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NONCONSUMPTIVE OUTDOOR RECREATION EXPENDITURES IN LOUISIANA: AN ECONOMIC ANALYSIS

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**NONCONSUMPTIVE OUTDOOR RECREATION EXPENDITURES
IN LOUISIANA: AN ECONOMIC ANALYSIS**

A Thesis

Submitted to the Faculty of the
Louisiana State University and
Agricultural and Mechanical College
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by

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ABSTRACT

The objective of this study was to analyze expenditure patterns of recreationists in the area of wildlife-based nonconsumptive outdoor recreation in Louisiana. Economic theory suggests a basis for explaining the variation on nonconsumptive recreational expenditures. Linear regression was used to analyze the conceptual model using alternative functional forms. The model was analyzed using data from the *1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. Empirical results suggest that the life-cycle hypothesis does have some explanatory power in explaining the variation in nonconsumptive expenditures in Louisiana.

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I. Introduction

The state of Louisiana is well known for its abundance of wildlife and fisheries. Historically, the people of this state have enjoyed unparalleled hunting, fishing and outdoor recreational opportunities. Additionally, many thousands of individuals earn their living from Louisiana's vast commercial fisheries and the annual harvest of furbearing animals.

Recent changes in national demographics suggest that the impact of the "baby boom" generation may affect individual's financial ability and willingness to participate in traditional outdoor recreation activities. Baby boomers, people born between 1946 and 1964, comprised almost one third of the United States population in 1990. It has also been predicted that by the present year,

"40 percent of these baby boomers will have discretionary income in excess of \$10,000 per year to spend on recreation and entertainment."

(O'Sullivan, 1988).

As a major force in recreation consumption, baby boomers may eventually contribute to the noted change toward nonconsumptive outdoor recreation. Together with the fact that nonconsumptive wildlife recreation is the fastest growing activity among outdoor recreational activities, these trends suggest that nonconsumptive expenditures may represent an increasingly large portion of the discretionary income of consumers (Walsh, 1988).

A. RESEARCH PROBLEM

Wildlife resource activities as well as fisheries activities represent a steady revenue for the state of Louisiana. These activities have also been extensively analyzed in terms

of expenditure patterns. Examples of such analysis are the 1980, 1985, and 1991 "*National Survey of Fishing, Hunting, and Wildlife Associated Recreation*". What has not been as thoroughly studied is wildlife associated nonconsumptive recreation activities, including participation, expenditures or general demand for these activities.

B. RESEARCH OBJECTIVES

The general objective of this research is therefore to do economic analysis of expenditure patterns of recreationists in the area of wildlife-based nonconsumptive outdoor recreation.

The specific objectives include:

- 1) Identify nonconsumptive recreational patterns in the state of Louisiana.
- 2) Analyze nonconsumptive expenditure data for Louisiana.
- 3) Generate policy recommendations based on the patterns identified from nonconsumptive expenditures.

C. RESEARCH PROCEDURES

Nonconsumptive recreational patterns will be identified by the development of a theoretical model of nonconsumptive expenditures in the state of Louisiana. The specifics of this model will be determined from the general review of literature on nonconsumptive expenditures and from the study of previous analyses of nonconsumptive expenditures.

The expenditure data to be analyzed is provided by the *National Survey of Fishing, Hunting, and Wildlife Associated Recreation* (1991). An econometric expenditure model

will be specified and estimated for the data pertaining to the state of Louisiana.

Policy recommendations will be based on the outcome of the first two objectives. The results from objective one and objective two will be the basis for the development of future policy recommendations regarding the nonconsumptive expenditures in the state of Louisiana.

D. CONSUMPTIVE AND NONCONSUMPTIVE OUTDOOR RECREATION

Wildlife based recreation of Louisiana is divided into two categories. The first category, consumptive activities, is composed of fishing and hunting. This group is further subdivided into: a)sportsmen, b)anglers, and c)hunters. The second category is nonconsumptive activities, which is composed of activities such as observing, feeding, and/or photographing fish and wildlife.

These nonharvesting activities (i.e., nonconsumptive) can be further classified into primary nonconsumptive and secondary nonconsumptive activities. Primary nonconsumptive activities are those activities that are solely for the purpose of observing, feeding, or photographing wildlife. Secondary nonconsumptive activities would be activities such as incidentally observing wildlife while pleasure driving. This analysis will only take into consideration primary nonconsumptive activities.

The last division within the nonconsumptive activities to be considered in this analysis is that of residential and nonresidential activities. The nonresidential group includes persons who take trips or outings of at least one mile for the primary purpose of observing, feeding, or photographing fish and wildlife. The primary residential group includes those whose activities are within one mile of home and involve one or more of the

following: 1) closely observing or trying to identify birds or other wildlife, 2) photographing wildlife, 3) feeding birds or other wildlife on a regular basis, 4) maintaining natural areas of at least one-quarter acre for which benefit to wildlife is the primary purpose, 5) maintaining plantings for which benefit to wildlife is the primary concern, or 6) visiting public parks within one mile of home for the primary purpose of observing, feeding, or photographing wildlife (U.S. Department of Interior, 1991).

Louisiana's wildlife based nonconsumptive activities do not only represent outstanding recreational opportunities, but also provide significant economic opportunities for the state. These opportunities, at present, are not considered of great importance when viewed from the perspective of state expenditures. For example, the expenditure on natural resources and the environment was of only 1.5 percent of the total state government expenditure, and only 0.9 percent of the general fund expenditures for the fiscal year (FY) 1992-93. This total spending is equivalent to an expenditure of \$39 per Louisianan for FY 1992-93, and expected to increase to \$64 per Louisianan. State expenditures for FY 1993-94 should go up to \$277.6 million, from the \$165.1 million spent on FY 1992-93 (U.S. Department of Interior, 1991).

E. LOUISIANA OUTDOOR RECREATIONAL OPPORTUNITIES: CONSUMPTIVE

At present there are 38,656 acres of state parks in Louisiana. These parks are estimated to attract an average of 1.1 million visitors per year. Louisianans spend an average of 25 days each year taking advantage of the vast outdoor recreational activities like boating, skiing, fishing, hunting, and nonconsumptive activities (i.e. observing wildlife).

These outdoor recreational opportunities are further enhanced by the Department

of Wildlife and Fisheries (DWF) which manages 1.345 million acres to preserve habitats for fish and wildlife. These preserved lands also provide a variety of outdoor recreation opportunities including, 300,000 days of hunting, 425,000 days of fishing, and 190,000 days of non-consumptive activities in 1991 (Annual Report, State of Louisiana, 1991).

