EVALUATION OF BICYCLE AND PEDESTRIAN FACILITIES: USER SATISFACTION AND PERCEPTIONS ON THREE SHARED USES TRAILS IN TEXAS

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16. Abstract

This report describes research conducted to evaluate bicycle and pedestrian facilities (i.e., shared use trails) with user satisfaction and perception surveys. Public and community input on transportation projects is often mentioned as a necessary step in the planning process but seldom performed. The opinions and perceptions of facility users are immensely valuable in improving conditions at current trails as well as in the development and design of new trails. In this study, the research team developed on-site and mail-back survey instruments that were distributed on three shared use trails in Texas: the Brays and Buffalo Bayou Trails in Houston, and the Shoal Creek Trail in Austin.

The responses to the surveys were analyzed to determine consistent themes and trends in user satisfaction and perceptions. The study found that several trail attributes contribute significantly to user satisfaction and higher levels of trail use. Adequate separation from motor vehicles was noted as a positive attribute that should be provided whenever possible on shared use trails. Trail surface quality and width was also noted as an important attribute, particularly in cases where numerous user types (e.g., bicyclists, joggers, walkers) were using the same trail. The study also revealed that many of the trail users felt that the shared use trails significantly contributed to harmonizing transportation and community goals. The survey responses indicated that the trails were used for a variety of purposes, including transportation, recreation, social interaction, and enjoyment of the natural environment. The researchers concluded that user surveys (such as those conducted in this study) are a valuable addition to other traditional transportation planning tools, and as such, can provide more and better insight into roadway and trail user behavior and motivation.

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- Luke Albert;
- Troy Rother;
- Steve Sharma; and
- Mary Tinsley.

EXECUTIVE SUMMARY

Objectives of the Study

The objectives of this research study were to: 1) understand the full range of impacts (both positive and negative) associated with bicycle and pedestrian facilities, and 2) develop and test an evaluation tool that documents the contribution of bicycle and pedestrian facilities to transportation and community goals (e.g., quality of life) in urban areas. A better understanding of the impacts can help to develop an evaluation process that satisfies both transportation objectives and community values (Figure S-1).

In early stages of the study, the research team decided to focus on the perceptions of bicycle and pedestrian facility users as a method to gauge impact on community goals and values. With user surveys deployed at three shared use trails in Texas, the researchers were able to determine how trail users perceived the contribution of specific trails to transportation and community goals in their own communities. The findings of this study can be used to support assertions of the contribution of bicycle and pedestrian facilities to transportation and community goals.

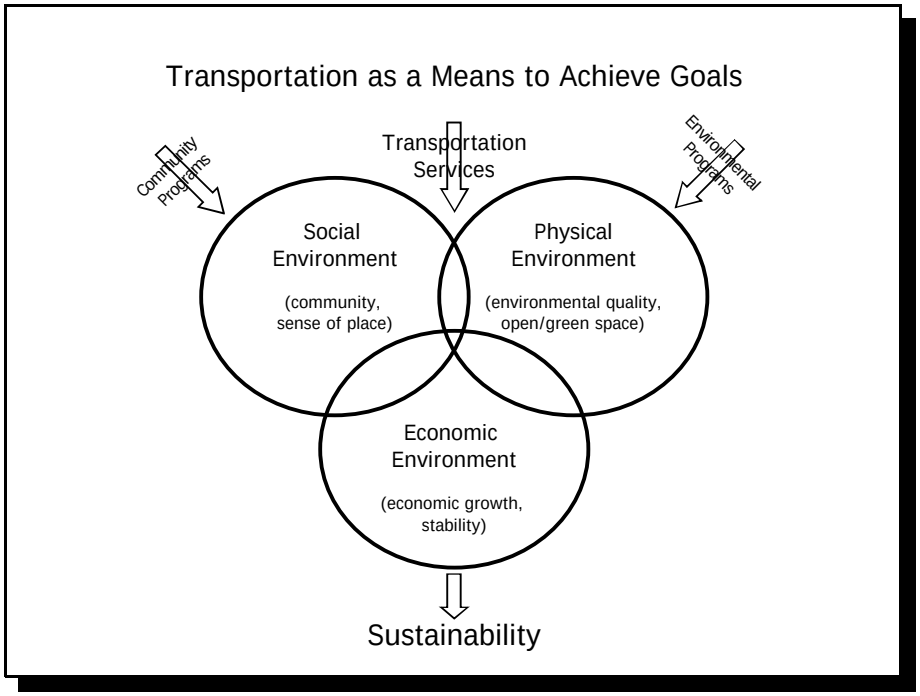


Figure S-1. Relationship of Transportation to Societal Goals from a Societal Perspective

Study Design

To meet the objectives of this study, an attempt was made to operationalize the concept of harmonization in a particular transportation context. Bicycle and pedestrian facilities encouraged through the federally-funded Transportation Enhancements Program often are oriented toward separated, shared-use trails commonly placed in remnant right-of-ways along rivers and streams. A movement in recent years by urban planners, park professionals, wildlife biologists, and flood plain administrators to integrate riparian greenways into communities has added to the interest in the Transportation Enhancements Program funding for the purchase of land and its development as alternative transportation corridors. This greenway trail movement provides an excellent opportunity to evaluate if and how shared-used trails might be contributing to (harmonizing) transportation and other community goals.

Greenway-based bicycle and pedestrian shared-use trails were selected for evaluation in this study because they were judged to have inherent qualities related to multiple community quality of life goals. By measuring and analyzing the perceptions of people who use these trails (key stakeholders), better insight can be obtained into whether this type of transportation facility contributes to the harmonization of transportation and community goals. For this study, three trails in Texas were selected as case study sites:

- Brays Bayou Trail, Houston;
- Buffalo Bayou Trail, Houston; and
- Shoal Creek Trail, Austin.

Two questionnaire forms were developed: one for on-site completion and one to be mailed to respondents and returned in the weeks following the on-site contact. The on-site survey form (one page) included questions about basic aspects of trail use behavior. The questions asked about people's origin and destination of travel, length of time spent on trail for this trip, whom they were using the trail with and mode of travel. We also asked respondents to provide positive and negative impressions of the trail. The intent of the on-site survey was to record basic behavior and perceptions *in situ* while using the opportunity to ask each person to participate in a more detailed postal survey. If a person responded favorably to the postal survey, their name and address were also recorded.

The questionnaire used on the postal survey consisted of several sections (five pages) and was designed to gather information on people's trail use, perceived conditions of the trail, and the way people felt about the trails' contribution to the quality of life of their communities. The first section asked about behavioral aspects of trail use (e.g., use history, use purpose, type of activities normally engaged in, etc.).

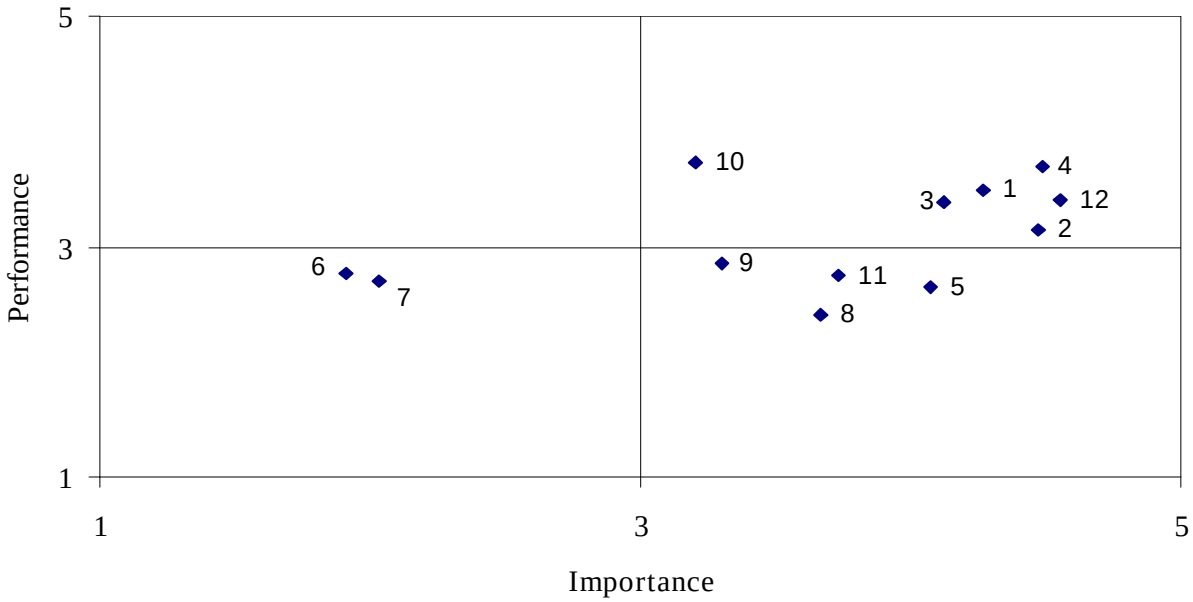
The two stage survey was conducted from June to August 1998. The on-site survey was conducted on the three trails during June, 1998. Users of each trail were sampled on three consecutive days (Thursday to Saturday) of a given week. With the exception of one day (surveys

canceled due to adverse weather), trail users were intercepted between 7 A.M. and 7 P.M. daily. On each trail one intercept point was selected in the trail's mid-section. A folding table was set up at the intercept point and signs were placed down the trail in both directions indicating that a trail study was in progress. An attempt was made to invite every user who passed the intercept point to take part in the survey. Approximately 80 percent of those passing the table agreed to participate. The one page on-site survey was administered to these people. At the end of this survey, trail users were asked to furnish their names and addresses if they were willing to participate in a more detailed mail-back survey. A total of 1,004 trail users filled out the on-site survey and 889 (88.5 percent) provided their names and addresses for the mail-back survey.

The mail-back questionnaire was sent to all 889 trail users who agreed to participate. This mailing included a cover letter explaining the purpose of the study, along with a postage paid, self-addressed envelope. A reminder postcard was sent to non-respondents 10 days after the initial mailing. Two weeks after this, a second questionnaire, cover letter, and return envelope were mailed to non-respondents. The final returns for each trail were as follows: 217 from BRT (63 percent), 169 from SCT (62 percent), and 182 from BFT (67 percent). A total of 568 trail users responded to the mail (off-site) portion of survey for an overall response rate of 64 percent.

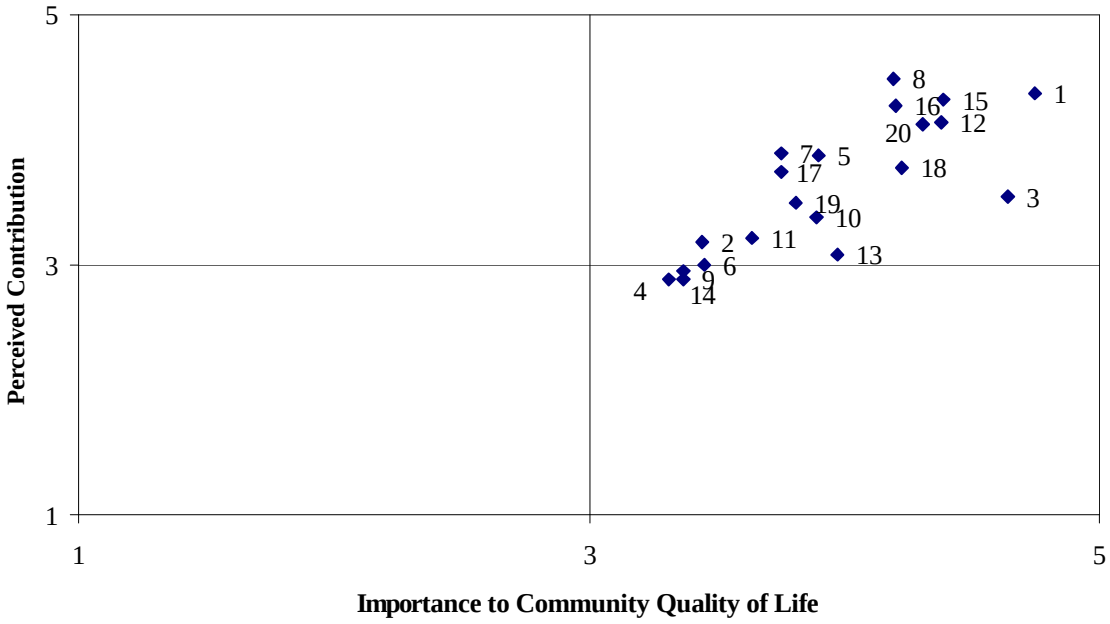
Study Findings and Conclusions

The responses to the surveys were analyzed to determine consistent themes and trends in user satisfaction and perceptions. The study found that several trail attributes contribute significantly to user satisfaction and higher levels of trail use (Figure S-2). Adequate separation from motor vehicles was noted as a positive attribute that should be provided whenever possible on shared use trails. Trail surface quality and width was also noted as an important attribute, particularly in cases where numerous user types (e.g., bicyclists, joggers, walkers) were using the same trail. The study also revealed that many of the trail users felt that the shared use trails significantly contributed to harmonizing transportation and community goals (Figure S-3). The survey responses indicated that the trails were used for a variety of purposes, including transportation, recreation, social interaction, and enjoyment of the natural environment. The researchers concluded that user surveys (such as those conducted in this study) are a valuable addition to other traditional transportation planning tools, and as such, can provide more and better insight into roadway and trail user behavior and motivation.



Label	
1 : trail surface type	7 : places for eating
2 : trail surface maintenance	8 : lighting facilities
3 : width of trail	9 : trail markers
4 : trail's separation from traffic	10 : number of steep hills
5 : water fountains	11 : level of patrol
6 : places for shopping	12 : litter on trail

Figure S-2. Importance-Performance Grid on Trail Attributes, Overall



Label

1: natural area present
2 : access to public transportation
3 : amount of pollution
4 : new business development
5 : opportunity for other transportation
6 : accessibility to shopping areas
7 : social interaction among residents
8 : conditions of people's health and fitness
9 : time spent on shopping
10 : accessibility to work/school
11 : cost of transportation
12 : residents' pride in community
13 : time spent on commuting
14 : diversity in types of industry
15 : accessibility to recreation
16 : land use patterns
17 : equity among different residents
18 : place for wildlife
19 : economic growth
20 : features contributing to community

Figure S-3. Importance-Contribution Grid of Trail's Contribution to Quality of Life, Overall

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1. INTRODUCTION

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 provided substantially increased funding for bicycle and pedestrian facilities as a means to promote multi-modal transportation systems. The Transportation Equity Act for the 21st Century (TEA-21) continues this trend of funding support for bicycle and pedestrian facilities. Most of the bicycle and pedestrian funding has been provided through the Transportation Enhancements and Congestion Mitigation and Air Quality (CMAQ) funding categories. Many federal agencies, including the U.S. Department of Transportation (DOT), the Federal Highway Administration (FHWA), and the Environmental Protection Agency (EPA) have recognized the benefits of integrating bicycle and pedestrian facilities into multi-modal transportation systems and the role that bicycle and pedestrian facilities have in sustainable communities.

Bicycle and pedestrian advocates assert that bicycle and pedestrian facilities contribute to the quality of life in sustainable communities. This contribution to the quality of life, they say, is achieved through increased interaction with other community members, healthy lifestyles, and an enhanced interaction with the surrounding environment, to name a few. To date, however, many of these assertions about biking and walking's contributions to quality of life have not been scientifically documented.

STUDY OBJECTIVES

The objectives of this research study were to: 1) understand the full range of impacts (both positive and negative) associated with bicycle and pedestrian facilities, and 2) develop and test an evaluation tool that documents the contribution of bicycle and pedestrian facilities to transportation and community goals (e.g., quality of life) in urban areas. A better understanding of the impacts can help to develop an evaluation process that satisfies both transportation objectives and community values.

In early stages of the study, the research team decided to focus on the perceptions of bicycle and pedestrian facility users as a method to gauge impact on community goals and values. With user surveys deployed at three shared use trails in Texas, the researchers were able to determine how trail users perceived the contribution of specific trails to transportation and community goals in their own communities. The findings of this study can be used to support assertions of the contribution of bicycle and pedestrian facilities to transportation and community goals.

REPORT ORGANIZATION

This report is organized into the following chapters:

- **Introduction -** summarizes the research problem and study objectives;
- **Background** - contains background information on performance-based transportation planning, harmonization of transportation and community goals, and evaluation methods for bicycle and pedestrian facilities;
- **Study Design -** summarizes the study design used to evaluate user perceptions of the contribution of bicycle and pedestrian facilities to transportation and community goals;
- **Findings -** documents the development and testing (through on-site and mailed user surveys) of the user perception-based bicycle and pedestrian evaluation framework; and
- **Conclusions and Recommendations -** summarizes the primary conclusions and recommendations from the study.

2. BACKGROUND

This section presents background information on several topics relevant to the development of an evaluation framework for bicycle and pedestrian facilities. The initial section presents information on performance-based planning for multi-modal transportation systems. Another area of interest in the transportation engineering profession is the harmonization of transportation and community goals. The chapter concludes with a review of current bicycle and pedestrian facility evaluation methods.

PERFORMANCE-BASED MULTI-MODAL TRANSPORTATION PLANNING

Widespread interest in performance-based transportation planning has stemmed from many factors (1,2), with the primary motivation being:

- federal transportation legislation (ISTEA and TEA-21) that encouraged multi-modal transportation solutions and innovative transportation planning, as well as the Government Performance and Results Act (GPRA) of 1993 that requires government agencies ". . . to set strategic goals, measure performance, and report on the degree to which goals were met."

- heightened concern about the most effective use of scarce financial resources for transportation; and

- increased awareness and concern about the role of transportation in supporting numerous goals, including economic competitiveness and community livability.

Based upon previous research (1,2,3), transportation agencies with successful multi-modal, performance-based planning processes perform the following steps:

- define an agency vision and strategic mission (e.g., mission statement);
- establish long-term and annual performance goals/targets;
- develop performance measures tied to annual performance goals/targets;
- use performance measures in improving program performance; and
- communicate results to policy makers, managers, and the public.

This section describes the underlying concepts of performance-based transportation planning, and provides examples of performance goals and measures that can be used to measure and communicate results of transportation investments. These concepts and examples are discussed in the context of multi-modal transportation systems, such as bicycle and pedestrian facilities.

