

ECONOMIC IMPACTS AND MOTIVATIONS OF OFF-HIGHWAY VEHICLE
RECREATIONISTS: A CASE STUDY FROM FLORIDA

By

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Abstract of Thesis Presented to the Graduate School
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ECONOMIC IMPACTS AND MOTIVATIONS OF OFF-HIGHWAY VEHICLE
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Off-highway vehicle (OHV) recreation is a popular and fast growing forest-based activity. As such it is necessary to understand the participants involved and their impacts to better manage for this use. While OHV use does generate negative impacts, such as noise pollution, adverse soil effects, and user conflicts, positive impacts also arise from this activity. My thesis reports a study of OHV users who visited the Croom Motorcycle Area (CMA), a single use OHV recreation area in the Withlacoochee State Forest, Florida. Specifically, this study focuses on economic impacts of OHV recreation on local economies. Evaluation of the economic impact was achieved through travel expenditure surveys combined with economic input-output analysis to estimate the direct, indirect, and induced economic impact arising from OHV. The impact is significant to the surrounding communities with a total value estimated at over \$21 million.

My study goes one step further to evaluate consumer surplus (CS) of CMA users through the application of the individual travel cost method, to quantify this additional societal benefit. Results suggest that participants with more experience in OHV recreation at the CMA will more frequently visit the site reflecting the effect of habit formation. Regression coefficients were used

to estimate CS with individual household CS evaluated at over \$1,600, while the total annual CS of all households recreating at the CMA was estimated at over \$31 million.

In addition, the study analyzed the benefits that act as motivations for users involved in OHV recreation. Results indicated that the attainment of family oriented benefits were the main motivation for their participation. The motivations to “be with friends and family” and to “strengthen family kinship” had the top two overall mean rank scores out of a list of 19 motivation variable. Furthermore, motivational subgroups exist within the overall population and vary in the benefits that motivate them to ride OHVs. Results revealed three distinct homogenous motivational groups; group one, the Experiencers, riding for the attainment of multiple and diverse benefits; group two, the Familists, riding mainly for the attainment of family based benefits; and group three, the Individualists, riding for the attainment of individual oriented benefits.

CHAPTER 1 INTRODUCTION

Understanding Off-Highway Vehicle Recreation

Nature-based recreational activities on forested lands in the United States attract millions of participants yearly. Over 200 million people visited US Forest Service managed lands annually from 2000-2003 to participate in varied forms of recreation such as hiking, backpacking, skiing and off-highway vehicle (OHV) riding (USDA, 2005). One of the fastest growing forms of recreation over the last decade has been OHV recreation. Cordell et al., (2005) estimated that from 1999 to 2004 OHV recreation grew by over 15 million participants in the United States. This growth has been mirrored in Florida with an estimated 1.78 million participants as of 2004, ranking it fifth within the US and first within the southern US (Cordell et al., 2005). The enormous and growing popularity of OHV recreation has spurred many states into creating new OHV management policies to address the positive and negative externalities and capitalize on positive externalities that arise from this form of recreation.

To date, the majority of the research undertaken on OHV recreation has focused on the negative environmental and social impacts resulting from OHV recreation. OHV use is a highly consumptive form of recreation, whose impacts tend to be very visible (Major, 1987). Repeated use of OHVs on trails lead to the reduction in air and organic soil components, reduced levels of vegetation on trail margins, and increased erosion (Kay, 1981; Webb et al., 1978). A study in California deserts by Sheridan (1978) found that areas with high OHV use experienced a 60%-75% decrease in animal life. Similarly, white-tailed deer populations were found to be inversely proportional to OHV levels along trails in Minnesota (Dorrence, 1975). Sound pollution is also a major problem with OHVs. In a 1974 study, Harrison found that motor noise from OHVs could be detected from up to 15,000 feet away depending on the engine and OHV type.

These negative environmental impacts in turn generate user conflicts between OHV users and other stakeholders. Hunters are particularly affected by OHV recreation due to the tendency of animals to avoid areas with heavy OHV use. Other recreation groups often seek out solitude or undisturbed environments; these groups can be negatively affected by the aggressive nature of OHV impacts (Kariel, 1990). A study by Vail & Heldt (2004), on snowmobile recreation in Sweden and Maine, demonstrated that the conflict between snowmobilers and cross-country (XC) skiers was largely asymmetrical, with the environmental impacts of snowmobiling perceived highly by XC skiers, reducing their enjoyment. The same study also illustrated the conflict that arises between the OHV riders and private landowners due high noise levels and damage to property. Mountaineers gave OHV noise an aggregate score of 4.98 on a scale of one to five where five means annoying and indicated that their enjoyment of nature decreased when unnatural sounds were introduced to the environment (Kariel, 1990). These negative environmental and social impacts can be minimized through the creation of OHV recreation areas in which the impacts could be concentrated, and by the formulation of effective management policies.

OHV Recreation Policy in Florida

Florida's first attempt at managing OHV recreation came in 1972 when the Division of Forestry (DOF) established the Croom Motorcycle Area (CMA) within the Withlacoochee State Forest. The DOF created the CMA in response to the high level of perceived forest-wide environmental degradation and the increasing conflicts between OHV riders and other stakeholders (Florida Department of Agriculture and Consumer Services, 2002). By the founding of this single-use OHV recreation area, it was the DOF's hope to confine all OHV riding to this 2,600 acre area, thus reducing the negative costs throughout the rest of the 133 thousand acres of

the Withlacoochee. DOF personnel have found that this has indeed been the case and the CMA is now highly visited and liked by OHV riders.

However, the negative externalities that are associated with OHV riding persisted to be an issue throughout the rest of Florida as OHV recreation continued to grow. The state of Florida took notice in 2002 when they passed the T. Mark Schmidt Off-Highway Vehicle Safety and Recreation Act. In formulating this legislation, the legislator recognized that positive externalities are also present in OHV recreation. In the pursuit of OHV recreation, riders make substantial travel and equipment expenditure that has a positive impact on the economy (see chapter 3 for a further discussion on economic impacts). In addition to the positive economic impacts, society can also gain from the beneficial social effects. As well as the personal benefits riders get such as stress relief, physical fitness, and the enjoyment of nature, OHV recreation also tends to be an outlet for socializing, family bonding, and community building (Maine Sunday Telegram, 2002).

The 2002 OHV Safety and Recreation act was designed to provide opportunities for people pursuing OHV recreation in a managed and controlled manner, thus reducing the negative environmental and social impacts of illegal or unmanaged riding. The act explicitly recognizes that current and future OHV recreation areas are compatible with Florida's overall recreation plan and underlying goal of multiple use. The act laid the groundwork for the creation of at least two new OHV riding areas¹ that would be modeled after the CMA. The DOF has considered the CMA to be a success as it has both reduced illegal riding and continues to attract large numbers of users. The CMA was the only riding area on state land until 2005 when the DOF created a

¹ In stating the need for at least two additional riding area, the legislature recognized that at a time when OHV is growing in popularity, riding opportunities are decreasing in the State as the USDA Forest Service further restricts riding on national forest lands through the Access Designation Process.

new area in northern Florida.² However the DOF, who manages the CMA and would be responsible for any future OHV recreation areas, knew little about the population that rides OHVs at its facilities and has limited information about the associated economic impacts. This information gap has prompted the DOF to approach the University of Florida to conduct this study.

Study Area: The Croom Motorcycle Area

The Croom Motorcycle Area (CMA) is located within the Croom tract of the 133 thousand acre Withlacoochee State Forest (Appendix A). It is a 2,600-acre single-use area dedicated to Off-Highway Vehicle (OHV) recreation with the use of both off-road motorcycles³ (ORM) and all-terrain vehicles⁴ (ATV) permitted. Forest-wide, the Withlacoochee supports multiple uses within its borders, from extractive forestry activities to various recreational pursuits (Florida Department of Agriculture & Consumer Services, 2005). The CMA came into existence in 1972 as an attempt by the DOF to manage the forest for multiple uses by confining OHV riding to one area, thereby concentrating the environmental impacts, eliminating conflicts between OHV riders and other user groups on non-OHV areas (Florida Department of

² Currently the two main OHV riding areas in Florida are within the State Forests of Withlacoochee and Tate's Hell. OHV riding also occurs in Big Scrub, however it is substantially restricted in terms of both numbers allowed and OHV vehicle type. Restricted OHV opportunities are also available on some Florida Fish and Wildlife Conservation Commission managed lands.

³ Three types of ORMs are used at the CMA. Enduro motorcycles are street legal motorbikes designed for sport and long travel. Enduro motorcycles include a headlight and taillight, quiet muffler. Motocross motorcycles are similar to enduro motorcycles but lack the refinements, such as quiet mufflers and lights, to make them street legal. The third main type of ORM is the trial motorcycle. Trials motorcycles are distinctive and specialized for events known as observed trials. They are lightweight with a short suspension and have no seat as they are designed to be ridden standing up.

⁴ There are two main types of ATVs used at the CMA. Sport quads are small lightweight two wheel drive vehicles that can attain high speeds. Utility ATVs are larger four wheel drive vehicles that have a much lower top speed. Utility ATVs have the ability to perform other tasks such as hauling and towing items and often have lights on the front and rear ends.

Agriculture and Consumer Services, 2002). The popularity and lack of other riding areas makes the CMA a popular destination with an estimated 71,500 total user-days for the 2005 fiscal year.

Study Objectives

There were four objectives of this study. Objective one was to describe the visitor of the CMA in terms of their socio-demographics. The second objective was to evaluate the economic impact arising from visitation to the CMA. As objective two does not capture the benefit users get from their visitation of the CMA, objective three was to quantify this benefit through the estimation of visitor's consumer surplus. Objective four was to identify the specific desired benefits that riders are attempting to attain as a reason for their use of the CMA and, to identify and describe definable benefit subgroups.

To fulfill the above objectives a number of analytical methods were employed. Descriptive statistics, such as frequencies and means, were used to identify who the visitors are in terms of their socio-demographics. The estimate of economic impact to the region required the utilization input-output to generate this estimated impact. The individual travel cost method was employed to generate and estimate of visitors consumer surplus. Objective four was achieved by having participants rate 19 individual motivations on a Likert scale to identify the primary motivations. Cluster analysis was employed

CHAPTER 2 STUDY DESIGN AND IMPLEMENTATION

Researchers designed a comprehensive survey in order to achieve the four study objectives. During the development process, researchers met with DOF personnel, made site visits, and conducted pretests of the survey on participants at the CMA. The survey was developed using a modified Dillman (2000) method to increase response rate. On-site interviews (Appendix C) were conducted, asking basic questions such as overall trip satisfaction, OHV type used at the CMA, region of home residence, etc. The main objective of the on-site interviews was to introduce and familiarize the participants with the more comprehensive mail-back survey. The mail-back survey (Appendix D) contained the detailed questions that would provide the data necessary to meet the study objectives. The survey was designed to be filled out on a household basis, hence one mail-back survey was distributed per household.

Researchers approached potential participants in parking areas of the CMA asking OHV riders whether they would participate using a verbal consent script (Appendix B). On-site interviews were conducted from January through April 2006, with surveyors randomly approaching a total of 342 OHV riders and attaining the verbal consent of 321 participants. At the conclusion of each on-site interview a mail-back survey was distributed to the participant. An additional mail-back survey was mailed to the participant if the original survey was not returned after two weeks. A total of 116 out of the 321 mail-back surveys distributed were returned completed for a response rate of 36.14%. Surveyors also randomly left 99 surveys, a survey that combined the on-site questionnaire with the mail-back survey, on parked vehicles throughout the parking areas of the CMA. Out of the 99 surveys left with vehicles, 34 were returned, a response rate of 34.34%. The combined response rate for the mail-back survey was 35.71%.

Profile of Respondents

Visitor Characteristics

The mail-back survey contained detailed socio-demographic information (Table 2-1). Males made up a significant majority of the survey respondents (84.5%). For the survey participants who provided their age, the majority indicated they were 40 or above (60.3%). More than two thirds of respondents (67.8%) indicated that they were married, and 61.9% reported that they have at least one child still living at home. Nearly all (91.0%) of the participants identified themselves as Caucasian with 4.2% and 3.5% identifying themselves as Native American and Hispanic / Latino respectively. The survey participants were well educated with 91.1% having graduated from high school and 47.3% holding at least a bachelors degree. Close to 75% (74.5%) of survey participants had annual household incomes of at least \$55,000. Finally, the three main occupations of survey participants were that of business owner (24.5%), skilled trade (23.8%), and professional worker (19.0%).

Trip Characteristics

The mail-back and on-site surveys contained questions pertaining to the trip characteristics of the survey participant (Table 2-2). The majority (55.3%) of the survey participants have been riding OHVs for over 10 years with the mean years of ridding OHVs being over 16 years (16.3 years). Within the last year, participants indicated that they have taken numerous OHV recreational trips with over half (51.7%) having taken over 20 trips.

Participants have not been recreating as long at the CMA, with only 27.3% of participants having recreated at the CMA for over 10 years and a mean of 8.1. Close to 32% of participants have made over 20 trips to the CMA within the last year, with a mean of 18.6 trips per participant. Users of the CMA also tend to recreate with family, as 85% recreated with at least

one other family member on their last trip and approximately 20% travel to the CMA with at least 5 other members of their family. It is important to highlight that 18% of the participants live in the southeastern or southwestern regions of Florida, indicating substantial travel time to the CMA for a significant percentage of the participants.

Participants were asked for their zip code in order to evaluate their home region. Survey results (Figure 2-1) indicate that visitors traveled not only from different parts of Florida but also from other states and countries (4%) to recreate at the CMA. West-Central Florida was the home region of the largest percentage (35.9%), with the counties surrounding the CMA contributing close to a quarter (24.9%) of the survey participants.

The on-site and mail back surveys also asked participants questions pertaining to trip activities and experience while at the CMA (Table 2-3). Participants were asked to indicate what their primary OHV was at the CMA. Utility ATV, sport quad, motorcross bike, and trail/enduro bike were cited with about the same frequency. Trials bike was only used by about 2% of the participants as their primary OHV. In addition, the breakdown of use between two and four wheeled OHVs, was about equal with 46% saying they ride two wheeled OHVs (utility ATVs and sport quads) and 56% listing four wheeled OHVs (trail/enduro, motorcross, and trials bikes) as their primary OHV at the CMA. About 41% of the respondents ride another type of OHV in addition to their primary type while recreating at the CMA. The majority of survey participants (44.7%) consider themselves of intermediate skill level and 27% consider their skill level to be advanced. The on-site survey asked the participant to rank their last trip to the CMA on a scale of 1 to 10 with 10 being a perfect trip. Close to 29.3% considered their last trip to be perfect by indicating a ranking of 10. The vast majority also gave high satisfaction scores with 92% indicating a score of 7 or higher for their last trip to the CMA.

