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## **Economic Impacts Of White-Tailed Deer From Hunting In Mississippi**

Micah Whittington Whiteside

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ECONOMIC IMPACTS OF WHITE-TAILED DEER FROM HUNTING IN  
MISSISSIPPI

By

Micah Whittington Whiteside

A Thesis  
Submitted to the Faculty of  
Mississippi State University  
in Partial Fulfillment of the Requirements  
for the Degree of Master of Science  
in Forestry  
in the College of Forest Resources

Mississippi State, Mississippi

August 2007

ECONOMIC IMPACTS OF WHITE-TAILED DEER FROM HUNTING IN  
MISSISSIPPI

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White-tailed deer (*Odocoileus virginianus*) are an important ecological, social, and economic resource in Mississippi. Studies have been conducted on expenditures by white-tailed deer hunters, but none have administered a research-based, economic impact assessment for white-tailed deer in Mississippi. The economic impacts and associated values of white-tailed deer in Mississippi through a self-administered mail questionnaire were examined to collect white-tailed deer hunter expenditure data during the 2003/2004 hunting season. Expenditures of white-tailed deer hunters were obtained from a mail survey ( $N = 1,257$ , 38.6% response rate) and were used in an input-output model to determine economic impacts for the State. Economic impacts generated from white-tailed deer hunting expenditures totaled \$951.1 million for the 2003/2004 white-tailed deer hunting season. The value added component of the economic impact totaled \$686.7 million and supported 43,964 full- and part-time jobs.

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## CHAPTER I

### INTRODUCTION

White-tailed deer (*Odocoileus virginianus*) are one of the most important and widely distributed mammals in North America (Demarais and Krausman 2000). Recreational hunting of white-tailed deer makes a noteworthy contribution to both the United States and Mississippi economies. According to the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, there were 10.3 million white-tailed deer hunters in 2001, which is more than four times greater than the number of hunters pursuing the eastern wild turkey (*Meleagris gallopavo*), the second most hunted species (USDI and USDC 2002b). In 2001, 357,000 hunters devoted 8.4 million recreational days to hunting in Mississippi (USDI and USDC 2002b). Approximately one-third of hunters were from out-of-state and their trip-related expenses exceeded \$72.0 million. In comparison, resident hunting trip-related expenses exceeded \$360.2 million.

White-tailed deer have been intensively studied throughout its range, because of its importance as a big-game animal (Rooney 2001, Tremblay et al. 2004). Many biological studies have been undertaken on white-tailed deer management in Mississippi (Walock et al. 1997, Strickland and Demarais 2000). While there were relatively few studies involving economic impact assessments of hunting, studies have been done for northern bobwhite (*Colinus virginianus*) (Burger et al. 1999), eastern wild turkey (Grado

et al. 1997), and waterfowl (*Anas spp.*) (Grado et al. 2001). However, there has been no research-based, economic impact assessment for white-tailed deer in Mississippi or within the United States.

Economic information concerning wildlife species is beneficial because it provides a measure of relative importance to species like white-tailed deer for assessing and prioritizing wildlife management decisions. With increasing demands on natural resources, wildlife management agencies realize the need to more effectively measure harvests, hunter utilization, hunter satisfaction, and economic values. These measures are useful to wildlife managers in setting regulations and evaluating past and future management practices. They are also useful in identifying wildlife values for multiple-use resource planning (Whiteside 1979, Grado et al. 2001). This information can be used to evaluate land use policies that might affect this resource and services, businesses, and industries that depend on it. For example, with problems such as Chronic Wasting Disease (CWD) and other wildlife diseases potentially on the horizon, resource managers need sound economic and ecological assessments to justify funding and other resources to adequately research and take action to address this and similar problems.

To adequately gauge the economic impact of white-tailed deer hunting in Mississippi, total sales, employment, personal income, value-added, and tax generation impacts need to be determined. These results will enable natural resource managers, land use planners, the business community, and policymakers to estimate benefits that exist, or may result from having a viable white-tailed deer population in the state. Funding for white-tailed deer management can then be justified from a biological, ecological, social,

and economic standpoint. Research results will also be useful for establishing marketing and policy strategies and gaining legislative support for licensing and funding initiatives to address specific issues related to the resource.

## CHAPTER II

### OBJECTIVES

Three objectives need to be met to effectively quantify economic impacts associated with white-tailed deer hunting and entail:

- 1) Determining white-tailed deer hunting expenditures in Mississippi by residents and non-residents of the state using information collected for the mail questionnaire 2004 Mississippi Deer Hunting Economic Impact Survey.
- 2) Quantifying economic impacts of white-tailed deer hunting on the State's economy from hunting-related expenditures.
- 3) Compare the economic impacts from this study to the economic impacts from expenditure data collected from the annual mail questionnaire Survey of Mississippi Resident and Non-Resident Hunters implemented by the Human Dimensions and Conservation Law Enforcement Laboratory (HDCLEL) at Mississippi State University during the 2001/2002, 2002/2003, and 2003/2004 hunting seasons.

## CHAPTER III

### LITERATURE REVIEW

#### **Monetary benefits of wildlife resources**

Economic assessments centering on input-output analysis can describe: 1) how hunting activities impact an economy, 2) in part, the value of hunting to the participant, and 3) how hunting-related expenditures benefit not only services and other businesses that directly cater to hunters, but an overall economy as well (Southwick 1994). Most residents or local businesses benefit, either directly or indirectly from hunting-related expenditures, especially those in rural areas where most hunting activities occur and other sources of income may be limited (Marsinko et al. 1998). There are obvious monetary values related to white-tailed deer hunting, such as fee hunting revenues accrued by private landowners. For example, private landowners can sell hunting leases, permit hunts, and guided hunts. In a study of 11 southern states, Marsinko et al. (1998) found that leases provided a consistent, reliable source of annual revenue from each acre of leased land. Forest industry landowners also received three major benefits from their recreational leasing programs: protection (e.g., access control, arson reduction, limits on timber theft), public relations, and annual revenues (Marsinko et al. 1998). Hunt-leases generate considerable income for forest industry. Marsinko et al. (1998) reported that in 11 southern states in 1994, lease fees generated approximately \$40 million for all ownership types. Marsinko et al. (1998) also reported that average annual lease fees for



11 southern states ranged from \$4.18-8.10 per hectare. This was a 28% increase from a similar study by Stuckey et al. (1992) implemented from 1989 where average annual lease fees were \$2.89-6.37 per hectare for the same 11 states. Lease fees and lease-generated revenue have increased since the Stuckey et al. (1992) study and are expected to continue increasing (Marsinko et al. 1998).

One key difference exists between white-tailed deer hunters and other hunters in relationship to land leasing and owning land. Leonard (2004) stated that “other” expenditures which included those associated with books, membership dues, licenses, land leasing, and land ownership indicated that per person, white-tailed deer hunters spent more than twice the amount compared to non-white-tailed deer hunters on land purchases and ownership and more than three times the amount on land leasing in the United States (Leonard 2004). White-tailed deer hunters were considerably more likely to lease and own land for hunting than other hunters for alternative uses.

Studies have shown that as wildlife resources gained in value, as evidenced by a higher willingness-to-pay for access, landowners were motivated to consider managing resources for high quality game populations rather than just selling access rights (Yarrow 1998). Income generation from wildlife-recreation fee arrangements could also provide additional monetary incentives to private landowners for conservation and restoration of sensitive ecosystems (Jones et al. 1998).

## **Economic Impacts**

Economic impacts can be described as the changes in goods and services output, in per capita earnings, and in employment opportunities caused by a particular industry and associated money as it travels through various producing and consuming sectors of a given economy (Lovegrove 1971, Olson and Lindall 2000). Few studies involving wildlife-related economic impacts have been conducted in Mississippi. Studies dealing with specific positive and negative economic impacts have not been performed within Mississippi that quantify the nature and extent of the white-tailed deer as it impacts state, regional, and local economies. More specifically, there has never been a state-wide, research-based, economic impact assessment of the white-tailed deer hunting in Mississippi. In fact, across the United States this type of study has been rare to nonexistent.

Expenditures for hunting have been periodically catalogued (USDI and USDC 2002a). There have been a number of studies valuing white-tailed deer and white-tailed deer hunting throughout the United States (Conover 1997, Loomis et al. 1989). While data from these studies are useful, the primary emphasis has been on expenditures dedicated to white-tailed deer hunting. An in-depth assessment of expenditures is essential when analyzing the economic impacts of white-tailed deer hunting. Direct impacts from retail goods such as gasoline are important, but where gasoline is refined is also of interest. A study involving the effects of crude oil prices among the Gulf of Mexico region was conducted in 2006 and found that a rising oil price more often than not stimulates economic growth in oil exporting states (e.g., Louisiana, Texas, and Alabama) and hinders growth in oil importing states (e.g., Mississippi) (Lledare and

Olatubi 2006). The study also stated that employment, personal income, and revenue were impacted more directly following a price change rather than through changes in oil and gas production following a drastic price change. Even unemployment rates in the coastal Gulf States tended to decline in response to increases in petroleum prices (Lledare and Olatubi 2006). Indirect benefits are impacts of inter-industry trade within a defined economy. Subsequently, induced effects result from household consumption originating from employment tied to both direct and indirect activities (Grado et al. 2001). Indirect and induced impacts, which are indirectly related to the wildlife resource, are just as important to the economy as are direct benefits.

Economic impacts of recreational activities have been derived using various models, one of which is the Impact Analysis for Planning (IMPLAN) software (Olson and Lindall 2000). This program was developed for the USDA Forest Service as a tool for deriving regional economic impacts of forest management plans. Currently, IMPLAN consists of both national and county level data for 509 industrial and commercial sectors. IMPLAN software uses economic data from an area of interest (e.g., the State of Mississippi or an aggregation of selected counties) to construct a model of its economy. Expenditures made in-state, or in an aggregation of counties, on behalf of a recreational or hunting activity are targeted to final demands on state or county industries and businesses. Economic impact studies provide states and regions with useful information about the social and economic effects of proposed new projects and programs (Loomis and Walsh 1997). They also provide a hypothetical estimate for the absence of an activity. Multipliers derived from economic impact analysis can be used to assess relationships in state, regional, and local economies (Loomis and Walsh 1997). A

commonly used multiplier, the Social Accounting Matrix (SAM) multiplier, illustrates the magnitude of direct sales in promoting total economic impacts. For example, if an outfitter obtains food for each trip from a local grocery store, the grocery store, in turn, gets its produce from farmers or local distributors. Therefore, each dollar spent by a hunter on an outfitter will impact not only the outfitting company and its employees, but also the grocery store, the grocery store's employees, and even farmers and local distributors. As hunters purchase goods and services during their trips, the money spent makes its way to other sectors of the economy (Cooper et al. 2002).

In Oregon, policymakers were interested in the positive impacts of damming the Upper Klamath River to facilitate whitewater rafting (Johnson and Moore 1993). They found that since 90% of whitewater trips were commercially guided, expenditure data collected can play a major role in determining the majority of economic impacts from the River. To evaluate economic impacts, an estimation of expenditure data and IMPLAN were used by Johnson and Moore (1993) to calculate expenditures that would be lost without damming the river. However, it is important to realize that an economic perspective on this proposed action only has value if it is coupled with sound biological and ecological assessments. Only then can the full extent of any impact assessments be viewed appropriately.

Several studies have taken hunting expenditures and generated economic impacts. This included both trip-related and durable, more long-term expenditures (e.g., weapons, equipment). In 1991 Burger et al. (1999) found that northern bobwhite hunters spent 2.6 million days hunting and expended \$95 million in the South. Northern bobwhite hunting directly and indirectly supported 2,987 full- and part-time jobs resulting in a total south-

wide economic impact of \$193 million. In a study of 16 southeastern states, Southwick (1994) found that Mississippi hunters annually expended \$217 per state resident on retail sales within the State's economy (greatest of 16 states in the study). This \$217 annual resident expenditure generated a multiplier effect of 1.7, and yielded \$382 in total economic impacts for every state resident (Southwick 1994). This multiplier was on the low end of those typical for recreation expenditure multipliers that usually range from 1.5 to 2.7 in the United States (Loomis and Walsh 1997).

Multiplier size may be related to the areal size of a region's economy because value-added within a region has the potential to increase as its geographic area increases and, more than likely, a smaller proportion of expenditures are purchased outside the region (Loomis and Walsh 1997). Also, the extent of development within an economy is a factor in multiplier size. Grado et al. (2001) assessed the economic impact of waterfowl hunting in Mississippi. In a six county region in the Mississippi Delta, they reported total sale impacts of \$719,016 for the 1998/1999 waterfowl hunting season. If these data are applied state-wide, Mississippi's estimated economic impact was \$27.4 million in total sales (1999 dollars) which would support 512 full- and part-time jobs. The SAM multiplier for the study region was 1.33, indicating that for each dollar spent in the region there was an additional \$0.33 of economic impact. With these findings, management decisions can be applied to properly manage for waterfowl numbers, waterfowl habitat, and off-site accommodations and services. This could potentially maintain a positive attitude among waterfowl hunters, thus creating a more positive environment to enhance economic impacts. Utilizing expenditure data, similar to procedures used by Johnson

and Moore (1993) and Grado et al. (2001), can quantify economic impacts of white-tailed deer hunting in Mississippi and create a reliable database of information for the State's most important game species.