Concepts and Example Measures

In performance-based transportation planning, the essential first step includes understanding the agency's vision, mission and related goals. The agency mission and goals are the sole reason for the agency's existence and help to more clearly define annual performance targets and measures. A transportation agency's vision and mission is typically accomplished through self-assessment by the agency and through extensive public outreach efforts. For example, the U.S. DOT's defined vision is "*a visionary and vigilant DOT leading the way to transportation excellence in the 21st century*" and their mission is to "*serve the United States by ensuring a transportation system that meets our vital national interests and enhances the quality of life of the American people today and into the future.*" (4)

Transportation agencies' missions have evolved over the century from a roadway construction and basic mobility function (e.g., "getting the farmer out of the mud") to providing a quality multi-modal transportation system to a diverse customer base. With this evolving mission has come a slow recognition of the interdependence of transportation systems with other aspects, such as the environment, social communities, and the economy. Unfortunately, some transportation agencies have not recognized their evolving mission or the effects of transportation facilities on the environment or communities. Some transportation agencies continue the tradition of roadway construction and expansion even when their customers (e.g., communities and local citizens) are clearly opposed.

Transportation goals are derived from each transportation agency's stated vision and mission. It has been noted that transportation systems have several basic goals or roles to fulfill, such as:

- basic mobility to users;
- preserve environmental quality;
- improve quality of life;
- increase economic productivity;

These basic goals are represented in Figure 1, which shows the relationship of transportation systems to other societal goals. It should be noted that Figure 1 shows the relationships between transportation and societal goals from a transportation agency perspective, hence transportation's prominent position at the center of the figure. The authors hypothesize, however, that the societal perspective is quite different, as shown in Figure 2. This figure shows that there are numerous services and programs that can be used to achieve societal goals, with transportation services being one. Figure 2 also shows sustainability as a final goal that is ultimately achieved when some desired balance exists between societal goals related to the physical, social and economic environments in a community. In the development of transportation plans and programs, many public agencies typically expand on these three basic societal goals in defining how transportation relates to the public it serves. For example, Table 1 shows examples of goal statements from several transportation agencies in the U.S.

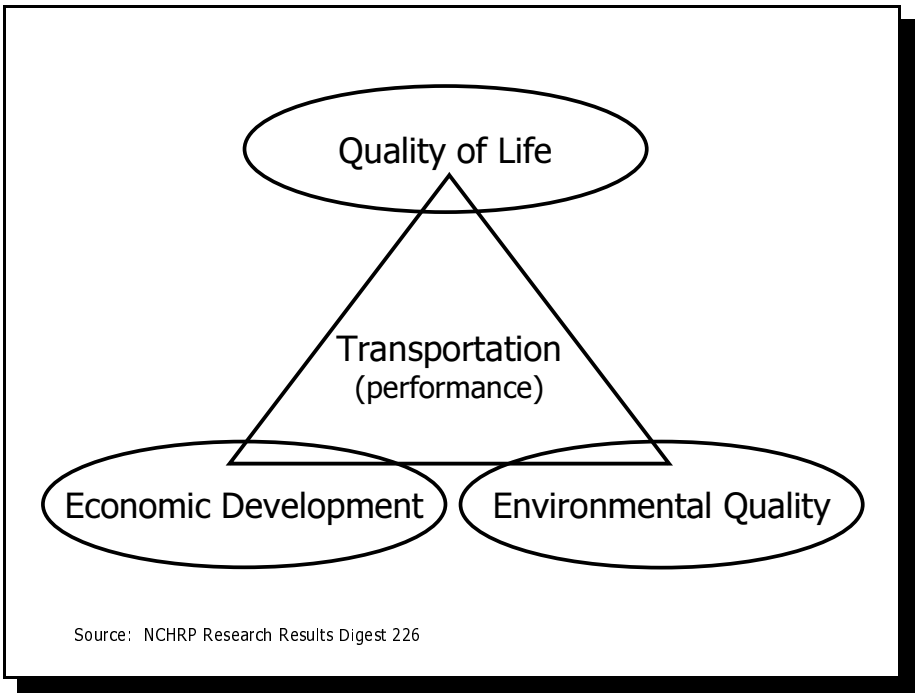


Figure 1. Relationship of Transportation to Societal Goals from a Transportation Perspective

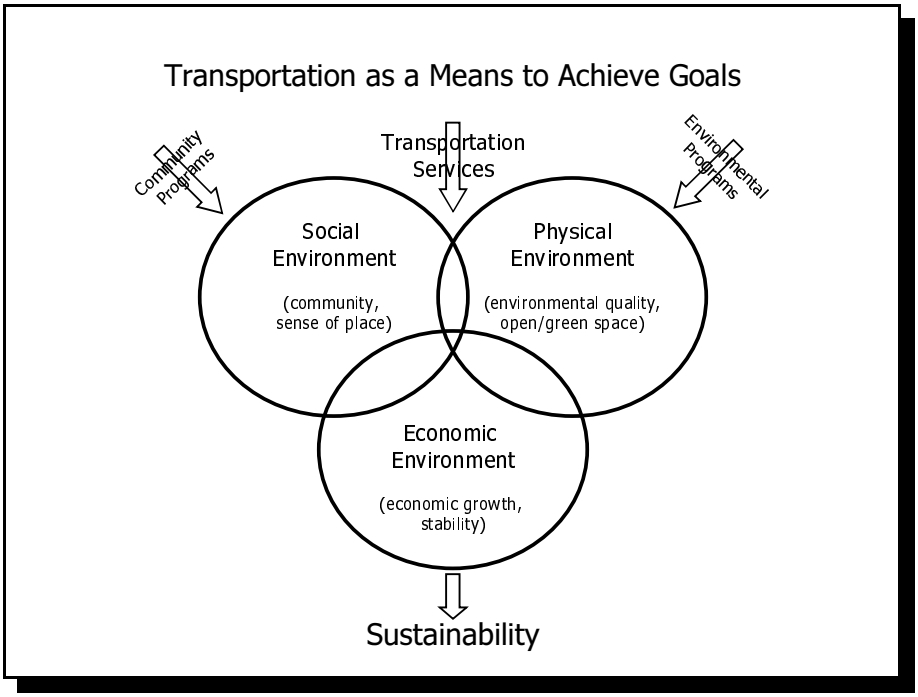


Figure 2. Relationship of Transportation to Societal Goals from a Societal Perspective

Table 1. Examples of Goal Statements for Various Transportation Agencies

AGENCY	GOAL STATEMENT
U.S. Department of Transportation Source: (4)	**Safety:** Promote the public health and safety by working toward the elimination of transportation-related deaths, injuries, and property damage.
	Mobility: Shape America's future by ensuring a transportation system that is accessible, seamless, and efficient and offers flexibility of choices.
	Economic Growth And Trade: Advance America's economic growth and competitiveness domestically and internationally through efficient and flexible transportation.
	Human And Natural Environment: Protect and enhance communities and the natural environment affected by transportation.
	National Security: Advance the nation's vital security interests by ensuring that the transportation system is secure and available for defense mobility, ensuring that our borders are safe from illegal intrusion, and promoting worldwide economic growth and stability.
Texas Department of Transportation Source: (5)	**Mobility And Accessibility:** To develop a multi-modal transportation system that meets the mobility and accessibility needs of all Texans.
	Effectiveness And Efficiency: To maximize the use of existing transportation facilities and services and ensure that investment decisions are based on efficient solutions.
	Choice And Connectivity: To maximize the modal options available to individual and business transportation system users and to ensure that all modes are efficiently connected to provide for easy transfers and timeliness.
	Safety: To ensure that all modes of transportation and transfers between modes are safe for transportation users and providers.
	Environmental And Social Sensitivity: To provide a transportation system that is environmentally sound, energy efficient, and sensitive to community needs and impacts.
	Economic Growth And International Trade: To build a transportation system that maximizes opportunity for economic growth, international trade, and tourism.
	New Technology: To take advantage of emerging and new technologies that increase the efficiency, safety, and attractiveness of the transportation system.
Houston-Galveston Area Council Source: (6)	**Vision:** The Houston-Galveston regional Metropolitan Transportation Plan will enhance mobility by providing an efficient, affordable, and environmentally responsible transportation system for both people and goods. **Goals:** Multi-modal transportation system Enhancement and maintenance of existing infrastructure Coordinated land use and transportation development Seamless connections Efficient movement of people and goods Environmentally responsible system Active citizen involvement Cost effective and affordable transportation system

The development of performance measures is an essential step in the performance-based planning process because it relates the transportation goals to measurable quantities that directly reflect progress toward stated goals. If performance measures are not keyed to the goals and tracked on a regular basis, an agency has no way to monitor progress toward goals. Performance measures are also used to communicate this progress to managers, decision-makers, and the public (users and customers of the transportation system).

Transportation performance measures are intended to gauge the effects of transportation investments on broad social **outcomes** (which should be closely related to agency goals), such as increased mobility or economic activity. Most of the existing performance measures in transportation, however, focus primarily on **outputs** of the transportation system (the literature also refers to measured outcomes as system **effectiveness** and the measured output as system **efficiency**), such as number of vehicles or vehicle capacity. Oftentimes these measured outputs are only indirectly related to the transportation agency's goals, thus providing a weak or nonexistent link between measured results and actual goals.

Some transportation agencies have struggled with performance measurement issues for several reasons:

- resistant to recognizing their evolving mission and customer needs;
- unfamiliarity with public participation in developing transportation plans and programs, thereby complicating the measurement of customer satisfaction; and
- accustomed to the use of efficiency measures, which captures progress toward a process, not the desired outcome.

Some of the difficulty of performance-based planning may lie within two of its processes:

- developing a set of performance measures that directly reflect outcomes and progress toward goals; and
- changing or adapting transportation decision-making processes to reflect the results of performance measurement and progress toward goals.

The following sections provide examples of performance measures that are related to relevant goals of transportation systems. The example measures are an attempt to directly measure social outcomes and to incorporate more measures of customer satisfaction.

Example: Oregon Benchmark Program

A recent trend among many governmental organizations is the development of a macro-level process for statewide strategic planning. One such process was undertaken in the State of Oregon. The Oregon Shines program was created in 1989 as a 20-year vision to guide Oregon's strategic development. Of primary concern were three strategic goals: an educated and prepared workforce, maintaining the natural environment and uncongested way of life, and sustained economic prosperity. In order to measure the progress of these three goals, a series of benchmarks were created. These benchmarks, as shown below, are intended to focus on the outcomes of various state agencies as they relate to the accomplishment of the three main goals.

Transportation

- Percentage of Oregonians who commute within 30 minutes between where they live and work
- Percentage of Oregonians who commute to and from work during peak hours by means other than a single occupancy vehicle

Environment

- Carbon dioxide emissions as a percentage of 1990 emissions
- Acres of state-owned parks per 1,000 Oregonians

Social Harmony

- Overall reported crimes per 1,000 Oregonians
- Number of Oregonians who are homeless on any given night

One of the unique aspects of the benchmarks program are its wide range of performance indicators. These indicators measure areas ranging from health care, education, environmental sustainability, economic development, transportation, and social harmony. For example, performance measures relating to transportation are concerned with destination travel times, highway congestion, and the adequate supply of bicycle/pedestrian facilities. Environmental performance measures such as air quality and acres of open park space are important to the achievement of environmental sustainability. Similarly, the performance measures of crime rates and community health measure the quality of social harmony. Together, these and other measures provide a balanced portrait of the progress Oregon is achieving toward its strategic development.

Example: Minnesota Department of Transportation

To better optimize its transportation system, the Minnesota DOT (MnDOT) has developed its own unique measurement system called the "Family of Measures." Unlike other measurement systems, the "Family of Measures" are designed to evaluate transportation investments and the outcomes those investments have on customer service. This is done by dividing the measurement effort up into the three categories: Systems Performance, Public Values, and Organizational Performance.

The Systems Performance category is designed to allow the department to analyze the actual operation of the transportation system. This performance is reflected in the desired outcomes of cost, time/directness, safety, quality of ride, and condition of infrastructure. For example, indicators tied to the outcome of time/directness include the number of congested highway miles, minutes of variation in travel time, the miles of detour travel by transportation mode, and the average metro area commuting time.

The Public Values category is designed to measure the perceptions that society has regarding the transportation system. The desired outcomes of environment, regional economics, personal security, and access/basic levels of service help to establish public sentiment. For example, indicators tied to the outcome of access/basic levels of service include the percent of people in the metro area with more than one modal choice and the percentage of transportation disadvantaged populations with access to public transportation.

The last category of Organizational Performance is designed to measure the productivity of the department itself. The outcomes of performance/productivity, partnerships, environment, and progress are all measured through a series of internal indicators. For example, indicators tied to the outcome of performance/productivity category include the percentage of funds allocated toward infrastructure improvements and costs of those improvements.

By grouping the three categories of System Performance, Public Values, and Organizational Performance, the MN/DOT is able to gain a wide range of feedback. This feedback includes the quantitative data of the transportation system and qualitative data of public sentiment.

HARMONIZATION OF TRANSPORTATION AND COMMUNITY GOALS

An emerging theme in the transportation engineering community is the harmonization of transportation and community goals, which is similar in concept to performance-based transportation planning. The Institute of Transportation Engineers (ITE) has been a major proponent of harmonization, which they define as using transportation programs to pursue a wide range of community goals in addition to typical transportation goals of mobility, efficiency, and safety (7). Examples of community goals include security, comfort, aesthetics, economic development, sustainability, environment and others.

The concept of harmonization embodies several unique aspects. Because of the many goals that may be considered in harmonization, there is potential to have competing goals. For example, economic development goals may compete with aesthetics or sustainability goals when considering a new location for a highway on the fringe of a suburban area. According to the principle, harmonization is achieved when there is a balance among competing goals. This balancing of goals may be delicate and somewhat difficult to achieve or maintain.

Without stakeholder participation, harmonization and the balancing of goals will become even more difficult. Stakeholders can include residents, business owners, interest and advocacy groups (e.g., bicycling, disabled, etc.), developers, and many other groups. Additionally, stakeholder participation involves more than just the required public meetings of the 1970s and 1980s, where detailed design alternatives were presented for public scrutiny. Stakeholder participation requires that stakeholders be involved at the early concept stages, where the actual problems are defined and the vision and goals for transportation projects are established.

EVALUATION METHODS FOR BICYCLE AND PEDESTRIAN FACILITIES

The current practice for evaluating bicycle and pedestrian facilities is varied and depends upon the type of analyses being conducted. In general terms, the current practice includes three basic types of evaluation methods:

- traditional traffic output methods (e.g., volumes, reductions in delay);
- capacity-based methods (e.g. *Highway Capacity Manual*);
- roadway characteristics-based methods (e.g., bicycle suitability indices);

The following sections contain a description of each of these methods, as well as a discussion of the benefits or shortcomings of these methods. A user perception-based evaluation approach is introduced as an alternative or supplement to the current evaluation practices.

Traditional Traffic Output Methods

Traditional traffic output methods typically use output measures that are designed to assess the efficiency of vehicle traffic flow. Examples of these output measures include vehicle throughput

(hourly or daily volumes), reduction in vehicle delay, increase in average speed, reduction of vehicle emissions, and other similar measures. Traditional traffic output methods often are used in the planning and programming of transportation improvements. In some cases, traffic output methods are used because bicycle and pedestrian facilities are being compared to traditional transportation improvements, such as freeway/street widening and other vehicle-oriented alternatives.

For example, the Houston-Galveston Area Council (HGAC) proposed to evaluate bicycle and pedestrian facilities (in comparison to other transportation improvements) in their congestion mitigation air quality improvement (CMAQ) program using the following measures: reduction in vehicle-miles traveled (VMT), reduction in emissions, and travel delay savings (8). In HGAC's analysis, bicycle and pedestrian facilities were analyzed as a generic, area-wide improvement using assumptions about their contributions to and effects on vehicle traffic. Their preliminary analysis ranked bicycle and pedestrian facilities as the least effective CMAQ project.

In many cases, traffic output methods are inappropriate for evaluating bicycle and/or pedestrian facilities because the output evaluation measures are biased toward vehicle traffic flow. Traditional traffic output measures assume, a priori, that the transportation goal is efficient traffic flow, and do not contribute to transportation agencies' evolving goal of multi-modal transportation accessible to all users. Other goals related to providing transportation users' choice of modal options in a seamless transportation system are also ignored using traditional traffic output methods and measures. In addition, many assumptions typically are made in such analyses because of the little-known effects of bicycle and pedestrian facilities on area-wide vehicle traffic patterns.

Capacity-Based Methods

Similar to traffic output methods, capacity-based methods use the principles of highway capacity that have been revised over the past 40 years to evaluate bicycle and/or pedestrian facilities. Capacity-based methods typically are applied to planned or existing bicycle and/or pedestrian facilities on a project or corridor basis. Typical evaluation measures used in capacity-based methods include bicyclist or pedestrian volume or density, volume-to-capacity ratio, and average speed.

For example, the *Highway Capacity Manual* (9), a standard traffic engineering reference, defines the level of service for pedestrian walkways based on the available space (sq. ft. per pedestrian), or essentially the inverse of pedestrian density. The pedestrian level of service (LOS) criteria also list average speed (ft. per minute) and flow rate (pedestrian per minute per ft.) as supplementary criteria. Planned updates to the bicycle facility analysis procedures suggest average speed as LOS criteria for interrupted flow facilities (e.g., bicycle lanes, wide curb lanes) and number of passing events per mile for uninterrupted flow facilities (e.g., exclusive bicycle or multi-use path or trail).

Capacity-based methods may be appropriate for planning or designing bicycle and pedestrian facilities when the expected volumes approach the physical capacity of the facility. Except for a very limited number of dense urban settings such as New York City, most bicycle and pedestrian use does not approach the capacity of typical facilities such as bike lanes or multi-use trails. In addition, the pedestrian capacity methods are mostly utilized in pedestrian-specific environments or at modal interfaces, such as transit stations, pedestrian plazas, or large stadiums or arenas. These capacity-based methods provide little useful evaluative information for the vast majority of bicycle and pedestrian facilities being planned or designed in the U.S.

Roadway Characteristics-Based Methods

The last category of methods are based largely on the characteristics of the roadway or streetscape upon which the bicycle and/or pedestrian facility is either located or within close proximity. These methods include concepts such as bicycle suitability, roadway condition index, and pedestrian quality of service. These methods are designed to reflect a bicyclist or pedestrian's perspective, in that the evaluation measures attempt to quantify the comfort level or stress level of bicyclists and/or pedestrians while encountering certain roadway characteristics. Analyses conducted using roadway characteristics typically are used for the planning and design of bicycle and/or pedestrian facilities, as the methods provide no means of comparison to other transportation improvements.

