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Economic Impacts of Fishing, Hunting, and Wildlife-Associated Recreation Expenditures across the U.S. South

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Economic impacts of fishing, hunting, and wildlife-associated recreation expenditures across the U.S. South

By

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Fishing, hunting and wildlife-associated recreation expenditures have played an important role in the U.S. economy. The 2006 U.S. Fish and Wildlife Service survey reported 87.5 million people participated in wildlife-associated recreation activities, spending $122.4 billion on trips and equipment in U.S. Periodic assessment of economic impact of wildlife associated recreation provides a consistent perspective for forest and wildlife resource management. This research used input-output analysis to evaluate the economic impacts of wildlife associated recreation expenditures in the U.S. South. IMPLAN models were developed for each state to determine the direct, indirect and induced effects of these expenditures. The comparison revealed the differences in the individual states' economies and levels of expenditures and illustrated the importance of understanding intra-regional variations in establishing wildlife programs and policies. Overall, this study shows that wildlife associated recreation expenditures had larger economic multiplier than of the other forest based industries in the U.S. South

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DEDICATION

I would like to dedicate this work to my family and friends who always provided me with great inspiration, encouragement and motivation in my life.

Thank you all!!

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CHAPTER I

GENERAL INTRODUCTION

1.1 Wildlife Associated Recreation

Consumptive and non-consumptive wildlife associated recreation has been attracting increasing numbers of people globally and generating growing economic benefits supporting wildlife conservation and rural and local communities (Duffus and Dearden, 1990; Fennell and Weaver, 1997; Higginbottom, 2004; Hvenegaard et al., 1989; Ingram and Lewandrowski, 1999; Manfredo et al., 2003; Shackley, 1996). Each year millions of Americans participate in wildlife associated recreational activities such as hunting, fishing and wildlife watching. The 2006 U.S Fish and Wildlife Service (USFWS) survey reported 87.5 million people aged 16 and above participated in wildlife associated recreation activities in United States, spending $122.4 billion on trips and equipment. This spending represents a 13 percent increase since 2001. The recently released 2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation reports $145 billion in expenditures on trips and equipment, which is an 18.5 percentage increase since 2006 and a 34.25 percentage increase from 2001. The demand for wildlife associated recreation is positively correlated with income and population (Ingram and Lewandrowski, 1999). However, wildlife is often most abundant far from major urban areas. Wildlife recreation can make a substantial economic contribution to rural areas (Goodwin, 1998) if these communities provide wildlife recreation related goods and

services, thereby capturing a large part of the recreation expenditures as this helps create jobs and income (Ingram and Lewandrowski, 1999; Benson, 2001). Innovative approaches that can help improve our understanding of the importance of wildlife recreation to human welfare and identify the social and economic benefits derived from the sustainable flow of wildlife associated recreational goods and services are becoming a policy necessity. As urban areas continue to expand, it is critical to identify the wildlife related goods and services that support economic development and how wildlife-associated recreation can help rejuvenate rural economies. Wildlife associated recreation expenditures can provide a considerable source of income and employment in both manufacturing and services sectors when the local economy responds to final demand changes for equipment and trip related goods and services. Wildlife associated recreation is attracting increasing interest from governments, industries, public organizations and researchers because of its economic benefits and impacts (Higginbottom, 2004; Saayman et al., 2011).

1.2 Economic impact of fishing, hunting and wildlife watching recreation expenditures

In 1991, 108.7 million people in the United States participated in some form of wildlife associated recreation activity spending $59 billion on trips and equipment (USDOI, 1991). Every five years, U.S Department of the Interior conducts the survey of hunter, anglers and wildlife viewers across the Nation. In 1996, 77 million people spent $101 billion on trips and equipment (USDOI, 1996). During that five year period, the number of participants decreased; however, there was a considerable increase in expenditures. This trend of increasing expenditures continued as indicated in the 2001,

2006, and 2011 survey reports[1]. These surveys report hunting, fishing and wildlife watching expenditures at the National and state levels and at different sub-activity levels, such as freshwater fishing, saltwater fishing, big game hunting, small game hunting, migratory bird hunting and other small animal hunting. There are very few economic impact analyses of these activities and their sub-activities at different geographical scales. Steinback et al., (2004) estimated the economic impact of recreational saltwater fishing in the U.S. Allen and Southwick, (2008) estimated the economic impact of freshwater and saltwater fishing in the U.S. There are several studies at the state level for hunting, elk hunting in Idaho (Cooper et al., 2002) and waterfowl hunting in Mississippi (Grado et al., 2001). At the regional level, Burger et al., (1999) estimated the economic impact of northern bobwhite in the South and Munn et al., (2010) estimated the economic impact of hunting, fishing and wildlife associated recreation expenditures in the South. These studies either focused on the state level or regional level and on different wildlife-associated recreational activities or their sub-activities. Research comparing the economic impact of hunting, fishing and wildlife watching expenditures across multiple states is lacking. An analysis of wildlife-associated recreation expenditures for the 13 U.S. southern states will allow for an understanding of the variation of expenditures between the states and for different activities, particularly when indirect and induced effects are considered. Hence, an assessment of wildlife-associated recreation expenditures and their economic impacts provides a greater appreciation of the economic benefits of state and

[1] 2001, 2006 and 2011 survey reports are publicly available at http://www.census.gov/prod/www/fishing.html

federal regulations and related management activities that advance wildlife habitat management and promote wildlife-associated recreational activities.

This research uses IMPLAN models to estimate the economic impact of hunting, fishing and wildlife watching activities and expenditures in terms of employment, total output, value-added, total income and personal income, using the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation report expenditure data. As outlined in subsequent chapters, this study addresses an important knowledge gap which provides a perspective on the importance of wildlife-associated recreation expenditures to individual states' economies and the total economic impact of these activities. The overall research objectives include the following:

1. Assess the economic impact of fishing expenditures and its sub-activities across the Southern states (Chapter 2).
2. Assess the economic impact of hunting expenditures and its sub-activities across the Southern states (Chapter 3).
3. Assess the economic impact of wildlife watching expenditures across the Southern states (Chapter 4).

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CHAPTER II

ECONOMIC IMPACT OF RECREATIONAL FISHING EXPENDITURES ACROSS THE SOUTHERN STATES

2.1 Abstract

Recreational fishing is enjoyed by many people, plays an important role in the U.S. economy, and helps promote conservation and environmental goals. The 2006 U.S. Fish and Wildlife Service (USFWS) survey reported 30 million anglers fished 516.8 million days in the United States, spending $42 billion on fishing trips and equipment during the year. There is an increased demand for recreational fishing-related goods and services as the number of anglers has increased and more money has been spent in recent years. Periodic assessment of the economic impact of the expenditures generated by these fishing activities and related sub-activities provides a greater appreciation for fishery and natural resource management programs and policies over time. This study used input-output (social accounting matrix multiplier) analysis to evaluate the economic impacts of recreational fishing expenditures across the thirteen states in the U.S. South[2] . IMPLAN models were developed for each state to determine the direct, indirect and induced effects of these expenditures. This approach allowed for a comparison of the relative importance

[2] Southern U.S includes: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Virginia.

of recreational fishing expenditures to the various southern states. In particular, the comparison revealed how differences in the individual states' economies and levels of expenditures affect the total economic impacts of recreational fishing activities. Differences in the impacts of various recreational activities, both among activities and among states, illustrate the importance of understanding intra-regional variations in establishing recreational programs and policies.

2.2 Introduction

Fishing is an important recreational activity for many people and it also contributes to the economy. In 2006, 30 million anglers fished 516.8 million days in the United States spending $42 billion on fishing trips and equipment during the year (USDOI, 2006). This spending is a 4 percent increase since 2001. Out of these total anglers, 25.4 million freshwater anglers spent $26.3 billion and 7.7 million saltwater anglers spent $8.9 billion on fishing trips and equipment (USDOI, 2006). Nature-based recreation is attracting increasing interest from governments, industries, public organizations and researchers because of its economic benefits and economic impacts (Saayman, 2011; Higginbottom, 2004). Most recreational expenditures occur in rural communities and these communities capture a large part of the spending by providing goods and services related to these types of recreation (Ingram and Lewandrowski, 1999). Fishing expenditures generated substantial income and employment in a wide range of manufacturing, transportation, and service sectors; from retail and services providing goods and services to freshwater and saltwater anglers, to manufacturing and transportation firms supplying the affected industries (Steinback et al., 2004). Along with substantial direct fishing expenditures, indirect and induced effects arise when industries

respond to provide good and services for anglers. Direct effects occur when anglers spend money to buy fishing equipment at retail stores (e.g. purchases of baits, hooks, ice, lines and leaders, etc.) and services for fishing business (e.g. food, lodging, transportation, rental vehicles, fees, etc.). Indirect effects are initiated by the directly impacted industry (i.e., retail and service stores) making purchases from local companies in order to create their product (e.g., the retailer purchases fishing rods from the manufacturers and pays electric bills). When these industries make local purchases from other local industries, the rounds of indirect effects continue until all indirect effects are derived from industries outside the region. Induced effects are generated as a result of employees in the directly and indirectly impacted industries spending their wages on locally produced goods and services (e.g., employee spending for lunch in local restaurant, paying federal and state taxes, etc.). The final demand (total impact or gross output) is the value of production required to meet the needs of an order or the demand for a product. It is the summation of direct, indirect and induced effects.

In 2000, recreational saltwater fishing generated over $30.5 billion in sales, nearly $12.0 billion in income, and supported nearly 350,000 jobs nationwide (Steinback et al., 2004). The American Sportfishing Association (ASA), 2007 reported that nearly 40 million anglers generated $45 billion in retail sales with a $125 billion impact, creating more than 1 million jobs nationwide in 2006 (Southwick and Allen, 2007). Similarly, freshwater and saltwater fishing generated total output impacts of $87 billion and $30 billion, creating 709 thousand and 263 thousand jobs, respectively (Southwick and Allen, 2007). At the regional level, Munn et al.(2010) estimated that $21.4 billion in total output impact was generated by fishing expenditures in the southern U.S., impacting

163,541 jobs. Of these total fishing impacts, freshwater and saltwater fishing generated $14.89 and $7.43 billion in gross output, impacting 109 and 63 thousand jobs respectively (Munn et al., 2010). Several studies have estimated the economic impact of fishing expenditures to quantify and evaluate the economic activities such as sales, income, employment, value-added, etc. These studies are focused on a county level (e.g., Schorr et al., 1995; Ditton et al., 1980), specific states (e.g., Bell et al., 1983), multistate regions (e.g., Talhelm, 1988) and on regions of various sizes and activities (e.g., Steinback, 1999; Pickton and Sikorowski, 2004; Hussain at al., 2012). Some literature evaluating recreational fishing expenditures at the different levels exists; however, research comparing the economic impacts of fishing expenditures and its sub-activities expenditures across states is lacking. This gap is an important problem because the variation between states can be substantial, particularly when indirect and induced effects are considered. Hence, periodic assessment of economic impacts associated with fishing expenditures provides a consistent perspective over time for the formulation of state and federal regulations and related management activities pertaining to recreational fishing, as these actions affect revenue, taxes, employment and income. In particular, the comparison documents which industries are directly and indirectly linked to fishing activities and illustrates how differences in the individual states' economies and levels of expenditures affect the total economic impacts of fishing-related activities. Differences in the impacts of fishing activities, both among activities and among states, illustrate the importance of understanding intra-regional variations in establishing recreational fishery related programs and policies.

This study focused on fishing expenditures and its sub-activities (saltwater and freshwater fishing) in the southern U.S. With regards to angler expenditures, two southern states, Florida and Texas, ranked first and second in the nation and South Carolina and North Carolina ranked in the top 10 (USDOI, 2006). Fishing expenditures in the Southeast U.S region accounted for 38% of the overall U.S fishing expenditures (Munn et al., 2010). Land in the southern U.S is also largely privately owned (Birch, 1996; Hussain et al., 2012). These features likely induce different expenditure patterns and consequently different regional economic impacts. Because the Sustainable Fisheries Act requires U.S federal regulators to recognize and assess the impacts of management actions on communities and fishery-dependent and independent business (Steinback, 1999). Thus, an economic impact analysis of recreational fishing expenditures can provide insights into the potential impacts to local economies of fisheries management and how government fisheries programs and policies can stimulate rural economies. This study compares the economic impact of fishing expenditures among the thirteen southern states using the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation data and 2009 IMPLAN data. This study also establishes baseline information so that changes over time can be documented.

2.3 Methods

Economic impact analysis is a useful tool for understanding the financial impacts of the sales and purchases of goods and services between the various industrial sectors of the economy. Input–output (I–O) modeling is a commonly used approach for performing economic impact analysis (Steinback, 1999). Economic impact analysis models the inter-

industries linkages and quantifies the net economic impact by adjusting for leakages induced by regional trade, taxes and savings (Leontief, 1986). This technique has increasingly been utilized to estimate the contributions of wildlife-related activities (e.g. recreational fishing expenditures) to local economies (Upneja et al., 2001; Southwick, 2008; Goldman et al., 1998; Hussain et al., 2008; Munn et al., 2010). IMPLAN (IMpact analysis for PLANning), a widely accepted economic input-output analysis software, was used to estimate economic impacts of recreational fishing expenditures across the southern United States. IMPLAN was originally developed by the U.S. Forest Service, the Federal Emergency Management Agency and the U.S.D.I. Bureau of Land Management for land and resource management planning (IMPLAN V3 Manual, 2009). IMPLAN databases are available at the national, state, congressional district, county, and zip code levels and include employment, earnings, total output, value-added, tax impacts, and economic multipliers. These economic databases are based on data collected by the U.S. Department of Commerce from 440 industry sectors[3]. To identify the economic impact of fishing expenditures, IMPLAN models were constructed for each southern state using 2009 IMPLAN data and 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation data to determine the direct, indirect, induced and total effects of these expenditures by estimating major economic indicators such as employment (full-and part-time jobs), total income, personal income, total output and value-added (in millions of dollars). Freshwater and saltwater fishing activities each have unique equipment, trip related and other expenditures impacting different industry sectors

[3] IMPLAN V3 Reference Manual provides complete details on data and methodology.

across the southern states. So each of the thirteen state IMPLAN models needed to be simulated separately using freshwater and saltwater fishing expenditures. To be compatible with the 2009 IMPLAN database, 2006 expenditure dollars were inflated to 2009 dollars, and after simulation, results were deflated to 2006 dollars for reporting purposes using IMPLAN-provided deflators.

