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## Valuing the Saint Johns River Basin: A Study of Recreation and Ecotourism in Northeastern Florida

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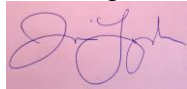
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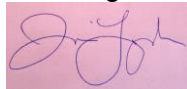
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To “every mosquito, every rattlesnake, every cane break, [...] every alligator, every black water swamp, every freshwater spring.” -JJ Grey

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Abstract of Thesis Presented to the Graduate School  
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VALUING THE SAINT JOHNS RIVER BASIN:  
A STUDY OF RECREATION AND ECOTOURISM IN NORTHEASTERN FLORIDA

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Rivers serve diverse communities along their banks and within their watersheds, but the services they provide are often undervalued which results in their overuse. Of the many goods and services that rivers provide, recreation is primarily referred to in literature as cultural ecosystem service, and it is a notable service for the communities along rivers' banks as well as those who travel from other regions to take part in outdoor activities. Many studies that estimate the value of recreation in natural areas use the cost of travel to measure revealed willingness to pay of a variety of visitors, referred to as the travel cost method (TCM).

In this study, the TCM is used to measure the consumer surplus value of ecotourism and recreation in the Saint Johns River Basin (SJRB) in northeastern Florida. Activities in the SJRB's natural areas range according to geographical variance and environmental suitability. In order to capture the total recreation value within the Basin, this research aimed to include all nature-based outdoor recreation activities available rather than focusing on only one group of outdoor enthusiasts.

The analysis is based on the responses to an online survey administered to anglers, paddlers, and members of local environmental organizations. Because

overdispersion is present in the data set, this study uses the Negative Binomial distribution to estimate the expected number of trips in order to calculate the consumer surplus.

The survey makes evident that SJRB provides recreation opportunities that are highly valued by both local residents and those living in other Florida regions. The data confirm the theoretical suppositions of the study – the travel cost is inversely related to the number of trips taken to the region, and this relation is statistically significant. The travel costs depend on the socio-demographic characteristics and the attitudes toward environmental protection. Consumer surplus for the recreational use of the SJRB was found to be significant. For those included in the analysis, the consumer surplus amounts to \$903,600.18, and the estimated total consumer surplus for the entire sample ( $n=15,295$ ) to yield a generalized consumer surplus of \$28,973,930.30. These conservative consumer surplus estimates fall within the range of results reported by other studies done within Florida.

The results suggest that the SJRB is a significantly valued by those who recreate there, and that its conservation is a justified investment. Increased public awareness of water issues, even for those who are frequent visitors to the region, could improve the management of natural areas and possibly increase visitation to the region for ecotourism activities. The complementary relationship evident between sites suggests that the areas may be best developed considering the recreation opportunities and nature quality at neighboring sites. A comprehensive approach to eco-tourism development creates the possibility of making the SJRB a well-known region for natural encounters.

## CHAPTER 1 INTRODUCTION

The purpose of this study is to measure the economic value of nature-based recreation on the St. Johns River in northeastern Florida and in its surrounding lands. In order to understand the economic significance of current recreation and the potential expansion of ecotourism in the area, it is critical to understand how these activities figure into the larger flow of ecosystem services provided by the St. Johns River Basin (SJRB). The accurate measurement of this portion of the SJRB's value can contribute to balanced policies addressing both water conservation and economic development in northeastern Florida.

The SJR starts its journey in marshes west of Vero Beach bisecting and skirting twelve Florida counties as it flows over 310 miles northward past the Orlando area and Palatka to empty out into the Atlantic Ocean through Jacksonville (Figure 1-1). Known also as the "River of Lakes" the SJR is the only designated American Heritage River in the state of Florida because of its historic, cultural, recreational, economic, and environmental value to the communities in the region (EPA, 1997).

The study area is composed of a variety of natural features including the river itself, as well as thousands of lakes, wetlands, and springs in the SJR Basin. Tannic blackwater of the river contrasts with nearly 100 freshwater springs scattered around in the central basin. The unique mix of water features gives life to flora and fauna that differs from faster running, whitewater rivers. The American river otter, great blue heron, and southern leopard frog make their home amidst underwater grasses; bald cypress and pickerelweed found in this region create a beautiful landscape.

Scenic and valuable in their own right, these water features are also host to a variety of water-based recreation activities like fishing, diving and snorkeling, boating, kayaking and canoeing. In this study, the natural lands surrounding bodies of water are also considered significant to the total economic value of the recreational activities in the region. Land based recreation such as hunting, camping, hiking, and wildlife viewing is experienced from the marshy areas in the southern portion to the flatwoods in the north. The host of recreation activities and unique combination of ecosystems attract visitors from far and wide as well as those with the SJRB in their backyard. Water is a vital component of each of these recreational landscapes and the focus of many of the outdoor recreation activities in the SJRB.

### **Ecosystem Functions and Ecosystem Services**

Aquatic ecosystem functions are physical, chemical, and biological processes or attributes of land categories that are vital to the integrity of the ecological system. The temporary storage of surface water, exportation of organic carbon, and maintenance of habitat for plant communities and wildlife are some examples of direct and indirect benefits that ecosystem functions of rivers provide the communities surrounding them. The Millennium Ecosystem Assessment defines the set of critical goods and services that ecosystems provide to human society as 'ecosystem services' (MEA, 2005). These services function in a circular flow, as seen in Figure 1-2.

The myriad of water related renewable ecosystem services can be categorized as provisioning services, regulating services, cultural services, and supporting services. Provisioning services are products such as timber, water, game, and other products that are extracted from the ecosystem to provide for direct human use. Examples of regulatory services include climate regulation, water purification, and sediment and

particulate retention. Regulatory services keep the environment stable and healthy, whose function also benefits humans by mitigating the destruction of living spaces and the risk of resource shortages. Inherited culture and spiritual beliefs are a third type of service that is traditionally intertwined with natural areas. Recreation and tourism are examples of this sort of cultural service which links human ritual to natural features (Barbier et al., 2011). These three conceptual divisions of ecosystem services are important to understand the unique attributes of a particular ecosystem, and each of these services functions contingent upon underlying, synergetic supporting services. Supporting services include all ecosystem processes that are necessary for providing the other three categories of ecosystem services (e.g., soil formation, primary production within ecosystems, and habitat provision) (MEA, 2005). Similar to a joint production in an industrial enterprise when several outputs are resulted from a single production process, the environment processes act together as 'supporting services' to provide either intermediate or final goods and as provisioning, regulating, and cultural services.

Recreation is often classified as a type of cultural service which mainly contributes to the health and social cohesion of communities. However, it is important to acknowledge that some researchers argue against classifying recreation as an ecosystem service because it requires private goods as well as other ecosystem services. The broad definition of the MEA equates intermediate and final services, and therefore reconciles private goods as providing a 'supporting service' (MEA, 2005). In the case of recreation, nature serves an intermediate role along with other goods that make up a final benefit. For example, the ecosystem provides the main service for

anglers in that it maintains a setting appropriate for a certain variety and volume of fish stock (i.e., nature provides supporting service), but private goods such as tackle and boat rental are necessary for the activity (Barbier et al., 2011). Although disagreement about the classification recreation and tourism exist in literature, this study follows MEA (2005) and adopts the classification of these activities as a type of cultural service.

### **Determinants of Riverine Ecosystem Flows**

Costanza et al. (1997) points out that there is a minimum threshold for the amount of ecosystem 'infrastructure' necessary in order to allow for natural functions to produce the range of services currently consumed. For example, lasting damage to a river's headwaters can cause an ecosystem to become so unstable that is not able to provide the basic support services for the community around it. A ripple effect can compromise ecosystem services far downstream. There are many obstacles – non-source pollution (i.e. urban storm water run-off and agricultural run-off of herbicides, pesticides, and fertilizers), physical impoundments, water diversions, deforestation of riparian zones, and the proliferation of invasive species – that compromise the capacity of aquatic ecosystems to provide the flow of services. Ever-increasing perturbations to these ecosystems degrades their robustness<sup>1</sup> and eventually results in their demise.

The EPA (2012) estimates that nearly 40% of the nation's rivers and lakes are too polluted for swimming or fishing. Approximately 66,000 dams are impeding the natural flows of rivers throughout the country, of which only approximately 2,540 produce hydroelectric power. The continental United States has also converted over 50% of its pre-Colonial wetlands into other land uses and similar losses have occurred

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<sup>1</sup> Robustness is the capacity to maintain system performance (commonly represented by output) when subjected to external or internal unpredictable disturbances (Janssen & Anderies, 2007).

in other areas of the world (Batzer & Shariz, 2006). Recent trends are hardly likely to be changing entirely due to natural causes and points to the necessity of understanding threats that originate from the direct effect of human alterations as well as from the indirect implications of climate change.

### **Market Failure**

Markets are claimed to be the efficient mechanism for allocating society's constrained productive resources to uses for which they are most valued. For free markets to achieve efficient resource allocation, property rights must be clearly defined as rival and excludable, and all the benefits and costs of an activity must be perfectly known and accounted for in market transactions<sup>2</sup>. In contrast, when the property rights are not clearly defined, and some benefits and costs are not accounted for in market transactions (i.e., positive or negative externalities are present), markets result in suboptimal allocation<sup>3</sup> of a society's resources. Situations when free markets fail to achieve efficient allocation are referred to as market failure.

It is clear that within the last century economic activity has led to socially undesirable environmental consequences, such as loss of habitat and species diversity, water shortages and pollution, and major climatic shifts. For the goods and services provided by a river, important conditions for the efficient function of free markets are violated and results in poor management of collective resources. A primary condition, rival and excludable property rights for the use of the services provided by a river, are

---

2 Other conditions for market efficiency are perfect competition, rational consumers, and the absence of distortive government policies.

3 If it were possible to improve one individual's situation without decreasing someone else's welfare, it would be incorrect to say that resources are being allocated to their full potential, or Pareto-optimal (Johansson, 2000).

often impossible to define. Water for personal and domestic uses is recognized by international law as a human right and riparian law in the United States dictates that users of upstream waters are responsible to preserve the flow and quality of water for those downstream. It is possible that when water is traded as a commodity, market prices could become inaccessible and the basic human right to water could be violated. Secondly, the benefits and costs of an activity affecting the flow of services from a river are not perfectly known. Market failures can occur in part due to the inability to credit the economic values of ecosystem services to its conservation. In order to address the concerns of the future, it is required to understand the models that are responsible for the decisions that are made to craft the cultural, material, and natural environs around global communities.

Information about the benefits and values provided by aquatic ecosystems assists decision makers to design environmental policy in a way that considers direct and indirect factors rather than depending on the market to integrate it into its calculations (Johansson, 2000). Despite increased difficulty in understanding the precise impact of interdependent services, policies that integrate environmental factors are more likely to ensure sustainable development. Unrepresented factors can be integrated into the system in order to appropriate resources in ways that will maximize society's well-being thus resolving market failure. Societally optimal conditions can be created with public policies (e.g., creating a Pigouvian tax for activities that impose a negative effect, or a subsidy for activities reducing negative effects), the establishment of clear property rights to facilitate private negotiations between those imparting and

those affected<sup>4</sup>, or creating new markets to trade these “internalized” costs or benefits, such as carbon exchanges.

### **Economic Valuation of River Basins**

In 1990, the landmark U.S. Environmental Protection Agency’s (EPA) report *Reducing Risk: Setting Priorities and Strategies for Environmental Protection* prepared by the Science Advisory Board recommended that the EPA develop economic valuation methods for natural resources and methods to incorporate environmental affects into its analysis (EPA, 1990). Although efforts were previously made to account for nature in U.S. environmental policy, they were principally regulatory and didn’t establish a way for the market to incorporate robust values. The report’s recommendation was followed by an “Ecosystem Valuation Forum” whose purpose was to identify the key research questions to be addressed in underdeveloped research areas including non-market valuation and interdisciplinary ecology. One recommendation of the Forum was to improve the identification of ecosystem services in order to value more than the tangible, on-site resource commodities such as timber and petroleum that were the focus at that time (Bockstael, Boynton, Costanza, Strand, & Bell, 1995).

Non-market valuation is a framework that helps translate the multifaceted goods and services that natural systems like rivers provide into monetary form, i.e. a format that can be easily compared with the other components of the economic system, rather than dismissing them as external to the system. Non-market valuation relies on ecological and economic modeling to integrate key aspects of both disciplines into

---

<sup>4</sup> The Coase Theorem demonstrates that agreements made under strict conditions of clear property rights, perfect information, and the absence of transaction costs, such as monitoring costs, will be economically efficient without government intervention. See Coase (1960).

robust studies. Interdisciplinary collaborations, as well as discipline-specific studies with alternative approaches, have greatly progressed from where they were in the 1990s, however there are still issues regarding verbiage and methodology to be addressed more than 20 years later. This study will contribute to the economic category of ecosystem services valuation by analyzing the study area using a standard method (i.e. the travel cost method) that is underused when considering the broad literature. In order to clarify how this contributes to the field, it is necessary to specify nomenclature.

The range of meaning that shared words carry is one of the sticking points in the academic jargon, causing confusion between ecologists and economists. Farber et al. (2002) provides a clear introduction to the vocabulary that economists employ, differentiating between the terms 'value system', 'value', and 'valuation'. 'Value systems' refer to a constellation of normative and moral principles that inform individual's judgments and actions. Societies function based on various 'value systems', which is one reason why the public-policy process apropos the natural environment varies so greatly; regulations and modifications that might be most functional for one region could fail in another (Linnerooth-Bayer & Davy, 1994). The term 'value' is used to mean the regard that an action or object is held to deserve to a particular individual. Values are derived from each user's unique value system, as it determines the relative importance of that action or object to others. Value is measured by economists by observing fluctuations in prices and behaviors shown through the market.

Lastly, the term 'valuation' is the process of assigning a value to a particular good or service. Because ecosystems provide a multi-faceted, unique, and significant set of benefits, their value is often poorly 'captured' in markets. In this project, valuation

attaches price tags to a variety of recreation activities in the Saint Johns River Basin, which represents one part of its total economic value. Economic valuation of recreation and eco-tourism has not been conducted for the entire SJRB and the results of this study fill in an otherwise unknown figure.

There are many valuation techniques that are appropriate to measure the worth of an ecosystem service which is considered a non-market good. Revealed preference methods and stated preference methods are used to demonstrate the value that people would place on a non-market good through their past actions and a series of carefully worded questions, respectively. The revealed preference category of methods uses actual choices that people make to draw statistical inferences about how they value environmental amenities. Four commonly used revealed preference methods are the travel cost, hedonic, defensive behavior, and damage costs methods. The travel cost models (TCMs) are typically used to value recreation activities and to gauge the fluctuation of a site's value associated with changes in environmental quality by examining the change in a site's demand function. The TCM is the model used in this study, but the quality of the site is used as a stable preference measure rather than a variable one. Stated preference methods include contingent valuation, attribute-based, and paired comparison which use different mixes of monetary value and preference ranking to estimate a gross value. These non-market valuation surveys have been in development since Robert Davis' 1963 work using contingent valuation to value outdoor recreation opportunities.

Stated preference models are generally less preferred by economists because of the unreliability of respondents' answers to survey questions. However, when well

designed, these models can provide a wealth of information about different levels of scenarios or phenomena that have not yet taken place. In contrast, revealed preference methods are dependent on the accuracy of the respondent's recollection in order to make its estimates. There is not as large of a validity issue when the questions are asked considering an appropriate recall period. Starting with the work of Cameron (1992) and Morikawa (1989), the literature started to move towards a combination of revealed preference and stated preference methods of valuation in order to gain a more complete preference estimate by either combining complementary data or by 'stacking' data to estimate a single model. The hybrid model is useful when trying to gain insight for an impact study, but is more expensive and time consuming and is not appropriate for this baseline valuation study.

### **Valuation of Services Provided by the Saint Johns River Basin**

SJR basin includes a variety of ecosystems including wetlands, springs, lakes, tributaries, and the main stem of the river, which is influenced by tidal waters. The diversity of ecosystems lends to a wide range of ecosystem services to northeastern Florida, the values of which are not captured through existing market transactions. One of the ecosystem services offered is outdoor recreation; activities such as boating, fishing, and wildlife watching (SJRWMD, 2005). Although there is a plethora of literature about macro-scale valuation and its methodological approaches, it is imperative that case studies are conducted in order to provide specific information to local policy makers. To design policies aimed at balancing water resource conservation and economic growth, there is a critical need to understand the flow of services provided by the SJR and quantify the associated economic values.