Table 2-1. Visitor characteristics of respondents.

| Variable | Valid Percent |
|--|---------------|
| Gender of Survey Participant (N = 148) | |
| Male | 84.5 |
| Female | 15.5 |
| Age (N = 106) | |
| 18-29 | 17.0 |
| 30-39 | 22.6 |
| 40-49 | 48.1 |
| Greater than 50 | 12.2 |
| Marital Status (N = 146) | |
| Single | 21.9 |
| Married | 67.8 |
| Separated / Divorced | 9.6 |
| Widowed | 0.7 |
| Children under 18 (N = 147) | |
| 0 | 38.1 |
| 1 to 2 | 50.3 |
| More than 2 | 11.6 |
| Ethnic Origin (N = 144) | |
| African American | 1.4 |
| Hispanic / Latino | 3.5 |
| Caucasian | 91.0 |
| Native American | 4.2 |
| Level of Education (N = 146) | |
| Some High School | 8.9 |
| High School Graduate / GED | 14.4 |
| Some College | 12.3 |
| Trade / Vocational School | 17.1 |
| College Graduate | 24.7 |
| Some Graduate School | 1.4 |
| Graduate Degree | 21.2 |

N= Number of valid survey responses

Table 2-1. Continued

| Variable | Valid Percent |
|-------------------------------------|---------------|
| Level of Household Income (N = 141) | |
| Less than \$15,000 | 1.4 |
| \$15,000-\$24,999 | 0.7 |
| \$25,000-\$34,999 | 2.8 |
| \$35,000-\$44,999 | 9.9 |
| \$45,000-\$54,999 | 10.6 |
| \$55,000-\$64,999 | 9.2 |
| \$65,000-\$74,999 | 11.3 |
| \$75,000-\$84,999 | 12.1 |
| \$85,000-\$94,999 | 7.8 |
| \$95,000-\$104,999 | 5.7 |
| \$105,000-\$124,999 | 5.7 |
| \$125,000 and above | 22.7 |
| Employment (N = 147) | |
| Business owner | 24.5 |
| Homemaker | 2.7 |
| Manager/Executive | 12.2 |
| Professional worker | 19 |
| Sales worker | 3.4 |
| Skilled trade | 23.8 |
| Laborer | 0.7 |
| Permanently disabled | 0.7 |
| Retired | 1.4 |
| Service worker | 2 |
| Student | 2 |
| Other | 7.5 |

N= Number of valid survey responses

Table 2-2. Trip Characteristics of Respondents.

| Variable | Valid Percent | Mean |
|--|---------------|-------|
| Number of years riding OHVs for recreational purposes (N = 149) | | 16.34 |
| Less than 3 | 16.0 | |
| 3 to 10 | 28.7 | |
| 11 to 20 | 22.0 | |
| 21 to 30 | 17.3 | |
| More than 30 | 16.0 | |
| Total OHV recreational trips taken within the last year (N = 149) | | 27.81 |
| 1 to 3 | 6.0 | |
| 4 to 10 | 21.5 | |
| 11 to 15 | 13.4 | |
| 16 to 20 | 7.4 | |
| 21 or more | 51.7 | |
| Number of years ridding OHVs at the CMA (N = 149) | | 8.08 |
| Less than 3 | 41.3 | |
| 3 to 10 | 31.3 | |
| 11 to 20 | 17.3 | |
| 21 to 30 | 6.7 | |
| More than 30 | 3.3 | |
| Total number of trips to the CMA within the last year (N = 147) | | 18.63 |
| 1 to 3 | 16.2 | |
| 4 to 10 | 29.7 | |
| 11 to 15 | 13.5 | |
| 16 to 20 | 8.8 | |
| 21 or more | 31.8 | |
| Total household party size on last trip to the CMA (N = 147) | | 3.20 |
| 1 | 15.0 | |
| 2 | 26.5 | |
| 3 | 25.2 | |
| 4 | 13.6 | |
| 5 or more | 19.7 | |

N= Number of valid survey responses

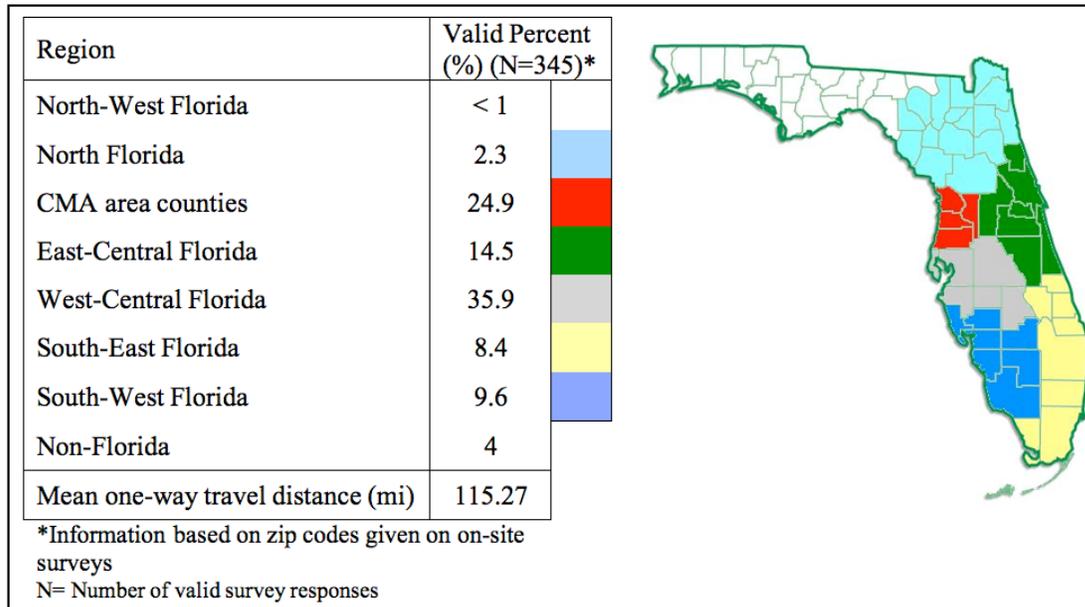


Figure 2-1. - Region of residence of CMA visitors.

Table 2-3. Activities and experience of Croom Visitors.

| Variable | Valid Percent |
|---|---------------|
| Primary OHV ridden at the CMA (N = 334) | |
| Utility ATV | 26.0 |
| Sport Quad | 27.8 |
| Motorcross Bike | 26.0 |
| Trail / Enduro Bike | 18.0 |
| Trials Bike | 1.5 |
| Self Reported Skill Level (N = 329) | |
| Beginner | 6.1 |
| Novice | 12.2 |
| Intermediate | 44.7 |
| Advanced | 28.6 |
| Expert | 8.5 |
| 1 to 5 | 3.8 |
| Participant rating of last visit to the CMA (N = 355) | |
| 6 | 4.0 |
| 7 | 16.5 |
| 8 | 28.4 |
| 9 | 18.0 |
| 10 | 29.3 |

N= Number of valid survey responses

CHAPTER 3
REGIONAL ECONOMIC IMPACT OF OFF-HIGHWAY VEHICLE RECREATION AT THE
CROOM MOTORCYCLE AREA THROUGH INPUT-OUTPUT ANALYSIS

Introduction

When studying economic impacts of outdoor recreation a common technique used is that of input-output analysis. This is achieved by collecting travel expenditure data through surveys administered to the recreation participants (Donnelly et al., 1998; Briassoulis, 1991; Fletcher, 1989). The direct benefits that the surveys establish can then be used to estimate the indirect and induced benefits through the implementation of I-O models (Cordell et al., 1992; Zhou, 1997). I-O models consider inter-industry relations in a regional economy, as well as their interrelations with final demanded sectors (households, employees, government, and trade) in order to evaluate the impact that an industry or, as in the case of this study, an activity can have on the local economy (Leontief, 1986; Millar & Blair, 1985). I-O analysis has become a popular tool for the estimation of regional economic impact by an activity and has been applied numerous times towards this end in recreation studies (Loomis, 1995; Bergstrom et al., 1990; Propst; 1985). The IMpact Analysis for PLANning (IMPLAN) software, a computer based modeling system that was developed by the USDA and modified to estimate economic impacts, is the most commonly used I-O model (Donnelly et al., 1998).

Studies using the IMPLAN input-output models to capture the direct, indirect and induced impacts of OHV recreation to state and local economies have been undertaken on several occasions. A study in Colorado estimated that OHV recreation contributed \$314 to \$354 million to the Colorado economy and supported 3,196 to 3,515 full and part-time jobs (Hazen and Sawyer, 2001). A similar study undertaken in New Hampshire found that OHV recreation contributed around \$318 million to the state's economy and helped to maintain 2,379 jobs

(Okrant & Gross, 2004). In Maine a study indicated that OHV recreation, not including snowmobiles, contributed over \$200 million and helps to sustain 1,975 jobs (Morris et al., 2005).

As with other forms of nature-based recreation that have garnered the attention from states as a rural development tool (Che, 2003; Lindberg et al., 1996), OHV recreation has not gone unnoticed in this regard, as states have recognized its' rural development potential (ATV Task Force, 2003; Vail & Heldt, 2004). However, investigation of the literature did not reveal any economic impact study focusing on the impacts from a single riding facility, nor did it find a study looking at impacts to any region smaller than that of a State.

Model Description

As is often done in establishing recreational economic impacts, the regional economic impact assessment for this study was achieved by developing an economic model using the Impact Analysis for Planning (IMPLAN) software for the four county area that surrounds the Withlacoochee State Forest. IMPLAN is a software package for the construction of I-O models to simulate the effects on economic activity that results from a change in the demand for goods and service in a given region.

Before running the model in IMPLAN it is necessary to achieve a reliable expenditure estimate to be introduced as the direct impact, or shock, into the model. Furthermore, to adequately evaluate the impact of the CMA to the regional economy, it is necessary to estimate the separate expenditures for residents and non-residents of this region in order to satisfactorily calculate the new money introduced to the region. Detailed survey questions on travel and equipment purchases, county of residence, and purchase location were used to compute the "new money". This new money (otherwise known as the direct impact) quantity will have a ripple effect throughout the economy (for a further mathematical description of the I-O model, see

Appendix E). The estimated total user-days of 71,500 for fiscal year 2006 was provided by the Florida Division of Forestry and used to estimate total number of households visiting the CMA. This estimated household population was then applied to average household expenditure per trip and average annual equipment expenditure to establish total expenditure for CMA visitors. For the purpose of this analysis, economic impact was assessed for the counties of Hernando, Pasco, Sumter, and Citrus. As such only the percentage of expenditure, as identified by the survey participants, was used in the establishment of the total economic impact. Expenditure levels were evaluated for both residents of the four county region and non-residents.

There are three types of economic impacts that input-output modeling will capture:

- Direct impacts- the initial expenditures that OHV participants make. The total expenditure level, direct impact, as the impetus for additional impacts.
- Indirect impacts- inter-industry change within the economy as they adjust their output levels to meet the demands of directly affected industries, as these industries will adjust inputs to the change in final demand. (Type I impacts, sum of direct and indirect impacts)
- Induced impacts- industry sectors that are both directly and indirectly affected will undergo income changes, further affecting other sectors as employees adjust their expenditures based on income level. (Type II impacts, sum of type I and induced impacts)

The sum of the direct, indirect, and induced impacts provides the total impacts that an activity generates. Impact estimates are provided in terms of sales, income, indirect business taxes, and jobs for the analysis region, and are given as follows:

- Output- total change in sales revenues.
- Value added- change in personal and business net income including property related income such as rents, dividends and interest.
- Labor income- change in employee wages and salaries.
- Indirect business taxes- the impact to the regional economy from a change in taxes, fees, licenses, and other payouts to government. (not including federal income taxes)
- Employment- an impact estimate based on a change in full and part-time jobs.

Results

Total Population Estimate

In order to establish the total economic impact of OHV recreation at the CMA, it was first essential to establish the total population recreating at the CMA. As the survey was designed on a per household basis, total population would be defined as total households recreating at the CMA. The Florida Division of Forestry estimates total user-days for fiscal year 2006 to be 71,500. Table 3-1 summarizes the results in establishing total household population for both resident and non-resident households. Dividing total user-days by mean household size per trip derived total household user-days. Dividing total household user-days by the mean number of trips per household provides the total households recreating at the CMA. The total household day-trip estimates of 6,088 and 16,283 by resident and non-resident households respectively were applied to mean expenditure per trip to evaluate total annual trip expenditure. The total population estimates of households recreating at the CMA of 313 and 1,347 resident and non-resident households, respectively, were used to evaluate total annual equipment expenditure.

Trip Expenditure

Trip expenditure levels were evaluated for both residents and non-residents. The estimated day-use populations of 6,088 and 16,283 respectively (Table 3-1) were multiplied by mean household trip expenditure (column N, Table 3-2) to achieve total annual household trip expenditure (column O, Table 3-2) with total resident expenditure estimated at over \$1.1 million and non-resident expenditure at about \$5.7 million. As the study is evaluating the regional economic impact to Hernando, Pasco, Sumter, and Citrus counties, the total annual trip expenditure column is multiplied by percentage of expenditure survey participants indicated that they made within the four-county region, 93.9% and 57.4% for residents and non-residents

respectively (Table 3-1). The resulting total annual trip expenditure (column P, Table 3-2) is estimated at just over \$1 million for residents and over \$3.2 million for non-residents. OHV related purchases (row A, Table 3-2) was the category of greatest expenditure for residents at \$0.5 million. For non-residents, purchases related to transportation (row B, Table 3-2) were the category of greatest expenditure at almost \$1.2 million. Entertainment, gift and souvenir purchases (row E, Table 3-2) was the category of lowest expenditure for both resident and non-residents.

Equipment Expenditure

Total annual equipment expenditure was also evaluated for both residents and non-residents. The population of individual households that travel to the CMA was estimated at 313 resident households and 1,347 non-resident households (Table 3-1). Multiplying household population estimates by mean annual expenditure per household (column Q, Table 3-3) generates total household equipment expenditure (column R, Table 3-3). Using only the percentage of expenditure indicated in Table 3-1 provides the total regional annual equipment expenditure estimate (column S, Table 3-3). Total regional equipment expenditure is estimated at over \$2.1 million for residents and about \$7.0 million for non-residents. New OHV purchases (row L, Table 3-3) was the highest expenditure category for both residents and non-residents, with total expenditure levels of \$1.4 million and 4.0 million respectively. The sum of resident and non-resident total expenditure for both trip and equipment expenditures is \$13.59 million and represents the direct impact to the region resulting from OHV recreation at the CMA. The direct expenditure was then distributed across the IMPLAN sectors (Table 3-4) to serve as shocks to those sectors within the model. This shock, or direct impact, will result in indirect and induced impacts as are described in the following section.

