factors (Hunt & Ditton, 1997; Hutt & Neal, 2010; Schramm et al., 2003).

The third section of the survey was focused on fishing at Alabama State Lakes. This section contains 5 questions with 13 items about the participants’ frequency of fishing the state lakes. One question asked participants to indicate their number of additional trips they would

take (fewer trips, 0, 1-3, 4-6, 7-9, 10+) regarding improvements at the participants nearest state lake. In this section, participants were instructed to use the map we included in the survey packet to indicate their nearest state lake. This section will allow analysis of frequency of visitation to specific state lakes and provides additional confirmation of setting preferences.

The fourth section of the survey asked 13 questions with 16 items about the participant's most recent fishing trip. Participants were instructed to indicate the location of their most recent fishing trip, related expenditures for that trip, and targeted species. Additionally, we asked 4 questions based on hypothetical management scenarios and asked the participant to indicate the number of additional trips they would take to their previously indicated site (no more trips, 1-3 more trips, 4-6 more trips, 7-9 more trips, 10 or more additional trips). These questions were derived to understand potential use based on management scenario (Oh & Ditton, 2006).

The fifth and final section of the survey included demographic information. This section asked participants to report their age, gender, employment status, ethnicity, education level, and income level. Finally, the last page included a statement of thanks and a space for their additional comments.

#### *Data Analysis and Response Rate*

As completed surveys were returned, participants' responses for each question were entered into the online survey program Qualtrics (2014). This program stored all the survey data and allowed for complete responses in spreadsheet format to be downloaded for analysis using statistical software.

Analysis of survey responses was done through IBM SPSS Statistics 21. Descriptive statistics, such as mean, were completed for each question. Additionally, grouping techniques

such as cluster analysis were used to determine distinct respondent groups following similar methods used by Waight and Bath (2014). Principal Component Analysis (PCA) with Varimax Rotation was used to define commonalities between survey question items. PCA is a commonly explanatory factor analysis tool that uncovers related variables within a larger set of variables (Vaske, 2008). Prior to running the PCA, scale questions were assessed using Bartlett's Test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure. Factor analysis is an acceptable procedure if the test is significant and the KMO score is greater than 0.6 (Tabachnick & Fidell, 2001). Scaled questions were tested for reliability using Cronbach's Alpha test (Vaske, 2008). Comparisons between identified groups of respondents were assessed using one-way analysis of variance (ANOVA) and Chi-squared tests.

In order to ensure the respondents of the survey represent the sampled population, a non-response bias check was conducted (Vaske, 2008). Of the sampled population, 589 surveys were returned as bad/undeliverable addresses or incomplete surveys. Of the 2411 useable surveys, 603 were returned complete and used for analysis for a 25% response rate. To ensure our response population was unbiased, the first step in the non-response bias check was to determine the breakdown of respondents based on license type (Lifetime or Annual License). The original sample contained 1290 (43%) Lifetime license holders and 1710 (57%) Resident Annual license holders, with the list being sampled from licenses sold up to March, 2014. Our response breakdown was 278 (46.1%) Lifetime and 325 (53.9%) Annual license holders.

Additionally, we conducted a non-response bias check against birthdates of provided license holders. The Lifetime license list provided included the birthdate of a majority of the license holders. The birthdates were used to create 4 age brackets, 18-35, 36-50, 51-65, and 66+. Next, the birthdates of the Lifetime License master list, which included 57,354 entries, and the

responses (278) were broken down into those 4 age brackets (Table 1.1). Due to the very similar breakdown of responses into each age bracket, as compared to the Master List, we feel confident that the respondents of the survey were sufficient despite the lower than expected response rate.

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**Table 1.1.** Percent of individuals in each age category for the Master license list and the survey respondents

<b>Lifetime License List</b>	<b>Size (N)</b>	<b>Age Categories</b>			
		18-35	36-50	51-65	66+
Master list	57,345	17.7	32.7	36.6	13.0
Survey Responses	277	17.3	29.6	43.7	9.4

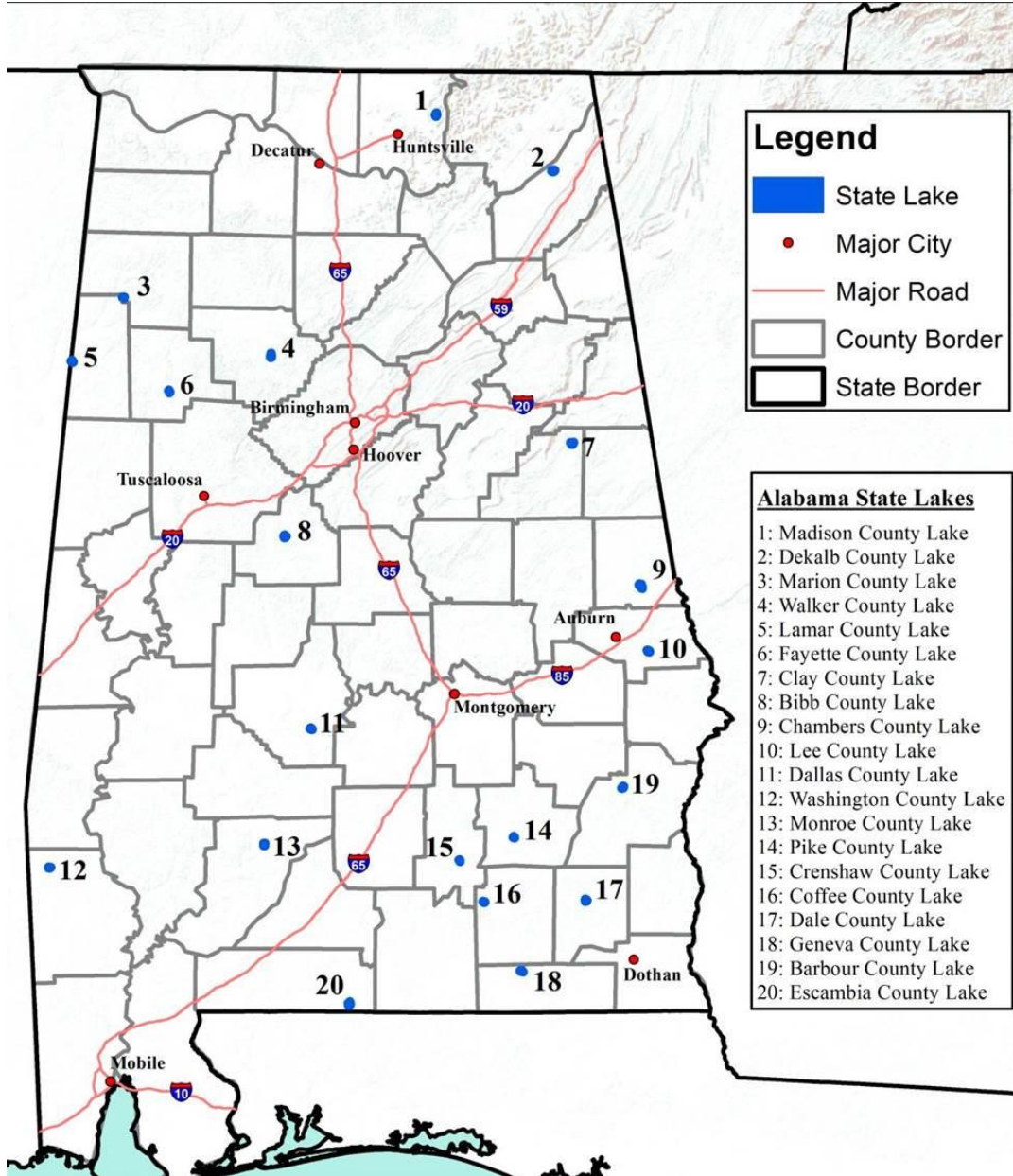


Figure 1.2. Locations of the Alabama Public State Lakes

## Chapter II: Using Specialization to Determine Differences in Setting Preferences of Freshwater Fishing Site Selection of Alabama Anglers

### **Abstract**

In order to properly manage fishery resources, comprehensive knowledge of not only the resource, but of those that utilize the resource, must be obtained to develop best management strategies. Many studies have found significant management implications when angler motivation, specialization, and setting preferences were considered. Adopting this mentality, the Alabama Wildlife and Freshwater Fisheries Division (WFF) is investigating ways to increase angler use of fishery resources throughout the state. With recent declining trends of the number of licensed anglers, research about the anglers in the state is critical. Using a comprehensive survey mailed to 3000 randomly selected licensed anglers in 2013, data was obtained on angler motivations and setting preferences for three levels of specialization. Results indicate that environmental features at freshwater fishing sites are most important across angler groups. Using this information, recommendations for fishing site improvements can be made to AL WFF for increased angler recruitment and retention efforts in the state.

Keywords: Angler, management, specialization, site preferences

## **Introduction**

Managing recreational fisheries resources can be greatly influenced by the anglers that use those systems. Understanding the diversity of anglers and the factors that influence the difference between anglers is a critical part of recreational fisheries management (Johnston et al., 2010). Much research has been done investigating driving factors on participation in recreational fishing (Arlinghaus et.al, 2015; Kuehn et.al, 2013; Hunt & Ditton, 2002) and found that participation of anglers varies upon many demographic factors such as age, race, and income. Along with those factors, participation has been found to be influenced by the level of commitment toward recreational fishing, or level of specialization (Beardmore et.al, 2011, 2013) and angling preferences (Hutt & Neal, 2010; Hutt & Bettoli, 2007).

In Alabama, very little research has been done to understand the diversity of anglers in the state and how those may impact participation in recreational fishing. This research is critical to the state, because the number of licensed anglers and associated expenditures within the state have seen recent declines. Between 2006 and 2011, the number of licensed anglers decreased by 15% (U.S. Fish & Wildlife Service, 2012). A decline in license sales can impact state agencies and their management of fisheries resources because, in Alabama, 100% of the revenue from licenses sales goes toward the management of natural resources in the state (ADCNR). The objective of this study is to explain the diversity of anglers within the state and understand how that can influence fishing preferences, and therefore, participation by providing relevant knowledge to state agency managers to develop strategies to meet the needs of anglers in Alabama.



## Literature Review

This research seeks to understand the relationship between recreational fishing participation and angling preferences using specialization categories to explain differences. Recreational specialization was first studied using trout angler populations (Bryan, 1977). Hobson Bryan's (1977) study illustrated that as specialization from the novice occasional fisherman to the highly specialized "bassmaster", the investment in fishing increased; whereas Bassmaster anglers spent more money, had more specialized equipment, and social groups were dependent on fishing. Conversely, the occasional angler illustrated low specialization by spending less time and money allotted toward fishing. This has been repeatedly confirmed through similar studies (Chipman & Helfrich, 1988; Fisher, 1997). Despite extensive research on recreational specialization, including much with anglers, as Scott and Shafer (2001) recognize, there is still a great deal of diversity on the exact method of precisely measuring recreational specialization. However, throughout those studies, three dimensions of specialization are recognized: behavior, skills and knowledge, and level of commitment (Beardmore et.al., 2013). Many studies have been conducted since then, utilizing the three dimensions to define specialization differences among anglers and have found that level of commitment or centrality to lifestyle is the key metric to determining specialization (Beardmore et.al, 2013). Using the three dimensions concept to measure specialization, research has shown links between specialization and catch orientation (Oh & Ditton, 2006; Beardmore, et.al, 2011), specialization and motivations (Hutt & Bettoli, 2007) and specialization and preferences (Oh & Ditton, 2006).