A workshop was held on April 8, 2014 at the University of North Florida in Jacksonville, Florida in order to diagnose the problems of the SJR and to plan out a research scheme that would efficiently address those problems. A list of issues considered most important to Florida's citizens was enumerated by an interdisciplinary group of economists, ecologists, and public and private stakeholders from around the state. This study is one of the results of this workshop and was one of the studies related to the ecosystem services provided by the SJR and its associated environs which was prioritized because of blatant water quality issues and shortages. The objectives of this study based on two of the formerly defined priority topics are to:

- Priority #6 – determine the economic value of recreation along the freshwater portion of the SJR
- Priority #7 – estimate the current and potential level and value of ecotourism in the SJR

The proposed method to address these priorities was the TCM, which uses the travel costs and number of trips taken as revealed preference data. With this information it is possible to calculate an expected number of trips for an average household in the sample and to use the travel cost for that number of trips to calculate the total consumer surplus of the sample. This method is commonly used to value recreation activities and will highlight important variables that can be used to estimate the potential expansion of ecotourism in the region.

This thesis is divided into five chapters. Ecological and economic concepts of ecosystem services and the practice of non-market valuation were presented in the Introduction to emphasize the necessity of this project. The following chapter orients the reader to the issues particular to the Saint Johns River Basin, as well as the recreation opportunities that pertain to the wide variety of ecosystems found in this area. Chapter 3

constructs the economic concepts fundamental to the theoretical framework of non-market valuation, then explains and validates the TCM selected to address the research objectives. Following are details about how the TCM will be used for the SJRB, and a presentation of hypotheses. Empirical data are applied to this model in Chapter 4. The methods for data collection, description of summary statistics, and computation of economic value are presented. The results are discussed in the concluding chapter as well as implications for the SJRB and its future.

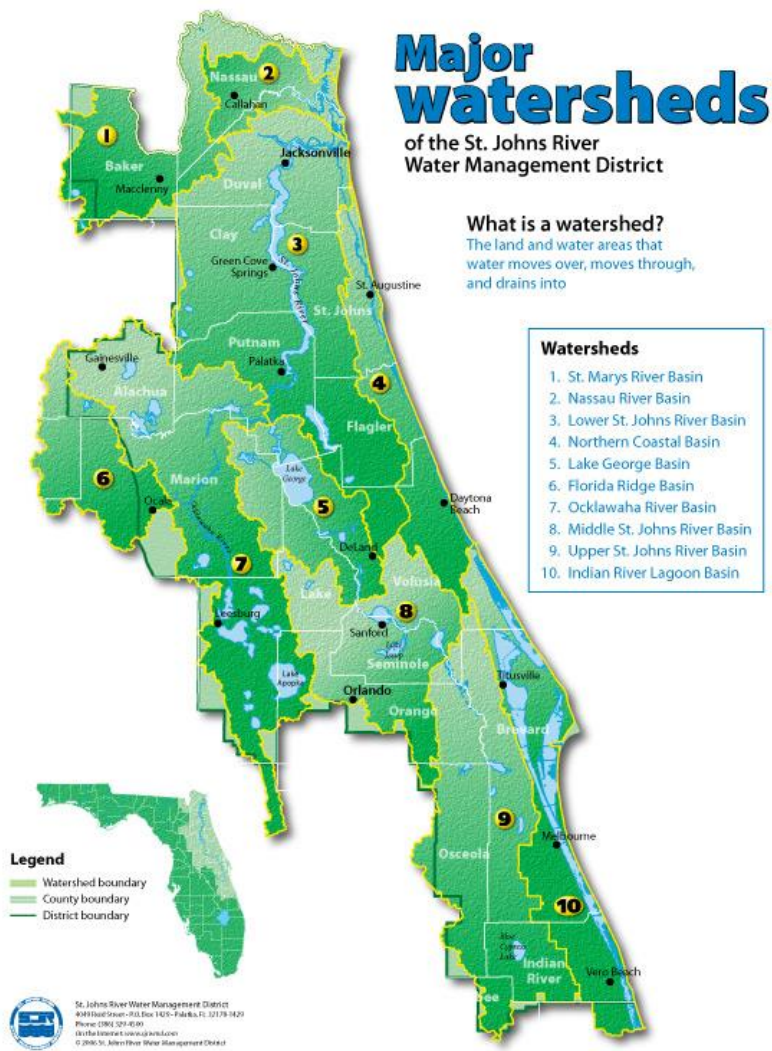


Figure 1-1. Map of SJRWMD with Watershed Delineations

Source: SJRWMD

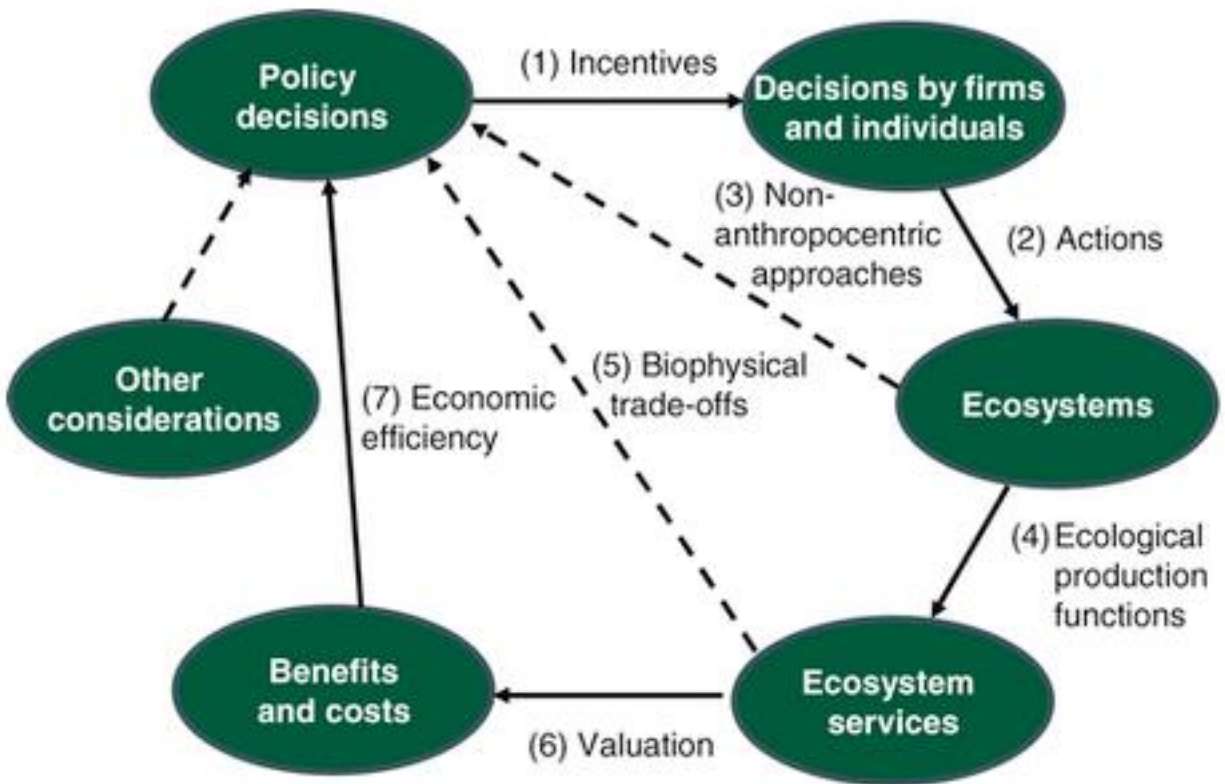


Figure 1-2. Ecosystem Services Diagram

Adapted from Barbier et al. (2011)

## CHAPTER 2 LIKE PEARLS ON A NECKLACE

### **St. Johns River Basin History, Current Issues, and Significance**

Areas surrounding the river are testament to the over 6,000 years of indigenous culture. Predating the inundation of the river basin by Europeans, over a dozen indigenous tribes inhabited the area. These Timucua speaking peoples celebrated rich cultures with plazas, nature-based worship practices, myth, and pyramidal temple mounds that still exist today (Belleville, 2000). Timucuan Ecological and Historic Preserve in Jacksonville, Florida, a site used in this study, is a namesake to the legacy of these peoples. Only recently has this history been revived, as multiple transfers of the territory between colonialists, disease, and cruel, forced migrations forced indigenous peoples off of their land and replaced their history with European tales of dominance.

Many attempts to ‘reclaim’ the wetlands starting in the 1880s through the First World War are testament to the settlers’ opinion of the sprawling marshes in the upper basin. For example Lake Hell n’ Blazes, where the natural flow of the SJR is first noticeable, was named so because it was ‘hell n’ blazes’ to navigate through the area seemingly composed of ‘floating islands’ (Belleville, 2000; McCarthy, 2008). Attempts were made to remedy this issue by draining with the prospect of multiple development projects, which were flooded multiple times until more reliable structures were constructed, but only agricultural producers remained. The disappearance of natives combined with racial violence, demolished development projects, and crop failure stunted Florida’s growth – until the mid-20<sup>th</sup> century, it was the least populous state in the South (U.S. Census Bureau, 1950). Throughout the territory wars and resource

extraction, the river acted as a significant highway transporting goods and people to strategic, inland areas.

In the latter half of the 19<sup>th</sup> century, the Saint Johns served as tourists' gateway to the inland areas of Florida and was made famous to Westerners attributable to the naturalist writings of William Bartram's *Nature*. Steamships, which primarily served as cargo vessels to homesteaders, began to accommodate visitors from the north who wanted to experience the exotic waterways of the state mythically endowed with a perfect climate, touted to cure disease and guarantee thrills from dragon-like alligators (Clyde Steamship Co., 1890). For nearly a century, the SRJ remained a tourist attraction and brought people to fish camps, springs, luxury hotels all the way from Lake Poinsett to the outflow in Mayport (Belleville, 2000).

As rail and roadways started to dissect the state, the St. Johns River lost its preeminence as a main commercial and tourist channel. However, it continues to function as the region's principle commercial port. In fiscal year 2013, the Jacksonville port in the Lower River Basin served as the largest vehicle-exporting port in the United States, and handled over 8 million tons of goods (Jacksonville Port Authority, 2013). Expansions of the burgeoning highway and trade system that were constructed along the SJRs banks disenfranchised the surrounding communities. A movement in the late 1960s focused on the river's revitalization and gentrification projects started popping up along its banks.

### **Institutional Governance**

The diverse 8,840 square miles that makes up the Saint Johns River Basin is governed by many tiers of institutions. The state, regional, county, and municipal levels of institutions are charged with regulating commercial use, upkeep, water quality, and

water quantity. Florida's state legislature designated five water management districts in 1972 to regulate water resources (Florida Statutes, 2014). Saint Johns River Water Management District (SJRWMD) includes all or part of 18 counties covering about 21% of the state's total area.

At the state level the Department of Environmental Protection (DEP) oversees the various institutions dealing with land conservation and water quality, and continually publishes reports about the state of the environment. The Division of Recreation and Parks (DRP) prepares the Statewide Comprehensive Outdoor Recreation Plan (SCORP) every 9 years as a resource for state policy makers to allocate funds for parks and recreation activities.

### **From South to North**

Inhabitants and visitors alike have recreated on the SJR since the days of the Timucua and it continues to be a hotspot for many outdoor activities such as fishing, kayaking, and wildlife viewing. Figure 2-1 provides an overview of the principle recreation activities at some of the most popular sites in the basin as determined by their respective management body sectioned by watersheds – upper, central, and lower – of the SJR, which will be described in the context of the regions' respective geography in the following section. Recreation opportunities are available throughout the entire basin, but certain areas are more suited for certain activities over others because of their geographic characteristics.

Recreational activities in the SJRWMD have been developed according to the landscape of the three different geographical sections of the river. Due to the multi-level institutional governance of public lands, a consistent public land development strategy is difficult to identify. However personal communication with Regional Recreational Lands

Manager for the SJRWMD, Nels Parsons, revealed that parks managed by the district are designed around the annual budget and the organizational identity as a resource management entity is at the forefront of their decisions (personal communication, July 10, 2014). There are dispersed recreation opportunities along the river, most of them passive use as there is only 1 ranger per 17,000 acres.

Outdoor recreation can be divided into two different categories: resource-based and user-oriented recreation. The first uses the natural features of the land as a setting for recreation, whereas user-oriented settings are typically constructed in an activity specific way. Trails and lakefronts are examples of the former and tennis courts or baseball diamonds are included in the latter. Resource-based recreation differs from user-oriented recreation in that the provision of the former is limited to the availability of cultural and natural resources. As population grows, greater demand is placed on resource-based recreation because suitable natural spaces and resources are converted to development or other land uses.

Springs, lakes, and rivers supply many towns and cities, including Jacksonville and Orlando, with water resources. The population in the region is projected to grow 38% from 4.7 million in 2010 to 6.5 million in 2035 and water needs are expected to reach 314 million gallons per day (SJRWMD, 2013). These issues are relevant due to the changing demands of the area from population growth, land use change, agriculture and industry. Water is integral to all of these aspects of development and can be used most efficiently when governing bodies are informed about its value.

A decade after the SJR was recognized as an American Heritage River for its multifaceted significance to the state, it was also deemed one of America's Most

Endangered Rivers by American River, the nation's largest river advocacy organization (American Rivers, 2008). This 2008 report claims that population growth, climate change, poor regulation, institutional crossover, and other factors affecting the SJR are contributing to its degradation and handicapping its ability to serve the ecosystems and communities depending on it.

Despite the problems facing the SJRB, many resource-based outdoor recreation opportunities are available at the active and passive parks that surround the river. In the upper basin marshes air boating and hunting are main activities. Downstream, where clearly delineated bodies of water begin to take form, kayaking, swimming, hiking, and wildlife viewing are all possible recreation activities with suited sites like Blue Springs State Park where over 525,000 tourists came in 2013 to witness gentle giants moseying about the waters (Department of Environmental Protection, 2013). All of the outdoor recreation activities that are found in Figure 2-2 can be enjoyed in this basin and it is proximate to diverse population centers, which attracts a greater variety of recreationists.

### **Upper Basin**

From the turn of the century until the 1970s, more than 300,000 acres, about 70%, of the southern marshes of the SJRB were drained through a series of dykes and levees for urban and agricultural development (McCarthy, 2008). This resulted in low flowing, oxygen depleted water which led to major fish kills and extreme swings between wet and dry season. The wetlands that previously acted as a natural buffer against storms common to Florida were not there to protect the area from strong floods in the 1920s and 1940s and the fishing industry was drastically altered (McCarthy, 2008).

In 1988, the SJRWMD was given permission from the Department of Environmental Protection (DEP) to issue permits and regulate areas affected by the drainage projects. Since this time, dykes are being removed, reservoirs have been built to contain runoff from agricultural operations, water quality is closely monitored, and the natural flow is being restored. As a part of the Upper St. Johns River Basin Project, more than 150,000 acres of marsh are being restored in effort to repair the damage done by development, agriculture and other diversions of water that have altered the headwater's floodplain and impacted the river downstream (SJRWMD, 2014).

The marshy headwaters provide hundreds of acres of space for air boating, seasonal hunting, fishing and kayaking. Multiple water fingers extend throughout the region and the possibility of getting lost detracts from high volume use (McCarthy, 2008; SJRWMD, 2005).

### **Middle Basin**

Bordered by the Orlando urban area and agricultural productive land, major water withdrawals and saturation of nitrates and organic material are polluting the aquatic areas. Pine plantation and forest regeneration land uses occupy about 15% of the basin. A multitude of springs are present in this section of the basin and have an economic impact of their own as a unique tourist destination, however many are spoiled by commercial interests and their restoration is underfunded by the state. The state's purchase of Silver Springs in 2013 makes both its former poor management and the park's ecotourism value evident.

There is debate about the water levels and flows of the river and how many gallons per day can be withdrawn from this portion of the basin. The Central Florida Water Initiative is an effort by management officials to identify alternative water sources

for the burgeoning population centers around Orlando, but is posing regional tension because many of the suggestions are to withdraw it from the upper basin area.

The middle section of the basin has as many issues as recreation activities. The area has a low volume of commercial traffic, it is navigable, and it has a well-established set of natural attractions.

### **Lower Basin**

Dredging, Jacksonville's water uses, pollution from commerce, and salinity problems plague the banks of the river in the lower basin. Environmental groups in the region are currently challenging the proposal by the Jacksonville Port authority to dredge the river channel from 40 to 47 feet. Advocacy organizations argue that the project cost and environmental impact outweighs the benefit from increased commerce traffic that the port authority claims.

The function of the mouth of the river as a port is somewhat limiting to the types of recreation activities available, but the lands surrounding the river present many opportunities like wildlife viewing, horseback riding, and hiking. North of the river are conserved wetlands that serve as an incubator to diverse, native species.



