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Case Study No. 7

Transportation Potential And Other Benefits Of Off-Road Bicycle And Pedestrian Facilities

National Bicycling And Walking Study

U.S. Department of Transportation
Federal Highway Administration

Foreword

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Final Case Study
for the

National Bicycle and Walking Study

Transportation Potential and Other Benefits of Off-Road Bicycle and Pedestrian Facilities

Prepared for
The Federal Highway Administration

January 1992

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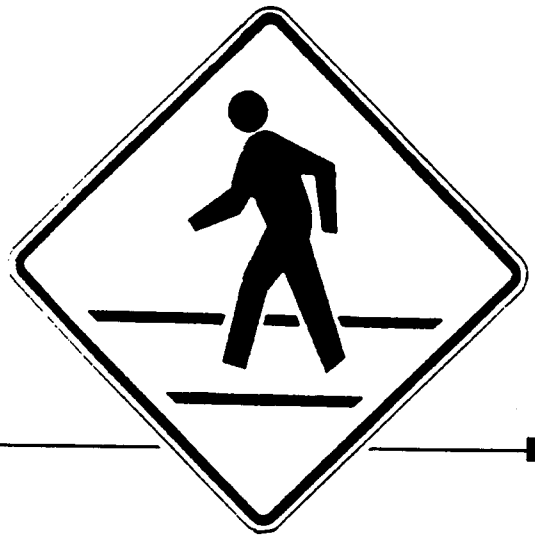


Executive Summary

During the last two decades, bicycling and walking have regained popularity in the United States. In 1990, it was reported that 100 million Americans walk for pleasure. Another 60 million ride bicycles. And much of this activity occurs on off-road trails. Trails for All Americans reports that we are seeking trail opportunities as never before. Young and old, families, individuals, organized groups, athletes, and disabled persons -- all use trails daily that squeeze through densely populated urban centers and wind through our country's great wilderness lands.

These off-road facilities offer transportation potential and other benefits to our society. In 1991, Congress realized this potential and mandated the Federal Highway Administration, U.S. Department of Transportation, to conduct a National Bicycling and Walking Study. As part of the new surface transportation reauthorization process, this study will be presented to the 103rd Congress to provide direction for implementing a new bicycle and pedestrian program that is integrated into normal transportation planning and design.

This report is one component of the National Bicycling and Walking Study. Given the objective of determining the transportation, economic, social, safety and environmental benefits of off-road bicycle and pedestrian facilities, four months of research was begun. Representative trail projects across the country were contacted. Existing literature on successful off-road facilities was collected, interpreted, and described by major headings in this case study report.

This report focuses on the benefits of human-powered forms of transportation as alternatives to the automobile. Biking and walking offer convenient and enjoyable ways for Americans to pedal and step toward healthy lifestyles, while improving the health of our nation and its natural resources as well. Off-road commuter trails offer safe and direct connections between the places where people live, work, and play. Individual trails can be linked together to form large networks of safe cycling and walking routes, and can even be included as part of urban mass transit systems.

Trails provide an outlet for the recreational needs of today's U.S. citizens. It is reported that more than 80 percent of our population will reside in urban areas by the year 2000, and will need close-to-home places to escape the stress and strain of normal day-to-day activities. Off-road trails become linear parks that are easily accessible and readily enjoyed by all citizens of a community.

This report examines the economic success stories of several corridors of land that struggled as railroads but are succeeding as trails, helping to revive local economies and derive dollars from tourism. Other projects demonstrate that off-road trails can be self-sustaining from income obtained through others who share use of their strip of land -- whether they are international telecommunications companies, local public works departments, or the individual users who hike, bike, and ride along a trail corridor. In addition, nearby landowners see the value of their properties increase and state governments gain sales tax revenues as a result of trail development.

The study takes a broad look at the land or right-of-way included in an off-road bicycle or pedestrian facility. The environments that trails and greenways preserve and protect can be thought of as outdoor classrooms complete with learning materials that captivate all educational levels, from schoolchildren to scientists. This report examines projects or case studies where trail users are provided numerous opportunities to learn about the plant life, animal life, and human life found along various off-road trails.

Environmentally, trail corridors can be harborers of wildlife, propagators of native vegetation, and protectors of water quality. Historically, they can tell the stories of events past, retrace the growth of our country, and capture the life and times of a group of people. In today's world, trails benefit the general public by providing much-needed opportunities to access areas of scenic beauty, recreate in the great outdoors, and escape from industrialized cores and populated suburbs of our cities.

And finally, in terms of benefits, the study examines trails and greenways as land use planning tools that aid in controlling the sprawl of cities and contribute to making the world a greener, cleaner, and better place to live.

The report goes on to compare and contrast representative projects, examining the similarities that exist among trails that have provided similar benefits. For example, findings indicate that there are similarities among bicycle and pedestrian transportation facilities, that certain types of projects receive greater direct economic benefits than others, and that quality of life benefits directly correlate to the quality of a trail project. The study also looks into how the benefits of off-road trails differ by the way in which projects are promoted.

Different types of off-road facilities are examined. Some trails are for bicyclists only, others accommodate pedestrians exclusively. Most are joint-use facilities where bicyclists and rollerbladers pass by mothers pushing baby strollers, and horses trot along beside wheelchairs and joggers. Several projects successfully accommodate the joint-use of snowmobiles and all-terrain vehicles on the trails. And different project elements help to ensure the successful use of off-road facilities by all user groups.

This study is a compendium of success stories and the hard work of many individuals, grass-roots organizations, private interests, volunteer groups, local governments, and state agencies. It is intended to share experiences, highlight innovations, and provide insight into the numerous benefits that can be experienced as a result of increased off-road trail development in the United States.

Section 1

Project Listing

Project Listing

The following is a listing of representative off-road trail projects cited as part of this case study. The listing is arranged alphabetically by project name, with project location and a brief summary description of each trail given.

These projects are representative of a broad cross section of the variety of off-road trails that exist across the country. Some projects are short, critical links in urban transportation systems, others are long, scenic recreation corridors. Some are exclusive bicycle paths and pedestrian walkways, others are multi-use facilities that accommodate both motorized and nonmotorized user groups. State and federal governmental agencies developed some projects; private developers, local citizen groups and bicycle, horseback riding and snowmobile advocates created others. No two projects are identical, but all provide insight into the many benefits of off-road trails.

ANCHORAGE BOWL TRAILS SYSTEM - Anchorage, AK
A citywide system of trails designed for transportation and recreation. Begun in 1978, the 85-mile paved trail system integrates parks, open spaces,and other bike facilities.

APPALACHIAN TRAIL - Maine to Georgia
A 2,144-mile hiking trail often thought of as the flagship of the greenway movement. Meanders across the scenic ridges and valleys of the eastern Appalachian Mountains.

AVENT FERRY ROAD BICYCLE PATH - Raleigh, NC
An off-road, "sidewalk" demonstration bicycle path of the 1970s. Developed to serve both the recreational and commuting needs of bicyclists and the North Carolina State University community.

BALTIMORE AND ANNAPOLIS TRAIL - Anne Arundel County, MD
A 13.3-mile heavily used, multi-purpose trail within a linear park which follows the route of the Old Baltimore and Annapolis Railroad from Glen Burnie to Annapolis.

BAY TRAIL - San Francisco, CA
One-third of this 400-mile regionwide trail is completed. When finished, the Bay Trail will be a continuous shoreline trail that traverses nine counties to encircle the San Francisco and San Pablo Bays.

BROOKLYN/QUEENS GREENWAY - New York, NY
A 40-mile bicycle/pedestrian path linking recreational, environmental, cultural, and historical resources within New York City. Route runs from the Atlantic Ocean to Long Island Sound.

BURKE-GILMAN TRAIL - Seattle, WA
A 12-mile multi-use trail constructed within the right-of-way of an abandoned railroad in urban Seattle. Known nationally as a well-established and heavily used-off road trail that is an integral part of the city's excellent bikeway network.

BURLINGTON WATERFRONT BIKEWAY - Burlington, VT
An 8.5-mile asphalt bike path traversing Burlington from north to south along the Lake Champlain waterfront.

CAPE COD NATIONAL SEASHORE BICYCLE TRAILS - Eastham, Truro & Provincetown, MA
Three completed segments of bicycle trails totaling 9.5 miles in length, with an additional 8 miles in the planning process.

CAPITAL AREA GREENWAY SYSTEM - Raleigh, NC
A multi-use paved asphalt system of trails usually located along creek corridors. 28 miles of trails completed; 200 miles anticipated total length.

CARRBORO RAILROAD BIKE/PED TRAIL - Carrboro, NC
An early bicycle demonstration project funded by FHWA in 1982. Was designed as a transportation project to get students and workers between Carrboro and the University of North Carolina at Chapel Hill.

CARY GREENWAYS - Cary, NC
An expanding system of crushed stone and asphalt greenway trails. Construction presently proceeds at rate of 1-2 new miles of multiple-use greenways each year.

CEDAR VALLEY NATURE TRAIL - Cedar Rapids to Waterloo, IA
52 miles of packed crushed limestone along an abandoned railroad corridor connecting these two cities.

CHENA RIVER BIKE TRAIL - Fairbanks, AK
Originally a 2.1-mile transportation and recreation project, is now the beginning of a much larger greenbelt/parkway following the river through Fairbanks.

CHERRY CREEK TRAIL - Denver, CO
One of 130 miles of multi-use trails in the City of Denver. This 13-mile concrete trail will be 45 miles at completion, providing uninterrupted access from the Platte River Trail to Castlewood Canyon State Park.

CHESAPEAKE AND OHIO CANAL NATIONAL HISTORICAL PARK TOWPATH - Washington, DC, to Cumberland, MD
A 53-year-old National Historical Park that contains 184.5 miles of dirt, shale, and gravel trails.

CLEVELAND METROPARKS ALL PURPOSE TRAILS - Cleveland, OH
Over 100 miles of parkways and an extensive system of trails that provide access to Cleveland Metroparks facilities.

DELAWARE AND RARITAN CANAL STATE PARK MULTI-USE TRAIL - Central NJ
A railroad conversion turned into a 28.5-mile crushed stone trail operated as a state park for non-motorized uses.

EAST BAY BICYCLE FACILITY - along Narragansett Bay, RI
An interim use of an inactive railroad corridor, this 10.5-mile Class I bicycle facility is developed for the exclusive use of bicycles, with pedestrians also allowed.

ELROY-SPARTA STATE TRAIL - Monroe and Juneau Counties, WI
The state's first linear recreation trail. A scenic tourist destination nationally known as a 32-mile rail-trail conversion that has had significant economic impact on surrounding communities.

FORT COLLINS TRAIL SYSTEM - Fort Collins, CO
A 20-mile system of asphalt and concrete trails following stream corridors. Began in 1974, it is the most popular recreation amenity in the Fort Collins park system.

GREENBELT, MARYLAND - Prince Georges County, MD
A development of 1930s which utilized the planned concept of connecting all aspects of the community with a trail network that enables pedestrians and cyclists to access the living components within the community by non-motorized vehicles.

GUILFORD COUNTY BICENTENNIAL GREENWAY - Guilford County, NC
North Carolina's longest greenway. The multiple surface trail will link together the cities of Greensboro and High Point while accessing valuable environmental preserves, protecting critical watershed lands, and preserving open space within new corporate and residential development.

HEARTLAND STATE TRAIL - Park Rapids to Walker to Cass Lake, MN
A 50-mile abandoned railroad grade converted to 27 miles of paved trails with parallel horse, hiking and mountain bike trails, and 23 miles of original ballast for general multi-purpose use.

HERITAGE TRAIL - Dubuque to Dyersville, Dubuque County, IA
A 26-mile rail-trail for multiple use including biking, hiking, nature studies, snowmobiling, and cross-country skiing.

ILLINOIS PRAIRIE PATH - Cook, DuPage and Kane Counties, IL
A public multi-purpose trail consisting of three main branches and two spurs along the right-of-way of the former Chicago, Aurora and Elgin electric railway line. This 55-mile recreational nature trail passes through 18 villages and cities in the three counties.

I-66/CUSTIS TRAIL - Arlington, VA
A 9-year-old transportation project that encourages bicycle commuting and pedestrian transportation. The 4-mile-long, 10-foot-wide asphalt trail shares right-of-way and parallels Interstate 66.

I-275 BIKEWAY- Western edge of the Detroit Metro Area, MI
A bike path within the limited access right-of-way of the 6-lane I-275 freeway. Intended to provide a 40-mile backbone trail to link local systems in the suburban communities which it connects.

KINGWOOD, TEXAS - Northeast Houston, TX
A 13,000-acre master planned residential community with a population of 45,000. Contains 45 miles of off-road trails located within 200 to 300-foot-wide natural forest corridors.

LAMBS CREEK HIKE AND BIKE TRAIL - Mansfield, PA
A 3.2-mile recreational trail project that connects the Lambs Creek Recreation Area at Tioga Lake with the community of Mansfield.

LITTLE MIAMI SCENIC STATE PARK - Greene, Warren, Clermont & Hamilton Counties, OH
A 45-mile railroad right-of-way containing 22 miles of paved recreation trails and 35 miles of undeveloped, original ballast.

MADISON BIKEWAY SYSTEM - Madison, WI
A 20-year-old system containing 20 miles of inventoried and designated off-road bike paths. Off-road elements are generally located within parks, greenways, rail corridors, and lakefronts.

MT. BLUE EXPERIMENTAL ATV TRAIL - Weld, ME
A 25-mile trail developed to study the impact of ATVs on the environment, other uses of the park, and trail development/maintenance techniques and costs. Allows for limited multi-use by ATVs, snowmobiles, and cross-country skiers, with future accommodations for horses, bicycles, and pedestrians.

NATIONAL CAPITAL REGION TRAILS - Maryland, Virginia, and Washington, DC
A metropolitan multi-use trail system. Consists of 75.7 miles of National Park Service trails connecting several city, county, and regional trails to form a loop trail system.

NEW RIVER TRAIL - Austinville, VA
Virginia's only linear state park. This 40-mile packed cinder trail is undergoing consideration for a national recreational trail designation.

NORTH CENTRAL BIKEWAY: BLACKHAND GORGE SECTION - Licking County, OH
A 4.25-mile recreational asphalt trail located within the Blackhand Gorge State Nature Preserve.

NORTH CHICKAMAUGA CREEK GREENWAY - Hixson, TN
A developing greenway along the lower 8 miles of the Chickamauga Creek, with more than 7 miles of multi-use trails.

OJAI VALLEY TRAIL - Ojai Valley, Ventura County, CA
A 25-foot-wide trail composed of the J.K. Ken MacDonald Bike Path and the Southern Pacific Equestrian/Hiking Path. The 9.5-mile route is an alternative to commuting on the shoulder of Highway 33, the major thoroughfare into the Ojai Valley.

PAINT CREEK TRAIL - Oakland County, MI
A quiet, scenic recreation area along 10.5 miles of a former Penn Central Railroad right-of-way that follows Paint Creek.

PENNSYLVANIA STATE GAME LANDS NO. 211 - Dauphin County, PA
This railroad bed is an undeveloped Game Commission administrative road that is also used as a multi-purpose recreation trail.

PINELLAS TRAIL - Clearwater to St. Petersburg Metro Area, Pinellas County, FL
A 47-mile urban linear park along an abandoned rail corridor. A model for community involvement and advanced design, 6 miles of this 15-foot-wide divided bikeway/pedestrian trail are completed to date.

RESEARCH TRIANGLE PARK PEDESTRIAN TRAIL SYSTEM - Research Triangle Park, NC
An ongoing project to construct asphalt walking and jogging trails in this corporate and research park. Provides for outdoor recreation for employees of RTP and the Fortune 500 companies located there.

RESTON, VIRGINIA - West of Washington, DC
One of the oldest and most successful planned communities. Founded in 1962, current population of 56,000. Contains 1,045 acres of open space with more than 50 miles of paved and natural trails.

RIDGELINE BIKE PATH - Eugene, OR
A recreational natural and gravel mountain bike trail that parallels a hiking trail which had developed problems with mixed use.

RIVER TO RIVER TRAIL - Shawnee National Forest, Southern IL
A 60-mile wilderness trail located within Shawnee National Forest. Successfully accommodates motorized and nonmotorized user groups.

ROOT RIVER STATE TRAIL - Southeastern MN
A 35-mile, multiple-use trail developed on an abandoned railroad grade that connects five small towns. Includes a 28.5-mile asphalt section and a 6.5-mile grass section with zoning for separation of users.

SAN ANTONIO RIVERWALK or PASEO DEL RIO - San Antonio, TX
6.5 miles of trails within a linear park that extends along the banks of the San Antonio River through downtown San Antonio. The river bend portion, known as Paseo del Alamo, is lined with shops, restaurants, hotels, and the River Center Mall.

SHEPHERD'S VINEYARD SUBDIVISION - Apex, NC
A 250-acre planned unit development with a 30-acre greenway system. Contains 1+ mile of asphalt trails, developed for transportation purposes.

SOUTHERN NEW ENGLAND TRUNKLINE TRAIL - Franklin, MA, to Willimantic, CT
A designated national recreational trail totaling 55 miles of original railroad grade. The multi-use Trunkline Trail represents 1/3 of the overall Triangular Trail System in Rhode Island, Massachusetts, Connecticut, and New Hampshire.

STOWE RECREATION PATH - Stowe, VT
A community-created greenway on 32 parcels of land donated by deeds of easement. The Stowe community has won several state and national awards for creation of the 5.3-mile biking, walking, jogging, roller-blading, and cross-country path.

SUGAR RIVER TRAIL - Green County, WI
A 1972 State of Wisconsin rails-to-trails project. The 10-foot-wide recreational path of limestone screenings totals 23.5 miles in length and has brought thousands of people into the rural community.

SWEENEY RIDGE - San Bruno to Pacifica, CA
A 20-year-old pedestrian- only trail running 3 miles through the National Park Service Golden Gate National Recreation Area.

TRAIL OF TWO CITIES - Omaha to Lincoln, NE
Nebraska's first rail-trail conversion. A proposed 52-mile, multi-use recreational facility running between the state's two largest cities.

TRAVERSE AREA RECREATIONAL TRAIL - Traverse City, MI
A nonmotorized path from the east side of Traverse City to Acme. Constructed primarily in the active railroad right-of-way under lease to Tuscola Saginaw Bay Railroad.

TROLLEY TRAIL - Mason City to Clear Lake, IA
A multiple use off-road trail constructed within the right-of-way of county road B35 for alternative transportation purposes. The 8-foot-wide asphalt trail totals 6 miles in length.

TUXACHANIE NATIONAL RECREATION TRAIL - Saucier, MS
A 21-mile hiking trail designed for pedestrian use only to avoid user conflicts and reduce resource damage.

WASHINGTON AND OLD DOMINION RAILROAD REGIONAL PARK - Northern VA
The W&OD is a 45-mile-long, 100-foot-wide multi-use park that stretches from the Potomac to the Blue Ridge, running through the urban heartland of Northern Virginia.

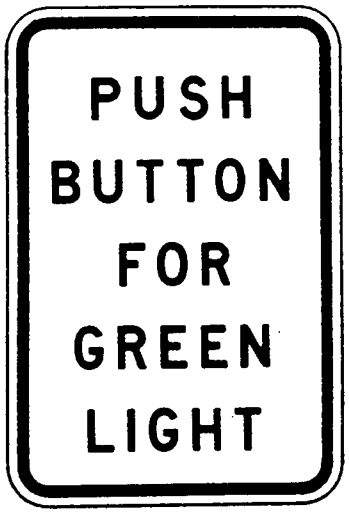
WILLAMETTE RIVER TRAIL: EUGENE SECTION - Eugene, OR
A 4.3-mile, multi-use, riverfront trail running mainly through city parks. Connects the University of Oregon to points in the central and northwest parts of the city.

WHITE ROCK CREEK TRAIL - Dallas, TX
An 8-foot-wide concrete trail initially developed to appease environmentalists after the water department cleared out land for a water main. Is now a 7.3-mile-long path used for bicycle commuting and recreational travel.

THE WOODLANDS, TEXAS - North of Houston, TX
A new town development of 35,000 people, and 150,000 ultimately, that contains 55 miles of concrete and asphalt trails.

Section 2

Case Study Methodology



Case Study Methodology

The objective of this case study, as defined by the Federal Highway Administration, is to "determine the transportation, economic, social, safety, and environmental benefits of off-road bicycle and pedestrian facilities." To accomplish this objective, the consultant was asked to review existing literature regarding off-road bicycle and pedestrian facilities and contact knowledgeable persons who have experience in successfully implementing off-road trails.

Literature reviewed as part of this process consisted of reports on off-road bicycle and pedestrian facilities, planning studies, press articles and media coverage, technical documents, promotional brochures, and results of trail usage studies. Resources utilized included the in-house library of Greenways Incorporated -- one of the most complete greenway, trail, bicycle, and pedestrian facility libraries in the nation; the National Greenway Archive at North Carolina State University -- a newly formed national repository of information on trails, greenways, open space, and parks; and the North Carolina Department of Transportation library -- a comprehensive set of bicycling information from the U.S. and other countries. (See *Appendix A* for reference bibliography.)

