

An Estimated Economic Value for the Audubon Sabal Palm Sanctuary

Gary McBryde*

Department of Agronomy and Resource Sciences, Texas A&M University-Kingsville,
Kingsville, TX 78363

ABSTRACT

The Audubon Sabal Palm Sanctuary near Brownsville, Texas, is recognized by bird watchers as a site to observe a large number of uncommon birds. The uniqueness of the birds and vegetation, mild winters, and easy access to an international airport and modern resort facilities attract bird watchers from all over the world. A technique to value recreation sites is the aggregate travel cost method. The method estimates economic value based on what visitors pay to travel to the site. Preliminary data on the total number of visitors, their origins, and party size were obtained from guest book registry at the sanctuary for 1990. Additional visitor characteristics were collected from a questionnaire administered to visitors in 1991. Results show visitors spend an average of \$443.10 to travel to the sanctuary. On the basis of total visitors, the sanctuary generates \$1.28 million per year. These results were compared to other recreational activities to contrast the value generated by bird watching. The estimated value and the number of visitors at other bird-watching sites in the region (such as Laguna Atascosa National Wildlife Refuge) suggest the need for additional studies to document more completely the value of non-game wildlife in the region.

KEYWORDS: bird watching, travel cost method

The 197-acre Audubon Sabal Palm Sanctuary adjacent to the Rio Grande near Brownsville, Texas, preserves a remnant plant community dominated by sabal palm (*Sabal texana*) trees that reach heights of 35-40 ft. The semi-tropical vegetation provides habitat for a number of rare vertebrates including the lesser yellow bat (*Lasirus ega*), hooded oriole (*Icterus cucullatus*), and northern cat-eyed snake (*Leptodeira septentrionalis*) (Jahrsdoerfer and Leslie, 1988). Consistent sightings of the buff-bellied hummingbird (*Amazilla yucatanensis*) and occasional sightings of the gray-crowned yellow-throat warbler (*Geothypis poliocephala*) on the sanctuary attract bird watchers seeking to add these species to their list of sighted birds (Farmer, 1991). Complimenting these species, which act as star attractions, are well documented descriptions of a wide variety of additional birds endemic to the Lower Rio Grande Valley.

The abundant information available serves to inform or alert bird watchers about the number and kinds of birds at the sanctuary. Just as the seriousness that bird watchers bring to their sport is wide, so is the documentation about the sport. Technical descriptions of the sanctuary for serious bird watchers exist in Oberholser

*Corresponding author.

(1974) and in Holt (1992). A telephone network maintained by the American Bird Association alerts bird watchers throughout the U.S. and internationally of rare bird sightings at the sanctuary (Pencelli, 1991). Articles such as Hodge (1992) publicize the sanctuary to the serious and casual nature enthusiast alike. Together, these documents have made the sanctuary a regular stop on the travel itinerary of serious bird watchers and a site that the more casual will learn about quickly.

Because visitors to the sanctuary accrue travel costs and give up other options, such as continuing to work and earning money when they make a choice to visit the sanctuary, an economic value can be estimated for the sanctuary. Goods or services that have economic value, but that are not directly valued through market exchange, are called non-market goods and services. Examples include clean air and water and recreation related to non-game wildlife, in particular, bird watching. Because the value of bird watching is not established through a market exchange, its economic value is not directly observable. In order to determine how much economic value the sanctuary generates, I estimated the average cost associated with a visit to the sanctuary using the travel cost method. Associated with estimating the trip cost, it was necessary to collect demographic data on site visitors. Because no descriptions of site visitors exist in the literature, this data was analyzed to give a brief description of the characteristics of site visitors. Several findings indicate most site visitors do not fit the stereotypical image of someone over-wintering in south Texas to escape a cold northern climate. The description should be useful to economists interested in describing the value of bird watching throughout the region rather than one site.

METHODS AND DATA

Economists have developed procedures for determining the economic value for different types of non-market items (Just et al., 1982; Crandall, 1992). One such procedure for valuing recreation sites is based on how much people spend to travel to an area. The method used in this analysis follows Rosenthal et al. (1984) and depends in part on the number of visitors and their origins. To derive an estimate of the value of the sanctuary, the travel cost method was applied to 1990 guest-book registration data. Guest registry that year (Farmer, 1991) showed 1,979 visitors (Figure 1).

