CHAPTER 3.0 AFFECTED ENVIRONMENT

For the purposes of this plan, the study area is the area considered to be directly influenced by the GMP/EIS. The study area for each affected resource includes this area but may extend outside to adjacent areas indirectly influenced by the GMP/EIS, depending upon the resource.

3.1 LAND USE AND SOCIO-ECONOMIC CONDITIONS

Land uses in the study area were inventoried to characterize the surrounding context of Great Falls Park. Land uses along with visitor activities within the park were also analyzed to understand how the park currently functions. Land use inventories for the park and surrounding area result from field observations and a review of aerial photographs of the area, contemporary and historic maps, Fairfax County's comprehensive plan and zoning ordinance, and Montgomery County's comprehensive plan and zoning ordinance. Visitor activities were characterized through use of an existing survey, field observations, and meetings with park staff.

3.1.1 Land Use and Property Boundaries

Land Use Patterns of the Surrounding Area

Great Falls Park is located in the northeast portion of Fairfax County, Virginia. This portion of Fairfax County consists of low-density, single-family residences, and open space uses. The Potomac River, under the State of Maryland's jurisdiction, borders the park to the east. Montgomery County, Maryland, is located to the east of the river. Similar to Fairfax County, this area of Montgomery County, within proximity of the park, consists of open space uses and low density, single-family residences.

The R-E (Residential Estate District) is the predominant zoning district adjacent to the park in Fairfax County. This district promotes agricultural uses, and low density residential dwellings at a density not to exceed one dwelling unit for every two acres. Other zoning districts within Fairfax County, that are located beyond the immediate surrounding area, include the R-A (Rural Agricultural District), R-1 (Residential District, one dwelling unit per acre), R-2 (Residential District, two dwelling units per acre), C-5 (Neighborhood Retail Commercial District), and C-8 (Highway Commercial District).

On the east side of the river, in Montgomery County, the RE-2 District (Residential, One-Family District) is the most prevalent zoning district in the area adjacent to the park. The district promotes low-density residential development.

Surrounding roadways include Old Dominion Drive, which provides public vehicular access to the park, Georgetown Pike (Route 193), which connects to Interstate 495 (Capital Beltway) located approximately four miles to the south, and Riverbend Road which connects to residences to the west of the park.

There are a number of open space uses including parks and trails adjacent to the park. To the north, Riverbend Regional Park provides approximately 400 acres of open space and shares a

portion of a common boundary with Great Falls Park. It is managed by Fairfax County Park Authority and includes a nature center, a boat ramp for private boat launches, a pavilion and picnic area, a playground for children, refreshment vending, and pedestrian and equestrian trails. The North River Trail, a multipurpose biking, hiking, and horseback riding trail within Great Falls Park, continues as a pedestrian trail into Riverbend Park.

To the east, the Chesapeake and Ohio Canal National Historical Park (C&O Canal NHP), managed by the NPS, is located immediately east of the Potomac River in Maryland. The park preserves the C&O Canal, a cultural resource listed in the National Register of Historical Places that extends for 185 miles from Georgetown (Washington, D.C.) to Cumberland, Maryland. Activities available at the park include backpacking, bicycling, bird watching, boating, camping, climbing, cross country skiing, fishing, hiking, horseback riding, interpretive programs, kayaking, nature walks, and wildlife viewing.

The Difficult Run Stream Valley Park, managed by Fairfax County Park Authority, is located to the west of the park, and Madeira School, a private boarding school, is located to the south. Other major open space uses, beyond the immediate surrounding area of Great Falls Park, include Spring Hill Recreational Center, and the Great Falls Grange Park (managed by Fairfax County), Scotts Run Nature Preserve (managed by Fairfax County Park Authority), and River Bend Golf and Country Club, a private facility.

Land Use Patterns within Great Falls Park

Great Falls Park consists of two parcels, separated by Old Dominion Drive, which total approximately 800 acres. The larger parcel is shaped in a long and narrow configuration and located along the Potomac River. It extends for approximately 2.5 miles in the north-south direction, and varies between approximately 800 feet at the narrowest location, and 3,400 feet at the widest location. The smaller parcel is somewhat triangular in shape. Its longest side borders Old Dominion Drive and extends approximately a half-mile in the north-south direction.

The park includes wooded areas, developed areas, cultural resource areas, and recreational areas. These are located as follows:

- *Wooded Areas:* The wooded areas cover most of the park. These include the park property to the west of Old Dominion Drive, most of the area to the west of the Old Carriage Road Trail, the area to the south of where the Patowmack Canal meets the Potomac River (canal cut area), the area north and west of the northern parking lot, and portions of the area to the east of the Patowmack Canal.

- *Developed Area:* The developed area is located towards the northern portion of the park and consists of three parking areas, a visitor center, maintenance facility, a law enforcement trailer, a comfort facility, and an entrance station. The maintenance facility is a fenced in area located near the entrance of the park that includes a single-storied structure where maintenance equipment is stored, and four temporary structures that house additional maintenance equipment and interpretive supplies. The law enforcement trailer provides offices for U.S. Park Police (USPP) personnel. See Figure 1.3: Park Facilities.

View of the Potomac River with C&O Canal NHP in the background

Wooded areas cover a large portion of the park

- *Cultural Resource Areas:* The major cultural resource areas include the Patowmack Canal and Matildaville. The Canal runs parallel to the Potomac River and extends from an area close to the northern parking lot, to the canal cut located approximately at the mid-point of the park's eastern boundary. Matildaville consists of structural remnants of buildings that are located to the west of the canal and south of the southern parking lot. In addition, there are a number of cultural resources that are scattered across the park (see Section 3.2 of this document for more details).

- *Recreational Areas:* Recreational uses at the park include overlook areas to view the Great Falls, a system of hiking, biking, and horseback riding trails, picnicking, rock climbing, whitewater boating, and fishing. The picnic area is a grassy area, with picnic tables and grills, that is located adjacent to the entrance road, between the visitor center and the lower parking lot. The rock climbing area is located along the Potomac River, largely between Overlook 3 and Cow Hoof Rock. Access to the river for whitewater rafting and kayaking occurs at Fisherman's Eddy and AA Gorge, and fishing occurs at these locations and many others along the river, as well as along Difficult Run. Kayaking and fishing are also available off Sandy Landing further to the south. See Figure 3.1: Recreational Opportunities.

Boundaries and Land Protection

As a part of the current planning effort, the boundaries for Great Falls Park are consistent with the area within NPS's authority that is illustrated in Figure 1.2: Aerial Map. These boundaries were identified based on criteria consistent with NPS management policy: to include significant or key natural and cultural resources that are central to protecting and fostering public understanding of Great Falls Park, a unit of the GWMP; to provide for visitor services and interpretation; to protect park resources critical to fulfilling the park's purposes; to address operational and management issues; and to protect the unique environments of the Mather Gorge of the Potomac River.

3.1.2 Visitation and Visitor Activities

Great Falls Park's visitation was 415,770 in 2005.[1] This is somewhat similar to the visitation in previous years (425,290 visitors in 2004; 399,399 in 2003; 430,200 in 2002; 440,852 in 2001; and 432,937 in 2000). A visitor survey conducted in April/May 1996 identified that the predominant visitor uses within the park consist of both passive and active recreational activities.[2] These activities, indicated in order of usage per activity, include viewing the Great Falls, walking/hiking, viewing wildlife, visiting the Patowmack Canal, picnicking, climbing, bicycling, walking pets, nature study, white water boating, jogging, fishing, ranger led walks/talks, and horseback riding.

Of these, the most common activities were identified as *viewing the Great Falls* (73 percent of the respondents), *walking/hiking* (56 percent), *viewing wildlife* (41 percent), and *visiting the Patowmack Canal* (31 percent).

1 NPS Public Use Statistics Office (http://www2.nature.nps.gov/mpur/index.cfm)

2 Great Falls Park, Virginia – Visitor Study. Cooperative Park Studies Unit, University of Idaho. Spring 1996.

Developed area of the park

Portion of the Patowmack Canal

Opportunities for these activities are achieved at the overlook areas, visitor center, park trails, picnic areas, rock climbing areas, and areas where the river can be accessed (see Figure 3.1: Recreational Opportunities).

- *Overlook Areas:* The most active portion of the Park is located in the vicinity of the visitor center and picnic area. There are three overlook areas (Overlook 1 also referred to as the Jetty Overlook, Overlook 2 and Overlook 3), located east of the visitor center, that allow visitors to view the falls. These three areas are connected by foot trails that branch out towards the river from the Patowmack Canal Trail. The park recently upgraded the overlook structures and provided ADA compliant accessibility to Overlooks 2 and 3.[3]

- *Visitor Center:* The visitor center consists of two, two-storied structures that are connected on the second floor. The building includes approximately 870 square feet of offices for the NPS staff (both administrative and interpretive), a 70-seat auditorium, a bookstore, a food concession stand, restrooms, and a 2,000-square-foot exhibit area for interpretation, and ranger talks. The park offers a variety of interpretive programs for visitors including a 10-minute slide presentation on the history of the Great Falls Park, ranger talks, and hikes with rangers on various trails within the park and programs for children. Due to its age and size, the visitor center is in need of several improvements. This includes a reconfiguration of the access ramps to meet ADA standards for slope and landing areas, and improvements to the restrooms to meet ADA accessibility standards.

- *Picnic Area:* The park offers a picnic area for visitors in an open expanse of land between the southern and middle parking areas. This area includes picnic tables and barbeque grills. During summer months and warm weekends, the tables are fully utilized.

- *Rock Climbing:* There are several stretches of rock faces along the Potomac River and Mather Gorge that provide opportunities for rock climbing. Some of the most popular are: Dihedrals, Juliet's Balcony, Seclusion, Matildaville Trail Shortcut, Romeo's Ladder, Aid Box, and Bird's Nest.[4] These are accessible off the River Trail. The park encourages climbers to register at the visitor center or at the lower parking lot; however, no equipment or formal programs are offered at the park for visitors interested in this activity. Most visitors either bring their own equipment, or come as part of groups organized by private businesses that service rock climbing activities. NPS issues a permit to these businesses on an annual basis and issued ten such permits in 2006.[5]

- *Nature Study:* The park offers a significant amount of preserved and largely undisturbed open space in a suburban environment. It includes woody vegetation, some of which is more than a 100 years old, rare plant and animal species including more than 150 different varieties of birds. A number of visitors visit the park to appreciate its natural environment and participate in activities such as bird watching and nature photography.

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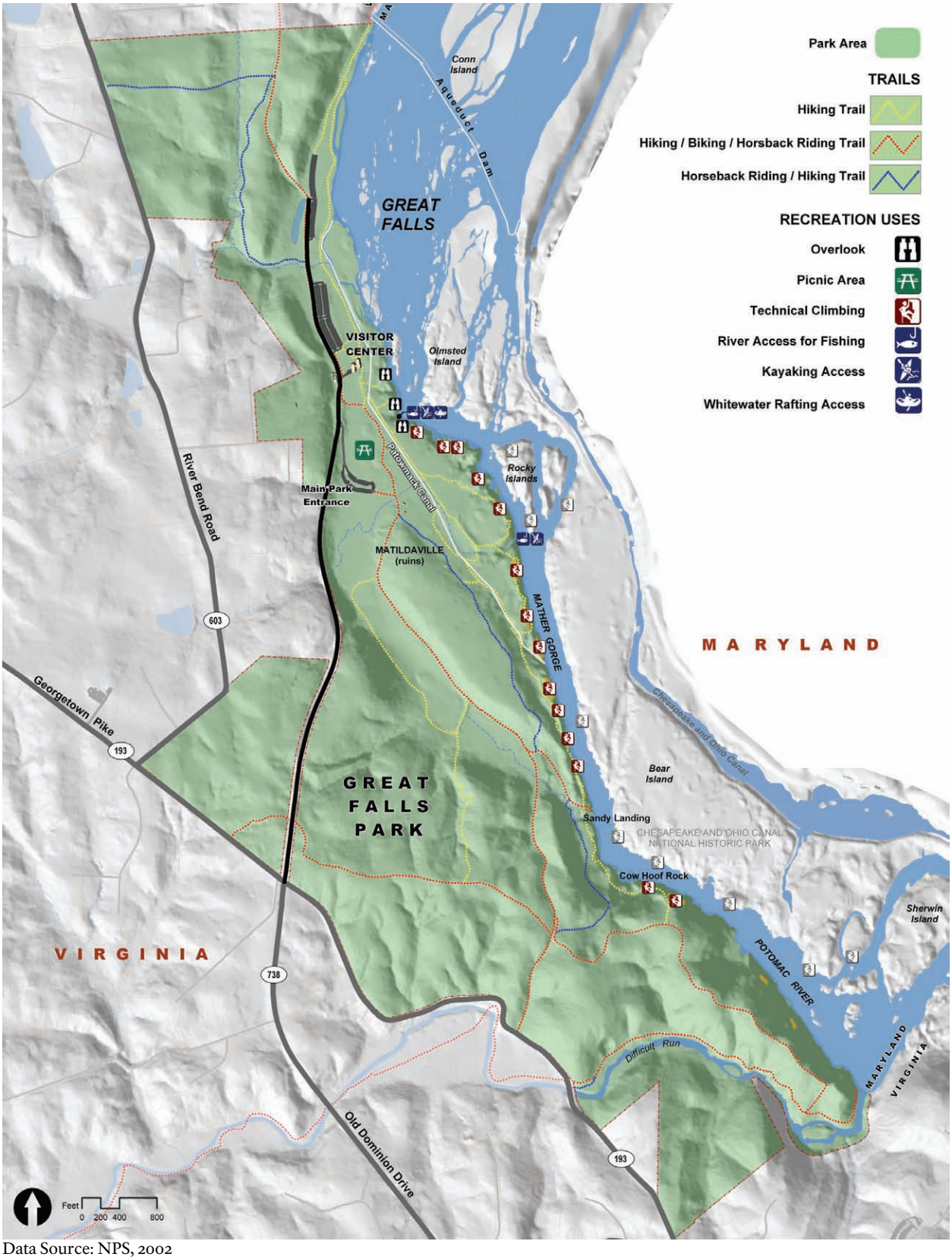
3 Document of Decision and Finding Of No Significant Impact - Improvements To Trails And Overlooks at Great Falls Park, Virginia, Great Falls Park, Virginia, 2003.

4 Brinkworth, Marinda, **The Complete Great Falls Climbing Guide**, Dog Days Graphics, Maryland, 1998.

5 Incidental Business Permits 2006, GWMP, dated November 16, 2006.



Data Source: NPS, 2002

Figure 3.1: Recreational Opportunities

- *Trails*: There are eleven trails within Great Falls Park. These vary by use, length, and the experience that they offer. The trails closest to the visitor center and parking areas experience the most usage as a large number of visitors tend to remain in this portion of the park. Usage is significantly reduced along trails that extend further away from the developed area of the park. The system of trails within the park are illustrated on Figure 3.2: Existing Trails, and consist of the following:

    - The Old Carriage Road Trail is a multipurpose trail that runs for approximately 1.6 miles in the north-south direction. The trail connects from the northern end of the park to Georgetown Pike in an area to the north of Difficult Run. The trail is for walkers, joggers, hikers, bicyclists, and horseback riders.