To supplement these existing data sources, the consultant requested additional information from a cross section of developers and administrators of successful trail systems across the country. Literature was gathered from transportation planners, bicycle enthusiasts, rails-to-trails groups, communities with established greenway systems, national trail interest groups, and developers of planned communities who have incorporated off-road systems into their developments. Information from historic, tourism and recreation trails, and motorized and equestrian user groups was also included in the case study to depict the broad range of views on the transportation potential and other benefits of off-road facilities. (A complete listing of persons who assisted in this effort is contained in *Appendix B*.)

After a thorough review of all information, the consultant was requested to compare and contrast results from different trails. Specific task components of this case study, as defined by FHWA, are outlined below, followed by the section of this report where the information is contained.

- Determine the benefits of off-road pedestrian and bicycle facilities - *Section 3*.
- Determine if there are similarities among trails that have provided similar benefits - *Section 4*.
- Determine if the benefits of trails differ by whether they are promoted as pedestrian trails, bicycle pathways, or joint use facilities - *Section 5*.
- Include reports of successful means of integrating different user types on an off-road facility - *Section 6*.
- Determine what elements are required to ensure successful utilization of these trails - *Section 7*.
- Assimilate any available usage data for trails, and where available, present trip generation rates for these facilities - *Section 8*.

Note:
Specific information on the example projects contained within this case study was obtained from a diverse collection of reference material. To avoid footnote repetition, all data were obtained from the reference sources corresponding to a respective project, unless otherwise noted in the text. (For convenience, sources are organized by project in the bibliography.) Any reference documents that do not correspond to a representative project are listed in parentheses following the text, and are listed in the "General" section of the bibliography.

Throughout the report, many benefits of off-road pedestrian and bicycle facilities are cited. Certain benefits are derived not only from the trails themselves, but also from the corridors of land -- often referred to as greenways, greenbelts, parkways, and linear parks -- that contain the off-road facilities.

Sometimes these lands are preserved to accommodate trail development; other times trails are added as an amenity to increase awareness of sensitive natural environments or to provide access to areas of scenic beauty. For clarification, the following definitions are given.

A trail, as defined in *Trails for All Americans*, is:

- A linear corridor, on land or water, with protected status and public access for recreation or transportation.

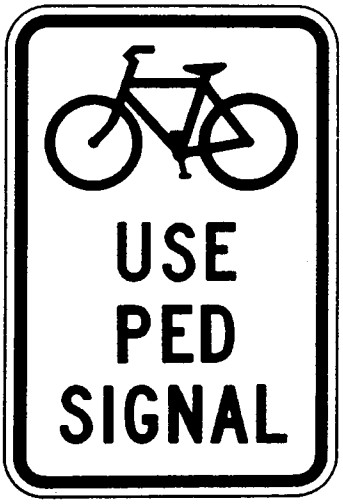
A greenway, as defined in Charles Little's book, *Greenways for America*, is:

- A linear open space established along either a natural corridor, such as a riverfront, stream valley, or ridgeline, or overland along a railroad right-of-way converted to recreational use, a canal, a scenic road, or other route.
- Any natural or landscaped course for pedestrian or bicycle passage.
- An open-space connector linking parks, nature reserves, cultural facilities, or historic sites with each other and with populated areas.
- Locally, certain strips or linear parks designated as a parkway or greenbelt.

As these definitions indicate, it is often difficult to separate the trail from the greenway, and therefore this report looks at the benefits and potential of both.

Section 3

Benefits of Off-Road Trails



Benefits of Off-Road Trails

This section of the case study examines the many benefits associated with off-road trails. These benefits can be realized in terms of transportation, recreation, economics, education, the environment, history, culture, access, land use planning, and general quality of life. The text presents how representative off-road trail projects across the country have experienced these different benefits and have creatively capitalized on their trail's surroundings and potential.

A. Transportation Benefits

Off-road trails offer several transportation benefits to pedestrians and bicycle users. They provide linkage, alternative to automobiles, integration with mass transit systems, and increased transportation safety. These benefits can be realized in terms of economics, convenience, environmental health, safety, personal health,and general well-being.

Linkage

Highly ranked among transportation benefits is the concept of linkage, where trails connect origins with destinations. Off-road trails and networks of trail systems can connect cities, regional points of interest, different parts of a community, various transportation routes, and basically, any two points that are desired to be linked together by means of bicycle or pedestrian travel.

The following are a few of the many examples of off-road trail projects that exemplify the concept of linkage:

For alternative transportation linkage, the Michigan DOT developed a 40-mile bike path within the right-of-way of a limited-access freeway. The I-275 Bike Path provides the backbone for a system of local bikeways within suburban communities on the western side of the Detroit Metro Area. Access to the bike path is available at selected freeway interchanges to unite the cities of Northville, Plymouth, and Romulus and the village of New Boston.

When complete, the 40-mile Brooklyn/Queens Greenway will link the Atlantic Ocean to the Long Island Sound. Along the way, a bicycle/pedestrian path will connect 13 parks, two botanic gardens, the Aquarium, the Brooklyn Museum, the New York Hall of Science, the Queens Museum, Shea Stadium, the National Tennis Center, the 1939/1964 World's Fair Site, three environmental education centers, four lakes, and a reservoir.

Maryland's Baltimore and Annapolis Trail is within one mile of half of Anne Arundel County's population of 400,000 people. The 13.3-mile trail bisects several suburban communities with offices, shopping malls, schools, and homes next to or nearby the trail.

In Colorado, a small 500-foot section of trail poured in August of 1991 connects the South Platte River's 20-mile trail to the C-470 trail and its extensive tributaries. As more and more gaps are closed and links in the system are completed, the Denver Metro Area will have more than 400 miles of interconnected bike paths.

The I-66/Custis Trail in Arlington, Virginia, provides a 4-mile link from the Westover neighborhood and Washington and Old Dominion Trail to the Rossyln business/ residential center and the Key Bridge, which in turn provides access to Washington, DC.

photo courtesy of Arlington County, VA

A critical new commuter link in the Virginia trails system is Arlington County's new bicycle/ pedestrian bridge. The bridge connects county and federal trail systems, completes a 17-mile loop throughout the county and is a model for a series of nested loops within the National Capital Region.

In Raleigh, North Carolina, off-road greenway trails are also critical for connections in the city's bicycle transportation system plan. The Capital Area Greenway trail system provides linkage across barriers such as highways and creeks, where viable on-road routes do not exist for bicyclists.

Whether large or small, the transportation-oriented trail projects included in this case study refer to linkage, time and time again, as a key factor contributing to the transportation success of off-road trails.

An Alternative to the Automobile

During the past 30 years, our country has come to rely more and more heavily on the use of the automobile as the principal, and often times only, mode of transportation. Unfortunately for cyclists and pedestrians, transportation planning and traffic engineering have too often been driven by considerations for the safety and efficiency of service for the automobile only. The resulting multiple-lane streets, heavy traffic flows, and fast travel speeds have forced many commuters into their cars and away from alternative modes of transportation.

Still, it is estimated that more than 3 million Americans commute to work by bicycle. These pedal pushers experience the same health and fitness benefits as recreational cyclists. Plus they receive economic benefits unrealized by the automobile-commuting public. For example:

The December 1990 issue of Bicycling magazine reports that with a commute of 9.9 miles each way and a fuel efficiency of 28.7 mpg, the average American uses 3.45 gallons of gasoline each week to commute to work by car. This costs $4.42, which means that a typical bicycle commuter can save $221 a year in gasoline costs alone.

The same Bicycling article also boasts additional economic benefits of bike commuting in terms of giving up a second vehicle. New or old, a car costs $3,000 per year. And this extra $250 per month in a budget equates into an additional $24,295 in home-buying power.

Our nation's dependence on the single occupant automobile affects not only individuals, but our nation and the world as a whole. The development of alternative, nonmotorized transportation systems throughout our country would yield several large-scale environmental and natural resource-related benefits, as indicated by the following:

Madison, Wisconsin, referred to as the Bicycling Capital of the Midwest, reports more than 100,000 bike trips are made daily, weather permitting. This interest in cycling helps to keep Madison's air clean and streets less congested.

In 1988, the Regional Bicycle Technical Subcommittee of the Washington, DC, area endorsed a goal of 5 percent transportation mode share for bicycles by the year 2000, and further increases in bicycle ridership in the next decade. As this goal is achieved, the region will benefit from reduced traffic flow across the highway network, reduction in the use of non-renewable energy resources and an improvement in ambient air quality.

Earth Day USA and Scholastic, Inc., report that, within a year, a family who walks or bikes two miles a day instead of driving will send 730 pounds less carbon dioxide into the atmosphere.

And, according to Bicycle Elements for the Washington Regional Transportation Plan, the U.S. Environmental Protection Agency estimates that, if bicycle commuting would result in 10 million fewer drivers on the road each day, an overall 5 percent decrease in carbon monoxide emissions would result.

A May 1991 Bicycling magazine article reiterates the benefits of commuting to save energy and resources. Take the following statistics for example:

- 100 bicycles can be produced for the energy and resources that it takes to build one medium-size automobile;
- Automobile emissions rank number one among all causes of air pollution;
- The United States daily consumes 17 million barrels of oil; and
- If U.S. commuters would bicycle to work 1.25 times each week, the need for Middle East oil would be eliminated.

Specifically relating to off-road trails, studies have been conducted that reveal a greater success and increase in the number of commuters in areas where off-road facilities are provided:

A 1986 study by David M. Eubanks indicates that off-road trails offer an alternative to using congested roadways for commuting in the Chicago area. The study shows that 7,000 commuters in the Chicago region use a bicycle to get back and forth to work every day, weather permitting. During peak summer months, this figure climbs to 14,000 commuters. The study indicated that most of the commuters using bicycles to travel to work live near one of the five linear trails found in the Chicago region. In census zones where these trails exist, an average of 15.6 percent of the commuter trips are by bicycle, but when compared to the region as a whole, only one percent of the working population commutes by bicycle. (source: Economic Impact of Protecting Rivers, Trails and Greenway Corridors)

The Eugene Section of the Willamette River Trail connects the University of Oregon to points in the central and northwest parts of the City of Eugene. The trail allows a significant portion of commuter trips to occur off of streets, which in turn has the ripple effect of encouraging more bike usage on street routes that feed into the trail.

The success stories of these off-road projects indicate that the number of bicycle commuters, and the resulting benefits, may be even further increased by providing improved off-road facilities in addition to improved cycling facilities in general.

An Integrated Transportation Mode

As bicycle commuting becomes a more standard mode of transportation, coordination of bicycle facilities and routes with mass transit and other transportation modes is sure to follow. Several

communities across the country have already taken this step forward, and are integrating bicycle and pedestrian transportation into their overall transportation plans in the following ways:

The Illinois Prairie Path traverses the western suburbs of Chicago and provides connection to Chicago's Metra system. This 55-mile off-road trail may be reached by Metra on the Chicago and Northeastern line with major access points in Lombard, Glen Ellyn, and Wheaton; or on the old Milwaukee Road line to Elgin.

Efforts have been made to encourage bicycling to Metro stations in the D.C. area. The Washington Metropolitan Area Transit Authority (WMATA) now includes bicycle storage facilities at most stations, and allows bicycles to be carried on board trains during weekend periods when ridership is low. It is estimated that 1,000 people a day commute by bicycle to the Metro system, and 3,600 people hold Bike-on-Rail permits. Plus, efforts are under way to establish safe and convenient access to all public transit stations and park-and-ride lots.

One of the long-term transportation objectives for the Anchorage, Alaska, area emphasizes the need to establish an efficient transportation system that reduces dependency on the automobile. The Anchorage Bowl Comprehensive Development Plan includes provisions for the full and rapid implementation of the Anchorage Trails Plan to establish a community-wide system of trails that will permit travel by several means other than the automobile.

In Reston, Virginia, a new transportation management program has been established to make it easy for residents and employees to ride the bus, find a carpool, join a vanpool, or use Reston's superb walkway network to walk or bike to work. Named LINK, the program has a telephone number to call to obtain information on the public transportation system, which includes the 50 miles of paved hike-and-bike paths that are an integral part of this planned community.

And, according to Missouri's Lower Meramec River Management Study, trails provide an opportunity to segregate commuting routes. Segregated trails and specifically designated lane markers are alternate means of helping to assure bikers and moped riders safer commuting corridors.

As these projects illustrate, rail-trail conversions, greenways, and other off-road trails are valid modes of transportation and should be planned, promoted, and developed as such. In addition to these types of trails, numerous other projects that integrate off-road bicycle and pedestrian facilities into large-scale transportation schemes are currently being developed as the concepts of Pedestrian Pockets and Neotraditional Planning are introduced into communities across the country. These efforts will further reinforce the value of alternative, nonmotorized modes of transportation as a critical component of integrated transportation planning.

On a similar note, the development of rail-trails and specifically, the acquisition of abandoned railroad rights-of-way, preserve the integrity of these corridors of land for transportation uses. The concept of "railbanking" allows railroad corridors to be preserved for future rail use, and provides for trails as an interim use.

Ultimately, as the need for all modes of transportation increases, off-road trail corridors will evolve to accommodate multiple transportation types. Several examples already exist which demonstrate the multiple-use of corridors to accommodate various transportation modes:

In Michigan, an 8-foot-wide asphalt path shares right-of-way with a spur line of the Tuscola Saginaw Bay Railroad. The Traverse Area Recreational Trail is contained in the

north 15 feet of the right-of-way and serves as a spine to a network of present and future alternatives to automobile travel.

By following an active Southern Railway spur instead of Carrboro's crowded streets, a North Carolina DOT transportation project allows cyclists to cut their distance by half and travel a safer route. The off-road trail, which links the community of Carrboro with the University of North Carolina at Chapel Hill, is used by 1,100 bicyclists and pedestrians per day.

Iowa county road B35 shares its right-of-way with the Trolley Trail, a 6-mile DOT off-road trail project developed to provide bicycle linkage between the cities of Clear Lake and Mason City. Seventeen feet separate the edge of the roadway and the trail. Utilities and an electric trolley line share the right-of-way on the other side of the road.

Safety

No transportation mode or route will be successful unless it is safe. The basic premise of transportation planning and design, whether it be for automobile, rail, airplane, boat, bicycle, or pedestrian, is that safety is always the most important factor.

The following three projects illustrate how important a safe, off-road transportation facility can be for cyclists and pedestrians. Inevitably, the increase in safety that has resulted from these projects is what has ensured their success.

Results of a survey conducted in 1988 on the Elroy-Sparta Trail in Wisconsin indicate that safety is the main reason for bicycling on the trail. Nearly half (45 percent) of the survey respondents indicated safety as the reason why they were using the trail. The study attributes the trail's safety to very little vehicular cross-traffic along the trail route and to the permitted use of nonmotorized recreation only.

In Rhode Island, transportation planners claim that the DOT's East Bay Bicycle Facility provides a safer, more comfortable ride through suburban and urban areas than on roadways. The facility was created to encourage an alternative mode of transportation and an appreciation of the natural beauty found within the state. Since the roads in the communities through which the bikeway passes are heavily travelled and often congested, especially during the tourist season, the bike path has proven to be a quicker and safer route for bicycle travel. Even with 49 vehicular intersections along the 14.5-mile stretch, in the summer it is quicker to get from Providence to Bristol on the trail than in a car.

Narrow, hilly California State Highway 33 into the Ojai Valley is a very busy and dangerous two-lane road that had been the scene, over the years, of many tragic accidents involving pedestrians, equestrians, joggers, and cyclists who had to use the shoulder of the highway to get to their destinations. Since 1989, when the County of Ventura and CalTrans completed a parallel multi-use trail to provide a safe route into the Valley, no accidents of this type have been reported on Highway 33.

In Summary

- The most successful commuter off-road trails offer a safe and direct link to origin and destination points, with access provided to adjacent residential, commercial, and recreational points of interest.
- Bicycling as a form of alternative transportation is energy efficient, economical, and healthy for the commuter and for the community at large.

- As a successful means of alternative transportation, trails link with mass-transit modes and a continuous system of bicycle and pedestrian trails throughout the community.
- Off-road trails offer safe routes as alternatives to on-street travel.

B. Recreation Benefits

According to The Report of the President's Commission on Americans Outdoors, nearly 90 percent of Americans age 12 and older go outdoors for recreation. Trails for All Americans reports that 60 million Americans are bicyclists, 17 million are horseback riders, more than 20 million are off-highway vehicle riders, 6 million are cross-country skiers, 9 million are canoeists, and 100 million walk for pleasure. And, several states have identified trails as key components in fulfilling the recreational needs identified in their State Comprehensive Outdoor Recreation Plans.

These national patterns of use, demand, and need reflect the benefits of trails for outdoor recreation. Whether they squeeze through our inner cities or meander through the great wilderness areas of our country, trails promote health and fitness, offer many benefits that traditional parks cannot and provide ample opportunity for close-to-home recreation.

Health and Fitness

A 1986 Market Opinion Research survey found that fitness and health were the two reasons that people cited most often for engaging in outdoor activities. This fact is reinforced by the results of the Benefits of Rail-Trails study, conducted on three trails in California, Iowa,and Florida. The results of this 1991 survey list health and fitness benefits as highest benefits perceived by trail users and landowners alike, on all three rail-trails studied.

Some specific health and fitness benefits derived from trails include the following:

The National Park Service's publication Economic Impacts of Protecting Rivers, Trails and Greenways Corridors examines how exercise derived from recreational activities such as trail use lessens health-related problems and reduces health care costs. The study states that people who exercise regularly have 14 percent lower claims against their medical insurance, spend 30 percent fewer days in the hospital,and have 41 percent fewer claims greater than $5,000.

Recreating is an important aspect of physical and mental health and well-being, and trails provide an unparalleled outdoor resource for many forms of recreation. Bikers, hikers, walkers, joggers, runners, horseback riders, cross-country skiers, roller-bladers, ATV operators, snowmobilers, mountain bikers,and skateboarders can all participate in their individual recreational pursuits within trail corridors.

photo courtesy of Greenways Incorporated

The Research Triangle Park Pedestrian Trail System was developed specifically to fulfill the need for a recreation resource for employees of this corporate park and its Fortune 500 companies. The first two phases of the ongoing project are easily accessible to a large number of employees throughout the Park and receive heavy use by pedestrians and joggers who enjoy the opportunity to exercise outdoors during their lunch hour or before and after work.

Northern Virginia's Washington and Old Dominion Railroad Regional Park provides recreational opportunities for people of all abilities. Each fall, the W&OD is the site for the National Wheelchair Race of Champions, an event in which the nation's top athletes compete in a 53-mile ultra-marathon.

Off-road trails such as the North Chickamauga Creek Greenway link places in the community where people live, work, shop, and play. Planners of this greenway in Hixon, Tennessee, state that almost everyone in the community will be near some part of the greenway during some part of the day. As a result, people can enjoy the benefits of a regular exercise program because a place to work out is always close by.

The Linear Nature of Corridors

Linear corridors offer several benefits over traditional park facilities. These benefits include providing greater perimeter area, multiple visitor experiences, increased access, and lower acquisition and development costs. Specific recreational trails and corridors that exemplify each of these concepts are listed below:

The North Chickamauga Creek Greenway Preliminary Master Plan says that greenway corridors offer advantages over compact urban parks for recreation planning because of their greater perimeter per unit area. The large perimeter means that more homes, businesses, and housing developments can abut the park and more points of access can be made available along a linear park than within a traditional compact park design.

The Chickamauga Plan also credits the corridor shape for providing a better park experience per visit. The long shape means that people can travel farther over more different types of terrain, see more different views and collect more different experiences than they could in a similar amount of time in a compact park of comparable size.

In North Carolina, the Raleigh Parks Plan states that the Capital Area Greenway System has greater potential for making convenient recreational settings available to more citizens than any other element of the Parks Plan. A study of the Capital Area Greenway Master Plan revealed that very few residential areas within the City of Raleigh are more than a mile from a proposed or existing greenway trail. Therefore, completed trails in these areas can become the spine of an interconnected system that provides additional recreational opportunities at the neighborhood and sub-neighborhood levels.

An earlier plan for Raleigh entitled Capital City Greenway, highlighted visibility as an additional attribute of linear parks. The plan emphasized the fact that a park can be viewed by dead-ending into it, by crossing perpendicularly through it, or by moving parallel to it. By developing greenways with greater perimeter area, Raleigh would gain the most visual impact from the open spaces within the city and would create an image which is much more pleasant than that of other urban areas.

In addition, this plan examined the recreation functions of linear greenways compared to traditional park facilities. Greenways provide for recreational activities that cannot be programmed as part of organized urban recreation. Walking for pleasure, bicycling, picnicking, fishing, nature walks, horseback riding, and hiking are usually excluded from urban recreation programs since most small urban parks cannot effectively accommodate these activities.