When applying the aggregate travel cost method in this study, I assumed all visitors have similar demand preferences. Visitors must also originate from diverse locations. When a visitor has to travel farther to reach the site, their costs increase, and the quantity of visitors from distant sites decreases. This inverse relation between the cost and the number of visitors forms the basis for the estimation of a demand curve, which is used to establish the value generated by the sanctuary. The demand curve more generally represents the number of visitors to the site given any particular travel cost. Moreover, the area underneath the demand curve represents the sum of all visitors' willingness to pay to visit the site or the value of the resource.

Origins of travel were established using the following rules. All visitors from within Texas were assigned to the county of origin, and travel costs were based on the mileage from the county seat to the sanctuary. Visitors from outside Texas but in the U.S. were assigned the state of origin, and travel costs were based on the

mileage from the respective state capital to the sanctuary. Visitors outside the U.S. were assigned to the country of origin, and mileage was based on the distance from the capital of the country to the sanctuary.

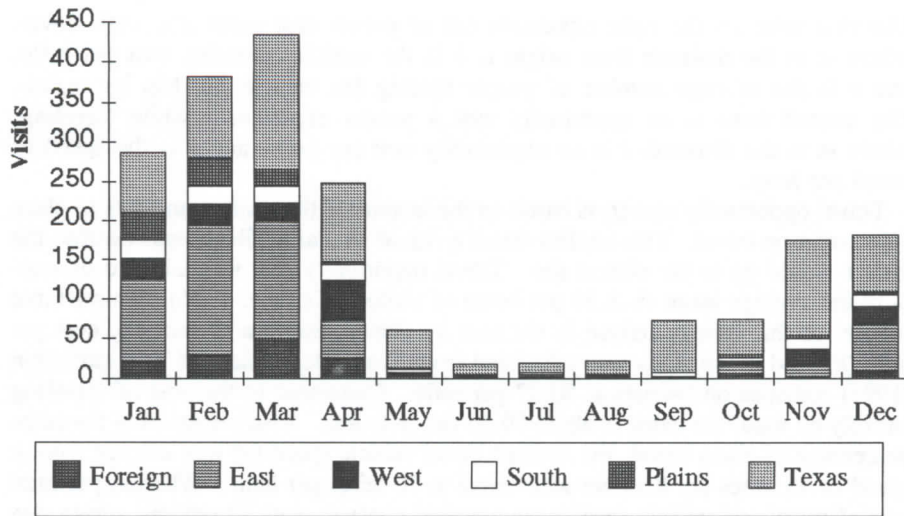


Figure 1. Visits registered in the 1990 guest book at the Audubon Sabal Palm Sanctuary near Brownsville, Texas, by geographic origin of visitor and month of visit.

Besides the actual cost of travel having an effect on the quantity of visitors arriving at the site from any particular origin, Rosenthal et al. (1984) lists several other variables that affect the number of visits. These include:

$$q_i = f(c_i, n_i, s_i, a, d_i)$$

where q_i is the quantity of visits from the i -th origin, c_i is the travel cost from the i -th origin, n_i is the population of the i -th origin, s_i is a measure of the substitutes for the site from the i -th origin, a is a measure of the site characteristics, and d_i is a measure of demographic characteristics for origin i such as income and education. In the estimation, population bias (total visits being larger from a higher populated region even though the two regions are the same distance from the site) was controlled by expressing total visits from any region as regional per capita visits or $r_i = q_i/n_i$.

Because the site represents an opportunity to observe several birds in a plant habitat that does not exist elsewhere in the U.S., the substitute term, s_i , was omitted.

Similarly, rather than try to establish a measure of overall sanctuary characteristics, the final demand estimate was thought to capture the effect of site characteristics on trip visits. A per person dollar cost of a round trip from the i -th origin was estimated based on the following relation:

$$c_i = (m_i * k)/e_i + (m_i * t)/v$$

The first term on the right represents out of pocket cost associated with travel, where m is the distance from origin i , k is the vehicle operating cost per mile, and e is the average number of people sharing the vehicle per trip by region. The second term is an opportunity cost a person experiences while traveling, where m is the distance, t is an opportunity cost per hour, and v is the speed of travel per hour.

