When shoulder bicycle lanes are added to a roadway, they generally add three to five feet to the width of the paved roadway surface. The additional surface area provided by bicycle shoulder lanes can enhance the safety of motorists along the same road. For example, Zeeger (1987) found that the addition of four-foot wide paved shoulders on rural two-lane roads reduced run-off, head-on, and sideswipe motor vehicle crashes by 29 percent.

3-5. Property Values

Parks and greenways have been found to enhance the value of near-by property (U.S. Dept. of Interior, 1995). This research was reviewed and updated by Crompton (2001) who notes that of 25 empirical studies considered, 20 found that parks enhance the value of adjacent or near-by property.[6]

A property value premium of five to ten percent is characteristic for properties near multi-purpose trails. The Brown County Planning Commission (1998) found an increase of nine percent for properties adjacent to the Mountain Bay Trail in Brown County, Wisconsin. Moore and Barthlow (1998) found that property near the Burke-Gilman Trail sold at a premium of six percent while those adjacent benefited by an additional one-half to one percent. PKF (1994) notes that an extension of a California greenway was estimated to generate a 6.5 percent premium for properties adjacent to the trail. PKF (1994) also notes that housing prices declined an average of $4.20 for each foot of distance away from a greenway up to 3,200 feet (PKF, 1994). In one neighborhood, the figure was $10.20 for each foot away from the greenway. In addition, survey results indicate that a substantial number of realtors and homeowners believe that a nearby trail enhances the value of their property or would reduce the amount of time required to sell the property.[7]

4. Economic Impact: Foundations

As indicated in the introduction, in order to assess the economic impact of the CGG, three broad questions must be addressed. How many users? What expenditures will they make? What else should be considered? The answers to these questions will be discussed in this section.

4-1. How Many Users?

One very crude estimate of demand can be derived by using the National Recreation and Park Association's (Lancaster, 1990) benchmark of roughly one mile of multi-purpose trail for every 2,000 persons. The study area's current population is estimated at 452,000, thus the standard implies a benchmark of 226 trail miles. An inventory of trails in the six county study area is provided in Appendix Table 1. Approximately 216 miles of multi-purpose trails currently exist in the six county area. Thus, the region appears to meet the minimum standard established by the National Recreation and Park Association.

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[6] Four of the five studies finding no effect were determined by Crompton (2001) to be flawed.
[7] For example, see citations in PKF (1994) and Department of the Interior (1995).

This figure, however, is somewhat misleading for reasons considered next. First, the National Recreation and Park Association backed away from numerical guidelines for recreational facilities in 1996 (Mertes and Hall, 1996) suggesting instead that local areas define their needs as appropriate to their own demand. Second, the currently existing trails in coastal Georgia cannot be thought of as a regional network or system as recommended in the NRPA guidelines. The trails are short, with a median length of 6.4 miles, and are scattered across the region without a connecting link. The Georgia Coastal Greenway will provide such a link and serve as the spine of the 350 mile network that forms a comprehensive system. The linking feature of the CGG would enhance the overall appeal of the trail to its users and increase usage of other linked trails.

4-2. Trail Demand Modeling

In a 1998 report issued by the University of Baltimore's Jacob France Center, the authors note "in all of the literature [on greenways and usage] reviewed there was little information on the potential greenway user base" (Jacob France Center, 1998, p. 2). Our review of this literature and that of the ensuing five years yields the same general conclusion. Few readily available formal studies estimate potential use of proposed facilities. The limited number of studies that did attempt to develop estimates of usage for proposed trails include the following: Betz, Bergstrom, and Bowker (2003) for the Antebellum Rail-Trail in northern Georgia; PriceWaterhouseCoopers (2001) for the Alberta section of the Trans Canada Trail (2001); Southeast Michigan Greenways Specialist Team (2001) for three trails in Michigan; Wilbur Smith Associates (2001) for facilities in Maine; The Jacob France Center (1998) for the Lower Susquehanna Heritage Trail; and Northwestern Ontario Development Network (1996) for the 2,200 mile La Route Verte. These studies employ a variety of techniques to forecast trail usage, some of which are proprietary.

In fact, in a response to the lack of standardized methodology and scattered literature on the topic, the Texas Transportation Institute and the Federal Highway Administration recently completed a series of studies on bicycle and pedestrian facility demand forecasting. Five broad classifications of demand estimation techniques exist. These include comparison studies, aggregate behavior studies, sketch plan models, discrete choice models, and regional travel models. These methods are thoroughly discussed elsewhere, and will not be reviewed here (U.S. Department of Transportation, Federal Highway Administration (FWA) (1999a, 1999b), and Turner, Hottenstein and Shunk (1997, 1998)).

The approach used in this study can be considered a composite of an aggregate behavior model and sketch plan, with benchmarking via comparative analysis. Initially, an aggregate behavior model is developed to estimate the overall size of the bicycling and pedestrian market for the CGG within a 75 mile radius. Next, a sketch plan approach is used to generate an order of magnitude estimate for CGG trail use under several different scenarios. Lastly, a comparative analysis is conducted to ensure that the projections developed from the preceding methodology are plausible.

4-2-1. Size of the CGG Bicycling and Pedestrian Market

The analysis proceeds in several steps. First, an estimate of gross day-trip use of the CGG is developed. Gross day-trips include those arising from non-local residents and local residents. Later, the net number of non-local day-trip users is derived by subtracting local use from the gross

number of day-trip users. Non-local overnight use is estimated separately based on the gross number of day-trip users. The distinction between non-local day-trip, non-local overnight, and local use has important implications for modeling the expenditures of each type of user. This is discussed further in Section 4-3 below.