For example, the bicycle compatibility index (BCI) is a measure used to evaluate the compatibility of specific roadways to accommodate both motorists and bicyclists (10). The BCI methodology uses the following roadway characteristics in calculating BCI values: bicycle/curb lane width, traffic volumes, vehicle speeds, presence of parking, and area type. Other roadway condition indices and suitability indices use similar characteristics, and also include variables such as pavement condition, speed limits, grades, driveway frequencies, presence of heavy vehicles, etc. (11). The pedestrian environment factor (PEF) is a similar evaluation measure for pedestrians that typically incorporates the following roadway or streetscape variables: sidewalk availability, ease of street crossings, connectivity of the street/sidewalk system, and terrain/grade (12). The PEF values are used to evaluate pedestrian facilities on a corridor or area-wide basis, and are most often used in mode choice models to determine the propensity for pedestrian travel.

Roadway characteristics-based methods have emerged to address specific needs in evaluating and comparing bicycle and/or pedestrian facilities with one another. Because the design of these measures are specific to bicycle and/or pedestrian facilities, these methods do not permit a comparison of bicycle and/or pedestrian facilities to other transportation improvements or modes of transportation. Some attempts have been made to link these methods to the vehicle mode by level of service (LOS) designations as used in the *Highway Capacity Manual*, but these LOS designations are not particularly meaningful for comparisons outside individual analyses.

There is also a weak link between roadway characteristics-based methods and transportation goals, in that the evaluation measures mostly reflect the output of bicycle and/or pedestrian

facilities. Some of the roadway characteristics-based measures attempt to measure outcomes such as comfort and convenience of users, but the measures are often not chosen to correspond with overall transportation goals, such as multi-modal accessibility or transportation choice.

User Perception Method

A potential supplement or alternative to the methods described above is a user perception method, which relies on actual user input in evaluating bicycle and pedestrian facilities. This study took a user perception approach to evaluate the effectiveness of bicycle and pedestrian facilities and their potential to meet transportation and community goals (e.g., quality of life). The harmonization of quality of life goals through transportation requires an understanding of how transportation facilities relate to the natural environment, sense of place and social interaction, as well as mobility and access. Transportation is not only the efficient movement of people and goods between places but the experience of moving between places. Human experience within a transportation corridor, be it an interstate highway or sidewalk, creates perceptions through which to measure the efficacy of goals related to physical, social and economic environments in a community. People's perceptions of how transportation facilities influence their communities have powerful political implications. Understanding public perceptions about different transportation improvements provides useful market information that can be employed to identify shortcomings in current facilities, develop new facilities, develop and justify planning strategies, and/or evaluate usefulness in achieving agency objectives.

3. STUDY DESIGN

To meet the objectives of this study, an attempt was made to operationalize the concept of harmonization in a particular transportation context. Bicycle and pedestrian facilities encouraged through the federally-funded Transportation Enhancements Program often are oriented toward separated, shared-use trails commonly placed in remnant right-of-ways along rivers and streams. A movement in recent years by urban planners, park professionals, wildlife biologists, and flood plain administrators to integrate riparian greenways into communities has added to the interest in the Transportation Enhancements Program funding for the purchase of land and its development as alternative transportation corridors. This greenway trail movement provides an excellent opportunity to evaluate if and how shared-used trails might be contributing to (harmonizing) transportation and other community goals.

Greenway-based bicycle and pedestrian shared-use trails were selected for evaluation in this study because they were judged to have inherent qualities related to multiple community quality of life goals. By measuring and analyzing the perceptions of people who use these trails (key stakeholders), better insight can be obtained into whether this type of transportation facility contributes to the harmonization of transportation and community goals.

STUDY LOCATIONS

For this study, three trails in Texas were selected as case study sites:

- Brays Bayou Trail, Houston;
- Buffalo Bayou Trail, Houston; and
- Shoal Creek Trail, Austin.

These trails were selected because each offered good connections between employment areas, neighborhoods, parks and commercial areas. Table 2 summarizes the characteristics of the three shared-use trails surveyed in this study. Figures 3, 4, and 5 represent the approximate alignment of each trail, major street intersections and other key reference points within their respective communities. Each of the trails is located along a riparian greenway. These trails were selected based upon previous bicycle and pedestrian research efforts and consultation with local authorities about trails in their jurisdictions. Research objectives dictated that the research team select trails that included a variety of activity types (e.g., bicycle, pedestrian) and trip purposes (e.g., commuting, recreational). The researchers also conducted on-site observations in early phases of the study to determine whether these trails meet the study requirements. These shared-use trails are typical of those funded through the Transportation Enhancements program, and each of these three trails is also slated to be improved with ISTEA funding in the near future.

Table 2. Characteristics of Shared-Use Trails

Case Study Trail	Trail Characteristics
Brays Bayou Trail (BRT)	• Parallels Brays Bayou, which is a concrete-lined channel that has been straightened (with some natural bends remaining) for flood protection. • Trail traverses mostly flat, grassy areas lining the concrete channel, and has very few grade changes. • Predominant use work trips (50 to 75 percent), with most other trips being of a recreational nature. • Average daily bicyclist and pedestrian volumes total nearly 400, with a relatively equal number of bicyclists and pedestrians.
Buffalo Bayou Trail (BFT)	• Parallels Buffalo Bayou, which is a natural channel that flows through the center of downtown Houston. • Trail traverses undulating terrain, with numerous grade changes from the channel banks to upper edges of the flood plain. • Relatively equal split between work and recreational trips, although this trail is a very popular midday and after work jogging circuit. • Average daily bicyclist and pedestrian volumes total approximately 800, with about 75 percent being pedestrians (mostly joggers).
Shoal Creek Trail (SCT)	• Parallels Shoal Creek, a natural channel that flows west of downtown Austin. • Trail traverses undulating terrain with some grade changes. Trail has dense vegetative cover. • Location of study site was in close proximity to a local park and included a dog area.

Note: Trail usage and trip information from (13).

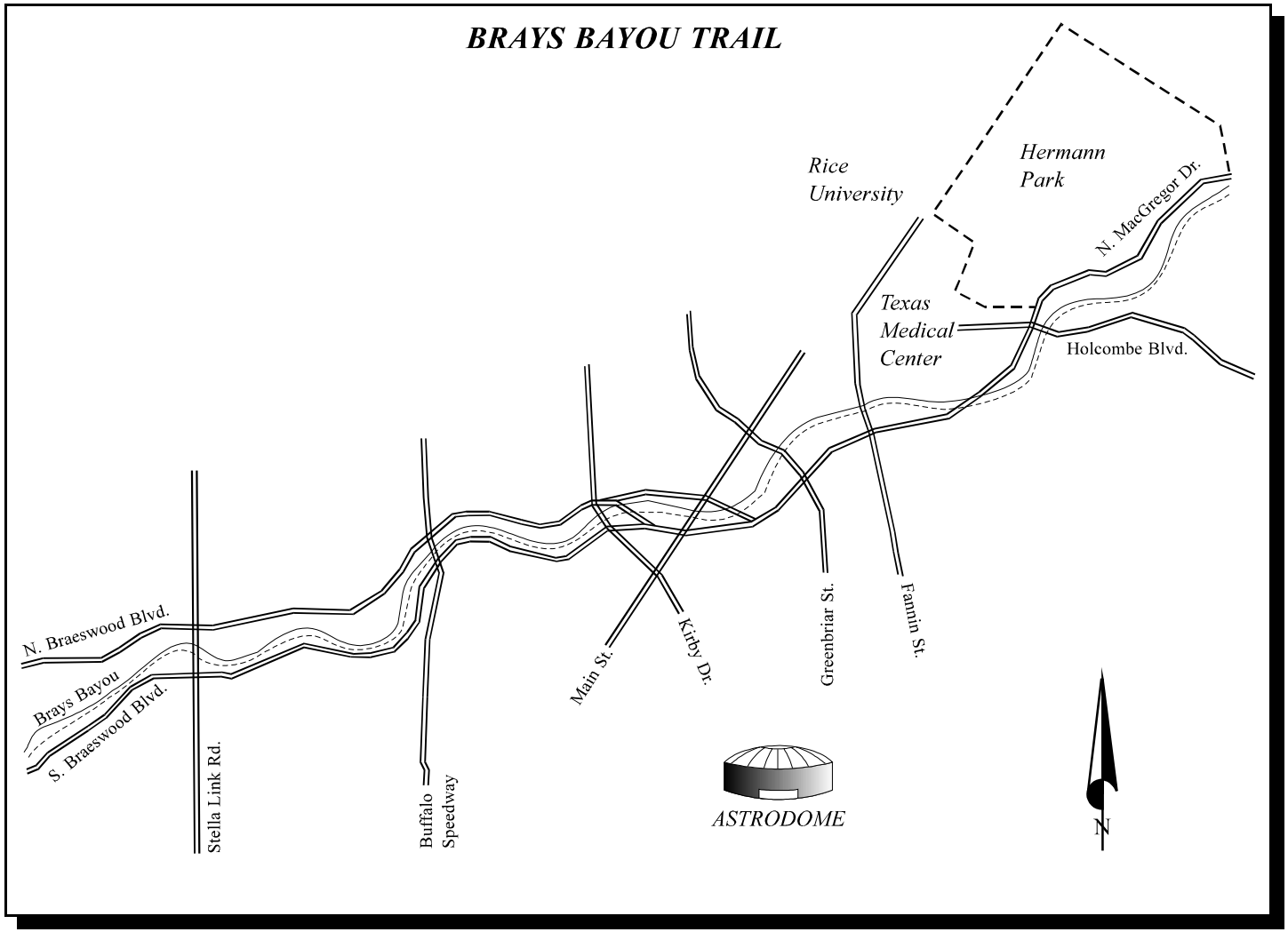


Figure 3. Vicinity Map of Brays Bayou Trail, Houston

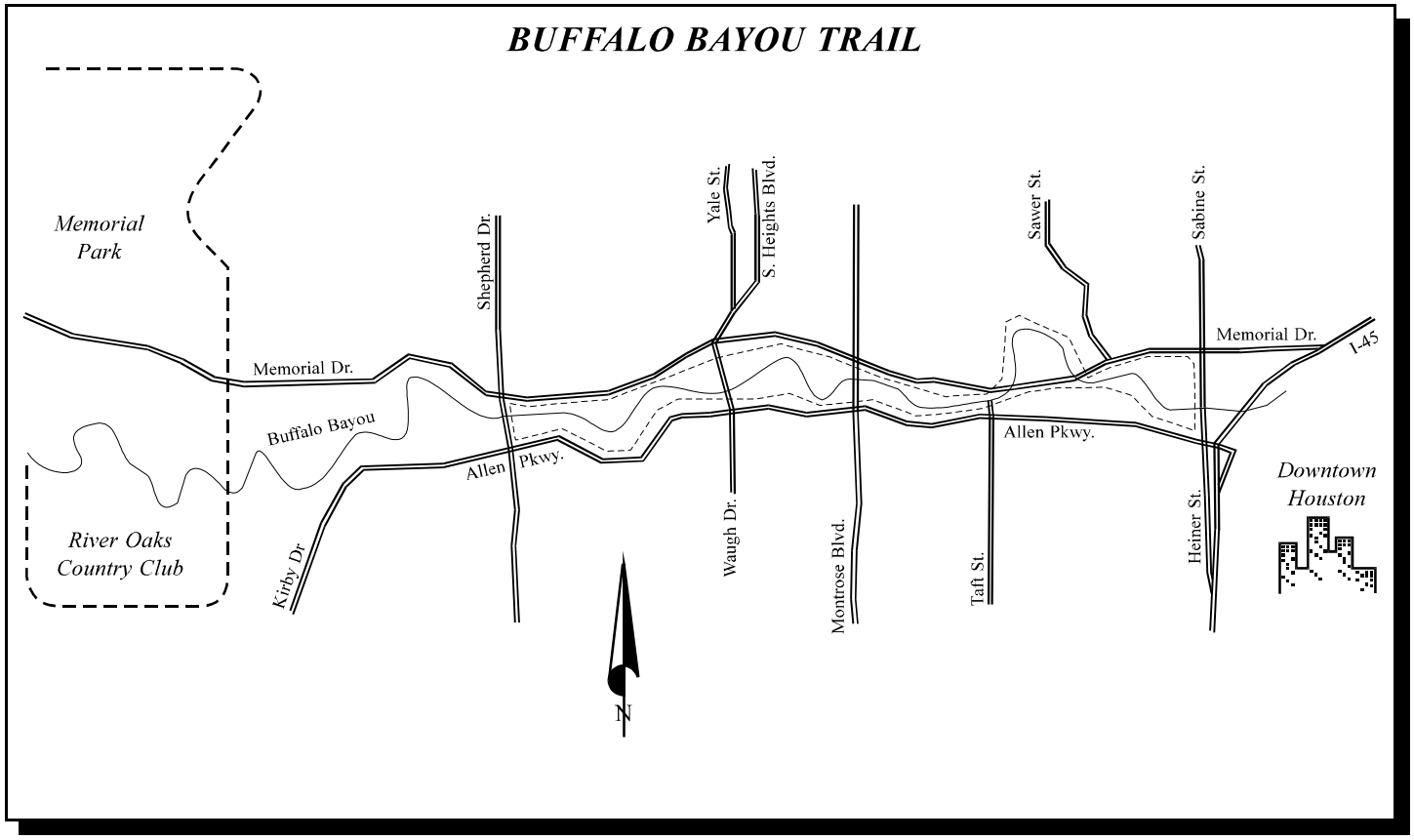


Figure 4. Vicinity Map of Buffalo Bayou Trail, Houston

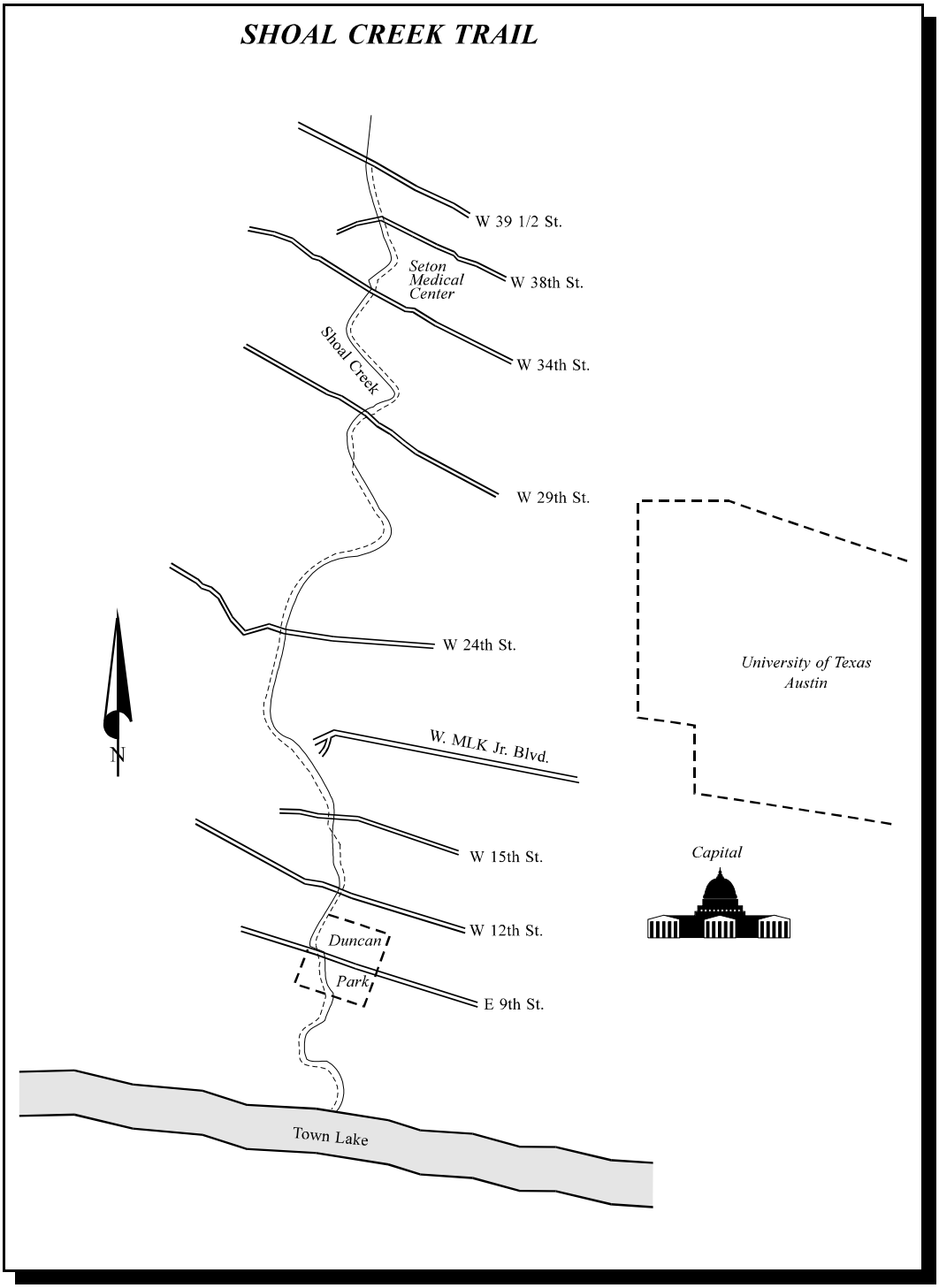


Figure 5. Vicinity Map of Shoal Creek Trail, Austin

QUESTIONNAIRE (SURVEY) DESIGN

Two questionnaire forms were developed: one for on-site completion and one to be mailed to respondents and returned in the weeks following the on-site contact. The on-site survey form (one page) included questions about basic aspects of trail use behavior. The questions asked about people's origin and destination of travel, length of time spent on trail for this trip, whom they were using the trail with and mode of travel. We also asked respondents to provide positive and negative impressions of the trail. The intent of the on-site survey was to record basic behavior and perceptions *in situ* while using the opportunity to ask each person to participate in a more detailed postal survey. If a person responded favorably to the postal survey, their name and address were also recorded.

