a planning guide to TRAILS for Montgomery County Parks
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for Montgomery County Parks

February 1991

A staff study prepared by the Park Planning and Development Division of the Department of Parks, Montgomery County.

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

MONTGOMERY COUNTY PARK COMMISSION
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PURPOSE

The Planning Guide for Trails is a working document developed to assist the Department of Parks in planning for hiking, bicycling and equestrian trails in Montgomery County. The Guide represents the first phase in the trail planning process, and all proposals are subject to further study and evaluation.

Trails are one of the most popular facilities within the Montgomery County park system. Three types of trails are currently available: (1) paved hiker-biker trails, (2) unpaved hiking trails, and (3) unpaved joint-use trails for both hiking and equestrian use.

The Planning Guide for Trails was developed to guide the Department of Parks in establishing an integrated trails network. An integrated trail system provides greenways which offer a wide range of recreational opportunities for County residents and ensures linkages to scenic, natural, historic and other recreation areas. Trails may also serve a transportation function by providing a safe, off-road alternative for non-motorized transportation. In addition, this regional system, where possible, connects to trails provided by other County, state or federal agencies. Future land acquisition can further aid trail development by providing corridors wide enough to accommodate trails outside of the floodplain.

The Planning Guide is a long range document designed to guide the Capital Improvements Program (CIP) for the Department of Parks. It examines the present and future demand for trails in the park system, identifies trail suitability given the goals of the Department, and prioritizes trail development. The Planning Guide for Trails focuses on parkland trails. It does not address on-road bikeways and other facilities not within the jurisdiction of the Department of Parks, such as equestrian easements across private property, but recognizes the need for coordination among appropriate agencies.

The need for a Planning Guide became obvious during a review of the hiker-biker trail recommendations adopted in the 1978 Master Plan of Bikeways. The Master Plan of Bikeways recommended an additional 75 miles of parkland hiker-biker trails be added to the system for a total of approximately 90 miles. The parkland hiker-biker plan proposals were evaluated according to the demand for and suitability of the trails. This Planning Guide refined the recommendations of the 1978 plan to a total of 74 miles of paved hiker-biker trails, of which 33 miles are existing. It is expected that the recommendations of this guide will be incorporated into a future update of the Master Plan of Bikeways, and utilized in future planning efforts for Greenways in Montgomery County.
The 1988 Park, Recreation and Open Space Master Plan (PROS) recognized trails as a vital aspect of Montgomery County parks. The PROS Plan did not address the need for hiking and equestrian trails. The Planning Guide refined the projections of the PROS Plan to include hiking and joint-use equestrian trails. To date there are more than 90 miles of trails in the County park system. There are 33 miles of hiker-biker trails, 34 miles of hiking trails and 22 miles of joint-use equestrian trails. The Planning Guide identifies an additional 41 miles of hiker-biker trails, 8 miles of hiking trails, and 42 miles of joint-use hiking and equestrian trails.

The Planning Guide for Trails presents an overview of existing trail resources, user preferences and demand. In addition, it proposes the potential development of specific trail corridors to meet user needs and prioritizes the order of new trail development. The Planning Guide identifies only general trail corridors for potential development. Final trail alignments will be determined during the design and engineering phase of the CIP process.

In addition to the trails provided by the Montgomery County Department of Parks, other jurisdictions within the County also provide trails. Table 1.1 summarizes the total number of miles of various types of trails available in the County, as well as programmed facilities.
## MILES OF TRAILS AVAILABLE IN MONTGOMERY COUNTY

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<tr>
<th>JURISDICTION</th>
<th>EXISTING TRAILS</th>
<th>PROPOSED TRAILS</th>
<th>TOTAL TRAILS</th>
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<tbody>
<tr>
<td></td>
<td>HIKER-BIKER</td>
<td>HIKE</td>
<td>HIKER-BIKER</td>
</tr>
<tr>
<td></td>
<td>HIKING EQUESTRIAN</td>
<td>JOINT-USE EQUESTRIAN</td>
<td>JOINT-USE EQUESTRIAN</td>
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<tr>
<td></td>
<td>Multi-Use</td>
<td>Multi-Use</td>
<td>Multi-Use</td>
</tr>
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<td>M-NCPPC PARK TRAILS</td>
<td>33.5 34.3 22.8</td>
<td>41 8 42</td>
<td>74.5 42.3 64.8</td>
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<td>COUNTY DEPARTMENT OF TRANSPORTATION</td>
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<td>0 0 0</td>
<td>33 0 0</td>
</tr>
<tr>
<td>ON-ROAD SIGNED ROUTES AND BIKE LANES</td>
<td>45 0 0</td>
<td>32.2 0 0</td>
<td>77.2 0 0</td>
</tr>
<tr>
<td>OFF-ROAD BIKE TRAILS/WIDE SIDEWALKS</td>
<td>0 0 0</td>
<td>3.6 0 0</td>
<td>3.6 0 0</td>
</tr>
<tr>
<td>CAPITAL CRESCENT TRAIL</td>
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<td>2.5 0 0</td>
<td>12 0 0</td>
</tr>
<tr>
<td>CITY OF ROCKVILLE</td>
<td>0.3 1 0</td>
<td>0 0.5 0</td>
<td>0.3 1.5 0</td>
</tr>
<tr>
<td>CITY OF GAITHERSBURG</td>
<td>7 5 15</td>
<td>0 0 0</td>
<td>7 5 15</td>
</tr>
<tr>
<td>STATE OF MARYLAND</td>
<td>0 3.5 19</td>
<td>0 0 0</td>
<td>0 3.5 19</td>
</tr>
<tr>
<td>SENEC A CREEK STATE PARK</td>
<td>37.5 6 27.5</td>
<td>0 0 0</td>
<td>37.5 6 27.5</td>
</tr>
<tr>
<td>PATUXENT RIVER STATE PARK</td>
<td>0 2.2 0</td>
<td>0 0 0</td>
<td>0 2.2 0</td>
</tr>
<tr>
<td>NATIONAL PARK SERVICE</td>
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<td>0 4.9 0</td>
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<tr>
<td>GREAT FALLS PARK</td>
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<td>0 0 13</td>
</tr>
<tr>
<td>C &amp; O CANAL TOWPATH (UNPAVED)</td>
<td>0 0 13</td>
<td>0 0 0</td>
<td>0 0 13</td>
</tr>
<tr>
<td>WASHINGTON SUBURBAN SANITARY COMM.</td>
<td>165.8 56.9 97.3</td>
<td>79.3 8.5 42</td>
<td>245.1 65.4 139.3</td>
</tr>
</tbody>
</table>

### TABLE 1.1
GOALS

The Planning Guide for Trails has four expressed goals:

(1) Evaluate the parkland hiker-biker trails recommended by the 1978 Master Plan of Bikeways and the 1988 Park, Recreation and Open Space Plan.

(2) Develop an integrated network of recreational trails through Montgomery County Parks to meet the recreational needs of County residents.

(3) Develop an integrated regional network of trails by connecting, where feasible, to other parkland within and contiguous to Montgomery County to further meet recreational needs and encourage non-motorized travel.

(4) Develop trails in harmony with surrounding historic and natural resources at a level that can be maintained in a safe and pleasing condition within the staff and fiscal constraints of the Department of Parks.

OBJECTIVES

The Planning Guide for Trails has six major objectives.

(1) Develop environmentally sensitive design, construction and maintenance guidelines.

(2) Use trails, wherever possible, to connect residents with public facilities, employment and commercial areas.

(3) Locate trails, where desirable, to take advantage of, and provide access to, recreation, scenic and historic sites to the extent that these trails do not conflict with preservation goals.

(4) Develop a trail classification system.

(5) Establish expenditure priorities for the development and maintenance of trails.

(6) Address the problems identified by the trail user surveys.
TRAIL BENEFITS

Trails are an important component in meeting outdoor recreational needs and are one of the most heavily used facilities in our park system.

Trails provide many benefits, the most basic of which is the recreational opportunity enjoyed by those who travel along the trails, either by foot, on bicycles or on horseback.

RECREATION: Trails provide an opportunity for passive enjoyment of our parkland. Trails are used by people of every age and ability. They provide a safe, enjoyable environment to jog, bicycle, walk or observe nature.

HEALTH AND FITNESS: Trails are an important component of a nationwide interest in health and fitness. Trail use promotes mental health and physical well being.

ACCESS TO NATURE: Trails provide an opportunity to experience nature within a largely urban environment. Trails often traverse open space corridors, or "greenways", allowing people to travel through interconnected ribbons of green. Trail corridors provide wildlife habitats for a variety of species.

TRANSPORTATION: Trails offer a safe, off-road alternative to motorized travel. They may be used to connect residential areas to shopping, employment centers, schools and public facilities and minimize the impacts of automobile traffic.

ECONOMIC: The availability of trails increase the demand for use-related items such as bicycles, athletic shoes and apparel, horse feed and trailers. The merchants benefit as does the County from tax revenue derived from sales. Trails are also frequently used as a marketing tool to increase the attractiveness of new housing subdivisions.

TRAILS AND THE PARK ENVIRONMENT

The Department of Parks' staff is aware that trail construction, maintenance and use have both short and long term impacts on the park environment. The Department of Parks is committed to minimizing those impacts to the greatest extent possible.

Trail impact zones vary widely according to trail type, location, and degree of use. Impacts of greatest concern include soil erosion, root compaction, native plant mortality, invasion by exotic and undesirable vegetation, and increased avian nest predation and cowbird parasitism associated with open forest corridors. Forest interior bird species are particularly at risk and are declining rapidly, in part due to changes on the breeding grounds associated with forest fragmentation. Recent evidence suggests an approximate 100' (30 meters) corridor of impacts, especially eventual invasion of exotic and undesirable vegetation associated with hiker-biker and equestrian trails through forest with broken canopy.
The impact zone can be lessened by using conservative clearance widths and heights, and by avoiding opening of the canopy during trail construction. A well planned trail with limited or controlled traffic, especially one that utilizes existing fields or cleared corridors would minimize impacts. The goal of the Department is to develop a well designed trail system that minimizes environmental impacts.

Decisions to build new trails or retain existing trails will be made only after a careful analysis of the effects of those trails on the natural, historical or archaeological resources, and a determination that trail development and use are acceptable from a resources conservation standpoint.

A detailed discussion of environmental considerations related to trails is contained in Chapter 5 (Trail Planning and Development Process) of this document.

PROFILE OF MONTGOMERY COUNTY

Montgomery County measures approximately 500 square miles, containing 324,000 acres (land and water). The County lies in the Piedmont Plateau on the east bank of the Potomac River, 30 miles west of the Chesapeake Bay and approximately 100 miles from the Atlantic Ocean.

The 1990 population of Montgomery County is estimated to be 730,000. (Round 4 Modified, March 1990)

Population in the County is expected to grow to approximately 820,000 by the year 2000. Population growth in the County has continued to increase because of increases in the rates of births and households. The 0-9 population increased 46.4% during the period 1984-1987.

Population growth is centered along the I-270 corridor, especially within Germantown and Gaithersburg, and the U.S. 29 corridor. Approximately two-thirds of recent County housing completions have been in these areas. These two corridors are expected to dominate total housing production over the next 10 years. The demand for recreation facilities will increase in these areas.

Age of the population has a significant relationship to demand for park and recreation facilities as different types of facilities are utilized by different age groups. For example, an increase in the 0-9 age group will increase the demand for play equipment. Recent surveys of trail use in the County indicated that the median user age group is 25-44. This age group has increased 35.2% between 1984-1987. It is expected, therefore, that the demand for trail facilities will increase.

In addition, the 65+ age group increased 31.9% during the same period. According to the National Sporting Goods Association, exercise walking is the predominant physical fitness activity among users.
level, exercise walking in 1987 attracted nearly 16 million participants aged 55 and older, almost 31% of the 51.7 million Americans in that age group. This trend will also increase demand for paved and unpaved walking trails in the County.

Horseback riding is an historic part of Montgomery County life and continues to be a popular form of recreation today. There are more than 12,000 pleasure riders in the County, more than 720 members of Trail Riders of Today, an equestrian organization for the Washington-Metropolitan Area, and approximately 60 licensed stables boarding six or more horses in the County.

TRAIL USER GROUPS

There are several organizations in the metropolitan area which promote trail activities.

WASHINGTON AREA BICYCLIST’S ASSOCIATION (WABA): Founded in 1972, WABA is a local, advocacy organization working to improve the bicycling conditions in the Washington Metropolitan Area and to encourage bicycle use as an alternative to the automobile.

WABA has approximately 750 members. Of the 210 Maryland members, the majority are from Montgomery and Prince George's County.

POTOMAC PEDALERS TOURING CLUB, INC. (PPTC): The largest bicycling organization in the Washington Metropolitan area with nearly 4,000 members. Forty-one percent of these members are from Maryland, largely from Montgomery and Prince George's Counties. PPTC offers opportunities for touring cyclists, utilitarian cyclists and racers.

MONTGOMERY COUNTY ROAD RUNNERS CLUB (MCRRC): A non-profit, educational organization which promotes personal health and fitness through the sport of running. The club sponsors regular running activities, including training sessions and races on the Rock Creek hiker-biker trail. The MCRRC has approximately 1,900 members.

POTOMAC APPALACHIAN TRAIL CLUB (PATC): Approximately 3,000 volunteers whose main purpose is to manage and maintain a portion of the Appalachian Trail and to preserve the lands through which it goes. The club also maintains 500 miles of other trails of which approximately 100 miles are in the metropolitan area, including the Cabin John Stream Valley in Montgomery County. The Club leads hikes in many of our parks.

TRAIL RIDERS OF TODAY (TROT): An equestrian organization of more than 700 members founded in 1980 to preserve what remains of a network of equestrian trails in Montgomery and adjacent counties. About half of TROT's membership ride in Montgomery County. TROT performs routine maintenance on equestrian trails in Montgomery County parks.
POTOMAC BRIDLE AND HIKING TRAIL ASSOCIATION (PBHTA): An association of Potomac area residents who are dedicated to maintaining the existing hiking and equestrian trails in the area, and developing new trails. Formed in the late 1950's, this group now has about 150 members, mostly families. PBHTA publishes a bi-annual newsletter and organizes group rides and family outings.

CENTER HIKING CLUB: This hiking club has more than 800 members and schedules an average of three events a week, generally including one local hike, one mountain hike and occasional bicycling trips.

ADULT SPORTS IN THE METROPOLITAN AREA

FIGURE 1
chapter 2:

HIKER-BIKER TRAILS
INTRODUCTION

This chapter examines national trends in bicycling, identifies needs for paved hiker-biker trails in Montgomery County parks and includes an inventory of existing and proposed trails and regional trail systems.

NATIONAL TRENDS IN BICYCLING

Bicycling in the United States began in the 1880's with the introduction of the high wheel from England. Bicycling for sport and recreation, as well as transportation, flourished during the late 19th century.

With the advent of the automobile and its profound effects upon transportation and lifestyle, the bicycle declined in significance. The popularity of bicycling for other than youthful recreation significantly diminished.

The early 1970's saw the reintroduction of the bicycle into American life. Concerns about the effect of automobile transport on the environment, rising gas prices and increased interest in health and fitness significantly increased the popularity of bicycling. The multi-geared, lightweight, European-style bicycles helped attract adults to bicycling. The popularity of bicycling is still growing.

Cycling was ranked third behind swimming and general exercise in a 1985 sports census by The Sporting Goods Dealer magazine. The census reported that 78.1 million Americans, more than one-third of the U.S. population, ride bicycles. The census also reported that 7.4 million Americans over age 50 ride bicycles. In the Washington Metropolitan Area, bicycling was rated as the most popular sport, having increased in popularity nearly 13% since 1986.