Figure 2-1. SJRWMD Map

| Activities by Site                               |         |        |                              |          |                      |         |         |                               |        |           |                     |                |      |
|--------------------------------------------------|---------|--------|------------------------------|----------|----------------------|---------|---------|-------------------------------|--------|-----------|---------------------|----------------|------|
|                                                  | Fishing | Picnic | Diving<br>Swimming<br>Tubing | Paddling | Motorized<br>boating | Hunting | Camping | Wildlife<br>Nature<br>viewing | Hiking | Bicycling | Horseback<br>riding | Geo<br>Caching | Tour |
| Lower SJR                                        |         |        |                              |          |                      |         |         |                               |        |           |                     |                |      |
| Timucuan<br>Ecologic and<br>Historic<br>Preserve |         |        |                              | x        |                      |         |         | x                             |        |           |                     |                | x    |
| Big Talbot<br>Island State<br>Park               | x       | x      |                              | x        | x                    |         |         | x                             |        | x         |                     |                |      |
| Bayard<br>Conservation<br>Area                   | x       |        |                              |          |                      | x       | x       | x                             |        | x         | x                   |                |      |
| Middle SJR                                       |         |        |                              |          |                      |         |         |                               |        |           |                     |                |      |
| Ocala<br>National<br>Forest                      | x       | x      |                              |          | x                    | x       | x       | x                             | x      | x         | x                   |                |      |
| Lake George                                      | x       |        |                              |          | x                    | x       | x       | x                             | x      |           |                     |                |      |
| Lake<br>Ocklawaha<br>(Rodman<br>Reservoir)       | x       |        |                              |          |                      |         | x       |                               |        |           |                     |                |      |
| Silver<br>Springs &<br>Silver River              | x       | x      | x                            | x        |                      |         | x       | x                             | x      | x         | x                   | x              | x    |
| Blue Springs                                     | x       | x      | x                            | x        |                      |         | x       | x                             | x      |           |                     |                | x    |
| Upper SJR                                        |         |        |                              |          |                      |         |         |                               |        |           |                     |                |      |
| Lake Monroe                                      | x       |        |                              | x        | x                    | x       | x       | x                             | x      | x         | x                   |                |      |
| Lake Harney                                      | x       | x      |                              |          |                      |         |         | x                             |        | x         | x                   |                |      |
| Blue<br>Cypress<br>Conservation<br>Area          | x       |        |                              | x        | x                    | x       | x       | x                             | x      | x         |                     |                |      |

Figure 2-2. Recreation Sites and Opportunities as Defined by the Relevant Managing Institution<sup>1</sup>

<sup>1</sup> U.S. Forest Service, Florida State Parks, SJRWMD, and Volusia County Parks

## CHAPTER 3 THEORY

### Individual Choice

Quality environmental policy decisions are made not only through discovery of which resource flows are unaccounted-for, but also through measurement of how much they are worth to society. The former problem has already been addressed by identifying the unaccounted-for resource flow as nature-based recreation in the SJRB. This section focuses on the measurement by describing the theoretical concepts of micro-level, individual preferences, subject to the limits imposed by income and market prices, and how they are integral to the formation of the values expressed in market demand functions (Dewey & Selikoff, 2010).

Consumers may choose among a variety of goods available in many combinations in the modern marketplace. Individuals decide between the goods and bundles of goods based on how much wellness they can expect to derive from them. Utility is the economist's metric for this 'wellness' and is expressed using indifference curves that depict an individual's ordinal list of preferences, as depicted in Figure 3-1. Utility is assumed to be a continuous function that is twice differentiable, increasing, and quasi-concave in all of its arguments. These assumptions give rise to the property of *non-satiation*, which dictates that consumers want to get the most utility considering their budget constraint, and so they will consume according to the tradeoffs available at the highest ranked indifference curve.

An adventurous example of consumer behavior and utility is illustrated imagining the surroundings of two natural areas: Niagara Falls and Grand Canyon National Park. First stop: a rush of excitement and the concept of decreasing marginal utility. Despite a

constant stream of water gushing over the peaks at the end of the Niagara River – there is a limit to the amount of satisfaction that can be gleaned from googling at white water. The excitement that builds while approaching the sound of pounding majesty and the first glimpse is divine. The second hour, the surrounding tourists start to nag. The third, the cold, wet weather sinks in and the amazement is still there, but it is not as intense as it was at the first moment. The decline in desire for experiencing the natural area as time passes, is referred to as diminishing marginal utility (Figure 3-2) (Farber et al., 2002).

Niagara Falls is not the only natural area worth visiting, though. Other destinations act as substitutes and are considered by consumers according to their quality and their income. An alternate to the falls could be the Grand Canyon, for example. According to the aforementioned property of non-satiation it is assumed that the consumer will spend her entire budget on this combination of falls and canyon. In addition, the goods will have a certain amount of *substitutability*; she will be indifferent to a bundle that takes away a certain amount of falls, as long as she is compensated with an appropriate amount of canyon. This is known as the marginal rate of substitution (MRS) and informs the construction of each individual's indifference curves (Figure 3-2). Each person has a unique set of preferences with regard to the substitutability of the goods in the bundle

$$u = f(w, c) \tag{3-1}$$

where  $w$  is the force of the water,  $c$  is the majesty of the canyon.

The amount of utility that can be reached is subject to constraints, like income, prices, or time. In order to choose the best-suited combination for their tastes,

individuals have to divide their income,  $M$ , in such a way that they strike a balance between all of the attributes within the bundle (Freeman, 2003). Specifically:

$$\max u = u(x_1, x_2, \dots, x_n) \text{ subject to } \sum_i p_i x_i = M \quad (3-2)$$

where  $x_n$  is the quantity of goods consumed and  $M$  is the fixed money income used to purchase the set of goods according to prices ( $p_i$ ) (Freeman, 2003).

Using the budget constraint and the MRS, Equation 3-2 is solved to reveal the marginal utility, the amount of wellbeing per additional unit consumed, provided by each good in the function – considering prices and income. The value of these goods informs the individual's choices can be applied to measure the ordinary or Marshallian demand for falls or canyons, among other things like the environment, durable goods, altruistic causes, and entertainment. Marginal utility and the ranking thereof (Figure 3-2) is therefore used to relate the somewhat arbitrary “goodness” that comes from consuming to the overall market demand using prices.

In the purchasing process, a consumer first considers the amount of value she places on the good and translates it into a reservation price. This internal measure is known as the willingness to pay (WTP), when aggregated it forms the individual demand curve. If the market price is above what the individual had in mind, she is not willing to buy the good. However, if her WTP is below the prevailing market price, not only is she willing to buy the good, she has some extra amount of satisfaction called consumer surplus (CS). The CS is the difference between the most a customer would pay for a good and the market price actually paid for the good – this is graphically expressed in Figure 3-3. The CS is considered the ‘value’ of the resource in this study.

## **The Spectrum of Goods: from Grey to Green**

Goods differ based on their characterization of rivalry and exclusivity. A rival good is one that is used up when consumed and an exclusive good is one that can be kept away from others. For example, a plane ticket is both rival and exclusive; it is not valid after you've taken a flight and it is illegal to falsify one's identity to take a vacation (Ostrom, 1990). The straightforwardness of private goods facilitates their management: individuals can choose efficient tradeoffs and prices are accurate based on market activity. However, all goods are not this way, and "market forces can be relied on neither to guide them to their most highly valued uses, nor to reveal prices that reflect their true social values." (Freeman, 2003). Thus, it is beneficial to consider the type of good when estimating its economic value.

Different markets, institutions, property regimes, and governance approaches are relevant according to the qualities of a good, all of which exist on a spectrum. As seen in Figure 3-4 there are four main categories of goods that vary based on the amount of rivalry and exclusivity it has. Club goods are also referred to as 'artificially scarce goods' because they are made to be excludable. An example is an open water swimming club; the natural space where they recreate is open to the public, but the services that the club provides like technique workshops and comradery is exclusive to members only. Conversely, common pool resources, like fish, are rivalrous because there is only a certain number of them, once one is caught, it can't be caught again, and they are non-excludable, a person is not prevented from fishing in common waters. Many aspects of nature are now considered common pool resources because it has become clear that they are exhaustible, and there is issue in limiting the use of natural resources. In order to regulate this depletion, governments and other institutional structures often times

issue exclusive rights to stakeholder groups who are then responsible for its management. The last type of good is a public good that is non-rival and non-excludable. One individual breathing doesn't limit another from doing the same, nor can anyone be limited in their use of that air. Other aspects of the environment, like public lands and bird-watching fit into this category because although they might be enjoyed the resource is not limited or destroyed.

When determining the WTP of goods and services provided by the environment, it is possible to apply the same neoclassical principles used for private goods. Some goods are so vital that they must be treated according to other standards. For example, in the tradeoff between an automobile factory and quality of air to breathe, there is no justification for allowing the latter to approach zero because of its obvious importance to life (Johansson, 2000). Recreation can be treated as a good marketable by the economic system because there are benefits that come from participating. An explicit price is not typically placed on recreation, but the WTP can be derived by using proxies such as individual demand.

### **Total Economic Value**

Not only do the natural environments provide critical service flows and amenities to the populous, they also work in synergy to support themselves in a self-containing system (Barbier et al., 2011). Nature as a common pool good has intrinsic value in its beauty, balance, and diversity, however it is the quantifiable values in which this study is interested.

A good's intrinsic value, or passive-use value, is not derived from its function or use, rather it is the "worth" of the good itself. For instance, many conservationist arguments are based the moral premise that natural areas have a fundamental intrinsic

worth and therefore tracts of land should be protected. The intrinsic valuation approach poses a problem because the “values are based on human preferences rather than the absolute merit of nature” (Mirovitskaya & Ascher, p. 181, 2001). Because the intrinsic value of nature makes a different theoretical argument than non-market valuation, it is not taken into account in this study.

Aside from the intrinsic value, worth is categorized on an environmental valuation spectrum. Figure 3-5 depicts the value scheme for each component of nature, it is clear that the market value is not fully inclusive of natural goods’ value to consumers. The existence value of nature and its instrumental value are two resource paradigms at opposite ends of this spectrum. Bequest value and altruistic value are examples of non-use values. In contrast, instrumental value is demonstrated through trade, modification, or use of a good for an alternative purpose (Parsons, 2003). The use value is further divided into consumptive use as is reflected in private markets, and non-consumptive use (e.g., direct uses like recreation and aesthetics or indirect use such as flood control and pollution filtration). Recreational activities involve direct physical interaction with nature and are thus considered non-consumptive, direct use values. Understanding that nature has different value when considered through different lenses allows for a more comprehensive management strategy. Recall that this study is only attempting to capture one portion of the TEV of the SJRB. It has value beyond what is estimated in this study.

### **Non-market Valuation**

As mentioned in the introduction, the most significant difficulty in valuation of ecosystem services is that very few are marketed. In the application, unique assumptions about non-market goods are made:

- value is based on benefits gleaned from using the good
- non-market goods often do not have a defined price, but users can still benefit from them
- their resource flows are predictable

Clawson and Knetsch (1966) used ZTCM to construct a demand curve for the resource itself, unaffected by the benefits arising from other recreational experiences which visitors enjoyed at that site. In this study, the non-consumptive, direct use value of the St. Johns riparian zone is based upon economic theory whose original purpose was to estimate instrumental, market value. Judging *how* to incorporate the value estimates into public policy or regulatory decision making is beyond the scope of this project. “In selecting estimates of the ‘value’ of this ‘intermediate’ ecosystem service in producing recreational benefits, it is ... important to consider only those valuation estimates that assess the effects of changes in the [aquatic] habitat on the tourism and recreation benefits, but not the additional influence of any human inputs.” (Barbier et al., 2011, p. 171). This valuation of the SJRB provides important information to environmental managers and policy makers, to firms, and to civil society.

### **The Travel Cost Model**

Consumer choice theory was applied by early writers to determine how resources should best be allocated in natural settings with recreational value. In practice, this principal of neoclassical economics is used to relate individual’s spending preferences to the obscure value of environmental goods.

This study adopts the Travel Cost Method (TCM) in order to highlight the area’s value of outdoor recreation and ecotourism by estimating a price that can be considered in the market system and used in policy decisions. TCM models have been in development for over sixty years, since Harold Hotelling proposed the concept in his

1947 paper on the economics of public recreation. Economic value is estimated by observing the demand for travel to a recreation site. The price paid for a trip is measured through a proxy of distance and time that a household spends on getting to a site. Consumer surplus is calculated through aggregating individual demand functions to a particular destination in order to create a site demand function. This way, a simple tool is assembled for decision makers to use when considering different options regarding the site.

The two most popular estimation methods are the zonal travel cost method (ZTCM) and the individual TCM. The former is the simplest and least expensive approach because it combines the travel cost for the population of entire zones for its estimates. Aggregating the data into zones disregards useful demand shifters such as income and education from the model and increases the likelihood of multicollinearity. The individual TCM allows for a more accurate estimation because the demand curves are more specific, and the estimation issue of multicollinearity is reduced (Ward & Loomis, 1986).

With TCM analysis, a wide array of unpriced goods and services such as drinking clean water, hiking through natural landscapes and benefits from gaining additional information are perceived in a market context. This can assist environmental engineers to put a dollar value on improvements in water quality, park services to justify the value of improvements to infrastructure, and policy makers to gauge community opinion of a potentially harmful development site. It's also a way to incorporate typically unaccounted for utility into economists' models of environmental topics. The wide use of this model to estimate values for the recreational use of natural resources, along with

the constraint of a short project timeline and seasonal conditions of river visitation are all justifying factors for using the TCM instead of other available methods.

### TCM Description

Assuming just two sites, the model of demand for recreational trips becomes:

$$x_1 = f(p_1, p_2, q_1, y, \epsilon) \quad (3-3)$$

where  $x_1$  is the number of trips to study site 1 in the past 12 months,  $p_1$  is the travel cost to the site 1,  $p_2$  is the travel cost to a substitute site,  $q_1$  is quality at the site in the study region they last visited,  $y$  represents a set of household variables that influence the frequency of visiting the site 1 (i.e., household income, whether or not they're in a recreation organization, age, gender, education, household size), and  $\epsilon$  is the random error term that represents recreation decisions assumed to be independent and identically distributed.

In order to employ the TCM, estimates of the travel cost ( $p_1, p_2$ ) are needed. The travel cost  $p_i$  represents for one unique household to get to a specific site. Knowing the previous site visited, an estimate of the costs that would have been incurred to travel to each alternative site (i.e., the implicit own and cross price variables, respectively) can be calculated. Since travel costs are the primary interest, two measures must be included: the monetary cost of travel and the opportunity cost of travel time. Both measures are calculated using the distance travelled from the mid-point of household  $i$ 's home ZIP code to the latitude and longitude of the site  $j$ :

$$p_{ij} = cd_{ij} + \gamma w_i \left( \frac{d_{ij}}{\text{mph}} \right) \quad (3-4)$$

where  $c$  is the cost per mile,  $d_{ij}$  is the round trip distance,  $mph$  is speed measured in miles per hour;  $i = 1, \dots, N$  respondent households;  $0 < \gamma < 1$  is a fraction of the household's hourly wage rate  $w_i$ .

Income is most typically solicited by asking the household annual income rather than the wage rate. Using this figure it is possible to calculate the implicit wage rate by dividing the respondent's household income by the number of working days per year. Given the estimated  $\gamma$  in the literature (i.e. Parsons, 2003), it is assumed that  $\gamma = 1/3$  and that a cost of \$0.56 per mile is incurred, based on the 2014 IRS standard mileage rate (Bilgic & Florkowski, 2007; Internal Revenue Service, 2014). The speed limit on Florida state highways is 60 miles per hour, however this average speed fails to consider the changes in speed limits that towns along the state highway impose and therefore an average speed of 50 miles per hour is used in the calculations (Florida Department of Transportation, 2014).

Since households in Florida can choose from a large number of substitute sites for freshwater-based recreation, it is necessary that the STC be included in the model. If the substitute cost was left out of the calculation missing variable bias would exist and the model could potentially be overestimated (Freeman, 2003). It is assumed that visitors will substitute the least expensive alternative – the site that is the closest – to the one they actually visited. In the case that the household visited the closest site, it is assumed that they will visit the second closest site as their substitute. This will be calculated by selecting the nearest – or second nearest – site along the SJR area to the zip code in which the household resides.