    - The Patowmack Canal Trail is another north-south trail that runs parallel to the Patowmack Canal for approximately 1.25 miles. The Patowmack Trail connects to the upper parking lot to the north, and River Trail to the south. The trail is a single-purpose trail restricted to foot traffic. It is one of the most heavily used trails, as it connects the parking areas to the overlooks and the picnic area.

    - The River Trail also runs in the north-south direction, parallel to the Potomac River for approximately 1.5 miles. The trail connects to the Patowmack Canal Trail to the north, in the vicinity of the picnic area, and the Ridge Trail to the south. The trail is a single-purpose trail that is restricted to walkers, joggers, and hikers. It offers views of the Potomac River, including the Mather Gorge. The trail is heavily used by visitors seeking to walk along the river, as well as to access climbing areas.

    - The Matildaville Trail runs for approximately 1.1 miles in the north-south direction. It connects to the Old Carriage Road Trail to the north, in the vicinity of the restrooms near the lower parking lot, and to the Ridge Trail to the south. The trail is open to horseback riders, walkers, joggers, and hikers.

    - The Ridge Trail is approximately 1.5 miles long and runs in the east-west direction. It is a multipurpose trail that originates to the west at Old Dominion Drive and terminates at the Difficult Run Trail to the southeast. The trail is for hikers, walkers, joggers, bicyclists, and horseback riders.

    - The Swamp Trail is approximately 0.4 miles long. It connects to the Old Carriage Road Trail to the north, and the Swamp-Ridge Connector Trail to the south. The trail is a single-purpose trail, restricted to foot traffic.

    - The Swamp-Ridge Connector Trail is approximately 0.4 miles long and connects Swamp Trail to the north and Ridge Trail to the south. Similar to Swamp Trail, the Swamp-Ridge Connector Trail is a single-purpose trail, restricted to foot traffic.

    - Riverbend Road Trail is approximately 0.4 miles long that runs in the east-west direction and connects Riverbend Road to the Fire Road. The trail is restricted to foot traffic and horseback riders.

Data Source: NPS, 2002

Figure 3.2 : Existing Trails

- The Difficult Run Trail is approximately 0.7 miles long and runs in the east-west direction adjacent to Difficult Run, between Georgetown Pike and the Potomac River. It is a multipurpose trail for hikers, walkers, joggers, bicyclists, and horseback riders.

- Mine Run Trail is approximately 0.5 miles long and runs in the north-south direction. The trail branches off from the Fire Road and loops around Clay Pond. It is restricted to foot traffic and horseback riders.

- North River Trail is approximately 0.25 miles long and run in the north-south direction between the northern parking lot and Riverbend Park. The trail is a single-purpose trail, restricted to foot traffic.

- The Fire Road is approximately 0.4 miles long and runs in the north-south direction. It connects the northern parking lot and Riverbend Park. It is a multipurpose trail for hikers, walkers, joggers, bicyclists and horseback riders.

- *Surrounding Trails:* The Great Falls Park is a primary node in a growing network of existing and proposed trails. On the north, a trail in the park connects with a trail in Riverbend Park, managed by the Fairfax County Park Authority (FCPA). On the southwest side of the park, the multi-purpose Difficult Run Trail, also managed by FCPA, extends upstream from the Park, and is part of the 40-mile Fairfax CCT which connects to Pohick Stream Valley Trail in the southern part of the County. In the northwest-southeast direction, the park will serve as a trailhead for a planned segment of the PHNST along Georgetown Pike, currently under study by Fairfax County. Along with trails in Great Falls Park and Riverbend Park and the 10-mile Potomac Heritage Trail and 17-mile Mount Vernon Trail in GWMP (south of I-495), PHNST would potentially include a 116-mile trail system between Prince William Forest Park in southern Prince William County and White's Ferry in Loudoun County, connecting with the C & O Canal Towpath in Georgetown and at White's Ferry. Trails within the park, where the geology transitions between the Atlantic Coastal Plain and the Piedmont, are some of the most prominent features in the 425-mile PHNST corridor between the mouth of the Potomac River and the Allegheny Highlands.[6]

- *Whitewater Boating and Kayaking*: Visitors can gain access to the Potomac River from Great Falls Park for whitewater rafting and kayaking. The park does not offer any equipment or formal programs for visitors interested in this activity. Most visitors either bring their own equipment, or come as part of groups organized by a number of private businesses that service non-motorized boating activities. NPS issues a permit to these businesses on an annual basis and issued three such permits in 2006. Access to the river is gained off Fisherman's Eddy, located between Overlooks 2 and 3, and AA Gorge area. In addition, access to the river can be achieved from Sandy Landing.

[6] Implementation Plan for the Potomac Heritage National Scenic Trail in Fairfax County, Prepared by the Northern Virginia Regional Commission, September 2002.

Patowmack Canal Trail

Kayaking in the Potomac River

- *Fishing:* The park provides access to the Potomac River for recreational fishing. A Virginia or Maryland fishing license is required for those over the age of 16 years. Access to the river is from Fisherman's Eddy, located between Overlooks 2 and 3, and other locations in the park such as near the Aqueduct Dam and AA Gorge.

Visitor Safety

Each year the park is the scene of accidents involving visitors engaged in a variety of activities. While most of these accidents are minor, sometimes these result in serious injuries, including fatalities. Accident records indicate that most victims are visitors engaged in passive recreational activities who had come to picnic, view the falls and fish, rather than visitors engaged in active recreational activities such as kayaking or climbing. Incidents such as getting too close to the edge of the cliffs, fishing near swift water, deciding to wade, or trying to scramble on some of the steep slopes, have resulted in the most serious injuries, as well as fatalities, in recent years.

Accident locations have varied greatly from year-to-year. Typically, the park may experience two to five years of low incident and accident rates followed by several years of increased incidents/accidents. In 2004, there were a total of 99 emergency medical incidents. Of these, six required advanced life-support treatment. There were also three fatalities in 2004 (two of these were the result of people scrambling on a steep area over the river). While the fatality rate was higher than in the past several years, the number of medical incidents was not significantly different (when one considers the improved reporting that was used in 2004).

3.1.3 Community Facilities - Police, Fire, and Rescue Services

The park is served by the USPP. The USPP uses a trailer for their offices, and leases space in a nearby stable (outside the park) for keeping its horses. In addition to the personnel at the park, USPP support from regional USPP facilities is provided when necessary. This includes helicopter support to access remote areas of the park.

Fairfax County also provides fire and rescue services to the park. There are four fire stations within a five-mile radius of the park: Company 12 on Georgetown Pike northwest of the park; Company 29 on Leesburg Pike south of the park; Company 1 near Dolley Madison Boulevard, southeast of the park; and, Company 39 on Leesburg Pike, northwest of the park. Of the four stations, Company 12 usually provides the first response to any emergency at the park.

3.1.4 Neighboring Population and Socio-Economic Conditions

The 2000 U.S. Census provides the basis for analyzing the demographic composition of the area around the park. Population, household, and income data from the Census provide useful demographic information. Executive Order (EO) 12898 requires federal agencies to: 1) identify any disproportionately high and adverse effects on human health or human environment of minority and/or low-income populations resulting from federal programs, policies, and activities, and 2) identify alternatives that may mitigate these impacts.

Characterization of a group of persons as a potentially "affected community" under EO 12898 requires the fulfillment of one of the three following criteria: a minority population of the affected area that exceeds 50 percent; a low-income population based on the Bureau of Census

Current Population reports; or a minority population meaningfully greater than the minority population percentage in the general population, or other appropriate geographic units.

Demographic data was collected and analyzed to determine the existing socio-economic conditions in the Great Falls Park study area. The potential impacts that may result from future activities at the park are localized; therefore, the potentially affected area can be defined narrowly. For this project, the study area was defined to include four adjacent census tracts in Fairfax County, Virginia and three adjacent census tracts in Montgomery County, Maryland.[7] Additional data for Fairfax and Montgomery Counties was also collected and analyzed in order to draw a comparison between the study area and the larger geographical area.

Population

Based on data from the 2000 Census, the population of the study area is 43,401 (25,898 persons in Fairfax County and 17,503 in Montgomery County). This figure represents approximately 2.36 percent of the total population of Fairfax and Montgomery Counties (1,843,090 persons).

The racial composition of the study area is less diverse than the greater geographic area (see Table 3.1: Population Characteristics in the Surrounding Area).

Table 3.1: Population Characteristics in the Surrounding Area

	Total Population	Declared One Race (%)	White (%)	Asian (%)	Black/ African American (%)	Others Declared One Race (%)	Declared More than One Race (%)
Fairfax County	**969,749**	**934,311 (96)**	**677,904 (70)**	**126,038 (13)**	**83,098 (9)**	**47,271 (5)**	**35,438 (4)**
Fairfax County Portion of Study Area	25,898	25,173 (97)	21,286 (82)	2,534 (10)	876 (3)	477 (2)	725 (3)
Montgomery County	**873,341**	**843,224 (97)**	**565,719 (65)**	**98,651 (11)**	**132,256 (15)**	**46,598 (5)**	**30,117 (3)**
Montgomery County Portion of Study Area	17,503	17,155 (98)	13,691 (78)	2,755 (16)	560 (3)	149 (1)	348 (2)

Note: Percentage is based on Total Population.
Source: US Census 2000

Census 2000 data also indicates that the median age in the study area is slightly higher compared to the two Counties. The median age in the Fairfax County portion of the study area was 40.4, compared to 35.9 in Fairfax County. Similarly, in the Montgomery County portion of the study area, the median age was 42.3, compared to 36.8 in Montgomery County. The Metropolitan Washington Council of Government anticipates population in Fairfax County to grow by approximately 234,000 persons between 2000 and 2025 (an approximate increase of 24.1 percent), and in Montgomery County to grow by approximately 165,000 persons (an approximate increase of 19.3 percent) for the same period.[8]

[7] Tracts 4801, 4804, 4819 and 4803, in Fairfax County, and Tracts 7006.08, 7060.07 and 7060.08 in Montgomery County.

[8] Metropolitan Washington Council of Government's Round 6.2, intermediate series, Summer of 2000.

Housing

The Fairfax County portion of the study area contains 8,807 housing units, representing 2.5 percent of all housing units in Fairfax County. The vacancy rate of 2.4 percent in this area is comparable to the County. The owner occupancy rate of 87.4 percent in the Fairfax County portion of the study area is significantly greater than the occupancy rate of 70.9 percent for Fairfax County.

The Montgomery County portion of the study area contains 5,578 housing units, representing 1.7 percent of all housing units in the County. The vacancy rate of 2.7 percent in this area is slightly less compared to the County (3.0 percent). The owner occupancy rate of 92.2 percent in the Montgomery County portion of the study area is much greater than the occupancy rate of 68.7 percent for Montgomery County.

The median value of owner-occupied housing in the Fairfax County portion of the study area varied between $418,100 and $755,600 in different Census Tracts (Census 2000). These are substantially higher than Fairfax County, where the median value of owner-occupied housing was $233,300. With regards to rental housing, the median rent in the Fairfax County portion of the study area is substantially higher compared to Fairfax County overall.

The median value of owner-occupied housing in the Montgomery County portion of the study area varied between $488,200 and $787,200 in different Census Tracts (Census 2000). These are substantially higher than Montgomery County, where the median value of owner-occupied housing was $210,600. With regards to rental housing, the median contract rent in the three Census Tracts within Montgomery County is greater than $2,000 per month. These rents are significantly higher than the median contract rent of $856 for the County.

Income Levels

The median household income in 1999 in three of the Census Tracts in Fairfax County portion of the study area varies between $156,614 and $167,568. These are approximately 1.9 to 2.1 times the median household income of $81,050 for Fairfax County. The median household income in Census Tract 4819 in 1999 was $76,261, approximately 94 percent of the County's median household income.

The median household income in 1999 for the three Census Tracts in Montgomery County is greater than $155,373. By comparison, the median household income in 1999 in Montgomery County was $71,551.

3.2 CULTURAL RESOURCES

NPS Management Policies (2006) prescribe that the NPS "will protect, preserve, and foster appreciation of the cultural resources in its custody and demonstrate its respect for the peoples traditionally associated with those resources through appropriate programs of research, planning, and stewardship."

3.2.1 Summary of Great Falls Park History

Pre-historic Context

American Indians once occupied various areas in the greater metropolitan Washington DC area. The lands along the Potomac and Anacostia Rivers, and the many tributaries that ran through the Washington DC, area offered game animals and fish, a variety of plant foods, and lithic resources. Locations along streams were often selected by American Indians for camp or village sites and for the exploitation of food resources.

Prior to the existence of the Patowmack Canal, American Indians occupied areas now within the park. They engaged in fishing in the Potomac River and obtained other sustenance from the surrounding forest. While the boundaries of the Patowmack Canal can be documented as occupying the low-lying land adjacent to the Potomac River, the activity zones of these pre-historic peoples are not so clearly defined. A 1969 archeological report documenting aboriginal occupation within Great Falls indicates the existence of seasonally occupied campsites and a trade network.[9]

Historic Context

The Patowmack Canal at Great Falls Park was built between 1786 and 1802 to establish a navigable route around the Great Falls on the Potomac River. The attempt to provide a transportation link to the Ohio River Valley began with the formation of the Ohio Company in 1749. George Washington, his brothers Lawrence and Augustus, and other prominent families were among the company's many stockholders. The company developed an overland route westward through the Potomac River basin, establishing numerous settlements along the way. However, financial losses during the French and Indian War (1756-1763) resulted in the company's demise. No canals were built and the Revolutionary War soon followed.

After the Revolutionary War, George Washington embarked on an extensive inspection of western lands to speculate on possible water routes to the Ohio Valley. In 1785, a charter was obtained to establish the Patowmack Company that was delegated the responsibility of constructing canals and roads from the eastern waters leading toward Lake Erie. Construction of the Patowmack Canal commenced in 1785 and was completed in 1802. The canal functioned until 1828, at which time the C&O Canal was completed on the Maryland side of the Potomac River. Subsequent to the opening of the C&O Canal, the Patowmack Canal locks were dismantled and abandoned.

[9] Gardner, William M., Stephen J. Gluckman, Ellis E. McDowell, and Charles W. McNett, Jr., **A Report of Excavations at the Stout Site. Quarterly Bulletin of the Archaeological Society of Virginia** 24(1):133-143, 1969.

Matildaville

In 1790, an act of the Virginia state legislature provided for a town of 40 acres to be established adjacent to the canal.[10] The act specified that the town be laid out in one-half acre lots. The lots were sold at auction under the provision that the purchaser erect "a dwelling house, 16 feet square with a brick or stone chimney," to be finished and fit for habitation within five years of the date of sale. Over 80 plots were available, however, not a large number of them were sold during auctions held between 1795 and 1797.

At the height of development, Matildaville, as the town was called, consisted of a number of dwellings, a springhouse, a forge, a gristmill, a sawmill, several warehouses, an inn, and a handful of company buildings. Although some of the structures in the town continued to be occupied throughout the 19th century, the official recognition of Matildaville ceased in 1839 when an act was passed to incorporate another town, South Lowell, at the same location.

Mid-1800s to Mid-1900s

The majority of land currently comprising Great Falls Park was purchased in 1854 by the Great Falls Manufacturing Company. In 1895 the Great Falls Power Company purchased the rights to the land. The Power Company expanded its ownership to 900 acres. In the early part of the 20th Century, a portion of the land was leased for a resort that included a carousel and lookout tower. Between 1906 and 1934, the Great Falls and Old Dominion Railroad provided a 14-mile public trolley line along Old Dominion Drive that originated in Georgetown, Washington, DC. In the 1920's, a religious retreat, Camp Clark, provided water sports and overnight stays, and was operated above Sandy Landing, below the exit of the lowest lock of the Canal.