Understanding angling preferences for species targeted, site preferred, slot limits, and size limits is key to understanding why people participate in recreational fishing and how to manage to best meet angler preferences. Chi-ok Oh and Robert Ditton (2006) found that more

specialized anglers were pleased with restrictive management, whereas, casual anglers favored management that allowed for harvesting more fish. The same findings were present in Hutt and Bettoli's (2007) study that found more specialized anglers valued catching trophy fish and placed higher value on recreational fishing versus less specialized anglers that valued catching more fish, mainly for consumption, and valued fishing as a way to relax or "spend time with family." Specialization has also been used to assess anglers' affinity toward setting preferences and found that as specialization increased, anglers were likely to become place specialists and less likely to find suitable site replacements (Oh et.al, 2013). Preferred settings are the biophysical, social, and managerial environments in which people seek their desired experiences (Driver & Brown, 1978). Using these site attribute categories, significant differences have been shown between social versus lone anglers (Hunt & Ditton, 1997) and between urban and rural anglers (Hutt & Neal, 2010). Additionally, differences in site selection factors are recognized when grouping angler by preferences, i.e. preferred kind of fish, water type, consumption value, fishing frequency (Schramm et.al., 2003). However, very few studies, and none in Alabama, have looked at how angler specialization can influence site selection across multiple setting categories. Recognizing site selection differences and understanding the diversity of anglers is crucial for fisheries managers to implement strategies to help retain and recruit recreational anglers. By understanding the differences and diversity among anglers, managers can align management strategies that meet the needs of targeted anglers. These actions may positively influence recreational fishing participation and site visitation.

## **Methods**

### *The Questionnaire*

The study population consisted of Alabama anglers that purchased a state-wide freshwater fishing license in the 2013-2014 calendar year; as well as those that possessed a Lifetime License, which is a one-time purchase that allows license holders to retain fishing privileges for life. Using license lists provided by the Alabama Department of Conservation, Wildlife and Freshwater Fisheries Division, 3000 resident anglers, proportionally sampled from each license list, were selected to receive to receive a 53-question self-administered questionnaire. The mailing survey was conducted in the summer, 2014 using a modified Tailored Design Method (Dillman, 2009). Following the design method of four contacts with the recipient, in October, another full survey packet was mailed to a sample of non-respondents. Additionally, survey recipients were given the option to complete the survey online through Qualtrics, using a survey code provided to them via the original mailing.

### *Variable Selection*

The questionnaire collected data on angling behavior, motivations, preferences for site selection, and demographic of freshwater anglers. First, respondents were asked to rate their preference of species of fish included 5 options of species commonly sought in Alabama (i.e. bass, bream, catfish, crappie, striped bass) and preferred setting for freshwater fishing included 3 options, Rivers/Streams, Reservoirs/Lakes, and Ponds. Preference were valued on a 5-Point Likert type scales, where 1=Do not prefer, 3=Prefer, and 5= Strongly prefer for each item. Next, respondents were asked to indicate the level of importance they placed on 13 statements related to reasons they go fishing. Importance was valued on a 5-Point scale.

To determine specialization level, 11 specialization indicators were assessed and included items such as money invested in fishing within the last year, days spent fishing, self-perceived level of fishing skill and knowledge, and centrality to lifestyle (Needham et al., 2009; Beardmore et al., 2013). This information was used to group anglers into one of three specialization groups. Three 'skill and knowledge' questions asked the respondent to indicate their perceived level of fishing skill, knowledge, and knowledge of fisheries management. These were assessed using a 5-Point Likert Scale. Six 'centrality to lifestyle' questions asked respondents to indicate their agreement with how important fishing is to their life. Two questions "How much money do you spend annually on fishing gear?" and "Approximately how many trips did you take to fish in Alabama during the last 12 months?" were open ended questions.

To identify site selection preferences, respondents were asked to rank the level of importance they place on 29 statements regarding freshwater site attributes when selecting a lake or reservoir to fish using a 5-point scale (The site attributes were divided into 4 main categories: BIOLOGICAL, ENVIRONMENTAL, MANAGERIAL, and, FACILITY. Site attribute statements were taken from previous studies for each of the categories (Hunt & Ditton, 1997; Schramm et.al., 2003; Hutt & Neal, 2010). The BIOLOGICAL category included 4 statements referring to the quality of fish, such as "Catching the fish you prefer to catch" and "Knowing the fish are safe to eat". The ENVIRONMENTAL category included 8 statements referring to aesthetic nature of the site such as "Good, clean boat access" and "Well-mowed grounds". The MANAGERIAL category included 7 statements concerning safety (i.e., "Feeling safe at the fishing site" and "Safe boating conditions") and regulations (i.e., "Regulations that allow you to keep a lot of fish" and "Knowing there is no access fee"). The FACILITY category included 10

statements referring to site amenities including clean restrooms, concessions, and additional recreational opportunities such as camping opportunities or trails.

To assess the possibility of additional trips to the respondents nearest freshwater site, respondents were asked to indicate the number of additional trips they would take if certain site improvements were possible. Respondents were asked to indicate if they would take “Fewer trips”, “0 additional trips”, or “1 or more additional trips” choose 1 of 5 answer choices (0/No additional trips, 1-3 trips, 4-6 trips, 7-9 trips, or 10+ trips) for 8 site improvement statements that included at least one choice from each of the four site selection categories previously mentioned. Additional input from ADCNR fisheries biologists also suggested which statements to include. Lastly, respondents provided demographic information for descriptive purposes. Demographic data collected included birth year, gender, ethnicity, marital status, highest completed level of education, and 2013 household income. This information was used to provide demographic profiles for further descriptions of the 3 angler specialization groups.

### *Data Analysis*

All data collected was entered and analyzed using IBM SPSS Statistical software, version 21. Prior to additional analysis, descriptive statistical techniques were used to identify outliers that were removed from the dataset. In order to calculate a composite specialization index, the 11 indicators were standardized z-scores for analysis because the questions were a mixture of ordinal and ratio variables. Scale reliability of the composite index was verified using Cronbach’s Alpha ( $\alpha$ ) (Vaske, 2008). To classify respondents into specialization groups, K-means cluster analysis was used, which groups subjects according to similarities across the variables (Chipman & Helfrich, 1988). Cluster analyses ranging from 2-6 groups were generated,

until the suitable solution of 3 groups was identified. Differences between specialization groups and site selection preferences were analyzed using one-way ANOVA tests and deemed significant at the  $p < 0.05$  level and Tukey's Honestly Significant Difference's test Post hoc procedure (Scott & Thigpen, 2003).

A principal component analysis (PCA) with varimax rotation was used to group and describe angling motivations. Using PCA reduces the number of variables by grouping correlated variables into components which can help explain a majority of the total variance found in the data. Prior to analyzing using PCA, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test was used to confirm factor analysis was appropriate. The KMO score should be above 0.6 and Bartlett's Test should be significant at a determined significance level (i.e.  $p < 0.5$ ) (Vaske, 2008). Factors with an eigenvalue greater than 1 were extracted and variables with a factor loading greater than 0.40 or more were used to help identify which variables were associated with the components. The relationship between the specialization groups and the factor scores produced from the motivation components was assessed using one-way ANOVA, similar to site selection preference analysis.

## **Results**

### *Response and Non-Response*

Of the 3000 surveys sent to licensed freshwater anglers, 605 were returned usable questionnaires. After adjusting for non-deliverables, the useable sample size was 2,411 anglers, yielding a response rate of 25.1%. To check the respondents of the survey represent the sampled population, a non-response bias check was conducted (Vaske, 2008). The first step in the non-response bias check was to determine the breakdown of respondents based on license type

(Lifetime or Annual License). The original sample contained 1290 (43%) Lifetime license holders and 1710 (57%) Resident Annual license holders, with the list being sampled from licenses sold up to March, 2014 of an August – August annual license year. Our response breakdown was 278 (46%) Lifetime and 326 (54%) Annual license holders. Next, using the birthdates provided of the Lifetime License list, 3 age brackets, 18-35, 36-50, and 51-65 were created to determine sample and response ages. Comparisons between ages were only conducted up to age 65 because in Alabama, individuals over the age of 65 are not required to buy a license. Using those ages, we compared the master list, which included 57,354 entries to the ages of our responses (278) using Chi-square tests (Table 2.1). No significant differences ( $p \leq 0.05$ ) between the percent of individuals in each age category between any of the lists were identified. However, the responses were slightly skewed toward the older age brackets. Additionally, we found no significant differences between the ages of the Lifetime Licenses respondents and the Annual License respondents ( $X^2 = 1.826, p = 0.609, df = 3$ ), indicating that the responses to the survey are likely representative of the freshwater angler population in Alabama.

### *Descriptive Characteristics*

Of the 605 useable surveys, a majority of the respondents were White/Caucasian (92%) men (84%), between the ages of 51-65 (44.5%). A total of 17.9% of respondents were between the ages of 18-35 and 29.7% of respondents fell between the ages of 36-50. Only 7.8% 66 years of age or older, however, this demographic is not required to purchase a fishing license (N = 586). Most respondents (78.2%) reported being married (N = 551) and living with at least 2 other persons in their house (91.2%) (N = 602). Most respondents indicated having obtained a High school diploma or GED (27.4%) or attending college, but no degree (27.7%). Thirty-eight

percent indicated they received some sort of advanced degree (Associates or higher) (N = 559). For 2013, thirty-one percent reported a household income of less than \$35,000; 40% made between \$35,000 and \$74,999; 23% between \$75,000 and \$149,999; and only 5% made more than \$150,000 (N = 530).

An initial PCA analysis was run on the 13 motivation variables. The KMO measure was 0.81 and Bartlett's test of sphericity was significant ( $p < 0.001$ ). The result of the analysis produced 3 factors with eigenvalues greater than 1 and accounting for 61.9% of the total variance. Of the 13 variables, 11 variables had loadings greater than 0.40, resulting in removal of the two variables from further analysis. Shown in Table 2.2, Component 1 consisted of four variables, account for 23.8% of total variance. The four variables included in Component 1 included variables like "For relaxation" and "For peace and quiet", therefore, being termed the ESCAPE motivation component. Component 2 also consisted of four variables, accounting for 20.5% of the total variance and included variables like "To catch trophy fish" and "To test my equipment". This motivation component was termed CHALLENGE. Lastly, Component 3 consisted of three variables and accounted for 17.6% of the total variance. Component 3 consisted of variables like "To be with family" and "To be with others that enjoy the same things", therefore being termed the SOCIAL motivation component.

### *Recreation Specialization*

Scale reliability of the 11 specialization indicators was good at  $\alpha = 0.86$ . After adjusting for incomplete responses to all 11 variables and outliers, 413 (68.3%) responses were included in cluster analysis. The K-means cluster analysis procedure produced three distinct subgroups of freshwater anglers (Table 2.3). Based on the responses, the subgroups were labeled as *Casual*



(37%), *Active* (34%), and *Dedicated* (29%) anglers (Beardmore et.al, 2013). Groups differed the most across the importance of fishing ( $F = 172.31, p \leq 0.001$ ) and what fishing says about the respondent ( $F=179.16, p \leq 0.001$ ). Differences were less determined by number of trips taken ( $F = 27.42, p \leq 0.001$ ) and the social connection of fishing ( $F = 54.31, p \leq 0.001$ ). Demographic characteristic comparisons using Chi – square between each group are shown in Table 2.4.

Casual anglers ( $n = 154$ ) were mostly (59%) annual license holders, male (80%), with an average age of 49. This group contained 80% Males and 20% Females, which is similar to the Active angler group, but a larger proportion of females when compared to the Dedicated angler group. Casual anglers were the largest of the three subgroups and reported the lowest means across all 11 indicators. On average, casual anglers spent only \$158.18 on fishing related expenditures per year and fish only 11 days in the previous 12 months. Casual anglers also reported themselves as intermediate anglers across self-assessed skill ( $M = 2.93$ ) and knowledge ( $M = 2.96$ ), and as more novice for knowledge of fisheries management ( $M=2.32$ ). Casual anglers reported the most disagreement with the social connection fishing has to their lives in relation to keeping in touch with friends ( $M = 1.66$ ) and how organized their life is around fishing ( $M = 1.54$ ).

Active anglers were the median group of anglers both in size ( $N = 139$ ) and responses. Active anglers were more even split between being Annual License holders (51.8%) and Lifetime license holders (48.2%) when compared to Casual Anglers. They were mostly male (81.2%) between the ages of 51-65 (42%). Active anglers spend, on average, \$294.96 per year and 20 days fishing the previous 12 months. They also reported themselves as more intermediate anglers across the 3 self-assessed skill and knowledge indicators. They placed slightly more agreement on the importance of fishing ( $M = 4.72$ ) and the amount of fishing equipment they

have accumulated ( $M = 4.32$ ). They agreed significantly more about wanting to fish more than any other activity ( $M = 3.56$ ) compared to casual anglers but remained fairly neutral ( $M = 2.96$ ) about how organized their life is around fishing.