### **Land management techniques**

By identifying expenditure data of white-tailed deer hunters, certain land management techniques can be recommended by agencies and consultants and appropriately selected by landowners to promote this activity. Practicing proper land management techniques (e.g., prescribe burning, thinning, installing food plots), while owning or leasing land for the primary purpose of hunting, can be valuable for a number of reasons. Landowners utilizing their land for the primary purpose of hunting could potentially increase wildlife habitat or make improvements to existing habitat. An increase in the number of hunters who own or lease land for the primary purpose of hunting could suggest easier access to quality white-tailed deer habitat (Leonard 2004). With the addition of increased numbers of hunters, wildlife populations can be better managed while the increase in wildlife-related expenditures and their impacts can benefit the State.

## CHAPTER IV

### METHODS AND PROCEDURES

#### **Questionnaire process**

The sampling frame of hunters for this study came from approximately 180,000 licensed resident hunters and 20,000 licensed non-resident hunters listed in the MDWFP database for the 2003/2004 hunting season. This study will be referred to as the “2003/2004 study.” A self-administered mail questionnaire was used to collect desired trip information. The economic impact analyses in this study of white-tailed deer hunting activities in Mississippi used information provided by white-tailed deer hunters in a self-administered mail questionnaire of Mississippi residents and non-resident hunters titled 2004 Mississippi Deer Hunting Economic Impact Survey (Appendix A). Economic data and other information such as activity days were acquired from a randomly selected list of 3,600 licensed hunters in Mississippi. The total included 1,800 Mississippians and 1,800 others from across the United States. Names and addresses of white-tailed deer hunters were available from the MDWFP. Residents were taken from the 2003/2004 Sportsman (n = 105,996) licenses and All Game Hunting and Fishing (n = 76,186) licenses issued in Mississippi. Non-resident names were taken from Non-Resident Annual All Game (n = 13,472) and Non-Resident All Game Trip (n = 8,137) licenses.

The first mailing (n = 3,600) was sent with a cover letter and postage paid return envelope (Appendix B). One week later a reminder/thank you postcard was sent to the

entire sample (n = 3,600), regardless of whether they returned a questionnaire or not (Appendix C). Two weeks after sending the postcard, a second mailing including a reminder cover letter, a questionnaire, and a postage paid envelope was sent to all remaining hunters that had not returned a questionnaire (Appendix D). All returned questionnaire data was then entered into Microsoft Access where it was transformed for use in the IMPLAN model.

Since the sample population was geographically dispersed and the intent was to have hunters recall, at their convenience, a typical hunting trip, the self-administered mail questionnaire was the best option for data collection. This was also the best way to reach those who hunt on private lands where access by researchers to hunters may be more difficult versus reaching those participating on public lands with an on-site survey. A typical hunting trip can be defined as a trip that may begin from an individual's principal residence or from another place, such as a vacation home or the home of a relative where they hunt white-tailed deer in Mississippi. A trip may last an hour, a day, or many days (USDI and USDC 2002a).

The self-administered mail questionnaire was designed to collect information to address four key areas, hunter characteristics, trip characteristics, trip expenditures, and long-term expenditures from white-tailed deer hunters in Mississippi (Appendix A). This is the preferred method of collecting expenditure data through mail or on-site surveys (Dillman 1978). All questions and research procedures were approved by the Mississippi State University Institutional Review Board's Committee for the Protection of Human Subjects (Docket #03-162).



To determine white-tailed deer hunter characteristics in Mississippi hunters were asked to indicate “What is the highest educational level you have attained?,” where they were given seven choices ranging from “Some high school” to “Doctoral or professional degree,” “Which of the following best describes your total household income before taxes?,” where they were given 11 choices in \$10,000 increments, “What is your age?,” “What is your ethnic background?,” where they were given six choices of “Asian or Pacific Islander,” “Black or African American,” “Hispanic,” “Native American or Alaskan Native,” “White or Anglo,” “Other,” and given a blank to describe. Lastly, hunters were asked “What is your gender?”

To determine trip characteristics hunters were asked, “Was white-tailed deer hunting the primary purpose for this trip?,” “How many total days did you spend on this trip, and deer hunting on this trip?,” “To the best of your recollection, what was the date(s) of this typical trip?,” “Using the map below, indicate the destination county or counties you hunted during this trip?,” and “Please indicate with an “X” where your primary hunting trip took place in the chart below.” There were four categories with subcategories included under each. The four main categories were “Hunting service providers,” “Public hunting,” “Private hunting with fees,” and “Private hunting without fees.” To determine trip characteristics surveyed hunters were also asked, “How did you find out about this hunting destination?,” “How many one-way miles did you travel from your home residence to get to your destination on this trip?,” “How many individuals made this trip with you, including yourself?,” “Of these individuals, how many individuals (e.g., father, son) did you pay for on this trip, including yourself?,” and “Did you harvest any white-tailed deer on this typical trip you described above?”

To establish white-tailed deer hunting trip expenditures in Mississippi hunters were to list “Trip expenses, that occurred only in the destination county or counties in Mississippi and expenses to and from the destination county or counties, before, during, and after your trip” under the appropriate categories. Four main categories were provided along with subcategories within, “Transportation” including gas, rental vehicle, and air fare, “Lodging (plus associated food),” “Food (not associated with lodging)” including restaurants and groceries, and “Other shopping, services.” Under “other shopping, services” these subcategories were included, “ammunition, casinos, entertainment, equipment rental, game processing, guide fees, heating/cooking fuel, hunting lodges, hunting package fees, miscellaneous retail, outfitters, private land use permit, taxidermy, and other.” Beside each subcategory, a blank was available to indicate the trip expense for each item, and the town or county, and state of purchase.

To determine long-term expenditures of white-tailed deer hunting in Mississippi hunters were asked to list “Long-term expenditures for items purchased over the last 12 months only and used on this typical trip.” For each item a blank space was provided for “total expense,” “town or county of purchase,” “state,” and “days used in last 12 months” for all purposes. Long-term expenditure items included: “ammunition, archery equipment, clothing for hunting, dog accessories, dogs, groceries in bulk, guns, knives, hunt club membership, hunting leases, hunting licenses, stamps, miscellaneous hunting gear, small equipment, trailer, ATV, tree stand, and other.” Hunters were also asked for “Long-term hunting expenditures for items purchased over the last 12 months only and used for the purpose of white-tailed deer hunting or management related to this trip.”

These items included: “dog training, feeder, feeder feeds, food plot equipment, food plot fertilizer, lime, food plot seed, and salt/mineral blocks.”

In an attempt to gauge economic impacts from resident expenditures, resident participants were also asked, if “Given the hypothetical situation whereby they would not be able to hunt white-tailed deer in Mississippi, what percent of the money they currently spend per year in Mississippi on this activity would then be spent out-of-state to hunt white-tailed deer or participate in any other activity (hunting or non-hunting-related).” This allowed for an estimation of the proportion of resident expenditures and subsequent economic impacts that could legitimately be considered as such versus being a mere recycling of dollars in the economy of interest.

The economic impact analyses of white-tailed deer hunting activities in Mississippi also used information provided by white-tailed deer hunters in the annual Survey of Mississippi Resident and Non-Resident Hunters implemented by the HDCLEL at Mississippi State University covering the 2001/2002, 2002/2003, and 2003/2004 hunting seasons. During this time frame the HDCLEL surveys provided white-tailed deer harvest data as well as hunter expenditures and activity days. Harvest data collected was the number of white-tailed deer (buck and doe) harvested by different hunting methods (i.e., archery, gun, primitive) by resident and non-residents. Other data included average seasonal harvest per hunter, proportion of licensed hunters and total hunters, total activity days, average seasonal number of days hunting per hunter, and harvest per day ratios. Economic data used to develop hunter expenditure profiles and resident and non-resident activity days for state-wide economic impact studies was acquired from licensed hunters contacted who completed and returned the questionnaire. The total included

Mississippians and those from adjacent states. The MDWFP provided HDCLEL a randomized listing of licensed hunter names and addresses.

The results from three surveys composed by HDCLEL, were used for comparison in this study. For the 2001/2002 survey 11,000 licensed hunters were contacted and included 6,000 residents and 5,000 non-residents. The following hunting season (2002/2003), 7,000 licensed hunters were contacted; 4,000 residents and 3,000 non-residents. For the 2003/2004 survey, 6,000 licensed hunters were contacted and consisted of 3,000 residents and 3,000 non-residents.

All mailings for the 2003/2004 study were completed before HDCLEL mailed their survey, so there was no overlap for that hunting season. Although potentially the names and addresses from the 2003/2004 study could have been randomly drawn for the HDCLEL Survey of Mississippi Resident and Non-Resident Hunters in previous years of its study (2001/2002, 2002/2003). This may have adversely affected the 2003/2004 study's return rate by over-sampling the hunters.

## **IMPLAN**

An IMPLAN model of the Mississippi economy was built to generate direct and secondary impacts resulting from in-state participant expenditures. The most current model at the time of this study of the Mississippi economy (2002) was used to perform the analysis. Direct impacts included total sales, salaries, value-added, indirect business taxes, wages, and jobs created by the initial purchases by participants that were retained by the state economy in the operation of its businesses. Secondary impacts were composed of indirect and induced impacts. Indirect impacts are created through

purchases made by directly impacted businesses or individuals with supporting businesses in the state economy. These impacts included the same categories as direct impacts. Induced impacts embodied purchases by employees within direct and indirect impacted sectors that generate total sales, salaries, value added, indirect business taxes, wages, and jobs. Leakages (expenditures leaving the state or a specified region to purchase goods or services) do occur and were accounted for in the impact analysis. Data on trip expenditures, equipment purchases, and state hunting attendance in Mississippi was acquired in the 2001/2002, 2002/2003, and 2003/2004 Survey of Mississippi Resident and Non-Resident Hunters, implemented by HDCLEL and were analyzed and compared to the 2003/2004 study results and the coinciding economic impacts.

### **Survey data analysis comparisons**

Attendance data acquired from the 2003/2004 HDCLEL survey was compared to the attendance data acquired from the 2004 Mississippi Deer Hunting Economic Impact Survey. Attendance data from the 2003/2004 Survey of Mississippi Resident and Non-Resident Hunters and the 2004 Mississippi Deer Hunting Economic Impact Survey were calculated using the same questionnaire format and methods. Participants were asked how many days they hunted white-tailed deer using any of the following methods: archery, primitive weapon, and gun; both within and outside Mississippi. Hunters were also asked if they hunted using more than one method on a particular day, and if so, to count a day for each method. The activity day data was then entered into Version 9.1 of the Statistical Analysis Software (SAS). A program was written to calculate average effort and harvest estimates for random sample formulas to create an estimate of the

average activity days for both resident and non-resident hunters. These averages were then extrapolated to the entire eligible licensed population of white-tailed deer hunters for that season.

To calculate expenditures related to a specific tourism resource activity using an input-output economic model, equipment expenditures in addition to total trip expenditures were collected for this study following a method proposed by Johnson and Moore (1993). Dollars spent per hunter per day were assessed from questionnaire data. First, the total amounts of individual trip expenditures were itemized (e.g., gasoline, food costs). These items were then divided by the average number of days of a typical hunt by the individual. Second, equipment-related items, purchased within the past year, were divided by the average number of days used for all purposes within the last 12 months. Resident and non-resident expenditure profiles were then developed by averaging these values and dividing them by the total number of hunters reporting expenditures. This itemized hunter expenditure profile (\$/hunter/day) was then used as an input in the IMPLAN model, where each item was entered separately and within the appropriate economic sector. For example, the lodging expense per hunter per day was affiliated with sector 479 in the IMPLAN model for Mississippi.

In addition to acquiring expenditure data, it was also necessary to acquire demographic information to establish who is making these expenditures and to pinpoint the location of their purchases. For example, hunters were asked what state they were from along with their corresponding county of residence. A map of Mississippi was

provided in the questionnaire so the hunter can circle the county where the hunting trip took place. The demographic questions in the questionnaire included education level, income, age, ethnic background, and gender.

True economic impacts allow for any combination of regional or local (i.e., by county) economic assessments within the state. For non-residents, dollars spent in the economy represent an influx of new money to the state industrial and commercial bases. For residents it is not as straight forward. Thus, the questionnaire then asked for information needed to determine the portion of resident expenditures that were truly economic impacts (versus recycled dollars). Past studies often discount resident expenditures and economic impacts because they were viewed as dollars that would otherwise be spent in the economy regardless of the activity. The position was taken in this project that some portion of resident expenditures should count as economic impacts. Thus, for residents, some portion of the dollars currently spent hunting white-tailed deer in the State would be spent outside the State hunting white-tailed deer or pursuing some other activity if white-tailed deer hunting were not available, and thus can be considered economic impacts (Grado et al. 2001). This breakdown for resident expenditures was determined by questionnaire responses to a specific question, as previously noted, addressing this issue.

Overall, the study provided the opportunity to collect data from an assessment that included state-wide estimates of white-tailed deer hunting activity on public and private lands, expenditures data (e.g., food, lodging, travel, equipment) by resident and non-resident deer hunters, measures of the economic impact to the State's economy (e.g., total sales output, employment, personal income, taxes generation, value-added), and

identification of impacted sectors of the economy (e.g., lodging, wholesale and retail trade). The use of economic multipliers to evaluate incremental contributions to the economy from changes in white-tailed deer hunting demand also were calculated, as well as summary demographic data that will aid agencies and conservation organizations seeking to understand their client base and other stakeholders.