Travel opportunity cost (t) is based on the income of the visitors and acts to place a deterrent on travel. This implies that if a site of similar attributes was nearby, the visitor would go to the closest site. Travel opportunity cost was taken to be one-third the average wage (\$18.30 per hour) of visitors (Cesario, 1976). Thirty-three percent of the visitors arrived in the area by plane. Because of this, the cost per mile (k) used in the study was calculated from Texas Department of Transportation (1991) statistics on tourists at \$0.17 per mile. Compared to the cost of traveling entirely by auto, the value is about \$0.10 per mile less. Also recognizing the large percentage of plane travel, the average travel vehicle speed (v) was inflated from a speed of 45 miles per hour for auto travel to 70 miles per hour. Whereas per mile cost of travel and vehicle speed were assumed constant over all regions, group size was calculated for each region based on guest registration data. Averaged across all origins, however, the average party size was 2.9 people.

The number of destinations or sites to visit per trip can also affect final results. If there are no side trips, then costs accrued by the visitor are all attributed to the value of the recreation site, otherwise a method for allocating costs among the various trip destinations needs specification. The method used by Haspell and Johnson (1982) was used to divide total trip cost by number of destinations. An average of 4 sites (all within a four county area) were visited while on the trip. Final model estimation and evaluation utilized linear regression analysis and numeric integration routines provided in RMTCM (Rosenthal et al., 1986).

Travel opportunity cost, cost per mile, vehicle speed, and average regional party size were determined based on summary information obtained by analyzing a questionnaire completed by 96 people in 1991. Additional analysis was made of the questionnaire data to explore percent frequencies and correlations between key visitor behaviors and their demographic characteristics. The correlations were calculated with commercial software (First Mark Technologies, 1990; Biggs et al., 1991). Reported correlations are significant at a 0.05 level.

RESULTS AND DISCUSSION

Frequency analysis of the questionnaire showed about 70% of the visitors were on their first visit, 20% had been once before, and the remainder had been twice or more. Seventy-four percent stated bird watching as their reason for visiting, and 64% belonged to a nature organization. Thirty-two percent of the visitors learned

of the sanctuary through travel guides, 22% through other refuge staff, and 19% through books. Considering visitor age, race, and income: 2% were less than 21 years old, 27% were between 21-40 years of age, 38% were between 41-55 years of age, and 33% were older than 55 years of age. Ninety percent listed themselves as Caucasian with the remaining 10% split evenly between Hispanic and an other category. Twenty-seven percent reported earning less than \$20 thousand, 31% earned between \$20-40 thousand, 24% between \$40-60, and 18% earned more than \$60 thousand.

Regarding travel arrangements, 57% made the decision to visit the site within the week prior to the excursion. Twenty-two percent had planned from a week to a month prior to their visit, and 21% had made travel arrangements 6 months prior to the trip. Thirty-three percent rented cars (the same as those traveling by air) and 45% of the visitors stayed in hotels. Fifty-six percent stayed in the region less than a week. In addition to the sanctuary, the most popular sites to visit while on the trip were the Santa Ana Refuge with 20% of the total side trips, 17% to the Laguna Atascosa Wildlife Refuge, 16% to Bentsen State Park, and 11% to South Padre Island.

Examining correlations between visitor characteristics, those earning higher incomes were most likely to belong to a nature organization. Repeat visitors were most likely to have traveled by plane; in fact, 30% of plane travelers had visited before. Travel size was most closely correlated to region of origin, and England produced the largest parties and most foreign visitors. Visitors indicating a return visit in the future indicated educational or bird watching as the reason. Those indicating bird watching as their reason for visiting were more likely to arrive in the area by plane or bus. Bird watchers and educational groups were most likely to have planned the current trip in advance. Hikers and the curious were the most spontaneous arrivals. Interestingly, those who had been to Bentsen State Park were most likely to have learned of the sanctuary through a book. There tended to be a high correlation between side trip visit sites. For example, those visiting Santa Ana Refuge tended to visit Laguna Atascosa refuge and Bentsen State Park.