## TCM Estimation

The expected number of trips is a non-negative integer, therefore a typical travel cost model is estimated using a count data probability function – the Poisson distribution is the basic model that has a discrete probability distribution and is useful for non-negative integers. The probability of observing a household  $i$  taking  $x_{i1}$  trips to site  $j$  in the last 12 months is given in (3-5):

$$pr(x_{i1}) = \frac{\exp(-\lambda) \cdot \lambda^{x_{i1}}}{x_{i1}!} \quad (3-5)$$

where  $x_{i1} = 0, 1, 2, 3, \dots$

The parameter  $\lambda$  ( $> 0$ ) is the expected number of trips that household undertakes and indicates the latent demand. To ensure nonnegative probabilities,  $\lambda$  usually takes a long-linear form, and the number of trips household takes to site 1 can be calculated as:

$$\ln(\lambda_{i1}) = \beta_0 + \beta_1 p_1 + \beta_2 p_2 + \beta_3 q_1 + \beta_4 y_i \quad (3-6)$$

Following (3-6), the estimated number of trips per household to site 1 in a given year can be obtained by:

$$\hat{\lambda}_{i1} = \exp(\hat{\beta}_0 + \hat{\beta}_1 p_1 + \hat{\beta}_2 p_2 + \hat{\beta}_3 q_1 + \hat{\beta}_4 y_i) \quad (3-7)$$

The well-known Poisson model described in (3-5) has the following drawbacks. First, the conditional mean of each dependent count variable is equal to conditional variance. The property of equidispersion is often found violated in empirical data because the variance exceeds the mean. This phenomena, known as over-dispersion, reduces the usefulness of this distribution (Freeman, 2003). The addition of a gamma

parameter in the negative binomial (NegBin) distribution eliminates this constraint and the more generalized model fits overdispersed data better. The NegBin's probability distribution is expressed as:

$$f(Z = z) = \frac{\Gamma(z + 1/\alpha)}{\Gamma(z + 1)\Gamma(1/\alpha)} (\alpha\lambda_i)^z (1 + \alpha\lambda)^{-(z+1/\alpha)} \quad (3-8)$$

where  $\Gamma(\cdot)$  is the gamma function, representing a discrete probability density function defined for  $z$ . The first two moments of the NegBin are:

$$E(Y|X) = \lambda = \exp(X\beta), \quad (3-9)$$

$$\text{Var}(Y|X) = \lambda(1 + \alpha\lambda), \text{ where } E(Y|X) < \text{Var}(Y|X) \quad (3-10)$$

When  $\alpha = 0$  the distribution reverts back to a standard Poisson model and the Vuong test can also be conducted to test for overdispersion in the data.

The probability mass function of the NegBin distribution is:

$$f(k; r, p) \equiv \Pr(X = k) = \binom{k+r-1}{k} p^k (1-p)^r \text{ for } k = 0, 1, 2, \dots \quad (3-11)$$

where  $k$  is the number of successes and  $r$  is the number of failures.

Another drawback to the simple Poisson distribution is that data on recreation activities often include a relatively higher frequency of zero observations in off-site surveys for the general population. In the presence of over-dispersion and excess zeros, zero-inflated Poisson (ZIP) and zero-inflated NegBin models (Anderson, 2010; Haab & McConnell, 1996; Haab & McConnell, 2002) or hurdle model (Bilgic & Florkowski, 2007) have been used to estimate the TCM using data from off-site surveys.

The extension from the Poisson model to a ZIP model follows the idea that two different processes can generate zero trip observations. The basic Poisson model is capable of explaining zero trip observations, but in the case that there is an over-

abundance of zeros, the process should be separated because the excess zeros may need to be explained by their own function rather than the basic Poisson function. For example, some people may not be able to enjoy the recreation benefits of the natural resources due to poor health. Those are nonparticipants and the decision to participate can be determined by factors other than travel cost and site quality that are included in the basic Poisson model. Alternatively, zero trip observation is generated from the Poisson process. The zero trip observation reflects the corner solution, which indicates that the current “market” price is higher than the choke price below which the individual would demand a positive number of trips. In the case of the ZIP model, the participation decision and the frequency decision is given (Haab and McConnell, 1996; Anderson, 2010):

$$pr(x_{i1}) = F(\beta_1' z_1) + (1 - F(\beta_1' z_1)) \frac{\exp(-\lambda_i) \lambda_i^{x_{i1}}}{x_{i1}!} \quad (3-12)$$

where  $x_{i1} = 0, 1, 2, 3, \dots$ ,  $z_1 = (p_1, p_2, q_1, y_1)$ , and  $F(\cdot)$  represents the probability that  $x_{i1} = 0$ , and  $1 - F(\cdot)$  represents that the probability that  $x_{i1} > 0$  for the Poisson process. The factors influencing the two processes may not be mutually exclusive.

Using the estimated coefficients of either the Poisson or the NegBin model, the consumer surplus (CS) of one trip to the study site 1 can be calculated as follows (Bockstael, Hanemann, & Kling, 1987; Creel & Loomis, 1990):

$$CS / household / trip / year = -\frac{1}{\beta_1} \quad (3-13)$$

To calculate the annual value of CS for a visit to site 1, the expected number of trips (3-7) and the per trip CS (3-10) are multiplied:

$$CS / household / year = - \frac{\widehat{\lambda_{ij}}}{\beta_1} \quad (3-14)$$

The estimate of the total consumer surplus for the study area is the multiplication of Formula 3-14 by the number of households in the sample that visited the SJR area in the last 12 months. The annual CS per household can also be projected to the project sample using the percentage of respondents who did indeed visit the area and then multiplying it by the total survey sample.



Figure 3-1. Diminishing Marginal Utility

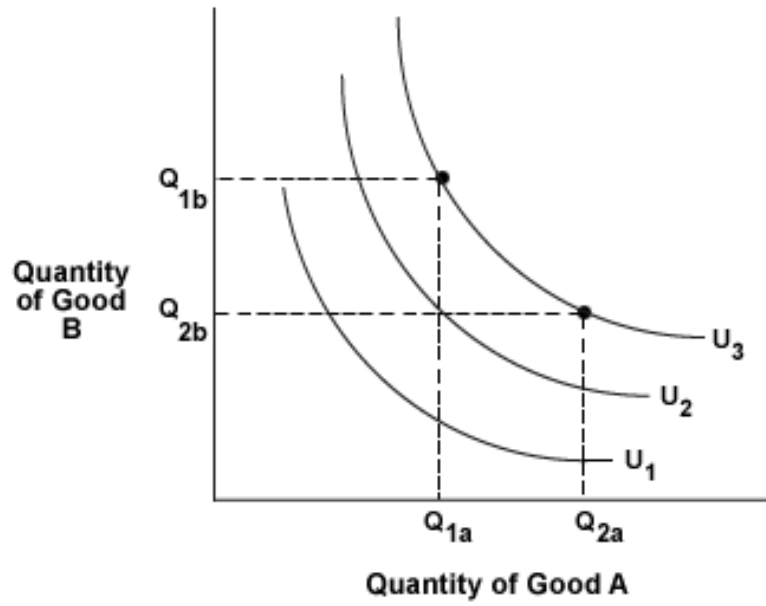


Figure 3-2. Utility Bundles

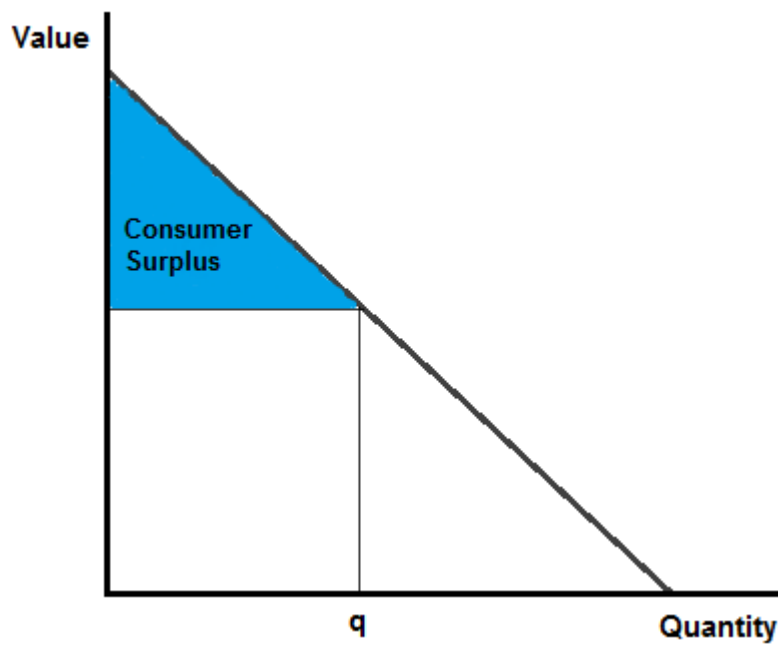


Figure 3-3. Consumer Surplus

|             | Excludable   | Non-Excludable       |
|-------------|--------------|----------------------|
| Rivalry     | Private Good | Common Pool Resource |
| Non-Rivalry | Club Good    | Public Good          |

Figure 3-4. Typology of Goods

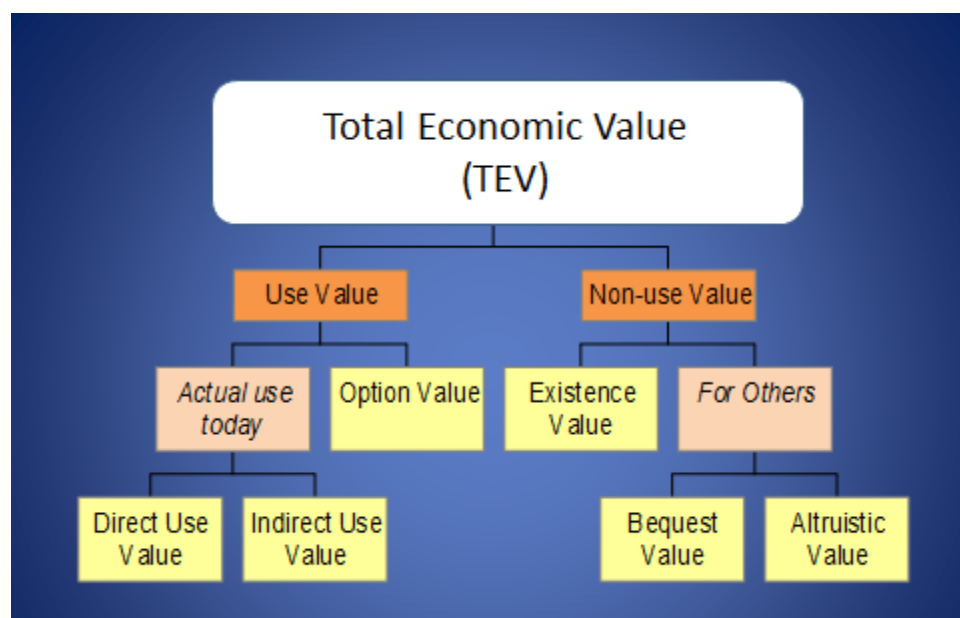


Figure 3-5. Example of classification of Total Economic Value (TEV)

Components for a given natural resource based on Barbier et al., 2011.

## CHAPTER 4 ANALYSIS

### **Survey Design and Methods**

#### **Survey Design**

An online survey was constructed using Qualtrics Software (Qualtrics, 2014, Provo, UT) to gather the data necessary to value the recreational benefits of the SJRB. Low cost, quick distribution, targeted sample, and more efficient post-survey data organizing contributed to the selection of the on-line survey method over the phone, in-person intercept, and mail survey alternatives considered. This form of survey also avoids truncation, a sampling issue that excludes a portion of the population and a common problem in travel cost studies that exclude non-users. In addition to the logistical efficiency of this survey method, it allowed for the creation of an innovative questionnaire that included distinguishable maps, varied answer formatting, skip patterns for different types of users, and incompleteness alerts. Fleming and Bowden (2009) also finds that web-based based surveys are suitable for non-market valuation studies; and according to their study there was no significant differences between the consumer surplus estimates when comparing traditional mail and online surveys.

Not only are web-based surveys convenient for researchers, they are also convenient for respondents. Growth in the use of the Internet for communication facilitates the process for participants to receive and complete the survey when compared to traditional methods (Fleming & Bowden, 2009). The two most common disadvantages to online surveys are sample frame and non-response bias (Fowler, 2014). Sample frame error is introduced when format of the survey causes there to be a non-random exclusion of a particular demographic. Socio-economic and spatial barriers

still exist between those with Internet access and those without – potential respondents who have low-incomes or who live in rural areas could be ill equipped to complete the survey. Similarly, non-response occurs when respondents significantly differ from people within the sample frame who decided not to respond. This can occur due to appeal of the introduction email, differences in personal interests, or technical incapability, and may skew the results if response rates are low.

Multiple efforts to minimize these and other errors were taken. To minimize non-response bias, the invitation email was generally stated, mentioning relevance of the member's experience in freshwater areas of Florida so as to not exclude people who had not been to the SJRB, and worded in a friendly, neutral tone. The wording of the survey was vernacular and questions were decided on based on similar non-market valuation studies with the assistance of experts in water resource, recreation, data analysis, and survey issues. Dr. T. Borisova, Dr. S. Larkin, Dr. X. Bi, and the Florida Survey Research Center assisted with the content, order, and style of the questionnaire. See Appendix A for complete survey.

Eleven sites were identified along the river that were representative of the variety of nature based activities, in order to cue respondents of the landmark recreation sites along the river. They were decided upon based on their geography – a semi-uniform spatial distribution representing the spectrum of geographical features – and their visitation rates – sites with a higher number of visitors were given more consideration. A series of regional guidebooks provided information about the characteristics of the recreation sites, DEP statistics ranked the most visited state parks in the study region, and personal interviews with SJRWMD officials and local business owners informed site

selection when unclear (SJRWMD, 2006; Bellville, 2000; McCarthy, 2008; Department of Environmental Protection, 2013); Nels Parsons, personal communication, July 21, 2014). See Appendix B for contact record.

A series of filtering questions divided potential respondents into three categories: “active user”, “active non-user”, and “inactive non-user”. The first filtering question asked if the household or any member thereof had traveled more than 10 miles to recreate outdoors within the last year, which separated the pool into “active” and “inactive” categories. The next filtering phase sorted those who had traveled to recreate in the SJRB, active users, from those who had traveled elsewhere to recreate, active non-users. Both of these categories were forwarded to later sections of the survey. The active users were asked their number of trips within the last year as well as detailed questions about their last visit to the SJRB. The precise destination, season, length of stay, primary activity, water quality, and impression of ecotourism opportunities at the site were included.

The survey design featured questions that corresponded to the core variables necessary in the TCM. The annual rate of visitation, most recent site visited, home zip code, site-specific water quality perceptions, and income were asked to calculate the most parsimonious function of the travel cost model. In addition to questions contributing to the model, public policy and water perception questions were asked to all respondents in order to contribute to an understanding of the respondents’ opinion of water issues in their home county and in the state. “Active users” and “active non-users” were asked about their plans for future visit in order to gauge future visits and to note any consistency in activity choice. The survey also included questions soliciting

respondents' opinions about the expansion of ecotourism and recreation possibilities in the area. Supplemental variables such as residency classification, organizational affiliations, and demographics are included in the summary statistics, and responses to a selection of key questions were used to estimate the travel cost models.

## **Survey Administration**

### **Sample**

Members of recreation organizations and river advocacy groups, were the targeted sample. It was assumed that recreationists and river advocates would be more likely to visit the SJRB and at a higher frequency, making them appealing informants compared to a general state-wide population that is less likely to recreate in this region. Under these suppositions, it is also probable that recreationists and river advocates will have well-formed visitation preferences, revealed by their past visits. The reliability measures that accompany these conditions lends to a more accurately defined demand function and thus consumer surplus for outdoor recreation to the region.

The sample was built by contacting a broad selection of outdoor recreation organizations and advocacy groups in Florida. In order to have a representative sample of high-users, the organizations were chosen based on the activities that they represent. These activities included fishing, Florida Freshwater Fishing permit holders (FWC); canoeing and kayaking, Putnam County Blueways and Trails, CSO; and advocacy, Florida Defenders of the Environment Board of Trustees and Advisors, St. Johns River Alliance, and the St. Johns Riverkeeper. In order to respect the privacy of the potential respondents and to reassure the organizations that their contact lists would not be used in the future, members were contacted by the outreach coordinator of each organization, who forwarded a message from the researcher. The exception to this

practice was the FWC List which was divided into three groups: Florida resident, out of state visitor, and out of country visitor. A random sample of 9,519 anglers was weighted using the same proportions of people in different residency categories as were evident from the total freshwater fishing license list of over 200,000 license holders. This sample number was decided upon considering the number of emails expected to be invalid and the common low-response rate. The total sample was 15,327; 9,519 from the FWC, 581 from Putnam County Blueways and Trails, CSO, 32 from Florida Defenders of the Environment Board of Trustees and Advisors, 1390 from St. Johns River Alliance, and 3805 from the St. Johns Riverkeeper.

### **Data Collection**

The survey was distributed through two channels. FWC license holders were contacted directly through the Qualtrics survey website, the members of other organizations were contacted by the communication directors who forwarded them the welcome email (Qualtrics, Provo, UT). The non-FWC members were contacted by the outreach director of their respective organizations because it was thought that the participation rate may improve if the email's source was familiar, and because it enhanced the privacy of each organizations' members.

