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## IV. STUDY RESULTS – SURVEY OUTCOMES

A variety of surveys and bicycle traffic counts were conducted in the northern Outer Banks region, which was chosen for this study based on known bicycling in the area and the presence of bicycle facilities. (See Table 3 for a list and description of facilities used in this study.) The surveys and bicycle traffic counts may be broken down into four parts in order to study this bicycling activity:

- **Intercept surveys** were conducted by interviewers who stopped bicyclists riding by three survey locations from July 30 to August 1, 2003. Questions were intended to develop a “profile” of bicyclists and their perceptions of the quality of cycling in the area. The cyclists surveyed were both visitors to the area and local residents. A limited number of these surveys were also made available at two local bicycle shops. (Respondents who filled out an intercept survey are generally referred to as either *Intercepted Visitor Cyclists*, or *Intercepted Resident Cyclists*.)



Example of a Survey Station intended to intercept both visiting and residential cyclists. Photo courtesy NCDOT

- **Self-administered surveys** aimed at general visitors (cycling and non-cycling) were made available at three visitor centers in the area, primarily to find out what proportion of respondents engaged in some bicycling activity while in the area. They were collected on-site in Manteo and Southern Shores and could be mailed back over a six-week period from July to September 2003. (These respondents are generally referred to as either *Visitor Center Cyclists*, or *Visitor Center Non-Cyclists*.)
- **Mail-back surveys** were sent to the owners or managers of Bed and Breakfast and campground establishments and were made available to their guests.
- **Pneumatic tube counters** were placed on bicycle facilities at eleven locations (off-road paths and wide paved shoulders) to physically count users of the facilities over a period of one week from July 29 to August 4, 2003.

The results of these surveys and counts are discussed below. More details on the survey methodology can be found in Appendix B (page 49). Through each method of data-collection, a certain number of respondents were attained. Non-response information was not collected for comparison, but total response numbers are listed below. Although these numbers represent how many people returned a survey, note that each respondent did not necessarily answer all the questions. This form of non-response was tracked, and unanswered questions are not reflected in the charts and graphs following.

**Table 4. Respondent types and total surveys collected from each type.**

Respondent Type	Total
Intercepted Respondents (Visitors and Residents)	173
Visitor Center Respondents (Cyclists and Non-cyclists)	392

## Intercept Survey Respondents

A key part of the Economic Impact Analysis was to develop a “profile” of visitors actually using bicycle facilities in the area. This was accomplished by conducting “intercept” surveys of bicyclists at three locations adjacent to bicycle facilities over a period of 2½ days (two of the locations were in Duck, one was in Nags Head, as shown in the detailed maps in Appendix A on page 45.)

The questions covered such topics as the size of the travel party, the amount of bicycling done, perceptions of the quality of cycling in the area, and how much was spent while on the trip. A copy of the questionnaire is included in Appendix G (page 71).

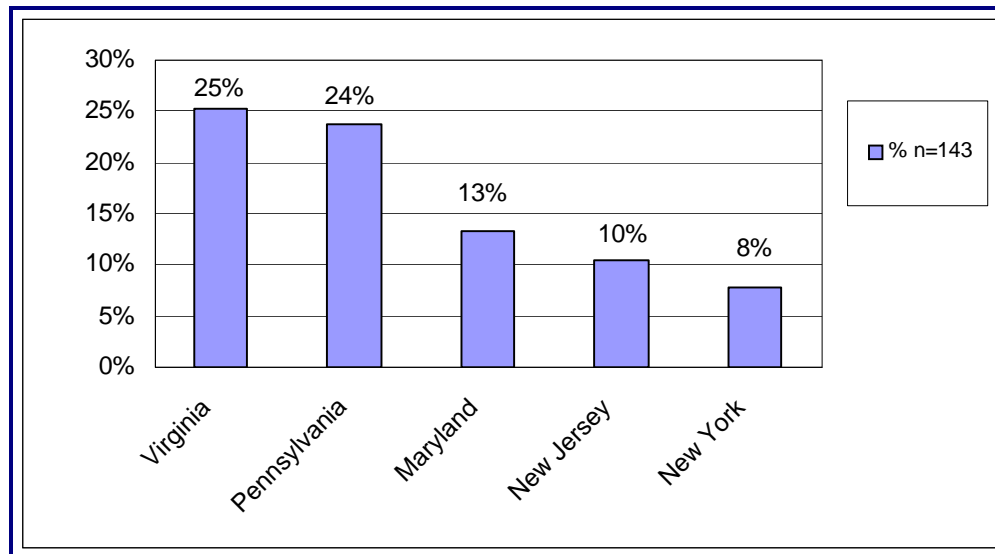
Although the focus of the intercept survey was on visiting cyclists, local residents using the facilities were also surveyed. (See the Intercepted Resident Cyclist Survey on page 74.) It was recognized that even though residents don’t figure into an Economic Impact Analysis, the availability of bicycling facilities also benefits them. A summary of the survey responses by residents can be found in Appendix D (page 59).

Following are the findings from the intercept surveys of visitors.

### Demographics

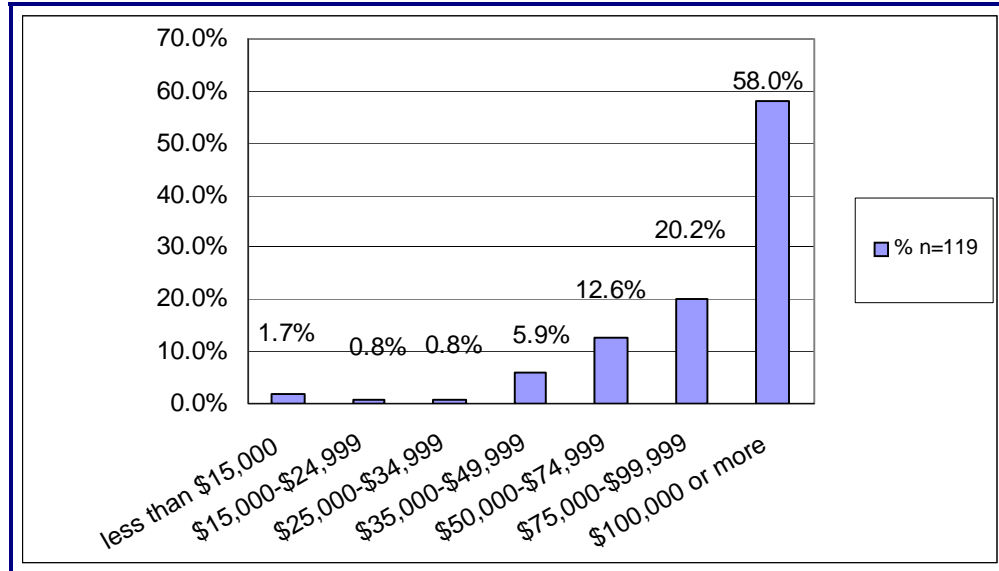
About 80 percent of domestic Intercepted Visitor Cyclists came from the five states shown in Figure 1. Only three percent of Intercepted Visitor Cyclists came from North Carolina. The origins of the remaining domestic visitors are scattered throughout the U.S. Six cycling visitors (about four percent of total respondents) came from the countries of Scotland, the Czech Republic, Lithuania, Turkey and Poland. (Because all of the foreign visitors came for work purposes, not tourism, they were not included in the analysis.)