Regional Economic Impact Estimate

Table 3-5 summarizes the results of the input-output model in determining the economic impacts of OHV riding at the CMA. Total output impacts were estimated at \$21.7 million. Direct output impacts were estimated at \$13.6 million and measure the direct purchases made by OHV users in the pursuit of their activity. The indirect output impacts, that capture the activity between industries, were estimated at \$1.5 million. Induced output impacts, increased activity resulting from industry employees, were estimated at \$6.6 million. Looking at the value added portion of the impacts associated with an activity is often more important to policy makers than focusing only on the output impacts. The value added is an estimate of the additional value created within the region as a portion of total output. The value added impact was estimated at \$14.7 million, comprised of \$9.6 million in direct, \$0.8 million in indirect, and \$4.3 million in induced impacts. Total impacts resulting from a change in labor income was \$9.4 million, consisting of \$6.1 million, \$0.5 million, \$2.8 million in direct, indirect, and induced impacts respectively. Total indirect business taxes impact was \$2.1 million and comprised of \$1.7 million, \$0.06 million, and \$0.3 million in direct, indirect and induced impacts. Total impacts to employment of 318 full and part-time jobs were estimated to have resulted from this activity, with 215 direct, 16.4 indirect, and 86.9 induced job impacts.

Economic impacts from OHV use at the CMA are disaggregated in Table 3-6 to see the impacts to industry groups within the counties of Hernando, Pasco, Citrus, and Sumter (see appendix E to view the direct, indirect and induced impacts of each industry group and by impact type). The largest impacts are within the retail trade industry group with output impacts of \$11.6 million, \$8.8 million in value added impacts, and 196 job impacts to employment. Other industry groups with total output impacts of over \$0.5 million are government, real estate and rental, other

services, health and social services, accommodation and food service, and construction. In addition, all of these industry groups had total employment impacts of over eight jobs.

Table 3-1. Population Estimate of visitors to the CMA.

| | Resident | Non-Resident |
|---|----------|--------------|
| Estimated total user days, 2006 | 71,500* | - |
| Percent of user population | 24.9 | 75.1 |
| Total User-days | 17,804 | 53,697 |
| Household members per Trip | 2.9 | 3.3 |
| Total household user-days | 6,088 | 16,283 |
| Number of trips per household | 19.5 | 12.1 |
| Total households riding at the CMA | 313 | 1,347 |
| Percent of expenditure made within region | 93.9% | 57.4% |

*Total user days estimate provided by the Florida Division of Forestry

Table 3-2. Trip expenditure of a typical visitor to the CMA and total trip expenditure for 2006.

| Expenditure Category | N | | O | | P | | |
|----------------------|--|--------------|--|--------------|--|--------------|--------|
| | Mean Household expenditure per trip | | Total estimated household trip expenditures (millions of \$) | | Total estimated household expenditure within region of analysis (millions of \$) | | |
| | Resident | Non-Resident | Resident | Non-Resident | Resident | Non-Resident | |
| A | OHV related purchases (gas, equipment, etc.) | \$88 | \$72 | \$0.53 | \$1.17 | \$0.50 | \$0.67 |
| B | Purchases related to transportation to the CMA (gas, tolls, rental fees, etc.) | \$36 | \$126 | \$0.22 | \$2.04 | \$0.21 | \$1.17 |
| C | Food & beverage purchases | \$44 | \$79 | \$0.27 | \$1.29 | \$0.25 | \$0.74 |
| D | Lodging (hotel, motel, campsite, etc.) | \$12 | \$41 | \$0.08 | \$0.67 | \$0.07 | \$0.38 |
| E | Entertainment, gift and souvenir purchases | \$3 | \$12 | \$0.02 | \$0.20 | \$0.02 | \$0.11 |
| F | Miscellaneous/other purchases | \$8 | \$23 | \$0.05 | \$0.37 | \$0.04 | \$0.21 |
| Total | | \$191 | \$352 | \$1.16 | \$5.74 | \$1.10 | \$3.29 |

Table 3-3. Equipment expenditure of a typical visitor to the CMA and total equipment expenditure for 2006.

| Expenditure Category | Q | | R | | S | | |
|----------------------|---|--------------|---|--------------|--|--------------|--------|
| | Mean annual household equipment expenditure | | Total estimated household equipment expenditures (millions of \$) | | Total estimated household expenditure within region of analysis (millions of \$) | | |
| | Resident | Non-Resident | Resident | Non-Resident | Resident | Non-Resident | |
| G | Repairs / routine maintenance to OHVs (gas/oil, lubricants, tools, air filters, tires, wear items, etc.) | \$661 | \$746 | \$0.21 | \$1.01 | \$0.19 | \$0.58 |
| H | OHV equipment modifications and upgrades (exhaust, suspension, other aftermarket accessories, etc.) | \$538 | \$869 | \$0.17 | \$1.17 | \$0.16 | \$0.67 |
| I | OHV Riding apparel (helmets, boots, eye protection, gloves, additional protective clothing) | \$333 | \$597 | \$0.10 | \$0.80 | \$0.10 | \$0.46 |
| J | Equipment or purchase of rentals related to the transport of OHVs (transport vehicle, trailer, gas/fuel, loading ramp, tie-downs, etc.) | \$721 | \$1,139 | \$0.23 | \$1.53 | \$0.21 | \$0.88 |
| K | OHV expenditure related to permits, fees (day-use fees, special events fees, competition entry fees, etc.), insurance, Titling, club membership | \$158 | \$336 | \$0.05 | \$0.45 | \$0.05 | \$0.26 |
| L | New OHV Purchases | \$4,774 | \$5,178 | \$1.49 | \$6.97 | \$1.40 | \$4.00 |
| M | Miscellaneous/other purchases related to OHV riding | \$196 | \$237 | \$0.06 | \$0.32 | \$0.06 | \$0.18 |
| Total | | \$7,381 | \$9,105 | \$2.31 | \$12.26 | \$2.17 | \$7.04 |

Table 3-4. Regional impact events by IMPLAN sector.

| Expense Item | Implan Sector | Resident* (millions of \$) | Non- Resident (millions of \$) |
|--|---|----------------------------------|---|
| Gas, equipment for OHV | 407- Gasoline stations | \$0.50 | \$0.67 |
| Transportation to the CMA (gas, tolls, rental fees, etc.) | 407- Gasoline stations | \$0.21 | \$1.17 |
| Food & beverage | 405- Food and beverage stores | \$0.25 | \$0.74 |
| Lodging (hotel, motel, campsite, etc.) | 479- Hotels and motels | \$0.07 | \$0.38 |
| Entertainment, gifts and souvenirs | 478- Other amusement and recreation industries | \$0.02 | \$0.11 |
| Miscellaneous/other | 411- Miscellaneous store retailers | \$0.04 | \$0.21 |
| Repairs / routine maintenance (lubricants, tools, air filters, tires, wear items, etc.) | 483- Automotive repair and maintenance | \$0.19 | \$0.58 |
| Equipment modifications and upgrades (exhaust, suspension, other aftermarket accessories, etc.) | 401- Motor vehicle and parts dealers | \$0.16 | \$0.67 |
| Riding apparel (helmets, boots, eye protection, gloves, additional protective clothing) | 408- Clothing and clothing accessory stores | \$0.10 | \$0.46 |
| Transport equipment purchase or rental (vehicle, trailer, gas/fuel, loading ramp, tie-downs, etc.) | 432- Automotive equipment rental and leasing | \$0.21 | \$0.88 |
| New OHV purchase | 401- Motor vehicle and parts dealers | \$1.40 | \$4.00 |
| Permits, fees, insurance, titling, club membership | 499- Other state and local government enterprises | \$0.05 | \$0.26 |
| Miscellaneous/other purchases related to OHV riding | 411- Miscellaneous store retailers | \$0.06 | \$0.18 |

*Participants residing in the counties of Citrus, Sumter, Hernando, Pasco Counties

Table 3-5. Direct, indirect and induced regional economic impact of OHV recreation at the CMA.

| | Output (millions of \$) | Value Added (millions of \$) | Labor Income (millions of \$) | Indirect Business Taxes (millions of \$) | Employment (Jobs) |
|--------------|----------------------------|---------------------------------|----------------------------------|---|----------------------|
| Direct | \$13.59 | \$9.55 | \$6.13 | \$1.75 | 215 |
| Indirect | \$1.50 | \$0.82 | \$0.50 | \$0.06 | 16 |
| Induced | \$6.57 | \$4.32 | \$2.75 | \$0.33 | 87 |
| Total | \$21.66 | \$14.69 | \$9.38 | \$2.14 | 318 |

Table 3-6. Total regional economic impact by industry group for OHV activity at the CMA.

| Industry Group (NAICS)* | Output (millions of \$) | Value Added (millions of \$) | Labor Income (millions of \$) | Indirect Business Taxes (millions of \$) | Employ- ment (Jobs) |
|--------------------------------------|-------------------------------|---------------------------------------|--|--|---------------------------|
| Ag, Forestry, Fish & Hunting | 0.047 | 0.025 | 0.011 | 0.001 | 0.8 |
| Mining | 0.001 | 0.001 | 0.000 | 0.000 | 0 |
| Utilities | 0.311 | 0.224 | 0.068 | 0.032 | 0.8 |
| Construction | 0.733 | 0.296 | 0.256 | 0.004 | 8 |
| Manufacturing | 0.258 | 0.064 | 0.046 | 0.001 | 1.2 |
| Wholesale Trade | 0.159 | 0.121 | 0.068 | 0.026 | 1.7 |
| Transportation & Warehousing | 0.273 | 0.171 | 0.131 | 0.004 | 3.3 |
| Retail trade | 11.598 | 8.804 | 5.691 | 1.723 | 195.7 |
| Information | 0.261 | 0.094 | 0.048 | 0.008 | 1.3 |
| Finance & insurance | 0.371 | 0.234 | 0.109 | 0.007 | 2.7 |
| Real estate & rental | 1.490 | 0.719 | 0.292 | 0.065 | 12.5 |
| Professional- scientific & tech svcs | 0.381 | 0.196 | 0.167 | 0.003 | 4.9 |
| Management of companies | 0.060 | 0.033 | 0.025 | 0.001 | 0.5 |
| Administrative & waste services | 0.323 | 0.163 | 0.129 | 0.005 | 5.4 |
| Educational svcs | 0.037 | 0.020 | 0.019 | 0.000 | 0.9 |
| Health & social services | 0.898 | 0.565 | 0.491 | 0.006 | 12.4 |
| Arts- entertainment & recreation | 0.192 | 0.115 | 0.066 | 0.014 | 3.8 |
| Accommodation & food services | 0.827 | 0.499 | 0.305 | 0.064 | 17 |
| Other services | 1.185 | 0.567 | 0.420 | 0.072 | 20.8 |
| Government & non NAICs | 2.256 | 1.782 | 1.032 | 0.104 | 24.2 |
| Total | 21.661 | 14.689 | 9.376 | 2.139 | 318 |

*North American Industry Classification System

CHAPTER 4
CONSUMER SURPLUS ESTIMATION: AN INDIVIDUAL TRAVEL COST METHOD
APPROACH

Introduction

The previous chapter dealt with the economic impact estimation through input-output (I-O) analysis. I-O analysis is inherently a supply side model as it is designed around regional production process (Leontief, 1986). While the data that I-O analysis provides is useful to recreational planners and policy makers, it does not fully capture the impact or benefit of a recreation area to society as it fails to capture the benefits to consumers. To capture this value of a resource it is necessary to evaluate consumer surplus (CS). CS can be defined as the total value that recreational consumers place on the resource minus actual expenditures. The estimation of consumer surplus is achieved through the quantification of the area under the demand curve of a user between the choke price and the price actually paid (Dobbs, 1993).

One approach for the calculation of this demand curve is the travel cost method (TCM). The TCM is derived from revealed preference theory (Ward & Beal, 2000); hence it is based on real market data as the purchase decisions have already been made by the participant (Oh et al., 2005). TCM allows one to determine a Marshallian demand curve to calculate the area between consumers actual price and the maximum price they are willing to pay.

Potential visitors to a site will decide to visit that site only if they achieve some value from their visit or their costs are not greater than their perceived benefit (Siderelis & Moore, 1995). In accordance with demand theory, as the cost of the trip to a site increases, the visits will decrease (Fix & Loomis, 1997), allowing one to derive a site demand curve. As such, the value of this site can then be estimated using a site demand model (Siderelis & Moore, 1995; Hesseln et al., 2004; Dobbs, 1993).

Within TCM there are two methods, zonal and individual. Zonal TCM is based on census data and arbitrary geographic areas generated by zip codes leading to zonal bias (Bowker et al., 1996). Individual TCM (ITCM) is based on survey information gathered from visitors to the site. In addition to avoiding zonal bias, it is possible to incorporate further explanatory variables within the demand function through the collection of data on trip and visitor characteristics (Siderelis & Moore, 1995). Given the above, the ordinary demand function for a user of a recreation area is $t = f(TC, TD, TChar, VChar)$ where :

- t = number trips per year
- TC = travel cost per trip
- TD = travel distance per trip
- $TChar$ = vector of trip characteristics variables
- $VChar$ = vector of visitor characteristics variables.

The estimation of CS for recreation sites through the use of ITCM has been used extensively. Siderelis & Moore (1995) concluded that the total consumer surplus from three different rail-trail sites throughout the United States ranged from \$1.9 million to \$8.5 million (\$9.56-\$49.78 individual CS per trip). Shrestha et al. (2002) estimated that CS to be between \$35 million and \$57 million (\$540.45-\$869.57 individual CS per trip) for recreational fishing visitors to the Brazilian Pantanal. Another study undertaken by Oh et al. (2005) on recreational fishers of the Sam Rayburn Reservoir in Texas evaluated individual CS per trip to be between \$249-\$414. Lockwood & Tracy (1995) evaluated the CS of an urban park in Australia to be between \$23 million to \$33 million. However, with the exception of a study on snowmobiling in Wyoming where individual CS per trip was estimated at \$68 (Coupal et al., 2001), no other study on the estimation of CS for OHV recreation was found.

ITCM Model Specification

There are several alternative methods for establishing demand models (Dobbs, 1993). This study uses the continuous ordinary least squared (OLS) model with a logarithmic transformation of the dependent variable. The semi-log OLS method has been applied many times for the estimation of consumer surplus (CS) for recreation participants (Balkan & Kahn, 1988; Willis & Garrod, 1991). Alternative models that have been used include OLS without the logarithmic transformation of the dependent variable and maximum likelihood estimators (Hesseln et al., 2004; Shrestha et al., 2002). Two studies that have utilized the semi-log OLS model along with the alternative models have indicated the semi-log OLS CS estimate to be a median value estimate compared to other models (Smith, 1988; Siderelis & Moore, 1995)

Table 4-1. Description of variables used in the ITCM model.

| Variable | Description |
|-----------|---|
| TRIPS | Total number of household trips taken in the last year. |
| TRVLCOST | Household travel cost per trip. |
| DISTTRVL | One-way travel distance to the CMA. |
| YRSRIDCMA | Years riding at the CMA. |
| FMPRTYSZ | Family party size riding at the CMA |
| TRPRATING | Overall rating of last trip to the CMA. (Scale of 1 to 10 where 10 is a perfect trip) |
| OHVTYPE | Primary OHV type ridden at the CMA. (0 = ORM, 1 = ATV) |
| OVRNGHTDM | Dummy variable for multi-day trips to the CMA. (1 = made at least one overnight trip within the last year) |
| GENDER | Gender of the survey participant. (1 = male, 0 = female) |

In the construction of the semi-logarithmic OLS model to evaluate individual household and total consumer surplus for this study, explanatory variables were evaluated in addition to the travel cost variable to further refine the final model, as such various trip and visitor

characteristics variables were included in the model. TRVLCOST, DISTTRVL, and YRSRIDCMA were included in the several regression models that were constructed incorporating contrasting groupings of trip and visitor characteristics. Visitor characteristic variables were never significant predictors in the models, as such all except for GENDER were not included in the final model, as shown in equation 4-1, which was selected based upon its goodness of fit to the population as evaluated by the adjusted R² statistic and reached its highest level with the inclusion of these variables in equation 4-1. The description of the variables used are given in Table 4-1.

$$\ln TRIPS = \beta_0 + \beta_1(TRVLCOST) + \beta_2(DISTTRVL) + \beta_3(YRSRIDCMA) + \beta_4(GENDER) + \beta_5(OHVTYPE) + \beta_6(FMPRTYSZ) + \beta_7(OVRNGHTDM) + \beta_8(TRPRATING) \quad (4-1)$$

To estimate the individual CS from the resulting model, it is necessary to evaluate the area under the demand curve generated by the semi-log OLS model. Normally this would be accomplished by the calculation of the integral of the function. However, since the semi-log form was used the accepted estimation method, as described by Smith and Devouges (1985), is to approximate the integral as the negative inverse of the coefficient on the travel cost, $-(1/\beta_1)$.