## CHAPTER V

### RESULTS

Data for the 2004 Mississippi Deer Hunting Economic Impact Survey mail questionnaire were collected from white-tailed deer hunters whose names and addresses were made available by the MDWFP. Of the 3,600 names originally acquired, 3,538 questionnaires were mailed. Several of the 3,600 names or addresses were either duplications or incomplete. There were 1,788 resident and 1,750 non-resident questionnaires mailed out. Data from the returns were entered into Microsoft Access. A total of 1,257 questionnaires were returned and, when accounting for non-deliverables, the return rate was 38.6%. Residents responded at a rate of 34.7% (n = 551), while the non-resident return rate was 42.5% (n = 706) (Table 1).

Of the returned questionnaires from residents, they were, on average, 41 years old, white (92.4%) (Table 2), and male (94.0%) (Table 2). The median values for education and income were, with some college (Table 3), and a total household income of \$50,000 – 59,000 (Table 4). Non-residents were on average, 47 years old, white (94.5%), and male (97.4%). The median values for education and income were, with some college, and a total household income of \$70,000 – 79,000, for non-resident respondents (Tables 2-4).

The 2004 Mississippi Deer Hunting Economic Impact Survey and the HDCLEL 2003/2004 Survey of Mississippi Resident and Non-Resident Hunters asked nearly the same demographic questions and received nearly identical results, as seen in Tables 2-4. Of the returned questionnaires for HDCLEL 2003/2004 survey from residents, they were, on average, 43 years old, white (93.3%), and male (93.8%). The median values for education and income were, college, and a total household income of 50,000 – \$59,000. Non-residents were on average, 47 years old, white (95.2%), and male (97.3%). The median values for education and income were, college, and a total household income of 60,000 – \$69,000, for non-resident respondents. There was a slight difference in the method of asking the highest level of education, therefore, the results were presented in Table 3 to reflect this.

Table 1. Return rates by year for the 2004 Mississippi Deer Hunting Economic Impact Survey and Human Dimension and Conservation Law Enforcement Lab Survey of Mississippi Resident and Non-Resident Hunters.

	2001/2002 (%)	2002/2003 (%)	2003/2004 (%)
<b>2004 Mississippi Deer Hunting Economic Impact Survey</b>			
Resident			34.7
Non-resident			42.5
<b>Survey of Mississippi Resident and Non-Resident Hunters</b>			
Resident	46.4	45.1	49.0
Non-resident	53.2	60.0	55.0

Table 2. Ethnic background and gender of respondents by residence for the 2004 Mississippi Deer Hunting Economic Impact Survey and the 2003/2004 Human Dimension and Conservation Law Enforcement Lab Survey of Mississippi Resident and Non-Resident Hunters.

Ethnic Background	Resident (%)		Non-resident (%)	
	Deer Econ.	HDCLEL	Deer Econ.	HDCLEL
Asian or Pacific Islander	0.3	n/a	0.4	0.1
Black or African American	4.1	5.4	2.0	2.0
Hispanic	0.0	0.6	0.2	2.1
Native American or Alaskan Native	1.4	0.6	2.0	0.5
White or Anglo	92.4	93.4	94.5	95.2
Other	1.7	n/a	0.9	n/a
Male	94.0	93.8	97.4	97.3
Female	6.0	6.2	2.6	2.7

Table 3. Highest education level attained by from respondents by residence for the 2004 Mississippi Deer Hunting Economic Impact Survey and the 2003/2004 Human Dimension and Conservation Law Enforcement Survey of Mississippi Resident and Non-Resident Hunters.

Education	Resident (%)	Non-resident (%)
<b>Deer Econ.</b>		
Some high school	6.5	2.4
High school	27.5	31.5
Some college	33.1	30.0
College graduate	22.5	24.6
Some graduate work	3.8	2.2
Master's degree	3.8	4.6
Doctoral or professional degree	2.6	4.6
<b>HDCLEL</b>		
Elementary	1.9	1.2
High school	42.6	42.5
College	46.5	45.4
Graduate school	9.0	11.0

Table 4. Total household incomes of respondents by residence for the 2004 Mississippi Deer Hunting Economic Impact Survey and the 2003/2004 Human Dimension and Conservation Law Enforcement Lab Survey of Mississippi Resident and Non-Resident Hunters.

Total Household Income	Resident (%)		Non-resident (%)	
	Deer Econ.	HDCLEL	Deer Econ.	HDCLEL
Under \$10,000	3.2	4.1	0.9	3.3
\$10,000 – 19,999	3.5	6.9	0.9	3.8
\$20,000 – 29,999	10.5	11.5	3.1	6.0
\$30,000 – 39,000	11.2	11.9	7.4	9.8
\$40,000 – 49,000	12.1	12.0	10.0	8.5
\$50,000 – 59,000	13.4	12.3	12.1	13.1
\$60,000 – 69,000	8.9	8.8	10.7	10.2
\$70,000 – 79,000	10.2	8.4	10.2	7.4
\$80,000 – 89,000	8.0	5.9	7.8	8.0
\$90,000 – 99,000	4.4	4.3	6.6	5.5
\$100,000 and above	14.4	13.8	30.0	24.5

Data from the 2004 Mississippi Deer Hunting Economic Impact Survey illustrated that average expenditures incurred for various trip-related goods and services for residents (n = 276) and non-residents (n = 444) per day in Mississippi during the 2003/2004 hunting season were \$102.01/hunter/day and \$132.82/hunter/day, respectively (Table 5). Average expenditures incurred for equipment for residents (n = 276) and non-residents (n = 444) in Mississippi during the 2003/2004 hunting season were \$84.56/hunter/day and \$73.90/hunter/day, respectively (Table 5). Activity days for state residents and non-residents during the 2003/2004 hunting season were 2,784,424 and 324,298, respectively (Table 6).

Table 5. Average expenditure data/hunter/day by residence for the 2004 Mississippi Deer Hunting Economic Impact Survey and Human Dimension and Conservation Law Enforcement Lab Survey of Mississippi Resident and Non-Resident Hunters. <sup>a</sup>

		Average expenditures for various trip related goods and services (\$)	Average equipment expenditures (\$)	
<b>2004 Mississippi Deer Hunting Economic Impact Survey</b>				
Resident	n = 276	102.01	n = 276	84.56
Non-resident	n = 444	132.82	n = 444	73.90
<b>Survey of Mississippi Resident and Non-Resident Hunters</b>				
Resident	n = 1,211	49.98	n = 1,237	111.10
Non-resident	n = 1,355	89.30	n = 825	158.30

<sup>a</sup> Expenditure profiles are from 2001/2002 hunting season and were used for all three years of the Human Dimension and Conservation Law Enforcement Lab study.

Table 6. Total activity days by residence for the 2004 Mississippi Deer Hunting Economic Impact Survey and Human Dimension and Conservation Law Enforcement Lab Survey of Mississippi Resident and Non-Resident Hunters.

	2001/2002	2002/2003	2003/2004
<b>2004 Mississippi Deer Hunting Economic Impact Survey</b>			
Resident			2,784,424
Non-resident			324,298
<b>Survey of Mississippi Resident and Non-Resident Hunters</b>			
Resident	3,065,770	3,181,957	2,390,619
Non-resident	357,253	304,921	271,140

T-tests were run on the 2003/2004 study expenditure categories for trip and long-term expenditures to look for significant differences between residents and non-residents by expenditure item. Using SAS, the equality of variances was calculated which tests the assumption that the variances on the 2003/2004 study's two populations (resident and non-resident) were equal. If the p-value from the equality of variance for the category was greater than 0.05 then a pooled t-test of equal variances was used. If the p-value from the equality of variance was less than 0.05 then a Satterthwaite t-test of unequal variance was performed. In the 2003/2004 study the average/hunter/day trip expenditures, several expenditure items were significantly different between residents and non-residents: lodging ( $p=0.0155$ ), food ( $p<0.0001$ ), ammunition ( $p<0.0001$ ), entertainment ( $p=0.0017$ ), and processing/taxidermy ( $p=0.0325$ ). The average/hunter/day long-term expenditures had several items that were significantly different between the two populations, such as, archery equipment ( $p=0.0049$ ), clothing for hunting( $p=0.0056$ ), groceries in bulk( $p=0.0001$ ), hunt club membership ( $p=0.0003$ ), hunting leases ( $p<0.0001$ ), hunting licenses ( $p<0.0001$ ), miscellaneous hunting gear ( $p=0.0020$ ), feeder ( $p=0.0041$ ), feeder feeds ( $p=0.0256$ ), food plot fertilizer ( $p=0.0023$ ), food plot seed ( $p=0.0408$ ), and salt/mineral blocks ( $p=0.0169$ ). Many of these expenditure items that were significantly different were understandable, in part, because many residents were not purchasing lodging or spending as much on food than non-residents. Non-residents also were spending much less, or not purchasing at all, many of the long-term expenditures when coming from outside Mississippi.

The Survey of Mississippi Resident and Non-Resident Hunters implemented by the HDCLEL in 2001/2002 yielded a return rate from residents of 46.4% (n = 2,121), and non-residents of 53.2% (n = 2,430) (Table 1). In 2002/2003 the survey had a return rate of 45.1% (n = 1,532) for residents and 60.0% (n = 1,559) for non-residents. The return rate in 2003/2004 for residents was 49.0% (n = 1,285), and non-residents was 55.0% (n = 1,402).

Resident and non-resident expenditure profiles were developed from reported expenditures for trip-related items and equipment from HDCLEL Survey of Mississippi Resident and Non-Resident Hunters (Table 5). Average expenditures incurred for various trip-related goods and services for residents (n = 1,211) and non-residents (n = 1,355) per day in Mississippi during the 2001/2002 hunting season were \$49.98/hunter/day and \$89.30/hunter/day, respectively. Average expenditures incurred for equipment for residents (n = 1,237) and non-residents (n = 825) in Mississippi during the 2001/2002 hunting season were \$111.10/hunter/day and \$158.30/hunter/day, respectively. These expenditure profiles were used for all three years of this study; however, activity days were determined for each hunting season. Activity days for state residents and non-residents during the 2001/2002 hunting season were determined to be 3,065,770 and 357,253, respectively (Table 6). For the 2002/2003 and 2003/2004 hunting seasons the activity days for state residents and non-residents were 3,181,957 and 304,921 and 2,390,619 and 271,140, respectively.

Each activity day estimate had a margin of error of +/- 1.96. A 1.96 standard error created a 95% confidence interval (CI). HDCLEL 2001/2002 (CI = 2,895,785-3,235,755) and 2002/2003 (CI = 2,980,592-3,383,322) resident activity days were significantly greater than its 2003/2004 (CI = 2,189,398-2,591,840) resident activity days. The 2003/2004 study resident activity days were not significantly different (CI = 2,464,824-3,053,514) from any of the HDCLEL resident results. HDCLEL 2001/2002 (CI = 336,224-378,282) non-resident activity days were significantly greater than its 2002/2003 (CI = 280,225-329,617) and 2003/2004 (CI = 254,151-288,129) non-resident activity days, but not greater than in the 2003/2004 study (CI = 296,109-352,487). The 2003/2004 study non-resident activity days were not significantly different than HDCLEL 2002/2003 data, but were significantly greater than HDCLEL 2003/2004 study conducted the same year.

### **Resident hunters of Mississippi**

Resident hunters, on average, spent \$102.01/hunter/day in Mississippi for various trip-related goods and services during the 2003-2004 season (Table 8). The average trip length of resident hunters was 3.35 days. The largest expense category was daily private land use permits (\$20.53/hunter/day). The next two largest categories were for processing/taxidermy and transportation (e.g., fuel, vehicle rental) at \$16.90 and \$15.97/hunter/day, respectively.



Table 7. Average expenditures/hunter/day<sup>a</sup> for various goods and services bought in Mississippi by residents on a typical white-tailed deer hunting trip in Mississippi during the 2003/2004 hunting season (2003 dollars).

Expenditure Item	Percent of hunters with an expenditure on item <sup>b</sup>	Average dollars spent per day by hunters with an expenditure on item	Average dollars spent per day by all hunters
	%	\$	\$/h/d
Ammunition	51.1	13.50	6.90
Daily private land use permit (not including hunting leases)	4.7	435.95	20.53
Entertainment (e.g., casino, movie, amusement park)	2.2	23.85	0.52
Equipment rental	0.7	222.50	1.61
Food, drinks, and ice (e.g., including restaurants)	63.8	21.87	13.94
Guide fees, hunting package fees, outfitters, lodge fee	7.2	205.21	14.87
Heating and cooking fuel	12.0	10.68	1.28
Lodging (e.g., hotel and hotel food, condo rental, camping)	11.6	55.50	6.43
Transportation (e.g., fuel, rental car, airplane)	83.3	19.16	15.97
Processing and taxidermy costs	18.5	91.42	16.90
Anything else for this trip	8.3	36.77	3.06
Total average expenditure/hunter/day			102.01

<sup>a</sup> A typical white-tailed deer hunting trip averaged 3.35 days.

<sup>b</sup> n = 276.

The total average expenditure in Mississippi incurred for equipment by residents was \$84.56/hunter/day (Table 8). The largest expenditure items for equipment purchases by residents were for trailers and All Terrain Vehicles (ATVs) with a \$18.03/hunter/day expenditure. The next largest expenditure items were food plot fertilizer (\$8.12/hunter/day) and “anything else” purchased for this trip (\$8.03/hunter/day), such as optical equipment and boat repairs. For the 2003/2004 hunting season, the total sales impact of resident hunters of Mississippi was nearly \$841 million (2006 dollars), supporting 38,020 full- and part-time jobs (Table 9).