National Park Service Acquisition

A brief change in title occurred in August of 1947 when the Washington Railway and Electric Company took control. A week later, the Potomac Electric Power Company (PEPCO) became the titleholder of the property. In 1953, the Fairfax County Park Authority purchased 16 acres adjacent to the Falls. In 1960, an agreement was reached between the U.S. Government and PEPCO, whereby PEPCO leased 790 acres of land in Great Falls, Virginia to the National Capital Parks. In return, the U.S. Government leased 390 acres of land in Prince George's County, Maryland (known as the Blue Ponds Property) to PEPCO. In 1965, the U.S. House and Senate passed enabling legislation that authorized the NPS to swap the Blue Ponds property and "not more than one million dollars" for the Great Falls property.

3.2.2 Archaeological Resources

The museum collection for Great Falls Park consists of over 76,000 artifacts primarily associated with American Indian prehistory and the Patowmack Canal-era history of the park. A large percentage of the objects were collected and documented during archaeological excavations. Several sites that have been investigated include the Patowmack Canal (limited testing), Stout

[10] Barnes, Arthur G., **History of Potomac Canal: Matildaville**, Southside Historical Sites, Inc., College of William and Mary, Williamsburg, Virginia, March 1978.

site, William Dickey House, "Ruins of Old Jail", Springhouse, Samuel Briggs Grist Mill, Potts and Wilson Iron Forge/Foundry.[11]

Recent archeological investigations unearthed additional evidence of past human activities in Great Falls Park.[12] Two sites of refuse disposal dating from early to mid-twentieth century were identified during an excavation to locate a cell tower. Preliminary analysis of other recovered artifacts indicated that an early to mid-19th century domestic site existed near the area of impact.

In addition to the resources that have been revealed, the park has the potential to contain additional archaeological resources. These could be associated with the Patowmack Canal (its construction, use and abandonment), Matildaville, the trolley line, Camp Clark, and other prehistoric Native American Indian and historic period sites and structures that have existed within the park.

Petroglyph Site

The park contains a petroglyph site that was discovered in the 1980s and is believed to be attributable to pre-historic American Indians. The petroglyph (a carving or inscription on a rock) depicts four stick figures in a possible atlatl spear throwing sequence. An atlatl is a device like a hooked stick and is used to help propel a spear or dart with greater force. The exact age and nature of the petroglyphs are unknown.

3.2.3 Historic Resources

Patowmack Canal Section at the Park

The Great Falls Park section of the Patowmack Canal is a designated National Historic Civil Engineering Landmark, as well as a National Historic Landmark for being one of the earliest canals in the history of the U.S. and an engineering accomplishment of its time. In addition, the canal is an "extraordinary manifestation of certain leaders of the early American republic, notably George Washington and James Madison".[13] The Patowmack Canal included a series of five skirting canals around falls areas on the Potomac River spaced from Georgetown to Harpers Ferry, and approximately 5,400 feet of the Great Falls skirting canal is located in the park. Principal elements of the canal system that survive in various degrees of preservation within the park include a large wing dam above the Great Falls, upper and lower guard gates linking a relatively long channel that includes a large Holding Basin, and a series of five locks running from below the Lower Guard Gate to the Potomac River below the falls.[14] NPS's List of Classified Structures (LCS) identifies properties that are either listed or eligible for listing on the National Register of Historic Places based on their historical, architectural or engineering significance (see Table 3.2, which identifies structures in the park that are on the NPS's LCS).[15]

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[11] Little, Barbara J., **National Capital Area Archaeological Overview and Survey Plan**, U.S. Department of Interior, NPS-NCR, 1995.

[12] Environmental Assessment, Bell Atlantic Mobile Application for Wireless Telecommunication Facility, Ridge Trail Site, Great Falls Park, Virginia. 2001.

[13] **National Register of Historic Places Inventory – Nomination Form**, National Park Service, 1984.

[14] Ibid.

[15] **Documentation and Stabilization of Various Masonry Features – Condition Assessment Report,** Patowmack Canal, Great Falls Park, GWMP. Prepared by the Historic Preservation Training Center, NPS, 1998.

Table 3.2: List of Classified Structures within Great Falls Park

Feature	Description
Canal Inlet and Wing Dam	Wing Dam extended into the Potomac River to channel water into the canal. The canal inlet and dam still allow water into the canal, although most of the dam has washed away. The remnants of the inlet and dam are still visible during low water.
Upper Spillway	Located on the river side, next to the upper guard gate, it functioned as a stone dam that allowed excess water to overflow and return to the river. It continues to divert water to the river.
Upper Guard Gate/Bull Nose	This includes the stone-lined portion of canal between upper spillway and upper guard dam. The guard gate functioned to protect the rest of the canal from excessive water. No remains exist of the gate. The canal walls and bull nose at the guard gate were recently stabilized.
Lower Spillway, Dam, and Waste Weir	The canal splits at the southeast end of the middle canal, and is in a state of ruin. The dam is in poor condition.
Mill Site	The mill site, known as Brigg's Mill, is located on the upstream portion of the lower canal. The mill was powered by water from the canal to produce flour for Matildaville.
Collecting Basin or Upper Holding Basin including the West Wall, East Wall, and Control Gate	A basin area of approximately two acres was used to dock, hold, and turn boats, and to store water for the canal locks. The basin is mostly filled in and the perimeter is used as part of the park's trail system. It now consists of low vegetation and large shade trees. The walls of the basin still exist, as do the remnants of the control gates.
Forge Foundry Site	The foundry site, known as Pott's Forge, is located adjacent to the access trail to Fisherman's Eddy. Footings and foundation of the foundry remain. These are overgrown with vegetation and are barely visible. There are also some remains of stone foundation walls adjacent to the foundry. These may be from the railroad/amusement park period, or from the canal operation period.
Waste Weir / Spillway	The weir/spillway is located at the southeast end of the holding basin. It functioned to regulate water depth and allowed for drainage of the entire canal. Adjacent to the weir, there are remains of two rectangular foundation walls that may have been a lumber mill. Portions of the building footprint and dry laid stone walls were recently stabilized by the park.
Lower Guard Gate and Walls	The lower guard gate, also identified as the head gate, is located at the southeastern end of the upper holding basin. The walls adjacent to the gate, along with flat strap iron clamps in the stone walls, still remain. The channel leading to the gate is filled with soil and grass.
Lock Number 1 including canal walls between the Locks 1 and 2	Lock number 1 is 14 feet wide by 100 feet long. The walls are made of ashlar-dressed, red Seneca sandstone with rubble interiors. (Two pairs of wood-swing mitre-type gates, with sliding wicket gates that controlled the flow of water, still exist and are on display in the Visitor Center.)
Lock Number 2	Lock number 2 is 12 feet wide by 88 feet long. Wood-swing, mitre-type gates with butterfly wicket gates controlled the flow of water. Part of the wall has collapsed and part is covered with vegetation.
Locks Number 3, 4 and 5	The three locks form a step-like system and share gates. Lock 3 cuts into the riverside wall and creates a small holding area. It also bends slightly towards locks 4 and 5. The locks were severely damaged during the 1996 floods and have since been stabilized.
Upper Guard Gate Dam	The dam consists of a stone dam and earthern berm that runs perpendicular to the canal.
False Canal	This feature is located 600 feet upstream from the Wing Dam. It is approximately 1,200 feet long and 30 feet wide and may have functioned as a mooring place for boats entering the canal. This area is in a state of ruin and is filled with water due to debris that has dammed up either end of this feature.

Feature	Description
Upper Canal Walls and Bed	The upper portion of the canal, between the inlet area and the upper spillway is approximately 800 feet long and 20 feet wide. It consists of earthern walls. This portion of the canal is filled with water and is silted. There are three stone spring houses, concrete culverts, and chimney remains in the vicinity of this portion of the canal.
Middle Canal	The middle portion of the canal, from the upper guard gate to lower spillway, is 300 feet long and 30 feet wide. The walls are constructed of dry-laid stone with slight batter. The walls are 20 feet thick and 10 feet high, above the canal bed. The stone walls are still present, although overgrown vegetation is causing deterioration of the stonework. The canal bed is also visible. At the southeast end of this portion of the canal, a lot of silting has occurred near the lower spillway dam.
Lower Canal	The lower portion of the canal consists of the portion between the lower spillway to the upper holding basin. The canal in this stretch is 1,200 feet long and 20 feet wide. Most of this portion of the canal is filled in with soil and only the top of the canal walls are visible in many locations.
D.A.R. Bronze Plaque	This plaque is in memory of George Washington of Fairfax County, Virginia. As president of the Patowmack Company, he was responsible for the construction of the canal.
Double AA Canal Route	A 12 feet wide feature, located adjacent to the lower guard gate and similar in appearance, probably functioned as a spillway for the alternative canal route to the river. This feature is in poor condition and overgrown with vegetation. The alternate canal route ties into the natural ravine to the river. Boats in this stretch may have been pulled with ropes rather than moved through a system of locks. Stone retaining walls are visible at the downstream end of the upper holding basin, south and east of the waste weir. The exact route and function of this canal is unknown. This feature is in poor condition and overgrown with vegetation.
Lower Holding Basins (2nd and 3rd, between Locks 1 and 2 and Locks 2 and 3 along AA route)	The second holding basin, located between Locks 1 and 2, along the AA route, fed water into locks and functioned as a holding area for boats. The crumbled walls of the second basin are still visible, although these are in a state of ruin and overgrown with vegetation. The third holding basin, located between Locks 2 and 3, along the AA route, fed water into the canal at Lock 3. The area between the holding basin and Lock 3 was substantially damaged during the 1996 flood.
Higg's Hole	This feature is a diamond-shaped hole, 15 feet across, and cut into solid rock. The function of this feature is unknown.
National Historic Civil Engineering Landmark Plaque	The plaque recognizes the engineering feat of constructing the canal and George Washington's role in its construction.
Jetty	The jetty is cut into rock at the base of Lock 5. It was built to protect the end of the canal and to facilitate the entry and exit of boats. This feature has been damaged by flood action and is barely visible.
Matildaville Landscape	The Matildaville landscape includes several ruins, of which the following three are identified in the LCS[16]: Dicky's Inn (Pile of rubble and chimney remains that are surrounded by rusted scaffolding); Canal Superintendent's House (Foundation walls and corner stones remain visible); and Spring House (Stone foundation walls and stairs remain with a spring, which is rarely visible, but that continues to run through it).

[16] An archaeological survey carried out in 1978 that located 31 structures and features in the area thought to be Matildaville. Source: Barka, Norman F. and Charles G. Troup. Southside Historical Sites, Inc. College of William and Mary, Williamsburg, Virginia, March 1978.

Other Historic Resources within the Park

There are several other resources that have been identified as culturally important within the park.[17] However, additional research is needed to understand their archaeological or historic significance. The resources include old road traces, domestic sites, American Indian sites, railroad and industrial sites, and remains of the old amusement park site. Examples include the Hubble Farmstead, the Native American Indian Stout Site (prehistoric), Carousal Site, and Quarry Site. Some old road traces continue to function as trails (e.g. Old Carriage Road Trail and Ridge Road), while others are no longer in use. These cultural resources also contribute to the park's history and are illustrated (without identification to prevent potential damage) on Figure 3.3: Cultural Resources.

Historic Resources in the Vicinity of the Park

Other historical sites in the immediate vicinity of Great Falls Park which have been listed on the National Register of Historic Places include the C&O Canal NHP, located directly across the Potomac River, Cornwell Farm, just west of the park on Georgetown Pike, and Colvin Run Mill, approximately 2 miles to the west.

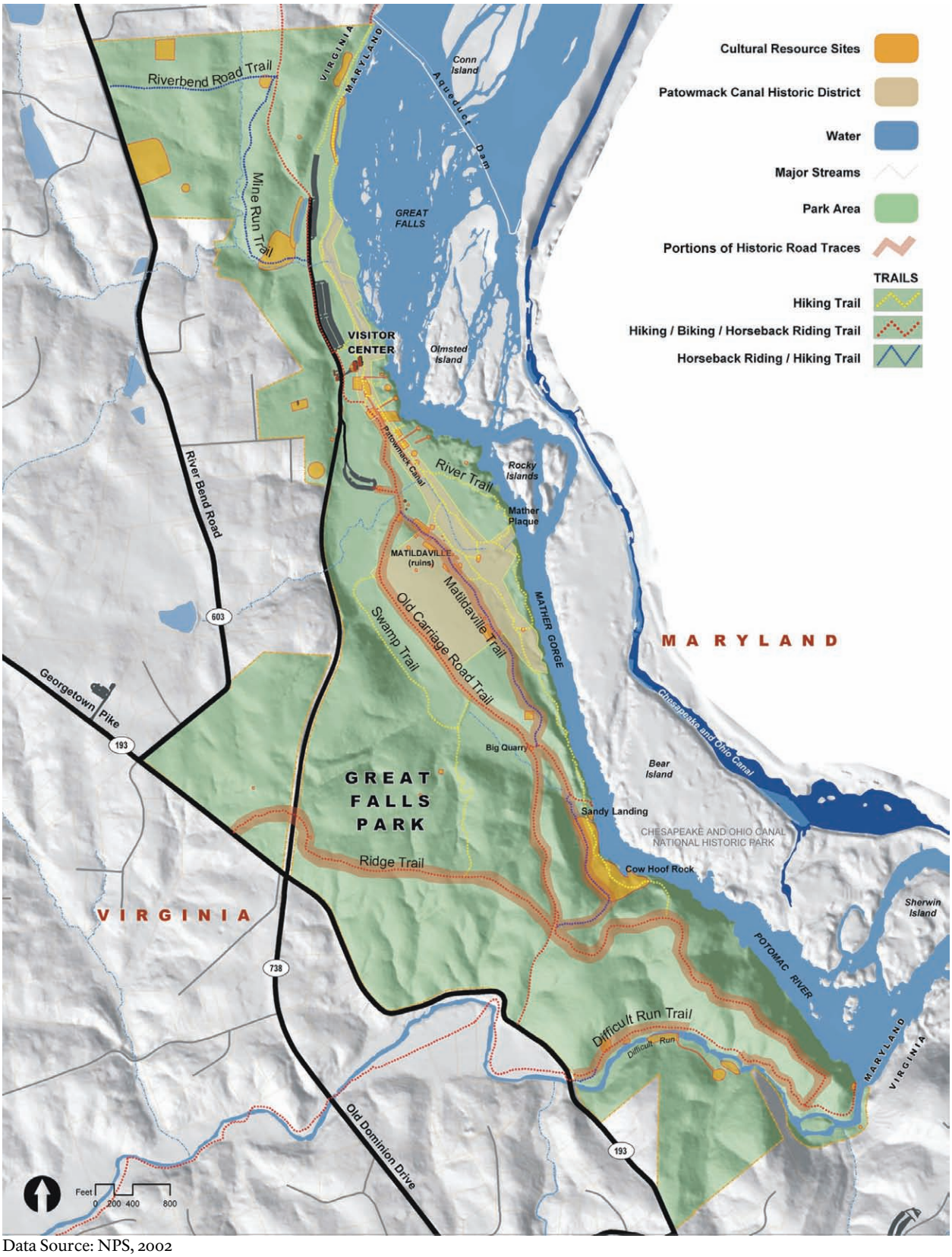
The C&O Canal NHP includes over 50 features on the LCS. As such, they are mandated for preservation through the park's enabling legislation (Public Law 91-664—Chesapeake and Ohio Canal Development Act).