More people were bicycling in the United States for recreation, fitness, and competition during 1988, and more are expected to ride in 1990 than ever before, according to the Bicycle Federation of America.

Table 2.1 indicates the magnitude and trends in bicycle use in the United States. Figure 2 which follows compares bicycle and auto sales. It is interesting to observe the continued increase in bicycle sales and use in the last decade.
### BICYCLE USE IN THE UNITED STATES
1983-1988 (in millions)

<table>
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<tr>
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<th></th>
<th></th>
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<tr>
<td>Total U.S. bicyclists</td>
<td>72.0</td>
<td>75.0</td>
<td>78.0</td>
<td>82.0</td>
<td>85.0</td>
<td>88.0</td>
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<tr>
<td>Adults riding regularly (average once a week)</td>
<td>10.0</td>
<td>11.0</td>
<td>12.0</td>
<td>14.0</td>
<td>17.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Bicycle commuters</td>
<td>1.5</td>
<td>1.6</td>
<td>1.8</td>
<td>2.0</td>
<td>2.2</td>
<td>2.7</td>
</tr>
<tr>
<td>Racing (in thousands)</td>
<td>40K</td>
<td>75K</td>
<td>100K</td>
<td>120K</td>
<td>150K</td>
<td>180K</td>
</tr>
<tr>
<td>All-terrain bike users</td>
<td>0.2</td>
<td>0.5</td>
<td>1.1</td>
<td>2.6</td>
<td>5.0</td>
<td>7.5</td>
</tr>
<tr>
<td>Touring &amp; vacations</td>
<td>0.50</td>
<td>0.55</td>
<td>0.60</td>
<td>0.75</td>
<td>0.85</td>
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<td>Event participants</td>
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<td>1.2</td>
<td>1.2</td>
<td>1.8</td>
<td>2.4</td>
</tr>
</tbody>
</table>

(Source: Pro Bike News, April 1989)  

### TABLE 2.1

### TRENDS IN BICYCLE AND AUTO SALES

**SALES IN MILLIONS**

![Bar chart showing trends in bicycle and auto sales from 1977 to 1987](image)

*Source: Pro Bike News, April 1989*

**FIGURE 2**
NATIONAL TRENDS IN 
FITNESS WALKING 
AND JOGGING

Fitness walking is growing in popularity. In 1987 more than seven million new participants joined the sport. The National Sporting Goods Association estimates that in 1987 more than 58 million Americans were walking for fitness. A 1989 survey by American Trails and the National Park Service indicated that nearly 100 million Americans walk for fitness or pleasure.

Fitness walking is a lifetime exercise that can be enjoyed by all age groups. The only required equipment is a sturdy pair of walking shoes. Fitness walking is less stressful on the joints and the heart than running or jogging and produces similar benefits. Walking at a brisk pace of four to five miles an hour for 30 to 45 minutes produces the same benefits as jogging at a medium pace for 20 to 30 minutes.

The popularity of fitness walking is increasing among the age 55 and older group. Nearly 16 million, or approximately 31% of the total population aged 55 or older, walk for exercise. Fitness walking is often prescribed as treatment after a heart attack because it helps recondition the damaged heart muscle without the stress associated with running or jogging.

Running and jogging remains popular. 2.6 million persons began running or jogging for fitness in 1987 for a total of nearly 25 million.
LOCAL DEMAND FOR HIKER-BIKER TRAILS

Recent surveys by the Montgomery County Department of Parks indicate that hiker-biker trails are one of the most popular facilities within our park system. Hiker-biker trails in 1987 had an average use rate of 44 users per hour. Most of the use occurs on weekday evenings or weekends. Hiker-biker trail activities are fairly evenly distributed between bicycling (35%), jogging (33%) and walking (31%). Hiker-biker trail users regularly use the trails 1-3 times per week.

Hiker-biker trails fulfill many recreation needs. In addition to bicycling and pedestrian activities, the asphalt surface and trail grade provides a generally accessible facility for wheelchairs, as well as parents with strollers. In addition, the 55 and older age group in this County is one of the fastest growing populations, and the interest in walking for fitness among this age group is increasing rapidly. Hiker-biker trails provide a safe, enjoyable environment for our older residents.

Hiker-biker trails in parks are primarily designed for recreational bicycling of 10-12 miles per hour. These trails generally wind through our parks taking advantage of the natural contours and providing a pleasing environment. The design, however pleasing, does not always provide the most direct route. The utilitarian bicyclist who uses the bicycle for transportation will generally choose on-road bike lanes over the hiker-biker trail. In addition to a longer route, the speeds traveled by the utilitarian bicyclist may exceed 20 miles per hour. It is dangerous to mix bicyclists going this speed with other users on a recreational trail.

Bicycling on roadways should be encouraged as part of a package of alternatives to automobile travel and roadways should be enhanced to safely accommodate automobiles and bicycles. Bicycling is a non-polluting, highly energy efficient mode of transit. For comparison, a study by the International Bicycle Fund found that an auto would have to achieve the equivalent of 1,400 miles per gallon of gasoline to match the energy efficiency of a bicyclist traveling at a moderate speed of 15 miles per hour.

In addition to hiker-biker trails under the jurisdiction of the Montgomery County Department of Parks, there are other agencies that provide hiker-biker trails or bikeways in the County. Table 2.2 summarizes the miles of bicycling facilities available in the County. Appendix 1 summarizes requests received for new hiker-biker trails in Montgomery County Parks.
BICYCLING IN MONTGOMERY COUNTY

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<thead>
<tr>
<th>JURISDICTION</th>
<th>EXISTING MILES</th>
<th>ADDITIONAL MILES PROPOSED</th>
<th>TOTAL MILES PROPOSED</th>
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<tr>
<td>M-NCPPC PARK TRAILS</td>
<td>33</td>
<td>41</td>
<td>74</td>
</tr>
<tr>
<td>COUNTY DEPARTMENT OF TRANSPORTATION BIKEWAYS</td>
<td>78</td>
<td>35.8</td>
<td>113.8</td>
</tr>
<tr>
<td>(INCLUDES ON-ROAD ROUTES)</td>
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<td></td>
<td></td>
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<tr>
<td>CITY OF ROCKVILLE</td>
<td>9.5</td>
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<td>CITY OF GAITHERSBURG</td>
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<td>STATE OF MARYLAND</td>
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<tr>
<td>SENECA CREEK STATE PARK</td>
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<td>7</td>
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<td>NATIONAL PARK SERVICE</td>
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<td></td>
<td></td>
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<tr>
<td>C&amp;O CANAL TOWPATH (UNPAVED)</td>
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<tr>
<td>TOTALS</td>
<td>165.3</td>
<td>79.3</td>
<td>244.6</td>
</tr>
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</table>

**TABLE 2.2**

The extensive park system provides many opportunities for hiker-biker trails. The Department of Parks has been developing trails since 1973, and to date, approximately 33 miles have been completed. Table 2.3 below details the existing hiker-biker trail system.

**HIKER-BIKER TRAILS IN MONTGOMERY COUNTY PARKS**

<table>
<thead>
<tr>
<th>PARK</th>
<th>MILEAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLACK HILL REGIONAL PARK</td>
<td>2.0</td>
</tr>
<tr>
<td>LITTLE FALLS STREAM VALLEY</td>
<td>3.5</td>
</tr>
<tr>
<td>LONG BRANCH STREAM VALLEY</td>
<td>1.2</td>
</tr>
<tr>
<td>NORTHWEST BRANCH STREAM VALLEY</td>
<td>1.0</td>
</tr>
<tr>
<td>PAINT BRANCH STREAM VALLEY</td>
<td>4.9</td>
</tr>
<tr>
<td>(INCLUDES MLK RECREATIONAL PARK)</td>
<td></td>
</tr>
<tr>
<td>ROCK CREEK STREAM VALLEY</td>
<td>14.2</td>
</tr>
<tr>
<td>(INCLUDES ROCK CREEK REGIONAL PARK)</td>
<td></td>
</tr>
<tr>
<td>SLIGO CREEK STREAM VALLEY</td>
<td>6.7</td>
</tr>
<tr>
<td>(INCLUDES WHEATON REGIONAL PARK)</td>
<td></td>
</tr>
<tr>
<td>TOTAL MILES</td>
<td>33.5</td>
</tr>
</tbody>
</table>

**TABLE 2.3**
REGIONAL
HIKER-BIKER TRAILS
IN MONTGOMERY COUNTY

Montgomery County hiker-biker trails connect to other major trail systems within the Washington-Metropolitan Area to form a regional trail network.

The Northwest Branch hiker-biker trail is a one mile trail in Montgomery County between I-495 and the Prince George's County line. It continues for an additional five miles south to Ager Road in Prince George's County. A connection to the Northeast Branch hiker-biker trail in Prince George's County is proposed with an ultimate connection to the Anacostia watershed.

The Rock Creek hiker-biker trail is a 14 mile trail in Montgomery County between Lake Needwood in Rock Creek Regional Park and the Montgomery County/District of Columbia border. It is part of a larger network. At the County line the trail continues through Rock Creek Park and continues 7.6 miles to Georgetown and the C & O Towpath. The trail also continues to the Mall and connects to the Theodore Roosevelt Bridge. From there, one can continue west along the Custis Trail (I-66) or south along the George Washington Parkway to Alexandria and Mount Vernon. The trail also connects to the Arlington Memorial Bridge which passes through Arlington National Cemetery along US-50 into Fairfax County.

The Maine-to-Virginia link of the East Coast Bike Route enters Montgomery County from Howard County at New Hampshire Avenue (RT. 650). It currently runs west of the City of Rockville via surface streets. An extension of the Rock Creek hiker-biker trail to Muncaster Mill Road or the Agricultural History Farm Park would enable riders to use the Rock Creek hiker-biker trail rather than surface streets within the County. This trail connects to Rock Creek Park in the District of Columbia, crosses the Memorial Bridge and continues on the Mt. Vernon trail. South of Mount Vernon, the East Coast Bicycle Route uses Bike Route 1, an on-road route installed by the Commonwealth of Virginia in 1973.

The Little Falls Stream Valley hiker-biker trail can be utilized to reach the 163 mile C & O canal trail which extends from Georgetown in Washington, D.C. to Cumberland, Maryland.
I-NCPPC • EXISTING • PROPOSED

THE CAPITAL CRESCENT TRAIL IS NOT CURRENTLY PROPOSED FOR FUNDING BUT MAY BE ADDED TO THE PROGRAM AT A LATER DATE. THE PORTION FROM SILVER SPRING TO BETHESDA WILL BE CONSTRUCTED BY THE DEPARTMENT OF TRANSPORTATION.

M-NCPPC EXISTING AND PROPOSED PARKS
STATE, W.S.S.C. AND NATIONAL PARKS
PROGRAMMED HIKER-BIKER TRAILS

The following hiker-biker trails are programmed in the FY 91-96 Capital Improvements Program:

Magruder Branch Hiker-Biker Trail: This is the first hiker-biker trail in the up-county area. The first phase will be between Sweepstakes Road and Valley Park Drive. The second phase is between Sweepstakes Road and Damascus Recreational Park.

Sligo Creek Hiker-Biker Trail Extension: The existing trail is 6.7 miles long between Wheaton Regional Park and Piney Branch Road. The trail will be extended 1.5 miles to the County line. Prince George's County will extend the trail to Ager Road. The trail will then connect to the Northeast Branch hiker-biker trail and ultimately to the Anacostia watershed.

Northwest Branch Stream Valley and Recreational Park: A hiker-biker trail north of Wheaton Regional Park through the Northwest Branch Stream Valley to the Recreational Park is programmed. This will provide direct access from Wheaton Regional Park and the Sligo Creek Stream Valley to Northwest Branch Recreational Park. Also, the Sligo Creek hiker-biker trail could be linked indirectly to the Rock Creek hiker-biker via the proposed Rockville Facility and Matthew Henson State Park hiker-biker trails.

Park Road Shoulders: Beach Drive and Sligo Creek Parkway have high volumes of bicycle traffic on the roadway. Shoulders will be added to the park roads where possible to provide additional roadway for cyclists. Shoulders enhance the safety of the bicyclist as well as facilitate traffic flow.

Meadowbrook Lane to Candy Cane City: A connection between East-West Highway and Candy Cane City is programmed. One possibility is to improve the existing trail along Meadowbrook Lane. The current two-way bike lane on the southbound side of Meadowbrook Lane should be made into a one-way bike lane and a separate 4' lane should be placed on the northbound side. This will remove the hazard of bicycles traveling against traffic. Past the curve on Meadowbrook Lane, a separated hiker-biker trail should be constructed along the grass shoulder between the roadway and the shoulder. There is no sidewalk along this road.
PROPOSED
HIKER-BIKER TRAILS

The following hiker-biker trails are proposed for addition to the Capital Improvements Program beyond FY 96:

Rock Creek Stream Valley Unit 2: A connector from the existing hiker-biker trail along Kensington Parkway would provide access to the MARC station and the Kensington commercial district, and link Rock Creek Hills, Kensington-Frederick Avenue, and Kensington Cabin Neighborhood Parks.

The Long Branch Hiker-Biker Trail: Extension of the existing trail north of the Long Branch Recreation Center will provide access to the soon to be renovated recreation center, and improve access to the Long Branch-Arliss Neighborhood and Long Branch-Wayne Local Parks.

The Capital Crescent Trail: This is an 11 mile abandoned railroad-right-of-way between Silver Spring and Georgetown. 7.3 miles of the right-of-way are within Montgomery County, and the remainder are in the District of Columbia. The corridor intersects the C & O Canal Historical Park in D.C. and the Rock Creek and Little Falls hiker-biker trails in Maryland and will provide an off-road recreation and transportation corridor for the metropolitan area.

Matthew Henson State Park/Rockville Facility Right-of-Way: Development of a hiker-biker trail within this corridor will provide a valuable east-west connection between the Rock Creek hiker-biker and Northwest Branch Recreational Park, as well as local and neighborhood parks. The Matthew Henson State Park property is owned by the Maryland Department of Natural Resources, but managed by the Department of Parks.

Great Seneca Extension: A hiker-biker trail through Great Seneca Extension would link the City of Gaithersburg, Seneca Creek State Park, Magruder Branch Stream Valley Park and Goshen Recreational Park.

Gude Drive Recreational Park: A hiker-biker trail through Gude Drive Recreational Park would connect to the planned DOT bikeways on West Edmonston and Old Baltimore Roads and to the Rock Creek hiker-biker trail.

Rock Creek Regional Park/Agricultural History Farm Park: An extension of the existing Rock Creek hiker-biker trail would provide non-motorized access for the local communities to the Agricultural History Farm Park, Rock Creek Regional Park and connect to planned County bikeways along the Mid-County Highway, Airpark Road and Muncaster Mill Road. The trail surface could be designed as a multi-purpose trail. Extension of the trail beyond Muncaster Mill Road would require a grade-separated crossing.

Northwest Branch Recreational Park: The programmed multi-use trail should include a trail through the Recreational Park to provide access to the surrounding communities.

Little Bennett Regional Park: Prescott and Clarksburg Roads should be made bicycle compatible to encourage bicycle entry into the park.
PROPOSED MULTI-USE TRAIL CORRIDORS

The Planning Guide for Trails recognizes the need for multi-use trails and recommends their utilization wherever feasible. Multi-use trails combine several trail uses within the same corridor to minimize the impact of the trail upon the surrounding resources. Multi-use trails generally consist of two parallel trails, an asphalt trail for walkers and bicyclers, and a natural surface trail for hikers and equestrians. It is desirable to separate the trails slightly by vegetation to minimize conflicts. A minimum of 12' is needed for a multi-use trail.