A social accounting matrix (SAM) captures the actual dollar amount of all transactions between businesses and institutions taking place in a regional economy in a year. It shows the current structure of the local economy. For example, a SAM multiplier of 1.80 for total output indicates that for every $1 of direct impact generates additional 0.80 cents in the economy. Similarly, a SAM multiplier of 1.80 for employment indicates that for every direct job created, 0.80 additional jobs will be generated in the economy. Multipliers are calculated using the direct, indirect, and induced effects generated by the original activity in the sector (Minnesota IMPLAN Group 2009).

2.4 Results

2.4.1 Economic impacts by all fishing expenditures

Expenditures incurred by anglers in the southern states as derived from the 2006 National Survey and total economic impacts associated with these expenditures are reported in Table 2.1 and Table 2.2 respectively. In the region, anglers spent $16.1 billion (39.6% of total national expenditures) for fishing activities (Table 2. 1), out of which $8.4 billion (34% of total national expenditures) was spent on freshwater fishing and $5 billion (57% of total national expenditures) was spent on saltwater fishing activities. This $16.1 billion spent on goods and services for fishing activities generated direct economic impacts of $10.7 billion in output and 157,407 full- and part-time jobs.

These direct impacts in turn generated indirect impacts of $5.3 billion in output and 33,337 full- and part-time jobs and induced impacts of $9.3 billion in output and 80,098 full- and part-time jobs. The total impact due to fishing expenditures is $25.3 billion in output and 270,842 full- and part-time jobs, indicating a SAM multiplier of 2.37 for total output and 1.72 for total employment (Table 2.2). Of the total impact, 58% or $14.6 billion is value-added by the industries related to fishing activities.

To provide a perspective on the economic impact of fishing expenditures and its sub-activities (saltwater fishing and freshwater fishing) across the thirteen southern states, Table 2.3 reports employment, total income, personal income, total output and value-added and Table 2.4 reports these same results as a percentage of the state economy. Total output due to fishing expenditures in the southern regional economy was 0.31% of the region's total output and 0.47% of employment. Similarly, saltwater and freshwater fishing expenditures expressed in absolute terms and as a percentage of the southern region's economy generated $8.5 billion (0.10%) and $14.8 billion (0.18%) in total output and 82,443 (0.14%) and 131,414 (0.23%) full- and part-time jobs, respectively[4].

At the state level, there was considerable variation with respect to employment and value-added for fishing activities (Table 2.3 and Table 2.4). Fishing-related employment ranged from 70,013 jobs (0.72% of state employment) in Florida to 3,532 (0.24% of state employment) in Mississippi. Value-added generated by fishing ranged

[4] Total output generated from freshwater and saltwater fishing expenditures does not added up to total output from all fishing expenditures because of multiple response (those who fished in saltwater and freshwater appear in both of these totals) and non-response (some respondents did not or could not answer the question).

from $3.9 billion (0.55% of state value-added) in Florida, to $138 million (0.15% of state value-added) in Mississippi. In contrast, fishing accounted for a higher share of state employment (0.94%) and value-added (0.70%) in South Carolina than in other states in the region.

2.4.2 SAM multiplier for fishing activities

SAM multipliers for employment, total income, personal income, total output and value-added varied considerably across the states (Table 2.5). Florida had the largest employment multiplier (1.76) whereas Arkansas (1.31) had the smallest. Employment multipliers averaged 1.5 across the thirteen southern states. Similarly for other economic indicators, the total income multiplier ranged from 2.26 in Georgia to 1.61 in Oklahoma and averaged 1.90 across the individual states in the region. Personal income multipliers ranged from 1.94 in Georgia and Texas to 1.48 in Mississippi, averaging 1.70 for the states in the region. Total output multipliers ranged from 2.17 in Texas to 1.57 in Arkansas. The average state multiplier for total output is 1.84. Value- added multipliers ranged from 2.21 in Georgia to 1.58 in Mississippi. The average state multiplier for value-added is 1.86.

2.4.3 Economic impacts by freshwater and saltwater fishing activity

There were substantial differences in the expenditure patterns between saltwater and freshwater fishing as different types of equipment are required and different locations are involved. Fishing sub-activities results are reported in Table 2.3. The $8.4 billion spent by anglers for the freshwater fishing activities generated, after accounting for leakages, a direct economic impact of $6.7 billion in output and 74,912 full- and part-

time jobs. These direct impacts resulted in indirect impacts of $4.3 billion in output and 23,566 full- and part-time jobs and induced impacts of $3.8 billion in output and 32,936 full- and part-time jobs. Total impacts due to freshwater fishing expenditures were $14.8 billion in output and 131,414 full- and part-time jobs, indicating a SAM multiplier of 2.20 for total output and 1.75 for employment. Similarly, the $5.06 billion spent by anglers for the saltwater fishing activities generated direct economic impacts of $3.7 billion in output and 47,987 full- and part-time jobs. These impacts resulted in indirect impacts of $2.2 billion in output and 13,109 full- and part-time jobs and induced impacts of $2.4 billion in output and 21,347 full- and part-time jobs.

Total impacts due to saltwater fishing expenditures were $8.5 billion in output and 82,443 full- and part-time jobs, indicating a SAM multiplier of 2.26 for total output and 1.72 for employment. Of the total impacts resulting from freshwater fishing expenditures, 48.7% or $7.2 billion represented value-added by the industries related to freshwater fishing activities. Similarly, of the total impacts resulting from saltwater fishing expenditures, 51.1% or $4.3 billion represented value-added by the industries related to saltwater fishing activities.

At the state level, there was considerable variation among states with respect to employment and value-added for the freshwater and saltwater fishing activities (Table 2.3, Table 2.4). In four states saltwater fishing expenditures are not reported in the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation as these states do not have coastal areas. In terms of employment impact generated by freshwater and saltwater fishing expenditures, Texas had the most freshwater fishing related employment (28,310 jobs; 0.20% of state employment) in the thirteen southern states whereas Florida

had the most salt-water related employment (35,951 jobs; 0.37% of state employment). Alternatively, Mississippi had the least employment generated by both freshwater (2,336 jobs; 0.16% of state employment) and saltwater (502 jobs; 0.03% of state employment) fishing activities in the region. However, as a percentage of state employment, fishing accounted for 0.36% of state employment in Arkansas but only 0.12% in Virginia.

Value-added generated by the freshwater fishing expenditures ranged from $1.5 billion (0.12% of state value-added) in Texas to $92.4 million (0.10% of state value-added) in Mississippi. As a percent of the state total, value-added from freshwater fishing expenditures was greatest in Kentucky, Oklahoma and South Carolina with a 0.21% share. For saltwater fishing activities, the share of total state employment is largest in Florida (0.37%) and lowest in Georgia (0.02%). Value-added generated by the saltwater fishing expenditures ranged from $1.8 billion (0.26% of state value-added) in Florida, to $18.7 million (0.02% of state value-added) in Mississippi. Florida (0.26%) and South Carolina (0.23%) ranked first and second with respect to value-added as percentage of state value-added, whereas in other states value-added from saltwater fishing accounted for a substantially smaller share of total value-added.

2.4.4 SAM multiplier for fishing sub-activities

Multipliers for the freshwater and saltwater fishing activities also varied. Florida had the largest employment multipliers for the both freshwater (1.75) and saltwater activities (1.69) whereas Arkansas had the lowest (1.34) for freshwater fishing and Mississippi had the lowest (1.37) for saltwater fishing activities. For all other economic indicators, Texas had the largest multipliers and Mississippi had the lowest (Table 2.6 and 2.7).

2.5 Discussion and conclusion

Fishing and its sub-activities have an important role in natural resource management as they provide a source of income and employment in a wide range of industrial sectors where anglers spend money for fishing equipment and trip related activities. Identifying the contribution of fishing expenditures to regional and state economies is important because it illustrates how fishing expenditures can boost economic development and can help justify government investment in recreational fisheries management and related infrastructure projects. This study estimated the economic impact of fishing and its sub-activity (salt and freshwater) expenditures across the southern states using input-output techniques with IMPLAN software and data.

Fishing expenditures in the U.S South accounted for at least 39.7% of overall U.S fishing expenditures. This relationship to total US expenditures holds true for fishing sub-activities as well. Freshwater and saltwater fishing accounted for 34% and 57% respectively of all U.S expenditures for these categories. In 2006, anglers spent $16.1 billion for recreational fishing activities, which resulted in US$25.3 billion in total output impact in the regional economy, with a SAM multiplier 2.37. The average state multiplier for total output is 1.84. This average state multiplier value is not substantially different than other forest-based industries estimated by (Tilley and Munn, 2007) in the Southeast U.S., such as lumber and wood products (1.82), wood furniture (1.78) and paper and allied products (1.57). Each additional job generated by initial spending creates more jobs. Total employment generated by fishing expenditures is 270,842 indicating a SAM multiplier of 1.72. The average state employment multiplier is 1.50. However, this employment multiplier is smaller than other forest-based industries (wood furniture: 1.70;

lumber and wood products: 2.11 and the paper and allied products: 2.54) as reported by (Tilly and Munn, 2007). This comparison illustrates the fact that fishing-related output has similar impacts than outputs of equal size from other forest-based industries. However, these impacts may be more when considered with nonmarket nature of fisheries resources. The economic impacts of recreational fishing estimated in this study provide important information for government agencies responsible for fisheries management. However, periodic assessment of the economic impact of freshwater and saltwater fishing expenditures should be documented as the economy changes overtime.

The SAM multipliers for other key economic indicators of the regional economy vary substantially. Consider, for example, labor income (2.35), total income (2.04), value-added (2.30) multiplier values. These multipliers indicate that total value paid to local workers within a region by the industries that provide good and services for fishing activities have substantial impacts on other sectors of the economy. Moreover, SAM multipliers for employment, total income, personal income, value-added and total output do not vary substantially between fishing sub-activities (freshwater and saltwater fishing). This suggests that both, saltwater and freshwater fishing activity generated similar indirect and induce impacts in southern region. However, SAM multipliers for the broad fishing activity and the fishing sub-activities varied. For example, employment multipliers for freshwater fishing activity are greater than saltwater fishing or all fishing activity combined. This suggests that people are more dependent on fresh water fishing activities and this validates the fact that large numbers of people participate in freshwater angling as compared to saltwater as reported by 2006 National survey report. Fifty-eight percent of the total output resulting from fishing-related activities consisted of value-

added. Similarly, for freshwater fishing and saltwater fishing, value-added accounts for 48.74% and 51.45% of their respective total output. This means all fishing activities combined generates more wealth than freshwater and saltwater activities with respective to their expenditures. This is understandable because of difference in total expenditures at broad activity level and sub-activity level as reported in 2006 National survey reports.

At the state level, the economic impact of fishing expenditures varied greatly. The two states with the largest fishing-related economic impacts as measured by fishing-related employment were Florida (70,013.30; 0.72%) and Texas (45,840; 0.33%), whereas the two smallest fishing-related impacts as measured by total employment are Mississippi (3,532.20; 0.24%) and Arkansas (7,281.50; 0.47%). In contrast, as a percentage of total state employment, South Carolina had the largest share with 0.94% whereas Mississippi had the lowest share with 0.24%. This means that in South Carolina, fishing related activities accounted for a greater percentage of the state's jobs than in Florida despite much larger fishing related activities in that state. There were notable differences between the employment multipliers for the region and individual southern states. With the exception of Florida, all other states in the region had lower employment multipliers than the region as a whole. The average employment multiplier for the southern states was 1.50. Similarly, the multipliers for all other economic indicators for all states in the region were lower than the regional multipliers. For example, the total output multiplier for Mississippi for freshwater fishing is 1.46 which is lower than region multiplier of 1.75 and average state multiplier of 1.66. This economic multiplier is also lower than those estimated by Hutt et al. (2013) for recreational fisheries in two Mississippi reservoirs (1.86). This may be due to difference in methodology used to drive

expenditure profiles. However, this comparison illustrates that adaptations with different data sources and methodology will likely give different multiplier effects and it generally varies from county level to state level. State multipliers are generally lower than the corresponding regional multiplier is due to differences in expenditure profiles at the state and regional levels. Expenditures profiles at the regional level include more sectors and captured a large part of recreational fishing spending as compared to the individual state level. The SAM multipliers associated with all fishing activity were larger than SAM multipliers associated with sub-activities. This result is contrary with the results estimated by Munn et al. (2010). There was no substantial variation in SAM multipliers estimated by Munn et al. (2010) at broad and sub-activity level of fishing expenditures. However, results from this study show that there is substantial variation in SAM multiplier between the broad level and sub-activity level. This difference in outcomes is likely due to differences in how missing data was extrapolated from available data. This study used all the recreational data available in 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation report and only prorated the missing data with respect to national share, whereas Munn et al., 2010 prorated the southern recreation expenditure data with respect to National level. State level expenditures for some sectors were missing or were not reported but were present at the regional level (e.g., tents, special fishing clothing, cabins, membership fees etc.) Also, there are more opportunities for leakage from the economy at the individual state level (e.g., IMPLAN sector 10006-household income, 12001-State/local government spending). IMPLAN sector 1006, 12001, 11001 are categorized under institutional sectors and its spending pattern examines impacts of spending by households or government. Institutional spending does not induce demand

for inputs and result in a leakage. The value-added multiplier for the region was greater than all the individual states. This is reasonable since the size of the economy and opportunity for greater inter-industry transactions is greater in a regional economy.