Among the features listed are: several miles of the C&O Canal; the canal towpath and six locks (numbers 15-20); the Great Falls Tavern, located above the Great Falls at Lock 20 of the Canal; Mary's Wall (according to the Dry Stone Wall Conservancy "…one of, if not the tallest canal-carrying retaining walls in the world."); Old Anglers Inn adjacent to the C&O Canal; and the Civil War-era gold mines. As a result, the C&O Canal General Plan for this area has been designated as Zone A, a National Interpretive Center Zone, which must have a superior significant cultural landscape. The Great Falls Maryland Zone A area (4.2 miles in length) is thus described because of the integrity of the historic canal operations and natural setting. Since the beginning of the twentieth century, preservation in the Great Falls area has been interpreted to mean preservation not only of material structures but also of the cultural ambiance of the landscape of the area.

Cornwell Farm is a residential structure that is important for its Georgian Architecture. It was constructed in the early 1800s and is privately owned. Colvin Run Mill is a 19th century water powered gristmill that is still operational. The property is managed by the Fairfax County Park Authority.

Georgetown Pike runs parallel to the southwestern boundary of the park and was designated as the Commonwealth's first Virginia Byway in 1974. In 1993, the Virginia Department of Historic Resources determined that Georgetown Pike appears to meet the criteria for listing in the Virginia Landmarks Register as well as the National Register of Historic Places. Historical documentation (de la Camp 1866) indicates the Ridge Trail was at one time the original road trace for the Old Georgetown and Leesburg Road, the predecessor to Georgetown Pike.

[17] List compiled by Historian Jim Putman, Cultural Resource Preservation Team, GWMP, 1990.



Data Source: NPS, 2002

Figure 3.3: Cultural Resources

There are also several historic properties within two miles of the park that are listed on Virginia's Landmark Register and Fairfax County Inventory of Historic Sites. These are identified in the following table:

Table 3.3: Historic Properties within Approximately two miles of Great Falls Park that are Listed on the Virginia Landmark Register (VLR) or Fairfax County Inventory of Historic Sites (IHS)[18]

Resource	Listed On	Resource	Listed On
Bethel Primitive Baptist Church	Fairfax County IHS	Four Stairs	VLR, Fairfax County IHS
Bull Neck Gold Mine	Fairfax County IHS	Great Falls Grange	VLR, Fairfax County IHS
Coleman (George C.) House	Fairfax County IHS	Great Falls Post Office (old School House)	Fairfax County IHS
Colvin Run Community Center	Fairfax County IHS	Greek Revival House	Fairfax County IHS
Colvin Run Mill	Fairfax County IHS	Gunnell's Run	Fairfax County IHS
Colvin Run Miller's House	Fairfax County IHS	Jackson (Verlinda) House	Fairfax County IHS
Cornwell (Henry) House	Fairfax County IHS	Kalorama Springs (Site)	Fairfax County IHS
Cornwell Farm	Fairfax County IHS	King Subdivision	Fairfax County IHS
Eastern Shore House	Fairfax County IHS	Leigh (Dr. Alfred) House	Fairfax County IHS
Feighery Store and House, (Thelma's Ice Cream)	Fairfax County IHS	Towlston Grange	Fairfax County IHS
Follin (J.N.) House	Fairfax County IHS	Turner (Mark) Dairy Farm	Fairfax County IHS
Forestville Colored School	VLR, Fairfax County IHS		

3.2.4 Viewsheds

This section describes several noteworthy viewsheds, both within, and outside the park, that could be affected by any changes in the park.

Views within the Park

The view of Great Falls is one of the most important resources in the park. A large number of visitors come to the park to see this view. Three overlooks provide a formal area for viewing. In addition, the falls can be seen from portions of the Patowmack Canal Trail. Also important are views of the river and the Potomac Gorge that are available at various locations along the River Trail. While there are no formalized viewing areas south of the three overlooks, there are several natural areas, including the Cow Hoof Rock and the Mather Plaque location, where visitors experience views of the river and gorge.

Another important view is the entrance into the park. After going past the entrance station, one of the first views offered to a visitor is that of the maintenance facility and the wooden fence that surrounds it. The facility and fence are unattractive and often the southern gate is open and reveals the storage area adjacent to the maintenance facility to visitors.

[18] Sources: Virginia Department of Historic Resources website (http://www.dhr.virginia.gov/registers/register.htm); Email communication with Fairfax County Department of Planning and Zoning dated 02/15/2005.

View of the Potomac River and Gorge from Cow Hoof Rock

Park entrance with a view of the Maintenance facility

Views from Surrounding Areas

Views from C & O Canal NHP

Great Falls Park, Virginia contributes to the visual quality of the C&O Canal NHP. The McMillan Commission, created to study and recommend improvements to Washington's park system, and included among its members the noted landscape architect Frederick Law Olmsted, Jr., wrote in 1901:

> "…the surroundings of the Great Falls on both sides of the river should, in our opinion, be converted into a national park… No buildings should be allowed between the drives and the river, and no change should come to pass in the character of the canal that will tend to transform its primitive character and quaint beauty. The canal has a charm of its own, as, half disclosed and half revealed, it winds among the trees; and not the least part of this charm, so desirable to be preserved, is the slow, old-fashioned movement of the boats and the people on and near this *ancient waterway* [emphasis added]."[19]

Visitors within the C&O Canal NHP, along the Billy Goat Trail, adjacent to the Potomac, along the outlooks and observations decks, or along Mary's Wall, are offered a view of Great Falls Park's natural character on the opposite banks of the river. Any changes within the park have the potential to impact these sensitive viewsheds from C&O Canal NHP.

Views along Georgetown Pike

Georgetown Pike is a designated Virginia Byway. According to the Virginia Department of Transportation, such designation is ascribed to road corridors that contain aesthetic or cultural values near areas of historical, natural, or recreational significance. The park shares a major portion of its southwestern border with Georgetown Pike. In this portion, the road is primarily wooded on either side. Any changes within this portion of the park would have the potential to affect views from the road.

[19] Environmental Assessment, Bell Atlantic Mobile Application for Wireless Telecommunication Facility, Ridge Trail Site, Great Falls Park, Virginia. 2001.

3.3 NATURAL RESOURCES

3.3.1 Geophysical Resources

Geology

The NPS Management Policies (2006) prescribe that NPS "will preserve and protect geologic resources as integral components of park natural systems," and would "allow natural geologic processes to proceed unimpeded."

The park is within the Piedmont physiographic province, resting upon igneous and metamorphic rock, formed during a history of complex geological activities. The geologic materials of the park began as clay, silt, and sand deposited in a sea over 440 million years ago. The sediments underwent intrusion by magma, metamorphosis, and folding during the course of tectonic events resulting in mountain building in North America. Eventual tilting of the Potomac region toward the east resulted in streams cutting through Piedmont materials from the west and the deposition of sediment in what would become the Coastal Plain province.[20]

Over the past approximately 100,000 years, the Potomac River has continued to erode through the Piedmont and deposit sediment in the Coastal Plain. The promontories at the park, and the adjacent water falls in the Potomac, are the result of differential erosion by the Potomac on resistant Piedmont rocks and softer sedimentary Coastal Plain materials over thousands of years.

Within Great Falls Park, geologic mapping published by the United States Geological Survey (USGS) identifies and locates common groups of formations. The geology of the park consists of: surficial boulders deposited on Glade Hill; surficial deposits of alluvium, colluvium, and fill from construction in lower drainage areas; metamorphosed sedimentary rocks of the Mather Gorge Formation on the rolling hills between Glade Hill terrace and lower areas; and igneous rocks along the Gorge at the southeastern portion of the park.

Topography

Six terrace levels, resulting from erosion at various past Potomac River elevations, are evident in the Potomac Gorge area. The two upper-most elevation terraces are exhibited in Great Falls Park. The highest terrace is at the crest area of Glade Hill. The entrance, parking, visitor center, and Patowmack Canal areas of the park are located at the second highest terrace level.[21]

The topography and slopes at Great Falls Park are mapped in Figure 3.4: Site Topography and Slopes. The elevation of the property ranges from about 75 to 320 feet above mean sea level. In general, the property consists of rolling hill topography common to the Piedmont, as well as cliffs along the eastern boundary of the park, descending to the edge of the Potomac River. The average change in elevation from the top of the cliffs to the base is about 45 feet. Several drainage courses descend more gradually from the park to the river level.

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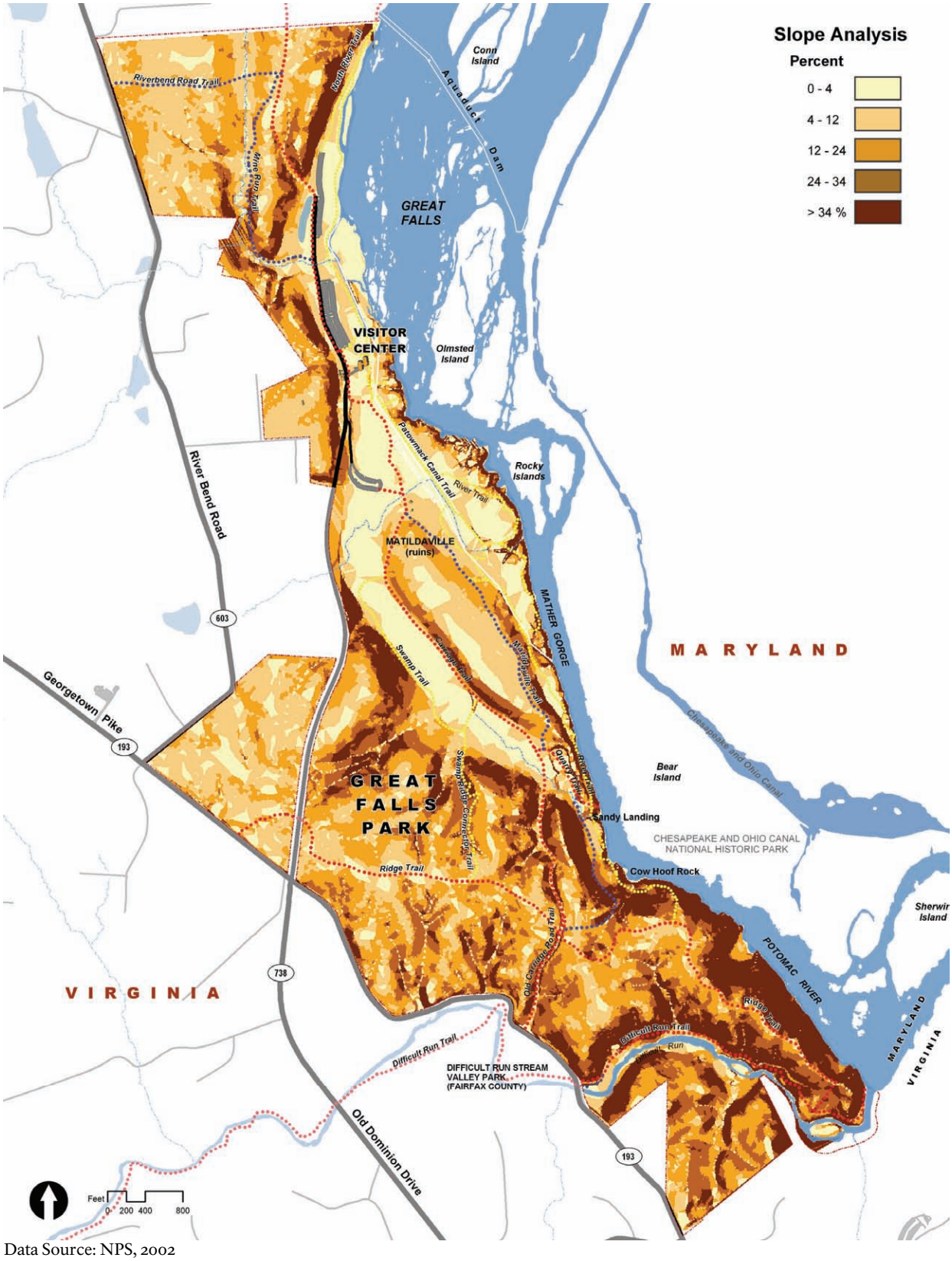
[20] **Potomac Gorge Site Conservation Plan**, Nature Conservancy, 2001.

[21] Southworth, Scott. **Geologic Map of the Potomac Gorge: Great Falls Park, Virginia, and Part of the C&O Canal National Historical Park, Maryland**. USGS. 2000.



Data Source: NPS, 2002

Figure 3.4: Site Topography and Slopes

Soils

In 1963, the soils at Great Falls Park were mapped as part of the Fairfax County Soil Survey. An updated soil survey for Fairfax County is currently being conducted by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS). It is likely that the NRCS survey will result in changes to the list of soil series currently considered present at the park.

According to the 1963 survey, the soils at Great Falls Park include eight specific soil series (Captina, Wehadkee, Glenville, Chewacla, Manor, Glenelg, Meadowville, and Elioak) and several generalized soil types including rocky land, very rocky land, mixed alluvial land, fill, pond, and unknown soils. The distribution of these units in the park was mapped in the 1963 survey. In general, more poorly drained soils are present in the floodplain while moderately well-drained to well-drained soils are present on the rolling topography above the floodplain.

The NPS Management Policies (2006) prescribe that "NPS will actively seek to understand and preserve the soil resources of parks, and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources."

3.3.2 Water Resources

Watersheds and Resource Protection Areas

Within the park, drainage occurs toward the permanent streams of Mine Run and Difficult Run, as well as toward temporary tributaries of the Potomac River including the Patowmack Canal channel. The Mine Run Watershed is lightly developed, with land cover consisting primarily of forest and private residences of lots of two or more acres. Mine Run Watershed has a relatively low impervious surface ratio of approximately 5.2 percent. The Great Falls Park drainage area, including the Mine Run drainage, is located within the 88-square-mile Difficult Run watershed (as delineated by the Chesapeake Bay Program). Approximately 95 percent of the watershed is under the jurisdiction of Fairfax County. The Chesapeake Bay Program reports that the land cover of the overall Difficult Run Watershed is approximately 75 percent urban, 2 percent agricultural, 19 percent forest, 4 percent barren, and the remainder is water. In 2000, the population within the watershed was estimated to be 146,855.[22]

The Difficult Run Watershed is a component of the Middle Potomac-Catoctin Watershed, which encompasses 2,517 square miles.[23] The Middle Potomac-Catoctin Watershed is within the 14,679-square mile watershed of the Potomac River, which is within the Chesapeake Bay Watershed that totals 66,387 square miles.[24]

Watersheds of the Chesapeake Bay are protected and managed as vital habitat under the Chesapeake 2000 Bay Agreement, as signed by Virginia, Maryland, Pennsylvania, the District of Columbia, the Environmental Protection Agency, and the Chesapeake Bay Commission. In the Agreement, the signatory states establish goals for living resource protection and restoration, vital habitat protection and restoration, water quality protection and restoration, sound land

[22] Chesapeake Bay Program. http://maps.chesapeakebay.net/wsp/, 2002.

[23] Ibid.