This planning guide recommends approximately 16 miles of multi-purpose trails. These would be most appropriate for a future trail along the Rockville facility right-of-way and along the northern section of Northwest Branch.
chapter 3:

JOINT-USE

EQUESTRIAN AND HIKING TRAILS
CHAPTER 3:

JOINT-USE EQUESTRIAN AND HIKING TRAILS

INTRODUCTION

Many soft surface trails can be used by both hikers and equestrians. Although much of the discussion on the following pages relates to equestrian activity, these trails are equally used by hikers. Specific information on hiking trails is included in the next chapter.

The following sections examine trends in equestrian activity, demand for trails, existing equestrian/hiking trails, and future proposals for joint-use trails.

NATIONAL TRENDS IN EQUESTRIAN ACTIVITY

Horseback riding is a sport enjoyed by many across the country. It is not just a sport for the very wealthy; people from a wide variety of economic groups, backgrounds and physical abilities ride regularly.

Horseback riding provides many benefits including exercise for both horse and rider, a chance to experience nature by traveling through forest and fields and the pleasure and companionship derived from working with a horse. It also provides an opportunity to experience nature for individuals unable to travel trails by foot. Horseback riding provides benefits to disabled children by increasing self-confidence and permitting mobility that they cannot otherwise enjoy.

Participation in trail riding is increasing. Nationally, long distance endurance races on horseback are growing in popularity as is trail riding for recreation. In a 1989 survey, American Trails reported that horseback riding for pleasure and sport is growing. In 1960 there were an estimated 7.8 million equestrians in the United States. Today there are more than 17 million. The North American Trail Ride Conference (NATRC) is a national organization for competitive trail riding founded in 1961. In 1972 NATRC had 494 members. By 1989 membership had reached 1193. In addition to increased participation in the sport, organizations dedicated to the preservation of horse trails have formed.
LOCAL DEMAND FOR EQUESTRIAN TRAILS

Local demand for equestrian trails has risen in recent years as trail riding has become more popular and private land available for riding has decreased. Montgomery County's farms and forests once provided local riders with a variety of opportunities for trail riding. Today, private trails are rapidly disappearing as land is subdivided. The pressure on public land management agencies, including the Department of Parks, to provide for these lost opportunities is increasing. A recent survey estimated that there are more than 12,000 pleasure riders in the County.

Trail Riders of Today (TROT), is an equestrian organization devoted to equestrian trail preservation. TROT began as a small, local group with 20 members organized to save equestrian trails in the Paint Branch area. TROT now has more than 750 members, largely from Montgomery, Frederick, and Howard counties, but also has members from other areas in the Mid-Atlantic region. Local members of TROT have been actively involved in parkland equestrian trail development issues, as well as in preserving access to parkland trails by acquiring public equestrian easements across adjacent private lands. The growth in TROT's membership indicates that local riders are concerned about the loss of equestrian trails in the area, and are working to slow this trend.

There are four public agencies which manage land in Montgomery County that have equestrian trails. Table 3.1 summarizes the public land available for equestrian use. In addition, equestrian activity is permitted on Sugarloaf Mountain which is private land available for public use. Private equestrian trails are also available at stables and farms in the County. There are an estimated 60 licensed stables in the County that provide boarding and/or riding opportunities. There are also numerous trails used on an informal basis with maintenance done solely by the rider. These trails were examined for this guide and the recommendations for areas in which to continue joint-use equestrian trails as part of the managed park trail system are addressed later in this chapter.

The Special Operations Division of the M-NCPPC Park Police has an equestrian unit to patrol parkland. Cleared and maintained equestrian trails improve access to parkland that is generally not accessible by patrol car and increase safety for the horse and rider by removing overhanging vegetation and improving lateral clearance.

A summary of requests for additional trails, as noted in the Equestrian Trail Use Survey conducted in 1989 by the Department of Parks, is listed in the appendix.
## JOINT-USE EQUESTRIAN AND HIKING TRAILS IN MONTGOMERY COUNTY

<table>
<thead>
<tr>
<th>JURISDICTION</th>
<th>MILES</th>
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<td>11.6</td>
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<tr>
<td>LITTLE BENNETT REGIONAL PARK</td>
<td>8.6</td>
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<tr>
<td>WHEATON REGIONAL PARK</td>
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<td>STATE OF MARYLAND</td>
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<tr>
<td>PATUXENT RIVER STATE PARK</td>
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<td>SENECA CREEK STATE PARK</td>
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<tr>
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<tr>
<td>C &amp; O CANAL</td>
<td>27.5</td>
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<tr>
<td>GREAT FALLS</td>
<td>6.0</td>
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<tr>
<td>WASHINGTON SUBURBAN SANITARY COMMISSION</td>
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<tr>
<td>ROCKY GORGE RESERVOIR</td>
<td>13.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>103.3</td>
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**TABLE 3.1**
INFORMAL TRAILS IN MONTGOMERY COUNTY PARKS

An extensive informal network of trails has developed over the years. These trails have been used for many years by local equestrians, and in many parks the trails predate our acquisition of the property. These trails are not part of the managed park system. Routine maintenance is generally done by the local riders and/or members of TROT.

The 1989 Equestrian Trail Use Survey provided information about equestrian use on managed as well as informal trails. Of the 443 respondents, 35% indicated that they rode in Montgomery County parks, and it is likely that this figure is significantly higher. Almost half of the parkland users rode on park equestrian trails once a week. Table 3.2 summarizes use by park.

<table>
<thead>
<tr>
<th>PARK NAME</th>
<th>% OF USERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Bennett Regional Park</td>
<td>20.6%</td>
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<td>Upper Rock Creek S.V./Rock Creek R.P.</td>
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<td>Black Hill Regional Park</td>
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<tr>
<td>Wheaton Regional Park/Wheaton Stables</td>
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<td>Hawlings River Stream Valley Park</td>
<td>7.3%</td>
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<tr>
<td>Muddy Branch S.V./Maryland Horse Center</td>
<td>7.3%</td>
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<td>Lower Rock Creek S.V./Meadowbrook Stables</td>
<td>5.7%</td>
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<td>Paint Branch Stream Valley Park</td>
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<tr>
<td>Rachel Carson Conservation Area</td>
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<tr>
<td>Northwest Branch Stream Valley Park</td>
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<td>Watts Branch Stream Valley Park</td>
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<td>Burtonsville Local Park</td>
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<tr>
<td>Fairland Recreational Park</td>
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<tr>
<td>Great Seneca Extension S.V. Park</td>
<td>2.5%</td>
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<td>North Branch Stream Valley Park</td>
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<tr>
<td>Goshen Branch Stream Valley Park</td>
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<td>Damascus Recreational/Magruder Branch S.V. Park</td>
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</tr>
<tr>
<td>Blockhouse Point Conservation Area</td>
<td>0.7%</td>
</tr>
<tr>
<td>Dickerson Conservation Area</td>
<td>0.5%</td>
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<tr>
<td>Dry Seneca Creek Stream Valley Park</td>
<td>0.5%</td>
</tr>
<tr>
<td>Rock Run Stream Valley Park</td>
<td>0.2%</td>
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TABLE 3.2
AREAS OF EQUESTRIAN ACTIVITY IN MONTGOMERY COUNTY

* Shaded areas include horse boarding, or riding locations, as indicated by survey results.

REGION 1 (North)

REGION 2 (South)

REGION 3 (East)

LEGEND

ACQUIRED    PROPOSED

M-NCPPC Parkland

EQUESTRIAN ACTIVITY

ADMINISTRATIVE REGION BOUNDARY

SCALE IN MILES

FIGURE 4
FIGURE 5
MONTGOMERY COUNTY, MARYLAND

JOINT-USE HIKING & EQUESTRIAN TRAILS

- - - - M-NCPPC - EXISTING
----- M-NCPPC - PROPOSED

M-NCPPC EXISTING AND PROPOSED PARKS

STATE, W.S.S.C. AND NATIONAL PARKS
JOINT-USE TRAIL PROPOSALS

The Planning Guide reviewed the existing informal trails throughout our park system. The trails described below are trails which should be considered for designation as part of the formal Montgomery County Department of Parks joint-use trails network for hiking and equestrian use. There are many other informal trails not designated in this Guide because they are considered less suitable for use. For a discussion of the trail suitability factors, see Chapter 5.

The joint-use trail network developed in this guide largely utilizes existing informal trails. The implementation of trails along existing corridors would require little additional clearing or development. It is important to recognize the need to provide greenway trail connectors to the existing trail network by preserving access to the park trail system through adjacent developing subdivisions. This may be achieved through park dedication or public access easements. Consideration should also be given to obtaining trail easements through utility rights-of-way.

The focus of trail development should be on providing trails that are properly designed. Properly locating trails and providing the needed engineering and erosion control measures at the beginning will minimize trail maintenance beyond biannual clearing and inspection which may be done by volunteers or the Conservation Corps, and also minimize the impact to the surrounding area. Safe road crossings and small parking areas for horse trailers should be provided near trails wherever desirable.

Trails in the following parks should be reviewed as part of the Master Plan for each park, and if desirable, included as part of the park development:

Muddy Branch S.V./Maryland Horse Center: A trail system between the Maryland Horse Center and Es-worthy Road will serve local riders, and may increase the viability of the Maryland Horse Center. Trailer parking during non-event days should be permitted to provide local riders access to this trail. This trail would connect into the Blockhouse Point Conservation Park trail system and ultimately to the C & O Canal forming an equestrian circuit between Gaithersburg and the C & O Canal.

Northwest Branch Stream Valley Park: Equestrian use in Northwest Branch north of Wheaton Regional Park supports the Wheaton Stable as well as local riders in a highly urbanized area. Continuing equestrian use south of Wheaton Regional Park below the existing bluestone trail will require considerable attention and study. Because of severe environmental constraints in this area, staff will work with user groups, Natural Resources and region staff to see if an equestrian trail can be provided.
Fairland Recreational Park: Continuing equestrian use through Fairland Recreational Park serves residents of both Counties. There is a designated equestrian trail in the Prince George's County portion of the park which is part of the County Equestrian Plan. Fairland Recreational Park is part of a larger trail system that extends throughout eastern Montgomery County as well as northwestern Prince George's County through Little Paint Branch. Trailer parking is provided in the Prince George's portion of the park.

Paint Branch Stream Valley Park: This park provides opportunity for equestrian use within the rapidly urbanizing Route 29 Corridor. A circuit is formed via Valley Brook Drive between the Paint Branch and Northwest Branch Stream Valleys. Access to Fairland Recreational Park via easements and agreements is also possible.

Little Bennett Regional Park: Consideration should be given to providing trails parallel to Hyattstown Mill and Prescott Roads within the park. These trails would be developed to replace the existing Dark Branch trail. The trailer parking area at the end of Hyattstown Mill Road should be retained.

Watts Branch/Kilgour Branch Stream Valley Park: A joint-use hiking and equestrian trail in this area can serve as a link between the City of Rockville, the C&O Canal and Blockhouse Point Conservation Park. A parking area adjacent to Big Piney Way could serve as a public access point to this trail system.

Rock Creek Regional Park: Equestrian use on the east side of the park connects the Rock Creek Stream Valley with the Hawlings River Stream Valley and Rachel Carson Conservation Park via the Reddy Branch Stream Valley and Unit 4 of the North Branch of Rock Creek. Access to the Agricultural History Farm Park is addressed in the hiker-biker trail proposals. Additional hiking/equestrian trail proposals will be addressed during the update of the Rock Creek Regional Park Master Plan.

Rachel Carson Conservation Park/Hawlings River S.V. Park: These parks form the eastern boundary of a trail network which begins in the Rock Creek Stream Valley and continues into the Patuxent River State Park trail system. Access into the Patuxent River State Park trail system also provides access into the WSSC/Brighton Dam Trail System.

Reddy Branch Stream Valley: Reddy Branch provides the link between the North Branch of Rock Creek and the trail system which extends north and east from Hawlings River Stream Valley, including Patuxent River State Park and the equestrian trails in the WSSC watershed.

Great Seneca Extension: There is an opportunity to develop a long distance equestrian trail in this park. In addition to trail riding within Great Seneca Extension, the park provides direct access to the
equestrian trails in Seneca Creek State Park and indirect access via Seneca Creek State Park to the C & O Canal towpath and the equestrian trails in Blockhouse Point Conservation Park. Following acquisition of the remaining parcels, Great Seneca Extension also will be directly linked to the Magruder Branch Stream Valley Park.

**Magruder Branch Stream Valley/ Damascus Recreational Park:** An equestrian trail is programmed for this park between Damascus Recreational Park and Valley Park Drive and will generally parallel the programmed hiker-biker trail. Extension of this trail north will provide access into the Town Center when acquisition of the stream valley is complete.

Also, when acquisition of Great Seneca Extension is complete, extending the Magruder Branch Trail would connect to the trails in this park. Trailer parking should be allowed at Damascus Recreational Park when the fields are not permitted for team use.

**Goshen Branch Stream Valley Park:** A large portion of this stream valley park is under an agricultural lease. It is recommended that when the lease is renewed, equestrian access to Great Seneca Extension from Brink Road be provided.
chapter 4:

HIKING TRAILS
CHAPTER 4: HIKING TRAILS

INTRODUCTION
In addition to the many miles of joint use equestrian/hiking trails discussed in the previous chapter, there are several other trails that are available to Montgomery County residents desiring to hike on parkland. This section of the Planning Guide contains recommendations for unpaved trails in areas that are so steep, rocky, or environmentally sensitive that their use should be limited to hiking, and not include equestrian activity. Hiking trails are soft surface trails (generally dirt or woodchip) that traverse the more natural, undeveloped portions of our park system. They are often located in heavily wooded areas adjacent to streams and enable the user to feel far removed from the nearby urban environment.

TRENDS IN HIKING
Hiking trail use in the United States has been increasing steadily. In 1980, for example, each mile of trail was used six times more heavily than in 1960. In addition to an increase in the popularity of hiking, the number of miles of trails at the national level have declined. In 1936, there were approximately 132,000 miles of trails in the National Forests. Today, this figure has declined by 25% to approximately 98,500 miles. The increasing popularity of the sport, combined with the decreasing availability of trails, increases the pressures on the remaining resources. The demand for hiking and nature trails will continue as the public's interest in fitness and outdoor recreational opportunities grows.

According to a survey conducted by the National Sporting Goods Association, there were 17.4 million Americans who hiked for recreation and fitness in 1987. This number included more than 1.8 million new participants, an increase of more than 10% since 1986. Projections are that by the year 2000, more than 30% of the American population will be hiking for recreation and fitness.

Hiking can also be a lifelong activity. Older Americans can continue to participate in day hikes and nature walks on moderate terrain.

Locally, the number of hikers also continues to grow. In a survey of Adult Sports in the Washington Metropolitan Area in 1988, hiking/backpacking was second only to bicycling in popularity. Hiking ranked ahead of many activities, including jogging, distance running and tennis. An estimated 556,000 adults, or nearly 22% of the adult population in the Washington Metropolitan Area, went hiking in 1988. This is an increase of 7% since 1986. This figure closely approximates the 1985-87 Public Area Wilderness Study which estimated that 24% of the American population nationwide enjoys hiking.
LOCAL DEMAND FOR HIKING TRAILS

As the demand for outdoor recreation and fitness continues, and the miles of trails available in National Forests declines, local demand for hiking trails will increase. Table 4.1 summarizes the miles of hiking trails available in the County.