**Figure 1. Intercepted Visitor Cyclists: top five states of origin.**



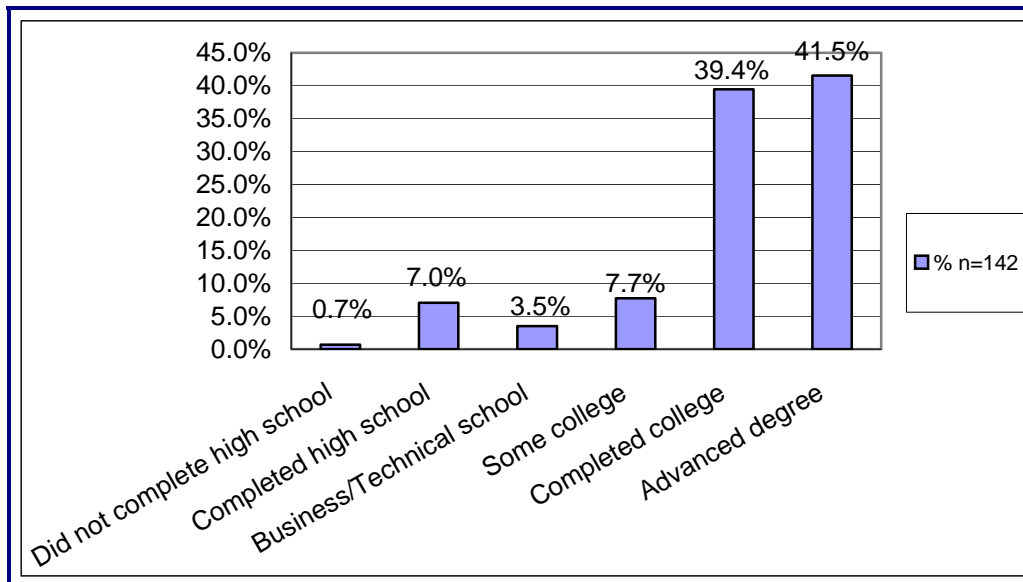
As shown in other research, bicyclists tend to be relatively affluent and well educated. The household income of intercept survey respondents visiting the northern Outer Banks is shown in Figure 2. Seventy-eight percent of the respondents indicated that they have household incomes of \$75,000 or more.

**Figure 2. Intercepted Visitor Cyclists: household income.**



The education level of respondents is also quite high. As shown in Figure 3, 81 percent have earned a college degree. Forty-two percent have an advanced degree.

**Figure 3. Intercepted Visitor Cyclists: education levels.**



Other demographic highlights include:

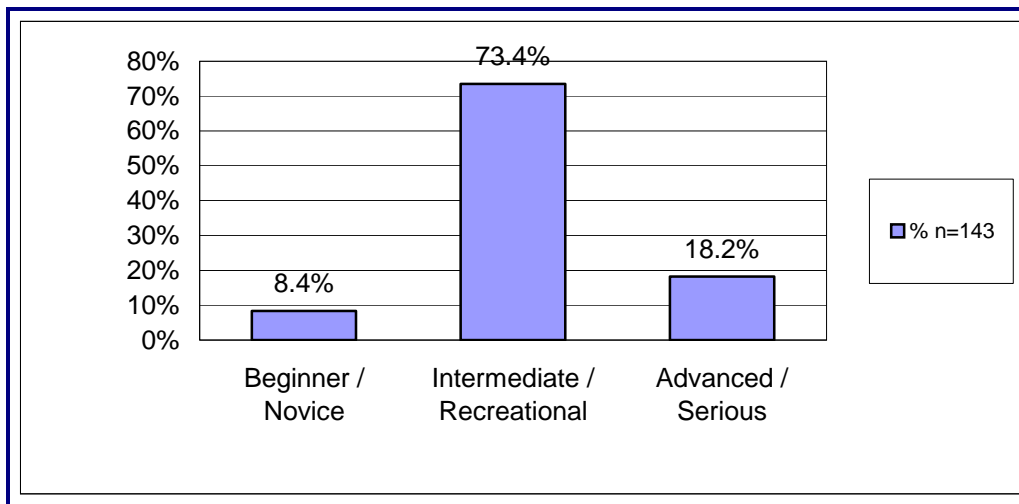
- Visitor ages ranged from 18-70 with an average of 44.7. Fifty-two percent were male, 48% female.
- The furthest traveling international respondent came from Turkey. Most of the others came from Eastern Europe. All of the international visitors came for work reasons.

Only one domestic visitor out of 143 came to the area for work reasons.

### Bicyclists' Characteristics

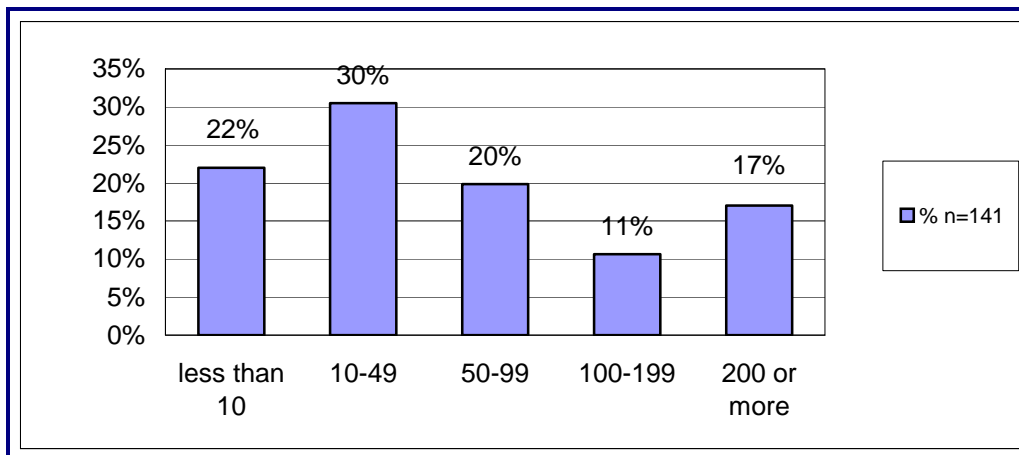
Most of the respondents (73.4%) rated themselves as Intermediate/Recreational in terms of their cycling ability. Exactly 18.2 percent regarded themselves as Advanced/Serious cyclists, and 8.4 percent as Beginner/Novice. Note: Intercept surveys were also analyzed by the skill level of the bicyclists. These results are included as Appendix C (page 53).

**Figure 4. Intercepted Visitor Cyclists: bicycling skill ratings.**



The Intercepted Visitor Cyclists indicated a wide range of riding activity as shown below in the chart of average miles typically ridden per month.

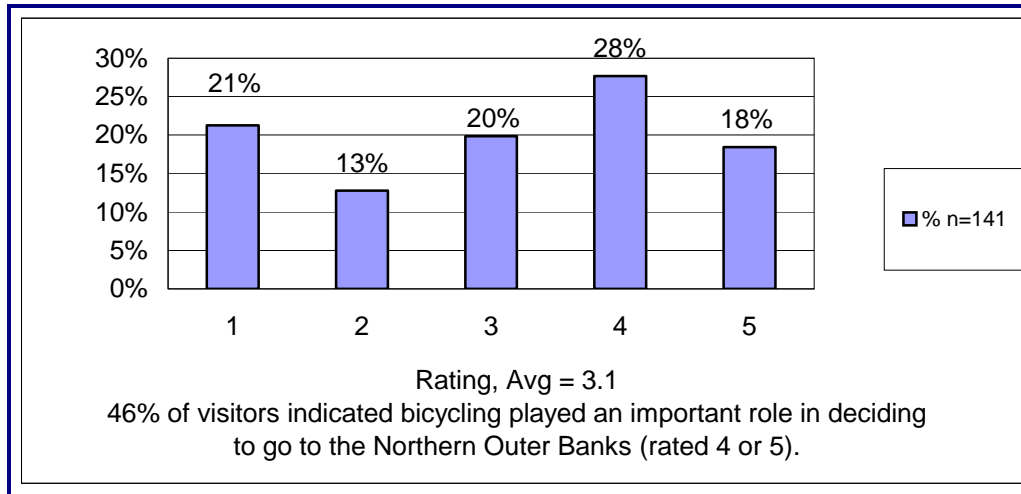
**Figure 5. Intercepted Visitor Cyclists: miles per month ridden.**