The Brooklyn-Queens Greenway attributes another benefit to the linear open space that complements the existing City park system. The Urban Greenway circumvents the

prohibitive costs of purchasing land because it often only involves acquiring easements or other rights associated with the land. Since most of the property, such as existing parks and city streets, is already in city ownership, the major cost associated with greenways is the upgrading of existing facilities.

Fulfillment of Close-to-Home Recreational Needs

Trails for All Americans states that by the year 2000, more than 80 percent of the nation's population will reside in urban areas. The number of two-career couples and single-parent families is growing, the physical and economic limits to mobility are increasing and available leisure time is decreasing. These factors influence recreation options and restrict the ability of more and more Americans to travel to distant park and recreation facilities. Close-to-home opportunities are a priority, and off-road trails can fulfill these recreation needs. For example:

> The Brooklyn/Queens Greenway increases accessibility to facilities for an urban population severely underserved in terms of recreational and cultural resources.
>
> San Francisco's Bay Trail provides new opportunities for recreation close to the urban core for people of all age levels, abilities, and interests. The Bay Trail is seen as a diverse and accessible setting for people to enjoy walking, jogging, and bicycling. The trail acts as a connecting thread for over 100 existing parks, open space, and recreation facilities.

In summary

- Individuals and families, children and the elderly, beginners of a sport and athletes in training can all benefit by recreating within off-road trail corridors.
- Trail users realize improved health, increased fitness, convenient access to the outdoors, and a diversified selection of close-to-home recreational opportunities.
- In addition, developers and administrators of linear parks and trail systems realize higher visibility, increased urban recreation programming, and lower facility acquisition and development costs for outdoor recreation facilities.

C. Economic Benefits

Economic benefits resulting from trail development and use can be broken down into direct and indirect benefits. Direct benefits include trail-related expenditures for goods and services, the creation of trail-related jobs and the generation of income from trail passes, user fees, permits, and utility easements within the trail corridors. Indirect benefits include increased real estate values, tax revenues, investment by local businesses and the private sector, and environmental quality.

Tourist Income

Recent studies across the country have indicated that major economic gain has been experienced by communities located along off-road trails. This type of off-road trail is typically many miles long, primarily used for recreation purposes and is often developed as a rails-to-trails conversion project. According to the Rails-to-Trails Conservancy, in rural areas, particularly those hard hit by the impact of railroad abandonment, rail-trails can be a significant stimuli to local economies. These off-road trail projects generate direct income from tourists and local trail users, and often result in the creation of new businesses and trail-related jobs. Success stories include:

> The small, rural town of Graf, located within Dubuque County, Iowa, has taken advantage of its location along the 26-mile Heritage Trail. Established to serve the old railroad, the town of 100 now serves the trail. Graf provides food, camping (with hook-ups and showers), and a city park with a shelter directly adjacent to the trail. One businessman who built a campground and a restaurant served 3,500 trail users in his first year of expanded business.

The Wisconsin Department of Natural Resources reports that the 23.5-mile Sugar River Trail has attracted thousands of people, who would otherwise not have come to the rural communities of Greene County.

The economic benefits of trail development can also be seen along Maryland's Baltimore and Annapolis Trail Park. Six trail-related stores have opened and two more have relocated next to the trail to find new customers.

Private businesses have been created in response to user demand along the Delaware and Raritan Multi-Use Trail in central New Jersey. Concessionaires and rental establishments cater to the many users of the trail and canal. Some of the businesses that profit from having the trail as a neighbor include a historic train station restored into a restaurant, a combination canoe/bicycle rental outfitter, and a hotel.

To promote tourist spending along the Elroy-Sparta Trail, The Foxxy Shopper network, publisher of local tabloids, creates an annual Bike Trail Guide. This tabloid contains information about the trail and is financed through advertisements, like those at right, from area restaurants, gift shops, hardware stores, and motels that profit from trail tourism.

advertisements from the Elroy-Sparta Bike Trail Guide

Similar businesses have been established or revitalized by the money being spent by users of the Cedar Valley Nature Trail. In addition, some small towns along this Iowa trail have plans to capitalize on their location along the trail by organizing civic activities and summer celebrations to coincide with the periods of increased trail use.

Several studies and surveys have been undertaken to document examples of dollar figures generated by off-road trails. Direct income has resulted from the purchase of goods and services such as food, lodging, equipment, clothing, supplies, gasoline and automotive services, souvenirs, and entertainment. Some of the results of trail studies and their quantifiable economic benefits are as follows:

The Sugar River Trail in southwestern Wisconsin surveyed users from 1979 through 1985. The analysis shows a low average in 1979 of $5.20 per person and a high average in 1984 of $10.99 being spent per trail user. Based on these estimates and amount of trail use, the total annual contribution of the trail to the local economy ranged from $158,704 to $522,025. (source: The Iowa Statewide Recreational Trails Plan)

A survey of Minnesota's Sugar Valley Trail users reflected an average expenditure of $12.21 per couple per day. The Minnesota Department of Natural Resources reports a figure of $13.92 spent per participant. (source: Trail of Two Cities C.R.I.&P. Rail Corridor Plan)

In 1973, an economic impact study was made of the trail communities serving the Elroy-Sparta Trail. A total of 72 business establishments in five communities were identified as receiving direct economic benefits from trail users. Gross sales to trail users were $295,129 or 6.4 percent of total sales. (source: Trail of Two Cities C.R.I.&P. Rail Corridor Plan)

A second study conducted in 1988 reports that, based on a per person expenditure of $25.14 per day for trip-related expenses, users of Wisconsin's Elroy-Sparta Trail spent more than $1.2 million in the area in that year. Approximately 50 percent of the trail users were from out-of-state, with the typical user traveling 228 miles to get to the trail and staying 1.43 nights in the area.

A 1989 survey of trail users on the Heartland State Trail, a 50-mile abandoned railroad in north-central Minnesota, showed that the average trail user was expected to spend $7.94 on the day they were using the trail. The survey also revealed that an estimated 47,330 people used the trail during the survey season. Annually, this calculates into $375,800 being spent on trail use-related shopping.

A 1991 National Parks Service/Penn State University study of three rail-trails revealed that average per person per day trip expenditures were $9.10 for Heritage Trail users in eastern Iowa, $11.02 for St. Marks Trail users in Florida, and $3.69 for Lafayette/ Moraga Trail users east of Oakland, California. When multiplied by the total visits made to each trail during the year, the total annual economic activity resulting from trail use was estimated to be $1,222,500 for the Heritage Trail, $1,873,400 for the St. Marks Trail, and $1,476,000 for the Lafayette/Moraga Trail.

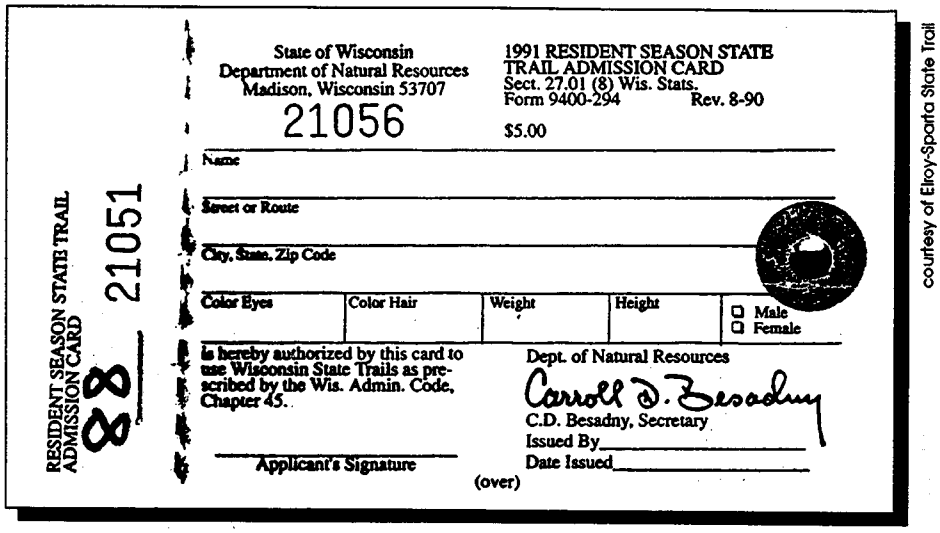
An Illinois Railbanking Study entitled Economic and Tax Implications of Rail-Trails summarizes expenditure data from several trails. This study cites that expenditures on scenic rural trails average $25 per trip per person. Expenditures for short-term day trips are substantially lower, averaging $1.00 for urban trails; $2.50 for trails in suburban areas and forest preserves; and $5.00 for more scenic close-in parks. The study applied its findings to Illinois trails and determined that a dollar of local expenditure related to rail-trail use will generate about $2.30 of output in Illinois and $1.50 locally. In addition, about 50 jobs will be created for every million dollars of direct expenditure.

Trail Passes and User Fees

Recreational facilities that serve targeted segments of the population, that are designed for a specific user group, or that experience high development and maintenance costs commonly collect user fees. Traditional examples include county and state parks, swimming pools and campgrounds. Similarly, direct income can be derived from the sale of passes to users of a trail.

User fees cover all of the operating costs of Iowa's Heritage Trail, including the salary for a ranger, the expenses of operating a patrol vehicle, grass cutting, and minor surface repairs. Total trail user fee revenue in 1991 was approximately $20,000. The cost to administer this program is minimal because private businesses sell the majority of the $1.00 daily passes and $5.00 annual passes. Self-registration tubes are also located on the trail, and the trail ranger collects the fees and checks trail users for pass compliance as part of his regular management duties. As trail utilization and pass compliance continue to improve on the Heritage Trail, some surplus funds are anticipated to be generated for major repairs and trail improvements.

On the Elroy-Sparta Trail, trail passes are sold on a daily, annual, resident, and non-resident basis. Passes, ranging in price from $1.50 for a resident daily to $7.00 for a


RESIDENT SEASON STATE TRAIL ADMISSION CARD
88 21051

State of Wisconsin
Department of Natural Resources
Madison, Wisconsin 53707
21056

1991 RESIDENT SEASON STATE TRAIL ADMISSION CARD
Sect. 27.01 (8) Wis. Stats.
Form 9400-294 Rev. 8-90
$5.00

Name
Street or Route
City, State, Zip Code
Color Eyes | Color Hair | Weight | Height | ☐ Male ☐ Female

is hereby authorized by this card to use Wisconsin State Trails as prescribed by the Wis. Admin. Code, Chapter 45.

Applicant's Signature

Dept. of Natural Resources
Carroll D. Besadny
C.D. Besadny, Secretary
Issued By
Date Issued
(over)

courtesy of Elroy-Sparta State Trail

non-resident season, are sold on the trail, at the visitor's headquarters and at a number of local off-site locations. The State of Wisconsin's Department of Natural Resources reports that user fees bring $40,000 to $45,000 into the general fund each year, almost covering the $48,000 maintenance cost for annual Elroy-Sparta Trail operations. Since approximately 80 percent of passes are sold off-site by private vendors through a non-profit corporation, DNR costs to collect the fees are kept at a minimum.

Utility Easements

Aggressive development is consuming millions of acres of land across our country and the cost of real estate is on the rise. On a separate track, technological advances are creating new methods of communication and information dissemination. As areas of our country become more and more urbanized, the demand for land for utility easements increases, as does the cost of land acquisition. Off-road trails can capitalize on these circumstances.

The inherent linear characteristics of both trails and utility lines has resulted in the creation of several partnerships between trails advocates and utility companies. Direct income can be generated from leases that allow different groups to share both above-ground and below-ground development rights. For example:

> In California, the Ventura County Parks Department receives no tax support from the County and must pay for all of its facilities, including the Ojai Valley Trail through self-generated income. The Trails Manager reports that the Parks Department will spend about $25,000 a year maintaining the trail, but will bring in over $36,000 a year from the utility leases along and across it.
>
> The Northern Virginia Regional Park Authority (NVRPA) requires permits or licenses for the many nonrecreational uses along the Washington and Old Dominion (W&OD) Railroad Trail. NVRPA requires every company wishing to construct a utility across W&OD land, or even to engage in temporary activities such as surveying, to get a revocable license to do so, to pay a fee for the license and to post a cash bond which is repaid only when the construction is cleaned up to NVRPA standards. In addition, the licensee must pay its portion of NVRPA's administrative costs of running the licensing program.

Similar to the W&OD, rail-trail conversions across the country are receiving economic benefits from utility companies for joint corridor use. These major trail corridors can support electric

power, water mains, gas pipelines, and fiber-optic cables. The development of rail-trail projects preserves the long, linear integrity of railroad corridors and ensures that the land will remain as one unit capable of accommodating future long-distance development. The Rails-to-Trails Conservancy has a list of representative projects that have benefitted from these relationships, some of which include:

In 1984, telecommunications firm U.S. Telecom was granted a perpetual easement on the Glacial Drumlin State Park Trail. In return, it paved the entire trail, a $375,000 project from Madison to Milwaukee, Wisconsin.

AT&T recently bought a 36-mile strip of land for an underground fiber optics line and donated the surface to the State of Washington as part of the Iron Horse State Park Trail.

In Michigan, both electric lines and pipe lines along the Paint Creek Trail generate $2,000 annually. The Paint Creek Trailways Commission is also negotiating with a fiber-optics company for an additional easement.

The King County Parks Department recently granted U.S. Sprint a 25-year permit to operate a fiber-optics line under the Burke-Gilman Trail in Seattle, Washington. Trail income will be $728,000. In addition, a 5 year renewable lease has been given for 2.25 miles of trail, with payments that started at $6,900 and escalate by 10 percent per year.

Iowa's Cedar Valley Nature Trail is used by Northwestern Bell for fiber-optic communications. In 1982 a perpetual easement was granted for a 3 mile segment of the trail for a one-time $12,000 fee.

The University of Washington granted U.S. Sprint permission to use 1.7 miles of trail in exchange for $113,000 worth of fiber-optic cables in University facilities.

Other Lease Income

Trail projects may also receive lease income from agricultural and/or industrial purposes and facilities. For example, when the Heritage Trail in Dubuque County, Iowa, was first in operation, the trail leased some right-of-way property and adjacent land to two lumber companies and a fertilizer plant, generating income of $1,600 per year. According to the Dubuque County Conservation Board, the trail now receives annual in-kind donations from the lumber company instead of cash income.

Multi-Use Corridors

Multiple land use is a reciprocal concept. Just as utilities can be developed within trail corridors, trails can be constructed within existing utility right-of-ways. Utility companies were often the first ones to purchase land rights after a railroad abandonment, or even earlier during active railway use. And sections of greenway trails often follow sanitary sewer and water line easements through developed urban and suburban areas.

Indirect economic benefits can occur through cooperative use of publicly and privately owned utility lands. Savings in the cost of land acquisition are realized if easements are obtained to accommodate both utilities and public access. Both parties may realize economic benefits if the trail and utility are planned and developed together, and maintenance of the corridor may be shared by both managing organizations. In addition, utility companies desiring positive public relations may help to develop and support trails and public access to their lands.

Some representative off-road trail projects illustrating the concepts and benefits of planning for multi-use corridors are as follows:

DuPage County, Illinois, purchased an abandoned railroad right-of-way in which Commonwealth Edison had an existing aerial easement in perpetuity along the entire corridor. The County leased the land to the non-profit Illinois Prairie Path organization which negotiated with ComEd and adjacent land owners to obtain access to the electric utility corridor for a recreational trail. Based on the successful relationship with the Illinois Prairie Path, ComEd has since entered into similar agreements along other rights-of-way for recreational uses. (source: Trails on Electric Utility Lands: A Model of Public-Private Partnership)

photo courtesy of Greenways Incorporated

The utility department of the City of Raleigh installs gravity-flow sanitary sewer lines along the natural drainage system of the city. The City has capitalized on the relationship of the Capital Area Greenway and the sanitary sewer lines as both occupy roughly the same area contiguous to the city's streams. The City is able to overlap these two rights-of-way and establish both systems at less expense than providing for the functions of both separately. In addition, the trails provide easier access for routine sewer line inspection and maintenance.

The City of Eugene, Oregon, in efforts to provide bicycle and pedestrian access across the Willamette River, has created a beneficial partnership with the Eugene Water and Electric Board. Three bicycle/pedestrian bridges have been built piggyback on a steam conduit, a water main, and a sewer trunk line and telephone cable to connect miles of asphalt trails along both banks of the Willamette River.

Real Estate Value

The creation of trails and greenways can have a positive effect on the value of properties adjacent to and near the proposed trail route.

Studies show that Seattle's Burke-Gilman Trail has increased the value of homes near, but not on, the trail by 6.5 percent. The trail has had no significant effect on the value of homes immediately adjacent to the trail. In addition, the study showed homes and condominiums near and adjacent to the Burke-Gilman Trail are easier to sell because of their proximity to the trail.

A survey of adjacent landowners along the Luce Line rail-trail in Minnesota showed that 87 percent of the owners believed that the trail increased or had no effect on the value of their property. In suburban areas, 61 percent of home owners noted an increase in property values as a result of the trail, with new owners indicating a more positive effect on adjacent properties than continuing owners. Appraiser and real estate agents claimed that trails were a positive selling point for suburban residential property, hobby farms, farmland proposed for development, and some types of small town commercial property. (source: Economic Impacts of Protecting Rivers, Trails and Greenway Corridors)

In Boulder, Colorado, off-road trails are found within the city's greenbelts. A study of property values noted that housing prices declined an average of $4.20 for each foot of distance from a greenbelt up to 3,200 feet. In one neighborhood, this figure was $10.20 for each foot of distance. The study determined that, other variables being equal, the

average value of property adjacent to the greenbelt would be higher than those 3,200 feet away. (source: Economic Impacts of Protecting Rivers, Trails and Greenway Corridors)

Developers across the country find that greenways and trail systems add to a project's identity as well as the dollar value. Proximity to greenways and off-road trails can increase sales price, increase marketability, and result in faster property sales.

New Jersey's Delaware and Raritan Canal State Park is an example of a tremendously successful trail. There is a premium on land adjacent to the Canal Park and the proximity of a development to the canal is always used as a selling point when nearby properties or residential units are marketed.

The Big Blue Trail in northern Virginia received a 50-foot-wide, 7-mile easement from a land developer in Fort Royal, Virginia, who realized the amenity value of the proposed trail. The developer advertised that the trail would cross approximately 50 tracts of land and sold all of the adjacent parcels within four months. (source: Economic Impacts of Protecting Rivers, Trails and Greenway Corridors)

On the commercial side of real estate, the Bay Trail offers the City of San Francisco recreational and aesthetic tie-ins for local economic development and waterfront planning projects.

Sales Tax Revenues

Just as trail-related expenditures bring direct economic benefit to the communities through which off-road trails pass, indirect revenues can be realized in the form of sales tax revenues. An Illinois study entitled Economic and Tax Implications of Rail-Trails discusses several hypothetical cases where out-of-state users are diverted to yield in-state revenue. The study determined that:

At levels of use (50,000 per year) and local use patterns (scenic tourist destination) found on the Elroy-Sparta Trail in Wisconsin, local sales tax revenues would be $15,700 per year. If out-of-state users of the Elroy-Sparta Trail and their expenditures could be attracted to Illinois by a similar bike trail, the state would gain sales tax revenues of $36,200 per year. If Illinois bike trails would divert the Illinois residents currently using the Elroy-Sparta Trail and staying in Wisconsin campgrounds and commercial accommodations, Illinois would gain $14,460 in sales tax revenues annually.

At lower levels of use (20,000 per year) on a scenic rural trail, where expenditures are similar to the Elroy-Sparta Trail but use is 70 percent local and only 30 percent tourist, additional local sales tax revenues would be $4,250 per year.

A local trail that is heavily used, as is the Washington and Old Dominion Trail in Virginia (at least 1 million per year), even at the very lowest expenditure for casual local urban use observed in Illinois, would yield local sales tax revenue of $12,500 per year.

A suburban trail with a far more modest number of users (2,500 per week, or 130,000 per year) who spend the average observed in Illinois for such trails would yield local sales revenues of $4,060 per year.

Similarly, The Economic Impact of the Proposed Missouri River Trail reports increases in tax revenues for the State of Missouri. The 1987 study determined that tax revenue to local and state governmental units was estimated to total $960,000 annually as a result of $6.2 million in tourism sales generated by the Katy-Missouri River Trail.

Although only two studies are used as examples of increased sales tax revenues, the conclusions reached were based on the experiences of several off-road trail projects across the country. Therefore, these studies give an indication of how various types of off-road trails can impact tax revenues on a statewide basis.

Other Indirect Economic Benefits

In addition to providing increased real estate values and sales tax revenues, trails offer other indirect economic benefits.