[24] Ibid.

use, and stewardship and community engagement. In accordance with the Agreement, Virginia implements the Commonwealth's Chesapeake Bay Preservation Act. Areas subject to the Chesapeake Bay Preservation Act include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs).[25] RPAs include tidal shores; tidal wetlands; non-tidal wetlands connected by surface flow and contiguous to tidal wetlands, or water bodies with perennial flow; and, a 100-foot buffer located landward from these features. In Fairfax County, all areas which do not meet the RPA definition are designated RMAs.[26] The RPAs within Great Falls Park are along the Potomac River, Difficult Run, and Mine Run, with the remainder of the park designated as RMAs. See Figure 3.5: Water Resources. A conservation plan for the Potomac Gorge, completed recently by the Nature Conservancy has emphasized the need for cooperative management and restoration on watersheds that embrace the gorge, including Great Falls Park.[27]

Surface Water

NPS Management Policies (2006) specify that surface waters should be perpetuated by NPS as an integral component of park aquatic and terrestrial systems. The two permanent streams present within the park, Difficult Run and Mine Run, flow into the Potomac River, which flows into the Chesapeake Bay. Clay Pond is another surface water feature in the park, located across the road from the northern-most parking area. These features are illustrated on Figure 3.5: Water Resources.

As the river passes through the Potomac Gorge, it is a Sixthth-order stream. On average, the river exhibits a one-day mean discharge of 11,397 cubic feet per second (cfs), not adjusting for municipal water withdrawals.[28]

Groundwater

The project area is situated within the Piedmont province aquifer system. According to the Potomac Gorge Site Conservation Plan the hydrology of groundwater in the Potomac Gorge area has not been studied in detail, but was summarized by Feller in 1997 as follows[29]:

> "Aquifers within the… Piedmont province are characteristically small, particularly in metamorphic strata… Springs are numerous, exhibit flow rates of low magnitude and many are seasonal. Nutter's (1974) analysis of well data… suggests joints are probably the most important structural features for transmitting water within the strata and these disappear or become narrow with depth. Although precipitation is highest in spring and summer, the greatest input to groundwater aquifers occurs in winter and spring. Temporal recharge asymmetry is due primarily to phototranspiration uptake by plants during the growing season. When plants are dormant, from November to April, groundwater infiltration is highest and spring emergence flow rates peak."

Groundwater springs and seeps in the Potomac Gorge provide habitat for a variety of groundwater invertebrates including rare species.[30] The locations of known seeps, as well as general areas of groundwater recharge at Great Falls Park are illustrated as 'groundwater recharge' in Figure 3.5: Water Resources.

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25 Commonwealth of Virginia Chesapeake Bay Local Assistance Department. http://www.cblad.state.va.us, 2003.

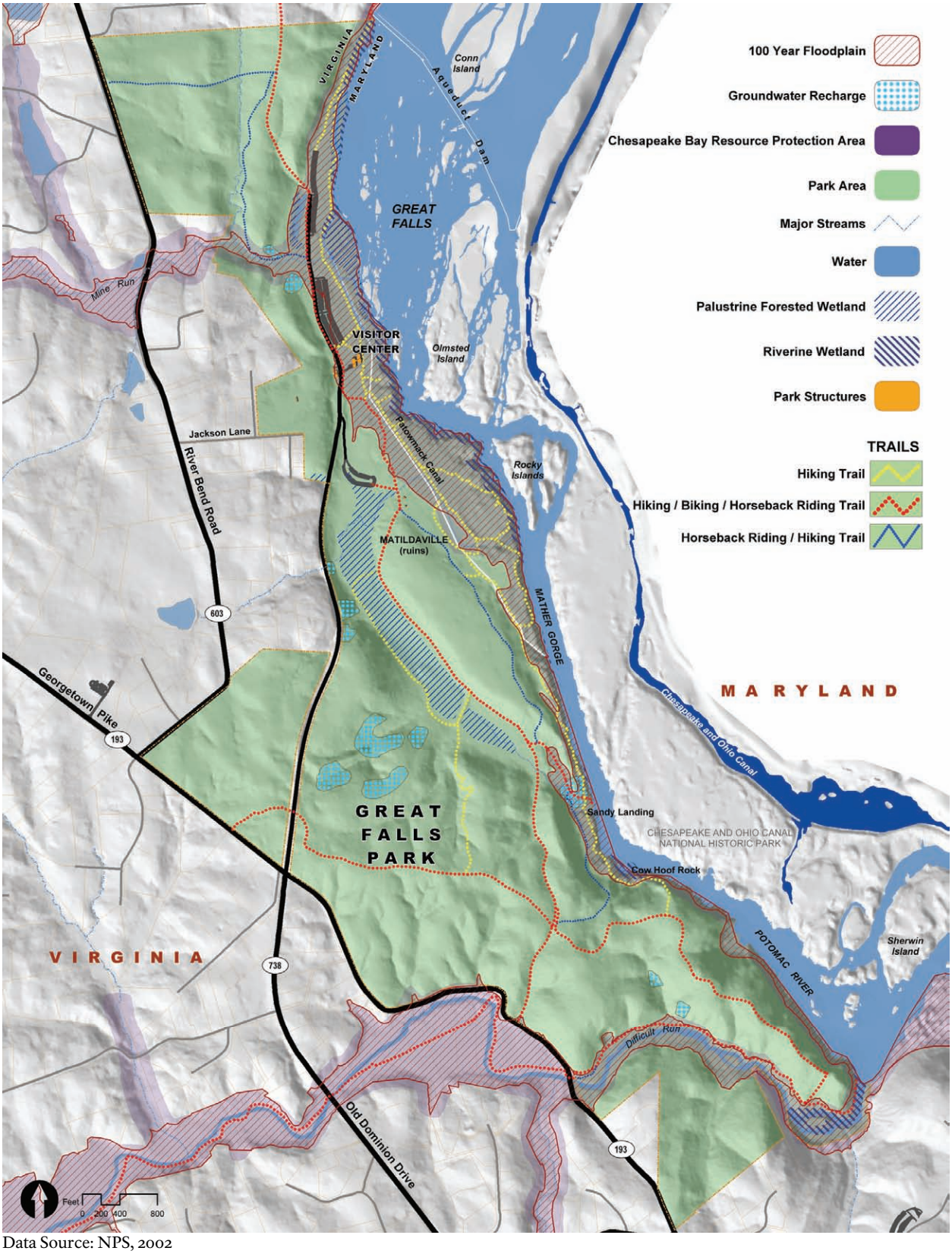
26 Irons, Ellie L., Comments from the Commonwealth of Virginia Department of Environmental Quality on the Draft GMP/EIS, 12 October 2005.

27 **Potomac Gorge Site Conservation Plan**, Nature Conservancy, 2001.

28 Ibid.

29 Ibid.

30 Ibid.



Data Source: NPS, 2002

Figure 3.5: Water Resources

Wetlands and Waters of the United States

Activities affecting Waters of the United States (WOUS), including Special Aquatic Sites, are regulated by the U.S. Army Corps of Engineers (COE) under Section 404 of the Clean Water Act of 1977. WOUS are defined in 33 CFR Part 328.3(a) as "waters used in interstate or foreign commerce; waters subject to the ebb and flow of the tide; all interstate waters, including wetlands; all other waters such as intrastate lakes, rivers, streams, mudflats, sandflats, playa lakes, natural ponds (the use, degradation, or destruction of which could affect interstate or foreign commerce); and waters which are or could be used for recreation by interstate or foreign travelers, the taking of fish and/or shellfish sold in interstate or foreign commerce, or industrial purposes used in interstate commerce." Special Aquatic Sites, which are regulated as a subset of WOUS, include sanctuaries, refuges, mud flats, vegetated shallows, coral reefs, pool and riffle complexes, and wetlands. Except for wetlands, none of these Special Aquatic Sites are present within the park.

NPS specifically addresses the protection of wetlands on NPS parkland in the NPS Management Policies (2006), stating a goal to achieve net gain of wetlands across the park system by achieving no net loss of existing wetlands and by implementing restoration of previously degraded or destroyed wetlands.

The National Wetlands Inventory (NWI) of the U.S. Fish and Wildlife Service produces information on the characteristics, extent, and status of the Nation's wetlands and deepwater habitats. Both federal and state regulatory agencies utilize this information in determining locations of regulatory wetlands. In the project area, the NWI has identified wetlands at locations as illustrated in Figure 3.5: Water Resources. According to the NWI characterization of the wetlands in Great Falls Park, the area contains both palustrine (swamp) and riparian (streamside) wetlands. The NWI mapping of wetlands has not been field-tested in the park, and smaller wetlands (less than 0.5 acres) are not included due to the scale of aerial surveys. Small wetlands on site may include riverine wetlands along intermittent and perennial streambeds.

Floodplains

The U.S. Federal Emergency Management Agency (FEMA) classifies areas of the nation regarding susceptibility to flooding. According to FEMA mapping, approximately 15 percent of the Great Falls Park land area is within the 100-year floodplain, as illustrated in Figure 3.5: Water Resources. In general, the lower drainage lying areas of Difficult Run, Mine Run, and the Patowmack Canal are in the 100-year floodplain.

NPS Management Policies (2006) specify that NPS should manage floodplains on parklands to: "protect, preserve and restore the natural resources and functions of floodplains; avoid the long- and short- term environmental effects associated with the occupancy and modification of floodplains; and avoid direct and indirect support of floodplain development and actions that could adversely affect the natural resources and functions of floodplains or increase flood risks."

Water Quality

With regard to water quality, NPS Management Policies (2006) specify that NPS will "determine the quality of park surface and groundwater resources and avoid, whenever possible, the pollution of park waters by human activities occurring within and outside of parks." In addition, under the Chesapeake Bay Agreement of 2000, Virginia and the other signatories of the Agreement have committed to a goal to achieve and maintain the water quality necessary to support the aquatic living resources of the Bay and its tributaries and to protect human health.

USGS studies the water quality of the major river basins and aquifers of the nation through the National Water Quality Assessment (NAWQA) program. In 1998, the NAWQA program published a report on *Water Quality in the Potomac River Basin- Maryland, Pennsylvania, Virginia, West Virginia and the District of Columbia, 1992-1996*. The report disclosed several major issues discovered in the Potomac River basin including: nutrients and pesticides in streams and groundwater, organic contaminants and metals in streams, and radon in ground water.

The elevated concentrations of nutrients and pesticides in streams of the Potomac River Basin are among the highest in the nation at several sites, and are generally related to agricultural or urban land in the watershed. The concentrations of PCBs, organochlorides, trace elements, and semivolatile organic compounds (SVOCs) in streams that drain intensely agricultural or urban areas are also among the highest measured by the NAWQA program areas, and exceeded criteria for the protection of aquatic life at some sites.[31]

In general, the pesticides, nitrate, and dissolved solids present in the groundwater of the Potomac River Basin are related to agricultural land uses, particularly in carbonate aquifers. The occurrence of radon in the groundwater of the Potomac watershed is related to the geology of the aquifers. Rocks that contain more uranium, and are therefore associated with higher radon levels, include igneous, metamorphic, and carbonate rocks.[32]

Beyond the USGS assessment of water quality in the major U.S. watersheds, under the Clean Water Act of 1977, the EPA is responsible for developing water quality standards that define goals for U.S. waterbodies by designating uses, setting criteria to protect those uses, and establishing provisions to protect water quality from pollution. To assess water quality conditions, the EPA monitors criteria related to aquatic life, human health, bioassessment, nutrients, microbiology (pathogens), and wetlands.[33]

According to EPA data (managed by Virginia Department of Environmental Quality) from the year 2004, the Potomac was not impaired with regard to the designated uses within the vicinity of the park. However, 2.93 miles of Difficult Run was impaired, where the water body did not meet the state water quality standards for aquatic life use or recreation use.[34] This includes the 0.5 mile portion of Difficult Run that flows through the park. The source of the impairment is

[31] USGS NAWQA Program. Water Quality in the Potomac River Basin- Maryland, Pennsylvania, Virginia, West Virginia and the District of Columbia, 1992-1996. 1998.

[32] Ibid.

[33] U.S. Environmental Protection Agency website, 2002. (http://www.epa.gov/waterscience/criteria/)

[34] Virginia Department of Environmental Quality website (http://gisweb.deq.virginia.gov/deqims/factsheet2004.cfm?tmdlid=VAN-A11R-01)

unknown. Three years of benthic macro invertebrate sampling indicates that the water quality in Mine Run is considered acceptable.[35]

The Nature Conservancy Potomac Gorge Site Conservation Plan reports the viability of both Difficult Run and Mine Run as fair. Mine Run supports relatively rich fish communities overall, but shows great variability in the richness of fish and benthic invertebrate species across different subwatersheds. Difficult Run exhibits moderate richness of fish communities, with average diversity in the communities higher than in many other Fairfax County watersheds. However, taxa richness in the benthic macroinvertebrate communities of Difficult Run varies greatly across subwatersheds. In addition, most of the macroinvertebrate communities sampled in Difficult Run were dominated by tolerant aquatic worms (oligochaetes).

3.3.3 Biological Resources

Vegetation

The vegetation of Great Falls Park includes a complex of upland and floodplain forest communities, as well as several rare vegetation types that occupy the bedrock terraces, exposed rocks, and frequently flooded river shores. Although disturbed, secondary forests are common in formerly cleared areas of the park, especially around the historical town of Matildaville, much of the contemporary forest consists of maturing second-growth stands that belong to the following ecological groups[36] : basic mesic forest, mesic mixed hardwood forest, acidic oak-hickory forest, oak/heath forest, and Piedmont/Mountain floodplain forest. Older-age stands (> 100 years) occur on ridges at both the northern and southern ends of the park. Abrams and Copenheaver (1999) documented several white oak (Quercus alba) individuals more than 200 years old on the northern ridge.[37]

The park's complex topography, varied hydrological influences, and diversity of flood-influenced habitats foster a corresponding diversity of vegetation types, some of them of significant conservation concern. On the bedrock terrace, the ancient oxbow west of the Old Carriage Road supports one of the largest known examples in Virginia of a Coastal Plain/Piedmont basic seepage swamp (G4G5/S2). On flats along the rocky rim of the terrace are two other rare forest communities that are scoured by periodic catastrophic floods: the Riverside Bedrock Terrace Pine Woodland (G1/S1), known only from the Potomac Gorge in Virginia and Maryland and the New River Gorge in West Virginia; and the Potomac River Bedrock Terrace Oak - Hickory Forest (G1G2S1), which is endemic to the Potomac Gorge. Rare communities of exposed rocks on the lower portions of the bedrock terrace, the gorge rim, and the river channel shelf include the Central Appalachian / Piedmont riverside prairie (G2G3S1) and the Potomac Gorge riverside outcrop barren (G2/S1). A substantial number of regionally rare plants associated with these rocky habitats are unknown elsewhere in Virginia, including

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35 Grulkowski, Darin, Rob Moreton, Melissa Kangas, and Brent Steury. **NPS George Washington Memorial Parkway Stream Monitoring Program 2006 Annual Report.** NPS, George Washington Memorial Parkway, McLean, Virginia. 2006.

