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**AN EVALUATION OF TRAFFIC
COUNTS USED FOR ESTIMATING
RECREATION VISITATION:
A Case Study of Jekyll Island State Park, Georgia**

A RECREATION Research Report in the IRIS Series¹

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Introduction

This paper is a case study of methods used to estimate recreation use of a public recreation area, i.e., Jekyll Island. An interesting and important discussion has been occurring for the past year over the direction of trend in annual visitation to Jekyll Island State Park, GA. The discussion has been interesting because it touches on a topic of long-standing interest to the authors of this paper, that is, methods for monitoring public land visitation. The discussion is important because a multi-million dollar proposal for accelerated development on Jekyll Island is in part being justified on the basis of one interpretation of the 20-year trend in the island's visitation, i.e., that visitation has been declining.

Visitation to the Island is based on records of incoming visitor traffic. Currently, there are two sources of year-to-year traffic counts for Jekyll Island. One source is the Georgia Department of Transportation (GA DOT) and their traffic monitoring system which provides estimates of traffic volume on most roads across the state, both major highways and local roads, such as the Causeway onto Jekyll Island. The other source is traffic monitoring by the Jekyll Island Authority (JIA), which occurs at the entrance to the state park. This traffic monitoring is basically a cumulative count of vehicles stopping to pay the entrance fee to this state park.

Knowing market trends, in this case recreation visitation, as accurately and as reliably as is possible is fundamental to sound business decision making. In the case of Jekyll Island, a development proposal has been adopted by the JIA that is estimated to cost the developer \$350 million. The state through the JIA is providing a subsidy in the form of revenue bonds in the amount of \$84.5 million. Thus, the total investment of the proposed project is \$434.5 million. Such large investments of both private capital and state revenue bonds must be based on sound analysis. Sound investment planning means a thorough and objective analysis of the market which is to be served. It also means sound projections of total business operating costs, revenues from sales, and net profits.

Key to understanding potential profits from a development project is understanding trends in and the potential market for the facilities and services of that project. Errors of understanding the market and market trends can seriously compromise investment and financial support decisions, including use of government financial incentives. For Jekyll Island, the debate is precisely about understanding historic and recent visitation trends. A recreation visit is defined universally as a person entering a place for the purpose of participating in one or more recreation activities (including just relaxation). A visit can be for any amount of time up to the time of departure from that place. Very different interpretations of traffic flow records have led to very different interpretations of recreation visitation trends from the 1980s to now. It is important to note these interpretive differences because they have huge implications for the future of Jekyll Island. We examine the data and methods used to derive visitation estimates.

Traffic Counts are the Basis for Estimating Visitation

Technology for estimating visitation has existed for many years. And while the technology of counting devices and of remote sensing have improved dramatically, the use of traffic flow monitoring for estimating recreation visitation has hardly changed at all. This technology has long been well known in the federal and state public land management systems, and among these systems' professionals. An excellent example of this early technology is a paper written by George A. James in 1968 (James, George A.; Henley, Robert K. 1968. Sampling procedures for estimating mass and dispersed types of recreation use on large areas. Res. Paper SE-31. Asheville, NC: Southeastern Forest Experiment Station, Forest Service, U.S. Department of Agriculture; 15 p.)

Examined here are the only two known sources of annual traffic count data for Jekyll Island. The Jekyll Island internal traffic count records (actually number of paying vehicles) have been cited as the primary basis used by the JIA for estimating visitation. From these estimated visitation numbers, the JIA has noted an apparent decline in visitation of 47 percent in recent years. This assumed decline has been cited as the primary justification for the proposed development as described below:

"Linger Longer (the private developer contracted for development) proposes the creation of a new Jekyll Island Village as a unique coastal conservation community with an active and vibrant Village center that provides amenities, services and entertainment for visitors. The Village would include a new convention center, three hotels, condominiums, vacation ownership properties, a commercial center and a unique arrangement of parks and other public spaces. The company believes that Jekyll (Island State Park) needs a significant concentration of new facilities and hotels in order to provide a sense of excitement and a "jumpstart" to new visitation for the island. The mix of hotels, condos, and vacation ownership properties will also help boost and stabilize visitation across all seasons of the year" (www.jekyllislandauthority.org/LingerLongerPlan).