Off-road trails are often constructed along tree-lined lands and, as dedicated public lands, trail corridors preserve and protect existing vegetation along the corridor that might otherwise be bulldozed under development pressures. Large stands of mature trees are a valuable natural resource that offers several indirect economic benefits:

> The National Park Service publication Economic Impacts of Protecting Rivers, Trails and Greenway Corridors states that trees in greenways provide ambient temperature mediation and help reduce heating and cooling costs. Trees reduce winter heating costs by 40 percent in some cases; and in summer shading might provide even greater benefits. A single, isolated tree, generously supplied with water, can transpire energy equivalent to five average room air conditioners running 20 hours per day. The species of tree, available moisture, and available soil volume affect the quantity of water evapotranspired per tree.
>
> The American Forestry Association reports that a tree left to grow can be worth $196,250. In 50 years it produces $62,500 in air pollution control, $37,000 in water recycling and humidity control, $31,350 in wildlife shelter, and $2,500 worth of protein in the leaves and bark consumed by wildlife.
>
> The Town of Cary, North Carolina, has a Tree Advisory Board that has assessed the value of the town's urban forest. Cary has approximately 200 acres of tree-covered greenways contained within the Town limits. The estimated replacement value of these trees is $9,250,000. The trees are considered as much a part of the infrastructure of the Town of Cary as are water and sewer lines, streets and roads, and the police, fire, and sanitation departments. But unlike many public expenditures, trees are a capital investment which appreciate over time.

Off-road trails not only bring direct tourist income into a community, but they also promote non-trail related expenditures by visitors and tourists.

> A proposal for a trans-recreational linear parkway in Nebraska states that the Trail of Two Cities would lure more visitors to the Platte River State Park, Schramm Park, Louisville State Recreation area and Ak-Sar-Ben Aquarium, thereby increasing the potential for the state to benefit economically.
>
> In San Antonio, Texas, the River Walk is considered to be the anchor of the visitor industry. Along with the Alamo, the River Walk is the center of attraction, creating the second largest economic sector in the city --an annual $1.2 billion tourism industry.

Trails also offer potential for businesses and the private sector to reinvest in their community. Several case studies attribute the success of their projects to the public-private partnerships that were formed to implement an off-road trail project.

It is also pertinent to mention in this section that, as previously discussed, the transportation and recreation aspects of off-road trails reduce commuting costs and health care costs, thereby contributing to the economic benefits of off-road trails.

In Summary

- Off-road trails can provide tourist income for communities along a trail route and spur development of new businesses and the creation of new jobs to serve trail users.
- Trail passes and user fees can generate direct income for trail facility management, maintenance, and improvements.
- Permits and leases to utility companies can yield direct income, or can create partnerships for joint development and implementation of off-road trail systems on utility lands.
- Real estate adjacent to trail corridors increases in value, takes on a sense of identity, and becomes easier to market with the development of successful trail facilities.
- Additional indirect economic benefits can be realized through sales tax revenues from trail-related expenditures, preservation of natural vegetation, investment by local businesses and the private sector in the community, and reductions in commuting and health care costs.

D. Educational Benefits

The scientific community, educators, students, trail developers, and the general public can attribute significant educational benefits to off-road trail projects. Trails provide access into a variety of environments and open up substantial educational opportunities that otherwise would not exist.

Value to the Scientific Community

Trail development preserves environmental areas that are of special value to the scientific community. Dedicating land for open space preservation and obtaining public access easements help to ensure that valuable educational resources will not be lost nor go unappreciated.

> The Cedar Valley Nature Trail reports that, according to the Illinois Natural Areas Inventory, many of the few remaining stands of native prairie and undisturbed prairie soils occur on railroad rights-of-way. These pristine areas exist because many of the railroads were built before the prairies were cultivated. The value of these remnants lies in the base they offer for providing scientific comparison, illustrating original native cover and soils, and preserving a living museum of fauna and flora typical of the native landscape.
>
> Along the C&O Canal National Historical Park Towpath, ecological exhibits, plant communities and wildlife habitats are recognized as being highly important for scientific study. These areas are strictly protected, with the public allowed into the areas by special permit only.

Value to Educators and Students

Off-road trails offer close-to-home educational benefits as well as close-to-home recreational benefits. A trail corridor will often encompass several environments along its route, and can therefore be thought of as an outdoor classroom full of educational materials capable of accommodating all learning levels and a wide range of studies.

Restricted budgets in schools across the nation have heavily affected transportation and have reduced educators' abilities to provide away-from-the-classroom learning experiences. Trails within communities offer nearby opportunities for field trips in study areas such as biology, history, and art. To illustrate the range of possibilities in promoting the educational benefits associated with trail experiences, this report cites the following case studies:

The Illinois Prairie Path markets itself, in addition to being a fine recreation facility, as a natural science laboratory and a 55-mile-long bird observatory.

Tennessee's North Chickamauga Creek Greenway is being designed to interpret the natural and cultural history of the area. Greenway plans include educating trail users about tree identification, aquatic plants and animals, community and Civil War history, how the local Indians lived, and how the valley and nearby hills were formed.

In North Carolina, the Piedmont Environmental Education Center is receiving several benefits from the routing of the Guilford County Bicentennial Greenway across its environmental preserves. The center's Education Director is actually teaching classes out on the greenway. By using bicycles typically available for rent at the center, classes can effectively move from one area of the greenway to another. And interest in the program is high as students think that bicycling is a fun way to study soils, amphibians, river history, wetlands, forests, and other environmental topics.

The Cedar Valley Nature Trail offers excellent features for interpretation and education. The right-of-way is an example of wildlife habitat that co-exists with farming operations, and the entire corridor is a naturally succeeding area that can be studied and contrasted to habitat plantings available from the state conservation commission.

photo courtesy of Greenways Incorporated

Boy Scouts who belong to the five councils in the region surrounding the C&O Canal National Historical Park comprise the largest single user group of the towpath. Normally traveling in groups of 10 to 20, they hike a section at a time to earn the C&O Canal Historical Trail Patch.

Increased Awareness

Off-road trails provide firsthand experiences that educate citizens about the importance of the natural environment and respect for nature. Anyone who is provided with the opportunity to interact with nature while using an off-road trail can become interested in learning about the environment that he/she is in.

Several trail projects have successfully created interpretive signage programs and/or have established volunteer staffs to turn a typical outdoors outing into an educational learning experience. Other projects increase environmental awareness through promotional materials and publications about the trail. Examples include:

In addition to six National Interpretive Zones located along the C&O Canal Towpath, handbooks aid interpretation and supplemental graphic displays are placed in locations where it is essential to help visitors understand a major feature of the canal.

The Baltimore and Annapolis Trail Park has developed extensive volunteer programs which include a Trail Blazers component. "Blazers" are special volunteers who learn park operation procedures, assist visitors, patrol the park, and serve as trail ambassadors.

The Bay Trail in San Francisco, California, is seen as a catalyst for increasing people's knowledge of and identification with the Bay and its importance to the region.

Promotional brochures for Florida's Pinellas Trail further promotes this increase in environmental awareness:

> "As a natural connector between our existing parks and recreation areas, the Trail will take us into yesterday's unspoiled environment, free from development and immersed in nature. How often do we see Spanish moss hanging from Pinellas County trees? . . . The Trail is also needed to save and preserve our unique Florida life-style and our rapidly disappearing natural beauty, being eaten up by commercial and residential development. These railroad rights-of-ways present a unique one-time opportunity to achieve this goal, and we MUST act NOW to save these parklands for our children and grandchildren."

Off-road trails also educate and increase awareness in areas other than environmental preservation and historical interpretation. The following three projects demonstrate how a raised level of consciousness has been attributed to the development of off-road trail systems.

The purpose of the Trail of Two Cities is to link Nebraska's two largest cities, Omaha and Lincoln. In order to do so, the project must traverse rural areas and run through small, agricultural communities. This routing allows people from the urban areas to learn more about nature, become better attuned to rural life and its problems, and develop a greater understanding of the agricultural basis of Nebraska's economy.

The largest benefit of the Root River State Trail in southeastern Minnesota has been the acceptance and support of new trail proposals. The Minnesota Department of Natural Resources, administrator of the Root River Trail and coordinator of recreational trails statewide, reports that local communities are now taking the lead in creating new trail systems based on the success of the Root River State Trail.

Greenways Incorporated, designers of the Bicentennial Greenway in Guilford County, North Carolina, report that construction of the first two sections of this 16-mile trail has increased environmental awareness for contractors who typically do road construction work. Early in the trail construction process, bulldozers were ready to undertake massive clearing, grading and trail-building efforts, just as in a typical highway project. But through close, on-site contact with the trail designers, the construction crews became aware of the sensitive environments that they were working in, learned how to construct a trail to fit in with the landscape, and actually became excited about the prospect of saving trees.

In Summary

- Development of trails in existing corridors, such as abandoned railroad rights-of-way, and within sensitive environments, preserves unique plant communities, wildlife habitats, ecological systems, and remnants of native prairie that are invaluable resources for scientific study.
- Educators and students can use off-road trails for field trips to outdoor classrooms that contain a wide range of study materials.
- Interpretive signage, volunteer programs and promotional materials developed in conjunction with trail systems provide the opportunity for each and every trail user to learn about the areas through which he is passing.
- Trails educate people about environmental issues, increase awareness of different lifestyles, and provide insight into trail building and the resulting benefits.

E. Environmental Benefits

Off-road trails can be developed as overland connectors or they can meander alongside of streams and rivers. Whether developed strictly to offer pedestrian and bicycle passage, or developed as part of a larger greenway concept, trails can link existing parks, open spaces, and undeveloped lands. When all of these lands are considered as a whole, the resulting network of tree-lined trails, natural areas, and streamside ecosystems provides immeasurable benefits to the environment.

The following listing of case studies describes the various environmental benefits that have resulted from the development of trails and greenways across the country. These benefits fall into categories of wildlife preservation, water quality protection, storm water management, preservation of vegetation, and other environmental issues.

Wildlife Preservation

According to the Cedar Valley Road Conservation Recreation Corridor Study, the presence of a long continuous corridor of wildlife, as exists along the Cedar Valley Nature Trail, may be critical to the survival of a variety of species in several areas. The corridor configuration offers the unique advantage of distributing a relatively small acreage of land, and amount of wildlife cover, over a large area that runs through several counties.

In addition, the study reports that trail corridors in agricultural regions preserve wildlife habitat in the middle of areas where most of the land has been devoted to row crops. In the winter months, these harvested lands provide little or no habitat for wildlife.

Minnesota's Heartland Trail traverses a varied natural environment that provides habitat for abundant wildlife including white-tailed deer, raccoon, fox, bald eagles, osprey, ducks, and great blue herons. In addition to the natural habitats attracting wildlife, a "bluebird trail" has been created by maintaining 110 birdhouses along the trail. Bluebirds nest in more than 40 percent of the houses, with wrens, swallow, red squirrels, and flying squirrels occupying the remainder of the houses.

The 52-mile Trail of Two Cities corridor will create more than 200 acres of nesting cover for upland game birds. Because of its permanent, undisturbed aspect, a minimum of 800 pheasant chicks alone would be expected to be produced along the trail. As brooding, escape and winter cover, the right-of-way probably represents the best habitat of its type in the area, influencing a zone 1/2 mile on either side of the right-of-way that totals more than 33,000 acres.

Water Quality Protection

In Maryland, a statewide system of Natural Greenway Parks buffers vital drainages from the impacts of surrounding development. Through filtering of sheet runoff and uptake of excess nutrients from surface and sub-surface flows, greenways protect water quality. Ninety-five percent of Maryland's land drains into the Chesapeake Bay, and the establishment of buffer areas is vital to efforts to reserve the estuary's decline. Greenways also provide habitat corridors and improve fish habitat by shading streams.

The Reedy Creek Greenway Plan for Kingsport, Tennessee, states that the water quality of the stream is protected (and eventually improved) as the streamside strand of vegetation is allowed to replace itself. The vegetation cools the water, slows runoff, and filters out solids, silt and agricultural chemicals.

Storm Water Management

The Stowe Recreation Path receives credit for stabilization of the stream bank through the Vermont resort community. Before the path was built, floods used to erode huge areas of the banks. Now the river valley land is better protected from erosion due to the greenway.

The Mecklenburg County Greenways study states that the preservation of select floodplains as open space will reduce flood damages that historically have averaged $1.4 million annually. Preserving floodplains in their natural state as greenways protects the amount of open land that can allow for water penetration and maintains sufficient groundwater storage where water can infiltrate the earth beneath.

In Kingsport, Tennessee, the flooding characteristics of Reedy Creek were determined to have a definite effect on land acquisition costs for greenway development. In order to qualify for federally subsidized flood insurance, municipalities are required to regulate development in areas subject to flooding. Considering restrictions on development in the floodway, desirable lands are therefore easily donated or sold for the greenway.

Preservation of Vegetation

Long-distance trail projects, like the Trail of Two Cities, can encompass a variety of important and interesting vegetation types along its route. This proposed 52-mile trail will preserve remnants of native prairie vegetation, upland woody tree and shrub species, riparian zones of elm, ash and cottonwood, and excellent examples of typical prairie species rapidly disappearing under more intensive agricultural operations.

A report on the benefits of establishing a greenway system in Raleigh, North Carolina, states that greenways reduce noise, smog, dust, heat, and rainfall. The vegetation along greenways acts as a buffer strip to decrease noise, influence air movement, and filter dust. Transpiration by trees cools the air in the urban area, which ultimately, stabilizes rainfall increases and lowers the potential for flooding.

Other Environmental Benefits

The Cedar Valley Nature Trail reports that in the Midwestern states, vegetation-lined trail corridors can serve as wind shelter belts for the purpose of reducing soil erosion. The Agricultural Stabilization and Conservation Service has a program to provide financial assistance to landowners wishing to establish such shelter belts.

Sweeney Ridge, part of the NPS Golden Gate National Recreation Area in San Bruno and Pacifica, California, sees a unique environmental/safety benefit of the park's trails. The pedestrian trail system doubles in function as a fire road, and as such, serves as a fire break.

In Summary

- Off-road trails preserve and protect varied wildlife species, their habitat, nesting cover, winter cover, and breeding grounds.
- The lands encompassing trails and greenway systems act as buffer areas that protect water quality by cooling water temperatures and filtering sheet runoff, excess nutrients, silt, and agricultural chemicals.
- Trail and greenway projects aid in storm water management by stabilizing stream banks, protecting river valley lands from erosion, serving as natural flood control mechanisms, and keeping flood prone lands free of urban development.
- Trail corridors preserve various types of vegetation which reduce noise, cool and filter air, remove dust, reduce smog, offer microclimate control, and stabilize rainfall increases that contribute to flooding.

- Depending on regional location, trails can serve unique functions ranging from wind shelter belts in the prairie states to fire breaks in heavily forested areas.

F. Historic and Cultural Benefits

Off-road trails can educate and increase awareness about the history and culture of a region. Trails can take advantage of physical events and historical sites of an area, or can emphasize the life and times of a group of people who currently or formerly resided in a region.

Transportation History

Trails may follow historic travel routes and re-explore the paths that our nation used decades and centuries ago. For example:

> A study of the Katy-Missouri River Trail, designated as part of the NPS Lewis and Clark Trail, speaks of the historical significance of the trail in national history: "The 1804-6 Lewis and Clark expedition carried the flag of our fledgling nation westward into thousands of miles of unexplored territory. It was an epic feat that captures the imaginations of millions."
>
> The Vanderbilt Motor Parkway was one of the first expressways to Long Island, built to reach the estates of the North Shore by Cornelius Vanderbilt. In the 1920s, the "private highway" charged $2.00 per car to those who used it. Today, the Brooklyn/Queens Greenway includes a mile and a half of the Parkway, which even has its own overpasses.
>
> Alaska has a rich heritage of pioneer and gold rush trails that were used by dog-pulled freight sleighs, horses, wagons, and foot travelers early in this century. The Iditarod Trail, once one of Alaska's most famous gold rush trails, is now preserved as a National Historical Trail from Anchorage to Nome. The trail is dotted with sites of historical significance: inactive mining camps, homesteads, and abandoned communities.

Transportation history has also come to the forefront in the national trails community with the popularity of rails-to-trails conversion projects.

Rail-trails are off-road trails developed to re-utilize railroad corridors that have been abandoned due to changing modes of transportation. Once the lifeblood to many American communities, railroads have often been abandoned due to rising operating costs, but the remaining corridors are rich in the history of our country's expansion and development, as exemplified by the following projects:

New River Trail, Austinville, VA
photo courtesy of Greenways Incorporated

> Parts of the Traverse Area Recreation Trail (T.A.R.T.) will tap the railroad heritage of the local community. The trail is constructed primarily within the active right-of-way of Tuscola and Saginaw Bay Railroad in Traverse City, Michigan.
>
> The Illinois Prairie Path is a 55-mile trail that follows the right-of-way of the former Chicago, Aurora and Elgin Railway, an electric commuter line which suspended

operation in 1957 and abandoned the property in 1961. Trail maps and literature promote the Path as a nostalgic trip for fans of "The Great Third Rail."

The Washington-Baltimore & Annapolis Recreational Trail is a historic reminder of Maryland's past. A Historical Society has been created to compile and share artifacts, memorabilia, and photographs about the history of the B&A Railroad and its surrounding communities. For 32 years, the railroad carried passengers and served the area farming community. A Washington-Baltimore & Annapolis Recreational Trail promotional brochure states, "All that is left of the B&A today is a single lamp post, and perhaps -- a legacy to our children and grandchildren of a trail that has unlimited recreational and commuting possibilities in the region."

Preservation of Historic Sites

Many off-road trails across the country are fortunate to route near sites of historical importance. The following projects represent some of the trails that chronicle the history of their region:

The proposed Allegheny Highlands Trail will access the rich cultural and historical past of Somerset County, Pennsylvania, and Allegany County, Maryland. A fascinating archaeological find is located in the Forest Hill area where the top of the mountain has been leveled and cleared by an unknown group of people possibly before the arrival of Columbus.

The history of San Antonio has spanned more than 250 years, and much of that history is recorded in the development of the San Antonio River. Paseo del Rio, or the River Walk, is a pedestrian facility that provides tourists, residents and the business community access to several historical sites and the influence of many cultures.

The Guilford County Bicentennial Greenway celebrates the ratification of North Carolina as the thirteenth state in the Union of States. History is prominent along the greenway -- parts of the trail follow a 19th century wagon road, a historic log cabin located along the route is being renovated into a visitor's center, historical classes on the importance of river use in the 1800s are taught out on the greenway, and the trail's terminus is the historic Guilford Courthouse Battleground Park.

The Chesapeake and Ohio Canal is the finest relic of America's canal-building era. The purpose of the parallel 184-mile towpath is to provide public access to the canal to gain an insight into the era of canal building in our country and to help understand the canal's reason for being, its construction, its role in transportation, economic development and westward expansion, the way of life which evolved upon it, and the history of the region through which it passes. National Interpretive Center Zones located along the canal and towpath contain major historic restoration opportunities and are considered to be living outdoor museums.

The path of the W&OD in Northern Virginia is rich in American history. The trail passes Ball's Bluff, the smallest U.S. national cemetery to mark the site of a Civil War battle; the ruins of President Buchanan's summer White House; Falls Church, where George Washington and George Mason were vestrymen; the site of the first tactical use of a train in military conflict; and the Freeman house, which served as a Civil War hospital.

Location for Cultural Events

Other trail projects link cultural facilities, provide a location for cultural events,or are an added attraction for visitors who come to participate in various regional events held in surrounding communities. For example:

Off-road trails in Alaska provide opportunity for continuing a part of Eskimo culture. For example, the Anchorage Bowl Trails System is comprised of 85 miles of trails, some of which are dog-mushing trails and others are trails for skijoring, a similar sport in which one or two dogs pull a person on skis instead of a sled. Anchorage is the start of the Iditarod Trail Dog Sled Race, where dog teams leave downtown Anchorage and travel over 1,000 miles to Nome. Another winter festival, Fur Rondy, also uses off-road trails for special races.

The big pine country of the Heartland Trail is home to the legends of Paul Bunyan and Babe the Big Blue Ox. The trail winds through remnants of the large red and white pine timber forests. And the Paul Bunyan Historical Museum, one of three located along the trail, houses many interesting artifacts from the logging era in northern Minnesota.

The Brooklyn/Queens Greenway links together a large number of New York City's cultural attractions such as zoos, museums, and botanic gardens. In addition, the Greenway enhances the cultural heritage of Brooklyn and Queens by connecting a number of ethnic neighborhoods, providing trail users with a great diversity of foods.

The northern terminus of Wisconsin's Sugar River Trail is the town of New Glarus, known as the center of "America's Little Switzerland." This unique and authentic Swiss community of 1,763 residents is home to the Chalet of Golden Fleece Museum, several cheese and pastry shops, Swiss music, yodeling and old-world gourmet dining. Trail users may also take in such cultural events as Schiller's Wilhelm Tell Drama, Heidi Festival and Volksfest, or the Yesteryear Day Celebration and Country Western Bluegrass Music Festival in Albany, another town located along the 39-kilometer trail.

Several community greenways also cite that areas of their projects may be used for local cultural events such as art-in-the-park activities and outdoor musical performances.

In Summary

- Rails-to-trails projects offer unique and intimate opportunities to appreciate and relearn the history and importance of America's railroad industry.
- Trail projects can provide linkage to sites of historical significance.
- Innovative project planning and development can emphasize the history of a region. Trail routes may follow historic transportation routes or a historical theme may be used for project development.
- Off-road trails can highlight local culture, be the site of cultural activities, or serve as an added attraction for events held in surrounding communities.