The questionnaire used on the postal survey consisted of several sections (five pages) and was designed to gather information on people's trail use, perceived conditions of the trail, and the way people felt about the trails' contribution to the quality of life (QOL) of their communities. The first section asked about behavioral aspects of trail use (e.g., use history, use purpose, type of activities normally engaged in, etc.).

The second section consisted of two parts. Part one asked respondents to indicate how important 20 items were to QOL in their communities. The items were developed as measures to operationalize the concept of harmonization by representing characteristics of community QOL that relate to both transportation goals (as outlined in Table 1) and other QOL characteristics in the literature. Items were selected and adopted from literature related to quality of life (14, 15, 16,17,18,19,20,21) and sustainable communities (22,23,24,25). Some examples include: having access to public transportation, the amount of pollution, social interaction among residents, diversity in the types of industry, and level of economic development.

The second part of this section shifted from broad quality of life items to trail specific items. Twelve items were included to elicit responses on the importance of trail attributes to respondents' enjoyment of trails. Items used were selected and adopted from previous trail-related research (26,27,28,29,30). Some examples were: what the trail surface is made of, how wide the trail is, how well the trail is separated from auto traffic at intersections, and places along the trail to get a drink of water. For all 32 items in this section, respondents were asked to respond on a 5-point Likert type scale (i.e., 1: very unimportant to 5: very important).

The third section also consisted of two parts and included the same items as the second section but the context of the items was **performance** as opposed to **importance**. Respondents again used a 5-point Likert type scale (i.e., 1: very poorly to 5: very well) to answer items in this performance section of the questionnaire. This method of measurement and subsequent analysis is termed "importance-performance." Questioning people about both the importance of characteristics and their performance allows for a more complete evaluation of their relevance. This method was employed to help meet one of the study's primary objectives and enhance

understanding of if and how the trails studied might be meeting transportation and other community goals.

The last section asked about demographic characteristics of trail users and gave them an opportunity to provide additional thoughts. Finally, respondents were asked to use a map of their trail to mark points where they typically got on and off the trail, and to mark problem areas along the trail and give a brief description of each problem they marked.

SURVEY PROCEDURES

The two stage survey was conducted from June to August 1998. The on-site survey was conducted on the three trails during June, 1998. Users of each trail were sampled on three consecutive days (Thursday to Saturday) of a given week. With the exception of one day (surveys canceled due to adverse weather), trail users were intercepted between 7 A.M. and 7 P.M. daily. On each trail one intercept point was selected in the trail's mid-section. A folding table was set up at the intercept point and signs were placed down the trail in both directions indicating that a trail study was in progress. An attempt was made to invite every user who passed the intercept point to take part in the survey. Approximately 80 percent of those passing the table agreed to participate. The one page on-site survey was administered to these people. At the end of this survey, trail users were asked to furnish their names and addresses if they were willing to participate in a more detailed mail-back survey. A total of 1,004 trail users filled out the on-site survey and 889 (88.5 percent) provided their names and addresses for the mail-back survey. The dates of the on-site survey, the number of on-site contacts, and the resulting pool of potential respondents for the mail survey are presented in Table 3.

The mail-back questionnaire was sent to all 889 trail users who agreed to participate. This mailing included a cover letter explaining the purpose of the study, along with a postage paid, self-addressed envelope. A reminder postcard was sent to non-respondents 10 days after the initial mailing. Two weeks after this, a second questionnaire, cover letter, and return envelope were mailed to non-respondents. The final returns for each trail were as follows: 217 from BRT (63 percent), 169 from SCT (62 percent), and 182 from BFT (67 percent). A total of 568 trail users responded to the mail (off-site) portion of survey for an overall response rate of 64 percent.

Table 3. Number of On-Site Interview Contacts made at Three Trail Study Sites

Study Site (City)	Dates of On-Site Survey	On-Site Interviews Completed n (%)	Pool for Mail-Back Survey n (%)
Brays Bayou (Houston)	6/04/98 to 6/06/98	392 (39.0)	347 (39.0)
Shoal Creek (Austin)	6/11/98 to 6/13/98	303 (30.2)	272 (30.6)
Buffalo Bayou(Houston)	6/18/98 to 6/20/98	309 (30.8)	270 (30.4)
Total		**1004 (100.0)**	**889 (100.0)**

DATA ANALYSIS

Data were analyzed using cross-tabulations and other descriptive statistics. The importance-performance analysis was utilized to examine how trails might influence community quality of life and how users judged specific trail characteristics. Chi-square and analysis of variance were used to examine differences among respondents from each trail in terms of their behavioral characteristics, demographic characteristic, and their perceptions of quality of life and trail attributes.

4. FINDINGS

The presentation of research results consists of three sections. The first section presents on-site survey results, including a profile of trail users. The second section contains a basic summary of mail-back survey data, including respondents' demographic and behavioral characteristics and their perception of trail conditions. The third section addresses the purpose of this study, which was to evaluate how trails contribute to community quality of life.

ON-SITE SURVEY FINDINGS

Table 4 reveals the origins and destinations of respondents on the trail at the time they were contacted. Overall, 76 percent had left from and were returning to home. Another 14 percent of respondents had left from and were returning to work. This indicates that almost 90 percent of the users in the study sample were in the midst of a round trip when the research team intercepted them on-site. Approximately 10 percent of the sample was involved in a one-way trip between work and home or some other destination. The trend for origin and destination types was similar across BRT and SCT, while BFT had a much higher proportion of users in the midst of a round trip from work to work (typically mid-day joggers), but a lower proportion of home to home users.

Table 5 indicates that the primary modes of travel on these trails were bicycling (39 percent), walking (32 percent), and running or jogging (29 percent). Each trail appeared to have a dominant mode-of-travel group. In the case of BRT, bicycling was dominant as 52 percent of all intercepts were with cyclists. Walking was the dominant mode at SCT with a 52 percent participation rate. Finally, running/jogging was dominant on BFT (53 percent of the users).

Table 4. Origin and Destination of Trail Users at the Time of On-Site Interviews

Trail	Origin and Destination						χ^2	p-value
	home-home n (%)	home-work n (%)	home-other n (%)	work-work n (%)	work-home n (%)	work-other n (%)		
Brays Bayou	324 (86.9)	0 (0.0)	25 (6.7)	7 (1.9)	15 (4.0)	2 (0.5)	288.5	.000
Shoal Creek	219 (84.2)	0 (0.0)	23 (8.8)	7 (2.7)	9 (3.5)	2 (0.8)		
Buffalo Bayou	134 (51.3)	7 (2.7)	3 (1.1)	109 (41.8)	8 (3.1)	0 (0.0)		
Total	677 (75.7)	7 (0.7)	51 (5.7)	123 (13.8)	32 (3.6)	4 (0.4)		

Table 5. Mode of Travel for On-Site Interview Respondents

Trail	Travel Methods					Total	χ^2	p-value
	Bicycling n (%)	Walking n (%)	Running/ Jogging n (%)	In-line Skating n (%)	Other n (%)			
Brays Bayou	204 (52.2)	111 (28.4)	68 (17.4)	7 (1.8)	1 (0.3)	391 (100)	195.4	.000
Shoal Creek	86 (28.5)	157 (52.0)	59 (19.5)	0 (0.0)	0 (0.0)	302 (100)		
Buffalo Bayou	92 (30.0)	52 (16.9)	163 (53.1)	0 (0.0)	0 (0.0)	307 (100)		
Total	382 (38.2)	320 (32.0)	290 (29.0)	7 (0.7)	1 (0.1)	1000 (100)		

Table 6 shows mode of transportation respondents used to get to the trail. Overall, more people used bicycles (33 percent) to get to the trail than any other mode. The next most frequently used mode was walking (25 percent), followed by cars (22 percent) and run/jog (19 percent). Relatively few people used in-line skates (0.5 percent) or public transportation (0.3 percent). Most people (greater than 75 percent) used the same mode of travel to get to the trail as they did on the trail. There were differences among the three trails regarding the proportion of people who used private automobiles to get there. SCT and BFT users were much more likely to have driven a car to get to the trail (40 percent and 21 percent respectively) than were BRT users (9 percent).

Overall, users of these trails tended to use the trail alone (61 percent) or with family/friends (31 percent). This pattern was almost identical across trails. However, SCT users (11 percent) tended to use the trail with their dogs more often than users of the other two trails. Users of BFT tended to be accompanied by business associates (9 percent) more often than others (Table 7). On average, trail users estimated they were on the trail for just over one hour and this did not differ among the three trails studied (see Table 8).

Table 6. Mode of Transportation Respondents Had Used to Get to Trails

Trail	Mode of Transportation to the Trail							Total n (%)	χ^2	p-value
	Car n (%)	Transit n (%)	Bicycle n (%)	Walk n (%)	Run/Jog n (%)	In-line Skate n (%)	Other n (%)			
Brays Bayou	34 (8.7)	0 (0.0)	185 (47.4)	121 (31.0)	41 (10.5)	5 (1.3)	4 (1.0)	390 (100)	212.3	.000
Shoal Creek	12 (39.9)	2 (0.7)	71 (23.6)	70 (23.3)	36 (12.0)	0 (0.0)	2 (0.7)	301 (100)		
Buffalo Bayou	64 (20.8)	1 (0.3)	77 (25.0)	54 (17.5)	112 (36.4)	0 (0.0)	0 (0.0)	308 (100)		
Total	218 (21.8)	3 (0.3)	333 (33.3)	245 (24.5)	189 (18.9)	5 (0.5)	6 (0.6)	999 (100)		

Table 7. Who On-Site Interview Respondents Were Traveling with When Contacted

Trail	Trail Companions					Total n (%)	χ^2	p-value
	Alone n (%)	Family/ Friends n (%)	Business Associates n (%)	Pet n (%)	Other n (%)			
Brays Bayou	274 (70.4)	104 (26.7)	0 (0)	10 (2.6)	1 (0.3)	389 (100)	122.05	.000
Shoal Creek	151 (50.0)	107 (35.4)	3 (1.0)	34 (11.3)	7 (2.3)	302 (100)		
Buffalo Bayou	183 (59.6)	97 (31.6)	26 (8.5)	1 (0.3)	0 (0)	307 (100)		
Total	608 (60.9)	308 (30.9)	29 (2.9)	45 (4.5)	8 (0.8)	998 (100)		

Table 8. Average Time That On-Site Interview Respondents Were Spending on the Trail

Trail	Number of Respondents (n)	Average Time (minutes)	Standard Deviation	F	p-value
Brays Bayou	389	64.4	38.54	1.90	.150
Shoal Creek	298	65.4	39.42		
Buffalo Bayou	306	59.9	32.98		
Total	993	63.3	37.23		

Trail users were asked to provide their opinions about things they did and did not like about the trail they were on. Tables 9 and 10 show the results of a content analysis of responses to these open-ended questions that categorized them into types of likes and dislikes.

The scenery people saw along the trail was most frequently mentioned as a "like" (25 percent). Other frequently mentioned likes were that the trail was close (convenient) to home or work (13 percent), the trail's surface (11 percent), and its separation from car traffic (10 percent) (Table 9). Each trail was perceived as having unique characteristics. More specifically, users of BRT listed close to home/work place (17 percent), scenery (16 percent), no car traffic (15 percent), and trail surface (12 percent) as things they liked about the trail. Users of SCT indicated scenery most frequently (30 percent), followed by a "no leash" areas for dogs (14 percent). Whereas, users of BFT liked scenery (33 percent), proximity to home/work place (16 percent), and the terrain (16 percent).

In terms of things trail users disliked about trails, poor surface quality was mentioned most often (10 percent) (see Table 10). Users also disliked trash/litter (9 percent), poor maintenance (8 percent), and a lack of water fountains (8 percent). Users of different trails mentioned some dislikes more often than others. For example, BFT users were more likely to mention the lack of water fountains, SCT users a lack of maintenance and BRT users were most likely to mention the trail's tread characteristics, both surface and width. SCT, on the other hand, had very few people who mentioned they disliked the trail tread. On average the SCT was three to five feet wider than either of the other two and it had a crushed rock surface.

Table 9. Content Analysis of Things Respondents Liked about the Trails

Categories	Trails			Total n (%)
	Brays Bayou n (%)	Shoal Creek n (%)	Buffalo Bayou n (%)	
Scenery	80 (16.0)	121 (30.1)	124 (33.1)	325 (25.1)
Close to home/work	83 (16.6)	29 (7.2)	61 (16.3)	173 (13.4)
Trail Surface	62 (12.4)	31 (7.7)	25 (6.7)	138 (10.7)
No car traffic	75 (15.0)	28 (7.0)	32 (8.5)	135 (10.4)
Hills/terrain	2 (0.4)	6 (1.5)	58 (15.5)	62 (4.8)
No-leash areas for dogs	0 (0.0)	56 (13.9)	0 (0.0)	56 (4.3)
Trail length	36 (7.2)	9 (2.2)	11 (2.9)	56 (4.3)
Cleanliness	12 (2.4)	14 (3.5)	10 (2.7)	36 (7.2)
Recreational amenities	8 (1.6)	2 (0.5)	24 (6.4)	36 (2.8)
Water fountains	3 (0.6)	1 (0.2)	10 (2.7)	14 (1.1)
Other	139 (27.8)	105 (26.1)	20 (5.3)	264 (20.4)
Total	**500 (100)**	**402 (100)**	**375 (100)**	**1,295 (100)**

Note: n = total number of mentions for this type of response

Table 10. Content Analysis of Things Respondents Disliked about the Trails

Categories	Trail			Total n (%)
	Brays Bayou n (%)	Shoal Creek n (%)	Buffalo Bayou n (%)	
Poor surface quality	76 (17.1)	11 (3.9)	58 (19.5)	145 (10.4)
Trash/litter	12 (2.7)	3 (1.1)	12 (4.0)	121 (8.7)
Lack of trail maintenance	24 (5.4)	47 (16.8)	45 (15.1)	116 (8.3)
Lack of water fountains	22 (5.0)	22 (7.9)	71 (23.9)	115 (8.3)
Trail is not wide enough	79 (17.8)	2 (0.7)	11 (3.7)	82 (5.9)
Bicyclists	46 (10.4)	7 (2.5)	13 (4.4)	66 (4.7)
Unsafe street crossings	43 (9.7)	3 (1.1)	12 (4.0)	58 (4.2)
Dogs	13 (2.9)	41 (14.6)	1 (0.3)	55 (4.0)
Unsafe portions of trail	19 (4.3)	5 (1.8)	23 (7.7)	47 (3.4)
Smell	8 (1.8)	5 (1.8)	8 (2.7)	21 (1.5)
Walkers/Runners	6 (1.4)	2 (0.7)	1 (0.3)	9 (0.6)
Need for curb cuts	0 (0.0)	0 (0.0)	7 (2.4)	7 (0.5)
Other	96 (21.6)	132 (47.1)	35 (11.8)	263 (18.9)
Total	**444 (100)**	**280 (100)**	**297 (100)**	**1,391 (100)**

Note: n = total number of mentions for this type of response

POSTAL SURVEY FINDINGS

Demographic profiles for respondents to the postal survey are shown in Tables 11 and 12. Overall, the average age of respondents to this part of the survey was 42 years. Users of BRT were older than users of SCT or users of BFT. About two thirds of respondents in the sample were male. This trend was different for users of SCT, where respondents were more evenly distributed between male and female. Almost 90 percent of trail users were Anglo-American and less than 10 percent of trail users were Hispanic and African-American combined. Trail users appear to be well educated, as 85 percent had at least a college degree and almost 50 percent had an advanced degree. Approximately 45 percent of all respondents indicated that their annual income was more than or equal to $80,000. Another one-third reported their annual income level as between $40,000 and $80,000.

The mailed survey asked respondents to indicate how much they used their respective trails for different types of activity. Table 13 indicates that about three-fourths of respondents used the trail for recreation 100 percent of the time. Another 20 percent reported that they used the trail for both commuting and recreation. Less than 7 percent used the trail predominantly for commuting. Although this trend could be found in all three trails, more respondents of BRT used the trail for commuting purposes than respondents from either SCT or BFT. A somewhat higher portion of respondents from SCT (28 percent) used the trail for mixed purposes (i.e., commuting and recreation).

In terms of activity types in which respondents were participating, mixed activity or combination of several activities was a major category in which respondents were participating (50 percent), followed by riding a bicycle (21 percent), running/jogging (16 percent), and walking (13 percent). Each trail shows a distinct pattern of use. Most BRT users indicated engaging in mixed activity (51 percent) and others in bicycle riding only (31 percent). SCT was also dominantly used by people who mixed their activity (57 percent) though many were walkers only (23 percent). Finally, major activity types occurring on BFT were either running/jogging only (42 percent) or mixed activity (40 percent). These differences were statistically significant (χ^2 = 135.96, $p < .001$).

Table 11. Average Age of Trail Users

Variable	Trail Name	n	Mean	Multiple Comparison	F	p-value
Age	Brays Bayou	212	46.32	1 2 3 1 * * 2 3	27.17	.000
	Shoal Creek	165	37.75			
	Buffalo Bayou	174	40.30			
	Total	551	41.85			

Table 12. Demographic Characteristics of Trail Users

Variables	Categories	Trail Name			Total	χ^2	p-value
		Brays Bayou n (%)	Shoal Creek n (%)	Buffalo Bayou n (%)			
Gender	Female	82 (38.3)	80 (48.2)	42 (23.9)	204 (26.7)	22.17	.000
	Male	132 (61.7)	86 (51.8)	134 (76.1)	352 (63.3)		
Ethnic Back-ground	Afro-American	10 (4.7)	3 (1.8)	5 (2.9)	18 (3.3)	19.88	.003
	Anglo American	189 (88.7)	154 (93.3)	141 (80.6)	474 (87.3)		
	Hispanic	8 (3.8)	6 (3.6)	19 (10.9)	33 (6.1)		
	Other	6 (2.8)	2 (1.2)	10 (5.7)	18 (3.3)		
Education Level	Less than College	25 (11.8)	32 (19.2)	26 (14.7)	83 (14.9)	17.41	.002
	College Degree	65 (30.8)	73 (43.7)	75 (42.4)	213 (38.4)		
	Graduate/ Professional	121 (57.3)	62 (37.1)	76 (42.9)	259 (46.7)		
Income Level	Less than $40,000	27 (13.9)	58 (37.4)	28 (17.6)	113 (22.2)	33.24	.000
	$40,000 to $79,999	66 (34.0)	49 (31.6)	54 (34.0)	169 (33.3)		
	More than $80,000	101 (52.1)	48 (31.0)	77 (48.4)	226 (44.5)		

Most respondents indicated that they use the trail all year long (81 percent). While a small portion of respondents used the trail during only one season (1 percent). The rest of the respondents used the trail more than two seasons, but less than all year (18 percent). Differences in seasonal use patterns appear to be most pronounced between the SCT and BFT groups. BFT users were more likely to be year round users and SCT users more likely to be seasonal. Overall, respondents indicated that they used the trails, on average, 14 times a month. Respondents from BRT tended to use the trail more frequently than respondents from the other two trails (Table 14).

