Maryland Recreational Fisheries Management Survey

Prepared by Scott Knoche, Morgan State University in cooperation with Fishing and Boating Services, Freshwater Fisheries Program

Introduction

Recreational fishing in non-tidal waters is a popular outdoor recreational activity in Maryland, with an estimated 227,000 anglers taking over 2.5 million fishing trips and spending nearly $400 million on trips and equipment in 2011 (USDOI, 2013). Popular fish species targeted by Maryland non-tidal anglers include largemouth bass, smallmouth bass, trout, catfish, and a variety of panfish species (e.g., sunfish, bluegill, crappie, perch), with the non-tidal portion of the Potomac River being among the most popular non-tidal fishing areas (Rivers, 2004). To better manage the Maryland recreational fisheries, up-to-date information is needed on angler participation, preferences and expenditures. Further, to better understand how segments of anglers differ with respect to non-tidal recreational fishing, such information should be examined within the context of relevant sociodemographic information (e.g., age, gender, ethnicity, income and education). This is particularly true for trout fishing and trout management in Maryland, which is intensively managed to both produce desirable fisheries-related outcomes for a diverse set of anglers and to achieve preferred conservation outcomes.

Objectives

The objective of this project was to collect and analyze data on Maryland non-tidal anglers to aid with development of management decisions and achieve superior fisheries outcomes which benefit Maryland recreational anglers. Below are the key components of the survey:

- Angler Trip Profile
    - The objective of this section was to collect and analyze details of specific fishing trips taken by anglers.
- Participation, Effort, and Location
    - The objective of this section was to collect and analyze information on non-tidal fishing effort and participation.
- Species Targeted & Fishing Methods Used
    - The objective of this section was to collect and analyze information on species targeted, gear used and fishing methods.
- Trout Fishing Section
    - The objective of this section was to collect information on trout fishing in Maryland, with an emphasis on understanding how different fishing site attributes influence site choice.
- General Questions Section
    - The objectives of this section were to gather information for:
        - Angler's motivation to go fishing.
        - Individual's favorite non-tidal fishing location.

        - Name and location of the favorite fishing area
- Demographics
    - The objective of this section was to collect information on key non-tidal angler socio-demographic and socio-economic variables such as age, gender, race/ethnicity, education, household composition and household income.

Methods

This project involved the development and implementation of a mixed-mode (internet & mail) survey of Maryland non-tidal anglers. This mixed-mode internet/mail survey was conducted according to principles of the Tailored Design Method (Dillman, 2007).

Survey Development & Pre-Testing
This survey was developed in conjunction with Maryland Department of Natural Resource, Fishing and Boating Services. After informal discussions about survey focus and content, an initial draft of the survey was presented at a meeting with Fishing and Boating Services on October 21, 2015. To begin the meeting, hard copies of the survey were handed out and attendees took the survey. Subsequently, a discussion took place regarding ways to improve survey content, layout and formatting. During the following months, the hard copy and online survey went through a series of iterations.

In spring 2016, external pretesting of the survey instrument was conducted with a number of Maryland non-tidal anglers to identify and correct any remaining issues before the survey invitations were mailed to non-tidal anglers. Fishing and Boating Services personnel compiled a list of 32 Maryland anglers who might be interested in helping with survey pretesting. Six of these individuals were affiliated with Trout Unlimited (a coldwater fisheries conservation organization), six individuals were affiliated with Maryland Sportfish Advisory Commission (SFAC), and 20 other individuals were not affiliated with the previous two organizations but had an interest in Maryland non-tidal fishing. These 32 individuals were contacted by email in a recruitment effort for survey pretesting. Ultimately, 17 individuals agreed to participate in the hour-long survey pretesting session. During survey pretesting, screen sharing software was used which enabled individuals to proceed through the survey online while progress through the survey was monitored visually by a member of the survey development team from a remote location. A phone connection was maintained throughout the process to address immediate comments, questions or concerns an individual might have regarding specific aspects of the survey instrument. A thorough assessment of respondent comprehension occurred after the survey was completed. Each individual was asked a series of questions designed to identify potential issues with survey instrument design or content. Though no major issues were identified in the pretesting process, helpful comments and suggestions were received which facilitated the improvement of various aspects of the survey layout and design.

Population Sampling Procedure

The survey sample (N = 4,285) was drawn from the population of anglers who purchased a license that permitted the individual to fish in Maryland non-tidal waterways during the 2015 calendar year. Specifically, this included individuals who held at least one of the following licenses during 2015:

- Resident Annual non-tidal fishing license.
- Resident 7-day non-tidal fishing license.
- Non-Resident Annual non-tidal fishing license.
- Non-resident 3-day non-tidal fishing license.
- Non-resident 7-day non-tidal fishing license.
- Senior Consolidated fishing license.

Ordinarily, the sample would be obtained by randomly selecting individuals from all individuals holding at least one of the above licenses during 2015. However, in spring 2016, there was a concurrent survey of Maryland trout anglers with a very similar mailing protocol (process described in "Survey Implementation" that follows this section). It was determined that given the population size and sample size for each survey, an independent random sampling procedure for each survey would likely result in between 100 to 200 individuals receiving both surveys. Those developing and implementing the surveys believed that the potential of confusing/irritating this number of individuals with multiple, similar mailings for different surveys were unacceptably high. To avoid this overlap, the following procedure was employed. First, staff used a random number generator to construct two sub-populations (N=25,000) from the population of Maryland non-tidal anglers. Then they used a random number generator to select from the first sub-population the final sample for this survey (given the sample size and population criteria listed above). This procedure preserved the desired random sampling feature while allowing for the construction of two non-overlapping survey samples.

Survey Implementation

The survey consisted of an initial mailing, followed by up to three additional contacts if an individual had not responded to the previous mailing. The survey was sub-contracted to an independent firm for the printing and mailing of contact materials and hard-copy surveys. The timeline for survey mailings are as follows:

- The first Contact Mailing Date was on March 29, 2016. This contact consisted of a two-sided 8.5" by 11" document. The front of the document contained information about the purpose of the survey and a website address to access the survey online. The back of the document contained answers to common questions individuals often have about the nature and purpose of such surveys. The mailing envelope contained the survey logo - an outline of the state of Maryland overlain with an outline of a trout.

- The second Contact Mailing Date was on April 12, 2016. This contact consisted of a two-sided 5.5" by 4.25" postcard. The front of the postcard consisted of a brief request to complete the survey, the survey website address, and a color image of the survey logo. The back of the postcard contained information about the survey and contact information.

- The third Contact Mailing Date was on April 26, 2016. This contact consisted of a two-sided 8.5" by 5" postcard. The front of the postcard consisted of a brief request to complete the survey, the survey website address, and a color image of the survey logo. The back of the postcard contained information about the survey and contact information.

- The fourth Contact Mailing Date was on May 19, 2016. This contact contained a two-sided 8.5" by 11" document that reminded individuals about the survey and contained a website address to access the survey. This contact also contained a 12 -page survey consisting of three 17" by 11" pages folded over to create a booklet. The page containing the front and back of the survey was of slightly heavier weight forming a survey cover. Finally, this wave contained a 9" by 12" business reply mail envelope. These materials were mailed in a 9" by 12" envelope which contained the same image and text as the first outgoing envelope.

To reduce undeliverable mail, the sub-contractor cross-checked the individuals' mailing addresses with the National Change of Address list (NCOA). A total of 179 individuals were dropped from the sample as a result of this process. Throughout the mailing process, 277 addresses were returned as undeliverable. To calculate the effective response rate, the 179 individuals from the NCOA process and 277 undeliverable addresses were removed from the sample, yielding an effective sample size of 3,829.

The internet nature of the survey, combined with the uncertainty associated with the date that a respondent received a mailing, complicates calculating the precise survey response by wave. However, we provide an estimate of response rate by mailing below and in Table 1.

- First Wave Response – 215 internet surveys.
- Second Wave Response – 134 internet surveys.
- Third Wave Response – 158 internet surveys.
- Fourth Wave Response – 404 valid mail surveys and 51 internet surveys.

Below is the equation for the effective response rate.

$$Effective\ Response\ Rate = \frac{Valid\ Internet\ Surveys + Valid\ Mail\ Surveys}{Survey\ Sample\ Size - Undeliverables - NCOA\ Drops}$$

$$= \frac{558 + 404}{4285 - 179 - 277} = 25.1\%$$

Survey Content

1) Angler Trip Profile
   Individuals were asked to think back to a specific fishing trip during a specific season, and then proceed to answer survey questions on that page while thinking about that trip. Key questions included:

   - Name and location of waterbody.
   - Number of people on trip.
   - Number of nights away from home.
   - Fishing methods used and species targeted.
   - Angler satisfaction with catch and environmental quality.
   - Trip expenditures.

   Answers to these questions provided information on angler expenditures on nontidal fishing trips, angler satisfaction with the fishing experience at key locations and other important issues.

2) Participation, Effort, and Location
   Individuals were asked to list the three rivers/streams and the three lakes/ponds/reservoirs they fished most during 2015, and then proceed to list the number of trips and species targeted at each location. Answers to these questions will provide information on the frequency and location of fishing trips, the proportion of trips taken to fish for different species and other key metrics regarding fishing effort and participation.

3) Species Targeted & Fishing Methods Used
   Individuals were asked to check all fishing types and methods (e.g., Natural Bait, Fly Fishing, Ice Fishing) they used to fish for each nontidal fish species during 2015. Answers to these questions will allow the estimation of the proportion of the non-tidal angler population that targets each species and the fishing methods used to target those species.

4) Trout Fishing Section
   Individuals were first asked how many trips they took to fish for trout during the 2015 season, and then asked Likert-Scale questions (i.e., Strongly Agree/Strongly Disagree with a range of options between the two extremes) regarding the influence of fishing site attributes (e.g., distance from home, regulations, catch rate) on fishing site choice.

   This survey also included a stated preference choice experiment of trout angler fishing site choice to better understand angler preferences for aspects of the trout fishing experience. The stated preference choice experiment approach (Kanninen, 2007) is a survey-based approach that, when employed within a trout fishing site choice context, allows for the identification of angler preferences for fishing site attributes and angler willingness to pay for changes in the level of these attributes.

In determining which potential fishing site attributes should be included in the fishing site choice scenarios, staff considered attributes that were believed to influence angler site selection and also have management relevance (i.e., be under manager's influence or control). Ultimately, staff identified seven attributes for inclusion in the choice scenarios. These site attribute levels vary both within and across surveys, and include: Distance (driving distance to fishing site), Type of Waterbody (River/Stream or Lake/Pond), Large Fish Potential (probability of catching "trophy-sized" fish), Catch Rate (expected hourly catch rate), Species (type of trout species available), Harvest Regulation and Gear Regulation (Table 2).

To examine angler preferences for trout fishing site attributes, staff constructed choice scenarios that consisted of hypothetical trout fishing sites defined by these attributes. Each survey contained four of these choice scenarios. The attribute levels varied both within surveys (i.e., each individual saw four unique choice scenarios with fishing sites that differed by attribute levels) and across surveys (there were 84 survey versions, with each survey having four unique choice scenarios). Hence, in total, there were 336 unique choice scenarios. This very large number of unique choice scenarios enables the identification of the probabilistic effect site attribute levels have on angler fishing site choice and also enables the calculation of angler willingness-to-pay for site quality improvements.[1] These 336 unique choice scenarios were constructed using NGene choice software. This enables the construction of choice scenarios that will yield the greatest possible tradeoff information. Bayesian priors were developed through a review of the literature and used to avoid "dominated" choice scenarios that would likely yield little attribute level trade-off information. For example, a fishing site with low catch rate and far from someone's residence would (in theory, and all else equal) be "dominated" by a fishing site with high catch rate and close to home. The Bayesian priors help avoid dominated choice

[1] Mean willingness-to-pay – a tradeoff measure revealing the maximum amount the average individual would be willing to pay (in monetary terms) to receive a specified fishing site quality change - is calculated as the ratio of model-estimated site quality attribute parameters and the model-estimated travel cost parameter. In the random utility model to be estimated, the distance attribute (i.e., distance to fishing site) is converted to round-trip travel costs. This allows the estimation of individual willingness-to-pay for changes in fishing site attributes. In random utility models of recreation demand, travel costs are assumed to be a function of vehicle operating costs and the opportunity cost of an individual's time (Parsons, 2003). Vehicle operating costs are calculated by multiplying the round-trip miles to a fishing site by the 2016 average per-mile driving cost (gas, maintenance, tires, depreciation) as calculated by the American Automobile Association. The opportunity cost of an individual's time is calculated by multiplying a household's hourly wage rate (determined either through survey responses or U.S. census estimates if survey response to income question is not available) by the number of round-trip travel hours necessary to visit a fishing site (determined assuming average travel rate of 40 miles per hour) by one-third. In random utility models, the opportunity cost of time is assumed to be a percentage of an individual's wage rate wage rate, generally between 0 percent and 100 percent of wage rate. Staff chose 1/3 of wage rate, as is common in the recreation demand literature (Parsons, 2003).

scenarios and ensure that as much trade-off information as possible is extracted from each choice scenario.

The behavioral theory underlying the stated preference discrete choice experiment approach, known as Random Utility Theory, was developed by McFadden (1974). Haab and McConnell (2002) provide a complete description of this theory, along with econometric estimation and the method of calculating willingness-to-pay measures presented within this report. The theory suggests that the utility of an alternative (in this case, a fishing site), is a function of the attributes of the alternative. Parameters (weights) associated with each attribute are often estimated using statistical regression models known as logit models. The conditional logit model (McFadden, 1974) has long been used to examine consumer preferences and willingness-to-pay for changes in outdoor recreation amenities. The mixed logit model (see Train, 2009 for a description) is becoming increasingly popular as it enables the practitioner to understand how preferences for alternative attributes vary throughout the population. This is important for attributes such as fishing regulations, as anglers may differ substantially with respect to how regulations may affect fishing site choice.

5) General Questions Section
First, individuals were asked Likert-Scale questions regarding whether changing various aspects of the fishing experience would result in the individual going fishing more often. Second, individuals were asked "Yes" or "No" questions regarding statements about their favorite nontidal fishing area. Finally, individuals were asked to list the name of the waterbody and county that constitutes their favorite nontidal fishing area. Answers to these questions will provide important insights into the factors influencing fishing effort, an important issue in fisheries management given stagnating or declining fishing participation and license sales in many areas. Further, the question with respect to an angler's favorite fishing location was asked in the Rivers 2002 survey, and thus will allow comparison across 13 years to examine changes in fishing motivations at an angler's favorite fishing area.

6) Demographics
This section collected information on key non-tidal angler socio-demographic and socio-economic variables such as age, gender, race/ethnicity, education, household composition and household income. Answers to these questions will allow for the examination of whether and to what extent angler participation, preferences, and motivations vary across different segments of the population. This will allow fisheries managers to develop fisheries management strategies that are responsive to the needs of many different types of anglers.

Results and Discussion

A list of all questions and data collected from the survey can be found in Appendix A. An example of a survey that was mailed to is available in Appendix B.

Preferred fishing areas
A primary objective of this survey was to explore angler preferences for different fishing areas. Specifically, the survey asked anglers to record the number of fishing trips they took to their three most-visited Maryland nontidal river/stream fishing areas, and their three most visited Maryland lake/pond reservoir fishing areas. The Potomac River was the most popular fishing area in terms of both the proportion of anglers who reported taking at least one trip to this river, and the total number of reported trips to this fishing site. Nearly ⅓ of anglers reporting fishing in a Maryland nontidal river/stream during 2015 took a trip to fish in the Potomac River, with a total of 1,304 trips reported by respondents. The next most popular nontidal fishing location, Deep Creek Lake in Garrett County, was visited by about 19 percent of lake/pond/reservoir anglers with a total of 476 trips reported. While the Potomac River and Deep Creek Lake were the most frequently visited fishing locations in Maryland, survey findings indicated that anglers fish a wide variety of Maryland waterways. There were a total of 19 rivers/streams and 16 lakes/ponds/reservoirs named by 10 or more anglers as destinations for at least one fishing trip in 2015. Further, there were a total of 21 rivers/streams and 19 lakes/ponds/reservoirs for which there were at least 50 trips reported by survey respondents. Angling effort was relatively equally distributed across lakes and streams, with 508 survey respondents reporting that they took at least one fishing trip to a lake/pond/reservoir, and 444 respondents reporting that they took at least one fishing trip to a non-tidal river/stream.