Dedicated anglers made up the smallest group of respondents ( $N = 120$ ) and were evenly split between Annual license holders (51.7%) and Lifetime license holders (48.3%). They were also a majority male (93%) between the ages 51-65 (44.4%). Dedicated anglers reported the highest means on all 11 indicators. On average, dedicated anglers spent over twice the amount as Active anglers in the last 12 months with \$457.63 and spent 23 days fishing, similar to Active Anglers. They assessed themselves as more expert anglers in terms of skill ( $M = 4.07$ ) and knowledge ( $M = 4.11$ ). Dedicated anglers most strongly agreed with statements of the importance of fishing ( $M = 4.86$ ) and accumulating a lot of fishing equipment ( $M = 4.70$ ).

Preferences for species and fishing site were compared between the specialization groups. Significant differences between means were found between at least two specialization groups for 3 of the 5 species choice options (Bass, Bream, and Crappie). However, all groups most strongly preferred Bass and Crappie and least preferred Striped Bass as a primary target species. However, Casual and Active anglers most strongly preferred fishing in a reservoir/lake setting, whereas Dedicated anglers most preferred fishing in rivers/streams. Statistically significant differences were also present between all three motivation components between Casual and Active anglers and between Casual and Dedicated anglers. However, all three specialization groups indicated higher importance on the variables in the SOCIAL and ESCAPE motivation component (Table 2.5).

### *Site Selection Attributes*

One-Way ANOVA's were run between the specialization groups and the four site selection attribute categories (Table 2.6). In the BIOLOGICAL category, 3 of the 4 variables were significant ( $p < 0.05$ ), with all three groups indicating highest importance on "Knowing the fish are safe to eat". Dedicated and Active anglers placed moderate important ( $M = 3.60$  and  $M = 3.36$ ) on "Knowing trophy size fish are available to be caught", whereas Casual anglers placed little importance on the same variable ( $M = 2.69$ ). The Casual angler group felt "Catching the kind of fish you prefer to catch" was of average importance ( $M = 3.61$ ), which differed significantly from Active ( $M = 4.00$ ) and from Dedicated angler groups ( $M = 4.24$ ). Of the eight ENVIRONMENTAL site selection attributes, six were found to have significant differences ( $p < 0.05$ ). Casual and Dedicated differed significantly for all six variables. The Casual angler group placed significantly lower importance on the variable "Good boat access" ( $M = 3.68$ ) when compared to Active ( $M = 3.90$ ) and Dedicated anglers ( $M = 4.38$ ). All specialization groups indicated the highest importance on "Good water quality", "No litter or debris in the water or fishing area", and "Natural beauty of the water and surroundings".

The MANAGERIAL site attribute category had seven variables. Casual and Active angler groups did not differ significantly on any of the variables, but Casual and Dedicated were significantly different ( $p < 0.05$ ) for "Regulations that allow you to keep a lot of fish", "Seeing few or no anglers while fishing", and "Safe Boating conditions". In general, the variables in this category were indicated to have the lowest importance for all specialization groups. Additionally, the FACILITY site attribute category yielded only two of ten variables as significant. All three specialization groups indicated the highest importance for "Secure Parking". However, attributes

like “Playgrounds”, “Pavilion for large groups”, and “Concessions (snacks and tackle)” were ranked as of very low to not at all important.

No significant differences were found between the groups for the eight site improvement variables (Table 2.7). However, similar trends were present throughout the responses of this question. For all specialization groups, the variables “Increasing the number of fish likely to be caught” and “Increasing the size of fish likely to be caught” yielded the highest percentage of respondents indicating they would take at least 1 more additional trip if those specific improvements were made. Conversely, all specialization groups yielded the highest percentage of not taking any additional trips with the addition of playgrounds and hiking and biking trails to the site, suggesting that additional amenities at a fishing site would not positively add to the recruitment of anglers. When compared to the percent of Casual and Active anglers, Dedicated anglers yielded higher percentages in 10+ additional trips option on almost all variables including “Additional clean boat access” (11.6 %) and “Increase the aesthetics of the lake” (10.6%). Specifically, Dedicated anglers indicated the highest percent of taking at least one additional trip for the “Increasing the size of fish likely to be caught” variable (79.8 %). Casual and Active anglers reported the highest percentage of taking at least one additional trip for the “Increasing the number of fish likely to be caught” variable.

## **Discussion**

The objective of this article was to understand a relationship between angler specialization and preferences for site attributes for the potential of taking additional trips. Understanding the diversity of anglers and their specific preferences is critical to fisheries agencies effort to retain and recruit recreational anglers. Our results add to those of previous

studies (Chipman & Helfrich, 1988; Hutt & Bettoli, 2007; Beardmore et.al, 2013) in which distinct angler subgroups by specialization level are present. Segmenting anglers by specialization is useful because it can inform fisheries managers of the type of anglers that frequent a specific site, which allows for more direct management for that group at those particular sites.

Despite specialization, we were able to identify key site attributes that were most important throughout the responses which allows for site improvements and management actions that can benefit all types of anglers. Site attributes such as ensuring good water quality, personal safety of visitors, and providing an atmosphere that is relaxing and beautiful are relatively minor improvements to current sites that could really appeal to most people. Being able to advertise fishing sites for these qualities is a great approach to recruiting new anglers.

Using specialization as a classification approach, we were able to identify three distinct groups of anglers within Alabama. More specialized anglers spent more money and time fishing and placed more importance on recreational fishing as compared to Casual and Active anglers. As expected, more specialized anglers assessed themselves to have a higher level of fishing skill and knowledge, as well. These ideas are consistent with the specialization theory first proposed by Bryan (1977). Of the 11 variables of specialization, the centrality to lifestyle indicators were the most useful in distinguishing between angler specialization groups, which is consistent with previous recreational specialization studies (Beardmore, et.al., 2013; Oh & Ditton, 2006). Of those variables, significant differences were found between all three groups for 4 of the 6 variables and difference between Casual and Active anglers for all variables. The three groups did not differ significantly between the demographic variables, and were all consistent with the

total sampled population (N = 602), being male, annual license holders, between the ages of 51-65.

In regards to motivation, all specialization groups were more motivated by SOCIAL and ESCAPE factors, such as “To be outdoors” and “For relaxation”, when choosing to go fishing. Casual anglers and Dedicated anglers did differ significantly for motivation categories, especially, CHALLENGE motivation variables confirming previous studies that suggest more specialized anglers are more motivated across more motivation factors, specifically, activity specific variables (Oh & Ditton, 2006; Beardmore et. al., 2011). Understanding motivations is key for managers because it provides the information needed to advertise a specific site in a way that targets specific angler groups. Because all specialization groups indicated the variables in the ESCAPE category were the most important, managers can develop or enhance recreational fishing sites to provide a relaxing atmosphere with scenic views.

Despite the lack of statistically significant differences between the specialization groups and majority of the site selection attributes, all three groups did indicate that the variables within the ENVIRONMENTAL and BIOLOGICAL categories were the most important. Similar to results from Schramm et. al. (2003), his comparisons between motivations, species, and fishing site, factors like “Good water quality” and “Knowing the fish are safe to eat” ranked among the highest for his response population, similar to our results. Complementing his findings is important for recognizing that angler site selection is not solely determined by species. Although angler heterogeneity was present in our study, we did find a lack of differences in site selection attributes, suggesting that the most important site attributes between our groups will benefit the general Alabama angling population. Ensuring cleanliness and safety are variables that managers cannot readily control. However, focusing efforts to provide better cleanliness and safety by

adding additional trash receptacles or putting in additional lighting around parking areas, as opposed to providing playgrounds or restrooms at a site, can be a minor management priority that provides a great way to recruit and retain anglers.

Our approach to determine the possible number of additional trips yielded no significant difference between groups. However, it is important to recognize the trend in these data, that adding amenities like playgrounds, camping opportunities, and hiking/biking trails yielded the highest percent of respondents to indicate they would not take any additional trips. But increasing catch and size of fish caught, followed by increasing aesthetics resulted in the highest percent of respondents indicating they would take at least 1 additional trip, again, these were consistent for all specialization groups. This confirms the importance of the site attributes in the ENVIRONMENTAL and BIOLOGICAL category of important site selection attributes. Because we did not measure the possibility of additional trips for each variable in the four site attribute categories, we cannot suggest that solely improving variables in the BIOLOGICAL and ENVIRONMENTAL category will yield the most additional angling trips. Also without understanding angler fishing constraints, such as reasons that kept them from fishing, it is difficult to assume the indicated number of additional trips will actually result in respondents taking more trips.

Certain limitations were present within this study. Even though our study provided a relatively even distribution between the three specialization groups, it is critical to understand that the proportion of Dedicated anglers to Casual and Active anglers is realistically smaller within our population. Our sampled population was taken from the state license database in March of an August to August license year; therefore, proportions of anglers in the subgroups may have varied with the end of the license year. Our population was from licensed anglers in

Alabama, so caution is warranted to generalizing our results to different populations. Also, our response population was overwhelmingly Caucasian male, therefore results may be skewed in favor of that demographic.

Based on the results in our study, fisheries managers should consider non-catch related fishing preferences when managing sites for angler recruitment or retention. There are two key areas of management that can successfully aid in angler recruitment and retention for lake sites in Alabama. First, maintaining a quality fishery. With understanding environmental factors beyond control, such as weather, providing the opportunity for any level of specialized angler to be able to catch fish is critical to increasing retention at current popular fishing sites. Second, placing more emphasis on providing cleaner and safer fishing areas is essential for recruiting anglers to new sites. Attention to management details easily monitored and corrected are key to helping increase the angling population.

The ideal fishing site is one that provides a clean, safe place for anglers to come and relax, whether that is alone or with family and friends. These sites should have good water quality and provide the opportunity to catch fish even for the novice anglers. Ensuring the site is clean, both on and around the water, to help increase the over aesthetic quality of the site is most important. Attention to these site attributes can further recruitment and retention efforts by appealing to all types of anglers.



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**Table 2.1.** Percent of individuals for each age category for the Lifetime License Master list and survey responses.

<b>Lifetime License List</b>	<i>n</i>	<b>Age Categories</b>			$X^2$	<i>P</i> - value
		18 - 35	36 - 50	51 - 65		
Master List	57,345	20.3	37.6	42.1	7.379	0.061
Survey Responses	277	19.1	32.7	48.2		

**Table 2.2.** Principal Component Analysis results for motivation statements

Motivation Factor*	Factor 1: Escape	Factor 2: Challenge	Factor 3: Social
<b>Escape (<math>\alpha = 0.784</math>)</b>			
To enjoy solitude	<b>.847</b>	.098	.000
For peace and quiet	<b>.826</b>	.173	.175
For relaxation	<b>.759</b>	.103	.294
To be close to water	<b>.465</b>	.327	.373
<b>Challenge (<math>\alpha = 0.727</math>)</b>			
To catch a trophy fish	-.011	<b>.839</b>	-.001
To test my equipment	.140	<b>.776</b>	.071
For the challenge of catching fish	.461	<b>.619</b>	.058
To share my knowledge of fishing with others	.185	<b>.561</b>	.364
<b>Social (<math>\alpha = 0.614</math>)</b>			
To do something with my family	-.048	-.042	<b>.870</b>
To be with others who enjoy the same things	.227	.302	<b>.627</b>
To be outdoors	.323	.052	<b>.620</b>
Eigenvalue	4.10	1.45	1.26
Percent of total Variance Explained	23.80	20.52	17.56
Cumulative variance explained	23.80	44.33	61.89

\* Motivation scale: 1 = Not at all important, 3 = Important, 5 = Very important

**Table 2.3.** Comparison of 11 specialization indicators across the three clusters of anglers.

Specialization Variables (Cronbach's $\alpha = 0.86$ )	Specialization Group Means			<i>F (sig)*</i>
	Casual (n=154)	Active (n=139)	Dedicated (n=120)	
<b>Behavioral Indicator<sup>1</sup></b>				
How many trips did you take to fish in Alabama during the last 12 months?	11.25 <sup>a</sup>	20.08 <sup>b</sup>	23.18 <sup>b</sup>	27.42
How much do you spend annually of fishing gear?	158.18 <sup>a</sup>	294.96 <sup>b</sup>	457.63 <sup>c</sup>	50.154
<b>Skill and Knowledge Indicator<sup>2</sup></b>				
Level of fishing Skill	2.93 <sup>a</sup>	3.06 <sup>a</sup>	4.07 <sup>b</sup>	137.31
Level of fishing knowledge	2.96 <sup>a</sup>	3.03 <sup>a</sup>	4.11 <sup>b</sup>	151.994
Level of fishing knowledge of fisheries management	2.32 <sup>a</sup>	2.32 <sup>a</sup>	3.58 <sup>b</sup>	89.376
<b>Centrality to Lifestyle Indicator<sup>3</sup></b>				
Fishing is important to me	3.71 <sup>a</sup>	4.72 <sup>b</sup>	4.86 <sup>c</sup>	172.31
I have accumulated a lot of fishing equipment	3.27 <sup>a</sup>	4.32 <sup>b</sup>	4.70 <sup>c</sup>	121.16
If I stopped fishing, I would probably lose touch with a lot of friends	1.66 <sup>a</sup>	2.53 <sup>b</sup>	3.00 <sup>c</sup>	54.31
I would rather fish than do any other activity	2.21 <sup>a</sup>	3.56 <sup>b</sup>	3.92 <sup>c</sup>	120.12
I find that a lot of my life is organized around fishing	1.54 <sup>a</sup>	2.96 <sup>b</sup>	3.24 <sup>b</sup>	140.632
Fishing says a lot about who I am	1.78 <sup>a</sup>	3.48 <sup>b</sup>	3.63 <sup>b</sup>	179.16

<sup>1</sup> Based on Total count in days and dollars

<sup>2</sup> Variable 5-point scale: 1 = Novice and 5 = Expert.