MILES OF HIKING TRAILS AVAILABLE IN MONTGOMERY COUNTY

<table>
<thead>
<tr>
<th>AGENCY</th>
<th>AVAILABLE MILES</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-NCPPC PARK TRAILS</td>
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</tr>
<tr>
<td>HIKING ONLY</td>
<td>34.3</td>
</tr>
<tr>
<td>JOINT-USE EQUESTRIAN (Hiking Permitted)</td>
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<tr>
<td>MD DEPARTMENT OF NATURAL RESOURCES</td>
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<td>HIKING ONLY</td>
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<td>JOINT-USE EQUESTRIAN (Hiking Permitted)</td>
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<tr>
<td>NATIONAL PARK SERVICE</td>
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<tr>
<td>HIKING ONLY</td>
<td>23.1</td>
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<tr>
<td>JOINT-USE EQUESTRIAN (Hiking Permitted)</td>
<td>27.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>153.2</td>
</tr>
</tbody>
</table>

TABLE 4.1
Hiking trails, soft surface trails of natural surface or woodchips, are most frequently found in regional parks. There are currently over 34 miles of exclusive hiking trails in Montgomery County parks, and eight additional miles are proposed.

In addition, 23 miles of hiking trails are provided as joint-use trails. Table 4.2 summarizes the miles of hiking trails in Montgomery County parks. Chapter 3 details the joint-use trail system in the County.

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<thead>
<tr>
<th>PARK NAME</th>
<th>MILES AVAILABLE</th>
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<tr>
<td>BLACK HILL REGIONAL PARK</td>
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<td>CABIN JOHN REGIONAL PARK</td>
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<td>WHEATON REGIONAL PARK</td>
<td>4.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>34.3</td>
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</table>

TABLE 4.2
REGIONAL HIKING TRAILS IN MONTGOMERY COUNTY

Hiking trails in Montgomery County parks connect to other major trail systems within the Washington-Metropolitan Area and form regional trail networks.

Blockhouse Point Conservation Park has a 2.4 mile hiking trail system that connects to a 2.3 mile joint-use equestrian trail. Hikers in Blockhouse Point can access the C & O Canal towpath at Pennyfield Lock via the joint-use equestrian trail. Hikers may continue their hike along the towpath, enter Great Falls National Park (C&O Canal) to the southeast or Seneca Creek State Park to the west. An extended trip may be made by accessing the Appalachian Trail at the Gold Mine Trail or continuing west along the towpath to Harper’s Ferry National Historical Park. Camping is available along the towpath, along the Appalachian trail and at Harper’s Ferry.

The Potomac Appalachian Trail Club maintains a 5.8 mile trail through the Cabin John Stream Valley between Cabin John Regional Park and MacArthur Boulevard. The C & O Canal towpath, and the related trails, can be easily accessed from MacArthur Boulevard.

PROPOSED HIKING ONLY TRAILS

There are many informal trails throughout our park system that are currently used for hiking. The following proposals would provide improved hiking areas in Northwest Branch and Fairland Recreational Parks. Chapter 3 details the proposed joint-use hiking and equestrian trails.

Northwest Branch Stream Valley Park: Improving the existing informal hiking only trail between Route 29 and Wheaton Regional Park would provide a safe and attractive area for hiking and interpretive activities. This park is frequently used by park naturalists for interpretive walks. Defining access for the communities would decrease the erosion created by the array of informal access trails. It may be necessary to improve the drainage and provide some surfacing at areas along the trail. Continuing the trail across Colesville Road is not advisable. This area is very steep and rocky. Maintenance, patrol or emergency vehicle access would be extremely difficult. Also, it would be necessary to cross Colesville Road at-grade and this is not desirable.

Fairland Recreational Park is a bi-County park. A network of interpretive hiking only trails is recommended in connection with the proposed Nature Center. In addition, it is recommended that Fairland Recreational Park be the site of the first multi-sensory trail in Montgomery County. A multi-sensory trail is a short loop trail designed to be fully accessible to all individuals.
HIKING ONLY TRAILS

- - - - M-NCPPC - EXISTING

- - - - M-NCPPC - PROPOSED

M-NCPPC EXISTING AND PROPOSED PARKS
STATE, W.S.S.C. AND NATIONAL PARKS
chapter 5:

TRAIL PLANNING

AND DEVELOPMENT PROCESS
CHAPTER 5: TRAIL PLANNING AND DEVELOPMENT PROCESS

INTRODUCTION
This chapter discusses all aspects of the planning and development process for trails including evaluation of trail routes, funding and construction. Additional information on construction and maintenance is located in the appendix of the report.

TRAIL PLANNING PROCESS
The trail planning process is designed to determine the appropriate trail development for a given park. The goal is to satisfy the recreational demand for trails provided environmental impacts can be held to an acceptable level.

The first step in developing the Planning Guide for Trails was to develop a comprehensive inventory of the existing trails network. There is an extensive network of informal trails within the park system, some of which are redundant in purpose or located in sensitive ecological areas. These are trails that were developed over time by users. For example, while working on the trail plan for Blockhouse Point Conservation Park, staff recorded several miles of trails, many of which ended at the overlooks. The trail plan that was developed for the park retains access to the overlooks, but directs users on a path that is least disruptive to the environment and has reclaimed many of the trails through the more fragile areas. Informal trails are not maintained by the Department of Parks. As the Master Plan is drafted for a park and a formal trail system is designated, remaining trails may be closed and/or restored, if necessary.

INVENTORY OF EXISTING TRAILS

Formal Trails Inventory
Developing the inventory of formal, officially recognized trails was a straight-forward process of collecting source documents, including construction drawings for hiker-biker trails and trail maps for hiking and equestrian trails. The formal trails, however, are only a small part of the entire trails network in the County.

Informal Trails Inventory
The extent of the informal trails network within our park system was largely unknown at the start of this Planning Guide. In order to fully evaluate the demand for trails within our park system, as well as to properly manage our resources, it was necessary to develop an inventory of the informal trails. The process used to develop the informal trails inventory was to:

1. Gather topographic base maps for each park and assemble available floodplain and wetlands information.

2. Acquire leaf-off aerial photography for the parks under consideration. Aerial photography was used to locate many trails. These trails were then transferred to the topographic base maps for in-house evaluation. This
process saved considerable staff time in the field. Staff located many trails from the aerials thus avoiding the trial-and-error approach of searching for trails in the field.

(3) Acquire as much information as possible from trail users. The Trail Riders of Today (TROT), the Potomac Appalachian Trail Club, (PATC), and the Center Hiking Club provided maps of the trails they were using. These trails were compared to our existing inventory and any new information was added to our base maps. The trail information gathered from the aerials, together with user group information and existing trail maps, formed the inventory of informal trails in Montgomery County Parks.
TRAIL EVALUATION PROCESS

The Trail Evaluation Process is designed to evaluate the recreational demand for trails as well as to provide a preliminary assessment of the impact of the existing and proposed trails in our park system. The goal of the Department is to provide for the recreational use of a park while minimizing or mitigating the impact upon the resource.

Recreational Demand
The recreational demand for trails is a function of the current level of use as well as the projected need. Hiker-biker trail use surveys confirmed the popularity of the facility and made specific recommendations for new trail corridors. Specific requests by citizens or user groups were also considered.

The level of use on informal hiking and equestrian trails was assessed through field work and the results of the 1989 Equestrian Trail Use Survey. Trails that were identified with aerial photographs, but were overgrown when field checked, were considered to be in low demand. Trails that were used frequently (e.g. well worn paths, manure on trails, or recent trail maintenance) were considered to be in high recreational need. The number of horses in an area was also considered when evaluating the demand for equestrian trails.

When a new paved hiker-biker trail is constructed over a soft surface trail previously used by hikers and equestrians, a relocated soft surface trail should be provided whenever desirable and feasible, if space is available to accommodate both trails.

Resource Assessment
There are six general design principles to minimize impact upon the resources:

(1) Trails should be located to avoid wetlands and other perennially wet soils;
(2) Trails should be located outside of, or at the limits of, the floodplain;
(3) Trails should avoid steep slopes;
(4) Trails should avoid fragile root systems in order to prevent early tree mortality;
(5) Existing trails should be retained and improved wherever possible to minimize resource disturbance and project costs. In addition, it is important to realize that existing trails developed because they met users needs. Significantly deviating from the existing alignment may result in a new trail that is seldom used, while use on the existing trail continues; and
(6) Multiple use corridors should be developed wherever possible. In parks where there are to be hiker-biker as well as joint-use equestrian trails, multiple use corridors
help to contain the impact. The trail evaluation process began by identifying the desired trail corridors based on recreational demand. A preliminary review of the resources along the proposed corridor was made. This review will be expanded to further evaluate the feasibility of the trail proposals.

The following conditions were then reviewed for each trail:

**Trail Location:** The proposed trail should be located outside the floodplain and any wetlands to the greatest extent possible. If it is necessary to locate a section of trail within these areas it should be on the perimeter and it will be necessary to provide measures to minimize or mitigate the impact.

**Grade:** The trail proposal should follow the contours of the land. Grades generally should not exceed 8% and short sections generally should not exceed 10%. Erosion control measures may be required for slopes greater than 8%.

**Soil:** The trail proposal should be routed to avoid highly erodible soils in order to minimize erosion and compaction of the soil. Where this is not practical, methods of minimizing impact, including improving drainage, installing erosion control measures, or providing surfacing along sections of the trail should be considered.

**Flora and Fauna:** The trail proposal should be aligned to avoid rare, endangered or fragile species and to not disrupt wildlife habitats.
TRAIL DEVELOPMENT & IMPLEMENTATION

TRAIL DEVELOPMENT SCHEDULE

The trail planning process included a preliminary review of the feasibility of the trail proposals in terms of need as well as preliminary impact to the surrounding resources. The trail phasing process is designed to prioritize and guide the development of the trail network over time. The development criteria are based upon the goals and objectives of the Planning Guide for Trails.

Following the trail evaluation process, each feasible proposal was then evaluated according to the trail phasing criteria to prioritize its order of review. The trail proposal was given a score on a scale of one to ten, with ten being the highest score, for each criterion. Each trail type was evaluated separately. The points for each trail proposal were totaled and ranked against the other trail proposals in the category. The greater the total points, the sooner the trail should be more fully considered for development. The trail development schedule is outlined in Table 5.2.

Trail Phasing and Evaluation Criteria:
(1) Will the proposed trail connect to an existing trail, thus providing a more extensive network of trails?
(2) Is the proposed trail the first in the area?
(3) Is the proposed trail easily accessible to a significant number of residents?
(4) Will the proposed trail provide access to parks, recreation and open space?
(5) Will the proposed trail facilitate access to public institutions and commercial areas?
(6) Is the proposed trail valuable for historic, cultural, geographic or scenic reasons?
(7) Will the proposed trail be accessible to people with disabilities?
(8) Will the proposed trail significantly disrupt the surrounding environment?

TRAIL IMPLEMENTATION PROCESS

The proposed trails program should be implemented through the Capital Improvements Program (CIP). At present there are CIP projects for hiker-biker and equestrian trails. It is recommended that the existing equestrian trails Capital Improvements Program be expanded to include joint-use trails for hiking and equestrian activities.

Trail alignments proposed in this Planning Guide will be defined during the design and engineering phase of trail development. This phase of the development process will finalize trail alignment and recommend appropriate engineering. The first step in the design phase is the evaluation stage. The purpose
of this stage is to review current information about the demand for and impacts of the proposed trail corridor. This information provides the basis for the build/no build recommendation which would be presented to the Park Commission for approval.

It is important to evaluate the present conditions to determine if conditions have changed significantly since the trail was first identified in the Planning Guide. For example, a new utility right-of-way may be planned that did not exist when the trail corridor was first identified. It would be necessary to evaluate the utility corridor to determine if it would be a better choice for the trail alignment.

It is also important to determine if the need for a proposed trail has changed significantly. During the evaluation stage, the current and projected demographics of the area should be reviewed to further evaluate the need for the recommended trail. It may be necessary to modify the trail proposal to reflect the current and likely future trail users if there has been a significant change in the population. For example, an area that was generally large acreage lots with horses at the time this Planning Guide was developed may have been sold and subdivided subsequent to the development of the recommended equestrian trail. It may then be determined that there is no longer a significant need to provide equestrian trails in the area and that the existing and future users would be better served by hiking or bicycling trails, or that there is no longer a demand for any trails.

The resources of the area will be further evaluated during this stage. Soils and wetlands maps will be reviewed to identify any areas that may need engineering for erosion control or improved drainage, or areas that should be avoided. A flora and fauna inventory, as well as an archaeologic and historical resources inventory will be conducted along any corridors proposed for clearing to preserve any natural, cultural or historical resources.

The recommended action will be based upon the results of the evaluation stage. Every effort shall be made to accomplish the goals of this Planning Guide. It is recognized, however, that there may be instances in which it is in the best overall interest of the Department of Parks not to proceed with a project. Elimination of a project may be recommended, for example, if the findings of the evaluation stage indicate that the need for the trail has significantly decreased, the impact to the ecology of the area is significant, the cost of engineering and development is prohibitive, or there are inadequate resources to maintain the trail.

Project development or elimination shall require the Park Commission's approval.
## TRAIL CONSTRUCTION SCHEDULE

### HIKER-BIKER TRAILS

<table>
<thead>
<tr>
<th>PARK</th>
<th>PROJECT LIMITS</th>
<th>ESTIMATED MILEAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>MAGRUDER BRANCH</em></td>
<td>DAMASCUS RECREATIONAL PARK TO VALLEY PARK DRIVE</td>
<td>4</td>
</tr>
<tr>
<td><em>SLIGO CREEK</em></td>
<td>WAYNE AVENUE TO PRINCE GEORGE'S COUNTY LINE</td>
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</tr>
<tr>
<td><em>ROCK CREEK UNIT 1</em></td>
<td>EAST-WEST HIGHWAY TO DISTRICT OF COLUMBIA LINE</td>
<td>1</td>
</tr>
<tr>
<td><em>NORTHWEST BRANCH</em></td>
<td>WHEATON REGIONAL PARK TO BONIFANT ROAD</td>
<td>2</td>
</tr>
<tr>
<td><em>BIKE LINES/SHOULDER</em></td>
<td>BICYCLE LINES OR PAVED SHOULDERS ALONG BEACH DRIVE AND SLIGO CREEK PARKWAY</td>
<td>N/A</td>
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### ADDITIONS TO THE CAPITAL IMPROVEMENTS PROGRAM

<table>
<thead>
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<th>PARK</th>
<th>PROJECT LIMITS</th>
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<tr>
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<td>BETHESDA AVENUE TO DALECARLIA RESERVOIR AT THE DC LINE</td>
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<tr>
<td>NORTHWEST BRANCH REC’L</td>
<td>BONIFANT ROAD NORTH THROUGH PARK</td>
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</tr>
<tr>
<td>ROCK CREEK REGIONAL</td>
<td>LAKE NEEDWOOD TO MUNCASTER MILL ROAD</td>
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</tr>
<tr>
<td>ROCK CREEK UNIT 2</td>
<td>KENSINGTON PARKWAY TO MARC TRAIN STATION</td>
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</tr>
<tr>
<td>ROCKVILLE FACILITY/</td>
<td>NORTHWEST BRANCH TO GEORGIA AVENUE</td>
<td>1.5</td>
</tr>
<tr>
<td>MATTHEW HENSON ST PK</td>
<td>GEORGIA AVENUE TO VIERS MILL ROAD</td>
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</tr>
<tr>
<td>GUDE DRIVE REC’L</td>
<td>OLD BALTIMORE RD EAST TO ROCK CREEK HIKER-BIKER TRAIL</td>
<td>1.3</td>
</tr>
<tr>
<td>GREAT SENECA EXTENSION</td>
<td>MAGRUDER BRANCH TO SENECA CREEK STATE PARK</td>
<td>2.2</td>
</tr>
<tr>
<td>LOWER MAGRUDER BRANCH</td>
<td>DAMASCUS REC’L PARK SOUTH TO GREAT SENECA EXTENSION</td>
<td>1.6</td>
</tr>
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*FY 91-96 CAPITAL IMPROVEMENTS PROGRAM

