

# 3

## AFFECTED ENVIRONMENT

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This chapter characterizes the existing social, economic, and environmental setting potentially affected by the candidate build alternatives outlined in Chapter 2. First, a discussion regarding how potential environmental issues were identified is presented. Next, information on park management and operations, land use, the social environment (neighborhoods, community facilities, and parks), demographics, the economy, cultural resources, visual characteristics, noise, air quality, natural resources, hazardous materials, and special jurisdictions is presented. Effects on these resources are discussed in Chapter 4.

### 3.1 ISSUES IDENTIFICATION

Consistent with Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act of 1969 (NEPA), this document focuses on the most important environmental issues, and de-emphasizes less important issues (40 CFR 1501.1(d)). The environmental issues were identified with input from citizens at a number of public meetings, agency comments, mapping and aerial photography from various sources, visual observations of human and natural resources in the corridor, and other sources. See Chapter 7 for discussion of public and agency coordination.

**Table 3-1** lists several environmental issues with remarks indicating their relevance to the project. Some issues involve resources that receive a relatively high level of protection under environmental laws and regulations. Other issues were identified by the public or are considered particularly sensitive to potential adverse effects due to implementation of any of the alternatives. Some of the issues involve resources likely to experience only minor effects from the proposed project and some involve resources that are not present in the corridor, or that have only a limited presence in the corridor.

**TABLE 3-1: ENVIRONMENTAL ISSUES**

Issue	Remarks
Noise	Traffic related noise is a frequently expressed concern by citizens. Numerous residences and recreation areas are located in the study area.
Home Displacements, Community Impacts, Property Damage	Frequently expressed concern of citizens and localities. Some homes and neighborhoods are located near candidate build alternatives.
Air Quality	Frequently expressed concern of citizens. Comments from U.S. Environmental Protection Agency and Virginia Department of Environmental Quality. High traffic volumes in congested area with numerous points of human exposures (residential yards and other outdoor activity areas). The Washington, DC Region has been designated as "severe nonattainment" for ozone.
Parks and Recreation Areas	Important parks and recreational properties within the affected environment. Comments from local officials and from citizens. High level of protection under Section 4(f) regulations.
Cultural Resources	The Park and the surrounding area contain several sensitive cultural resources and historic landscapes. High level of protection under Section 4(f) and Section 106 regulations.

**TABLE 3-1: ENVIRONMENTAL ISSUES**

Issue	Remarks
Streams/Water Resources/Wetlands	Wetland concerns mentioned by some citizens and by state and Federal agencies.
Visual Impacts	Study area is characterized by rural areas with scenic views. Mentioned by some citizens.
Lighting and Light Pollution	Mentioned by some citizens as a concern with any potential candidate build alternative.
Wildlife and Habitat	The area consists of both natural and suburbanized areas occupied by a variety of wildlife.
Environmental Justice (EJ) Populations	Executive Order (EO) 12898 " <i>Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations</i> ," directs Federal agencies to "promote nondiscrimination in Federal programs substantially affecting human health and the environment, and provide minority and low-income communities access to public information on, and an opportunity for public participation in, matters relating to human health or the environment."
Land Use/Secondary & Cumulative Effects	Concern that roadway improvements stimulate development or be attached to larger projects, beyond the scope of this study. Mentioned by several citizens and advocacy groups. Comments from U.S. Environmental Protection Agency.
Hazardous Material Sites	A number of sites containing potentially hazardous materials are scattered throughout the study area. The potential human health effects of such materials and the potential costs cleaning up such sites make them a concern.
Forest Land	Several forest resources, including Conway Robinson Memorial State Forest and forested areas within the park. Comments from citizens, advocacy groups, and Virginia Department of Forestry.
Farmland	The Farmland Protection Policy Act of 1981 contains provisions to minimize the extent that Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses, and to assure compatibility with local and State programs and policies to protect farmland. Comments from Virginia Department of Agriculture and Consumer Services and from U.S. Natural Resources Conservation Service.
Public Water Supplies	No public water supplies in the affected area. Some personal groundwater wells exist in the area. Comments from Virginia Department of Health.
Navigable Waterways	No navigable waterways in corridor.
Endangered Species	USFWS has indicated that Federally listed endangered, proposed for listing, or threatened species could be present within the counties comprising the study area. Comments from U.S. Fish and Wildlife Service, Virginia Department of Agriculture and Consumer Services, Virginia Division of Natural Heritage, Virginia Department of Game and Inland Fisheries.
Scenic Rivers/Scenic Byways	None in study area. Comments from Virginia Department of Conservation and Recreation.

### 3.2 TRAFFIC AND TRANSPORTATION

This section of the report summarizes the evaluation of the overall traffic conditions in the study area. The evaluation included an inventory of existing roadways within the boundaries of the Park, traffic data for the larger study area, the calculation of levels of service (LOS) at intersections and interchanges throughout the

study area, the measurement of travel speeds and travel times at key locations, and the identification of high accident locations in the study area.

### 3.2.1 Study Area Roadways

The study area extends beyond the Park boundaries and includes several County, State and Federal roadways that may be affected by any alternatives to be developed. The average daily traffic volumes on study area roadways are illustrated in **Figure 3-1**. A description of the major and local roadways that were studied follows:

*U.S. Route 29:* Route 29 is a rural principal arterial with a 45-mph speed limit from Route 705 to the Prince William/Fairfax county border. The four-lane divided typical section is reduced to two lanes just inside the western park boundaries and continues as a two-lane section until approximately  $\frac{3}{4}$  mile east of the Prince William/Fairfax county border, where it becomes a four-lane divided urban principal arterial with a 50-mph speed limit.

*VA Route 234 Business:* Business 234 is a rural major collector with a 35-mph speed limit between Battleview Parkway and Route 29. Business 234 extends from the City of Manassas northward to Route 15. The four-lane section at Battleview Parkway is reduced to two lanes immediately north of the entrance to the Manassas campus of the Northern Virginia Community College, and continues as a two-lane section northward through the Park until reaching U.S. Route 15.

*VA Route 234 Bypass:* Route 234 Bypass is a limited access highway with a mixture of at-grade signalized intersections and grade-separated interchanges. Route 234 Bypass is a four-lane divided highway that extends from Interstate 66 in the north to Route 234 Business in the south.

*I-66:* I-66 is an east-west limited access divided highway that extends from the Theodore Roosevelt Memorial Bridge in the east to I-81 in the west. I-66 carries heavy commuter traffic to and from Washington, D.C. and has as many as eight lanes in some segments through the study area.

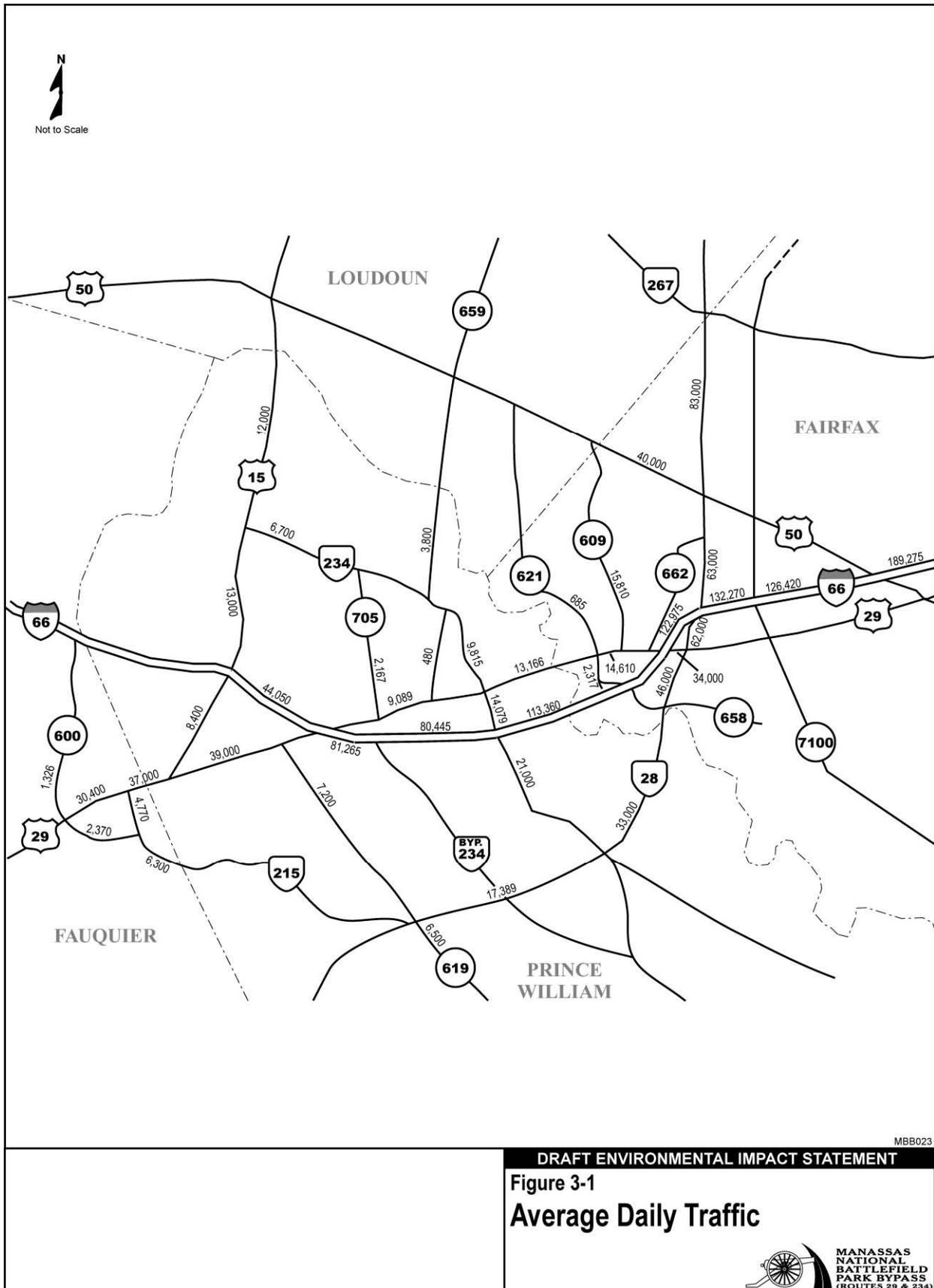
*U.S. Route 15:* Route 15 is a two-lane rural principal arterial through most of the study area from north of Route 50 to Route 29. Then Route 15 combines with Route 29 to form a four-lane urban principal arterial.

*U.S. Route 50:* Route 50 has a mix of grade separated interchanges and at-grade signalized intersections. It is an east-west six-lane urban principal arterial until dropping to four lanes at Route 28. It then becomes a rural primary arterial just west of Route 659 where it drops to two lanes and continues through the study area.

*VA Route 28:* Route 28 is a limited access six-lane divided highway to the north of the study area with at-grade signalized intersections and grade-separated interchanges. In the Cities of Manassas and Manassas Park, Route 28 becomes a four-lane urban principal arterial as it continues through the study area.

*County Route 7100 (Fairfax County Parkway):* Route 7100 is a four-lane controlled access divided highway with a mix of at-grade signalized intersections and grade-separated interchanges through the entire study area.

*County Route 705:* Route 705 borders on a portion of the southern and western boundary of the Manassas National Battlefield Park. Route 705 is a rural local road with a 45 mph speed limit that extends from Route 622 northward to Route 234.



*County Route 622:* Route 622 is a rural local road that extends from Route 621 on the south side of I-66 to Route 234 on the north end of the Park. Between Routes 705 and 29, Route 622 has a 35-mph speed limit.

*County Route 621:* Route 621 is a rural local road that extends from Route 28 on the south side of I-66 to Route 50 in the north. It passes just to the east and northeast of the Manassas National Battlefield Park.

*County Route 609:* Route 609 is a four-lane minor arterial that extends from Route 29 in the south to Route 50 in the north.

*County Route 662:* Route 662 is a four-lane minor arterial that extends from Route 29 in the south to Route 28 in the north.

*County Route 659:* Route 659 is a rural local road that extends from Route 234 in the south to Route 50 to the north.

*County Route 619:* Route 619 extends from Route 28 in the south to Route 29 in the north. The cross section of Route 619 varies from six-lanes to two-lanes.

*County Route 600:* Route 600 is a rural local road that extends from Route 215 in the south to Route 55 in the north just to the south of Interstate 66.

*VA Route 215:* Route 215 is a rural local road that extends from Route 28 in the south to Route 29 in the north.

### 3.2.2 Types of Vehicular Traffic

Vehicle class counts were also recorded in order to determine the percentage of heavy vehicles (Class 4 or higher) using Route 29 and Route 234 through the park. The counts yielded the following information.

<u>Route</u>	<u>Location</u>	<u>Percentage of Heavy Vehicles</u>
Route 234	North of Rt. 29	12.6%
Route 234	South of Rt. 29	10.3%
Route 29	West of Rt. 234	9.4%
Route 29	East of Rt. 234	10.4%

These are particularly high percentages of heavy vehicles compared to the 2 to 5 percent typically seen on many roads in the country. The high percentage of trucks can be attributed the close proximity of a number of quarries, as well as a significant amount of construction occurring in the area of the Park.

### 3.2.3 Existing Capacity Analysis

All traffic capacity analyses are based on the procedures specified by the Transportation Research Board, Special Report 209: *Highway Capacity Manual (HCM)*, 1997. These procedures include evaluating traffic conditions based on the concept of levels of service. Levels of service range from A (best) to F (worst). A brief description of each level of service for signalized and unsignalized intersections is provided below:

**Level of Service at Signalized Intersections:** Level of service (LOS) at signalized intersections is based upon the traffic volume present in each lane on the roadway, the capacity of each lane at the intersection, and the delay associated with each directional movement. The levels of service for signalized intersections are defined below:

LOS A describes operations with very low average delay per vehicle, i.e., less than 10.0 seconds. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop. Short signal cycle lengths may also contribute to low delay.

LOS B describes operations with average delay in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of delay.

LOS C describes operations with delay in the range of 20.1 to 35.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures (where all waiting vehicles do not clear the intersection during a single green time) may begin to appear at this level. The number of vehicles stopping is significant at this level although many still pass through the intersection without stopping. This is generally considered the lower end of the range of the acceptable level of service in rural areas.

LOS D describes operation with delay in the range of 35.1 to 55.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and/or high traffic volumes as compared to the roadway capacity. Many vehicles are required to stop and the number of vehicles that do not have to stop declines. Individual signal cycle failures are noticeable. This is generally considered the lower end of the range of acceptable levels of service in urban areas.

LOS E describes operations with delay in the range of 55.1 to 80.0 seconds per vehicle. These higher delay values generally indicate poor progression, long cycle lengths, and high traffic volumes. Individual cycle failures are frequent occurrences. LOS E has been set as the limit of acceptable conditions (at capacity).

LOS F describes operations with average delay in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over-saturation, i.e., when traffic arrives at a flow rate that exceeds the capacity of the intersection. It may also occur at high volumes with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such delays.

**Level of Service at Unsignalized Intersections:** At an unsignalized intersection, the major street through traffic and right turns are assumed to operate unimpeded and therefore receive no level of service rating. The level of service for the minor street and the major street left-turning traffic depends on the volume and capacity of the available lanes, and, the number and frequency of acceptable gaps in the major street traffic to make a conflicting (i.e.: against traffic) turn. The level of service grade that is provided for each conflicting movement at an unsignalized intersection is based on the total average delay experienced by each vehicle. The delay includes the time it takes a vehicle to move from the back of a queue through the intersection.

The unsignalized intersection level of service analysis does not account for variations in driver behavior or the effects of nearby traffic signals. Therefore, the result from this analysis usually indicates worse levels of service than may be experienced in the field. The unsignalized intersection level of service descriptions are provided below:

LOS A describes operations where there is very little to no conflicting traffic for a minor side street movement, i.e., an average total delay of less than 10.0 seconds per vehicle.

LOS B describes operations with average total delay in the range of 10.1 to 15.0 seconds per vehicle.

LOS C describes operations with average total delay in the range of 15.1 to 25.0 seconds per vehicle.

LOS D describes operations with average total delay in the range of 25.1 to 35.0 seconds per vehicle.

LOS E describes operations with average total delay in the range of 35.1 to 50.0 seconds per vehicle.

LOS F describes operations with average total delay of 50 seconds or more per vehicle. LOS F exists when there are insufficient gaps of suitable size to allow a vehicle on a side street to cross safely through or enter a major street traffic stream. This level of service is generally evident from extremely long total delays experienced by side street traffic and by queuing on the minor approaches. It is important to note that LOS F may not always result in long queues but may result in adjustments to normal driver behavior.

### Signalized Intersections

**Table 3-2** summarizes the existing baseline traffic operations at the signalized intersections within the study area during the critical AM and PM peak hours. All analyses were prepared using Synchro Version 5 software, which is based on methods compatible with the *Highway Capacity Manual* guidelines mentioned earlier. The traffic signal timings used in the analysis for the following intersections were obtained either from VDOT files or from field observations during peak hour periods.

As Table 3-2 shows, a number of the intersections operate at acceptable levels of service (LOS D or better) during both AM and PM peak traffic hours. However, four signalized intersections in the study area are not operating at acceptable levels of service today. Below are brief discussions of the operations at three of the four intersections, followed by a more lengthy discussion of the intersection of Route 29 and Route 234:

**Route 29 at Route 619 (Linton Hall Road).** This intersection operates at an overall LOS “E” during the PM peak traffic hour. All of the left-turn movements on each approach operate at individual LOS F, due to high volumes of turning traffic and insufficient left-turn signal phases. The overall unacceptable level of service at this intersection is due, in general, to the high volume of commuting traffic exiting onto southbound Route 29 from I-66 combined with high turning volumes generated by the shopping centers and residential subdivisions located adjacent to the intersection.

**Route 29 at Route 609 (Pleasant Valley Road).** This intersection experiences high left-turning volumes for both southbound Route 609 and northbound Route 29. Both movements total more than 400 vehicles per hour. Combining these turn volumes with heavy commuting traffic on Route 29 yield the low overall level of service during the AM peak hour.

**TABLE 3-2: EXISTING SIGNALIZED LEVELS OF SERVICE**

ID#	Intersection	Peak Hour Level of Service (Avg. delay/vehicle, seconds)	
		AM	PM
16	Rt. 28 at Rt. 619 (Linton Hall Road)	D (53.6)	C (31.3)
15	Rt. 28 at Rt. 215 (Vint Hill Road)	B (12.4)	A (8.3)
8	Rt. 29 at Rt. 619 (Linton Hall Road)	D (49.9)	E (55.8)
13	Rt. 29 at RT. 609 (Pleasant Valley Road)	E (69.8)	C (26.7)
14	Rt. 29 at Rt. 662 (Stone Road)	E (72.9)	E (63.1)
17	Rt. 28 Southbound (Grant St.) at Rt. 234 BUS	B (17.9)	C (21.2)
18	Rt. 28 Northbound (Center St.) at Rt. 234 BUS	B (18.7)	C (24.4)
5	Rt. 29 at Rt. 600	B (18.6)	C (28.9)
11	Rt. 29 at Rt. 234	F (118.4)	F (80.2)
7	Rt. 29 at Rt. 15	B (10.1)	D (35.8)
3	Rt. 15 at Rt. 234	A (7.2)	A (8.1)
1	Rt. 15 at Rt. 50	B (16.7)	B (15.3)

**Route 29 at Route 662 (Stone Road).** The unacceptable level of service experienced at this intersection during the AM peak traffic hour is due to an extremely high volume of left turning traffic from northbound Route 29 onto northbound Route 662 in a single left-turn lane. This movement operates at LOS F, yet all other movements at LOS D or better. During the PM peak traffic hour, the overall LOS is again an E with an extremely high southbound left-turn movement from Stone Road to northbound Route 29, which is a bypass route for southbound Route 28 traffic around the interchange with I-66.