All data were recorded using the same instrument. The survey design and administration process is thought to be generalizable to the population of recreationists and advocates in the state, because there were not any sections of the populous that were excluded and the assortment of measures listed above were taken to ensure a quality sampling technique.

## **General Results**

Six hundred and sixty four out of the 15,295 total sample accepted the conditions of the survey (a gross response rate of 4.34%). Of the respondents who started the survey, 477 (71.8%) responded to the essential questions about their home zip code and were included in the TCM regressions. High non-response rates are a typical problem with online surveys, as are drop-out rates (Fowler, 2014). The summary statistics included in the discussion may vary slightly due to the exclusion of non-users from non-pertinent questions, skipped questions and incompletions, but are not lacking so much as to affect the overall picture of the data.

Of the 615 respondents who answered the first content question, 68% claimed that they were affiliated with a recreation or advocacy group. It is possible that individuals were included on organizations' email lists, but were not formal members therefore did not identify as such. For example, a volunteer at a river cleanup who signed up for the email list of an environmental organization may not consider herself a member. People who carried FWC freshwater permits were expected to identify with the FWC, especially because the email included information about why they were being contacted and how their experience was relevant to the study. The number of additional organizations that were listed by respondents under the 'Other' category are indicative of the wide variety of recreation and advocacy groups that are active in the state.

A question about land- and water-based recreation participation in inland areas revealed that 87% of respondents had traveled over 10 miles from their home to participate in inland recreation within the last year. This participation rate far surpasses

the nationwide general population statistics<sup>1</sup> – less than half of US Americans traveled to recreate in 2012 (The Outdoor Foundation, 2013).

## **Demographics**

The respondent profile was quite consistent with national recreationists' demographics and the study's expectations. An overwhelming majority of respondents (91%) identified as white and there was a 31/69 female to male split. This race and gender distribution is not representative of demographics in the State of Florida where 78.1% of the population is Caucasian and the female to male ratio is 51.1:48.9, but it is more understandable when compared to national outdoor recreation statistics (U.S. Census Bureau, 2013). According to the Outdoor Participation Report (OPR) (2013), females represented 45% of outdoor recreationists aged 25-44 and 41% of people over 45 years old. Another report studying the diversity within environmental organizations also found that females comprised 41% of the membership with a sample size of 3.2 million people (Taylor, 2014).

Seventy percent of respondents in the OPR identified as Caucasian, still a large differential from 91%. This difference could occur because members of recreation or advocacy organizations are being compared to outdoor recreationists, rather than the national bodies of recreation or advocacy organization. Very few environmental organizations keep statistics regarding the diversity of their membership. However, of the 13 organizations from a total of 103 that kept this information in the 2014 report, only 7 reported having any minority members (Taylor, 2014).

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<sup>1</sup> Although the study's sample is not representative of the general population, it makes the disparity between the general population and the sample population evident.

Age of the participants was cut off at 18 years and ranged all the way to one 79 year old. The age variable is normally distributed, with an average age of 53 and a median of 55. According to the 2013 American Community Survey, Florida has the largest population of citizens aged 65 and over in the United States at 18.7% (U.S. Census Bureau, 2013). The median age (40.8) in Florida also outranks most other states and the national median falls 3.6 years under the state's (U.S. Census Bureau, 2013). The participation of an older population is reinforced by the nature of the activities examined in the survey. Outdoor recreation is, after all, a leisure activity and requires a time commitment. It is possible that retired people are involved in organizations because they have more free time.

Respondents tended to have higher levels of education compared to state categories. This is partly attributable to the age composition, as mature adults have had more time to graduate with a formal degree. Over half of the respondents (56%) have a bachelor, graduate, or professional degree, compared with state statistics which totaled 28.9% of citizens over the age of 25. The OPR indicates that 38% of the sample were college or higher-level graduates. The higher percentage stands even though the sample was skewed because participants aged 6 and over were included. Higher levels of education were reflected in the income distribution, whose categories over \$50,000 ranged from 2.8 to 9.7 percentage points higher than state averages when divided into US Census standard increments. Education and income percentages are depicted in Figure 4-1 and 4-2.

### **The Future of Fresh Water and Public Policy Opinions**

In order to better understand outdoor recreation preferences, the questionnaire solicited information on respondents' level of concern for water issues and opinions

about state environmental policies. It was hypothesized that environmental attitudes would be correlated with how individuals value outdoor recreation, which is shown by their trip demand function. Respondents were asked two questions about water expectations in their home county, as well as their opinion about state water laws and state budget expenditures including spending on the environment. These questions were based on questions asked in Pew research studies. An additional question about their donation history to environmental causes was included.

The portion of respondents who were 'Not Sure' about water in their home county and state laws ranged from 6.8%, when asked about the government expenditures on infrastructure, to 13.3% who were unsure about the suitability of state laws protecting water. Otherwise, the summary statistics revealed an overall environmentally conscious sample. This is most clearly evidenced the 69% of respondents who contributed to environmental causes in the past five years.

Responses to the questions about water quality problems and water shortages have a bimodal distribution (Figures 4-3 and 4-4). The percentages of people who were more or less concerned about the quantity and quality of water in their home county were very similar (32/38% quality/shortage for small problem and unlikely) and (60/55% quality/shortage for big problem and likely). State-wide laws and regulations protecting water quality were claimed by 59% to be inadequate, while only 6% thought that they were over prescribed (Figure 4-5). The following survey question framed economic constraints that state legislators face and asked for their opinion about state-wide spending for the education system, the environment, infrastructure, and economic development. Responses to the state budget allocation ranking were not as drastic as

the question prior, but they tended to express that state monies distributed for education and the environment was 'far too little' or 'too little', whereas spending for economic development was the 'right amount' or 'too high' (Figure 4-6). The revealed preference data showing respondents' commitment to environmental organizations through monetary and service donations, further confirming that the sample is indeed environmentally concerned.

### **Trip Characteristics**

Respondents who indicated that they traveled more than 10 miles to recreate in the SJRB within the last year were asked how many times they recreated. The trip mean was 6.48, and the average trip length was 1.55 days. It is understandable and likely that 76% of the most recent trips participants returned home on the same day. Day trips are popular because most of the respondents were local residents, the SJRB may not offer sufficient lodging and camping opportunities, and it isn't popularly known as a tourism destination, especially when compared to competing attractions in the state like the internationally renowned Florida Everglades. Only 6% of the respondents reported spending more than 3 nights in the SJRB region.

Detailed questions about the respondents' most recent trip within the past 12 months were asked to enrich the travel cost analysis by accounting for the factors affecting visitation rate. The activities with the highest participation were paddling (27%), fishing (23%), motorized boating (12%) and land based recreation<sup>2</sup> (12%). The activity distribution is possibly due to the sample representation, as there were more anglers contacted than any other group. Additional activities in the survey included swimming

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<sup>2</sup> Hiking, biking, picnicking, or horseback riding were included in this answer selection on the survey.

(9%), wildlife viewing (6%), hunting (3%), camping (2%), and a write in option (7%). Cultural events, photography, geocaching, and nature-based education were listed multiple times in the 'other' category.

Most of the recreation activities took place in the middle basin (68%), possibly because there is an initiative from local governments to promote ecotourism in the area, a suitable environment for a wider selection of activities, a larger area of undeveloped land, or less traffic from commercial uses when compared with the other regions. Travel cost per site is depicted in Figure 4-7 as well as Table 4-1.

The survey respondents were asked for their perceptions of the water quality at most recent site that they visited. Eighty-six percent of the respondents answered that the freshwater was 'good' or 'excellent' and only 2% claimed that it was 'fair'. This could be because water pollution was hard to detect, that they were considering 'quality' as water being free from litter, or the possibility that the sites that were chosen for the survey had higher water quality because they are maintained as recreation destinations.

## **Analysis and Results**

### **Model Selection**

All of the models that are discussed in Chapter 3 (i.e. Poisson, ZIP, Negative Binomial, and ZINB) were suitable to be considered in the analysis, as they are all count models widely used to describe the data in TCM literature. The summary statistics for this study indicate that over-dispersion in the independent variables is likely and an over-abundance of zeros in the dependent variable is possible. To test for over-dispersion a likelihood ratio test was calculated with a negative binomial model. The alpha value was equivalent to zero and significant at the 1% level, indicating over-dispersion. It was clear that there was overdispersion just by looking at the variance,

14.8, which was 4.98 times the mean of 2.97. To correct for this problem, the theory and literature suggest using the negative binomial model which will be used to analyze this study's data. The functional form and estimation of consumer surplus remains the same with this specification.

The next concern was the over-abundance of zeros; out of a total 477 observations, 189 (39.6%) were zeros. This proportion of zero counts could indicate that there are both structural and sampling zeros as discussed in the theory chapter in which case a zero-inflated model may be appropriate. The structural zeros came from inactive non-users – those whose trip amount would not vary based on other variables because travelling for recreation isn't relevant. Other zeros can happen by chance, active non-users fit into this category. The suitability of a ZINB model was tested against the standard negative binomial using the Vuong test<sup>3</sup>. This test was insignificant at all levels and suggests that the data are indeed generated by a single process rather than two different processes. Therefore the negative binomial model was considered appropriate for this analysis.

The maximum-likelihood estimation (MLE) was used because it has desirable mathematical and optimality properties. The MLE is an efficient estimation process because it allows for a small variance and therefore a narrow confidence interval for the parameters whose errors it is minimizing. Due to the flexibility of the estimation, it is also well-suited for comparing the four models with a consistent approach. Robust standard

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<sup>3</sup> The Vuong closeness test has a null hypothesis that the data are equally estimated in both models. A rejection of the null hypothesis signals that the data is more appropriately fit using a model with parallel processes (Bilgic & Florkowski, 2007).

errors were deemed unnecessary because of the flexibility of the negative binomial model.

### Recreational Demand

Recall Equation 3-3 depicts that the demand function of outdoor recreation is composed of the price of travelling to a recreation area and the number of trips demanded at those prices. For convenience repeated here:

$$x_1 = f(p_1, p_2, q_1, y, \epsilon) \quad 3-3$$

The qualities of the SJRB's demand curve are made evident through regression

analysis of these theoretically important parameters. Income was previously discussed as a defining household characteristic, but there are other influential characteristics in this case organizational affiliation and respondent age

$$y = g(i, o, a) \quad 4-1$$

where  $i$  is income,  $o$  is organizational affiliation, and  $a$  is respondent age.

The complete demand function is

$$x_1 = f(p_1, p_2, q_1, i, o, a) \quad 4-2$$

It is expected that those who have traveled less times to the study area are

expected to have a higher travel cost, the reverse is true for those who travel there more often. This expectation follows what demand theory dictates – as prices increase, the amount of demand diminishes. It is expected that the general population will have a lower number of trips than the members of specialty organizations because members are assumed to be engaged with the study area. It is expected that those who are older will visit more times because retirees have more time and money to travel to the area, and may live (i.e. have a primary or secondary home) close to the recreation areas.

## **Variable Description**

Many questions that were asked to the user group resulted in variables that would have truncated the data, and excluded the 39.6% of respondents who did not travel to the SJRB. Of the variables that the two groups had in common, most of them were related to water issues and policy perception. Excluding the majority of variables from the water and policy categories left comparatively few variables besides for those included in the core model presented in Formula 3-3 to describe the number of trips to the SJRB. These variables include characteristics such as organizational affiliation, recreation status, residency, number of years lived in Florida, type of housing, house ownership, environmental philanthropy, age, education, and gender. These were all considered when performing the analysis and those selected for the final analysis are written about in detail below<sup>4</sup>.

### **Travel cost and substitute travel cost**

As explained in the model description, the principle travel cost variable employs both travel and time expenses in for each individual respondent. The first step in calculating the travel cost (TC) was estimating the distance traveled. The mid-point of individual zip codes was used as a starting point to measure the distance to the latitude and longitude of the site they indicated. Distance calculated was actual driving distance, programmed in Matlab software based on Google's Application Programming Interface (API) which was able to use the coordinates provided instead of requiring a proper address. Many of the 11 sites in the studies were large bodies of water and having the

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<sup>4</sup> Many combinations of variables were tested, beginning with the most parsimonious model described in Chapter 3 and adding other household characteristics that were expected to be important according to theory. The models similar in AIC, BIC, and pseudo log-likelihood were then verified using k-fold cross validation.

capability to pinpoint recreation locations improved the distance estimate. Each distance was doubled in the TC calculation to represent round trip distance, then multiplied by the \$0.56 per mile cost as specified in Chapter 3.

The substitute travel cost (STC) was calculated in the same manner, but the distance actually traveled was replaced with the assumed alternative. The imputed alternative was selected in accordance with economic theory discussed in Chapter 3 and assumed to be the least expensive alternative to the site visited. In the case that the site visited was the least expensive (i.e. the closest site), then it was assumed that they would visit the next closest site. Because substitute sites had a short distance between them, substitute values were very close to the actual values, and this small differential decreased the effect of the substitute travel cost on the regression. Other variables were also used to impute a different STC, but the theoretical support of what might inform the decision was not strong enough.

In addition to the literal explicit expenditures on travel, the opportunity cost of time was included in the travel cost function. In anticipation that many respondents would refuse to provide exact income information, the questionnaire provided categories with ranges consistent with the Internal Revenue Service. Unreported income was imputed for 47 values using the median household income pertaining to the respondent's zip code (U.S. Census Bureau, 2008-2012), as is an acceptable practice in the literature (Alvarez, Larkin, Whitehead, & Haab, 2014). Categorical expressions of income would not work with this formula, therefore the lower bound of each category's dollar value was used<sup>5</sup> for a more conservative estimate. Debate within the literature

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<sup>5</sup> For the lowest bracket – less than \$14,999 – the mean of \$7,500 was taken.

makes choosing an appropriate opportunity cost unclear (Bockstael, Strand, & Hanemann, 1987; McKean, Johnson, & Taylor, 2012; Phaneuf & Smith, 2005). In this study, the opportunity cost was assumed to be valued at 30% of the hourly wage rate, a rate that is most consistently used in recent studies and is used in the national guidelines for ecosystem valuation.

After plotting the TC and the STC against the average number of trips in grouped regions, the squared values of each of these parameters were included. The improvement of the parameter estimates and slightly higher log-likelihood of the model when squared variables were included confirm that there is a non-linear relationship.

### **Water quality**

Visitors were able to rate the water quality from 'fair' to 'excellent' according to their subjective interpretation of the phrase or indicate that they were 'not sure'. The quality ranking could vary based on a host of things including education, experience in natural settings, visitation history to a particular area, and information available at the site which can all affect the user's perception. It is assumed that the water quality, no matter how it is defined by the particular user, will have a positive relationship to the number of expected trips in the model.

This variable is problematic in that there is a large proportion of the sample that was unable to rate the water quality because they had never been in the SJRB for recreation purposes. Cross tabulating the region and the water quality shows little spatial variance. Nor did the quality vary significantly based on the activity done, which made it difficult to impute quality variables for non-visitors or to use it to improve the specifications of other variables like the substitute travel cost. Due to the lack of alternative variables that could inform the calculation of a quality and to avoid

disregarding a large amount of data, non-users were given a quality variable of zero. Although not optimal, it is acceptable to impute zeros in studies that use off-site surveys (Bilgic & Florkowski, 2007).

As discussed in the General Results, the water quality rankings were skewed to the 'good' and 'excellent' categories that accounted for 86% of the responses of users. In addition, the imputed zeros represented a large portion of the water quality indicator and would clearly bias the results if included as a part of the ranking. To solve this problem the water quality variable was divided into three categories: indifferent, negative, and positive. The negative category included the 'poor' and 'fair' ratings, the positive category included the 'good' and 'excellent' ratings, and all of the zeros and the observations that were 'not sure' about the quality were included in the indifferent category.

## **Income**

It was conjectured that the income might have a non-linear relationship with the number of trips taken. The reason being, on one side, people with less income could recreate often because their opportunity cost of time isn't that high or because they are using recreation as another means (e.g., fishing for dinner). Conversely, people who have a higher income can afford to recreate as a leisure activity. In order to articulate the potential differences between households in these income groups, broader categories were created for the income variable. The original nine categories were divided into three: lower income (\$34,999 and below), middle income (\$35,000 to \$99,999), and upper income (\$100,000 and above). The middle income group accounted for 58.46% of the total, while the lower and upper income groups composed 12.2% and 29.33%, respectively. As previously mentioned, 45 missing income values

were imputed using the median household income. All but one of the imputed values pertained to the middle group.

### **Additional variables**

Age and organizational affiliation status were also taken into account in the model. Age was calculated from the birth year given by the respondent and used as a continuous variable. As mentioned in previous chapters, membership to an environmental organization is expected to increase the frequency of trips. Whether or not the household was affiliated with an organization was included as a dummy variable. Although these variables are not included in the model presented in the Chapter 3, they are characteristic indicators and contribute to understanding the results of the study (see footnote 4).