<sup>3</sup> Variables scale: 1 = Strongly Disagree, 3 = Neither agree nor disagree, 5 = Strongly agree.

<sup>abc</sup> Entries with different letter superscripts across each row differ at a  $p < 0.05$  using Tukey HSD or Games – Howell post-hoc tests.

\*Significant at  $p \leq 0.001$

**Table 2.4.** Demographic data comparisons between the three angler specialization groups

Demographic Data	Specialization Group			$X^2$	<i>p</i> - value
	Casual ( <i>n</i> = 152)	Active ( <i>n</i> = 138)	Dedicated ( <i>n</i> = 117)		
<b>Age</b>	49.0	48.0	49.0	0.165	0.848
<b>Gender (%)</b>					
Male	80.1	81.3	93.2	9.86	0.007
Female	19.9	18.7	6.8		
<b>Ethnicity (%)</b>					
African American	2.0	4.3	4.3		
American Indian	0.7	4.3	4.3		
Asian	0.7	1.4	-	14.48	0.152
Caucasian	94.1	89.9	91.5		
Latino	0.7	-	-		
Other	2.0	-	-		
<b>Education (%)</b>					
Did not complete high school	1.4	2.3	3.7		
High school diploma/GED	18.1	31.1	27.8		
Some college but no degree	27.8	31.1	34.3	16.370	0.037
College degree	36.1	28.0	26.9		
Graduate degree	16.7	7.6	7.4		
<b>Household Income (%)</b>					
Less than \$24,999	10.3	21.5	23.8		
\$25,000 - \$34,999	8.1	13.8	10.5		
\$35,000 - \$49,999	16.9	16.2	14.3		
\$50,000 - \$74,999	25.7	23.8	24.8	24.039	0.020
\$75,000 - \$99,999	12.5	11.5	12.4		
\$100,000 - \$149,999	15.4	12.3	9.5		
\$150,000 or more	11.0	0.8	4.8		

**Table 2.5.** Comparison of specialization groups across fishing motivation components

Motivation Factors	Specialization Group			<i>F</i>
	Casual (n=149)	Active (n=132)	Dedicated (n=118)	
Escape	3.61a	4.13b	4.24b	11.855*
Challenge	2.42a	3.15b	3.41b	36.361*
Social	3.82a	4.24b	4.31b	7.119*

\* Significant at the  $p < 0.001$  level

ab Groups with different letters are significantly different at  $p < 0.05$



Table 2.6. Comparison of specialization groups across 29 site attributes

Site Characteristic*	Specialization Group			F	p - value
	Casual (n=130) Mean	Active (n=126) Mean	Dedicated (n=109) Mean		
<b>Biological <math>\alpha = 0.710</math></b>					
Knowing the fish are safe to eat	3.87a	4.07	4.29b	3.93	0.020
Catching the kind of fish you prefer to catch	3.61a	4.00b	4.24b	10.59	0.000
Knowing there are a lot of fish to be caught	3.65	3.86	3.94	2.53	0.081
Knowing 'trophy' size fish are available to be caught	2.69a	3.36b	3.60b	14.67	0.000
<b>Environmental <math>\alpha = 0.833</math></b>					
Good water quality	4.09a	4.31	4.43b	4.38	0.013
No litter in the water or fishing areas	3.99a	4.3b	4.43b	7.68	0.001
Natural beauty of the water and surroundings	4.05a	4.26	4.41b	5.37	0.005
Clean bank access	3.48a	3.78	3.98b	5.48	0.005
Good boat access	3.68a	3.9b	4.38a	11.50	0.000
Well-mowed grounds	2.62a	3.19b	3.22b	8.01	0.000
Fishing piers	2.82a	3.13a	3.06a	1.99	0.139
Shaded fishing areas	2.86a	3.17a	3.14a	2.09	0.125
<b>Managerial <math>\alpha = 0.728</math></b>					
Feeling safe at the fishing site	4.10	4.12	4.20	0.31	0.732
Safe boating conditions	3.80a	4.00	4.17b	3.54	0.030
Knowing uniformed personnel are present to enforce regulations	3.05	3.31	3.12	1.49	0.228
Knowing there is not access fee	3.20	3.40	3.39	0.84	0.433
Fishing information available at the site	2.70	2.98	2.97	2.06	0.129
Regulations that allow you to keep a lot of fish	2.21a	2.50	2.69b	4.74	0.009
Seeing few or no other anglers while fishing	2.42a	2.53	2.87b	4.95	0.008

(Continued)

(Continued)

Site Characteristic*	Specialization Group			<i>F</i>	<i>p</i> - value
	Casual (n=130) <i>Mean</i>	Active (n=126) <i>Mean</i>	Dedicated (n=109) <i>Mean</i>		
<b>Facilities <math>\alpha = 0.890</math></b>					
Secure parking	3.66a	3.97	4.18b	7.18	0.001
Sites that are close to home	3.53a	3.71	3.87b	2.81	0.062
Clean restrooms	3.02	3.29	3.37	2.53	0.081
Clean picnic areas and tables	2.89	3.12	3.09	1.19	0.306
Campground (primitive)	2.29	2.48	2.67	2.49	0.085
Campground (with RV connections)	2.18	2.48	2.29	1.64	0.195
Trails (Hiking and Biking)	2.37	2.27	2.28	0.22	0.803
Concessions (snacks and tackle)	2.02	2.30	2.11	1.72	0.180
Pavilion for large groups	1.89	2.13	2.01	1.37	0.257
Playground	1.95	1.99	2.01	0.10	0.905

\* Site preferences scale: 1 = Not at all important, 3 = Important, 5 = Very important  
ab Groups with different letters are significantly different at the 0.05 confidence level

**Table 2.7.** Percentage of the number of additional trips by individuals within each specialization cluster. Statistical differences tested using Chi-square at  $p < 0.05$  significance level.

Site improvement variable	Cluster	Number of additional trips					$X^2$	P - value
		Fewer/ 0	1 - 3	4 - 6	7 - 9	10+		
Increasing the number of fish likely to be caught	Casual	30.8	42.0	16.8	4.9	5.6	8.53	0.383
	Active	27.9	35.7	19.4	3.9	13.2		
	Dedicated	21.1	43.0	18.4	6.1	11.4		
Increasing the size of fish likely to be caught	Casual	39.2	32.9	16.8	4.2	7.0	14.19	0.077
	Active	28.7	31.0	22.5	7.0	10.9		
	Dedicated	20.2	42.1	19.3	7.9	10.5		
Addition of hiking or biking trails	Casual	67.1	21.0	8.4	0.7	2.8	4.61	0.799
	Active	69.0	15.1	10.3	3.2	2.4		
	Dedicated	71.4	15.2	8.0	2.7	2.7		
Camping opportunities	Casual	61.7	22.7	12.8	1.4	1.4	13.55	0.094
	Active	51.6	23.4	14.8	5.5	4.7		
	Dedicated	51.8	32.1	8.9	1.8	5.4		
Children's playgrounds	Casual	74.5	17.7	7.1	0.0	0.7	11.88	0.157
	Active	67.5	20.6	7.9	1.6	2.4		
	Dedicated	72.6	16.8	3.5	0.9	6.2		
Additional clean boat access	Casual	54.6	28.4	11.3	2.8	2.8	14.10	0.079
	Active	43.3	28.3	16.5	5.5	6.3		
	Dedicated	38.4	30.4	16.1	3.6	11.6		
Additional clean bank access	Casual	49.3	31.7	14.1	1.4	3.5	15.37	0.052
	Active	44.5	24.2	20.3	6.3	4.7		
	Dedicated	34.5	31.9	18.6	5.3	9.7		
Increase the aesthetics of the lake	Casual	45.4	37.6	12.8	1.4	2.8	14.08	0.080
	Active	41.5	26.0	18.7	4.9	8.9		
	Dedicated	41.6	27.4	15.9	4.4	10.6		

### Chapter III: Assessing Changes in Participation of Fishing Trips by Target Species in Alabama

#### **Abstract**

Understanding changes in angler participation is critical to recreational fisheries management. Using angler surveys to identify factors that influence participation, managers can evaluate changes in management before implementation and understand how those changes might impact angler use. Additionally, estimating travel costs gives a value to a fishing trip that can demonstrate the impact of management decisions. Using responses from a state – wide angler survey in Alabama, we developed demand curves to demonstrate the number of additional trips in response to increased catch rates. This study identified differences in fishing preferences by targeted species. Angler participation was shown to vary among targeted species as catch rates were increased. Bass anglers indicated they would take the most trips if their catch rates doubled, but crappie anglers had the highest value per trip at \$106.51. Positive trends in additional trips and related expenditures were present for all anglers with diminishing returns as more fish are caught. Using these results, managers can evaluate ways to increase catch of certain species and understand angler use and economic impact those changes can make.

Keywords: Angler, fishing participation, travel cost

## **Introduction**

Understanding angler motivations and preferences is critical to effective fisheries management. If managers can recognize the differences between anglers, they can direct management to appeal to certain anglers. Additionally, differences in economic impacts by various types of fishing can contribute to the value of recreational fishing in different ways. In 2011, anglers spent over \$456 million on fishing trip related expenditures in Alabama (USFWS, 2012). However, the economic contribution can vary for the different types of anglers and across settings. Anglers can differ on many levels, which influence their frequency of fishing participation (Connelly et al., 2001).

Previous research has classified anglers in a variety of ways, such as by fishing preferences (Schramm et al., 2003; Hutt & Neal, 2010; Connelly et al., 2013) or level of angling specialization (Fisher, 1997; Hutt & Bettoli, 2007; Beardmore et al., 2013). Hutt and Neal (2010), for example, grouped anglers by residence type, urban, rural, or intermediate, and found that urban anglers placed higher importance on catch rates and safety, whereas rural anglers valued scenic beauty. Hutt and Bettoli (2007) classified trout anglers using hierarchical clustering of 14 variables to identify 5 groups of anglers, from occasional to specialist, recognizing as specialization increases, increases in annual days fishing occurred, which is consistent with past research on the topic (Fisher, 1997).