In terms of employment generated at the state level by freshwater and saltwater fishing expenditures, Texas had highest employment (0.20% of state employment) generated by freshwater expenditures whereas Florida led (0.37% of state employment) on saltwater fishing expenditures. Alternatively, Mississippi had the lowest employment generated by both freshwater and saltwater fishing activities in absolute terms. However, the percentage of total state employment from freshwater fishing expenditures is 0.16% in Mississippi. In contrast, Arkansas had the highest share (0.36%) and Virginia the lowest (0.12%). Saltwater fishing related employment as a percentage of total state employment was greatest in Florida with 0.37% and lowest in Georgia with 0.02%. Florida (0.26%) and South Carolina (0.23%) ranked first and second in the region with respect to value-added as percentage of state value-added. Value-added as a percentage of the state total was substantially lower in all other states in the region. Thus, the relative importance of fishing and its sub-activities expenditures are inversely related to the overall size of a state's economy. This observation is consistent with Tilley and Munn (2001) who found similar relationship with the forest products industry in the U.S. South. However, the variations for recreational fishing were not as large as for the forest product industries. At the fishing sub-activities level, there was not substantial difference in the regional multipliers between freshwater fishing and saltwater fishing activities. However, regional output multipliers are greater for saltwater fishing expenditures than freshwater fishing expenditures. Similarly, broad fishing activity level has greater output multiplier than

fishing sub-activity level. As the size of the economy increases, there will be more inter-industrial transactions, resulting in greater multipliers. Economic impacts due to recreational fishing expenditures estimated in this study provide valuable information to recreation managers, rural economic developers, government agencies and policy makers. This information can be used to estimate the potential economic benefits of investment in recreational fisheries management and related infrastructure projects and services to anglers and other wildlife recreation activities.

Table 2.1 Expenditures incurred by anglers in the southern states in 2006.

States	Expenditures		
	Fishing[5]	Freshwater fishing	Saltwater fishing
Alabama	699,533	492,746	131,290
Arkansas	420,572	380,228	NA
Florida	4,308,582	1,131,855	2,443,802
Georgia	1,020,410	725,011	71,564
Kentucky	855,417	605,319	NA
Louisiana	1,006,137	403,899	336,943
Mississippi	240,332	188,106	31,441
North Carolina	1,124,273	515,018	450,313
Oklahoma	501,786	464,345	NA
South Carolina	1,404,132	532,287	572,143
Tennessee	599,683	553,807	NA
Texas	3,237,212	2,016,972	797,202
Virginia	733,776	415,891	234,522
Total Southern States	16,151,845	8,425,484	5,069,220
National	40,720,973	24,581,671	8,879,948
South as % of National	39.66	34	57

[5] Details do not add to total because of multiple responses or no responses.

Table 2.2 Economic Impact of fishing and its sub-activities expenditures in regional South

Expenditures	Impact Type	Employment	Personal income	Total Income	Value-added	Output	Value-added as % of total output
Freshwater Fishing	Direct Effect	74,912	2,525,124,010	1,947,707,398	2,812,993,261	6,775,393,274	41.52
	Indirect Effect	23,567	2,019,921,398	1,234,486,207	2,202,376,204	4,304,414,508	51.17
	Induced Effect	32,936	2,013,481,745	1,226,177,800	2,241,872,354	3,809,642,406	58.85
	Total Effect	131,415	6,558,527,152	4,408,371,405	7,257,241,819	14,889,450,188	48.74
	SAM Multiplier	1.7543	2.5973	2.2634	2.5799	2.1976	
Saltwater Fishing	Direct Effect	47,987	1,541,467,015	1,175,634,437	1,733,807,913	3,775,548,994	45.92
	Indirect Effect	13,109	1,097,098,785	667,328,021	1,196,484,645	2,274,150,099	52.61
	Induced Effect	21,347	1,305,299,710	794,911,710	1,453,345,806	2,469,818,157	58.84
	Total Effect	82,443	3,943,865,510	2,637,874,168	4,383,638,364	8,519,517,251	51.45
	SAM Multiplier	1.7180	2.5585	2.2438	2.5283	2.2565	
All Fishing	Direct Effect	157,407	5,555,732,876	4,408,695,847	6,394,553,424	10,703,753,792	59.74
	Indirect Effect	33,337	2,591,303,049	1,603,196,281	2,821,992,964	5,310,118,229	53.14
	Induced Effect	80,099	4,913,787,374	2,991,270,433	5,470,521,409	9,301,718,820	58.81
	Total Effect	270,843	13,060,823,299	9,003,162,561	14,687,067,797	25,315,590,841	58.02
	SAM Multiplier	1.7207	2.3509	2.0421	2.2968	2.3651	

Table 2.3 Economic impact of fishing expenditures by sub-activities across the thirteen southern states.

State	Activity Expenditures	Employment (full-and part-time jobs)	Total Income (millions of $)	Personal Income (millions of $)	Total output (millions of $)	Value-added (millions of $)
Alabama	Freshwater fishing	6,793.20	253.50	174.51	597.65	283.65
	Saltwater fishing	2,309.30	80.29	54.56	166.64	89.95
	All Fishing	11,656.60	405.89	288.27	784.70	465.46
Arkansas	Freshwater fishing	5,544.50	180.20	127.88	469.77	202.37
	Saltwater fishing	NA	NA	NA	NA	NA
	All fishing	7,281.50	240.90	174.20	491.46	276.84
Florida	Freshwater fishing	15,364.40	754.72	535.61	1,732.94	836.25
	Saltwater fishing	35,951.90	1,684.53	1,187.54	3,570.23	1,877.51
	All fishing	70,013.30	3,496.98	2,529.42	6,664.49	3,929.17
Georgia	Freshwater fishing	10,295.70	453.46	320.05	1,060.35	502.35
	Saltwater fishing	998.10	43.85	29.47	93.31	49.08
	All fishing	16,322.20	755.19	537.49	1,455.30	849.81
Kentucky	Freshwater fishing	8,230.90	300.32	222.19	782.32	333.24
	Saltwater fishing	NA	NA	NA	NA	NA
	All fishing	8,460.10	293.31	215.97	585.13	335.10
Louisiana	Freshwater fishing	5,002.40	196.04	140.44	512.11	219.17
	Saltwater fishing	4,091.30	158.28	114.93	407.28	177.47
	All fishing	13,956.70	579.38	424.22	1,196.25	657.39
Mississippi	Freshwater fishing	2,336.50	82.92	60.87	225.22	92.44
	Saltwater fishing	502.20	16.73	11.87	39.32	18.71
	All fishing	3,532.20	120.21	87.91	240.31	138.12
North Carolina	Freshwater fishing	7,140.40	290.87	212.58	696.99	323.45
	Saltwater fishing	7,263.20	279.63	197.94	605.80	312.44
	All fishing	18,257.30	770.00	549.41	1,469.44	870.24
Oklahoma	Freshwater fishing	6,262.20	292.04	178.63	613.98	322.11
	Saltwater fishing	NA	NA	NA	NA	NA
	All fishing	8,227.60	360.50	231.95	624.84	407.97
South Carolina	Freshwater fishing	7,822.30	299.63	218.59	669.58	335.20
	Saltwater fishing	8,183.10	337.69	256.17	738.18	374.71
	All fishing	22,676.70	998.07	754.11	1,880.14	1,122.27
Tennessee	Freshwater fishing	7,567.10	318.40	221.39	771.37	353.68
	Saltwater fishing	NA	NA	NA	NA	NA
	All fishing	9,900.30	424.36	304.44	843.50	480.94
Texas	Freshwater fishing	28,310.20	1,369.96	918.69	3,142.67	1,522.71
	Saltwater fishing	11,226.20	591.79	367.49	1,268.00	657.93
	All fishing	45,840.00	2,168.64	1,442.95	4,014.97	2,458.90
Virginia	Freshwater fishing	5,763.50	234.98	168.39	550.50	261.33
	Saltwater fishing	3,393.50	132.59	89.36	268.02	149.93
	All fishing	12,038.10	490.78	356.44	944.97	557.43
Regional South	Freshwater fishing	131,414.60	6,558.53	4,408.37	14,889.45	7,257.24
	Saltwater fishing	82,443.10	3,943.87	2,637.87	8,519.52	4,383.64
	All fishing	270,842.60	13,060.82	9,003.16	25,315.59	14,687.06

Table 2.4 Economic impacts of fishing expenditures by sub-activities as a percentage of the state economy.

State	Expenditures Activities	Employment	Total Income	Personal Income	Total output	Value-added
Alabama	Freshwater fishing	0.27	0.16	0.16	0.18	0.17
	Saltwater fishing	0.09	0.05	0.05	0.05	0.05
	All fishing	0.47	0.26	0.27	0.23	0.28
Arkansas	Freshwater fishing	0.36	0.20	0.20	0.23	0.21
	Salt Water fishing	NA	NA	NA	NA	NA
	All fishing	0.47	0.26	0.27	0.24	0.28
Florida	Freshwater fishing	0.16	0.12	0.12	0.15	0.12
	Saltwater fishing	0.37	0.26	0.27	0.30	0.26
	All fishing	0.72	0.53	0.58	0.56	0.55
Georgia	Freshwater fishing	0.20	0.12	0.13	0.15	0.12
	Saltwater fishing	0.02	0.01	0.01	0.01	0.01
	All fishing	0.31	0.20	0.21	0.20	0.21
Kentucky	Freshwater fishing	0.35	0.21	0.22	0.25	0.21
	Saltwater fishing	NA	NA	NA	NA	NA
	All fishing	0.36	0.20	0.22	0.18	0.21
Louisiana	Freshwater fishing	0.20	0.11	0.12	0.12	0.12
	Saltwater fishing	0.16	0.09	0.10	0.10	0.09
	All fishing	0.56	0.33	0.37	0.28	0.35
Mississippi	Freshwater fishing	0.16	0.10	0.10	0.12	0.10
	Saltwater fishing	0.03	0.02	0.02	0.02	0.02
	All fishing	0.24	0.14	0.15	0.13	0.15
North Carolina	Freshwater fishing	0.14	0.08	0.09	0.10	0.09
	Saltwater fishing	0.14	0.08	0.08	0.09	0.08
	All fishing	0.35	0.22	0.23	0.21	0.23
Oklahoma	Freshwater fishing	0.30	0.20	0.19	0.21	0.21
	Saltwater fishing	NA	NA	NA	NA	NA
	All fishing	0.39	0.25	0.25	0.21	0.26
South Carolina	Freshwater fishing	0.32	0.20	0.22	0.22	0.21
	Saltwater fishing	0.34	0.23	0.26	0.25	0.23
	All fishing	0.94	0.67	0.75	0.63	0.70
Tennessee	Freshwater fishing	0.21	0.14	0.14	0.16	0.14
	Saltwater fishing	NA	NA	NA	NA	NA
	All fishing	0.28	0.18	0.19	0.17	0.19
Texas	Freshwater fishing	0.20	0.12	0.13	0.13	0.12
	Saltwater fishing	0.08	0.05	0.05	0.05	0.05
	All fishing	0.33	0.19	0.20	0.17	0.20
Virginia	Freshwater fishing	0.12	0.06	0.06	0.08	0.06
	Saltwater fishing	0.07	0.03	0.03	0.04	0.04
	All fishing	0.25	0.13	0.13	0.14	0.14
Regional South	Freshwater fishing	0.23	0.16	0.16	0.18	0.16
	Saltwater fishing	0.14	0.10	0.10	0.10	0.10
	All fishing	0.47	0.32	0.33	0.31	0.33

Table 2.5 SAM multipliers for fishing expenditures in the U.S South.

States	Employment	Total Income	Personal income	Output	Value-added
Alabama	1.40	1.81	1.63	1.76	1.76
Arkansas	1.31	1.65	1.53	1.57	1.61
Florida	1.76	2.24	1.89	2.14	2.20
Georgia	1.66	2.26	1.94	2.11	2.21
Kentucky	1.35	1.69	1.54	1.65	1.66
Louisiana	1.60	2.07	1.79	1.92	2.02
Mississippi	1.34	1.61	1.48	1.58	1.58
North Carolina	1.58	2.01	1.79	1.94	1.97
Oklahoma	1.40	1.61	1.56	1.68	1.59
South Carolina	1.61	1.85	1.59	1.84	1.84
Tennessee	1.49	1.92	1.73	1.83	1.88
Texas	1.57	2.14	1.94	2.17	2.09
Virginia	1.37	1.85	1.63	1.76	1.82
Regional South	1.72	2.35	2.04	2.37	2.30

Table 2.6 SAM multipliers for freshwater fishing expenditures in the U.S South.

States	Employment	Total Income	Personal income	Output	Value-added
Alabama	1.41	1.82	1.69	1.59	1.81
Arkansas	1.34	1.81	1.68	1.50	1.79
Florida	1.75	2.34	1.99	1.90	2.32
Georgia	1.55	2.20	1.93	1.76	2.19
Kentucky	1.42	1.89	1.68	1.57	1.88
Louisiana	1.44	1.95	1.74	1.61	1.93
Mississippi	1.38	1.72	1.56	1.46	1.71
North Carolina	1.51	1.99	1.76	1.65	1.98
Oklahoma	1.45	1.72	1.69	1.59	1.72
South Carolina	1.47	1.82	1.62	1.63	1.81
Tennessee	1.52	2.08	1.90	1.71	2.06
Texas	1.60	2.40	2.11	1.97	2.38
Virginia	1.40	2.01	1.77	1.65	2.00
Regional South	1.52	2.10	1.87	1.75	2.08

Table 2.7 SAM multipliers for saltwater fishing expenditures in the U.S South.

States	Employment	Total Income	Personal income	Output	Value-added
Alabama	1.41	1.85	1.72	1.71	1.84
Arkansas	NA	NA	NA	NA	NA
Florida	1.69	2.30	1.97	1.99	2.27
Georgia	1.55	2.15	1.97	1.84	2.12
Kentucky	NA	NA	NA	NA	NA
Louisiana	1.45	1.97	1.74	1.62	1.94
Mississippi	1.37	1.71	1.58	1.54	1.71
North Carolina	1.50	2.01	1.81	1.76	2.00
Oklahoma	NA	NA	NA	NA	NA
South Carolina	1.51	1.81	1.58	1.65	1.81
Tennessee	NA	NA	NA	NA	NA
Texas	1.67	2.43	2.28	2.07	2.41
Virginia	1.39	2.01	1.83	1.81	1.97
Regional South	1.72	2.56	2.24	2.26	2.53

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CHAPTER III

ECONOMIC IMPACT OF HUNTING EXPENDITURES AND ITS SUB-ACTIVITIES ACROSS THE U.S SOUTH

3.1 Abstract

Millions of people participate in hunting activities in United States. These hunting activities have played an important role in the U.S. economy and help promote conservation and environmental goals. The 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (USFWS) survey reported 12.5 million people aged 16 and above participated in recreational hunting activities, spending $22.9 billion on trips and equipment. Unfortunately, very little research has been done on the economic impact of hunting and sub-activity expenditures across multiple states. Periodic assessment of economic impacts associated with hunting expenditures provides a greater appreciation of the economic benefits associated with forest and wildlife resource management. This research quantified economic impacts of hunting and its sub-activity expenditures for the thirteen states in the U.S. South by calculating total gross output, employment, total income, personal income and value-added. IMPLAN models were developed for each state using the 2006 USFWS survey data to determine the direct, indirect and induced impacts of these expenditures. The analysis computed economic impacts at broad activity levels: hunting, and at sub-activity levels: big game, small game, migratory bird and other hunting. This approach enabled comparisons of the

relative importance of recreational hunting to the various southern states. In particular, the comparison revealed how differences in the individual states' economies and levels of expenditures affect the total economic impacts of hunting activities. Differences in the impacts of various hunting activities, both among activities and among states, illustrate the importance of understanding intra-regional variations in establishing wildlife programs and policies.