The above cited emphasis on visitation (as associated with "jump starting") is the primary interest of this paper. An attempt is made to better understand the reported downward trend in recreation visitation of 47 percent in recent years. This reported downward trend has been cited as the main justification for the proposed new development. This reported trend is based on records of number of vehicles stopping at the park entrance to pay the entrance fee. Computation of visitation for the Jekyll Island State Park is simply multiplication of vehicle count by a constant. That constant is assumed number of visitors per vehicle, which since the early 1980s has been 3.46. The Jekyll Island Authority has been contacted to obtain documentation of the origins of the constant, 3.46.

Recreation visitors are required to pay a \$3 fee for entrance. This fee is a per-visit entrance fee and does not require payment on a daily basis. The fee has been increased over time from \$1 to \$2, and finally now to \$3 per vehicle per visit. A windshield decal is issued to assumed non-recreation visitors, such as residents, service or delivery personnel, business commuters, etc. Although, it should be noted, many of these "non-recreation visitors" likely do participate in recreational activities during their stay on the island. It is known that visitors coming to the island for an extended stay usually purchase an annual pass to avoid paying each time they reenter the park.

An independent traffic monitoring system is provided by the GA DOT. This traffic counting provides an opportunity to compare an independent traffic count source with the Jekyll Island entrance fee counts. The GA DOT data and methods for monitoring and reporting traffic flows can be found at:

http://www.dot.state.ga.us/DOT/plan-prog/transportation_data/traffic_counts.pdf.

Generally, the GA DOT maintains permanently installed and constantly operating counters on major highways throughout the state. As well, the GA DOT maintains a system of roving traffic counters (typically pneumatic tube counters across the roadway) whereby traffic for each identified roadway is sampled. There are currently about 1,000 portable traffic collection devices which are installed on a rotational basis at approximately 17,000 sites each year to count and classify traffic. A series of adjustment factors are used to provide an Average Annual Daily Traffic (AADT) flow estimate. An example factor is an adjustment for vehicles with more than two axles. Vehicles with trailers have more than two axles. One of the GA DOT roving counters has historically been located on the Jekyll Island Causeway at varying times including winter and summer seasons most years.

The JIA's estimates of traffic flow are reported as annual incoming total vehicle counts. Reported traffic flows dating back to 1984 can be found in Appendix A to a document prepared by the JIA entitled "Developing a Visitor Impact Study for Jekyll Island" (Hunter and Frangiamore, October, 2007). The footnote to this Appendix table identifies the 3.46 constant used to transform traffic counts to visitation estimates. Full documentation of methods for obtaining and monitoring traffic counts at the Jekyll Island State Park entrance going back to the 1980s and 1990s have not been located, but a formal request for this documentation has been submitted.

Methods

The GA DOT traffic count estimates for the years 1990 to 2007 were obtained directly from the official DOT web site for traffic monitoring station No. 136, which is usually located on the Causeway to the Island to provide a 24-48-hour count of land vehicles coming onto the Island. These data represent AADT for two-way traffic onto and off of the Island. For this paper's analysis, these AADT vehicle counts were divided by two as the means for converting them to one-way average daily count comparable to the JIA counts (assuming traffic onto the Island over a year's time equals traffic off the Island). The DOT counts include both per-visit and annual pass vehicles. JIA annual traffic count data is only 1-way and is reported as annual total number of Per-visit paying vehicles entering the Island. To make the JIA traffic flow data comparable to the GA DOT traffic counts, the JIA total annual estimates were divided by 365 to convert them to an equivalent daily average. Thus both the JIA and GA DOT traffic counts were expressed as the average daily number of incoming vehicles per year.