**Importance of Bicycling**

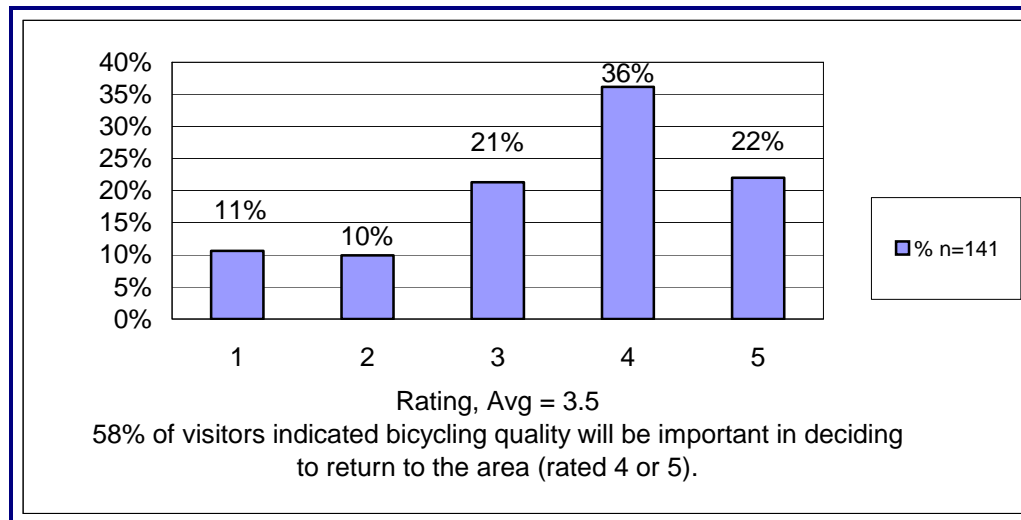
Respondents were asked to rate the importance of bicycling in their decision to visit the northern Outer Banks. As shown in the chart below, 46 percent indicated that bicycling was quite important in their decision (rated as either a 4 or 5, where 1 = Not Important and 5 = Very Important).

**Figure 6. Intercepted Visitor Cyclists: importance of biking in decision to come to northern Outer Banks.**



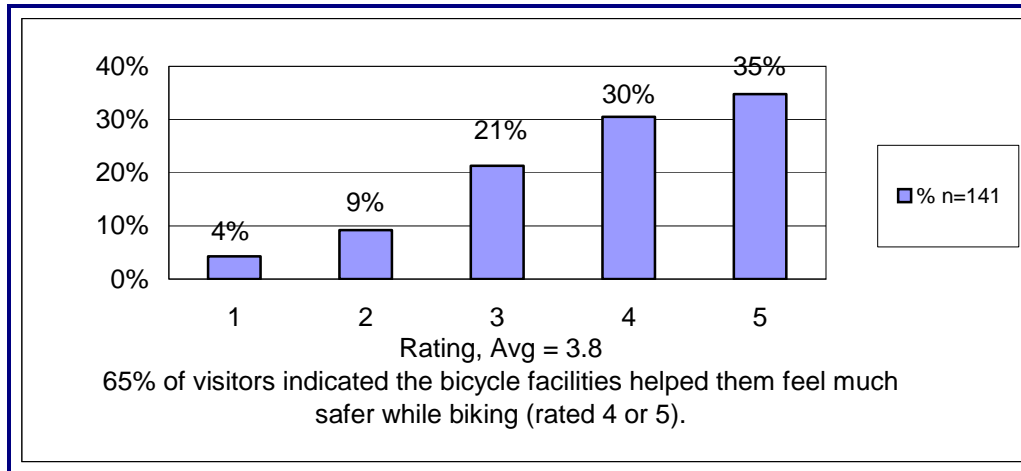
Interestingly, a higher percentage (58%) of respondents said that bicycling would be important to their decision to return to the area (rated as either a 4 or 5, where 1 = Not Important and 5 = Very Important). This suggests that once exposed to the quality of bicycling in the area, visitors are more likely to return.

**Figure 7. Intercepted Visitor Cyclists: importance of bicycling in decision to return to the area.**



Respondents also indicated that the presence and quality of the bicycle facilities made them feel safer while riding, with 65 percent rating this question either a 4 or 5 (where 1 = Not a Factor and 5 = A Great Deal).

**Figure 8. Intercepted Visitor Cyclists: feeling of safety due to bicycle facilities.**



### Trip Information

An important finding from the survey was that eleven percent of Intercepted Visitor Cyclists answered that their visit duration was longer because of biking by an average of three days (with a range of two to seven days longer). Following is additional information from the surveys about such factors as the nature of the trips being made, the size of the travel parties, the types of accommodations used, and the amount of bicycling done.

- Most visitors came in travel groups of Multiple Families (58%). Single Families were the next most frequent group (22%). The number of adults ranged from one to 26, with an average of 6.3. The number of children (defined as younger than 18) was zero to 16, with an average of 2.9 (some respondents were in the Individual or Couple groups and did not have children).
- Cycling starting points varied, but the most frequent points were Duck (19%) and Southern Shores (14%). This is likely due to the fact that the surveys were conducted in this area.
- The most common destinations included Duck (33%) and Corolla (7%). Eight percent of visitors were just out for a ride, with no particular destination.
- Rides averaged 7.2 one-way miles, with a range of 1 - 20 miles. (The national survey cited in the literature review stated that an average trip on a typical summer day was 3.9 miles—round trip.)
- Seventy percent of Intercepted Visitor Cyclists brought their own bike.
- Visitors stayed in Rental Homes most frequently (70%) with an average stay of eight days. Condos/Time Shares were second with 8% and an average stay of 6.8 days. Hotels/Motels/Resorts had 7% with an average stay of 2.9 days.
- The top three towns stayed in (or near) were Duck (40%), Nags Head (25%) & Southern Shores (13%).
- The top three recreational activities while in the area were Beach activities (25%), Shopping (19%), and Sightseeing/cultural attractions (17%).
- Trips ranged from 2 - 90 days in duration and averaged 8.6 days. Visitors answered they would bike 0 - 21 days, with an average of 5.4 days.

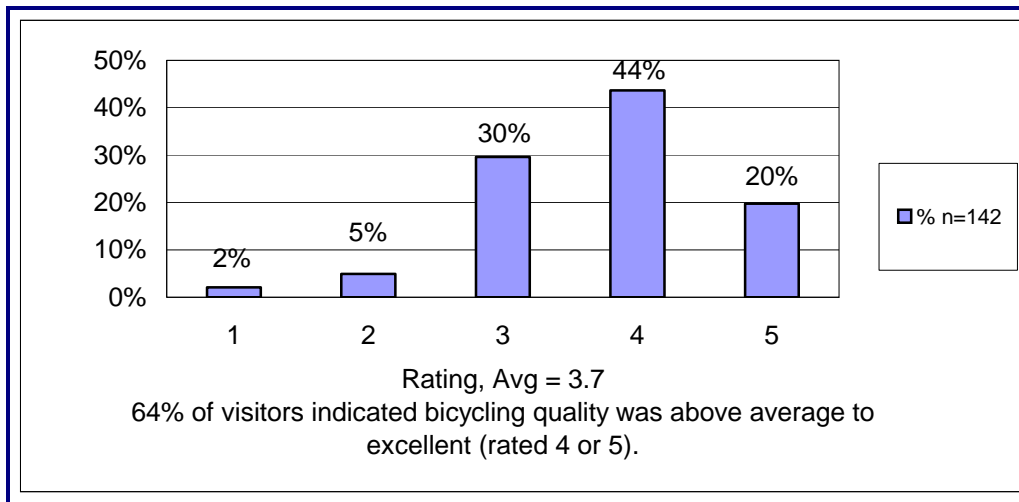
- Visitors took similar trips to the northern Outer Banks an average of 0.66 times in the last twelve months (range of 0 – 4 trips), and an average of 1.1 times to other areas (range of 0 – 10 trips).
- Respondents expected to make an average of 0.9 similar trips in the coming twelve months (range 0 - 4).
- The most common trip months (past and planned) were July (43% past, 43% planned), and August (23% past, 21% planned).