Within these angler groups, individuals have been found to be motivated to go fishing for different reasons (Arlinghaus, 2006; Beardmore et al., 2011). In a study comparing anglers by preferred species, differences in motivation led to anglers being classified into one of five categories from trophy-seeking anglers to social anglers (Beardmore et al., 2011). Research into differences between anglers targeting different fish has been limited, but understanding those

differences may have a greater influence on management, such that differences between species can influence regulatory preferences. When making comparisons between species, Schroeder and Fulton (2013) found that Minnesota Walleye anglers were more inclined to catch and keep fish regardless of size when compared to Largemouth Bass anglers, who preferred releasing their catch, and Northern Pike anglers, who emphasized catching large fish. Dividing anglers into subpopulations by targeted species provides important information about anglers that can influence management decisions that may impact fishing participation rates.

Research investigating factors influencing changes in angler participation rates is relatively scarce. Loomis (2006) looked at changes in angler visitation on Snake River sites in Idaho and Wyoming by asking anglers how their visitation would change if they were able to catch larger or catch more fish. He found anglers would increase use over 50% by increasing angler catch. Using a similar model for anglers in the Great Lake's region, site use was strongly influenced by catch rates at those sites (Melstrom & Lupi, 2013). Both of these studies found that positive increases in angler participation lead to positive economic trends.

Quantifying the economic impact of recreational fishing is a great tool to aid in management decisions for recreational fisheries. Economic valuation in recreational fishing has been conducted on scales nationwide (USFWS, 2012) to local site-specific studies (Dorr et al., 2002; Lothrop et al., 2014). Using the travel cost model (TCM) methodology, estimates of demand for recreational uses for specific sites can be valued by incorporating travel cost data and use data (Parsons, 2003). TCM recognizes that the cost of travel is an important component to the full cost of a trip, which can vary greatly between users, and can impact the frequency of visitation (Freeman, 2003). By valuing fishing trips, specifically by targeted species, managers

can understand the value of fishing between different anglers, and assess tradeoffs for management of those species.

The goal of this research was to understand fishing trip participation differences between common freshwater species anglers in Alabama and the potential for additional trips if sites were managed in a way that catch rates were increased. Additionally, we evaluated trip costs to understand the value of fishing trips per targeted species. We were interested in identifying differences in fishing motivations and preference by anglers targeting different species. Also, we want to know if those differences lead to changes in participation and the differences in fishing trip costs. By understanding the potential number of additional trips an individual would take, we can estimate the additional value that would add in revenue in Alabama. This information is useful to managers because they can utilize this information to meet the needs of anglers. Managers can design management strategies for specific species and understand the value that can add, as well as, the influence on fishing participation. Using the method of predicting additional trips as a result of increases in the number of fish caught is a technique that has not been done.

## **Methods**

We implemented a comprehensive survey to a random selection of 3,000 licensed Alabama freshwater anglers in Summer 2014. Using fishing license data provided by the Alabama Wildlife and Freshwater Fisheries Division (WFF), we sampled from the Annual License list and the Lifetime License list, which is a one-time license purchase that allows the licensee to retain fishing privileges for life. We sampled proportionally from each list for license sold up till March of the August 2013- August 2014 license year. Licensees that provided a non-

Alabama address were removed to ensure sampling of state residents only. Of the 3,000 selected, 43% (1,290) were Lifetime license holders and 57% (1,710) were Annual license holders. The survey design and mailing follows a modified Tailored Design Method (Dillman, 2009). This design, which includes four contacts with the recipient, includes a pre-notice letter informing of their selection for participation, the survey packet which includes the survey and a stamped return envelope, a reminder postcard, and finally a letter detailing instructions to complete the survey online through Qualtrics (2014). Respondents and returned mailings for insufficient addresses were removed between mailings. This method is modified to include a fifth mailing sent to a sample of non-respondents in October 2014.

#### *Variable Selection*

The survey was a comprehensive survey that collected data on recent trip activity, angler preferences, motivations, specializations, and sociodemographic information (gender, ethnicity, age, annual income). The survey was designed to include some similar questions asked in the previous state-wide angling survey, conducted in 2002, for comparison. For this study, 11 questions were used to detail the respondent's most recent fishing trip, with a trip being defined as "anytime you went fishing for any portion of the day". Trip data collected included location of most recent fishing trip, distance traveled (one-way), frequency of visitation, trip expenditures, and primary target species. Comparisons for this study were made between four of the most common targeted freshwater species as indicated from the previous state survey (ADCNR, 2003) and included Largemouth Bass, Bream (Bluegill and Redear/Shellcracker), Catfish, and Crappie (Table 3.1).



To identify differences between anglers' motivations, respondents indicated their level of importance on reasons why they go fishing for 13 statements. Statements were on a 1 -5 Likert Scale, where 1 = Not at all important, 3 = Important, and 5 = Very Important. A principal component analysis (PCA) with varimax rotation was used to group correlated motivation statements into components. Components with an eigenvalue greater than 1 were extracted and statements with a factor loading greater than 0.40 were retained to identify statements associated with each component, resulting in the removal of 2 statements (Vaske, 2008). A separate PCA was run for each of the 4 primary species. To further identify differences, respondents within each primary species group were grouped using a standard set of 11 specialization indicators (Beardmore et al., 2013), using cluster analysis and were identified as Casual, Active, or Dedicated anglers. Next, responses to method of fishing (bank, pier, or boat) and fishing preferences (catching a lot of fish, catching big fish) were identified using a 1 – 5 scale. Comparisons were made between the groups of anglers using one – way ANOVA and Tukey HSD Post – hoc procedure at the  $p < 0.05$  significance level. Survey data was entered and analyzed using IBM SPSS 21 statistical software.

### *Calculating Additional Trips*

To assess additional or fewer trips, respondents were asked to indicate how many of their target species they caught on their most recent trip. Then, they were asked, “How many additional/fewer trips per year would you take if it were possible to manage in a way that you could catch twice/half the amount of your primary species?” The responses included 5 options: Same amount of trips, 1-3 more/less trips, 4-6 more/less trips, 7-9 more/less trips, 10 or more additional/less trips. To predict additional/fewer trips, the median value of each category, 0 for

‘Same amount of trips’, and 10 for ‘10 or more additional/less trips’ was used to create a scale of predicted number of trips an individual would take in response to number of fish caught for each target species. The median value was added to the current number of trips for the possibility of catching double the amount of fish and subtracted for the possibility of catching half as many of their primary species.

The predicted number of additional trips per species was analyzed using polynomial regression in R 3.1.1 (Quinn & Keough, 2002). The predicted number of additional trips as a function of fish caught was assessed using a quadratic model in the form:

$$T = \beta_0 + \beta_1 C + \beta_2 C^2, \quad (1)$$

where  $T$  is the predicted number of trips taken per year for a given target species (Bass, Bream, Catfish, Crappie),  $\beta_0$  is the coefficient estimate for the average number of trips an individual takes at 0 fish caught of a targeted species,  $\beta_1$  is the rate at which predicted number of trips increases for one additional fish caught ( $C$ ) when  $C = 0$ , and  $\beta_2$  dictates whether the slope of the curve increases or decreases as the number of fish caught increases. We predict this to decrease. Also, a random effect due to the individual was included.

To help explain additional variance within the data for the individuals whose primary species was Bass, a similar model was analyzed that included a variable for specialization level, indicating anglers could be further classified by their level of angling specialization. However, the specialization variable was not significant ( $p = 0.4253$ ) and therefore not included in the final model.

### *Estimating Trip Cost*

Evaluating trip cost is used to estimate the average value of a fishing trip by primary species. Using methods described by Parsons (2003), survey respondents were asked to estimate their travel expenditures by type (fuel, food, lodging, and bait/tackle) as well as include their distance traveled in miles to reach their fishing destination. The mean value for all anglers per targeted species was used to compare fishing trip costs per species. Travel cost per individual ( $C_a$ ) was estimated by:

$$C_a = X_a + O_a , \quad (2)$$

where  $X$  is the summation of an individual's estimated expenditures on their most recent fishing trip, including the cost of vehicle operation, lodging, and food expenses, and  $O$  is the opportunity cost of travel time for each individual  $a$ . The cost of vehicle operation was determined by multiplying the individuals' roundtrip mileage driven by \$0.575, which is the current Federal standard mileage reimbursement rate of cars, trucks, and vans (Internal Revenue Service, 2014).

The opportunity cost is a standard variable in the TCM. Opportunity cost is the value of the time spent during that trip on travel time and time spent at the site that could have been time spent on other activities and is a function of income (Freeman, 2002). The opportunity cost of time spent traveling to a fishing site for the individuals' targeted species ( $O_a$ ) was estimated using:

$$O_a = (H_a/2000) \times (D_a/55 \text{ mph}) \quad (3)$$

where  $H$  is the annual household income from 2013, divided by 2,000 hours worked per year, when 40 hours a week is multiplied by 50 weeks per year, to achieve an hourly pay rate, and  $D_a$  is the roundtrip distance traveled in miles for individual  $a$  which is divided by the an average speed of 55 miles per hour to determine hours of travel (Lothrop, 2014; McKee, 2013).

Individual income data was obtained by individual's response to the income range that they survey respondent fell within. For the TCM, the midpoint of each income bracket was used. Since the smallest (Less than \$14,999) income choice was not a defined bracket, one-half of the next income bracket ( $\$19,999 - \$15,000 = \$5,000 / 2 = \$2,500$ ) was subtracted from the highest value ( $\$14,999 - \$2,500 = \$12,500$ ) to be used as the value for that bracket. The same procedure was used for the highest income bracket ( $\$150,000$  or more), except using the preceding bracket and adding it to the highest value, so the new value used was \$175,000.

## **Results**

### *Survey Results and Response Rate*

After correcting for non-deliverable surveys, of the 3,000 originally mailed out, the usable sample size was 2,411 individuals. Of that, 605 were returned completed surveys, which yielded a response rate of 25.1%. To determine if the response sample was representative of the sample population, and therefore the angler population, a two-step non-response bias was conducted (Vaske, 2008). First, we compared responses by license to the sampled population, and found our responses were 46% Lifetime License and 54% were Annual License holders, which was not significantly different (at the  $p < 0.001$  level) from the sampled population of 43% and 57% respectively.

Next, using the ages from the Lifetime License list provided by ADWFF, 3 age brackets were created (18-35, 36-50, and 51-65) and distribution of the list was determined for each age group. We compared the age distribution of the Lifetime License master list to our sampled population then to our responses. Individuals 65 and older were not included because they are not required to buy a fishing license in Alabama. Of the Lifetime License master list ( $n =$

57,354), 17.7% were 18 – 35, 32.7% 36 – 50, and 36.6% 51 – 65. No significant differences at the  $p < 0.05$  were found between the responses of the master list to that of the sampled population (17%, 33.6%, and 36.8%, respectively) or the response population (17.3%, 29.6%, and 43.7%) ( $X^2 = 8.090$ ,  $p = 0.232$ ). Additionally, no significant differences were found between the ages of the Lifetime License respondents and the Annual License respondents ( $X^2 = 1.826$ ,  $p = 0.609$ ), indicating that our responses are likely representative of the anglers in Alabama.

### *Descriptive Characteristics*

After removing the surveys that did not complete all the questions used for analysis, indicated “Other”, or marked more than one choice as their primary species were excluded, we had a sample size of  $n = 353$  for analysis. Between the species, gender was the only factor that was statistically significant (Table 3.1). Results from the individual PCA’s were very similar between the species, such that 3 components were extracted for each species. Because the components were grouped similarly, the descriptive name used is the same for each species. The SOLITUDE component consisted of statements like “For peace and quiet”, the SOCIALIZE component consisted of statements like “To be with others who enjoy the same things”, and the “ACTIVE” component consisted of statements like “To catch trophy fish” and “To test my equipment”. Combined, the three components explained over 63% of the variance in each of the angler groups.

Individuals whose primary species was Bass was the largest group ( $n = 191$ ). Bass anglers are majority Caucasian (91.7%) males (87.8%) with a mean age of 47.6 and annual income between \$50,000 and \$100,000 (40.1%). Bass anglers strongly prefer fishing using a motorized boat ( $m = 4.50$ ) over any other method and indicated “Knowing ‘trophy’ size fish are

available to be caught” has significantly more important than any of the other species.

Additionally, they indicated “Catching fish to eat” as significantly less important compared to bream and catfish anglers. After running the PCA on the motivation statements, 3 components were extracted, with the SOLITUDE component explaining the most variance (26.7%), followed by the ACTIVE component.