### **Expected Trip Frequency Results**

The travel data was analyzed using an MLE with a negative binomial distribution in which the trip frequency was regressed against the variables specified in Formula 4-2. Table 4-2 specifies the models analyzed. Model 3 was considered the most accurate model and the expected number of trips estimated was 4.79. Model 1 estimates a linear relationship between the trip frequency and the TC and STC, and the next two take the same functional form but differ in the data. Model 2 and Model 3 include the same indicator variables. They differ in that Model 2 includes all complete responses, whereas Model 3 excludes those who traveled more than 700 miles round trip<sup>6</sup>. The trip cost displays a sign consistent with economic theory across models, albeit with varying levels of significance. The coefficient of the linear model is dramatically inflated, most

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<sup>6</sup> A total of 21 observations were excluded imposing this criterion.

likely due to under specification. Multicollinearity between the TC and STC limits the amount of interpretation possible for the STC variable, especially in Model 1. The addition of the squared term makes some variability evident, and the coefficient are opposite signs of one another. However, the coefficients have a minor effect on the number of trips and further description thereof is not justified. The similar behavior of the TC and STC may suggest that, contrary to the hypothesis, the primary and substitute sites are complementary goods rather than substitutes because of their proximity and variation in recreational offerings.

The highly significant, negative coefficient for the 'indifferent' quality category suggests that respondents would rather not travel for recreation than travel to a site with 'poor' or 'fair' water quality. Although the 'positive' quality category is not significant, its sign is contrary to expectations. Unless one takes trips to 'poor' or 'fair' quality sites for river clean-ups or advocacy, it is difficult to imagine that someone would prefer an inferior site. Also not significant was the income category variable. The positive coefficient for the upper income group was expected, and, in contrary to the unorthodox demand relationship proposed in the income variable description, the middle income's coefficient fits into traditional economic theory (i.e. the more income one has, the more she consumes).

The age, affiliation, and the model constant are all significant and related to the dependent variable as expected. Older people are slightly more likely to recreate more often, this could be due their time availability, especially if they are retired. The affiliation variable was significant at the 5% level for all three of the models and had the largest coefficient of all of the variables included in the models. Organizational affiliation

increases the expected number of trips which is expected because organizations encourage participation and trips by hosting events, raising awareness, and, for some, by requiring an investment.

### **Consumer Surplus Estimation**

The consumer surplus (CS) is calculated by integrating from the price point of the expected number of trips to the choke price, the price at which zero number of trips can be expected. Whichever model is used, the negative inverse of  $\beta_1$  renders the household CS per visit (Formula 3-8). Because off-site studies include non-users, the amount of low surplus values drag down the mean and lead to a lower total CS – this should be considered when looking at the estimations. Three estimations of CS per visit were calculated; the first without squared TC and STC terms, second with all of the data including outliers, and a third excluding those who traveled more than 700 miles round trip. These estimations were \$6,329.11, \$892.86, and \$564.97, respectively.

The per household figure is then multiplied by the number of observations to give the total CS for the group. Model 1 which only included the linear cost relationship had results that greatly surpassed the estimates of Models 2 and 3. The CS per trip for Model 1 was \$6,329.11, however the TC variable itself was not significant and an interpretation thereof is not necessary. Recall that the STC was significant at the 1% level in this model. Calculating the CS for it as a substitute yields a reasonable estimate of \$446.43. The CS for Model 2 (n=498) was \$892.86 and for Model 3 using the limited data set (n=477) it was \$564.97. The high variance in the distance greatly affected the travel cost and thus its coefficient. The CS of the model including outliers was 158.04% of the model excluding them, which is demonstrative of the sensitivity of the estimation.

The predicted number of trips was 4.79, and using the CS from Model 3 the annual consumer surplus per household derived from visiting SJR was \$2,706.21 per household. Furthermore, 70% of the online respondents had visited the SJR in the past 12 months, and 96% of them planned to visit the SJR in the next 12 months. Thus, the estimated benefit conditional on their past visitation would be around  $70\% \times 4.79 \times \$564.97 = \$1,894.34$  per household per year. There is no reliable indication of how many Floridians recreate in freshwater areas, however the conditional per household estimate can be multiplied by the number of observations ( $n=477$ ) for a reliable, very conservative estimate of \$903,600.18. Alternatively, the CS can be applied to the entire sample ( $n=15,295$ ) to yield a generalized consumer surplus of \$28,973,930.30.

### **Discussion of Empirical Results**

Household consumer surplus estimates associated with the most current visit of a non-representative sample over a 12 month period from October 2013 to September 2014 ranged from \$564.97 to \$6,329.11 per trip for the SJRB. As Model 3 was considered the most appropriate model, the concluding, most conservative figure is \$903,600.18. Due to the nature of this data it is not generalizable to the state population, but shows that the river basin is indeed significant to the people who are engaged with outdoor recreation and conservation initiatives. Bear in mind that the economic valuation conducted in this study is only one portion of the many aspects that comprise the SJRB's total economic value (TEV). Other research projects in this area are actively contributing to compose other portions of the TEV and, as their results are comparable in positive significance, it can be expected that the actual, unaccounted for TEV far surpasses the value that markets have historically attributed to the Saint Johns.

SJR visitors were asked about their likelihood to recreate in this area within the next year, and their most probable primary activity. This variable is useful to understand how consistent they are as users (66.3% indicated that they would do the same activity in the next year), and resulted in the understanding that those who have recreated in the past, doing a certain activity, to continue recreating in the future. In addition, questions about intentions for future visitation can identify a 'potential user' percentage of the population. The active non-user category of respondents was also asked their anticipated number of trips in the coming year in order to gauge the growth potential of SJRB recreation areas. Both user and non-user groups indicate that the expansion of eco-tourism opportunities would be worthwhile to the SJRB.

The results also revealed that there is a very narrow understanding about what water quality encompasses. Recall all of the pollution issues in the SJRB that were discussed in Chapter 2. It is probable that such a large percentage of people ranked the water quality 'good' or 'excellent' because there is some misunderstanding about what water quality is, what can harm water sources, and how to measure pollutants. This result was not anticipated because of the knowledge and experience assumed of outdoor-recreationists and environmental advocates. If the people who interact with the river and its surroundings don't understand the environmental issues, it is likely that the general population is not adequately informed. Extension programs and outreach to the general population add to the possibility of creating public awareness around water issues. The increase in knowledge about water issues in the region could cultivate demand for additional public funds to be allocated to conservation measures or

recreation infrastructure, and the possibility of increased donations to environmental organizations for such things as riverine restoration and political involvement.

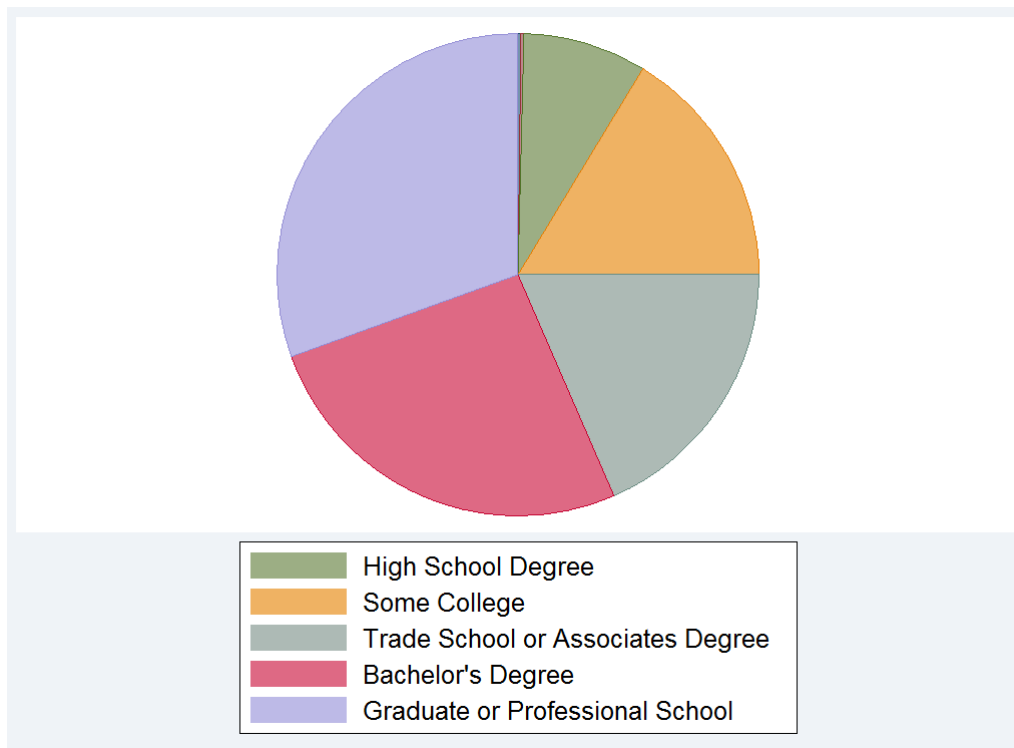


Figure 4-1. Respondents' Education

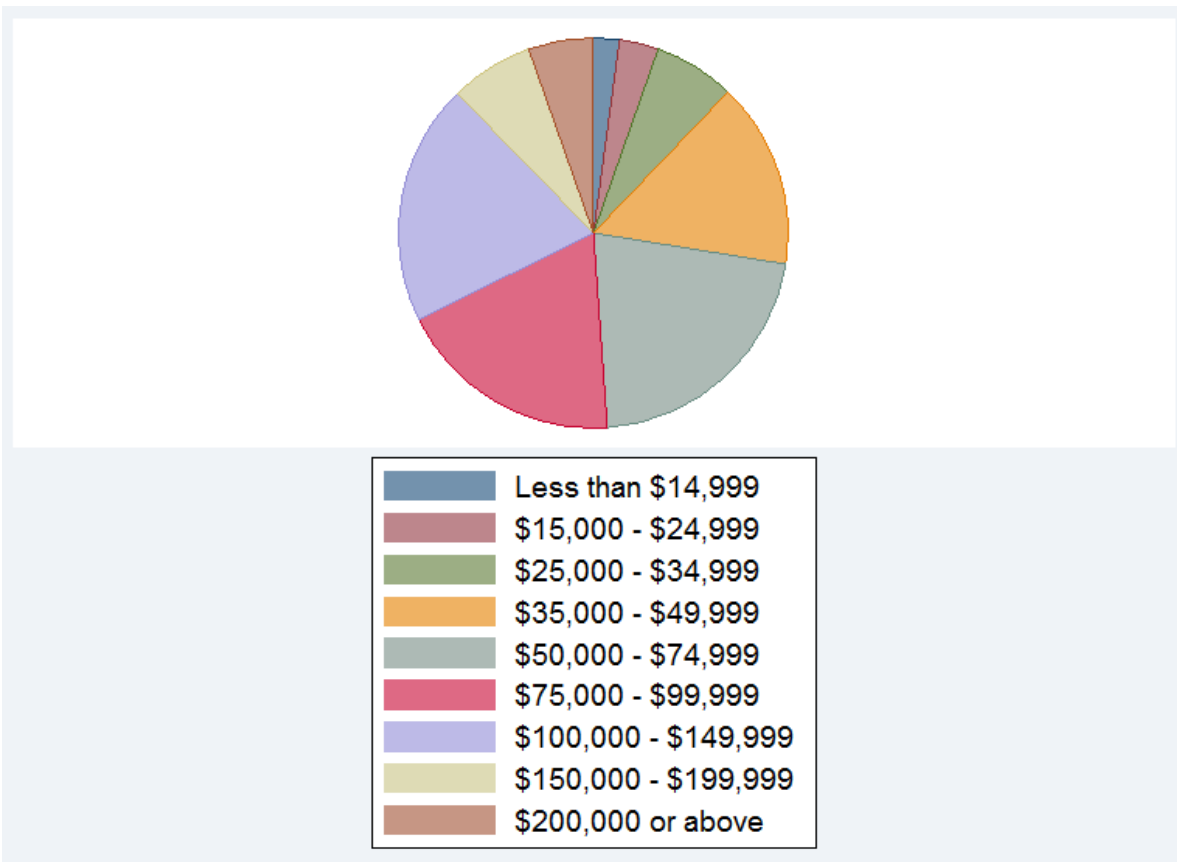


Figure 4-2. Respondents' Income

| Answer            |                        | Response | %    |
|-------------------|------------------------|----------|------|
| No problem at all | <div><div></div></div> | 62       | 12%  |
| Small problem     | <div><div></div></div> | 106      | 20%  |
| Moderate problem  | <div><div></div></div> | 166      | 31%  |
| Very big problem  | <div><div></div></div> | 154      | 29%  |
| Not sure          | <div><div></div></div> | 46       | 9%   |
| Total             |                        | 534      | 100% |

Figure 4-3. Perception of Water Quality Problem in Home County

| # | Answer             |                        | Response | %    |
|---|--------------------|------------------------|----------|------|
| 1 | Extremely unlikely | <div><div></div></div> | 45       | 8%   |
| 2 | Unlikely           | <div><div></div></div> | 159      | 30%  |
| 4 | Likely             | <div><div></div></div> | 172      | 32%  |
| 5 | Extremely likely   | <div><div></div></div> | 120      | 23%  |
| 6 | Not sure           | <div><div></div></div> | 37       | 7%   |
|   | Total              |                        | 533      | 100% |

Figure 4-4. Perception of shortage threat in home county

| # | Answer        |  | Response | %    |
|---|---------------|--|----------|------|
| 1 | Not enough    |  | 305      | 59%  |
| 2 | Right balance |  | 111      | 21%  |
| 3 | Too much      |  | 32       | 6%   |
| 4 | Not sure      |  | 69       | 13%  |
|   | Total         |  | 517      | 100% |

Figure 4-5. Perception of State Laws and Regulations Protecting Water Quality in Florida

