

Economic Value of Florida Water Resources: Value of Freshwater-Based Recreational Experiences¹

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Introduction

This paper is part 3 of the series “Economic Value of Florida Water Resources.” Overall, this series discusses various components of the total economic value of goods and services provided to people by water resources (often referred to altogether as “ecosystem services provided by water resources”).

This article uses Florida-based economic studies to provide natural resource professionals and interested citizens with information regarding the value of water-based tourism and recreation. The economic values reported in this article can be used to evaluate more comprehensively the costs and benefits of water resource protection and restoration options. Specifically, this paper presents dollar estimates of the benefits that can result from protecting water resources that currently provide recreational benefits. This information can be used to compare with the costs of water resource projects. In addition, this information can be used to illustrate a potential increase in benefits from improving amenities offered by recreational sites, as well as losses that could result from inaction (e.g., if no investments are made to protect and restore water resources).

This article illustrates that the economic activity spurred by water-based tourism and recreation (and discussed in part 2 of this EDIS series) represents only a part of the total value of water-based recreation. Indeed, regional economic

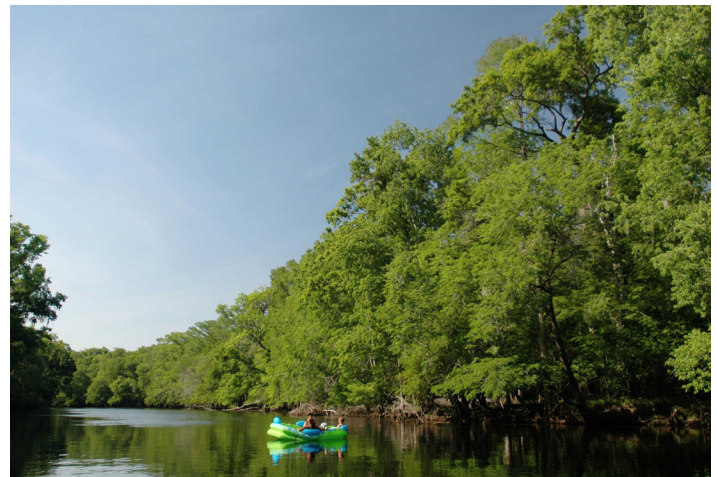


Figure 1. Recreation on Santa Fe River.

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activity gets a boost from spending by tourists attracted to the recreational sites. However, the value of recreational experiences to tourists can be higher than their spending. Usually, the term “consumer surplus” refers to total willingness to pay (WTP) above actual spending, added up among all the consumers of a given service or commodity, in this case, all the recreational visitors to water recreation sites. As the name indicates, consumer surplus reflects the value to the consumers (i.e., visitors of recreation sites) above the prices they pay. (That is why it is called “surplus.”)

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Six studies summarized in this fact sheet focus on freshwater-based recreation in Florida. Four of these studies focus on spring-based recreation in northern and central Florida, and three studies discuss recreation in large regions associated with the Apalachicola and St. Johns Rivers. In addition, estimates of the value of freshwater-based recreation in the three national forests in Florida (Ocala, Apalachicola, and Osceola) are presented. Studies of WTP for freshwater-based recreation in south Florida are lacking, indicating the need for additional research. Analyses of saltwater-based tourism in the area are available, e.g., see Park et al. (2002); however, they are not reviewed in this fact sheet.

When reading this article, natural resource professionals and interested public can focus on the values of recreational activities most relevant to their geographical regions (e.g., north Florida or central Florida), specific types of water bodies (e.g., springs or river), or specific types of recreational activities (e.g., fishing or non-motorized boating). While this article focuses on recreational activities, a review of the studies examining other types of benefits provided by water resources (e.g., increases in property prices due to proximity to a clean river or the value of wildlife habitat) can be found in the other papers of the series (see an overview in *Valuing Florida's Water Resources: Ecosystem Services Approach*).

Methods Used to Measure the Value of Freshwater-Based Recreational Experiences

Tourists make economic tradeoffs to visit a recreational site. For example, they choose to spend their incomes on fuel to travel to a recreational site instead of purchasing other goods. They may also decide to forego potential income to take time off for a recreational trip. Such tradeoffs indicate the value that recreationists assign to the recreation. To illustrate the fact that the pleasure from water-based recreation can exceed the actual expenditure, the reader can consider the following example. Friends with similar tastes and incomes are frequent visitors to a spring site. Their gas expenditures to travel from their homes to the site depend on the distances to the site. Since the tastes of these friends and their economic opportunities are similar, those living closer to the site would be willing to incur at least the same expenses to visit the site as those who live further away. In other words, the WTP of those friends living close to the site is higher than their actual expenditure, and this can be discovered when comparing the frequency of the trips, traveled distances, incomes, and various preferences among members of the group.