Table 8. Average long-term white-tailed deer hunting expenditures/hunter/day<sup>a</sup> by licensed Mississippi resident hunters for items used on this trip and purchased within the last 12 months in Mississippi for the 2003/2004 hunting season (2003 dollars).

Expenditure Item	Percent of hunters with an expenditure on item <sup>b</sup>	Average dollars spent per year by hunters with an expenditure on item	Average dollars spent per day by hunters with an expenditure on item	Average dollars spent per day by all resident hunters
	%	\$	\$	\$/h/d
Ammunition	51.8	55.77	6.88	3.56
Archery equipment	15.6	183.53	20.22	3.15
Clothing for hunting	38.0	177.02	10.35	3.94
Dogs	4.0	533.18	22.39	0.89
Dog accessories	4.7	177.02	4.59	0.22
Dog training	1.1	1,500.00	80.00	0.87
Feeder	4.7	122.38	4.29	0.20
Feeder feeds (e.g., corn)	12.7	207.46	6.03	0.76
Food plot equipment	13.8	1,933.42	49.81	6.86
Food plot fertilizer, lime	28.3	180.24	28.74	8.12
Food plot seed	28.0	138.94	11.46	3.20
Groceries in bulk	20.3	249.03	8.25	1.67
Guns, knives	16.3	486.60	36.17	5.90
Hunt club membership	21.7	632.37	30.73	6.68
Hunting leases	8.3	364.00	38.40	3.20
Hunting licenses, stamps	100.0	26.35	2.46	2.46
Misc. hunting gear	18.5	117.55	6.36	1.17
Salt/mineral block	12.7	59.71	3.38	0.43
Small equipment	6.5	788.22	34.70	2.26
Trailer, ATV	13.8	2,945.13	130.95	18.03
Tree stand	18.1	252.40	16.34	2.96
Anything else for this trip <sup>c</sup>	3.6	10,177.00	221.75	8.03
Total average expenditure/hunter/day				84.56

<sup>a</sup> A typical white-tailed deer hunting trip averaged 3.16 days.

<sup>b</sup> n = 276.

<sup>c</sup> For example, boat, truck, and land purchases.

Table 9. Total economic impacts from resident white-tailed deer hunter expenditures for goods and services and equipment bought in Mississippi during the 2003/2004 hunting season (2006 dollars).

Industry	Direct Sales	Secondary Sales	Total Sales Impact	Value-Added	Indirect Business Taxes	Employee Income	Jobs
	\$	\$	\$	\$	\$	\$	(N)
Ag, Forestry & Fisheries	18,933	4,181,626	4,200,559	1,706,044	169,573	741,004	46.6
Mining	0.0	13,733,442	13,733,442	7,888,552	1,123,127	3,518,675	73.1
Construction	0.0	60,507	60,507	10,762	614	6,961	0.2
Manufacturing	342,746,528	132,955,144	475,701,672	320,461,232	60,550,936	201,214,032	9,736.7
Transp., Comm., & Utilities	9,444	9,825,315	9,834,759	6,742,903	159,230	5,646,356	125.3
Trade	49,742,100	13,141,827	62,883,927	44,104,199	745,686	19,397,328	732.0
F.I.R.E. <sup>a</sup>	0.0	4,123,332	4,123,332	1,983,964	52,085	1,786,246	97.5
Services	168,624,360	102,105,003	270,729,363	218,867,968	8,166,997	185,908,212	27,208.6
<b>Total</b>	<b>561,141,365</b>	<b>280,126,196</b>	<b>841,267,561</b>	<b>601,765,624</b>	<b>70,968,248</b>	<b>418,218,814</b>	<b>38,020.0</b>

<sup>a</sup>Finance, insurance, and real-estate.

### Non-resident hunters of Mississippi

Non-resident hunters on average spent of \$132.82/hunter/day for various trip-related goods and services (Table 10). The average trip length of non-resident hunters was 6.87 days. The largest expense category was guide fees, hunting package fees, and outfitters (\$42.24/hunter/day). This is fitting because many non-residents that hunt in Mississippi often go through an outfitter or guide to find a hunting location. The next two largest per day expenditures were for food and lodging at \$21.75/hunter/day and \$17.32/hunter/day, respectively. Food and lodging tend to be higher expenditures because non-residents do not live in state and require lodging and food accommodations for multiple-day trips.

Table 10. Average trip-related expenditures/hunter/day<sup>a</sup> for various goods and services bought in Mississippi by non-residents on a typical white-tailed deer hunting trip in Mississippi during the 2003/2004 hunting season (2003 dollars).

Expenditure Item	Percent of hunters with an expenditure on item <sup>b</sup>	Average dollars spent per day by hunters with an expenditure on item	Average dollars spent per day by all hunters
	%	\$	\$/h/d
Ammunition	28.4	9.33	2.65
Daily private land use permit (not including hunting leases)	10.1	162.22	16.48
Entertainment (e.g., casino, movie, Amusement park)	9.0	44.05	3.98
Equipment rental	1.6	54.73	0.86
Food, drinks, and ice (including restaurants)	78.0	27.85	21.75
Guide fees, hunting package fees, Outfitters	17.6	239.93	42.24
Heating and cooking fuel	17.6	12.97	2.28
Lodging (e.g., hotel and hotel food, condo rental, camping)	26.8	64.47	17.32
Transportation (e.g., fuel, rental car, airplane)	84.7	18.52	15.71
Processing and taxidermy costs	13.5	52.08	7.05
Anything else for this trip	12.4	20.13	2.50
Total average expenditure/hunter/day			132.82

<sup>a</sup> A typical white-tailed deer hunting trip averages 6.87 days.

<sup>b</sup> n = 444.

Average long-term expenditures incurred for equipment by non-residents was \$73.90/hunter/day (Table 11). The largest expenditure item for long-term equipment purchases in Mississippi by non-residents was hunting licenses at \$20.00/hunter/day. Food plot-related equipment was the second largest expenditure at \$10.90/hunter/day, followed by trailer and ATV purchases at \$7.57/hunter/day. For the 2003/2004 hunting season the total sales impact of non-resident hunters of Mississippi was \$109.8 million (2006 dollars), supporting 5,944 full- and part-time jobs (Table 12).

Table 11. Average long-term white-tailed deer hunting expenditures/hunter/day<sup>a</sup> by licensed Mississippi non-resident hunters for items used on this trip and purchased within the last 12 months in Mississippi for the 2003/2004 hunting season (2003 dollars).

Expenditure Item	Percent of hunters with an expenditure on item <sup>b</sup>	Average dollars spent per year by hunters with an expenditure on item	Average dollars spent per day by hunters with an expenditure on item	Average dollars spent per day by all non-resident hunters
	%	\$	\$	\$/h/d
Ammunition	11.7	77.94	8.90	1.04
Archery equipment	2.7	167.67	11.93	0.32
Clothing for hunting	8.3	258.68	10.63	0.89
Dogs	1.1	458.00	40.90	0.46
Dog accessories	0.0	0.00	0.00	0.00
Dog training	0.2	71.28	17.82	0.04
Feeder	2.7	292.19	14.65	0.40
Feeder feeds (e.g., corn)	7.9	371.32	8.17	0.64
Food plot equipment	6.8	3,012.71	161.22	10.90
Food plot fertilizer, lime	18.2	478.23	38.88	7.10
Food plot seed	18.5	453.80	30.46	5.62
Groceries in bulk	15.3	498.00	15.18	2.32
Guns, knives	2.2	335.50	19.24	0.43
Hunt club membership	20.3	922.94	36.28	7.35
Hunting leases	10.8	1,275.12	49.17	5.31
Hunting licenses, stamps	100.0	216.35	20.00	20.00
Misc. hunting gear	6.8	200.00	8.13	0.55
Salt/mineral block	7.4	104.40	2.58	0.19
Small equipment	3.0	744.23	8.83	0.26
Trailer, ATV	3.6	3,791.56	210.21	7.57
Tree stand	4.1	333.00	10.89	0.44
Anything else for this trip <sup>c</sup>	3.1	750.57	65.85	2.07
Total average expenditure/hunter/day				73.90

<sup>a</sup> A typical white-tailed deer hunting trip averaged 5.75 days.

<sup>b</sup> n = 444.

<sup>c</sup> For example, property taxes, land purchase, vehicle repair, firewood, and camp maintenance.

Table 12. Total economic impacts from non-resident white-tailed deer hunter expenditures in Mississippi during the 2003/2004 hunting season (2006 dollars).

Industry	Direct Sales	Secondary Sales	Total Sales Impact	Value-Added	Indirect Business Taxes	Employee Income	Jobs
	\$	\$	\$	\$	\$	\$	(N)
Ag, Forestry & Fisheries	0.0	590,479	590,479	252,396	23,258	102,630	6.7
Mining	0.0	1,785,596	1,785,596	1,072,743	145,859	455,196	9.4
Construction	0.0	8,862	8,862	1,707	90	1,020	0.0
Manufacturing	30,290,000	17,903,804	48,193,804	33,048,354	5,791,279	19,547,221	875.5
Transp., Comm., & Utilities	657	1,208,911	1,209,568	877,366	20,513	687,600	15.1
Trade	2,370,588	1,410,728	3,781,316	2,758,110	45,509	1,304,126	46.5
F.I.R.E. <sup>a</sup>	0.0	547,077	547,077	273,476	6,653	238,108	12.8
Services	39,000,939	14,745,004	53,745,943	46,680,567	1,793,704	38,894,068	4,977.6
<b>Total</b>	<b>71,662,184</b>	<b>38,200,461</b>	<b>109,862,645</b>	<b>84,964,719</b>	<b>7,826,865</b>	<b>61,229,969</b>	<b>5,944.0</b>

<sup>a</sup>Finance, insurance, and real-estate.

### Total sales impact of white-tailed deer hunters in Mississippi

The overall economic impact from white-tailed deer hunting expenditures was derived from resident and non-resident expenditure profiles and activity days collected from the survey data. Total economic impacts of white-tailed deer in Mississippi were reported as direct sales, secondary sales, total sales, value-added, indirect business taxes, employee income, and employment for aggregated sectors within the State economy. For the 2003/2004 hunting season the total sales impact was \$951.1 million (2006 dollars), supporting 43,964 full- and part-time jobs (Table 14). The SAM multiplier for this analysis was 1.55, meaning that for every dollar spent in the State on white-tailed deer hunting-related expenditures there was an additional economic impact return of \$0.55. The manufacturing group had the highest sales impact (\$523.9 million) and included

Table 13. Total economic impacts from resident and non-resident white-tailed deer hunter expenditures in Mississippi resulting from the 2003/2004 hunting season (2006 dollars).

Industry	Direct Sales	Secondary Sales	Total Sales Impact	Value-Added	Indirect Business Taxes	Employee Income	Jobs
	\$	\$	\$	\$	\$	\$	(N)
Ag, Forestry & Fisheries	18,933	4,772,105	4,791,038	1,958,440	192,831	843,634	53.0
Mining	0.0	15,519,038	15,519,038	8,961,295	1,268,986	3,973,871	83.0
Construction	0.0	69,369	69,369	12,469	704	7,981	0.0
Manufacturing	373,036,528	150,858,948	523,895,476	353,509,586	66,342,215	220,761,253	10,612.0
Transp., Comm., & Utilities	10,101	11,034,226	11,044,327	7,620,269	179,743	6,333,956	140.0
Trade	52,112,688	14,552,555	66,665,243	46,862,309	791,195	20,701,454	779.0
F.I.R.E. <sup>a</sup>	0.0	4,670,409	4,670,409	2,257,440	58,738	2,024,354	110.0
Services	207,625,299	116,850,007	324,475,306	265,548,535	9,960,701	224,802,280	32,186.0
<b>Total</b>	<b>632,803,549</b>	<b>318,326,657</b>	<b>951,130,206</b>	<b>686,730,343</b>	<b>78,795,113</b>	<b>479,448,783</b>	<b>43,964.0</b>

<sup>a</sup>Finance, insurance, and real-estate.

hunting equipment, clothes, food, and mounting materials used by taxidermists. The manufacturing group supplies the largest portion of the value-added (\$353.5 million) to the State. Value-added impacts includes employee compensation, proprietary income (e.g., income by the self-employed), other property income (e.g., interest), and indirect business taxes (e.g., sales, excise, and property taxes) (Olson and Lindall 2000). The services group had the second largest total sales impact and value-added in the State, estimated at \$324.5 million and \$265.5 million, respectively. This group included the hotel and lodging sectors.

## Nonresponse bias

Even though a nonresponse bias survey was not conducted in the 2003/2004 study, it was felt that a homogeneous group was sampled. Error due to nonresponse in questionnaire surveys can be detected by applying a linear regression to the trend observed between cumulated observations for estimating parameter values of the population (Filion 1974). A linear regression model was run on the total number of days respondents went white-tailed deer hunting in Mississippi during the 2003/2004 season versus the date the survey was returned. At a 95% confidence interval the 2003/2004 study received a p-value = 0.9361, which resulted in no slope or a straight line (Figure 1) and there was no significant difference between days hunting white-tailed deer in Mississippi and the dates surveys were returned.