**Attitudes about Bicycle Facilities and Investments**

An important aspect of the survey was to determine the visiting bicyclists’ attitudes toward the quality of bicycling in the area in general, and towards bicycle facilities in particular. (All ratings were from 1 to 5, where 1 = Poor, and 5 = Excellent.)

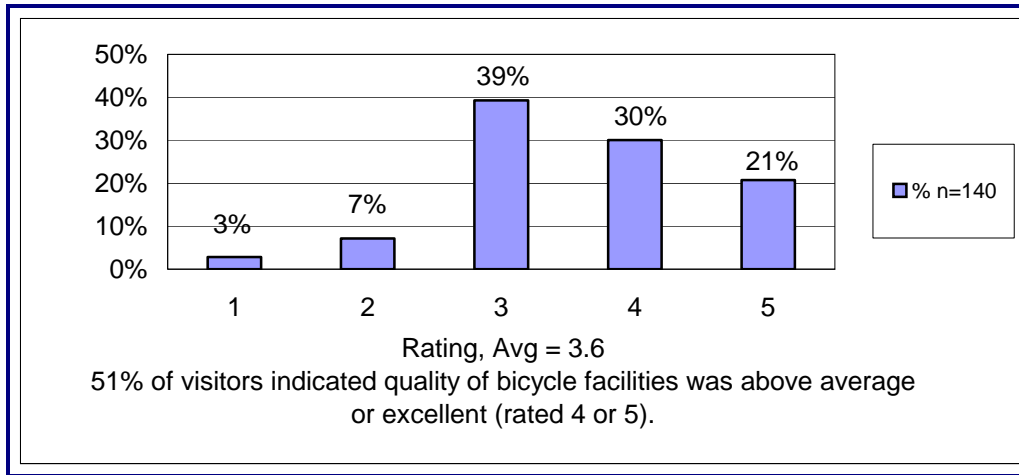
When asked about their opinion of the quality of bicycling in the area, 64 percent considered it above average or excellent (rated either a 4 or 5).

**Figure 9. Intercepted Visitor Cyclists: quality of bicycling in the area.**



Similarly, 51 percent of respondents gave a high rating to the quality of bicycling facilities in the area, while only ten percent rated the quality as low.

**Figure 10. Intercepted Visitor Cyclists: quality of bicycle facilities in the area.**



### Investment Priorities

Other Intercepted Visitor Cyclist survey highlights:

- Seventy-six percent indicated additional facilities should be built in the area.
- Ninety-five percent favored the use of state and/or federal funds to build such facilities.
- The top five priorities given for improving bicycle facilities were, in order of priority: Wider Bike Lanes, More Bike Paths, Wider Bike Paths, Bike Path Only (no walkers), and Crossing Areas. (See Appendix F, on page 63 for more detail on investment priorities.)

### Spending Patterns

The key to the Economic Impact Analysis is determining how much visitors spend while in the area and on what. These findings are summarized below:

**Table 5. Intercepted Visitor Cyclists: list of expenditures per visitor per day.**

Expense Category	Expenditure (\$ per person per day)
Accommodations	43
Restaurants/fast food/bar	25
Groceries/beverages/snacks	23
Retail/shopping	23
Recreation/entertainment	19
Bicycle accessories/equipment	4
Car/fuel	13
<b>Total</b>	<b>\$150</b>

## Visitor Center Respondents - General Tourists

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In addition to surveying Intercepted Visitor Cyclists, general tourists to the area were also surveyed. This was accomplished by making questionnaires available at three visitor centers—two in Manteo and one in Southern Shores. A copy of this questionnaire is included in Appendix G (see Visitor Center Survey on page 68).

The primary purpose of surveying general tourists was twofold:

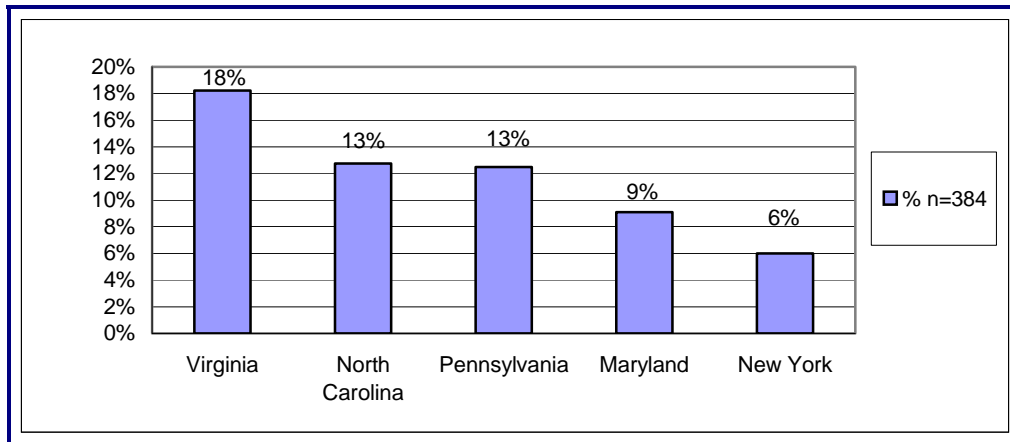
- To determine the percentage of tourists that engage in bicycling while in the area.
- For those who engage in some bicycling, to determine how important bicycling was in their decision to visit the area.

### Demographics

- Visitor ages ranged from 18-75 with an average of 47.4. Thirty-two percent were male, 68% female.
- The furthest traveling international respondents came from New Zealand. Most of the others came from Western Europe. None of the international visitors came for work reasons. (There were eleven non-U.S. resident visitors total.)
- Only three visitors (1%) came to the area for work reasons. Ten visitors responded Vacation (9%) and Other (7%) as their reasons to come to the area. (One individual responded Work and Vacation).
- The number of adults ranged from 1 - 88 (a tour group), with an average of 4.9 people. The number of children ranged from 0 - 15, with an average of 1.5 children.
- Visitors stayed in Hotels/Motels/Resorts (30%) and Rental Homes (30%) most frequently. The overall average stay was 6.4 days. Not enough respondents answered how long they stayed in each accommodation type to determine averages for each of them.
- The top towns stayed in (or near) were Nags Head (20.6%), Kill Devil Hills (12.9%), Kitty Hawk (10.6%), Duck (9.4%), Manteo (5.5%), and Corolla (5.3%).
- The top three recreational activities were Sightseeing/cultural attractions (85%), Beach activities (82%), and Shopping (72%). Seventeen percent of respondents marked Bicycling as one of their recreational activities.

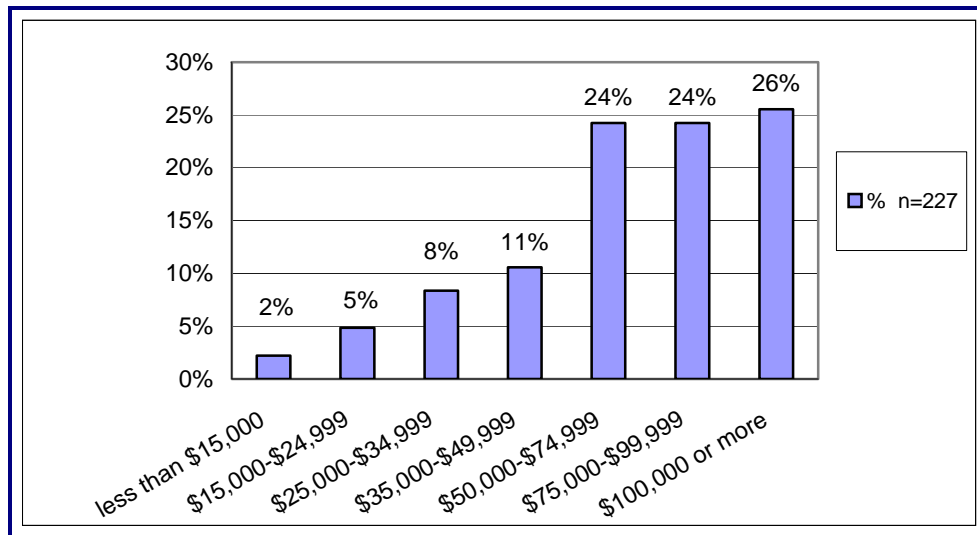
As shown in Figure 11, visitors from North Carolina accounted for 13 percent of visitor center survey respondents (second only to Virginia at 18 percent). In general, tourists tended to come from mid-Atlantic and northeastern states, very much like the intercepted visiting respondents. One difference is that a higher proportion of Visitor Center Respondents than Intercepted Visitor Cyclists come from elsewhere in North Carolina (13% vs. 3%, respectively).