Results

Table 4-2 summarizes the descriptive statistics of the variables used in the regression model. As a non-response in any variable will result in the entire case be excluded when conducting linear regression, the sample size for this analysis was 139 out of the initial 150 cases. Survey questions revealed that households in this sample make over 18 (18.68) trips annually to the CMA and spend over \$255 on average per trip on travel related expenses. On average, households travel over 104 miles one-way and recreate at the CMA with over 3 family members. Participants tended to be loyal to the CMA through the indication that they have been

riding there for almost 8 (7.92) years and showing an overall enjoyment of their experience, giving the CMA a mean score of 8.46 out of a maximum of 10. Types of vehicles ridden at the CMA were almost equally split between off-road motorcycles (ORM) (48.9%) and all-terrain vehicles (ATV) (51.1%). Over 56.1 indicated that they made at least one overnight trips within the last year. The gender results must be interpreted with a bit of caution as the surveys were designed on a household basis to reduce the complexity and length of the survey. As such the variable GENDER may under-represent females.

As stated, the final model was selected based on the adjusted R^2 value, in this case 0.275 (Table 4-3). The R^2 value is 0.317. But since R^2 tends to optimistically estimate the model fit to the population, the adjusted R^2 value was used.

As the key property of the ITCM is the inverse relationship between the travel cost variable and that of the number of annual trips taken, without this relationship it would be impossible to get a demand function and the corresponding estimate of the CS. As shown in Table 4-3, an inverse relationship does exist as TRVLCOST has a negative impact on the number of trips taken and is significant ($p=0.031$).

In looking at the other explanatory variables in the model, for variables are significant at the $P \leq 0.05$ level. DISTTRVL has a negative effect on trips taken with a p-value of 0.01. The negative sign on DISTTRVL was expected, one would expect to observe a decline in trips taken as the distance needed to travel to an area increases. Another highly significant variable is YRSRIDCMA ($p=0.004$) and it exhibits a positive relationship with trips taken. It is also important to note that this variable was always the most significant and always at the $P \leq 0.010$ in every model run. This result is highly suggestive of habit formation of users at the CMA, as the more users experienced the CMA, the greater the amount of trips they would make in a year.

TRPRATING was significant with a p-value of 0.016 and had a positive relationship with trips made. Again, this was a result that was anticipated, as one would expect to observe an increase in trips taken with an increased enjoyment of their experience. The variable FMPRTYSZ was significant at the $P \leq 0.10$ level ($p=0.051$), with a negative impact on trips taken, hence the greater the family riding groups is, the fewer the trips taken.

While the remaining three variables are not significant at the $P \leq 0.10$, it is interesting to note that visitor characteristics were not significant, nor were the socio-demographic variables significant in any of the various models created. This result was not expected. Often socio-demographic such as age, sex and income are significant predictors of the dependent variable, not in the case of OHV recreation.

Total Consumer Surplus Estimation. By taking the negative inverse of the TRVLCOST coefficient $-(1/-6.232E-04)$, the resulting individual household CS per trip is estimated at \$1,605. To evaluate total annual CS, it is necessary apply this to total household trips, 19,455 the number of unique trips of all households to the CMA. As such, the total annual household CS is estimated at \$31.23 million.

Table 4-2. Descriptive statistics of variables used in the model (N = 139).

| Variable | Mean |
|--------------------------------------|----------|
| Total trips to the CMA | 18.68 |
| TRVLCOST (\$) | \$255.01 |
| DISTTRVL | 104.31 |
| YRSRIDCMA | 7.92 |
| FMPRTYSZ | 3.20 |
| TRPRATING | 8.46 |
| | % |
| OHVTYPE | |
| Off-road motorcycles (0) | 48.9 |
| All-terrain vehicles (1) | 51.1 |
| OVRNGHTDM | |
| No overnight trips (0) | 43.9 |
| Made at least one overnight trips(1) | 56.1 |
| GENDER | |
| Female (0) | 16.5 |
| Male (1) | 83.5 |

Table 4-3. Regression model results (N = 139).

| Variable | Coefficient (Beta) | P-value | Standard. Error |
|-------------------------|--------------------|---------|-----------------|
| (constant) | 1.255 | 0.049** | .632 |
| TRVLCOST | -6.232E-04 | 0.031** | .000 |
| DISTTRVL | -1.389E-03 | 0.010** | .001 |
| YRSRIDCMA | 2.694E-02 | 0.004** | .009 |
| FMPRTYSZ | -8.615E-02 | 0.051* | .225 |
| TRPRATING | 0.155 | 0.016** | .176 |
| OHYTYPE | -0.250 | 0.158 | .044 |
| OVRNGHTDM | 0.250 | 0.163 | .178 |
| GENDER | 0.238 | 0.292 | .064 |
| R ² | 0.317 | | |
| Adjusted R ² | 0.275 | | |

**Significance at $p \leq 0.05$

*Significance at $p \leq 0.10$

CHAPTER 5 MOTIVATIONS OF OFF-HIGHWAY VEHICLE USERS

Introduction

Visitors to the CMA have made the decision to participate in OHV recreation at that facility. Previous results have indicated that their decision has generated economic benefit to the surrounding communities. In addition, visitors to the CMA receive benefits from their involvement, captured by the individual household consumer surplus estimate per trip of \$1,605. As CS can be defined as the value of the total experience minus travel expenditures (Huppert, 1983; Dobbs, 1993), the CS can also be considered a value estimate of visitors experience at the CMA. Driver & Tocher (1970) define a recreationists experience as the desired psychological result (benefit) that motivates them to participate in a recreation opportunity. They only engage in a recreation opportunity if their efforts lead to their desired benefit (Haas et al., 1981; Manfredo et al., 1983; Lawler, 1973). Given this, it is important for planners to understand the desired benefits of visitors in order to provide the opportunities for the attainment of these benefits (Graefe & Fedler, 1986; Stein & Lee, 1995; Driver, 1985). By providing these opportunities, planners can aid in the production of economic, personal, social and environmental benefits that result from the individual's choice to participate in a recreation activity (Brown, 1984; Stein & Lee, 1995).

Research on the desired benefits of visitors has been ongoing since the 1970s (Stein et al., 2003). There has been a profusion of studies done on recreational activities to identify the desired benefits that motivate the individual to participate in a given activity. Loomis & Ditton (1987), Wilde et al. (1998) and Fedler & Ditton (1994) investigated the benefits that are important motivations to recreational anglers. Cross-country skiers were studied by Haas et al. (1981) to identify their desired benefits. Other studies have looked at and determined the benefits

for backpacking (Brown & Hass, 1980) and hunting (Hautaluoma & Brown, 1978). Studies have also found that experiences are not homogenous to activity classification, that, in fact, benefit sub-groups exist within activities (Manfredo et al., 1983; Brown & Haas, 1980; Hautaluoma & Brown, 1978). Yet, no study could be located that attempted to establish the desired benefits for recreational OHV users, nor potential subgroups within the activity.

Data Analysis

To identify the desired benefits that motivate visitors to participate in OHV recreation at the CMA, a 19-item list was given where the participant was asked to rate the importance of each benefit item as a motivation for their involvement⁵. Cluster analysis was then undertaken on the 19-item list in order to classify respondents into homogenous subgroups based on their similarity in motivational responses (Lorr, 1983). This approach has been applied many times in recreation research as a means of identifying homogenous subgroups (Purnomo et al., 2005; Manfredo et al., 1983; Oh et al., 2005; Hautaluoma & Brown, 1978; Collins & Hodge, 1984; Stein & Lee, 1995) and undertaken using the K-means cluster procedure using SPSS 11.0 for Mac. A final solution of three-clusters was accepted based on the size and interpretability of the resulting groups (Hair et al., 1998; Lorr, 1983).

Results

Desired Benefit Profile of OHV Users at the CMA

The mean responses for each of the 19 benefit variables are listed in descending order in the first column of Table 5-2. A look at the overall means illustrate the family oriented nature of the motivations behind OHV recreation. The benefits to “be with friends and family” (mean = 4.47) and “strengthen family kinship” (mean = 4.17) are the top two ranked benefits.

⁵ For this purpose a Likert scale was used where 1 = Not at all important, 2 = Not very important, 3 = Important, 4 = Very important, 5 = Extremely important

Additionally, the results indicate that individual oriented benefits are also important to OHV recreationists. Ranked third and fifth respectively were to “reduce tensions and stress from everyday life” (mean = 4.14) and “improve my skills and abilities” (mean = 4.05). The two other benefits with a mean ranking of over four were to “enjoy nature” (mean = 4.07) and “promote physical fitness” (mean = 4.03), ranked fourth and sixth respectively. Ranked at the bottom of the list of motivations and two of only three benefit statements with a mean of below three, are to “engage in personal / spiritual reflection” (mean = 2.81) and “take risks” (mean = 2.63), ranked 17th and 19th respectively and individualistic in nature. Taken as a whole, the population participates in OHV recreation at the CMA mainly for the attainment of family based benefits but, while less important, place some significance on individual benefits.

Benefit Subgroup Identification

Cluster analysis classified the participants into three subgroups based on their motivations for participating in OHV recreation at the CMA (Table 5-1). To identify the motivational makeup of the three groups, an analysis of variance (ANOVA) test was undertaken with the cluster group as the factor and the 19 benefit scale questions as dependent variables. By examining the post hoc test results of the motivational statements for the groups (Table 5-2) and the listwise ranking of the motivations for each group, evident difference emerges between the groups.

Group 1 (n = 70, 52.2%), the Experiencers, indicated that both family and individualistic benefits as important reasons for their involvement in OHV recreation. Post hoc analysis revealed that Experiencers mean score on 18 out of the 19 variables was either greater than the other two groups or at least greater than one group while exhibiting no significant difference with the other group. The only variable in which the Experiencers had a mean score significantly

smaller than another group was the benefit item to “take risks”. As Table 5-2 illustrates, Experiencers had a mean score of over three for each item except the aforementioned “take risks” (2.79), an indication of the importance for the attainment of multiple benefits as a motivation for riding. Table 5-3 gives the top and bottom five ranked benefits for each group with the ranking of the other two groups in the succeeding two columns. While family-based motivations are the top two, the fourth and fifth are very much individualistic in nature, “reduce tension” (M = 4.54) and “promote physical fitness” (M = 4.39).

Group 2 (n=32, 23.9%), Familists, ranked family oriented benefits as primary reasons for their involvement in OHV recreation. While Familists may have certain top five benefits in common with Experiencers, Familists are even more family centric in regards to riding motivations. Where as Experiencers ranked the statement to “Continue family traditions” 12th, it was 3rd for Group 2 (M = 3.97). The statement to “be in an area where I feel secure and safe”, a motivation one would expect to be higher for families, is ranked fourth by Familists as apposed to eighth for Experiencers.

Group 3 (n = 32, 23.9%), the Individualists, rated individualistic oriented benefits at the top for reasons as to why they participate in OHV recreation. Whereas the other two groups placed importance on family centered benefits, the results indicated that Individualists rode, as the name would suggest, primarily for the attainment of individual benefits. The top two benefits for group 3 were to “improve my skills and abilities” (M = 4.28) and “depend on my skills and abilities” (M = 4.16). As table 5-3 shows, with the exception of to “promote physical fitness” for Experiencers (5th), none of the Individualists’ top five benefits were ranked within the top five of the other two groups. Until now the bottom five benefits as shown in Table 5-1 have not been mentioned, largely due to the similarity between the first two groups. However, looking at

Individualists' bottom five, further illustrates just how centered Individualists are for the attainment of individual benefits. To "continue personal or family traditions" ranked 3rd by Familists and 12th by Experiencers, was ranked 15th by Individualists, with a mean score of below three (2.59). The benefit to "take risks" was ranked last when looking at the overall population (M = 2.63), last by Familists (M = 1.56), and last by Individualists (M = 2.79), but was ranked ninth by Group 3, with a mean of 3.34 and the only mean for which Group one had a significantly smaller mean than another group.

Benefit Subgroup Description

With the knowledge that homogenous subgroups exist based on their desired benefits for riding OHVs at the CMA, it is important to understand the differences between the groups in terms of visitor and trip characteristics. To this end, ANOVA and Chi-squared tests were undertaken to identify if any significant differences in visitor and trip characteristics existed between the groups.

Table 5-4 and 5-5 display the results of ANOVA and Chi-Squared test respectively on visitor characteristics. No significant differences were found between groups for the variables number of children in the household, age, marital status, education, or income. The groups only differed significantly ($p = 0.021$) when it came to gender, where Individualists were significantly more male at 96.9% versus 82.9% for Experiencers and 71.0% for Familists

Considerably more variation existed between the groups when looking at trip characteristic variables. While no significant difference was found in total number of annual OHV recreation trips or annual trips to the CMA, Experiencers were more likely to have made at least one multi-day trip per year, 68.6%, with 56.3 % of Familists making a multi-day trip. However only 31.3% of Individualists indicated they made at least multi-day trip within the last

year, indicating their preference for day trips, a deviation that is statistically significant ($p = .002$). When at the CMA, the groups differ significantly ($p = 0.038$) in their OHV type preference. While 62.5% of Individualists indicated their primary OHV at the CMA is an ORM, only 31.3% of Familists rode ORMs, suggesting families may consider a four wheel OHV a safer alternative. Not surprisingly there was a significant difference ($p = 0.020$) in mean party size between the groups with Individualists having a mean of 2.39 people per trip versus means of 3.56 and 3.55 for Experiencers and Familists. Individualists gave the CMA a significantly lower mean trip rating ($p = 0.050$), however it is important to note that while they rated the CMA lower than the other groups, it was still above 8 (8.03).