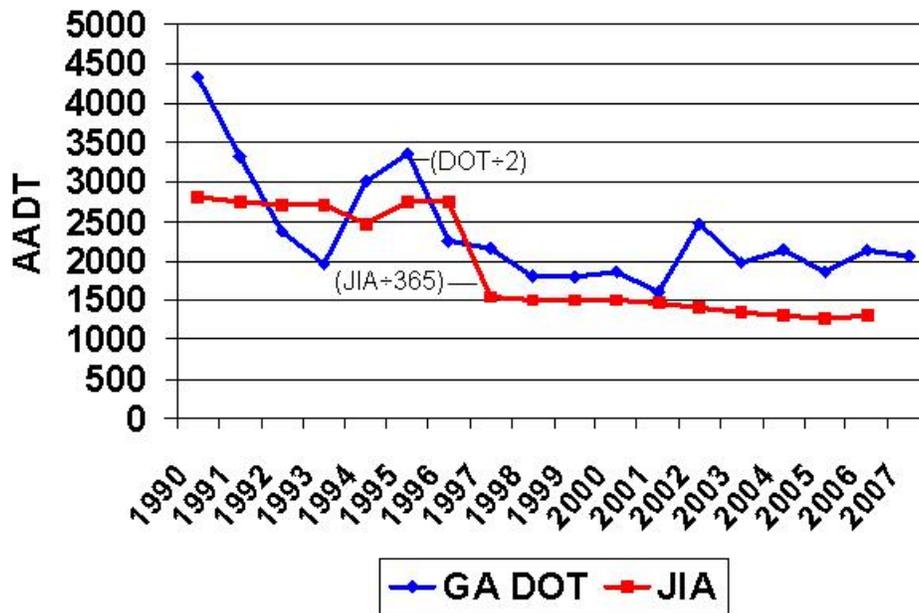
The GA DOT data records were coded to identify time of the year that traffic flow sampling occurred (winter, spring and summer indicating on-season versus off-season) and to identify the years in which sampling did or did not occur. In some years, an actual traffic monitoring station was not installed, so an approximation of traffic flow based on recent data was used.

Thus, comparable AADT estimates from these two sources, i.e., JIA and GA DOT, were aligned for comparison. Trends in these two independent sources of traffic trend data were compared using line graphs for annual traffic recorded across the years 1990 to 2006, including 2007 as available. Trends from these two sources were also compared after GA DOT data were adjusted to show what their traffic counts would have been if all counts and estimates had been based on spring-summer-fall season sampling, the "on" season, and had been based on an actual sample with counting device installed.

Results

Comparable one-way AADT counts from each of the two traffic count sources for Jekyll Island are shown in Figure 1. These are the data as reported without any adjustment. The GA DOT estimates of AADT (blue line) are erratic because sampling occurred at different times of the year and because no traffic sampling occurred in some years. This is typically the behavior of traffic data when sampling timing and method are inconsistent across sampling periods.

Figure 1. -- Comparison of average annual one-way daily traffic counts for Jekyll Island