**TABLE 5.1**
# TRAIL CONSTRUCTION SCHEDULE

## HIKING TRAILS

<table>
<thead>
<tr>
<th>PARK</th>
<th>PROJECT LIMITS</th>
<th>ESTIMATED MILEAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>*BLOCKHOUSE POINT NORTHWEST BRANCH FAIRLAND REC'L</td>
<td>TRAIL SYSTEM THROUGH THE WESTERN PORTION OF THE PARK RTE 29 TO WHEATON REGIONAL PARK INTERPRETIVE TRAIL SYSTEM RELATED TO FUTURE NATURE CENTER AND INCLUDING A MULTI-SENSORY TRAIL.</td>
<td>2.4 2 2.5</td>
</tr>
<tr>
<td>* UNDER CONSTRUCTION</td>
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## TABLE 5.2

### JOINT-USE EQUESTRIAN TRAILS

<table>
<thead>
<tr>
<th>PARK</th>
<th>PROJECT LIMITS</th>
<th>ESTIMATED MILEAGE</th>
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<td>*BLOCKHOUSE POINT</td>
<td>TRAIL SYSTEM THROUGH THE EASTERN PORTION OF THE PARK</td>
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<tr>
<td>**MACRUDER BRANCH</td>
<td>DAMASCUS REC'L PARK TO VALLEY PARK DRIVE</td>
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</tr>
<tr>
<td>NORTHWEST BRANCH</td>
<td>NORTHWEST BRANCH REC'L SOUTH TO WHEATON REGIONAL PARK</td>
<td></td>
</tr>
<tr>
<td>MUDDY BRANCH</td>
<td>ESWORTHY LANE NORTH TO ABOUT 1 MILE ABOVE THE MD HORSE CENTER</td>
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</tr>
<tr>
<td>FAIRLAND REC'L</td>
<td>GREENCastle ROAD TO THE COUNTY LINE</td>
<td></td>
</tr>
<tr>
<td>LITTLE BENNETT</td>
<td>PARALLEL TO HYATTSTOWN MILL AND PRESCOTT ROADS</td>
<td></td>
</tr>
<tr>
<td>ROCK CREEK REGIONAL</td>
<td>NORBECK RD TO MUNCASTER MILL RD AROUND EAST SIDE OF LAKE FRANK</td>
<td></td>
</tr>
<tr>
<td>WATTS BRANCH</td>
<td>SOUTH OF THE PEPCO RIGHT-OF-WAY TO SMOKY QUARTZ LANE</td>
<td></td>
</tr>
<tr>
<td>PAINT BRANCH</td>
<td>BRIGGS CHANEY ROAD SOUTH TO MARTIN LUTHER KING RECREATIONAL PARK</td>
<td></td>
</tr>
<tr>
<td>GOSHEN BRANCH/</td>
<td>LOWER MACRUDER BRANCH SOUTH TO SENECA CREEK STATE PARK</td>
<td></td>
</tr>
<tr>
<td>GREAT SENECA EXT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAGRUDER BRANCH</td>
<td>PARK VALLEY DRIVE NORTH TO BETHESDA CHURCH ROAD</td>
<td></td>
</tr>
<tr>
<td>RACHEL CARSON/</td>
<td>DAMASCUS RECREATIONAL PARK SOUTH TO GREAT SENECA EXTENSION</td>
<td></td>
</tr>
<tr>
<td>HAWLINGS RIVER</td>
<td>ZION ROAD TO GEORGIA AVENUE</td>
<td></td>
</tr>
<tr>
<td>REDDY BRANCH</td>
<td>GEORGIA AVENUE TO WINDSWEPT LANE</td>
<td></td>
</tr>
<tr>
<td>NORTH BRANCH</td>
<td>WSSC TO NORTH BRANCH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>REDDY BRANCH TO EAST SIDE OF ROCK CREEK REGIONAL</td>
<td></td>
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## TABLE 5.3
GENERAL TRAIL DEVELOPMENT PRINCIPLES

This section presents the general principles of trail development. The word "trail" is used in this chapter as a generic term to refer to hiker-biker, hiking or equestrian trails.

A successful trail design should be simple and harmonize with the surrounding terrain. The intent should always be to preserve the natural environment. The absolute minimum of land alteration (grading, cuts, fills, drainage pattern changes) should occur. Routes should be located along existing rights-of-way where feasible.

The trail configuration should follow the natural contours of the landscape and be gently curved. Sharp, angular turns greater than 50 degrees have a limited sight distance and should be avoided.

Protection of the native vegetation and of the basic resources of land and water must be fully recognized when considering trail location. Trails should be located outside the floodplain and any known wetlands to the greatest extent possible. In addition, trails and crossings should be located to minimize the impacts upon Class III waters.

Trails should be routed to avoid mature trees whenever possible to protect their root systems, as well as minimize tread maintenance. Heavy vegetative clearing is to be avoided to minimize impacts to surrounding plant and animal life, as well as to minimize maintenance costs. Vista clearing should not be done. Trails should follow along forest edges bordering meadows rather than crossing them.

Areas which contain severe physical constraints to trail development such as a narrow rights-of-way, thin or unstable soils or geology, abnormally steep grades, or other fragile resources, should be avoided wherever possible to prevent saturation and erosion problems. Deterioration from erosion and saturation can be avoided by good design and appropriate engineering. Problems with poor soils, for example, can be minimized if other limits to trail stability, such as grade and drainage, are minimal and the distance covered over the unstable soils is short.
SOILS AND DRAINAGE

Trail deterioration may result from soil saturation as well as erosion. The physical components of the terrain are essential factors in trail stability. Trails should be located in areas with relatively dry soils. As wetness and grade increase in an area, the presence of deep subsoils become more important.

Sandy-clay loams are the best soils for trails. These soils contain small silt and clay particles which add cohesion to the soil and sand and gravel particles which increases drainage. Soils with a high clay or organic content retain water for long periods of time and should be avoided to the greatest extent possible. The Soils Map for Montgomery County should be used to identify the soils present within the desired trail corridor. The development capacity of the existing soils, as identified by the United States Department of Agriculture, should be considered when determining the feasibility of the trail project, including the type of trail to be constructed.

Proper drainage is one of the most important factors in trail development. Planning for adequate drainage will prevent sections of trail and the surrounding areas from being damaged and will also prevent maintenance problems. The design should include considerations for preserving the natural ground cover as much as possible. Seeding, mulching, or sodding of adjacent slopes and other erodible areas should also be included, where necessary, in the design.

Water should be diverted from the trail before it becomes an erosive force. Trails should be placed away from surface channels which could direct run-off onto the trail. Gullies and ravines that would collect drainage from the surrounding area should be avoided. Varying the grade of the trail will also facilitate drainage. The tread could also be outsloped 1% - 3% to allow water to sheet off the trail rather than running off in a stream.

Trails generally should not be located through areas that are perpetually damp or subject to shallow flooding (1-4"). When this is not possible, the treadway must be raised to achieve a dry surface. This may be done by engineering and grading the area, or constructing a boardwalk trail section. For hiking and equestrian trails, the wet area may also be filled with gravel or blue dust and railroad ties used to reinforce the fill. Small logs, rocks or water bars can also be placed diagonally across the surface of a hiking or equestrian trail to divert the water. A culvert may also be used to carry water away from the trail.
TRAIL DESIGNATION AND SIGNAGE

TRAIL ROUTE DESIGNATION
A standardized method of designating trails throughout our park system is important. This allows users unfamiliar with a particular park to discern trail layout and facilities.

In addition to indicating the route, the careful placement of trail markers (blazes) can also serve to reduce trailside erosion and vegetation trampling by directing users away from fragile areas. In open areas, it can help confine foot traffic to one area and minimize the impact upon the surrounding areas.

One method of marking trails is by using paint blazes on trees adjacent to the trail. Each trail within a park should be blazed with a significantly different color to avoid confusing the user at trail intersections.

Blazes should be placed at the eye level of the intended user, facing in both directions. In open fields and meadows, blazes for hiking or equestrian trails may be placed on large rocks or on posts.

At trail intersections, important turns, and other areas requiring alertness, two blazes should be placed, one directly above the other. Trails should not be overblazed, however. No more than a single blaze should be visible at one time in either direction. Too many blazes will mar the character of the area.

Small markers with equestrian or hiking figures may also be used to mark trails.

SIGNS
In addition to blazes, trail signs may be used to provide supplemental information. Signs along a trail may identify and label facilities and points of interest. Signs may also warn of danger from natural hazards or unusual trail conditions, list guidelines or regulations and promote the protection of natural resources. Signs can direct the user by listing destinations and distances. Messages should be simple and concise. Signs should only be as large as necessary to convey the required information.

Trailhead signs may provide information such as trail names, trail system map, destinations, distance, and degree of difficulty. Trailhead signs should be placed at the main entrances to trails.

Interpretive and regulatory signs should be provided at trailheads to educate users about trail etiquette. This can help reduce abuse and misuse of our natural resources.

Directional signs are used at intersections with roads or other trails where paths could be confusing and blazing alone would be insufficient. Each trail link should be clearly marked. Although wood routed
signs are preferred, metal signs may be used where vandalism is a problem.

Warning signs serve to alert the user of hazardous conditions on the trail. Warning signs should be located no less than 50 feet ahead of the hazard to give the user time to react.

All signs should be placed two feet beyond the edge of the treadway to provide adequate lateral clearance.

The use of signs on hiker-biker trails should conform to the specifications of the Manual on Uniform Traffic Control Devices.

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STANDARD HIKING BLAZE

STANDARD EQUESTRIAN BLAZE
TRAIL CONSTRUCTION AND MAINTENANCE

Trails should be constructed in the most economical manner without compromising the safety of the user or the park environment. The construction of hiker-biker trails requires specialized construction techniques and equipment and the crew should have experience in similar construction. The Department of Parks should employ the Montgomery County Conservation Corps (Corps) whenever possible, however, for the construction of hiking and equestrian trails. The Corps is well-trained in trail construction and is familiar with the techniques necessary to minimize erosion and drainage problems. The cost to the Department of Parks is generally materials and a nominal labor charge.

Trails should challenge the user by the length or grade, not because of overgrowth or poor maintenance. Trails should be easy to follow and a pleasure to travel. Trail clearing and periodic maintenance are essential, therefore, to a successful trail experience.

It is important to remove blowdowns and dead trees as soon as they are discovered to avoid new trails being cut around them. It is usually sufficient to make one cut and remove the ends from the trails, or to cut a four to eight foot section from the middle of the log. Removed logs and brush should be placed at least 100' to one side of the trail to create a wildlife habitat. Separate piles should be made for brush and logs. Uprooting plants should be avoided. Leaving the roots and allowing low growing shrubs, trailing plants, and other small species to grow to the edge of the hiking or equestrian trails will help to stabilize the soils.

Trash receptacles should be available at trailheads and along the route as feasible. All trash receptacles should be easily reached by maintenance vehicles.

TRAIL CLOSINGS

It may be necessary during wet weather to prohibit use on hiking and equestrian trails. Wet trails are slippery and can be dangerous to a hiker or equestrian. Use of trails when wet can cause tread damage due to compaction of the soils.

One to two days should generally be sufficient to dry the tread. It may be necessary, however, to close trails for longer periods following extended rainy conditions.

It may also be necessary to temporarily close trails for rehabilitation. Signs should be posted on the trails as far in advance as possible to notify users.

It is recommended that a phone number be added with a recorded message regarding trail conditions and closings as well as the status of trail projects.
The level of trail maintenance required is directly related to the level of development.

Level 1: Level 1 trails are paved hiker-biker trails. They are maintained for high use. The surface should be smooth, free of potholes and bumps and maintained to the highest standards. These trails require the most frequent inspections, although repairs may be infrequent. Hiker-biker trails should be inspected biweekly during the high use months and monthly during the winter months. Attention should be given to maintaining the full paved width and not allowing the edges to deteriorate. Signs and pavement markings should also be kept in good repair. Vegetation should be controlled to provide adequate clearance and sight distance. Trails should be inspected as soon as possible after a storm to remove mud, sand, and debris from the trail surface.

Hiker-biker trails represent a significant capital investment in recreation. It is essential that trails be maintained to protect this investment. It is recommended that a trail maintenance team of 2-3 persons be established for each Region. This team would be responsible for regular trail inspection and normal maintenance. Major repairs and renovations would still be handled through the Capital Improvements Program.

Level 2: Level 2 trails are hiking trails maintained at relatively high standards for concentrated use and the comfort of the user. These trails are generally located in regional parks and are frequently used by groups or staff for interpretive activities. Traffic on these trails is medium to heavy. The surface is often improved with wood chips or blue dust for the length of the trail. Level 2 trails should be inspected regularly during the year. The surface should be maintained and repairs made promptly by park staff.

Level 3: Level 3 trails may be either hiking or equestrian trails which are designed for semi-primitive use. Traffic is low to medium. These trails are cleared and blazed for user convenience, but the surface is generally unimproved except as needed for drainage and erosion control. Maintenance is low, generally limited to removing blowdowns and inspecting drainage and erosion control improvements. A bi-annual clearing should take place in early spring and late fall (before March 15 after October 15 to minimize disturbance to flora.) The spring clearing highlights the branches and sprouts which need to be trimmed and leaves the trail in good condition for the spring and summer season. The fall clearing allows the removal of woody growth and provides visual inspection to ensure that the trail is still in good condition. Any repairs should restore the trail to its original design condition.
FUNDING AND STAFFING TRAILS

County residents in recent years have become more active in their leisure pursuits and the popularity of trails continues to increase. Trail maintenance and development must become as much a priority item in the Department as are ballfields and tennis courts in order to meet the goal of creating an integrated network of trails. Expanding our trail system much beyond our current levels appears to be beyond our capacity given the current funding and staffing levels for trails. Additional resources will be required to meet this increasing demand with a quality trail system.

A trail maintenance crew should be established within each region for the purpose of inspecting and maintaining trail conditions. Trails, especially hiker-biker trails, require significant capital investments. A program of scheduled inspections and regular maintenance protects the investment, assures the quality of the trail and minimizes liability against defects and poor maintenance.

Park Police should patrol all types of trails on a regular basis. The use of mounted police for patrol has been very successful. Bicycle patrols are becoming more popular. Bicycles have the advantage of being more flexible than horses or patrol cars and faster than foot patrol. In addition to serving as a deterrent to crime and providing good public relations, regular police patrols can also help protect the environment by encouraging users to stay on trails and discouraging four wheel drive and other motorized vehicle abuse of our parkland.

The Montgomery County Conservation Corps can be used to supplement the staff of the Department. The Corps can be used to reduce the impacts of an expanded trail system upon the Regions. The Montgomery County Conservation Corps has worked successfully with the Department for several years on park improvement projects, including trails construction and maintenance.