G. Benefits in Terms of Access

Trails allow the general public and people with special needs and abilities to access outdoor environments and participate in outdoor activities.

Public Access

Off-road trails improve access to and through areas that otherwise would be difficult or impossible for the general public to view and enjoy. Many of our most prized natural resources - scenic areas, lakes, rivers and streams, undeveloped wilderness lands, and outdoor recreational areas - benefit from the trail systems that provide for public access and use.

Nature cannot be fully appreciated until one is allowed to interact with it and understand it. Off-road trails provide a means of placing people into all types of natural environments, many of which offer isolation from the typical surroundings of urban and suburban development. Trails allow

people to interact with nature in a way that does not damage those qualities of the natural environment that we value most.

Literature reviewed on trail projects across the country indicates the trails offer many benefits by providing access to streams and rivers, bays and lakes, open countrysides and undeveloped green spaces. Trails may benefit special interest user groups who desire access to certain areas along a trial route. For example, trails can provide fishermen with improved access to remote stretches of river valleys, secluded ponds and other prime fishing areas. And many examples exist that demonstrate how trails help to fill the scenic and recreational needs of the general public.

> In Knoxville, Tennessee, access to the waterfront of Fort Loudin Lake goes beyond experiencing its beauty and visual appeal alone. To take advantage of the river's natural beauty and economic and recreational potential, people must have access to the river and its shoreline. Planners in the area feel that improved pedestrian and bicycle access to and along Fort Loudin Lake can create the best opportunity for the citizens of Knoxville to enjoy the river. Well-developed and conveniently located parks, open spaces, and other facilities that allow for a wide variety of activities can give people reasons to come and enjoy the waterfront.
>
> Northern Indiana is one of the most heavily industrialized areas in the United States. The Calumet Trail provides a rare opportunity for nonvehicular access to an expansive recreation area. In one day, cyclists can see all the representative features of the Indiana dunes region. (source: Trails on Electric Utility Lands)
>
> The Sugar River State Trail provides year-round access to the rolling agricultural lands of south central Wisconsin, where prairie remnants exist in many areas along the former railroad right-of-way. During the summer months, a continual change in colorful native grasses can be observed and diversified vegetation types contribute to a spectacular autumn color display. Ample snow cover in the winter months allows for year-round outdoor recreation.
>
> Proponents of the Hudson River Valley Greenway in New York feel that public access should include the traditional recreational activities that involve direct water contact such as swimming, boating from marinas, trailer and hand launches, deep water docking for tour boats, and recreational hunting and fishing. It should also include land-based access and compatible activities such as parks that accommodate picnicking, walking and horseback riding, linkage sites that provide a walkway between two or more recreational sites, and viewpoints that provide visual access to areas of scenic quality.
>
> Their concept of a greenway is not just about access to the countryside, it is also about green linkages within urban areas. Many inner-city citizens are being deprived of access to open spaces, recreational opportunities and natural habitats. Proponents feel that the Greenway should include the greening of the cities of the Hudson Valley, providing links between existing parks, the open, yet often derelict, sites within the cities and out along abandoned corridors to the open countryside beyond the cities' edges.

By providing access into remote or difficult to reach areas, trails also aid maintenance and emergency personnel. Several projects report that their trails double as a maintenance road for sewer line repairs, flood control access, ambulance use, and general trail maintenance and patrol.

Outdoor Access for Less-Mobile Persons

All Americans, including the elderly, the very young, the urban poor, and the disabled, should be able to access the great outdoors. These less-mobile groups of people can

comprise a significant portion of off-road trail users if proper facilities are provided. For instance, more than 14 percent of noninstitutionalized Americans have physical disabilities and another 12 percent have visual or hearing impairments. And walking is the favorite activity among older Americans, with participation rates of 60 percent or more.

photo courtesy of Greenways Incorporated

The Anchorage Trails Plan cites several advantages to designing and creating recreation facilities that are free of barriers and accessible to all people. According to this plan, the advantages of accessible trail systems, to both recreation consumers and providers, include:

- Otherwise restricted persons are encouraged to participate in the mainstream of society, thereby maximizing the use of facilities and programs.
- Mental and physical health are improved, because more people are able to recreate where they choose and to the best of their abilities.
- People have continued access to public facilities even after the onset of a disability.
- Attitudinal barriers and stigmas often attached to older or disabled persons are removed, thereby increasing the human resources available for the entire community's benefit.
- General safety and ease of maintenance are increased, thereby reducing operating costs.

These concepts can be summed up in the phrase, "Because the world belongs to everyone." This saying is on the cover of a promotional brochure for Whole Access, a national organization that works exclusively to promote sensible and sensitive accessibility planning for parks and open spaces. Whole Access states that the benefits of creating accessible outdoor public areas are felt by people with a broad range of disabilities, older people, pregnant women, families with young children, and the friends and families of all of these people.

It is noted that no specific case studies are mentioned in this section of the report because, according to Phyllis Cangemi, Executive Director of Whole Access, very few trail facilities currently exist in our country which have applied the concept of universal design in its entirety. While a lot of progress has been made on numerous projects which are accessible by the nature of their paved surfaces, gentle grades and ramped curbs, these trails are still missing pieces that allow complete access by all users to all aspects of the facility. (Please see discussions on specific project elements in *Section 7* of this study.)

It is also relevant to mention another potential benefit of universal design. Off-road trail projects that are designed to be universally accessible can receive additional economic benefits. Section 504 of the 1973 National Rehabilitation Act requires that persons with disabilities have equal access to all programs receiving federal funding, or all programs of agencies receiving federal funding. The Symms National Recreational Trails Act of 1991 also conditions state eligibility for funds that are used to provide and maintain recreational trails. According to the Symms Act, "a State shall be eligible to receive moneys under this part only if . . . (there is a) provision of features which facilitate the access and use of trails by persons with disabilities." Off-road trails and their associated larger projects may therefore be ineligible for potential funding from the Federal government if the concept of universal design is not applied.

In Summary

- Year-round, trails make the outdoors more easily accessible to the general public.
- Trails provide people with an intimate opportunity to enjoy the waterfronts and shorelines of rivers, lakes, bays, and streams.
- Trails allow people to interact with nature and with other people.
- Trails improve access to remote areas for emergency and maintenance personnel.
- Trails help to fill the scenic and recreational needs of all people, including the disabled, the elderly, the urban poor, young children, and families.
- Finally, properly designed and accessible trail facilities allow otherwise restricted persons to participate in the mainstream of society.

H. Benefits as a Planning Tool

The greenway concept is a land-use planning tool that is broad in scope. Most greenways are developed to include off-road trails for transportation and recreation. In addition to trail development, the greenway concept typically embodies river and stream preservation, watershed protection, and buffering between adjacent uses of land. As such, physical greenway corridors are wider tracts of land than are required for simple trail development, and can therefore provide additional benefits.

As exemplified by the following projects, greenway corridors and associated trail systems help to regulate urban growth, create buffer zones, provide for open space, and promote efficient land use and development:

Urban Growth Regulation

A promotional brochure for the Bay Trail, which will encircle the San Francisco Bay, promotes the project as an incentive for new park development to occur along the Bay shoreline, as well as for future wetland restoration projects.

The Master Plan for the Little Cross Creek Streamway, an urban greenway in Fayetteville, North Carolina, heightens the importance of urban green space, water courses, downtown revitalization, and archaeological and historical sites. The Plan helps to make the growth process of the City sensitive to the natural phenomenon of streamways as they relate to the quality of life and development. It also serves to stem the practice of consuming lands traditionally considered to be marginal for development. At the same time, these lands, disregarded in the past, become assets for residential development in particular because of their newly found aesthetic value.

In the existing urban area of Raleigh, North Carolina, the only undeveloped land is that which has traditionally been thought of as marginal in value for development purposes. To the city planner, these open spaces represent the common denominator that keeps the city's density rates from rising; density being one of the major factors that "distinguishes bearable urban environment from the unbearable." The effect of greenway development will be to conserve some of the last remaining open space within the Raleigh urban area, thus stabilizing the density and maintaining the liveability of the city.

Buffer Zones

Areas of Raleigh that urbanize after adoption of the greenway concept will have a great potential for buffering the conflicts that occur during urbanization. In this manner, the greenway separates competing land uses, reduces the undesirable impact one use has upon the other, and connects the various compatible land uses located along the greenway perimeter.

The Appalachian Trail is a prime example of how an off-road trail can spur efforts in land use planning. The Appalachian Trail Conference (ATC) has established its own land trust to protect lands along the trail. Their Greenway Initiative includes an expansive concept of protecting the Appalachian Trail footpath by creating a "countryside zone." This buffer zone will preserve the full range of scenic beauty, cultural and natural resources, and recreational opportunities associated with the Appalachian mountains landscape and will shield the trail from development and other intrusions.

Open Space Within Urban Areas

Program Open Space of the Maryland Department of Natural Resources reports that metropolitan sprawl consumes nearly five million acres of land each year. Nowhere else in the Nation is this more evident than in the Northeast Corridor, where in Maryland alone 10,000 acres are consumed annually. Greenways improve the liveability of expanding cities. They maximize the recreational, biological, and economic benefits of undeveloped lands by connecting isolated tracts to form a network of open space.

The goal of the Massachusetts Bay Circuit Program is to preserve open space, or breathing space, in close proximity to urban and dense suburban development. The basic premise of the program is that residents of Boston, now and in the future, do not have to drive 2 or 3 hours in order to experience open countryside. One of the chief criticisms of the Northeastern United States is that it is too urban, that there is no place to get away from it all. Those who love Massachusetts know that that is not yet true. And the Bay Circuit offers an excellent way to make sure it never is.

Efficient Land Use

As previously discussed under the economic benefits of multiple-use corridors, the multi-purpose nature of greenways makes infrastructure projects more cost-effective. Trails can be accommodated within the same strip of land as sewer lines, water mains, steam conduits, maintenance access roads, overhead utility lines, underground cables and natural drainageways.

Greensboro, NC
photo courtesy of Greenways Incorporated

Projected increases in vehicular traffic resulting from increased growth and development indicate a need for a more balanced approach to efficient transportation planning.

In an era of limited construction opportunities and rising maintenance costs for all transportation projects, efficient alternative uses of land, such as trail development, should not be overlooked.

Planned Communities

Throughout the past few decades, several innovative developments have been created around the country using the concept of planning and designing an entire community around a system of off-road alternative transportation corridors. As part of this case study, developers of several of these

planned communities were contacted to determine what benefits they can attribute to off-road trail facilities.

Twenty-five miles northeast of Houston, a 13,000-acre master planned community is promoted as "The Liveable Forest." In Kingwood, Texas, greenbelt trails are located within 200-to 300-foot natural forest corridors that offer environmental protection, open space preservation and recreational opportunities. Real estate developers note that both new and resale homes on streets with direct access to the greenbelts market well.

A nearby new town development, The Woodlands, Texas, sees a transportation benefit in their off-road trail systems because the trails replace the need for "sidewalks to nowhere." The trail system links all of the neighborhoods within this 25,000-acre community to schools, parks, retail centers and other popular destinations.

In the past 54 years since the planned community of Greenbelt was developed in Prince George's County, Maryland, several benefits have been derived from the trail network that connects the residential components with all other aspects of the community. The trails have resulted in fewer cars on city streets, cleaner air, less oil and gas consumption, more opportunities for family activities, more friendly interaction among people living within the community, and an overall increase in quality of life.

The Reston Land Corporation, developer of the planned community of Reston, Virginia, reports that the exceptional balance of recreational trails and direct destination connector trails have greatly benefitted this community of 56,000 people. Since Reston was built upon the New Town concept of living, working and enjoying recreation in one community, it has seen economic, marketing and general quality of life benefits, in addition to energy conservation since the extensive network of trails allows for alternative transportation routes for work, school, shopping, etc.

On a much smaller scale, subdivisions and individual housing developments have incorporated the same linkage concept into their development plans and are receiving similar benefits from their off-road trails. For example:

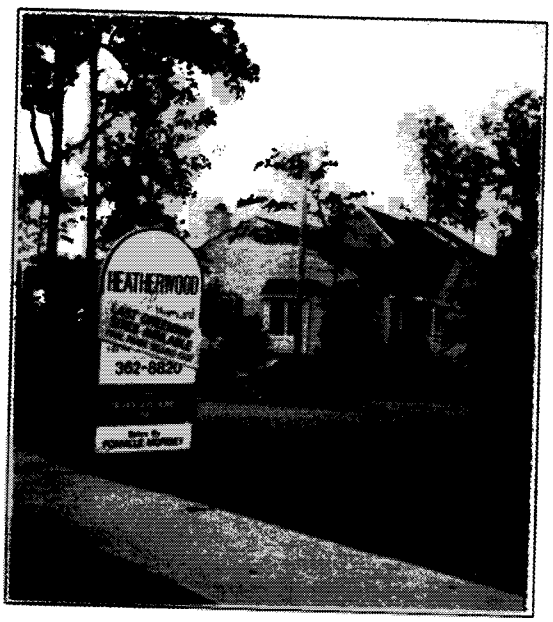


photo courtesy of Greenways Incorporated

Shepherd's Vineyard is a 250-acre planned unit development located in Apex, North Carolina, a community of 6,000. The PUD includes a 30-acre greenway system with approximately 1 mile of asphalt trails, an amenity that is prominently used in the subdivision's marketing strategies. Used primarily for transportation, the trail system links one townhouse development and four single-family neighborhoods with the subdivision's pool facility. The on-site sales agent reports that single family lots abutting the trail system have a premium of $1,000-$3,000 placed on them, and still sell much faster than other lots due to the increased privacy associated with their location along the greenway.

A recently completed study, Linking Land Use and Transportation, examines the potential of converting a major suburban arterial, and the lands surrounding it, to better serve public transportation and pedestrian/bicycle circulation. The study, for Washington Highway 99 north of Seattle, explores changes in land use that would make walking and bicycling workable additions to suburban transportation solutions.

Through land use planning, area residents could get from home to a transit stop without using a car. Careful location of shopping areas, apartments, condominiums and office buildings, and incorporation of bicycle and pedestrian facilities would allow commuters to walk or bike from home to nearby arterial streets, and then board buses or join carpools traveling in HOV lanes. This concept of creating "Suburban Centers" or "Pedestrian Pockets" integrates land use planning and transportation planning. In this way, land use can be more intensive and centralized, transport can be oriented to non-automobile modes, high-speed traffic flows can be restrained and public transit systems can perform better.

In Summary

- Greenways, and the trails systems that they contain, heighten sensitivity to the natural environment and lands that are traditionally considered to be marginal for development.
- As such, greenways promote parkland development, wetland preservation and environmental protection.
- Greenways preserve undeveloped lands in urban areas, thereby keeping density rates from rising and maintaining the liveability of a city.
- Greenways separate and buffer competing land uses and reduce the undesirable impact one use has upon the other.
- Greenways are a mechanism for preserving close-to-home open space.
- By their multi-purpose nature, greenways make trail and infrastructure projects more cost-effective and land use more efficient.
- Trails and greenways within planned developments have resulted in environmental protection, open space preservation, recreational opportunities, transportation benefits, friendly interaction among people, increases in quality of life, and economic and marketing benefits for developers.
- Off-road pedestrian and bicycle facilities allow planners to adjust suburban land uses to meet changing transportation needs.

I. Quality of Life Benefits

Communities and regions see positive contributions to lifestyles in their area from the successful development and operations of off-road trail facilities. As Uel Blank states in his Katy-Missouri River Trail study, "Trails represent a view of human life that values living experiences beyond monetary considerations. This view proclaims that life is by the heartbeat, not by miles traveled. These are important parts of the meaning of quality living."

Increases in the quality of life can be realized through expressions of community character and pride, aesthetics of the local environment, the attraction of business to the area, increased access to the outdoors and improved opportunities for socialization.

Expression of Community Character and Pride

No two off-road trail projects are alike. Each one contains elements of local character and regional influence, and reflects the pride and commitment of a variety of individuals, groups and agencies that united to make the project a success. Examples are evident all across the country, with the following projects illustrating the unity that a trail project can bring to a community.

The Reedy Creek Greenway in Kingsport, Tennessee, is an example of a greenway system designed to be a focal point and gathering place for the community. The greenway is an undertaking that defines the community's pride and determination to preserve a pleasant living environment for all of its citizens.

From the beginning, Reston, Virginia, was not envisioned to be just another bedroom suburb of Washington D.C., but was instead to be a planned community that included the attractive elements of open space, woods and nearby recreational opportunities. Reston attributes its ability to accommodate business expansion without destroying the quality of life to the community master plan, which calls for saving trees, allowing land use plans to follow natural terrain, building lakes and adding jogging paths and recreation amenities.

photo courtesy of Reston Land Corporation

Uniting the community and establishing civic pride were major benefits of creating the Stowe Recreation Path. The Vermont resort community, with a base population of 3,500, has retained a strong sense of a small town even when the population soars to 10,000 in visitor seasons. Stowe residents combined with second home owners and tourists to plan, design, and fund the path. Stowe's community-created greenway prompted one magazine to comment, "Walk the Village and ask any resident or merchant for an example of civic pride, and invariably the reply is the Stowe Recreation Path."

Aesthetics of the Local Environment

The preservation and protection of local scenic resources is a major contributing factor to the quality of life of an area. Likewise, improving and revitalizing less scenic or underutilized areas benefits a community. Off-road trails can bring about these quality of life improvements, as represented by the following success stories:

The Bay Trail in San Francisco, California, offers a means for enhancing the scenic quality of the Bay shoreline by providing appropriate buffering from sensitive natural environments. The trail also allows for the integration of preserved natural areas into urban waterfronts.

Reviewers of the Ojai Valley Trail in California have captured the quality of life benefits of this 9.5-mile multi-use trail. According to the Ventura County Star Free Press, the trail has "quickly earned a treasured place in any listing of the wonders of the County . . . ample shaded resting spots . . . tranquil serenity . . . in places (it) is tucked behind a ridgeline, giving travelers a sense of being alone in the magnificent Ventura River Valley." Potential increases in the quality of life were realized early in the planning process to create the Ojai Valley Trail. Adjacent neighbors -- often a source of initial opposition to trail development -- were in favor of the trail because they saw a patrolled park as a way of ending the illegal motorbike use occurring within the abandoned rail line corridor.

The Trail of Two Cities C.R.I.&P. Rail Corridor Plan also states that a properly developed and maintained trail curtails the problems of littering and trespassing associated with abandoned railroad rights-of-way.

Attraction of Business and Growth

The importance of quality of life in an area is increasingly cited by corporations and businesses as a major factor in making location decisions. As an amenity that plays an important role in increasing a community's quality of life, greenways and trails are attractive to businesses and their employees.

The City of Pueblo, Colorado, attributes the investment in trails and parks along the Arkansas River and Fountain Creek as one of the most important components in the economic revitalization efforts of this industrial city.

The River Walk is often visited by prospective businesses looking to relocate to the San Antonio area. A business location along the River Walk is considered very desirable for the pedestrian system provides a retreat for employees during lunch and access to valuable greenspace within the central business district.

The 45-mile Illinois Prairie Path reports that the trail generates at least 300,000 user-trips annually. Many of these users say that the trail is what makes life worth living in Chicago's western suburbs. It improves the quality of life and maintains property values.

A 1988 Survey of Public Attitudes on Open Space in Iowa revealed that 82 percent of respondents considered open spaces, including trails, "very important" to the quality of life in Iowa. Reasons why open space areas should be protected were recorded as being 75 percent related to human use and enjoyment of these areas and 25 percent related to the protection of wildlife, vegetation, and soil and water conservation. In addition, abandoned railroad beds converted to multi-use recreation trails received a 60 percent share of "important" responses.

Access to the Outdoors

The following quotes from promotional brochures indicate the quality of life benefits that trail advocates place on their off-road trail projects by providing access to high-quality outdoor environments.

Pinellas Trail, Pinellas County, Florida:
"Along the different parts of the Trail you can enjoy the deep glades of ancient live oaks, trailing Spanish moss, tidal streams with their herons, egrets and cormorants, quiet waterways to wet a fishing line or net some stone crabs. Sometimes you'll be breezing along just a few safe feet from bumper-to-bumper traffic. Sometimes you'll be right 'downtown' like at the Dunedin Plaza or the pretty Seminole City Hall complex. But whether you use it for a quick picnic or hike or bike its whole length, the Pinellas Trail is a priceless haven in a busy, overcrowded world."

Willamette River Greenway, Eugene Oregon:
"Three bicycle bridges now cross the green banks and eddying currents of the Willamette River where it cleaves the center of metropolitan Eugene, Oregon . . . (The bridges) connect ten miles of asphalt trails along both river banks. The routes pass manicured lawns of city and county parks with picnickers and frisbeeists as well as natural sections of unkempt shrubbery whence darts the occasional squirrel or rabbit . . . In the city beyond the river, the old squabble for street space continues. Along the bank trails and on the bike bridges the sights and sounds of the river give a sense of well-being."