Programs like the Natural Heritage Program in the DWF which has identified 75 distinct natural communities, 250 ecologically significant sites, and most importantly, 31 threatened or endangered species in the state, is creating management plans to ensure the protection and expansion of these natural communities, ecological sites, and endangered species. An example of this program is the Black Bear Conservation Committee, which has drafted a plan to restore the population of this native species to a healthy one, in order to preserve the state mammal (Herring, 1994).

The wildlife resources of the state of Louisiana provide an almost unlimited amount of outdoor activities. Because of progressive deer management, Louisiana's deer herd is at its largest ever, providing 214,900 hunters with 3.6 million days afield in the state in 1991. Also, due to progressive deer management, Louisiana had the harvest of 20 recordbook deer in 1993. Aiding the progressive deer management program is the DWF's Deer Management Assistance Program, which is intended to provide technical assistance on proper management of Louisiana's deer resources to some 725 clubs, whose sum landholding represent 1.6 million acres. Deer hunting in Louisiana represents an overall economic impact of more than \$143 million (Annual Report, State of Louisiana, 1991; Walsh and Harpman, 1989).

Other wildlife resource activities that represent revenue for the state must also be

taken into consideration. One of these activities is the hunting of wild turkey, which at present is the fastest growing hunting sport in the state. Another activity is hunting small game which includes rabbits, squirrels, and upland birds. Louisiana had 300,000 licensed small-game hunters who totalled approximately 6.9 million days afield. In addition 172,000 furbearer pelts, with the nutria being the most important, were harvested during the 1992-93 season.

According to survey results cited by U.S. Department of Interior, nearly one-fourth of all Louisianans fish, making fisheries important for the state. Louisiana issued 16,000 commercial fishing licenses, about 535,000 recreational licenses, and 246,000 saltwater fishing licenses in 1993 (Louisiana Department of Wildlife and Fisheries, 1994). The amount of licenses issued by the state in 1993 suggests that Louisiana's fisheries provide abundant resources for both commercial production as well as recreational enjoyment.

In terms of commercial fishery production, Louisiana produced a billion pounds of fishery products and a seafood industry that exceeded a value of \$273 million in 1993. The shrimp industry, which has been harvesting near its capacity of production since the 1970's, harvested 98 million pounds of shrimp, yielding nearly \$145 million in revenue in 1992. Oystermen made about \$20.7 million in 1992 from a harvest of 9.1 million pounds, and expect to harvest some 11 million pounds in the 1993 season (Annual Report, State of Louisiana, 1991).

Turning to recreational fisheries, the DWF Inland Fish Division stocked nearly 2.2 million Florida largemouth bass, some 484,000 hybrid striped bass, 1.4 million catfish and 6,000 black crappie at various locations across the state. In order to make these resources

available to fisherman, the DWF treated 23,692 acres of water hyacinth and other noxious weeds during 1993. A new state largemouth bass record was set in Caney Creek Reservoir, with a weight of 15.54 pounds. At least 16 fish over 13 pounds were caught in Louisiana waters during this past year (Annual Report, State of Louisiana, 1991).

F. LOUISIANA OUTDOOR RECREATIONAL OPPORTUNITIES: NONCONSUMPTIVE

As previously defined, nonconsumptive activities are mainly observing, feeding, and photographing fish and wildlife. According to the 1991 National Survey of Fishing, Hunting, and Wildlife Associated Recreation(1991), 1.1 million state residents 16 years old and older participated in nonconsumptive activities in 1991. There were one million residential participants accounting for 99 percent of the nonconsumptive participants in Louisiana (U.S. Department of Interior, 1991).

Out of 368 thousand primary nonresidential in-state participants, 352 thousand observed wildlife, 154 thousand feed wildlife, and 163 thousand photographed wildlife. The sum of the three activities is much higher than the number of participants due to the fact that many people perform more than one of these activities (Table 1, Figure 1).

Louisiana residents spent two million days engaged in primary nonresidential activities in their state. Louisiana residents spent 1.9 million days observing wildlife, 1.2 million days feeding wildlife, and 742 thousand days photographing wildlife. Again the sum of the individual activities is more than the total days spent in primary nonresidential activities in the state because individuals may have engaged in more than one activity some days.

Table 1. Participants and Days of Participation in Primary Residential and Nonresidential Nonconsumptive Wildlife Associated Recreation Activities in Louisiana: 1991.
(State residents 16 years old and older)

Primary Nonresidential Participants	
Observe wildlife	247 thousand
Feed wildlife	134 thousand
Photograph wildlife	102 thousand
Total	256 thousand people
Primary Nonresidential Participants: Days	
Observe wildlife	1.9 million
Feed wildlife	1.2 million
Photograph wildlife	742 thousand
Total	2.0 million days
Primary Residential Participation	
Observe wildlife	777 thousand
Feed wildlife	954 thousand
Photograph wildlife	210 thousand
Visit public areas	177 thousand
Maintain natural areas	118 thousand
Maintain plantings	84 thousand
Total	1.0 million people

Detail does not add to total because of multiple responses.

Source: U.S. Department of the interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the Census. *1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*.

Figure 1. Participants and Days of Participation in Primary Residential and Nonresidential Nonconsumptive Wildlife Associated Recreation Activities in Louisiana: 1991.