3.2 Introduction

Every year, millions of people participate in hunting activities in United States. Wildlife-associated recreational services are increasingly being recognized for the benefits they can provide to local economies. In 2006, 12.5 million people participated in hunting activities in the United States spending over $22.9 billion on hunting trips and equipment during the year (USDOI, 2006). Big game hunting is the most popular type of hunting with 10.7 million big game (e.g., deer and elk) hunters spending $11.8 billion on trips and equipment. Similarly, there were 4.8 million small game (e.g., squirrels and rabbits) hunters spending $2.4 billion on trips and equipment, and 2.3 million migratory bird hunters spending $1.3 billion on trips and equipment[6]. Hunters spent $207.8 million on trips and equipment for hunting other animals (e.g., groundhogs, raccoons, foxes and coyotes). Hunting equipment such as guns, ammunitions, and telescopic sights composed 50% of all equipment purchases, whereas land leasing and ownership for hunting accounted for 19% of all hunting-related expenditures. In 1996, 14 million people participated in hunting activities spending $20.6 billion on hunting trips and equipment.

[6] Complete data on the numbers of hunters and their expenditures are reported in 2006 National survey of fishing, hunting and wildlife-associated recreation.

Trip related spending comprised 25 percent of that total. In 2001, 13 million people spent $20.6 billion on hunting trips and equipment. Participation in hunting activities decreased and spending was also decreased by 12 percent in absolute term since 1996. This trend continued in 2006. However, in 2011, National Survey of Fishing, Hunting and Wildlife-Associated Recreation reports 13.7 million people participated in hunting activities spending $33.7 billion on trips and equipment. The number of hunters increased by 9 percent and expenditures were increased by 29% in absolute term since 2006. Most hunting activities occur in the southern United States and generate economic benefits for rural communities (Burger et al., 1999; USDOI, 2006). Rural communities capture a large part of the associated spending by providing goods and services related to wildlife recreation (Ingram and Lewandrowski, 1999; Benson, 2001). These hunting expenditures can have a significant direct impact on an economy. However, there are other indirect and induced impacts that arise from expenditures for hunting-related goods and services.

Direct effects occur when hunters spend money to buy hunting equipment at retail stores (e.g., purchases of firearms, ammunition, bows, arrows, etc.) and services (e.g., food, lodging, transportation, rental vehicles, fees, etc.). Indirect effects are initiated by the directly impacted industry (e.g., retail and service stores) making purchases from local companies in order to create their product (i.e. the retailer purchases bows and arrows from the manufacturers and pays electric bills). When these industries make local purchases from other local industries the rounds of indirect effects continue until all indirect effects are derived from outside the region of industries. These out of region purchases are called leakages. Induced effects are generated as a result of employees in the directly and indirectly impacted industries spending their wages on locally produced

goods and services (i.e., employee spending for lunch in local restaurant, paying federal and state taxes, etc.). The final demand (total impact or gross output) is the value of production required to meet the needs of an order or the demand for a product. It is the summation of direct, indirect and induced effects. Several studies have estimated the economic impact of hunting expenditures to quantify and evaluate the economic activities by estimating sales, income, employment, and value-added. For example, Burger et al. (1999) estimated the economic impact of northern bobwhite hunting in the southern states and found that economic activity associated with northern bobwhite hunting was significant in rural areas. Similarly, Cooper et al. (2002) estimated the economic impact of elk hunting expenditures in Idaho and found that elk hunting expenditures provide $218 million in personal income and supported 1,424 jobs. Grado et al. (2001) analyzed the economic impact of waterfowl hunting in Mississippi and found that waterfowl hunting generated $27.4 million in total output and supported 512 jobs. Studies typically focused at the state level (e.g., Grado et al., 2001; Cooper et al., 2002; Pickton and Sikorowski, 2004; Hussain et al., 2008; Henderson et al., 2010; Grado et al., 2011) or the regional level (e.g., Burger et al., 1999; Munn et al., 2010; Hussain et al., 2012).

Although there are some studies evaluating hunting expenditures at various geographical and activity levels, research comparing the economic impacts of hunting expenditures and its sub-activities expenditures across states is lacking. This gap is an important problem because the variation between states can be substantial, particularly when indirect and induced effects are considered. Hence, periodic assessment of economic impacts associated with hunting expenditures provides a greater appreciation of

the economic benefits for the formulation of state and federal regulations and related management activities pertaining to recreational hunting, as these actions affect revenues, taxes, employment and income. In particular, the comparison reveals the industries and infrastructures that are directly and indirectly linked to hunting activities and illustrates how differences in states' economies affect the total economic impacts of hunting-related activities. Differences in the impacts of hunting activities, both among sub-activities and across states, illustrate the importance of understanding intra-regional variations in establishing wildlife programs and policies impacting recreational hunting.

This study focused on hunting and its sub-activities (i.e., big game hunting, small game hunting, migratory bird hunting and other hunting) expenditures in the southern U.S. As most hunting occurs in this region (Burger et al., 1999; USDOI, 2006) and land in the region is mostly privately owned (Birch, 1996) with hunting lease markets being more developed (Hussain at al., 2012); these features likely induce different expenditure patterns and consequently different regional economic impacts than other parts of the U.S. Given that hunting activities and forest management are closely interlinked in programs and policies, it is appropriate that economic impacts associated with recreational hunting expenditures are analyzed at the same geographic scale (Tilly and Munn, 2007) to provide an additional perspective on the region's forestry and associated wildlife resource management. Economic impact analysis of recreational hunting is helpful to resource management agencies and policy-makers so they can better evaluate the ecological and economic returns of management activities (Burger et al., 1999).

The objective of this study is to compare the economic impact of hunting expenditures across the thirteen southern states using the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation data and 2009 IMPLAN data. The results of this study will establish baseline results similar to those that are available for the forest-products industry (Tilly and Munn, 2007).

3.3 Methods

To identify the economic impact of hunting expenditures, we used IMPLAN (IMpact analysis for PLANning); a widely accepted economic input-output analysis software. IMPLAN models were built for each southern state using 2009 IMPLAN data and 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation data to generate the indirect and induced impacts of hunting expenditures. This survey report contains data on trip and equipment related expenditures made by hunters for the purpose of big game, small game, migratory bird and other hunting (such as raccoons, coyotes, fox). Economic impact analysis is a useful tool for understanding the impacts of sales and purchases of goods and services between all industrial sectors of the economy. Input-output (I-O) modeling is a commonly used approach for performing economic impact analysis (Steinback, 1999). This system describes the product flow between sectors (Miller and Blair, 2009). This type of analysis models the inter-industry linkages and quantifies the net economic impact by adjusting for leakages induced by regional trade, taxes and savings (Leontief, 1986). This technique is increasingly being utilized to estimate the contributions of wildlife-associated recreation activities to local economies (Goldman et al., 1998; Upneja et al., 2001; Cooper et al., 2002; Southwick, 2008; Hussain et al., 2008; Munn et al., 2010). IMPLAN data and software were originally

developed by U.S. Forest Service, the Federal Emergency Management Agency and the U.S.D.I. Bureau of Land Management for land and resource management planning (IMPLAN V3 Manual, 2009). IMPLAN, an input-output model, is based on a matrix describing the relationships between various sectors of the economy. This matrix is based on U.S. Census Bureau surveys of industry and commerce that track where expenditures are typically made. IMPLAN databases are available at the national, state, county, and zip code level and include employment, earnings, total output, value-added, and tax impacts used to generate economic multipliers. The databases include data collected by the U.S. Department of Commerce for 440 industry sectors. Each of the hunting activities examined in this study have unique equipment, trip related, and other expenditures accruing to different industry sectors across the southern states. Therefore, IMPLAN models for each of the thirteen states must be simulated separately for big game hunting, small game hunting, migratory bird hunting and other hunting expenditures. To be compatible with the 2009 IMPLAN database, the 2006 expenditure data were inflated to 2009 dollars, and after simulation, results were deflated to 2006 dollars for reporting purposes using IMPLAN-provided deflators.

IMPLAN's social accounting matrix (SAM) captures the dollar amount of all transactions between business and institutions taking place in a regional economy for a year. It shows the current structure of the local economy. For example, a SAM multiplier of 2.35 for total output indicates that every $1 of direct output generates additional $1.35 of indirect and induced output in the economy. Similarly, a SAM multiplier of 2.35 for employment indicates that for every 1 direct job, 1.35 additional jobs will be generated in the economy. Multipliers are calculated using the direct, indirect, and induced effects

generated by the original activity in the directly impacted sector (Minnesota IMPLAN Group 2009).

Direct effects represent the expenditures in the individual industry sectors, which are the initial changes in production in the input-output model. Indirect effects are the impacts initiated by the directly impacted industry making purchases from local companies in order to create their product. As these industries make local purchases from other local industries, the rounds of indirect effects continue until completely eliminated by leakages from the local economy. Induced effects occur because of household spending by employees of the both the directly and indirectly impacted sectors. Social Accounting Matrix (SAM) multipliers can be derived from the model outputs by adding the direct, indirect, and induced effects and dividing by the direct effects.

3.4 Results

3.4.1 Economic impacts of hunting activity

Expenditures incurred by hunters across the southern states as derived from the 2006 USFWS survey report are given in Table 3.1 and total economic impacts associated with these expenditures are reported in Table 3.2. In southern states, hunters spent $8.3 billion (36.5% of the national total) for all hunting activities (Table 3.1). Of this, $4.6 billion (39.32% of the national total) is spent on big game hunting, $761million (32.21% of the national total) is spent on small game hunting activities, $708 million (52.49% of the national total) is spent on migratory bird hunting activities and $95 million (45.94% of the national total) is spent on other hunting activities. This $8.3 billion spent on goods and services for hunting activities generated direct economic impacts of $5.9 billion in output and 74,012 full- and part-time jobs. These direct impacts in turn generated indirect

impacts of $2.8 billion in output and 17,966 full- and part-time jobs and induced impacts of $5.9 billion in output and 51,451 full- and part-time jobs. The total impact due to hunting expenditures was $14.8 billion in output and 143,429 full- and part-time jobs, indicating a SAM multiplier of 2.48 for total output and 1.93 for total employment (Table 3.2). Of the total output impact related to hunting activities, 56.7% or $8.3 billion was value-added. To provide a perspective on the economic impact of hunting expenditures and its sub-activities (i.e., big game, small game, migratory birds and other animal hunting) across the thirteen southern states, Table 3.3 reports employment, total income, personal income, total output and value-added and Table 3.4 reports the percentage of the state economy by state for each of these economic indicators. Total output and employment due to hunting expenditures in the southern regional economy represents 0.18% of all southern states' total output and 0.25% of employment. Similarly, big game hunting, small game hunting, migratory bird hunting and other small animal hunting expenditures generated $8.8 billion (0.10%), $1.5 billion (0.019%), $1.3 billion (0.016%) and $231 million (0.003%) in total output and 88,206 (0.15%), 14,655 (0.026%), 13,329 (0.023%), and 2,618 (0.005%) jobs, respectively .

At the state level, there was considerable variation with respect to employment and value-added for all hunting activities (Table 3.3 and Table 3.4). Hunting-related employment ranged from 34,581 (0.24% of state employment) in Texas to 4,625 (0.19% of state employment) in South Carolina. Similarly, total income ranged from $1.8 billion (0.162% of state total income) in Texas to $198 million (0.13%) in South Carolina. Value-added generated by all hunting ranged from $2.06 billion (0.169% of state value-added) in Texas to $225 million (0.141% of state value-added) in South Carolina. Total

output ranged from $3.5 billion (0.15% of state total output) in Texas to $380 million (0.128% of state total output) in South Carolina. However, when ranked as a percentage of each state‘s economy, Arkansas and Mississippi had the largest share of state employment generated by hunting activities and North Carolina and Florida the lowest. This pattern continued with other economic indicators as well. Alabama ranked top among the southern states in terms of percentage share of states’ total income, personal income, total output and value-added, whereas Florida, having a large economy as compared to Alabama, ranks bottom of the southern states in terms of the percentage share of the state’s total income, personal income, total output and value-added.

3.4.2 SAM multiplier for hunting activities

SAM multipliers for employment, total income, personal income, total output and value-added varied considerably across the states (Table 3.5). The employment multiplier ranged from 1.92 in Georgia to 1.46 in Virginia. Employment multipliers averaged 1.64 across the thirteen southern states. Similarly, for other economic indicators, multipliers ranged from 2.58, 2.31, 2.40 and 2.53 for total income, personal income, total output and value-added respectively in Georgia to 1.74, 1.59, 1.63, and 1.71 for total income, personal income, total output and value-added respectively in Oklahoma. The average total income, personal income, total output and value-added multipliers for the South are 2.04, 1.88, 1.93 and 2.00, respectively.

3.4.3 Economic impacts by hunting sub-activity

There were significant differences in expenditure patterns between big game, small game, migratory birds and other small game hunting activities as different types of

equipment are required and different locations are involved. So trip-related expenses vary accordingly. This section presents the results of big game, small game, migratory game and other small game hunting expenditures and examines whether there is variation between broad categories and sub-activities of hunting expenditures in terms of employment, value-added, and total output impact values and multipliers.