36 Fleming, G.P., P.P. Coulling, K.D. Patterson, and K. Taverna. 2005. **The Natural Communities of Virginia: Classification of Ecological Community Groups.** Second approximation. Version 2.1. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia (web site http://www.dcr.virginia.gov/dnh/ncintro.htm)

37 Abrams, M.L. and C.A. Copenheaver. 1999. **Temporal variation in species recruitment and dendroecology of an old-growth white oak forest in the Virginia Piedmont, USA**. Forest Ecology and Management 124: 275-284.

Nantucket shadbush (*Amelanchier nantucketensis*), sterile sedge (*Carex straminea*), western sunflower (*Helianthus occidentalis*), and sticky goldenrod (*Solidago racemosa*).[38]

Finally, the frequently flood-scoured channel shelf of the river above the falls contains good examples of the Piedmont/Mountain Low Herb Sand Bar/River Shore, Water-Willow Rocky Bar and Shore, Sycamore-River Birch River-Scour Woodland, and Mixed Bedrock Floodplain River-Scour Woodland communities. While these have not yet been formally ranked by Natural Heritage ecologists, at least two of them are likely to be rare throughout their total range (globally rare) and as well as within their state range (state rare).[39]

Wildlife Habitat

Great Falls Park exhibits exceptional wildlife habitat within the context of the predominantly developed suburban environment. The diverse types of wildlife habitat existing in the park include uplands, terraces, cliffs, and riparian areas.

A large population of whitetail deer utilize Great Falls Park habitat. In a 2001 study, deer were found in the park at an approximate average density of 88 deer per square mile; in 2002 the average density was found to be about 72 deer per square mile. Thirty-four deer per square mile were counted at Great Falls Park in 2004. The number has been decreasing due to controlled hunting that occurs at Riverbend Park. Ongoing research has suggested varying deer carrying capacities that allow for the maintenance of plant and bird biodiversity in habitats. Studies by whitetail specialist David Decalestra (for a different part of the country) have estimated that sustainable carrying capacity for deer habitat is about 40 deer per square mile. That recommended density has been used to gauge deer herd sustainability in the National Capital Region parks. Great Falls Park could potentially sustain a higher density herd if deer are feeding outside of the park.

Rare, Threatened, and Endangered Species

While there are no Federally listed rare, threatened, or endangered species known to reside in the park, the Potomac Gorge area provides a variety of habitat for a diverse range of plants and animals. These include 28 plant species found in the park that are on the State list of rare, threatened or endangered species. [40]In 2001, the Nature Conservancy prepared a plan to specify a protection strategy for the biological resources of the Potomac Gorge.[41] To address conservation of the overall biological diversity of the Gorge, the Plan identifies threats to, and protection measures for, particular target biological resources (conservation targets) encompassing all known rare, threatened, and endangered species and communities in the Gorge including: riparian communities, terrace communities, upland forest blocks, tributary stream systems, rare groundwater invertebrates, anadromous and semianadromous fish, and

[38] Townsend, J.F. **Natural Heritage Resources of Virginia: Rare Plants. Natural Heritage Technical Report 04-06.** Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA. 56 pp. plus appendices. 2004.

[39] Irons, Ellie L. (Gary Fleming) , Comments from the Commonwealth of Virginia Department of Environmental Quality on the Draft GMP/EIS, 12 October 2005.

[40] Townsend, John F. **Natural Heritage Resources of Virginia: Rare Plants. Natural Heritage Technical Report 02-13**. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. 2002.

[41] **Potomac Gorge Site Conservation Plan**, Nature Conservancy, 2001.

wetlands. The following paragraphs highlight sensitive species identified at the park in association with respective conservation targets.

Sensitive Plant Species

Relatively recently, record searches and field surveys were performed to identify sensitive plant species present at Great Falls Park. From October 1992 through September 1993, research was conducted by Cris Fleming to identify and locate rare plant species at the park.[42] From October 1993 to October 1994, Fleming conducted research to identify and locate watchlist and uncommon plant species present at the park.[43] From late 2002 through 2004, Virginia Natural Heritage Program (VANHP) ecologist Gary Fleming documented additional rare species occurrences while conducting an intensive study of the park's vegetation ecology. VANHP botanist John F. Townsend and NPS botanist Brent Steury also documented rare plant populations during the past several years. The areas of sensitive vegetation habitat identified Cris Fleming's reports, as well as the more recent fieldwork, correspond to several of the conservation targets specified in The Nature Conservancy's conservation plan.

Riparian communities occur along the Potomac River at elevations that flood relatively frequently and are dominated by species associated with floodplains (see Figure 3.6: Sensitive Plants and Habitats). Riparian communities are subject to stresses by: roads, trails and utility corridors; park facilities, operation, maintenance, and use; deer over-browsing; and invasive species. Overall, riparian communities in the Gorge are considered to have good viability based on good size, good landscape context, and the fair condition of resources (Nature Conservancy 2001). At Great Falls Park, the sandy/gravelly shores and bedrock floodplain north of the falls provides habitat for rare species including *Sparfina pectinata* (G5S2), *Eleocharis compressa* (G4S2), *Solidago racemosa* (G5T3S1), *Desmodium cuspidatum var. cuspidatum* (G5T5S2), and *Hemicarpha micrantha* (G5S1). The floodplain forest above the falls contains the rare species *Hasteola suaveolens* (G3G4S2), *Erythronium albidum* (G5S2), *Maianthemum stellatum* (G5S2), and a large colony of *Valeriana pauciflora* (G4S2). Watch list species identified in riparian communities at the park include *Bapfisia australis*, *Cardamine douglassii*, *Carex conjuncta*, *Carex hirtifolia*, *Erigenia bulbosa*, and *Floerkea proserpinacoides*.

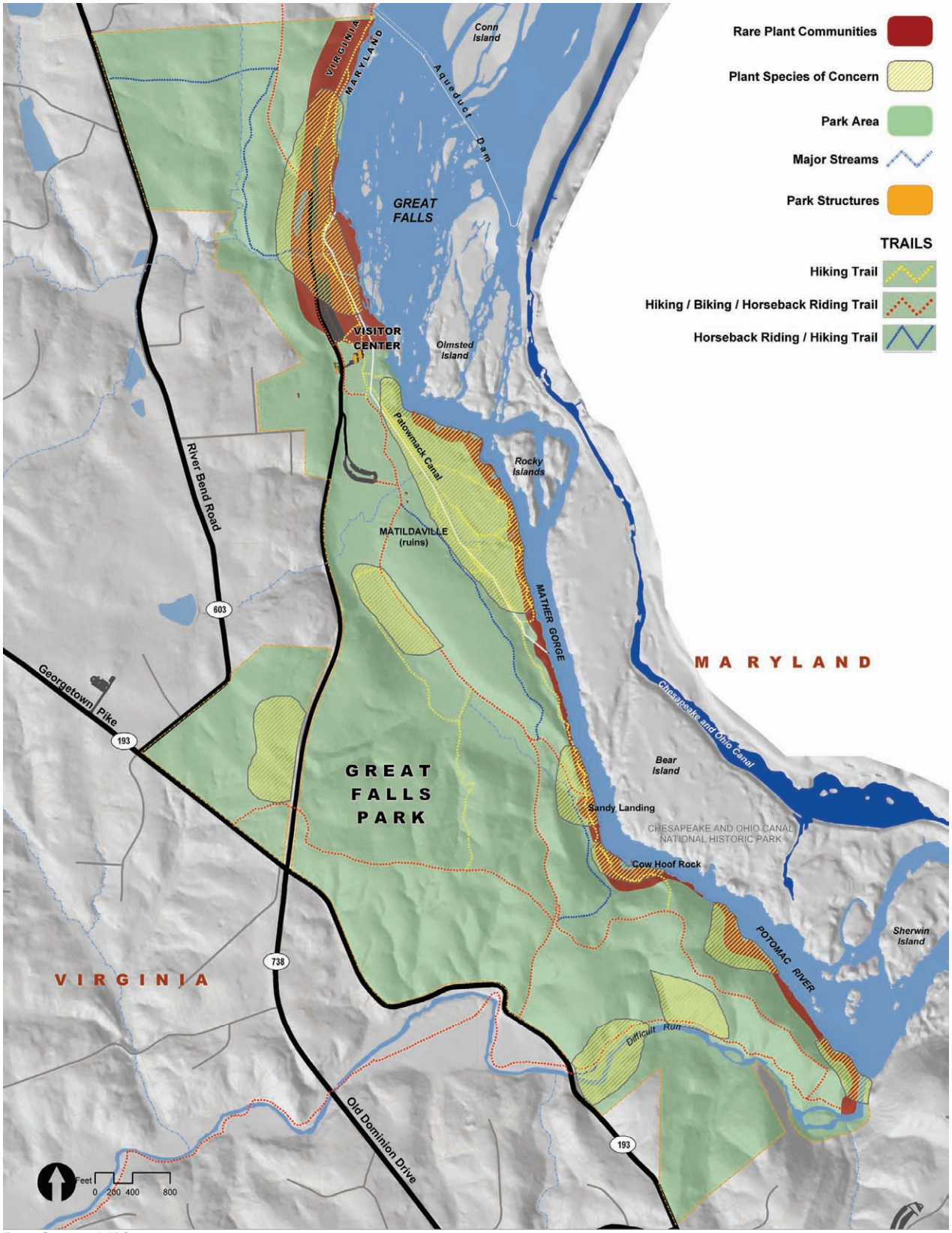
Terrace communities include bedrock terrace, outcrop, and cliff areas located at higher elevations along the Potomac River that are flooded less frequently than riparian areas and are dominated by upland species. Terrace communities are subject to stresses by: roads, trails and utility corridors; cultural resources; park facilities, operation, maintenance, and use; deer over-browsing; and invasive species (Nature Conservancy 2001). Overall, terrace communities in the Gorge are considered to have good viability based on good size, good landscape context and the fair condition of resources (Nature Conservancy 2001). At Great Falls Park, the greatest concentration of rare plants occurs south of the falls in terrace communities. The globally rare *Amelanchier nantucketensis* (G3QS1), as well as the state-rare species *Carex straminea* (G5S1), *Cerastium arvense ssp. Velutina* (G4T4S2), *Eleocharis compressa* (G4S2), *Helianthus occidentalis* (G5S1), and *Solidago racemosa* (G5T3S1) occur in the bedrock terrace area. Another globally rare plant, *Sida hermaphrodita* (G2G3S1), was recorded in a gully of the bedrock terrace in 1979 but has not been seen recently. The rocky bluffs and sandy coves area supports the rare

[42] Fleming, Cris. **Report on Rare Plant Search at Great Falls Park, Virginia,** 1993.

[43] Fleming, Cris. **Report on Search for Watchlist and Uncommon Species at Great Falls Park, Virginia,** 1994.

species *Hasteola suaveolens* (G3G4S2), *Solidago rupestris* (G4S1), *Solidago racemosa* (G5T3S1), *Rhododendron arborescens* (G4G5S2), *Helianthus occidentalis* (G5S1), and *Cerastium arvense ssp. Velutinum* (G5T4S2). Within the Terrace Forest area near Sandy Landing, the rare *Arabis shortii* (G5S2) and *Onosmodium virginianum* (G4S2) are found. The only known Virginia population of *Carex davisii* (G4S1) was recently found by Brent Steury on the Terrace near Matildaville. Watchlist species identified in terrace communities at the park include *Baptisia australis, Cornus amomum ssp. obliqua, Juglans cinerea,* and *Packera paupercula.* Regionally uncommon species found in the riparian and terrace communities at the park include *Agalinis setacea*, *Apocynum sibiricum*, *Aralia nudicaulis*, *Arisaema dracontium*, *Asclepias verticillata*, *Aster schreberi*, *Celtis tenuifolia*, *Clematis viorna*, *Clitoria mariana*, *Commelina diffusa*, *Commelina erecta*, *Coreopsis tripteris*, *Coreopsis verticillata*, *Dirca palustris*, *Dryopteris cristata*, *Epigaea repens*, *Gentiana villosa*, *Iris cristata*, *Jeffersonia diphylla*, *Lathyrus venosus*, *Liatris spicata*, *Lilium superbum*, *Liparis lilifolia*, *Lycopus rubellus*, *Magnolia macrophylla*, *Matelea obliqua*, *Mecardonia acuminata*, *Myosotis verna*, *Orchis spectabilis*, *Orontium aquaticum*, *Passiflora lutea*, *Polygala verticillata*, *Ranunculus pusillus*, *Rhus aromatica*, *Rhus vernix*, *Rhynocospora glomerata*, *Rosa virginiana*, *Scleria triglomerata*, *Spiraea alba* (S. latifolia), *Trautvetteria carolinensis*, *Trientalis borealis*, *Tsuga canadensis*, and *Viburnum rafinesquianum*.

Upland forest blocks exist in the Potomac Gorge on rolling upland terrain that rarely or never experiences flooding. Upland forest blocks are subject to stresses by: roads, trails and utility corridors; cultural resources; park facilities, operation, maintenance, and use; deer over-browsing; and invasive species. Overall, upland forest habitat in the Gorge are considered to have only fair viability based on the fair condition of resources, fair landscape context and poor size (Nature Conservancy 2001). In Great Falls National Park, the upland forest habitat contains rare examples of mature forest, including an old growth stand. As previously discussed, tree species in the old growth stand included: *Quercus alba*, *Quercus rubra*, *Liriodendron tulipifera*, *Fagus grandifolia*, *Carya glabra*, *Acer rubrum*, *Nyssa sylvatica*, and *Ostrya virginiana* (Abrams 1999). The oldest trees in the stand are white oaks (*Quercus alba*) of 251, 232, and 208 years of age (Abrams 1999). With the exception of a 166-year-old *Nyssa Sylvatica*, the other trees in the stand were less than 100 years old.



Data Source: NPS, 2002

Figure 3.6: Sensitive Plants and Habitats

Mammals

Four species of bats were found to be present at Great Falls Park during a 2001 survey.[44] None of the identified species are considered uncommon; however, the park does contain potential roost habitat for the Eastern small-footed myotis (Myotis leibii), a Virginia-listed S1 species. There are also historic records of the presence of the Eastern small-footed myotis at Plummers Island, approximately 10 miles north of D.C. in Montgomery County, Maryland. Additionally, the hoary bat is also likely to utilize habitat in the park during seasonal periods of movement (generally spring and fall).

Records indicate that the Allegheny woodrat (Neotoma magister), a Virginia-listed species of concern, was historically present at Great Falls Park. Usual habitat for the woodrat includes rock slides, talus, cliffs, boulders, and caves.[45]

Birds

While no federally threatened or endangered birds have been documented nesting in Great Falls Park, a pair of bald eagles is known to have nested near the park on Conn Island for the last 12 years. In 2002, the mating pair was not located, however the Conn Island area is still considered an active nesting site by NPS.

The Nature Conservancy Potomac Gorge Site Conservation Plan lists eight species of Forest Interior Dwelling and neotropical migratory birds that are associated with upland forest blocks in the Gorge. Seven species are considered priorities for conservation by the Partners in Flight Program, and one additional species (the ovenbird) is included because it is a priority species for upland forest. The identified bird species and their respective micro-habitats within upland forest are listed in the following table.