Figure 1.1

Primary Nonresidential Participants

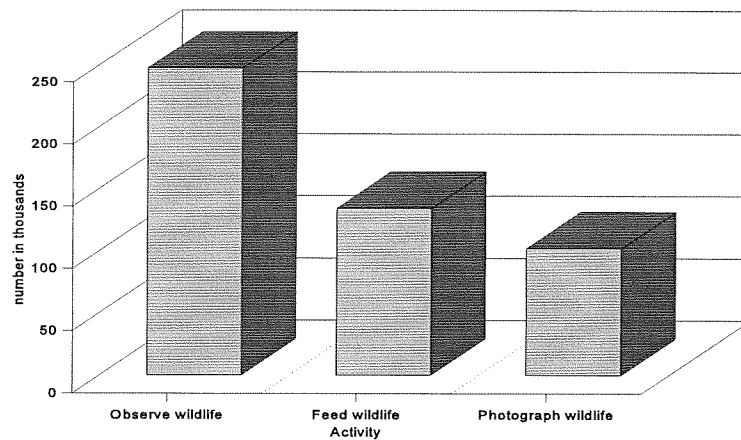


Figure 1.2

Primary Nonresidential Participants:Day

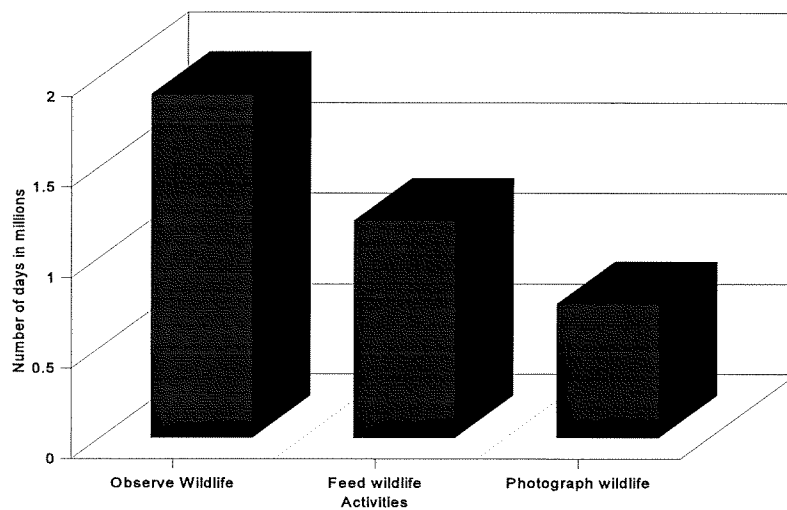
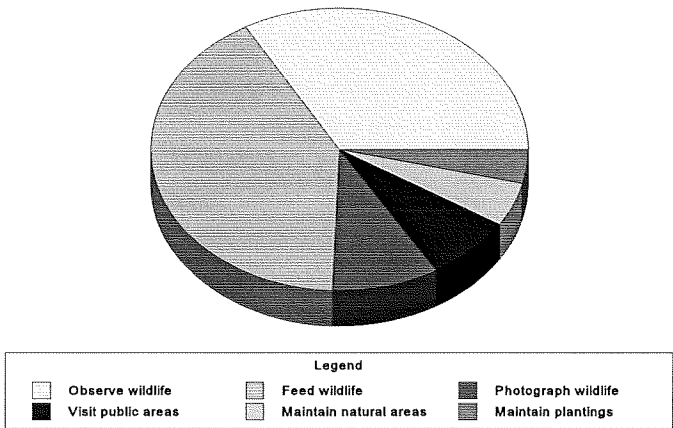


Figure 1.3

Primary Residential Participation



Source: U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the census. *1991 national Survey of Fishing, Hunting, and Wildlife Associated Recreation.*

Also in 1991, one million state residents enjoyed observing, feeding and photographing wildlife within one mile of their homes. Of this group, 777 thousand observed wildlife, 954 thousand fed wildlife, and 210 thousand photographed wildlife around their homes. Another 177 thousand residential participants visited public parks and natural areas within a mile of home; 118 thousand participants maintained natural areas of 1/4 acre or more for the primary benefit of wildlife; and 84 thousand participants maintained plantings for the benefit of wildlife (U.S. Department of Interior, 1991).

Nonconsumptive activities in Louisiana are just beginning to be identified and analyzed. Represented mainly by the Natural Heritage Program, in the DWF, the nonconsumptive activities have been given a much lower status than that of hunting and fishing. Even with a modest budget, this program has put forth incredibly successful publications like the "Louisiana's Hummingbirds", "Gardening for Butterflies in Louisiana", and "Atlas of the Vascular Flora of Louisiana", which have succeeded with almost no marketing or publicity. This could be seen as an example of the demand for nonconsumptive activities (Lester, 1994).

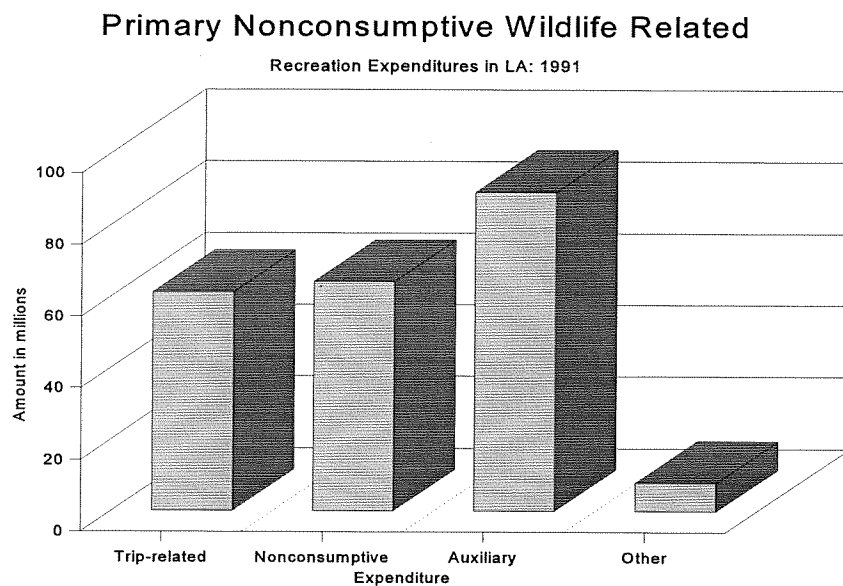
Nonconsumptive activities are often associated with costless activities, which represent no earnings for the state. However, in 1991, nonconsumptive activities involved an expenditure of \$222 million from state residents of 16 years of age or older. These expenditures, as opposed to those of hunting and fishing, have not been analyzed in depth. Patterns that have been created for hunting and fishing expenditures are often the basis for the previously mentioned management programs. The same kinds of patterns should be created for the expenditures on nonconsumptive activities in order to devise a development and management program (Table 2, Figure 2).

Table 2. Primary Nonconsumptive Wildlife Related Recreation Expenditures in Louisiana: 1991

Expenditure	Amount \$
Trip-related	\$ 61 million
Equipment	\$153 million
Nonconsumptive	\$ 64 million
Auxiliary and Special	\$ 89 million
Other	\$ 8 million
Total	\$222 million

Source: U.S. Department of Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the census. *1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*.

Figure 2. Primary Nonconsumptive Wildlife Related Recreation Expenditures in Louisiana: 1991



Source: U.S. Department of Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the census. *1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*.

An example of the growth of this group can be seen in the purchase of the Wild Louisiana Stamp, which is bought by people who wish to go into reserves or state parks for the single purpose of engaging in nonconsumptive activities. More than one thousand were sold last year. With a price of \$5.50, it represents a revenue of over \$5,500 just in stamps (Lester, 1994).

G. THESIS OUTLINE

Chapter One first identified the differences between consumptive and nonconsumptive activities, and primary and secondary nonconsumptive activities. Chapter One also specified the quantity (physical and dollar amount) and quality of consumptive and nonconsumptive recreational opportunities in the state of Louisiana. Chapter Two will present a review of recent research on nonconsumptive recreation, including economic and socio-economic studies. The theoretical basis for economic expenditure studies will be developed as the conceptual frame work for an empirical analysis in chapter Three. Chapter Three will then present the conceptual and empirical analysis of Louisiana nonconsumptive recreation expenditures. Chapter Four will conclude the thesis with policy recommendations based on this research.