The variable most closely linked to race was region of origin. All Mexican visitors indicated Hispanic. Within the U.S., the distinction between Hispanic and Caucasian was linked to the visitor's state of origin. Texas produced the most Hispanic visitors, and young visitors were most likely to be Hispanic. The mode of travel, private car versus rental car, was not unexpectedly linked to those who arrived by plane. Plane travelers were those most likely to rent cars. The length of stay was most closely linked to lodging the previous night. Visitors who stayed in hotels commonly stayed between 1-3 weeks. Travelers staying longer were most likely to have stayed in a recreational park and traveled by recreation vehicle. Out-of-state visitors tended to be more affluent, older, and on a trip averaging less than a week. This description suggests most visitors to the site are visiting for the intended purpose of bird watching. That a group of individuals is planning to visit the Valley area specifically for bird watching is important for regional policy planning.

Turning to the estimation of the travel cost model, several functional forms were estimated. A double log model with the natural log of per capita visits, r , a function of the natural log of the transformed costs, c , gave the best statistical results. Estimated coefficients and t-values (underneath) are:

$$\ln(r) = -4.85 - 1.11 * \ln(c)$$

(6.99) (9.29)

The overall fitness of the equation as indicated by the F value was 84.81, with 90 degrees of freedom. The estimated average cost per person per trip is \$443.10. The value can be converted to \$6,497 per acre per year of value generated by the sanctuary or \$1.28 million for the entire sanctuary. Moreover, the sanctuary is like any other productive asset that generates benefits not just this year, but next year, the year after, and so on. Assuming present benefits hold constant over the next 50 years and at a 7% interest rate, a net present value of \$17.6 million for the sanctuary is generated by visitors.

Frequently, studies report the value of trips as per person per day. At the sanctuary the visitor's length of stay is skewed toward short visits, 76% stayed on their trip for less than a week. This result makes the value of the trip close to the value of the per person per day expense for most visitors. Yet, a few visitors did stay for longer periods (over the winter). Adding these longer staying visitors into the equation creates a higher average length of stay (26.12 days), which yields a per person per day value of \$67.86.

Given the caveat that most visitors stay less than the average length of stay (implying a higher per person per day value than \$67.86), it is useful to compare the results to estimates obtained for hunting recreation. For example, deer hunting values have ranged between \$26.79 to \$114.61 per person per user day (Donnelly and Nelson 1986). Sorg and Nelson (1987) calculated a value of \$28.51 for waterfowl hunting in Idaho. McCollum et al. (1990) estimated a per trip value of \$170.79 for wildlife observation in Alaskan national forests and had a large percentage of visitors who traveled long distances. But, because the visitors stayed long periods, when converted to per person per day values, the values are relatively low at \$6.53.

When compared to other wildlife based recreation studies, the low range value of \$67.86 per person per day at the sanctuary is within the values obtained for other studies. Although the per person per trip value of \$443.10 is out of the range of the other studies, if it is assumed to be a more accurate measure of the per person per day cost of visiting the sanctuary, several characteristics of the sanctuary support a value that would be higher than the other studies. In particular, the large percentage of long distance travelers and limited, if any, sites where the birds at the sanctuary can be seen in a similar environment.

While the estimated value is thought to be an accurate estimate of the true value of the sanctuary, refinements in input data could be made such as assigning each region its own average travel cost and vehicle speed. Another aspect that should receive attention in future studies is the allocation of costs to side trips. Mendelson et al. (1992) review the problem and provide an application of an alternative model. The present study was meant to provide an initial measure for gauging the need for more in depth investigations. The relatively high estimated per trip value of \$443.10 needs additional corroboration.

Economic factors also suggest additional research. Although the total value generated by the sanctuary is not a value which contributes directly to the local economy (compared to tourist expenditures), it does contribute to overall economic value. Also, travel plans made by visitors at the sanctuary indicated the importance of three other locations within close proximity; Laguna Atascosa National Wildlife

Refuge, Santa Ana National Wildlife Refuge, and Bentsen State Park. A total of 793,371 visits were made to these areas in 1990. Extrapolating similar per trip values estimated from the sanctuary to these visits would yield a large economic value. Additional research should address the accuracy of such an extrapolation. Also, the Texas Department of Commerce (1991) ranked Cameron County, which contains the sanctuary, Laguna Atascosa Refuge, and the resort at South Padre Island, as tenth in capturing tourist expenditures in Texas. Another area research should focus on is the role bird watching plays in generating tourism dollars in the Valley area. If bird watchers to all the sites in the region share demographic characteristics as those visiting the site, then they may be adding a significant value to the local economy through tourist expenditures such as car rental, hotels and restaurants.

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