**Intersection of Route 29 at Route 234.** The intersection of Route 29 and Route 234 is the only signalized intersection within the Manassas National Battlefield Park and is located in the center of the Park. Observations at the intersection reveal that there are extensive queues in the direction of commuting traffic during the peak hour periods. In fact, moving queues of up to 1.7 miles in length have been observed on northbound Route 29 in the AM peak traffic hour, and up to 1 mile on southbound Route 29 in the PM peak traffic hour.

Due to the extensive queues of vehicles still on Route 29 at the end of both the AM and PM peak traffic hours, the traffic counts recorded at the intersection do not, in reality, reflect the actual vehicular demand at the intersection. For purposes of obtaining an accurate capacity analysis, the hourly traffic volumes in the direction of these long queues were boosted to reflect the actual traffic demands. The hourly traffic volume for the northbound through movement on Route 29 in the AM peak hour was therefore increased by 200 vehicles per hour to reflect the typical observed queue of approximately 1 mile. The volume in the southbound direction on Route 29 in the PM peak hour was increased by 100 vehicles per hour to reflect a shorter queue of approximately ½ of a mile.

Using this method to estimate the actual traffic demand at this intersection, the level of service was calculated to be at LOS F during both the AM and PM peak hour periods and was confirmed by observations at the intersection.

In order to further quantify the current delay and level of congestion experienced in the Park at this intersection, travel time observations were taken during the AM and PM peak traffic periods on several weekdays in January 2002. The median travel time results from the observations are compared to the ideal travel times on Route 29 and Route 234 in **Table 3-3**, yielding the approximate congestion delay on each main route through the Park. The ideal travel time is defined as the amount of time it takes a motorist to travel a certain distance at the speed limit without having to stop for traffic signals or queued vehicles along a roadway. In other words, the congestion delay reflects any delay experienced by a motorist caused by slow-moving vehicles, traffic signals, or any other traffic control devices.

**TABLE 3-3: TRAVEL TIMES ON HIGHWAYS WITHIN THE PARK**

	Observed Travel Time (min.)		Ideal Travel Time (min.)		Congestion Delay (min.)	
	AM	PM	AM	PM	AM	PM
Rt. 29 -Northbound	22:32	13:07	10:30	10:30	12:02	2:37
Rt. 29 - Southbound	10:57	15:37	10:30	10:30	0:27	5:07
Rt. 234 - Westbound	6:10	6:47	5:12	5:12	0:58	1:35
Rt. 234 - Eastbound	6:21	5:48	5:12	5:12	1:09	0:36

Note: Direction (Northbound, Southbound, Westbound, & Eastbound) is based on official roadway classifications and may differ from the physical configuration of the roadway within the study area. For example, Route 29 runs east-west through the Park, but is officially designated as a north-south route throughout Virginia.

As shown in Table 3-3, the most significant delays through the park occur in the northbound direction on Route 29 during the AM rush hour period. According to the travel time runs, the typical delay in this direction during the AM peak period is approximately 12 minutes. In the southbound direction, the delay is not quite as long due to a slightly lower volume of traffic, but still is over 5 minutes.

**Corridor Capacity Analysis**

An analysis was also conducted to determine the level of service for the highway segments bisecting the Park. All four of the two-lane segments of Route 29 and Route 234 that approach the signalized intersection inside the Park were analyzed. The results are presented below in **Table 3-4**.

**TABLE 3-4: CORRIDOR LEVEL OF SERVICE FOR HIGHWAYS WITHIN THE PARK**

Two-Lane Road Segment	Level Of Service (LOS)	
	AM	PM
Rt. 29 – East of Rt. 234	F	F
Rt. 29 – West of Rt. 234	E	E
Rt. 234 – North of Rt.29	E	E
Rt. 234 – South of Rt.29	E	E

The results reveal that all sections of roadway approaching this intersection are currently operating at unacceptable levels of service during both the AM and PM peak hours. Although the section of Route 234 to the south of Route 29 carries the highest volume of traffic, it does not experience a failing level of service because the directionality of the traffic on this segment is even in both directions. The segment of Route 29 to the east of Route 234 has a highly directional flow of traffic with about 80 percent traveling in the direction of commuter traffic and therefore operates at a failing level of service during both peak hour periods.

**Unsignalized Intersections**

The unsignalized intersections in the study area were also analyzed to identify any locations with capacity deficiencies. The results are presented in **Table 3-5**.

**TABLE 3-5: EXISTING CONDITIONS: UNSIGNALIZED LEVEL OF SERVICE**

Intersection	Peak Hour Level of Service	
	AM	PM
Rt. 29 and Rt. 215	F	D
Rt. 29 and Rt. 621	F	D
Rt. 29 and Rt. 622	B	C
Rt. 29 and Rt. 705	C	C
Rt. 234 and Rt. 659	C	F
Rt. 50 and Rt. 659	F	F

The analysis reveals that a number of unsignalized intersections operate at LOS F during both the AM and PM peak hours. In general, the failing levels of service at the intersections along Route 29 are due to the high volume of commuting through traffic on Route 29. Without traffic signals close enough to the intersections with Route 621 and Route 215 to create interruptions in the flows of traffic, the high volumes create long delays for side street traffic waiting to cross or turn onto Route 29.

The intersection of Route 234 and Route 659 which lies beyond the northern entrance to the Park only experiences failing levels of service during the PM peak traffic hour, when high volumes of traffic were observed traveling south on Route 659. During the PM peak hour, traffic volumes on Route 234 are high enough to create long delays and backups for the increased amount of traffic turning from Route 659.

The intersection of Route 50 and Route 659 experiences failing levels of service in both the AM and PM peak hours. This is due to extremely high volumes of traffic on Route 50, and no nearby traffic signals to create interruptions in traffic flow for motorists to turn right or left during the peak hours. Observations of this intersection reveal that many left turning motorists create unsafe conditions at this intersection by pulling into the unprotected median on Route 50 while waiting for a gap in westbound traffic.

### Interchange Analysis

Capacity analysis was also performed at a number of interchanges throughout the study area. Analyses were completed at ramp merge, diverge, and weave locations at interchanges along I-66 from Route 50 to Route 15 and at isolated interchanges at the following locations:

- Route 28 and Route 50;
- Route 28 and Route 29;
- Route 7100 (Fairfax County Parkway) and Route 50.

The results of the capacity analyses were presented in the *Existing Conditions Report* (June 2, 2003). As expected in this region, the analysis results reveal a number of ramp merge, diverge, and weave locations that operate at LOS E or LOS F during the peak hours due to extremely high volumes of commuting traffic.

### 3.2.4 Speed Studies

Speed studies were completed on the roadways within the Manassas National Battlefield Park to evaluate the traffic flow characteristics within the Park. The information on speed were obtained from the machine count data placed at the following locations:

- Route 29 east and west of Route 234;
- Route 234 north and south of Route 29;
- Route 622 north of Route 29;
- Route 705 north of Route 29;
- Route 29 between Route 621 and Route 609.

The average calculated speed per direction at each of these locations over a typical 24-hour period is shown below in **Table 3-6**.

In general, the average daily speed on Route 29 is between 50-and 55-miles per hour, and is slightly lower at the locations approaching the Route 234 intersection. To determine more detailed effects of the traffic signal at Route 234 on traffic speeds on Route 29, average speeds were calculated for each 15-minute time interval and plotted over a 16-hour day.

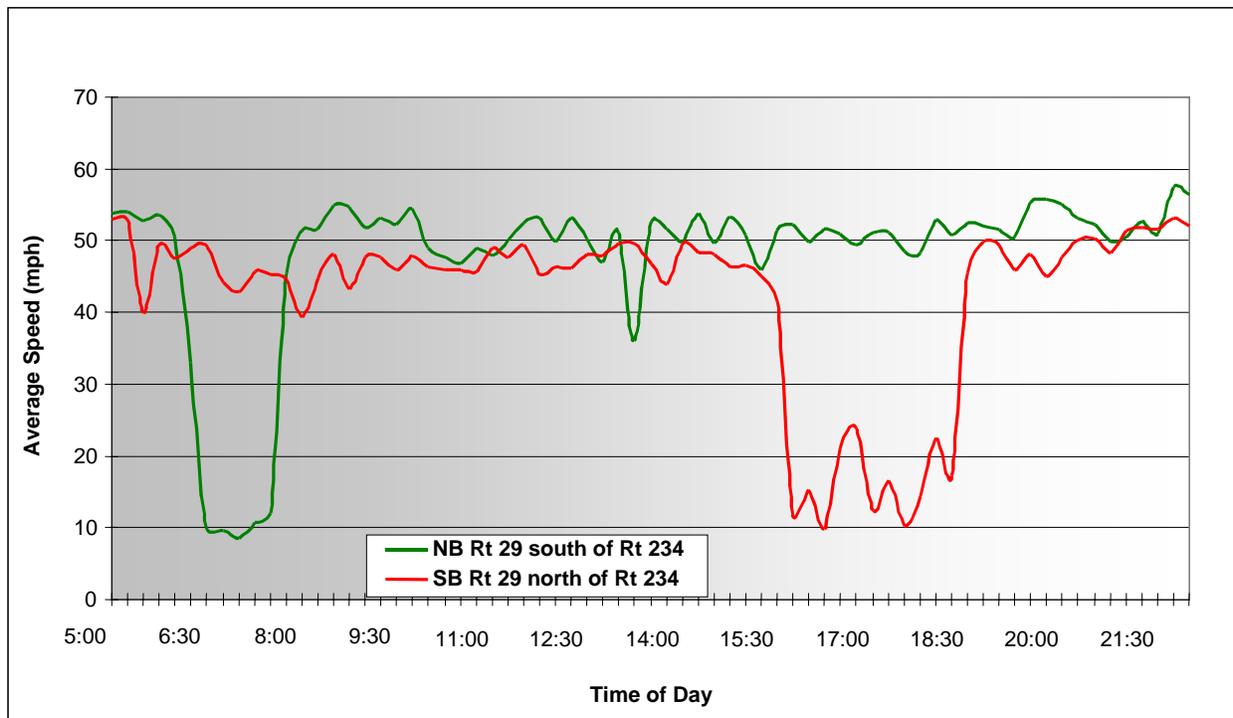
The following graph (**Figure 3-2**) presents the average speeds versus time for both northbound and southbound traffic on Route 29 approaching the intersection with Route 234. It should be noted that the counting locations on Route 29 were 1.7 and 1.3 miles away from the intersection with Route 234, in the northbound and southbound directions, respectively.

As shown in Figure 3-2, the speeds in either direction on Route 29 remain close to 50 miles per hour during most times of the day, except during peak hours. During the AM peak traffic period, northbound speeds slow to 10 mph from approximately 6:30 AM until 8 AM. During the PM peak traffic period, southbound speeds slow to 10 mph for a longer duration (from approximately 4:00 PM until 6:30 PM). Even with the count locations being more than a mile from the intersection, the graph shows the significant effects on travel speeds during peak hours from the queuing and congestion caused by the traffic signal.

**TABLE 3-6: AVERAGE DAILY SPEEDS (MPH)**

Road Link	Direction	
	NB/EB	SB/WB
<i>Route 29</i>		
West of Route 234	49.9	50.7
East of Route 234	49.6	45.2
Between Route 621 and Route 609	53.0	55.0
<i>Route 234</i>		
Between I-66 and Route 29	45.3	45.8
Between Route 29 and Route 659	50.4	48.7
<i>Route 705</i>		
Between Route 29 and Route 234	38.7	40.9
<i>Route 622</i>		
Between Route 29 and Route 234	38.7	41.8

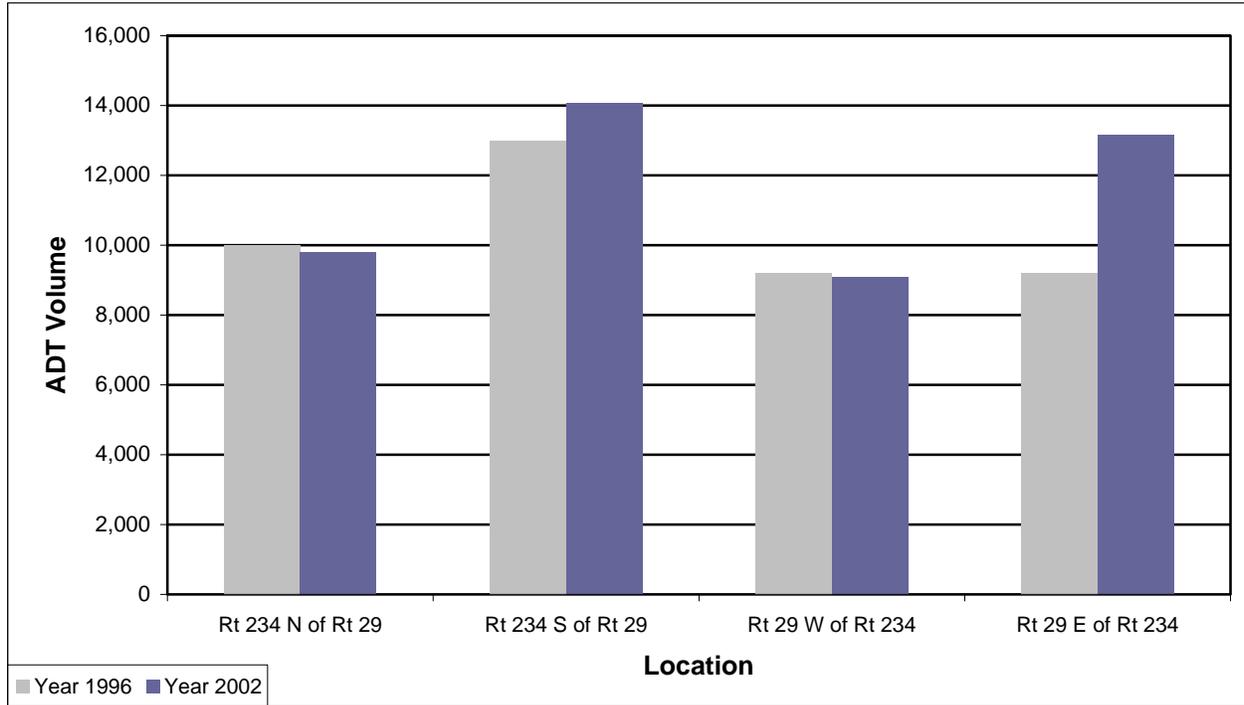
**FIGURE 3-2: AVERAGE SPEEDS ON ROUTE 29 WITHIN PARK**



### 3.2.5 Traffic Growth

Current (2002) daily traffic counts on roadways in and around the Park were compared to 1996 traffic counts taken from the *U.S. Route 29 Corridor Development Study* in order to calculate traffic growth trends. **Figure 3-3** presents the comparison between these counts on Routes 29 and 234 in the Park.

**FIGURE 3-3: TRAFFIC VOLUMES WITHIN THE PARK, 1996 - 2002**



As the graph shows, no significant regional traffic growth has been realized on Route 234 at the north end of the Park or on Route 29 at the west end of the Park since 1996. However, Route 234 (south of Route 29) has averaged 1.3% growth in traffic per year between 1996 and 2002, and Route 29 (east of Route 234) has averaged a 6.1% growth rate per year.

The traffic volumes seem to have reached a plateau on Route 29 on the west end of the park and on Route 234 on the north end of the park due to the long backups for traffic during the peak hours caused by the signalized intersection of Routes 29 and 234. In order to determine whether the traffic growth on Route 29 may have shifted to the nearest parallel route, 1996 and 2002 traffic volumes were also compared on I-66. The graph on the following page compares the ADT volumes between interchanges on I-66.

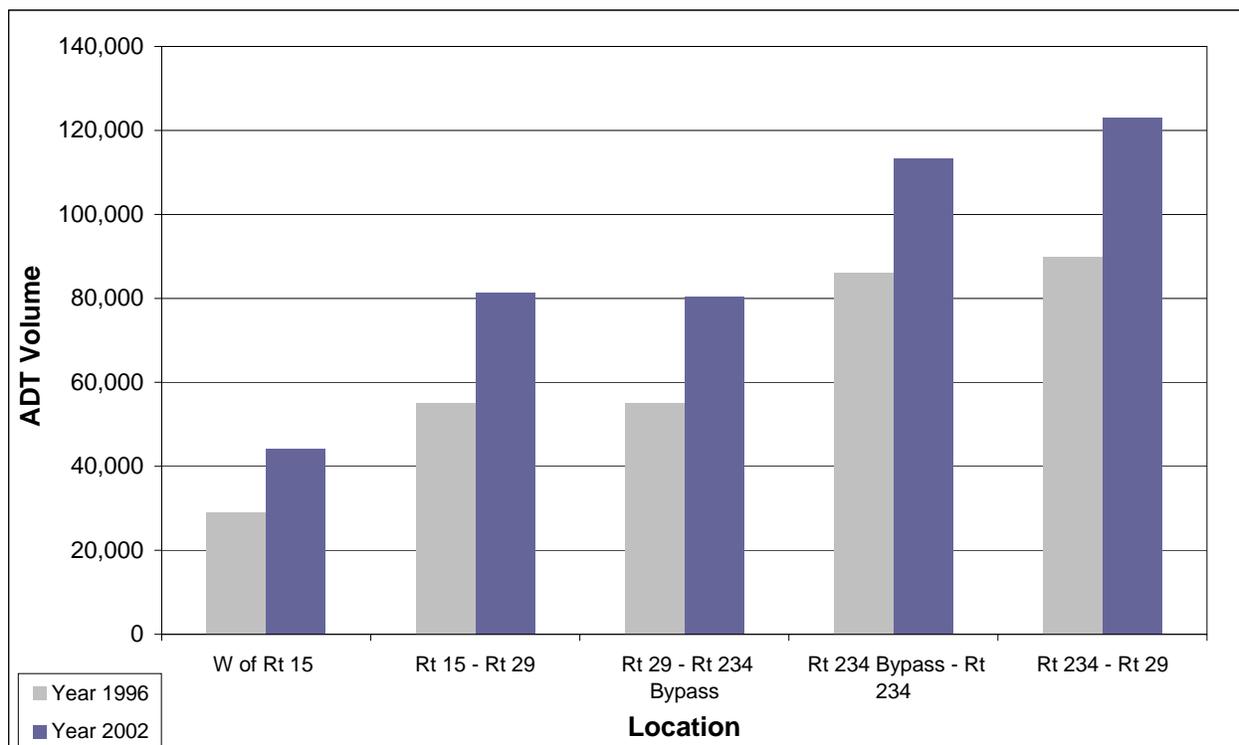
The extremely high growth percentages on the section of I-66 immediately to the east of the western interchange with Route 29 are shown in **Figure 3-4**. This growth signifies that there could be a shift in travel choice from Route 29 to I-66 caused by the congestion or lack of capacity on Route 29.

### 3.3 PARK MANAGEMENT AND OPERATIONS

Park management and operations require use of Park roads throughout the day. Conflicting uses of roads within the Park boundaries impedes access both to the Park and to sites within the Park. Park visitation tends

to vary seasonally by both the amount and type of visitation. During the spring, visitation is heaviest on weekends and is usually concentrated around the visitor center and surrounding areas. Overall visitation is highest during the summer due to increased visitation from families and other groups on extended vacations. Fall visitation includes visits from senior citizen and organized tour groups and is concentrated on weekends. Local residents also tend to make increased use of the Park in the fall. Visitation is lightest during the winter. Peak daily use generally occurs between 11:00 a.m. and 4:00 p.m. with the heaviest amounts on weekends.