A Volunteer Trail Monitor Program should be implemented by the Department of Parks through the Volunteer Service Coordinator. This program would facilitate the use of volunteers in monitoring trail conditions through periodic inspections and performing routine trail maintenance or improvements to supplement the resources of the Department. There are many individuals or groups who regularly use certain trails or segments of trail. The program would recruit those users and assign them to the trail or segment that they regularly use. The user would report existing or potential problems to designated staff. Routine maintenance or simple repairs could be handled by the user or group for that trail. Serious problems would be handled by the Department.
APPENDIX A:
HIKER-BIKER TRAIL DEVELOPMENT GUIDELINES

DEVELOPMENT GUIDELINES
FOR HIKER-BIKER TRAILS

TRAIL WIDTH
The paved width required for a hiker-biker trail is one of the primary design considerations. The desirable usable width is 10', but 8' can be adequate where the following conditions prevail:

1) bicycle traffic is expected to be low, even on peak days or during peak hours;

2) the horizontal and vertical alignments will be adequate, providing safe and frequent passing opportunities;

3) the trail won't be subject to maintenance vehicle loading conditions that would cause pavement edge damage; and

4) environmental conditions do not permit 10' of pavement.

Trails must not be designed as one-way facilities because of safety and enforcement problems.

LATERAL CLEARANCE
A minimum 2' wide graded area should be maintained on both sides of the trail to provide clearance from trees or other stationary objects, but 3' is desirable. A graded area can also serve as a jogging path and reduce the potential for conflict among different types of trail users.

A 5' separation between the hiker-biker trail and an adjacent roadway is desirable. When it is not possible to provide this separation, a suitable physical divider such as a fence, curb, or dense shrubs may be considered to protect the trail user from motor vehicle traffic. The minimum height for dividers and other barriers is 4.5'.

VERTICAL CLEARANCE
Hiker-biker trails should have a minimum vertical clearance of 8' between the surface of the trail and any overhead obstruction. The desirable vertical clearance in tunnels and undercrossings is 10'.

MULTIPLE USE CORRIDORS
Multiple use corridors should be designed to accommodate all expected users. Since users share the same trail surface, the trail width should be expanded to 10-12'. Bluestone and dust would be a more acceptable surface than asphalt when equestrian use is expected. An alternative is to provide a 3-4' wide natural surface trail adjacent to the asphalt trail. If width permits, a bluestone trail could be developed parallel to the asphalt trail with a grass median between the trails.
TRAIL ENGINEERING

DESIGN SPEED AND CURVES

Hiker-biker trails are designed for recreational bicycle riding defined as approximately 10-12 miles per hour, in addition to many pedestrian uses. It is not desirable to mix high speed bicyclists on these trails. A design speed of 25 miles per hour should be used. When downgrades exceed four percent, it is recommended that a higher design speed of 30 miles per hour be used.

The minimum curvature radius necessary is a function of three items: the speed of the bicycle, the superelevation of the trail surface and the coefficient of friction between the bicycle tires and the trail surface. The American Association of State Highway Transportation Officials (AASHTO) 1981 Guide for Development of New Bicycle Facilities should be consulted for details on the derivation of the minimum design radius, horizontal alignment and the superelevation rate.

SIGHT DISTANCE

Providing adequate sight stopping distance is essential. Adequate sight stopping distance provides trail users with the opportunity to see and react to an unexpected event safely and can reduce the potential for conflict. The distance required to bring a bicycle to a full, controlled stop is a function of the cyclist's perception of the hazard and brake reaction time, the initial speed of the bicycle, the coefficient of friction between the tires and the pavement, and the braking ability of the bicycle.

Table 6.1 provides recommended stopping sight distance for various design speeds and grades based on a total perception and brake reaction time of 2.5 seconds and a coefficient of friction of 0.25 to account for the poor wet-weather braking ability of many bicycles. For two-way bicycle paths, the sight distance in the descending direction, or the downhill, will control the design.

Refer to the 1981 AASHTO Guide to select the minimum length of vertical curve necessary to provide minimum sight stopping distance at various speeds on crests, as well as the minimum clearance for line-of-sight obstructions for horizontal curves. The eye height of the bicyclist is assumed to be 3.75 feet and the object height is assumed to be zero to account for pavement hazards.
APPENDICES

A: Hiker-Biker Trail Development Guidelines

B: Equestrian Trail Development Guidelines

C: Hiking Trail Development Guidelines

D: Trail User Surveys
   1. Hiker-Biker Trail Survey
   2. Equestrian Trail Survey

E: Glossary of Terms
**DESIGN STOPPING SIGHT DISTANCE FOR BICYCLES**

<table>
<thead>
<tr>
<th>Design Speed (miles per hour)</th>
<th>Stopping sight distances for gradients of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0% (feet)</td>
</tr>
<tr>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td>20</td>
<td>130</td>
</tr>
<tr>
<td>25</td>
<td>175</td>
</tr>
<tr>
<td>30</td>
<td>230</td>
</tr>
</tbody>
</table>

**NOTE:** Design values for stopping sight distances on bikeways can be developed in the same manner as on highways. The values shown were based on the following factors and developed by AASHTO:

- Coefficient of skid resistance = 0.25
- Perception-reaction time = 2.5 seconds
- Eye height = 3.75 feet
- Object height = 6 inches

**TABLE 6.1**

**MITIGATING LIMITED SIGHT DISTANCES OR SUBSTANDARD RADIUS CURVES**

The physical features of the right-of-way may constrain trail development. In areas where the safe stopping sight distance is less than the recommended because of substandard curvature radius, precautionary measures should be taken to lessen the impact.

These measures include the following:

1) Widen the pavement through the curve to partially offset the negative effects of substandard curves or limited stopping sight distance.

2) Stripe through the curve with a solid yellow line to direct traffic to keep right.

3) Post standard curve warning signs installed no less than 50' before the curve in either direction.

4) Provide information signs instructing trail users to Keep Right/Pass Left.
GRADE
The basic criterion upon which grade acceptability is judged is the amount of work which a trail user is able to maintain over time. The amount of energy required to negotiate a route is a function of many conditions, including the slope and length of the grade, the characteristics of the user (age, skill, weight, physical condition), the bicycle (type, weight, tires, gear ratios), trail surface, natural topography, as well as the purpose of the trip. Since the amount of energy required to negotiate a route will affect its use, it is important to keep grades to a minimum, especially on long inclines, in order to accommodate a variety of users and activities.

Generally, long stretches of any uniform grade should be avoided. The grade of the trail should vary. Steep grades are tiring and can create erosion problems. An expansive level section of trail, however, can be as monotonous as a long steep grade is tiring. Varying the grade also allows the trail to fit the topography and allows natural drainage. To encourage drainage, the grade should never be zero.

Ramp and bridge approaches may be subject to steeper grades. Acceptable grades, in such cases may be adjusted accordingly, but generally should not exceed 8%. Every effort, within practical design limits for the site, shall be made to minimize the gradient, including providing additional curvature or travel distances.

Table 6.2 below summarizes the recommended relationship between gradient and maximum sustained length.

<table>
<thead>
<tr>
<th>GRADIENT</th>
<th>TRAIL SECTION (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - 4 PERCENT</td>
<td>1500-500</td>
</tr>
<tr>
<td>5 - 7 PERCENT</td>
<td>400-150</td>
</tr>
<tr>
<td>8 PERCENT</td>
<td>NOT TO EXCEED 150'</td>
</tr>
</tbody>
</table>

TABLE 6.2
TRAIL STRIPING AND SIGNAGE
Striping hiker-biker trails establishes travel lanes for bicyclists and pedestrians and can reduce conflict among users, particularly on hills, around curves, and other areas where a sight line is limited or obstructed. All hiker-biker trails shall have a solid 4" wide yellow centerline through curves and other areas where the sight line is limited or obstructed. The solid line prohibits passing. Trail striping should be supplemented by signs instructing the user to "Keep Right/Pass Left" when passing is permitted or "No Passing" around curves or other areas with limited sight distances.

Pavement markings may be used to supplement signs. They should not be used instead of signs, however, because they may be obscured by debris, leaves, or snow. The standard color for pavement markings, except the centerline stripe, is white. Paint is recommended rather than thermoplastic stripes. Thermoplastic stripes are expensive, thicker than paint and slippery when wet, particularly under a narrow tire.

The Manual for Uniform Traffic Control Devices (MUTCD) should be consulted for details on bicycle-use related signs and pavement markings.

TRAIL SURFACE AND DRAINAGE
Hiker-biker trails must have a surface which offers a smooth ride and good frictional resistance for tires and footwear. Asphalt is the preferred choice for pavement surface. A compacted stonedust surface free of potholes may be desirable where visual compatibility with the park character is desired and bicycle traffic is expected to be low. Pavement surfaces should be smooth, and the edge of the pavement should be uniform and meet the existing grade.

Trails should be drained by a cross-slope of 2% applied according to topography. A minimum cross-slope of 2.5% is recommended for trails of 10' width. Sloping in one direction instead of crowning is preferred.

STRUCTURES
A bridge may be necessary to continue a hiker-biker trail across a busy intersection or a stream. The minimum deck width for a bridge which must accommodate emergency or maintenance vehicles is 10'-12', and 12' is desirable. Any bridge which must carry emergency or maintenance vehicles must be designed to accommodate the height and weight requirements of these vehicles. Bridges for trail users only should be at least 8' wide.

Railings, fences or other barriers should be included on both sides of a bridge at a minimum height of 4.5'. Smooth rub rails should be attached to the barriers at a handlebar height of 3.5'. If the bottom of the barrier is open, a third railing should be placed to prevent falling under the rub bar in the event of a collision.
Pathways adjacent to deep water, steep slopes, culverts or drainage ditches, warrant a railing to protect the trail user. Dense planting or resilient shrubs may also fulfill the role of a railing.

ROADWAY CROSSINGS
Intersections are an important consideration of hiker-biker trail design and the number of crossings should be minimized. Where possible, crossings should be grade-separated. Recognizing the expense associated with these enhancements, crossings may occur at-grade with the establishment of a right-of-way. At minimum, a crosswalk should be provided for trail users. If the intersection is heavily traveled, if high travel speeds exist, or if the sight distance is limited, a crosswalk signal should be provided and trail users considered in the timing of the traffic signal, as well as the traffic detection device. The trail should be clearly signed on the other side of the intersection.

Signs warning motorists of a trail intersection should be posted at least 150' before the crossing.

RAILROAD CROSSINGS
When it is necessary to cross a railroad, compressible flangeway filler should be used whenever possible to enhance the cyclist's safety. When this is not possible, the crossing should be designed at a right-angle to the rails. A sign showing how to cross should also be used to prevent the bicyclist's front wheel from being trapped in the flangeway and losing steering control. At crossings with less than a 45 degree angle, consideration should be given to widening the trail to allow bicyclists to cross the tracks at a right angle. The trail approach should be at the same elevation as the rails.

Standard MUTCD warning signs should be posted no less than 50' before the crossing from either direction. Figures 15 and 16 detail trail design at a railroad crossing.
DESIGN SPEED, HORIZONTAL ALIGNMENT AND SUPERELEVATION

The minimum design radius of curvature can be derived from the formula below:

\[ R = \frac{V^2}{15(e + f)} \]

- \( R \) = Minimum radius of curvature (ft)
- \( V \) = Design speed
- \( e \) = Rate of superelevation
- \( f \) = Coefficient of friction

For most trail applications, the superelevation rate will vary from a minimum of 2% (the minimum necessary to encourage adequate drainage) and a maximum of approximately 8% (with 5% being the desirable). The minimum superelevation rate of 2% will be adequate for most conditions and will simplify construction.

The coefficient of friction depends upon the following: speed, surface type and condition (wet or dry), and tire type and condition. Extrapolating from values used in highway design, design friction factors for paved hiker-biker trails can be assumed to vary from 0.30 at 15 miles per hour, to 0.22 at 30 miles per hour.

Based upon a superelevation rate (e) of 2%, minimum radii of curvature can be selected from the table below:

<table>
<thead>
<tr>
<th>Design Speed(V)</th>
<th>e = 2 percent Superelevation rate</th>
<th>Design Radius(R) (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.27</td>
<td>95</td>
</tr>
<tr>
<td>25</td>
<td>0.25</td>
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<td>35</td>
<td>0.19</td>
<td>390</td>
</tr>
<tr>
<td>40</td>
<td>0.17</td>
<td>565</td>
</tr>
</tbody>
</table>

TABLE 6.3
HIKER-BIKER TRAILS
DESIGN AND CONSTRUCTION GUIDELINES SUMMARY

DESIGN PARAMETERS AND GUIDELINES HIKER-BIKER TRAILS

Trail Width:  One-way: not recommended
             Two-way:  8' minimum; 10' desirable

Horizontal Clearance:  2' minimum; 3' desirable
                      (each side of trail)

Vertical Clearance:  8' minimum; 10' desirable

Barrier Dimension:  4.5' minimum height

Design Speed:  25 mph minimum; 30 mph advisable where
               grades exceed 4%

Safe Stopping Sight Distance:  125' (level terrain);
                               130' (5% grade)

Superelevation rate:  2% minimum; 5% maximum
                      (where necessary)

Grade:  5% maximum desirable; not to exceed 8% for
        lengths greater than 150'

Cross Slope:  2% minimum in direction of positive drainage
              for 8' wide trails; 2.5% minimum in direction
              of positive drainage for 10' wide trails

Surface:  3" Asphalt; 3" CR-6 subgrade

Bridges:  Ramped approach equal to width of trail.
          Minimum width of 10' to accommodate vehicles.
## Hiker-Biker Trail Design Parameters

<table>
<thead>
<tr>
<th>Item</th>
<th>Master Plan</th>
<th>National Park Service</th>
<th>AASHTO</th>
<th>Montgomery County Master Plan of Bikeways, 1978</th>
<th>Prince George's County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trail Width</td>
<td>5' minimum</td>
<td>5' minimum</td>
<td>5' minimum</td>
<td>6' minimum</td>
<td>6' minimum</td>
</tr>
<tr>
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<td>10' w/heavy use</td>
<td>10' preferred</td>
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<td>12' preferred</td>
</tr>
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<td>Horizontal Clearance</td>
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<td>8' minimum</td>
<td>8' minimum</td>
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</tr>
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<td>Height of 4.5'</td>
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<tr>
<td>Design Speed</td>
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<td>20 mph</td>
<td>20 mph minimum</td>
<td>20 mph @ level</td>
<td>10 mph minimum</td>
</tr>
<tr>
<td></td>
<td>30 mph &gt; 4%</td>
<td>30 mph &gt; 4%</td>
<td>30 mph &gt; 4%</td>
<td>30 mph preferred</td>
<td>20 mph on downgrade</td>
</tr>
<tr>
<td>Safe Stopping</td>
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<td>12' minimum</td>
<td>125' minimum</td>
<td>130' @ level</td>
<td>130' @ level</td>
</tr>
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<td>Sight Dist.</td>
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<td>5% maximum</td>
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<td>5% maximum</td>
<td>5% maximum</td>
<td>10% maximum</td>
<td>5% preferred</td>
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<td>2% minimum</td>
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<td>BIT</td>
</tr>
<tr>
<td></td>
<td>3&quot; CR-6</td>
<td></td>
<td>3'-4&quot; agg. base</td>
<td>4&quot; agg. base</td>
<td>BIT</td>
</tr>
</tbody>
</table>

Table 6.4
APPENDIX B:
EQUESTRIAN TRAIL DEVELOPMENT GUIDELINES

DEVELOPMENT GUIDELINES FOR EQUESTRIAN TRAILS

Equestrian trails in the parks are designed with an emphasis on providing a variety of options for all types of equestrians. Trails vary from a network of loop trails in recreational and regional parks to longer distance linear trails in stream valley parks.

Equestrian trails may be used to connect local non-parkland trails to parkland trails. Such a system provides riders in the County with a network of trails that can either be accessed from local horse farms and stables or from available trailer parking areas provided within the park system.