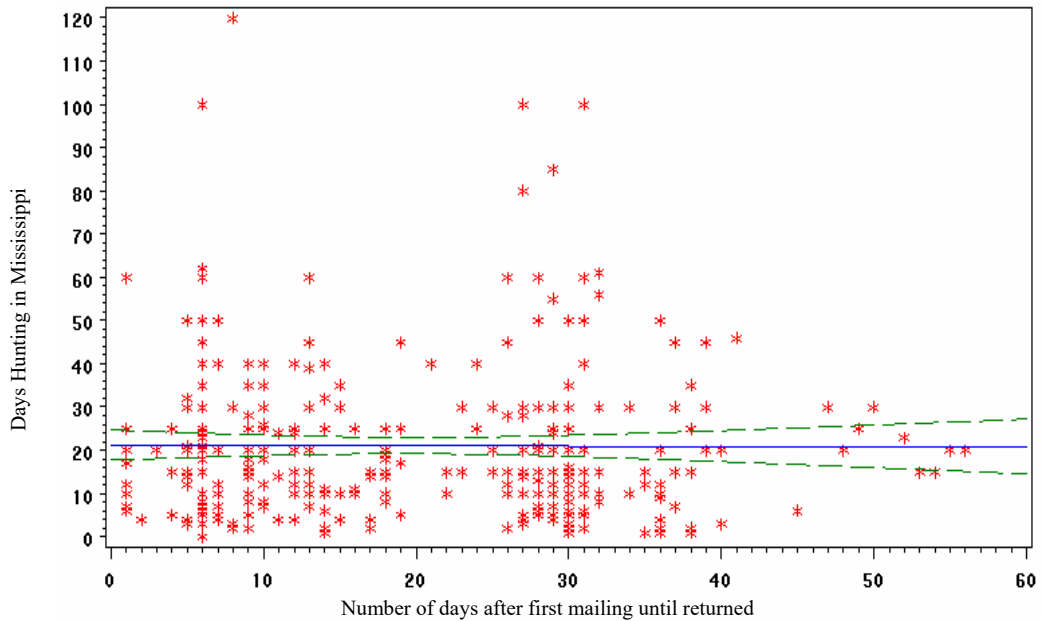


Figure 1. Linear regression between total number of days hunting white-tailed deer in Mississippi during the 2003/2004 season versus the numbers of days after first mailing until the surveys were returned.



A linear regression was also created for total trip expenditures versus the number of days after survey was mailed (Figure 2) and total long term expenditures versus total number of days after survey was mailed (Figure 3). Both relationships showed no significant differences between expenditures and number of days it took to return the survey. Figure 2 at a 95% confidence level received a p-value = 0.5233.

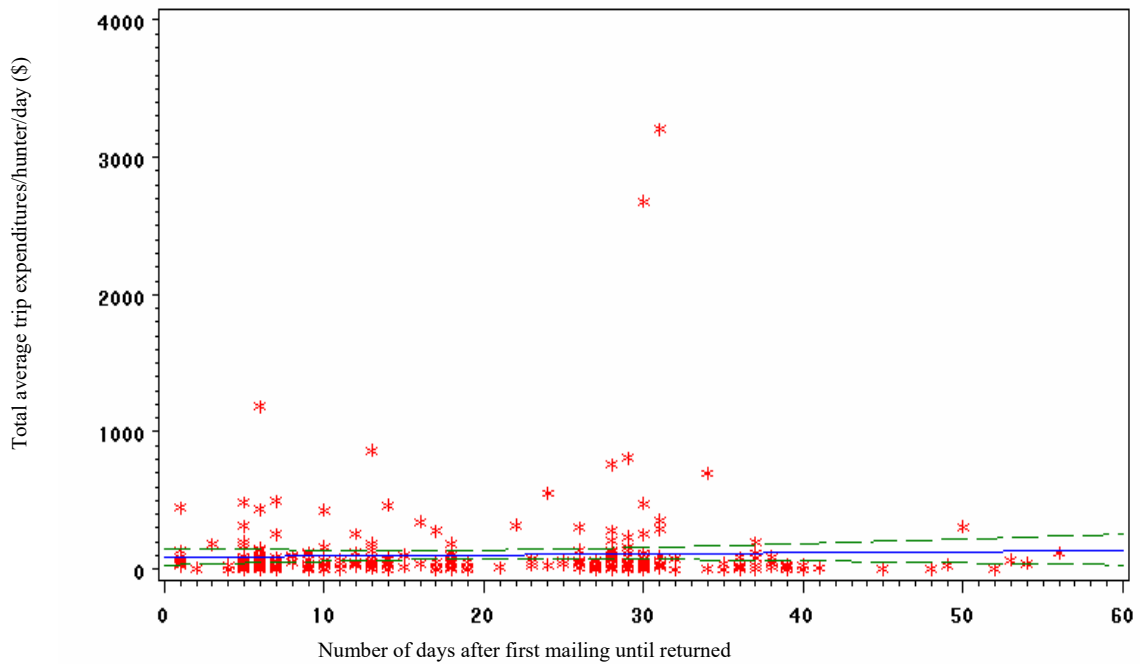


Figure 2. Linear regression between resident total average trip expenditures/hunter/day in Mississippi during the 2003/2004 season versus the numbers of days after first mailing until the surveys were returned.

The total average long-term expenditures versus the number of days after the first mailing resulted in a p-value = 0.2448 at a 95% confidence level (Figure 3). There was no significant difference between when the mail survey was returned the long-term expenditure data.

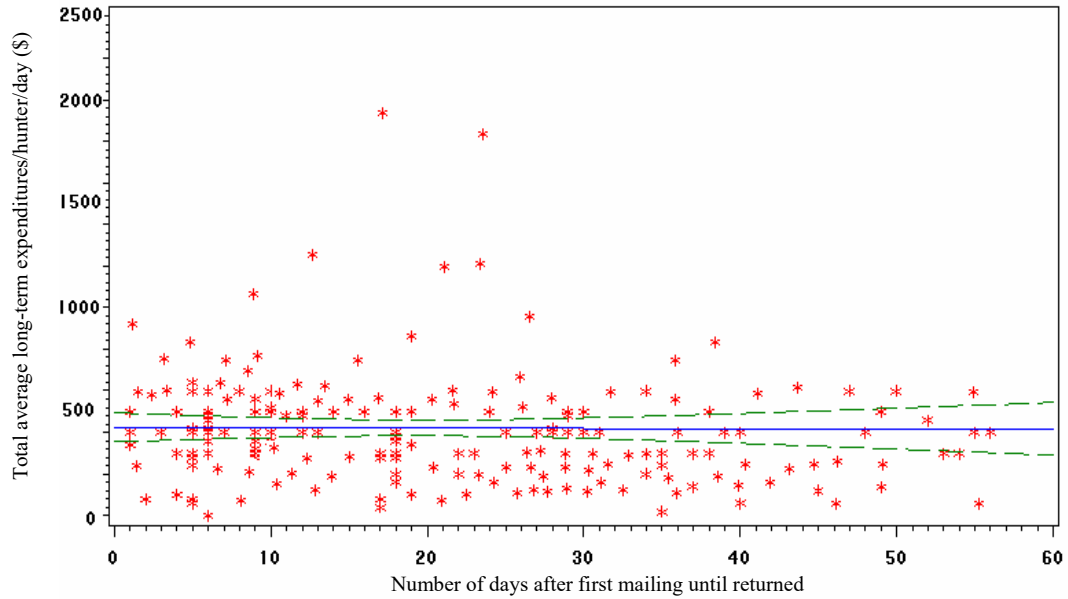


Figure 3. Linear regression between resident total average long-term expenditures/hunter/day in Mississippi during the 2003/2004 season versus the numbers of days after first mailing until the surveys were returned.

### Adjusted resident economic impacts

When residents were asked how much money they would spend out-of-state if denied the opportunity to hunt white-tailed deer in Mississippi they indicated that 74.4% of the dollars currently spent in state would then be spent out-of-state on white-tailed deer hunting or any other activity (hunting or non-hunting). Thus, of the original \$841,267,561 (Table 9) of economic impact, 74.4% would be considered as resident impacts on the Mississippi economy. Tables 15 and 16 represent the original resident trip-related and long-term expenditures that have been reduced by 25.6%, resulting in a total sales impact of \$620,706,090.

Table 14. Economic impacts from white-tailed deer hunter expenditures for various trip-related goods and services by residents in Mississippi during the 2003/2004 hunting season whereby expenditures were reduced by 25.6%<sup>a</sup> (2006 dollars).

Industry	Direct Sales	Secondary Sales	Total Sales Impact	Value-Added	Indirect Business Taxes	Employee Income	Jobs
	\$	\$	\$	\$	\$	\$	(N)
Ag, Forestry & Fisheries	13,836	1,710,633	1,724,469	638,288	68,623	301,953	19.4
Mining	0.0	5,405,829	5,405,829	2,013,298	438,800	1,386,903	29.0
Construction	0.0	25,206	25,206	4,833	256	2,901	0.0
Manufacturing	96,774,816	53,729,952	150,504,768	24,037,426	18,621,516	60,223,400	2,694.1
Transp., Comm., & Utilities	5,863	4,195,055	4,200,918	1,661,023	67,469	2,416,934	53.9
Trade	36,997,524	4,769,944	41,767,468	944,879	495,001	12,021,106	477.6
F.I.R.E. <sup>b</sup>	0.0	1,688,066	1,688,066	575,710	21,282	735,448	40.1
Services	92,726,336	42,387,396	135,113,732	25,328,240	4,445,140	96,113,448	14,901.4
<b>Total</b>	<b>226,518,375</b>	<b>113,912,081</b>	<b>340,430,456</b>	<b>55,203,697</b>	<b>24,158,087</b>	<b>173,202,093</b>	<b>18,215.5</b>

<sup>a</sup> Residents would spend 74.4% of this money out-of-state for either white-tailed deer hunting or any other activity (hunting or non-hunting) if denied the opportunity to white-tailed deer hunt in Mississippi.

<sup>b</sup> Finance, insurance, and real-estate.

When total resident expenditures were reduced by 25.6% the total economic impact for residents and non-residents drops from \$951,130,206 (Table 13) to \$730,568,735 (Table 16). This is a decrease of \$220,561,471 representing original resident economic impacts which serves as an estimate of potential recycled dollars in the State economy.

Table 15. Economic impacts from white-tailed deer hunter expenditures for long-term equipment by resident hunters for items used and bought on this trip and purchased within the last 12 months in Mississippi during the 2003/2004 hunting season whereby expenditures were reduced by 25.6%<sup>a</sup> (2006 dollars).

Industry	Direct Sales	Secondary Sales	Total Sales Impact	Value-Added	Indirect Business Taxes	Employee Income	Jobs
	\$	\$	\$	\$	\$	\$	(N)
Ag, Forestry & Fisheries	0.0	1,367,569	1,367,569	593,966	56,304	243,787	14.9
Mining	0.0	4,738,591	4,738,591	2,867,483	390,630	1,213,221	25.0
Construction	0.0	19,271	19,271	3,709	195	2,216	0.0
Manufacturing	158,221,696	44,268,705	202,490,401	146,860,080	26,352,464	89,193,216	4,540.5
Transp., Comm., & Utilities	1,173	3,064,488	3,065,661	2,219,124	50,067	1,755,247	38.7
Trade	0.0	4,973,799	4,973,799	3,235,489	59,170	2,391,614	66.3
F.I.R.E. <sup>b</sup>	0.0	1,355,325	1,355,325	684,876	17,218	582,204	31.9
Services	29,555,988	32,709,029	62,265,017	49,616,608	1,584,448	38,768,968	5,263.9
<b>Total</b>	<b>187,778,857</b>	<b>92,496,777</b>	<b>280,275,634</b>	<b>206,081,335</b>	<b>28,510,496</b>	<b>134,150,473</b>	<b>9,981.2</b>

<sup>a</sup> Residents would spend 74.4% of this money out-of-state for either white-tailed deer hunting or any other activity (hunting or non-hunting) if denied the opportunity to white-tailed deer hunt in Mississippi.

<sup>b</sup> Finance, insurance, and real-estate.

## HDCLEL study results

The annual Survey of Mississippi Resident and Non-Resident Hunters implemented by HDCLEL was used for comparison to the detailed analysis of this study. The overall economic impact from white-tailed deer hunting expenditures was derived from resident and non-resident expenditure profiles and activity days collected from survey data. For the 2001/2002 hunting season the total sales impact was \$983.2 million (2006 dollars), supporting 46,589 full- and part-time jobs (Table 17). The SAM multiplier for this analysis was 1.54. Meaning that for every dollar spent in the State on white-tailed deer hunting-related expenditures there was an additional economic impact return of \$0.54.

Table 16. Total economic impacts from reduced resident<sup>a</sup> (25.6%) and non-resident<sup>b</sup> white-tailed deer hunter trip-related and long-term equipment expenditures in Mississippi resulting from the 2003/2004 hunting season (2006 dollars).