American River Bike Trail, Sacramento California:
"At many locations along the bicycle trail you can wade into the river, cast a line, and not see a single sign of civilization. The river trails provide abundant salmon fishing and

natural areas for hiking, horseback riding, or biking -- a chance to get away from it all without having to leave the city."

Opportunity for Socialization

Off-road trails offer opportunities for people to get out of their homes and cars and come in close contact with each other on a regular basis. Trail Projects contribute to personal interaction, neighborhood socialization, and community unity. Examples include:

By linking Nebraska's two largest metropolitan areas, the Trail of Two Cities will run through rural areas and seven small agricultural towns. The existing feeling of rural/urban alienation will fade with increased interaction on the trail, as people from the urban areas meet their rural neighbors.

The Baltimore and Annapolis Trail Park has had several requests for permission to use the trail for a wide variety of charitable causes including walk-a-thons and bike-a-thons. In response, the Anne Arundel County Department of Recreation and Parks has developed a policy for charitable fund-raising activities to expedite the approval process and answer questions about sponsoring privately run special events in the park.

Many organizations use the Waterfront Bikeway in Burlington, Vermont, for fundraising and special events. Sponsors of competitive sporting events also host marathons and triathlons on the trail.

Opportunities for socialization in New York City's most populated boroughs are provided by the Brooklyn/Queens Greenway. The New York Open Space Coalition emphasizes that, "Most importantly, the Brooklyn/Queens Greenway is a resource for children to explore, adults to appreciate, and neighbors to share. It can perform a small role in the quest to reshape our city as a place where people can live, work, and play as we enter the 21st century."

In Summary

- Trails unite communities. Projects demonstrate community pride, involvement, and support for a common goal.
- Off-road trails contribute to a high quality of life by preserving and protecting local scenic resources and improving the aesthetics of less scenic or underutilized areas.
- Business and growth are attracted to communities that offer amenities such as trails and greenways which improve local quality of life.
- Improving access to the outdoors provides for an escape from the city and a sense of well-being.
- And trails provide for social opportunities such as getting to know neighbors, participating in charitable fund-raising activities, and preserving a livable environment for future residents of a community.

Section 4

Similarities Among Trails

Similarities Among Trails

Research for this case study has determined that similarities exist among off-road trails that have provided similar benefits.

As previously discussed, trails have resulted in major benefits reflected in transportation, recreation, economics, education, environment, open space, quality of life, socialization, and safety. The following discussion summarizes the case study research and review of existing literature to provide insight into similarities that exist among trails across the country.

Projects Experiencing Transportation Benefits

Some of the off-road trail projects included in this case study were designed specifically to serve a transportation function, while other projects have simply experienced major transportation benefits as a result of general trail development.

In general, all transportation projects are hard-surfaced trails. Asphalt is the most common surfacing material used, with several urban greenway trails constructed out of concrete. Fine limestone screenings, graded and packed to provide a hard, smooth riding surface, are also used in certain regions where readily available and where the length of the project prohibits more expensive pavement designs.

Transportation trails are similar in that they are designed to be at least 8 feet wide, following minimum AASHTO standards for bicycle facilities. Several projects with heavy transportation use have implemented trail widths greater than 10 feet and have successfully utilized lane striping and separate trail treads to accommodate different user groups.

The projects vary in length, from a 1-mile crosstown connection in Carrboro, North Carolina, to the 100-mile Cleveland Metroparks system. The majority are developed as part of a system of off-road trails, or provide connections with on-street bikeways and other transportation routes. Also included are several rail-trail conversions located within urban and suburban areas such as the Baltimore and Annapolis Trail, which is within one mile of one-third of all county residents, and the East Bay Bike Path, which passes through five communities in 14.5 miles.

It is interesting to note that out of 21 projects reporting to receive major transportation benefits, only six are exclusive bicycle and pedestrian-only facilities. Twelve are used by multiple nonmotorized users including equestrians, cross-country skiers and the like, and three also allow motorized use, indicating the ability of multiple users to share facilities and not interfere with the transportation potential of a trail.

Most projects report higher bicycle transportation use than pedestrian transportation use. This is more than likely due to the distances that must be travelled between origin and destination points. Exceptions include short community trails and city-wide greenway systems. These trails typically offer frequent access points and several connections to points of interest in the community, thereby providing for convenient short-distance pedestrian transportation. As the Stowe Recreation Path reports, transportation should not only be thought of as commuting, but also as going to a store or restaurant located along the trail. In addition, rural projects, such as the Southern New England Trunkline Trail and the Mt. Blue

Experimental ATV Trail, report that their projects are experiencing transportation use by other user groups such as snowmobiles and horseback riders.

Part of the research for this case study focused on what problems have been experienced on off-road trails that were not developed as transportation facilities, but are being used for transportation purposes. Trail projects report that bicycle transportation has most frequently been limited by substantial use or multi-user conflicts. Transportation is also limited to daylight hours on several projects due to lack of nighttime lighting. And several trails report that their off-road project does not provide safe and complete transportation linkage. Users must travel additional unsafe or unauthorized routes to reach their final destination points.

Other problems reported correspond with trail designs that do not meet minimum standards as set by AASHTO for bicycle facilities. Problem areas include paving widths that are too narrow for two-way travel, limited sight distances, frequent or unsafe intersections with vehicular traffic, and trail designs that do not meet the 20 mph minimum design speed for cyclists. Narrow clearing and grading limits, tight curves, and narrow bridges and structures are also commonly cited problem areas.

Trails that were not designed for transportation purposes experience fewer problems with pedestrian transportation use than bicycle transportation use. Common factors limiting pedestrian transportation include infrequent maintenance of trail, substantial use or multi-user conflicts, lack of lighting for night use and incomplete linkage to areas of final destination.

Guilford County Bicentennial Greenway, High Point, NC
photo courtesy of Greenways Incorporated

Projects
Experiencing Recreation Benefits

All projects contacted as part of this case study report that major recreational benefits have been experienced as a result of trail development. The only exception is the Carrboro Bikeway, which is a 1-mile origin/destination project that experiences 100 percent transportation use and is of little value otherwise.

A wide variety of surface materials are used on recreational trails. The list includes asphalt, concrete, macadam paving, gravel, shale, limestone screenings, packed cinders, dirt, grass, rock, original railroad ballast, and wood chips. Trail widths range from a 4-foot-wide dirt mountain bike trail to the 25-foot-wide Ojai Valley Trail.

Single surface, multi-use trails are most common. These are off-road facilities that accommodate a wide variety of activities and user groups on the same trail. As such, use and support of the project is high and construction costs are lower as several groups can unite resources to achieve a common goal.

Projects Experiencing Economic Benefits

Projects that experience the greatest economic benefits as a result of trail development fall into two general categories. The first type consists of rails-to-trails conversion projects. Typically, these projects are 20 or more miles long, have become major tourist attractions for people wanting to take short, one-day vacations and are often in areas experiencing economic depression after railroad abandonment. Regionally, many are located in the Mid-West. Developed to fill recreational needs, these off-road projects vary in trail widths and surfacing materials used. But their common ability to accommodate a wide array of user groups contributes to their success in generating direct income from tourists and local trail users.

The second type of trail project resulting in economic benefits is the urban trail that caters to the tourism industry. A prime example is the San Antonio Riverwalk, a city park along the river that now has its own staff position to assist the Tourist Attractions manager with work on "Paseo del Rio," as the Riverwalk is known. The Riverbend portion of the pedestrian trail system is lined with shops, restaurants, hotels and a mall, and is the second largest tourist attraction in San Antonio. On a smaller scale, the community-created Stowe Recreation Path and adjacent businesses located along the trail serve the recreating needs of visitors, as well as residents, of the Vermont resort community.

Projects Experiencing Educational Benefits

No apparent commonalities exist between the various off-road trail projects whose developers and managers report receiving educational benefits. Case study research has shown that the ability to derive educational benefits is dependent upon how the facility is used and promoted for education. Development of educational flyers, interpretive signage programs and, in some cases, classes that utilize the trail corridor for outdoor studies increase a trail's potential to yield educational benefits.

Projects Experiencing Environmental Benefits

Only a small number of projects included within this case study were designed with the primary goal of environmental preservation. However, most of the recreation projects report secondary environmental benefits, as do some transportation projects like the East Bay Bicycle Facility, which has been referred to as *the* only way to really see Rhode Island's Narragansett Bay waterfront.

It is interesting to note that an equal number of these projects are hard-surfaced, paved trails, and unpaved, natural trails. This indicates that sensitive environments can handle sensitive trail construction without destroying the environmental quality of surrounding lands. And, it is often mentioned in trail literature that the acquisition of lands for trail corridors preserves these sensitive environments from future destruction from other forms of development.

It is also interesting to examine the uses that are allowed on projects which are experiencing environmental benefits. Case study research shows that all user groups, motorized and non-motorized, can successfully be provided access to and through prized environments. In some instances, erosion of steep slopes seems to be the only deterrent to multiple use by bicycles and other groups on unpaved trails.

Projects Experiencing Open Space Benefits

All of the projects participating in this case study that receive open space benefits also report major benefits of an increase in quality of life, greater recreational opportunities, improved access, increased transportation potential, and environmental preservation.

Most projects are urban trails or are scenic off-road trails, such as the Appalachian Trail, that are beginning to experience encroachment by adjacent development. They are broad in project scope, usually consisting of more than just a developed trail within a narrow easement. Concepts of storm water management, open space linkage and scenic viewshed protection are typically major goals of a project.

Projects Experiencing Quality of Life Benefits

Long and short, urban and rural, off-road trail projects report an increase in quality of life as a major benefit of trail development. These quality of life benefits seem to be dependent only upon the quality of the project -- both in terms of design and development, and ongoing maintenance and operations. No other similarities exist between projects.

Platte River Greenway, Denver, CO
photo courtesy of Greenways Incorporated

Projects Experiencing Social Benefits

Social interactions and quality of life seem to go hand in hand, as projects that report social benefits also cite that they are experiencing recreational and quality of life benefits. It is interesting to note that most of these trail projects are single surface/multi-use trails, and many are 8-foot-wide rather than 10 or 12 feet. This suggests that an intimate trail setting for multiple users promotes social interaction among the user groups.

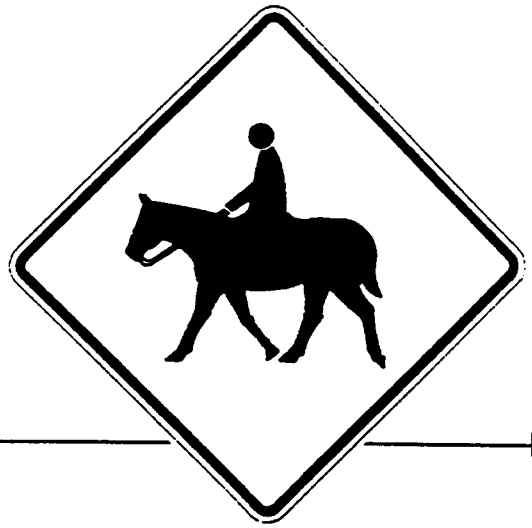
Projects Experiencing Safety Benefits

Many of the off-road projects speak simultaneously of safety and improved alternative transportation, while other projects refer to trails as safe places to recreate. Either way, separation from motor vehicle traffic is the primary safety benefit of off-road trails.

Literature review has indicated that safety can also be thought of in terms of the perception that adjacent property owners have of a trail corridor, both before and after trail development. Several projects cite that developing a corridor for active public use increases safety and security for adjacent property owners and decreases litter, vandalism, and illegal or unauthorized use of the undeveloped or abandoned corridor. In fact, seven of the twelve rail-trail conversions participating in this case study report that safety has been a major benefit resulting from trail development.

Section 5

Project Promotion



Project Promotion

The section of the case study summarizes how the benefits of trails differ by whether they are promoted as pedestrian trails, bicycle pathways, or joint-use facilities.

Pedestrian Trails

Off-road trail projects designed for exclusive pedestrian use feel that they receive two basic benefits from being promoted as a pedestrian project. First, other uses of the facility are reduced. Pedestrian trails are not usually designed to accommodate other uses, therefore non-design uses can result in user conflicts and resource damage. Second, pedestrian-only trails located in park settings report that promotion of their trails as pedestrian facilities strengthens community support for park policies.

Bicycle Pathways

Several exclusive bicycle facilities have been researched as part of this case study. These projects have experienced several benefits from promotion as bicycle facilities. Specific examples include:

- East Bay Bike Path, Rhode Island - People know that bicyclists have the right-of-way and should have an unobstructed travel way along the path.
- I-275 Bike Path, Michigan - The facility receives more use from out-of-state bicyclists unfamiliar with the facility and area.
- Cape Cod National Seashore Bicycle Trails, Massachusetts - Naming, signing and marketing trails as bicycle facilities serves as a frame of reference.
- Bike Path, Oregon - For a trail developed to specifically accommodate mountain biking, promotion as such is good for public relations.
- Madison Bikeway System, Wisconsin - As part of a city-wide system, promotion of trails as bicycle facilities aids in locating and following system improvements.

It is important to note that all of these bicycle facilities include a reference to bicycling in their name. By comparison, several multi-use projects are also named as bicycle trails, but no indications are given that specific benefits have been derived from naming their projects as such.

Joint-Use Facilities

Education of the general public is the main benefit of promoting off-road trail projects as multiple-use facilities. Some of the most commonly cited educational benefits resulting from the promotion of joint-use facilities include:

- Trails receive better recognition, identification,and acceptance by the public.
- Awareness of a trail's location and, subsequently, use of the facility increases.
- Public awareness and support for efforts to maintain and extend projects are increased.

- Users expect to see other types of users on the trail.
- Conflicts among differing types of users are reduced.
- Safety is increased because trails are used more sensibly and users are educated.
- The public identifies the trail as a park, and uses it following normal park rules.
- Promotions for multi-use let every user know he has more in common with every other user than he has differences.

Guilford County Bicentennial Greenway, High Point, NC
photo courtesy of Greenways Incorporated

Trail promotions for multiple use also help to reach a larger audience, attract a wide variety of users and bring more people out on the trail. Where local community members have been instrumental in creating the project, publicity also heightens the level of self-esteem for all groups who were involved.

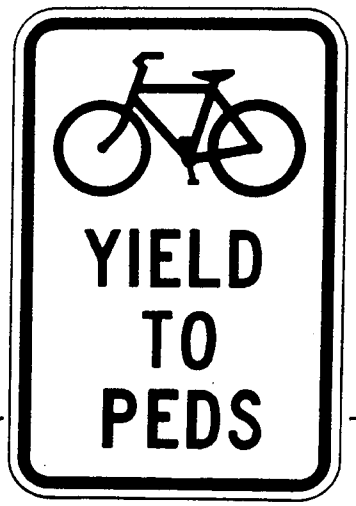
Types of Effective Promotions

Several methods of promoting trail facilities are available to project developers and operators. For example, proponents of the Stowe Recreation Path actively seek project publicity by writing articles, appearing on TV, doing radio interviews and applying for awards. But a great majority of trail projects report that a good facility and brochures or maps are really all that is necessary:

> In Denver, trails seem to need no promotion. People simply want to know where trails are. But naming, signing, and marketing trails are perceived as essential to heighten awareness of the trails' needs.
>
> The Prairie Path is so unique and popular in Illinois that it promotes itself. Trail advocates do not solicit newspaper stories, but they still appear regularly. The project's trail map is considered to be the best advertisement.
>
> Similarly, word of mouth and mentions in magazines, bulletins, and other publications promote the Southern New England Trunkline Trail.
>
> The 1988 Elroy-Sparta Bike Survey indicated that the most common source of information about the trail is obtained from a friend or relative. Advertisement by word of mouth accounted for 44 percent of the information sources, with 27 percent of the users attributing a trail brochure to their source of information.

Section 6

Types of Trails



Types of Trails

In addition to comparing and contrasting off-road trails by benefits experienced, this case study looks into similarities of projects that accommodate various user groups on various types of trails.

In this section of the study, further examination is given to the issue of single-use versus multi-use trails. Off-road trails developed for exclusive use by bicycles, pedestrians, and other single user groups are compared to joint-use facilities that accommodate a variety of nonmotorized and motorized users. The text includes reports of successful means of integrating different user types on an off-road facility through separate trail treads and other innovative techniques.

Again, this study is a report on a broad cross section of off-road trail projects across the country. The case study does not intend to recommend standards for off-road trail design, for each project is unique and must have individual design factors considered in project development. Instead, this report shares creative ideas, innovative trail designs and success stories of several types of off-road trail projects, categorized by type of trail tread and use.

A. Single Tread/Single Use

Research and review of available literature has revealed that off-road facilities which are developed for exclusive use by one user group are fairly rare. Projects have been developed for this intent, but their popularity has attracted a wider range of users. Restriction of use is difficult to enforce and most trails, therefore, do not operate as single-use, exclusive facilities.

Representative single tread/single use trail projects included within this case study are summarized as follows:

Bicycle Facilities

The National Park Service has developed three bicycle trails within the Cape Cod National Seashore. The Nauset Trail, Head of the Meadow Trail, and Province Lands Trail were intended for bicycle-only use, but these trails are also experiencing bird watching, hiking, running, jogging, walking, and roller blading.

Eugene's Ridgeline Bike Path is a mountain bike trail developed to parallel a hiking trail that was experiencing problems with mixed use. The 4-foot-wide trail was developed for and is used exclusively by all-terrain bicycles.

Pedestrian Facilities

Operators of three hiking trails -- Sweeney Ridge in California, Tuxachanie in Mississippi, and the Appalachian Trail, running from Maine to Georgia - feel there are several benefits to single-use trails. These pedestrian-only trails are reported to be more apt to allow visitors to view wildlife, hear the sounds of nature and enjoy peaceful park surroundings or wilderness solitude. As hiking-only trails, they avoid conflicts between users and reduce erosion and resource damage. Better concentration of maintenance and management efforts is also reported.

The Research Triangle Park Pedestrian/Jogging Trail is a unique single-use project implemented for corporate use. Developers report that safety is a major benefit of this pedestrian off-road facility for there are no conflicts between multiple users. Walkers,

joggers, and runners use the 8-foot-wide asphalt trail daily. Cyclists and roller skaters can also be seen on the trail system, but bicycle use is minimal.

The San Antonio Riverwalk's pedestrian-only nature stems from original development as a city park for strolling along the river. As a tourist/convention center attraction, the Riverwalk continues to be a pedestrian-only facility with heavy usage. The River Operations Supervisor reports two advantages of single-use trails: some uses require lower levels of maintenance than others and single-use facilities tend to be safer, with fewer accidents occurring between users.

Single-use trails exist along the route of the Brooklyn/Queens Greenway. For most of the 40-mile route, pedestrians and cyclists share the same trail or are accommodated on parallel treadways within the same corridor. In certain sections of the greenway, however, pedestrian-only paths exist where bicycles are accommodated through a Class II on-road bicycle facility. Other areas have separate pedestrian paths on one side of a street and bike and bridle paths on the other.

Single tread/single use trails are also found within some of the highly developed greenway systems that exist in communities such as Raleigh, Greenbelt, Madison and Reston. Madison, for example, has special cinder-surfaced jogging trails located within two community parks.

Sidewalks help to fulfill the pedestrian transportation needs of many communities and are, in effect, off-road facilities for pedestrian use only.

Other Single-Use Facilities

In Alaska, some of the trails within the Anchorage Bowl Trails System are strictly dog mushing trails, others mostly equestrian trails.

The Mount Blue Experimental ATV Trail is a very unique project designed for an intensive three-year study on appropriate trail development and management to minimize environmental and social impacts of all terrain vehicles. The project is also studying user preference and conflicts. Currently, use is limited to ATV only, but special permits are granted to bicycling and horseback riding clubs and individuals who desire to use the trail occasionally. In the winter, snowmobile and cross-country skiing are allowed. When the study is complete, the trail will most likely be opened to accommodate multiple users including horses, cyclists, and walkers.

As part of the case study research, specialized user groups were contacted to provide information on their special use facilities so that the transportation potential of a variety of trails could be examined. Responses and literature received indicate that equestrians, snowmobilers, and other groups typically have not developed single-use facilities, but have united with other trail advocates to create projects that are used by a wide variety of interest groups.

B. Single Tread/Multi-Use

Single tread/multi-use trails are the most common type of off-road trail facility in place across the country. They are popular for a variety of reasons, including the fact that a single trail tread is less expensive to build and maintain, is more heavily used by a variety of user groups, and, within limited space, may be the only feasible design option.

To be successful, these projects need to integrate different user types on the same trail with minimal user conflict. Many trails have accomplished this with much success. In some instances, the location and physical layout of the project helps to reduce potential user conflict:

Visitor separation on the New River Trail occurs by access dispersement. Access areas are never closer than 3.5 miles apart. Therefore, visitors using 1 of 13 access areas have a smaller probability of visitor contact.