Table 3.4: Priority Conservation Bird Species of Potomac Gorge Upland Forest

Common Name	Scientific Name	Micro-Habitat Use	Minimum Habitat Size in Acres		
			Marginal	Suitable	Optimal
Worm-eating warbler	*Helmitheros vermivorus*	Understory	15	379	2,611
Ovenbird	*Seirus aurocapillus*	Understory	2	22.5	575.5
Kentucky warbler	*Oporonis formosus*	Understory	13	117	1,768.5
Wood thrush	*Hylocichla mustelina*	Mid-Canopy to Understory	0.5	0.5	64
Yellow-throated vireo	*Vireo flavifrons*	Mid-Canopy	79	876	3,540
Scarlet tanager	*Piranga olivacea*	Canopy	2	30	319
Louisiana waterthrush	*Seiurus motacilla*	Streams	62	817	3,510
Acadian flycatcher	*Empidonax virescens*	Streams	0.5	36	963

[44] Hobson, C. S. 2001. Results of mist net surveys for the eastern small-footed myotis. (*Myotis leibii*) at Turkey Run and Great Falls Parks, Virginia, 1999-2000. Natural Heritage Technical Report #01-04. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond. 14pp.

[45] Mengak, M. T. 1998. Status of the Allegheny woodrat (*Neotoma magister*) in Turkey Run Park. Report to the National Park Service. Environmental Science Program, Ferrum College, Ferrum, Virginia. 7pp.

The microhabitats utilized by bird species reveal the vital habitat requirements for the species and determine the potential habitat threats that could adversely affect the species. Understory birds require well developed understory vegetation, dense ground cover, and large tracts of unfragmented nesting habitat. Deer damage to the understory is a potential threat to understory birds. Mid-canopy birds require well developed subcanopy and midstory vegetation, with a relatively open understory. Forest canopy birds require diverse midstory vegetation and an open understory and utilize the largest trees available in the canopy. Habitat fragmentation is a potential threat to forest canopy birds. Stream birds inhabit closed-canopy forest near water (preferably streams), with varying levels of understory. The protection of extensive contiguous moist and riparian woodlands is critical to the preservation of stream birds.

Great blue herons are another bird of concern in the Potomac River Gorge. While the area is a good habitat for these birds, according to the Maryland Department of Natural Resources, great blue herons exhibit more sensitivity to disturbance in comparison to bald eagles.

Thirteen additional bird species that occur occasionally in Great Falls Park are listed on the Virginia Natural Heritage database of rare and watchlist species. Seven of the thirteen species are considered to be of special concern, including the Brown creeper (*Certhia americana*), Golden-crowned kinglet (*Regulus satrapa*), Hermit thrush (*Catharus guttatus*), Magnolia warbler (*Dendroica magnolia*), Purple finch (*Carpodacus purpureus*), Swainson's Warbler (*Limnothlypis swainsonii*), and Winter wren (*Troglodytes troglodytes*). These birds are listed on the state database for breeding occurrences only. None of these species have been observed breeding Great Falls Park.

Invertebrates

In 1997, Christopher Hobson prepared a study to "verify the presence (or absence), distribution, and population status of specific elements of biological diversity: federally listed threatened or endangered species; proposed candidate species for federal listing; and animal species monitored by the Virginia DCR-DNH, focusing on those species associated with groundwater habitats within the GWMP," including Great Falls Park.[46] The inventory resulted in the identification of two rare animal species within the GWMP area. The rare animals identified were the amphipods *Stygobromus pyzzinii* (Global rarity rank G2, State rarity rank S1S2) and *Stygobromus* sp. 15 (Global rarity rank G1, State rarity rank S1). These two rare amphipods, and the locally abundant but narrowly endemic (thus relatively rare) *Stygobromus tenuis,* are associated with the rare groundwater invertebrates conservation target of the Nature Conservancy.[47]

In sampling conducted by Hobson at Great Falls Park in 1994, 22 species of groundwater invertebrates were identified at 16 sampling sites (seeps). A more recent survey (February 2005) by Hobson, David Culver (American University), and others found both *Stygobromus pyzzinii* and *Stygobromus* sp. 15 to be present in groundwater seeps in the park.[48]

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[46] Hobson, Christopher, **A Natural Heritage Inventory of Groundwater Invertebrates Within the Virginia Portions of the George Washington Memorial Parkway Including Great Falls**, 1997.

[47] **Potomac Gorge Site Conservation Plan**, Nature Conservancy, 2001.

[48] Irons, Ellie L. (Gary Fleming) , Comments from the Commonwealth of Virginia Department of Environmental Quality on the Draft GMP/EIS, 12 October 2005.

The following state listed species have also been documented in Great Falls Park:[49]

- Snails – *Fontigens bottimeri* (a freshwater snail, ranked S1S2 G2), and *Striatura milium* (fine-ribbed striate, ranked S1S3 G4);

- Moths – *Acronicta radcliffei* (Radcliffe's dagger moth, ranked S2S4 G5), *Acronicta spinigera* (nondescript dagger moth, ranked S1S3), *Anticlea multiferata* (many-lined carpet, ranked S1S3), *Anticlea vasiliata* (variable carpet, ranked S1S3), *Balsa tristrigella* (three-lined Balsa moth, ranked S1S3), *Bellura brehmei* (narrow-leaved cattail borer moth, ranked S1S3), *Eutelia pulcherrima* (beautiful eutelia, ranked S1S4), *Euxoa violaris* (violet dart, ranked S1S3), *Metarranthis indeclinata* (pale metarranthis, ranked S1S3), *Oligia crytora* (mantled brocade, ranked S1S3), and *Papaipema pterisii* (bracken borer moth, ranked S3);

- Dragonflies – *Cordulegaster erronea* (tiger spiketail, ranked S3 G4), *Gomphus fraternus* (midland clubtail, ranked S1 G5), and *Neurocordulia yamaskanensis* (stygian shadowdragon, ranked S2 G5).

Additionally, the first Virginia records for many species including a bee, a copepod, and 14 species of leaf beetles have been found in Great Falls Park.

Reptiles

Difficult Run has been designated as a Threatened and Endangered Species Water, due to the presence of wood turtles, which are listed by the Commonwealth of Virginia as a threatened species. Other streams in the vicinity of the park also support this species. Wood turtles are found primarily in and near clear brooks and streams in deciduous woodlands. Although highly terrestrial, they typically remain in moist areas.

[49] Roble, S.M. **Natural Heritage Resources of Virginia: Rare Animal Species. Natural Heritage Technical Report 06-10.** Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. 2006.

3.3.4 Air Quality

Regulatory Framework

In response to the Clean Air Act (CAA) of 1970 and the CAA Amendments of 1977 and 1990, the EPA has established National Ambient Air Quality Standards (NAAQS) for the protection of human health and welfare. Current NAAQS are set for carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), particulate matter equal to or less than 10 microns in size (PM_{10}), and fine particulate matter ($PM_{2.5}$). The EPA assesses the status of compliance with the NAAQS for geographic regions specified throughout the United States. Regions that meet the NAAQS are called "attainment areas" and regions that do not meet the NAAQS are called "nonattainment areas." EPA has designated the Washington DC metropolitan area as a nonattainment area for ozone.[50]

For nonattainment areas, the CAA requires that each state or air quality region develop a State Implementation Plan (SIP) that identifies how the state or air quality region will attain and/or maintain the primary and secondary NAAQS. Provisions of Sections 182 and 187 of the 1990 CAA Amendments emphasize strategies for reducing vehicle miles traveled for areas that have non-attainment status for O_3 and CO, respectively.

General Conformity

The CAA Amendments of 1990 require the EPA to promulgate rules to ensure that federal actions conform to the appropriate SIP. These rules are known together as the General Conformity Rule (40 C.F.R. §§ 51.850-860 and 40 C.F.R. §§ 93.150-160), which requires any federal agency responsible for an action in a nonattainment area to determine that the action is either exempt from the General Conformity Rule requirements, or that the action conforms to the applicable SIP. The conformity assessment process is intended to ensure that federal agency actions: (1) will not cause or contribute to new violations of NAAQS; (2) will not increase the frequency or severity of any existing violations of ambient air quality standards; and (3) will not delay the timely attainment of ambient air quality standards. There are exemptions established and available in the General Conformity Rule. In addition, an agency may establish that the projected emission rates would be less than specified emission rate thresholds, known as *de minimis* thresholds, and that the emissions would be less than ten percent of the area's annual emission budget. If these conditions are met, then the requirement to demonstrate conformity is not applicable (i.e., conformity of the project is presumed and exempt from conformity determination).

Regional Air Quality Conditions

Great Falls Park is located within the National Capital Interstate Air Quality Control Region which includes Washington DC; Arlington, Fairfax, Loudoun, Stafford, and Prince William Counties in Virginia; the City of Alexandria, Virginia; and Montgomery, Prince George's, Calvert, Charles, and Frederick Counties in Maryland. Air pollutant concentrations are measured at monitoring stations throughout the region to evaluate the air quality of the area and

[50] U.S. Environmental Protection Agency. *Area Listings: Classification of Ozone Nonattainment Areas*, 2004 (www.epa.gov)

to determine compliance with the NAAQS. Ambient air monitoring is conducted in accordance with EPA-approved methodologies, and standard operating and quality assurance procedures.

The air in the Washington DC metropolitan area has exceeded the federal health standard for ozone (O_3) for the last approximately 25 years and the region was previously designated by the EPA as a "serious nonattainment area" for ozone. In 2002, EPA redesignated the region from serious to "severe nonattainment area" for ozone. The number of days per year of ozone violations ranged from a low of 2 to a high of 27 (Federal law allows only one violation of the standard a year, averaged over three years, in any one location in the region). The highest levels of ozone generally occur during the summer, from early May to late October, when the increased temperature and sunlight intensity enhance its formation.

Ozone is a colorless gas formed in and downwind of urban areas when sunlight and high temperatures cause photochemical reactions between emissions of volatile organic compounds (VOCs) and oxides of nitrogen (NO_x), called ozone precursors. Major sources of VOC include, but are not limited to, motor vehicles, gasoline storage facilities, and refueling stations. Principal sources of NO_x, include motor vehicles, construction equipment, fossil fuel-fired power plants, and open burning.[51]

In the greater metropolitan Washington DC region, automobile traffic is also a principal source of localized carbon monoxide (CO). While it is difficult to associate ozone levels with local traffic levels, because ozone is not emitted directly, CO is directly emitted and concentrates locally around heavily traveled roadways and congested intersections. CO levels tend to be highest in the winter when cold weather causes automobiles to burn gas less efficiently.

[51] Metropolitan Washington Council of Governments website (http://www.mwcog.org/environment/air/)

3.3.5 Noise Levels

Introduction and Terminology

Noise is generally defined as unwanted or objectionable sound. The effects of noise on people include annoyance, interference with speech communication, sleep disturbance, and in the extreme, hearing impairment. Noise levels are measured and expressed in decibels (dB), on a logarithmic scale. Quantification of environmental sound commonly consists of evaluating the frequencies of a sound according to a weighting system that reflects that the human ear is not equally sensitive to all frequencies within the sound spectrum. Human hearing is less sensitive at low frequencies and extremely high frequencies than at mid-range frequencies. A method called "A-weighting" is used to filter frequencies not audible to the human ear. The typical A-weighted noise levels for common outdoor and indoor activities are shown in Table 3.5: Typical Noise Levels.

While an A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of frequencies from distant sources, creating a relatively steady background noise in which no particular source is identifiable. Average noise levels over a period of minutes or hours are usually expressed as dBA L_{eq}, or the equivalent noise level for that period of time. When no time period is specified, a one hour average is assumed. Construction noise standards are typically stated as average noise levels over a period of 1, 8, or 12 hours.

Human perception of noise is complicated as there is no simple correlation of perception with acoustical energy. It is widely accepted that the average healthy human ear can barely perceive noise level changes of three dBA. Based on the results of many acoustical studies, it has been further accepted that a five dBA change is readily perceptible, and a ten dBA increase is perceived as twice as loud (Caltrans 1998).

Table 3.5: Typical Noise Levels

Common Outdoor Activities	Noise Level dBA	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 1,000 feet (300 meters)		
	--100--	
Gas Lawn Mower at 3 feet (1 meter)		
	--90--	
Diesel Truck at 50 feet (15 meters), at 50 mph (80 km/hr)	--80--	Food Blender at 3 feet (1 m) Garbage Disposal at 3 feet (1 meter)
Helicopter (intermediate size) at 500 feet (150 meters)	--75--	
Noisy Urban Area, Daytime		
Gas Lawn Mower, 100 feet (30 meters)	--70--	Vacuum Cleaner at 10 feet (3 meters)
Commercial Area		Normal Speech at 3 feet (1 meter)
Heavy Traffic at 300 feet (90 meters)	--60--	
		Large Business Office
Quiet Urban Daytime	--50--	Dishwasher Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference
Quiet Suburban Nighttime		Room (Background)
	--30--	Library
Quiet Rural Nighttime		Bedroom at Night, Concert
	--20--	Hall (Background)
		Broadcast/Recording Studio
	--10--	
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans 1998.

Regulatory Framework

Virginia does not currently have comprehensive state-wide noise regulations. Applicable Fairfax County noise regulations are stated in Chapter 108 of the Code of Ordinances for Fairfax County. The noise standards by general zoning districts in the county are listed in the following table.

Table 3.6 : Fairfax County Environmental Noise Standards

Zoning District	Level
Industrial	72 dBA
Commercial	60 dBA
Residential	55 dBA

Source: Code of Ordinances for Fairfax County, 2002.

The Federal Highway Administration (FHWA) has established traffic noise abatement criteria (NAC) for various land uses adjacent to proposed FHWA projects. The GMP/EIS is not an FHWA project and the FHWA criteria are not directly applicable, but are useful as an objective means of comparison for motor vehicle noise. Traffic noise impacts occur when the predicted traffic noise levels approach or exceed the noise abatement criteria, as shown in Table 3.7: FHWA Traffic-Related Noise Abatement Criteria, or when predicted traffic noise levels substantially exceed the existing noise levels.

Table 3.7: FHWA Traffic-Related Noise Abatement Criteria

$L_{eq}(h)$	Description of Activity Category
57 dBA	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
67 dBA	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
72 dBA	Developed lands, properties, or activities not included in categories A or B above.
None	Undeveloped lands.
52 dBA	Interior of residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Sensitive Noise Receptors

Sensitive noise receptors are generally considered to be human activities or land uses that may be subject to the stress of significant interference from noise. Land uses associated with sensitive receptors include residential dwellings, mobile homes, hotels, motels, hospitals, nursing homes, education facilities, and libraries. Sensitive receptors may also include threatened or endangered noise-sensitive biological species. Commercial and industrial land uses are not considered "noise sensitive" by most definitions. However, jurisdictions may have noise/land use compatibility standards or noise impact standards that apply to commercial and business uses.

The known sensitive noise receptors currently within the park include the educational facilities of the visitor center. The off-site noise sensitive receptors of concern in the study area are the residences close to the roadways that would carry the greatest volumes of project-generated vehicle traffic. Specifically, the residences adjacent to Georgetown Pike, Old Dominion Road, and Riverbend Road are potentially of interest with regard to noise.

3.3.6 Hazardous Materials

A review of the EPA's and the Virginia Department of Environmental Quality's databases regarding hazardous waste indicates that neither the park nor any abutting sites were identified as federal or state Superfund or potential Superfund sites.[52] Also, neither the park, nor abutting sites were identified as being engaged in the treatment, storage, and/or disposal of hazardous waste.

Based on its age, the visitor center may contain outdated, now hazardous, materials such as lead-based paint and asbestos-containing materials. This may also be the case for the maintenance facility. If disturbed, these materials are potential health hazards through ingestion, absorption, or inhalation of airborne particles.