Industry	Direct Sales	Secondary Sales	Total Sales Impact	Value-Added	Indirect Business Taxes	Employee Income	Jobs
	\$	\$	\$	\$	\$	\$	(N)
Ag, Forestry & Fisheries	13,836	3,668,681	3,682,517	1,484,650	148,185	648,370	41.0
Mining	0.0	11,930,016	11,930,016	5,953,524	975,289	3,055,320	63.0
Construction	0.0	53,339	53,339	10,249	541	6,137	0.0
Manufacturing	285,286,512	115,902,461	401,188,973	203,945,860	50,765,259	168,963,837	8,110.0
Transp., Comm., & Utilities	7,693	8,468,454	8,476,147	4,757,513	138,049	4,859,781	108.0
Trade	39,368,112	11,154,471	50,522,583	6,938,478	599,680	15,716,846	590.0
F.I.R.E. <sup>c</sup>	0.0	3,590,468	3,590,468	1,534,062	45,153	1,555,760	85.0
Services	161,283,263	89,841,429	251,124,692	121,625,415	7,823,292	173,776,484	25,143.0
<b>Total</b>	<b>485,959,416</b>	<b>244,609,319</b>	<b>730,568,735</b>	<b>346,249,751</b>	<b>60,495,448</b>	<b>368,582,535</b>	<b>34,140.0</b>

<sup>a</sup> Tables 14 and 15.

<sup>b</sup> Table 12.

<sup>c</sup> Finance, insurance, and real-estate.

Table 17. Total economic impacts from resident and non-resident white-tailed deer hunter trip-related and long-term equipment and other item expenditures in Mississippi during the 2001/2002 hunting season from the Survey of Mississippi Resident and Non-Resident Hunters implemented by the Human Dimensions and Conservation Law Enforcement Laboratory (2006 dollars).

Industry	Direct Sales	Secondary Sales	Total Sales Impact	Value-Added	Indirect Business Taxes	Employee Income	Jobs
	\$	\$	\$	\$	\$	\$	(N)
Ag, Forestry & Fisheries	0.0	4,899,814	4,899,814	2,113,475	197,906	473,848	54.2
Mining	0.0	16,049,722	16,049,722	9,011,672	1,317,055	3,673,042	85.0
Construction	0.0	71,204	71,204	13,710	722	8,156	0.1
Manufacturing	409,089,656	155,555,553	564,645,209	399,754,804	73,969,418	198,109,129	12,190.3
Transp., Comm., & Utilities	3,392	11,296,150	11,299,542	8,233,040	183,889	4,492,586	143.8
Trade	51,136,523	15,411,044	66,547,567	49,958,426	789,620	16,110,782	777.2
F.I.R.E. <sup>a</sup>	0.0	4,780,779	4,780,779	2,415,205	60,120	1,891,898	113.3
Services	195,028,851	119,874,076	314,902,927	265,751,131	9,188,705	211,375,410	33,224.8
<b>Total</b>	<b>655,258,422</b>	<b>327,938,342</b>	<b>983,196,764</b>	<b>737,251,463</b>	<b>85,707,435</b>	<b>436,134,851</b>	<b>46,589.0</b>

<sup>a</sup> Finance, insurance, and real-estate.

For the 2002/2003 hunting season, the total sales impact was \$993.4 million (2006 dollars), supporting 46,873 full- and part-time jobs (Table 18). The SAM multiplier for this analysis was similarly 1.54. Meaning that for every dollar spent in the State on white-tailed deer hunting-related expenditures there was an additional economic impact return of \$0.54. For the 2003/2004 hunting season the total sales impact was \$734.5 million (2006 dollars), supporting 34,751 full- and part-time jobs (Table 19). The SAM multiplier for this analysis was also 1.54. Again, meaning that for every dollar spent in the State on white-tailed deer hunting-related expenditures there was an additional economic impact return of \$0.54.

Table 18. Total economic impacts from resident and non-resident white-tailed deer hunter trip-related and long-term equipment and other item expenditures in Mississippi during the 2002/2003 hunting season from the Survey of Mississippi Resident and Non-Resident Hunters implemented by the Human Dimensions and Conservation Law Enforcement Laboratory (2006 dollars).

Industry	Direct Sales	Secondary Sales	Total Sales Impact	Value-Added	Indirect Business Taxes	Employee Income	Jobs
	\$	\$	\$	\$	\$	\$	(N)
Ag, Forestry & Fisheries	0.0	4,946,741	4,946,741	2,133,976	199,867	478,370	54.7
Mining	0.0	16,222,250	16,222,250	9,130,583	1,331,200	3,712,778	85.7
Construction	0.0	71,847	71,847	13,833	728	8,229	0.1
Manufacturing	415,079,286	157,124,722	572,204,008	405,219,560	74,997,743	200,832,910	12,362.6
Transp., Comm., & Utilities	3,442	11,417,025	11,420,467	8,321,193	185,784	4,540,940	145.4
Trade	51,709,080	15,605,029	67,314,109	50,532,457	798,662	16,301,174	786.1
F.I.R.E. <sup>a</sup>	0.0	4,829,693	4,829,693	2,440,086	60,763	1,910,956	114.6
Services	195,433,965	120,978,241	316,412,206	266,847,623	9,221,842	212,107,927	33,323.5
<b>Total</b>	<b>662,225,773</b>	<b>331,195,548</b>	<b>993,421,321</b>	<b>744,639,311</b>	<b>86,796,589</b>	<b>439,893,284</b>	<b>46,873.0</b>

<sup>a</sup> Finance, insurance, and real-estate.

HDCLEL study results from 2001 to 2004 revealed that the largest sector generating economic impacts was manufacturing. The next two largest sectors were services and trade. These three sectors coincided with the results of the 2003/2004 study.

Table 19. Total economic impacts from resident and non-resident white-tailed deer hunter trip-related and long-term equipment and other item expenditures in Mississippi during the 2003/2004 hunting season from the Survey of Mississippi Resident and Non-Resident Hunters implemented by the Human Dimensions and Conservation Law Enforcement Laboratory (2006 dollars).

Industry	Direct Sales	Secondary Sales	Total Sales Impact	Value-Added	Indirect Business Taxes	Employee Income	Jobs (N)
	\$	\$	\$	\$	\$	\$	
Ag, Forestry & Fisheries	0.0	3,658,441	3,658,441	1,578,075	147,777	353,802	40.4
Mining	0.0	11,988,500	11,988,500	6,744,061	983,722	2,743,736	63.4
Construction	0.0	53,156	53,156	10,234	538	6,089	0.1
Manufacturing	305,407,726	116,178,512	421,586,238	298,425,002	55,232,500	147,868,788	9,093.9
Transp., Comm., & Utilities	2,526	8,448,285	8,450,811	6,158,026	137,461	3,360,320	107.5
Trade	38,826,651	11,518,441	50,345,092	37,813,863	597,319	12,151,743	587.6
F.I.R.E. <sup>a</sup>	0.0	3,571,267	3,571,267	1,804,317	44,924	1,413,288	84.7
Services	145,377,728	89,498,705	234,876,433	198,188,311	6,852,020	157,618,587	24,772.9
<b>Total</b>	<b>489,614,631</b>	<b>244,915,307</b>	<b>734,529,938</b>	<b>550,721,889</b>	<b>63,996,261</b>	<b>325,516,353</b>	<b>34,751.0</b>

<sup>a</sup>Finance, insurance, and real-estate.

## CHAPTER VI

### DISCUSSION

Survey participants responded to the 2003/2004 study mail questionnaire at a rate of 38.6%. The Survey of Mississippi Resident and Non-Resident Hunters implemented by the HDCLEL yielded higher return rates; 2001/2002 n = 49.8%, 2002/2003 n = 52.5%, 2003/2004 n = 52.0%. The 2003/2004 study received a lower return rate than The Survey of Mississippi Resident and Non-Resident Hunters implemented by the HDCLEL perhaps because it surveyed a broader range of participants covering a number of different topics, which included not only white-tailed deer, but all game species in Mississippi. Consequently, if a respondent did not hunt white-tailed deer, questionnaire did not apply to them and they probably discarded it. It has been reported that response rates to mail surveys (natural resource based topics) between 1971 and 2000 (n=105 studies) have fallen 0.77% per year and will gradually decline over time (Connelly et al. 2003). This trend could have affected the 2003/2004 study survey and similar mail surveys, thus, providing a lower rate of return than expected.

Another aspect of the survey process that could have influenced the 2003/2004 study return rate was that the questionnaires asked for detailed expenditure data, thus potentially leading to a higher nonresponse rate. The length and quality of the survey can be related to the extent of survey nonresponse bias. Length and complexity of a survey



potentially reflects the magnitude of the task researchers ask of respondents, and the corresponding respondent burden (Connelly et al. 2003). Connelly et al. (2003) developed a model to measure factors affecting response rate and found that keeping questions as simple as possible is helpful, in fact, each complex question added to a survey decreases response rates by 0.5%. HDCLEL trip expenditure questions did not have an available space to indicate the town or county of purchase to analyze expenditures on a regional level. HDCLEL long-term expenditures also did not provide a space to indicate the town or county of purchase or days of use for an item in the last 12 months, allowing for the appropriate calculation of total average expenditure/hunter/day. As a result the survey used in this study also had several more long-term expenditure categories, such as, food plot equipment, food plot seed, feeder, fertilizer, and lime. The HDCLEL equipment expenditures were prorated over the hunting season versus year-round use, thus over estimating their value.

The HDCLEL 2003/2004 Survey of Mississippi Resident and Non-Resident Hunters received a higher return rate (52%) compared to the 2004 Mississippi Deer Hunting Economic Impact Survey (39%). As previously mentioned, the HDCLEL study looked at a more representative population sample. The lower the response rate, the reduction in confidence in the reliability of estimates occurs and with a higher response rate, this provides confidence that results are reliable and representative to the target population (Dillman 1978). HDCLEL surveyed all respondents that hunted in Mississippi, regardless of species. The 2003/2004 study survey was only mailed out to white-tailed deer hunters in Mississippi. HDCLEL may be more representative of the overall Mississippi hunter population, however this analysis better represented the

Mississippi white-tailed deer hunter specifically. It is important to minimize nonresponse bias by factoring in the relationship of the survey audience to the subject of study (Dillman 1991). There is good reason to have confidence that the 2003/2004 study respondents had a positive relationship with white-tailed deer hunting because the survey was species specific and the sample population came from licensed hunters in Mississippi.

The 2003/2004 study and the HDCLEL study surveyed respondents that had very similar demographics. The 2003/2004 study respondents were on average, 41 years old, white, and male. The median values for education and income were, with some college, and a total household income of \$50,000 – 59,000. Non-residents were on average, 47 years old, white, and male. The median values for education and income were, with some college, and a total household income of \$70,000 – 79,000, for non-resident respondents. The HDCLEL 2003/2004 survey from residents, they were, on average, 43 years old, white, and male. The median values for education and income were, college, and a total household income of 50,000 – \$59,000. Non-residents were on average, 47 years old, white, and male. The median values for education and income were, college, and a total household income of 60,000 – \$69,000, for non-resident respondents. It was believed that a homogenous group was sampled in the 2003/2004 study and that there was little to no nonresponse bias.

It was felt that the number of activity days in the 2003/2004 study was accurate based on previous studies with similar results. In the 2003/2004 study, average days hunted in the season was 21.34 days, while HDCLEL for the same year averaged 20.25 days. The International Association of Fish and Wildlife Agencies (2002) reported that

Mississippi white-tailed deer hunters spent on average 23.2 days hunting white-tailed deer in Mississippi. The 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation reported an average of 20.0 days of hunting per year for white-tailed deer hunters in the United States (USDI and USDC 2002a). Those who responded to the 2003/2004 study hunted more days, were more avid, and were the same demographically as HDCLEL. The only difference was that the 2003/2004 study respondents hunted more days which can possibly lead to an overestimate of activity days which then can result in an overestimate of total economic impact.

According to the HDCLEL study, average expenditures incurred for various trip-related goods and services for residents (n = 1,761) and non-residents (n = 1,447) per day in Mississippi during the 2001/2002 hunting season were \$49.98/hunter/day and \$89.30/hunter/day, respectively. Average expenditures incurred for equipment and other purchases for residents (n = 1,761) and non-residents (n = 1,447) in Mississippi during the 2001/2002 hunting season were \$111.10/hunter/day and \$158.30/hunter/day, respectively. These expenditure profiles, adjusted for inflation, were used for all three years of this study. In comparison, during the 2003/2004 white-tailed deer hunting season, average expenditures incurred for various trip-related goods and services for residents (n = 276) and non-residents (n = 444) per day in Mississippi were \$102.01/hunter/day and \$132.82/hunter/day, respectively. Average expenditures incurred for equipment and other purchases in the 2003/2004 study for residents (n = 276) and non-residents (n = 444) were \$84.56/hunter/day and \$73.90/hunter/day, respectively. The expenditure data for the 2003/2004 study and HDCLEL may have differed due to the more detailed expenditure data requested from respondents. The more detailed the

analysis of expenditure data is the more respondents tend to systematically under report, while if asked to lump expenditures together they may be prone to over report data (Handa and Maluccio 2006).

The economic impact of white-tailed deer hunting to Mississippi is vital to the State's economy and white-tailed deer population. The 2003/2004 study hunting season showed the total sales impact was \$951.1 million (2006 dollars), supporting 43,964 full- and part-time jobs. This included \$686.7 million in value-added impacts consisting in part of \$479.5 million in employee income. In comparison, an estimate for the economic impacts of waterfowl hunting in Mississippi was given as \$27.4 million (1999 dollars) (Grado et al. 2001). This comparison illustrates, in part, the economic importance of the white-tailed deer as a state resource. With the lack of other studies determining the economic impact of hunting white-tailed deer in Mississippi and around the country this study provides a point of reference for future studies in Mississippi and the United States.