**Figure 11. Visitor Center Respondents: top five states of origin.**



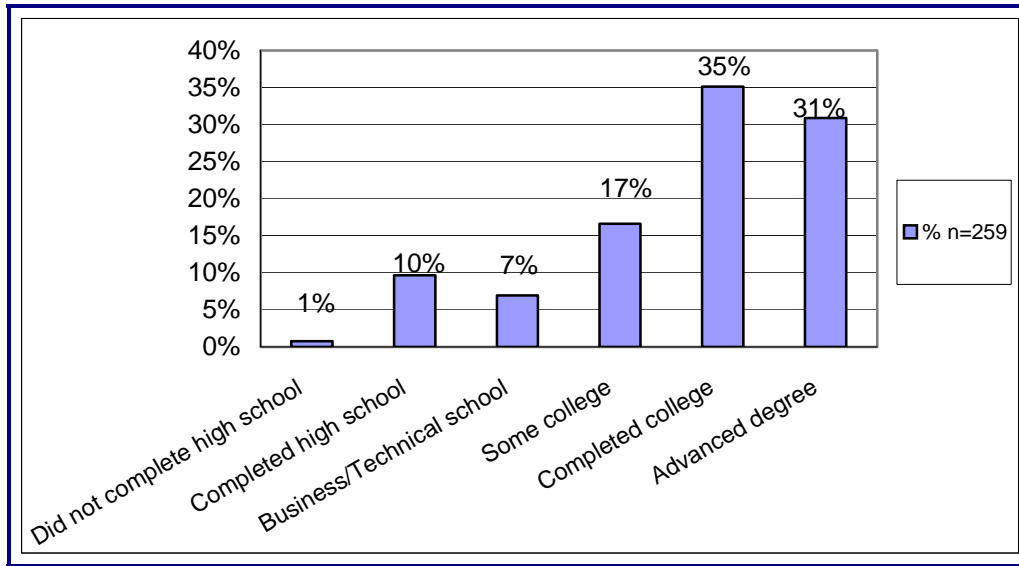
Like the intercept respondents, the general tourists are relatively affluent although they are not as affluent as the Intercepted Visitor Cyclists. Approximately one-half of the respondents reported a household income of more than \$75,000 per year compared to 78 percent for the intercepted visiting respondents.

**Figure 12. Visitor Center Respondents: household income.**



The visitors are also well-educated., with about two-thirds having earned a college degree, compared to 81 percent for the intercepted visiting respondents.

**Figure 13. Visitor Center Respondents: education level.**



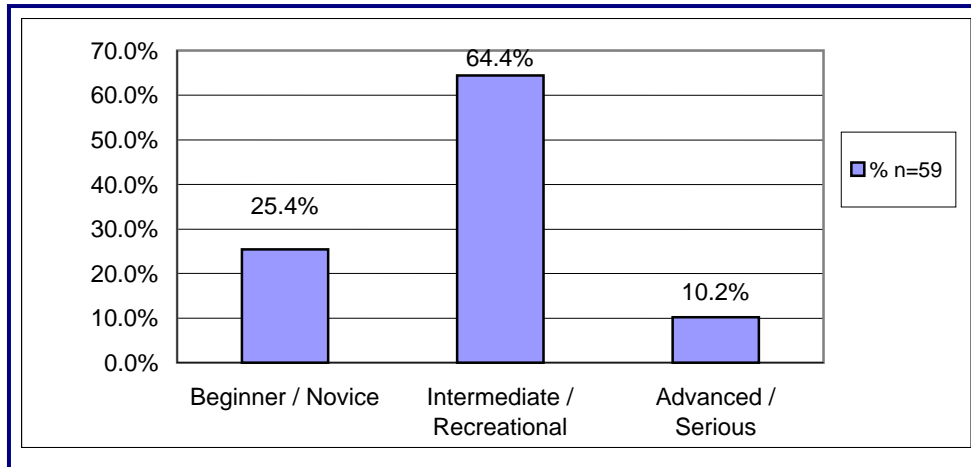
As indicated above, seventeen percent of the general tourists in the survey indicated that they engaged (or would engage) in bicycling during their trip to the northern Outer Banks. *The following charts and information show responses only from those tourists, identified as Visitor Center Cyclists.*

### Bicyclist Characteristics

- Sixteen percent of Visitor Center Cyclists answered that their visit duration was longer because of biking. Their visit was longer by two to seven days, with an average of four days longer.
- Sixty-two percent of Visitor Center Cyclists brought their own bike.

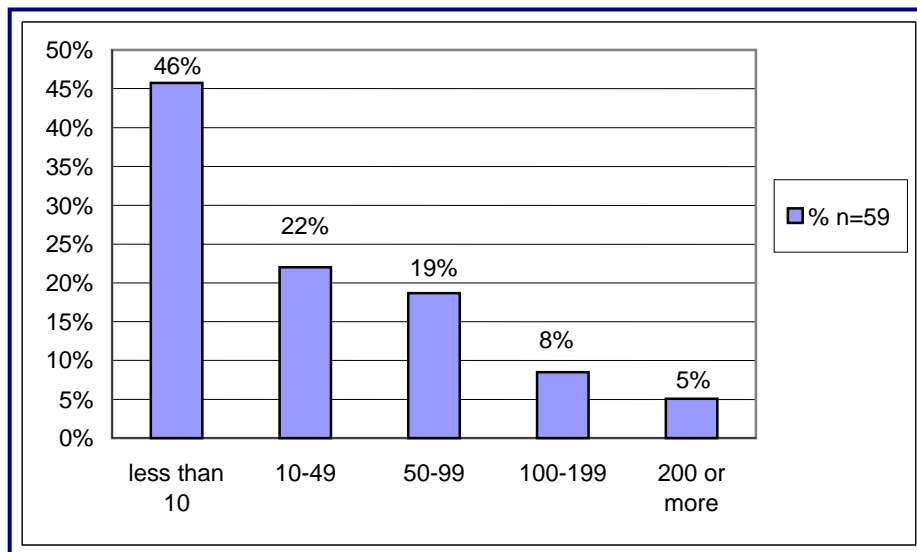
In terms of bicycling skill levels, 25.4 percent of Visitor Center Cyclists answered they were Beginners/Novices, 64.4 percent rated themselves at Intermediate/Recreational level, and 10.2 percent answered they were Advanced/Serious riders. This compares to 8.4 percent, 73.4 percent and 18.2 percent respectively for the Intercepted Visitor Cyclists.

**Figure 14. Visitor Center Cyclists: bicycling skill ratings.**



The Visitor Center Cyclists tend to ride less on average than the Intercepted Visitor Cyclists. For example, 22 percent of intercepted visiting respondents ride less than ten miles per month compared to 46 percent for the Visitor Center Cyclists. At the other end, 17 percent of Intercepted Visitor Cyclist respondents ride 200 or more miles per month compared to only 5 percent for the Visitor Center Cyclists.