TRAIL DESIGN

The recommended equestrian trail design and layout is a loop system leaving and returning to near the same point. Equestrian trails in the stream valleys are generally linear following, but not always parallel to, the stream bed. Trail impact upon the stream banks and shoreline can be minimized by including a vegetative buffer between the trail and the water's edge and by following cleared utility rights-of-way.

LOCATION

Trails should be located, whenever possible, outside the floodplain, overlooking, but not directly adjacent to the water's edge. Access to drinking water for horses should be provided at intervals not to exceed 10 miles.

Some horses are skittish and startle easily, so equestrian trails should be kept away from campsites, ballfields, tennis courts and other areas where a lot of human activity occurs. Trails should be located a minimum of 25' from recreation facilities, and have a minimum separation of 5' from hiker-biker trails. Trees and shrubs may be used to provide a buffer between equestrian trails and adjacent facilities or property when there is not a sufficient buffer width.

Equestrian trailheads should be located, wherever possible, at or near other park amenities to provide the rider with access to water, trash receptacles and restrooms. In addition, trailer parking should be provided wherever possible near trailheads. Many equestrians depend upon horse trailers to safely transport their horses. In the 1989 Survey of Equestrian Trails in Montgomery County, nearly one-third of the respondents indicated that they accessed our trails via trailer. This method of access is likely to become more important as development cuts off private connecting trails and increased traffic makes at-grade road crossings too dangerous.
TRAIL WIDTH
Trail width is determined by the projected volume of trail use, as well as by the topography and vegetation within the corridor. The recommended tread width is 36", with 24" acceptable to accommodate single file use. Trail width for stream fords should be at least 36". Where the trail is narrow and allows only single file use, passing areas should be provided occasionally. An 8' wide open area is needed for horses to pass safely. When switchback construction is necessary, the tread width should be increased 12" from the switchback approach area, and each switchback landing should be 8' wide.

LATERAL CLEARANCE
A cleared area is needed on either side of the treadway. This margin should be pruned so it is free of limbs and woody or thorny vegetation that could snag, scratch or injure horse or rider. Tall grasses growing next to the trail tread may conceal dangerous situations for horses and should be routinely inspected for burrows and sharp objects. The desired horizontal clearance is 2' on either side of the trail, with a minimum of 1' of cleared area.

VERTICAL CLEARANCE
Equestrian trails need adequate overhead clearance. The desired vertical clearance is 12', with 10' the minimum acceptable clearance. Pruning of tree limbs which overhang the trail, and removal of dead limbs which are lodged or leaning over the trail, is essential to the safety of horse and rider. Adequate clearances for below-grade crossings are a minimum of 12' of vertical clearance and 10' of horizontal clearance.

GRADE
Trail grades should be moderate to challenge the rider, but not encourage erosion. Equestrian trails should be located parallel to the contours of the land. Grades of 10% or less are desirable for equestrian trails. The maximum grade should not exceed 15% on short stretches. Trails should only be located in these areas if the trail surface is stable. Switchbacks to route an equestrian trail up or down a steep area should be used only if there is no other alternative trail alignment. See Appendix I for switchback construction guidelines.

SURFACE AND DRAINAGE
The treadway, or trail surface, should be cleared of stumps, roots and surface rocks greater than 4" across. Grasses and non-woody plants should be left to maintain treadway stability. Saplings and low shrubs should be removed from the treadway, but trees greater than 10" in diameter at chest height should be left and the trail routed around them. Limbs and brush should be removed from the treadway.

In areas where no grading or clearing of the treadway is required, simply sweep off the debris without removing the soil.
Treadway elevation and/or reinforcement may be required when it is necessary to locate short sections of trails in areas that are perpetually damp or subject to shallow flooding. See Appendix 2 for trail construction techniques for wet areas. Additional surface materials can also be used. They include woodchips, bluestone and/or bluedust and coarse sand. Surface materials to avoid are large rough stones, asphalt, and cement. Hard surfaces such as asphalt and cement are too slick, especially when wet.

FORDS

When equestrian trails must cross streams, the safety of the user is the primary concern in determining whether to use a ford, culvert, or bridge. Fords are desirable and generally safer than bridges or culverts providing the stream velocity, depth of water, and tread across the ford are acceptable. They also provide horses with a place to drink. Fords should not be used to cross Class III waters.

Fords should be in slow moving water with an average depth of 18". Debris at the bottom of the stream bed should be visible. Swift, deep water is dangerous, as well as frightening, to a horse.

Fords should enter and leave the stream on a grade parallel to the stream banks. This will prevent deflection of water into the trail and minimize erosion of the stream banks.

The stream banks should also be stabilized to minimize damage. Ramps may be considered in areas with heavy horse traffic. The ramps should have no more than a 2:1 slope and be at least 36" wide. The footing on the stream bank should be firm. In addition, the footing on the stream bottom must be stable and free of large rocks, soft mud, sinking sand, holes, and debris which would make their crossing dangerous for horse and rider. The best footing is natural gravel that is 2" or less in diameter.

If possible, fords should be designed to accommodate two horses side by side so riders can assist each other if help is needed in the crossing, and also so that riders watering their horses in mid-stream can be passed. Fifteen feet is the recommended ford width in the stream. Fords should be inspected on a seasonal basis. Any damage should be repaired to its original condition.

BRIDGES

Bridges are recommended where a ford is not a feasible option. Bridges should be built at the narrowest part of the stream possible to minimize the crossing and should be 1' to 2' above the high water mark. The bridge should be a minimum of 6' wide with a load carrying capacity equal to the number of horses that can occupy it at any one time. Railings should be installed to prevent the horse from stepping off the bridge.
Railings should be 4' high and sturdy. Floor planks must be butted tightly so that horses cannot see through them. Horses may be reluctant to cross if they can see between the planks. The bridge should also be flat and level. Wooden bridges are desirable because they are less noisy than steel bridges. Bridges should be inspected for weak spots on a seasonal basis, and as soon as possible after severe storms or flooding of the area has occurred.

If repair work must be deferred, the trail should be closed or an alternative route provided until the repair has been completed. Riders should not be allowed to use the structure in a state of disrepair. Warning, detour, and directional signs should be placed on the structure, along the trail leading to the structure, and along the alternative route.

ROAD CROSSINGS
At-grade equestrian crossings of roadways can be dangerous and grade-separated crossings of major roadways are desirable. Grade-separated crossings, however, are not generally available. At-grade crossings should be designed, therefore, to maximize safety. The trail should approach the road at a right angle before the crossing. At the location of the crossing there should be a minimum 660' (1/8 mile) sight distance in both directions from the trail. Equestrian crossings should not be located at curves in the road, or at the foot or crest of a hill. Horses are easily surprised and might shy at an unexpected vehicle suddenly appearing from a blind spot. A STOP or WARNING sign must be posted on both sides of the trail at least 300' before the trail crosses the road.

Horse crossing signs, cross walks, blinking yellow lights, or red stop lights must be installed at the site of the crossing to notify drivers. The method used depends on the volume of traffic and frequency of equestrian crossings, as well as the difficulty of the crossing. Horse crossing signs with an additional SLOW warning are preferred to the traditional stencil of the horse and rider. Figure 18 is one example of signage for an at-grade equestrian crossings.
EQUESTRIAN TRAILS
DESIGN AND CONSTRUCTION GUIDELINES SUMMARY

DESIGN PARAMETERS AND GUIDELINES FOR EQUESTRIAN TRAILS

TRAIL WIDTH (TREADWAY): 24" minimum; 36-48" desirable
HORIZONTAL CLEARANCE: 1' minimum; 24" either side desirable
VERTICAL CLEARANCE: 10' minimum; 12' desirable
GRADE: 10% or less, desirable; 15% maximum sustained
STREAM FORDS: Depth of water not to exceed 18". 36" wide ramps with no more than 2:1 slope.
BRIDGES: 1-2' above water mark. Width of 6-8' inside railings. Railing height of 4'.
ROAD CROSSINGS: 660' sight distance in either direction
BLAZING: Standard MCDP equestrian blaze
SIGNAGE: Keep to minimum needed to convey necessary messages
### Equestrian Trail Design Parameters

**Equestrian Trails - Comparison of Design Parameters for Different Jurisdictions**

<table>
<thead>
<tr>
<th>Item</th>
<th>Master Plan</th>
<th>National Park Service</th>
<th>US Dept/Agriculture Forest Service</th>
<th>Howard County</th>
<th>Prince George's County</th>
<th>MD Dept. of Nat'l Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treachway</td>
<td>24&quot; minimum 36-48&quot; desired</td>
<td>24&quot; minimum</td>
<td>18-24&quot; minimum 48-60&quot; along hazardous area.</td>
<td>36-48&quot;</td>
<td>4' minimum one-way; 6'10&quot; minimum two-way.</td>
<td></td>
</tr>
<tr>
<td>Horizontal Clearance</td>
<td>12&quot; minimum, 2' desired on either side of trail</td>
<td>Undefined</td>
<td>12&quot; on either side of trail.</td>
<td>1-2' on either side of trail.</td>
<td>2' on either side of trail.</td>
<td>2' on either side of trail.</td>
</tr>
<tr>
<td>Vertical Clearance</td>
<td>10&quot; minimum 12&quot; desired</td>
<td>Undefined</td>
<td>8-10&quot;</td>
<td>9-10&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>Grade</td>
<td>10% or &lt; desired 15% max. sustain. 20% for &lt; 50 yds. 0% undesirable</td>
<td>10% or &lt; desired 7% ideal 0% undesirable</td>
<td>15% sustained</td>
<td>15% or less Undefined</td>
<td>10% or &lt; desired 10% or &lt; desired 10% or &lt; desired 10% or &lt; desired</td>
<td></td>
</tr>
<tr>
<td>Stream Fords</td>
<td>18&quot; or less water depth, 36&quot; ramps, 15&quot; ford width.</td>
<td>2' or less water depth, 36&quot; ramp 15&quot; ford width.</td>
<td>3' ford width; undefined water depth.</td>
<td>Undefined</td>
<td>2:1 max. ramp slope; 15&quot; ramp width.</td>
<td>18&quot; or less water depth.</td>
</tr>
<tr>
<td>Horse Bridges</td>
<td>1-2' above high water mark. 6-8' wide. 4' high railing.</td>
<td>Undefined</td>
<td>4' min. width. Undefined railing height.</td>
<td>4' min. width. 3-4' high railings.</td>
<td>Undefined</td>
<td>1-2' above high water mark. 8' width. 4' high railing.</td>
</tr>
<tr>
<td>Road Crossings</td>
<td>660' (1/8 mi.) sight distance in either direction.</td>
<td>Undefined</td>
<td>Undefined</td>
<td>660' sight distance 660' sight distance in either direction. in either direction. in either direction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blazing</td>
<td>4x6&quot; blaze, horseshoe shape, painted on tree.</td>
<td>Undefined</td>
<td>Undefined</td>
<td>2x6&quot; blaze painted on tree.</td>
<td>Undefined</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

**No National Standards or Guidelines Exist for Equestrian Trails**

**Table 6.5**
APPENDIX C:
HIKING TRAIL DEVELOPMENT GUIDELINES

DEVELOPMENT GUIDELINES FOR HIKING TRAILS

DESIGN
A successful hiking trail design should incorporate aesthetic qualities as well as some conveniences. Aesthetic qualities include summits, vistas, water features or historic points of interest. Conveniences may include road access to trails and parking, access and side trails, and bridges.

The preferred trail alignment is a closed loop beginning and ending at approximately the same location. Trails should interconnect, where possible, to form a trail network within a park. This provides the user with a choice of trip lengths and adds variety and interest. Trails with curves and bends create an element of surprise for the user as well as a sense of remoteness. Long, straight trails should be avoided, except where necessary as connectors among trails.

The route should be planned for minimum maintenance while providing maximum ecological variety. The trail should provide solitude for the hiker. The alignment should be used to disperse users from fragile areas.

TRAIL WIDTH
The tread width should be determined by the amount and intensity of use, as well as the topography and vegetation. The treadway should not be cleared so wide as to destroy the character of the footpath, nor should it be too narrow so as to permit too much growth and impede foot travel.

The recommended tread width for hiking trails is 18"-36". A tread width of 24"-36" inches is desirable for trails that are used for interpretive activities, including group hikes. Trails used for unstructured hiking may have narrower tread width. If the tread width must be narrower than 18", occasional passing areas must be provided at areas with gentle slopes.

LATERAL CLEARANCE
In addition to the treadway, rocks, limbs, logs, or brush should be cleared an additional 12" on either side of the tread for increased safety. Low growing shrubs and other small plant species should be allowed to grow right to the edge of the treadway. This vegetation will maintain soil stability, prevent erosion and increase the attractiveness of the area.

VERTICAL CLEARANCE
Vegetation should be cleared to a height of 8'. This removes branches that could block the trail when weighted down with snow, ice, or rain, as well as removes those branches which could obscure the vision of users or snag on a hiker's daypack.
GRADE
Trail grades must be moderate to promote stability yet follow the contour of the land. The maximum grade for hiking trails is 15% for short distances. Grades greater than 15% can create serious erosion problems unless the treadway is reinforced. Short stretches of steep grades offer challenge to the hiker and variety during the hike. Steps made from logs, stone or railroad ties may also be used to assist the hiker in negotiating a steep grade and stabilizing the slope.

TRAIL SURFACE AND DRAINAGE
If the treadway is stable and does not require construction, simply sweep all herbaceous and trailing plants and leaf litter from the path. This will help the trail to be worn in the desired location. Do not disturb the soil. The humus should be left to reduce wear. Large stones, rocks, and outcrops of bedrock in the treadway may make the trail rough, but can be helpful in making the treadway more resistant to erosion, especially where soils, drainage or slopes are unfavorable. Trails generally should not be overdug and backfilled to get a smooth grade.

Trail surfaces should remain natural and should avoid areas where drainage, slopes and soils do not provide a stable treadway. Trail reinforcement, including the introduction of additional vegetation at the trail edge, wood chips or shredded bark, cinders, fine shale or small gravel and bluedust or boardwalking may be necessary to reinforce the treadway and minimize problems associated with soil erosion and compaction. If it is necessary to have short segments of trail pass through wet areas, it may be necessary to raise the treadway through grading, or use boardwalk or railroad ties to achieve a dry surface.

HIKING TRAILS
DESIGN AND CONSTRUCTION GUIDELINES SUMMARY

DESIGN PARAMETERS AND GUIDELINES FOR HIKING TRAILS

TRAIL WIDTH (TREADWAY): 18" minimum; 24-36" desirable

HORIZONTAL CLEARANCE: 12" either side of trail

VERTICAL CLEARANCE: 8'

GRADE: <10% desirable; maximum sustained: 15%;
less than 40 yds: 25% with stable tread

BLAZING: Standard hiking blaze

SIGNAGE: Keep to minimum; message to be clear and concise
## HIKING TRAIL DESIGN PARAMETERS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MASTER PLAN</th>
<th>NATIONAL PARK SERVICE</th>
<th>PRINCE GEORGE'S COUNTY</th>
<th>APPALACHIAN TRAIL CLUB</th>
<th>MARYLAND DEPT. NATURAL RESOURCES</th>
<th>EAST BAY REGIONAL PARK AUTHORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treadway</td>
<td>18&quot; minimum 24'-36&quot; desired</td>
<td>18&quot; minimum Undefined</td>
<td>4' desired</td>
<td>4' desired</td>
<td>10&quot; minimum 36'-48&quot; desired</td>
<td></td>
</tr>
<tr>
<td>Horizontal Clearance</td>
<td>1' on either side of trail Undefined</td>
<td>Undefined</td>
<td>1-2' on either side of trail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical Clearance</td>
<td>8' minimum Undefined</td>
<td>Undefined</td>
<td>8'</td>
<td>7'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>&lt; 10% desired 15% max. sustained 10% maximum</td>
<td>7% desired</td>
<td>Undefined</td>
<td>&lt; 15% desired</td>
<td>&lt; 5% desired 25% max. sustained 15% max. sustained</td>
<td></td>
</tr>
<tr>
<td>Blazing</td>
<td>4&quot; x 6&quot; blaze painted on tree Undefined, but painted on tree</td>
<td>Undefined</td>
<td>2&quot; x 6&quot; blaze painted on tree</td>
<td>Undefined</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** NO NATIONAL STANDARDS OR GUIDELINES EXIST FOR HIKING TRAILS

**TABLE 6.6**
HIKER-BIKER TRAIL SURVEY

There were several comments made on the survey data sheets with regard to hiker-biker trails. The comments ranged from the installation of water fountains to the expansion of the hiker-biker trail system. The comments are summarized below by area and include both user and non-user comments.