As in the example above, to measure tourists' WTP, economists collect and analyze data about the distances that tourists travel to a location, tourists' incomes (even if the tourists use paid vacation time to visit a spring, they incur the "cost" of not using this time for work and income), the number of trips to recreational locations of interest, and other information. Differences in visitation patterns depending on sites' characteristics (such as better or worse water quality, or access to equipment rental) allow economists to express the value of these characteristics in dollar terms. This method is referred to as the *travel cost method* (see more about this method in the publication *Valuing the Recreation Uses of Natural Resources: The Travel Cost Method* at <http://edis.ifas.ufl.edu/uw386>).

The travel cost method uses information about the actual choices that people make (i.e., the "revealed choices" method). Alternatively, economists can rely on the travel choices that people *state* they would make (i.e., the "stated choices" method). In this case, economists survey people and ask about their potential travel choices in various situations, for example, a choice between a site with a low entrance fee and limited amenities, and a site with a higher entrance fee but improved amenities. The survey responses can then be used to infer the value that people assign to different levels of amenities, including improved water quality. If surveys are carefully designed, the survey responses are a close representation of actual travel choices. An example is the "contingent valuation" method wherein respondents indicate their travel choices contingent on a described situation.

While only relatively few Florida-based studies examined the value of freshwater-based recreational opportunities, studies conducted in other states can also help to infer the value of such experiences for Florida locations. The benefit-transfer method describes how economic values estimated for different recreational locations can help to determine the recreational value for a site never studied (see Rosenberger et al. 2017).

Note that studies of the same recreational site can result in different estimates depending on the method used (e.g., travel cost, contingent valuation, or the benefit-transfer method), the time period in which the study was conducted, the study's focus, assumptions made, etc. These differences in estimates could point to changing visitor preferences over time or to the need to conduct more studies (to further investigate differences in the results and validate the assumptions made). At the same time, differences indicate the importance of using the study results with care, and taking time to learn the specific focus of the studies.

The Value of Recreation in Two Major River Basins in Florida

Three studies examine recreation in regions associated with two major rivers in Florida, the Apalachicola River in the Panhandle and the St. Johns River in northeast Florida. Rivers are often considered together with their “river basins,” the land areas that drain into the rivers. As a result, most recreational activities related to a river include both land- and water-based recreation in the basin.

RECREATION AT FIVE SITES IN THE APALACHICOLA RIVER BASIN

Shrestha et al. (2007) used the travel cost method to examine visitors’ travelled distances and the number of recreational trips to assess visitors’ value of the recreation options in the Apalachicola River Basin. The study surveyed visitors at five sites in the Apalachicola River Basin: St. Vincent National Wildlife Refuge, Tate’s Hell State Forest, Apalachicola River Wildlife and Environment Area, Apalachicola National Forest, and St. George Island State Park. Some of the activities that visitors were engaged in were water-based (such as swimming), while others were land-based (such as camping). Overall, researchers found that on average visitors’ WTP for nature-based recreation was \$787.76 per trip, or \$74.18 *per visit-day* (given that the estimated average length of a trip was approximately 11 days).

The total value of nature-based recreation at the five sites in the Apalachicola River Basin in the fiscal year 2000–2001 was \$484.56 million. This total value should be used with caution because it depends on an assumption about the total number of visitors to the area. In the study, Apalachicola National Forest accounted for a large part of the total visitation to the area and the recreational value (\$309.90 million out of \$484.56 million per year). The total number of visits to Apalachicola National Forest reported in Shrestha et al. (2007) for the fiscal year 2000–2001 was 393,400. This value is approximately twice as high as the number of visits the USDA Forest Service reported for the fiscal year 2016, which was 183,000 (2018). Moreover, Shrestha et al. (2007) estimated the average length of a trip to the Apalachicola River Basin at more than a week, while USDA Forest Service (2018) reports that most of the visits to the Apalachicola National Forest were day-long visits. This difference in visitation illustrates that the consumer surplus values vary from year to year, and generally, valuation studies should be updated periodically. On the other hand, the lack of funding for research generally precludes repeated studies of the same area, and, therefore, studies received from a single year, or benefit-transfer studies

utilizing information from a larger region are frequently used to illustrate the value of recreation in a region.