**FIGURE 3-4: TRAFFIC VOLUMES ON I-66, 1996 AND 2002**

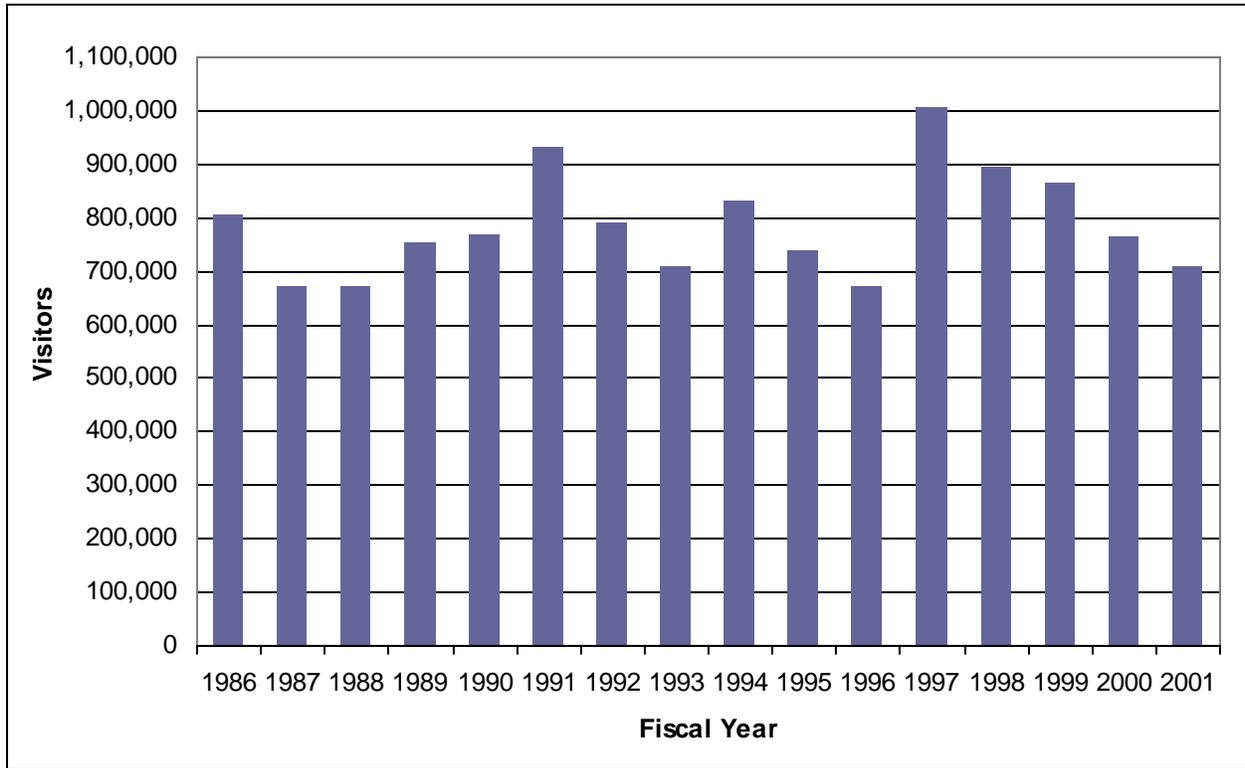


Accounts of Park visitation between 1986 and 2001 show a range of between 670,063 and 1,008,126 people per year. As shown in **Figure 3-5**, Park visitation has been relatively consistent over the 15-year period, with a slight decline over the past five years from the high in 1997. Average annual visitation for the 15-year period was slightly more than 839,621.

Park visitors taking the park tours may need to cross Route 29 and Route 234 at several points. These pedestrian crossings with heavily traveled roadways are a significant operational and safety problem within the Park

**3.4 PRIVATE IN-HOLDINGS**

Private in-holdings refer to privately owned properties that are either fully or partially located within the legislative boundaries of Manassas National Battlefield Park. The Park’s legislative boundary differs from the physical boundaries of existing Park-owned land. The legislative boundary refers to the entire land area the Park may acquire through future purchases of land or other grants of land ownership. **Figure 3-6** illustrates the Park’s legislative boundary and the actual park-owned property. Private in-holdings are illustrated in **Figure 3-7**.

**FIGURE 3-5: ANNUAL PARK VISITATION**

Source: National Park Service

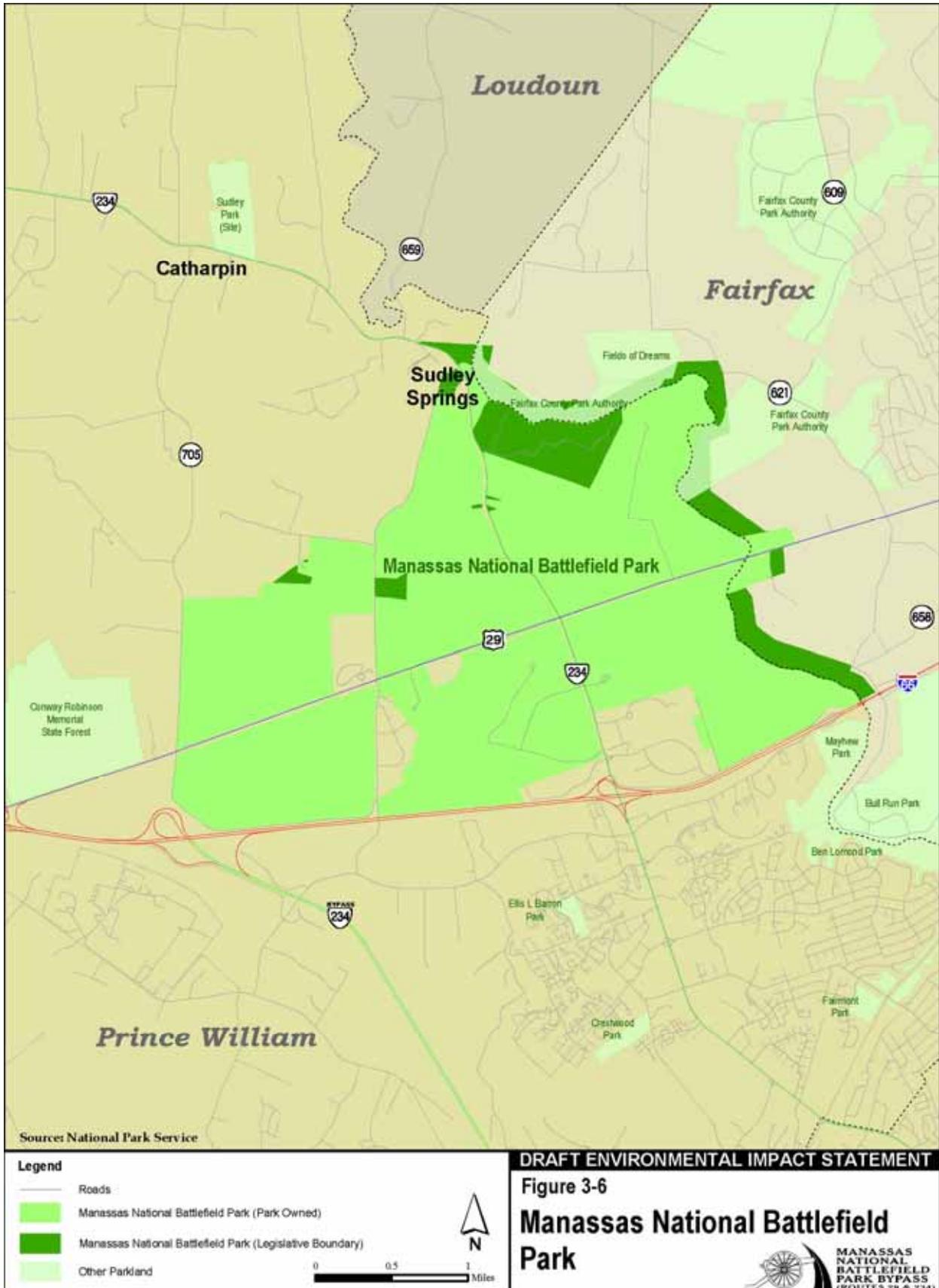
Private in-holdings within the boundaries of the Manassas National Battlefield Park were inventoried based on consultations with National Park Service representatives, an assessment of Park records, and searches of real estate databases for Prince William and Fairfax counties. In-holdings are concentrated in several areas within the Park's legislative boundaries. Some of the areas with clusters of private in-holdings include:

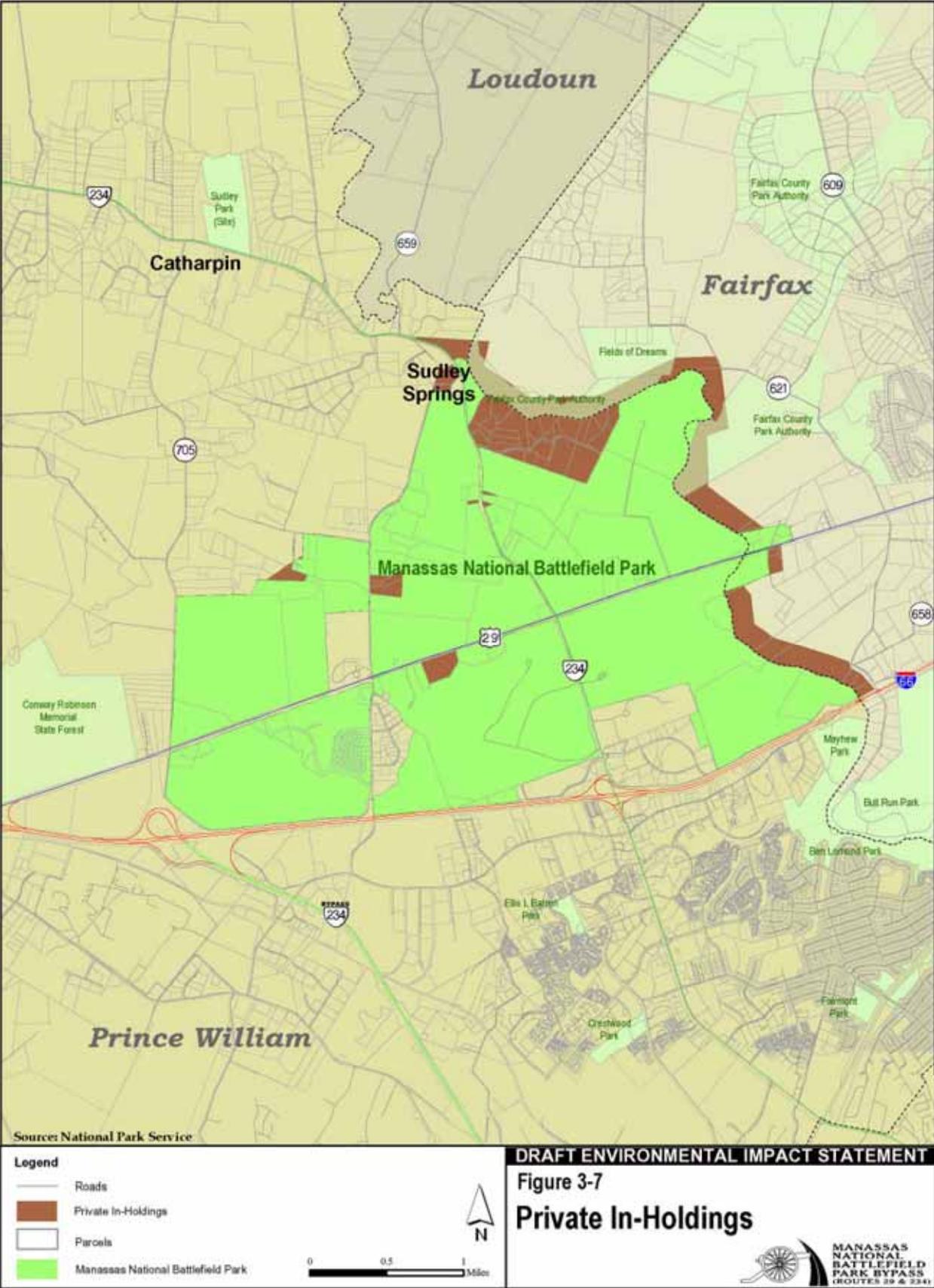
- The *Sun Rise Hill Farm* neighborhood, located in the northeast corner of the park, includes a number of residences along Poplar Ford Trail.
- Four private in-holdings are located on VA 234 between US 29 and Poplar Ford Trail.
- Mostly north of the Stonewall Memory Gardens Cemetery, there are several private-held properties off of Featherbed Lane, ranging from 1-acre to 10-acre lots. In-holdings are typically considered to be privately owned properties within the Park boundary. Because these properties near Featherbed Lane are located outside the Park boundaries, they are not considered in-holdings.

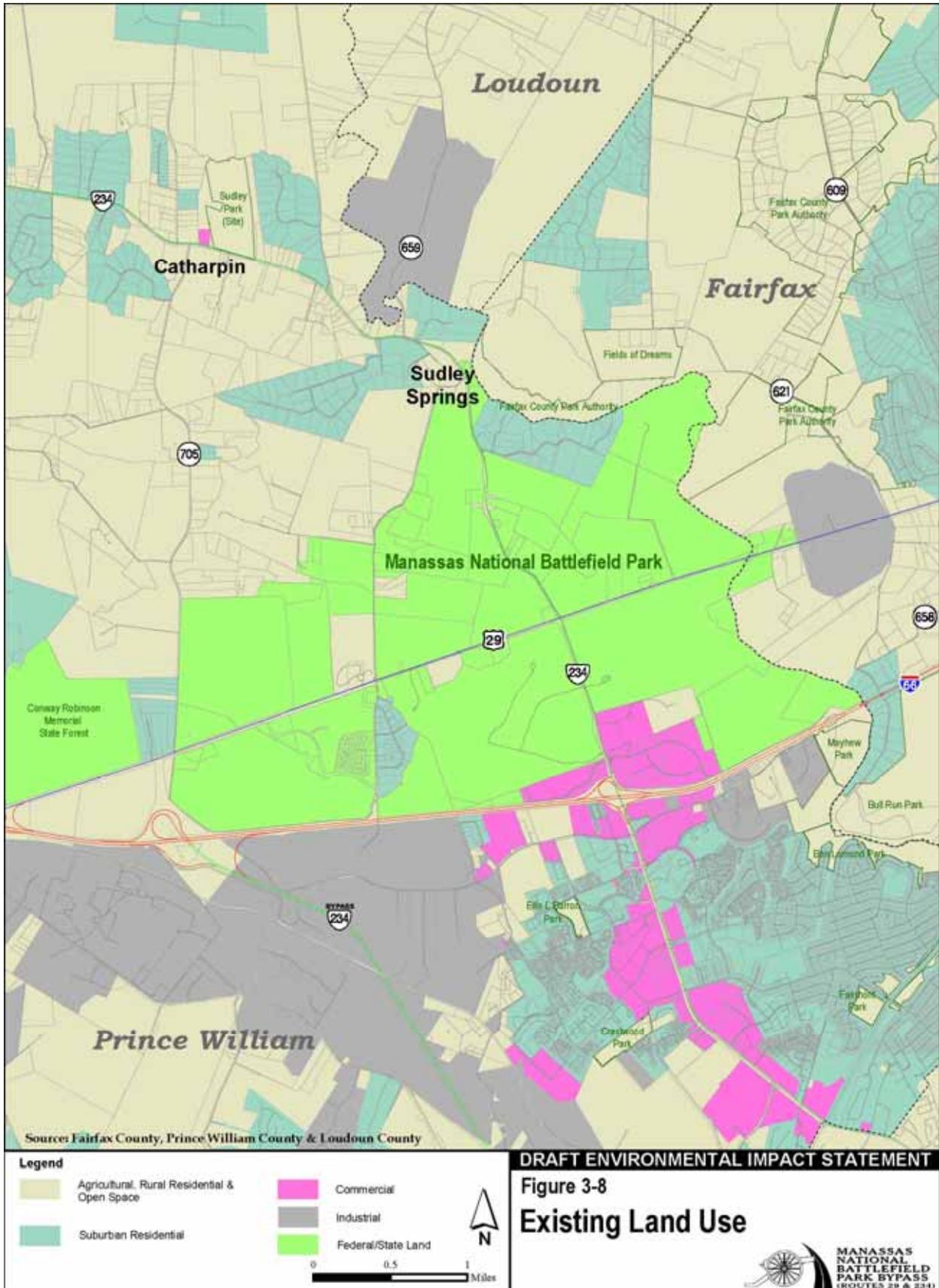
Other private in-holdings include the property located off Route 29 (11505 Lee Highway), of which the Park has a scenic easement, and some other properties in Prince William County, which are either partially or fully within the Park's legislative border.

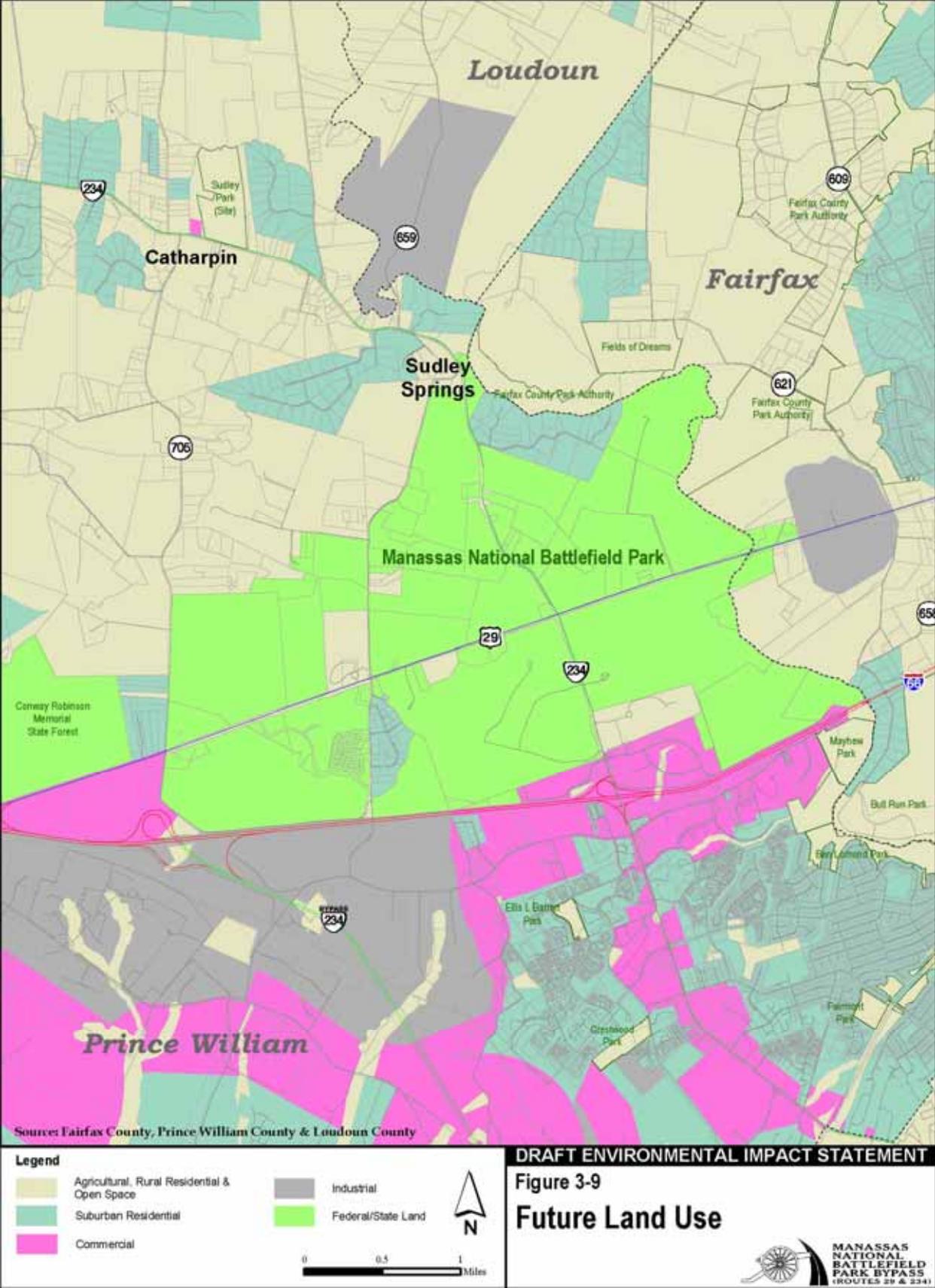
### 3.5 LAND USE

Existing land uses were characterized based on a review current zoning designations, county records, aerial photography, site visits, and windshield surveys. Future land uses were identified based on a review of local comprehensive plans, ongoing development patterns, and interviews with local officials and planning staff. Maps of existing and future land use are illustrated in **Figure 3-8** and **Figure 3-9** respectively. The study area









is located in parts of three counties: Prince William, Fairfax, and Loudoun. Existing and planned land use within the study area is described below for each of the jurisdictions.