II. Expenditure Analysis

A. Previous Research

Historically, the human interaction with wildlife meant the death or removal of organisms from their natural habitat. This is supported by the fact that the main function of most wildlife management authorities has been to provide for the conservation of wild population according to demand-generated objectives. Recently, history has taken a turn. For the past two decades,

"the growth of nonconsumptive uses of wildlife has expanded to the point where larger proportion of people, with a concurrently large proportion of economic and, potentially, ecological impact, have engaged in nonconsumptive recreational interaction with wild species than in traditional wildlife pursuits" (Duffus and Dearden, 1990).

In North America, detailed nationwide studies and site-specific research have measured substantial economic and recreational benefits from nonconsumptive wildlife use. In the United States wildlife viewing as a primary recreational activity increased from 83.2 million to 104.7 million user-days between 1980 and 1985 (US Fish and Wildlife Service, 1987).

One must also consider that expenditures on wildlife-oriented activity only address fairly simple components of value, such as regional economic impact. The actual total value of wildlife involves a wide spectrum of market and non-market values, some of which are conducive to well-established economic valuation methods and others which evoke arguments such as the appropriateness of these economic valuation techniques (Carson, Meade, and Smith, 1993). For this reason, few studies have been done in the field of nonconsumptive expenditures, but a larger, and similar amounts of studies have been done for consumptive expenditures.

Spotts and Mahoney (1991) have analyzed the viability of targeting heavy spenders in regional travel marketing. The basis for this study is that marketing researchers have found that for many products, the heavy users account for a disproportionately large percentage of sales. For this study, no comprehensive list of travelers to the study region existed from which to draw a sample, therefore travelers were contacted on-site. Travelers were contacted at selected attractions such as campgrounds, motels, restaurants, and roadside parks in the region and asked to complete a self-administered questionnaire. Permanent residents of the region, seasonal residents of any region, and travelers on bus tours were excluded from this study.

The findings of this study indicate that expenditure based segmentation appears to hold at least some promise as one possible way of segmenting a destination region's travel market. The heavy spenders had a significantly higher expenditure than their counterparts. Although only 33% of the parties were classified as heavy spenders, the expenditures of this segment counted for 78% of the expenditures of the sample as a whole. The various results that emerged from the study provide insights as to how the regions's appeal to heavy spenders could be maximized and its existing market of heavy spenders could be encouraged to stay longer and return in the future. Heavy spenders were distinguishable from the other segments on the basis of their larger party size, longer length of stay, greater involvement with recreation, and greater propensity to use the information provided by the region's travel industry. The one shortcoming of the study is that no insights emerged on how to reach potential heavy spenders who have not visited the region.

Another study related to expenditures on recreational activities was conducted by Long and Perdue (1990). This study was conducted with the purposes of: 1) estimating

visitors' expenditures at a rural arts and crafts festival in Colorado and 2) describing the spatial distribution of those expenditures. With the purpose of describing their behaviors, particularly their expenditures, attendees were contacted as they entered the fair grounds. To assure a representative sample of visitors, sampling periods were randomly selected from all possible hours of fair operation. Since the focus of this study was on nonresident expenditures, an initial screening question was asked to determine attendee residence. Overall, 450 nonresident visitor groups were contacted.

This study's results further emphasize the value of repeat visitors in that they tended to spend significantly more money than did first-time visitors. Of the nonresident expenditures associated with the festival, the mean percentage spent in the community by the survey respondents was 69.7%. However, it is very important to note that 77.9% of this spending was done at festival booths, many of which were not operated by local residents. While the ability to generalize these results is limited, the findings imply that research which fails to correct for nonlocal spending may significantly overestimate the economic benefits of festivals to the host community.

Howard, Lankford, and Havitz,(1991) addressed a fundamental question of travel spending measurement: How accurately do travelers report trip expenditures? Two additional propositions were also examined: 1) travelers tend to underestimate expenditures incurred during a trip experience, and 2) travelers will provide more accurate expenditure data when responding to broad expenditure categories than to open-ended questions. The method used involved randomly assigning one member of a traveling party the task of compiling a complete record of trip expenditures. A second member was asked to estimate the same expenditures on the last day of the trip. The spending recall accuracy

hypotheses of the study were tested by comparing the actual trip expenses maintained by each recorder against the more spontaneous estimates provided by their estimating partners. Matched t-tests revealed estimators significantly underestimated overall daily expenditures.

The study draws two important conclusions from its findings. The first one is that self-reported data used to document the economic impact of travel must be adjusted to more accurately reflect the true benefits associated with travel activity. The second one is that recall accuracy appears to decay rapidly. Evidence from this study suggest that response error increased as a function of length of trip. It appears then that recall accuracy is affected by two dimensions of travel time. Both the elapsed time between the trip and post trip data collection, and the duration of the trip itself can influence the degree of response error in self-reported expenditure estimates.

Dardis, Derrick, Lehfeld, and Wolfe, (1981) examined factors influencing recreation expenditures by households in the United States. The study used data from the 1972-73 Bureau of Labor Statistics Consumer Expenditure Survey to determine the impact of various household characteristics on recreation expenditures. Approximately 12,000 households were surveyed each year resulting in more than 10,000 usable responses in both years. The unit of observation in this study was the household and the dependent variable was recreation expenditures. These expenditures included vacation homes, boats and aircraft, wheel goods, tours, lodging and transportation expenses associated with vacations, television, and other recreation items.

This study came up with six major conclusions, which are the following: 1) There is a strong relationship between recreation expenditures and income. Also to be noticed, is

the fact that the relationship between recreation and total expenditures is elastic in contrast to the relationship between recreation and disposable income which is unit elastic. 2) Household in the middle of the life cycle spend more on recreation than households located at either extreme of this cycle. Households with young children and older households spend less than other households. 3) Social class has a significant impact on recreation expenditures. Education is positively related to recreation expenditures while there are no definite trends with respect to occupation. 4) Location of the household is significant. Urban households spend more than rural households while households located in the western region spend more than other households. These patterns may reflect different life styles as well as different recreation opportunities. 5) Households headed by non-blacks spend considerably more than households headed by blacks, and 6) All the above relationships were stable from 1972 to 1973 according to the data from the Bureau of Labor Statistics Consumer Expenditure Survey.