Table 13. Behavioral Characteristics of Trail Users

Variables	Categories	Trail Name			Total	χ^2	p-value
		Brays Bayou n (%)	Shoal Creek n (%)	Buffalo Bayou n (%)			
Trail Use Purpose	Recreation/Fitness	156 (72.6)	113 (68.5)	140 (80.5)	409 (73.8)	18.6	.001
	Commuting	22 (10.2)	6 (3.6)	6 (3.4)	34 (6.1)		
	Mixed	37 (17.2)	46 (27.9)	28 (16.1)	111 (20.0)		
Activity Type	Bike Riding Only	67(31.0)	21 (12.5)	26 (14.7)	114 (20.8)	136.0	.000
	Walking Only	25 (11.6)	39 (23.2)	6 (3.4)	70 (12.8)		
	Running/Jogging Only	13 (6.0)	13 (7.7)	74 (41.8)	88 (16.0)		
	Mixed	111 (51.4)	95 (56.5)	71 (40.1)	277 (50.4)		
Use Time of Year	Single Season Only	1 (0.5)	6 (3.6)	1 (0.6)	8 (1.4)	14.3	.006
	Any Combination	42 (19.4)	37 (22.0)	22 (12.4)	101 (18.0)		
	All Season	174 (80.2)	125 (74.4)	154 (87.0)	453 (80.6)		
Company	Alone	87 (40.1)	37 (22.0)	58 (32.8)	182 (32.4)	56.5	.000
	Family/Friends	29 (13.4)	27 (16.1)	32 (18.1)	88 (15.7)		
	Alone or Family/Friends	96 (44.2)	59 (35.1)	62 (35.0)	217 (38.6)		
	Other Combination	5 (2.3)	45 (26.8)	25 (14.1)	75 (13.3)		

Table 14. ANOVA Results on Differences Among Trail Users' Behavioral Characteristics

Variable	Trail Name	n	Mean	Multiple Comparison	F	p-value
Length of time been using this trail (months)	Brays Bayou	210	104.57	1 2 3 1 2 3	3.69	.026
	Shoal Creek	167	84.83			
	Buffalo Bayou	176	85.39			
	Total	553	92.50			
Time of Use per Month	Brays Bayou	216	15.44	1 2 3 1 2 * 3	4.33	.014
	Shoal Creek	165	12.81			
	Buffalo Bayou	175	13.53			
	Total	556	14.06			

IMPORTANCE OF TRAIL ATTRIBUTES TO USERS

Users were asked to indicate the relative importance of 12 trail attributes to their use of any bicycle/pedestrian trail. Table 15 indicates that respondents felt that attributes like litter on trail, trail's separation from traffic, trail surface maintenance, trail surface type, width of trail, and water fountains were most important among the attributes questioned. Attributes like places for shopping, places for eating, and number of steep hills were less important to trail users. The relative importance of these attributes was fairly consistent across the three trails studied. However, BRT users' ranked scores indicate that litter may have been less important than it was on the other two trails. BRT users ranked the importance of trail surface and width of trail higher than users at either BFT or SCT.

Next, respondents indicated how well their trail performed on these same attributes. Overall, attributes like number of steep hills, trail's separation from traffic, trail surface type, and litter on trail were perceived as performing well on all three trails. On the other hand, lighting facilities, water fountains, and places for eating were attributes that performed poorly across trails (Table 16).

Mean values for the way that respondents rated both the importance and performance of trail attributes were plotted in an "importance-performance" grid (see Figures 6 - 9). Quadrants were separated using the midpoint of the response scales in the survey. Based on the scales we used 3 as the midpoint of the 5 point scale because it represented a neutral feeling toward an item. Performance scores were placed on the vertical (y) axis and importance scores were placed on horizontal (x) axis. This plotting acted as a two dimensional evaluation of the trail attributes providing a spatial pattern that reflected an attribute's importance and how well it performed.

Interpreting the importance-performance grid is straightforward. Items that fall into a given quadrant can be characterized in different ways. Issues of high importance to trail users and that show excellent performance are in good shape and can be seen as currently helping to meet goals and objectives. That is, people care about these things and they are performing quite well. The basic message is "keep up the good work." On the other hand, items that are important but which may not perform all that well should be scrutinized more closely and may be detracting from goals. The message for items in this quadrant is "concentrate here." Items of lesser importance but that performed well might be overkill. That is, resources may be squandered by continued investment in these areas. Finally, low performance and unimportant items may need little attention of any kind.

Looking at all trails combined (Figure 6), it appears that respondents perceived attributes like "places for shopping" and "places for eating" as needing little attention when planning for these trails. However, more attention should evidently be paid to attributes like "water fountains," "lighting facilities," "trail markers," and "level of patrol." The separation of trails from traffic and amount of litter were both seen as very important and both performed relatively well. Figures 7 through 9 show how individual analyses of trails can reveal differences in the way local users feel. The patter of response for BRT users indicates that trail tread attributes are meeting desires while attributes related to safety potentially need attention. SCT users had a more even spread in their evaluation of trail attributes. Trail tread attributes of surface type and width were less important but performed better. The trail tread attribute of surface maintenance falls near the poor performance quadrant but is seen as very important. Trail maintenance needs more attention on SCT as do water fountains. The BFT grid shows a need for trail surface maintenance while tread attributes related to surface type and width come very close to falling into the same "needs attention" quadrant. If one goal of trail provision is to provide comfortable, safe and conflict free access between destinations, then both SCT and BFT trails may not be contributing as well as possible to the goal. Trail treads that are poorly maintained, too narrow or too rough may be creating negative perceptions toward use.

Table 15. Mean Scores of Importance of Trail Attributes

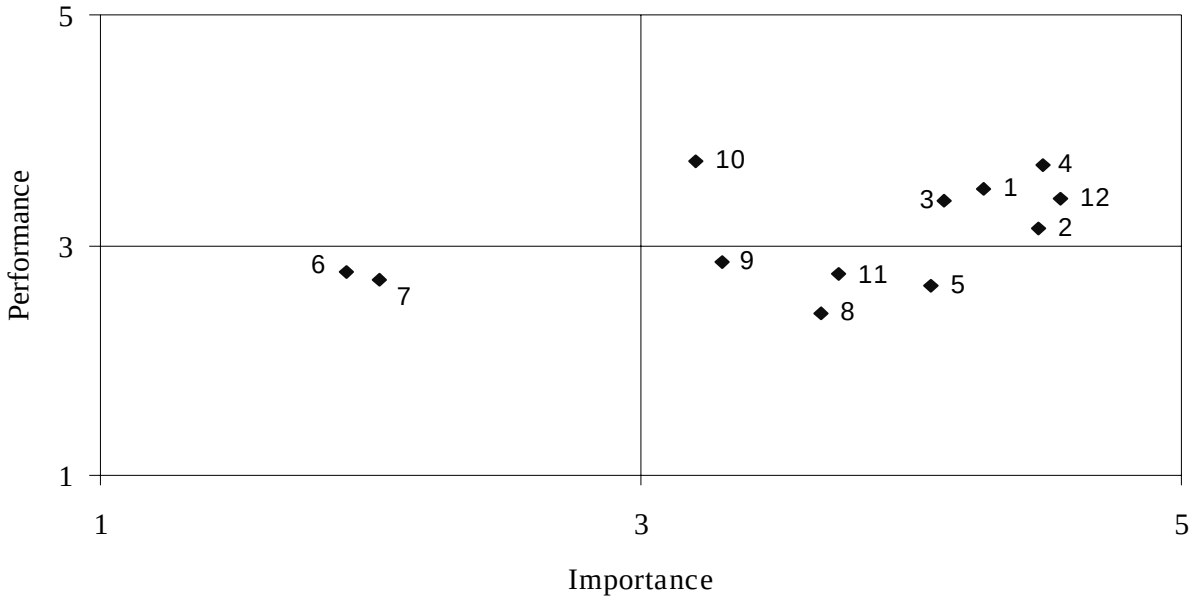
Item	Overall			Brays Bayou			Shoal Creek			Buffalo Bayou		
	Mean	S.D.	Rank	Mean	S.D.	Rank	Mean	S.D.	Rank	Mean	S.D.	Rank
trail surface type	4.27	.83	4	4.50	.70	3	3.93	.92	5	4.32	.79	4
trail surface maintenance	4.47	.61	3	4.62	.53	1	4.20	.68	3	4.54	.55	2
width of trail	4.12	.81	5	4.42	.66	5	3.77	.84	6	4.08	.81	6
trail's separation from traffic	4.49	.66	2	4.56	.58	2	4.51	.66	2	4.40	.74	3
water fountains	4.07	.98	6	4.00	.95	6	4.00	.97	4	4.23	1.00	5
places for shopping	1.91	.92	12	2.14	.96	12	1.65	.79	12	1.87	.91	12
places for eating	2.03	1.09	11	2.19	1.02	11	1.86	.92	11	2.01	1.30	11
lighting facilities	3.67	1.10	8	3.81	1.06	7	3.26	1.16	8	3.89	.99	8
trail markers	3.30	1.04	9	3.35	1.10	9	3.16	1.00	9	3.38	.99	10
number of steep hills	3.20	1.00	10	3.08	.93	10	2.95	.96	10	3.59	1.01	9
level of patrol	3.73	.90	7	3.75	.89	8	3.45	.95	7	3.97	.77	7
litter on trail	4.55	.63	1	4.47	.65	4	4.61	.65	1	4.57	.57	1

Note: Mean values calculated based on a 5 point scale where 1 = very unimportant, 2 = unimportant, 3 = neither, 4 = important, 5 = very important.

Table 16. Performance of Trail Attributes

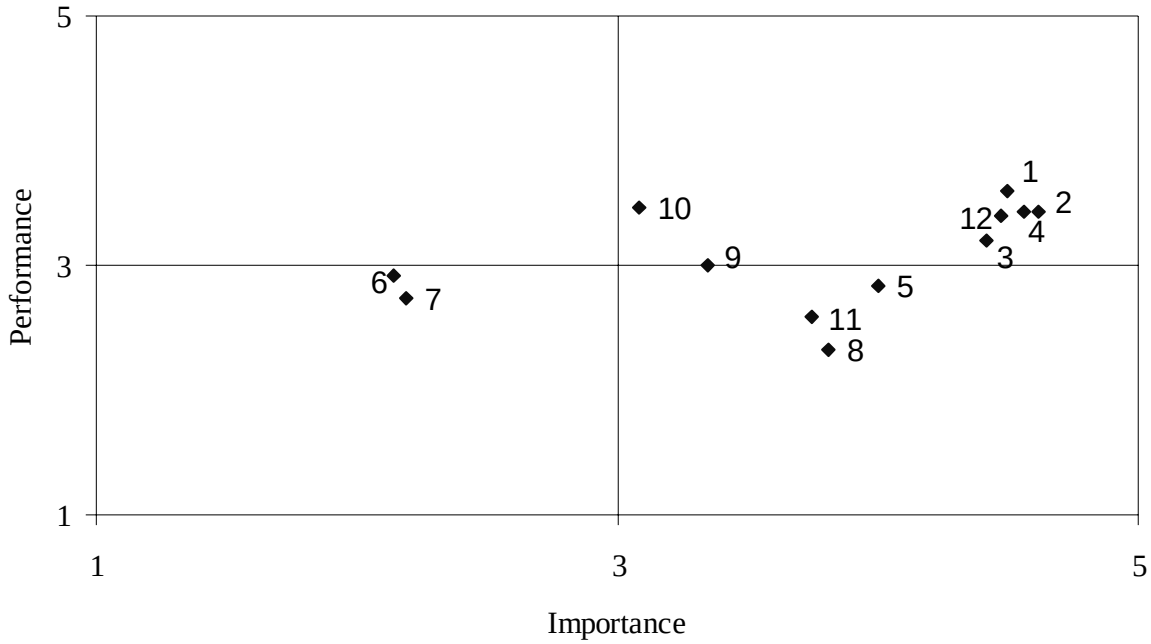
Item	Overall			Brays Bayou			Shoal Creek			Buffalo Bayou		
	Mean	S.D.	Rank	Mean	S.D.	Rank	Mean	S.D.	Rank	Mean	S.D.	Rank
trail surface type	3.49	1.04	3	3.59	.96	1	3.72	1.04	4	3.16	1.05	4
trail surface maintenance	3.14	1.11	6	3.43	.97	3	3.00	1.19	7	2.91	1.13	6
width of trail	3.38	1.06	5	3.20	1.03	6	3.92	.87	3	3.08	1.06	5
trail's separation from traffic	3.70	1.03	2	3.43	1.07	3	4.08	.88	1	3.67	.99	2
water fountains	2.65	1.08	11	2.84	1.01	9	2.43	1.06	12	2.62	1.14	8
places for shopping	2.76	1.10	8	2.91	.96	8	2.90	1.17	10	2.44	1.13	10
places for eating	2.70	1.10	10	2.73	.96	10	2.94	1.18	8	2.46	1.12	9
lighting facilities	2.40	1.09	12	2.32	1.01	12	2.61	1.16	11	2.31	1.09	12
trail markers	2.85	1.05	7	3.00	.98	7	3.19	1.01	6	2.37	.99	11
number of steep hills	3.73	.83	1	3.47	.90	2	3.96	.65	2	3.81	.83	1
level of patrol	2.75	.99	9	2.59	.89	11	2.91	1.04	9	2.81	1.05	7
litter on trail	3.41	1.02	4	3.40	.94	5	3.46	1.12	5	3.37	1.02	3

Note: Mean values calculated based on a 5 point scale where 1 = very poor, 2 = poor, 3 = neither, 4 = good, 5 = very good.



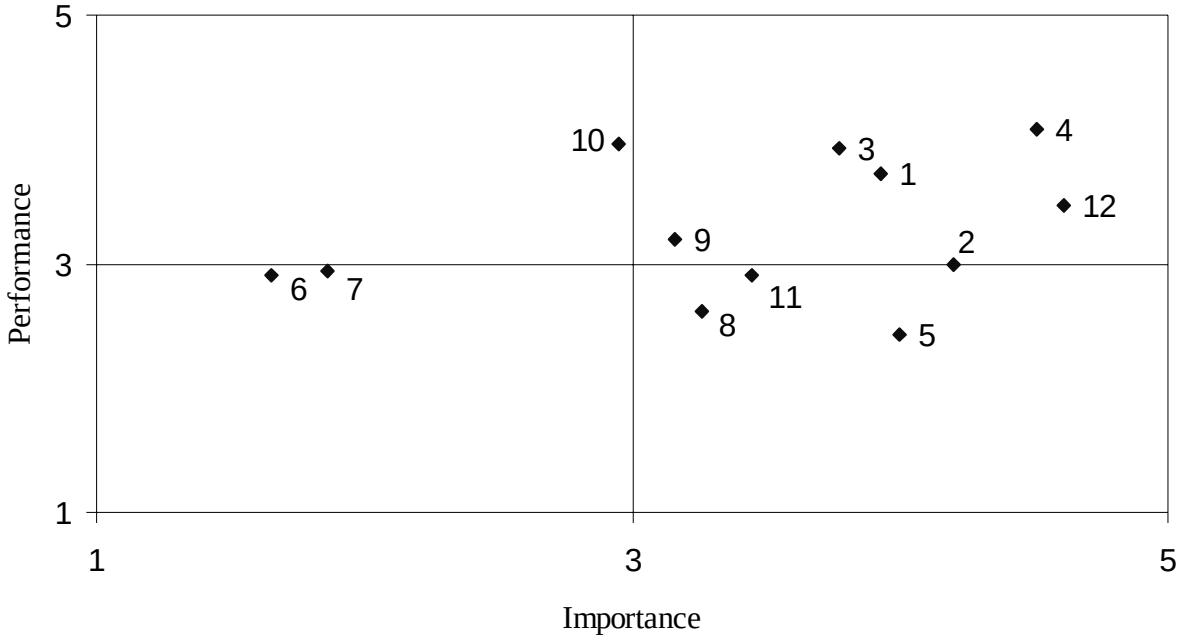
Label	
1 : trail surface type	7 : places for eating
2 : trail surface maintenance	8 : lighting facilities
3 : width of trail	9 : trail markers
4 : trail's separation from traffic	10 : number of steep hills
5 : water fountains	11 : level of patrol
6 : places for shopping	12 : litter on trail

Figure 6. Importance-Performance Grid on Trail Attributes, Overall



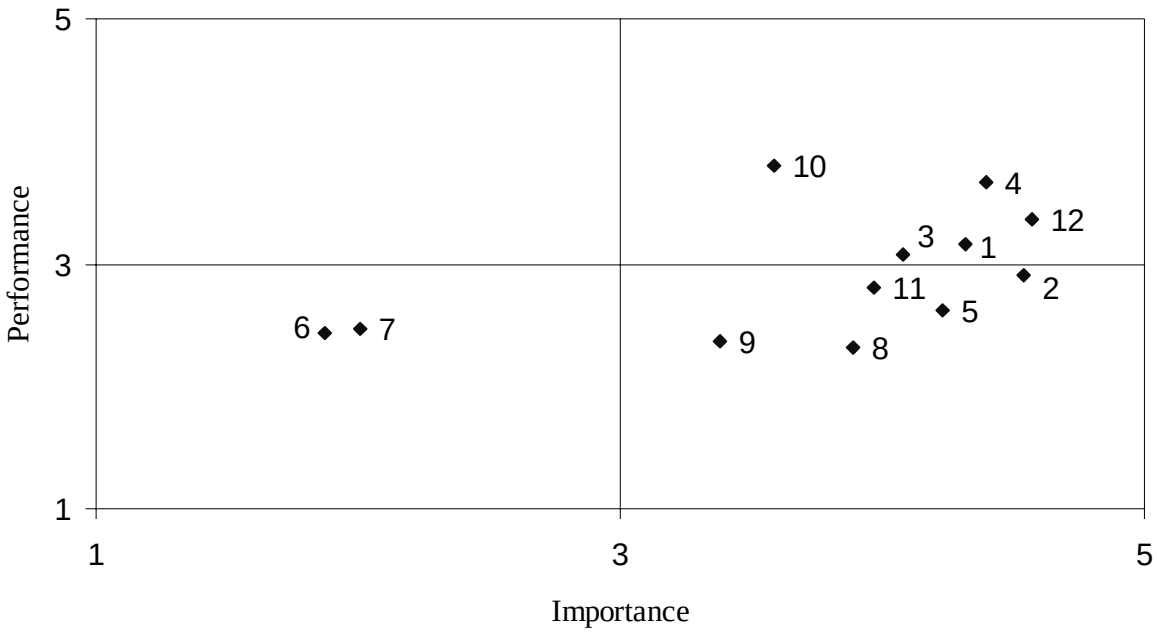
Label	
1 : trail surface type	7 : places for eating
2 : trail surface maintenance	8 : lighting facilities
3 : width of trail	9 : trail markers
4 : trail's separation from traffic	10 : number of steep hills
5 : water fountains	11 : level of patrol
6 : places for shopping	12 : litter on trail