3.4.3.1 Big game hunting

Hunters spent $4.6 billion on big game hunting activities which generated, after accounting for leakages, a direct economic impact of $3.8 billion in output and 49,957 full- and part-time jobs. These direct impacts resulted in indirect impacts of $1.9 billion in output and 11,972 full- and part-time jobs and induced impacts of $3 billion in output and 26,277 full- and part-time jobs. The total impact due to big game hunting expenditures was $8.8 billion in output and 88,206 full- and part-time jobs, indicating a SAM multiplier of 2.28 for total output and 1.77 for employment. Of the total impact of big game hunting expenditures, 60.71% or $5.3 billion represented value-added by industries benefiting from big game hunting activities. At the state level, there was considerable variation among states with respect to employment and value-added for the big game hunting activities (Tables 3.3 and 3.4). Big game hunting-related employment ranged from 19,435 (0.14% of state employment) in Texas to 2,852 (0.11% of state employment) in South Carolina. Similarly, total income ranged from $1.06 billion (0.09% of total state income) in Texas to $131 million (0.09%) in South Carolina. Value-added generated by big game hunting ranged from $1.2 billion (0.10% of state value-added) in Texas, to $148 million (0.09% value-added) in South Carolina. Total output ranged from $1.9 billion (0.08% of state total output) in Texas to $236 million (0.08) in

South Carolina. However, when ranked as a percentage of the state economy, Arkansas had the largest share of state employment generated by big game hunting activities whereas Florida had the lowest. This pattern continued with other economic indicators as well. Arkansas ranked top among the southern states in terms of percentage share of the state's total income, personal income, total output and value-added, whereas Florida, having a much larger economy then Arkansas, ranked last in terms of the percentage share of the state's total income, personal income, total output and value-added.

SAM multipliers for employment, total income, personal income, total output and value-added from big game hunting expenditures varied considerably across states (Table 3.6). The employment multiplier ranged from 1.82 in Florida to 1.37 in Arkansas and averaged 1.53 across the thirteen southern states. Similarly for other economic indicators, multipliers ranged from 2.14, 1.97, 2.15 and 2.1 for total income, personal income, total output and value-added respectively in Florida to 1.57, 1.51 and 1.55 for total income, personal income and value-added in Oklahoma and 1.54 for total output in Arkansas. The average total income, personal income, total output and value-added multipliers for the South were 1.77, 1.68, 1.77 and 1.75, respectively.

3.4.3.2 Small game hunting

Hunters spent $761 million for small game hunting activities which generated, after accounting for leakages, a direct economic impact of $699 million in output and 8,350 full- and part-time jobs. These direct impacts resulted in indirect impacts of $348 million in output and 2,219 full- and part-time jobs and induced impacts of $472 million in output and 4,086 full- and part-time jobs. The total impact due to small game hunting expenditures was $1.5 billion in output and 14,655 full- and part-time jobs, indicating a

SAM multiplier of 2.17 for total output and 1.76 for employment. Of the total output impact for small game hunting expenditures, 62.21% or $946 million was value-added generated by the industries benefiting from small game hunting activities. At the state level, there was considerable variation among states with respect to employment, total income, personal income, total output and value-added for small game hunting activities (Tables 3.3 and 3.4). Small game hunting-related employment ranged from 2,625 (0.05% of state employment) in North Carolina to 488 (0.03%) in Mississippi. Similarly, total income ranged from $146 million (0.04% of state total income) in North Carolina to $21.7 million (0.03%) in Mississippi. Value-added generated by small game hunting ranged from $166 million in North Carolina, to $24.7 million in Mississippi. Total output ranged from $246 million in North Carolina to $39.7 million in Mississippi. When ranked as a percentage of state economy, North Carolina had the largest share of state total output, value-added, personal income and total income generated by small game hunting activities whereas Florida had the lowest.

SAM multipliers for employment, total income, personal income, total output and value-added from small game hunting expenditures varied considerably across the states (Table 3.7). The employment multipliers ranged from 1.78 in Florida to the 1.38 in Mississippi and averaged 1.53 across the thirteen southern states. Similarly for other economic indicators, multipliers ranged from the 1.96, 2.03 and 1.93 for total income, total output and value-added respectively in Texas and 1.99 for personal income in Alabama to 1.46, 1.44, 1.51 and 1.44 for total income, personal income, total output and value-added in Mississippi. The average total income, personal income, total output and

value-added multipliers for states in the South were 1.69, 1.68, 1.72 and 1.67, respectively.

3.4.3.3 Migratory bird hunting

Hunters spent $708 million for migratory bird hunting activities which generated, after accounting for leakages, a direct economic impact of $602 million in output and 7,789 full- and part-time jobs. These direct impacts resulted in indirect impacts of $295 million in output and 1,879 full- and part-time jobs and induced impacts of $424 million in output and 3,660 full- and part-time jobs. The total impact due to migratory bird hunting expenditures was $1.3 billion in output and 13,329 full- and part-time jobs, indicating a SAM multiplier of 2.19 for total output and 1.71 for employment. Of the total output impact of migratory bird hunting expenditures, 62.24% or $823 million was value-added. At the state level, there was considerable variation among states with respect to employment, total income, personal income, total output and value-added for the migratory bird hunting activities (Tables 3.3 and 3.4). Migratory bird hunting-related employment ranged from 4,215 in Texas to 250 in North Carolina. Similarly, total income ranged from $241 million in Texas to $11.7 million in Alabama. Value-added generated by migratory bird hunting ranged from $272 million in Texas, to $12.9 million in Alabama. Total output ranged from $427.9 million in Texas to $22.1 million in North Carolina. When ranked as a percentage of each state's economy, Arkansas had the largest share of the state's total output, value-added, personal income and total income generated by migratory bird hunting activities whereas Florida had the lowest.

SAM multipliers for employment, total income, personal income, total output and value-added from migratory bird hunting expenditures varied considerably across states

(Table 3.8). The employment multipliers ranged from 1.71 in Florida to the 1.34 in Mississippi and averaged 1.48 across the thirteen southern states. Similarly for the other economic indicators, multipliers ranged from 1.97, 1.88 and 1.93 for total income, personal income and value-added respectively in Florida to 1.48, 1.45, 1.53 and 1.47 for total income, personal income, total output and value-added in Mississippi. The average total income, personal income, total output and value-added multipliers for the South were 1.69, 1.65, 1.73 and 1.67, respectively.

3.4.3.4 Other hunting

Hunters spent $95.4 million for other hunting activities which generated, after accounting for leakages, a direct economic impact of $113 million in output and 1,693 full- and part-time jobs. These direct impacts resulted in indirect impacts of $47.3 million in output and 308 full- and part-time jobs and induced impacts of $71.3 million in output and 617 full- and part-time jobs. The total impact due to other hunting expenditures was $213.7 million in output and 2,618 full- and part-time jobs, indicating a SAM multiplier of 2.05 for total output and 1.55 for employment. Of the total impact of other hunting expenditures, 69.71% or $161 million was value-added. At the state level, there was considerable variation among states with respect to employment, total income, personal income, total output and value-added for other animal hunting activities (Table 3.3 and 3.4). Other hunting expenditures data were not available for eight southern states (Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina and South Carolina). Other hunting-related employment ranged from 1,352 in Texas to 92 in Tennessee. Similarly, total income ranged from $73.9 million in Texas to $4.7 million in Tennessee. Value-added generated by other hunting ranged from $84 million in Texas to

$5.4 million in Alabama. Total output ranged from $117 million in Texas to $6.6 million in Tennessee. When ranked as a percentage of each state's economy, Oklahoma had the largest share of total output, value-added, personal income and total income generated by other hunting activities whereas Tennessee had the lowest.

SAM multipliers for employment, total income, personal income, total output and value-added from other animal hunting expenditures across the states is reported in Table 3.9. Multipliers for eight southern states were not estimated as data for those states were not available. For those states where data were available, Texas had the largest employment multiplier of 1.47 whereas Arkansas had the smallest at 1.3. Similarly for other economic indicators, Texas had the largest multipliers of any southern state, 1.68, 1.7 and 1.91 and 1.65 for total income, personal income, total output and value-added, respectively.

3.5 Discussion and conclusion

Hunting and its sub-activities have an important role in natural resource management as they provide a source of income and employment across a wide range of economic sectors. Understanding the economic impact of hunting expenditures to regional and state economies is important because it illustrates the contribution of hunting expenditures to rural economic development. This study estimated the economic impact of expenditures for hunting and its sub-activities (big game hunting, small game hunting, migratory bird hunting and other animal hunting) across the southern states using IMPLAN software and data. Hunting expenditures in the southern United States accounted for at least 36.55% of overall U.S. hunting expenditures. There was a similar pattern for the hunting sub-activities as well. Big game, small game, migratory bird and

other animal hunting accounted for 39.32%, 32.21%, 52.49% and 45.94 respectively of all U.S. expenditures for these categories.

The $8.3 billion spent in 2006 by hunters for recreational hunting resulted in a US$14.8 billion total gross output impact to the South's regional economy, with a SAM multiplier of 2.48. The average southern states total gross output multiplier is 1.92. This average multiplier value for the hunting activities are greater than those estimated by Tilley and Munn (2007) for forest-based industries in the southeast U.S., such as lumber and wood products (1.82), wood furniture (1.78) and paper and allied products (1.57). This comparison illustrates the fact that hunting-related output has a greater multiplier effect than outputs of other forest-based industries and suggests that wildlife policies and programs designed to promote recreational hunting activities should be considered by policy makers when seeking ways to stimulate rural economies. This result provides support for wildlife managers and policy makers at both federal and state levels to improve or increase recreational access to publicly owned lands and to implement programs that incentivize landowners to allow public hunting access on their private lands. Programs and policies (such as Walk-In Hunting Access programs, America's Great Outdoor initiatives, Department of Agriculture's Public Access and Habitat Incentive Programs) designed to provide funding for recreational programs have potential to generate substantial economic impacts to regional or local economies. However, periodic assessment of economic impacts of hunting expenditures should be undertaken as the economy, participants, expenditures and policies vary overtime.

The hunting SAM multipliers for other key economic indicators of the South's regional economy vary. Consider, for example, personal income (2.31), total income

(2.57), and value-added (2.50) multiplier values. These multipliers indicate that total value paid to local workers within a region by the industries that provide goods and services for hunting activities have substantial impacts on other sectors of the economy. Of the total output impact related to hunting activities, 56.72% is value-added. This is a very important economic indicator because it measures the net contribution of hunting activity to the economy. Among the hunting sub-activities, other hunting generated the largest percentage (almost 70% of total output from other hunting) of value-added compared to big game, small game and migratory bird hunting activities. Of the total output impact for big game hunting expenditures, 60.71% or $5.3 billion was value-added generated by the industries benefiting from big game hunting. Similarly, for small game hunting and migratory bird hunting, value-added accounts for around 62% of their respective total output. Value-added represents a greater percentage of total output for the hunting sub-activities of big game, small game, migratory bird, and other hunting activities as compared with all hunting activities combined. This means hunting sub-activities generates more wealth with respective to their expenditure than broad hunting activities. Whereas, a SAM multiplier for employment, total income, personal income, value-added and total output for hunting sub-activities are smaller than broad hunting activity. This illustrates the fact that indirect and induced impact generated by hunting sub-activities is smaller than broad hunting activity and expenditures made for hunting sub-activities were not as well captured at the economy. This may be because of less number of industrial or institutional sectors that are associated with hunting sub-activities such as categories like magazines, books, membership dues, land leasing and ownership,

licenses, stamps, permits, federal duck stamps sectors are not available at hunting sub-activities or supporting business may be located outside the study area.

At the state level, Arkansas and Mississippi had the largest share of employment generated by hunting activities. This indicates that large number of people in those states depends on industries related to hunting sectors. Georgia has large employment multiplier of 1.92 .The average total output multiplier for the South is 1.93 which is within the range of total output multiplier for recreation expenditures from 1.5 to 2.7 in the United States (Loomis and Walsh, 1997; cited in Grado et al., 2001). For total output, Georgia has large multiplier of 2.40 among the southern states, which is above the average value. In terms of value-added multipliers, the region has a greater multiplier (2.50) than the individual states. This is reasonable since the size of the economy and opportunity for greater inter-industry transactions is greater in a regional economy. However, Georgia has greater value added multiplier of 2.53 for all hunting activities which is above regional value. This suggests that there are greater inter-industry transactions in Georgia from direct hunting expenditures as compared to other southern states. Multiplier effect is related to the size of region as value added within a region increase as its geographical area increases. The variation in the multiplier at the region and the state level is because of the difference in an expenditure profile. An expenditure profile at the regional level includes more sectors and captures a large part of hunter spending as compared to the individual state level. Furthermore, state level expenditures for some sectors are missing or are not reported but are present at the regional level (e.g., membership dues, licenses, stamps, tags, etc.) and also, there are more opportunities for leakages from the economy at the individual state level. Expenditure item such as membership dues/contributions,

land leasing and ownership, licenses, federal duck stamps, stamps/tags/permits are categorized under IMPLAN sectors-330(miscellaneous retail sales), 386(business services), 10006(household income), 12001(State/local government spending) and 11001(federal government-non-military spending) respectively are present at the regional level, but missing at individual state level. These IMPLAN sector 10006, 12001, 11001 are categorized under institutional sectors and its spending pattern examines impacts of spending by households or government. Institutional spending does not induce demand for inputs nor result in leakage.

The relative importance of hunting and its sub-activities expenditures are inversely related to the overall size of a state's economy. This observation is consistent with Tilley and Munn (2001) who found similar relationships for the forest products industry in the U.S. South and is the only other study available at the same geographical level. The 2011 USFWS survey reports, the increase in hunting expenditures as compared to 2006 survey, industries related to hunting activity in the South has the potential to increase its economic impact at the regional and state level. However, there could be variations in multipliers and economic impact across the thirteen southern states and at the regional South. The economic impacts due to hunting and its sub-activity expenditures estimated in this study provide valuable information to natural resource managers, rural economic developers, government agencies and policy makers and provide the baseline information for the future research.