Smith and Luzar (1995), explored the existence of potential barriers to public participation in nonconsumptive recreational activities. With data from the 1991 U.S. Fish and Wildlife Service survey of nonconsumptive recreation participation in Louisiana, this study created an economic model identifying factors influencing the decision to participate or not in nonconsumptive recreations. The participation decision was then analyzed in a qualitative choice framework by using logit and probit analyses. Smith and Luzar identified a number of socio-economic factors which economic theory, including the life cycle hypotheses (Raunikaar and Huang, 1987), and previous studies suggested might influence the participation decision. Among these were ethnicity, marital status, education, income, place of residence, age, and gender. As stated in the results,

"The empirical results suggest that ethnicity and marital status are the only factors which might be considered as potentials barriers to participation in wildlife related nonconsumptive recreation participation"(Smith and Luzar, 1995).

B. Summary

In summary, although expenditure studies do not directly convey economic valuation information, they can contribute greatly to our understanding of demand factors influencing nonconsumptive wildlife based recreation. The following chapter presents the theoretical basis for expenditure analyses and develops a conceptual model of nonconsumptive expenditures.

III. Theoretical Basis for Expenditure Analyses

A. Demand Relationship

Demand is a relation indicating the quantity of a well-defined good that consumers are willing and able to buy at each possible price during a given period of time, with all other factors that affect demand held constant. This demand relationship can be described in two ways: as a table of prices and quantities (a demand schedule) and as a graph of prices and quantities (a demand curve). This demand relationship simply defines the relationship between price and the quantity purchased per unit of time while holding other factors constant.

In demand, price and quantity vary inversely, meaning the demand curve has a negative slope. This is also called the law of demand and states that,

"the quantity of a good demanded during a given time period is inversely related to its price, other things constant." (McEachern, 1991)

Two types of changes can occur to the demand. One is a change in the quantity demanded which refers to movements along a demand curve. The second type of change is a change in demand which refers to shifts in the level of the demand curve. The major factors influencing the level of demand may be grouped into four groups: 1) Population size and its distribution by age, geographic area, etc. (i.e. changes in number of consumers), 2) Consumer income and distribution, 3) Price and availability of other commodities and service (i.e. changes in the prices of complements and substitutes), and 4) Consumer tastes and preferences.

The change toward nonconsumptive consumption of outdoor recreation is an example of changing recreation tastes and preferences. Income changes in terms of disposable income available for outdoor recreation may also have grown with demographic increases associated with the baby boom generation. Population also changes in terms of age and gender distribution, and geographic area movement. As a result,

"Economists have long been interested in incorporating socio-economics and psychological variables in demand analyses"(Raunika and Huang, 1987).

The impact of sociodemographic and psychological variables on food consumption has been analyzed mainly from cross-sectional data. These kind of data usually exhibits minimal price variations. They reduce the use of traditional economic theory since "adding-up" becomes the only restriction left that can be used in empirical work.

"Typically, a traditional demand function is then specified as a function of income. However, previous research has shown that income alone has a low explanatory power in the analysis of cross-sectional data, especially with disaggregated consumption" (Hassan and Johnson, 1977).

This findings suggest that sociodemographic variables, which usually exhibit large variations in cross-sectional data, play a key role in explaining consumption behavior.

"The introduction of sociodemographic variables in demand analysis has presented new challenges for both theoretical and applied research. One question concerns the usefulness of consumer theory when such variables are considered. The economic unit of consumption is typically the household, with a given household income distributed to each household member. Very little work has been done on household, as distinct from individual, preference functions. It is usually assumed that the household is a closely knit group that behaves in such a way that justifies the existence of a household preference function. It is usually argued that households' preferences are functions of their sociodemographic characteristics, reflecting the fact that households with different characteristics have different physical and psychological needs."(Raunika and Huang, 1987)

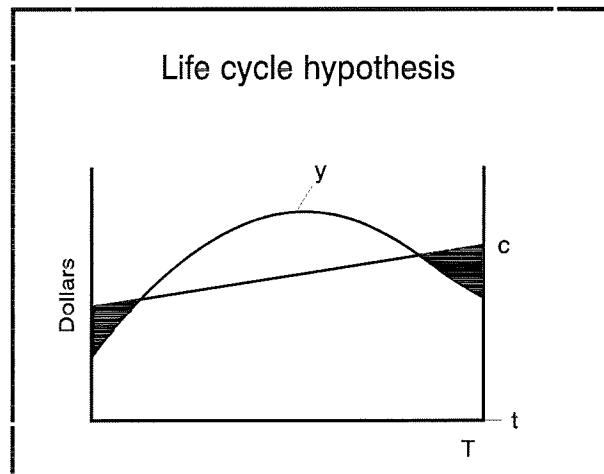
Thus, in the absence of price variations, demand functions can be specified as:

$$X_i = X_i(M, N, S) \quad (i = 1, \dots, n) \quad (1)$$

where X_i is the family consumption of the i^{th} commodity, M is household income, N represents family size, and S is a set of other sociodemographic or psychological variables such as race, age, marital status, gender, education, and location of residence.

Two areas of Economic theory contribute to the understanding of these expenditure relationships: the Life Cycle Hypotheses (Figure 3) and the Engel Curve (Figure 4.1 and 4.2).

Figure 3



According to the *life-cycle* hypothesis of consumption, the typical individual has an income stream which is relatively low at the beginning and end of his/her life, when his productivity is low, and high during the middle of his/her life. This typical income stream is shown as they, as the y curve in figure 3, where T is expected lifetime. On the other hand, the individual might be expected to maintain a constant or slightly increasing level

of consumption throughout of his life, denoted as c in figure 3. The constraint on this consumption stream is that the present value of his total consumption does not exceed the present value of his total income. This model suggests that a person at the beginning of their life cycle is a net borrower, denoted by the first shaded portion of figure 3. In the middle years, the person saves to repay debt and provide for retirement. It is at this stage of their life where participants have the highest level of expenditure on nonconsumptive recreational activities. In their late years the person spends his/her savings, as shown by the second shaded area in figure 3 (Branson, 1979). The first and last stages, explaining the lower participation and expenditures in nonconsumptive recreational activities by the participants in these two extremes of their life cycles.

An *Engel curve* is the relationship between changes in consumer income and quantity of an item purchased. As income increases, more or less of a commodity may be bought. A normal good is one in which consumers buy more of it as income increases. An inferior good is one that consumers buy less of as income increases. In figures 4.1 and 4.2, both Engel curves are for normal goods, since they both increase in quantity consumed as income increases (Crammer and Jensen, 1994). The difference between the two figures is the fact that figure 4.1 is increasing at a decreasing rate, while figure 4.2 is increasing at an increasing rate. This means that the proportion of income spent for food (figure 4.1) decreases as income increases. Other items such as clothing (Figure 4.2) show that the quantity of clothing purchased changes substantially as income rises. In the case of nonconsumptive expenditures it is hypothesized that its Engel curve reflects that of a luxury good, and therefore, as income increases the amount of nonconsumptive recreational activities expenditure increases at an increasing rate (Crammer and Jensen, 1994).