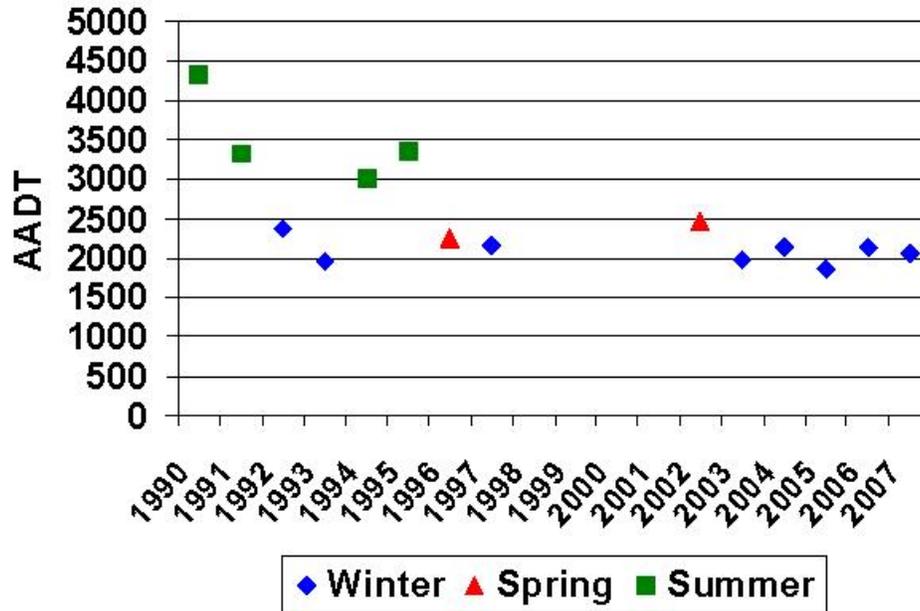


Sources: Georgia Department of Transportation (GA DOT) and Jekyll Island Authority (JIA). GA DOT provides data as 2-way traffic. These counts were divided by 2.

Figure 2 color codes the years during which GA DOT actual traffic counting devices were installed during the winter (blue), spring (red), and summer (green). This illustrates the very large influence of time of year of sampling on AADT estimates. In 1992, 1993, 1996, 1997, and 2003 - 2006, the temporary traffic counting device was set up in February and March, in the "off-season", when traffic flows were low relative to the late spring, summer and early-fall high visitation season. Note in Figure 1 the extreme drop off of the AADT for 1992 and 1993. This is the result of traffic flow sampling having

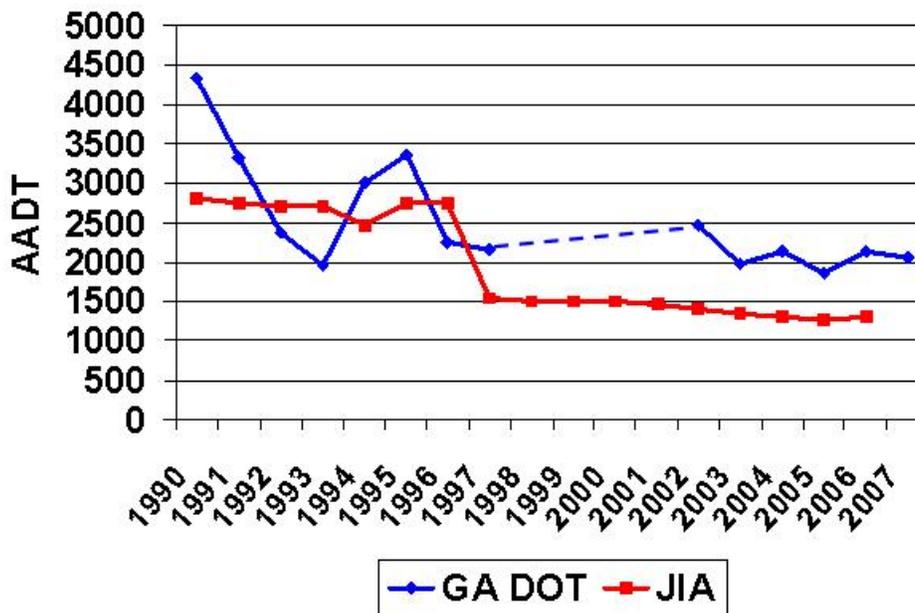
occurred in February instead of May through October. Note also in Figure 1 the low AADT estimates for 2003 through 2006. These low counts were the result of traffic sampling occurring in February and March, the off season. In the years 1998 through 2001 and in 2007, no actual traffic counting device was set up, indicating that AADT estimates for those years were assumed, not measured.

Figure 2. – GA DOT annual one-way daily traffic counts for Jekyll Island by survey season using only actual traffic count years (DOT numbers in years traffic counters not installed are omitted.)