Figure 7. Importance-Performance Grid on Trail Attributes, Brays Bayou



Label	
1 : trail surface type	7 : places for eating
2 : trail surface maintenance	8 : lighting facilities
3 : width of trail	9 : trail markers
4 : trail's separation from traffic	10 : number of steep hills
5 : water fountains	11 : level of patrol
6 : places for shopping	12 : litter on trail

Figure 8. Importance-Performance Grid on Trail Attributes, Shoal Creek



Label	
1 : trail surface type	7 : places for eating
2 : trail surface maintenance	8 : lighting facilities
3 : width of trail	9 : trail markers
4 : trail's separation from traffic	10 : number of steep hills
5 : water fountains	11 : level of patrol
6 : places for shopping	12 : litter on trail

Figure 9. Importance-Performance Analysis on Trail Attributes, Buffalo Bayou

TRAILS' CONTRIBUTIONS TO TRANSPORTATION AND COMMUNITY GOALS

To evaluate the degree of effectiveness of a trail's contribution to more broad-based transportation and community goals, the 20 quality of life items from the mailed survey were analyzed. Overall, respondents indicated that the things most important to community quality of life were the presence of natural areas, areas for wildlife, amount of pollution, accessible recreation, pride in community, community identity, and land use patterns (Table 17). The five least important components were perceived as new business development, access to and time spent shopping, diversity in types of industry in the community and access to public transportation. Generally, respondents of each trail perceived these components similarly in their levels of importance.

Respondents indicated that trails have contributed most to QOL through peoples' health and fitness, the provision of natural areas, accessible recreation, land use patterns, pride in the community and community identity. Feelings about the contributions made to quality of life were almost identical regardless of location, though some variations in rank order of these items did occur among trails. There was a lower perceived contribution to new business development, access to shopping, diversity of industry, and time spent commuting. Respondents from each trail reacted in a similar way to these contribution items (Table 18).

As with the trail attributes reported previously, QOL characteristics were plotted based on both the importance people placed on them and how well they felt trails contributed to these aspects of QOL. Figures 11, 12, and 13 indicate that all of these items were seen as at least somewhat important to community quality of life. However, groupings of items reveal that these trails may be better at meeting some QOL goals in comparison to others. Characteristics seen as both important and well supported by trails (upper right quadrant) were related to health/fitness, nature, land use and a unique community identity. This grouping of characteristics was particularly pronounced at SCT where the importance of, and contribution to, natural areas was particularly pronounced. On the other end of the spectrum, new business development, shopping time and diversity of industry were consistently in the lower right quadrant.

The amount of pollution was seen as very important to community quality of life across all three trails, ranking second only to having natural areas. However, trails were not seen as having a very positive contribution in this regard. That is, trail users see trails as contributing somewhat to reducing pollution but may not feel they are as useful as they could be. The low number of commuters in this sample may have influenced this result. Commuters may be more likely to recognize a trail's contribution to a reduction in pollution as reflected in their choice to ride or walk rather than drive. Recreationists may not see the trail as a way to substitute a non-polluting behavior (walking for exercise) for one that pollutes (driving a car to a gym to use a tread mill) while commuters may see their non-polluting behavior (travel to work by bike) as directly substituting for travel by car which pollutes.

Table 17. Level of Importance that Trail Users Placed on Community Quality of Life Items

Item	Overall			Brays Bayou			Shoal Creek			Buffalo Bayou		
	Mean	S.D.	Rank	Mean	S.D.	Rank	Mean	S.D.	Rank	Mean	S.D.	Rank
having natural areas present	4.75	.49	1	4.65	.56	1	4.91	.29	1	4.72	.50	1
having access to public transportation	3.44	1.23	17	3.42	1.17	18	3.54	1.23	16	3.37	1.31	17
the amount of pollution	4.64	.60	2	4.60	.60	2	4.80	.43	2	4.53	.70	2
new business development	3.31	1.12	20	3.26	1.11	19	3.26	1.15	20	3.40	1.11	16
opportunity to use transportation other than cars	3.90	1.09	10	3.89	1.07	12	4.05	1.05	9	3.78	1.14	12
access to places for shopping	3.45	1.11	16	3.61	1.03	15	3.38	1.09	18	3.31	1.19	19
social interaction among residents	3.75	.97	13	3.76	.94	14	3.98	.86	12	3.53	1.05	14
the health and fitness of people who live there	4.19	.85	8	4.19	.82	7	4.25	.78	8	4.13	.93	6
amount of time spent traveling to shopping areas	3.37	1.03	18	3.45	1.00	17	3.35	.98	19	3.29	1.11	20
accessibility to work places/schools	3.89	.99	11	3.93	.97	9	3.93	.87	13	3.80	1.13	10
cost of transportation	3.64	1.60	15	3.57	.96	16	3.65	.98	15	3.72	2.46	13
amount of pride residents take in their community	4.38	.69	4	4.39	.62	3	4.47	.67	5	4.29	.78	4
amount of time spent traveling to work	3.97	.97	9	3.91	1.00	10	4.02	.80	10	3.98	1.08	9
diversity in the types of industry	3.37	1.00	18	3.25	1.03	20	3.51	.87	17	3.37	10.5	17
accessibility to recreational opportunities	4.39	.72	3	4.32	.76	4	4.49	.65	4	4.39	.73	3
the pattern of land use	4.20	.83	7	4.22	.73	6	4.30	.81	7	4.08	.94	8
equity among different types of residents	3.75	1.00	13	3.77	.95	13	3.99	.88	11	3.49	1.09	15
places for wildlife to live	4.23	.87	6	4.13	.87	8	4.50	.74	3	4.10	.91	7
level of economic growth	3.81	.86	12	3.90	.79	11	3.70	.88	14	3.80	.92	10
features that give the community a unique identity	4.31	.78	5	4.25	.77	5	4.43	.64	6	4.27	.91	5

Note: Mean values calculated based on a 5 point scale where 1 = very unimportant, 2 = unimportant, 3 = neither, 4 = important, 5 = very important.

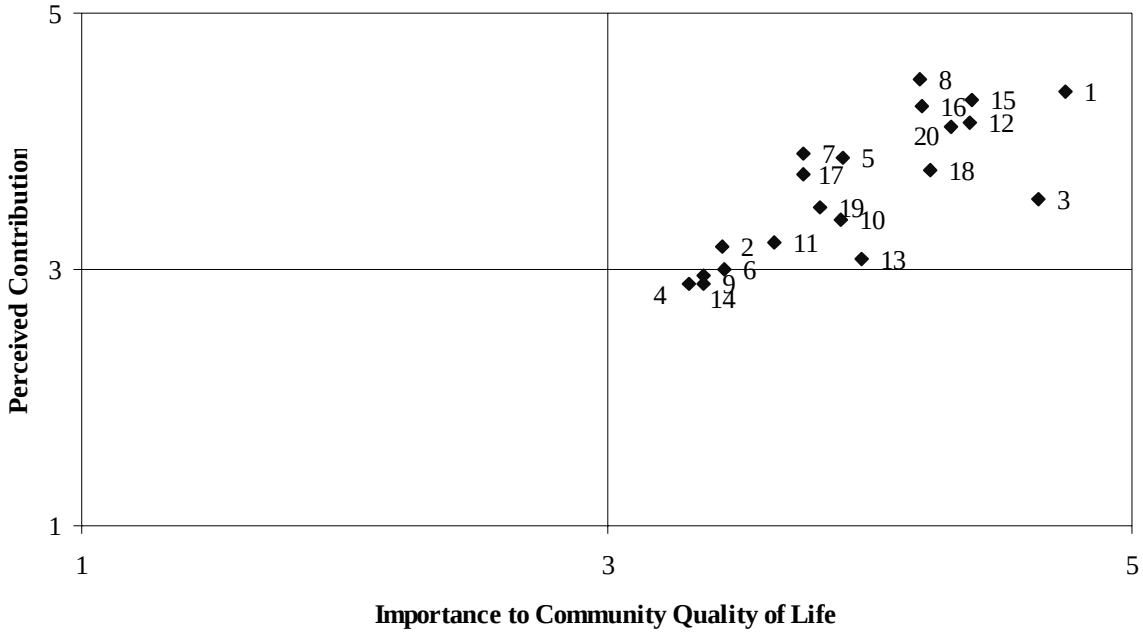
Table 18. The Level of Contribution that Trail Users Felt Their Trails Made to Items Related to Community Quality of Life

Item	Overall			Brays Bayou			Shoal Creek			Buffalo Bayou		
	Mean	S.D.	Rank	Mean	S.D.	Rank	Mean	S.D.	Rank	Mean	S.D.	Rank
natural areas present	4.38	.70	2	4.14	.76	2	4.57	.67	1	4.50	.56	1
access to public transportation	3.18	.79	15	3.29	.81	15	3.20	.76	15	3.01	.79	15
amount of pollution	3.55	.94	11	3.53	.89	10	3.71	.92	11	3.41	.99	12
new business development	2.89	.77	19	2.86	.81	20	2.85	.74	19	2.96	.74	18
opportunity for other transportation use	3.87	.95	8	3.99	.87	6	3.97	.92	8	3.61	1.03	9
accessibility to shopping areas	3.00	.82	17	3.21	.82	16	2.99	.81	17	2.74	.74	20
social interaction among residents	3.90	.79	7	3.87	.74	8	4.15	.72	7	3.69	.84	8
conditions of people's health and fitness	4.48	.56	1	4.47	.57	1	4.53	.57	2	4.46	.52	2
time spent for shopping	2.89	.75	19	2.96	.75	18	2.85	.81	19	2.85	.71	19
accessibility to work/school	3.38	.91	13	3.48	.90	12	3.38	.90	13	3.27	.94	13
cost of transportation	3.21	.90	14	3.31	.85	14	3.27	.91	14	3.03	.93	14
residents' pride on community	4.14	.77	5	4.03	.76	5	4.35	.74	6	4.06	.78	5
time spent on commuting	3.08	.82	16	3.16	.79	17	3.03	.83	16	3.01	.85	15
diversity in types of industry	2.95	.80	18	2.93	.82	19	2.94	.82	18	2.99	.75	17
accessibility to recreation	4.33	.70	3	4.16	.76	4	4.53	.57	2	4.33	.69	3
land use patterns	4.27	.70	4	4.14	.68	2	4.48	.66	4	4.23	.71	4
equity among different residents	3.74	.86	10	3.75	.79	9	3.91	.92	9	3.56	.84	10
place for wildlife	3.78	.96	9	3.52	1.04	11	3.91	.96	9	3.98	.80	7
economic growth	3.49	.84	12	3.40	.85	13	3.52	.81	12	3.56	.85	10
features contributing to community identity	4.12	.79	6	3.97	.78	7	4.43	.61	5	4.02	.87	6

Note: Mean values calculated based on a 5 point scale where 1 = very poorly, 2 = poorly, 3 = neither, 4 = well, 5 = very well.

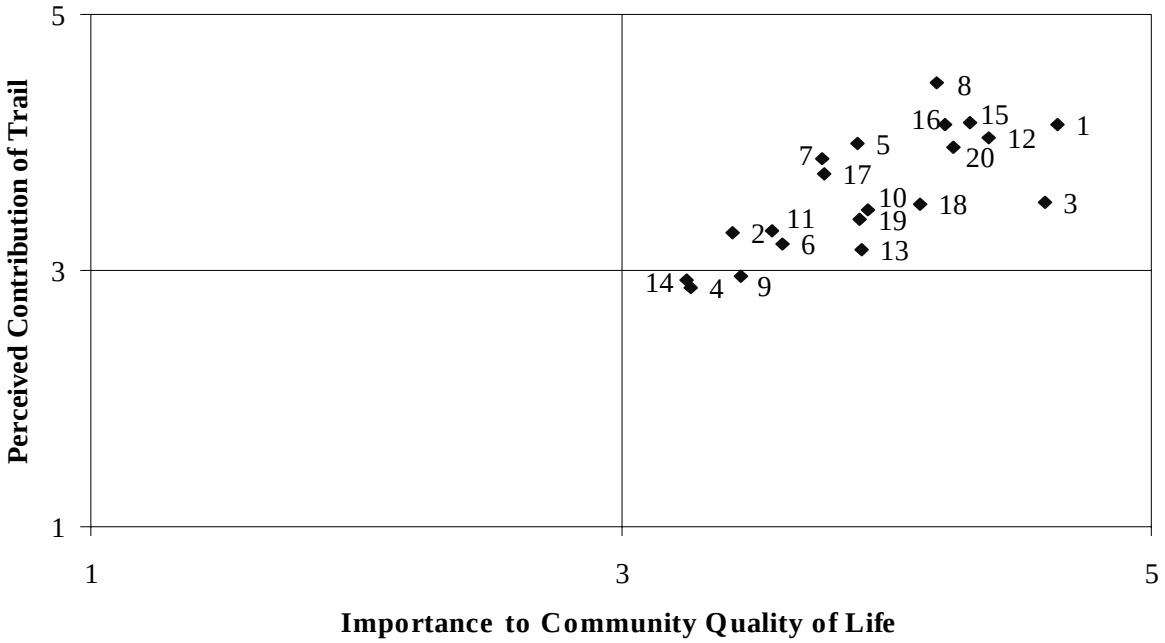
Table 19. Comparison Between the Importance of, and Contribution Trails Made to, Quality of Life Items

Item	Overall			Brays Bayou			Shoal Creek			Buffalo Bayou		
	Import-ance Mean	Contri-bution Mean	Diff.	Import-ance Mean	Contri-bution Mean	Diff.	Import-ance Mean	Contri-bution Mean	Diff.	Import-ance Mean	Contri-bution Mean	Diff.
natural areas present	4.75	4.38	-.37	4.65	4.14	-.51	4.91	4.57	-.34	4.72	4.50	-.22
access to public transportation	3.44	3.18	-.26	3.42	3.29	-.13	3.54	3.20	-.34	3.37	3.01	-.36
amount of pollution	4.64	3.55	-1.09	4.60	3.53	-1.07	4.80	3.71	-1.09	4.53	3.41	-1.12
new business development	3.31	2.89	-.42	3.26	2.86	-.40	3.26	2.85	-.41	3.40	2.96	-.44
opportunity for other transportation use	3.90	3.87	-.03	3.89	3.99	.10	4.05	3.97	-.08	3.78	3.61	-.17
accessibility to shopping areas	3.45	3.00	-.45	3.61	3.21	-.40	3.38	2.99	-.39	3.31	2.74	-.57
social interaction among residents	3.75	3.90	.15	3.76	3.87	.11	3.98	4.15	.17	3.53	3.69	.16
conditions of people's health and fitness	4.19	4.48	.29	4.19	4.47	.28	4.25	4.53	.28	4.13	4.46	.33
time spent for shopping	3.37	2.89	-.48	3.45	2.96	-.49	3.35	2.85	-.50	3.29	2.85	-.44
accessibility to work/school	3.89	3.38	-.51	3.93	3.48	-.45	3.93	3.38	-.55	3.80	3.27	-.53
cost of transportation	3.64	3.21	-.43	3.57	3.31	-.26	3.65	3.27	-.21	3.72	3.03	-.69
residents' pride on community	4.38	4.14	-.24	4.39	4.03	-.36	4.47	4.35	-.12	4.29	4.06	-.23
time spent on commuting	3.97	3.08	-.89	3.91	3.16	-.75	4.02	3.03	-.99	3.98	3.01	-.97
diversity in types of industry	3.37	2.95	-.42	3.25	2.93	-.32	3.51	2.94	-.57	3.37	2.99	-.38
accessibility to recreation	4.39	4.33	-.06	4.32	4.16	-.16	4.49	4.53	.04	4.39	4.33	-.06
land use patterns	4.20	4.27	.07	4.22	4.14	-.08	4.30	4.48	.18	4.08	4.23	.15
equity among different residents	3.75	3.74	-.01	3.77	3.75	-.02	3.99	3.91	-.08	3.49	3.56	.07
place for wildlife	4.23	3.78	-.45	4.13	3.52	-.61	4.50	3.91	-.59	4.10	3.98	-.12
economic growth	3.81	3.49	-.32	3.90	3.40	-.50	3.70	3.52	-.18	3.80	3.56	-.24
features contributing to community identity	4.31	4.12	-.19	4.25	3.97	-.28	4.43	4.43	0	4.27	4.02	-.25



Label	
1: natural area present	11 : cost of transportation
2 : access to public transportation	12 : residents' pride in community
3 : amount of pollution	13 : time spent on commuting
4 : new business development	14 : diversity in types of industry
5 : opportunity for other transportation	15 : accessibility to recreation
6 : accessibility to shopping areas	16 : land use patterns
7 : social interaction among residents	17 : equity among different residents
8 : conditions of people's health and fitness	18 : place for wildlife
9 : time spent on shopping	19 : economic growth
10 : accessibility to work/school	20 : features contributing to community identity