Bream anglers ( $n = 63$ ) are also majority Caucasian (95.4%) males (87.7%), but slightly older with an average age of 50 and have a more evenly distributed annual income than the other angler groups. Bream anglers were the only group that had more individuals with a Lifetime License (53%) compared to an Annual fishing license. Bream anglers prefer fishing from a pier significantly more than bass anglers ( $m = 3.21$ ), but most preferred fishing from a motorized boat. Additionally, bream anglers felt “Knowing the fish are safe to eat” is more important ( $m = 4.33$ ) than any of the other anglers. After running the PCA, similar to bass anglers, the first two components were also the SOLITUTDE and ACTIVE, explaining 46.5 % of the total variance combined.

The smallest group were catfish anglers ( $n = 45$ ), which are a majority male (82.4%) with a mean age of 51.6; however this group was more ethnically diverse, where 16% of individuals indicated being non-Caucasian. Catfish anglers also indicated making the lowest annual income with 41.3% making less than \$35,000. Catfish anglers prefer fishing from either a motorized ( $m = 4.10$ ) or a non-motorized ( $m = 3.11$ ) boat; whereas the other groups least prefer a non-motorized boat. After running the PCA on motivation statements, just like bass and bream anglers, the top two components which explain 50.4% of the total variance combined were SOLITUDE and ACTIVE.

Crappie anglers ( $n = 53$ ) are mostly Caucasian (94%) with an average age of 48. However, crappie anglers had the highest percent of females at 30.6%. Crappie anglers averaged an annual income between \$35,000 and \$75,000 (40%), but had the highest percent of individuals making over \$100,000 (22.2%). Crappie anglers are similar to bass anglers such that they most preferred fishing from a motorized boat ( $m = 4.33$ ) and least preferred from a non-motorized boat ( $m = 2.48$ ). Additionally, they felt “Catching the kind of fish you prefer to catch” was an important factor for selecting a fishing site, similar to bass. After running the PCA for crappie anglers, unlike any of the other anglers, the SOCIALIZE component explained the most variance (26.1%) and the ACTIVE component explained the least (19.2%).

#### *Additional Trips*

Predicted number of trips as a function of catch given a target species can be seen in Figure 3.1. For Bass, at 0 fish caught, anglers would take approximately 8 trips per year. Using the mean value of bass caught ( $mean = 6$ ), if it were possible to double angler catch, bass anglers would take an additional 3.5 trips per year. For individuals whose primary species was Bream, at 0 fish caught, anglers would take approximately 9 trips per year. Bream anglers caught an average of 18 fish per trip, doubling their catch, anglers would take an additional 2 trips per year. For individuals whose primary species was Catfish, at 0 fish caught, they would take 9 trips per year. If it were possible to double their catch with an average of 8 fish caught per trip, Catfish anglers would take 1.7 additional trips per year. For individuals whose primary species was Crappie, at 0 fish caught, anglers would take approximately 11 trips annually. If it were possible to double catch at a mean of 13, crappie anglers would take an additional 1.5 trips per year. Because the average number of trips taken and species caught differed between angler groups,

the rate of change for increased number of additional trips per 1 additional fish caught ( $\beta_1$ ) varied between the species which can explain the differences in potential number of additional trips for each species (Table 3.2).

### *Fishing Trip Estimates*

Of all the respondents, those indicating that Crappie is their primary species had the highest average trip cost (Table 3.3). Crappie anglers spent an average of \$106.51 per trip and took an average of 13 trips per year, traveling 61.87 miles roundtrip. The total of all trip expenditures for crappie anglers (lodging, food, bait, cost of vehicle operation) is \$58.40, and the opportunity cost of travel (\$46.49) is the highest among the groups. Anglers who primarily target bass had the lowest average trip cost at \$77.76 and the lowest roundtrip miles per trip at 52 miles. Bream anglers take the least amount of annual trips at 8.4, and have the lowest opportunity costs of driving, estimated at \$25.31. Lastly, catfish anglers spent \$99.25 on average per fishing trip and an average of 9.8 annual trips. However, catfish anglers indicated driving the farthest, with an average roundtrip being 68.7 miles. Across all species, the average trip cost is \$91.59, which is a slight increase from the reported average trip cost in the 2002 state-wide angler survey with the average fishing trip costing \$77.41. Variables such as increase in fuel costs may easily account for this increase.

Using the predicted number of additional trips and the average trip cost, managing recreational fisheries in a way where angler catch could be doubled, each bass angler would spend an additional \$272.16 per year for fishing trips, which is the highest contribution among the 4 angler groups. Crappie anglers would spend \$159.77 additional on fishing trips, which is the least amount, which is due to having the lowest rate of increase for additional trips (1.5



additional trips). Bream anglers would contribute an additional \$165.69, which is slightly higher than catfish anglers, where improving catch would contribute an additional \$168.73 per year per angler.

## **Discussion**

Overall, our study successfully identified critical differences between anglers when compared by targeted species. Continuing the trend from previous state freshwater surveys, the highest percent (54.1 %) of participations indicated bass as their primary species. Bass anglers have the potential to take more (#) additional trips for each additional fish caught which would contribute more revenue annually. The goal of this study was to distinguish a link between increased participation as a result of improvements in catch rates. Although differences between the value of fishing trips between species was not significant, when increasing catch rates at their most recent site, all angler groups indicated taking more annual fishing trips, supporting results from past studies (Loomis, 2006; Dorr et al., 2002). Despite using a similar scenario of being able to double the anglers' current catch rate to predict additional trips, our results differed quite a bit from Loomis (2006). Our highest rate of increase (27.7 %) was for bass anglers, whereas, Loomis's (2006) study revealed an increase of over 68%. Our predicted rate of increase seems more realistic assuming that changes in available time to go fishing, or constraints would not change for anglers. These variables were not assessed for either study so it is difficult to know if using his method of making comparisons by site, whereas ours made comparisons by targeted species could account for the different estimated rates of increase.

Our study revealed preference differences between species that can strongly influence management. Similar to Schroeder and Fulton (2013), our study identified differences in catch

preferences between different species; furthermore, bass anglers in our study did not find “Catching fish to eat” as important, similar to bass anglers in their study, expressed little interest in keeping the fish they catch. With angler participation rates and associated license sales declining, providing key information such as differences in catch preferences can help managers’ design strategies that target specific anglers and have a better understanding of how their management actions will impact those anglers and effect participation rates or overall satisfaction (Arlinghaus, 2006).

Despite having the lowest rate of increase in additional trips, Crappie anglers had the highest number of average trips taken and spend the most per trip. Additionally, crappie anglers caught more fish per trip, suggesting that with current catch rates higher than other species, the incentive to catch more is not as influential. These results reflect Reed and Parsons (1999) who found over 90% of Mississippi crappie anglers in his study would not change their fishing effort even with increased slot and size limits. However, managing fisheries resources for Crappie would benefit anglers and overall state angling days very positively. More females indicated being crappie anglers, and crappie anglers were most motivated by the SOCIALIZE component, improving crappie fisheries in the state may influence the amount of female anglers or increase the chances that an angler will bring someone to go fishing with, therefore, increasing participation.

Certain limitations within our study are present. Although our response rate was lower than expected, we feel that our results are very useful for future fisheries management in Alabama. However, the first mailing of the survey was sent in Summer, which conflicts with summer vacation time, most likely impacting our survey responses. Caution is also warranted

when generalizing our results or applying demographic comparisons due to our responses underrepresenting women and non-Caucasian ethnicities.

This study did not include estimates of consumer surplus or willingness – to – pay (Lothrop et al., 2014) because estimates as such are dependent upon a single site or location for analysis (Parsons, 2003). Therefore, our study did not include options for looking at changes in participation as a result of increased size of fish or changes in slot limits, all of which vary across specific sites. However, by analyzing differences by species, managers can apply these results to various locations that support a Bass, Bream, Catfish, and/or Crappie populations. Even though it is unrealistic to think that managers can ensure catching double the amount of current fish caught at a site, using this information, managers can assess the tradeoff of managing for specific species and how that will impact the types of anglers that visit those sites. However, using the quadratic model from our study, we can estimate predicated number of trips for each 1 additional fish caught. Increasing catch by 10% is more realistic than being able to double catch rate, which our model allows for the prediction of increases at any level. This model would be extremely useful if applied to specific sites, understanding that setting preferences differ with site, therefore would influence management decision.

## **Conclusions and Management Implications**

This study successfully demonstrated how incorporating general angling survey results on intended visitation and common economic valuation techniques can provide information for improved fisheries management. Understanding the tradeoffs for managing for different species and how that impacts angler participation is useful when making site specific management decisions. Increasing catch rates can lead to increased angler participation, which leads to

increased expenditure contributions. Not only can improving management lead to increases in fishing trips, the addition of associated costs of those trips can directly benefit local economies. If anglers are willing to take more trips, they will spend more on fuel, food, and other associated costs, which directly benefit retailers of those commodities.

This information is especially critical for managers that are interested in increasing visitation to less frequented fishing sites. Our results give managers direct knowledge of what can be done to improve visitation at those sites and how implementing those changes will potentially influence angler recruitment and retention. Segmenting anglers by primary species and identifying those differences can also influence management decisions. Recognizing that bream and catfish anglers are more likely to harvest their catch, programs such as increasing fish stocking may increase angler use at those sites. Additionally, recognizing changes in management may influence participation by specific angler demographics. For example, if stocking was increased, attracting more bream would suggest attracting slightly older demographic and attracting catfish anglers attracts more non-Caucasian anglers. This study demonstrated the critical value of a state-wide survey in understanding angler participation. Implementing similar surveys more frequently can help fisheries managers keep up with trends and difference on the angling population.

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**Table 3.1.** Sociodemographic characteristics between primary species angler groups; comparisons were made using Chi – Square at  $p < 0.05$  significance level

Demographic Data	Angler Group				<i>F/X</i> <sup>2</sup>	<i>P</i> – <i>value</i>
	Bass ( <i>n</i> = 191)	Bream ( <i>n</i> = 63)	Catfish ( <i>n</i> = 45)	Crappie ( <i>n</i> = 53)		
<b>Age</b>	47	50	51	48	12.78	0.619
<b>Gender (%)</b>						
Male	87.8	87.7	82.4	69.4	18.15	0.003
Female	12.2	12.3	17.6	30.6		
<b>Ethnicity (%)</b>						
African American	2.1	1.5	5.9	4.1	29.577	0.241
American Indian	4.2	-	5.9	2		
Asian	1.1	1.5	-	-		
Caucasian	92.6	95.4	84.3	93.9		
Latino	-	-	2.0	-		
<b>Household Income (%)</b>						
Less than \$20,000	13.0	3.6	17.4	17.8	17.78	0.275
\$20,000 - \$34,999	15.8	21.4	23.9	6.7		
\$35,000 - \$49,999	14.1	23.2	10.9	20.0		
\$50,000 - \$74,999	26.0	21.4	28.3	20.0		
\$75,000 - \$99,999	14.1	12.5	10.9	13.3		
\$100,000 or more	16.9	17.9	8.7	22.2		