BETHESDA
Some residents felt the trails were too narrow and unsafe for pedestrian and cyclists traveling together. There is a problem of muddy conditions on trail sections after rainfalls. There were several recommendations for widening the trail and installing connector trails from Little Falls to MacArthur Boulevard, Silver Spring to Bethesda and through the District, and a suggested loop connector trail for all Montgomery County parks.

ROCKVILLE
Residents of this area would like to have better trail design, better signage and increased maintenance, including trail resurfacing. Water fountains between Ken-Gar Palisades and Lake Needwood, and more visible and frequent park patrols were requested. Connector routes from the upper regions of the county to down-county areas were recommended.

SILVER SPRING
Residents of this area had a number of recommendations, including increasing trail widths, correcting maintenance problems, additional park facility signs and sanitary facilities, enforcement of dog leash laws, and increased motorcycle/horse Park Police patrols. There were a number of recommendations made for specific parks, including safe access routes between Wheaton Regional Nature Center, Brookside Gardens and the Equestrian Center. Extending the Northwest Branch Stream Valley hiker-biker trail north from Wheaton Regional to Bonifant Road, as well as developing the Capital Crescent trail from Silver Spring to Georgetown, were frequently recommended. Enhancing aesthetic features, mile markers on trails and regulations where riders and walkers would use the right side of the trail for safety precautions were also suggested.

TAKOMA PARK
Hiker-biker trail problems in this area include maintenance and design of the Sligo Creek hiker-biker trail, including inaccessible bridges, poor sight distance around curves, and conflicts among users on the trail. Lighting for evening walkers was recommended as was connecting the Sligo Creek and Rock Creek hiker-biker trails.

OTHER
Other comments not mentioned above included the development of trails in Germantown, Gaithersburg, and other areas in the northern section of Montgomery County.
EQUESTRIAN TRAIL SURVEY

REQUESTS FOR NEW, ADDITIONAL AND CONNECTING EQUESTRIAN TRAILS
# Responses/Trail Improvements Desired

BLACK HILL REGIONAL PARK (10 responses)
4 Connect Black Hill to Little Bennett & Sugerloaf Mtn.
2 Connect trails cut off by Countryside Mooring Development
1 Connect over Rt. 121 to side of old Ten Mile Crk. & new trails
1 Need trailer parking at trailhead
1 Cut trail around second lakeside field on Old Balt. Rd. side
1 Cut trail through woods to connect w/Ganley Road (SW park boarder)

BLOCKHOUSE POINT - No comments made

BURTONSVILLE LOCAL PARK - No comments made

DAMASCUS RECREATIONAL PARK/MAGRUDER BRANCH (2 responses)
1 Need more trails in general
1 Connect Upper Magruder Branch Park to Little Bennett

DICKERSON CONSERVATION PARK (1 response)
1 Need established trails connecting park to C&O towpath

DRY SENECA CREEK STREAM VALLEY - No comments made

FAIRLAND REGIONAL PARK (1 response)
1 Connect Fairland Regional Park to Paint Branch SV trail system

GOSHEN BRANCH STREAM VALLEY (5 responses)
1 Need parking for 2-3 trailers on Huntmaster Road
1 Access to this and Great Seneca Ext. being cut off by developments
1 Need preservation of trails from Goshen Reg. Park to Seneca Creek area
1 Need trails connecting Goshen - Germantown Greenbelt - Seneca Ext. 1 Need more trails in general

GREAT SENECA EXTENSION STREAM VALLEY (6 responses)
2 Need established, maintained trails throughout park
1 Access to this area is being cut off by development
1 Preservation of trails from Seneca Creek to Goshen RP/SV
1 Need trailer parking and trailheads
1 Want trail following Seneca Creek between Blunt and Woodfield to Rt. 108

HAWLINGS RIVER STREAM VALLEY (3 responses)
3 Connect Hawlings River to Triadelphia Reservoir

LITTLE BENNETT REGIONAL PARK (62 responses)
17 Need additional trails in park
13 Connect Little Bennett to Sugerloaf and Monocacy Nat. Res. area
8 Need more trails to connect those lost by golf course development
5 Connect Little Bennett to Black Hill Regional Park
4 Connect Little Bennett with Patuxent River Watershed
3 Need more trails in eastern part of park along Burnt Hill Road
3 Want horse trails leading to camp store and campgrounds
LITTLE BENNETT REGIONAL PARK (continued)
2 Connect Little Bennett Schoolhouse to Kings Valley Road
2 Reopen Bennett Ridge to horse use
2 Need loop trail at northeast end of park
1 Connect park to Rocky Top Farm on Burnt Hill Road
1 Connect Little Bennett to Magruder Branch, old way is being paved over
1 Would like small corrals near camping area and horses allowed

MUDDY BRANCH STREAM VALLEY/MARYLAND HORSE CENTER (34 responses)
8 Need continuous trail all the way to the C&O towpath
7 Connect Muddy Branch Park to Seneca Creek State Park
4 Need safe crossing into Muddy Branch from Maryland Horse Center
4 Need more trails altogether
4 Replace trails lost to housing development around Maryland Horse Center
1 Connect Muddy Branch to Blockhouse Pt. to Seneca Creek St. Park
1 Reopen overgrown trail from Rt. 28 picnic grounds following stream intersection
1 Connect Muddy Branch, Blockhouse Point, Seneca Creek State Park, Black Hill and Little Bennett
1 Power line access is blocking entrance from Maryland Horse Center
1 Connect Turkey Foot/Jones Lane at Rt. 28 to Seneca Creek St. Park
1 Plan trailer parking w/enough room, separate from car parking

NORTHWEST BRANCH STREAM VALLEY (12 responses)
4 Need clearly marked connection between NW Branch and Paint Branch Park
2 Access to trails north of Randolph Road threatened by devel.
2 Need more trails through NW Branch
1 Connect Spencerville area (Rts. 650 and 198) to NW Branch Park
1 Widen NW Branch trail past culvert-trail too overgrown to pass
1 Connect NW Branch to Hawlings River Stream Valley Park
1 Fix impassable crossing under Randolph Road to connect to trolley museum

PAINT BRANCH STREAM VALLEY (12 responses)
2 Need more trails in park
2 Guardrails and erosion block crossing at Briggs Chaney Road
2 Connect Paint Branch to Rocky Gorge Reservoir
2 Connect upper park at Oak Springs to Good Hope Road, then Peachwood Road
1 Connect Paint Branch to Fairland Regional Park
1 Need better connection fr. Burtonsville to Spencerville Park
1 Connect Lower Paint Branch to Wheaton Regional Park
1 More trails needed in Valley Mill and Pilgrim Hill area

RACHEL CARSON CONSERVATION AREA (7 responses)
3 Access from Hawlings SV cut off by development
1 More trails between Zion and Sundown Roads
1 Open up trail leading to and getting across Georgia Avenue
1 Connect 18420 Brooke Grove Rd. to Rachel Carson & Hawlings River SV
1 Need connections from Sunshine-crossing Georgia Ave. too dangerous
UPPER ROCK CREEK STREAM VALLEY & ROCK CREEK REG. PARK  (19 responses)
4 Need new additional trails at north end of Rock Creek
4 More trails needed in general
2 Crossing at Camp Olympic and connect to Lake Needwood
2 Want trail from Lake Needwood up to Bussards Farm
2 Need better system of loops and connector - trails go nowhere
1 Need cart driving trails in Rock Creek RP and SV
1 Connection across Bowie Mill into Camp Olympic (Oatland Farm)
1 Development of Inter-County Connector will cut many access pts.
1 Replace original horse trail paved over for bike trails
1 Casey Property development cutting off access - need trail along creek

ROCK CREEK STREAM VALLEY AND MEADOWBROOK STABLE  (7 responses)
4 Need more trails in general in lower Rock Creek
1 More trails needed north of Meadowbrook Stable
1 Want jumps along the trails
1 Want trails between Meadowbrook and Rock Creek Horse Center

ROCK RUN STREAM VALLEY  (6 responses)
3 Access to C&O towpath from Rock Run/Avenel area
3 More equestrian trails needed in this area

WATTS BRANCH STREAM VALLEY  (1 response)
1 Need connection between Brushwood Terrace and Glen Road

WHEATON REGIONAL PARK  (14 responses)
5 Developed area rapidly encroaching area trails off Randolph Rd.
5 Need more trails to increase/provide more variety
1 Extend Wheaton trails by connecting w/other stream valley trails
1 Extend circle trail in Wheaton Regional Park
1 Clear connector trail to side trails 1/2 way along main Wheaton trail
1 Extend trail from Glenallen Avenue

TOTAL NUMBER OF RESPONSES: 202
## APPENDIX E: GLOSSARY OF TERMS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials.</td>
</tr>
<tr>
<td>ACCESS TRAILS</td>
<td>Trails that generally connect the main trail to roads or to other trail systems.</td>
</tr>
<tr>
<td>AT-GRADE CROSSING</td>
<td>A trail crossing a roadway on the same plane.</td>
</tr>
<tr>
<td>BICYCLE FACILITIES</td>
<td>Improvements and provisions made by public agencies to encourage or accommodate bicycling, including parking facilities, maps, all bikeways and shared roadways designed for bicycle use.</td>
</tr>
<tr>
<td>BIKEWAY, CLASS I</td>
<td>Bikeway completely separated from vehicular traffic and within an independent right-of-way or the right-of-way of another facility, including travelways shared by both bicycles and pedestrians.</td>
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<tr>
<td>BIKEWAY, CLASS II</td>
<td>A bikeway which is part of the roadway or shoulder and delineated by pavement markings or barriers. Vehicle parking, crossing or turning movements may be permitted within the bikeway.</td>
</tr>
<tr>
<td>BIKEWAY, CLASS III</td>
<td>A road designated as suitable for bicycling.</td>
</tr>
<tr>
<td>BLAZE</td>
<td>A method of marking trails consisting of a &quot;blaze&quot; of paint or trail marker placed at intervals along the trail.</td>
</tr>
<tr>
<td>BUFFER ZONE</td>
<td>Area between the trail and other facilities.</td>
</tr>
<tr>
<td>BLOWDOWNS</td>
<td>Trees that have been uprooted or broken and block passage along a trail.</td>
</tr>
<tr>
<td>CLINOMETER</td>
<td>An instrument used for measuring angles or elevation or inclination.</td>
</tr>
<tr>
<td>CORDUROY</td>
<td>A log structure covered with a tread of soil and laid on the ground, used for crossing wet areas.</td>
</tr>
<tr>
<td>DESIGN SPEED</td>
<td>The maximum safe speed that can be maintained over a specified section of bikeway when conditions are so favorable that design features of the bikeway govern.</td>
</tr>
<tr>
<td>DESIGNATED TRAIL</td>
<td>A trail that is approved and maintained by the Department of Parks.</td>
</tr>
<tr>
<td>EQUESTRIAN TRAIL</td>
<td>A soft surface trail utilized for horseback riding.</td>
</tr>
</tbody>
</table>
FORD: A stream crossing maintained to provide safe crossing for equestrians.

GRADE-SEPARATED CROSSING: Overcrossings or undercrossings to separate pedestrian, bicycle or equestrian crossings for motor vehicles.

GREENWAY: A continuous interconnected network of linear natural and scenic corridors preserved for active and passive recreation use or conservation.

GRUBBING: Removal of roots from the trail tread.

HIKING TRAIL: An unpaved trail used for nature walks and hiking.

HIKER-BIKER TRAIL: A paved path designed for use by pedestrians or bicycles and generally separated from motor vehicle traffic.

INFORMAL TRAIL: A trail that has developed through informal use and is not designated or maintained by the Department of Parks.

JOINT-USE HIKING/EQUESTRIAN TRAIL: An unpaved trail suitable for both hiking and horseback riding.

LATERAL CLEARANCE: Horizontal width required for the safe passage of a pedestrian, bicycle or horse.

MULTI-USE TRAIL: A trail corridor accommodating all types of trail uses consisting of either parallel asphalt and soft surface trails, or one 12' bluestone trail.

MUTCD: Manual on Uniform Traffic Control Devices. Approved by the Federal Highway Administration as the national standard for the selection and location of traffic control devices on or adjacent to all highways open to public travel in accordance with Title 23, U.S. Code, Section 109-b, 109-d and 402-a.

OUTSLOPING: A method of base grading the trail that leaves the outside edge of the trail lower than the inside edge of the trail.

PAVEMENT MARKINGS: Painted or applied line(s) or legend placed on a paved trail surface to regulate, guide or warn users.

RIGHT-OF-WAY: (1) A general term denoting land, property, or interest therein, usually in a strip, acquired for, or devoted to, transportation purposes. (2) The right of one trail user to proceed in a lawful manner in preference to another vehicle or pedestrian.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHY DISTANCE</td>
<td>The distance between the trail's edge and any fixed object capable of injuring a trail user.</td>
</tr>
<tr>
<td>SIDE TRAILS</td>
<td>Dead-end trails which access features near the main trail</td>
</tr>
<tr>
<td>SIGHT DISTANCE</td>
<td>The length of trail visible to the user.</td>
</tr>
<tr>
<td>SKEW ANGLE</td>
<td>Less than at right angle to a bikeway. Usually an oblique angle of 45 degrees or less.</td>
</tr>
<tr>
<td>STEP STONES</td>
<td>Rocks used to form a stable tread on wet areas of a trail.</td>
</tr>
<tr>
<td>STOPPING SIGHT DISTANCE (SSD)</td>
<td>The sum of two distances: (1) the distance a bicycle travels after the cyclist sights an object and before braking, and (2) the distance traveled after braking.</td>
</tr>
<tr>
<td>SUPER-ELEVATION</td>
<td>Slope or bank of a curve or trail expressed as the ratio of feet of vertical rise per foot of horizontal distance. The outside edge of a trail is raised for the purpose of overcoming the force causing a vehicle to skid when maintaining speed.</td>
</tr>
<tr>
<td>SWITCHBACKS</td>
<td>Successive sharp, short radius curves in a trail that are used to gain elevation on steep hillsides.</td>
</tr>
<tr>
<td>TERMINUS</td>
<td>Refers to either the beginning or end of a trail.</td>
</tr>
<tr>
<td>TRAILWAY</td>
<td>A trail.</td>
</tr>
<tr>
<td>TREAD/TREADWAY</td>
<td>The surface of the trail cleared for travel.</td>
</tr>
<tr>
<td>VERTICAL CLEARANCE</td>
<td>Vertical height necessary for the safe passage of a pedestrian, bicycle or horse.</td>
</tr>
<tr>
<td>WATERBARS</td>
<td>Rock or log barriers that divert water off the treadway.</td>
</tr>
</tbody>
</table>
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Delves, John "Bikes: A Place of Their Own," Backpacker, January 1987, p.4.


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