When looking at total yearly OHV expenditure excluding new OHV purchases, Experiencers spend more money (\$5,077) than either Familists (\$2,665) or Individualists (\$2,197) a difference that is highly significant ($p = 0.000$). This result is interesting as there was no significant difference in OHV trips per year and no difference in one-way travel distance to the CMA. In fact, Individualists traveled further (146.38 mi) than Experiencers (122.45 mi) to get to the CMA and made more trips in a year (22.75 versus 17.52). As Experiencers are after the attainment of multiple benefits, this goal may necessitate the outlay of additional expenditure towards that end.

Table 5-1. Results of cluster analysis (N = 134).

| Cluster | N |
|--------------------------|----|
| Group 1 (Experiencers) | 70 |
| Group 2 (Familists) | 32 |
| Group 3 (Individualists) | 32 |

Table 5-2. Desired benefits of respondents and benefit subgroups.

| Statement | Means | | | | Tukey HSD Post Hoc Mean test Ordering |
|--|-----------------|---------------------------|------------------------|-----------------------------|--|
| | Overall Mean | Group 1 (Experiencers) | Group 2 (Familists) | Group 3 (Individualists) | |
| Be with friends and family | 4.47 | 4.74 | 4.53 | 3.75 | 1,2>3 ^a |
| Strengthen family kinship | 4.17 | 4.64 | 4.22 | 2.97 | 1>2>3 ^a |
| Reduce tensions and stress from everyday life | 4.14 | 4.54 | 3.66 | 3.63 | 1>2,3 ^a |
| Enjoy nature | 4.07 | 4.60 | 3.69 | 3.37 | 1>2,3 |
| Improve my skills and abilities | 4.05 | 4.36 | 3.25 | 4.28 | 1,3>2 |
| Promote physical fitness | 4.03 | 4.39 | 3.31 | 3.97 | 1>3>2 |
| Be in an area where I feel secure and safe | 3.93 | 4.34 | 3.91 | 3.03 | 1>2>3 |
| Depend on my skills and abilities | 3.88 | 4.26 | 2.81 | 4.16 | 1,3>2 |
| Challenge myself and achieve personal goals | 3.70 | 4.10 | 2.69 | 3.81 | 1,3>2 |
| Explore the area and natural environment | 3.67 | 4.37 | 3.12 | 2.87 | 1>2,3 |
| Feel a sense of independence | 3.64 | 4.13 | 2.88 | 3.25 | 1>2,3 |
| Continue family traditions | 3.57 | 3.93 | 3.97 | 2.59 | 1,2>3 ^a |
| Test vehicle's performance | 3.51 | 3.69 | 2.69 | 3.91 | 1,3>2 |
| Meet new people | 3.27 | 3.66 | 2.84 | 2.72 | 1>2,3 |
| Escape noise/crowds | 3.15 | 3.66 | 2.47 | 2.56 | 1>2,3 |
| Learn about the natural environment of the area | 3.05 | 3.70 | 2.53 | 1.81 | 1>2,3 |
| Engage in personal/spiritual reflection | 2.81 | 3.51 | 1.84 | 2.31 | 1>2,3 |
| Learn about history and culture of the area | 2.68 | 3.29 | 2.25 | 2.12 | 1>2>3 ^a |
| Take risks | 2.63 | 2.79 | 1.56 | 3.34 | 3>1>2 ^a |

Note: Means are based on a scale of 1 to 5, where 1 = not at all important, 2 = not very important, 3 = important, 4 = very important, and 5 = extremely important. Mean differences between the groups were evaluated using the Tukey Highest Significant Difference test at the $p < 0.05$ level. ^a Indicates that the assumption of equal variance does not hold and the Games-Howell test was used to evaluate mean difference, where $p < 0.05$.

Table 5-3. Desired benefit ranking by cluster membership.

| Top 5 | | | | | |
|---|--------------------------|---|--------------------------|---|--------------------------|
| Group 1 (Experiencers) | Group Rankings 2 3 | Group 2 (Familiists) | Group Rankings 1 3 | Group 3 (Individualists) | Group Rankings 1 2 |
| Be with friends and family | 1 6 | Be with friends and family | 1 6 | Improve my skills and abilities | 7 8 |
| Strengthen family kinship | 2 12 | Strengthen family kinship | 2 12 | Depend on my skills and abilities | 9 12 |
| Enjoy nature | 5 8 | Continue family traditions | 12 15 | Promote physical fitness | 5 7 |
| Reduce tensions and stress from everyday life | 6 7 | Be in an area where I feel secure and safe | 8 11 | Test vehicle's performance | 14 13 |
| Promote physical fitness | 7 3 | Enjoy nature | 3 8 | Challenge myself and achieve personal goals | 11 14 |
| Bottom 5 | | | | | |
| Meet new people | 11 14 | Learn about the natural environment of the area | 13 19 | Continue family traditions | 12 3 |
| Escape noise/crowds | 16 16 | Escape noise/crowds | 16 16 | Escape noise/crowds | 16 16 |
| Engage in personal/spiritual reflection | 18 17 | Learn about history and culture of the area | 18 18 | Engage in personal/spiritual reflection | 17 18 |
| Learn about history and culture of the area | 17 18 | Engage in personal/spiritual reflection | 17 17 | Learn about history and culture of the area | 18 17 |
| Take risks | 19 9 | Take risks | 19 9 | Learn about the natural environment of the area | 13 15 |

Table 5-4. Visitor characteristics by cluster membership (ANOVA).

| Variable | Overall | Group 1 | Group 2 | Group 3 | F | P | Group mean ranking ^a |
|--|---------|---------|---------|---------|-------|-------|---------------------------------|
| Number of Children under 18 in Household | 1.17 | 1.20 | 1.47 | 0.90 | 1.731 | 0.181 | NS |
| Age | 40.59 | 38.90 | 42.39 | 40.61 | 1.068 | 0.348 | NS |

^aDifference in group means evaluated using Tukey's HSD post hoc test where p<0.05

Table 5-5. Additional visitor characteristics by cluster membership (χ^2).

| Variables | % | | | | χ^2 | P |
|-----------------------------------|---------|---------|---------|---------|----------|-------|
| | Overall | Group 1 | Group 2 | Group 3 | | |
| Gender | | | | | | |
| Male | 83.5 | 82.9 | 71.0 | 96.9 | 7.694 | 0.021 |
| Female | 16.5 | 17.1 | 29.0 | 3.1 | | |
| Marital Status | | | | | | |
| Married | 67.2 | 65.7 | 75.0 | 62.5 | 1.273 | 0.529 |
| Single | 32.8 | 34.3 | 25.0 | 37.5 | | |
| Education | | | | | | |
| High school grad or less | 23.1 | 25.7 | 25.0 | 15.6 | 4.389 | 0.356 |
| Trade/voc. School or some college | 27.6 | 30.0 | 15.6 | 34.4 | | |
| College graduate and above | 49.3 | 44.3 | 59.4 | 50.0 | | |
| Household income | | | | | | |
| Below \$35,000 | 4.5 | 5.7 | 0.0 | 6.3 | 4.754 | 0.576 |
| \$35,000 to \$64,999 | 29.9 | 34.3 | 31.3 | 18.8 | | |
| \$65,000 to \$94,999 | 28.4 | 24.3 | 31.3 | 34.4 | | |
| \$95,000 and above | 37.3 | 35.7 | 37.5 | 40.6 | | |

Table 5-6. Trip characteristics by cluster membership (ANOVA).

| Variable | Overall | Group 1 | Group 2 | Group 3 | F | P | Group mean ranking ^a |
|------------------------------------|---------|---------|---------|---------|-------|-------|---------------------------------|
| Years of riding OHV's | 16.23 | 15.89 | 15.13 | 17.56 | 0.324 | 0.724 | NS |
| Years of riding OHVs at the CMA | 7.76 | 7.96 | 7.27 | 7.81 | 0.119 | 0.888 | NS |
| One-way travel distance to the CMA | 121.01 | 122.45 | 92.37 | 146.38 | 0.527 | 0.592 | NS |
| Party Size while riding at the CMA | 3.22 | 3.56 | 3.55 | 2.39 | 4.028 | 0.020 | 1,2>3 |
| Overall trip rating | 8.46 | 8.69 | 8.41 | 8.03 | 3.009 | 0.050 | 1,2>3 |

Variables where homogeneity of variances cannot be assumed

| Variable | Overall | Group 1 | Group 2 | Group 3 | Statistic ^c | P | Group mean ranking ^b |
|---|---------|---------|---------|---------|------------------------|-------|---------------------------------|
| Total trips to the CMA | 18.53 | 17.52 | 12.97 | 22.75 | 2.37 | 0.102 | NS |
| Total Yearly OHV trips | 27.81 | 29.12 | 18.31 | 32.97 | 2.89 | 0.062 | NS |
| Total Yearly OHV expenditure ^d | 3896.43 | 5076.66 | 2665.15 | 2196.88 | 10.25 | 0.000 | 1>2,3 |

^aDifference in group means evaluated using Tukey's HSD post hoc test where $p < 0.05$. ^bDifference in group means evaluated using Games-Howell post hoc test where $p < 0.05$. ^cBrown-Forsythe statistic used, Asymptotically F distributed. ^dExcluding new OHV purchases.

Table 5-7. Additional trip characteristics by cluster membership (χ^2).

| Variable | % | | | | χ^2 | P |
|--|---------|---------|---------|---------|----------|-------|
| | Overall | Group 1 | Group 2 | Group 3 | | |
| Primary OHV type | | | | | | |
| Four wheel type | 50.7 | 48.6 | 68.8 | 37.5 | 6.529 | 0.038 |
| Two wheel type | 49.3 | 51.4 | 31.3 | 62.5 | | |
| Made a multi-day trip within the last year | | | | | | |
| Yes | 56.7 | 68.6 | 56.3 | 31.3 | 12.464 | 0.002 |
| No | 43.3 | 31.4 | 43.8 | 68.8 | | |

CHAPTER 6 DISCUSSION AND CONCLUSIONS

While much of the literature and public attention towards OHV recreation has centered on the negative ecological and social impacts resulting from OHV riding, this study investigates the potential positive impact. Whereas the negative impacts are especially visible, positive social and economic externalities looked at in this study are largely veiled from public perception. In the case of the CMA the total economic impact did not occur in one site nor in a single event, but resulted from thousands of small purchase decisions, by over 1500 households throughout a years time, and over a wide geographic area. The sum total of the purchases related to recreating at the CMA was over \$13 million, with a total impact of \$21 million and over 318 jobs.

The \$21 million economic impact is a benefit to the region but this value does not capture all the benefits generated by the CMA, as it does not capture the user benefits to the CMA. User benefits as measured by consumer surplus (CS) were evaluated in Chapter 3 and, at over \$31 million with an individual household CS per trip at over \$1,600, is substantial. Relative to other TCM valuation studies (page 34), CS per trip was on the high side. But it is not to far above other estimates when one accounts for the fact that the \$1,605 estimate was household CS. As such, with an average of 3.2 family members per trip the individual CS is \$501, which is in-line with other CS estimates such as Oh et al. (2005) CS estimate of \$249-\$414 per trip for recreational fishing site in Texas. The high CS result is consistent with the concept of commitment which states that a participant's level of emotional and equipment investment in an activity is greater for those who are most committed (Buchanan, 1985; McFarlane, 1996; Oh et al., 2005). A considerable investment results in a larger CS (willingness-to-pay) as they would have the most to lose from a loss of recreation areas. OHV recreation necessitates a considerable outlay of thousands of dollars for equipment required to recreate, necessitating a considerable

commitment. One must also consider the scarcity of riding areas when interpreting these results. The CMA is one of only five riding facilities in Florida and, located at 30 miles north of Tampa, the southern most OHV riding area. Visitors travel significant distant (over 100 miles one-way) and make the journey multiple times a year (18.6 annual trips) to ride at the CMA. Their commitment and the lack of riding areas results in the appreciably large value they place on the benefits they attain from the CMA, as there are few other opportunities in Florida for the attainment of the desired benefits of recreational OHV users.

As such, it is important to understand what these highly valued benefits are that riders hope to attain through their involvement in OHV recreation in order to better manage for the opportunities that provide them. Results from Chapter 5 indicate that it is in the attainment of family oriented benefits that are the top two motivations. However, riders also indicated the importance of individual benefits such as “reduce tensions and stress from everyday life” and “improve my skills and abilities” as important motivations. Rounding out the top five was “enjoying nature” indicating a riding preference for riding in natural settings. The \$1,600 individual household CS is the estimated value that households place on the attainment of these benefits.

It is important to identify potential motivational subgroups, as groups of visitors may ride for the attainment of benefits that differ from the general population. Understanding these subgroups allows managers to incorporate their benefits in the planning process to ensure the continued visitation of these subgroups. Results from cluster analysis in Chapter 5 reveal the existence of 3 homogenous benefit subgroups: Experiencers, Familists, and Individualists. Experiencers and Familists did not differ from the general population, in that their top benefits were still family oriented. However, results show that Experiencers consider the attainment of a

diversity of benefits as motivations for their involvement. Familists were more oriented toward the attainment of family based benefits than the general population. The Individualists were the most unique out of the three subgroups. Individualist rode almost exclusively for the attainment of individual oriented benefits. None of the top five motivations for the Individualists were within the top 5 of the other two groups, nor the top five of the general population.

Is the CMA providing the necessary opportunities that allow for the attainment by the visitors of these diverse benefits? While this study did not specifically address this question, interpretation of the data leads one to conclude that the CMA is providing the opportunities for the attainment of diverse benefits. Visitors to the CMA have been riding there for almost eight years and taking an average of over 18 trips annually. Granted, Florida does have limited riding areas, but this long-term frequent use would not be expected if visitors were not attaining their desired benefits. Additionally, when participants were asked to rate their last visit to the CMA, they gave a mean score of 8.46 out of a possible 10. All three motivational subgroups had similar results in respect to the variables mentioned. The group with the lowest mean years of riding at the CMA and number of annual trips taken were the Familists, but who have still been riding at the CMA 7.27 years with an annual average of 12.97 trips. The lowest mean rating was given by the individualists, but at 8.03 still considered their experience at the CMA worthwhile.

It is because visitors to the CMA attain the benefits they seek, that they return year after year. The value they place on their benefits is captured by their CS, and is substantial. The substantial user valuation of these benefits induces their decisions to make purchases in pursuit of their desired benefits. Their expenditures, in turn, generates economic benefits to the surrounding communities, through the addition of new money into the region and the associated additional economic activity.

Policy Implications

Florida has committed to provide several additional riding areas to meet the increasing demand and reduce the negative impacts associated with OHV recreation. However, this will only be possible if the new riding areas provide the opportunities for OHV riders to attain their desired benefits. If Florida is able to design and manage future areas that incorporate the desired benefits of the participants, the results could be similar to that of the CMA.

This study has illustrated that for OHV recreationists the prime motivations for riding are for the attainment of family based benefits. As such, future areas need to design areas that would provide the facilities and experiences that would attract these riders. However, simply designing areas to attract family OHV riders would fail to attract the maximum number of people as this study demonstrated that motivational homogenous subgroups exist. While family oriented benefits are still important, the group Experiencers indicated the importance of multiple and diverse benefits in riding OHVs. Another group, Individuals, ride almost exclusively for the attainment of individual oriented benefits.