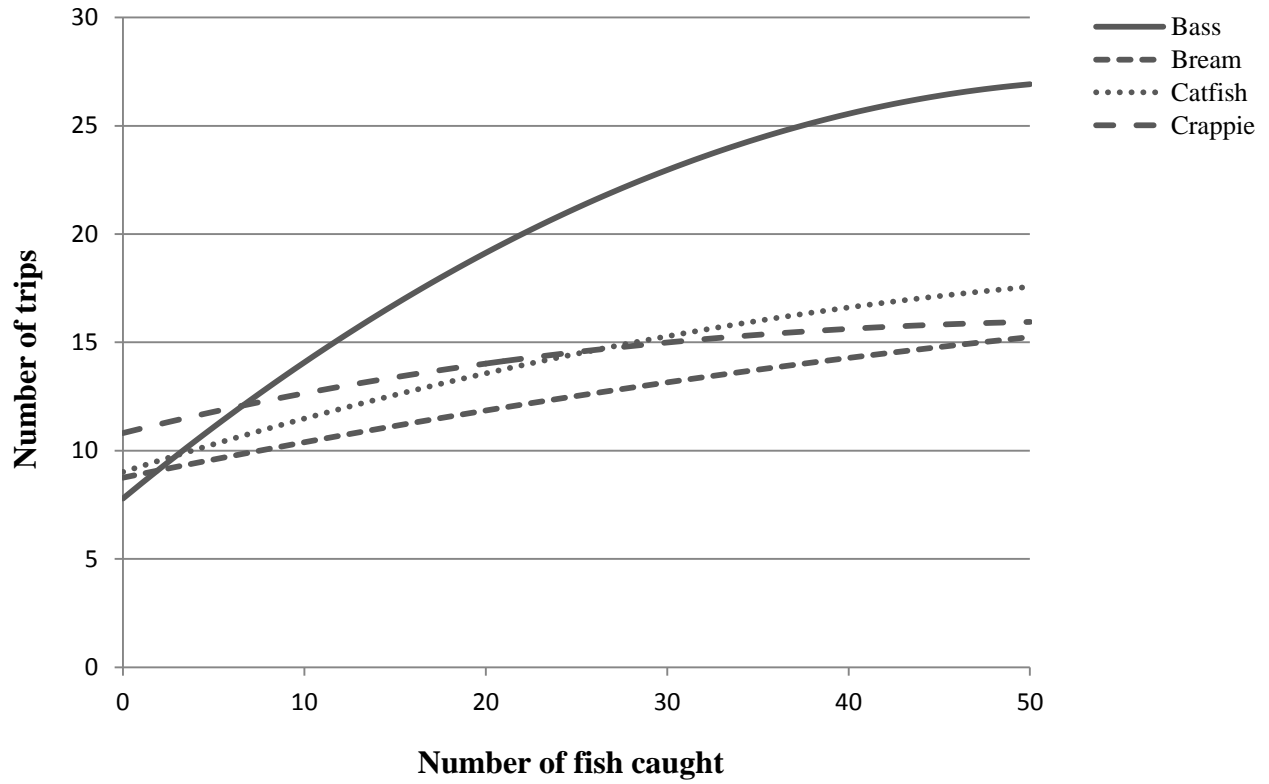


**Table 3.2.** Results from the Quadratic regression model for additional trips as a function of one fish increase in catch per target species.

Variable	Bass			Bream			Catfish			Crappie		
	Estimate	St. Error	<i>p</i> – value	Estimate	St. Error	<i>p</i> – value	Estimate	St. Error	<i>p</i> – value	Estimate	St. Error	<i>p</i> – value
Intercept	7.7915	0.8639	< 0.0001	8.7534	1.6548	< 0.0001	9.0172	1.8475	0.0000	8.3317	1.9784	< 0.0001
Catch	0.6902	0.0463	< 0.0001	0.1719	0.0293	< 0.0001	0.2654	0.0706	0.0003	0.3330	0.0442	< 0.0001
Catch <sup>2</sup>	-0.0062	0.0008	< 0.0001	-0.0008	0.0002	< 0.0001	-0.0019	0.0006	0.0018	-0.0019	0.0004	< 0.0001
Random Error of Individual		3.1383			2.8399			3.1820			3.3837	

**Table 3.3.** Fishing trip characteristics for average fishing trip for each primary targeted species.

Variable	Bass		Bream		Catfish		Crappie	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Annual trips	12.59	13.74	8.42	10.25	9.8	9.45	13.16	13.53
Roundtrip distance per trip (miles)	52.12	66.9	63.07	110.1	68.76	78.33	61.87	78.89
Expenditures (\$)	44.99	55.51	58.39	67.1	68.04	84.64	58.40	65.60
Opportunity Cost (\$)	32.67	53.32	25.31	27.29	38.95	68.35	46.49	76.5
Total average trip cost (\$)	77.76	101.71	82.85	82.94	99.25	127.97	106.51	138.06
Total annual fishing trip cost (\$)	979.00		697.60		972.65		1,401.67	
Additional annual trips with increased catch rates	3.5		2		1.7		1.5	
Increased angler expenditures for increased trips (\$)	272.16	355.98	165.69	165.89	168.73	217.55	159.77	207.10



**Figure 3.1.** Projected number of additional trips for each additional fish caught for each primary targeted species.

## Chapter 4: Project Summary

Recreational angling in Alabama is a multi – billion dollar industry which has seen recent declines in participation over the last decade. Understanding reasons for decreased angling and ways that may change that trend is critical to the Alabama WFF because their budget is dependent on license purchases. We used various methods to classify anglers to identify the different motivations, setting preferences, and participation rates between anglers in Alabama. By using the specialization framework, anglers were able to be classified through their commitment to the activity, showing that various levels of anglers are present which impact their participation. Additionally, using the classification by targeted species, we were able to demonstrate how species management impacts participation and associated angler costs and benefits. Understanding these results can have significant implications for management and angling in the state.

By recognizing these differences, managers can align their management strategies with those of specific angler groups and understand management tradeoffs for site improvements. For example, in our results, *Dedicated anglers* indicated taking more additional trips for improvements in size of catch, versus number of fish caught, which yielded the highest percent of additional trips for *Casual* and *Active anglers*. Managing for more fish is not the same as managing for bigger fish. Both of those results can have biological implications as well. When managing for more fish, managers must also account for harvest rates to avoid a single species-crowded situation. Additionally, managing for increases in size of fish caught will impact the species present at site. Both situations have the potential to attract certain anglers, and recognizing who those anglers are is important.

Using similar sampling methods, fisheries managers can identify specific needs of anglers and focus management on meeting those specific needs at a single site. If increasing visitation at a fishing site is the main management objective, based on our results, it is critical to consider non – catch related site attributes. All anglers indicated higher importance on a site that is aesthetically pleasing, clean, and safe. In terms of management, this is easily obtained and is more cost effective. Enhancing sites for non – catch related attributes can include things like adding additional lights in parking areas or on roads, having more areas to throw away trash, or maintaining clean landscaping, all of which may be costly up front, but may not require annual replenishment such as stocking fish. Using both angler classification techniques, this study was able to identify factors that can influence specific management objectives which positively influence angler participation in the state.

Using classification by targeted species, this study was able to develop and demonstrate the use of a quadratic model that has never been used in this context. Using the model, we were able to predict the number of additional trips anglers targeting certain species would take based on the number of fish they caught, and make comparisons between those rates. Our study resulted in anglers targeted Bass as taking the most additional trips. The quadratic model used in our study is a new tool for managers to take identified site preferences and predict the related impact of site improvements and assess tradeoffs for different scenarios. Additionally, by estimating trip costs, managers can better understand implications of management which can make management decisions making more efficient and effective in terms of angler recruitment and retention.

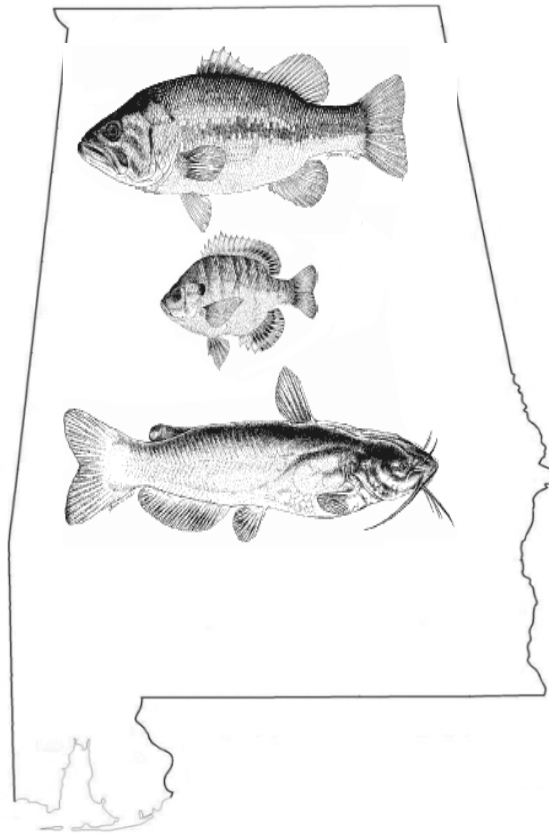
Overall, using a comprehensive survey such as the one in this study is a great way to obtain a vast amount of information in a single tool. Implementing a similar survey at a single

location or specific sites, such as the State Lakes, may result in the use of a shorter survey, which may help to increase response rate. Additionally, at specific sites, survey responses will be more representative of the anglers of those specific locations. In general, conducting a comprehensive state-wide angler survey periodically to identify trends would be extremely beneficial. It would allow for managers to identify trends throughout the population, as well as justify management decision making. In a number of surveys returned for this study, respondents provided additional comments expressing gratitude for sending out the survey and taking an interest in their specific opinions before adjusting management. Positive feedback from respondents is another way that managers can feel secure and justify their decisions for management.

In conclusion, this study was successful in identifying angler diversity, angler preferences, and how those preferences influence participation. Moving forward from this study, similar analysis will be conducted on survey responses from specific state lakes. Using those results, and results from this study, management recommendations can be made that align general angling preferences with more site specific results and develop an ideal management plan that can improve satisfaction and visitation at the Alabama Public State Lakes.

# 2014 Alabama Angler Survey

Understanding your freshwater fishing and management preferences



**Alabama Division of Wildlife and Freshwater Fisheries  
and  
The School of Forestry and Wildlife Sciences  
Auburn University**

## **Greetings from Auburn University and the Alabama Division of Wildlife and Freshwater Fisheries**

The Alabama Division of Wildlife and Freshwater Fisheries (WFF) wants to understand your fishing preferences to help guide the management of these important resources. For this reason, WFF has partnered with Auburn University to gather information about your fishing motivations, preferences, and satisfactions to help guide in management decisions in the state.

The best way we have of learning about fishing related issues is by asking a diversity of anglers to share their thoughts and opinions. You are one of a small number of randomly selected fishing license buyers who we are asking to complete this survey. This questionnaire is only available to participants ***age 19 and over*** that purchased a fishing license for the 2014 season. The questions should take approximately 15 minutes to complete. Your responses are voluntary and will be kept confidential. Your answers will never be associated with your mailing address or your name. We appreciate and value your input and look forward to receiving your completed survey.

Your decision about whether or not to participate will not jeopardize your future relations with AU, the School of Forestry and Wildlife Sciences, or WFF. If you have any questions about this survey, please contact Dr. Wayde Morse, by telephone at (334) 844-1086 or by email at [statelakes@auburn.edu](mailto:statelakes@auburn.edu). WFF appreciates your support of our fishing heritage through your purchase of a fishing license. WFF strives to keep a balance that is beneficial to Alabama's wildlife populations and its anglers

By taking a few minutes to share your experiences, you will be helping WFF have a better understanding of Alabama anglers. The information you share with us will be used to enhance fishing and management related decisions in Alabama. We look forward to receiving your responses.