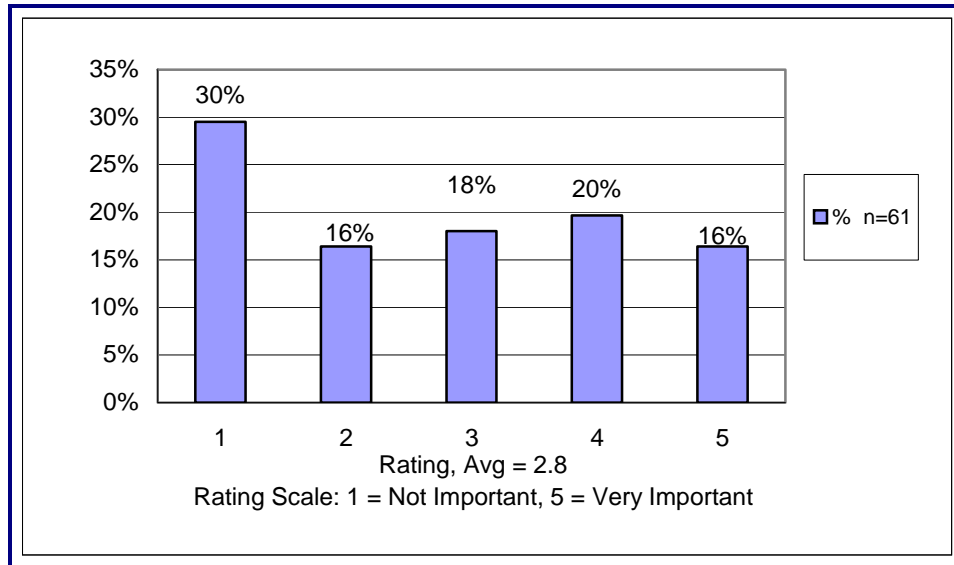
**Figure 15. Visitor Center Cyclists: miles per month ridden.**



**Importance of Bicycling**

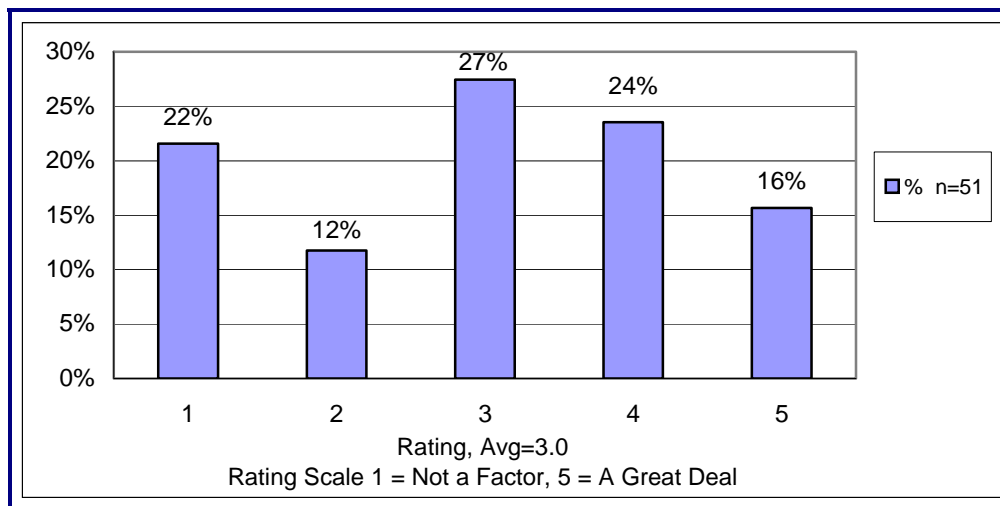
Thirty-six percent of the Visitor Center Cyclists indicated that bicycling played an important role in their decision to come to the northern Outer Banks (rated it either a 4 or 5). The average rating of 2.8 was slightly lower than the 3.1 rating by the Intercepted Visitor Cyclist respondents.

**Figure 16. Visitor Center Cyclists: importance of bicycling in decision to come to northern Outer Banks.**



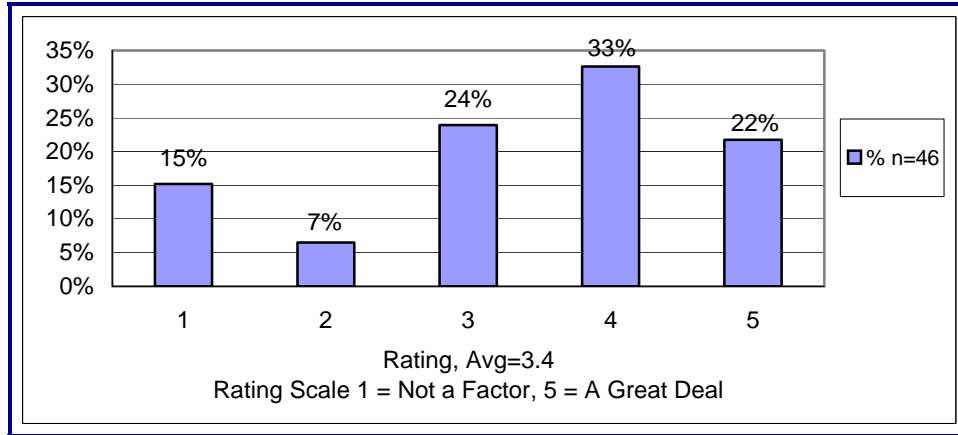
Forty percent of Visitor Center Cyclists indicated bicycling quality would be important in deciding to return to the area. Fifty-eight percent of the Intercepted Visitor Cyclists indicated likewise. The average rating was 3.0 and 3.5, respectively.

**Figure 17. Visitor Center Cyclists: importance of bicycling in decision to return to the area.**



Fifty-five percent of Visitor Center Cyclists indicated the bicycle facilities helped them feel safer while bicycling, compared to 65 percent for the Intercepted Visitor Cyclists (average rating of 3.4 and 3.8, respectively).

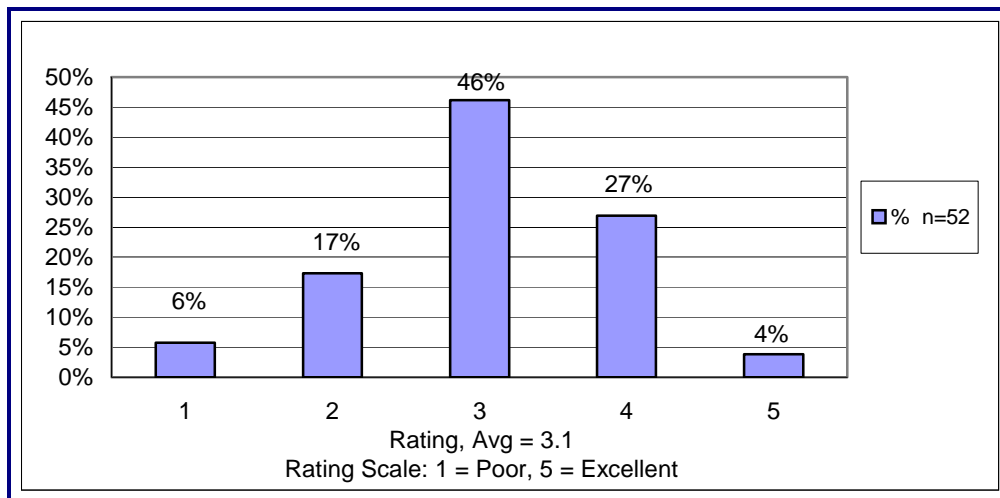
**Figure 18. Visitor Center Cyclists: feeling of safety due to bicycle facilities.**