Planners need to be aware of and manage for the multiple benefits desired by the OHV riding population, otherwise future areas may be unsuccessful in drawing OHV riders away from unmanaged and illegal riding opportunities. The CMA has done just this with DOF personnel indicating that OHV riding is no longer an issue throughout the rest of the Withlacoochee State Forest. This is attributable to the CMA providing the benefits that riders are looking for. The DOF has never integrated this type of information into their management plan for the CMA; however managers have been successfully achieved satisfied users. But understanding why riders come to the CMA will improve the management of future areas through the integration of participant desired benefits into the management process. This integration in future area is

crucial as areas may not be as big or rural, hence the need to specialize. In addition, the fact that the CMA has done this well, gives further weight to the DOF plan to use the CMA as a model for the design of future areas.

The results from this study testified to the substantial economic impact that OHV recreation generates to the surrounding communities. The estimate of \$21 million in total output impacts and over 318 jobs is a product of the expenditure of visitors to the CMA. Future OHV areas in Florida will undoubtedly induce economic impact within their region, but the level of the impact will be directly tied to the amount of riders attracted to the area. Again, to maximize economic impact, planners need to provide the opportunities that allow OHV riders to attain their desired benefits. If this is done, results similar to the CMA could be expected, with communities seeing both economic impact and a reduction in illegal riding on non-OHV lands.

The economic impacts and the natural setting nature of OHV recreation has already prompted other states and communities to recognized OHV recreation as a potential rural development tool. But, like other regions, communities in Florida have not been receptive to potential future areas. This is not surprising given the visible nature of the environmental and social impacts of OHV recreation along with the hidden nature of economic impacts. By illustrating the regional economic impacts, additional information is know available for the decision making process. As such, communities may be more receptive to a potential OHV riding area as this information has the possibility of adjusting the cost-benefit analysis and communities may deem the costs acceptable in light of the economic impacts.

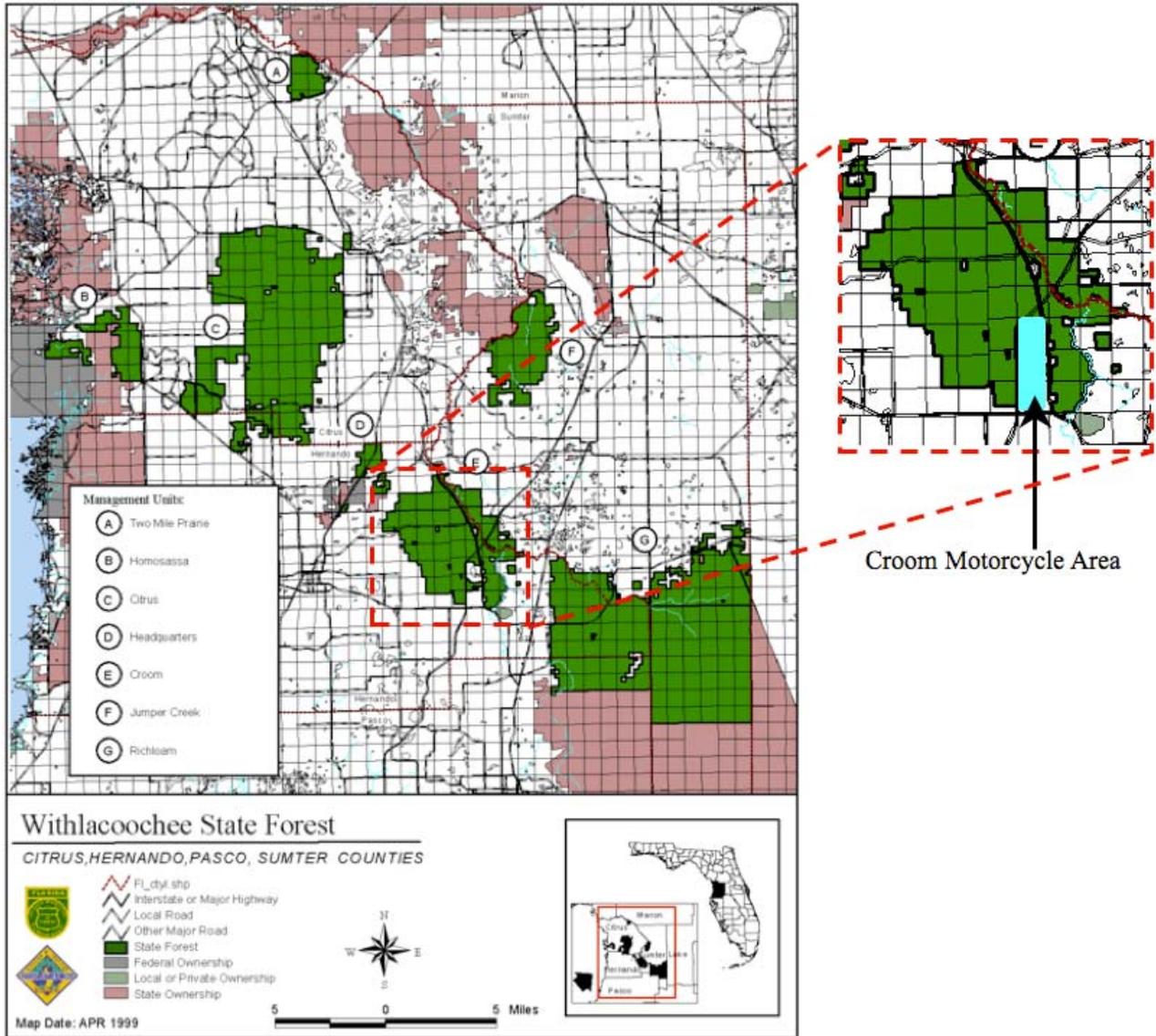
Future Work

Towards the understanding of OHV recreation, the largest gap in the data is that of resident perceptions of the impacts. While some secondary sources exist, no comprehensive

study could be located that looked at how local residents perceived the economic, social, environmental impacts. Information of this type could further help managers plan OHV riding areas that would be more acceptable to residents. To date no information could be found that illustrated the integration of resident perceptions into any OHV area design.

While establishing economic impact was an element of this study and has been undertaken in other OHV recreation studies, what has yet to be undertaken is a study into the potential economic impact that the negative externalities of OHV recreation could have on a region. A region that allows some form of OHV riding, may experience a reduction in visits from other potential recreation forms that seek an experience void of urban stimuli that OHV machine noise would eliminate, such as bikers, hikers, birdwatchers, and hunters. The resulting loss of these visitors, along with the expenditure they would have brought, would function as a negative externality. A comprehension of the negative economic impacts would provide further information to policy makers towards the goal of a more efficient and socially acceptable allocation of resources devoted to OHV recreation.

APPENDIX A MAP OF THE WITHLACOOCHEE STATE FOREST



APPENDIX B
VERBAL CONSENT SCRIPT

Croom Motorcycle Area Visitor Study

Verbal Consent Script

Hello. My name is _____, and I work for the University of Florida. We're working with the Florida Department of Agriculture & Consumer Services, Division of Forestry to better understand visitor preferences and their economic impact for off-highway vehicle recreation at the Croom Motorcycle Area. The information we are collecting will help us better manage the Area and provide desired OHV recreation opportunities in the Area.

I have a few questions I would like to ask you which should take only about two minutes of your time. First, are you at least 18 years old? *(If they answer yes, continue, if no, thank the individual for his/her time and terminate the conversation.)* If you have the time to spare now, would you be willing to answer some questions? *(If they answer yes, continue, if no, thank the individual for his/her time and terminate the conversation.)*

Thank you for your willingness to participate. You do not have to answer any question you do not wish to answer, and you may discontinue participation or withdraw your answers at any time without consequence. There is no anticipated risk or direct benefit to participants. Unfortunately, I cannot compensate you for your time, but your participation is greatly appreciated. If you have any questions regarding this project, you may contact Dr. Alavalapati at 352-846-0899 or email janaki@ifas.ufl.edu. Questions or concerns about research participants' rights may be directed to the UFIRB Office at 352-392-0433. May I begin the survey? *(If answer is no, thank the individual and terminate the conversation. If yes, begin the on-site survey.)*

Before asking question 5:

We are interested in learning more about your OHV recreational experience at the Croom Motorcycle Area (CMA). To do this, I have a more detailed questionnaire that you can take with you and fill out when you have the time. The questionnaire takes approximately 15 minutes and is completely confidential. Would you be willing to help us with this survey? *(If the answer is yes, give the participant the mail-back survey and continue, if no, thank the individual for his/her time and terminate the conversation.)*

Could you please tell me your name and address, city, state, and zip code so we can send you a thank you postcard? Even though I'm taking your name and address, **your participation will be kept confidential to the extent provided by law.** *(If they agree to give you their name and address, write it in the space provided and continue on with the survey. If not, thank the individual for his/her time and terminate the conversation.)*

Complete the survey with willing participants.

Thank you for participating. Your time is greatly appreciated and is extremely helpful to our study.

APPENDIX C
ON-SITE SURVEY

ID# _____

Croom Motorcycle Area On-site Visitors Survey

(For the purpose of this survey, Off-Highway Vehicle (OHV) stands for both ATV and off-highway motorcycle.)

1. What type of OHV do you primarily use to ride at the Croom Motorcycle Area?

| | |
|--|--|
| <input type="checkbox"/> Utility ATV | <input type="checkbox"/> Sport Quad |
| <input type="checkbox"/> Trail / Enduro Bike | <input type="checkbox"/> Motorcross Bike |
| <input type="checkbox"/> Trials Bike | |

2. What other types of OHV do you use to ride at the Croom Motorcycle Area?

| | |
|--|--|
| <input type="checkbox"/> Utility ATV | <input type="checkbox"/> Sport Quad |
| <input type="checkbox"/> Trail / Enduro Bike | <input type="checkbox"/> Motorcross Bike |
| <input type="checkbox"/> Trials Bike | |

3. How do you rate your skill level in OHV riding?

| | | | | |
|-----------------------------------|---------------------------------|---------------------------------------|-----------------------------------|---------------------------------|
| <input type="checkbox"/> Beginner | <input type="checkbox"/> Novice | <input type="checkbox"/> Intermediate | <input type="checkbox"/> Advanced | <input type="checkbox"/> Expert |
|-----------------------------------|---------------------------------|---------------------------------------|-----------------------------------|---------------------------------|

3. How would you rate your last visit here? (from 1-10 with 10 being a perfect trip, please circle appropriate number)

| | | | | | | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|
| <input type="radio"/> 1 | <input type="radio"/> 2 | <input type="radio"/> 3 | <input type="radio"/> 4 | <input type="radio"/> 5 | <input type="radio"/> 6 | <input type="radio"/> 7 | <input type="radio"/> 8 | <input type="radio"/> 9 | <input type="radio"/> 10 |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|

4. What is your gender? Male or Female

5. If others within your household are riding today, how many are:

| | |
|--|--|
| <input type="checkbox"/> Males older than 18 | <input type="checkbox"/> Females older than 18 |
| <input type="checkbox"/> Males younger than 18 | <input type="checkbox"/> Females younger than 18 |

6. Will you be participating in any other forms of recreation during this trip, such as camping, biking, and hiking? If yes, please list. (use the back as needed)

5. Name and address:

Name:

Address:

City:

State:

Zip:

APPENDIX D
MAIL-BACK SURVEY

UNIVERSITY OF
FLORIDA

I F A S

ASFR School of Forest Resources & Conservation

118 Newins-Ziegler Hall
PO Box 110410
Gainesville, FL 32611-0410
www.sfrc.ufl.edu

Dear Participant,

The University of Florida School of Forest Resources and Conservation and the Florida Department of Agriculture & Consumer Services, Division of Forestry are conducting a survey to learn more about your off-highway vehicle (OHV) recreation experience at the Croom Motorcycle Area. Only a small number of people have been chosen to participate in this study; therefore, *your response is very important*.

Your participation is voluntary, but we sincerely hope that you will help us with this project. You are not required to answer any question that you do not wish to answer, and there are no risks to you from participating in this study. *Your answers will be kept entirely confidential to the extent provided by law.*

Your responses will be very helpful in assessing the current and future needs of visitors to the Croom Motorcycle Area. Providing input about your OHV knowledge, experiences, motivations, and expenditures will help the Florida Division of Forestry better manage the Croom Motorcycle Area; therefore, we urge you to complete this questionnaire and return it as soon as possible. The total time needed to complete the survey should be approximately 15 minutes.

Please be assured that all of your responses will be confidential. We will not release information which could identify individuals that participate in the survey. The identification number on the questionnaire will be used only to verify the questionnaire's return. You will receive no benefit for completing the survey and your return of the survey will be interpreted as consent for participating in the study. If you have any questions about your rights concerning the study, please feel free to contact the UFIRB office, Box 112250, University of Florida, Gainesville, FL 32611-2250.

When completed, please put your questionnaire in the enclosed postage paid envelope. If you have any questions about this survey, please call (352) 846-0899 or email janaki@ifas.ufl.edu

Your input is important to the Florida Division of Forestry. It is important that we hear from you by **May 1st** so your input can be added to the study.

Thank you for your help!

Sincerely,

Janaki Alavalapati
Associate Professor

We would like to start by asking questions about your preferences for off highway vehicle recreation.

(For the purpose of this survey, Off-Highway Vehicle (OHV) stands for both ATV and off-highway motorcycle.)