### **3.5.1 Existing Land Use**

Portions of the study area located to the north and west of the Park within Prince William County consist of mostly agricultural and large-lot residential land uses and are generally zoned for 1 dwelling unit per 10 acres. Areas south of the Park within Prince William County (near the I-66/234 Bus interchange) have been developed for commercial use. This area, which includes the land between the Park's southern border and I-66, is the location of the Manassas Campus of the Northern Virginia Community College (NOVA), the Battlefield Business Park, and the Parkridge Shopping Center.

Portions of the study area located to the north and east of the Park within Fairfax County are mostly undeveloped or consist of low intensity large-lot residential areas with a few industrial areas located along US 29, including the Luck Stone Corporation Bull Run Plant, an active rock quarry. A 27-hole golf course and driving range is located in the area just north of the Park and an athletic field complex is being developed just east of the golf course.

The small portion of the study located in Loudoun County, consists of mostly low-density residential uses, but also includes the Luck Stone Corporation Fairfax Plant, another active rock quarry.

### **3.5.2 Planned Land Use**

According to the Prince William County Comprehensive Plan, most of the land surrounding the Park will remain in similar use as is current. Most of the area is within Prince William County's "Rural Crescent", an area that the County intends to limit development to agricultural, forestal, and large-lot residential uses (1 dwelling unit per 10 acres) and residential clustered developments. One exception is the area west of the Park between I-66 and Route 29. This area is planned as a Regional Employment Center, which would include medium to high density commercial and other uses.

The Fairfax County portion of the study area is located within the Stone Bridge Community Planning Sector. According to the Fairfax County Comprehensive Plan, 2003 Edition, most of the land in this area is planned for low-density residential uses consistent with the existing area development. Residential development is generally limited to 1 dwelling unit per 5 acres. Some easements in this area are owned by Fairfax County for the possible construction of the Tri-County Parkway. Fairfax County also owns several parcels of land, sometimes referred to as the Hunter-Hacor Assemblage. The assemblage is currently undeveloped, but planned as a future park area. According to Fairfax County, the areas within the study area will most likely not contain active recreation uses, but will be used for natural resource preservation. The county is currently developing more formal plans for the park areas.

Loudoun County's Revised General Plan identifies most of this area as a "Transition Area" designed to provide a visual and spatial transition between the suburban and rural areas of Loudoun County. According to the plan, the areas may receive additional phased development in the future. Residential development is generally limited to 1 dwelling unit per 3 acres.

## **3.6 SOCIOECONOMICS**

The social environment is made up of neighborhood and residential areas, community facilities, and shared recreation resources in the study area. The study area for the social environment includes areas within 1,000

feet of a candidate build alternative except for most areas located south of I-66 that would not be directly affected by alternatives located north of I-66. Demographic information for the study area was considered in the context of both regional dynamics and local area development. Demographic conditions were developed based on a review of regional forecasts, local comprehensive plans, information from local governments, and the most recent available U.S. Census data.

### 3.6.1 Population Characteristics

The population characteristics, including racial distribution, age distribution, median family income, and percentage of persons living below the poverty level for each of the various jurisdictions surrounding the study area are provided in **Table 3-7**.

**TABLE 3-7: POPULATION CHARACTERISTICS (2000)**

	Fairfax	Fauquier	Loudoun	Prince William	Manassas	Manassas Park	Study Area BGs
<b>Total Population</b>	969,749	55,139	169,599	280,813	35,135	10,290	14,733
<b>Racial Distribution:</b>							
White alone	676,295	48,643	139,951	193,069	25,234	7,475	12,339
Black or African American alone	81,744	4,646	11,541	52,873	4,542	1,109	942
American Indian and Alaska Native alone	2,415	163	441	1,262	45	46	29
Asian alone	123,612	471	8,927	10,436	1,103	385	888
Native Hawaiian and Other Pacific Islander alone	884	13	125	242	0	0	77
Some other race alone	45,383	304	4,129	12,329	2,955	874	233
Two or more races	39,416	899	4,485	10,602	1,256	401	225
<b>Age Distribution:</b>							
Less than 15	206,449	12,229	44,265	72,317	8,799	2,769	3,593
15-24	499,903	18,725	73,913	160,061	18,700	5,584	5,987
25-34	706,352	30,954	118,178	232,378	27,499	8,353	9,580
35-44	1,206,255	49,679	192,091	392,439	46,199	13,937	15,567
45-54	1,912,607	80,633	310,269	624,817	73,698	22,290	25,147
55-64	3,825,214	161,266	620,538	1,249,634	147,396	44,580	50,294
65 and older	8,356,780	353,486	1,359,254	2,731,646	322,291	97,513	110,168
Median household income in 1999	\$81,050	\$61,999	\$80,648	\$65,960	\$60,409	\$60,794	\$86,302

**TABLE 3-7: POPULATION CHARACTERISTICS (2000)**

	Fairfax	Fauquier	Loudoun	Prince William	Manassas	Manassas Park	Study Area BGs
Persons with Income in 1999 below poverty level	4.47%	5.38%	2.73%	4.34%	6.12%	5.15%	2.69%

Source: 2000 US Census.

Projected increases in population are illustrated in **Figure 3-10**. Much of the population growth is projected for areas surrounding the Manassas NBP. According to the forecasts (see **Table 3-8**), the largest percentage of population growth will occur in Loudoun and Prince William Counties. Loudoun’s population will nearly triple by 2025 with enormous increase of approximately 195%. The second highest percent increase is in Prince William County (41%). Much of the growth in Prince William County will occur in the western portion of the county including the area where I-66, Route 29, and Route 15 converge, sometimes called the “Golden Triangle”. Additional growth in Prince William County is projected along the southern boundary of the study area, to the west of the City of Manassas. The population of Fairfax County is expected to increase by 235,000 (24%), the largest total population increase next to Loudoun.

**TABLE 3-8: POPULATION FORECAST BY JURISDICTION**

Jurisdiction	Pop. 2000	Pop. 2025	% Change
Fairfax County	968,200	1,203,700	24%
Fauquier County	55,139	Not Available	Not Available
Loudoun County	172,200	508,200	195%
Prince William County	286,100	405,700	41%
Manassas and Manassas Park	43,200	46,400	7%

Source: 2000 population based on US Census. 2025 population based on MWCOG, Round 6.2 cooperative forecasts.

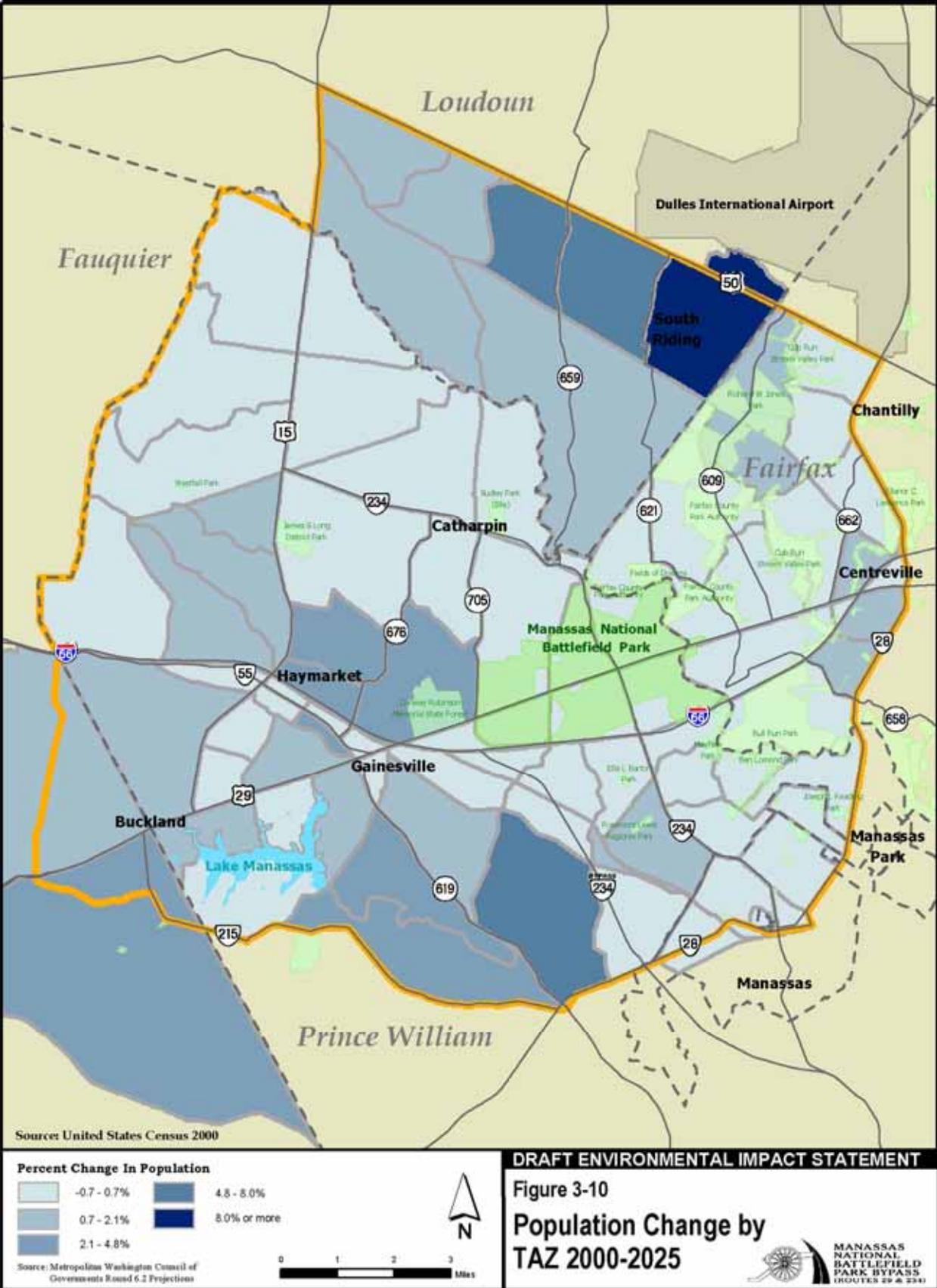
As with population growth, much of the region’s employment growth will occur in areas near the Park. Growth areas are concentrated south of the park along VA 234 Business, at the Innovation development located west of Manassas, and near the intersection of Route 28 and Route 50 south of Dulles International Airport.

**Table 3-9** lists the employment forecast for area jurisdictions. The projected rate of employment growth is greatest in Loudoun County where the number of jobs will increase dramatically by 173% in the year 2025. Prince William County will also experience a rapid rate of job growth with an increase of 69%. Fairfax County is expected to add the largest total number of jobs with more than 200,000 new jobs in the county.

**TABLE 3-9: EMPLOYMENT FORECAST BY JURISDICTION**

Jurisdiction	Jobs 2000	Jobs 2025	% Change
Fairfax County	526,400	727,800	38%
Loudoun County	85,300	232,800	173%
Prince William County	90,600	152,700	69%
Manassas and Manassas Park	21,600	25,400	17%

Source: Metropolitan Washington Council of Governments, Round 6.2 cooperative forecasts.



### 3.6.2 Housing Characteristics

Housing characteristics of the study area were reviewed based on an analysis of block group data (see **Figure 3-11**) from the 2000 Census. Selected housing and household characteristics from this analysis are listed in **Table 3-10**. These figures indicate Prince William and Fairfax Counties as the jurisdictions containing block groups with the largest numbers of households, housing units, and highest vacancy rates in the project study area. Average household and family sizes are generally similar for block groups within the project study area. The preliminary study area includes more than 44,000 households with an average household size of 3.4.

**TABLE 3-10: HOUSING CHARACTERISTICS (2000)**

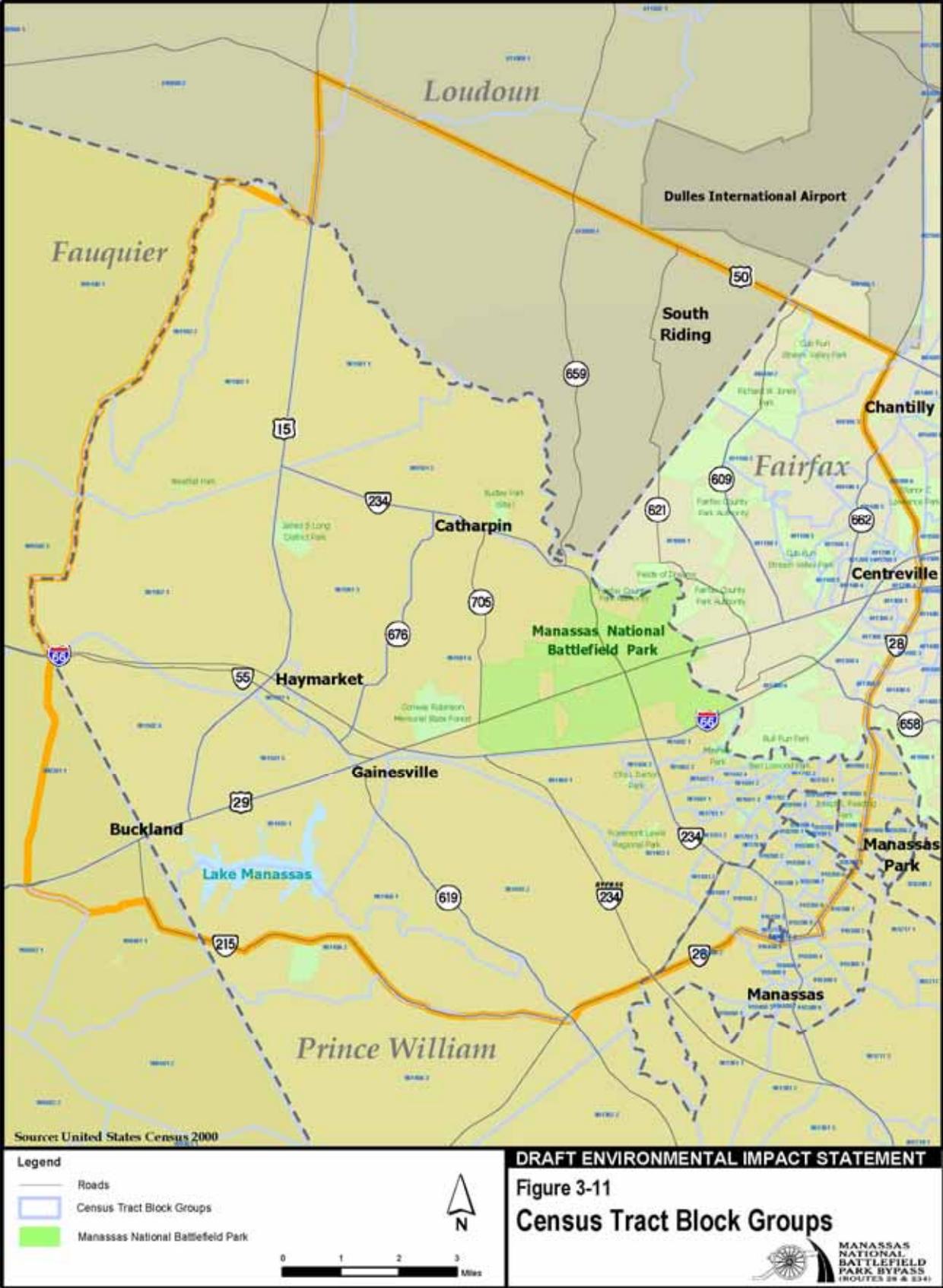
Housing Characteristic	Fairfax	Fauquier	Loudoun	Prince William	Manassas	Manassas Park	Study Area
Total Housing Units	359,411	21,046	62,160	98,052	12,114	3,365	5,403
Occupied	350,714	19,842	59,900	94,570	11,757	3,254	5,228
Vacant	8,697	1,204	2,260	3,482	357	111	175
Housing Unit Type:							
Single-Family Detached	180,853	17,916	35,639	52,826	5,197	2,203	3,432
Single Family Attached	82,592	1,240	17,153	26,288	4,29	1,111	1,245
Multi-Family	93,763	1,411	9,078	17,132	2,703	37	696
Mobile Home/Other	2,203	479	290	1,806	185	14	30
Median Housing Value	\$233,300	\$162,700	\$200,500	\$149,600	\$154,500	\$116,000	\$260,038.59

Source: 2000 US Census.

### 3.6.3 Environmental Justice Populations

Executive Order (EO) 12898 *"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,"* directs Federal agencies to "promote nondiscrimination in Federal programs substantially affecting human health and the environment, and provide minority and low-income communities access to public information on, and an opportunity for public participation in, matters relating to human health or the environment." EO 12898 provides the following definitions of the terms "minority" and "low-income" in the context of environmental justice populations.

- **Minority Individuals** - Minority individuals are members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black (not of Hispanic Origin), and Hispanic.
- **Minority Populations** - According to the CEQ Guidelines, minority populations should be identified where either (a) the minority population of the affected area exceeds 50% or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. In identifying minority communities, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a geographically dispersed/transient set of individuals, where either type of group experiences common conditions of environmental exposure or effect. A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the thresholds.



- Low-Income Population - A low-income household is one where the median household income is below the Department of Health and Human Services poverty guidelines.

**Table 3-11** lists the block groups within the study area that meet environmental justice criteria for minority persons or populations.

**Table 3-11: Block Groups that Meet Environmental Justice Criteria for Minorities**

Tract	Block Group	Jurisdiction	% Black	% Asian	% Hispanic	% Minority
4901	BG1	Fairfax County	3.1%	1.5%	24.2%	31.7%
4911	BG6	Fairfax County	14.7%	9.4%	21.8%	48.9%
4913	BG6	Fairfax County	13.8%	16.2%	10.1%	43.0%
Study Area			9.5%	6.0%	9.8%	27.5%

Source: U.S. Census 2000

No areas were found to meet EJ criteria for low-income populations.

### 3.6.4 Neighborhoods and Residential Areas

Neighborhood and residential areas (including private in-holdings) within the study area include several large-lot single family homes located along local roadways, rural residences on agricultural properties, and subdivision developments that consist of a mix of long-standing and recently constructed single-family residential communities on large-lots. Some of the areas evolved over a long period of time and lack distinct boundaries, while others were subdivided more neatly and were constructed over a much shorter time period with similar architectural characteristics and building materials. Neighborhood and residential areas within the study area are illustrated in **Figure 3-12** and were identified based on field visits, reviews of county property records, and public input. A description of characteristics for neighborhood, residential areas, and private in-holdings within the study area follows in alphabetical order.