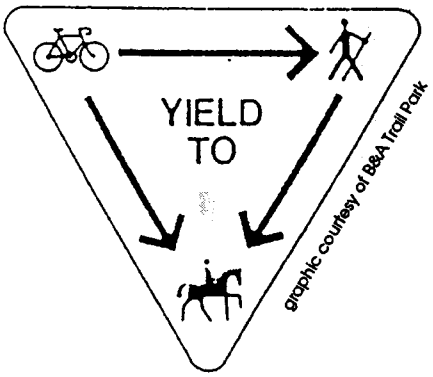
The Stowe Recreation Path reports that the breathtaking beauty along the trail helps to avoid conflicts among users by slowing people down. There are "close-up visual distractions" such as daffodils and flower beds planted along the path, and "distance visual distractions" including the view of Vermont's Mt. Mansfield. Other scenes that trail users take in along the path include historic architecture, working farms, the West Branch River, and other people who use the path.

Other projects have effectively established a hierarchy of use on their multiple-use off-road facilities. Example usage codes, which are fairly representative of practices found on similar trails across the country, include:

North Carolina's Guilford County Bicentennial Greenway follows a standard code of conduct, where users travel on the right side and pass on the left. All users yield when entering and crossing trails and bicyclists always yield to pedestrians, giving audible signal when passing.

The River to River Trail is an 8-to 10-foot-wide dirt trail that successfully accommodates both motorized and nonmotorized user groups. Potential conflicts are avoided as motorized users must yield to nonmotorized users such as hikers, equestrians, and mountain bikes.

The Baltimore and Annapolis Trail uses this graphic to show that the B&A Trail Park is shared by hikers, bikers, horses, joggers, and other trail users. The graphic illustrates that bikers must yield to all others, and that horses should always be given the right-of-way. This code of multiple use, and the accompanying graphic, are increasingly being used across the nation on off-road trails that permit these uses.



Many projects report that user conflicts can be most effectively minimized on off-road facilities through education, regulation clarification, and enforcement. Trail maps, brochures, and signage regularly list rules, regulations, and visitor etiquette for off-road trail facilities. And several projects use volunteers or trail rangers patrolling on foot, horse, ATV, and mountain bike to enforce their policies.

Additional user separation may be attained through permitting. Several projects require that horse-drawn carriages, motor vehicles, and snowmobiles obtain special use permits to access a trail, while others ask the same of large groups of users and charitable fund raisers who plan to use a trail for special events.

A few unique measures have also been employed to eliminate conflicts caused by specific users. The City of Anchorage, for example, has implemented a scoop system for dog owners who use the trail system for dog-mushing and skijoring, two sports where teams of dogs pull either a sled or a skier along a trail.

Separation Through Pavement Markings

Single-tread trails can effectively use pavement markings to separate uses on their facilities. Although not found on every multi-use facility, lane striping is becoming more widely used as trail popularity and usage increases. Examples of different types of off-road pavement markings include:

The I-66/Custis Trail is representative of several trails that utilize a trail center line to separate user directions, with all users keeping to the right except when passing.

On the East Bay Bike Path, a painted yellow line also separates the right and left bicycle travel lanes. However, pedestrians who use the bicycle facility must stay to the left, facing and yielding to bicyclists who have the right-of-way. Signs regulating traffic flow between cyclists and pedestrians are used to help minimize some of the bike/pedestrian conflicts that have resulted due to the popularity of the facility.

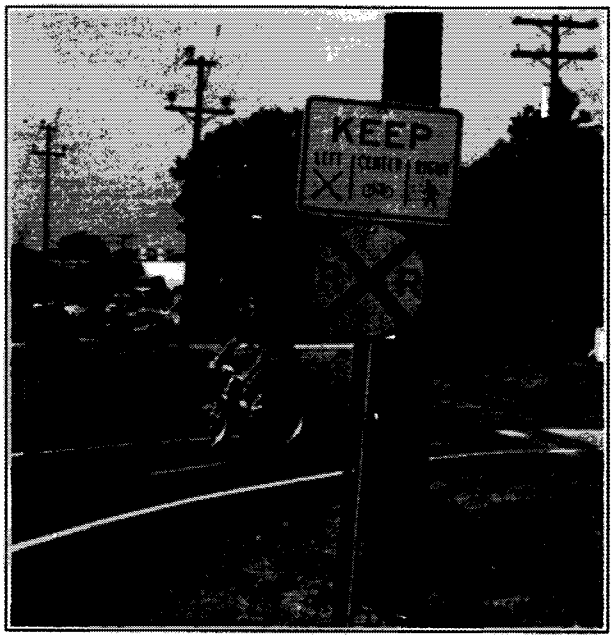


photo by Tom Norman/courtesy of NCDOT Bicycle Program

The Carrboro Railroad Bike/ Pedestrian Trail was developed to accommodate students and professors who commute from the Town of Carrboro to the nearby University of North Carolina at Chapel Hill. The trail is a single, 12-foot-wide asphalt tread laned into three divisions. Solid white pavement striping is used to separate two bicycle lanes from a single, two-way pedestrian lane. In addition, the two directions of bicycle travel are separated by a dashed yellow centerline. As illustrated at left, trail signage reinforces the separation of uses on this urban transportation facility.

Separation through Zoning

Other off-road trails that are several miles in length have divided their projects into sections in which certain uses are restricted:

The Heartland State Trail is a 50-mile multiple-use facility constructed on an abandoned railroad grade. The Minnesota trail has 2 segments: a 22-mile north-south segment that consists of a mowed path suitable for hiking, horseback riding and mountain biking, and a 27-mile east-west segment developed with an asphalt surface for bicycling.

Michigan's Paint Creek Trail offers 8.5 miles of smooth hard all-weather limestone for jogging, biking, walking, and cross-country skiing. On the northern end, approximately two-thirds of the trail is also open to equestrian use, but areas in and nearest the City of Rochester and its suburbs are not.

The Experimental ATV Trail in Maine's Mt. Blue State Park has sections of trails zoned for different winter uses. Snowmobiles use a portion of the ATV trail, and cross-country skiers have their own trail but can also use certain sections zoned for snowmobile use.

The concept of zoning for separation of use is effective in protecting natural resources from trail uses that may cause damage to the resource. It may also be implemented when a greater demand for certain uses exists in certain areas. For example, sections of trails located near population densities may receive heavy usage from commuting cyclists and pedestrians. Therefore, these sections may be zoned restrictive to horses or motor vehicles.

Separation Through Time of Use

Seasonal use separation is the most commonly implemented type of time of use zoning on trail facilities. Several trails located in areas of the country with adequate snowfall provide groomed trails for cross-country skiing and/or snowmobiling throughout the winter. Then, in warmer months, projects such as the Heartland State Trail, Mount Blue ATV Trail, Root River Trail, and the Brooklyn/Queens Greenway offer biking, hiking, and a host of other trail activities.

Separation can also be achieved following similar methods that designate certain weeks, days or even hours for particular uses, and prohibit conflicting uses during those time frames.

C. Multi-Tread/Multi-Use

As the popularity of off-road trails grows and trail usage increases, single tread/multi-use trails can become overcrowded. Conflicts between various users typically result. To offset and prevent these conflicts, newer projects are constructing multi-tread facilities. On these projects, a single trail corridor contains different trail treads for different users. In addition to providing for user separation, multi-tread/multi-use projects can offer each user group their preferred trail surfacing material. The following are some of the representative projects located throughout the country:

All of the off-road trails developed as part of the Seattle, Washington, bicycle program are multi-use trails. However, within the city system, sections of trails provide for user separation through "heels" and "wheels" paths. Heel users are runners, walkers, and joggers; wheel users are bicyclists, roller skaters, and in-line skaters.

The Little Miami Scenic State Park has developed stretches of its trail to include a paved surface for bikes, roller blades, walkers, and wheelchairs, and an adjacent path for exclusive equestrian use.

The Ojai Valley Trail is a unique railroad conversion project in Ventura County, California. The trail design innovatively combines the J.K. Ken MacDonald Bike Path and the Southern Pacific Equestrian/ Hiking Path. The 12-foot-wide asphalt trail can be seen on the left side of this photograph. A 4-1/2-foot-high wood rail fence separates the asphalt tread constructed for joggers, cyclists, and pedestrians from the parallel 12-foot-wide wood chip tread for equestrian use.

photo courtesy of County of Ventura Recreation Services

The east-west segment of the Heartland State Trail consists of a 6-foot-wide asphalt treadway constructed on an abandoned railroad grade. Parallel to it going up and down the hills is a 10-foot-wide horse, hiker, and mountain bike trail. The trails are separated by trees and brush except at intersections of roads, in towns, and on trestles. The Minnesota DNR reports no major conflict between user groups, although use by horseback riders is low.

The design for the urban Pinellas Trail includes a 15-foot-wide asphalt trail with separate pathways for bicycles and pedestrians. Pavement striping is used in places to help avoid user conflicts. In certain areas, due to the popularity of the Pinellas Trail , the 15-foot width is even reported to be too narrow to accommodate the heavy bicycle use on the trail.

D. Multi-Tread/Single Use

Although case study research revealed no representative examples of this type of trail, multi-tread/single-use facilities can be found in other countries. As the popularity of off-road trails continues to increase and bike paths and pedestrian walkways become accepted transportation facilities in the United States, we may see development of this type of off-road trail, especially in densely populated urban areas.

Examples of multi-tread/single-use facilities would include trails that have separate treads for each direction of travel. Projects that have different trail treads for different skill levels and speeds would be another example.

Section 7

Elements of a Successful Trail

Elements of a Successful Trail

This section of the case study is a summary of what makes an off-road trail a successful trail. The text discusses common project elements that are perceived necessary for the successful utilization of off-road trails. It presents a summary of general concepts and project elements that have been successfully used on existing off-road trail projects across the country.

This study concludes that trails that are similar in purpose, scope, and use contain similar key project elements and receive similar benefits. For the purpose of project classification, this section of the study groups off-road trails according to the *primary* objective of trail development. The study concludes that most off-road trail projects were developed either as transportation trails, recreational trails, trails for mixed transportation and recreation use, or trails developed as part of a larger project which embodies the concepts of open space preservation, environmental protection, historical preservation, and the like. The following text compares and contrasts projects that were developed for these main objectives and discusses common elements have brought about success.

Transportation Trails

This study concludes that trails, as a good form of alternative transportation, must serve important and necessary transportation needs. Many transportation trails are shortcuts across town that offer a safer, more direct or flatter route than other facilities such as streets and sidewalks.

The success of any project is ultimately determined by continuity, or how well all project elements work together and fit in with the project's surroundings. However, research into off-road trail projects across the country has revealed that the success of transportation projects is most often attributed to three key project elements: trail accessibility, an active maintenance program, and overall safety of the facility.

As a transportation alternative, off-road trails must be accessible, meaning that trails should be located near potential users. Convenience to major destinations such as employment centers, schools, residential areas, and points of interest is paramount. The location of access points along the trail route should also be frequent and convenient. Various off-road trail projects report that trail maps and other forms of publicity can assist in increasing awareness on trail location and access, thereby generating increased use and success of a trail project.

A good trail maintenance program includes provisions for routine inspections, collecting and removing trash and litter, mowing grass, removing fallen trees and damaged vegetation, repairing vandalism, blowing leaves and debris from trail surface, and completing general repairs to damaged areas of the trail and associated amenities.

Off-road transportation facilities must place emphasis on the safety of the user throughout trail design, construction, and maintenance. Signage, including entrance/trail head signage, directional signage, regulatory signage, and pavement markings, is perceived to be an important element in project safety. And case study research has indicated that provisions for emergency access to trails and the proper design and construction of trail surfacing, bridges, overpasses and vehicular crossings are essential.

Results of other studies reaffirm that safety is paramount to the success of alternative transportation and off-road trail facilities. The following examples provide insight into what additional elements can make a trail safe and successful:

The April 1991 issue of Bicycling magazine gives the results of a Harris poll regarding what it would take for this country to embrace cycling as a transportation option. In October 1990, when the survey was conducted, 1 in 60 adults or the equivalent of 2.8 million people commuted to work by bicycle. The survey went on to determine that 1 in 5 would commute if better facilities were available. The key elements that would result in increased bicycle commuting, and their expected percent of increase, are as follows:

1. a safe route -- 20 percent or 32.9 million people
2. financial incentives given by employers -- 18 percent or 29.7 million people
3. secured parking, storage, and showers -- 17 percent or 29 million people

Surveys conducted in the Fairbanks North Star Borough of Alaska revealed that 28 percent of bicycle accidents were blamed on poor maintenance of the facility.

Statistics on the National Capital Region's Mount Vernon Trail show that accidents frequently occur and are clustered at intersections and at steep or curving slopes. These statistics suggest that properly designed vehicular crossings and trails designed for the correct travel speed on slopes are key elements to ensure user safety.

Recreational Trails

Developers and administrators of recreational trails perceive that a maintenance/management program is the single most essential project element for long-term project success. Similar to transportation trails, the best programs include provisions for maintenance staff, equipment, volunteer labor, and most importantly, ongoing funding for continued trail management.

An excellent example is the Baltimore and Annapolis Trail Park Management Plan. The management philosophy of the Anne Arundel County Department of Recreation and Parks revolves around quality and safety. Their management plan covers park operations, from administration to public relations, visitor services and patrol, programming, park safety, and grounds and building maintenance.

Security, an overall signage package, trail continuity, and project setting are the next most commonly noted elements of successful recreational facilities. Trail security may be realized by the use of trail rangers, vehicle barriers, emergency access, landscaping, and fencing. A successful trail signage package includes several sign types: entrance, directional, informational, interpretive, educational, regulatory, and vehicular. Trail continuity encompasses the concepts of connecting origin and destination points, providing for a continuous surface of travel, and linking trails together to form trail systems and interconnected networks of recreational facilities. A trail's setting also refers to a location in pleasant surroundings, with beautiful scenery and a gentle grade capable of accommodating all recreational activities that occur along off-road trails.

In general, this study has determined that recreational trails also place a lot of importance on community support. User education, community involvement in projects, overall communication, and lots of publicity are often documented as leading elements that ensure project successes.

Transportation/Recreation Multi-Purpose Trails

Off-road trail projects that were developed with a dual primary goal of providing for both transportation and recreation report similar successes as do the first two types of trails. Essential project elements include maintenance programs, proper signage at vehicular intersections, a good trail surface, safety and the development of projects that are part of interconnected trail systems.

These types of projects also reflect a need for well-educated users and successful multiple participation by the various user types found on the facility.

Trail Projects Designed to Meet Other Goals

Certain off-road trail projects included within this case study were developed with primary goals other than transportation or recreation. For example, the San Antonio River Walk was designed to preserve open space, the Sweeney Ridge Trail to protect the environment, and the White Rock Creek Trail to offset the impact of the local water department clearing land for a water main. These projects cite security, safe vehicular intersections, and community support as common elements that have resulted in success.

Trails for All Users

Providing for access and connecting attractions along the trail are critical to the success of all off-road projects, regardless of intent or use. These same elements are important to all users, regardless of abilities. Lack of an overpass across a four-lane interstate limits access and linkage for cyclists and joggers, just as lack of a ramped curb limits wheelchairs in getting from a parking lot to a trail. For these reasons, it is critical to employ the concept of universal design in the development of trail facilities whenever possible.

photo by Julie Maloney/courtesy of Northern Virginia Regional Park Authority
Washington & Old Dominion Railroad Regional Park

According to Phyllis Cangemi, Executive Director of Whole Access, a continuous path of travel is the single most important trail feature to a person with a physical disability. But designing the trail itself for accessibility is not enough. Four additional elements must also be accessible to all users if an off-road facility is to be truly universal in design. These elements include:

1. access to the site, including parking areas and the path of arrival used to get from parking to the trail;
2. access and egress points located along the trail;
3. support facilities and desirable amenities, including the placement of rest rooms, drinking fountains, telephones, etc. with respect to the trail and any access paths leading to these support elements;
4. information access, including accurate information regarding the project location, how to get to the site and potential hazards of a project, plus location and height of on-site interpretive signage programs.

And, once developed, maintenance is again *the* critical element that will make a trail an enjoyable trail for all users. Ongoing support for maintenance and operations from local agencies, organizations, and individual trail users will result in success.

Section 8

Trail Usage Data

Trail Usage Data

As part of the research for this case study, the consultant was asked to assimilate any available usage data for off-road trails and, where available, present trip generation rates for these facilities. Unfortunately, little data of this type are currently available. A thorough review of existing data sources contained within the libraries of Greenways Incorporated, the NCDOT Bicycle Program, and the National Greenway Archive revealed few trail usage counts. The representative off-road projects that participated in this study were also asked to submit usage data.

The following listing is a summary of data that was obtained. An asterisk (*) denotes a project that has detailed trip generation rates and usage data studies available.

• AVENT FERRY ROAD BICYCLE PATH *
1,331 people traveled along the corridor in a 12-hour period on September 14, 1988. Of these, 861 were observed using the bike path, others used the opposite sidewalk and road right-of-way.

More bikers used the path rather than street or sidewalk. Nearly 3 out of every 4 of the pedestrians and 5 out of 6 joggers used the path.

• BURKE-GILMAN TRAIL
In 1987, the trail had an estimated 3/4 million users per year. As many as 4,000 to 5,000 users enjoy the trail on a busy day. Eighty percent of these are bicyclists.

• CARRBORO RAILROAD BIKE/PED TRAIL
A 1983 count found 1,100 bikes per day.

• CHERRY CREEK TRAIL
Use can reach 100-200 cyclists per hour during peak times and locations.

• EAST BAY BICYCLE FACILITY *
Attracts more than 8,000 people per weekend day -- quadruple the predicted use level -- and the trail is not yet open in Providence.

Data collected in 1990 show an average modal spilt of approximately 80 percent bicycles and 20 percent pedestrians. Estimated average daily bicycle traffic varies from 200 to 475 at different locations along the trail.

• ELROY-SPARTA STATE TRAIL
Annual visitor use is approximately 60,000.

• HEARTLAND STATE TRAIL
An estimated 47,330 people used the trail between May 21 and September 9, 1989, an increase in use of 16% from the summer of 1987. Seventy -six percent of these trail users were adults. Fifty-four percent were riding bicycles. Twenty-one percent of of all use took place on weekends.

• ILLINOIS PRAIRIE PATH
The trail generates at least 300,000 user trips annually.

• NATIONAL CAPITAL REGION TRAILS *

A total 369 users were reported in a four-hour period on Sunday, July 22, 1990 on the I-66/ CUSTIS TRAIL. Ninety percent of these were bicyclists, of which 53 percent wore helmets. Ten percent were pedestrians.

On July 26, 1990, 331 bicyclists, 61 percent of which were wearing helmets, rode on MEMORIAL CIRCLE in a two-and-one-half-hour period.

The MT. VERNON TRAIL reported 78 percent bicycle use and 22 percent pedestrian use during a four hour period on Saturday, July 21, 1990.

During a two-hour period on the morning of June 19, 1990, 228 bicycles used ROSSYLN CIRCLE.

On Sunday, July 8, 1990, 652 users were reported in a three hour period on the WASHINGTON AND OLD DOMINION TRAIL. Seventy-one percent were bicyclists, 17 percent joggers, and 12 percent walkers.

Appendices

Bibliography
Project Contacts

Appendix A:
Reference Bibliography

Information on specific projects contained within this case study report was obtained from one of two sources: the review of published plans, reports and newsletters on various off-road trail projects, and through direct contact with the persons listed in *Appendix B*.

All literature gathered as part of FHWA Case Study #7 will be housed at the newly formed National Greenway Archive at North Carolina State University in Raleigh, North Carolina. The National Greenway Archive is a repository of information pertaining to the planning, development, marketing, and management of greenways. The Archive is also being developed as an information exchange for people who want to know about greenways and related topics.

The following listing of references are the major publications that were used to complete this case study. To avoid footnote repetition throughout the text, all information was obtained from the source(s) that correspond(s)to a respective project unless otherwise noted.

ALLEGHENY HIGHLANDS TRAIL

The Allegheny Highlands Trail Feasibility Study. November 1989. The Allegheny Highlands Trail Study Task Force and The National Park Service.

AMERICAN RIVER BIKE TRAIL

American River Bike Trail. Sacramento, CA. Promotional brochure.

ANCHORAGE BOWL TRAILS SYSTEM

Anchorage Ski Trails. Municipality of Anchorage Parks and Recreation Department. Map.

Anchorage Trails: Bicycle/Winter Running. Municipality of Anchorage Parks and Recreation Department. Map.

Anchorage Trails Plan. July 1985. Municipality of Anchorage Parks and Recreation Design and Development Division. Anchorage, AK.

Cross Country Ski Trail: Russian Jack Springs Park. Municipality of Anchorage Parks and Recreation Department. Map.

Mirror/Edmonds Lake Skijoring Trails. Map.

APPALACHIAN TRAIL

Appalachian Trail Conference. Promotional brochure.

Appalachian Trail Conference Member Handbook. Thirteenth Edition. 1988. The Appalachian Trail Conference, Inc. Harpers Ferry, WV.

Appalachian Trailway News. Vol. 52, Number 2. May/June 1991. Appalachian Trail Conference, Inc. Harpers Ferry, WV.