To estimate the total number of nontidal fishing trips taken to rivers/streams and lakes/ponds/ reservoirs, multiply the total number of fishing trips taken to the rivers/streams and lakes/ponds/ reservoirs by the ratio of unique license holders to survey respondents. The equation is as follows:

> 2015 Non-tidal River/Stream Maryland Fishing Trips = (Total river/stream trips taken by survey respondents * (unique license holders /survey respondents) =
> 8898 * (174,853/962) = 1,617,299 trips

Using the same approach to estimate fishing trips to Lakes/Ponds/Reservoirs during 2015, the estimate showed that there were a total of 974,051 trips to these waterbodies. The total estimated fishing trips to Maryland non-tidal waterways in 2015 was 2,591,350.

Geographically by county, the majority of nontidal angling effort occurs in counties west of the main stem of the Chesapeake Bay. In terms of visitation by unique individuals, Garrett County was the most popular, with about 18 percent of survey respondents reporting at least one nontidal fishing trip to a waterway in Garrett County. Given that Garrett County has the third smallest population of all Maryland counties, the popularity

of Garrett County as a fishing destination speaks volumes to the appealing nontidal fishing opportunities available in that part of the state. While Garrett County was visited by the largest proportion of unique anglers, Baltimore County was second for unique visits (13.1 percent of anglers) and first for total number of reported trips (1109). That Baltimore County is second in terms of unique visits but first in total trips is likely due to fishing sites being in close proximity to the heavily populated Baltimore metropolitan area, allowing for more frequent trips.

Finally, the survey asked individuals to identify their favorite nontidal waterway and to answer an assortment of follow up questions related to their fishing experiences at that waterway. Survey results found that there are a wide variety of nontidal waterways favored by Maryland nontidal anglers. The Potomac River was identified as the favorite waterway by about 11 percent of anglers, closely followed by Deep Creek Lake at 9.5 percent. Gunpowder Falls and Loch Raven Reservoir were third and fourth, with about 4 percent of anglers identifying these respective waterbodies as their favorite waterbody.

Note: In angler responses, one area was referred to in numerous ways which proved to be synonymous. Gunpowder Falls in Baltimore County was referred to as Gunpowder Falls, Gunpowder and Gunpowder River. While there is a Gunpowder River, it is located in the tidal portion of the Chesapeake Bay. In checking the surveys and correlating location and targeted fish species, it became clear that all these various named locations were, in fact, Gunpowder Falls.

Time/Seasonal Preferences

The survey asked anglers to list the number of trips they took during each season during the 2015 calendar year, with seasons defined as Winter 2015 (January, February, March), Spring 2015 (April, May, June), Summer 2015 (July, August, September), and Fall (October, November, December). Across all seasons during 2015, 700 anglers reported taking a total of 8,898 fishing trips in Maryland nontidal rivers/streams, for an average of 12.7 trips per angler. Across all 2015 seasons, 700 anglers reported taking a total of 5,359 fishing trips in Maryland lakes/ponds/reservoirs, for an average of 7.7 trips per angler during 2015. Spring and summer were the most popular seasons in terms of total fishing trips, comprising 34 percent and 39 percent of total fishing trips, respectively. Still, non-tidal angler trips were distributed over the fall and winter seasons as well, with about 18 percent of reported trips occurring in fall and 9 percent of trips occurring in winter. The seasonal distribution of Maryland nontidal fishing trips for Maryland lakes/ponds/reservoirs was similar to these participation figures. The majority of trips occurred in summer (39 percent), followed closely by spring (35 percent), then fall (18 percent) and winter (9 percent).

In the bullet points below, additional information is provided on how aspects of nontidal fishing experiences vary across season in Maryland.

- Waterbody Fished - For each of the four seasons, Deep Creek Lake and Potomac River fishing trips were most frequently identified when anglers

were asked to think about their most recent fishing trip during a specific season. The Gunpowder Falls was either third or fourth most identified during the fall, winter and spring seasons. The reason that the Gunpowder Falls is not as frequently identified during the summer season may be due to the fact that it is a highly used, multi-recreational location. The Gunpowder Falls runs between two water supply reservoirs for Baltimore City and is widely contained within a large linear state park. In the summer months, the river is a destination for swimmers, tubers, kayaks, canoes, hikers, summer camps and picnicking. Since this survey has shown many anglers prefer more secluded locations, they may skip the Gunpowder Falls during the heavy use summer months.

- City/Town - For three of the four seasons (winter, spring, summer), McHenry was the most often visited city/town. Other popular cities/town visited for fishing trips for each of the four seasons include Oakland, Cumberland, and Frederick. Notably, McHenry, Oakland, and Cumberland are all located in Western Maryland, a two to three hour drive from major population centers Baltimore and Washington D.C.

- People on trips and nights away from home - Survey results indicated that people are more likely to go on solo nontidal fishing trips during winter (33 percent of trips were solo trips) and fall (35 percent), versus spring (28 percent) and summer (23 percent). Nontidal fishing trips involving three or more people were most often taken in spring (33 percent) and summer (37 percent), versus fall (20 percent) and winter (20 percent). Seasonal differences were also evident with respect to the number of nights spent away from home on the reported fishing trip. The day-trip (i.e., zero nights away from home) was the predominant fishing trip for all seasons; about 23 percent of summer nontidal fishing trips were reported to be overnight trips. This is followed by spring (16 percent), fall (12 percent) and winter (6 percent).

- Fishing Methods - Survey results found that natural bait was more frequently used in summer (64 percent of trips involved the use natural bait). Spring was next highest at 55 percent, followed by fall at 43 percent. Fly fishing is least-often used during the summer months, with less than 10 percent of reported trips involving this method. Using watercraft while fishing, either with or without a motor, was least popular during the winter season. About ¼ of reported summer and fall fishing trips involved the use of a motorized vessel.

- Species Targeted - For the fish species category “Bass” (which includes individuals who specifically listed largemouth bass, smallmouth bass, or another type of bass), anglers were less likely to pursue this species on winter fishing trips (33 percent), and most likely to pursue bass on summer (48 percent) and fall (51 percent) fishing trips. There were notable differences among anglers who stated that they fished for some type of trout. Nontidal

fishing trips during the winter and spring months had the highest proportion of anglers fishing for trout, with 41 percent of winter fishing trips and 33 percent of spring fishing trips involving the pursuit of trout. Comparatively, only 13 percent of summer fishing trips involved the targeting of trout.

- Fishing trip purpose and experience - The primary difference in this category of questions was whether fishing was the primary reason for taking a trip to the area referenced. While a large majority of anglers reported that fishing was the primary purpose in all seasons, the percentage was particularly high during cooler weather months. For winter fishing trips, 91 percent of anglers reported fishing as their primary purpose, with a fall percentage of 93 percent and a spring percentage of 87 percent. In contrast, about 75 percent of anglers reported that summer fishing trips had fishing as a primary purpose.

- Fishing trip expenditures - Mean per-trip fishing expenditures was notably different across seasons, with mean per-trip expenditures highest in summer ($236.72) and lowest in winter ($57.53). Spring mean per-trip expenditures ($122.01) and fall mean per-trip expenditures ($100.47) were similar. Summer mean per-trip expenditures were influenced by more expensive multi-day trips. The median trip expenditures were relatively similar across seasons, with the median expenditure of spring and summer fishing trips being $40, whereas for winter it was $30 and for spring it was $31.

Total Fishing Trip Expenditures

For surveys not implemented at regular time intervals throughout the year, it can be difficult to obtain an estimate of total annual angler trip expenditures. Asking anglers to provide an estimate of their average, per-trip expenditure during the year presents recall and computational challenges for these anglers, given the potential for multiple fishing trips to different locations. Asking anglers about expenditures on the most recent fishing trip likely reduces angler recall error, but presents challenges to survey researchers with respect to estimating total seasonal expenditures given the clustering of reported trip expenditures in proximity to the time the survey was distributed. For example, as all survey mailings (i.e., initial contacts and follow up contacts) for this survey were mailed to households between March 29 and May 19, surveys arriving during the spring fishing season would very likely result in an over-representation of trout fishing trips (and possibly other types of fishing as well) and would potentially bias seasonal expenditure estimates (to the extent that fishing trips during this time period are correlated with different trip expenditure patterns). To best mitigate this potential bias, four different survey designs were constructed to obtain trip details and expenditures throughout the year. These four survey designs each contained questions that asked anglers to indicate which seasons they fished in a Maryland nontidal waterway, with the ordering of these four seasons varying in four different ways. Through an automated process on the online survey and through explicit instructions on the hard copy mail survey, survey respondents were instructed to think back to the first nontidal fishing trip they took during a specific season. This process enabled the calculation of seasons-specific mean per-trip

expenditures estimates. These estimates can then be applied to season-specific trips, and ultimately produce total expenditure estimates during the 2015 calendar year.

> 2015 Non-tidal Fishing Expenditures = [(Mean winter per-trip expenditures * # of winter trips + Mean spring per-trip expenditures * # of spring trips + Mean summer per-trip expenditures * # of summer fishing trips + Mean fall per-trip expenditures * # of fall fishing trips) * (sample population /survey respondents)
>
> 2015 Non-tidal Fishing Expenditures =
> ($57.53 * 1251 + $122.01 * 4983 + $236.72 * 5491 + $100.47 * 2532) * (174,853/962) = $406,081,551

Fish Species Preferences & Angling Methods Used

For this section, reported percentages were calculated using only anglers who reported at least one targeted species and fishing method in 2015. Largemouth bass was the most popular fish species targeted, with about 2/3 of anglers reporting fishing for largemouth bass at least once during this calendar year. Smallmouth bass was second, with close to 3 out of 5 anglers fishing for smallmouth bass at least once during 2015. Panfish species were also popular, with about one-half of anglers targeting bluegill/sunfish at least once, just over one-third of anglers targeting crappie, and over one-quarter of anglers targeting yellow perch in nontidal waterways during the 2015 fishing season. Trout fishing was also popular, with just under 40 percent of anglers reporting fishing for stocked trout during the 2015 fishing season. Despite more limited geographic range of wild brown trout and wild brook trout, 17 percent and 18 percent of anglers reported pursing these species during 2015.

The survey revealed that Maryland nontidal anglers use a variety of fishing methods to target fish species. Artificial lures was the most popular type of fishing, with about four out of five anglers using lures to target fish species in nontidal waterways during 2015. Natural bait was also a popular fishing method, with nearly two out of three anglers reporting that they used natural bait during 2015. Despite being method requiring specialized gear and some know-how, fly fishing was used by nearly 20 percent of anglers. The majority of anglers (about 3/5) fished from shore or while wading. Boat use was still popular with about 1/3 anglers reporting fishing from a motorized boat in a nontidal waterway, while about one out of six anglers reported fishing from a non-motorized vessel.

Types of fishing and fishing methods employed varied considerably across species. Of anglers fishing for largemouth and smallmouth bass, between 84 percent and 87 percent reported using artificial lures to target these species, whereas less than 50 percent of people targeting these species reported using natural bait. Natural bait was most often used to target channel and flathead catfish (88 percent each), white and yellow perch (79 percent each), and bluegill/sunfish (71 percent). Fly fishing was used by 48 percent and 49 percent of anglers targeting wild brown trout and wild brook trout, respectively. About 28 percent of anglers targeting stocked trout reported using fly fishing method. Roughly

one out of 10 anglers targeting largemouth bass, smallmouth bass, carp, shad, and bluegill/sunfish reported using the fly fishing method to target these species.

Trout Angler Participation, Effort, and Preferences

This survey contained a section specifically designed to elicit participation, effort, and preference information from those anglers who fish for trout. To identify these anglers, the survey asked individuals whether they had fished for trout in Maryland in the previous 10 years. About 46 percent of angler responded "Yes" to this question, and were instructed to proceed through the trout fishing portion of the survey. Anglers responding "No" were directed past the trout fishing questions. Trout anglers reported taking an average of 6.8 trout fishing trips during the 2015 calendar year, with a median number of three trout fishing trips. In this section, anglers were presented with color images of the three major trout species pursued in Maryland, along with typical catch sizes and trophy criteria for each species (developed in consultation with state fisheries biologists). Trout anglers generally agreed (74 percent agreed or strongly agreed) that most trout they catch are within the typical sizes described. The survey did find that relatively few anglers were catching trophy sized trout, with only 18 percent of anglers stating that they catch a trout that fits the trophy criteria in most seasons.

The following 12 Likert-Scale questions asked anglers to indicate the extent to which they agreed or disagreed with statements on how aspects of trout fishing sites affect their decision on where to fish. Environmental quality, the opportunity to catch many fish, and seeing few or no other people were particularly influential fishing site characteristics, with 73 percent, 65 percent, and 70 percent (respectively) agreeing or strongly agreeing with statements probing the importance of these characteristics. With respect to the potential impact of regulations on angler site choice, several questions examined the importance of allowable gear and harvest levels. About 28 percent of trout anglers indicated that they prefer to fish in areas where catch-and-release is required. About 45 percent of anglers stated that the ability to harvest trout is important, and 28 percent of anglers prefer to use natural bait when fishing for trout.

Impediments to Angler Participation

The survey asked anglers to indicate whether different factors influence how often they go fishing in nontidal waterways. The lack of leisure time was clearly the most substantial impediment to fishing more often in nontidal waterways, with about three out of five anglers either agreeing or strongly agreeing with this statement. Other important characteristics and factors constraining how often they went fishing included "...if I was able to catch more fish" (55 percent agreed or strong agreed), "...if access to fishing sites was better" (55 percent), "...if I knew when and where to fish" (55 percent), and "...if I was able to catch larger fish" (50 percent). Relatively speaking, regulations (25 percent), cost of fishing (29 percent) and having somebody to go with (35 percent) were less important. In general, results from this section suggest that anglers' fishing frequency is influenced by a number of factors, with many under some level of management influence and control (e.g., more fish, larger fish, better access).

Behaviors and Motivations at Favorite Non-Tidal Fishing Area

Anglers were asked to respond to "Yes / No" - style questions about factors, behaviors and motivations regarding their favorite fishing location. In order to examine potential changes over the past 15 years in Maryland, this question was an exact replica of a question asked in a 2002 survey (Rivers, 2004). Generally speaking, 2016 survey results were comparable to results from the 2002 survey, with the exception of the factor "I go there because I always catch something". Answers from the 2002 survey showed 81 percent answered "Yes", but the 2016 survey showed the number of affirmative responses had reduced to 54 percent. In this survey, about 57 percent of people reported releasing all fish they caught at their favorite waterway, a slight increase from 2002 (54 percent). At the same time, about 22 percent reported that they "prefer to leave with a stringer full of fish" (17 percent in 2002 survey). This implies that only about one out of five anglers have harvest preferences that lie between "release everything" and "keep everything up to the limit" when it comes to their favorite fishing area. About 22 percent of people responded "No" to the prompt "I fish for sport and pleasure rather than food". This is a slight uptick from 2002 and suggests a small portion of the angling public is fishing primarily to obtain something to eat, and not for recreation. The series of behavioral and motivation questions about an individual's favorite waterway was followed up by a prompt for the individual to name the waterbody and the county where the waterbody is located when responding to these questions. Potomac River and Deep Creek Lake were most often named by respondents (11.3 percent and 9.5 percent, respectively) followed by Gunpowder River and Loch Raven Reservoir (each 3.7 percent). The county most often named was Garrett county (16 percent) followed by Baltimore (14 percent) and Washington (11.5 percent).