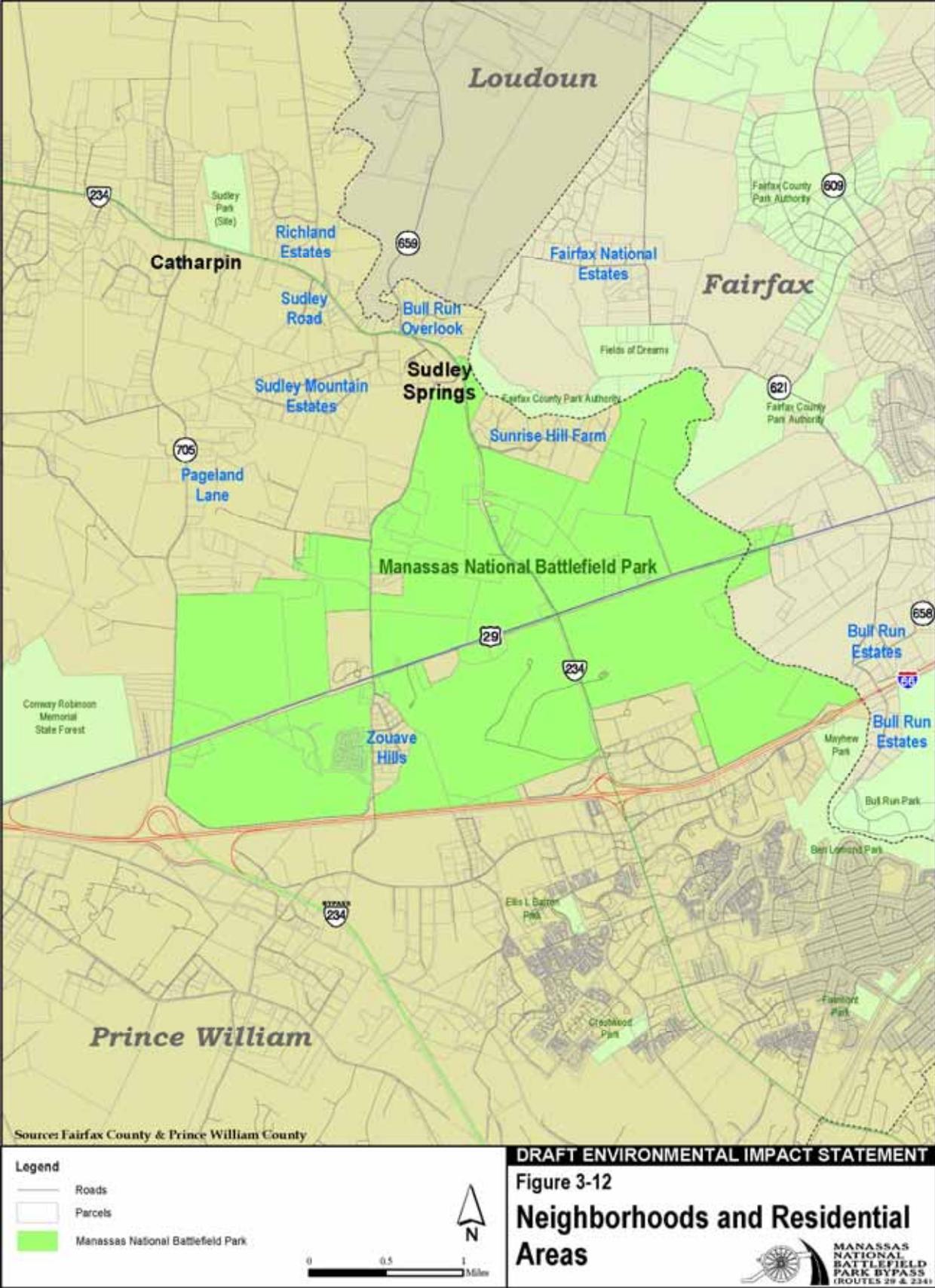
#### Neighborhoods

*Bull Run Estates.* This neighborhood is located in Fairfax County between the southeast corner of the Manassas NBP and Bull Run Regional Park. Areas of the neighborhood are located both the north and south side of I-66. Bull Run PO Road/Bull Run Drive, which is the main street of the neighborhood, provides access. Many of the lots in this neighborhood were built in the 1960’s and 1970’s and are approximately 5 acres each.

*Bull Run Overlook.* This small neighborhood of seven houses is located north of the Park in Prince William County off of VA 234. The main street of the neighborhood is Bull Run Overlook Ct.

*Fairfax National Estates (also called Cedar Crest Estates).* This neighborhood is located north of the Park and the Fairfax National Golf Course. Most of the homes in this neighborhood are of similar architectural style and building materials. Many of the homes have been built after 1999 and are on lots slightly more than 5 acres in size. Several lots are still under development. Access to the neighborhood is provided by Bull Run PO Road. Local neighborhood streets include Fairfax National Way

*Richland Estates.* The Richland Estates neighborhood was established between 1977 and 1978. The main street is Richland Drive, located just off Aldie Road. The neighborhood consists of single-family detached houses.



*Sudley Mountain Estates.* This neighborhood is located just south of Catharpin Run and VA 234. Most of the homes in this neighborhood were developed between 1970 and 1980, although some were developed later and some vacant properties remain. Neighborhood streets include Robin Dr., Bluebird Lane, Bobwhite Dr., and Goldfinch Dr. The topography in this neighborhood is very hilly as the name implies.

*Sudley Springs.* This area includes homes in the Sudley Springs area located off of Sudley Road. Houses in this area were developed gradually from 1930 to as recently as 2000

*Sunrise Hill Farm.* Sunrise Hill Farm is located within the Park's legislative boundaries and was constructed between 1973 and 1978. Bull Run separates Sun Rise Hill Farm from Fairfax National Golf Course to the north. The two main through streets in this neighborhood is Poplar Ford Trail, accessible from Sudley Road, which turns into Sun Rise hill Road, where the street then comes to a dead end.

*Zouave Hills.* This neighborhood is located off of Groveton Road. Although the Zouave Hills neighborhood is surrounded by the Park, it is not considered an in-holding because it is not within the Park's legislative boundary.

### **Other Residential Areas**

Other residential areas within the study area include the following:

- Several private homes are located along or just off of Featherbed Lane including some homes that are within the legislative boundaries of the Park. Featherbed Lane is an unpaved rural local road. The build years of homes along Featherbed Lane varies significantly.
- Seven single-family homes are located on Lolan Street between the Park and the Conway Robinson Memorial State Forest. Lot sizes range from half-acre lots to 14-acre lots. Most of the homes were built between 1950 and 1967, however one house was built in 1901 and another in 1982. Several lots on the street do not have houses.
- Several residences are located along or just off of Pageland Lane, a rural local road with a 45 mph speed limit. Residences in this area are mostly large-lot single-family homes and with some areas currently in agricultural use.
- Several residences, two churches, and some commercial operations are located along or just off of the section of Sudley Road (VA 234) north of the Park. Build ages of structures in this area vary significantly.

### **3.6.5 Community Facilities and Services**

Community facilities were identified based on county records, field investigations, and review of ADC maps. Community facilities within study area, which include churches, cemeteries, and schools, are illustrated in **Figure 3-13**. Details of community facilities are provided in **Table 3-12**.

### **3.6.6 Parks and Recreation Areas**

Several parks and recreation centers are located within the study area. Federal protections pertaining to parks and recreation centers are included in Section 4(f) of the U.S. Department of Transportation Act of 1966 and Section 6(f) of the Land and Water Conservation Fund Act. Recreation areas were identified based on resources provided by the Virginia Department of Conservation and Recreation, various park websites, ADC Maps, and information provided by local park authorities. Parks and recreation areas within the study area are described below and illustrated in Figure 3-13. Additionally, Virginia Outdoors Foundation easements are illustrated in **Figure 3-14**.

**TABLE 3-12: COMMUNITY FACILITIES**

Name	Location	Type
Cub Run Primitive Baptist Church	Compton Road	Church
Lighthouse Assembly of God	5012 Gum Spring Road, Manassas	Church
Mt. Cavalry Church and Cemetery	4949 Sudley Road	Church and Cemetery
Northern Virginia Community College	6901 Sudley Road, Manassas	Community College
Sudley United Methodist Church	5308 Sudley Road, Catharpin	Church and Cemetery
Stonewall Memory Gardens	12004 Lee Highway (not located within the Park)	Cemetery
Living Faith Ministries	10266 Battleview Parkway	Church

### National Parks

*Manassas National Battlefield Park.* (4f) The Manassas NBP was established in 1940 to preserve the scene of two major Civil War battles. Located a few miles north of the prized railroad junction of Manassas, Virginia, the peaceful Virginia countryside bore witness to clashes between the armies of the North and South in 1861 and 1862. Today the Park provides the opportunity for visitors to explore the historic terrain where men fought and died for their beliefs a century ago. Details of visitor use, management, and operations at the Manassas NBP are discussed in the following section.

### State Parks

*Conway Robinson Memorial State Forest.* (4f) This 400-acre forest provides a wildlife and wildflower sanctuary. The area is used for environmental education, hiking activities, natural and historic resource preservation, watershed protection, and timber production. The forest is also used for scouting activities and field trips.

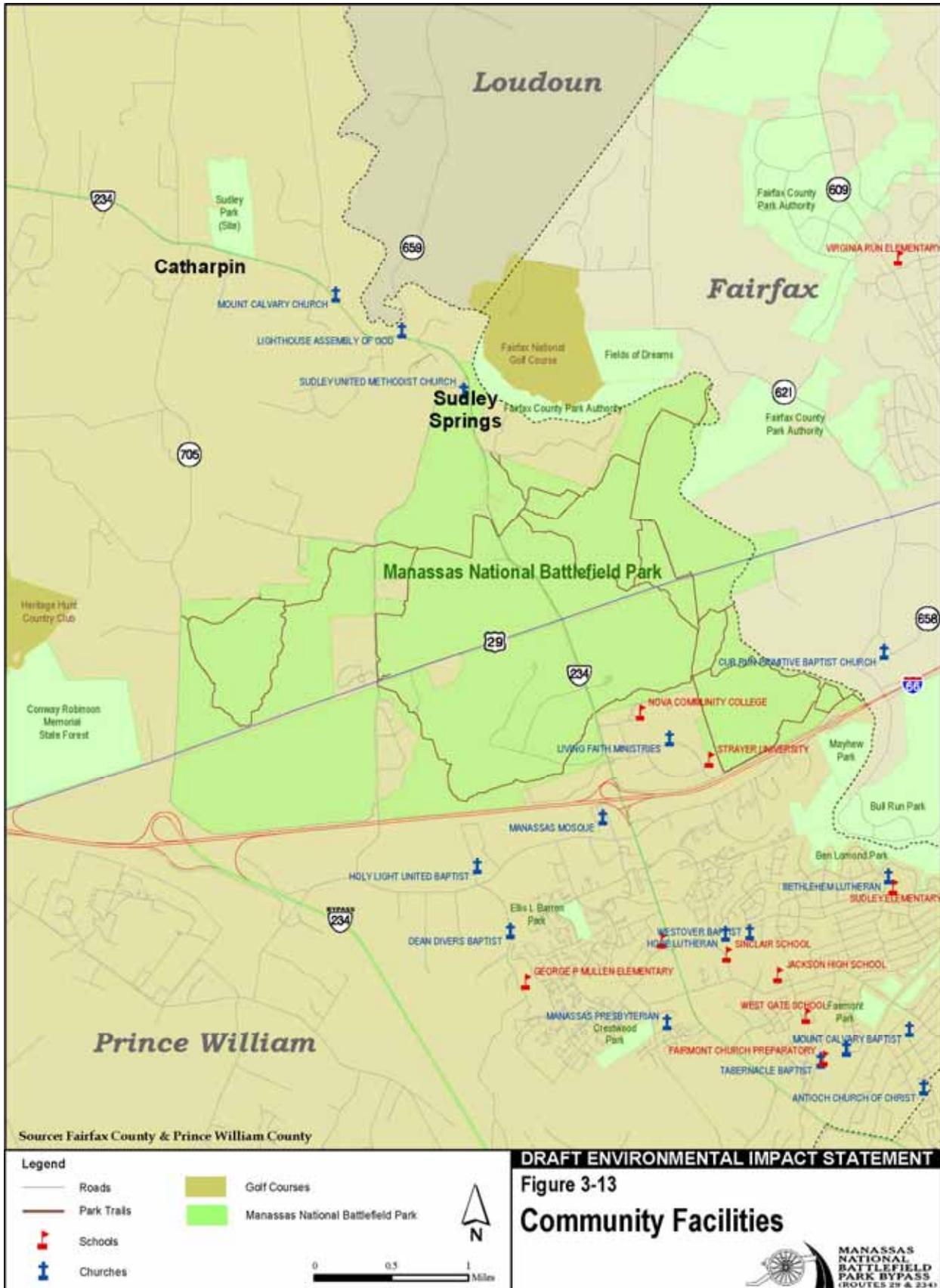
### Regional Parks

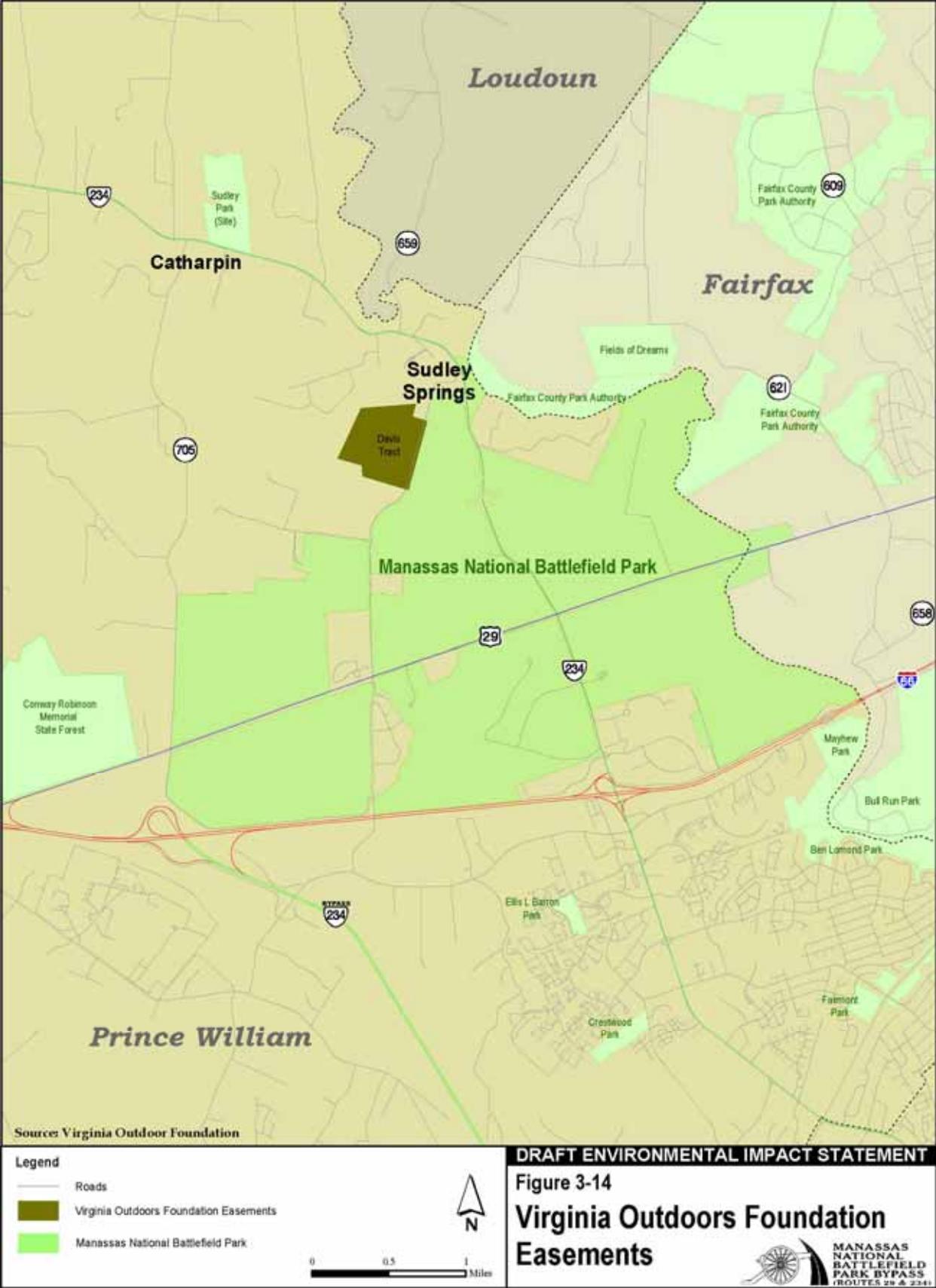
*Bull Run Regional Park.* (4f) This large 1,563-acre park is located on the south side of I-66. Facilities at the park include: outdoor swimming pool, family campground, miniature golf, Frisbee golf, bridle path and staging area, hiking trails, picnic tables, grills, rental picnic shelters, soccer fields, children's playground, and a public shooting center.

### Local Parks

*Hunter-Hacor Assemblage (Fairfax County).* Fairfax County owns several parcels of land including some within the study area known as the Hunter-Hacor Assemblage. The county is currently developing plans for the land. Based on conversations with county officials, areas west of Bull Run Post Office Road would most likely be used for passive recreation uses, such as a natural resource preservation area.

*Sudley Park.* (4f) This 102-acre tract is currently being developed by Prince William County as a county park that will initially include 5 lighted softball fields. The second phase of development will add 5 soccer fields and 2 football fields.





### Other Recreational Areas

*Fairfax National Golf Course.* Fairfax National Golf Course is located on the Park's northwest boundary at 16850 Sudley Road. The course, which opened in 1959, has 27 holes and a driving range.

*Fields of Dreams.* The Fields of Dreams is a 120-acre sports complex currently being developed by Southwestern Youth Association, a non-profit, volunteer organization whose mission is to provide a safe and positive environment for the children of southwestern Fairfax County to enjoy the benefit of sports competition. When completed the complex will include 4 baseball fields, 4 soccer fields, 2 football fields, a running track, and other recreation features.

*Union Ridge Equestrian Center.* The Union Ridge Equestrian center is a privately owned facility with stables and pastures for horseback riding. The center is located north of Route 29 on Bull Run Post Office Road and is near several equestrian trails in the area.

### 3.6.7 Regional Economy and Tax Base

The Manassas NBP is located within the greater Washington, D.C. metropolitan region. The driving forces of the regional economy include the Federal government, the technology sector, international business, the hospitality industry, and the building industry. The linkage to the nation's capital is a unique characteristic of the region and contributes significantly to the regional economy.

As the nation's capital, the region is home to many Federal agencies, as well as state and local government agencies. However, while the Federal government remains a key employer in the region, its relative share of employment is decreasing. Growth in other economic sectors over the past 20 to 30 years has diversified the region's economic base. This growth has included numerous private employers, including defense contractors, information-based industries, and other secondary service industries. While the percentage of Federal workers in the region has dropped, Federal spending continues to contribute to the development of other area industries through procurement and other opportunities.

Regional transportation facilities have contributed to economic development in and around the study area. The Park is located close to an interstate highway (I-66), rail service (operated by the Virginia Railway Express and Amtrak), and local and international airports (Manassas Airport and Washington-Dulles International Airport). In addition, the expansion of the Washington-Dulles International Airport (Dulles) is underway as are plans for the extension of transit to Dulles and along the I-66 corridor.

In Prince William, Fairfax Counties and Loudoun Counties, more than half of the total revenues in each county come from real estate taxes, which are assessed at 100% of fair market value. The remainder of revenues comes from personal property taxes, sales tax, consumer utility tax, fines and forfeitures, investment income, and others.

### Activity Centers and Major Employers

Much of the projected economic growth in the region will be concentrated at existing and planned activity centers in the study area. Activity centers, as defined by MWCOG, are areas with more than 15,000 total jobs at more than 10 jobs per acre. These activity centers, which provide high concentrations of jobs, are major trip generators and destinations. There are four activity centers within the study area. Employment at the four activity centers is expected to nearly double by 2025 with the addition of approximately 50,000 new jobs.

**Table 3-13** provides more information about job growth at each of the activity centers.

**TABLE 3-13: ACTIVITY CENTERS**

Activity Center	Jurisdiction	Jobs 2000	Jobs 2025	% Change
Bull Run–Sudley Area	Prince William County	13,185	16,813	28%
Innovation	Prince William County	1,573	18,209	1114%
Dulles West	Fairfax County	20,271	35,996	78%
Dulles East	Fairfax County	17,009	30,574	80%

Source: MWCOG, Planning Directors Technical Advisory Committee

The location of activity centers and other areas of economic concentration are illustrated in **Figure 3-15**. A brief discussion of the four activity centers and other major employers in the study area follows.

*Bull Run-Sudley Area.* The Bull Run-Sudley Area activity center includes the Battlefield Business Park, and Parkridge Shopping Center, both of which are located between the park's southern boundary and I-66. The Bull Run-Sudley area also includes the commercial development that surrounds Sudley Road/Route 234 to the south of the Park. Much of this development consists of strip-style shopping centers, offices, and the Manassas Mall.