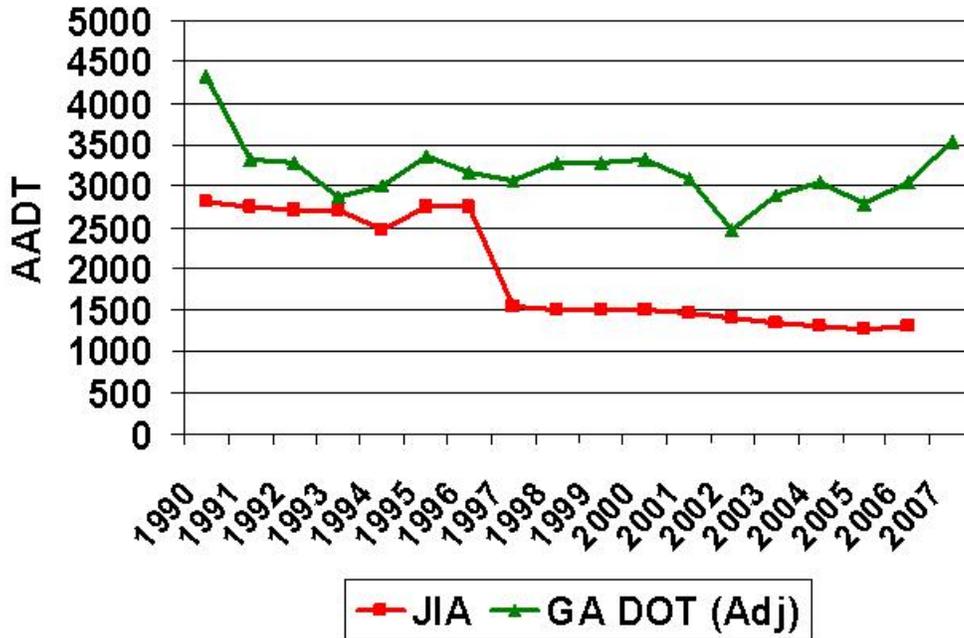
A revised line graph for the GA DOT AADT records is shown in Figure 3 as a modified blue line across the years. The plotting of DOT records is the same as in Figure 1, except that the assumed rather than measured AADT estimates are eliminated, i.e., 1998 to 2001. Instead, a dashed blue line is inserted to connect the AADT measured estimate for 1997 to that of the measured estimate for 2002. The dashed blue line is a reasonable approximation of the true trend for GA DOT AADT estimates between 1997 and 2002. Traffic flows from year to year do not tend to fluctuate to the degree shown for the original DOT trend (blue line) in Figure 1. Thus adjusted, the GA DOT estimates for 1996 to 2006 show a relatively flat AADT trend from 1996 to 2007. This suggested the need for a further analytical step. The JIA red line trend is the same as shown in Figure 1.

Figure 3. -- Comparison of average annual one-way daily traffic counts for Jekyll Island using only actual traffic count years (DOT numbers in years traffic counters not installed are omitted.)



The next part of this analysis was to estimate what the GA DOT AADT data trend would likely have been had the sampling of traffic occurred in the "on-season," between May 1 and October 30. This is the heaviest visitation time of the year and the correct time for sampling the majority of year-long visitation. Ideally, traffic monitoring should occur in the same season, if not the same month every year. Even more ideally, some sampling should occur in every season of the year. Figure 4 shows two lines of data representing the next stage of the analysis. Shown are lines color coded red (the JIA original divided by 365) and an adjusted GA DOT line, green.

Figure 4. -- Comparison of average annual one-way daily traffic counts for Jekyll Island showing JIA and GA DOT traffic counts adjusted to show what they would have been if taken in primary use season--May through October



This adjusted green GA DOT traffic flow line is based on calculation of the average difference between GA DOT AADT estimates that were based on actual traffic sampling during the Jekyll use season (May through October) and estimates of traffic flow based on sampling taken in the off season (November through March). This involved the years 1992, 1993, 1996, 1997, and 2003 - 2006. The average estimate for AADT for years when traffic sampling occurred in the use season was 5,122 vehicles. The average AADT for years when sampling occurred in the off season was 4,204. The difference ($5,122 - 4,204 = 918$) was added to AADT estimates derived from off-season traffic sampling for the above cited years.