Recommendations

Based on the results described in the previous pages, the following recommendations are proposed:

- The age structure of anglers in this survey indicates that younger people under the age of 35 are not pursuing angling.
    - Programs should be developed to target this demographic.
    - Youth programs need to be increased to educate children on the sport of fishing.
- Future programs should be developed to teach minority groups about angling. These groups include females and ethnic minorities. The largest minority identified in the survey was females at roughly 87 percent, followed by African Americans (6.7 percent) and Hispanic/Latino peoples (2.2 percent).
- Rivers and streams are the most popular class of nontidal fishing areas.
    - Care must be taken to protect the fish species in those areas.
        - Get information to local municipalities on the worth and economic value of these opportunities for citizens to the local community.
    - Conduct outreach to permitting agencies to increase awareness of the economic value of recreational river and stream fisheries when drafting protective permit conditions.

    - Access to these areas must be improved where possible.
    - The Potomac River was the most popular fishing river so protection and sound management of fish species there, particularly black bass species is the key to meeting angler expectations.
- Impoundments
    - The most popular impoundment was Deep Creek Lake, a multi-use recreational area.
        - Apply sound management strategies to fish species in the lake.
        - Work with Park Service and local citizen groups to protect water quality and prevent invasive fish and plant species from impacting the lake and resident species.
    - Fishery managers should increase data collection and management strategies to improve panfish/crappie fisheries.
- Non-consumptive fisheries (limited harvest, catch and return only) were not popular with anglers. These management strategies were put in place to preserve the fisheries in given locales.
    - Fishery biologists must do a better job at educating the public about the necessity of this management in certain areas to improve catch and size of fish, both identified as desired attributes for angler participation.
    - Consumptive opportunities must be equally available.
- Anglers provide economic benefit to the local economy of communities that surround popular fishing areas.
    - Get information to local municipalities on the worth of these opportunities to the local community.
    - Partner with local municipalities to protect resources by sharing resource information and working to have best management practices applied to any projects that might impact the aquatic resources and associated fish populations.
- Trout
    - Stocking remains popular, so hatchery production remains an important facet of fishery management.
    - Many trout fisheries in the state contain native or wild populations and are a source of enjoyment for many anglers, so these areas need to be preserved and protected.

Table 1. Summary of trout angler survey response and disposition.

Initial Sample Size	4,285
NCOA Drops	179
Returned Undeliverable	277
Total Responses	962
Wave 1 Responses (internet survey)	215
Wave 2 Responses (internet survey)	134
Wave 3 Responses (internet survey)	158
Wave 4 Responses (mail and internet survey)	455
Wave 4 Mail Survey	404
Wave 4 Internet Survey	51
Total Responses	962

Table 2. Trout fishing attribute variables selected for inclusion in the choice scenarios.

Trout fishing site attribute variables	**Fishing site attribute variable definition**	**Attribute levels**
Distance[2]	One-way distance from individual's residence (in miles)	10; 20; 35; 50; 75; 125
Waterbody	Type of Waterbody	River/Stream; Lake/Pond
Catch rate	Typical number of trout caught per hour of fishing	0.25; 0.5; 1; 1.33; 2; 4
Trophy catch	Probability of catching a trophy-sized trout during the fishing trip	0.0; 0.1; 0.2; 0.5
Harvest restrictions	Number of trout that may be legally harvested from the fishing site	Catch & Release Only ; Limit 2; Limit 5
Gear restrictions	Restrictions on type of fishing gear that may be used at a fishing site	No Restrictions (natural bait allowed); Artificial Lures and Flies only; Artificial Flies only

[2]In the random utility model to be estimated, distance to fishing site will be converted to travel costs. This allows the estimation of individual willingness-to-pay for changes in fishing site attributes. In random utility models of recreation demand, travel costs are assumed to be a function of vehicle operating costs and the opportunity cost of an individual's time (Parsons 2003). Vehicle operating costs are calculated by multiplying the round-trip miles to a fishing site by the 2016 average per-mile driving cost (gas, maintenance, tires, depreciation) as calculated by the American Automobile Association. The opportunity cost of an individual's time is calculated by multiplying a household's hourly wage rate (determined either through survey responses or U.S. census estimates if survey response to income question is not available) by the number of round-trip travel hours necessary to visit a fishing site (determined assuming average travel rate of 40 miles per hour) by one-third. In random utility models, the opportunity cost of time is assumed to be a percentage of an individual's wage rate wage rate, generally between 0 percent and 100 percent of wage rate. Staff chose 1/3 of wage rate, as is common in the scientific literature (Parsons 2003).

Appendix A. Survey question responses.

<u>Recreational Fishing in Maryland Questions</u>

1. **Did you go fishing in Maryland in 2015?**
    - **A. Yes**
    - **B. No**

Did you go fishing in Maryland in 2015?	Question responses (%)
Yes	860 (91.5)
No	80 (8.5)
TOTAL	940

2. **How many fishing trips did you take in Maryland in 2015?**
    - **A. 1-5**
    - **B. 6-10**
    - **C. 11-15**
    - **D. 16-20**
    - **E. More than 20**

# of fishing trips	Question responses (%)
1-5	333 (38.1)
6-10	182 (20.9)
11-15	93 (10.7)
16-20	77 (8.8)
> 20	188 (21.5)
TOTAL	873

3. Where did you fish in Maryland during 2015?

A. Both nontidal waterways & tidal waterways

B. Nontidal waterways <u>only</u>

C. Tidal waterways <u>only</u>

Waterways fished	Question responses (%)
Both Nontidal & tidal waterways	343 (39.3)
Nontidal waterways only	395 (45.3)
Tidal waterways only	134 (15.4)
Total	872

Maryland Non-Tidal Fishing Trip Questions

4. During which seasons did you fish in Maryland nontidal waterways? (check all that apply)

Summer 2015 (July 2015 – September 2015)
Fall 2015 (October 2015 - December 2015)
Winter 2015 (January 2015 – March 2015)
Spring 2015 (April 2015 – June 2015)

Did you fish?*	Winter 2015	Spring 2015	Summer 2015	Fall 2015
Yes	155 (21.3%)	513 (70.5%)	527 (72.4%)	296 (59.3%)
No	573 (78.7%)	215 (29.5%)	201 (27.6%)	432 (40.7%)
Total	728	728	728	728

*Results include only individuals reporting fishing in Maryland nontidal waterways in 2015.

5. During which month was this fishing trip?

With the anglers keeping in mind what season they checked first on the survey (See Appendix A), they were asked what month they take their first fishing trip.

Number of fishing trips per month			
Season	**Month**	**# of fishing trips (% for season)**	**Responses per season**
Winter	January	22 (27.9)	79
	February	12 (15.2)	
	March	45 (57)	
Spring	April	134 (49.3)	272
	May	85 (31.3)	
	June	53 (19.5)	
Summer	July	117 (65)	180
	August	42 (23.3)	
	September	21 (11.7)	
Fall	October	53 (86.9)	61
	November	5 (8.2)	
	December	3 (4.9)	

6. Name of the waterbody and nearest city/town where you fished.
Note: areas that were mentioned only once were compiled to reduce the list of areas reported.

Waterbody fished winter 2015			
Waterbody fished	**Question responses (%)**	**Waterbody fished**	**Question responses (%)**
Deep Creek Lake	8 (10.3)	Evitts Creek	2 (2.6)
Potomac River	5 (6.4)	Jennings Run	2 (2.6)
Gunpowder Falls	4 (5.1)	Little Falls	2 (2.6)
Conowingo Reservoir	3 (3.8)	Patapsco River	2 (2.6)
Middle Creek	3 (3.8)	Savage River	2 (2.6)
Blair's Valley Lake	2 (2.6)	Tuckahoe Creek	2 (2.6)
Deer Creek	2 (2.6)	38 areas received one mention (1.3% each)	
Total Question Responses 78			

Waterbody fished spring 2015			
Waterbody fished	**Question responses (%)**	**Waterbody fished**	**Question responses (%)**
Potomac River	34 (13.3)	Little Falls	3 (1.2)
Deep Creek Lake	21 (8.2)	MLK Jr. Pond	3 (1.2)
Gunpowder Falls	11 (4.3)	Monocacy River	3 (1.2)
Loch Raven Reservoir	8 (3.1)	Morgan Run	3 (1.2)
Liberty Reservoir	7 (2.7)	Stream	3 (1.2)
Pond	7 (2.7)	Wills Creek	3 (1.2)
Chesapeake Bay	6 (2.3)	Youghiogheny River	3 (1.2)
Bear Creek	5 (2)	Antietam Creek	2 (0.8)
Patuxent River	5 (2)	Black Hills Regional Park	2 (0.8)
Beaver Creek	4 (1.6)	Centennial Lake	2 (0.8)
Jennings Run	4 (1.6)	Greenbrier Lake	2 (0.8)
Patapsco River	4 (1.6)	Lake Habeeb	2 (0.8)
Savage River	4 (1.6)	Lake Roland	2 (0.8)
15 Mile Creek	3 (1.2)	Northeast River	2 (0.8)
Blair's Valley Lake	3 (1.2)	Piney Run	2 (0.8)
Casselman River	3 (1.2)	Piney Run Reservoir	2 (0.8)
Choptank River	3 (1.2)	Pocomoke River	2 (0.8)
Conowingo Reservoir	3 (1.2)	Prettyboy Reservoir	2(0.8)
Deer Creek	3 (1.2)	Susquehanna River	2 (0.8)
Lake Needwood	3 (1.2)	Triadelphia Reservoir	2 (0.8)
Total Question Responses 256	68 areas received one mention (0.4% each)		

Waterbody fished summer 2015			
Waterbody fished	**Question responses (%)**	**Waterbody fished**	**Question responses (%)**
Deep Creek Lake	26 (15.7)	Prettyboy Reservoir	3 (1.8)
Potomac River	25 (15.1)	Beaver Creek	2 (1.2)
Monocacy River	5 (3)	Greenbrier Lake	2 (1.2)
North Branch Potomac River	4 (2.4)	Gunpowder Falls	2 (1.2)
Pond	4 (2.4)	Hutchins Pond	2 (1.2)
Chesapeake Bay	3 (1.8)	Patapsco River	2 (1.2)
Conowingo Reservoir	3 (1.8)	Patuxent River	2 (1.2)
Lake Habeeb	3 (1.8)	Piney Run Reservoir	2 (1.2)
Total question responses 166	76 areas received one mention (0.6% each)		

Waterbody fished fall 2015			
Waterbody fished	**Question responses (%)**	**Waterbody fished**	**Question responses (%)**
Potomac River	6 (9.8)	Antietam Creek	2 (3.3)
Deep Creek Lake	4 (6.6)	Choptank River	2 (3.3)
Loch Raven Reservoir	4 (6.6)	Lake Waterford	2 (3.3)
Gunpowder Falls	3 (4.9)	Monocacy River	2 (3.3)
Liberty Reservoir	3 (4.9)	Patuxent River	2 (3.3)
Susquehanna River	3 (4.9)	Piney Run	2 (3.3)
Total Responses 61	26 areas received one mention (1.6% each)		

Waterbody fished all seasons*			
Waterbody fished	**Question responses (%)**	**Waterbody fished**	**Question responses (%)**
Potomac River	70 (12.5)	15 Mile Creek	3 (0.5)
Deep Creek Lake	59 (10.5)	Broadford Lake	3 (0.5)
Liberty Reservoir	22 (3.9)	Clopper Lake	3 (0.5)
Gunpowder Falls	20 (3.6)	Cunningham Falls Lake	3 (0.5)
Loch Raven Reservoir	18 (3.2)	Lake Habeeb	3 (0.5)
Chesapeake Bay	11 (2.0)	Little Patuxent River	3 (0.5)
Pond	11 (2.0)	ML King Jr. Pond	3 (0.5)
Conowingo Reservoir	10 (1.8)	Morgan Run	3 (0.5)
Monocacy River	10 (1.8)	Rocky Gap Lake	3 (0.5)
Patuxent River	10 (1.8)	APL Pond	2 (0.4)
Patapsco River	9 (1.6)	Back River	2 (0.4)
Beaver Creek	8 (1.4)	Cash Lake	2 (0.4)
Savage River	8 (1.4)	Catoctin Creek	2 (0.4)
Susquehanna River	8 (1.4)	Chester River	2 (0.4)
Youghiogheny River	8 (1.4)	Evitts Creek	2 (0.4)
North Branch Potomac River	7 (1.3)	Hutchins Pond	2 (0.4)
Antietam Creek	6 (1.1)	Lake	2 (0.4)
Bear Creek	6 (1.1)	Lake Artemesia	2 (0.4)
Choptank River	6 (1.1)	Lake Linganore	2 (0.4)
Jennings Run	6 (1.1)	Lake Roland	2 (0.4)
Blair's Valley Lake	5 (0.9)	Little Seneca Creek	2 (0.4)
Casselman River	5 (0.9)	Marshy Hope Creek	2 (0.4)
Deer Creek	5(0.9)	Middle Patuxent River	2 (0.4)
Lake Needwood	5(0.9)	Myrtle Grove	2 (0.4)
Lake Waterford	5(0.9)	Northeast River	2 (0.4)
Little Falls	5(0.9)	Piney Reservoir	2 (0.4)
Piney Run	5 (0.9)	Piney Run Lake	2 (0.4)
Prettyboy Reservoir	5 (0.9)	Piney Run Reservoir	2 (0.4)
Black Hill Regional Park	4 (0.7)	Pocomoke River	2 (0.4)
Centennial Lake	4 (0.7)	Private Pond	2 (0.4)
Greenbrier Lake	4 (0.7)	Rocky Gorge Reservoir	2 (0.4)
Middle Creek	4 (0.7)	Triadelphia Reservoir	2 (0.4)
Seneca Lake	4 (0.7)	Tuckahoe	2 (0.4)
Stream	4 (0.7)	Unicorn Lake	2 (0.4)
Tuckahoe Creek	4 (0.7)	Urieville Pond	2(0.4)
Wills Creek	4 (0.7)	97 areas received one mention (0.2% each)	
Total survey responses 561			

Nearest city/town

Nearest city - winter 2015			
Waterbody city	**Question responses (%)**	**Waterbody city**	**Question responses (%)**
McHenry	6 (7.9)	Myersville	2 (2.6)
Cumberland	3 (3.9)	Oakland	2 (2.6)
Frederick	3 (3.9)	Queen Anne's	2 (2.6)
Clear Spring	2 (2.6)	56 towns mentioned once (1.3% each)	
Total question responses 76			

Nearest city - spring 2015			
Waterbody city	**Question responses (%)**	**Waterbody city**	**Question responses (%)**
McHenry	13 (5.1)	LaPlata	3 (1.2)
Frederick	8 (3.1)	Little Orleans	3 (1.2)
Oakland	8 (3.1)	Pocomoke City	3 (1.2)
Bowie	7 (2.7)	Swanton	3 (1.2)
Cumberland	7 (2.7)	Sykesville	3 (1.2)
Eldersburg	7 (2.7)	Westminster	3 (1.2)
Baltimore	6 (2.3)	Accident	2 (0.8)
Friendsville	6 (2.3)	Bel Air	2 (0.8)
Monkton	6 (2.3)	Chesapeake Beach	2 (0.8)
Hagerstown	5 (2)	Chestertown	2 (0.8)
Brunswick	4 (1.6)	Columbia	2 (0.8)
Dickerson	4 (1.6)	Conowingo	2 (0.8)
Germantown	4 (1.6)	Corriganville	2 (0.8)
Parkton	4 (1.6)	Flintstone	2 (0.8)
Rockville	4 (1.6)	North East	2 (0.8)
Thurmont	4 (1.6)	Ocean City	2 (0.8)
Towson	4 (1.6)	Olney	2 (0.8)
Williamsport	4 (1.6)	Point of Rocks	2 (0.8)
Boonsboro	3 (1.2)	Rising Sun	2 (0.8)
Clear Spring	3 (1.2)	Salisbury	2 (0.8)
Elkton	3 (1.2)	Sandy Hook	2 (0.8)
Frostburg	3 (1.2)	Sharpsburg	2 (0.8)
Gaithersburg	3 (1.2)	White Oak	2 (0.8)
Grantsville	3 (1.2)	81 cities mentioned only once (0.4% each)	
Total question responses 256			