Table 3.1 Expenditures incurred by hunters for hunting and its-sub-activity across the Southern States in 2006. (In thousands of dollars)

States	Hunting	Big game hunting	Small game hunting	Migratory Bird hunting	Other hunting
Alabama	678,024	458,080	50,344	18,011	NA
Arkansas	788,576	373,180	49,182	115,435	7,325
Florida	377,394	236,977	65,236	21,072	NA
Georgia	677,762	306,711	51,524	86,191	NA
Kentucky	423,439	211,220	44,820	20,616	NA
Louisiana	525,505	286,233	35,602	58,883	NA
Mississippi	519,808	233,622	27,321	30,796	NA
North Carolina	430,562	214,288	152,293	14,601	NA
Oklahoma	476,656	343,691	32,968	20,275	18,435
South Carolina	278,640	163,035	39,067	21,754	NA
Tennessee	488,420	363,885	37,981	33,349	5,696
Texas	2,222,298	1,118,473	124,684	250,677	53,033
Virginia	480,802	312,012	50,889	16,549	10,995
Total Southern States	8,367,886	4,621,407	761,911	708,209	95,484
Total National	22,893,153	11,754,121	2,365,778	1,349,148	207,855
Southeast as % of total National	36.55	39.32	32.21	52.49	45.94

Table 3.2 Total economic impacts of hunting and its sub-activity expenditures in the Southern States.

Activity	Impact Type	Employment	Total Income	Personal income	Value-added	Output	% of Value-added of total output
Hunting	Direct	74,012	2,894,046,666	2,142,212,713	3,353,889,198	5,962,655,219	56.25
	Indirect	17,966	1,391,489,665	869,050,090	1,515,759,904	2,841,571,356	53.34
	Induced	51,451	3,166,018,849	1,926,729,731	3,524,358,428	5,995,832,012	58.78
	Total	143,429	7,451,555,180	4,937,992,534	8,394,007,531	14,800,058,586	56.72
	Type-SAM	1.94	2.57	2.31	2.50	2.48	
Big Game Hunting	Direct	49,957	2,253,003,150	1,582,723,668	2,573,258,297	3,888,595,952	66.17
	Indirect	11,972	941,032,063	586,586,261	1,025,188,431	1,944,100,507	52.73
	Induced	26,277	1,608,415,132	979,455,337	1,790,766,674	3,043,871,406	58.83
	Total	88,206	4,802,450,345	3,148,765,266	5,389,213,401	8,876,567,865	60.71
	Type-SAM	1.77	2.13	1.99	2.09	2.28	
Small Game Hunting	Direct	8,350	420,842,690	267,305,105	481,390,906	699,841,194	68.79
	Indirect	2,219	171,418,850	106,686,344	186,949,973	348,953,257	53.57
	Induced	4,086	249,953,855	152,217,050	278,297,635	472,989,663	58.84
	Total	14,655	842,215,395	526,208,499	946,638,514	1,521,784,114	62.21
	Type-SAM	1.76	2.00	1.97	1.97	2.17	
Migratory Bird Hunting	Direct	7,789	362,318,496	235,272,602	414,977,725	602,896,964	68.83
	Indirect	1,879	145,648,015	90,239,227	158,926,169	295,901,352	53.71
	Induced	3,660	224,077,621	136,444,810	249,481,871	424,061,125	58.83
	Total	13,329	732,044,131	461,956,639	823,385,766	1,322,859,441	62.24
	Type-SAM	1.71	2.02	1.96	1.98	2.19	
Other hunting	Direct	1,693	80,441,369	47,666,953	93,042,336	113,112,498	82.26
	Indirect	308	24,355,670	15,050,846	26,578,374	47,370,002	56.11
	Induced	617	37,686,785	22,951,062	41,961,917	71,303,864	58.85
	Total	2,618	142,483,825	85,668,861	161,582,627	231,786,364	69.71
	Type-SAM	1.55	1.77	1.80	1.74	2.05	

Table 3.3 Economic impact of hunting and its sub-activities expenditures across the Southern States.

State	Hunting Expenditures Activities	Employment (full-and part-time jobs)	Total Income (millions of $)	Personal Income (millions of $)	Total output (millions of $)	Value-added (millions of $)
Alabama	Big game	5,921	273.96	176.26	618.52	303.98
	Small game	575	30.82	17.74	69.15	34.07
	Migratory birds	271	11.73	7.23	25.68	12.99
	Other	NA	NA	NA	NA	NA
	All Hunting	10,431	437.95	299.33	886.30	498.24
Arkansas	Big game	6,098	237.88	169.57	497.52	272.18
	Small game	836	36.87	24.15	70.45	42.11
	Migratory birds	1,941	80.94	53.54	151.83	92.39
	Other	199	8.57	5.35	14.43	9.85
	All Hunting	11,696	456.83	318.94	933.47	521.31
Florida	Big game	4,024	217.76	146.04	398.11	245.46
	Small game	1,102	63.69	40.73	112.82	72.04
	Migratory birds	362	19.46	12.69	34.99	21.98
	Other	NA	NA	NA	NA	NA
	All Hunting	6,065	311.80	204.76	591.90	354.62
Georgia	Big game	5,341	272.67	179.95	494.94	307.17
	Small game	934	48.73	31.24	88.08	54.80
	Migratory birds	1,528	76.32	49.22	131.81	86.23
	Other	NA	NA	NA	NA	NA
	All Hunting	10,283	515.93	344.61	977.01	580.78
Kentucky	Big game	3,673	164.01	112.85	306.62	185.83
	Small game	783	38.09	24.50	68.02	43.20
	Migratory birds	399	18.10	11.81	32.88	20.56
	Other	NA	NA	NA	NA	NA
	All Hunting	6,461	271.14	183.20	530.52	308.97

Table 3.3 (Continued)

Louisiana	Big game	4,720	212.13	144.42	410.57	240.30
	Small game	587	28.56	18.43	53.05	32.41
	Migratory birds	960	43.41	28.73	82.71	49.20
	Other	NA	NA	NA	NA	NA
	All Hunting	7,823	340.17	234.37	693.32	386.67
Mississippi	Big game	3,990	162.92	111.13	313.40	185.09
	Small game	488	21.79	14.08	39.70	24.78
	Migratory birds	570	22.85	15.18	41.69	25.90
	Other	NA	NA	NA	NA	NA
	All Hunting	7,423	297.32	202.70	593.53	336.78
North Carolina	Big game	3,796	186.08	129.68	337.78	209.99
	Small game	2,625	147.00	94.97	246.77	166.23
	Migratory birds	250	12.40	8.23	22.12	14.05
	Other	NA	NA	NA	NA	NA
	All Hunting	7,060	322.83	225.01	648.38	368.70
Oklahoma	Big game	5,779	277.14	182.12	481.54	313.17
	Small game	540	30.59	17.52	49.45	34.44
	Migratory birds	320	17.69	10.17	28.59	19.94
	Other	432	21.92	12.36	31.99	24.98
	All Hunting	7,111	316.43	223.04	660.85	360.35
South Carolina	Big game	2,852	131.63	90.79	236.36	148.78
	Small game	680	29.29	19.26	56.13	33.24
	Migratory birds	466	19.84	13.23	36.05	22.44
	Other	NA	NA	NA	NA	NA
	All Hunting	4,625	198.11	130.40	380.66	225.73

Table 3.3 (Continued)

Tennessee	Big game	6,377	322.84	219.06	582.49	363.96
	Small game	669	36.62	23.17	63.59	41.28
	Migratory birds	577	28.94	18.70	51.06	32.62
	Other	92	4.78	2.87	6.64	5.47
	All Hunting	7,571	360.22	258.68	779.24	407.85
Texas	Big game	19,435	1,068.16	685.28	1,947.29	1,202.25
	Small game	2,259	130.18	79.76	235.76	146.45
	Migratory birds	4,215	241.52	149.65	427.92	272.72
	Other	1,352	73.98	44.36	117.06	84.03
	All Hunting	34,581	1,831.93	1,199.12	3,540.27	2,067.66
Virginia	Big game	5,400	267.10	180.69	479.45	301.61
	Small game	920	46.80	30.07	82.14	52.85
	Migratory birds	284	13.82	8.93	23.85	15.65
	Other	341	17.30	10.52	28.43	19.76
	All Hunting	7,541	355.04	241.19	702.59	404.32
Regional South	Big game	88,206	4,802.45	3,148.77	8,876.57	5,389.21
	Small game	14,655	842.22	526.21	1,521.78	946.64
	Migratory birds	13,329	732.04	461.96	1,322.86	823.39
	Other	2,618	142.48	85.67	231.79	161.58
	All Hunting	143,429	7,451.56	4,937.99	14,800.06	8,394.01

Table 3.4 Economic impacts of hunting and its sub-activity expenditures across the Southern States as percentage of the state economy.

State	Hunting Expenditures Activities	Employment	Total Income	Personal Income	Total output	Value-added
Alabama	Big game	0.238	0.175	0.163	0.185	0.180
	Small game	0.023	0.020	0.016	0.021	0.020
	Migratory birds	0.011	0.007	0.007	0.008	0.008
	Other	NA	NA	NA	NA	NA
	All Hunting	0.420	0.279	0.277	0.264	0.295
Arkansas	Big game	0.397	0.261	0.267	0.244	0.277
	Small game	0.054	0.040	0.038	0.035	0.043
	Migratory birds	0.126	0.089	0.084	0.074	0.094
	Other	0.013	0.009	0.008	0.007	0.010
	All Hunting	0.761	0.501	0.501	0.458	0.531
Florida	Big game	0.041	0.033	0.033	0.034	0.034
	Small game	0.011	0.010	0.009	0.010	0.010
	Migratory birds	0.004	0.003	0.003	0.003	0.003
	Other	NA	NA	NA	NA	NA
	All Hunting	0.062	0.048	0.047	0.050	0.050
Georgia	Big game	0.102	0.071	0.071	0.068	0.074
	Small game	0.018	0.013	0.012	0.012	0.013
	Migratory birds	0.029	0.020	0.019	0.018	0.021
	Other	NA	NA	NA	NA	NA
	All Hunting	0.196	0.135	0.136	0.135	0.141
Kentucky	Big game	0.158	0.112	0.113	0.097	0.117
	Small game	0.034	0.026	0.025	0.021	0.027
	Migratory birds	0.017	0.012	0.012	0.010	0.013
	Other	NA	NA	NA	NA	NA

Table 3.4 (Continued)

	All Hunting	0.278	0.186	0.184	0.168	0.194
	Big game	0.189	0.121	0.125	0.096	0.128
	Small game	0.024	0.016	0.016	0.012	0.017
Louisiana	Migratory birds	0.039	0.025	0.025	0.019	0.026
	Other	NA	NA	NA	NA	NA
	All Hunting	0.314	0.194	0.203	0.163	0.205
	Big game	0.269	0.192	0.190	0.165	0.203
	Small game	0.033	0.026	0.024	0.021	0.027
Mississippi	Migratory birds	0.038	0.027	0.026	0.022	0.028
	Other	NA	NA	NA	NA	NA
	All Hunting	0.500	0.350	0.346	0.312	0.369
	Big game	0.073	0.053	0.055	0.049	0.056
	Small game	0.051	0.042	0.040	0.036	0.044
North Carolina	Migratory birds	0.005	0.004	0.003	0.003	0.004
	Other	NA	NA	NA	NA	NA
	All Hunting	0.136	0.093	0.095	0.094	0.098
	Big game	0.273	0.191	0.197	0.165	0.200
	Small game	0.026	0.021	0.019	0.017	0.022
Oklahoma	Migratory birds	0.015	0.012	0.011	0.010	0.013
	Other	0.020	0.015	0.013	0.011	0.016
	All Hunting	0.336	0.218	0.241	0.226	0.230
	Big game	0.118	0.089	0.091	0.079	0.093
	Small game	0.028	0.020	0.019	0.019	0.021
South Carolina	Migratory birds	0.019	0.013	0.013	0.012	0.014
	Other	NA	NA	NA	NA	NA
	All Hunting	0.191	0.134	0.130	0.128	0.141

Table 3.4 (Continued)

	Big game	0.181	0.138	0.138	0.120	0.144
	Small game	0.019	0.016	0.015	0.013	0.016
Tennessee	Migratory birds	0.016	0.012	0.012	0.011	0.013
	Other	0.003	0.002	0.002	0.001	0.002
	All Hunting	0.215	0.154	0.163	0.161	0.161
	Big game	0.140	0.095	0.096	0.083	0.098
	Small game	0.016	0.012	0.011	0.010	0.012
Texas	Migratory birds	0.030	0.021	0.021	0.018	0.022
	Other	0.010	0.007	0.006	0.005	0.007
	All Hunting	0.249	0.162	0.168	0.150	0.169
	Big game	0.114	0.070	0.068	0.073	0.074
	Small game	0.019	0.012	0.011	0.013	0.013
Virginia	Migratory birds	0.006	0.004	0.003	0.004	0.004
	Other	0.007	0.005	0.004	0.004	0.005
	All Hunting	0.159	0.093	0.090	0.107	0.099
	Big game	0.154	0.118	0.116	0.109	0.122
	Small game	0.026	0.021	0.019	0.019	0.021
Regional South	Migratory birds	0.023	0.018	0.017	0.016	0.019
	Other	0.005	0.003	0.003	0.003	0.004
	All Hunting	0.251	0.183	0.183	0.181	0.190

Table 3.5 State SAM multipliers for hunting expenditures in the southern states

States	Employment	Total Income	Personal Income	Total Output	Value-added
Alabama	1.60	1.96	1.80	1.84	1.92
Arkansas	1.51	1.88	1.74	1.77	1.83
Florida	1.84	2.29	2.13	2.18	2.22
Georgia	1.92	2.58	2.31	2.40	2.53
Kentucky	1.59	1.92	1.81	1.87	1.87
Louisiana	1.60	1.97	1.82	1.86	1.93
Mississippi	1.72	2.12	1.92	2.02	2.08
North Carolina	1.53	1.80	1.68	1.70	1.76
Oklahoma	1.48	1.74	1.59	1.63	1.71
South Carolina	1.65	1.95	1.82	1.87	1.91
Tennessee	1.61	2.01	1.80	1.79	1.95
Texas	1.87	2.50	2.26	2.39	2.44
Virginia	1.46	1.87	1.74	1.74	1.83
Regional South	1.94	2.57	2.31	2.48	2.50

Table 3.6 State SAM Multiplier for big game hunting expenditures in the southern states

States	Employment	Total Income	Personal income	Total Output	Value-added
Alabama	1.62	1.89	1.85	1.67	1.89
Arkansas	1.37	1.62	1.53	1.54	1.59
Florida	1.82	2.14	1.97	2.15	2.10
Georgia	1.63	1.97	1.86	1.96	1.94
Kentucky	1.42	1.59	1.52	1.62	1.56
Louisiana	1.48	1.72	1.63	1.72	1.70
Mississippi	1.42	1.59	1.52	1.60	1.57
North Carolina	1.54	1.72	1.62	1.76	1.70
Oklahoma	1.43	1.57	1.51	1.65	1.55
South Carolina	1.58	1.73	1.60	1.78	1.71
Tennessee	1.54	1.76	1.68	1.82	1.73
Texas	1.68	2.06	1.95	2.14	2.03
Virginia	1.42	1.72	1.62	1.72	1.70
Regional South	1.77	2.13	1.99	2.28	2.09

Table 3.7 State SAM Multiplier for small game hunting expenditures in the southern states.