FRESHWATER-BASED RECREATION IN THE ST. JOHNS RIVER BASIN

Ehrlich et al. (2017) used the travel cost method to estimate the value of freshwater-based recreation for visitors to the St. Johns River Basin. A 2014 phone survey of a sample of Florida residents from 49 counties in north, central, and south Florida was used to estimate the number of Florida recreation tourists as a proportion of the Florida population, and to collect information on the frequency of visitation. This approach is different from the method used by Shrestha et al. (2007), which intended to examine five specific recreational sites within Apalachicola River Basin, and therefore surveyed visitors at these five locations only. Ehrlich et al. (2017) aimed at a comprehensive evaluation of freshwater-based recreation at all locations in the St. Johns River Basin. Therefore, the study area includes the St. Johns River, as well as its tributaries, lakes, springs, and wetlands in the river basin. The St. Johns River Basin covers a large part of Florida, stretching roughly from the Georgia border south to Vero Beach, and from Gainesville east to the Atlantic Ocean. This area includes multiple recreational opportunities and sites (see SJRWMD 2018). At the same time, surveying Florida residents only, Ehrlich et al. (2017) did not account for the potential value of recreational tourists from other states.

The estimated value that visitors receive from freshwater recreation was correlated with the visitors’ attitudes toward environmental protection, the number of recreational trips they took, and other visitor characteristics. When these differences are set aside, households valued recreation in the St. Johns River Basin at an average of \$212.50 *per year per household* over their actual expenditure for recreational trips. Given that the total number of households in the regions surveyed was 6,237,279, and 15.8 percent of them were estimated to visit the St. Johns River Basin for freshwater-based recreation in the year preceding the survey, the total value derived by the visitors to the St. Johns River Basin was \$208.9 million per year.

FISHING AND OTHER FRESHWATER-BASED RECREATION ALONG THE OCKLAWAHA RIVER, A TRIBUTARY OF THE ST. JOHNS RIVER

While Ehrlich et al. (2017) aimed at a comprehensive evaluation of recreational values at various recreational sites in the St. Johns River Basin, another study “zooms in” on a particular tributary of the St. Johns River, namely the Ocklawaha River. The management of the Ocklawaha

River has been a point of controversy for more than forty years because a part of the river (the upstream stretch) is impounded by the George Kirkpatrick dam, which significantly alters stream and floodplain ecosystems. On the other hand, the dam and related Rodman reservoir became one of Florida's prime destinations for bass fishing. The differences in river management for the impounded and free-flowing stretches of the river allow a comparison of the WTP of two types of recreational visitors: fishing visitors (who generally prefer the impounded portion, while they also recreate on the free-flowing stretch) and non-motorized boating and other recreationists (who prefer the free-flowing section).

Bi et al. (2019) used interviews of recreational visitors at several sites along the free-flowing and impounded sections of the river to estimate visitors' WTP for their recreational experiences. The study found that the WTP is \$152.79 *per person per year* (above their actual trip expenditure) for those involved in fishing activities and \$69.98 *per person per year* (above their actual trip expenditure) for those engaged in the other types of recreational activities. The difference is driven by the difference in the frequency of recreational visits (on average, 8.91 trips per year for fishing, as compared with 4.08 trips per year for the other activities). The estimated total number of recreational visitors (calculated based on vehicle counter data shared by the Florida Office of Greenways and Trails) was more significant for the locations along the free-flowing river stretch as compared with the impounded section (with the impounded section also being much shorter). Therefore, the total estimated consumer surplus is \$2.2 million per year for the reservoir stretch and \$4.0 million per year for the free-flowing stretch. The total consumer surplus for recreation along the Ocklawaha River was \$6.2 million per year.

Bi et al. (2019) is one of the few studies that combines consumer surplus estimates with analysis of the economic impacts of river-based recreation. The study shows that the reservoir side generates \$6.6 million in value-added (which is an analog of the gross domestic product used to characterize economic activity on a national level). Recreation along the free-flowing river stretch results in \$9.7 million in value-added per year. The total value-added for both stretches is \$16.2 million. These value-added estimates should be reported together with the willingness to pay estimates of \$6.2 million per year to illustrate the importance of recreational activities along the Ocklawaha River.