Nearest city - summer 2015			
Waterbody city	**Question responses (%)**	**Waterbody city**	**Question responses (%)**
McHenry	16 (9.5)	Westernport	3 (1.8)
Eldersburg	5 (3)	Williamsport	3 (1.8)
Oakland	5 (3)	Annapolis	2 (1.2)
Sykesville	5 (3)	Brunswick	2 (1.2)
Clear Spring	4 (2.4)	Cockeysville	2 (1.2)
Cumberland	4 (2.4)	Columbia	2 (1.2)
Frederick	4 (2.4)	Flintstone	2 (1.2)
Hagerstown	4 (2.4)	LaPlata	2 (1.2)
Darlington	3 (1.8)	Owings	2 (1.2)
Friendsville	3 (1.8)	Perry Hall	2 (1.2)
Gaithersburg	3 (1.8)	Poolesville	2 (1.2)
Randallstown	3 (1.8)	Sharpsburg	2 (1.2)
Rockville	3 (1.8)	Swanton	2 (1.2)
Towson	3 (1.8)	75 cities mentioned only once (0.6% each)	
Total question responses 168			

Nearest city - fall 2015			
Waterbody city	**Question responses (%)**	**Waterbody city**	**Question responses (%)**
Hagerstown	3 (5.3)	Frederick	2 (3.5)
Port Deposit	3 (5.3)	Germantown	2 (3.5)
Baltimore	2 (3.5)	McHenry	2 (3.5)
Cambridge	2 (3.5)	Thurmont	2 (3.5)
Conowingo	2 (3.5)	Williamsport	2 (3.5)
Total question responses 57	35 cities mentioned only once (1.75% each)		

Nearest city total – all cities			
Waterbody city	**Question responses (%)**	**Waterbody city**	**Question responses (%)**
McHenry	37 (6.6)	Parkton	7 (1.3)
Frederick	17 (3.1)	Rockville	7 (1.3)
Oakland	16 (2.9)	Thurmont	7 (1.3)
Cumberland	15 (2.7)	Boonsboro	6 (1.1)
Eldersburg	13 (2.3)	Brunswick	6 (1.1)
Hagerstown	13 (2.3)	Conowingo	6 (1.1)
Baltimore	10 (1.8)	Dickerson	6 (1.1)
Williamsport	10 (1.8)	Gaithersburg	6 (1.1)
Bowie	9 (1.6)	Swanton	6 (1.1)
Clear Spring	9 (1.6)	Annapolis	5 (0.9)
Friendsville	9 (1.6)	Chestertown	5 (0.9)
Sykesville	9 (1.6)	Columbia	5 (0.9)
Monkton	8 (1.4)	Darlington	5 (0.9)
Towson	8 (1.4)	Grantsville	5 (0.9)
Germantown	7 (1.3)	Randallstown	5 (0.9)
La Plata	7 (1.3)	Westernport	5 (0.9)
Total responses 557	268 cities mentioned only once (0.2% each)		

7. Including you, how many people went on this fishing trip?

Number of People on Fishing Trip Per Season					
Number of people	**Winter 2015 (%)**	**Spring 2015 (%)**	**Summer 2015 (%)**	**Fall 2015 (%)**	**All seasons (%)**
1	26 (32.9)	74 (27.6)	41 (23.3)	21 (35)	162 (27.7)
2	37 (46.9)	106 (39.6)	70 (39.8)	27 (45)	240 (41.2)
3	10 (12.7)	42 (15.7)	35 (19.9)	6 (10)	93 (16.0)
4	5 (6.3)	25 (9.3)	18 (10.2)	4 (6.7)	52 (8.9)
≥5	1 (1.3)	21 (7.9)	12 (6.8)	2 (3.3)	36 (6.2)
Total question responses	79	268	176	60	583

8. How many nights were you away from home on this trip?

Number of Nights Away from Home Per Season					
# Of nights away	**Winter 2015 (%)**	**Spring 2015 (%)**	**Summer 2015 (%)**	**Fall 2015 (%)**	**All seasons (%)**
0	74 (93.7)	223 (84.1)	135 (76.7)	52 (88.1)	484 (83.6)
1	1 (1.3)	5 (1.9)	9 (5.1)	2 (3.4)	17 (2.9)
2	4 (5.1)	18 (6.8)	12 (6.8)	3 (5.1)	37 (6.4)
3	-	9 (3.4)	5 (2.8)	1 (1.7)	15 (2.6)
4	-	3 (1.1)	5 (2.8)	1 (1.7)	9 (1.5)
5	-	4 (1.5)	2 (1.1)	-	6 (1.0)
6	-	1 (0.4)	3 (1.7)	-	4 (0.7)
7	-	1 (0.4)	4 (2.3)	-	5 (0.9)
8	-	1 (0.4)	1 (0.6)	-	2 (0.3)
Question Responses	79	265	176	59	579

9. Which fishing types and methods did you use on this trip? (Check all that apply)

____Natural Bait
____Artificial Lures
____Fly Fishing
____Ice Fishing
____Watercraft (with motor)
____Watercraft (without motor)
____Shore/Wading

Fishing types/methods used per season*					
Fishing types/methods	**Winter 2015 (%)**	**Spring 2015 (%)**	**Summer 2015 (%)**	**Fall 2015 (%)**	**All Seasons (%)**
Natural bait	39 (49.4)	146 (54.3)	114 (63.7)	26 (43.3)	325 (55.4)
Artificial lures	57 (72.2)	184 (68.4)	124 (69.3)	45 (75)	410 (69.9)
Fly fishing	14 (17.7)	42 (15.6)	17 (9.5)	12 (20)	85 (14.5)
Ice fishing	9 (11.4)	0	0	0	9 (1.5)
Watercraft w/ motor	10 (12.7)	51 (19)	45 (25.1)	16 (26.7)	122 (20.8)
Watercraft w/o motor	4 (5.1)	23 (12.9)	23 (12.9)	6 (10)	56 (9.5)
Shore/wading	39 (49.4)	111 (41.3)	71 (39.7)	25 (41.7)	246 (41.9)
Total question responses	79	269	179	60	587

*There were multiple responses available for each method, so the percentages reported are the fishing type/method by season divided by total question responses. The percentages do not add up to 100% for rows or tables.

10. Which fish species did you target on this trip?

Number of times a species was targeted per season*					
Species	**Winter 2015 (%)**	**Spring 2015 (%)**	**Summer 2015 (%)**	**Fall 2015 (%)**	**All Seasons (%)**
Smallmouth bass	9 (11.5)	45 (16.9)	43 (24.4)	11 (18)	108 (18.6)
Largemouth bass	14 (18.0)	58 (21.7)	36 (20.5)	16 (26.2)	124 (21.3)
Bass	26 (33.3)	117 (43.8)	84 (47.7)	31 (50.8)	258 (44.3)
Bluegill/sunfish	3 (3.9)	34 (12.7)	33 (18.8)	9 (14.8)	79 (13.6)
Crappie	12 (15.4)	21 (7.9)	14 (8)	9 (14.8)	56 (9.6)
White perch	3 (3.9)	6 (2.3)	2 (1.1)	5 (8.2)	16 (2.8)
Yellow perch	4 (5.1)	10 (3.8)	7 (4)	3 (4.9)	24 (4.1)
Shad	0	3 (1.1)	0	0	3 (0.5)
Stocked trout	16 (20.5)	47 (17.6)	14 (8)	8 (13.1)	85 (14.6)
Brown trout	4 (5.1)	19 (7.1)	6 (3.4)	5 (8.2)	34 (5.8)
Brook trout	1 (1.3)	12 (4.5)	5 (2.8)	0	18 (3.1)
Trout	32 (41)	88 (33)	23 (13.1)	13 (21.3)	156 (26.8)
Walleye	8 (10.3)	13 (4.9)	6 (3.4)	6 (9.8)	33 (5.7)
Pike	1 (1.3)	2 (0.8)	4 (2.3)	4 (6.6)	11 (1.9)
Musky	1 (1.3)	1 (.4)	3 (1.7)	0	5 (0.9)
Total responses	78	267	176	61	582

*There were multiple responses available for each method, so the percentages reported are the species targeted by season divided by total question responses. The percentages do not add up to 100% for rows or tables.

11. When thinking about this previous fishing trip, please indicate how much you agree or disagree with the following statements. Ranging from strongly disagree, disagree, neutral, agree, and strongly agree.

- **Catch (ex: size, # of fish) met or exceeded my expectations**
- **Environmental quality met or exceeded my expectations**
- **Fishing was the primary reason for taking a trip to this area**
- **I plan on taking a fishing trip to this location again**

Winter 2015 (January - March)						
	Strongly Disagree (%)	**Disagree (%)**	**Neutral (%)**	**Agree (%)**	**Strongly Agree (%)**	**Survey Responses**
Catch (ex: size, # of fish) met or exceeded my expectations	7 (8.9)	18 (22.8)	27 (34.2)	27 (34.2)	0	79
Environmental quality met or exceeded my expectations	1 (1.3)	7 (9)	21 (26.9)	44 (56.4)	5 (6.4)	78
Fishing was the primary reason for taking a trip to this area	1 (1.3)	3 (3.8)	3 (3.8)	36 (45.6)	36 (45.6)	79
I plan on taking a fishing trip to this location again	0	2 (2.5)	2 (2.5)	34 (43.1)	41 (51.9)	79

Spring 2015 (April - June)						
	Strongly Disagree (%)	**Disagree (%)**	**Neutral (%)**	**Agree (%)**	**Strongly Agree (%)**	**Survey Responses**
Catch (ex: size, # of fish) met or exceeded my expectations	20 (7.5)	55 (20.6)	75 (28.1)	93 (34.8)	24 (9)	267
Environmental quality met or exceeded my expectations	13 (4.9)	16 (6)	55 (20.7)	150 (56.4)	32 (12)	266
Fishing was the primary reason for taking a trip to this area	1 (.4)	11 (4.1)	23 (8.6)	100 (37.5)	132 (49.4)	267
I plan on taking a fishing trip to this location again	3 (1.1)	6 (2.3)	21 (7.9)	96 (36.1)	140 (52.6)	266

Summer 2015 (July - September)						
	Strongly Disagree (%)	**Disagree (%)**	**Neutral (%)**	**Agree (%)**	**Strongly Agree (%)**	**Survey Responses**
Catch (ex: size, # of fish) met or exceeded my expectations	21 (11.9)	39 (22.2)	59 (33.5)	50 (28.4)	7 (4)	176
Environmental quality met or exceeded my expectations	5 (2.8)	14 (7.9)	47 (26.4)	89 (50)	23 (12.9)	178
Fishing was the primary reason for taking a trip to this area	7 (3.93)	14 (7.87)	24 (13.48)	63 (35.4)	70 (39.3)	178
I plan on taking a fishing trip to this location again	5 (2.8)	4 (2.3)	14 (8)	86 (48.9)	67 (38.1)	176

Fall 2015 (October - December)						
	Strongly Disagree (%)	**Disagree (%)**	**Neutral (%)**	**Agree (%)**	**Strongly Agree**	**Survey Responses**
Catch (ex: size, # of fish) met or exceeded my expectations	2 (3.3)	18 (29.5)	16 (26.2)	17 (27.9)	8 (13.1)	61
Environmental quality met or exceeded my expectations	2 (3.3)	6 (9.8)	15 (24.6)	27 (44.3)	11 (18)	61
Fishing was the primary reason for taking a trip to this area	0	2 (3.3)	2 (3.3)	23 (37.7)	34 (55.7)	61
I plan on taking a fishing trip to this location again	1 (1.6)	0	0	25 (41)	35 (57.4)	61

All Seasons 2015						
	Strongly Disagree (%)	**Disagree (%)**	**Neutral (%)**	**Agree (%)**	**Strongly Agree (%)**	**Survey Responses**
Catch (ex: size, # of fish) met or exceeded my expectations	50 (8.6)	130 (22.3)	177 (30.4)	187 (32.1)	39 (6.7)	583
Environmental quality met or exceeded my expectations	21 (3.6)	43 (7.4)	138 (23.7)	310 (53.2)	71 (12.2)	583
Fishing was the primary reason for taking a trip to this area	9 (1.5)	30 (5.1)	52 (8.9)	222 (38.0)	272 (46.5)	585
I plan on taking a fishing trip to this location again	9 (1.6)	12 (2.1)	37 (6.4)	241 (41.4)	283 (48.6)	582

Fishing in Maryland Non-Tidal Waterways in 2015 Questions

12. For the same trip as above, please enter the dollar amount of your share of expenditures for each category below. Please be as accurate as possible - if unsure, provide your best estimate. If you made no expenditures for a category, please enter a "0".

Transportation (ex: Gas and Tolls)
Boat Expenses (ex: Gas and Launch fees)
Groceries/snacks/Drinks
Restaurant/ Takeout
Other
Entertainment
Bait, Lures, and Tackle
Guide Fees
Lodging

Expenditures Winter 2015 (January - March)					
Expenditures	**N**	**Minimum**	**Maximum**	**Average**	**Median**
Transportation (ex: gas & tolls)	76	$0	$94	$13.12	$7.5
Boat expenses (ex: gas & launch fees)	77	$0	$100	$3.96	$0
Groceries/snacks/drinks	77	$0	$50	$9.00	$6
Restaurant/takeout	77	$0	$50	$3.88	$0
Entertainment	77	$0	$20	$.25	$0
Bait, lures, & tackle	76	$0	$100	$18.46	$12
Guide fees	77	$0	$0	$0	$0
Lodging	77	$0	$250	$3.89	$0
Other	77	$0	$250	$4.61	$0
Trip total	76	$0	$374	$57.53	$30
Expenditures Spring 2015 (April - June)					
Expenditures	**N**	**Minimum**	**Maximum**	**Average**	**Median**
Transportation (ex: gas & tolls)	262	$0	$250	$20.29	$10
Boat expenses (ex: gas & launch fees)	262	$0	$1400	$12.90	$0
Groceries/snacks/drinks	262	$0	$30	$19.28	$6.5
Restaurant/takeout	262	$0	$300	$11.77	$0
Entertainment	261	$0	$200	$3.16	$0
Bait, lures, & tackle	261	$0	$500	$19.14	$10
Guide fees	262	$0	$300	$5.40	$0
Lodging	262	$0	$2000	$25.49	$0
Other	262	$0	$500	$4.59	$0
Trip total	261	$0	$2900	$122.01	$40
Expenditures Summer 2015 (July - September)					
Expenditures	**N**	**Minimum**	**Maximum**	**Average**	**Median**
Transportation (ex: gas & tolls)	170	$0	$200	$24.09	$10
Boat expenses (ex: gas & launch fees)	168	$0	$1000	$23.98	$0
Groceries/snacks/drinks	170	$0	$300	$25.39	$10
Restaurant/takeout	170	$0	$500	$18.87	$0
Entertainment	170	$0	$500	$7.45	$0
Bait, lures, & tackle	170	$0	$500	$24.65	$10
Guide fees	170	$0	$600	$3.52	$0
Lodging	170	$0	$5000	$108.23	$0
Other	170	$0	$50	$1.47	$0
Trip total	168	$0	$5450	$236.72	$40