[52] http://www.deq.virginia.gov/waste/hazardous.html
http://www.epa.gov/superfund/sites/cursites/index.htm
http://www.epa.gov/enviro/html/rcris/rcris_query_java.html
(Database Search of performed on November 28, 2006)

3.4 TRANSPORTATION SYSTEM

The following section provides an overview of existing traffic access, parking, and circulation patterns at Great Falls Park, including traffic volumes, available parking, parking utilization, and typical queue sizes. This summary is based on a variety of information sources including data obtained from the NPS, data gathered at Great Falls Park, phone interviews of park users, feedback from local emergency service providers, and public comments received at a public scoping meeting.

Parking Supply

Great Falls Park is served by three paved parking lots, with a total of 533 parking spaces, including 12 designated as handicapped parking spaces. All of the parking spaces at Great Falls Park are designed for passenger cars. There are no designated spaces for buses, oversized vehicles or horse trailers. The upper lot, which contains 173 regular parking spaces, is generally used for overflow parking when the main lot fills. Several spaces at the northern end of the upper lot are taken up by trash dumpsters. The main lot is located near the visitor center and contains 261 parking spaces, including eight handicapped spaces. Five of the spaces in the main lot are reserved for park staff. The lower lot, which was constructed in 2002, contains 99 parking spaces, including four handicap-accessible spaces. This lot is frequently used by rock climbers and boaters, and therefore, is sometimes referred to as the "Climber's Lot".

Roadway Access

The only vehicular access to Great Falls Park is from Old Dominion Drive, a narrow two-way, two-lane road (10-foot lanes with no shoulders) that continues for approximately one mile from Georgetown Pike to the park entrance station. In addition to the park, Old Dominion Drive provides access to 10 single family homes that share two common driveways. At the entrance station, visitors pay a parking fee and are provided with maps of the park. Park staff indicated that in recent years on peak weekends, traffic has queued back from the entrance station along Old Dominion Drive. They estimated that, to their knowledge, these queues had not reached as far as the Georgetown Pike intersection. The frequency (10-12 times per year) and typical length of the peak weekend queues (usually extending about one-half to three-quarters of the way to the Georgetown Pike intersection) was generally corroborated by public comments received during the public scoping meeting and by comments received from various park users who were interviewed as part of the development of this plan. A new entrance station was recently constructed, and opened in June 2003.

Traffic Volumes

An initial assessment of traffic characteristics at Great Falls Park was made based on historical traffic count data obtained from NPS. The data covered an entire year, from September 2000 through August 2002 (2001 data was unavailable) and consisted of traffic volumes collected 24-hours-a-day by in-road sensors installed on Old Dominion Drive near the entrance fee station within the park. The data indicated the following trends:

- The peak season is from May to September;

- Saturday and Sunday are the peak days;
- Sunday generally has the highest volume and was the peak day of the month for nine of the 12 months. Saturday was the peak day for two of the 12 months, and Christmas (Monday) was the peak day in December (however, the patronage was much lower on this day than the other peak days);
- During the peak months, an average of approximately 490 vehicles are typically on the site during the peak weekend hour, compared to an average of 190 vehicles on the site during the peak hour from October to April;
- On the peak day of the year (Sunday, May 5, 2002), 535 vehicles were on-site during the peak hour;
- The peak hour for entering traffic is usually between 1:00 pm and 2:00 pm during the peak season;
- The peak hour for exiting traffic varies more throughout the peak season (2:00 pm to 6:00 pm);
- The largest volume of traffic entering the park in a single day was 1,528 (Sunday, May 5, 2002);
- The figure below summarizes the inbound and outbound flow of vehicles at Great Falls Park on the peak day of Sunday, May 5, 2002:

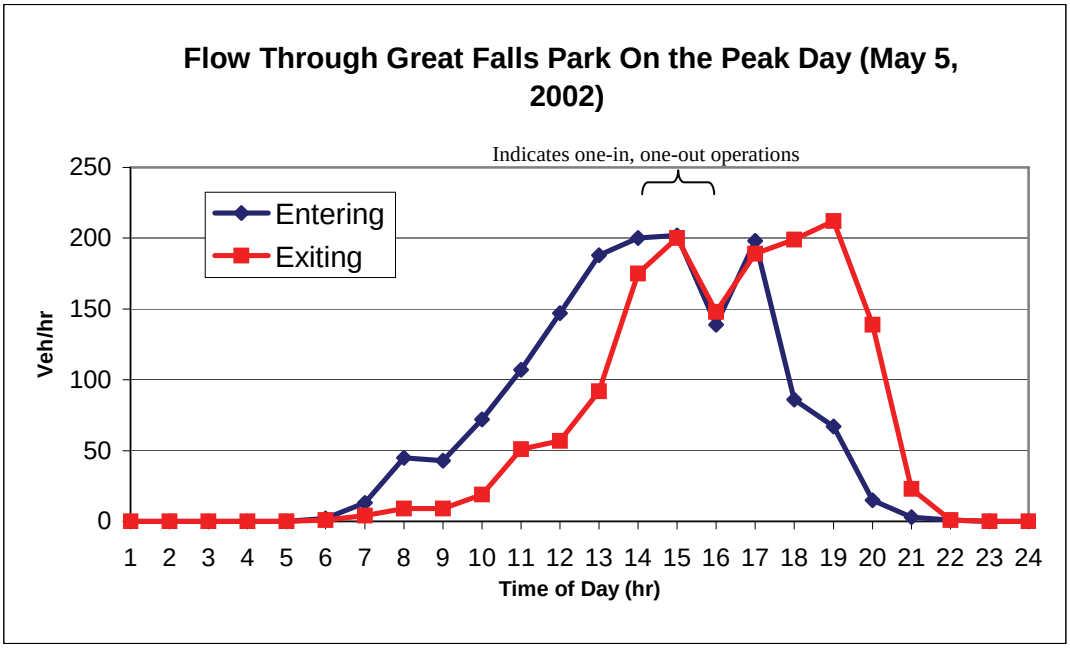

Figure 3.7: Summary of Inbound/Outbound Vehicular Flow on a Peak Day

- When comparing traffic volumes to visitor totals obtained from the NPS, the average vehicle occupancy is approximately 2.5 visitors per vehicle;

- Park records indicate that about 275 heavy vehicles enter the park each year. This includes approximately 200 school buses, 25 tour buses, 25 delivery trucks, and 25 tractor-trailers that enter the park accidentally; and

- Historical traffic data indicates a slight decline in total traffic on Georgetown Pike outside the park over the last 10 years (approximately 5 percent reduction from 1991 to 2001).

To get a better indication of typical daily traffic patterns during a peak day, traffic was manually counted on Sunday, June 1, 2003 from 7:00 AM to 8:15 PM. This date was selected because it fell in a month that historically generated some of the highest visitor totals of the year. Attendance is dependent on weather conditions, and the day of data collection, while forecasted to be warm and sunny, turned out to be fair.

Data was collected on Old Dominion Drive just prior to the entrance station. Since Old Dominion Drive is the only access road to the park, this count should reflect all vehicles that entered and exited the park. A total of 1,345 vehicles entered the park, including five trucks/buses/carpool vans and two vehicles with trailers. This total represented approximately 85 percent of the peak daily attendance in 2002. Compared to the historical count data obtained from the NPS - despite the weather being "good" but not "great" - this volume was still representative of an average June weekend day. The peak hour traffic flow of vehicles entering the park was 210 vehicles/hour, which occurred between 2:00 pm and 3:00 pm. The peak flow of vehicles exiting the park was 218 vehicles/hour, which occurred between 4:45 pm and 5:45 pm.

Parking Demand

In addition to traffic counts, on June 1, 2003, the number of vehicles parked in each of the three lots was counted at a half-hour interval throughout the day between 7:30 am and 8:00 pm. The maximum number of vehicles parked at Great Falls Park on the day of the data collection was 403, which occurred at 3:00 pm. The main lot was filled (100 percent capacity) from 1:30 pm to 5:00 pm. The lower lot reached 77 percent capacity at 3:30 pm, while the upper lot reached 48 percent capacity at 2:30 pm.

Although the park never reached its total parking capacity on the day of the data collection, park staff indicated that all three parking lots typically reach capacity (approximately 500 spaces) about 10 to 15 times per year during the peak days.

Entrance Station Processing Rate

The time required to process a vehicle entering the park at the entrance station was also recorded randomly throughout the day on June 1, 2003. A total of 100 samples were taken in the morning, during midday, and in the afternoon, and also reflect several different staff members operating the booth. The average processing rate was found to be 21 seconds/vehicle. This equates to a capacity of about 170 vehicles/hour that can enter the park via the single-lane entrance station, which was the case during the data collection on June 1, 2003. As noted in the

previous "Traffic Volumes" section, this rate was exceeded during the peak hour (210 vehicles/hour), resulting in a queue of approximately 650 feet.

Queue Lengths

As noted previously in the "Roadway Access" section, long queues of vehicles entering the park occur on Old Dominion Drive an average of 10-12 times each year. Based on the historic traffic volume data, the entrance station processing rates, the current size of the three parking lots, and comments from the park staff who operate the parking lots, it appears that these long queues are the result of two factors:

- On peak days, the flow of arriving vehicles may exceed the ability of the park staff to process them through the entrance station. This is what happened on June 1, 2003.

- In the event that the 521 existing parking spaces fill completely, vehicles are not permitted to enter the park until other vehicles leave. At this point, the park operates a one-in, one-out process, and vehicles waiting to enter the park queue in a single line along Old Dominion Drive. A manually operated foldout sign indicating "Lots Full" is sometimes displayed on Old Dominion Drive when this occurs.

Emergency Access

Company 12 Fire Station in Great Falls, Virginia was contacted to obtain feedback regarding emergency vehicle access to Great Falls Park, and provided the following comments:

- The fire company recognizes that there are traffic queues on Old Dominion Drive during the peak summer weekends (typically in August). However, this problem is not unique to Great Falls Park and, therefore, they expect it and deal with it accordingly.

- The trails throughout the park are generally adequate for emergency vehicle access. It was noted that "about 90 percent" of the trails are accessible and wide enough to get all of the fire equipment through.

- The fire company sometimes uses Old Carriage Road to enter the park. This is a dirt road, but it is wide enough to handle their big trucks. Occasionally, this road requires grading-related maintenance.

- The primary concern addressed by the fire company was the Sandy Landing boat ramp, which they use to launch boats for rescues. According to the Fire Station, this ramp is unable to accommodate all of their equipment. An engineering study conducted to redesign this ramp has been completed and reconstruction is currently being undertaken.

User Feedback

A telephone survey of permit-holding climbing and boating schools that use Great Falls Park was conducted to obtain their feedback regarding traffic and parking issues. The following general comments from the groups were noted:

- Long delays are experienced when trying to access the park at midday on the weekends. Most permit-holding groups try to arrive early in the day to avoid the rush. Delays at the gate make it difficult for groups to meet within the park at a given time.

- The groups expressed interest in having a parking permit and specific locations to park a bus. While buses and 15-passenger vans are available to most groups, they are difficult to park on site. Therefore, the rock climbing groups usually don't use the buses and everyone drives individually, which contributes to the parking shortage in the park.

3.5 SITE UTILITIES

Great Falls Park has four buildings located within the park boundaries. These facilities are the entrance station, visitor center, maintenance building, and comfort station. The majority of the buildings are located in the north central section of the park. The comfort station is approximately 300 feet south from the lower visitor parking lot. These on-site buildings, as well as the USPP trailer, have utility hook-ups.

3.5.1 Water

The water supply distribution system is a stand-alone system under the jurisdiction of the NPS. A 30,000-gallon water storage tank feeds the park facilities. The storage tank is located in the northwestern part of the park and can only be accessed from outside the park using Jackson Lane. Located 100 feet east from the storage tank is a 5-foot by 5-foot concrete well. A pump inside the well supplies water to the tank via a 2-inch line. A 6-inch ductile iron gravity trunk line from the storage tank supplies potable water to the park's distribution system. Water is supplied through this distribution system to the comfort facility, entrance station, maintenance building, and the visitor center.

One fire hydrant is identified in the park, located just south of the maintenance building. The distribution system appears to have valves placed in strategic locations to isolate parts of the system, if necessary.

3.5.2 Sanitary Sewer

There is a large sanitary sewer interceptor that enters the park from the south and extends north. This system is part of the Potomac Interceptor, an extensive system, which spans several counties throughout Virginia and Maryland. The system begins in the District of Columbia and follows the Potomac River through Maryland. It crosses into Virginia following the route of the Potomac River and then turns southwest, paralleling the Loudoun and Fairfax county boundary, into Dulles Airport.

The sanitary sewer branch that enters the park is a 54-inch reinforced concrete line. The sewer flows from the south towards the north bisecting the park. It is within a 60-foot easement, with the line located in the center of the easement through most of the park. Due to the park's topography, the depth of the sewer line varies from 20 feet to 3 feet of cover. There are sewer manholes, approximately 900 feet apart and 48-inches in diameter, along with air-intakes or vents associated with each manhole. Sanitary sewer laterals from the park facilities flow into the 54-inch branch line.

3.5.3 Electric Supply

Dominion Virginia Power provides electricity to the park. The estimated demand of power for the park is approximately 200kW. The electrical system consists of overhead power lines and below-grade conduits. The overhead electrical service enters from the west side of the park at two locations, through a possible easement off of River Bend Road, and off Jackson Lane. The underground conduits are for service connections to the various buildings within the park.

3.5.4 Telephone System

Similar to the electric system, the land line telephone phone system consists of overhead lines and underground conduits and enters from the west property line of the park from Jackson Lane. It appears the telephone lines are attached to the Virginia Electric and Power (VEPCO) power poles and follows the VEPCO pole line into the park and to the adjacent park facilities

Bell Atlantic Mobile constructed a 150-foot, freestanding monopole and adjacent equipment building that provides cellular telephone communication for users within the park and surrounding area. The monopole also houses NPS radio equipment. The monopole and equipment building are located along the Ridge Trail, less than 100 feet east of Old Dominion Drive.

3.5.5 Gas Supply

There is no indication of a natural gas distribution system or propane storage facilities within the park. Also, there is no indication of a gas transmission pipeline passing through the park or the indication of a natural gas pipeline easement.

3.5.6 Stormwater Drainage

There are isolated storm drainage systems located near the visitor center building, the north parking area and some roof drainage from the entrance station. The majority of the storm drainage from the visitor center is within the area located in the courtyard between the two wings of the visitor center. The courtyard is paved with concrete and is graded towards two catch basins approximately 50-feet diagonal from each other. There is an 8-inch pipe that connects the catch basins and the outfall line is a 10-inch pipe. The outfall line flows south from the courtyard and connects to a manhole approximate 60 feet away. The manhole also receives stormwater from a system that collects drainage from the visitor center building walkway and overhang. There is a 10-inch outfall pipe from the manhole that flows approximately 50 feet east to the Potomac Canal.

The parking lot upper and main parking lots drain into catch basins that discharge water into the Potomac Canal. The entrance station has a 3-inch storm drain that collects roof runoff. This drain flows eastward and connects to the Potomac Interceptor.

3.5.7 Solid Waste Disposal

Solid waste is stored within the park in three dumpsters that are emptied by a private contractor on a weekly basis. Recyclable materials such as cardboard, plastic, and glass are stored separately and are also removed periodically by a private contractor.