Value that Visitors Assign to Springs-Based Recreation

Florida offers a unique opportunity to enjoy recreation on large (first- and second-magnitude) springs. Florida has more large springs than any other state in the nation. Each of the springs is unique. Several studies examined the value visitors derive from recreating at spring sites, and changes in the value depending on the amenities. These studies illustrate the importance of investing in spring protection and restoration.

SPRINGS IN THE OCALA NATIONAL FOREST

Shrestha et al. (2002) used the contingent valuation method to estimate the value visitors derive from water-based recreation at Sweetwater Springs, Silver Glen Springs, Juniper Springs, and Salt Springs sites in the Ocala National Forest. Visitor activities included boating, canoeing, swimming, fishing, and wildlife viewing. Researchers surveyed visitors about their WTP for experiences at the springs and presented different scenarios of spring site facilities. Estimated WTP differed among day visitors and overnight (extended) visitors. Day visitors were willing to pay an average of \$4.88 *per visitor per trip* (above the actual expenditures incurred for the trip), given the current facilities at the spring sites. Day visitors were willing to pay more, \$8.75 *per visitor per trip*, for moderately improved facilities (e.g., basic grocery, camping facilities, daytime tours), and \$11.72 *per visitor per trip* for greatly improved facilities (e.g., children's play area, restaurant, rental cabins, weekend tours). In turn, for visitors who stayed overnight, WTP averages were \$9.33, \$12.95, and \$17.45 *per visitor per trip*, for different levels of improvements to spring site facilities, respectively.

Based on the overall number of visitors, this amounted to a total annual consumer surplus of about \$1.0 million for current basic facilities, \$1.8 million for moderately improved facilities, and \$2.5 million for greatly improved facilities at the spring sites in the Ocala National Forest. Note that these estimates are lower than the value of recreation in the Ocala National Forest reported below and derived using the benefit-transfer method (\$6.2 million). The difference could be due to the differences in methods used (contingent valuation vs. benefit-transfer), a different number of recreational sites (four springs vs. all water bodies in the Ocala National Forest), fluctuations in the total number of recreational visitors from year to year, and inflation since 2002.

VALUE OF DIVING IN WAKULLA AND JACKSON BLUE SPRINGS

Cave diving is a unique activity available at selected Florida springs, and this unique experience attracts visitors from other states and countries. The value of such an experience is higher than that for other types of activities (such as swimming or canoeing, examined in the study discussed above). However, special training is required to engage in the activity, and, therefore, the total number of visitors engaged in this activity is smaller than the total number of visitors engaged in other types of spring-based recreation. Two studies published in peer-reviewed journals, Huth and Morgan (2011) and Morgan and Huth (2011), examined visitors' WTP (above the actual expenses incurred, i.e., consumer surplus) for spring cave diving at Wakulla Springs and Jackson Blue Springs. At Wakulla Springs, for two different cave dives and a cavern dive that is currently closed to anything but scientific research-permitted diving, surveyed cave divers who had previously visited the area reported a WTP ranging from \$52 to \$83 *per dive*. In turn, for Jackson Blue Springs, under the existing conditions, diver's WTP was \$155 per person, *per trip* (a trip might include several dives). Given the total number of visitors, this represents \$0.58 million in annual consumer surplus for divers visiting Jackson Blue Springs. The addition of a second cave system could add approximately \$0.05 million per year, while an improvement in access to the site could increase the annual consumer surplus by roughly \$0.025 million per year.

RECREATION AT FOUR SPRING SITES IN SUWANNEE RIVER BASIN, NORTH FLORIDA

Wu et al. (2018) examined the value that visitors derived from recreation at four spring sites located in north central Florida: Blue Springs (Madison County), Fanning Springs State Park, Ichetucknee Springs State Park, and Blue Springs (Gilchrist County, High Springs area). These springs offer a variety of recreational activities, such as tubing and scuba diving (at Ichetucknee Springs), snorkeling and underwater photography (at Blue Springs in Gilchrist County), kayaking and wildlife viewing (at Fanning Springs), and scuba diving and swimming (at Blue Springs in Madison County). Three of the springs are located in state parks (Ichetucknee, Fanning, and Blue Springs, Madison County), while Blue Springs (in Gilchrist County) was a private spring at the time of the study.

In 2016, following the travel cost method, visitors at these four sites were surveyed about their perception, the number of trips they make to the area, home zip codes, and socio-economic and demographic characteristics.