Expenditures Fall 2015 (October - December)					
Expenditures	**N**	**Minimum**	**Maximum**	**Average**	**Median**
Transportation (ex: gas & tolls)	59	$0	$100	$17.57	$6
Boat expenses (ex: gas & launch fees)	59	$0	$500	$18	$0
Groceries/snacks/drinks	59	$0	$200	$15.03	$8
Restaurant/takeout	59	$0	$200	$8.22	$0
Entertainment	59	$0	$25	$.76	$0
Bait, lures, & tackle	59	$0	$200	$17.06	$0
Guide fees	59	$0	$0	$0	$0
Lodging	59	$0	$900	$23.47	$0
Other	59	$0	$10	$.33	$0
Trip total	59	$0	$1925	$100.47	$31

Expenditures All Seasons 2015					
Expenditures	**N**	**Minimum**	**Maximum**	**Average**	**Median**
Transportation (ex: gas & tolls)	567	$0	$250	$20.19	$10
Boat expenses (ex: gas & launch fees)	566	$0	$1,400	$15.51	$0
Groceries/snacks/drinks	568	$0	$300	$19.28	$10
Restaurant/takeout	568	$0	$500	$12.46	$0
Entertainment	567	$0	$500	$3.80	$0
Bait, lures, & tackle	566	$0	$500	$20.49	$10
Guide fees	568	$0	$600	$3.55	$0
Lodging	568	$0	$5,000	$47.12	$0
Other	568	$0	$500	$3.22	$0
Trip Total	76	$0	$5450	$145.24	$37

13. Please list the number of fishing trips you took to Maryland nontidal rivers/streams during each season below.

Winter (January 2015 - March 2015)
Spring 2015 (April 2015 - June 2015)
Summer 2015 (July 2015 - September 2015)
Fall 2015 (October 2015 - December 2015)

Number of fishing trips taken to nontidal rivers/streams						
Season	**N**	**Min**	**Max**	**Average**	**Median**	**Total trips**
Winter 2015	700	0	50	1.08	0	755
Spring 2015	700	0	51	4.50	2	3143
Summer 2015	700	0	51	4.89	2	3425
Fall 2015	700	0	35	2.25	0	1575
All year	700	0	156	12.71	5	8898

14. Please list the three Maryland nontidal rivers/streams where you went fishing the most in 2015. For each waterbody, also list the county, # of trips, and species targeted.

Nontidal river/stream	Question responses (%)	# of trips	Nontidal river/stream	Question responses (%)	# of trips
Potomac River	145 (32.7)	1304	Tuckahoe Creek	7 (1.6)	46
Gunpowder River	60 (13.5)	302	Middle Creek	6 (1.4)	63
Patapsco River	33 (7.4)	247	Little Falls	5 (1.1)	49
Savage River	31 (7)	183	Middle Patuxent River	5 (1.1)	27
Monocacy River	29 (6.5)	234	15 Mile creek	4 (0.9)	18
Patuxent River	23 (5.2)	105	Marshyhope Creek watershed	4 (0.9)	112
Susquehanna River	23(5.2)	147	Seneca Creek	4 (0.9)	27
Deer Creek	19 (4.3)	51	Severn River	4 (0.9)	12
Youghiogheny River	17 (3.8)	108	Big Elk Creek	3 (0.7)	18
North Branch Potomac River	15 (3.4)	112	Licking Creek	3 (0.7)	8
Casselman River	14 (3.2)	58	Northeast River	3 (0.7)	9
Beaver Creek	13 (2.9)	89	Pocomoke River	3 (0.7)	14
Wills Creek	13 (2.9)	86	Shenandoah River	3(0.7)	12
Big Hunting Creek	11 (2.5)	61	Town Creek	3 (0.7)	32
Evitts Creek	11 (2.5)	97	Wicomico River	3 (0.7)	25
Antietam Creek	10 (2.3)	53	Beaver Dam Creek	2 (0.5)	33
Bear Creek	10 (2.3)	59	Blackwater River	2 (0.5)	2
Jennings Run	10 (2.3)	79	Little Youghiogheny River	2 (0.5)	7
Little Gunpowder River	10 (2.3)	32	Mattawoman Creek	2 (0.5)	8
Little Patuxent River	9 (2)	28	Octoraro Creek	2 (0.5)	2
Catoctin Creek	8 (1.8)	17	Owens Creek	2 (0.5)	6
Choptank River	8 (1.8)	45	Severn Run	2 (0.5)	5
Conococheague Creek	7 (1.6)	96	Sideling Hill Creek	2 (0.5)	10
Morgan Run	7 (1.6)	19	Winters Run	2 (0.5)	14
Total Question Responses	**444** (170 area received one mention @ 0.25% each)				

15. Please list the number of fishing trips you took to Maryland Lakes, Ponds, or Reservoirs during each season below.

Winter (January 2015 - March 2015)
Spring 2015 (April 2015 - June 2015)
Summer 2015 (July 2015 - September 2015)
Fall 2015 (October 2015 - December 2015)

Number of fishing trips taken to lakes, ponds, or reservoirs						
Season	**N**	**Min**	**Max**	**Average**	**Median**	**Total**
Winter 2015	700	0	51	0.71	0	496
Spring 2015	700	0	51	2.63	0	1840
Summer 2015	700	0	51	2.95	1	2066
Fall 2015	700	0	40	1.37	0	957
All Year	700	0	153	7.66	2	5359

16. Please list the three Maryland lakes, ponds, or reservoirs where you went fishing the most in 2015. For waterbody, also list the # of trips, county and species targeted.

Lake, pond, or reservoir	Question responses (%)	# of trips	Lake, pond, or reservoir	Question responses (%)	# of trips
Deep Creek Lake	96 (18.9)	476	Savage River Reservoir	4 (0.8)	7
Loch Raven Reservoir	51 (10)	283	Youghiogheny Lake	4 (0.8)	24
Liberty Reservoir	41 (8.1)	307	Battie Mixon Pond	3 (0.6)	8.0
Little Seneca Lake	28 (5.5)	110	C&O Canal	3 (0.6)	13.0
Piney Run Reservoir	26 (5.1)	105	Carroll County Farm Museum Pond	3 (0.6)	14.0
Centennial Lake	23 (4.5)	83	Hamburg Pond	3 (0.6)	11.0
Prettyboy Reservoir	23 (4.5)	129	Herrington Lake	3 (0.6)	5.0
Triadelphia Reservoir	23 (4.5)	132	Hutchins Pond	3 (0.6)	10
Rocky Gap Lake	18 (3.5)	53	Johnson's Pond	3 (0.6)	18
Conowingo Reservoir	17 (3.3)	113	Lake Roland	3 (0.6)	17
Blair's Valley Lake	14 (2.8)	72	Local Ponds	3 (0.6)	17
Greenbrier Lake	14 (2.8)	52	Rising Sun Pond	3 (0.6)	10
Cunningham Falls Lake	13 (2.6)	54	Schumaker Pond	3 (0.6)	23
Rocky Gorge Reservoir	12 (2.4)	104	Smithville Lake	3 (0.6)	6
Piney Reservoir	11 (2.2)	66	Urbana Lake	3 (0.6)	20
Big Pool Lake	10 (2)	34	APL Pond	2 (0.4)	13.0
Lake Needwood	9 (1.8)	67	Cosca Lake	2 (0.4)	23.0
New Germany Lake	9 (1.8)	26	Culler Lake	2 (0.4)	3.0
Broadford Lake	8 (1.6)	43	Evitts Creek Pond	2 (0.4)	7.0
Clopper Lake	8 (1.6)	31	Funks Pond	2 (0.4)	0.0
Pond	8 (1.6)	173	Greenbelt Lake	2 (0.4)	1.0
Tuckahoe Lake	8 (1.6)	40	Hunting Creek Lake	2 (0.4)	3.0
Cash Lake	7 (1.4)	62	Lake Hashawha	2 (0.4)	10
Unicorn Lake	6 (1.2)	13	ML King Jr. Pond	2 (0.4)	7
Wheatley Lake	6 (1.2)	26	Middletown Pond	2 (0.4)	18
Allen Pond	5 (1)	14	Newtown Park Lake	2 (0.4)	13
Farm Pond	5 (1)	19	Parkers Pond	2 (0.4)	15
Lake Elkhorn	5 (1)	4	Pine Lake	2 (0.4)	1
Lake Waterford	5 (1)	56	Random House Park Pond	2 (0.4)	4
Leonard's Mill Pond	5 (1)	38	St. Mary's Lake	2 (0.4)	16
Myrtle Grove Ponds	5 (1)	11	Urieville Lake	2 (0.4)	6
Jennings Randolph Lake	4 (0.8)	22	Wilde Lake	2 (0.4)	6
Lake Artemesia	4 (0.8)	16	Wye Mills Lake	2 (0.4)	9
Lake Linganore	4 (0.8)	57			
Total question responses	**508**	(106 area received one mention only @ 0.2% each)			

County of targeted lake, pond or impoundment.

County	Question Responses (%)	# of Trips	County	Question Responses (%)	# of Trips
Garrett	123 (18.3)	1079	Charles	14 (2.1)	261
Baltimore	88 (13.1)	1109	Queen Anne's	14 (2.1)	88
Frederick	74 (11)	673	Caroline	12 (1.8)	194
Washington	73 (10.9)	816	Wicomico	11 (1.6)	189
Montgomery	71 (10.6)	509	Calvert	9 (1.3)	55
Carroll	49 (7.3)	320	Kent	9 (1.3)	57
Howard	46 (6.8)	286	Dorchester	8 (1.2)	33
Allegany	39 (5.8)	453	Saint Mary's	7 (1)	70
Harford	38 (5.7)	232	Baltimore City	3 (.4)	16
Prince George's	30 (4.5)	231	Talbot	3 (.4)	3
Cecil	27 (4)	179	Worcester	3 (.4)	56
Anne Arundel	24 (3.6)	159	Somerset	2 (.3)	13
Total Question Responses	**560**	(217 received one mention only @ 0.15% each)			

Species targeted in lakes, ponds and impoundments.

Species targeted	Question responses (%)	Species targeted	Question responses (%)
Largemouth bass	219 (33.7)	Shad	14 (2.2)
Smallmouth bass	181 (27.9)	Stocked Trout	144 (22.2)
Bass	389 (59.9)	Brown Trout	54 (8.3)
Bluegill/sunfish	184 (28.4)	Brook Trout	37 (5.7)
Crappie	129 (19.9)	Trout	248 (38.2)
Catfish	108 (16.6)	Walleye	66 (10.2)
White perch	29 (4.5)	Pike	24 (3.7)
Yellow perch	51 (7.9)	Musky	13 (2.0)
Total question responses	649		

17. For this question, only consider your 2015 fishing in Maryland nontidal waterways.

Check all of the fishing types and methods you used to target each non-tidal fish below. Types of fishing include artificial lures, natural bait, and fly fishing. Fish methods include shore/wading, watercraft with a motor, watercraft without a motor and ice fishing.

	Type of fishing (%)*			Fishing methods (%)				Species total (%)
Species	**Artificial lures**	**Natural bait**	**Fly fishing**	**Shore/ wading**	**Watercraft - motor**	**Watercraft – no motor**	**Ice fishing**	
Largemouth bass	376 (86.6)	204 (47)	35 (8.1)	218 (50.2)	149 (34.3)	79 (18.2)	5 (1.2)	434 (66.1)
Smallmouth bass	317 (83.9)	175 (46.3)	40 (10.6)	177 (46.8)	127 (33.6)	73 (19.3)	3 (.8)	378 (57.5)
Striped bass (non-tidal)	101 (74.8)	81 (60)	8 (5.9)	54 (40)	44 (32.6)	19 (14.1)	2 (1.5)	135 (20.5)
Bluegill/ sunfish	196 (58.2)	239 (70.9)	45 (13.4)	197 (58.8)	74 (22)	51 (15.1)	9 (2.7)	337 (51.3)
Carp	27 (33.3)	65 (80.2)	9 (11.1)	44 (54.3)	11 (13.6)	10 (12.3)	1 (1.2)	81 (12.3)
Channel catfish	47 (25)	166 (88.3)	7 (3.7)	101 (53.7)	40 (21.3)	16 (8.5)	1 (.5)	188 (28.6)
Flathead catfish	24 (23.5)	90 (88.2)	1 (1)	58 (56.9)	22 (21.6)	10 (9.8)	2 (2)	102 (15.5)
Crappie	168 (74.3)	145 (64.2)	14 (6.2)	119 (52.7)	69 (30.5)	43 (19)	9 (4)	226 (34.4)
Musky	37 (74)	22 (44)	2 (4)	21 (42)	18 (36)	4 (8)	1 (2)	50 (7.6)
Northern pike	59 (80.8)	36 (49.3)	2 (2.7)	28 (38.4)	28 (38.4)	8 (11)	3 (4.1)	73 (11.1)
White perch	82 (56.6)	114 (78.6)	4 (2.8)	80 (55.2)	35 (24.1)	12 (8.3)	4 (2.8)	145 (22.1)
Yellow perch	110 (59.1)	147 (79)	7 (3.8)	93 (50)	54 (29)	21 (11.3)	10 (5.4)	186 (28.3)
Pickerel	67 (80.7)	43 (51.8)	4 (4.8)	43 (51.8)	26 (31.3)	16 (19.3)	4 (4.8)	83 (12.6)
Shad	22 (55)	20 (50)	5 (12.5)	22 (55)	2 (5)	2 (5)	1 (2.5)	40 (6.1)
Stocked trout	177 (68.1)	134 (51.5)	73 (28.1)	178 (68.5)	16 (6.2)	12 (4.6)	3 (1.2)	260 (39.6)
Wild brown trout	50 (45)	47 (42.3)	53 (47.7)	73 (65.8)	2 (1.8)	2 (1.8)	1 (.8)	111 (16.9)
Wild brook trout	55 (46.2)	46 (38.7)	58 (48.7)	80 (67.2)	3 (2.5)	1 (.8)	1 (.8)	119 (18.1)
Walleye	89 (77.4)	72 (62.6)	4 (3.5)	41 (35.7)	46 (40)	10 (8.7)	11 (9.6)	115 (17.5)
Method total	**512 (77.9)**	**427 (65.0)**	**125 (19.0)**	**392 (59.7)**	**211 (32.1)**	**115 (17.5)**	**21 (3.2)**	**657**

*Multiple answers were possible so percentages are derived from the species total divided by the method total. Column and row totals do not equal 100%.

Maryland Trout Fishing Questions

18. In the past 10 years, have you fished for trout in Maryland?

A. Yes

B. No

Did you fish for trout in Maryland in the past 10 years?	Survey responses (%)
Yes	407 (45.6)
No	485 (54.4)
Total question responses	892

19. In 2015, how many fishing trips did you take in Maryland?

# of trout fishing trips taken in Maryland					
N	**Min**	**Max**	**Average**	**Median**	**Total**
367	0	51	6.8	3	2486

20. When fishing for trout in Maryland, please indicate how much you agree or disagree with the following statements. Ranging from strongly disagree, disagree, neutral agree, and strongly agree.