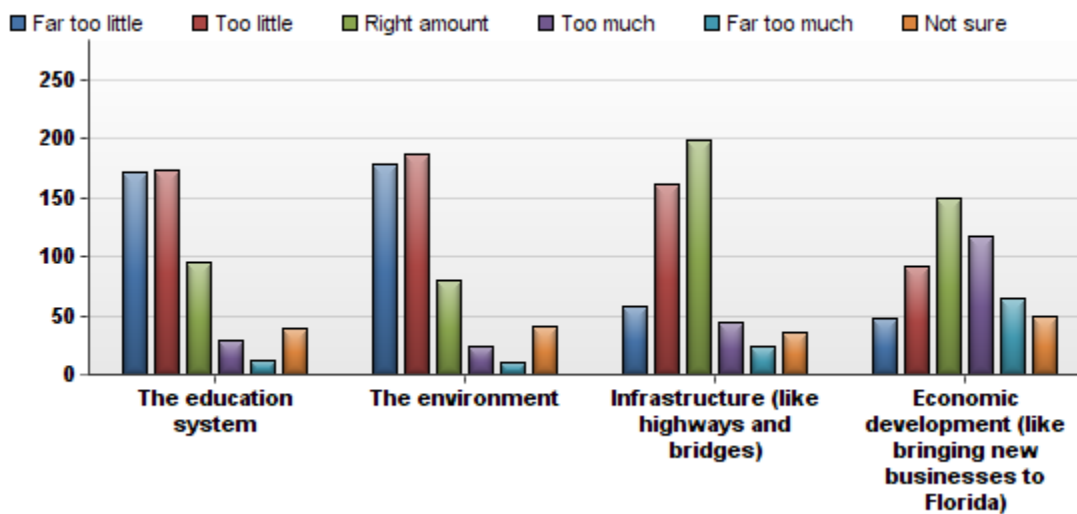


Figure 4-6. Perception of State Spending by Category

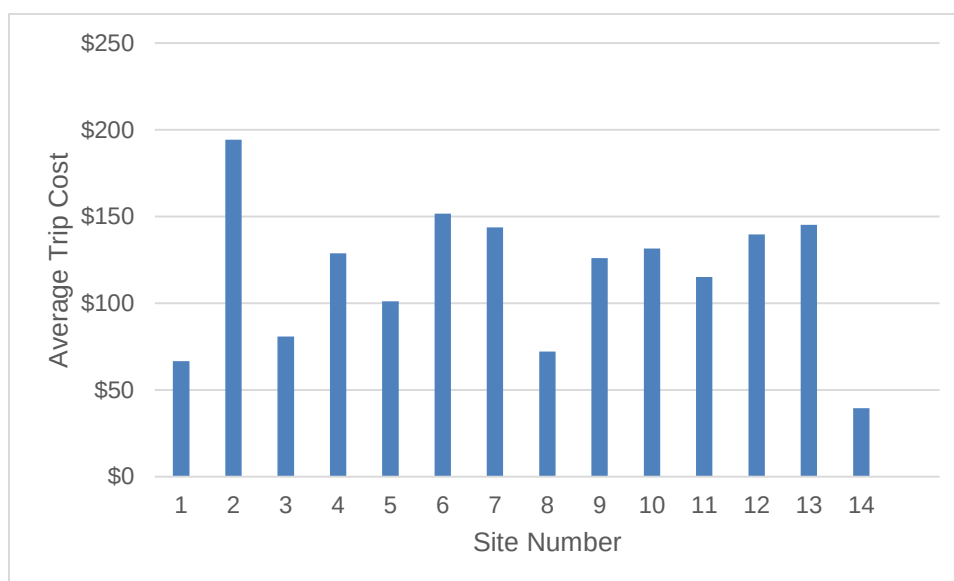


Figure 4-7. Average Trip Cost per Site Visited

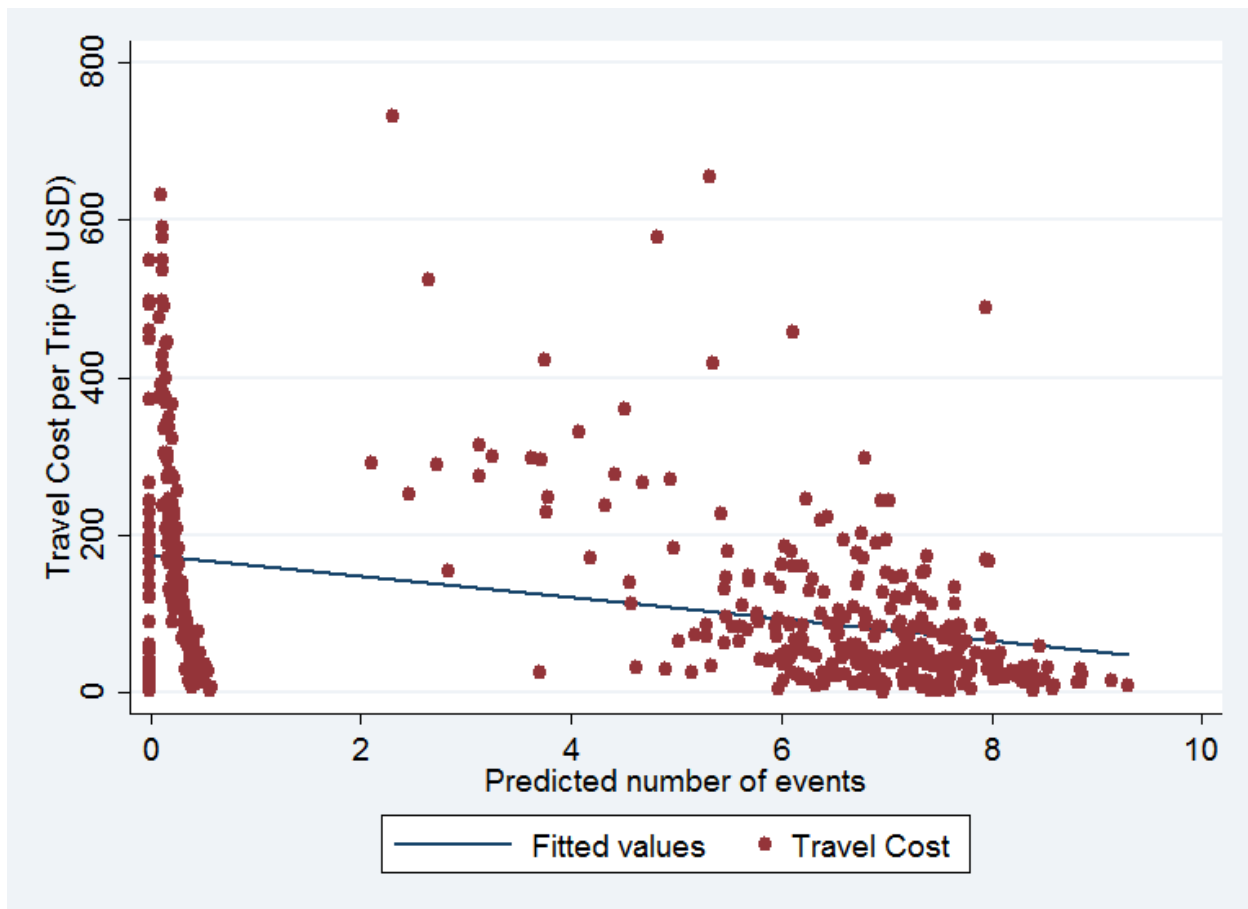


Figure 4-8. Estimated Number of Trips – Demand

Table 4-1. Average Trip Cost per Site Visited

| Site | Obs | Mean     | Std. Dev | Min   | Max    |
|------|-----|----------|----------|-------|--------|
| 1    | 16  | 89.263   | 102.507  | 5.4   | 328.0  |
| 2    | 10  | 232.480  | 555.686  | 31.0  | 1812.0 |
| 3    | 7   | 162.629  | 279.745  | 13.8  | 784.0  |
| 4    | 33  | 153.976  | 202.196  | 6.8   | 864.0  |
| 5    | 30  | 144.167  | 118.422  | 34.6  | 622.0  |
| 6    | 22  | 179.582  | 169.434  | 21.8  | 726.0  |
| 7    | 12  | 153.667  | 285.431  | 33.6  | 1056.0 |
| 8    | 43  | 93.986   | 73.286   | 7.6   | 342.0  |
| 9    | 16  | 161.725  | 133.191  | 6.4   | 498.0  |
| 10   | 63  | 165.298  | 300.281  | 2.6   | 1644.0 |
| 11   | 18  | 164.400  | 468.791  | 9.8   | 2032.0 |
| 12   | 11  | 178.109  | 119.245  | 28.4  | 342.0  |
| 13   | 19  | 200.716  | 412.836  | 11.8  | 1842.0 |
| 14   | 4   | 51.150   | 9.997    | 42.2  | 60.2   |
| 15   | 2   | 1017.000 | 1081.873 | 252.0 | 1782.0 |

Table 4-2. Travel Cost Method Results

| VARIABLES             | Model 1                   | Model 2                   | Model 3                   |
|-----------------------|---------------------------|---------------------------|---------------------------|
| TC                    | -0.000158<br>[0.000424]   | -0.00112*<br>[0.000590]   | -0.00177**<br>[0.000785]  |
| STC                   | -0.00224***<br>[0.000599] | -0.00134**<br>[0.000583]  | -0.00238**<br>[0.00110]   |
| TC^2                  |                           | 2.43e-06***<br>[8.10e-07] | 4.59e-06**<br>[1.91e-06]  |
| STC^2                 |                           | -1.29e-06*<br>[7.18e-07]  | -0.00000087<br>[3.02e-06] |
| Quality - Positive    | -0.00758<br>[0.0890]      | -0.0132<br>[0.0889]       | -0.0195<br>[0.0886]       |
| Quality - Indifferent | -3.404***<br>[0.202]      | -3.541***<br>[0.202]      | -3.388***<br>[0.201]      |
| Income - Middle       | 0.12<br>[0.0959]          | 0.143<br>[0.0951]         | 0.134<br>[0.0956]         |
| Income - Upper        | 0.104<br>[0.106]          | 0.0982<br>[0.105]         | 0.117<br>[0.106]          |
| Age                   | 0.00529**<br>[0.00262]    | 0.00504*<br>[0.00260]     | 0.00461*<br>[0.00262]     |
| No Affiliation        | -0.172**<br>[0.0738]      | -0.183**<br>[0.0729]      | -0.190**<br>[0.0739]      |
| Constant              | 1.690***<br>[0.184]       | 1.703***<br>[0.183]       | 1.813***<br>[0.190]       |
| AIC                   | 1702.706                  | 1758.12                   | 1700.412                  |
| Log Likelihood        | -841.3528                 | -867.06008                | -838.20604                |
| Consumer Surplus      | 3018987                   | 444404.79                 | 268990.02                 |
| Observations          | 477                       | 498                       | 477                       |

Standard errors in brackets

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

## CHAPTER 5 CONCLUSION

### **Study Summary**

Natural resources around the globe have been valued principally considering the extractive use price, and have seldom included the value of other ecosystem goods and services (i.e. clean water, fresh air) that nature provides to humanity. As long as the market fails to capture an accurate value of nature, it will sub-optimally allocate natural resources. The misallocation of the earth's factors of production can lead to environmental problems such as erosion, degradation, and extinction. Academia's answer to market failure is to better understand and value the components of nature in order to incorporate the "true" price into the economic system. In effort to capture another portion of the TEV (see Figure 3-5) of the northeast Florida SJRB, this study estimates the value of outdoor recreation using the economic expenditures of recreationists and advocates on eco-tourism on its lands and in its waters.

Methodologies to estimate diverse non-market values abound. Some of the revealed preference, non-market valuation techniques include using housing prices as a proxy (i.e. hedonic), the costs of actions that people take to reduce environmental damages (i.e. defensive behavior), and the repair cost of an environmental shift or adverse effect (i.e. damage costs). Time and travel costs (i.e. TCM) are also commonly used in natural resource valuation, especially in recreation studies, and was therefore considered the most appropriate method of the non-market valuation methodologies detailed in the literature. Due to the overdispersion of the data, a negative binomial distribution was used in a maximum likelihood estimation to calculate the parameter coefficients.

The results of the study were mostly consistent with expectations formed from economic literature and experience with stakeholders in the state. The average respondent being a 53 year old, highly educated, white male with Florida residency. Nevertheless, the results were affirming and showed useful relationships between the variables in question. Organizational affiliation and age were used in conjunction with travel cost, substitute travel cost, income, and water quality to estimate the number of trips taken from October 2013 to September 2014. As the subchapter “Discussion of Empirical Results” puts forward, the behavior of most of the variables in the model is consistent with economic theory. The high correlation of the TC and STC variables, along with the unexpected signs and insignificance of the water quality and income variables bring up interesting attributes of the data. The TC and STC relationship may indicate that, due to the physical proximity of the sites, the “alternative” site could in fact be a complementary site to the recreation area visited. The positive skewed water quality variable indicates that there is a possibility that even frequent visitors may not have sufficient knowledge about water issues in the area or methods to observe telling features about the kind of pollutants that may be affecting the area.

Consumer surplus estimates are within the range of comparable studies done about Florida recreation that are featured in Table 5-1. Although on the high end of the range, the conservatively calculated estimates of \$903,600.18 for the respondents, and the estimated generalized consumer surplus of \$28,973,930.30 are understandable for a study of this geographical scope and range of activities.

### **Study Implications**

As opposed to other studies in the state that value specific sites, this study estimates the economic value of an entire region using pooled data as opposed to only

considering a single site. It is important for valuation research to focus on broader areas as their heterogeneous nature can contribute enriching insight into the connections that sites have to one another and the future of the region as a whole.

In addition to the large site area, a broad spectrum of activities is included in this model making for a very robust study. Most valuation studies concentrate on one type of recreation activity and sacrifice understanding the diverse opportunities that a place has to offer. Deciding to include such a range of activities shows how much utility is generated through each action and allows for better natural area planning. Different seasonal uses of the area attract different types of people, and introduces the possibility of engaging a wide variety of people to experience the SJRB.

This study is useful for policy makers when considering the value that local constituents place on outdoor recreation among the competing demands of the diverse stakeholders in the region. Not only do local peoples benefit from the SJRB, it is also clear that visitors from other regions place a high value on the region. Policy makers may also account for the revenue that could be created if further attention is invested in this already valuable area.

### **Limitations of the Analysis**

The data collection process was positive in that the stakeholders were actively involved in distributing the survey, but the understanding about distribution methods was not consistent. Plenty of back-and-forth communication led to confusion and resulted in two state-wide organizations forgetting to distribute the survey. Although it was eventually confirmed that everyone received a reminder email, it is uncertain whether or not all of the organizations sent them out within a similar time period, this could have biased the results.

Variable inaccuracy is also a limitation. The actual and substitute travel cost variables are thought to have captured most of the price of the trip, but excluded the peripheral costs such as tolls, the time spent at the site, equipment cost, and access fees to recreation areas. It was also assumed that the recreation trip taken was the primary purpose of the trip. Excluding the possibility of a multi-purpose trip could have over-estimated the consumer surplus. The multicollinearity problem between the TC and the STC may have been solved by imputing alternative STCs using other variables such as primary activity, water quality, and average distance travelled to the site by the active user group. However, due to the semi-homogeneous results in these other variables, the attempts to impute them were not successful. Lastly, a water quality measure for non-visitors, even if ill-informed, could enrich the binomial zero-inflation function by showing if the water quality was a deterrent for those with zero trips. Estimating the value of the missing records is an unreliable technique and imputing the values biases the results. A more detailed survey would be able to capture these factors.

Travel cost studies often have the problem of either truncated data, in the case that non-visitors are excluded (e.g. intercept surveys), or excess zeros, which were present in these data and alleviated employing the ZIP model. In this study there was also an uncommon case of censored data – a condition where partial information is known about the respondent, but the value surpasses the range of the measuring instrument. Thirty four percent of respondents who visited the SJR for recreation went 10 or more times. Poor question design is the cause for this censorship. More options for high frequency users, or the use of a Tobit model to account for upper-end

truncation would have resulted in a more precise rate and therefore a more realistic demand function.

### **Suggestions for Future Research**

The limitations presented in the previous sub-section are all relevant for future research in the area. More detailed studies have the possibility of tracking the change in water quality or trip costs and estimating its impact on the willingness-to-pay of visitors and non-visitors. Recently, the travel cost method has been combined with the contingent valuation method to show revealed and stated preferences for natural resource use. This method is attractive in that it accounts for the revealed and stated preferences of respondents, and it is not as exclusive as the TCM because the respondents must not have travelled to the region in order to answer important questions.

The consumer surplus is a stepping stone to understanding eco-tourism's effect on the economy at large. This study demonstrates that the SJRB is valued by those who visit, however it is not an economic impact study. Further research can explore the cash flows throughout the SJRB that occur due to its natural resources, and possibly estimate how economic benefits could be brought to the area through improvements of the resource. An eventual research question could be "By how much would an improvement of the water quality in the SJRB affect locally-owned businesses in tourism and recreation?"

| Publication                 | Geographical Scope                                                 | Recreation Activity                          | CS Estimates                                                          |
|-----------------------------|--------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------|
| Bell (1987)                 | Lake Okeechobee                                                    | Fishing                                      | \$8.3 million per year                                                |
| Milon (1988)                | Dade County                                                        | Fishing                                      | \$20.41 per person per trip                                           |
| Bell (1992)                 | Coastal beaches in Florida                                         | Salt water fishing                           | \$3.18 per day per person<br>\$2 billion per year                     |
| Bell et al. (1995)          | Lake Jackson                                                       | Water-based recreation                       | \$3.68 per person per day                                             |
| Bell et al. (1998)          | Lake Tarpon                                                        | Water-based recreation                       | \$3.30 per day per person                                             |
| Siderelis and Moore (1995)  | St. Marks Historic Railroad Trail in northern Florida (bike trail) | Biking, hiking                               | \$49.78 per trip<br>\$8.55 million per year                           |
| Leeworthy and Bowker (1997) | Florida Keys                                                       | Open water recreation                        | \$750 per person-day                                                  |
| Shrestha et al. (2002)      | Ocala National Forest                                              | Water-based recreation at the springs        | \$6.35 per person-trip<br>\$1.3 million per year for current facility |
| Bhat (2003)                 | Florida Keys                                                       | Diving, snorkeling, glass-bottom boat riding | \$122 per day-person                                                  |
| Shrestha et al. (2007)      | Apalachicola                                                       | Camping                                      | \$74.18 per trip-year                                                 |
| Morgan et al. (2009)        | USS Orskany Pensacola                                              | Diving                                       | \$480-750 per person-visit<br>\$1.2-3.5 million per year              |

Figure 5-1. Previous TCM Literature on Florida

Adapted from (Leeworthy, Bell, & Johns, 2002)

## APPENDIX A QUALTRICS INTERNET BASED SURVEY

Thank you for taking the time to complete our survey today. The purpose of this study is to measure the economic value of recreation and to estimate the future value of ecotourism of the St. Johns River and its surrounding lands. Your participation will contribute to a more accurate study that will be used to inform local decision makers and interested stakeholders about the value of outdoor recreation in the study area. Please note that there are no right or wrong answers to the following questions. Please be assured that all answers will be kept strictly confidential and used only for the purpose of this research. This survey takes approximately 15 minutes to complete. For more information on your privacy as a research participant, select 'more information' below, otherwise select 'continue' to begin the survey.