States	Employment	Total Income	Personal income	Total Output	Value-added
Alabama	1.73	1.85	1.99	1.63	1.86
Arkansas	1.38	1.52	1.51	1.52	1.50
Florida	1.78	1.94	1.89	2.01	1.90
Georgia	1.60	1.90	1.85	1.89	1.87
Kentucky	1.44	1.52	1.51	1.59	1.50
Louisiana	1.48	1.63	1.61	1.68	1.60
Mississippi	1.38	1.46	1.44	1.51	1.44
North Carolina	1.54	1.58	1.57	1.70	1.57
Oklahoma	1.47	1.50	1.55	1.62	1.49
South Carolina	1.60	1.86	1.75	1.80	1.83
Tennessee	1.55	1.68	1.68	1.78	1.65
Texas	1.65	1.96	1.94	2.03	1.93
Virginia	1.41	1.67	1.63	1.70	1.64
Regional South	1.76	2.00	1.97	2.17	1.97

Table 3.8 State SAM Multiplier for migratory bird hunting expenditures in the southern states.

States	Employment	Total Income	Personal income	Total Output	Value-added
Alabama	1.50	1.79	1.80	1.62	1.80
Arkansas	1.36	1.53	1.51	1.55	1.51
Florida	1.71	1.97	1.88	2.01	1.93
Georgia	1.51	1.79	1.75	1.87	1.76
Kentucky	1.44	1.58	1.56	1.65	1.56
Louisiana	1.48	1.71	1.65	1.72	1.68
Mississippi	1.34	1.48	1.45	1.53	1.47
North Carolina	1.49	1.64	1.59	1.69	1.62
Oklahoma	1.46	1.51	1.55	1.63	1.49
South Carolina	1.49	1.69	1.60	1.71	1.67
Tennessee	1.53	1.75	1.73	1.84	1.72
Texas	1.63	1.90	1.87	2.02	1.87
Virginia	1.38	1.65	1.60	1.70	1.63
Regional South	1.71	2.02	1.96	2.19	1.98

Table 3.9 State SAM Multiplier for other hunting expenditures in the southern states.

States	Employment	Total income	Personal income	Total output	Value-added
Alabama	NA	NA	NA	NA	NA
Arkansas	1.3	1.41	1.43	1.48	1.39
Florida	NA	NA	NA	NA	NA
Georgia	NA	NA	NA	NA	NA
Kentucky	NA	NA	NA	NA	NA
Louisiana	NA	NA	NA	NA	NA
Mississippi	NA	NA	NA	NA	NA
North Carolina	NA	NA	NA	NA	NA
Oklahoma	1.34	1.4	1.46	1.57	1.39
South Carolina	NA	NA	NA	NA	NA
Tennessee	1.37	1.47	1.52	1.73	1.45
Texas	1.47	1.68	1.7	1.91	1.65
Virginia	1.35	1.57	1.58	1.65	1.54
Regional South	1.55	1.77	1.8	2.05	1.74

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CHAPTER IV

ECONOMIC IMPACT OF WILDLIFE WATCHING RECREATION EXPENDITURES ACROSS THE SOUTHERN STATES

4.1 Abstract

Non-consumptive wildlife recreation is one of the most popular recreational activities for many people and, while providing incentives for wildlife conservation and protection, its importance to the U.S. economy is gradually expanding. In 2006, 71 million people participated in wildlife watching activities, spending $45.7 billion in equipment and trip related expenses. This is an eight percent increase in participation and a four percent increase in expenditures since 2001. Periodic assessment of economic impacts associated with wildlife watching expenditures provides a consistent perspective on wildlife resource management. This research quantified economic impacts of wildlife watching expenditures for the thirteen states in the U.S South[7]. Input-output models were constructed for each southern state using 2009 IMPLAN data and software and the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation data to determine the indirect, induced and total effects of these expenditures. Impacts were estimating for total industry output, employment, total income and personal income and value- added. This study used input-output analysis to evaluate the economic impacts of

[7] Southern U.S includes: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Virginia.

wildlife recreational expenditures. This approach enabled comparison of the relative importance of wildlife watching expenditures to the various southern states. In particular, the comparison revealed how differences in the individual states' economies and levels of expenditures affect the total economic impacts of wildlife-associated activities. Differences in the impacts of various recreational activities, both among activities and across the states, illustrate the importance of understanding intra-regional variations in establishing wildlife programs and policies.

4.2 Introduction

Non-consumptive wildlife-associated recreation activities, such as observing wildlife behavior, photographing and feeding and deriving aesthetic enjoyment, are popular recreational activities for many people. These services of wildlife ecosystems are increasingly recognized as an essential component of some economies, and their associated values provide incentives for wildlife conservation and protection (Hvenegaard et al., 1989). Each year millions of Americans participate in wildlife-associated recreation. In 2006, 71 million people participated in wildlife watching activities, spending $45.7 billion on equipment and trip-related expenses. There was an eight percent increase in participation and a four percent increase in expenditures since 2001 (USDOI, 2006). Rural communities captured a large part of this spending by providing wildlife recreation related goods and services which in turn, generated jobs and income (Ingram and Lewandrowski, 1999; Benson, 2001). Innovative approaches designed to document the importance of wildlife to human welfare and to identify the social and economic benefits derived from a sustainable flow of wildlife watching goods and services are becoming a policy necessity. As urban areas continue to expand, it is

critical to identify the wildlife recreation related goods and services that support rural development and consumption and develop new ways to rejuvenate rural economies (Aylward et al., 2009). Expenditures from wildlife watching activities generate employment and income in various manufacturing industries and service sectors when businesses respond to the demand for equipment and trip related goods and services. Wildlife watching has attracted interest from many communities, organizations, and public agencies to promote and accommodate wildlife-associated programs and policies (Leones et al., 1998). This interest may initially have arisen because of the financial benefits or for preservation purposes; however, it may create opportunities for educating the public about natural resources and rural development (Cole and Scott, 1999). Wildlife watching expenditures generate direct, indirect and induced effects when industries respond to final demand changes by providing goods and services for recreationalists. Direct effects occur when wildlife viewers spend money to buy wildlife watching equipment at retail stores (e.g. binoculars, cameras, lens etc.) and services to support for their wildlife watching activities (e.g. food, lodging, transportation, rental vehicles, fees, etc.). Indirect effects are initiated by the directly impacted industries (retail and service stores) making purchases from local companies in order to create their product (e.g., the retailer pays electric bills and purchases binoculars and cameras and their accessories for resale from manufacturers). These industries then make local purchases from other local industries and the rounds of indirect effects continue until all indirect effects are derived from outside the region of interest. Induced effects are generated as a result of employees in the direct and indirectly impacted industries spending their wages on locally produced goods and services (e.g., employees buying meals in local restaurants, paying federal and

state taxes, etc.). The total effect is the summation of direct, indirect and induced effects. The objective of this research was to determine the economic impact of wildlife watching recreation expenditures across the southern U.S. states. Economic impact analysis of wildlife recreation expenditures at different scales (e.g., local, regional, statewide) can play an important role in determining how economic benefits are distributed across society.

In 1996, 62.9 million people participated in wildlife watching activities, spending $29.2 billion in trip-related expenses and equipment (USDOI, 1996). In 2001, 66.1 million people spent $38.4 billion for wildlife watching activities. From 1996 to 2001, spending increased 31.4 percent. In 2006, 71.1 million people spent $45.7 billion for wildlife watching activities, an 18.8 percent increase since 2001 and a 56.2 percent increase since 1996. In addition to these direct expenditures, there are indirect and induced impacts that arise when industries respond to demand for wildlife-associated goods and services (Steinback, 1999; Henderson et al., 2010; Munn et al., 2010). Few studies have examined the economic impacts of wildlife watching expenditures at the state and county level. During 2001, $562 million was spent by wildlife viewers, generating a total output of $940 million and 13,000 jobs in Colorado's economy (Pickton and Sikorowski, 2004). At the national level in 2006, wildlife watching expenditures of $45.7 billion generated $122.6 billion in total output across the U.S. Each $1 of direct spending associated with wildlife watching generated an additional $1.68 of economic activity (Leonard, 2008). At the regional level, Munn et al. (2010) estimated the economic impact of wildlife watching expenditures in the southern U.S. Wildlife viewers in these states spent $13.4 billion, which generated $21.3 billion in total output

and impacting 168,380 jobs. Several studies have estimated the economic impact of wildlife-associated recreation expenditures which quantify and evaluate economic activities measured by sales, income, employment, value-added, etc. Some studies are focused at the county level (e.g., Schorr et al., 1995; Ditton et al., 1980), state level (e.g., Bell et al., 1983; Henderson et al., 2010), multistate regional level (e.g., Talhelm, 1988) or on regions of various sizes and activities (e.g., Steinback, 1999; Pickton and Sikorowski, 2004; Hussain at al., 2012). Though some literature evaluating recreational expenditures at different levels exists, research comparing the economic impacts of wildlife watching recreation expenditures across states is lacking. Addressing this gap in the literature is important because the variation of recreation expenditures and their economic impacts between states can be substantial, particularly when indirect and induced effects are considered. Hence, periodic assessments of economic impacts associated with wildlife watching recreation expenditures are necessary to provide a consistent and current accounting of the importance of wildlife-associated recreational activities at the state and regional level. In particular, such assessments shows how differences in individual state economies affect total economic impacts of recreation related activities. Differences in the economic impacts of wildlife watching activities between states illustrates the importance of understanding intra-regional variations in establishing wildlife recreation dependent policies.

This analysis focused on wildlife watching expenditures in the southern U.S., which accounted for 30% of the overall U.S wildlife watching expenditures (Munn et al., 2010). Two southern states, Florida and Texas, ranked second and third nationally, after California, in terms of total wildlife viewer expenditures (USDOI, 2006). Mostly all

publicly owned forestland such as parks and refuges can be used for wildlife watching recreational purposes whereas use of privately owned land depends on the landowner. In the U.S South, land is largely privately owned (Birch, 1996) and this region has unique wildlife watching opportunities (Hussain et al., 2012) in national parks like Great Smoky Mountians. These different features likely induce different expenditure patterns than in other regions and subsequently different regional economic impacts. Given that wildlife watching and forest management are closely interlinked in programs and policies, it is appropriate that economic impacts associated with wildlife watching recreation expenditures be analyzed at the same geographic scale as forest based industries (e.g., Tilly and Munn, 2007) to provide a similar perspective on the region's wildlife resource and forest management. This paper compares the economic impact of wildlife watching expenditures across the thirteen southern states using the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation data and 2009 IMPLAN data and establishes baseline information on the impacts of wildlife-associated expenditures, which is necessary for tracking changes in these expenditures and their related economic impacts over time.

4.3 Methods

Over the past 20 years, researchers have estimated the economic value of wildlife-associated recreation by consumptive and non-consumptive users using either contingent valuation or travel cost methods. These techniques do not provide all the economic details policy makers need for appropriately allocating resources to wildlife resource management issues. Economic impact analysis supplements the information provided by such methods (Cooper et al., 2002). Economic impact analysis is a useful tool for

understanding the impact of the purchases of goods and services between industrial sectors of an economy. Input–output (I–O) modeling is a commonly used approach for performing economic impact analysis (Steinback, 1999). This system describes product flows between industrial sectors, with industrial sectors as producers (Miller and Blair, 2009). I-O models the inter-industry linkages and quantifies the net economic impact by adjusting for leakages induced by regional trade, taxes and savings (Leontief, 1986). This technique has been utilized to estimate the contributions of wildlife-associated recreation activities to local economies (e.g., Goldman et al., 1998; Upneja et al., 2001; Cooper et al., 2002; Southwick, 2008; Hussain et al., 2008; Munn et al., 2010). In this study, IMPLAN (IMpact analysis for PLANning), a widely accepted economic input-output analysis software package, was used to estimate the economic impact of wildlife watching recreation expenditures across the southern states. The IMPLAN model was originally developed by U.S Forest Service, the Federal Emergency Management Agency and the USDI Bureau of Land Management for land and resource management planning (IMPLAN V3 Manual, 2009). The IMPLAN model is based on a matrix describing the relationships between various sectors of the economy. This matrix is based on U.S. Census Bureau surveys of industry and commerce that track where their expenditures are typically made. IMPLAN databases are available at the national, state, county, and zip code levels and provides estimates for employment, earnings, total output, value-added, and tax impacts, and economic multipliers. These economic databases are based on the data collected by the U.S Department of Commerce from 440 producing industries sectors[8]. To identify the economic impact of wildlife watching

[8] IMPLAN V3 Reference Manual provides complete details on data and methodology.

recreation expenditures, IMPLAN models were constructed for each southern state using 2009 IMPLAN data and 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation data to determine the direct, indirect, induced and total effects of these expenditures (i.e., direct effects) by estimating total industry output, total income, personal income, employment and value-added. Wildlife watching activities have unique equipment, trip related and other expenditures that can vary from state to state. In light of this, the economic impacts resulting from wildlife watching expenditures for each of the thirteen southern states were modeled using IMPLAN. To be compatible with the 2009 IMPLAN database, 2006 expenditure dollars were inflated to 2009 dollars, and after simulation, results were deflated to 2006 dollars for reporting purposes using IMPLAN-provided deflators.