- **Most trout I catch are within the typical catch sizes**
- **In most years I catch a trout that fits the trophy criteria above**
- **I prefer to fish in areas that have a specific species of trout**
- **I prefer to fish for trout where catch-and-release is required**
- **I prefer to use natural bait when fishing for trout**
- **The ability to harvest that I can catch is important**
- **I prefer to fish for trout where I might catch a "trophy" fish**
- **I prefer to fish for trout where I can catch many fish**
- **Distance is a factor when deciding where to go trout fishing**
- **I prefer to fish in a location where I can catch wild trout**
- **Aesthetic beauty of area influences where I fish for trout**
- **I would rather fish for trout in a river/stream than a lake or pond**
- **Environmental quality of area influences where I fish for trout**
- **I prefer to fish for trout where I see few or no other people**

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Most trout I catch are within the typical catch sizes above (see survey)	11 (2.9)	37 (9.7)	50 (13.1)	197 (51.6)	87 (22.8)
In most years I catch a trout that fits the trophy criteria above (see survey)	128 (33.4)	134 (35.0)	54 (14.1)	52 (13.6)	15 (3.9)
I prefer to fish in areas that have a specific species of trout	32 (8.4)	71 (18.7)	193 (50.8)	64 (16.84)	20 (5.26)
I prefer to fish for trout where catch-and-release is required	67 (17.5)	84 (22)	126 (32.9)	56 (14.7)	49 (12.8)
I prefer to use natural bait when fishing for trout	66 (17.2)	78 (20.4)	133 (34.7)	67 (17.5)	39 (10.18)
The ability to harvest trout that I catch is important to me	67 (17.4)	49 (12.7)	95 (24.6)	104 (26.9)	71 (18.4)
I prefer to fish for trout where I might catch a “trophy” fish	21 (5.6)	47 (12.4)	135 (35.7)	104 (27.5)	71 (18.8)
I prefer to fish for trout where I can many fish	10 (2.8)	23 (6.1)	99 (26.1)	161 (42.4)	87 (22.9)
Distance is a factor when deciding where to go trout fishing	15 (3.9)	50 (13)	90 (23.4)	182 (47.4)	47 (12.2)
I prefer to fish in a location where I can catch wild trout	11 (2.9)	35 (9.1)	170 (44.3)	121 (31.5)	47 (12.2)
Aesthetic beauty of area influences where I fish for trout	11 (2.9)	44 (11.6)	115 (30.3)	138 (36.3)	72 (19)
I would rather fish for trout in river/stream than a lake/pond	14 (3.6)	35 (9.1)	112 (29.1)	107 (27.8)	117 (30.4)
Environmental quality of area influences where I fish for trout	6 (1.8)	22 (5.7)	75 (19.6)	171 (44.7)	109 (28.5)
I prefer to fish for trout where I will see few or no other people	4 (1)	19 (4.9)	94 (24.4)	177 (46)	91 (23.6)

21- 29. Questions about Preferred Trout Fishing Sites

To examine individual preferences for and willingness-to-pay associated with trout fishing sites, staff estimated two logit models. First, they estimated a conditional logit model, which assumed that all parameters are fixed and as such do not account for preferences varying throughout the population of anglers. Then, they estimated a mixed logit model of trout angling in Maryland. The mixed logit models allow the parameters associated with the four restrictive trout fishing regulations (catch & release only, two fish harvest limit, artificial lures & flies only, and fly fishing only) to vary, with the assumption that preferences for these regulations have a normal (Gaussian) distribution. Using the Akaike Information Criterion (AIC) to assess relative quality of each model, we find the mixed logit model, which accounts for angler heterogeneity of preferences in the fishing regulations, to be the preferred model. As such, the mixed logit model estimates are presented in Table A, along with willingness-to-pay estimates and preference distributions for fishing regulations.

Table A. Trout angler site choice mixed logit model**.**

Site attribute	Coefficient (mean)	Std. error	P-value	Coefficient (std. deviation)	Std. error	P-value
Travel cost	-0.0070***	0.0012	P<0.01	N/A	N/A	N/A
Waterbody (river/stream)	0.4257***	0.1085	P<0.01	N/A	N/A	N/A
Trophy possibility	0.4622**	0.2243	P=0.039	N/A	N/A	N/A
Catch rate	0.1409***	0.0348	P<0.01	N/A	N/A	N/A
Stocked brown trout	0.0648	0.0916	P = 0.479	N/A	N/A	N/A
Wild brown trout	0.5837***	0.1703	P < 0.01	N/A	N/A	N/A
Wild brook trout	0.0940	0.1753	P = 0.592	N/A	N/A	N/A
Catch-and-release	-0.6912***	0.1658	P<0.01	1.6016	0.3081***	P<0.01
Limit 2	-0.3194***	0.0761	P<0.01	0.0268	0.0352	P=0.446
Fly fishing only	-0.7175***	0.1785	P<0.01	1.6507	0.2951***	P<0.01
Lure fishing only	-0.1366	0.0910	P = 0.133	0.3560	0.3627	P=0.326

***=statistically significant at 1% level; ** = statistically significant at the 5% level

The mathematical sign of the mean coefficients in the table above reflects the directional influence that a change in the level of the site attribute has on the probability an individual chooses that site. For example, the travel cost variable is negative and statistically significant at the 1 percent level. The negative sign on the travel cost

coefficient reveals that holding all other site attributes constant, an increase in round-trip travel reduces the probability that an individual will choose that site. As the travel cost coefficient is statistically significant at the 1 percent level, it is highly unlikely that this is an artifact of the data collection process and there is a very high degree of confidence that increasing travel costs to a trout fishing site does indeed reduce the probability that an individual takes a trip to that fishing site. Generally, signs of other mean coefficients are as expected. All else equal, increases in catch rate and probability of catching a trophy-sized trout at a fishing site increase the likelihood of an individual choosing that fishing site. Mean coefficients on all gear and harvest regulations are negative, indicating that the average angler is less likely to choose a site with greater restrictions, relative to the least restrictive regulation. For example, mean coefficients on "Catch & release only" and "Limit 2" restrictions are negative, meaning that all else equal, individuals are on average less likely to choose a site with these restrictions, relative to the least restrictive harvest regulation (5 fish harvest limit). Similarly, mean coefficients on "Artificial lures & flies only" and "Fly fishing only" restrictions are negative, meaning that all else equal, individuals on average are less likely to choose a site with these restrictions, relative to the least restrictive lure/bait regulation (no restrictions). Angler preferences for different types and species of trout at a fishing site were evaluated against stocked rainbow trout. Model results indicate that anglers did not have strong preferences for stocked brown trout versus stocked rainbow trout, as the mean coefficient on stocked brown trout was not statistically significant at conventional levels of measurement. Similarly, there was no difference between mean angler preferences between wild brook trout and stocked rainbow trout. However, relative to stocked rainbow trout, the average angler preferred to fish for wild brown trout. Finally, mean angler preferences were stronger for fishing in moving bodies of water (rivers/streams) than in still bodies of water (lakes/ponds).

In the above paragraph, mean angler preferences for fishing site attributes were described. However, an advantage of the mixed logit model is that variation in preferences for fishing site attributes across the angler population can be examined. As stated previously, the model presented within this report allows for angler preferences for four types of fishing regulations to vary across the angler population through a normal distribution. That is, these parameters associated with these regulations have a mean (as with all site attributes in the model), but also have a standard deviation which captures how preferences vary across the population. The standard deviation associated with the two most-strict regulations - "Catch & release only" and "Fly fishing only" are statistically significant at the 1 percent level, revealing that preferences for these regulations vary across the trout angler population. For the two less-restrictive regulations - "Limit 2" and "Artificial lures and flies only", there was weaker evidence that preferences for these regulations vary across the population. The standard deviation associated with "Artificial lures and flies only" and "Limit 2" are not statistically significant at conventional levels of measurement.

Given the modeling assumption that these regulation variables have normally-distributed preferences across the angling population, this enables the use of mean and standard deviation estimates to calculate the proportion of anglers that are "better off" or "worse

off" with different regulations (relative to the least restrictive regulations). That is, while angler mean preferences for these regulations are negative, the statistically significant standard deviation estimates imply that some anglers are "better off" with these restrictive regulations, all other site attribute levels held constant. For the two most strict gear and harvest regulations ("Fly fishing only" and "Catch-and-release only"), about one-third of anglers are "better off" with these regulations, while just less than two-thirds of trout anglers are "better off" (see Table B below). While model results show that the majority of trout anglers do not have positive preferences for strict regulations, it is noteworthy that a sizable minority of anglers (holding all other site attribute levels constant) prefer these strict regulations. This conforms with previous findings from Knoche and Lupi (2016), who also found that some trout anglers prefer to fish in strictly regulated waterways. It is important to remember that the statistical model holds site attributes constant that might be perceived by anglers to be correlated with regulations (such as trout catch rate and catch size). As such, the positive preferences amongst these trout anglers for strict regulations are unlikely to be influenced by expectations of higher quality catch site attributes and other site attributes included in the choice scenarios. However, it is possible that anglers, when making their choice of where to go trout fishing, are inferring that more highly regulated waterways are signals for higher quality site attributes not included in the choice scenarios, such as less angler congestion or higher levels of environmental quality/scenic beauty. It may also be the case that some anglers view the choice scenarios as an opportunity to register their overarching regulatory preferences, as opposed to answering the question as intended (i.e. where would the angler prefer to go fishing. Finally, it also may be the case that fishing in regulated waterways provide angler with psychological rewards that are independent of expectations of related improvements in other site attributes.

Table B: "Catch & release only" and "Limit_2" evaluated against the "Harvest limit 5 regulation. The gear restriction "Fly fishing only" is evaluated against the "No restrictions" (i.e., natural bait allowed) regulation.

Evaluate the first restrictions impacts on fishing as compared to the second	**Better off (%)**	**Worse off (%)**
Catch & release only and Limit 2 versus harvest limit 5	33.3	66.7
Fly fishing only versus no restrictions	33.2	66.8

In Table C, we provide trout angler willingness-to-pay estimates for improvements in site characteristics for all site attributes that are found to influence angler site choice ($P<0.05$). As stated previously, the interpretation of willingness to pay is trout anglers would be willing to incur an increase of per-trip travel costs up the amount listed in Table C in order to receive a change in the level of the site attribute. Trout anglers have mean willingness-to-pay for river/stream attribute of $60.82, meaning that anglers, on average, would be willing to incur an increase in per-trip travel costs of up to $60.82 to fish for

trout in a river/stream as opposed to a lake/pond. The average trout angler would not incur travel costs greater than $60.82 to fish in a river/stream. Given these necessary increased travel costs, a trout angler would prefer to fish in a lake/pond. Finally, if the additional required travel costs were exactly $60.82, a trout angler would be indifferent between incurring these travel costs and fishing in a river/stream, and not incurring these travel costs and fishing in a lake/pond.

Regarding species preference, model results indicate strong preference for fishing for wild brown trout, with a mean angler willingness-to-pay of $83.39 to fish at an area with wild brown trout relative to an area with stocked rainbow trout. This result suggests that the average angler places a high priority on fishing for wild brown trout, and that the creation, maintenance and enhancement of fishing sites with wild brown trout are important to trout anglers. Trout anglers have positive willingness-to-pay for catch rate and catch size, with willingness-to-pay for a 1 trout per hour increase in catch rate of $20.14, and willingness-to-pay for a 10 percent increase in the possibility of catching a trophy-sized trout at a fishing site of $6.60. Due to possible fisheries management tradeoff decisions between catching more fish and catching bigger fish, and in particular the optimization decision facing hatchery managers (i.e., incur less costs by releasing trout into waterbodies as soon a minimum catchable-size is met or incur greater costs by holding trout longer until they reach a larger size), it is useful to examine the break-even (indifference) point for anglers with respect to trout catch rate and catch size. The ratio of catch rate willingness-to-pay of $20.14 and trophy possibility willingness-to-pay of $6.60 implies that anglers would be indifferent between an increase in catch rate of one per hour and an increase in the probability of catching a trophy-sized trout by 33 percent. That is, the average trout angler would need a greater than 33 percent increase in per-trip trophy trout probability to prefer that increase over a 1 trout per hour increase, whereas with a trophy trout increase of less than 33 percent, trout anglers would prefer a one trout per hour increase over the change in trophy potential. Finally, Table C shows that the average trout angler would be willing to incur greater travel costs to fish in less regulated waterways versus more regulated waterbodies. This is particularly the case with the most-strict regulations, with the average angler willing to incur additional travel costs to avoid fly fishing only areas and also to avoid areas that have harvest restrictions more stringent that a five fish limit (i.e., limit 2 or catch-and-release only).

Table C. Trout angler mean willingness-to-pay (95% confidence intervals) for fishing Maryland attributes.

Site Attribute	Change Interpretation	Willingness-to-Pay
River/stream	River/stream instead of lake/pond	$60.82 ($29.24 — $106.76)
Trophy	10 percent increase in probability of catching trophy-sized fish on trip	$6.60 ($0.58 — $149.07)
Catch	Increase in catch of 1 trout per hour	$20.14 ($10.63 — $34.49)
Wild brown trout	Fishing site has wild brown trout as opposed to stocked rainbow trout	$83.39 ($31.88 — $164.66)
Catch & release only	Fishing site is catch & release only, as opposed to harvest limit of 5.	-$98.76 (-$54.83 — -$158.55)
Limit 2	Fishing site has harvest limit of 2, as opposed to harvest limit of 5.	-$45.64 (-$23.50 — -$75.23)
Fly fishing only	Fishing site is fly fishing only, as opposed to having no restrictions (i.e., natural bait allowed).	-$102.50 (-$56.27 — -$167.15)

General Questions about Fishing in Maryland Nontidal Waterways

29. For this question, please think about what factors affect how often you go fishing in Maryland nontidal waterways. Please indicate how much you agree or disagree with the following statements. Ranging from strongly disagree, disagree, neutral, agree, or strongly agree.*

- **I was able to catch more fish**
- **access to fishing sites was better**
- **I knew when and where to fish**
- **environmental quality was higher**
- **regulations were less restrictive**
- **fishing areas were less crowded**
- **fishing was less expensive**
- **I had somebody to go with**
- **I was able to catch larger fish**
- **I had more leisure time**

		Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
I would go fishing more often in Maryland non-tidal waterways if…..	I was able to catch more fish	33 (4)	79 (9.6)	255 (31.1)	291 (35.5)	162 (19.8)
	access to fishing sites was better	26 (3.2)	85 (10.4)	257 (31.5)	302 (37)	146 (17.9)
	I knew when and where to fish	44 (5.4)	79 (9.9)	246 (30.2)	307 (37.6)	140 (17.2)
	environmental quality was higher	34 (4.2)	78 (9.6)	332 (40.9)	256 (31.5)	122 (13.8)
	regulations were less restrictive	75 (9.3)	169 (20.9)	365 (45.1)	136 (16.8)	65 (8)
	fishing areas were less crowded	38 (4.7)	95 (11.6)	302 (37)	265 (32.4)	117 (14.3)
	fishing was less expensive	70 (8.6)	155 (19.1)	354 (43.5)	158 (19.4)	76 (9.4)
	I had somebody to go with	76 (9.4)	143 (17.6)	310 (38.1)	207 (25.4)	78 (9.6)
	I was able to catch larger fish	43 (5.3)	81 (9.9)	284 (34.8)	267 (32.7)	141 (17.3)
	I had more leisure time	37 (4.5)	57 (6.9)	219 (26.5)	243 (29.4)	270 (32.7)

* Multiple answers are possible, columns do not add up to 100%, but row totals do.

30. With your favorite Maryland nontidal fishing area in mind, please check Yes or No for each of the following statements.

- **I go there because I always catch something**
- **The bigger the fish, the better the trip**
- **I release all the fish I catch there**
- **I prefer to leave with a stringer full of fish**
- **The trip is a total loss if I don't catch any fish**
- **I fish for sport and pleasure rather than food**
- **I give away some or all of the fish I catch**

* The purpose of this question was to compare the findings to a previous Maryland nontidal angler survey (Rivers, 2004). The question content is exactly the same in this survey as in the 2002 survey.