Analysis of the survey responses showed that the estimated average trip was valued at \$28.91 *per person per trip*, which is comparable to the estimates reported in the other studies reviewed above. Given an average expected trip frequency of 2.33 per person per year, the annual consumer surplus per person per year is \$67.36. Annual consumer surplus can be multiplied by the population of spring visitors to calculate total annual benefits. The total recreational value for these four springs was about \$25 million annually. The Ichetucknee Springs State Park is the most visited site of the four considered in this study (with 507 thousand day-visits in the fiscal year 2015–2016), and the total recreational value was approximately \$15 million annually. Fanning Springs State Park was also very popular (with 219 thousand day-visits in the fiscal year 2015–2016), and its total recreational value was estimated at \$6 million annually. The other two sites were visited by 78 thousand and 48 thousand, resulting in \$2 million and \$1 million in annual consumer surplus, respectively for Blue Springs (Gilchrist) and Blue Springs (Madison).

Note that these benefits are in addition to the impact of tourism on the regional economy. Specifically, in the fiscal year 2016–2017, Ichetucknee Springs State Park resulted in \$39.59 million in direct economic impact (FDEP 2017). Therefore, it is correct to say that according to the latest estimates, annually, Ichetucknee Springs State Park results in about \$40 million in direct economic impacts, and in addition, \$15 million in the value derived by recreational visitors that is not reflected in market transactions.

Similarly, Fanning Springs State Park had a direct economic impact of \$23 million in the fiscal year 2016–2017, and an additional estimated \$6 million in visitors' recreational value not reflected in market transactions. For Blue Springs State Park, the direct economic impact was \$4 million in the fiscal year 2016–2017 (FDEP 2017), and visitors' recreational value was \$1 million (Bi et al. 2018). Finally, for Blue Springs (Gilchrist), the latest economic impact estimate was produced by Borisova et al. (2014). The value-added was estimated at approximately \$2 million in the fiscal year 2012–2013, and based on Bi et al. (2018) the value derived by recreational visitors was also \$2 million annually.

Value Visitors Assign to Water-Based Recreation in Florida's National Forests

Two studies discussed above examine the value of recreational experiences in Florida's national forests: Shrestha et al. (2002) discussed spring-based recreation in the Ocala National Forest, and Shrestha et al. (2007) focused on recreation at five locations in the Apalachicola River Basin,

including the Apalachicola National Forest. Florida is home to three national forests, Apalachicola, Osceola, and Ocala National Forests, and they offer a variety of recreational experiences. While only relatively few Florida-based studies examined the value of freshwater-based recreational opportunities, studies conducted in other states can also help to infer the value for the sites not studied (i.e., benefit-transfer method).

Rosenberger et al. (2017) summarized studies published in 1958–2015 that examine the value of recreation in the National Forest System in various regions in the United States, as well as forest-based recreation in Canada. Fourteen recreational activity sets were examined, and three of them are freshwater-based recreation: freshwater fishing, motorized boating, and non-motorized boating. The southern region (or region eight of the USDA Forest System) encompasses 13 States, from Virginia to Florida and Oklahoma, as well as Puerto Rico. Analysis of studies conducted for different sites in the region showed that the average WTP for fishing, motorized boating, and non-motorized boating is \$70.98, \$57.83, and \$108.38 per person per day. The average for all the different activities that visitors are engaged in (e.g., backpacking, biking, camping, hiking, hunting, fishing, etc.) is \$66.70 per person per day for the southern region. Note that this value is close to the average estimated reported for the Apalachicola River Basin (that includes Apalachicola National Forest) in Shrestha et al. (2007), that is \$74.18 per visit-day. On the other hand, this value far exceeds the estimate reported for spring-based recreation in Ocala National Forest in Shrestha et al. (2002), which was from \$4.88 to \$17.45 per visitor per trip (where the trip can be longer than one day). As discussed above, this difference might be due to the differences in the estimation methods (contingent valuation method in Shrestha et al. [2002], as compared with the benefit-transfer method in Rosenberger et al. [2017]), the differences in the number of recreational sites included into the two studies, variation in visitation number from year to year, or inflation.

Application of the estimation steps suggested in Rosenberger et al. (2017) results in the following estimated consumer surplus of freshwater-based recreation in Florida's national forests: \$6.2 million for Ocala National Forest, \$0.6 million for Osceola National Forest, and \$0.3 million for Apalachicola National Forest (Table 1). Note that freshwater-based activities and related benefits are only a small fraction of the total consumer surplus provided by the three national forests, which attract many visitors for such activities as hunting, hiking, camping, and others.