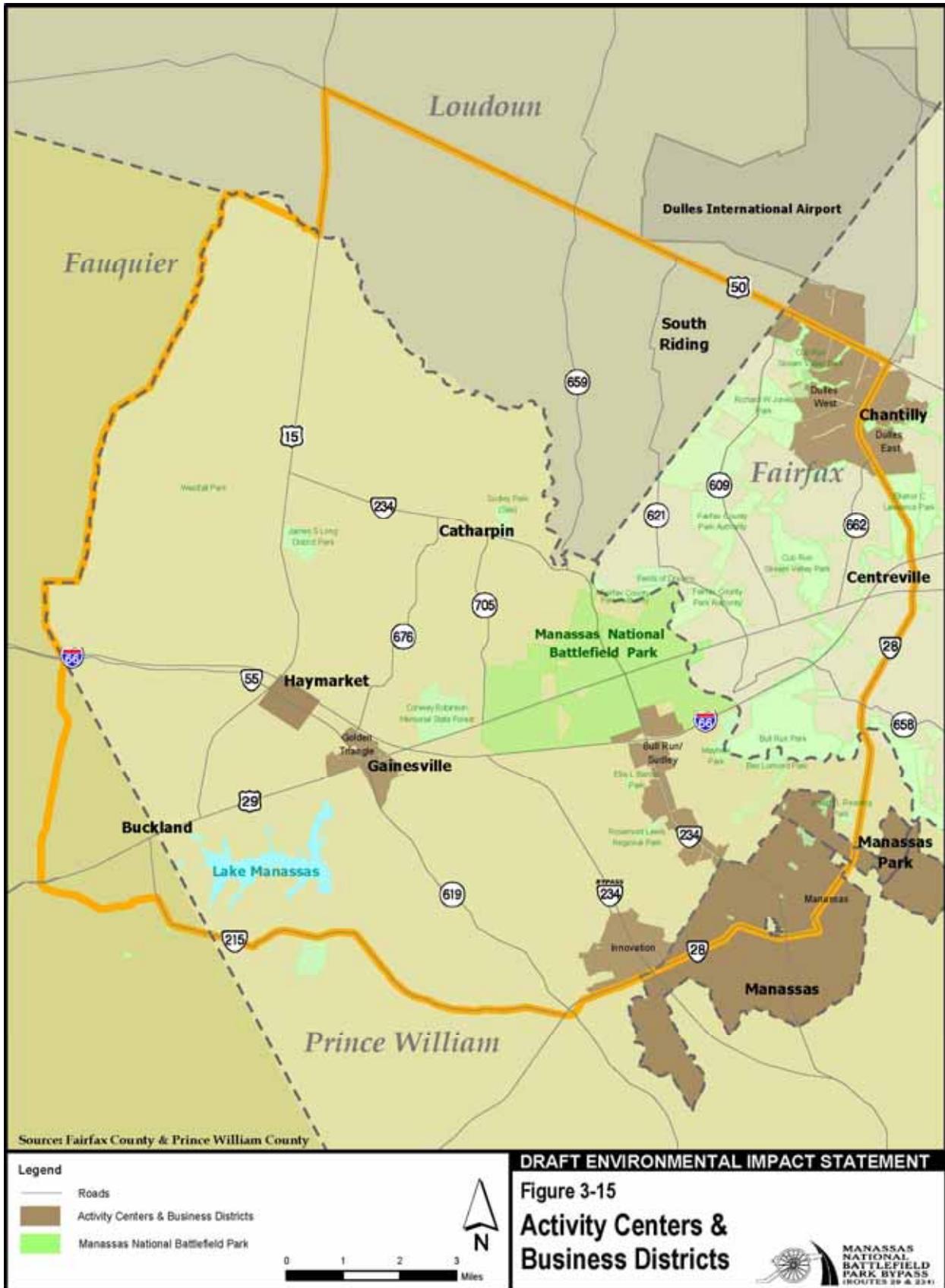
*Innovation.* Farther south is the Innovation activity center. Innovation is projected to employ more than 18,000 people by 2025 and is located on the edge of the City of Manassas. Major employers include Lockheed Martin, Dominion Semiconductor and the Prince William Campus of George Mason University.

*Dulles East and West.* Northwest of the Park is the Washington-Dulles International Airport located in both Loudoun and Fairfax Counties. Employment at the airport accounts for more than 15,000 jobs and is projected to employ 30,000 people by 2010 and 65,000 by 2035. The recent expansion of the airport has increased transportation demand in the study area and future growth at the airport itself is planned. More than 20 million passengers used Dulles in 2000, with more than 32 million expected to use the airport in 2010 and 55 million by 2035. The Smithsonian's new Steven F. Udvar-Hazy Center of the National Air and Space Museum also opened in December 2003. The museum is expected to receive 3 to 5 million visitors annually when completed. The Dulles East and West activity centers are located just south of the airport. Major employers in this area include Lockheed Martin, the National Reconnaissance Office, Northrop Grumman, and Boeing.

*Other Activity Centers.* Other activity centers or locations that generate significant activity within the study area include the Nissan Pavilion, the "Golden Triangle" area of Gainesville, South Riding, the City of Manassas, and Manassas National Battlefield Park itself, which receives approximately 800,000 visitors per year. In addition, the Park is a cultural and recreation attraction that contributes to the area's ability to attract and retain employers and employees. The quarrying operations operated by Luck Stone near the Park's borders also contribute to the local economy and generate significant heavy truck traffic.

### 3.7 CULTURAL RESOURCES

Cultural resources consist of archaeological and architectural resources. Archaeological resources include both prehistoric and historical sites. Prehistoric archaeological resources are physical properties resulting from human activities predating written records. These archaeological sites are the loci of human behavior as indicated by concentrations of artifacts, features, or floral and faunal remains. Prehistoric land use patterns were more closely



related to local environmental conditions than are most modern settlements. Historical archaeological resources are physical properties that postdate the existence of written records and include features such as trails, roadbeds, foundations, and refuse concentrations.

Architectural resources consist of standing buildings or structures from the historical period. These resources consist of residential buildings (e.g., farmhouses, plantation manors and associated outbuildings including sheds and barns), industrial structures such as mills and millraces, commercial buildings (e.g., stores, banks, and other business related office buildings), and transportation structures such as bridges.

Civil War resources are specifically defined as any archaeological or architectural resources that are, or may be considered, a contributing element to the Manassas Battlefield Historic District. High probability areas of Civil War archaeological sites were defined based on troop movement maps prepared by Hennessy (1989, 1993). Three overall landscapes and seventeen component cultural landscapes have been defined (Joseph, 1996a, 1996b; Parsons, 1996) and represent both the battlefield and agricultural contexts.

Previously identified cultural resources within the project area were documented through a site files search conducted at the Virginia Department of Historic Resources (VDHR) archives in Richmond, Virginia. Archaeological site locations and state site numbers were gathered from digitized topographic maps; additional data was then gathered from state archaeological site files at the state archives and at the Fairfax County Archaeological Services office in Falls Church. Additional architectural resource information was gathered from the RELIC room of the Prince William Public Library's Bull Run Branch in Manassas. Information on which resources are listed on the National Register of Historic Places (NRHP) or the Virginia Landmarks Register (VLR) was obtained from websites maintained by the National Park Service (NPS) and VDHR.

Only a small percentage of the project area has been surveyed for archaeological resources; it is anticipated that numerous sites are yet to be identified. More than 60 percent of the project area has been surveyed for architectural resources; most existing buildings and structures yet to be identified are ones which reached 50 years of age in the last several decades.

### **3.7.1 Archaeological Resources**

Archaeological resources identified in the project area that may be considered NRHP-eligible or are currently unevaluated include six prehistoric and seven historical sites. The prehistoric sites are small campsites or lithic scatters; two sites contained temporally diagnostic artifacts dating to the Middle Archaic and Middle Woodland periods and one site is associated with the Late Woodland. The seven historical sites consist of four refuse concentrations dating from the 19<sup>th</sup> century through the early 20<sup>th</sup> century, a 19<sup>th</sup> century road, a 19<sup>th</sup> century farmstead and remains of a millpond/millrace. Additional archaeological sites are likely to be encountered in portions of the project area that have not been surveyed for cultural resources; some of these resources may also be considered NRHP-eligible.

### **3.7.2 Architectural Resources**

Architectural resources identified in the project area that may be considered NRHP-eligible or are currently unevaluated consist of residential buildings, (e.g., farmhouses and associated outbuildings including sheds and barns), commercial buildings (i.e., post office, spring house), the Sudley United Methodist Church, cemeteries, fords, commemorative plaques, and a park. Residential buildings include a 1790s residence, a 1850s residence and cemetery, a 1880s Italianate style residence with extensive archaeological deposits, a 1900s residence and cemetery, a 1900s residence, a 1920s residence, and an 1850 shed or outbuilding. Commercial resources include

the 1840 Sudley Post Office/Thornberry House, the Sudley Post Office privy, and the 1850 springhouse foundation for the Springs Hotel in Sudley. Seven isolated cemeteries are located in the project area and represent either small family plots or slave cemeteries. Two fords, across Bull Run and Catharpin Run, are located in the Sudley Springs area. Two small 1930s commemorative plaques are located in the project area, erected by the Haymarket Agricultural Club and by the Virginia Garden Clubs. The Conway Robinson Memorial State Forest was established in 1938 and is identified as a cultural resource by VDHR. Additional architectural resources are likely to be encountered in portions of the project area that have not been surveyed; some of these resources may be considered NRHP-eligible.

Rural historical landscapes are defined as “a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads, waterways, and natural features” (McClelland et al., n.d.:1). No rural historical landscapes have yet been identified in the project area; however, the two areas, along Pageland Lane and along Bull Run Post Office Road, may contain characteristics associated with rural historical landscapes.

### **3.7.3 Civil War Resources**

Civil War resources as defined here consist of archaeological sites, architectural features and battlefield landscapes listed as contributing elements of the Manassas Battlefield Historic District. The Manassas Battlefield Historic District includes 82 contributing buildings, sites and structures dating from the period between 1820 and 1942 (Trieschmann, 2001), associated with the First and Second Battles of Manassas and the commemoration that followed. Important aspects of the battlefield landscape include natural elements such as small streams (i.e., Bull Run and Little Bull Run or Catharpin Run) and ridges (i.e., Stony Ridge, Matthews Hill, Henry Hill, Chinn Ridge and Stuart’s Hill); linear elements such as roads (Warrenton Turnpike [U.S. Route 29], Sudley Road [Virginia Route 234], Pageland Lane, Groveton-Sudley Road, and Groveton Road [Lewis Lane]) and railroad lines (Manassas Gap Railroad). Current vegetation has obstructed approximately 45 percent of the historic vistas important to the battlefield landscapes (Trieschmann, 2001).

The First Battle of Manassas (July 21, 1861) was the first major land battle of the armies in Virginia (Hennessey, 1989). Roughly 28,000 Union forces under Brigadier General Irvin McDowell fought 32,000 Confederate troops under General Joseph E. Johnston and Brigadier General P.G.T. Beauregard. Union troops crossed Bull Run at Sudley Ford and attacked the Confederates on Matthews Hill (Lowe, 1995a). The core area of engagement is now within the Manassas National Battlefield Park.

The Second Battle of Manassas occurred from August 28-30, 1862. The major forces were under Union Major General John Pope and Confederate General Robert E. Lee and Major General Thomas J. "Stonewall" Jackson (Hennessey, 1993). Most of the action took place within the boundaries of the Manassas National Battlefield Park (Lowe, 1995b). The first several hours of battle took place at Brawner Farm on August 28th and resulted in a stalemate. Pope attacked the following day, concentrating in the morning on Jackson's troops positioned along an unfinished railroad grade. Both sides suffered many casualties. The Confederates were reinforced in the afternoon by the arrival of Longstreet's troops from Thoroughfare Gap. On the third and final day of the battle, the Confederate artillery backed up a counterattack by 28,000 of Longstreet's men. The Union forces were defeated and driven back to Bull Run (on the eastern edge of the battlefield park). This Confederate victory resulted in over 13,000 Union casualties and over 8,000 Confederate casualties.

Civil War archaeological resources may include artillery battery locations, firing lines, rifle pits, short-term campsites, tent platforms, field hospital locations, and cemeteries and burials. Specific Civil War archaeological resources previously identified consist of the unfinished railroad bed, the unfinished railroad quarry, a campsite and a cemetery. Several high probability areas for Civil War archaeological resources have been identified in the project area based on troop movement maps prepared by Hennessy (1989, 1993). These areas have not been previously surveyed and most likely contain numerous archaeological sites associated with infantry, cavalry and artillery locations, field headquarters, and field hospitals for Union and Confederate forces from both the First and Second Battles of Manassas. Most, if not all, of these resources may be considered contributing elements to the Manassas Battlefield Historic District. Civil War architectural resources include standing structures such as the Stone House, the Lucinda Dogan House, the Stone Bridge, and commemorative monuments and markers.

Three broad landscapes and seventeen component cultural landscapes have been identified within the Manassas National Battlefield Park (Joseph, 1996a, 1996b; Parsons, 1996). The three overall landscapes are separated into the northeast quadrant, the northwest quadrant and the southern portion of the Park. Defining characteristics for the overall landscapes include spatial organization, natural environment, land use, views and vistas, and circulation patterns. Component landscapes are defined by a variety of contributing features including vegetation, structures, archaeological sites, and small-scale features. These landscapes reflect both the battlefield and agricultural contexts.

### **3.8 VISUAL AND AESTHETIC CONDITIONS**

This section describes the existing visual and aesthetic character of the Manassas National Battlefield Park Bypass Study Area.

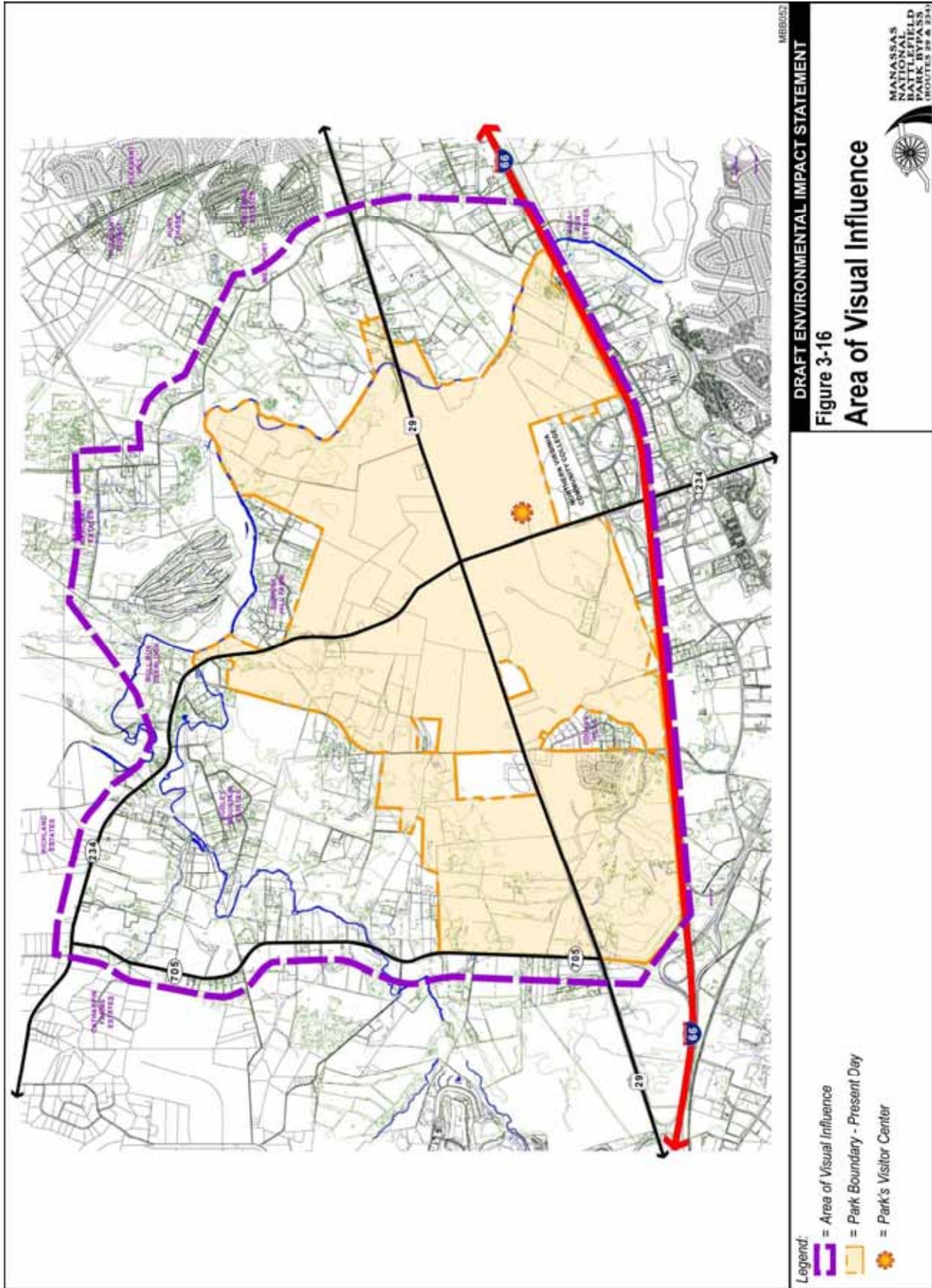
#### **3.8.1 Methodology**

The evaluation of existing aesthetic resources in the landscape requires the application of a process that seeks to objectively identify the visual features, or resources, of the landscape; assesses the character and quality of those resources relative to overall regional visual character, and identifies the importance to people, or sensitivity, of views of visual resources in the landscape. With this preliminary establishment of the baseline (existing) conditions, a proposed project or another change to the landscape can be systematically evaluated for its degree of impact. The degree of impact depends on both the magnitude of change in the visual resource (i.e., visual character and quality) and viewers' responses to and concern for those changes. This general process is similar for all established Federal procedures for visual assessment (Smardon, et al. 1986) and represents a suitable method for visual assessment for other projects and areas.

The area of visual influence (AVI) for the proposed project is defined so as to encompass the main locations from which the study area can be seen. The AVI provides the basis for evaluating impacts to the visual environment that may arise from the proposed project. Buildings, monuments, and walls, together with natural topography, trees, and other vegetation, control view corridors within the AVI. The AVI is illustrated in **Figure 3-16**.

#### **3.8.2 Existing Landscape Character**

The study area includes portions of Prince William, Loudoun, Fairfax, and Fauquier Counties. The physical land area of the Manassas National Battlefield Park consists of approximately 5,100 acres of mostly open rolling terrain. The area surrounding the Park includes I-66, various residential developments, and some scattered



suburban office parks and activity centers. Additionally, there are a few rock quarries in operation on land adjacent to the Park.

The open rolling hills and fields nestled around thick woodlands presents the visual character that once covered the region. Historic buildings along the hilltops and ridges overlook the rolling open fields with thick woodlands in the background. In some areas hedgerows, stonewalls, or wood fences interrupt the open views. Add the historic significance of the two battles of Manassas and it creates a unique visual experience. The Park has “preserved in time” the buildings, structures and landscapes representative of the Civil War time period. Together, they are essential for understanding and interpreting the battles and therefore preservation with minimal intrusion is necessary.

The existing landscape character is described below in more detail for different sectors of the study area, which include the Park Sector, the I-66 Corridor Sector, the Residential Sector, and the Commercial Sector.

### **Park Sector**

The purpose of Manassas National Battlefield Park is to preserve the nationally significant lands containing historic sites, buildings, objects and views associated with the First and Second Battle of Manassas for the use, inspiration and benefit of the public. The significance of these lands is that the surrounding woodlands, fields, streams, rolling hills and views are representative of the landscape that existed at the time of the battles. The Park also preserves the region’s historic agrarian landscape that is slowly giving way to development pressures throughout the Washington D.D. metropolitan region.