Economic output multiplier effects capture a wide array of economic transactions by estimating the direct and indirect effect of change among industries. Social accounting matrix (SAM) captures the linkage between the generation of income into households and the reaction of households as their income changes. For example, each dollar spent by the wildlife recreationalist can raise the aggregate demand for goods and services by more than a dollar. It reflects the current structure of the local economy. For example, a SAM multiplier of 2.45 for total output indicates that a $1 of direct impact generates an additional $1.45 in the economy. Similarly, a SAM multiplier of 2.45 for employment indicates that for every 1 direct job, 1.45 additional jobs will be generated in the economy. Multipliers are derived using the direct, indirect, and induced effects generated by the original activity in the sector (Minnesota IMPLAN Group 2009). Direct effects represent the expenditures in the individual industry sector, which is the initial change in

production in input-output modeling (i.e., purchase of cameras, lens etc.). Indirect effects are the impacts initiated by the directly impacted industry making purchases from local companies in order to create their product. If these industries make local purchases from the other local industries, the rounds of indirect effects continue. Induced effects occur because of household spending by employees of both the directly and indirectly impacted industries. The SAM multiplier shows how the economy can amplify the impact of changes in spending. A small initial change in the purchase of wildlife watching equipment or services can have a large effect on aggregate demand.

4.4 Results

Expenditures incurred by wildlife viewers across the southern states as derived from the 2006 National Survey report are reported in Table 4.1 and the total economic impacts for the region resulting from these expenditures are reported in Table 4.2. Major economic indicators include employment (full-and part-time jobs), total income, personal income, total output and value-added (in millions of dollar). In the southern states, wildlife viewers spent $13.4 billion (29.5% of total National) for wildlife watching activities. Florida, Texas and Georgia ranked first ($3 billion), second ($2.9 billion) and third ($1.6 billion) respectively in terms of expenditures incurred by wildlife viewers. This $13.4 billion spent on goods and services for wildlife watching activities generated direct economic impacts of $10.9 billion in output and directly impacted 107,213 jobs. These impacts resulted in indirect impacts of $7.8 billion in output and 51,977 jobs and induced impacts of $8.8 billion in output and 76,154 jobs. The total regional impact due to wildlife watching expenditures was $27.6 billion in output and 235,344 jobs, indicating a SAM multiplier of 2.53 for total output and 2.20 for total employment (Table

4.2). Value-added represented 48.44% ($13.4 billion) of the total output resulting from wildlife watching activities. Similarly, total income and personal income amounted to $12.1 billion and $8.1 billion, respectively.

To provide a perspective on the economic impact of wildlife watching expenditures across the southern states, Table 4.3 reports employment, total income, personal income, total output and value-added by state, and Table 4.4 reports these impacts as a percentage of the state economy. At the regional level, Employment from wildlife watching expenditures accounts for 0.41% of the South's total employment. Similarly, total income accounts for 0.30% of the South's total income, personal income accounts for 0.30% of the South's total personal income, value-added also accounts for 0.30% of the South's total value-added and total output from wildlife watching expenditure accounts for 0.34% of the South's total output. At the state level, there was some variation with respect to economic indicators. Florida, Texas, Tennessee and Georgia ranked 1st, 2nd, 3rd, and 4th respectively for employment, total income, personal income, total output and value-added, whereas Louisiana and Mississippi ranked last at 12th and 13th. Employment ranged from 3,618 to 47,569. Similarly, total income ranged from $138.21 million to $2,541.37 million. Personal income ranged from $96.18 million to $1,779.67 million. Total output ranged from $355.05 million to $5,520.78 million and value-added ranged from $155.09 million to $2,803.25 million. However, as a percentage of state economy, Tennessee ranked 1st in employment (0.63% of state employment), total income (0.43% of state total income), personal income (0.41% of state personal income) and value-added (0.44% of state value-added) and Florida ranked

2nd in each of these categories. For total output, Florida ranked 1st with 0.47% of the state's total output.

4.4.1 SAM multiplier for wildlife watching activities

SAM multipliers for employment, total income, personal income, total output and value-added varied across the states (Table 4.5). Florida had the highest employment multiplier (2.08) whereas Oklahoma had the lowest (1.62). The employment multiplier for the regional South was 2.20. Similarly, Texas had the largest multipliers for total income (2.91), personal income (2.53), total output (2.28) and value-added (2.89). On the other hand, Oklahoma had the lowest multiplier for employment (1.62), total income (1.94) and value-added (1.94). Mississippi had the lowest multiplier for personal income (1.84) and total output (1.69).

4.5 Discussion and conclusion

Wildlife watching expenditures generate income and employment in a wide range of industrial sectors, which helps justify natural resource management and promotes related policy measures. Documenting the contribution of these expenditures to regional and state economies is important because it provides a better understanding of the resulting economic impacts of these expenditures and how they benefit local economies. This study estimated the economic impact of wildlife watching expenditures across the southern states using input-output techniques with IMPLAN software and data. The $13.4 billion spent in 2006 by wildlife viewers resulted in US$27.6 billion in total gross output in the southern regional economy, with a SAM multiplier 2.53. This value is greater than multipliers estimated for forest-based industries in the southeast US (Tilley

and Munn, 2007), such as lumber and wood products (1.82), wood furniture (1.78) and paper and allied products (1.57). Total employment generated by wildlife watching expenditures was 235,344. The associated SAM multiplier was 2.20. These multipliers were greater than the corresponding multipliers for Forest products industry. This suggests that efforts to stimulate rural economies should consider wildlife watching activities as a viable option for economic development. The SAM multipliers for other key economic indicators of the regional economy, such as labor income (2.64), total income (3.08), value-added (3.07), vary substantially. These multipliers indicate that total value paid to local workers within a region by the industries that provide good and services for wildlife watching activities have substantial impacts on other sectors of the economy. At the state level, Florida has the largest employment multiplier of 2.08 which indicated that Florida contains more of the supply chain of goods and services and encompasses more of the induced spending. However, this in case of output multiplier Texas has largest multiplier of 2.28. This suggests that large part of the wildlife watching expenditure is well captured by Texas's economy compared to other southern states and there is more interdependence of sectors in the economy. Texas continue to lead in other economic indicators as well such as total income, personal income and value-added.

Wildlife-associated employment as a share of total state employment is greatest in Tennessee (0.63%) and lowest in Louisiana (0.21%). This suggests that people in Tennessee are more dependent on the industrial sectors related to wildlife watching activities compared to Louisiana. When compared with other forest-based industries, each state's employment as percentage of total state decreased from 1992 to 2001 (Tennessee: 1.9% in 1992 and 1.8% in 2001; Louisiana: 1.3% in 1992 and 1.1% in 2001)

(Aruna et al. 1997; Tilley and Munn. 2007). Since forest management and wildlife watching activities are closely related, it would be interesting to investigate the trend for wildlife watching recreation expenditures. Clearly, there is considerable variation in the employment impacts across the southern states resulting from jobs created by wildlife watching activities. This pattern is similar to other economic indicators across the southern states.

In general, the relative importance of the wildlife watching expenditures is inversely related to the overall size of the state economy. The same was true for the forest product industry in the U.S. South (Tilley and Munn, 2001); however, the variations between states were larger for forest product industry. This indicates that impacts from wildlife watching recreation expenditures are more consistent compared to forest product industries. Forest products industry have large clusters of related businesses in some states and thus have large impacts in related sectors compared to wildlife watching sectors. For example, the employment multiplier for the paper and allied products is 2.86 in Alabama but only 1.55 in Louisiana for the wood furniture industry. This variation in employment multiplier between states and sectors is larger than similar variation in the wildlife watching employment multipliers. A similar pattern holds for other economic indicators as well. Economic impacts of wildlife watching recreation expenditures estimated in this study provide valued information to recreation managers, rural economic developers, government agencies and policy makers for developing programs and policies. This information can be used to estimate the potential economic benefits of program and policies designed for wildlife watching activities and related infrastructure projects and services to wildlife viewers.

Table 4.1 Expenditures incurred by the wildlife viewers across the Southern States in 2006.

States	Wildlife watching expenditures(Thousands of dollars)
Alabama	450,004
Arkansas	606,701
Florida	3,081,496
Georgia	1,615,317
Kentucky	542,060
Louisiana	312,430
Mississippi	175,846
North Carolina	916,906
Oklahoma	328,661
South Carolina	550,777
Tennessee	992,365
Texas	2,939,018
Virginia	960,190
Total Southern States	13,471,771
Total National	45,654,959
Southeast as % of total National	29.51

Table 4.2 Economic impact of wildlife watching expenditures in regional South.

Expenditures	Impact Type	Employment	Personal income	Total Income	Value-added	Output
Wildlife Watching	Direct Effect	107,213	3,936,525,059	3,085,452,470	4,366,654,948	10,962,199,464
	Indirect Effect	51,977	3,514,145,521	2,216,388,082	3,841,926,804	7,876,285,090
	Induced Effect	76,154	4,678,731,782	2,847,637,564	5,208,588,486	8,858,493,810
	Total Effect	235,344	12,129,402,362	8,149,478,116	13,417,170,239	27,696,978,365
	SAM multiplier	2.20	3.08	2.64	3.07	2.53

Table 4.3 Economic impacts of wildlife watching expenditures across the Southern States

State	Employment (full- and part-time jobs)	Total Income (Millions of $)	Personal Income (Millions of $)	Total output (Millions of $)	Value-added (Millions of $)
Alabama	7,336	304.32	209.14	728.20	339.34
Arkansas	7,334	289.99	210.55	749.76	323.95
Florida	47,569	2,541.37	1,779.67	5,520.78	2,803.25
Georgia	17,392	874.95	604.51	2,067.44	970.59
Kentucky	8,066	323.93	229.04	821.38	360.97
Louisiana	5,315	221.54	159.05	545.44	247.65
Mississippi	3,618	138.21	96.18	355.05	155.09
North Carolina	14,088	662.90	468.09	1,553.89	737.00
Oklahoma	6,497	298.67	193.98	676.37	332.67
South Carolina	10,776	435.37	306.95	974.76	487.43
Tennessee	22,152	998.66	644.83	2,173.07	1,102.62
Texas	38,154	1,942.00	1,293.84	4,480.93	2,159.38
Virginia	14,318	663.79	451.16	1,536.10	733.10
Regional South	235,344	12,129.40	8,149.48	27,696.98	13,417.17

Table 4.4 Economic impacts of wildlife watching expenditures as a percentage of the state economy for the southern states.

State	Employment	Total Income (%)	Personal Income	Total output	Value-added
Alabama	0.30%	0.19	0.19	0.22	0.20
Arkansas	0.48	0.32	0.33	0.37	0.33
Florida	0.49	0.39	0.41	0.47	0.39
Georgia	0.33	0.23	0.24	0.29	0.24
Kentucky	0.35	0.22	0.23	0.26	0.23
Louisiana	0.21	0.13	0.14	0.13	0.13
Mississippi	0.24	0.16	0.16	0.19	0.17
North Carolina	0.27	0.19	0.20	0.23	0.20
Oklahoma	0.31	0.21	0.21	0.23	0.21
South Carolina	0.45	0.29	0.31	0.33	0.31
Tennessee	0.63	0.43	0.41	0.45	0.44
Texas	0.27	0.17	0.18	0.19	0.18
Virginia	0.30	0.17	0.17	0.23	0.18
Regional South	0.41	0.30	0.30	0.34	0.30

Table 4.5 SAM multipliers for wildlife watching expenditures for the southern states.

States	Employment	Total Income	Personal income	Output	Value-added
Alabama	1.64	2.11	1.92	1.77	2.10
Arkansas	1.63	2.17	1.92	1.73	2.16
Florida	2.08	2.67	2.26	2.15	2.68
Georgia	1.99	2.86	2.44	2.08	2.86
Kentucky	1.79	2.30	2.03	1.87	2.28
Louisiana	1.80	2.34	2.00	1.90	2.30
Mississippi	1.68	2.01	1.84	1.69	1.99
North Carolina	1.85	2.36	2.08	1.91	2.36
Oklahoma	1.62	1.94	1.86	1.73	1.94
South Carolina	1.71	2.12	1.86	1.81	2.11
Tennessee	1.73	2.23	2.17	2.00	2.23
Texas	1.97	2.91	2.53	2.28	2.89
Virginia	1.68	2.37	2.10	1.86	2.39
Regional South	2.20	3.08	2.64	2.53	3.07

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CHAPTER V

GENERAL CONCLUSIONS

The primary motivation behind this research was to address an important knowledge gap related to the economic impact of wildlife associated recreation expenditures across the southern U.S. Previous studies have estimated economic impacts of wildlife-associated recreation and its sub-activities at different geographical and activity levels. However, there was no work on the estimation and comparison of the economic impact of fishing, hunting and wildlife watching expenditures across states. This gap was addressed in the context of the southern U.S using IMPLAN models. The studies outlined in Chapters 2, 3 and 4 make important contributions to the field. Chapter 2 and Chapter 3 successfully quantify and compare economic impacts of fishing and its sub-activity expenditures and hunting and its sub-activity expenditures across the Southern states. Chapter 4 estimates the economic impacts of wildlife watching expenditures across the U.S South. Hunting, fishing and wildlife watching expenditures generated $67.8 billion in output and 649,615 jobs. Value-added totaled $36.4 billion, which accounted for almost 54% of total output. Induced and indirect effects accounted for 35.6% and 23.64% of the total economic impact. Wildlife watching activity generated $27.6 billion in total output, greater than hunting or fishing activities. This is 40.8% of total wildlife related activities. Overall, results from this study shows that wildlife

associated recreation expenditures had larger economic multipliers than of the other forest product industries in the southern United States.

5.1 Contributions

The key contribution of this research is the advancement of our understanding of the economic impact of wildlife recreation expenditures across the southern states. The outputs provide important baseline information in an otherwise understudied field and will be good reference source for future impact studies.

5.2 Future Research

IMPLAN modeling is a suitable approach for economic impact estimation related to wildlife recreation expenditures. Results from this work are relevant in the context of future comparative studies. As expenditure data from the 2011 National Survey report of Fishing, Hunting, and Wildlife-Associated Recreation was not available when this study was started, expenditure data from the 2006 National survey was used. When new survey reports are available, such as the 2011 National survey, this study can serve as template and reference for new impact analysis studies.

5.3 Limitations

This economic impact study is based on 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation report as the recent survey data was not available at the beginning of this project. Also, there have been some ongoing concerns about the survey design and data collection techniques for this survey; however, the resultant data is the best available for this study and the importance of producing a multi-state comparison is sufficient to warrant moving ahead at this time.