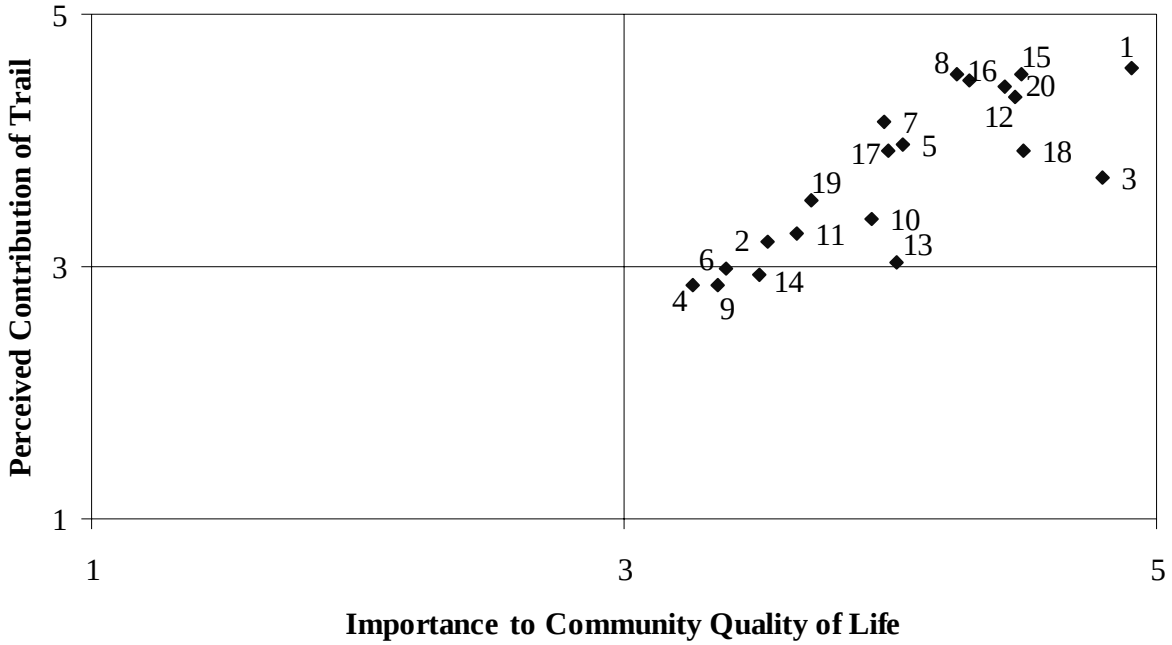
Figure 10. Importance-Contribution Grid of Trail's Contribution to Quality of Life, Overall



Label

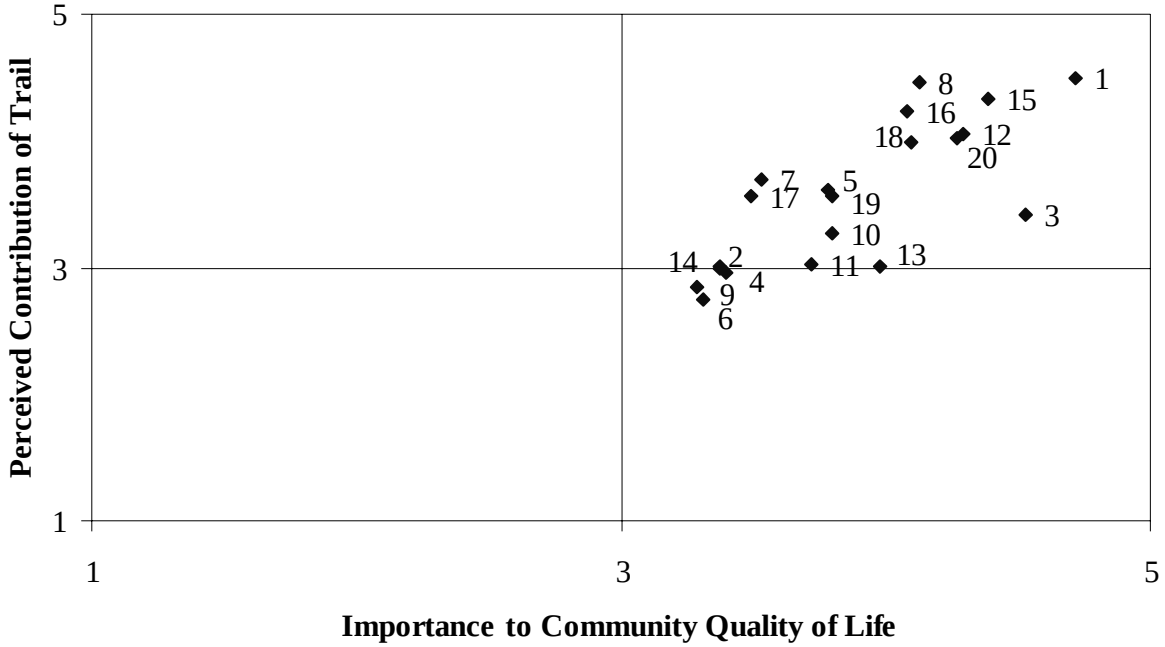
1: natural area present
2 : access to public transportation
3 : amount of pollution
4 : new business development
5 : opportunity for other transportation
6 : accessibility to shopping areas
7 : social interaction among residents
8 : conditions of people's health and fitness
9 : time spent on shopping
10 : accessibility to work/school
11 : cost of transportation
12 : residents' pride in community
13 : time spent on commuting
14 : diversity in types of industry
15 : accessibility to recreation
16 : land use patterns
17 : equity among different residents
18 : place for wildlife
19 : economic growth
20 : features contributing to community identity

Figure 11. Importance-Contribution Grid of Trail's Contribution to Quality Of Life, Brays Bayou



Label	
1: natural area present	11 : cost of transportation
2 : access to public transportation	12 : residents' pride in community
3 : amount of pollution	13 : time spent on commuting
4 : new business development	14 : diversity in types of industry
5 : opportunity for other transportation	15 : accessibility to recreation
6 : accessibility to shopping areas	16 : land use patterns
7 : social interaction among residents	17 : equity among different residents
8 : conditions of people's health and fitness	18 : place for wildlife
9 : time spent on shopping	19 : economic growth
10 : accessibility to work/school	20 : features contributing to community identity

Figure 12. Importance-Contribution Grid of Trails' Contribution to Quality Of Life, Shoal Creek



Label

1: natural area present	11 : cost of transportation
2 : access to public transportation	12 : residents' pride in community
3 : amount of pollution	13 : time spent on commuting
4 : new business development	14 : diversity in types of industry
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7 : social interaction among residents	17 : equity among different residents
8 : conditions of people's health and fitness	18 : place for wildlife
9 : time spent on shopping	19 : economic growth
10 : accessibility to work/school	20 : features contributing to community identity

Figure 13. Importance-Contribution Grid of Trails' Contribution to Quality Of Life, Buffalo Bayou

DIFFERENCES BETWEEN TRANSPORTATION AND RECREATION-BASED TRAIL USERS

Differences existed in terms of how different types of trail users perceived both trail attributes and characteristics related to quality of life. People who used the trail primarily for commuting (transportation), those who used it for mixed purposes (commuting and recreation), and those who used a trail exclusively for recreation felt differently in several ways. Table 20 conveys trail attribute variables that had significantly different importance scores. Fountains along the trail and number of steep hills in the route were less important to those who used a trail primarily for commuting than they were to mixed and recreational users. Places along the trail to shop or eat were more important to mixed users while recreational users saw these attributes as less important. However, recreational users scored "the level of police presence on the trail" significantly higher in importance than commuters or mixed users. While user types did place different levels of importance on some trail attributes they did not differ in the way they perceived a trail to perform in providing any of the 12 attributes in question (see Table 21).

The pattern of difference was more pronounced among groups of recreational, mixed and transportation based trail users on community QOL variables. Table 22 indicates that groups differed in the importance they placed on 8 QOL characteristics (of the 20 questioned). People who used the trail for purely recreational reasons scored several characteristics related to accessibility ("better access to public transport," "opportunity to use transportation other than a car," and "convenient access to work places/schools") and the environment ("a reduction in pollution," and "providing places for wildlife to live") significantly lower in importance to community quality of life. Commuters, on the other hand, scored "better health and fitness among residents" lower in importance to quality of life than the other groups.

Table 23 indicates a similar trend among groups in terms of how they felt these trails actually contributed to community quality of life. Six of these characteristics relate to transportation/access ("convenient access to shopping areas," "reducing time spent traveling to shopping areas," "reducing time spent traveling to work," "convenient access to work places/schools," "opportunities to use transportation other than a car," and "a reduction in transportation costs") and each was scored significantly higher by commuters and mixed users compared to recreationists. Commuters also scored trails significantly higher in their contribution to "a reduction in pollution" followed by mixed users and recreationists respectively. Trails were also seen differently in their contribution to "the identity of my community" and to "positive social interaction among residents." Mixed users scored these trail contributions significantly higher than recreationists.

Table 20. Mean Differences in Importance of Trail Attributes by Trail Use Purpose

Item	N				Mean[a]				F	p-value
	Total	Recrea-tion only	Commu-ting only	Mixed	Total	Recrea-tion only	Commu-ting only	Mixed		
trail surface type	555	409	35	111	4.27	4.27	4.51	4.18	2.16	.117
trail surface maintenance	556	411	35	110	4.47	4.46	4.51	4.47	.12	.885
width of trail	556	410	35	111	4.12	4.10	4.31	4.14	1.16	.314
trail's separation from traffic	556	411	35	110	4.49	4.48	4.51	4.55	.64	.528
water fountains	557	411	35	111	4.08	4.09	3.49	4.23	8.30	.000*
places for shopping	556	411	35	110	1.91	1.82	2.20	2.19	9.28	.000*
places for eating	557	412	35	110	2.04	1.95	2.11	2.37	6.76	.001*
lighting facilities	552	408	34	110	3.67	3.70	3.24	3.72	2.94	.054
trail markers	551	407	35	109	3.31	3.29	3.31	3.38	.28	.756
number of steep hills	552	408	35	109	3.19	3.24	2.74	3.17	4.05	.018*
level of patrol	553	409	34	110	3.73	3.80	3.38	3.56	6.00	.003*
litter on trail	555	411	35	109	4.54	4.55	4.34	4.56	1.87	.155

Note: Mean values calculated based on a 5 point scale where 1 = very unimportant, 2 = unimportant, 3 = neither, 4 = important, 5 = very important.
* : significant at .05 alpha level.

Table 21. Mean Differences in Performance of Trail Attributes by Trail Use Purpose

Item	N				Mean[a]				F	p-value
	Total	Recrea-tion only	Commu-ting only	Mixed	Total	Recrea-tion only	Commu-ting only	Mixed		
trail surface type	555	410	35	110	3.49	3.52	3.31	3.44	.87	.420
trail surface maintenance	557	413	35	109	3.14	3.16	2.97	3.12	.50	.607
width of trail	553	409	35	109	3.37	3.41	3.14	3.33	1.10	.335
trail's separation from traffic	552	407	34	111	3.70	3.69	3.65	3.78	.44	.648
water fountains	538	396	33	109	2.66	2.67	2.88	2.55	1.27	.281
places for shopping	476	349	31	96	2.75	2.71	2.97	2.80	.91	.403
places for eating	481	353	32	96	2.70	2.70	2.72	2.69	.01	.988
lighting facilities	489	359	31	99	2.40	2.39	2.42	2.43	.08	.925
trail markers	534	393	35	106	2.84	2.85	2.89	2.76	.35	.703
number of steep hills	548	404	34	110	3.73	3.68	3.74	3.91	3.35	.036*
level of patrol	479	359	27	93	2.75	2.72	3.00	2.80	1.12	.328
litter on trail	548	403	35	110	3.42	3.43	3.57	3.36	.57	.565

Note: Mean values calculated based on a 5 point scale where 1 = very poor, 2 = poor, 3 = neither, 4 = good, 5 = very good.
* : significant at .05 alpha level.

Table 22. Mean Differences in the Importance of Community Quality of Life Items by Trail Use Purpose

Item	N				Mean [a]				F	p-value
	Total	Recrea-tion only	Commu-ting only	Mixed	Total	Recrea-tion only	Commu-ting only	Mixed		
having natural areas present	557	411	35	111	4.75	4.73	4.66	4.83	2.37	.094
having access to public transportation	544	400	35	109	3.44	3.34	3.71	3.73	5.33	.005*
the amount of pollution	553	408	35	110	4.64	4.61	4.54	4.78	4.03	.018*
new business development	541	399	33	109	3.31	3.32	3.24	3.31	.07	.933
opportunity to use transportation other than cars	551	406	35	110	3.90	3.68	4.63	4.48	35.24	.000*
access to places for shopping	554	408	35	111	3.46	3.40	3.63	3.64	2.48	.085
social interaction among residents	553	409	35	109	3.76	3.67	3.71	4.11	9.19	.000*
the health and fitness of people who live there	554	409	35	111	4.19	4.18	3.94	4.32	2.79	.063
amount of time spent traveling to shopping areas	548	403	34	111	3.38	3.33	3.53	3.50	1.66	.191
accessibility to work places/schools	552	406	35	111	3.89	3.82	4.31	4.04	5.61	.004*
cost of transportation	546	402	35	109	3.64	3.61	3.83	3.71	.41	.666
amount of pride residents take in their community	554	408	35	111	4.38	4.40	4.26	4.38	.66	.516
amount of time spent traveling to work	542	399	34	109	3.97	3.95	4.26	3.94	1.70	.185
diversity in the types of industry	530	390	34	106	3.36	3.36	3.47	3.34	.23	.794
accessibility to recreational opportunities	550	405	35	110	4.39	4.39	4.26	4.45	1.04	.354
the pattern of land use	528	389	33	106	4.20	4.16	4.33	4.32	2.11	.123
equity among different types of residents	524	385	33	106	3.76	3.71	4.03	3.85	2.22	.110
places for wildlife to live	549	407	33	109	4.23	4.16	4.30	4.46	5.35	.005*
level of economic growth	536	396	33	107	3.81	3.83	3.58	3.83	1.35	.259
features that give the community a unique identity	552	408	35	109	4.31	4.28	4.14	4.49	3.94	.020*

Note: Mean values calculated based on a 5 point scale where 1 = very unimportant, 2 = unimportant, 3 = neither, 4 = important, 5 = very important.
* : significant at .05 alpha level.

Table 23. Mean Differences in the Perception of Trails' Contribution to the Community Quality of Life Items by Trail Use Purpose

Item	N				Mean [a]				F	p-value
	Total	Recrea-tion only	Commu-ting only	Mixed	Total	Recrea-tion only	Commu-ting only	Mixed		
having natural areas present	552	408	35	109	4.38	4.37	4.26	4.49	1.84	.160
having access to public transportation	440	316	30	94	3.17	3.13	3.27	3.29	1.69	.185
the amount of pollution	458	339	30	89	3.49	3.46	3.30	3.67	3.07	.048*
new business development	545	404	34	107	4.49	4.47	4.44	4.58	1.91	.150
opportunity to use transportation other than cars	478	344	32	102	3.00	2.92	3.31	3.18	6.65	.001*
access to places for shopping	448	324	34	90	3.08	2.91	3.74	3.42	27.69	.000*
social interaction among residents	463	336	35	92	3.54	3.46	4.20	3.61	10.59	.000*
the health and fitness of people who live there	526	384	34	108	3.78	3.78	3.71	3.81	.17	.841
amount of time spent traveling to shopping areas	466	334	34	98	3.38	3.22	4.03	3.71	21.62	.000*
accessibility to work places/schools	427	313	28	86	2.89	2.85	2.96	2.99	1.16	.313
cost of transportation	441	313	35	93	3.21	3.02	4.29	3.44	41.51	.000*
amount of pride residents take in their community	527	385	33	109	4.12	4.06	4.15	4.35	5.94	.003*
amount of time spent traveling to work	531	387	35	109	4.33	4.30	4.26	4.44	1.91	.149
diversity in the types of industry	441	317	30	94	2.89	2.82	3.07	3.06	4.48	.012*
accessibility to recreational opportunities	512	370	35	107	3.90	3.85	3.83	4.09	4.02	.019*
the pattern of land use	533	390	35	108	4.27	4.25	4.23	4.37	1.41	.245
equity among different types of residents	458	333	30	95	3.74	3.71	3.77	3.84	.87	.420
places for wildlife to live	505	363	35	107	3.87	3.64	4.77	4.36	48.25	.000*
level of economic growth	523	383	33	107	4.13	4.11	4.09	4.23	1.13	.324
features that give the community a unique identity	411	305	27	79	2.95	2.91	3.00	3.06	1.19	.304

Note: Mean values were calculated based on a 5 point scale where 1 = very poorly, 2 = poorly, 3 = neither, 4 = well, 5 = very well.
* : significant at .05 alpha level.

5. CONCLUSIONS AND RECOMMENDATIONS

EVALUATING BICYCLE/PEDESTRIAN TRAIL FACILITIES

People who use transportation facilities need to be consulted in community transportation planning. Their opinions about facility placement and design enhance understanding about how to meet goals related to mobility, access and safety. As importantly, their perceptions about the positive and negative roles that transportation projects play in a community go a long way toward informing transportation planners and engineers on how their work influences a community.

Surveys of facility users and importance-performance analyses are useful in acquiring relatively large quantities of perceptual data and analyzing them in a way that provides a complete evaluation of those perceptions. In this study, data on specific types of trails were collected and analyzed to reveal that there were many trail attributes and quality of life characteristics that varied in importance to users and in how they were currently performing. This method would be especially effective in comparing different types of transportation facilities. Surveys that include importance-performance items like those used to evaluate trails could also be administered to motorists. Applying the method in this way would allow for direct comparisons between users at two ends of the transportation spectrum. How might contributions of urban roadways be viewed differently than trails? How might they be alike? Answers to these and other questions would help transportation planners better understand the respective roles that different transportation facilities play in harmonizing among goals.