### **I-66 Corridor Sector**

I-66 is a limited access eight lane divided highway that extends from the Theodore Roosevelt Memorial Bridge in the east to US Interstate 81 (I-81) in the west. I-66 runs along the entire southern boundary of the Park, except for a small pocket of commercial development at the VA Route 234 Business intersection and carries heavy commuter traffic to and from Washington D.C. through the study area. A small rest area with comfort stations exists along I-66 westbound at the southeast corner of the Park and is planned to be relocated in the near future.

The corridor is a large span of pavement that follows the natural contours of the rolling hills, with low concrete barriers dividing the eastbound and westbound lanes. Signage, both roadside and overhead, and street lighting litter the corridor. Adjacent to the corridor is a mixture of dense woodlands, partial hedgerows and open fields giving the commuter limited open views into the Park.

A narrow two-lane road used by Park users, local residents, and commercial traffic runs between the Park and the I-66 corridor. This two-lane road becomes a major access road as it approaches the VA Route 234 Business intersection, providing access to commercial, industrial and private properties. This roadway’s alignment is one of the identified alternatives for the bypass.

### **Residential Sector**

The Residential Sector can be separated into two distinct sectors, North and South, with Interstate 66 as the dividing line. The housing units on the north side are primarily single-family detached homes situated in a rural setting, and include some suburban subdivisions. The south side of I-66 contains more dense housing units, such as condominiums and townhouses, situated in an urban setting. Details about neighborhoods and other residential areas within the study area are provided in Section 3.6.

**Commercial Sector**

Commercial development exists along VA Route 234 Business with its northern border adjacent to the Park. With the Park blocking the ability to develop further north development has spread east and west between the Park and the I-66 corridor.

To the west of VA Route 234 Business, just south of Chinn Ridge, typical suburban commercial development exists, including a movie theater, local food-chain restaurants and a “big-box” strip mall. Large expanses of asphalt parking with minimal vegetation litter the front. The back of the buildings with their dumpster enclosures, loading docks and employee break areas face the dense woods of the Park.

Immediately adjacent to the east of VA 234 is additional commercial development, behind that is a large office park, and the Northern Virginia Community College exists to the north near Henry Hill. Development in this area attempts to preserve the natural setting, unlike development to the west of VA 234. Development follows the natural rolling contours of the area and selective thinning was used to sustain as much of the existing vegetation as possible. However, a thin vegetative hedge lies between the office park and the historic Portici site. Following the main road of the office park east, the roadway makes a sharp turn and parallels the I-66. The roadway is used primarily for park visitors and access to the existing I-66 rest area. Open views of the Park exist along the roadway, interrupted only by narrow evergreen hedgerows.

**3.9 NOISE**

Noise levels associated with transportation facilities are important design parameters in the planning of roadway improvements and are subject to Federal regulations. Noise-sensitive land uses within the project study area include neighborhoods, community and recreation facilities, and parks, such as the Manassas National Battlefield Park. Existing noise levels were measured during November 2002 and 2003 at 37 noise sensitive sites (see **Figure 3-17**). Short-term measurements of 20 to 30 minutes were taken at Sites 1 thru 34, while 24-hour measurements were conducted at Sites LT-1, 2, and 3. The measured results at all sites were converted to hourly, A-weighted, equivalent sound levels in decibels (dBA) and are shown in **Table 3-14**. The table includes noise levels with (Total) and without (Traffic Only) noise events that were not representative or traffic-related. The A-weighted sound level is a single number measure of sound intensity with weighted frequency characteristics that corresponds to human subjective response to noise. Most environmental noise (and the A-weighted sound level) fluctuates from moment to moment, and it is common practice to characterize the fluctuating level by a single number called the equivalent sound level (Leq). The Leq is the value or level of a steady, non-fluctuating sound that represents the same sound energy as the actual time-varying sound evaluated over the same time period.

**TABLE 3-14: SUMMARY OF MEASURED EXISTING NOISE LEVELS**

Site	Location	Land Use	Date	Start Time	Leq in dBA	
					Total	Traffic Only
1	Manassas Battlefield-Stuart Hill Picnic Area	Park	04-Nov-02	12:46	57	57
2	Manassas Battlefield-Visitor Center	Park	04-Nov-02	16:06	50	49
3	Manassas Battlefield-Stone House	Park	04-Nov-02	16:08	67	64

4	Manassas Battlefield-Portici	Park	04-Nov-02	17:11	55	54
5	14623/14621 Storehouse Dr.	Residential	05-Nov-02	09:05	57	56
6	6425/6427 Paddington Ct.	Residential	05-Nov-02	09:22	57	55
7	Smith Trace	Residential	05-Nov-02	10:28	51	51
8	15575/15574 Pebblebrook Dr.	Residential	05-Nov-02	10:34	49	49
9	6610/6613 Peaceful Meadow Ln.	Residential	05-Nov-02	11:31	52	43
10	Sudley United Methodist Church	Church	05-Nov-02	11:42	64	64
11	Manassas Battlefield- Stovall Marker	Park	05-Nov-02	14:38	50	50
12	13895 Crabtree Way	Residential	06-Nov-02	08:33	51	49
13	Bull Run Middle School	School	06-Nov-02	08:50	50	50
14	13668 Paddock Ct	Residential	06-Nov-02	09:22	50	47
15	5705 Artemus Rd	Residential	06-Nov-02	09:36	53	46
16	Gainesville United Methodist Church	Church	06-Nov-02	10:39	60	60
17	6330 Omland Place	Residential	06-Nov-02	11:07	54	52
18	14102 Red Rock Way	Residential	06-Nov-02	11:35	60	60
19	14837 Cox Creek Ct.	Residential	06-Nov-02	12:30	50	49
20	Gainesville Presbyterian Church	Church	06-Nov-02	12:57	64	64
21	4378 Montreux Rd.	Residential	06-Nov-02	14:51	52	51
22	7440 Falkland Dr.	Residential	06-Nov-02	15:11	53	49
23	Manassas Battlefield- Battery Heights	Park	07-Nov-02	09:53	49	49
24	Manassas Battlefield- Chinn Ridge	Park	07-Nov-02	13:12	50	48
25	12008 Bobwhite Dr.	Residential	07-Nov-02	11:30	51	50
26	Manassas Battlefield- Stone Bridge	Park	07-Nov-02	12:15	60	60
27	Lighthouse Assembly of God	Church	07-Nov-02	12:21	58	58
28	10479 Butterfield St.	Residential	07-Nov-02	15:39	55	54
29	Equinox Landing Ct.	Residential	07-Nov-02	16:08	53	53
30	7410 Willoughby Ln.	Residential	07-Nov-02	16:48	53	52
31	Holy Light United Baptist Church	Church	08-Nov-02	10:12	62	56
32	6208 Artemus Road	Residential	10-Nov-03	14:23	44	41
33	5204 Goldfinch Drive	Residential	10-Nov-03	15:35	44	42

34	11501 Bull Run Overlook	Residential	10-Nov-03	16:31	48	44
LT-1	Manassas Battlefield Unfinished Railroad	Park	04-Nov-02	11:35	49	N/A
LT-2	Manassas Battlefield Stuart Hill Center	Park	04-Nov-02	12:15	55	N/A
LT-3	Manassas Battlefield NY Ave	Park	05-Nov-02	15:44	54	N/A

### 3.10 AIR QUALITY

Under requirements of the *Clean Air Act*, the U.S. Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) to protect human health and welfare. EPA designates metropolitan regions that have not yet attained the standards as “nonattainment areas.” The Washington D.C. metropolitan region, which includes Prince William, Fairfax, and Loudoun Counties, has been designated “severe nonattainment” for ozone. Ambient atmospheric concentrations of pollutants other than ozone are well below the NAAQS, as shown in the table below.

Ozone is not emitted directly by automobiles to the atmosphere. Rather, it is produced in the atmosphere through complex photochemical reactions involving precursor pollutants (primarily volatile organic compounds and various oxides of nitrogen) in the presence of sunlight. Due to the dependence of ozone formation on sunlight and high temperatures, high ozone concentrations occur most frequently during the summer. Common sources of volatile organic compound emissions in the atmosphere include motor vehicles, chemical manufacturing, dry cleaners, paint shops, and solvents. Common sources of nitrogen oxides include stationary fuel combustion, such as utility and industrial boilers, and motor vehicles.

### 3.11 NATURAL ENVIRONMENT

#### 3.11.1 Geology and Soils

The study area is located in the Outer Piedmont Province and more specifically within the boundaries of the Mesozoic-age (Triassic) Culpepper Basin. The Culpepper Basin topography is described as having gentle slopes, scattered low ridges, hills with flat summits, and, where there are igneous rock intrusions (dikes and sills), abruptly rising hills and rugged ridges.

The near-surface rock is a reddish to reddish-brown sedimentary type consisting largely of undifferentiated sandstone, mudstone, and interbedded sandstone, siltstone, and shale. Abutting these formations are highly deformed metamorphosed black-to-dark-green hornfels, amphibole, and pinkish syenite. In the east-central portion of the study area along U.S. Route 29 is the somewhat abrupt contact between the Mather Gorge Formation and the Piney Branch Complex, a *mélange* consisting of nutrient-rich metamorphosed and interlayered mafic rock (peridotite, pyroxenite, gabbro) and what have been termed ultramafic rock including basalt, greenstone, magnesium-rich serpentinite, and (locally) soapstone.

Higher ridges have dikes or sheets of feldspathic granite. Most notably, the Piney Branch formation contains country rock with naturally occurring asbestos minerals, primarily actinolite and tremolite, which, when encountered during land disturbance require special protection requirements for construction activities. The Piney Branch complex material is also prohibited for aggregate stone use in Fairfax County. Approximately 23.6 acres of land with asbestos-bearing rock and soils have been identified in the Fairfax County portion of the study area.

**TABLE 3-15: 2002 AMBIENT AIR QUALITY DATA**

Pollutant	Monitor Location	Averaging Period	Maximum Concentration	Second Maximum Concentration	NAAQS
Ozone	Long Park <sup>A</sup>	1 Hour	0.129 ppm	0.113 ppm	0.120 ppm <sup>E</sup>
		8 Hours	0.108 ppm	0.093 ppm	0.080 ppm <sup>F</sup>
Particulate Matter (PM <sub>2.5</sub> )	Broad Run <sup>B</sup>	24 Hours	45.3 µg/m <sup>3</sup>	38.3 µg/m <sup>3</sup>	65 µg/m <sup>3G</sup>
		Annual	13.5 µg/m <sup>3</sup>	Not applicable	15 µg/m <sup>3H</sup>
Particulate Matter (PM <sub>10</sub> )	Manassas <sup>C</sup>	24 Hours	51 µg/m <sup>3</sup>	46 µg/m <sup>3</sup>	150 µg/m <sup>3I</sup>
		Annual	18 µg/m <sup>3</sup>	Not applicable	50 µg/m <sup>3H</sup>
Nitrogen Dioxide	Long Park	Annual	0.011 ppm	Not applicable	0.053 ppm
Sulfur Dioxide	Chantilly <sup>D</sup>	3 Hours	0.26 ppm	0.20 ppm	0.50 ppm <sup>J</sup>
		24 Hours	0.014 ppm	0.011 ppm	0.14 ppm <sup>J</sup>
		Annual	0.004 ppm	Not applicable	0.03 ppm
Carbon Monoxide	Chantilly	1 Hour	2.2 ppm	1.4 ppm	35 ppm <sup>J</sup>
		8 Hours	1.2 ppm	1.2 ppm	9 ppm <sup>J</sup>

Source: Sorensen, Crystal. 2003. *Virginia Ambient Air Monitoring 2002 Data Report*. Virginia Department of Environmental Quality, Office of Air Quality Planning and Monitoring. Published June 2003.

<sup>A</sup> Long Park on US Route 15 in Prince William County, DEQ Station No. 45-L, EPA Aerometric Information Retrieval System (AIRS) No. 51-153-0009.

<sup>B</sup> Broad Run High School on Route 641 in Loudoun County near Ashburn, DEQ Station No. 38-I, EPA AIRS No. 51-107-1005.

<sup>C</sup> Manassas Health Department, 9301 Lee Avenue, City of Manassas, DEQ Station No. 45-A, EPA AIRS No. 51-153-0001.

<sup>D</sup> Upper Cub Run Drive in Chantilly, Fairfax County, DEQ Station No. L-46-F, EPA AIRS No. 51-059-0005.

<sup>E</sup> Not more than one exceedance per year, averaged over 3 years. Note: the 1-hour standard is being phased out and replaced with the more stringent 8-hour standard.

<sup>F</sup> 3-year average of the 4<sup>th</sup> highest 8-hour concentration may not exceed 0.08 ppm. Note: the 1-hour standard is being phased out and replaced with the more stringent 8-hour standard.

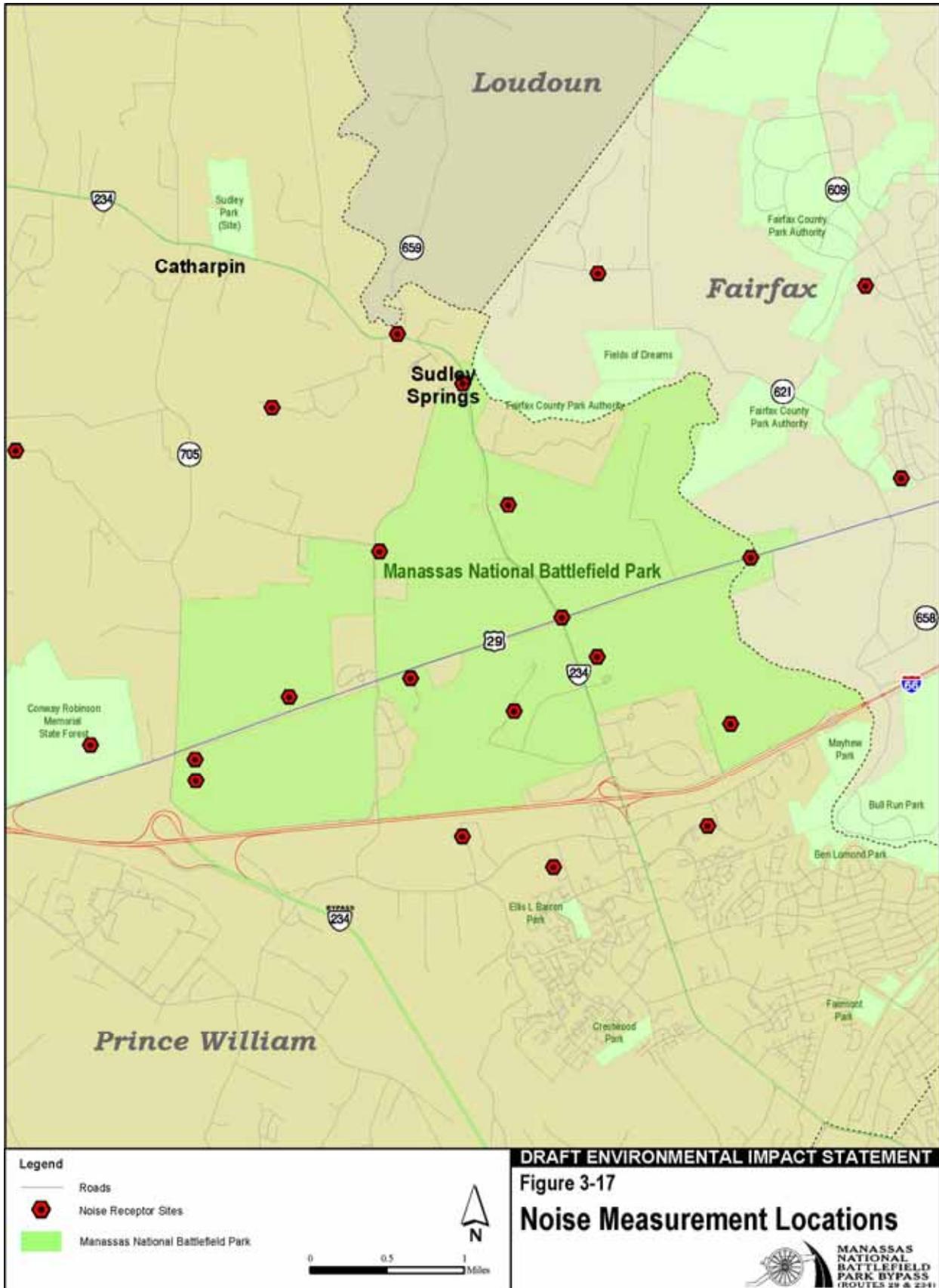
<sup>G</sup> Based on a 3-year average of annual 98<sup>th</sup> percentile values.

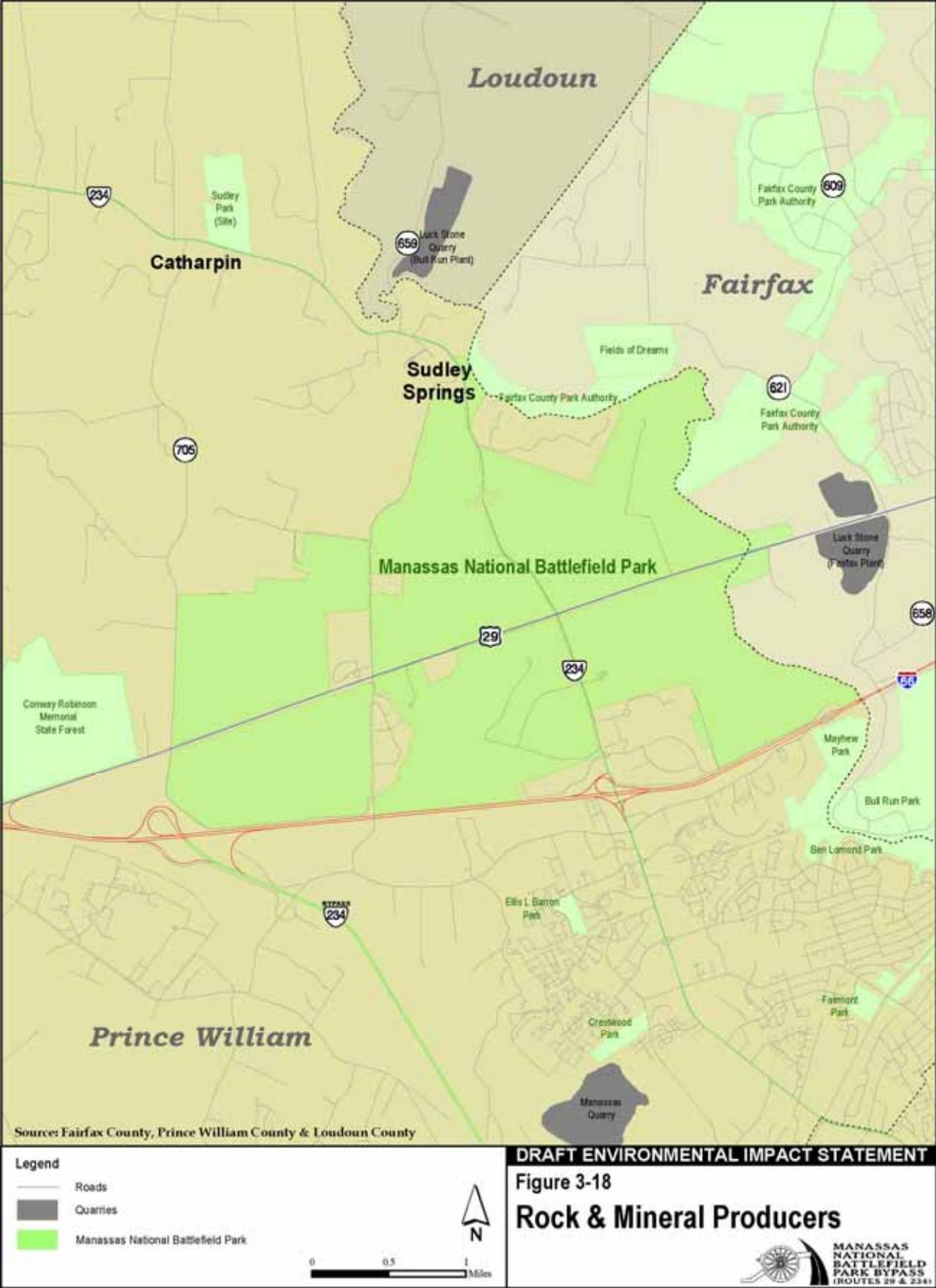
<sup>H</sup> Based on a 3-year average of annual averages.