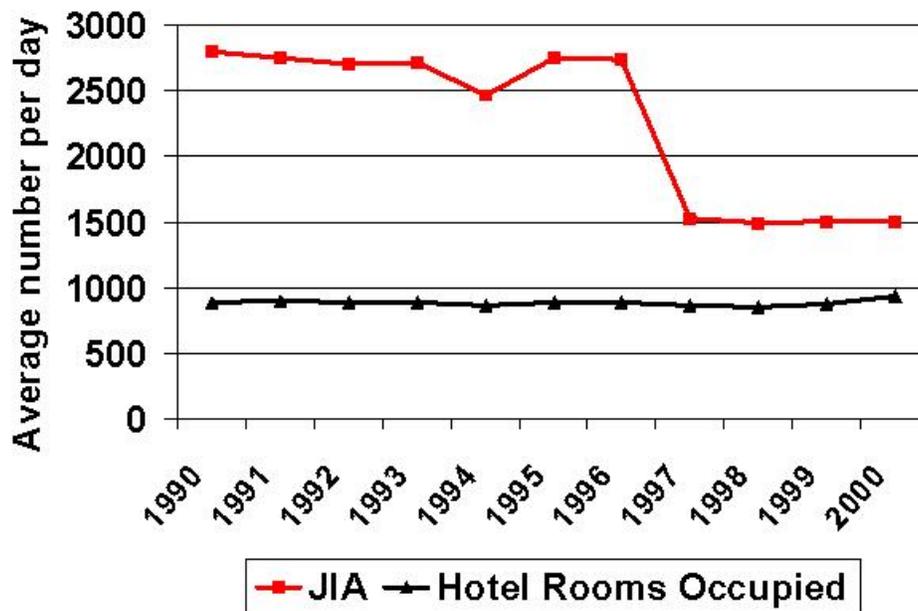
For the years when no actual traffic sampling occurred, 1998 - 2001, the GA DOT reported daily traffic was 3,646. The difference between true use season average AADT and the assumed AADT in years when sampling did not occur was $5,122 - 3,646 = 1,476$. This difference was added to the estimates of AADT for the non-sampled years noted above. The result from adding back what appears to be underestimates of AADT as provided by the GA DOT as a result of using off-season sampling and also not sampling traffic at all is the green line in Figure 4.

Except for a low estimate for 2002, which was a June traffic sample year, the green trend line indicates a relatively stable, naturally cycling trend line of AADT onto Jekyll Island. In contrast, the red JIA estimates of AADT show a precipitous drop between the years 1996 and 1997. Consultation with the JIA did not reveal knowledge or documentation of

how this data anomaly occurred. It is rare, however, barring road closure, a natural catastrophe or other threat, that traffic and visitation to a well known and established state park would drop by over 44 percent in a single year, accounting for most of the reported 47 percent drop in visitation. It is a relatively safe assumption that something about the JIA method of counting and estimating visitation changed between 1996 and 1997.

As a final step in this analysis, average daily traffic count data for entering vehicles paying entrance fees, as recorded by the JIA, was compared with average number of hotel rooms occupied, including the years in which the precipitous drop in Jekyll Island visitation was recorded, 1996 to 1997 (See Figure 5). In Figure 5 the red line is the same as in all figures, i.e., the original JIA annual traffic count converted to a daily average (AADT). The black line in Figure 5 shows average daily number of hotel rooms occupied by guests for each year from 1990 to 2000. The assumption is that a sharp, 44-percent decline in visitation to the Island would be reflected in the number of rooms occupied by Island visitors. Between 1990 and 2000, daily number of rooms occupied varied between a low of 852 in 1998 and a high of 936 in 2000. There was very little perceptible variation from year to year in daily room rentals. In 1996, the year before the reported precipitous drop in visitation, daily hotel rooms rented was 889. In 1997, the year of the drop in reported visitation, hotel rooms rented numbered 862--three percent lower than in 1997. In 2000, hotel room rentals were above both the 1996 and 1997 levels, at 936 per day. This is a five percent rise over the 1996 level. Hotel room occupancy has declined in the last few years because three of the Island's hotels have been demolished and not yet rebuilt.