Attitudes about Bicycle Facilities and Investments

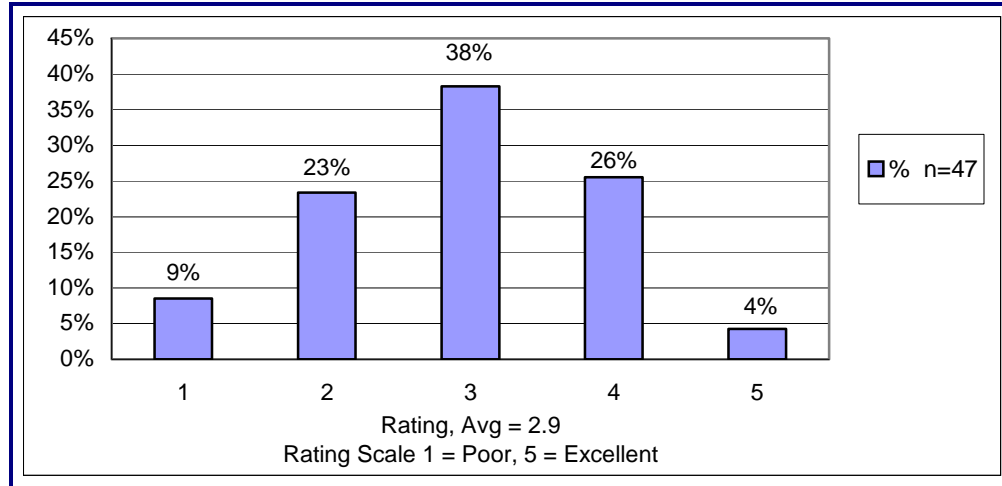
Thirty-one percent of Visitor Center Cyclists indicated that bicycling quality was above average to excellent, compared to 64 percent for Intercepted Visitor Cyclists. The average ratings were 3.1 and 3.7, respectively.

**Figure 19. Visitor Center Cyclists: quality of bicycling in the area.**



Thirty percent of Visitor Center Cyclists indicated the quality of bicycle facilities was above average or excellent, compared to 51 percent for the Intercepted Visitor Cyclists (average rating of 2.9 and 3.6 respectively).

**Figure 20. Visitor Center Cyclists: quality of bicycle facilities in the area.**



Investment Priorities

- Seventy percent of Visitor Center Cyclists indicated additional facilities should be built in the area.
- Eighty-eight percent of Visitor Center Cyclists favored the use of state and/or federal funds to build such facilities.
- The top priorities visitors gave for improving bicycle facilities were, in order of importance: More Bike Paths, More Bike Lanes, Off-road Trails, Public Restrooms, and More Trails.

Spending Patterns

The bicycling respondents to the Visitor Center Survey spend slightly more than the visiting respondents to the Intercept survey--\$175 per person per day versus \$150. The details shown in the table below may be compared with the Intercepted Visitor Cyclist list of expenditures in Table 5.

**Table 6. Visitor Center Cyclists: list of expenditures per visitor per day.**

Expense Category	Expenditure (\$ per person per day)
Accommodations	72
Restaurants/fast food/bar	33
Groceries/beverages/snacks	21
Retail/shopping	21
Recreation/entertainment	20
Bicycle accessories/equipment	N/A
Car/fuel	8
<b>Total</b>	<b>\$175</b>

## Bed & Breakfast and Campground Owners Survey

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Surveys related to bicycling were sent to 23 owners of Bed and Breakfast establishments (B&B's) and campgrounds in the northern Outer Banks. Because only six owners responded, the data are not statistically significant but may be useful anecdotally. A summary of the results of this survey is included as Appendix E (page 61). A copy of the questionnaire is included in Appendix G (page 76).

## Bicycle Traffic Counts

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In order to develop an estimate of total usage of bicycle facilities in the area, bicycle traffic counts were conducted on bicycle facilities throughout the area. Data were collected over a seven-day period, for 24 hours each day, at eleven separate locations. (See the detailed maps in Appendix A on page 45.) Pneumatic tube counters, similar to those used to count vehicle volumes on a street or highway, were placed perpendicular to the direction of travel on three shared-use paths and on eight roadway shoulder locations to physically count users of the facilities. They were calibrated to detect two “pulse” compressions of air in the tube within a certain time-interval - the two wheels of a bicycle going over the tube tripped the sensor while a pedestrian did not. The number of bicyclists per hour was recorded by a small device attached to the pneumatic tube. Counts were recorded hourly from July 29 to August 4, 2003, for 24 hours each day at each counter. The tubes used on the shoulders were placed in pairs on opposite sides of the roadway so information could be collected for each direction of travel. The photos below show the tube and counter installation. (See Appendix B - Methodology, on page 49, for more details.)

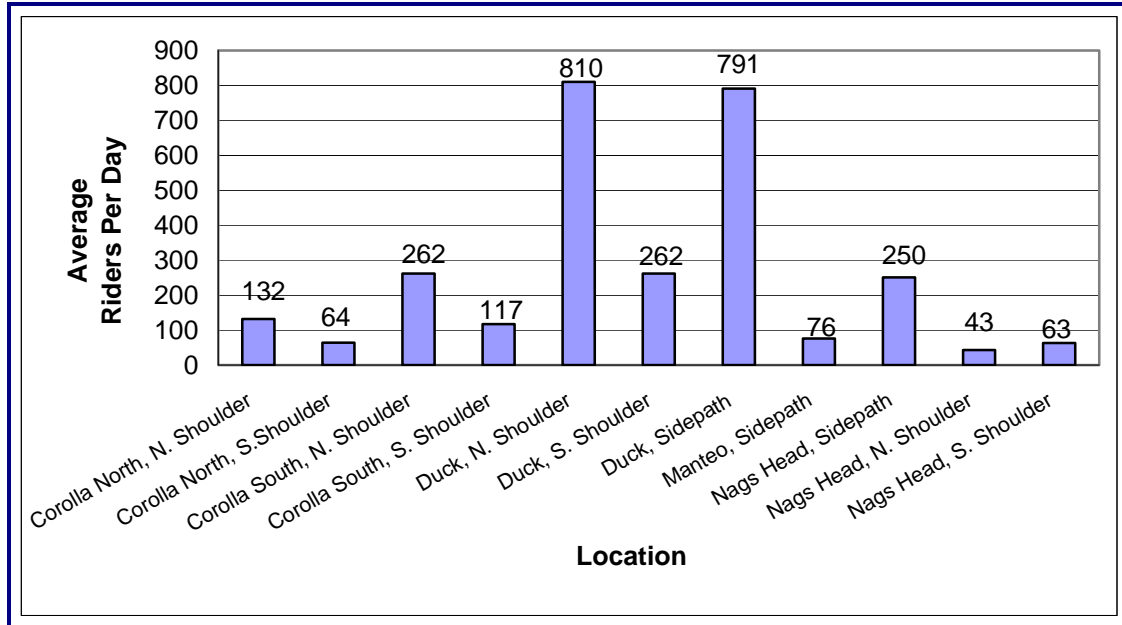


*Left:* Example of pneumatic tube across a wide paved shoulder. Note the sign alerting cyclists to the counter ahead. Photo courtesy NCDOT  
*Above:* A close-up of the sensor itself, which stores the number of counts per hour per day. Photo courtesy ITRE

It should be noted that the charts below reflect raw count data. These data simply show the number of times the counting devices were activated. They have not been adjusted to account for two-way trips, counts registered by something other than bicycles, or the possibility that riders on a long trip would cross more than one counting device. In addition, they do not reflect the fact that many of the same riders made trips on multiple days. None the less, the raw data counts provide evidence that there is significant usage of the bicycle facilities.