Trail Lands, Vol. 7, No. 1. Summer 1990. Newsletter of the Trust for Appalachian Trail Lands. Harpers Ferry, WV.

Trust for Appalachian Trail Lands of the Appalachian Trail Conference. Promotional brochure.

AVENT FERRY ROAD BICYCLE PATH

An Evaluation of the Use of the Avent Ferry Road Bicycle Path. October 20, 1988.

BALTIMORE AND ANNAPOLIS TRAIL

Baltimore & Annapolis Trail Park. Anne Arundel County Recreation and Parks Department. Promotional brochure/map.

Baltimore and Annapolis Trail Park Management Plan. Anne Arundel County Department of Recreation and Parks.

Baltimore and Annapolis Trail Park: Rules and Regulations/Visitor Ethics. Promotional brochure.

Charitable Fund Raising Activities in the Park: Policy and Procedure. Anne Arundel County Department of Recreation and Parks. Baltimore and Annapolis Trail Park.

The Washington-Baltimore & Annapolis (WB&A) Recreational Trail: A Rails to Trails Proposal. WB&A Recreational Trail Association. Seabrook, MD. Promotional brochure.

BAY CIRCUIT

The Massachusetts Bay Circuit Program. Department of Environmental Management, Boston, MA.

BAY TRAIL

San Francisco Bay Area's Trail Along the Bay. Oakland, CA. Promotional brochure.

BEAR CREEK GREENWAY

Bear Creek Greenway Plan: Ashland to Central Point. March 1988. Jackson County Parks and Recreation Department, Jackson County, OR.

BROOKLYN/QUEENS GREENWAY

The Brooklyn/Queens Greenway: A Design Study. Tom Fox and Anne McClellan, Neighborhood Open Space Coalition, New York, NY.

The Brooklyn/Queens Greenway: A Feasibility Study. Tom Fox, Anne McClellan and Maria Stanco, Neighborhood Open Space Coalition, New York, NY.

The Brooklyn/Queens Greenway: Shore to Shore - And So Much More. The Neighborhood Open Space Coalition, New York, NY. Promotional brochure.

Draft Proposal: An Urban Inventory for Metro NY. Transportation Alternatives Greenways Committee. New York, NY.

BURKE-GILMAN TRAIL

Burke-Gilman Trail Schematic Design Report. 1975. City of Seattle Department of Parks and Recreation. Seattle, WA.

Evaluation of the Burke-Gilman Trail's Effect on Property Values and Crime. May 1987. Seattle Engineering Department Office for Planning, Seattle, WA.

CAPE COD NATIONAL SEASHORE BICYCLE TRAILS

Bicycle Trail Plan: Cape Cod National Seashore, Massachusetts. September 15, 1988. U.S. Department of the Interior/National Park Service.

Cape Cod Bicycle Trails. National Park Service/U.S. Department of the Interior. Map.

CAPITAL AREA GREENWAY SYSTEM

Capital City Greenway: A Report to the City Council on the Benefits, Potential, and Methodology of Establishing a Greenway System in Raleigh. W.L. Flournoy, Jr., Raleigh, NC. pp. 6-29.

Raleigh Bicycle Plan. 1991. City of Raleigh Planning Department, Raleigh, NC.

Raleigh Parks Plan. 1989. Raleigh, NC.

CARRBORO RAILROAD BIKE/PED TRAIL
"Final Section of the Carrboro Bikeway System Dedicated." Bike Info. Vol. 8, No. 4. November 1982. Newsletter of the North Carolina Department of Transportation Bicycle Program. Raleigh, NC. p. 3.

CARY GREENWAYS
Cary Greenways: Explore Your Own Backyard. Cary Planning and Development Department. Cary, NC. Promotional brochure/map.

Town of Cary Parks, Recreation, and Greenways Survey: Final Report. March 1989. Dean F. Tucker and Hugh A. Devine, Department of Recreation Resources Administration, College of Forest Resources, North Carolina University, Raleigh, NC.

Urban Forestry in Cary. Cary Tree Advisory Board. Cary, NC. Promotional brochure.

CEDAR VALLEY NATURE TRAIL
Cedar Valley Road Conservation Recreation Corridor Study - Summary Report. January 1981. Iowa Natural Heritage Foundation, Des Moines, IA.

CHENA RIVER BIKE TRAIL
Bike Plan. November, 1989. Department of Community Planning, Fairbanks North Star Borough, Fairbanks, AK.

CHERRY CREEK TRAIL/DENVER TRAILS SYSTEM
"Building Support for Urban Trails." Stuart H. Macdonald. P&R. November 1987. pp. 26-33.

"Greenways: Preserving Our Urban Environment." Stuart H. Macdonald. Trilogy. November/December 1991. pp. 94-96.

"Metro Bike Path Comes Together." Michael Mehle. Rocky Mountain News. August 4, 1991.

"Urban Trails: Into the Mainstream?" Stuart H. Macdonald. The Urban Design Forum. pp. 6-7.

CHESAPEAKE AND OHIO CANAL NATIONAL HISTORICAL PARK TOWPATH
Chesapeake & Ohio Canal N.H.P. Monthly Public Use Report. December 1990. U.S. Department of Interior/National Park Service.

Chesapeake & Ohio Canal N.H.P. Monthly Public Use Report. August 1991. U.S. Department of Interior/National Park Service.

Chesapeake & Ohio Canal National Historical Park General Plan. January 30, 1976. John G. Parsons, Chief, Urban Coordination and Environmental Impact Division.

Chesapeake and Ohio Canal Official Map and Guide. 1991. National Park Service/U.S. Department of Interior.

Development Concept Plan for the Cumberland/North Branch Area Chesapeake & Ohio Canal National Historical Park. May 1983. U.S. Department of Interior/National Park Service.

CLEVELAND METROPARKS ALL-PURPOSE TRAILS
A Guide to the Cleveland Metroparks System. Cleveland Metroparks. Cleveland, OH. Map.

All Purpose Trails. Cleveland Metroparks. Promotional brochure.

Cleveland Metroparks Naturescape: A Visitor Guide. Vol. 1, No. 2. Fall/Winter 1991/92. Cleveland Metroparks. Cleveland, OH.

Physical Fitness Trails in Your Metroparks. Cleveland Metroparks. Promotional brochure.

DAVIS GREENWAY

The Davis Greenway: A Conceptual Plan for Open Space and Wildlife Habitat for the City of Davis, California. June 1988. A senior thesis by Stanton Jones, Center for Design Research, University of Davis, Davis, CA.

DELAWARE AND RARITAN GREENWAY

The Delaware and Raritan Greenway - A Regional Vision Realized Through Local Action. December 1988. Paper prepared for The Commonwealth of New Jersey: A Public Policy Forum, submitted by Maude Blacks, Director, Delaware and Raritan Greenway.

EAST BAY BICYCLE FACILITY

East Bay Bicycle Path. Rhode Island Department of Environmental Management, Division of Parks and Recreation. Promotional brochure/map.

East Bay Bicycle Path. Rhode Island Department of Transportation Planning Division. Map/information sheet.

1990 Estimated Bicycle Volumes - East Bay Bicycle Path. May 1991. Rhode Island Department of Transportation. Providence, RI.

Public Hearing Information Brochure: Planning and Preliminary Design for the Blackstone River Bikeway. Rhode Island Department of Environmental Management and Department of Transportation. July 22, 1987.

"Spotlight On . . .The East Bay Bicycle Path." Trailblazer. Vol. 6, No. 3. July-September 1991. Newsletter of the Rails-to-Trails Conservancy. Washington, D.C. pp. 3/12.

ELROY-SPARTA STATE TRAIL

Bike Trail Guide. 1991. The Foxxy Shopper Network.

A Look at Visitors on Wisconsin's Elroy-Sparta Bike Trail. January 1989. Recreation Resources Center, University of Wisconsin-Extension, Madison, WI.

Trail Pass Vendor Information. 1991. Handout.

Wisconsin's State Trail: Elroy-Sparta Bike Trail. 1991. Promotional brochure/map.

FORT COLLINS TRAIL SYSTEM

Trail User Survey. August, 31, 1990. City of Fort Collins Cultural, Library and Recreational Services/Parks Division. Fort Collins, CO.

GUILFORD COUNTY BICENTENNIAL GREENWAY

Guilford Greenways: Bicentennial Trail. Guilford County Planning and Development. Greensboro, NC. Promotional brochure/map.

HEARTLAND STATE TRAIL

Heartland State Trail: Park Rapids to Cass Lake. May 1991. Minnesota Natural Resources Trails and Waterways Unit. St. Paul, MN. Promotional brochure/map.

Heartland State Trail Summer Survey Results Summary. May 16, 1990. State of Minnesota Department of Natural Resources - Trails and Waterways.

HERITAGE TRAIL

Heritage Trail. Dubuque County, Iowa. Promotional brochure.

Iowa Statewide Recreational Trails Plan. February 1990. Barton-Aschman Associates, Inc.

HUDSON RIVER VALLEY GREENWAY

Draft Study for a Hudson River Valley Greenway. April 1990. Hudson River Valley Greenway Council, Albany, NY.

ILLINOIS PRAIRIE PATH

The Illinois Prairie Path Trail Map. The Illinois Prairie Path, Wheaton, IL.

I-66/CUSTIS TRAIL

1990 Trail Counts.

I-275 BIKEWAY

A Guide to the I-275 Bikeway in Southeastern Michigan. Michigan Department of Transportation. Promotional brochure/map.

KATY-MISSOURI RIVER TRAIL

The Economic Impact of the Proposed Missouri River Trail. February 1987. Uel Blank. Columbia, MO.

Katy-Missouri River Trail Economic Fact Sheet. Katy-Missouri River Trail Coalition. Columbia, MO.

KINGSPORT GREENBELT

Reedy Creek Greenway Plan. July, 1988. Kingsport, TN.

KINGWOOD, TEXAS

Kingwood Area Map. June 1990. Friendswood Development Company.

KNOXVILLE WATERFRONT

Report of the Mayor's Waterfront Task Force, November 1988. Waterfront Task Force, Knoxville, TN.

LITTLE CROSS CREEK STREAMWAY

Little Cross Creek Streamway Design and Development Model, September, 1985. Fayetteville Parks and Recreation Department, Fayetteville, NC.

LITTLE MIAMI SCENIC STATE PARK

Little Miami Scenic Park Map. Ohio Department of Natural Resources, Division of Parks and Recreation.

Little Miami State Park Private Concessions. Information sheet.

Little Miami State Park - Rules and Regulations. Ohio Department of Natural Resources, Division of Parks and Recreation. Information sheet.

MADISON BIKEWAY SYSTEM

Madison Bicycling Resource Guide & Route Map. City of Madison Department of Transportation Traffic Engineering Division. Madison, WI.

MECKLENBURG COUNTY GREENWAYS

Final Report of the Greenway Site Selection Committee. June 1980. Joan Sigmon, graduate intern, University of North Carolina at Charlotte. Charlotte, NC.

Mecklenburg County Greenways: A Planned Open Space Network of Floodplains. Nancy M. Brunnemer and Owen J. Foruseth. Charlotte, NC.

MERAMEC GREENWAY

MT. BLUE EXPERIMENTAL ATV TRAIL
Information and Rules for the Experimental ATV Trail. Mt. Blue State Park, Bureau of Parks and Recreation, Maine Department of Conservation. Promotional brochure/map.

NATIONAL CAPITAL REGION TRAILS
Adopted and Approved Countywide Trails Plan for Prince George's County, Maryland. July 1975. The Maryland-National Capital Park and Planning Commission.

Approved Master Plan, October 1989, and Adopted Sectional Map Amendment, May 1990, Langley Park, College Park and Greenbelt. The Maryland-National Capital Park and Planning Commission. Upper Marlboro, MD.

Bicycle Elements for the Washington Regional Transportation Plan.. Draft: June 1991. Regional Bicycle Technical Subcommittee of the Metropolitan Washington Council of Governments Transportation Planning Board.

Bowie, Collington, Mitchellville & Vicinity Adopted Master Plan. September 1990. The Maryland-National Capital Park and Planning Commission. Upper Marlboro, MD.

Equestrian Addendum to the Countywide Trails Plan. February 1985. The Maryland-National Capital Park and Planning Commission. Upper Marlboro, MD.

Executive Summary: A Planning Guide for Trails - Staff Draft. Department of Parks, Montgomery County, MD.

Existing Pedestrian/Bike Trails and Bike Routes. May 1991. The Maryland-National Capital Park and Planning Commission.

Largo-Lottsford Preliminary Plan Amendment & Public Release of Sectional Map Amendment. November 1989. The Maryland-National Capital Park and Planning Commission. Upper Marlboro, MD.

Maryland Rails-to-Trails: A Study of Maryland's Railroad Rights-of-Way and Their Potential for Conversion to Multi-Use Trails. December 1989. Maryland Department of Natural Resources.

Memorandum from William A. Krebs, Director, Program Open Space, to Keith Hay, Director, Greenways for America. March 14, 1989. Maryland Department of Natural Resources, Annapolis, MD.

Northeast Branch Indian Creek Park Hiker Biker Equestrian Trail. Maryland-National Capital Park and Planning Commission, Department of Parks and Recreation. Prince George's County, MD. Promotional brochure/map.

Parks & Recreation Facilities in Prince George's County, Maryland. 1983. The Maryland-National Capital Park and Planning Commission, Department of Parks and Recreation. Prince George's County, MD. Promotional brochure/map.

Paved Recreational Trails of the National Capital Region: Recommendations for Improvements and Coordination to Form a Metropolitan Multi-Use Trail System. June 1990, National Park Service, Washington, DC.

Robert M. Watkins Regional Park. Upper Marlboro, MD. Promotional brochure/map.

Subregion I Approved Master Plan, March 1990, and Adopted Sectional Map Amendment, October 1990, Beltsville, Calverton, Montpelier, South Laurel, West Laurel and Vansville. The Maryland-National Capital Park and Planning Commission. Upper Marlboro, MD.

Task Description - Maryland Greenways: Phase I. Proposal to Coastal Zone Management, MD.

Lower Meramec River Management Study. August 1990. St. Louis County Department of Parks and Recreation, Division of Research and Field Services, St. Louis, MO.

NORTH CHICKAMAUGA CREEK GREENWAY
North Chickamauga Creek Greenway: Preliminary Master Plan. June 1989. Hixson Chamber of Commerce, Hixson, TN.

OJAI VALLEY TRAIL
Hit the Trail! The Ojai Valley Trail. County of Ventura General Services Agency Recreation Services. Promotional brochure/map. Ventura, CA.

Ojai Valley Trail: Composed of the J.K. Ken MacDonald Bike Path and the Southern Pacific Equestrian/Hiking Path. Andy Oshita. 1990.

"Spotlight On . . .The Ojai Valley Trail." Trailblazer. Newsletter of the Rails-to-Trails Conservancy. Washington, D.C. p. 3.

PAINT CREEK TRAIL
Paint Creek Trail. Paint Creek Trailways Commission. Rochester, MI. Promotional brochure/map.

PENNSYLVANIA STATE GAME LANDS NO. 211
Sportsmen's Recreation Map: State Game Lands No. 211. Maps 1-3. Commonwealth of Pennsylvania, Pennsylvania Game Commission.

PINELLAS TRAIL
Get on the Trail: Pinellas Trail. Pinellas Trails, Inc. St. Petersburg, FL. Promotional brochure/map.

On The Trail. July, August, September 1991. Newsletter of Pinellas Trails, Inc. Clearwater, FL.

On The Trail. November - December 1989. Newsletter of Pinellas Trails, Inc. Clearwater, FL.

Pinellas Trails Amenities. Pinellas Trails, Inc. Clearwater, FL. Promotional brochure.

Pinellas Trails: Help Preserve 47 Miles of Old Florida Forever. Pinellas Trails, Inc. Clearwater, FL. Promotional brochure/map.

Up & Running: The Pinellas Trail. Pinellas Trails, Inc. Clearwater, FL. Promotional brochure/map.

REEDY CREEK GREENWAY
Reedy Creek Greenway Plan. Kingsport, TN.

RESEARCH TRIANGLE PARK PEDESTRIAN TRAIL SYSTEM
Research Triangle Park Jogging Trail Master Plan Map. January 1991. Research Triangle Foundation of North Carolina. Research Triangle Park, NC.

Research Triangle Park Jogging Trail Master Plan Priorities. June 21, 1991. Informational handout.

RESTON, VIRGINIA
How To Enjoy Reston with Facilities and Pathways Map. 1990. Reston Association. Reston, VA. Promotional brochure/map.

Reston Neighborhoods. 1990. Reston Land Corporation. Reston, VA. Promotional brochure.

Schools. Child Care. Arts. Business. Community Services. Transportation. 1991. Reston Land Corporation. Reston, VA. Series of promotional brochures.

ROOT RIVER STATE TRAIL
Root River State Trail Map. Minnesota Department of Natural Resources, Trails and Waterways Unit. St. Paul, MN.

SAN ANTONIO RIVER WALK/PASEO DEL RIO
"History of the San Antonio River and Its Development." San Antonio River Walk Policy Guide. p. 19-21.

San Antonio's River Walk: Paseo del Rio. River Taxi Guide. Promotional brochure/map.

SOUTHERN NEW ENGLAND TRUNKLINE TRAIL
The Bay State Trail Riders Association, Inc. December 2, 1978. Promotional handout/map.

Letter from Ed Whalley, Executive Secretary, Southern New England Trails Conference, to Gerald D. Patten, National Park Service/North Atlantic Region. July 25, 1991. Bellingham, MA.

"The Triangular Trail." The Bay State Bugle. November 1983. Newsletter. p. 8.

STOWE RECREATION PATH
Stowe Recreation Path: Help Continue the Dream of This 'Community Created Greenway.' Promotional brochure/map.

SUGAR RIVER TRAIL
Historical Sites and/or Points of Interest Within Biking Distance of the Sugar River State Trail. Informational handout.

Sugar River State Trail. Informational handout.

Sugar River State Trail: A National Recreational Trail. Wisconsin Department of Natural Resources. March 1991. Promotional brochure/map.

TRAIL OF TWO CITIES
Trail of Two Cities: C.R.I. & P. Rail Corridor Plan - A Trans-Recreational Linear Parkway Proposal. Nebraska Trails Council.

TRAVERSE AREA RECREATIONAL TRAIL
Traverse Area Recreational Trail. Friends of T.A.R.T. Promotional brochure/map.

WASHINGTON AND OLD DOMINION REGIONAL RAILROAD PARK
Washington & Old Dominion Railroad Regional Park Trail Guide. 1991. Northern Virginia Regional Park Authority. Fairfax Station, VA.

WILLAMETTE RIVER TRAIL: EUGENE SECTION
Bicycles in Cities: The Eugene Experience. Vol. III: Bridges for Bicycles. 1981. Bikeways Oregon. Eugene, OR.

Bicycles in Cities: The Eugene Experience. Vol. IV: River Bank Trail System. 1981. Bikeways Oregon. Eugene, OR.

Bicycles in Cities: The Eugene Experience. Vol. IX: Off-Street Bicycle Paths. 1981. Bikeways Oregon. Eugene, OR.

GENERAL
America's Rail-Trails. Sixth edition. June 1991. Rails-to-Trails Conservancy. Washington, D.C.

Beat the Heat: The CO_2 Challenge. Fall 1991. Supplement to Scholastic Inc.

"Beating Saddam" Nelson Pena. December 1990 Bicycling magazine. pp. 30.

Benefits of Rail Trails: A Study of the Users and Nearby Property Owners from Three Trails. Draft. September 22, 1991. Roger L. Moore, Alan R. Graefe, Richard J. Gitelson, and Elizabeth Porter. Penn State University and the National Park Service.

Economic and Tax Implications of Rails-Trails: Illinois Railbanking Study. September 1990. Illinois Department of Conservation, IL, and Hoffman Williams Lafen and Fletcher, Silver Spring, MD.

Economic Impacts of Protecting Rivers, Trails and Greenway Corridors: A Resource Book. Second Edition, 1991. Rivers, Trails and Conservation Assistance, National Park Service, Washington, DC.

Linking Land Use and Transportation: Design Strategies to Serve HOV's and Pedestrians. June 1991. Richard K. Untermann, University of Washington.

"On Track" Nelson Pena. July 1991 Bicycling magazine. pp. 92-96.

"Pedal Power vs. Petroleum" Mark Jenkins. May 1991 Bicycling magazine. pp. 94.

"Power in Numbers" Nelson Pena. December 1990 Bicycling magazine. pp. 44-46.

The Report of the President's Commission on Americans Outdoors. 1987. Island Press. Washington, D.C.

Rails-To-Trails Trailblazer, April-June, 1989.

Trails on Electric Utility Lands: A Model of Public-Private Partnership. American Trails and Edison Electric Institute. Washington, D.C.

Trails for All Americans: The Report of the National Trails Agenda Project. Summer 1990. American trails and U.S. Department of the Interior, National Park Service.

"Winning Over the Street People," by William Fulton. May 1991. Planning, Vol. 57, No. 5 pp. 8-11.

Appendix B:

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