- 1) How many years have you ridden an OHV for recreational purposes?
 ____ Number of years

- 2) How many years have you ridden at the Croom Motorcycle Area (CMA)? ____ # of years

- 3) a. Did you travel to OHV recreation areas other than the CMA within the last year?
 ____ Yes or ____ No
 b. If yes, approximately how many trips did you take? ____ Total # of trips taken
 c. How many of these trips were taken to ride on Private lands (motorcross or quad tracks, closed course races, friend or family lands, etc.)?
 ____ Total # of trips taken to private lands
 d. Please indicate the three other areas you went to most often.
 1) _____
 2) _____
 3) _____

- 4) People go to particular areas and participate in nature-based recreation activities for any number of reasons. Listed below are some possible reasons you might have for taking your trip. While engaging in OHV recreation, please indicate how important each of the following motivations are as reasons for your visit. *(Please circle the appropriate number for each statement)*

| Motivations | Importance | | | | |
|---|----------------------|--------------------|-----------|----------------|---------------------|
| | Not at all important | Not very important | Important | Very important | Extremely important |
| Reduce tensions and stress from everyday life | 1 | 2 | 3 | 4 | 5 |
| Strengthen family kinship | 1 | 2 | 3 | 4 | 5 |
| Learn about history and culture of the area | 1 | 2 | 3 | 4 | 5 |
| Promote physical fitness | 1 | 2 | 3 | 4 | 5 |
| Escape noise/crowds | 1 | 2 | 3 | 4 | 5 |
| Learn about the natural environment of the area | 1 | 2 | 3 | 4 | 5 |
| Be with friends and family | 1 | 2 | 3 | 4 | 5 |
| Feel a sense of independence | 1 | 2 | 3 | 4 | 5 |
| Take risks | 1 | 2 | 3 | 4 | 5 |
| Engage in personal/spiritual reflection | 1 | 2 | 3 | 4 | 5 |
| Explore the area and natural environment | 1 | 2 | 3 | 4 | 5 |

(Question 4 continued)

| | Not at all important | Not very important | Important | Very important | Extremely important |
|---|----------------------|--------------------|-----------|----------------|---------------------|
| Enjoy nature | 1 | 2 | 3 | 4 | 5 |
| Challenge myself and achieve personal goals | 1 | 2 | 3 | 4 | 5 |
| Depend on my skills and abilities | 1 | 2 | 3 | 4 | 5 |
| Be in an area where I feel secure and safe | 1 | 2 | 3 | 4 | 5 |
| Continue personal or family traditions | 1 | 2 | 3 | 4 | 5 |
| Meet new people | 1 | 2 | 3 | 4 | 5 |
| Improve my skills and abilities | 1 | 2 | 3 | 4 | 5 |
| Test vehicle's performance | 1 | 2 | 3 | 4 | 5 |
| Others: (please list) | | | | | |
| _____ | 1 | 2 | 3 | 4 | 5 |
| _____ | 1 | 2 | 3 | 4 | 5 |

- 5) We would now like you to think about OHV recreation opportunities that are provided on public lands throughout the **entire state of Florida**. Please read the statements below and indicate the extent to which you agree or disagree: *(Please circle the appropriate number for each statement)*

Statement

In general, do you believe that providing OHV recreation on public lands throughout Florida:

| | Totally disagree | Strongly disagree | Somewhat disagree | Somewhat Agree | Strongly agree | Totally agree | Neutral/ don't know |
|--|------------------|-------------------|-------------------|----------------|----------------|---------------|---------------------|
| helps improve visitors' and residents' awareness of environmental issues | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| is a good way for the state to protect threatened and endangered species | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| is a good way for the state to protect its natural areas | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| is done well by the state | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| should be further promoted in the state | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| benefits the economy of local communities near public lands | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| should occur on all public areas | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

6) The following question is related to OHV riding preferences. Please read the statements below and indicate the extent to which you agree or disagree: *(Please circle the appropriate number for each statement)*

Statement

When riding your OHV, you prefer riding:

| | Disagree | Somewhat disagree | Neutral | Somewhat agree | Agree |
|---|----------|-------------------|---------|----------------|-------|
| Off trails | 1 | 2 | 3 | 4 | 5 |
| On designated trails | 1 | 2 | 3 | 4 | 5 |
| Scramble areas (open riding areas such as pits) | 1 | 2 | 3 | 4 | 5 |
| Tight "technical" trails | 1 | 2 | 3 | 4 | 5 |
| Wide meandering trails | 1 | 2 | 3 | 4 | 5 |
| Children riding areas | 1 | 2 | 3 | 4 | 5 |
| Well maintained trails | 1 | 2 | 3 | 4 | 5 |
| Events (motorcross/quad tracks, hare scrambles, endures, fun runs, poker runs, & other sanctioned or club events) | 1 | 2 | 3 | 4 | 5 |

7) To what extent do you feel that each of the following conditions is a problem in the Croom Motorcycle Area (CMA)?

| | Not a Problem | Minor Problem | Moderate Problem | Serious Problem | Extreme Problem |
|---|---------------|---------------|------------------|-----------------|-----------------|
| Litter | 1 | 2 | 3 | 4 | 5 |
| OHVs traveling too fast | 1 | 2 | 3 | 4 | 5 |
| Overcrowding | 1 | 2 | 3 | 4 | 5 |
| Unsafe vehicle use by other OHV drivers | 1 | 2 | 3 | 4 | 5 |
| Lack of proper safety equipment worn by other OHV drivers | 1 | 2 | 3 | 4 | 5 |
| Noise from OHVs | 1 | 2 | 3 | 4 | 5 |
| Lack of varied terrain | 1 | 2 | 3 | 4 | 5 |
| Environmental degradation within the CMA (soil, vegetation, etc.) | 1 | 2 | 3 | 4 | 5 |
| Lack of safety & Environmental ethic training | 1 | 2 | 3 | 4 | 5 |
| Not enough rules and regulations | 1 | 2 | 3 | 4 | 5 |
| Too many rules and regulations | 1 | 2 | 3 | 4 | 5 |
| Poor enforcement of rules and regulations | 1 | 2 | 3 | 4 | 5 |
| Lack of knowledge by riders of rules and regulations | 1 | 2 | 3 | 4 | 5 |

(Question 7 continued)

| | Not a Problem | Minor Problem | Moderate Problem | Serious Problem | Extreme Problem |
|---|---------------|---------------|------------------|-----------------|-----------------|
| Lack of marked trails | 1 | 2 | 3 | 4 | 5 |
| Not enough children & family riding opportunities | 1 | 2 | 3 | 4 | 5 |
| Inadequate trail maintenance | 1 | 2 | 3 | 4 | 5 |
| Lack of adequate parking for support vehicles | 1 | 2 | 3 | 4 | 5 |
| Lack of adequate campground sites | 1 | 2 | 3 | 4 | 5 |
| Inadequate facilities | 1 | 2 | 3 | 4 | 5 |
| Other: _____ | 1 | 2 | 3 | 4 | 5 |

- 8) The following is a list of possible management actions that could be taken to improve the OHV riding experience at the Croom Motorcycle Area (CMA). Please indicate the extent to which you would support each action.

| Specific Management Actions: | Strongly Oppose | Somewhat Oppose | Neutral | Somewhat Support | Strongly Support |
|---|-----------------|-----------------|---------|------------------|------------------|
| Provide signs at trailhead and trail junctions indicating length | 1 | 2 | 3 | 4 | 5 |
| Provide signs at trailhead and trail junctions indicating level of difficulty | 1 | 2 | 3 | 4 | 5 |
| Provide scramble riding areas | 1 | 2 | 3 | 4 | 5 |
| Limit most OHV riding to designated trails | 1 | 2 | 3 | 4 | 5 |
| Provide an annual fee system that allows the purchaser to ride at all public OHV areas throughout the state | 1 | 2 | 3 | 4 | 5 |
| Provide detailed maps of the CMA | 1 | 2 | 3 | 4 | 5 |
| Provide more ranger patrols | 1 | 2 | 3 | 4 | 5 |
| Improve the maintenance of the OHV areas and trails | 1 | 2 | 3 | 4 | 5 |
| Take measures to protect and/or improve the natural environment in the CMA | 1 | 2 | 3 | 4 | 5 |
| Provide more parking space for OHV support vehicles | 1 | 2 | 3 | 4 | 5 |
| Provide primitive camping at appropriate places within the CMA | 1 | 2 | 3 | 4 | 5 |
| Provide more camping sites within the CMA | 1 | 2 | 3 | 4 | 5 |
| Provide more toilet facilities within the CMA | 1 | 2 | 3 | 4 | 5 |
| Provide more OHV safety education | 1 | 2 | 3 | 4 | 5 |
| Provide environmental ethic training | 1 | 2 | 3 | 4 | 5 |
| Provide additional pavilions and picnic tables | 1 | 2 | 3 | 4 | 5 |

We would now like to ask you a few questions regarding your expenditure related to off-highway vehicle recreation.

9) How many **day trips** did your household make to the CMA over the last 12 months? *(If your household did not take any day trips, please skip to question 13)*
 _____ # of trips

10) Including yourself, how many members of your household went on your **last day trip** to the CMA?
 _____ # of people

11) To your best estimate, how much money was spent by your household to purchase items in the following categories on your **last day trip** to the CMA?

| Category | Amount Purchased (\$) |
|--|-----------------------|
| OHV related purchases (gas, equipment, etc.) | \$ _____ |
| Purchases related to transportation to the CMA (gas, tolls, rental fees, etc.) | \$ _____ |
| Food & beverage purchases | \$ _____ |
| Entertainment, gift and souvenir purchases | \$ _____ |
| Miscellaneous/other purchases | \$ _____ |
| Total Amount Purchased | \$ _____ |

12) How many **over-night trips** did your household make to the CMA over the last 12 months? *(If your household did not take any over-night trips, please skip to question 15)*
 _____ # of trips

13) Including yourself, how many members of your household went on your **last over-night trip** to the CMA?
 _____ # of people

14) To your best estimate, how much money was spent by your household to purchase items in the following categories on your **last over-night trip** to the CMA?

| Category | Amount Purchased (\$) |
|--|-----------------------|
| OHV related purchases (gas, equipment, etc.) | \$ _____ |
| Purchases related to transportation to the CMA (gas, tolls, rental fees, etc.) | \$ _____ |
| Food & beverage purchases | \$ _____ |
| Lodging (hotel, motel, campsite, etc.) | \$ _____ |
| Entertainment, gift and souvenir purchases | \$ _____ |
| Miscellaneous/other purchases | \$ _____ |
| Total Amount Purchased | \$ _____ |

15) To your best estimate, how much money did your household spend in the following categories over the last twelve months for OHV recreation in general?

| Category | Amount Spent (\$) |
|--|-------------------|
| Repairs / routine maintenance to OHVs (gas/oil, lubricants, tools, air filters, tires, wear items, etc.) | \$ _____ |
| OHV equipment modifications and upgrades (exhaust, suspension, other aftermarket accessories, etc.) | \$ _____ |
| OHV Riding apparel (helmets, boots, eye protection, gloves, additional protective clothing) | \$ _____ |
| Equipment or purchase of rentals related to the transport of OHVs (transport vehicle, trailer, gas/fuel, loading ramp, tie-downs, etc.) | \$ _____ |
| OHV expenditure related to permits, fees (day-use fees, special events fees, competition entry fees, etc.), insurance, Tiling, club membership | \$ _____ |
| Miscellaneous/other purchases related to OHV riding | \$ _____ |
| Total Amount Spent | \$ _____ |

16) Do you feel that the existence of the CMA was a major factor in your decision to purchase most of the above items?

____ Yes or ____ No

17) Approximately what percentage of the above purchases was made in the counties of Citrus, Hernando, Sumter, and Pasco?

____ %

18) Has your household purchased a **new** OHV(s) in the last 12 months?
 Yes **or** No (If no, please go to question 12)

If yes, how many? # of **new** OHVs

Approximately how much did you spend in total? \$

Would you say that the existence of the CMA was a major factor in your decision to purchase the OHV(s) you cited above? Yes **or** No

19) Has your household purchased a **used** OHV(s) in the last 12 months?
 Yes **or** No

If yes, how many? # of **used** OHVs

Approximately how much did you spend in total? \$

Would you say that the existence of the CMA was a major factor in your decision to purchase the OHV(s) you cited above? Yes **or** No

20) If instead of charging a yearly fee the CMA charged per visit, how many times would you choose to ride per year for each of the below entrance fees?

| | | |
|--------------------------|---------------------------|---------------------------|
| <input type="text"/> \$0 | <input type="text"/> \$10 | <input type="text"/> \$35 |
|--------------------------|---------------------------|---------------------------|

We would like to end this survey with a few general questions about you.

21) What is your zip code?

22) What is your gender?
 Male
 Female

23) When were you born? 19

24) What is your present marital status?

| | |
|---|----------------------------------|
| <input type="checkbox"/> Single | <input type="checkbox"/> Married |
| <input type="checkbox"/> Separated/Divorced | <input type="checkbox"/> Widowed |

25) How many children do you have under the age of 18?

____ Number of children

26) Which of the following best describes your race or ethnic origin?

| | |
|---|--|
| <input type="checkbox"/> African American | <input type="checkbox"/> Asian or Pacific Islander |
| <input type="checkbox"/> Hispanic/Latino | <input type="checkbox"/> Native American |
| <input type="checkbox"/> Caucasian | <input type="checkbox"/> Other, please list: _____ |

27) Please indicate the highest level of education you have completed.

| | |
|--|--|
| <input type="checkbox"/> 8 th grade or less | <input type="checkbox"/> 9 th -12 th grade |
| <input type="checkbox"/> High school graduate or GED | <input type="checkbox"/> Trade/vocational school |
| <input type="checkbox"/> Some college | <input type="checkbox"/> College graduate |
| <input type="checkbox"/> Some graduate school | <input type="checkbox"/> Graduate degree |

28) Please indicate the range in which your 2005 annual household income falls.

| | | |
|---|--|--|
| <input type="checkbox"/> Below \$15,000 | <input type="checkbox"/> \$15,000-\$24,999 | <input type="checkbox"/> \$25,000-\$34,999 |
| <input type="checkbox"/> \$35,000-\$44,999 | <input type="checkbox"/> \$45,000-\$54,999 | <input type="checkbox"/> \$55,000-\$64,999 |
| <input type="checkbox"/> \$65,000-\$74,999 | <input type="checkbox"/> \$75,000-\$84,999 | <input type="checkbox"/> \$85,000-\$94,999 |
| <input type="checkbox"/> \$95,000-\$104,999 | <input type="checkbox"/> \$105,000-\$124,999 | <input type="checkbox"/> \$125,000 and above |

29) Which of the following best describes your current occupation? (Only check one.)

| | |
|--|--|
| <input type="checkbox"/> Business owner | <input type="checkbox"/> Clerical/Office worker |
| <input type="checkbox"/> Homemaker | <input type="checkbox"/> Laborer |
| <input type="checkbox"/> Manager/Executive | <input type="checkbox"/> Permanently disabled |
| <input type="checkbox"/> Professional worker | <input type="checkbox"/> Retired |
| <input type="checkbox"/> Sales worker | <input type="checkbox"/> Service worker |
| <input type="checkbox"/> Skilled trade | <input type="checkbox"/> Student |
| <input type="checkbox"/> Unemployed | <input type="checkbox"/> Other, please list: _____ |

We would like to thank you again for your time and effort in answering the questions within this survey.

APPENDIX E
 MATHEMATICAL DISCRIPTION OF INPUT-OUTPUT MODEL

To aid the reader in understanding I-O analysis, a basic description of a three-sector I-O model follows, as put forth by Leontief (1986) and Miller & Blair (1985), to illustrate how one derives the indirect and induced impacts from the initial direct impact.