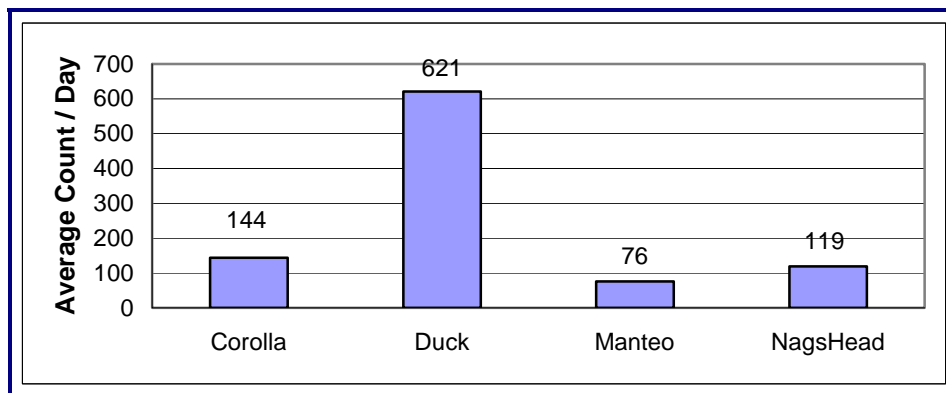
Figure 21 and Figure 22 below show that the popular tourist town of Duck accounted for a large proportion of the bicycle traffic measured by the counters. More specifically, the following chart shows the average daily bicycle traffic count at each of the eleven counting locations.

**Figure 21. Bicycle traffic counts: average count per day by counter location.**



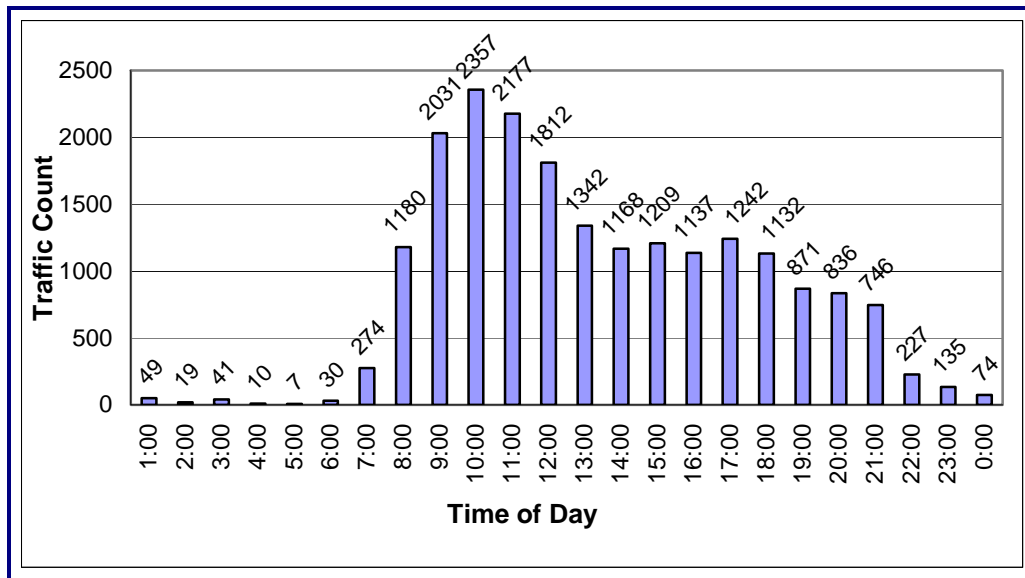
The chart below summarizes these data by town (the total counts in each town divided by the number of counters in that town):

**Figure 22. Bicycle traffic count: average count per day by town.**



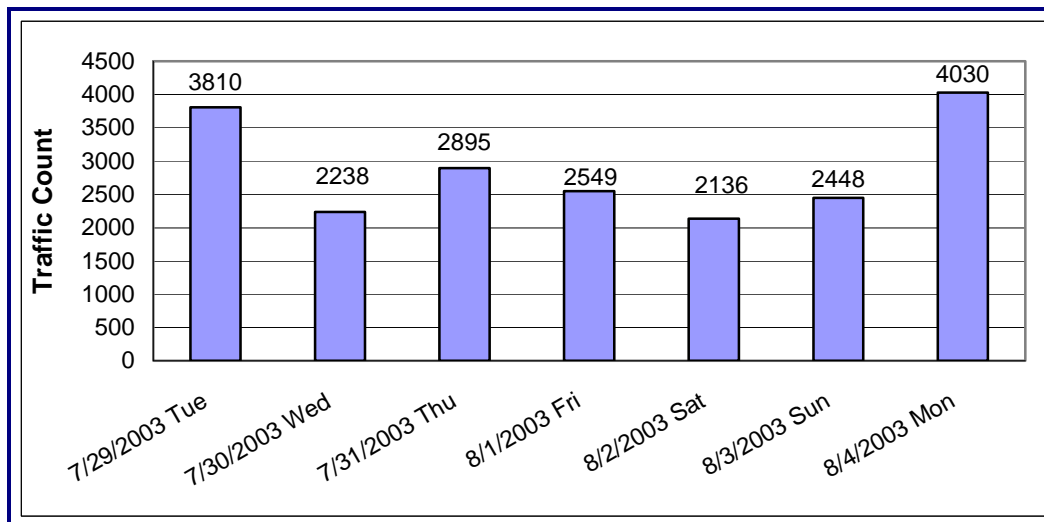
As shown below, morning hours appear to be the most popular hours for bicycling, hitting a peak about 10:00 AM. Counts diminish as the lunch hour approaches. The afternoon holds steady at about one-half of the morning peak level until about 7:00 PM. Not surprisingly, it drops significantly after 9:00 PM (shortly after it gets dark at that time of year).

**Figure 23. Bicycle traffic counts: total counts per hour of day (peak usage times).**



As for days of the week, the chart below shows that bicycle ridership was highest on Monday and Tuesday of the week studied and was relatively stable for the rest of the week. Visitors who rent homes or condominiums typically check in or check out on Saturday or Sunday, which may account for the low bicycling volumes on those days.

**Figure 24. Bicycle traffic counts: total counts per day.**



The traffic count data described above is just that—traffic count data. For a number of reasons, these counts are substantially higher than the number of actual individuals who were bicycling. For example, most individuals were making a round trip and were therefore counted twice. In addition, those on long trips would have activated multiple counters, and those who rode on several days would have been counted on each day. Therefore a number of adjustments were made to translate the count data into an estimate of the actual number of individuals involved.

Over the seven-day, 24-hour period, 20,106 raw total counts were recorded. In order to account for the overestimation of how many individual people were actually bicycling on the facilities, the raw traffic data counts were divided in half (assuming most trips were round-trip), and then further decreased to account for cyclists tripping multiple counters on long rides. (These adjustments are described in more detail in Appendix B on page 51.) After making these adjustments, the estimated number of individuals using these bicycle facilities daily is approximately 737 cyclists. Note that although the surveys suggest a proportion of visitor versus resident cyclists may be determined, there is no way to know whether this ratio holds true with the trip counter data. In other words, of the 737 average daily cyclists, it is unknown how many are visitors versus residents.

In order to figure out a total annual estimate of individuals taking advantage of the bicycle facilities, the Outer Banks Visitors Bureau room occupancy data were used so that monthly estimates would correspond with the fluctuation of tourist seasons. The primary tourist season at the Outer Banks is from May 10 to September 15. Annually, approximately 85,360 individual cyclists use the bicycle facilities in the northern Outer Banks, according to the traffic counts and the room occupancy data. Roughly 80 percent (68,313 people) of these individuals use the facilities during the primary tourist season.

It is prudent to point out that not all bicycle facilities in the northern Outer Banks were outfitted with the traffic counting devices. Another variable not accounted for is the concept that one individual cyclist may use a bicycle facility more than one day per year, depending on how frequently he/she bicycles and, for a visiting cyclist, how many vacations he/she takes to the northern Outer Banks over a twelve month period. These issues may modify the annual number of individual cyclists calculated above. Because there are so many assumptions and adjustments involved with determining the true annual number of individual visiting bicyclists, another method for estimation was used to perform the Economic Impact Analysis, which is discussed in the following section.