One unique aspect of the 2003/2004 study was a hypothetical inquiry on the percentage of money a resident hunter would spend out-of-state if they were no longer able to hunt white-tailed deer in Mississippi. In the 2003/2004 study, resident hunters claimed that if white-tailed deer hunting in Mississippi was no longer an option that 74.4% of their money would then be spent out-of-state to hunt white-tailed deer or pursue other activities. This percentage was comparable (70%) to a study by Grado et al. (2001) on the economic impact of waterfowl hunting in the Mississippi Delta when the same question was raised. Potentially, 74.4% of the State's total sales impact could be taken to out-of-state vendors, and a loss of \$730.6 million (2006 dollars) to the State's economy (Table 14) would occur. Therefore, resident expenditures were reduced by 25.6% to

calculate an adjusted resident economic impact. This was then added to the non-resident economic impacts to arrive at the adjusted total. This procedure allowed me to assume that the true economic impacts from white-tailed deer hunting lies somewhere in between the original total sales impact and the reduced adjusted total sales impact. Often resident expenditures are not considered in economic impact studies, or conversely, they are considered in total (Strauss et al. 1995). The claim here is that the economic impacts for residents lies between these two points.

Results from the HDCLEL Survey of Mississippi Resident and Non-Resident Hunters were compared to the 2004 Mississippi Deer Hunting Economic Impact Survey. Both mail surveys were implemented using a modified version of Dillman's Total Design Method (Dillman 1978) and both received comparable results. According to HDCLEL 2003/2004 data, total sales impact was \$734.5 million supporting 34,751 full- and part-time jobs, while the 2003/2004 study total sales impact during the same hunting season yielded \$951.1 million supporting 43,964 full- and part-time jobs. Yet there were several differences between the studies as well. Expenditure differences could have occurred because the HDCLEL survey inquired about all game species, not just white-tailed deer like the 2003/2004 study. Respondents could have accidentally combined data from a single hunting trip where they might have hunted more than one wildlife species. As previously mentioned, these annual studies have overestimated equipment expenditures. The HDCLEL study was unable to factor in the percentage of hunters that would hunt out-of-state if their opportunity to hunt in Mississippi was not possible.

In general, many goods and services were purchased by hunters outside the state, prior to their trip, which could have been purchased within the state. Purchases of goods

and services are commonly made prior to the trip simply for convenience, time constraints, or price. Nevertheless, some purchases were made outside the region because these items were not available in the area or hunters may not be able to locate certain items. For non-residents, expenditures made outside the state could potentially be equipment, lodging, food, and transportation. Items for residents that are difficult to locate could be equipment purchases. Local businesses could likely provide a share of these items along with other outdoor-related services and amenities. For example, non-residents on multi-day trips commonly purchase lodging outside the state. With an increase of lodging within the state an increase in economic impacts would occur. Information on trip packages and outfitters also need to reach non-resident hunters to enhance the value of their trip expenditures.

The economic impacts attributed to white-tailed deer hunting in the 2003/2004 study, \$951.1 million (2006 dollars), are by far the most significant impacts for a wildlife species in the State. As previously mentioned, waterfowl hunting economic impact to Mississippi was \$27.4 million (1998 dollars) (Grado et al. 2001). Other popular hunting and fishing activities in Mississippi include wild turkey hunting (Grado et al. 1997) and onshore marine fishing (Loden et al. 2004) that contributed \$16.7 million (1993 dollars) and \$2.9 million (2004 dollars) to the State, respectively. These studies further illustrated the importance of the management and health of white-tailed deer, their habitat, and businesses and industries that rely on this species and associated management decisions.

The methods and results of this study are of value for states or regions with rapid population growth where policymakers and communities are often confronted with land-use trade-offs, often between development and protecting wildlife habitat. Economic

values derived from the low-impact, natural resource-based recreation activities can provide additional justification for funding or expanding currently existing public sites. These data also justifies the creation of new public areas, which could be used for white-tailed deer hunting and other natural resource-based recreation.

Economic data can also be utilized by policymakers for assessing land and wildlife management decisions and businesses that depend on them. Simple expenditure estimates for wildlife-related recreation are important for justification of economic analysis because policy-makers understand them as indicators of the relative importance of competing demands for agency resources (Fisher and Grambsch 1989). Specific problems such as the spread of chronic wasting disease (CWD) and baiting issues can also benefit from these impact results. CWD is one of many emerging infectious diseases testing the financial, physical, and human resources of wildlife agencies throughout North America (Needham et al. 2004).

There are several short- and long-term impacts baiting can cause on an economy. In the short-term baiting can potentially cause an increase in hunter participation and added economic impacts. Winterstein (1992) estimated that in Michigan, over 13 million bushels of bait were used in 1991, with a net value in excess of 50 million dollars. Baiting has increased in hunters from Michigan. In 1984, 29% of hunters reported using bait, 41% in 1991, and 56% in 1993 (Langenau et al. 1985, Winterstein 1992, Minnis and Peyton 1994).

While there are relatively few short-term impacts of baiting, there are multiple long-term impacts baiting can have on the economy, habitat, and relative health of white-tailed deer. While facilitating the harvest, baiting deer also may increase disease

transmission, create hunter conflicts, or adversely impacting other resources (Van Deelen et al. 2006). Supplemental feeding has been suspected of contributing to the spread of CWD (Brown and Cooper 2006). Concentration of deer activity around feeding sites can be a risk for facilitating spread of infectious diseases such as CWD.

With a resource as valuable as white-tailed deer policymakers need to put forth the funding to research the spread and control of CWD. A questionnaire was sent in 2004/2005 to 24 state wildlife and agriculture agencies to examine organizational capacity for prevention and control of CWD in relation to standard disease management protocols (Burroughs et al. 2006). The study selected states that currently have CWD, states that are neighboring CWD states, and states that were one state away from a CWD state were randomly selected. Results showed that regardless of proximity to CWD, 75% of the states indicated they had less than satisfactory funding needed to combat CWD. It is important for policymakers to be aware of the economic impact of white-tailed deer hunting and the financial impact CWD can potentially have in Mississippi. Bishop (2004) conducted a study where the economic impact of CWD was assessed in Wisconsin. He concluded there were two types of losses in Wisconsin as a result of CWD: 1) the reduction in hunting participation led to a decrease in the total number of deer hunting days, 2) the quality of the white-tailed deer hunting experience seemed to have declined, which decreases the value per day per hunter. Even though CWD has not been linked to human illness, Petchenik (2003) reported that over a third of Wisconsin white-tailed deer hunters were concerned about the chance of becoming ill from CWD. This could create a negative light on white-tailed deer hunting if the concern of becoming ill outweighs, or limits a typical hunter's trip. In Wisconsin, Bishop (2004) stated that



hunter losses likely amounted to between \$53 and \$79 million in 2002 and \$45 to \$72 million in 2003. In 2002/2003 the State of Wisconsin spent approximately \$14.7 million combating CWD (Bishop 2004). As unstable as the spread of CWD is, hunting over bait could potentially decrease the overall total sales impact to a state's economy should similar diseases occur.

It is recommended that the quality and area managed for white-tailed deer on public and private lands in Mississippi needs to be increased and enhanced in the future to benefit the white-tailed deer and its users. Intense land use and development will make this task a difficult one. In the United States where private land predominates, most wildlife management efforts have focused on publicly owned land because of conflicting traditions of private property rights, public ownership of wildlife, and state regulation of wildlife (Daley et al. 2004). Increasing managed white-tailed deer habitat potentially could attract residents and non-residents of Mississippi to hunt or hunt more often and compel policymakers to make more funds available for habitat improvement and biological studies of white-tailed deer. Potentially state and federal funds are not always available for private landowners. In recent years private nongovernmental organizations (i.e., The Nature Conservancy) have worked along with state and federal agencies to improve management on private lands. Many of these private organizations preserve habitat through land acquisitions and conservation easements with private landowners (Daley et al. 2004). The 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation reported that 92% of all hunters in Mississippi hunted on private land. This is reasonable because the southeastern United States leads the rest of the nation in acreage under hunting leases, primarily because over 91% of the land is

privately owned (Yarrow 1998). Funds could be used for improvements of habitat quality to produce higher quality white-tailed deer, perhaps providing higher revenues for private landowners, lodges, and guided hunts. The result of these actions will contribute to a more sustainable environment and economy in Mississippi.

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**APPENDIX A**

**2004 MISSISSIPPI DEER HUNTING ECONOMIC IMPACT SURVEY**

*2004 Mississippi Deer Hunting  
Economic Impact Survey*



Conducted for the  
Mississippi Department of Wildlife, Fisheries & Parks  
by the  
Human Dimensions & Conservation Law Enforcement Laboratory  
Forest & Wildlife Research Center  
Mississippi State University



*In the following questions, please tell us about your hunting activity and experience. The information you provide will remain strictly confidential and you will not be identified with your answers.*

1. Do you reside in Mississippi?
  - 1 YES --- (If **YES**, which county? \_\_\_\_\_)
  - 2 NO --- (If **NO**, what state? \_\_\_\_\_, what county? \_\_\_\_\_)
  
2. Did you hunt white-tailed deer in Mississippi during the 2003-2004 hunting season (October 1, 2003 to January 31, 2004)?
  - 1 YES
  - 2 NO --- (If **NO**, please go to questions 27-28 and then return the survey in the postage paid envelope)
  
3. What is the total number of days you went white-tailed deer hunting (in Mississippi and elsewhere) during the 2003-2004 season?
 

\_\_\_\_\_ DAYS HUNTED DEER IN 2003-2004 SEASON
  
4. What is the total number of days you went white-tailed deer hunting in Mississippi during the 2003-2004 season?
 

\_\_\_\_\_ DAYS
  
5. Please indicate how many days you hunted deer using each of the following methods in Mississippi and out-of-state, and how many bucks and does you harvested using each method in the 2003-2004 hunting season (if unsuccessful please leave that space blank). If you hunted using more than one method on a particular day, count a day for each method you hunted.

Species/Method/Location	Days hunted deer in 2003-04 season, by method	Total bucks harvested in 2003-04 season	Total does harvested in 2003-04 season
Deer (Archery) in Mississippi			
Deer (Primitive Weapon) in Mississippi			
Deer (Gun) in Mississippi			
Deer (Archery) Outside of Mississippi			
Deer (Primitive Weapon) Outside of Mississippi			
Deer (Gun) Outside of Mississippi			

**PLEASE TRY TO RECALL A SPECIFIC DEER HUNTING TRIP IN THE 2003-2004 SEASON WHICH YOU CONSIDER A "TYPICAL" DEER HUNTING TRIP FOR YOU IN MISSISSIPPI.**

6. Was white-tailed deer hunting the primary purpose for this trip?

- 1 YES
- 2 NO --- (If NO, what was the primary purpose of the trip? \_\_\_\_\_)

7. How many total days did you spend on this trip, and deer hunting on this trip?

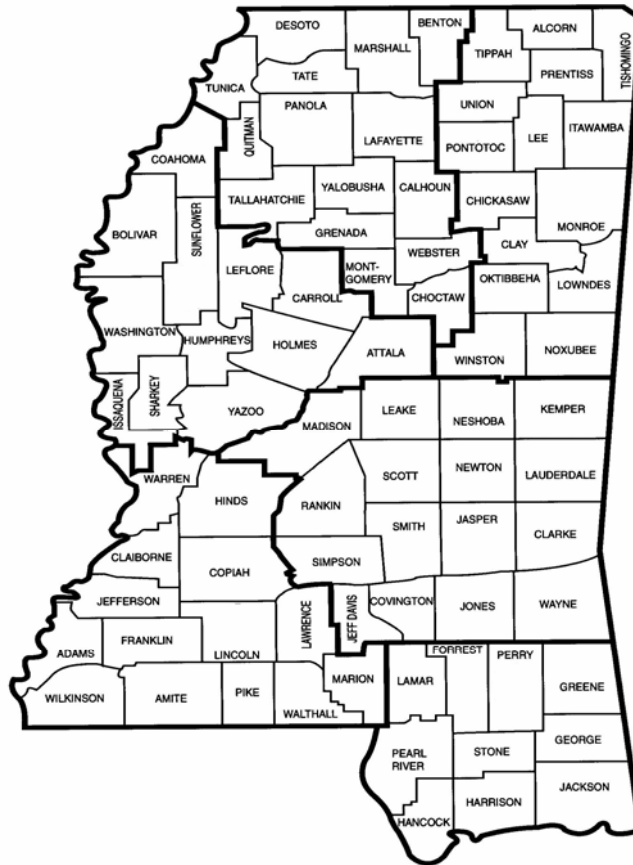
\_\_\_\_\_ TOTAL DAYS SPENT ON TRIP

\_\_\_\_\_ TOTAL DAYS SPENT DEER HUNTING ON THIS TRIP

8. To the best of your recollection, what was the date(s) of this typical trip

Left house: \_\_\_\_\_, 200\_\_      Returned home: \_\_\_\_\_, 200\_\_

9. Using the map below, indicate the destination county or counties you hunted during this trip. (Please circle the name(s)).