TRAIL ATTRIBUTES AND TRANSPORTATION GOALS

An understanding of how trail attributes contribute to use is important in meeting transportation goals related to safety and mobility. To reduce injuries and property damage, trail safety measures should lessen conflicts with other users both on the trail and at points of intersection with roads. As a safety issue, separation from motor traffic has been shown to be important to users in other studies as well (31). All three trails studied here made use of grade separations between adjacent roads and the trail but concerns about a lack of sufficient separation was raised by users, particularly by those on the west end of the BRT. The west end of the BRT intersects several major streets including arterials like the Loop 610 access roads and major collectors like Gessner, Fondren and Stella Link. When contacted on-site, users of the BRT expressed concerns about these crossings as conflict points between motorists and bikes/pedestrians. Trails separated at grade from intersecting roads provide safety to users in much the same way that "freeways" provide it safety to those in automobiles. Intersections at grade between trails and roads are likely to create a higher level of conflict, or concern for safety, among trail users than motorists. Roadways with bigger, heavier and faster motor vehicles can create intimidating barriers to the smaller, lighter and slower pedestrians and cyclists on trails

Safety can also be related to situations where people on trails feel vulnerable to unknowns. Trails are often avoided at night for this reason. Police presence and lighting were seen as less than

adequate on trails studied here but it is hard to predict if increases in either would enhance safety. Increased lighting has the potential to extend the useable hours of a trail, however, night use may also create a higher need for police presence in order to make a trail safe. Future research should examine before and after situations where lighting and police presence have been upgraded.

Goals related to mobility can be dealt with in many ways. The speed at which people travel and the volume of users can be indicators of mobility. Trail tread attributes deal with both of these things. The type of surface a trail has and how well it is maintained came up at the top of the list for respondents to both the on-site and postal surveys. Good surface quality (e.g., smooth, few holes) on a trail is like that of a road. The better it is the easier it is to make forward progress with out injury or damaged equipment. Surface quality has been shown to be especially important to bicycle riders in transportation scenarios (32,33). Respondents from the BRT, where cyclists were the majority user group, ranked their paved trail surface as the best performing of the 12 attributes in the survey. It should be noted however, that SCT users rated their crushed cinder surface as performing very well. SCT users gave their trail the best marks for width. While the trails width varied along its length, at our point of contact the trail was approximately 14 feet wide. This compared to six and eight feet at the other trail locations. Again the analogy of a freeway applies. The wider the thoroughfare the more people it can carry faster and safer. Width can be especially important in situations where there are multiple trail uses that move at different speeds. Conflict can be created among cyclists, walkers and in-line skaters on narrow trails where use is high and passing is frequent. For example bicyclists were mentioned as a dislike in open ended responses by 10 percent of users on the narrower BRT but by only 3 percent on the wider SCT. Studying multi-use trails, Moore (1994) and Heywood (1994) found that cyclists often feel that walkers and runners impede their progress by taking up too much width as they walk or run side by side. This makes it harder to pass. Walkers and runners, on the other hand, most often sight conflicts with cyclists that result from them passing too close and/or too fast (34,35). Trail width that is designed to accommodate agreed upon use types and levels can play a major role in meeting safety and mobility objectives. Those who use trails for transportation, in particular, might find trails more appealing as a point to point route if they provided adequate width for safe passing at speed.

Mobility goals developed by U.S. DOT include wording about users having a system that “offers flexibility of choices.” TxDOT has a goal statement that directly addresses the need to maximize choice and connectivity within and among transportation modes. Choices in using trails might be influenced by ease of access to different services within a community. Overall, users of the trails studied here felt that places to eat or shop along trails were unimportant. However, people who used trails for commuting scored these attributes significantly higher than those who did not suggesting that transportation based trail use fosters more positive attitudes toward attributes that complement it. Having restaurants and shopping areas in close proximity to trails would offer more choices about how one used such a facility in the personal transportation mix.

COMMUNITY QUALITY OF LIFE THROUGH TRAIL BASED TRANSPORTATION

Greenway based bike/pedestrian trails appear to lend strong support to the concept of harmonization (based on ITE's definition "the use of transportation to pursue a wide range of community goals"). While these projects may help some with traditional transportation goals related to mobility, access and safety, they likely help to harmonize through contributions they can make to the natural, social and, to a lesser extent, economic environments in communities.

The three trails studied here were primarily used for recreational activity. This is a key point in terms of goal harmonization between transportation agencies and communities. Transportation Enhancements funding is often tied to projects that have a clear "transportation" function. That is, they are point to point or destination to destination based so that they can be used for travel to shop, attend school or work. It was obvious that the trails in this study, while physically linear and connecting destinations, were primarily used for recreational activities by those surveyed. From the standpoint of experience, this type of use is allowing transportation agencies to help communities meet goals related to the health and fitness of residents and to positive social interaction. Texas trails have been used for a wide variety of well documented personal benefits (36). Exercise, stress relief, reflection, time with family or friends, achievement and interaction with nature are all benefits typically associated with recreational use of trials. Bicycle and pedestrian projects may be providing certain benefits that are harder to realize on roadways.

People are likely to perceive greenway trails as lying more lightly on the land than the typical road and thus as more complementary to the natural environment. Because these trails are often associated with riparian corridors and floodplains people see them as contributing to the natural environment and its related wildlife in urban areas. Trails can provide direct access to areas that provide opportunities to see water features and view wildlife. Such experiences are rare in urban areas. Research has also shown that communities that have more natural areas are attractive to today's employers as they consider relocating (37). Land values adjacent to such areas have been shown to be significantly higher than those in the same area but only a few streets away. Because these facilities are somewhat unique among urban areas they may also be seen as adding to community identity and pride through their provision of green space and alternative experiences in transport and recreation.

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APPENDIX A

ON-SITE SURVEY INSTRUMENT

Texas A&M University
On-Site Survey Form
Brays Bayou Trail

For Interviewer Use Only
Date ___ /___ / 98
Weekday M T W R F Sat Sun
Time ___:___ AM PM
Weather _____

1. For this trip, please tell us where you are traveling from and where you are traveling to.

   a. I am traveling from:
   ‘ home ‘ work
   ‘ school ‘ store
   ‘ friend’s ‘ other (please specify)_____

   Name of nearest building or street corner _____

   b. I am traveling to:
   ‘ home ‘ work
   ‘ school ‘ store
   ‘ friend’s ‘ other (please specify)_____

   Name of nearest building or street corner _____

2. About how long will you be on the trail for this trip today? _____ hours and _____ minutes

3. Who else is using the trail with you today? (Check only one)
   ‘ I am alone ‘ family member ‘ friends
   ‘ business associates ‘ other (please specify)_____

4. How are you traveling on the trail today? (Check only one)
   ‘ bicycling ‘ walking ‘ running/jogging
   ‘ in-line skating ‘ other (please specify)_____

5. How did you get to the trail today? (Check all that apply)
   ‘ drove a car ‘ public transportation ‘ rode a bicycle
   ‘ walked ‘ ran/jogged ‘ skated
   ‘ other (please specify)_____

6. Please tell us (if they apply):

   a. Something you like about this trail_____
   _____

   b. Something you do not like about this trail_____
   _____

7. We are conducting research on this and other bicycle/pedestrian trails in Texas. Please help us by participating in a short survey about this trail which we would like to send to your home within the next 5 to 10 days.

   If you agree to participate in this study, please give us your mailing address:

   Name:_____

   Address_____ Apt. _____

   City_____ State_____Zip Code_____

APPENDIX B

POSTAL SURVEY INSTRUMENT

Bicycle/Pedestrian Trail Survey

Conducted by the

Texas Transportation Institute (TTI)

and the

Department of Recreation, Park,
and Tourism Science (RPTS)
Texas A&M University

1998

Thanks again for agreeing to participate in this study of bicycle/pedestrian trails in Texas. Your response to this survey may help in making decisions about trail development in your community.

After completing the survey, please enclose it in the postage paid envelope provided and drop it in the mail. If the return envelope is not available, please mail the survey to the following address:

Texas Transportation Institute
ATTN: Bicycle/Pedestrian Survey
Texas A&M University, MS 3135
College Station, TX 77843-3135

If you have any questions about the survey, please contact either of the following researchers:

Scott Shafer
Department of Recreation, Park and Tourism Science
Texas A&M University
College Station, TX 77843-2261
Phone (409) 845-3837
E-Mail: sshafer@rpts.tamu.edu

or

Shawn Turner
Texas Transportation Institute
Texas A&M University
College Station, TX 77843-3135
Phone (409) 845-8829
E-Mail: shawn-turner@tamu.edu

Section I. Past use and experience on the Brays Bayou Trail.

Please answer the following questions about how you use the trail.

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1. How long have you been using this trail? ____ years ____ months

2. About how many times a month do you use this trail? ____ times a month

3. Please tell us what percentage of the time you use the trail for each of the following (please make sure they add to 100%):

   ___ % for recreation/fitness
   ___ % for travel to or from work/school
   ___ % for travel to a store/shopping area
   ___ % for travel to a friend's/family member's home
   ___ % for other _____
   100%

4. Please tell us your overall use of the trail by again indicating approximately what percent of the time you do the following (please make sure they add to 100%):

   ___ % of the time I am riding a bike
   ___ % of the time I am walking
   ___ % of the time I am running or jogging
   ___ % of the time I use in-line skates
   ___ % other use _____
   100%

5. What time of year do you normally use the trail? (mark all that apply)
   9 Spring (March-May) **9** Summer (June-August)
   9 Fall (September-November) **9** Winter (December-February)

6. What days of the week do you normally use the trail? (mark all that apply)
   9 weekdays **9** weekends

7. With whom do you typically use the trail? (mark all that apply)
   9 use it alone **9** with family/friends
   9 with organized clubs or group **9** other (please specify) _____

8. How far do you travel from home or another starting point to get on the trail? (mark only one)
   9 less than ¼ mile **9** ¼ to 1 mile **9** 1 to 5 miles **9** over 5 miles

9. How many other bicycle/pedestrian trails like Brays Bayou trail have you used in the past 3 years?
   9 none **9** 1 to 2 other trails **9** 3 to 4 other trails **9** more than 5 other trails

In the next few sections we ask for your feelings about what contributes to quality of life in your community and specifics about the trail design/condition. We also ask you to indicate how well you feel the trail "performs" on these items. You will see the same items repeated as a part of this process, but please consider each individually and answer all items.

Section II-A. Please indicate how important each of the following are to a good quality of life in your community?

	NOT AT ALL IMPORTANT	SOMEWHAT IMPORTANT	IMPORTANT	VERY IMPORTANT	EXTREMELY IMPORTANT
• having open spaces present in a community	( )	( )	( )	( )	( )
• having access to public transportation	( )	( )	( )	( )	( )
• the amount of pollution in a community	( )	( )	( )	( )	( )
• small business development	( )	( )	( )	( )	( )
• opportunities to use transportation other than cars	( )	( )	( )	( )	( )
• easy access to places for shopping	( )	( )	( )	( )	( )
• amount of social interaction among residents	( )	( )	( )	( )	( )
• health and fitness of community residents	( )	( )	( )	( )	( )
• amount of time spent traveling to shop	( )	( )	( )	( )	( )
• access to work places/schools	( )	( )	( )	( )	( )
• amount of money residents spend on transportation	( )	( )	( )	( )	( )
• pride that residents have in their community	( )	( )	( )	( )	( )
• amount of time spent traveling to work	( )	( )	( )	( )	( )
• diversity in the types of industry in a community	( )	( )	( )	( )	( )
• the access residents have to recreation areas	( )	( )	( )	( )	( )
• pattern of land use/development in the community	( )	( )	( )	( )	( )
• equity among different types of community residents	( )	( )	( )	( )	( )
• places for wildlife to live	( )	( )	( )	( )	( )
• economic health of a community	( )	( )	( )	( )	( )
• features in a community that help make it unique	( )	( )	( )	( )	( )

Section II-B. How important are each of the following to your use of a bicycle/pedestrian trail?

	NOT AT ALL IMPORTANT	SOMEWHAT IMPORTANT	IMPORTANT	VERY IMPORTANT	EXTREMELY IMPORTANT
• what the trail surface is made of (for example, gravel, concrete, etc.)	( )	( )	( )	( )	( )
• the level of maintenance of the trail surface	( )	( )	( )	( )	( )
• how wide the trail is	( )	( )	( )	( )	( )
• how well the trail is separated from auto traffic at intersections with streets	( )	( )	( )	( )	( )
• places along the trail to get a drink of water	( )	( )	( )	( )	( )

	NOT AT ALL IMPORTANT	SOMEWHAT IMPORTANT	IMPORTANT	VERY IMPORTANT	EXTREMELY IMPORTANT
• places along the trail to shop	( )	( )	( )	( )	( )
• places along the trail to eat	( )	( )	( )	( )	( )
• the amount of lighting present along the trail	( )	( )	( )	( )	( )
• the number of trail signs/markers	( )	( )	( )	( )	( )
• the number of steep hills on the trail	( )	( )	( )	( )	( )
• the level of police presence on the trail	( )	( )	( )	( )	( )
• the amount of litter along the trail	( )	( )	( )	( )	( )

Section III -A. Now, please tell us how well the Brays Bayou trail contributes to the quality of life in your community. Please indicate how the Brays Bayou trail rates in contributing to each of the following:

The Brays Bayou Trail contributes to:

	POORLY	FAIRLY WELL	WELL	VERY WELL	EXTREMELY WELL
• open space in the community	( )	( )	( )	( )	( )
• providing places for wildlife	( )	( )	( )	( )	( )
• better access to public transportation	( )	( )	( )	( )	( )
• economic health of surrounding communities	( )	( )	( )	( )	( )
• better health and fitness among residents	( )	( )	( )	( )	( )
• convenient access to shopping areas	( )	( )	( )	( )	( )
• reducing time spent traveling to work	( )	( )	( )	( )	( )
• a reduction in pollution	( )	( )	( )	( )	( )
• convenient access to work places/schools	( )	( )	( )	( )	( )
• reducing time spent traveling to shop	( )	( )	( )	( )	( )
• a reduction in transportation costs	( )	( )	( )	( )	( )
• opportunities to use transportation other than a car	( )	( )	( )	( )	( )
• the identity of this area	( )	( )	( )	( )	( )
• access to parks/open spaces	( )	( )	( )	( )	( )
• positive social interaction among residents	( )	( )	( )	( )	( )
• better land use/development patterns	( )	( )	( )	( )	( )
• equity among different types of people/residents	( )	( )	( )	( )	( )
• a sense of pride in the community	( )	( )	( )	( )	( )
• diversity in development of industry	( )	( )	( )	( )	( )
• development of small businesses	( )	( )	( )	( )	( )

Section III-B. How do you feel about each of the following attributes of the Brays Bayou trail?

Please indicate how the Braes Bayou trail rates on its performance of each of the following attributes in provided spaces based on the following:

	POOR	FAIR	GOOD	VERY GOOD	EXCELLENT
• the trail's surface is	( )	( )	( )	( )	( )
• the maintenance of the trail is	( )	( )	( )	( )	( )
• the width of the trail is	( )	( )	( )	( )	( )
• separation from auto traffic intersections is	( )	( )	( )	( )	( )
• the number of places to get a drink of water is	( )	( )	( )	( )	( )
• the number of places along the trail to shop is	( )	( )	( )	( )	( )
• the number of places along the trail to eat is	( )	( )	( )	( )	( )
• the lighting provided along the trail is	( )	( )	( )	( )	( )
• the trail signs/markers are	( )	( )	( )	( )	( )
• the steepness of the trail is	( )	( )	( )	( )	( )
• the amount of police presence on the trail is	( )	( )	( )	( )	( )
• the amount of litter along the trail is	( )	( )	( )	( )	( )

Section IV. The trail we've been asking you about has different types of users. We would like to know if you are ever bothered by other trail users and why.

Please circle a number to indicate how often you are bothered by <u>each</u> of these user types and, if you are bothered, check the boxes that best describe why.

<u>Bicyclists</u>

How often do **bicyclists** bother you? 0 never 1 occasionally 2 frequently

If you circled #1 or #2, why do **bicyclists** bother you?

- ☐ They move too fast.
- ☐ They move too slow.
- ☐ They are reckless.
- ☐ They do not yield to others.
- ☐ They do not warn when passing.
- ☐ They are unfriendly.

<u>Walkers</u>

How often do **walkers** bother you? 0 never 1 occasionally 2 frequently

If you circled #1 or #2, why do **walkers** bother you?

- ☐ They move too fast.
- ☐ They move too slow.
- ☐ They are reckless.
- ☐ They do not yield to others.
- ☐ They do not warn when passing.
- ☐ They are unfriendly.

In-line Skaters

How often do **in-line skaters** bother you? 0 never 1 occasionally 2 frequently

If you circled #1 or #2, why do **in-line skaters** bother you?

- ” They move too fast.
- ” They move too slow.
- ” They are reckless.
- ” They do not yield to others.
- ” They do not warn when passing.
- ” They are unfriendly.

Runners/Joggers

How often do **runners/joggers** bother you? 0 never 1 occasionally 2 frequently

If you circled #1 or #2, why do **runners/joggers** bother you?

- ” They move too fast.
- ” They move too slow.
- ” They are reckless.
- ” They do not yield to others.
- ” They do not warn when passing.
- ” They are unfriendly.

Section V. In this section, we are concerned about yourself. Please provide information as accurately as possible.

1. Your age in years? _____ years

2. Your gender? **9** female **9** male

3. Please indicate your race (or ethnic background).
   - **9** African American / Black
   - **9** Caucasian / White
   - **9** Hispanic / Mexican American
   - **9** Native American
   - **9** Asian / Asian American
   - **9** Other (please specify) _____

4. Please mark your highest level of education.
   - **9** grade school
   - **9** high school graduate
   - **9** technical school graduate
   - **9** college graduate
   - **9** graduate or professional degree

5. Your family income level before tax?
   - **9** less than $20,000
   - **9** $20,000 to $39,999
   - **9** $40,000 to $59,999
   - **9** $60,000 to $79,999
   - **9** $80,000 to $99,999
   - **9** more than $100,000

Thanks again for your time and cooperation!

Dear Brays Bayou Trail User:

We recently sent you a survey to determine how you felt about the Brays Bayou Trail and how it might contribute to your community. Your response to this survey is important to the future of urban trails in Texas.

If you have completed the survey and returned it, **Thank You!** If you have misplaced the survey and would like another, please call us collect at (409) 845-8829 for a replacement.

If you still have the survey, we hope you'll take the time to fill it out and drop it in the mail as soon as possible. Also, if you are interested in participating in future surveys, please check the box on the last page of the survey and include your name and address as well.

Thanks for your participation in this survey!

Scott Shafer
Assistant Professor
Recreation, Park and Tourism Sciences
Texas A&M University

Shawn Turner
Assistant Research Engineer
Texas Transportation Institute

Follow-Up Postcard for Postal Survey