Figure 5. -- Average number of entering vehicles (JIA original traffic data) and average number of hotel rooms occupied at Jekyll Island State Park, 1990 - 2000



Conclusion

A comparison of GA DOT and JIA estimates of one-way annual average daily traffic flows onto Jekyll Island for the years 1990 through 2006 demonstrates the importance of careful sampling design, estimation method and reporting. Low estimates of traffic onto Jekyll Island, as provided by the GA DOT for some years, were adjusted to account for traffic sampling in the off-season and for absence of sampling in some years. Thus adjusted, the DOT reports of average annual daily traffic divided by two represent one-way traffic onto the Island. Dividing the JIA traffic reports by 365 puts these traffic count data on a basis comparable with that of the GA DOT, i.e., converts them to an average daily number. Comparison of seasonally adjusted GA DOT daily traffic data and reported JIA daily data shows a discrepancy in traffic trend. The adjusted GA DOT daily average across the years 1990 to 2007 do not validate the reported precipitous drop shown in the JIA data between 1996 and 1997. Based on adjusted GA DOT estimates of AADT, the traffic and visitation trend from 1991 to present has been relatively stable, neither increasing nor decreasing. Further testing of the reported decline in visitation was accomplished by comparing the trend in daily number of hotel rooms occupied for the years 1990 to 2000 with the JIA daily traffic count for those same years. Hotel rooms occupied across these years varied very little and like the GA DOT traffic data, failed to substantiate the reported visitation decline.

The conclusion from this analysis is that the method of traffic counting, and therefore the basis for estimating visitation, changed substantially for some reason between 1996 and 1997. One possibility is that accounting for annual passes (displayed as windshield decals) changed at that time and were no longer counted. Annual passes can be purchased by anyone, including visitors who are visiting for extended periods. If a visiting party intends to stay for an extended time, purchasing an annual pass is less expensive than paying for a pass on a per-visit basis. Some as yet undocumented change in counting procedure obviously did occur to result in a 44 percent drop in recorded traffic flow in just one year. GA DOT records for other roadways and destinations do not reflect such dramatic changes in traffic flows, unless a particular roadway was closed for long periods during the count period or there had been a major catastrophic event.

Before further substantial investment into the proposed beachside development on Jekyll Island, a deeper examination of the Island's visitation trend, and therefore the market demand trend, appears warranted. Needed is a more rigorous, valid, reliable and documented method for estimating visitation to Jekyll Island. For example, the origins of the 3.46 persons per vehicle constant used as a multiplier to convert traffic counts to visitation are undocumented and apparently unknown. A relatively simple monitoring system (e.g., using volunteers, involving local universities, etc) could be set-up and initiated within a few months that would provide valid and reliable estimates of visitation. Such a system would not only improve estimates of numbers of visitors coming through and paying the per-visit fee, but also would include long-term visitors who purchase an annual pass and do not now get counted as visitors. This category of visitor may be as large in number as 30 to 35 percent of short-term pass visitors on the basis of equivalent

length of stay. This would suggest that visitation to Jekyll Island may not have declined, but in fact may have increased over time.

Implications

Obtaining valid, reliable and documented estimates of visitation to support decisions important to the stakeholders, taxpayers, managers and users is important for any publicly owned area. Not only are they important, they are critical, and required. For our case study, Jekyll Island, the use of inconsistent traffic flow monitoring data has resulted in flawed visitation estimates over time. This has led to misunderstanding of long-term visitation trends and proposals inconsistent with long-term market demand trends. Concerned in this misunderstanding are multiple stakeholders whose interests are what make that state park important. These include, for example, local Jekyll users, Island service providers, bird and sea turtle conservationists, historic district interests, hotel and restaurant businesses, outfitter and rental service providers, the fishing industry, 4-H campers, and many others. Management and stewardship of the Island can benefit from better visitation trend data. Among the benefits would be improvement in ability to evaluate investment and management alternatives. Providing more valid and reliable estimates of visitation to any publicly-owned area leads to increased credibility with all stakeholders. This study of Jekyll Island's traffic and visitation trend data is an important case example of how well- and long-known visitation monitoring technology can be applied for the benefit of the citizen owners of public lands.