Figure 4.1 Engel curve for food.

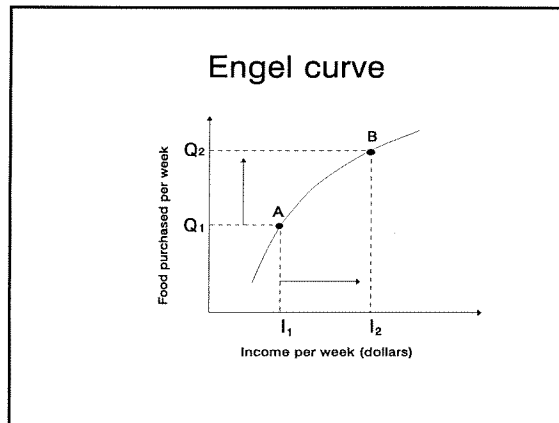
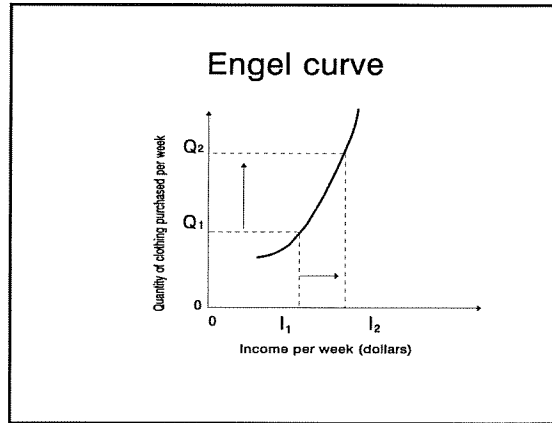


Figure 4.2 Engel curve for clothing.



B. Demand for Nonconsumptive Recreation

A number of relevant sociodemographic or psychological variables hypothesized to influence the demand for nonconsumptive recreation have been identified from the literature review. Dardis, et al.(1981) for example, determined some relationships between three variables and recreational expenditures. Dardis, et al. found a strong relationship between recreation expenditures and income (a positive relationship). This study also found that families in the middle of their life cycle spend more on recreation than households located at either extreme. Therefore, households with small children and older households spend less than other households. The third conclusion arrived at by Dardis, et al. was that social class has a significant impact of recreation expenditures. Education is positively related to recreation expenditures while there are no definite trends with respect to occupation (which was therefore not included in the sociodemographic variables of the analysis). The significance of location is based on the fact that urban households generally spend more than rural households. Dardis, et al. also concluded that households headed by non-blacks spend considerably more than households headed by blacks. It is important to notice that the above relationships were stable from 1972 to 1973, according to this study (Dardis, et al., 1981).

Although these relations explored by Dardis, et al. were for recreation in general, from a broader review of the literature, it is hypothesized that all these variables may have a significant effect on nonconsumptive expenditures. For example, the higher the household income, the higher the propensity to spend on nonconsumptive recreation. The families in the middle of their life cycle are more prone to spend more in recreation for the simple reason that they are able to do so with ease. Education is a very important factor

for nonconsumptive expenditures, since the educated portion of society is the one who understands the benefits of nonconsumptive expenditures and enjoys such expenditures. The other factor is location, as those who live in large cities and are not able to enjoy nature on a daily basis have a higher willingness to spend on recreation than those of rural areas where nature is part of an every day life.

C. Conceptual Model

Therefore, based on economic theory and previous research, the following relationship explains the variation in nonconsumptive expenditures is hypothesized:

$$\text{EXPENDITURE} = f(\text{Income, Age, Gender, Residence, Hunts, Fishes, Public, Income, } e) \quad (2)$$

Residence is hypothesized as a significant influence on a respondent's expenditure. Previous research suggests that urban residents spend considerably more overall than rural residents (Dardis, et al., 1981). Age will be consider in a continuous form and is hypothesized to be a positive determinant for those respondents in the middle of their life cycle. Households in the middle of the family life cycle typically spend more on recreation than households located at either extreme, and households with young children and older households spend less than other households (Dardis, et al., 1981). Studies have shown age to be a significant element affecting participation in recreational activities. According to the U.S. Fish and Wildlife Service (1984), rates of wildlife participation were highest for the 25-334 age group at 63 percent. This dropped off to 59 percent for the 35-44 age group. Marital status is hypothesized to influence expenditures, as is gender of the respondent. While male respondents are hypothesized to spend more on nonconsumptive

recreation, the hypothesized effect of marital status is not clear.

Education will be considered in a continuous form, where higher education has a positive effect on nonconsumptive activity expenditures. Research has suggested that education is positively related to recreation, while there are no definite trends identified with respect to occupation (Dardis, et al., 1981). Other studies have shown that a strong positive relationship exists between education and engagement in nature related activities. The U.S. Fish and Wildlife Service (1984) reported that participation rates ranged from 30 percent for people with seven or fewer years of education, to more than 77 percent for those with five or more years of college. Residence, designated as rural or urban, is hypothesized to influence expenditures. It is hypothesized in this case that residents of urban areas will spend more on nonconsumptive recreation. Income, just like education, will be measured in continuous form, where the higher the income, the more positive the effect on participation in nonconsumptive activities. As stated by Dardis, et al.(1981), there is a strong empirical relationship between recreation expenditures and income, as well as theoretical.

Other factors that will be considered in this model are those of respondent participation in either hunting or fishing activities. The study will also analyze the factor of participating in nonconsumptive recreational activities in public lands as opposed to participating in private lands.

To summarize, variation in nonconsumptive expenditures is hypothesized to be a function of age, gender, residence, public land, hunt, fish, and income. The following section presents the data and the empirical analysis of this model.

D. Data

The data used for this study come from The National Survey of Fishing, Hunting, and Wildlife Associated Recreation. This survey has been conducted by the Department of Interior since 1955 and is one of the oldest and most comprehensive continuing recreation surveys.

"The purpose of the Survey is to gather information on the number of anglers, hunters, and nonconsumptive participants in our country, as well as how often they participate and how much they spend on these activities"(U.S. Department of Interior, 1991).

Funding for the survey came from the administrative portion of the Federal Aid in Sport Fish and Wildlife Restoration Programs.

The survey was conducted by the U.S. Bureau of the Census for the Fish and Wildlife Service, in two phases. The first phase was mainly held in the form of a telephone interview. A sample of 129,500 households nationwide was used to determine who in the household had fished, hunted, or engaged in a nonconsumptive wildlife-related activity in 1990, and who planned to engage in this activities in 1991. This screener identified basic household and socio-economic characteristics of respondents, including income, education, gender, ethnicity, residence, age, employment, and marital status. The questionnaire also elicited information on expenditures, residential and nonresidential activities, public and private land use, frequency of activities, number of days participating in activities, and costs of nonconsumptive activities. This first phase was conducted in January and February 1991 and achieved a 95 percent response rate from those households that were eligible.