Sincerely,

Dr. Wayde Morse  
Assistant Professor and Researcher  
School of Forestry and Wildlife Sciences  
Auburn University

Matthew Marshall  
Alabama State Lakes Director  
Wildlife and Freshwater  
Fisheries Division

**HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE  
IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL  
SERVE AS YOUR AGREEMENT TO DO SO.**

**If you have any questions about your rights as a research participant, you may contact the Auburn University  
Office of Human Subjects Research or the Institutional Review Board by telephone at (334) 844-5966 or by email  
at [hsubjec@auburn.edu](mailto:hsubjec@auburn.edu)**

**The Auburn University Institutional Review Board has approved this document for the use from  
April 18, 2014 to- April 17, 2015  
Protocol # 14-146 EP 1404**



## Freshwater Fishing In Alabama

1. About how old were you when you first went fishing?

Years

2. Do other members of your family fish?

Yes

No

3. About how many years have you fished in Alabama?

Years

4. Which fishing license type did you purchase for 2014?

Resident

Non-resident

5. Not including this year, how many of the past 5 years have you had a license to fish in Alabama?

Years

6. Did you go fishing during the last 12 months?

Yes

No

**7. Please rate your preferred method of fishing in Alabama**

	1	2	3	4	5
	←—————→				
	Do not prefer		Prefer		Strongly prefer
Bank	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pier	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motorized boat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-motorized boat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Other:</b> _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**8. What is your preferred species to fish in Alabama?**

	1	2	3	4	5
	←—————→				
	Do not prefer		Prefer		Strongly prefer
Bass	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bream (Bluegill and shellcracker)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Catfish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Crappie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Striped Bass	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Other:</b> _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**9. What is your preferred type of freshwater fishing setting in Alabama?**

	1	2	3	4	5
	←			→	
	Do not prefer		Prefer	Strongly prefer	
Rivers/streams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reservoirs/ lakes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ponds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**10. Approximately how many trips did you take to fish in Alabama during the last 12 months? (A trip is any time you went fishing for any portion of the day.)**

**Trips**

**11. Of that number of trips fished that you listed above, approximately how many trips did you take to fish in the following types of settings?**

**Rivers/streams:**

**Trips**

**Reservoirs/lakes:**

**Trips**

**Ponds:**

**Trips**

**Other:** \_\_\_\_\_ 

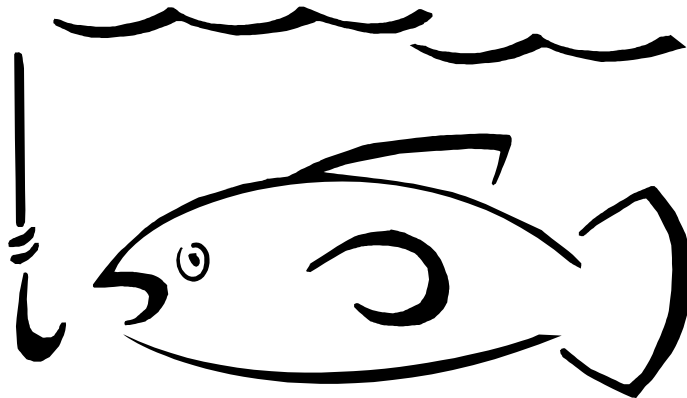
**Trips**

12. Approximately, how many trips did you take to fish in a different state in the last 12 months?

Trips

13. How would you rate your overall satisfaction with your fishing experience in Alabama during the last 12 months?

1	2	3	4	5
←—————→				
Very poor	Neither poor nor good			Very good
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>





**16. Please rate your abilities in comparison to other anglers as they apply to fishing**

	1	2	3	4	5
	←—————→				
	Novice			Expert	
Level of fishing skill	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Level of fishing knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Level of knowledge of fisheries management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**17. Please indicate your level of agreement with the following statements about the importance of fishing to you.**

	1	2	3	4	5
	←—————→				
	Strongly Disagree		Neither agree nor disagree		Strongly Agree
Fishing is important to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have accumulated a lot of fishing equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I stopped fishing, I would probably lose touch with a lot of friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would rather fish than do any other activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find that a lot of my life is organized around fishing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fishing says a lot about who I am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**18. Do you own any of the following that you use for fishing?**

- Motorized fishing boat
- Canoe
- Kayak
- Bellyboat
- Other \_\_\_\_\_

**19. Approximately how much do you spend annually on fishing gear?**

Dollars



**21. How important are each of the following reasons why you fish?**

	1	2	3	4	5
	←—————→				
	Not at all important		Important		Very important
To be outdoors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To do something with my family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For the fun of catching fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To catch fish to eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To catch a trophy fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To test my equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For peace and quiet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For the challenge of catching fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To share my knowledge of fishing with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To enjoy solitude	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To be with others who enjoy the same things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For relaxation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To be close to the water	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**22. Do you have any interest in fishing at lakes or reservoirs?**

- Yes
- No (*please skip to question # 27 after setting preferences*)



**23. How important to you are each of the following biological reasons for selecting a lake or reservoir to fish?**

	1	2	3	4	5
	←—————→				
	Not at all important		Important		Very important
Knowing the fish are safe to eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Catching the kind of fish you prefer to catch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing there are a lot of fish to be caught	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing 'trophy' size fish are available to be caught	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**24. How important to you are each of the following environmental factors for selecting a lake or reservoir to fish?**

	1	2	3	4	5
	←—————→				
	Not at all important		Important		Very important
Good water quality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No litter or debris in the water or fishing area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Natural beauty of the water and surroundings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good, clean bank access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good boat access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Well-mowed grounds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fishing piers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shaded fishing areas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**25. How important to you are each of the following managerial reasons for selecting a lake or reservoir to fish?**

	← 1	2	3	4	5 →
	Not at all important		Important		Very Important
Safe boating conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing uniformed personnel are present for enforcement of regulations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing there is no access fee	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fishing information available at the site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seeing few or no other anglers while fishing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Regulations that allow you to keep a lot of fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling safe at the fishing site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



**26. How important to you are each of the following facilities for selecting a lake or reservoir to fish?**

	← 1	2	3	4	5 →
	Not at all important		Important		Very Important
Sites that are close to home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clean restrooms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clean picnic areas and picnic tables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Secure parking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Campground (primitive)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Campground (with RV connections)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trails (hiking, biking, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Playground	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pavilion for large groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Concessions (snacks and tackle)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Other:</b> _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Fishing Alabama's State Lakes

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Please see the included map of Alabama's State Lakes for the following questions.  
The map is yours to keep!

27. Are you aware that the Alabama Division of Wildlife and Freshwater Fisheries manage 23 public fishing lakes?

Yes

No

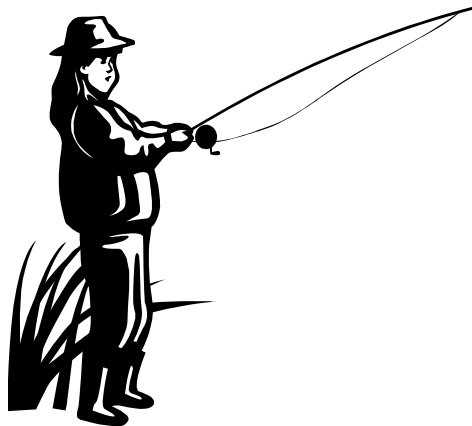
28. Looking at the map, what is the nearest state lake to your home? *(see map)*

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29. Have you ever fished at any of Alabama's State Lakes?

Yes

No *(Please skip to question #31)*



**30. A.** Please indicate if you **have ever fished** at any of the Alabama State Lakes during any point in your life by **checking the circle on the left** of the lake indicated. If you have never visited the lake, simply leave the circle blank

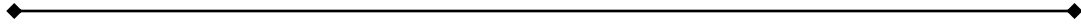
**B.** If you have visited any of the State Lakes during the **last 12 months**, please indicate the approximate number of trips you took to each lake. If you haven't visited in the last 12 months just leave them blank.

<b><u>Ever in your life</u></b>	<b><u>Last 12 months</u></b>
<input type="radio"/> Barbour County Lake	_____ Trips
<input type="radio"/> Bibb County Lake	_____ Trips
<input type="radio"/> Chambers County Lake	_____ Trips
<input type="radio"/> Clay County Lake	_____ Trips
<input type="radio"/> Coffee County Lake	_____ Trips
<input type="radio"/> Crenshaw County Lake	_____ Trips
<input type="radio"/> Dale County Lake	_____ Trips
<input type="radio"/> Dallas County Lake	_____ Trips
<input type="radio"/> DeKalb County Lake	_____ Trips
<input type="radio"/> Escambia County Lake	_____ Trips
<input type="radio"/> Fayette County Lake	_____ Trips
<input type="radio"/> Geneva County Lake	_____ Trips
<input type="radio"/> Lamar County Lake	_____ Trips
<input type="radio"/> Lee County Lake	_____ Trips
<input type="radio"/> Madison County Lake	_____ Trips
<input type="radio"/> Marion County Lake	_____ Trips
<input type="radio"/> Monroe County Lake	_____ Trips
<input type="radio"/> Pike County Lake	_____ Trips
<input type="radio"/> Walker County Lake	_____ Trips
<input type="radio"/> Washington County Lake	_____ Trips

**31. Even if you have never visited an Alabama State Lake, if any of the following improvements were made at your nearest Alabama State Lake, how many trips per year would you likely make due to that specific improvement?**

	Number of additional trips					
	Fewer trips	0	1-3	4-6	7-9	10+
Increasing the number of fish likely to be caught	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increasing the size of the fish likely to be caught	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Addition of hiking or biking trails	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Camping opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Children's playgrounds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Additional clean boat access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Additional clean bank access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase the aesthetics of the lake	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Your Most Recent Fishing Trip



32. What type of fishing setting did you visit on your most recent fishing trip?

- River/stream
- Reservoir
- State lake
- Pond
- Other \_\_\_\_\_

33. If your most recent fishing trip was to a lake or reservoir please write the name. If not, please write the stream or river name and indicate the nearest city to the area you fished.

Lake/Reservoir name

Name:

**OR**

Stream/River name and nearest city

Name:   
Nearest city:

34. How many trips did you make to this site in the last 12 months?

**Trips**

35. Approximately how many hours did you spend at this site?

**Hours**

**36. What is the primary species of fish you are targeting on your most recent trip?**  
(check *only one*)

- Bass
- Bream (Bluegill and Shellcracker)
- Catfish
- Crappie
- Striped Bass
- Other \_\_\_\_\_

**37. How many of your primary species did you catch on this trip?** \_\_\_\_\_





**38. If it was possible to manage this site such that you were able to catch twice the amount of your primary species, approximately how many additional trips would you take to this site per year?**

- No more trips
- 1-3 more trips
- 4-6 more trips
- 7-9 more trips
- 10 or more additional trips

**39. If this site was managed such that you were able to catch only half as many of your primary species, approximately how many fewer trips per year would you take to this site per year?**

- Same amount of trips
- 1-3 less trips
- 4-6 less trips
- 7-9 less trips
- 10 or more less trips

**40. How many trophy sized fish of your primary species did you catch on this trip? \_\_\_\_\_**

Bass Trophy = 8 lbs. or larger and 23 inches or larger

Bream (Bluegill and Shellcracker) Trophy = 1 lb or larger and 10 inches or larger

Catfish Trophy = 15 lbs or larger and 32 inches or larger

Crappie Trophy = 2.5 lbs or larger and 15 inches or larger

Striped Bass Trophy = 12 lbs or larger and 27 inches or larger

Other \_\_\_\_\_ Trophy = \_\_\_\_\_

**41. If this site was managed such that you were able to catch twice as many trophy sized fish, how many additional trips would you take to this site per year?**

- No more trips
- 1-3 more trips
- 4-6 more trips
- 7-9 more trips
- 10 or more additional trips

**42. Approximately how far did you travel one way from your home to reach that destination?**

**43. Approximately how many hours (one way) did you spend driving on this trip?**

**44. Approximately how much money did you spend on this trip?**

*(per day if the trip was longer than 1 day)*

Food/restaurant/drinks	<input type="text" value="Dollars"/>
Travel/gas	<input type="text" value="Dollars"/>
Hotel/campsite	<input type="text" value="Dollars"/>
Other_____	<input type="text" value="Dollars"/>

## Demographic Information

*For statistical purposes, we need to ask you a few demographic questions.  
Please remember that the information you provide is confidential!*

45. What year were you born?

19

46. What is your gender?

Female  Male

47. Including yourself, how many people live in your house?

people

48. How many of those in your household are under 18?

people

49. Are you retired?

Yes  No

50. What is your ethnicity?

- American Indian  Asian  
 Black/African American  White/Caucasian  
 Latino  Other

**51. What is your marital status?**

- Single       Divorced       Other
- Married       Widowed

**52. What is your highest degree or level of school completed?**

- Did not complete high school       Associate degree
- High School Diploma or GED       Bachelor degree
- Some college, but no degree       Graduate or professional degree
- Other

**53. Please check the box that corresponds to your income for 2013. This information is only used to understand angler satisfaction and management preferences across income groups.**

- Less than \$14,999       \$25,000- \$34,999       \$75,000- \$99,999
- \$15,000 - \$19,999       \$35,000- \$49,999       \$100,000- \$149,999
- \$20,000 - \$24,999       \$50,000- \$74,999       \$150,000 or more

**THANK YOU FOR PARTICIPATING IN THIS STUDY!!**

Your answers to this survey will provide our agency with useful information regarding the management and conservation of our natural resources. We appreciate your participation in the survey and value your continued support and purchase of Alabama fishing licenses.

Please provide any additional comments here.