Figure 1 is a generalized accounting table that I-O models utilize. An assumption that is key in I-O models is that total outputs from a sector equals total inputs. The columns within the table represent inputs that industries require to produce a given level output. Reading down the columns gives the level of inputs that each sector receives from others. Industry sector S1 purchases Z_{11} from itself, Z_{21} from S2, H_{31}

Figure 1: General accounting table

| Outputs | | Inputs | | | | | |
|------------------|------|------------------|----------|---------------------|----------|----------|---------------|
| | | Producing sector | | Final demand sector | | | |
| | | S1 | S2 | H (3) | G (4) | E (5) | Total outputs |
| Producing Sector | S1 | Z_{11} | Z_{12} | H_{13} | G_{14} | E_{15} | X'_1 |
| | S2 | Z_{21} | Z_{22} | H_{23} | G_{24} | E_{25} | X'_2 |
| Payments Sector | H(3) | H_{31} | H_{32} | T_{33} | T_{34} | T_{35} | X'_3 |
| | G(4) | G_{41} | G_{42} | T_{43} | T_{44} | T_{45} | X'_4 |
| | I(5) | I_{51} | I_{52} | T_{53} | T_{54} | T_{55} | X'_5 |
| Total inputs | | X_1 | X_2 | X_3 | X_4 | X_5 | |

inputs from households and so on for total inputs of X_1 , the bottom row of table 1. Conversely, reading across the rows shows the outputs sold by a sector to the other sectors. Hence, sector S1 will sell Z_{11} to itself, Z_{12} sector S2, H_{13} outputs will be sold to households, and so on for a total output of X'_1 , given the assumption stated above $X_2 = X'_2$.

As such:

$$X'_1 = Z_{11} + Z_{12} + Y_1$$

where Y_1 is total final demand for S2 outputs, $Y_1 = H_{13} + G_{14} + E_{15}$.

Dividing the column entry by gross outputs will provide the trade coefficients, the amount of input from each sector needed for S2 to produce one unit of output. Duplicating this for each producing sector results in a series of equations that will form the coefficient matrix A,

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$$

where:

Solving for X, the vector of gross output, provides the final equation:

$$X=(I-A)^{-1}*Y$$

Where $(I-A)^{-1}$ is the Leontif inverse matrix and Y is the vector of final demand.

Households can be treated as either exogenous or endogenous with respect to the model. When households are treated as exogenous, type I (direct and indirect) multipliers and impacts are derived. Type II (direct, indirect, and induced) multipliers and impact are obtained by extending the Leontif inverse matrix to include additional spending of wage income by households. As such, type II multipliers and the associated impacts are greater due to the inclusion of this additional sector.

By changing Y, one can derive economic impacts from an I-O model. Essentially an activity or policy change can affect the final demand from various sectors. A change in Y will result in a corresponding change in total output greater than the initial impact, as the sectors that experience an increase in final demand for their products will increase purchases of inputs from other sectors, hence causing the direct impact to multiply.

APPENDIX F
DIRECT, INDIRECT, AND INDUCED REGIONAL ECONOMIC IMPACTS OF OHV
RECREATION AT THE CMA BY INDUSTRY GROUP AND IMPACT TYPE

| Industry Group (NAICS) | Output Impact (\$) | | | | Total Impact |
|--------------------------------------|------------------------|-----------------------|-------------------------|------------------------|-------------------|
| | Direct Local Residents | Direct Non-Local Res. | Indirect Non-Local Res. | Induced Non-Local Res. | |
| Ag, Forestry, Fish & Hunting | 0 | 0 | 3,188 | 43,469 | 46,656 |
| Mining | 0 | 0 | 112 | 1,071 | 1,183 |
| Utilities | 0 | 0 | 111,577 | 199,311 | 310,888 |
| Construction | 0 | 0 | 69,285 | 663,505 | 732,790 |
| Manufacturing | 0 | 0 | 74,829 | 182,983 | 257,812 |
| Wholesale Trade | 0 | 0 | 27,064 | 131,507 | 158,571 |
| Transportation & Warehousing | 0 | 0 | 142,040 | 131,064 | 273,104 |
| Retail trade | 2,719,701 | 8,118,798 | 71,093 | 688,289 | 11,597,880 |
| Information | 0 | 0 | 114,365 | 146,439 | 260,804 |
| Finance & insurance | 0 | 0 | 92,742 | 278,367 | 371,109 |
| Real estate & rental | 211,638 | 881,019 | 186,681 | 210,874 | 1,490,212 |
| Professional- scientific & tech svcs | 0 | 0 | 179,506 | 201,346 | 380,852 |
| Management of companies | 0 | 0 | 51,593 | 8,667 | 60,260 |
| Administrative & waste services | 0 | 0 | 189,905 | 133,465 | 323,370 |
| Educational svcs | 0 | 0 | 726 | 36,731 | 37,457 |
| Health & social services | 0 | 0 | 47 | 897,788 | 897,835 |
| Arts- entertainment & recreation | 16,829 | 113,902 | 6,146 | 55,409 | 192,286 |
| Accomodation & food services | 70,897 | 383,565 | 41,005 | 331,914 | 827,380 |
| Other services | 194,065 | 577,305 | 83,206 | 330,019 | 1,184,595 |
| Government & non NAICS | 46,496 | 259,772 | 54,371 | 1,895,090 | 2,255,729 |
| Total | 3,259,626 | 10,334,361 | 1,499,482 | 6,567,306 | 21,660,775 |

*Citrus, Sumter, Hernando, and Pasco Counties

| Industry Group (NAICS) | Total Value Added Impact (\$) | | | | Total Impact |
|--------------------------------------|-------------------------------|-----------------------|-------------------------|------------------------|-------------------|
| | Direct Local Residents | Direct Non-Local Res. | Indirect Non-Local Res. | Induced Non-Local Res. | |
| Ag, Forestry, Fish & Hunting | 0 | 0 | 1,911 | 22,615 | 24,526 |
| Mining | 0 | 0 | 73 | 700 | 774 |
| Utilities | 0 | 0 | 80,357 | 143,532 | 223,889 |
| Construction | 0 | 0 | 31,054 | 264,534 | 295,588 |
| Manufacturing | 0 | 0 | 23,252 | 40,604 | 63,856 |
| Wholesale Trade | 0 | 0 | 20,585 | 100,023 | 120,607 |
| Transportation & Warehousing | 0 | 0 | 95,983 | 74,595 | 170,578 |
| Retail trade | 2,084,005 | 6,151,171 | 53,261 | 515,959 | 8,804,396 |
| Information | 0 | 0 | 41,580 | 52,746 | 94,327 |
| Finance & insurance | 0 | 0 | 65,930 | 168,010 | 233,940 |
| Real estate & rental | 87,331 | 363,548 | 126,762 | 140,879 | 718,520 |
| Professional- scientific & tech svcs | 0 | 0 | 85,580 | 110,048 | 195,627 |
| Management of companies | 0 | 0 | 28,135 | 4,726 | 32,861 |
| Administrative & waste services | 0 | 0 | 92,959 | 70,095 | 163,054 |
| Educational svcs | 0 | 0 | 353 | 19,508 | 19,861 |
| Health & social services | 0 | 0 | 20 | 564,622 | 564,642 |
| Arts- entertainment & recreation | 10,175 | 68,868 | 3,055 | 32,569 | 114,668 |
| Accomodation & food services | 50,279 | 272,020 | 21,061 | 155,684 | 499,044 |
| Other services | 93,476 | 278,073 | 32,364 | 162,880 | 566,793 |
| Government & non NAICs | 14,125 | 78,917 | 16,389 | 1,672,369 | 1,781,800 |
| Total | 2,339,392 | 7,212,596 | 820,663 | 4,316,699 | 14,689,351 |

*Citrus, Sumter, Hernando, and Pasco Counties

| Industry Group (NAICS) | Labor Income Impact (\$) | | | | Total Impact |
|--------------------------------------|--------------------------|-----------------------|-------------------------|------------------------|------------------|
| | Direct Local Residents | Direct Non-Local Res. | Indirect Non-Local Res. | Induced Non-Local Res. | |
| Ag, Forestry, Fish & Hunting | 0 | 0 | 941 | 10,501 | 11,442 |
| Mining | 0 | 0 | 38 | 362 | 400 |
| Utilities | 0 | 0 | 24,071 | 43,760 | 67,831 |
| Construction | 0 | 0 | 27,482 | 228,475 | 255,957 |
| Manufacturing | 0 | 0 | 17,666 | 28,393 | 46,059 |
| Wholesale Trade | 0 | 0 | 11,529 | 56,019 | 67,548 |
| Transportation & Warehousing | 0 | 0 | 72,899 | 58,309 | 131,208 |
| Retail trade | 1,352,449 | 3,981,654 | 33,435 | 323,794 | 5,691,332 |
| Information | 0 | 0 | 24,764 | 23,249 | 48,013 |
| Finance & insurance | 0 | 0 | 30,178 | 78,546 | 108,724 |
| Real estate & rental | 42,660 | 177,589 | 32,771 | 39,339 | 292,360 |
| Professional- scientific & tech svcs | 0 | 0 | 72,023 | 94,672 | 166,696 |
| Management of companies | 0 | 0 | 21,619 | 3,632 | 25,250 |
| Administrative & waste services | 0 | 0 | 73,756 | 55,664 | 129,421 |
| Educational svcs | 0 | 0 | 342 | 19,003 | 19,345 |
| Health & social services | 0 | 0 | 18 | 491,184 | 491,202 |
| Arts- entertainment & recreation | 5,669 | 38,367 | 2,251 | 20,078 | 66,364 |
| Accomodation & food services | 28,605 | 154,758 | 13,924 | 107,419 | 304,706 |
| Other services | 67,564 | 200,990 | 22,807 | 128,936 | 420,297 |
| Government & non NAICs | 12,209 | 68,214 | 16,059 | 935,822 | 1,032,304 |
| Total | 1,509,156 | 4,621,572 | 498,571 | 2,747,157 | 9,376,456 |

*Citrus, Sumter, Hernando, and Pasco Counties

| Indirect Business Taxes Impact (\$) | | | | | |
|--------------------------------------|------------------------|-----------------------|-------------------------|------------------------|------------------|
| Industry Group (NAICS) | Direct Local Residents | Direct Non-Local Res. | Indirect Non-Local Res. | Induced Non-Local Res. | Total Impact |
| Ag, Forestry, Fish & Hunting | 0 | 0 | 47 | 913 | 960 |
| Mining | 0 | 0 | 3 | 31 | 34 |
| Utilities | 0 | 0 | 11,484 | 20,244 | 31,728 |
| Construction | 0 | 0 | 425 | 3,170 | 3,594 |
| Manufacturing | 0 | 0 | 367 | 842 | 1,209 |
| Wholesale Trade | 0 | 0 | 4,453 | 21,637 | 26,090 |
| Transportation & Warehousing | 0 | 0 | 1,715 | 2,060 | 3,775 |
| Retail trade | 410,337 | 1,205,791 | 9,996 | 96,659 | 1,722,783 |
| Information | 0 | 0 | 2,841 | 5,603 | 8,444 |
| Finance & insurance | 0 | 0 | 2,221 | 4,736 | 6,957 |
| Real estate & rental | 4,325 | 18,003 | 20,370 | 22,069 | 64,767 |
| Professional- scientific & tech svcs | 0 | 0 | 1,139 | 2,005 | 3,143 |
| Management of companies | 0 | 0 | 465 | 78 | 543 |
| Administrative & waste services | 0 | 0 | 2,721 | 2,227 | 4,949 |
| Educational svcs | 0 | 0 | 7 | 343 | 350 |
| Health & social services | 0 | 0 | 0 | 6,076 | 6,076 |
| Arts- entertainment & recreation | 1,249 | 8,452 | 218 | 3,678 | 13,597 |
| Accomodation & food services | 7,045 | 38,113 | 2,440 | 16,694 | 64,291 |
| Other services | 13,913 | 41,388 | 3,173 | 13,060 | 71,533 |
| Government & non NAICs | 8 | 47 | 19 | 104,196 | 104,271 |
| Total | 436,876 | 1,311,793 | 64,104 | 326,321 | 2,139,094 |

*Citrus, Sumter, Hernando, and Pasco Counties

| Industry Group (NAICS) | Employment Impact (Jobs) | | | | Total Impact |
|--------------------------------------|--------------------------|-----------------------|-------------------------|------------------------|--------------|
| | Direct Local Residents | Direct Non-Local Res. | Indirect Non-Local Res. | Induced Non-Local Res. | |
| Ag, Forestry, Fish & Hunting | 0.0 | 0.0 | 0.0 | 0.8 | 0.8 |
| Mining | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Utilities | 0.0 | 0.0 | 0.3 | 0.5 | 0.8 |
| Construction | 0.0 | 0.0 | 0.9 | 7.2 | 8.0 |
| Manufacturing | 0.0 | 0.0 | 0.5 | 0.8 | 1.2 |
| Wholesale Trade | 0.0 | 0.0 | 0.3 | 1.4 | 1.7 |
| Transportation & Warehousing | 0.0 | 0.0 | 1.8 | 1.5 | 3.3 |
| Retail trade | 46.2 | 134.6 | 1.4 | 13.6 | 195.7 |
| Information | 0.0 | 0.0 | 0.7 | 0.6 | 1.3 |
| Finance & insurance | 0.0 | 0.0 | 0.7 | 2.0 | 2.7 |
| Real estate & rental | 1.8 | 7.4 | 1.5 | 1.8 | 12.5 |
| Professional- scientific & tech svcs | 0.0 | 0.0 | 2.2 | 2.7 | 4.9 |
| Management of companies | 0.0 | 0.0 | 0.4 | 0.1 | 0.5 |
| Administrative & waste services | 0.0 | 0.0 | 3.2 | 2.3 | 5.4 |
| Educational svcs | 0.0 | 0.0 | 0.0 | 0.9 | 0.9 |
| Health & social services | 0.0 | 0.0 | 0.0 | 12.4 | 12.4 |
| Arts- entertainment & recreation | 0.3 | 2.2 | 0.1 | 1.2 | 3.8 |
| Accomodation & food services | 1.3 | 7.2 | 0.9 | 7.5 | 17.0 |
| Other services | 3.0 | 9.1 | 1.2 | 7.5 | 20.8 |
| Government & non NAICs | 0.3 | 1.4 | 0.3 | 22.2 | 24.2 |
| Total | 52.9 | 161.9 | 16.4 | 86.9 | 318.0 |

*Citrus, Sumter, Hernando, and Pasco Counties

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BIOGRAPHICAL SKETCH

Gregory Parent was born in Dover, NH on the 24th of May 1978 and has spent the first eighteen years of his life living in Rochester, NH. Upon completion of his studies at Saint Thomas Aquinas High School in 1997, Gregory moved to Montreal, Quebec to pursue his B.A. degree at McGill University. Gregory graduated in 2001 from McGill with a double major in economics and international development.

In June of 2002 Gregory entered into service as a Peace Corps volunteer in the country of Togo. Gregory developed and managed projects in collaboration with villages that focused on improving the sustainability of natural resources use. Most of these projects centered on the generation of revenue from non-timber forest products, taking the form of a comprehensive ecotourism project and agroforestry regime promotion. During those two years in Togo Gregory gained a level of insight into the relationship between the village social organization and natural resources that he never could have gained in university studies alone. He developed an understanding of the prime importance of representing the diversity of interests and resource use issues of rural village communities in any attempted conservation plan.

Upon completion of his M.S. degree, Gregory will be entering into a PhD program at the University of Florida, through the auspice of a National Science Foundation fellowship through the Integrative Graduate Education and Research Traineeship program. His proposed area of research will be in developing economic models, most likely either computable general equilibrium (CGE) or econometric models, to analyze the economic structure of local communities with an emphasis on the regional economic linkages to natural resource use.