The second phase of the survey consisted of three detailed interviews conducted every four months with samples of likely anglers, hunters, and nonconsumptive participants

who were identified in the initial phase. The interviews for the second phase were mainly conducted by telephone and only considered respondents over 16 years of age. Those who could not be reached by phone were interviewed in-person. The sample sizes of this second phase were designed to provide statistically reliable results at the State level for fishing, hunting, and nonconsumptive activities. The number of anglers and hunters interviewed were 23,179 while 22,723 nonconsumptive participants were interviewed.

The 1991 survey questionnaires were quite similar to those used in the 1980 and 1985 surveys, and the sample sizes for the three surveys were roughly the same. The interviews are different in the fact that the Surveys for 1980 and 1985 were conducted mainly through in-person interviewing while the 1991 survey was conducted by telephone. Another difference among the surveys is that the 1991 survey had its first phase at the beginning of the survey year, rather than at the end like the 1980 and 1985 surveys. This meant screening people based on anticipated activity, rather than past activities. The other big difference between the 1991 survey and the 1980 and 1985 surveys is the three four-month recall periods used for each respondent in the 1991 survey. In the other two surveys, a single twelve-month recall period was used. This change was done because of the findings that the amount of activity and expenditures reported in twelve-month recall surveys was over-estimated in comparison with that of shorter recall periods.

Data used for this specific analysis include 5,235 observations on Louisiana residents, 430 of whom participated in nonconsumptive activities. Due to item nonresponse, the usable data set for this study was 411 observations. Table 3 presents relevant descriptive statistics for data used in this analysis.

Table 3. Descriptive Statistics: Variables used in Economic Analysis of Nonconsumptive Expenditures in Louisiana.

Variables	Mean	Std. Dev.	Minimum	Maximum
COSTPT	30.33	144.76	0.00	2000.00
TOTCOST	25.14	210.85	0.00	3500.00
INCOME	38277	22309	10000.00	75000.00
HOWOLD	42.68	15.69	16.00	87.00
LRGCITY	0.38	0.49	0.00	1.00
FEMALE	0.52	0.50	0.00	1.00
HUNTS	0.04	0.20	0.00	1.00
EDUC	16.94	6.51	2.00	26.00
NUMTRIPS	6.46	14.84	0.00	139.00
FISHES	0.16	0.36	0.00	1.00
PUBLIC	0.23	0.42	0.00	1.00
NONCOM	0.36	0.48	0.00	1.00
BIRDS	0.68	0.46	0.00	1.00
MAMMALS	0.58	0.49	0.00	1.00
WHITE	0.88	0.32	0.00	1.00
MSTATUS	0.72	0.45	0.00	1.00

N = 411

Source: U.S. Department of Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the Census. *1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*.

Costs per trip for nonconsumptive recreation average \$30.33, while the total cost average \$25.14, with an average number of trips of 119. Some respondents participate on a regular bases with a low expenditure, while other participants do so less often but with higher expenditures. The income of the respondents averages \$38,277.49, from the range of \$10,000 to \$75,000. The average age of the participants is between 42 and 43 years old. This supports the life cycle hypothesis, which states that middle aged people with a relatively high disposable income and few family restraints to participate, represent the highest participation rate in nonconsumptive activities. Another factor that could add to this hypothesis is the fact that the average education of the participants is that of almost 17 years, meaning that most participants have at least a college degree. The gender division on respondents was almost 50 percent for each gender, with women comprising 52 percent of respondents. As previously determined, the percentage of people who hunt and participate on nonconsumptive activities is extremely low, while of those who fish, some percentage (16) do participate in nonconsumptive activities. Almost one fourth of nonconsumptive activities take place on public lands where higher expenditures have been recorded. Other interesting factors to consider from Table 3 is the fact that 88 percent of the respondents are white and 72 percent of the respondents are married. Up to 68 percent of respondents participated in bird watching, while approximately 58 percent of the respondents observed mammals.

E. Empirical Analysis

Based on the conceptual model presented earlier, the following statistical model was specified for empirical estimation:

$$\text{EXPENDITURE} = F(\text{AGE, GENDER, RESIDENCE, HUNTS, FISHES, PUBLIC, INCOME, } e) \quad (3)$$

Variable definitions are given in Table 4. The model was estimated using SAS. Two forms of the model were estimated through linear regression, Log-Linear and Double-Log. These functional forms consistently yield superior fits for expenditure analyses.

Other factors that can be considered as influential to the expenditures on nonconsumptive activities such as education, race, or employment were not included in the model because of their high correlation to other variables being used in the model. Education, for example, is highly correlated with the fact that with a high education the respondent typically has a high income and is not a minority. Employment is another variable that is highly correlated with variables like income and age. As stated by the life cycle hypothesis, all these factors contribute to make a cycle where the relationships of income, age, education, and employment are highly correlated. Therefore, income and age were used to represent these other variables.

SAS was used in the regression analysis of the models. To improve the overall fit of the model, two forms of the same model were used. The first model was a semi-log model in which only the dependent variable is logged. The second model is the double-log model, in which not only the dependent variable was logged, but also the continuous independent variables. Tables 5 and 6 present the empirical results of the regressions.

Table 4. Explanatory Variables for Nonconsumptive Wildlife Associated Recreation Expenditures in Louisiana: 1991

EXPENDITURE	Total Expenditure on nonconsumptive recreational activities.
AGE(+)	Age of respondent in years.
GENDER(-)	Gender of participant: 1 if female, 0 if male
RESIDENCE(+)	population of respondent's residence: 1 if population > 50,000, 0 if otherwise
INCOME(-)	Income of respondents.
HUNTS(-)	Participation in hunting activities: 1 if hunts, 0 if otherwise.
FISHES(+)	Participation in fishing activities: 1 if fishes, 0 if otherwise.
PUBLIC(+)	Participation on nonconsumptive recreational activities in public lands as opposed to private lands. 1 if public lands, 0 if otherwise.
e	Econometric error term

Table 5. Empirical Results of Nonconsumptive Outdoor Recreational Expenditures in Louisiana: Semi-Log Function.

Variables	Parameter Estimates	Standard Error	T-Ratio
INCOME	0.0000004265	0.00000822	0.519
HOWOLD	0.024912	0.01178458	2.114*
LRGCITY	0.275002	0.37976734	0.724
FEMALE	-0.328821	0.36348313	-0.905
HUNTS	-3.096169	0.94738885	-3.268*
FISHES	1.950071	0.53450585	3.648*
PUBLIC	2.755352	0.43582648	6.322*

R-square = .13

N = 411

* Statistically significant at the .05 critical level of 1.65.