	2002		**2016**	
Survey question	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**
I go there because I always catch something	790 (80.8)	231 (19.2)	436 (54.4)	365 (45.6)
The bigger the fish, the better the trip	567 (47.2)	634 (52.8)	416 (52.1)	383 (47.9)
I release all the fish I catch there	648 (54)	553 (46)	458 (57.3)	342 (42.8)
I prefer to leave with a stringer full of fish	206 (17.1)	995 (82.9)	178 (22.4)	617 (77.6)
I fish for sport and pleasure rather than food	970 (80.8)	231 (19.2)	622 (78.2)	173 (21.8)
I give away some or all of the fish I catch	375 (31.2)	826 (68.8)	223 (28.4)	562 (71.6)

31. Which waterbody were you thinking of when responding to Question 30 above?

Favorite waterbody	Question responses (%)	Favorite waterbody	Question responses (%)
Potomac River	85 (11.3)	Evitts Creek	3 (0.4)
Deep Creek Lake	71 (9.5)	Greenbrier Lake	3 (0.4)
Gunpowder River	28 (3.7)	Hutchins Pond	3 (0.4)
Loch Raven Reservoir	28 (3.7)	Lake Elkhorn	3 (0.4)
Patapsco River	19 (2.5)	Lake Linganore	3 (0.4)
Liberty Reservoir	18 (2.4)	Little Falls	3 (0.4)
Patuxent River	15 (2)	Marshyhope Creek	3 (0.4)
Monocacy River	14 (1.9)	Middle Creek	3 (0.4)
Deer Creek	12 (1.6)	Morgan Run	3 (0.4)
Savage River	12 (1.6)	Myrtle Grove	3 (0.4)
Conowingo Reservoir	11 (1.5)	Pocomoke River	3 (0.4)
Susquehanna River	11 (1.5)	Smithville Lake	3 (0.4)
Little Seneca Lake	10 (1.3)	Tuckahoe	3 (0.4)
North Branch Potomac River	9 (1.2)	Tuckahoe Creek	3 (0.4)
Triadelphia Reservoir	9 (1.2)	15 Mile Creek	2 (0.3)
Beaver Creek	8 (1.1)	Fishing Creek	2 (0.3)
Prettyboy Reservoir	8 (1.1)	Back River	2 (0.3)
Rocky Gap Lake	8 (1.1)	Big Elk Creek	2 (0.3)
Pond	7 (0.9)	Blackwater River	2 (0.3)
Youghiogheny River	7 (0.9)	Blair's Valley Lake	2 (0.3)
Bear Creek	6 (0.8)	Catoctin Creek	2 (0.3)
Centennial Lake	6 (0.8)	Clopper Lake	2 (0.3)
Antietam Creek	5 (0.7)	Cunningham Falls Lake	2 (0.3)
Jennings Run	5 (0.7)	Lake Artemesia	2 (0.3)
Lake Waterford	5 (0.7)	Lake Hashawha	2 (0.3)
Piney Run Reservoir	5 (0.7)	Lake Roland	2 (0.3)
Allen Pond	4 (0.5)	Leonard's Mill Pond	2 (0.3)
Big Hunting Creek	4 (0.5)	Little Gunpowder River	2 (0.3)
Chester River	4 (0.5)	Little Patuxent River	2 (0.3)
Lake Needwood	4 (0.5)	Little Seneca Creek	2 (0.3)
Piney Reservoir	4 (0.5)	Middle Patuxent River	2 (0.3)
Piney Run	4 (0.5)	Northeast River	2 (0.3)
Private Pond	4 (0.5)	Octoraro Creek	2 (0.3)
Rocky Gorge Reservoir	4 (0.5)	Schoolhouse Pond	2 (0.3)
St. Mary's Lake	4 (0.5)	Seneca Lake	2 (0.3)
Unicorn Lake	4 (0.5)	Severn River	2 (0.3)
Big Pool Lake	3 (0.4)	Sideling Hill Creek	2 (0.3)
Broadford Lake	3 (0.4)	Town Creek	2 (0.3)
Bush River	3 (0.4)	Urieville Lake	2 (0.3)
Cash Lake	3 (0.4)	Wheatley Lake	2 (0.3)
Casselman River	3 (0.4)	Wills Creek	2 (0.3)
Choptank River	3 (0.4)	167 other areas were reported by only one angler but are not listed to conserve space	

County of favorite waterbody

Favorite waterbody county	Question responses (%)	Favorite waterbody county	Question responses (%)
Garrett	108 (16.1)	Queen Anne's	14 (2.1)
Baltimore	95 (14.1)	Saint Mary's	14 (2.1)
Washington	63 (1.5)	Calvert	12 (1.8)
Montgomery	61 (9.1)	Charles	12 (1.8)
Frederick	51 (7.6)	Caroline	11 (1.6)
Allegany	42 (6.3)	Dorchester	10 (1.5)
Harford	39 (5.8)	Kent	10 (1.5)
Howard	32 (4.8)	Worcester	7 (1.1)
Prince George's	25 (3.7)	Talbot	4 (.6)
Anne Arundel	22 (3.3)	Somerset	3 (.5)
Cecil	21 (3.1)	Carroll	2 (.3)

Nontidal Angler Demographics

32. Who is filling out this survey?

A. The person the invitation was addressed to
B. Another household member
C. Someone else

Responsible for the survey	Question responses (%)
The person the invitation was addressed to	819 (94.8)
Another household member	39 (4.5)
Someone else	6 (0.7)
Total question responses	864

33. What is your gender?

A. Male
B. Female

Gender	Question responses (%)
Male	756 (87.4)
Female	109 (12.6)
Total question Responses	865

34. In what year were you born?

Year born	Question responses (%)
1990 - 1999	56 (7.4)
1980 - 1989	79 (10.4)
1970 - 1979	114 (15.1)
1960 - 1969	170 (22.5)
1950 - 1959	160 (21.1)
1940 - 1949	142 (18.8)
1920 - 1939	36 (4.8)
Total question responses	757

35. What is your race/ethnicity?

A. White
B. Black/African American
C. Hispanic/Latino
D. Asian
E. American Indian
F. Other

Race/Ethnicity	Question Responses (%)
White	748 (87.6)
Black/African American	57 (6.7)
Hispanic/Latino	19 (2.2)
Asian	17 (2.0)
American Indian	10 (1.2)
Other	18 (2.1)

36. What is the highest degree or level of schooling you have completed?

A. Less than high school
B. High school or equivalent
C. Some college, no degree
D. Associate's degree
E. Bachelor's degree
F. Graduate or professional degree

Highest level of schooling completed	Question responses (%)
Less than high school	24 (2.8)
High school or equivalent	228 (26.8)
Some college, no degree	189 (22.2)
Associate's degree	70 (8.2)
Bachelor’s degree	169 (19.8)
Graduate or professional degree	172 (20.2)
Total question responses	852

37. Do any of the following live in your household? (check all that apply)

____Spouse or significant other
____Children age 5 and under
____Children age 6 - 17
____Other immediate family
____Extended family or other adults
____None of these

Household members	Question responses (%)
Spouse or significant other	636 (75.5)
Children age 5 and under	73 (8.7)
Children 6-17	198 (23.5)
Other immediate family	160 (19.0)
Extended family or other adults	61 (7.2)
None of these	86 (10.2)

38. What is your approximate annual household income?

A. Less than $25,000
B. $25,000 to $34,999
C. $35,000 to 49,999
D. $50,000 to $74,999
E. $75,000 to $99,999
F. $100,000 to $149,999
G. $150,000 to $199,999
H. $200,000 or more

Annual household income	Question responses (%)
Less than $25,000	59 (7.8)
$25,000 to $34,900	66 (8.7)
$35,000 to $49,999	89 (11.7)
$50,000 to $74,999	132 (17.4)
$75,000 to $99,999	142 (18.7)
$100,000 to $149,999	141 (18.6)
$150,000 to $199,999	79 (10.4)
$200,000 or more	51 (6.7)
Total question responses	759

39. What is your employment status?

A. Employed at hourly wage
B. Employed at annual salary
C. Out of work & looking for work
D. Out of work & not looking for work
E. Self-employed
F. Homemaker
G. Student
H. Military
I. Retired
J. Unable to work

Employment status	Question responses (%)
Employed at hourly wage	243 (28.7)
Employed at annual salary	231 (27.2)
Out of work & looking for work	49 (5.8)
Out of work & not looking for work	9 (1.1)
Self-employed	39 (4.6)
Homemaker	13 (1.5)
Student	30 (3.5)
Military	11 (1.3)
Retired	270 (31.8)
Unable to work	6 (0.7)
Total question responses	848

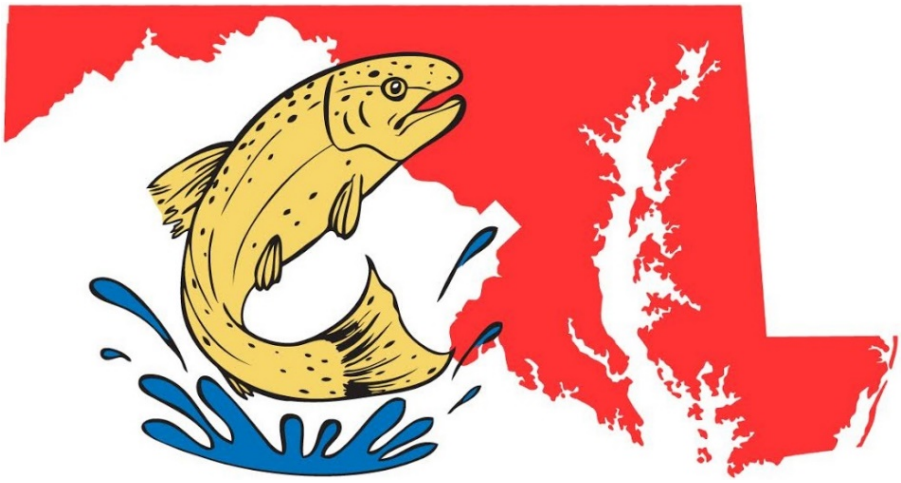
Appendix B: Hard copy survey version: Version 1 out of 84.

Maryland Recreational Fisheries Management Survey

We need your help!

Please complete the Maryland Recreational Fisheries Management Survey and return it in the postage-paid envelope.

YOUR input is needed even if you did not fish in the previous year.



If you have misplaced your postage-paid envelope, please return survey to:

Dr. Scott Knoche
Morgan State University
Patuxent Environmental and Aquatic Research Laboratory
Box <Survey ID>
10545 Mackall Road
Saint Leonard, MD 20685

THANK YOU!

Recreational Fishing in Maryland

1. **Did you go fishing in Maryland in 2015?**

☐ Yes → ***Proceed to the next question***

☐ No → ***Skip to question 18***

Fishing Trip Definition: For this survey, a **fishing trip** is an outing involving fishing. A trip may begin from your primary residence, vacation home or another place. A trip may last an hour, a day, or multiple days.

2. **How many fishing trips did you take in Maryland in 2015?**

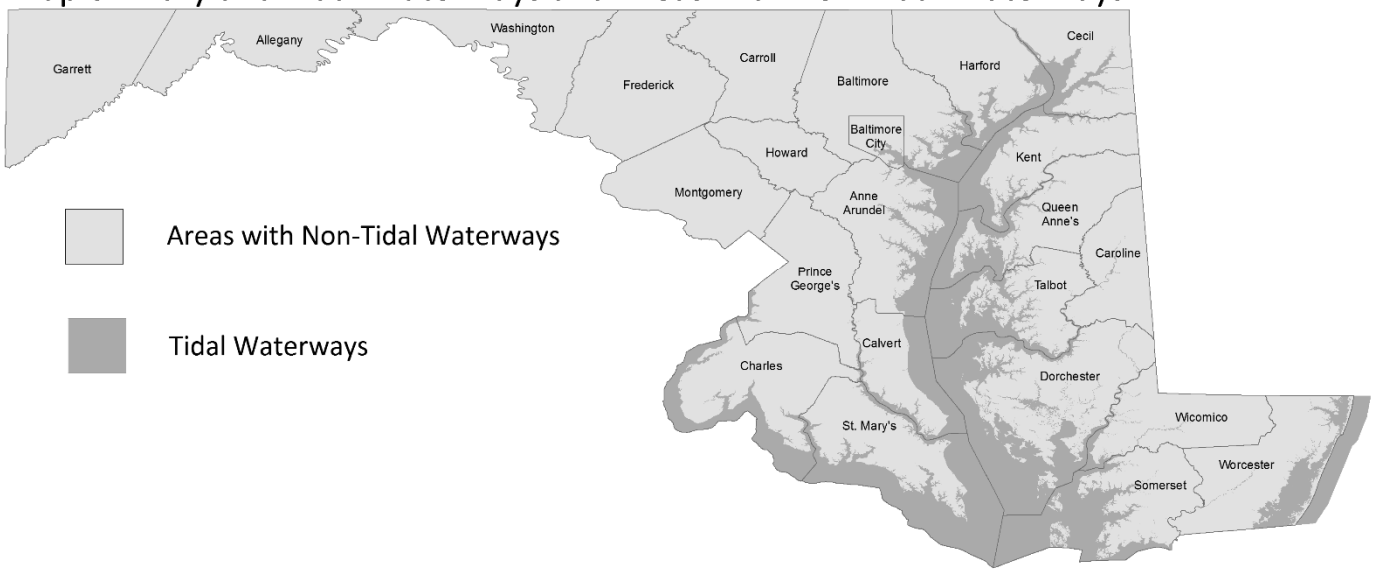
☐ 1-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ More than 20

Fishing in Non-Tidal Waterways and Tidal Waterways in Maryland

When responding to questions in this survey, it is important to distinguish between your fishing in **Non-Tidal Waterways** and **Tidal Waterways** in Maryland. These two types of waterways are defined below.

- **Tidal Waterways** – Chesapeake Bay & tidal tributaries, Coastal Bays & Atlantic Ocean
- **Non-Tidal Waterways** – Non-tidal rivers & streams, lakes, ponds, and reservoirs

Map of Maryland Tidal Waterways and Areas with Non-Tidal Waterways



3. Where did you fish in Maryland during 2015? (please check only one)

- ☐ **Both** Non-Tidal Waterways & Tidal Waterways → ***Proceed to the next question***
- ☐ Non-Tidal Waterways **Only** → ***Proceed to the next question***
- ☐ Tidal Waterways **Only** → ***Skip to question 18***

Maryland Non-Tidal Fishing Trip Questions

4. **During which seasons did you fish in <u>Maryland Non-Tidal waterways</u>? (<u>check all that apply</u>)**

☐ **<u>Winter 2015</u>** (Jan. 2015 – Mar. 2015)	☐ **<u>Spring 2015</u>** (Apr. 2015 – June 2015)	☐ **<u>Summer 2015</u>** (July 2015 – Sept. 2015)	☐ **<u>Fall 2015</u>** (Oct. 2015 – Dec. 2015)

BEFORE PROCEEDING, look back to Question 4 and identify the first season you checked, <u>from Left to Right</u>. We are interested in details of the FIRST Maryland Non-Tidal fishing trip you took during this specific season. <u>On the rest of this page</u>, think back to this trip when answering questions.