Summary and Conclusion

This article reviews six Florida-based studies published in peer-reviewed academic journals that examine the value assigned to freshwater-based recreation by recreational tourists (i.e., the consumer surplus, or the value to visitors above the actual expenditure incurred for the recreation). Based on the available economic literature, recreational experiences discussed in this article are associated with sites in the Florida Panhandle (Apalachicola River Basin), north Florida (springs in Suwannee River Basin), central Florida (springs in Ocala National Forest), and east Florida (St. Johns River Basin). In addition, approximate values of freshwater-based recreation in the three national forests (Apalachicola, Osceola, and Ocala) are presented, estimated based on results reported in various studies conducted in the southern United States.

Overall, visitors' value of water-based recreational experiences in Florida is high, and this value, combined with estimates of recreation-related economic activities (such as visitor spending, direct economic impact, or value-added reported in *Economic Value of Florida Water Resources: Contributions of Tourism and Recreation to the Economy*) demonstrates the importance of investing in water-resource protection and restoration activities. For example, freshwater-based recreational activities in Florida's national forests are estimated to be valued at \$58 to \$108 per person per day. Cave diving in Florida springs can be valued as high as \$52 to \$83 per dive. Recreation in the St. Johns River Basin is valued at \$212 per household per year. These estimates are in addition to the benefits of increased regional economic activity caused by the increased demand for local goods and services due to tourists attracted to the region by the recreational sites.

Assuming the types of recreational visitors and the recreational activities they engage in are similar among the sites discussed in this article and the other freshwater-based recreational studies in Florida, information reported in this article could help approximate the value visitors derive from recreation at various locations in Florida. For example, the USDA Florida Park Service (2017) states that the average WTP for fishing, motorized boating, and non-motorized boating is \$70.98, \$57.83, and \$108.38 per person per day, based on the studies conducted in various states of the southern United States. These values could be applied to get an approximate value of similar activities in different locations in Florida, for which statistics on the total number of day-visits per year are available. Similarly, Bi et al. (2018) estimated the average value of a trip to four spring sites in the Suwannee River Basin is \$28.91 per

person per trip, and this estimate could be combined with visitation statistics to approximately assess the value of visitors' recreation experiences at other (similar) springs in Florida.

Note that improvements in site conditions can further increase the value derived by the visitors. The springs in the Ocala National Forest could double or triple their visitors' WTP if site facilities are improved. For diving in Jackson Blue springs, increased access to the cave system can increase the economic value of recreation to the visitors by roughly 10 percent, while an additional 5 percent increase in the value can be achieved by improving access to the location. These studies suggest that improvements in water quality and restoration of the water flow in rivers, springs, and lakes could also increase the recreational value. Even though no direct measurements of the increased value are available from the Florida-based studies, Nguyen (2017) found a negative correlation between the visitors' perceptions of the spring sites and nitrogen concentration measurements, indicating that pollution loading can negatively impact the recreational experiences.

It is also important to note that estimates of recreational values from various studies vary significantly. The difference could be due to the use of different methods, the focus on slightly different recreational experiences, variations in visitation from year to year, or changes in the economy over time (such as inflation). While the differences in estimates can be confusing, they are typical for any scientific analysis. For example, results of different models predicting the path a hurricane will take can differ significantly; all these results ultimately reflect the fact that the hurricane's course could be altered by a variety of unpredictable factors. Using multiple models helps to improve the accuracy of the forecast by pointing out the potential paths on which most of the models agree. The differences in the estimates of recreational values point to the need to conduct more studies to help resolve part of the uncertainty and to monitor changes in the visitation and the value over time.

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Table 1. Estimated economic benefits from Florida’s three National Forests*.

National Forest	Total Estimated Visits in 2016 (1000s)	Main recreational activities in the forest	Estimated Economic Benefits in 2016 (thousand dollars)				
			Fishing	Motorized boating activities	Non-motorized boating activities	Total for fishing, and motorized and non-motorized boating	Total for all activities (water- and land-based)
Ocala	646	Relaxing, hiking, walking	655.70	179.32	5,377.04	6,212.05	54,275.54
Osceola	142	Hunting, driving for pleasure, camping	410.22	206.94	18.47	635.63	11,280.50
Apalachicola	183	Hunting	171.46	0.0	119.00	290.46	15,622.38

* Assessed using the national forests’ visitation statistics available in USDA Forest Service (2018), and coefficients suggested in Rosenberger et al. (2017).