The first step of the process is to develop an estimate of the overall size of the day-trip bicycling and pedestrian market from which the CGG will draw. The market 'catchment' basin is defined as all counties within 75 miles the CGG. This includes counties in South Carolina and Florida as well as those in Georgia. The 75 mile radius is from Betz, Bergstrom and Bowker (2003) based on their estimate of demand for the gross number of day-trips to the Antebellum Rail-Trail in northern Georgia. The vast majority of day-trip cyclists will fall within this 75 mile range.[8]

An aggregate behavior model was developed for this study to predict bicycle and pedestrian mode share (BPMS), the proportion of all trips that are made by bicycle or by pedestrians, as a function of several explanatory variables. The variables identified for use were selected on the basis of the literature review. BPMS is related to explanatory variables in an equation estimated with year 2000 data for 34 states[9] via regression analysis as follows:

$$BPMS = 2.42 + 0.0002(PCI) + 3.45(BIKECOM) + 0.48(PUBT) - 0.0005(RAINHOT)$$

where bicycle and pedestrian mode share (BPMS) is found to be positively related to per capita income (PCI), the percentage of workers that commuted to work via bicycle (BIKECOM), the percentage of workers commuting to work via public transportation (PUBT), and negatively related to RAINHOT which is an interactive variable reflecting above average temperatures and rainy weather.[10] The model performs well and explains 90% of the variation in state level bicycle and pedestrian mode share.

When the state level estimates are applied to the six county region and the counties within 75 miles of the CGG, the model returns a mode share of 7.99% for the six county region and 7.00% for the larger area. This means that 8% of all trips made in the six county area and 7% of all trips made in the larger area are by cycling or walking. This result is reasonable considering that Georgia's BPMS is 6.3% and is approximately 8.7% for the 34 state sample (NHTS, 2001).

Once bicycle and pedestrian mode share has been estimated, the potential market size or demand, can be estimated by multiplying bicycle and pedestrian mode share for an area by the total number of trips for the area, resulting in the estimated number of trips for the area made by pedestrians or on bicycles.[11] Thus,

Potential Demand = BPMS * Total Number of Trips.

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[8] The figure approaches 90% for comparable day-trip participants at the Historic Savannah Bikefest.

[9] Model estimated using state level data from the Bureau of Transportation Statistics' 2001 National Household Travel Survey (NHTS, 2001) and the U.S. Census Bureau (2001a, 2001b). Data limitations caused 16 states to be dropped from the data set, leaving 34 states in the sample.

[10] After correcting for heteroskedasticity using the White (1980) procedure, BIKECOM and PUBTRANS were significant at the 1% level, RAINHOT was significant at the 8% level, and PCINC was significant at the 11% level. The adjusted R-square for the model was 0.90 and the F-statistic for the model was 68.6 indicating a statistical confidence level of 99% for the model as a whole.

[11] At this point, the methodology is more akin to the sketch plan approach rather than an aggregate behavior model.

The total number of trips in the region is extrapolated on a per capita basis from the total number of trips made in Georgia, Florida, and South Carolina. This figure is multiplied by the estimated mode share for the region, and then multiplied by cycling's share of total cycling and pedestrian trips. This yields the number of cycling trips available in the market, or the overall market size from which bicycle use of the CGG will draw. The following expression is used to estimate the gross number of day-trip users on the CGG:

CGG Cyclist Demand = Potential Cyclist Demand * CGG Market Share

where CGG market share is assumed to be one-half percent.[12]

The computed figure for CGG cyclist demand serves as a leverage point for the computation of the total number of potential user-days for the CGG. Total CGG user demand from cyclists and walkers is computed based on the assumption that 30% of CGG trail users will be walkers and that 5% of the trail users will be over-night cyclists.[13]

Based on data from 2000, the projected number of potential user-days on the CGG is 300,000. There are two adjustments that are applied to this figure. First, since the data are from 2000, the potential number of user-days must be projected to 2015. Second, the ratio of actual trail use to potential trail use is expected to rise as the trail becomes a known entity. These two facets of projected use are considered in the next section.

4-2-2. Projected Market Growth

There are two significant elements to consider when calculating CGG market growth. The first concerns overall growth in the outdoor recreation market. First, growth in the general cycling market and in the number of trail users is of interest. Second, the review of the literature suggests that initial use of the trail will start below its potential level and rise toward its potential after several years. Both of these factors will affect the overall number of trail users and consequently, the economic impact of the trail.

Projected growth in the overall size of the CGG cycling market from the present to 2015 is developed from figures provided by the Georgia Partnership for Economic Development (GPED, 2003) and by Bowker, et al. (1999). The Georgia Partnership for Economic Development, which is the coordinating force behind the *Dodge Tour de Georgia,* estimates that the Georgia bicyclist

[12] This may be considered a relatively conservative estimate. At the national level, estimated rail-trail market share of total bicycle trips taken was 2.9% in 1996 and 1.3% in 1988. This is based on estimates of rail-trail use by RTC (reported by Morris (2001) and Moore, et al. (1992)) as compared to total number of cycling trips reported in NHTS surveys (various years). However, when the method is roughly applied to the Antebellum Rail-Trail studied by Betz, Bergstrom and Bowker (2003), the implied market share is approximately 1.2%. The market share figure is slightly above one-half of one percent when roughly applied to the Washington and Old Dominion Trail (Regnier, 1989).

[13] See the discussion below in Sections 4-3-1 and 4-3-2 to motivate the use of these assumptions.