5. **During which month was this fishing trip?** (see ★ above for instructions) _____

6. **Name of the waterbody and nearest city/town where you fished**

_____ Waterbody _____ Nearest city/town

7. **Including yourself, how many people went on this fishing trip?** _____

8. **How many nights were you away from home on this trip? (<u>if none, enter "0"</u>)** _____

9. **Which fishing types and methods did you use on this trip? (<u>check all that apply</u>)**

☐ Natural Bait	☐ Fly Fishing	☐ Watercraft (with motor)	☐ Shore/Wading
☐ Artificial Lures	☐ Ice Fishing	☐ Watercraft (without motor)	

10. **Which fish species did you target on this trip?** _____

11. **When thinking about this previous fishing trip, please indicate how much you agree or disagree with the following statements.**

	Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
Catch (ex: size, # of fish) met or exceeded my expectations	☐	☐	☐	☐	☐
Environmental quality met or exceeded my expectations	☐	☐	☐	☐	☐
Fishing was the primary reason for taking a trip to this area	☐	☐	☐	☐	☐
I plan on taking a fishing trip to this location again	☐	☐	☐	☐	☐

12. **<u>For the same trip as above</u>, please enter the dollar amount of your share of expenditures for each category below. Please be as accurate as possible – If unsure, provide your best estimate. If you made no expenditures for a category, please enter a "0".**

Transportation (ex: gas & tolls) $ _____	Restaurant/ Takeout $ _____	Guide Fees $ _____
Boat Expenses (ex: gas & launch fees) $ _____	Entertainment $ _____	Lodging $ _____

Groceries/Snacks/ Drinks $ _____	Bait, Lures, & Tackle $ _____	Other $ _____

Fishing in Maryland Non-Tidal Waterways in 2015

In this section, we are interested in your 2015 Maryland fishing activity in two types of Non-Tidal Waterways: **Non-Tidal Rivers/Streams** & **Lakes, Ponds, or Reservoirs**. When responding to questions 13-16, please only consider your fishing activity in these waterbodies.

13. **Please list the number of fishing trips you took to Maryland Non-Tidal Rivers/Streams during each season below.** (If you took no trips during a season, please enter "0")

	Winter 2015 (Jan. 2015 – Mar. 2015)	Spring 2015 (Apr. 2015 – June 2015)	Summer 2015 (July 2015 – Sept. 2015)	Fall 2015 (Oct. 2015 – Dec. 2015)
# of trips	_____	_____	_____	_____

14. **Please list the three Maryland Non-Tidal Rivers/Streams where you went fishing the most in 2015. For each waterbody, also list the county, # of trips, and species targeted.**
(If you did not fish in a Maryland Non-Tidal River/Stream in 2015, please skip to question 15.)

Non-Tidal River/Stream	County (list multiple, if necessary)	# of trips	Species Targeted (list multiple, if necessary)

15. **Please list the number of fishing trips you took to Maryland Lakes, Ponds, or Reservoirs during each season below.** (If you took no trips during a season, please enter "0")

	Winter 2015 (Jan. 2015 – Mar. 2015)	Spring 2015 (Apr. 2015 – June 2015)	Summer 2015 (July 2015 – Sept. 2015)	Fall 2015 (Oct. 2015 – Dec. 2015)
# of trips	_____	_____	_____	_____

16. **Please list the three Maryland Lakes, Ponds, or Reservoirs where you went fishing the most in 2015. For each waterbody, also list the county, # of trips, and species targeted.**
(If you did not fish in a Maryland Lake, Pond, or Reservoir in 2015, please skip to question 17.)

Lake, Pond, or Reservoir	County	# of trips	Species Targeted (list multiple, if necessary)

Fishing in Maryland Non-Tidal Waterways in 2015

17. **For this question, ONLY consider your 2015 fishing in Maryland NON-TIDAL waterways. Check ALL of the fishing types and methods you used to target each non-tidal fish below.**

	TYPE OF FISHING			FISHING METHODS			
	Artificial Lures	***Natural Bait***	***Fly Fishing***	***Shore/ Wading***	***Watercraft (with motor)***	***Watercraft (w/o motor)***	***Ice Fishing***
Bass, Largemouth	☐	☐	☐	☐	☐	☐	☐
Bass, Smallmouth	☐	☐	☐	☐	☐	☐	☐
Bass, Striped (non-tidal only)	☐	☐	☐	☐	☐	☐	☐
Bluegill/Sunfish	☐	☐	☐	☐	☐	☐	☐
Carp	☐	☐	☐	☐	☐	☐	☐
Catfish, Channel	☐	☐	☐	☐	☐	☐	☐
Catfish, Flathead	☐	☐	☐	☐	☐	☐	☐
Crappie	☐	☐	☐	☐	☐	☐	☐
Musky	☐	☐	☐	☐	☐	☐	☐
Northern Pike	☐	☐	☐	☐	☐	☐	☐
Perch, White	☐	☐	☐	☐	☐	☐	☐
Perch, Yellow	☐	☐	☐	☐	☐	☐	☐
Pickerel	☐	☐	☐	☐	☐	☐	☐
Shad	☐	☐	☐	☐	☐	☐	☐
Trout, Stocked	☐	☐	☐	☐	☐	☐	☐
Trout, Wild Brown	☐	☐	☐	☐	☐	☐	☐
Trout, Wild Brook	☐	☐	☐	☐	☐	☐	☐
Walleye	☐	☐	☐	☐	☐	☐	☐
Other _____	☐	☐	☐	☐	☐	☐	☐

Maryland Trout Fishing

18. **In the past 10 years, have you fished for trout in Maryland?**

☐ Yes → ***Proceed to the next question*** ☐ No → ***Skip to question 29***

19. **In 2015, how many trout fishing trips did you take in Maryland?** _____

MARYLAND TROUT SPECIES REVIEW

Below are the three Maryland trout species targeted by recreational anglers. Typical Catch Size and Trophy Criteria were established through conversations with Maryland fisheries biologists.

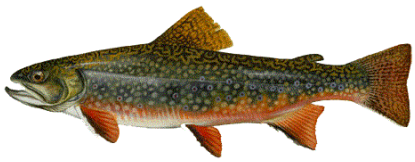
Brown Trout

- Typical Catch Size: 8" – 13"
- Trophy Criteria: 18" or above

Rainbow Trout

- Typical Catch Size: 8" – 13"
- Trophy Criteria: 18" or above

Brook Trout



- Typical Catch Size: 6" – 8"
- Trophy Criteria: 10" or above

20. **<u>When fishing for trout in Maryland</u>, please indicate how much you agree or disagree with the following statements.**

	Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
Most trout I catch are within the <u>typical catch sizes</u> above	☐	☐	☐	☐	☐
In most years I catch a trout that fits the <u>trophy criteria</u> above	☐	☐	☐	☐	☐
I prefer to fish in areas that have a specific species of trout	☐	☐	☐	☐	☐
I prefer to fish for trout where catch-and-release is required	☐	☐	☐	☐	☐
I prefer to use natural bait when fishing for trout	☐	☐	☐	☐	☐
The ability to harvest trout that I catch is important to me	☐	☐	☐	☐	☐
I prefer to fish for trout where I might catch a "trophy" fish	☐	☐	☐	☐	☐
I prefer to fish for trout where I can catch many fish	☐	☐	☐	☐	☐
Distance is a factor when deciding where to go trout fishing	☐	☐	☐	☐	☐
I prefer to fish in a location where I can catch wild trout	☐	☐	☐	☐	☐
Aesthetic beauty of area influences where I fish for trout	☐	☐	☐	☐	☐
I would rather fish for trout in a river/stream than a lake/pond	☐	☐	☐	☐	☐
Environmental quality of area influences where I fish for trout	☐	☐	☐	☐	☐
I prefer to fish for trout where I will see few or no other people	☐	☐	☐	☐	☐

EXAMPLE PAGE: Trout Fishing Site Choice Scenarios

In this section, you will be asked to compare the characteristics at two trout fishing sites – Fishing Site A and Fishing Site B – and then identify the trout fishing site where YOU would go fishing.

The table and question below is an EXAMPLE of a choice you will be asked to make on the following pages. Please review, and then proceed to the next page when you are finished reviewing.

***Compare** type of waterbody*

***Compare** type of trout, catch rate, & trophy possibility*

***Compare** trout fishing*

***Compare** driving distance*

***Choose** where you would go fishing!*

***Answer** follow up question*

Ex. **Choice X: Where would you go trout fishing? (check only one)**

Fishing Site Characteristics		Fishing Site A	Fishing Site B
Waterbody	*Type of Waterbody*	Lake/Pond	River/Stream
Catch	*Type of Trout*	Stocked Brown Trout	Wild Brook Trout
	Typical Catch Rate	1 trout per hour	1 trout per 2 hours
	Trophy Possibility	1 trophy per 5 trips (Brown Trout 18" or above)	1 trophy per 20 trips (Brook Trout 10" or above)
Regulations	*Lure/Bait*	No Restrictions	Lures & Flies Only
	Creel Limit	2 trout	5 trout
Distance	*Driving Distance*	35 miles	10 miles
Where would you go fishing? (Please Check Only One)		☒	☐

Ex. **Which of the following would you rather do? (check only one)**

- ☒ Go trout fishing at the site you selected above
- ☐ Go trout fishing at my usual location
- ☐ Do something else (go fishing for another species, stay home, etc.)

***Please note that the fishing sites described in the following choice questions do not necessarily describe actual trout fishing sites, nor do they reflect specific management and regulatory objectives**

Trout Fishing Site Choice Scenarios – Where would you go trout fishing?

21. Choice 1: Where would you go trout fishing? (check only one box below)

Fishing Site Characteristics		Fishing Site A	Fishing Site B
Waterbody	*Type of Waterbody*	Lake/Pond	River/Stream
Catch	*Type of Trout*	Stocked Brown Trout	Stocked Rainbow Trout
	Typical Catch Rate	1 trout per 2 hours	1 trout per 30 minutes
	Trophy Possibility	1 trophy per 2 trips (Brown Trout 18" or above)	No trophy trout available (Rainbow Trout 18" or above)
Regulations	*Lure/Bait*	No Restrictions	Artificial Lures & Flies Only
	Creel Limit	2 trout	5 trout
Distance	*Driving Distance*	10 miles	75 miles
Where would you go fishing? (Please Check Only One)		☐	☐

22. Which of the following would you rather do? (check only one)

☐ Go trout fishing at the site you selected above

☐ Go trout fishing at my usual location

☐ Do something else (go fishing for another species, stay home, etc.)

23. Choice 2: Where would you go trout fishing? (check only one box below)

Fishing Site Characteristics		Fishing Site A	Fishing Site B
Waterbody	*Type of Waterbody*	River/Stream	River/Stream
Catch	*Type of Trout*	Wild Brown Trout	Wild Brown Trout
	Typical Catch Rate	1 trout per 15 minutes	1 trout per 4 hours
	Trophy Possibility	1 trophy per 2 trips (Brown Trout 18" or above)	No trophy trout available (Brown Trout 18" or above)
Regulations	*Lure/Bait*	Fly Fishing Only	Artificial Lures & Flies Only
	Creel Limit	5 trout	Catch & Release Only
Distance	*Driving Distance*	50 miles	10 miles
Where would you go fishing? (Please Check Only One)		☐	☐

24. Which of the following would you rather do? (check only one)

☐ Go trout fishing at the site you selected above ☐ Go trout fishing at my usual location ☐ Do something else (go fishing for another species, stay home, etc.)

Trout Fishing Site Choice Scenarios – Where would you go trout fishing?

25. Choice 3: Where would you go trout fishing? (check only one box below)

Fishing Site Characteristics		Fishing Site A	Fishing Site B
Waterbody	*Type of Waterbody*	River/Stream	River/Stream
Catch	*Type of Trout*	Stocked Rainbow Trout	Wild Brown Trout
	Typical Catch Rate	1 trout per hour	1 trout per 4 hours
	Trophy Possibility	1 trophy per 5 trips (Rainbow Trout 18" or above)	No trophy trout available (Brown Trout 18" or above)
Regulations	*Lure/Bait*	Artificial Lures & Flies Only	Fly Fishing Only
	Creel Limit	2 trout	Catch & Release Only
Distance	*Driving Distance*	125 miles	20 miles
Where would you go fishing? (Please Check Only One)		☐	☐

26. Which of the following would you rather do? (check only one)

☐ Go trout fishing at the site you selected above ☐ Go trout fishing at my usual location ☐ Do something else (go fishing for another species, stay home, etc.)

27. Choice 4: Where would you go trout fishing? (check only one box below)

Fishing Site Characteristics		Fishing Site A	Fishing Site B
Waterbody	*Type of Waterbody*	River/Stream	River/Stream
Catch	*Type of Trout*	Stocked Rainbow Trout	Wild Brook Trout
	Typical Catch Rate	1 trout per 45 minutes	1 trout per hour
	Trophy Possibility	1 trophy per 5 trips (Rainbow Trout 18" or above)	1 trophy per 2 trips (Brook Trout 10" or above)
Regulations	*Lure/Bait*	Fly Fishing Only	Fly Fishing Only
	Creel Limit	2 trout	5 trout
Distance	*Driving Distance*	125 miles	35 miles
Where would you go fishing? (Please Check Only One)		☐	☐

28. **Which of the following would you rather do? (<u>check only one</u>)**

☐ Go trout fishing at the site you selected above ☐ Go trout fishing at my usual location ☐ Do something else (go fishing for another species, stay home, etc.)

General Questions about Fishing in Maryland Non-Tidal Waterways

29. **For this question, please think about what factors affect how often YOU go fishing in Maryland Non-Tidal Waterways. Please indicate how much you agree or disagree with the following statements:**

		Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
I WOULD GO FISHING <u>MORE OFTEN</u> IN MARYLAND NON-TIDAL WATERWAYS IF…	I was able to catch more fish	☐	☐	☐	☐	☐
	access to fishing sites was better	☐	☐	☐	☐	☐
	I knew when and where to fish	☐	☐	☐	☐	☐
	environmental quality was higher	☐	☐	☐	☐	☐
	regulations were less restrictive	☐	☐	☐	☐	☐
	fishing areas were less crowded	☐	☐	☐	☐	☐
	fishing was less expensive	☐	☐	☐	☐	☐
	I had somebody to go with	☐	☐	☐	☐	☐
	I was able to catch larger fish	☐	☐	☐	☐	☐
	I had more leisure time	☐	☐	☐	☐	☐

30. **With your FAVORITE Maryland Non-Tidal fishing area in mind, please check "Yes" or "No" for each of the following statements:**

	YES	**NO**
I go there because I always catch something	☐	☐
the bigger the fish, the better the trip	☐	☐
I release all the fish I catch there	☐	☐
I prefer to leave with a stringer full of fish	☐	☐
the trip is a total loss if I don't catch any fish	☐	☐
I fish for sport and pleasure rather than food	☐	☐
I give away some or all of the fish I catch	☐	☐

31. **you thinking of when responding to Question 30 above?**

Waterbody _____ County _____

About You: Summaries of the following questions help us represent the fishing activities of all types of anglers. Individual answers are CONFIDENTIAL.

32. **Who is filling out this survey?**

☐ The person the invitation was addressed to ☐ Another household member ☐ Someone else

33. **What is your gender?** ☐ Male ☐ Female **34.** **In what year were you born?** _____

35. **What is your race/ethnicity?**

☐ White ☐ Hispanic/Latino ☐ American Indian
☐ Black/African American ☐ Asian ☐ Other

36. **What is the highest degree or level of schooling you have completed?**

☐ Less than High School ☐ Some College, no degree ☐ Bachelor's Degree
☐ High School or equivalent ☐ Associate's Degree ☐ Graduate or Professional Degree

37. **Do any of the following live in your household? (<u>check all that apply</u>)**

☐ Spouse or significant other ☐ Children age 6-17 ☐ Extended family or other adults
☐ Children age 5 and under ☐ Other immediate family ☐ None of these

38. **What is your approximate annual household income?**

☐ Less than $25,000 ☐ $35,000 to $49,999 ☐ $75,000 to $99,999 ☐ $150,000 to $199,999
☐ $25,000 to $34,999 ☐ $50,000 to $74,999 ☐ $100,000 to $149,999 ☐ $200,000 or more

39. **What is your employment status?**

☐ Employed at hourly wage ☐ Out of work & looking for work ☐ Self-employed ☐ Student ☐ Retired
☐ Employed at annual salary ☐ Out of work & not looking for work ☐ Homemaker ☐ Military ☐ Unable to work

Please provide any comments below:

Thank you!

Please Return Survey in Postage-Paid Envelope!