- ☐ More information
- ☐ Continue

In this survey you will be asked to complete a questionnaire about past outdoor recreation in the St. Johns River Basin, planned future trips to the region, as well as respondents' demographics and knowledge level regarding water issues. There are no immediate risks or benefits to you for participating in this study, and you will not be compensated for participating in this study. Your identity will remain anonymous and your participation is voluntary. You have the right to withdraw from this survey at any time by exiting out of the page. If you have any questions about this study you may contact Dr. Xiang Bi or Ms. James Longanecker. By selecting 'continue', you are indicating that you voluntarily agree to participate in this survey.

- ☐ Exit Survey
- ☐ Continue

This survey has been sent out to multiple recreation organizations, and it is possible that the members of your household are affiliated with more than one. Please only complete this survey once. Select all of the organizations your household is affiliated with.

- ☐ Audubon Florida
- ☐ Florida Fish and Wildlife Permit Holder
- ☐ Florida Professional Paddlesports Association
- ☐ Putnam County Blueways and Trails, CSO
- ☐ St. Johns River Alliance
- ☐ St. Johns Riverkeeper
- ☐ Other \_\_\_\_\_
- ☐ None of the above

For the purposes of this survey, we'd like you to focus on outdoor activities in inland areas, instead of those at the beach or in the ocean. This includes activities like hiking, biking, bird watching or wildlife viewing, horseback riding or hunting, and freshwater-related activities like fishing, boating or swimming in freshwater such as lakes, rivers or streams. In the past 12 months, have you or anyone in your household

traveled more than 10 miles from your home to participate in any inland outdoor activity like those described above?

- ☐ Yes
- ☐ No

We are particularly asking about recreation in freshwater areas along the St. Johns River Basin in Florida, a region near the Atlantic Coast that stretches from the area surrounding Jacksonville, in the north, to areas around Vero Beach, in the south. This area is circled in blue on the map below. In the past 12 months, did you take any trips to participate in inland outdoor recreational activities to the St. Johns River Basin, excluding the coastal areas?

- ☐ Yes
- ☐ No

In the past 12 months, how many total trips did you or any member of your household take to the St. Johns River area for nature-based outdoor recreation activities?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10 or more trips

In what month did you take your most recent trip to this part of Florida?

- ☐ January
- ☐ February
- ☐ March
- ☐ April
- ☐ May
- ☐ June
- ☐ July
- ☐ August
- ☐ September
- ☐ October
- ☐ November
- ☐ December

Please check the basin map, and use the list below it to tell us where you visited on your most recent trip to recreate in the St. Johns River region. If you visited multiple places on your most recent trip to recreate in this area, pick the one place where you spent the most time.

- ☐ Timucuan Preserve (including Ft. Caroline & Kingsley Plantation)
- ☐ Big Talbot Island State Park
- ☐ Bayard Conservation Area
- ☐ Other site in the northern SJR basin \_\_\_\_\_
- ☐ Ocala National Forest
- ☐ Lake George
- ☐ Lake Ocklawaha (Rodman Reservoir)
- ☐ Silver Springs State Park
- ☐ Blue Springs State Park
- ☐ Other site in the central SJR basin \_\_\_\_\_
- ☐ Lake Monroe/Lake Monroe Park/Conservation Area
- ☐ Blue Cypress Conservation Area
- ☐ Lake Harney
- ☐ Other site in the southern SJR basin \_\_\_\_\_
- ☐ If you do not know, please tell us the nearest city or landmark to that site  
\_\_\_\_\_

Was your most recent trip a day trip, or did you spend one or more nights away from home?

- ☐ Day trip: returned home on the same day
- ☐ Overnight trip: spent 1 night
- ☐ Overnight trip: spent 2 nights
- ☐ Overnight trip: spent 3 nights
- ☐ Overnight trip: spent more than 3 nights

What was your primary inland recreation activity on that most recent trip to the St. Johns River Basin area? Remember: this excludes coastal areas

- ☐ Kayaking, canoeing, or other non-motorized boating
- ☐ Motorized boating
- ☐ Fishing from a pier, boat, or shore
- ☐ Swimming, snorkeling, diving at the freshwater portion of the area
- ☐ Camping
- ☐ Hunting
- ☐ Hiking, biking, picnicking, or horseback-riding
- ☐ Bird watching or wildlife viewing
- ☐ Other (please specify) \_\_\_\_\_

How would you rate the quality of the natural, outdoor, freshwater areas of the place you most recently visited in the St. Johns River Basin area?

- ☐ Poor
- ☐ Fair
- ☐ Good
- ☐ Excellent
- ☐ Not sure

What do you think about the number of ecotourism activities (those with a low environmental impact) already available at the place you most recently visited in the St. Johns River Basin area?

- ☐ Not nearly enough
- ☐ Not enough
- ☐ Just about right
- ☐ Too many
- ☐ Far too many

In your opinion, what additional ecotourism activity do you think would be best suited for the place you most recently visited in the St. Johns River Basin area?

- ☐ Kayaking, canoeing, or other non-motorized boating
- ☐ Hiking, biking, picnic, or horseback-riding
- ☐ Bird watching or wildlife viewing
- ☐ Geocaching
- ☐ Camping
- ☐ Other | please specify \_\_\_\_\_

Next, we have a few questions about future trips you might make to the St. Johns River Basin. To be clear, a "trip" includes day trips and overnight trips for the purpose of inland, nature-based outdoor recreation. During next 12 months, how many trips you plan to make?

- ☐ None
- ☐ 1
- ☐ 2-5
- ☐ 6-10
- ☐ More than 10 trips

What would be the primary activity you plan to do at that site during the next 12 months?

- ☐ Kayaking, canoeing, or other non-motorized boating
- ☐ Motorized boating
- ☐ Fishing from a pier, boat or shore
- ☐ Swimming, snorkeling, diving at the freshwater portion of the area
- ☐ Camping
- ☐ Hunting
- ☐ Hiking, biking, picnic, or horseback-riding
- ☐ Bird watching or wildlife viewing
- ☐ Other \_\_\_\_\_

Now, we have some questions about water resources in your home county and the state of Florida.

In your home county, how much of a problem is the quality of water in the lakes, streams, rivers, and springs?

- ☐ No problem at all
- ☐ Small problem
- ☐ Moderate problem
- ☐ Very big problem
- ☐ Not sure

How likely do you think it is that your home county will experience shortages of fresh water in the next 10 years?

- ☐ Extremely unlikely
- ☐ Unlikely
- ☐ Likely
- ☐ Extremely likely
- ☐ Not sure

In the past five years, have you contributed time or money to environmental causes? Some examples include: buying a specialty license plate, making direct donations, or volunteering for environmental organizations

- ☐ Yes
- ☐ No

At the present time, do you think that laws and regulations protecting water quality in Florida's rivers, lakes, and springs have not gone far enough, struck the right balance, or gone too far?

- ☐ Not enough
- ☐ Right balance
- ☐ Too much
- ☐ Not sure

Florida's budget includes a wide array of government expenses. Please indicate whether you think we're spending too much money, about the right amount of money, or too little money on the following areas.

|                                                                | Far too little        | Too little            | Right amount          | Too much              | Far too much          | Not sure              |
|----------------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| The education system                                           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The environment                                                | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Infrastructure (like highways and bridges)                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Economic development (like bringing new businesses to Florida) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Finally, we have a few background questions to be sure we've contacted a representative group of respondents. This is the last section of the survey.

Do you reside in the USA?

- ☐ Yes
- ☐ No, I live in: \_\_\_\_\_

What is your 5-digit zip code?

Including yourself, how many people live in your household?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7 or more

What is your self-identified gender?

- ☐ Male
- ☐ Female
- ☐ I identify as: \_\_\_\_\_

In what year you were born?

What is the highest level of education you have completed?

- ☐ 8th grade or less
- ☐ Some high school
- ☐ High school degree or equivalent
- ☐ Some college
- ☐ Trade/technical school or Associate's degree
- ☐ Bachelor's degree
- ☐ Graduate or Professional school

What is your residency classification?

- ☐ Permanent resident - live in Florida 8-12 months out of the year
- ☐ Part-time resident - live in Florida 1-7 months out of the year
- ☐ Not a resident of Florida

How many years have you lived in Florida?

- ☐ Less than a year
- ☐ 1-5
- ☐ 6-15
- ☐ 16-25
- ☐ 25-50
- ☐ More than 50 years
- ☐ Not applicable

Is your home a(n):

- ☐ Apartment or Condominium
- ☐ Townhome
- ☐ House
- ☐ Mobile home
- ☐ Other, please describe \_\_\_\_\_

Do you own your home or rent?

- ☐ Own
- ☐ Rent
- ☐ Other

Just for statistical purposes, which category includes your estimated household income before taxes for 2013?

- ☐ Less than \$14,999
- ☐ \$15,000-\$24,999
- ☐ \$25,000-\$34,999
- ☐ \$35,000-\$49,999
- ☐ \$50,000-\$74,999
- ☐ \$75,000-\$99,999
- ☐ \$100,000-\$149,999
- ☐ \$150,000-\$199,999
- ☐ \$200,000 or above
- ☐ Do not know

What is your ethnicity/race? Please select all that apply.

- ☐ White
- ☐ Black or African American
- ☐ Spanish, Hispanic, or Latino
- ☐ Native Hawaiian or Pacific Islander
- ☐ Asian
- ☐ American Indian or Alaska Native
- ☐ Other \_\_\_\_\_

This is the last page of the survey - If you have any additional comments about the survey or the St. Johns River itself, please feel free to share them here.

Are there any particular reasons why none of your trips involving inland outdoor recreation were to the St. Johns River Basin? Please select the most important reason that applies.

- ☐ The area is too far away
- ☐ Not familiar with the area
- ☐ Prefer other areas for inland recreation
- ☐ Costs too much in that area
- ☐ Poor water quality
- ☐ Not enough facilities in that area
- ☐ Other, please describe \_\_\_\_\_
- ☐ Not sure

**APPENDIX B**  
**SITE EXPERTS CONTACT INFORMATION AND COMMENTS**

| <b>Region 1 (Northern)</b>                                             | Contact                           | Phone                | Email                                                | Physical address | Comments                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------|-----------------------------------|----------------------|------------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Timucuan Ecologic and Historic Preserve -Ft Caroline national memorial | Craig Morris-lead park ranger     | 904-641-7111x412     |                                                      |                  | Boat ramp-Cedar Point -kayakers & fishermen<br>Birders-Kingsley Plantation<br>Hikers- Ft. Caroline<br>Theodore Roosevelt area-bird mecca (ebird)<br>Spanish Pond<br>October- best time once migrations have started<br>Need research permit-Ann Lewellen<br>904-221-7567 121                                                                                                                         |
| Big Talbot Island State Park                                           | Alison Conboy/Peter Maholland     | 904-251-2811         | pmaholland@dep.state.fl.us<br>aconboy@dep.sate.fl.us |                  | Permission from park mgr -email Peter & Alison w/survey and schedule<br>Little Talbot Island-one access point with parking(most use by car)-kayaking, hiking, picnic areas, fishing,<br>George Crady Bridge fishing pier at Amelia Island, Ft George Island-Ribault Club - (restored), kayak launch, hiking<br>Pumpkin Hill Club-equestrian trails, canoe launch<br>Boat launch on Big Talbot Island |
| Bayard Conservation Area (SJWMD)                                       | Karen Davis                       | 386-329-4404         |                                                      |                  | South side of SR 16 (area 1) entrance and parking area, area 1 closed to hunting all year round; SR 17 (West entrance) recommended for horseback riding<br>Email her background info and sites/dates you want to use                                                                                                                                                                                 |
| <b>Region 2</b>                                                        |                                   |                      |                                                      |                  |                                                                                                                                                                                                                                                                                                                                                                                                      |
| Ocala National Forest ***                                              | Toni Davis                        | 352-625-2520         | aldavis@fs.fed.us                                    |                  | Mid-October starts up again snow birds<br>Visitor's Ctr: 352-236-0288<br>Email her background info & sites we want to use; some sites are run by concessionaires and would need to be notified<br>visitors survey                                                                                                                                                                                    |
| Lake George:                                                           |                                   |                      |                                                      |                  |                                                                                                                                                                                                                                                                                                                                                                                                      |
| Forest & Wildlife Management Area-Volusia County                       | Randall Sleister, Program Manager | 386-736-5927 X 12092 | rsleister@volusia.org                                |                  | On Lake County side-boat ramp, Pine Island fish camp w marina-end of Lake George Rd.<br>Bluffton-Lake George State Forest-picnic area<br>South side of Lake George- private-Volusia Bar fish camp-Restaurant & boat ramp<br>Lake Woodruff                                                                                                                                                            |

|                                              |                                                                    |                                    |                                                         |                                                                           |                                                                                                                                                                                                                                                           |
|----------------------------------------------|--------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              |                                                                    |                                    |                                                         |                                                                           | Deleon Springs State Park<br>High Banks Marina-private restaurant etc.                                                                                                                                                                                    |
| Lake Ocklawaha (Rodman Reservoir)            | Mickey Thomason<br>Office of<br>Greenways &<br>Trails              | Cell:352-427-0630                  | mickey.thomason@dep.state.fl.us                         |                                                                           | At Rodman dam, campground & boat ramp, on north side -Kenwood rec area, Orange Springs, Eureka Springs<br>441 Santos trailhead S of Ocala-horse trails etc.<br>Fall is best time<br>Lives in Gainesville-would be happy to meet to discuss best locations |
| Silver Springs State Park                    | Sally Lieb<br>Park Manager                                         | 352-236-7148<br>Sally-352-236-7152 | sally.lieb@dep.state.fl.us                              |                                                                           | Email to Sally survey and schedule 2 entrances<br>Entrance to Silver Springs more accessible - parking lot and people walk in than south entrance -people drive in                                                                                        |
| Blue Spring State Park                       | Laura<br>Out until Weds-left message                               | 386-775-3663<br>386-775-1599       |                                                         | 2100 W. French Ave.<br>Orange City, FL 32763                              | Swimming, picnic pavilions, scuba, camping, boat tours, Manatee winter refuge<br>VM                                                                                                                                                                       |
| <b>REGION 3</b>                              |                                                                    |                                    |                                                         |                                                                           |                                                                                                                                                                                                                                                           |
| Lake Monroe Park-Volusia County              | Tim Baylie,<br>Director                                            | 386-668-3825<br>Tim-386-736-5953   | tbaylie@volusia.org                                     | 975 US HWY 17-92, Debarry                                                 | Boardwalk, camping, canoeing, picnic area, playground<br>SR 44 outside of Deland -Ed Stone County Park-boardwalk, fishing & picnic areas<br>VM                                                                                                            |
| Lake Harney Wilderness Area- Seminole County | Rick Durr                                                          | 407-665-2180<br>Rick-407-665-2173  | rdurr@seminolecountyfl.gov                              | Greenways & Natural Lands Manager<br>845 Markham Rd,<br>Sanford, FL 32771 | City of Sanford-Municipal Marina and river walk, 4 county facilities on river or lakes: all have boat ramps park on Lake Monroe 1. Lake Monroe Wayside Park 2. Mullett Lake Park 3. C.S. Lee boat ramp on St. Johns River 4. Cameron White Park -on river |
| River Lakes Conservation Area<br>SJRMD       | Nels Parson                                                        | 386-329-4410                       | nparsons@sjrwm.com                                      |                                                                           | Land manager in charge of recreation, extensive discussion about areas challenges and history                                                                                                                                                             |
| Lake Washington Park<br>Brevard County       | Greg Minor                                                         | (321) 255-4400                     | Greg's assistant:<br>vanessa.bethauser@brevardparks.com | 6000 Lake Washington Rd<br>Melbourne, FL 32934                            | Except Lake Washington County park<br>Picnic pavilion, playground, fishing pier, boat ramp<br>Write him a letter regarding research-copy of survey, would like results<br>Send email addressed to Greg to Vanessa                                         |
| Blue Cypress Conservation Area               | Karen Davis **<br>Administrative<br>Assistant for Land<br>Use Dpt. | 386-329-4404                       | landmgmt@sjrmd.com                                      |                                                                           | Parking area- during hunt season need pass from FWCA mostly hunters-archery starts Sept 13<br>Blue Cypress Recreation Center has parking and boat launch<br>Email her background info and sites/dates you want to use                                     |

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## BIOGRAPHICAL SKETCH

Jamie Longanecker is a Florida cracker language enthusiast who cares about world-scope issues. After completing a Bachelor of Science in economics at the University of Florida, she started in the Food and Resource Economics Department as a candidate for the Atlantis program. This program is a collaboration between US and European universities. After one semester, Jamie was awarded a Foreign Language and Area Studies grant and moved to Slovakia on a broken leg to complete a case study in Rural Development. Her next stop was Berlin where she continued coursework in institutional economics, a rural case study in China, and seemingly endless hours of German language. She believes in food justice, sustainable agriculture, and living so that others may live. She hopes to solve one part of the world's hunger.