Source: U.S. Department of Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the Census. *1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*.

Table 6. Empirical Results of Nonconsumptive Outdoor Recreational Expenditures in Louisiana: Double-Log Function.

Variables	Parameter Estimates	Standard Error	T-Ratio
LNINC	0.142596	0.27609845	0.516
LNAGE	1.015556	0.47035944	2.159*
LRGCITY	0.283485	0.37826236	0.749
FEMALE	-0.325686	0.36341564	-0.896
HUNTS	-3.137804	0.94676039	-3.314*
FISHES	1.965219	0.53572952	3.668*
PUBLIC	2.729433	0.43417870	6.286*

R-square = .13

N = 411

* Statistically significant at the .05 critical level of 1.65.

Source: U.S. Department of Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the Census. *1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*.

In reviewing the empirical results, the two functional forms appear to yield similar and consistent results. Overall, the double-log function yielded slightly better measures of overall model fit, as given by the model F values and R-squares. Although the R-squares are relatively low, they are consistent with other analyses of cross-sectional data which tend to have a high degree of variability.

Variables found to be statistically significant (at the 5 percent confidence level) included HOWOLD, HUNTS, FISH, and PUBLIC for both models. Income was not statistically significant, as well as variables representing residence and gender.

Signs on the estimated coefficients were largely as hypothesized in both models. It was hypothesized that income would have a strong positive influence in nonconsumptive outdoor recreational expenditures. The t-ratio for income denotes that it influences expenditures in a positive way, but is not statistically significant. Age was very significant with a t-ratio of 2.11, well above the 5 percent level of 1.65. This high positive influence of age on nonconsumptive expenditures correlates with the life cycle hypothesis previously mentioned. Another variable taken into consideration was the size of residency. The study hypothesized residence in large cities would be associated with higher expenditures. The relationship of this variable was a positive one, but not statistically significant. The factor of hunting was one that proved to be quite interesting, especially when contrasted to those who fish. As hypothesized, those respondents who participated in hunting have a negative and statistically significant relation to nonconsumptive expenditures. Opposed to this relation is the one of fishing. Fishing has a high statistical significance and a positive influence on nonconsumptive expenditures. Participation in nonconsumptive activities on

public lands as opposed to private lands was also evaluated in the model. This variable has a very high significance level, with a t-ratio of 6.32, meaning that those who participate and do it on public lands have a higher expenditure on nonconsumptive expenditure.

F. Summary

Economic theory suggests a basis for explaining the variation in expenditures on nonconsumptive recreations. This chapter has reviewed economic theory and previous research to form the basis for a conceptual and empirical expenditure model. The model was analyzed using data from the *1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. Empirical results suggest that the life-cycle hypothesis does have some explanatory power in explaining the variation in nonconsumptive expenditures.

Age, as stated in the life cycle hypothesis, demonstrates a positive relationship to expenditures with middle aged persons positively associated with higher expenditures in nonconsumptive activities. Income, which was hypothesized as a strong influence on expenditures, had a low, but a positive significance level as did the variable representing urban residence. Female gender, as hypothesized, was negatively associated with nonconsumptive expenditures, but was not statistically significant. An interesting factor which resulted in a negative and statistically significant relationship, was the activity of hunting. The study suggests that those people who hunt do not participate, as reflected in expenditures, in nonconsumptive recreational activities. Opposite to those results are the results of respondents who fished. The empirical results suggest that people who fish, are positively associated with higher expenditures in nonconsumptive activities. The last influential factor in the model was the participation in public lands. This variable was not

only positively related to the expenditures on nonconsumptive activities, but also very statistically significant.

IV. CONCLUSION

A. Summary

In a state with an abundance of wildlife and fisheries such as Louisiana, outdoor recreation plays an important role in the state's economy. For hundreds of years the people of the state of Louisiana have enjoyed unparalleled hunting, fishing and outdoor recreational opportunities. These commercial fisheries and the high annual harvest of furbearing animals also represent the way thousands of individuals earn their living. Wildlife resource activities as well as fisheries activities represent a steady revenue stream for the state of Louisiana. These activities have also been extensively analyzed in terms of expenditure patterns. What has not been as thoroughly studied is wildlife associated nonconsumptive recreation activities, including participation, expenditures or general demand for these activities.

The general objective of this research was to develop an economic analysis of expenditure patterns of recreationists in the area of wildlife-based nonconsumptive outdoor recreation. The specific objectives of this study included: a) identify nonconsumptive recreational patterns in the state of Louisiana, b) analyze nonconsumptive expenditure data for Louisiana, and c) generate policy recommendations based on the patterns identified from nonconsumptive expenditures.

Nonconsumptive recreational patterns were identified by the development of a theoretical model of nonconsumptive expenditures in the state of Louisiana. The specifics of this model were determined from the general review of literature on nonconsumptive expenditures and from the study of previous analyses of nonconsumptive expenditures

done on Chapter Two of this thesis. Although expenditure studies do not directly convey economic valuation information, they can contribute greatly to our understanding of demand factors influencing nonconsumptive wildlife based recreation.

Chapter Three determined the theoretical basis for the expenditure analysis. The demand relationship of any good is stated and supported through economic theory. The life cycle hypothesis was also used to support the hypothesized variables and the influence they may have on nonconsumptive expenditures. This was also supported by the explanation of Engel curves and their relation to nonconsumptive outdoor recreational expenditures.

B. Conclusion

Nonconsumptive wildlife recreation is the fastest growing activity among outdoor recreational activities, with trends that suggest that nonconsumptive expenditures may represent an increasingly large portion of the discretionary income of consumers. Therefore, nonconsumptive recreation can play a role in the Sportsman's Paradise serving a different clientele than hunters. Results from this study suggest that nonconsumptive recreation may be attracting higher levels of expenditures from a middle aged, wealthy, well educated, male, white segment of the population. This should be a target audience for efforts to promote this activity.

Public land managers need to be more aware of the growing demand for nonconsumptive recreation which need not conflict with traditional consumptive activities. Public programs, education, accessibility, and facilities are all focused toward consumptive activities. With very little investment, those facilities can serve a dual constituency pursuing

consumptive and nonconsumptive activities. This goal can be reached through public programs, education, accessibility, and even facilities that better fit the nonconsumptive outdoor recreation participant. Private lands may also desire to move in this direction. Leases for nonconsumptive activities, in addition to consumptive ones, could potentially enhance land owner incomes as well as provide incentive for better land use management.

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