10. Please indicate with an "X" where your primary hunting trip took place in the chart below.

*(Please check only one):*

	<b>a. Hunting Service Providers</b>		<b>c. Private Hunting with Fees</b>
	Outfitter Accessed Land		Private Land Lease
	Lodges		Private Land Daily Access Fee
			Forest Industry Lease
	<b>b. Public Hunting</b>		Forest Investment Company Lease
	National Forest		16 <sup>th</sup> Section Lands
	National Wildlife Refuge		Other <i>(Please describe below):</i>
	U.S. Army Corps		
	State Wildlife Management Area		<b>d. Private Hunting without Fees</b>
	TVA Land		Private Land
	Other <i>(Please describe below):</i>		Industry Land
			Other <i>(Please describe below):</i>

11. How did you find out about this hunting destination?

\_\_\_\_\_

12. How many one-way miles did you travel from your home residence to get to your destination on this trip?

\_\_\_\_\_ ONE-WAY MILES

13. How many individuals made this trip with you, including yourself?

\_\_\_\_\_ INDIVIDUALS

14. Of these individuals, how many individuals (e.g., father, son) did you pay for on this trip, including yourself?

\_\_\_\_\_ INDIVIDUALS YOU PAID FOR

15. Did you harvest any white-tailed deer on this typical trip you described above?

- 1 YES *(If YES, how many? \_\_\_\_\_)*
- 2 NO

Please estimate all expenses for all the people that you paid for, including yourself, to accomplish this typical trip using the following guidelines.

16. Trip Expenses that occurred only in the Destination County or Counties in Mississippi.

(1) Transportation	<u>Trip Expense</u>	<u>Town or County of purchase</u>
gas for vehicles _____	_____	_____
rental vehicle _____	_____	_____
other ( <i>Please describe below</i> ): _____	_____	_____
 (2) Lodging (plus associated food)	_____	_____
 (3) Food (not associated with lodging)		
restaurant or take-out meals _____	_____	_____
groceries _____	_____	_____
 (4) Other shopping, services		
ammunition _____	_____	_____
casinos _____	_____	_____
entertainment _____	_____	_____
equipment rental _____	_____	_____
game processing* _____	_____	_____
guide fees _____	_____	_____
heating/cooking fuel _____	_____	_____
hunting lodges _____	_____	_____
hunting package fees _____	_____	_____
misc. retail _____	_____	_____
outfitters _____	_____	_____
private land use permit _____	_____	_____
taxidermy* _____	_____	_____
other ( <i>Please describe below</i> ): _____	_____	_____

*\* Expense incurred within the destination county or counties as a result of animals harvested on this trip only.*

17. Trip expenses that occurred to and from the destination county or counties, before, during, and after your trip.

	<u>Trip Expense</u>	<u>Town or County</u>	<u>State</u>
<b>(1) Transportation</b>			<b><u>of purchase</u></b>
<u>gas stop #1 (e.g., gas only)</u>	_____	_____	_____
<u>gas stop #2 (e.g., gas only)</u>	_____	_____	_____
<u>gas stop #3 (e.g., gas only)</u>	_____	_____	_____
<u>rental vehicle</u>	_____	_____	_____
<u>air fare</u>	_____	_____	_____
<b>(2) Lodging: (plus associated food)</b>			
<u>Lodging to destination</u>	_____	_____	_____
<u>Lodging from destination</u>	_____	_____	_____
<b>(3) Food (not associated with lodging)</b>			
<u>restaurant or take-out meal #1</u>	_____	_____	_____
<u>restaurant or take-out meal #2</u>	_____	_____	_____
<u>groceries/snacks</u>	_____	_____	_____
<u>groceries/snacks</u>	_____	_____	_____
<b>(4) Other services, shopping</b>			
<u>ammunition</u>	_____	_____	_____
<u>casinos</u>	_____	_____	_____
<u>entertainment</u>	_____	_____	_____
<u>equipment rental</u>	_____	_____	_____
<u>game processing*</u>	_____	_____	_____
<u>guide fees (e.g., tips)</u>	_____	_____	_____
<u>heating/cooking fuel</u>	_____	_____	_____
<u>hunting lodges</u>	_____	_____	_____
<u>hunting package fees</u>	_____	_____	_____
<u>misc. retail</u>	_____	_____	_____
<u>outfitters</u>	_____	_____	_____
<u>private land use permit</u>	_____	_____	_____
<u>taxidermy*</u>	_____	_____	_____
<u>other (Please describe below)</u>	_____	_____	_____
_____	_____	_____	_____

*\* Expense incurred to and from your destination county or counties as a result of animals harvested on this trip only.*

18. How much more would you have been willing to pay for this trip, before you would have decided not to make this trip?

\$ \_\_\_\_\_ MORE PER TRIP

19. Long term hunting expenditures for items purchased over the last 12 months only and used on this typical trip\*.

	<u>Total Expense</u>	<u>Town or County of purchase</u>	<u>State</u>	<u>Days Used last12 months</u>
<u>ammunition</u>	_____	_____	_____	_____
<u>archery equipment</u>	_____	_____	_____	_____
<u>clothing for hunting</u>	_____	_____	_____	_____
<u>dog accessories</u>	_____	_____	_____	_____
<u>dogs</u>	_____	_____	_____	_____
<u>groceries in bulk</u>	_____	_____	_____	_____
<u>guns, knives, etc</u>	_____	_____	_____	_____
<u>hunt club membership</u>	_____	_____	_____	_____
<u>hunting leases</u>	_____	_____	_____	_____
<u>hunting license, stamps</u>	_____	_____	_____	_____
<u>misc. hunting gear</u>	_____	_____	_____	_____
<u>small equipment</u>	_____	_____	_____	_____
<u>trailer, ATV</u>	_____	_____	_____	_____
<u>tree stand</u>	_____	_____	_____	_____
<u>other (Please describe below):</u>	_____	_____	_____	_____
_____	_____	_____	_____	_____

20. Long term hunting expenditures for items purchased over the last 12 months only and used for the purposes of deer hunting or management related to this trip\*.

	<u>Total Expense</u>	<u>Town or County of purchase</u>	<u>State</u>	<u>Days Used last12 months</u>
<u>dog training</u>	_____	_____	_____	_____
<u>feeder</u>	_____	_____	_____	_____
<u>feeder feeds (e.g., corn)</u>	_____	_____	_____	_____
<u>food plot equipment</u>	_____	_____	_____	_____
<u>food plot fertilizer, lime</u>	_____	_____	_____	_____
<u>food plot seed</u>	_____	_____	_____	_____
<u>salt/mineral blocks</u>	_____	_____	_____	_____

21. For residents of Mississippi only, given the hypothetical situation that you would not be able to hunt white-tailed deer in Mississippi, what percent of the money you currently spend per year in Mississippi would then be spent out-of-state to hunt white-tailed deer or participate in any other activity (hunting or non-hunting related)?

\_\_\_\_\_ PERCENT I WOULD SPEND OUT OF STATE

22. What is the highest educational level you have attained? (Please circle only one)

- |   |                  |   |                                 |
|---|------------------|---|---------------------------------|
| 1 | SOME HIGH SCHOOL | 5 | SOME GRADUATE WORK              |
| 2 | HIGH SCHOOL      | 6 | MASTER'S DEGREE                 |
| 3 | SOME COLLEGE     | 7 | DOCTORAL OR PROFESSIONAL DEGREE |
| 4 | COLLEGE GRADUATE |   |                                 |

23. Which of the following best describes your total household income before taxes? (Please circle only one)

- |   |                      |    |                      |
|---|----------------------|----|----------------------|
| 1 | Under \$10,000       | 7  | \$60,000 to \$69,999 |
| 2 | \$10,000 to \$19,999 | 8  | \$70,000 to \$79,999 |
| 3 | \$20,000 to \$29,999 | 9  | \$80,000 to \$89,999 |
| 4 | \$30,000 to \$39,999 | 10 | \$90,000 to \$99,999 |
| 5 | \$40,000 to \$49,999 | 11 | \$100,000 and ABOVE  |
| 6 | \$50,000 to \$59,999 |    |                      |

24. What is your age? \_\_\_\_\_ YEARS

25. What is your ethnic background? (Please circle only one)

- |   |                                   |
|---|-----------------------------------|
| 1 | ASIAN OR PACIFIC ISLANDER         |
| 2 | BLACK OR AFRICAN AMERICAN         |
| 3 | HISPANIC                          |
| 4 | NATIVE AMERICAN OR ALASKAN NATIVE |
| 5 | WHITE OR ANGLO                    |
| 6 | OTHER (Please describe: _____)    |

26. What is your gender?

- |   |        |
|---|--------|
| 1 | MALE   |
| 2 | FEMALE |

27. Date questionnaire filled out: \_\_\_\_\_, 2004

28. Was this survey filled out by whom it was addressed to?

- |   |     |
|---|-----|
| 1 | YES |
| 2 | NO  |

*Your contribution of time to this study is greatly appreciated. Please return your completed questionnaire in the postage paid business reply envelope as soon as possible. Thank You.*

## **APPENDIX B**

### **COVER LETTER FROM FIRST MAILING THAT ACCOMPANIED SURVEY**



Appendix B. Cover letter from first mailing that accompanied survey.



February x, 2004

**Mississippi State**  
UNIVERSITY

Department of Forestry  
Box 9681  
Mississippi State, MS 39762-9681

Dear Hunter:

We are requesting your help. We are seeking information about a specific hunting trip you made during the 2003/2004 white-tailed deer hunting season in Mississippi that you considered a typical white-tailed deer hunting trip for yourself. It is part of a study conducted by Mississippi State University examining the economic impacts of white-tailed deer hunting in Mississippi and its respective counties.

Your name was randomly drawn from a list of hunters provided by the Mississippi Department of Wildlife, Fisheries & Parks. It is important that each questionnaire be completed and returned so the results will accurately represent the responses of all hunters. Please take 20 to 30 minutes of your time to complete the enclosed questionnaire. If you choose to fill out the questionnaire, please know that your participation is voluntary, you may stop at any time and you do not have to answer any questions. The study results will be used to document the importance of hunting to Mississippi.

**You may be assured of complete confidentiality.** The return envelope has an identification number for processing purposes only. It will be used to remove your name from the mailing list when you return your questionnaire. Your name will never be placed on the questionnaire or associated with any of the responses.

I appreciate your willingness to take part in this study. If you should have any questions, please contact me at (662) 325-4153, email: [sgrado@cfr.msstate.edu](mailto:sgrado@cfr.msstate.edu) or write me at Department of Forestry, Box 9681, Mississippi State, MS 39762-9681. For additional information regarding human participation in research, please feel free to contact the MSU Regulatory compliance Office at (662) 325-0994. Thank you in advance for your cooperation with this study.

I ask that you please return your questionnaire in the enclosed self-addressed stamped envelope before **February x, 2004**.

Sincerely,

A handwritten signature in cursive script that reads 'Stephen C. Grado'.

Stephen C. Grado  
Associate Professor  
Human Dimensions & Conservation Law Enforcement Laboratory

**APPENDIX C**  
**REMINDER/THANK YOU POSTCARD SENT ONE WEEK AFTER FIRST**  
**MAILING**

Appendix C. Reminder/thank you postcard sent one week after first mailing.

February x, 2004

About a week ago, we mailed you a questionnaire seeking information about a specific hunting trip you made during the 2003/2004 white-tailed deer hunting season in Mississippi that you considered a typical white-tailed deer hunting trip for yourself. I got your name from the Mississippi Department of Wildlife, Fisheries & Parks.

If you have already completed and returned your questionnaire, please accept my sincere thanks. If not, please do so today. It is extremely important that you return your questionnaire if the results are to accurately represent the value of white-tailed deer hunting to Mississippi and its county economies.

**If you did not receive a questionnaire, or it got misplaced, please call me today at 662 325-2792 and I will put one in the mail immediately.**

Sincerely,

Stephen C. Grado  
Associate Professor

**APPENDIX D**

**SECOND MAILING (TWO WEEKS AFTER POSTCARD) COVER LETTER  
THAT ACCOMPANIED SURVEY FOR HUNTERS THAT HAD NOT YET  
RESPONDED**

Appendix D. Second mailing (two weeks after postcard) cover letter that accompanied survey for hunters that had not yet responded.



Mississippi State  
UNIVERSITY

Department of Forestry  
Box 9681  
Mississippi State, MS 39762-9681

March 31, 2004

John Doe  
123 Buck Drive  
Fawn, MS 30759

Dear John:

About three weeks ago, I wrote to you seeking information about a specific hunting trip you made during the 2003/2004 white-tailed deer hunting season in Mississippi that you considered a typical white-tailed deer hunting trip for yourself. As of today, I have not received your completed questionnaire.

The number of questionnaires completed so far is very encouraging, but your response may provide valuable information that I have not received. It is important that each questionnaire be completed and returned so the results will accurately represent the responses of all hunters. The study results of will be used to document the importance of hunting to Mississippi.

In case my first letter did not reach you, I have enclosed a replacement questionnaire. I ask that you take a few minutes and complete the questionnaire and return it in the postage-paid reply envelope by **April 14, 2004**.

I appreciate your willingness to take part in this study. If you should have any questions, please contact me at (662) 325-4153, email: [sgrado@cfr.msstate.edu](mailto:sgrado@cfr.msstate.edu) or write me at Department of Forestry, Box 9681, Mississippi State, MS 39762-9681. For additional information regarding human participation in research, please feel free to contact the MSU Regulatory compliance Office at (662) 325-0994. Thank you for your cooperation with this study.

Sincerely,

A handwritten signature in cursive script that reads "Stephen C. Grado".

Stephen C. Grado  
Associate Professor  
Human Dimensions & Conservation Law Enforcement Laboratory