<sup>I</sup> Based on a 3-year average of annual 99<sup>th</sup> percentile values

<sup>J</sup> Not to be exceeded more than once per year.

Two active rock-quarrying facilities are located within the study area, which produce crushed diabase stone, cement treated base rock, riprap, gabion stone and asphalt sand and cobbles and one produces crushed basalt aggregate. Luck Stone's Fairfax Plant is located just east of the Park along both sides of US 29. Luck Stone's Bull Run plant is located north of the Park along Gum Spring Road. Another quarry, located in Manassas, is shown on **Figure 3-18**, but is outside of the study area.





Soil types within the study area vary widely. In areas with flatter relief, soils were formed in place by chemical weathering and local erosion of the underlying sedimentary rocks. Soils on the extreme outer eastern edge of the project area that formed from schistose metasedimentary rocks are commonly deep and well drained, while soils that formed from weathered diabase, diorite/syenite, and associated igneous rocks such as Piney Branch gabbro tend to be shallower, are stony, and often contain clay-rich soil with a subsurface impeding layer (fragipan) that slows surface drainage. The depth of the overburden in the vicinity of the study area ranges from less than 540 feet in most of the hilly or steep-sloped areas and between 10 to 40 feet in the upper reaches of stream valleys. It is generally less than 10 feet in the lower reaches of stream valleys.

Soils in stream valleys consist of alluvial sands and gravels formed by fluvial erosion and episodic deposition from overbank flooding. Some of these sediments are poorly drained or have seasonal high water tables (hydric), while others are well drained to somewhat poorly drained (non-hydric but are otherwise subject to flooding). The recent alluvial deposits consist of micaceous silt and sands as well as abundant quartz and crystalline pebbles, weathered cobbles, and boulders. In the southern end of the study area, terrace deposits are present above the modern floodplains and include well-bedded, gently sloping graded deposits of gravel, sand, silt, and clay. Many of these deposits are now, or formerly were mined for sand and gravel resources.

**3.11.2 Surface Waters and Watersheds**

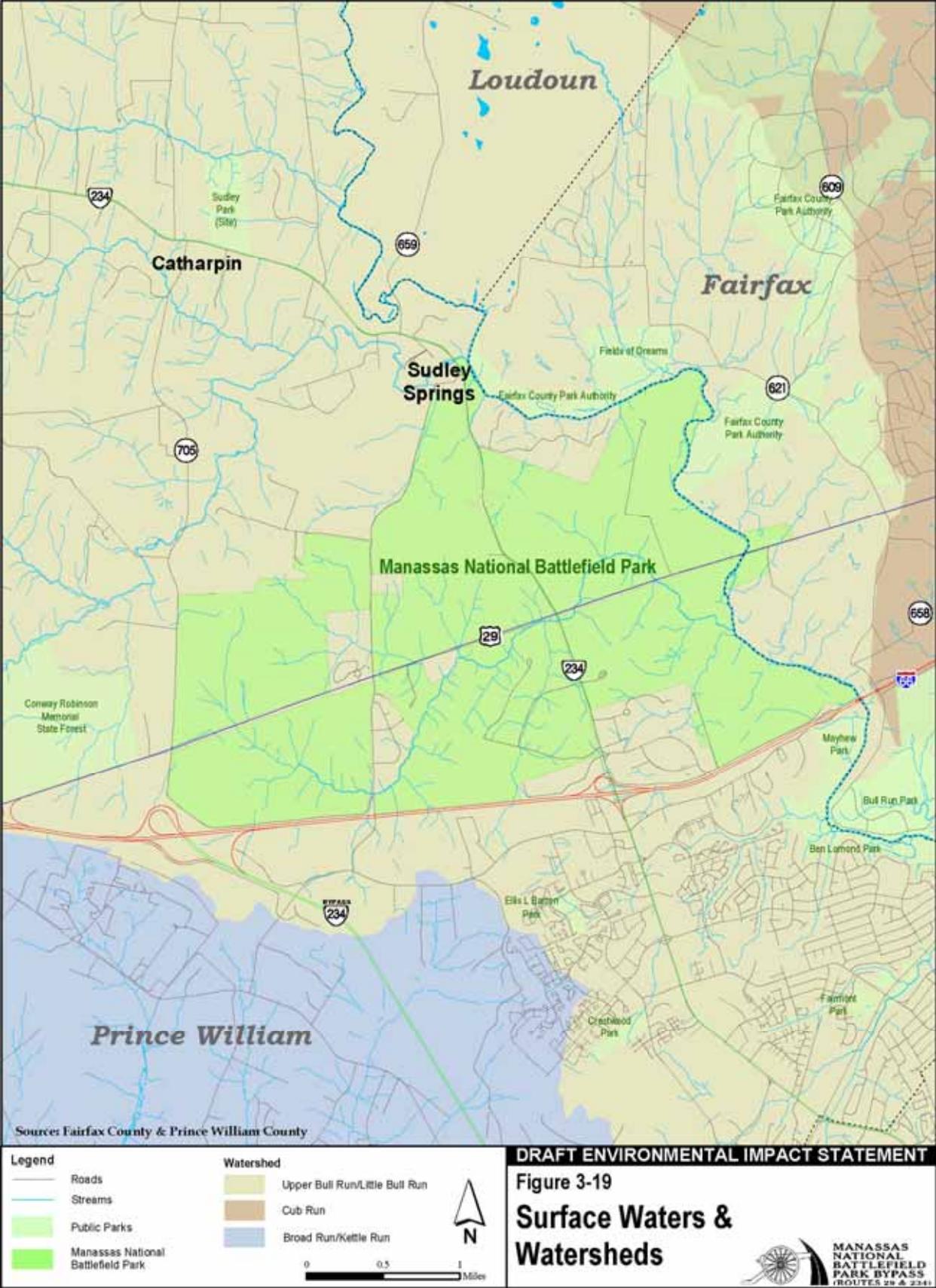
The study area is primarily located within the Potomac-Shenandoah Basin (PSB), and specifically the Middle Potomac-Anacostia-Occoquan (MPAO) watershed, which encompasses the Upper Bull Run/Little Bull Run, Cub Run, and Broad Run/Kettle Run sub-watersheds. A small portion of the study area (in the northwestern corner) also includes the Middle Potomac-Catoctin watershed, which includes Lower Goose Creek/Little River and Potomac River/Broad Run watersheds in Loudoun County. Howsers Branch is located within the study area in the Lower Goose Creek/Little River watershed and the upper reaches of Lenah Run and South Fork Broad Run are located within the Potomac River/Broad Run watershed. However, because none the Candidate Build Alternatives directly or indirectly affect Howser’s Branch or Lenah Run, these streams are not studied further in the DEIS. A summary of surface waters in the study area is provided in **Table 3-16**. **Figure 3-19** depicts the locations of the surface waters and watersheds within the study area.

**TABLE 3-16: SURFACE WATERS IN THE STUDY AREA**

Sub-Watersheds	Named Watercourses
Upper Bull Run Little Bull Run	Black Branch, Chestnut Lick, Foley Branch, Youngs Branch, Holkums Branch, Flat Branch, Little Bull Run, Lick Branch, and Catharpin Creek
Cub Run	Elklick Run, Round Lick Run, Big Rocky Run, Flatlick Branch, Cain Branch, Schneider Branch, Dead Run
Broad Run/Kettle Run	Broad Run, Catletts Branch, North Fork, South Run, Cannon Branch, Dawkins Branch, and Rocky Branch
Little Goose Creek/Little River	Howsers Branch *
Potomac River/Broad Run	Lenah Run, Broad Run (South Fork) *

Source: EPA Watershed Website at: <http://cfpub.epa.gov/surf/>

Note \* indicates the DEIS does not analyze these streams further because they are not directly or indirectly affected by any Candidate Build Alternatives.



All water resources in the project area have been influenced to varying degrees by human activities, such as road construction, drainage system installation, utility line construction, residential and commercial development, and stormwater management/erosion control construction. Other non-point source degradation is attributable from livestock ranging, agricultural operations, silvicultural practices, and inefficient land use management. Additional impacts result from normal natural processes including flooding, erosion and differential plant growth along streams.

VDEQ has designated surface waters in the project area as non-tidal waters of the Coastal and Piedmont Zones (Class III). **Table 3-17** summarizes Virginia water quality standards for these surface waters. Certification of compliance with state water quality standards is required for discharges to surface waters regulated under Section 401 of the Clean Water Act. VDEQ retains Section 401 certification authority for all surface waters in the state.

**TABLE: 3-17: WATER QUALITY STANDARDS FOR CLASS II NON-TIDAL WATERS**

Criteria	Dissolved Oxygen (mg/L)		pH Range	Maximum Temperature	Fecal Coliform	
	Minimum	Daily Average			30-Day <sup>1</sup>	Max. <sup>2</sup>
Standard	4.0	5.0	6.0-9.0	32°C	200	1,000

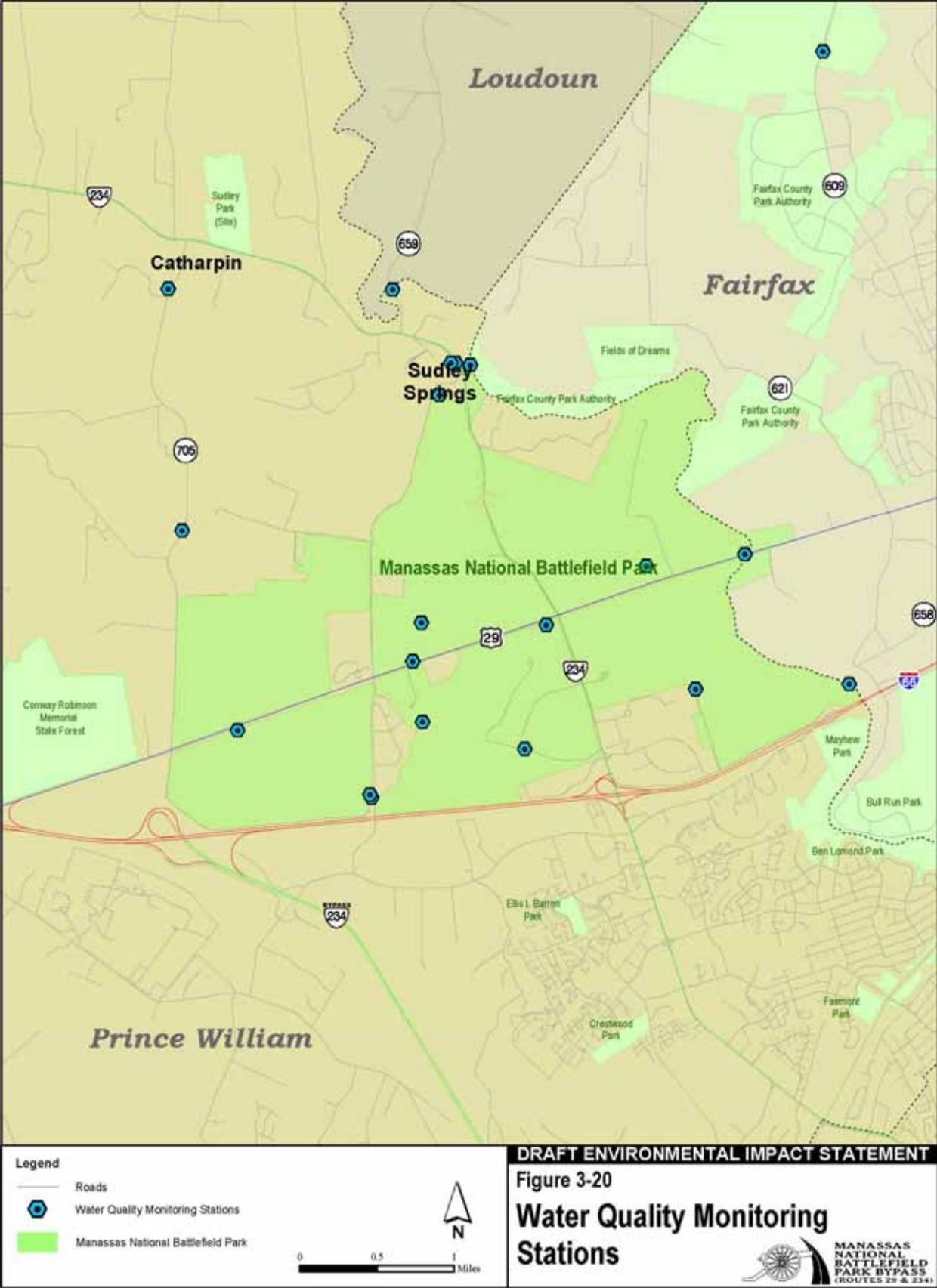
Source: Virginia Water Quality Standards (9 VAC 25-260-50)

1. Geometric mean of 200 fecal coliform bacteria per 100 ml of water for two or more samples over a 30-day period.
2. 1,000 fecal coliform bacteria per 100 ml at any time.

VDEQ’s 2002 305(b) *Water Quality Assessment Report* describes water quality conditions in Virginia and includes sampling stations within the study area on eight streams (see **Figure 3-20**): Broad Run (5 stations), Cub Run (4 stations), Bull Run (3 stations), Young’s Branch (3 stations), Catharpin Run (2 stations), Big Rocky Run (2 stations), Rocky Run (1 station), and South Run (1 station). None of the samples within the study area resulted in VDEQ water quality violations for the physical criteria temperature, dissolved oxygen (DO) and hydrogen potential (pH). Only one in 185 samples resulted in a state violation in Lick Branch for total phosphorus. Only 12 of 184 samples (6%) for fecal coliform concentrations exceeded the state criteria. This resulted in impairment classification in two stream reaches on Broad Run, a segment of South Run, and a segment of Bull Run.

Waters of Special Concern are found within Young’s Branch near the intersection of VA 234 and US 29. This classification is designated for the entire 5.64 miles of the watershed. Additionally, a 4.07 mile segment of Big Rocky Run, located on the eastern boundary of the study area where the stream flows beneath State Route 28, is also classified as a water of concern due to moderate to high probability of adverse conditions to macrobenthics from an unknown source.

In 2001, concentrations for total phosphorus, nitrate nitrogen, dissolved oxygen and pH was 0.10, 0.60, 8.6 and 7.2, respectively. For instance, average dissolved oxygen concentrations for all 152 samples in the vicinity of the study area were all above the minimum standard of 4.0 mg/l, and ranged between 8.0 and 9.1, with a mean of 8.42. Average total phosphorus for all sample stations in Cub Run and Bull Run were 0.1. Average pH readings at these monitoring stations were above the 6.0 pH minimum, ranging from 7.0 to 7.7. The average nitrate nitrogen ranged from 0.5 to 1.2, with a mean of 0.65.



Four stream sections totaling 15.91 miles in length within the study area that are classified by VDEQ as impaired waters (see **Table 3-18**). Bull Run was originally listed in 1994 for total maximum daily load (TMDL) priority listing in response to macrobenthic sampling results. South Run was originally listed in 1998 for the same reason. Because of fecal coliform testing results required as part of the 1999 Consent Decree, VDEQ priority-listed Broad Run in 2002. However, in 1999 the VDEQ Consent Decree Waters list included a larger portion of the main stem of Broad Run and Bull Run as waters to be studied for fecal coliform contamination. Some sections of Broad Run were listed as impaired, while others were considered fully supporting, and in 2002, were officially de-listed from the 1999 Consent Decree Waters. However, Bull Run remains impaired for the benthics standard deficiencies, although it is no longer impaired from fecal coliform contamination. Additionally, the Occoquan River (Station VAN-A20R), Cub Run (St. VAN-A22R), and Little Bull Run (St. VAN-A21R), were de-listed in 2002 from the 1999 Consent Waters to be studied for contamination, with zero sampling threshold violations in 67 sampling events. This would indicate that water quality in the study area was found to be better than the 1999 Consent Decree sought to establish.

**TABLE 3-18: VDEQ 2002 303(D) IMPAIRED WATERS DATA SUMMARY**

County	Stream	HUC	Segment ID	Segment Length (Miles)	Impairment Cause	Impairment Source
Fairfax/Prince William	Bull Run	02070008	VAN-A23R-01	4.8	General Standard (Benthic)	Unknown
Prince William	Broad Run	02070008	VAN-A19R-01	7.26	Fecal Coliform	Unknown
Prince William/Fauquier	Broad Run	02070008	VAN-A19R-02	1.51	Fecal Coliform	Unknown
Prince William/Fauquier	South Run	02070008	VAN-A19R-04	2.34	General Standard (Benthic)	Unknown
TOTAL				15.91		

Source: 2002 VDEQ 303(d) Part 1A Impaired Waters TMDL Priority List (Appendix A, 303d Report), website source at <http://www.deq.state.va.us/water/303d.html> .

Additionally, the VDEQ lists the entire headwaters of Young's Branch (USGS, 1987), which includes water quality sampling sites monitored by the Audubon Naturalist Society (ANS) sampling sites 4, 5 and 15 (within Bull Run) as "waters of concern" (formerly called threatened waters). The affected 5.64-mile segment, all of which is located within the study area, were assessed as "fully supporting", but threatened considering the aquatic life use goal in the 2002 305(b) report (VDEQ, 2003b).

Fecal indicator bacteria are the leading cause of impaired waters in Virginia. Proximity of fecal coliform sample sites to actual point sources of fecal coliform contamination vectors (*i.e.*, livestock pastures and feedlots, inefficient septic fields, and discharge pipes with fecal contamination) can have a significant effect on the validity of the quantitative analysis to describe ambient concentrations or to identify actual in-the-field areas where fecal contamination has a higher probability of occurring. High concentrations of fecal coliforms that can be a public health concern are mostly related to water temperature, rainfall amounts, and flow rates. Cub Run (6 sites), and Bull Run (1 site). For these two streams, which lie within the study area, the percentages of samples having good water quality for fecal coliforms were 10 and 14, respectively.

The June 2003 *Annual Report on Water Quality* indicates that of the more than 120 contaminants tested, very few were detected and those were in negligible amounts that are well below the EPA's maximum contaminant levels. None of the chemicals had concentrations above allowable maximum concentrations for drinking water.

Manassas NBP's water quality monitoring program indicates existing water quality in Young's Branch and tributaries is "good to excellent", with no stream deterioration noted over the nine-year period from 1983 to 1992. Sediment loading during soil disturbing activities into Young's Branch is cited as the major water quality concern relative to drinking water in Bull Run, which is the receiving water of Young's Branch.

In 2000, the Interstate Commission on the Potomac River Basin commissioned the FCWA, in association with the U.S. Army Corps of Engineers Washington Aqueduct Division and the Washington Suburban Sanitary Commission, to study regional water supply availability through 2020. Under high demand forecast scenarios compared against existing resources, the study found current resources adequate to meet 2020 water use demands.

### 3.11.3 Groundwater

The study area encompasses portions of the Piedmont physiographic province where ground water occurs in secondary fractures of igneous and metamorphic rocks and is generally available in moderate quantities (10-200 gpm). Federal laws focus on controlling potential sources of ground water contamination on a national basis. States and local governments are responsible for implementing general ground-water protection activities such as wellhead protection programs or the development of ground-water protection strategies. Because Virginia has elected not to apply for an EPA-approved Wellhead Protection Program, local governments and water suppliers are encouraged to participate in wellhead protection activities voluntarily. The Sole Source Aquifer (SSA) Protection Program was authorized by the Safe Drinking Water Act of 1974 and was amended in 1986 and 1996 to include springs and groundwater. There are no SSAs within the study area. In June 2002, the FCWA issued a summary of finished water characteristics. No violations of water quality standards occurred.

The quality of ground water within the Piedmont province is generally good, although there are areas of naturally occurring high iron, water hardness (up to 350mg/l CaCO<sub>3</sub>), and concentrations of dissolved solids and other dissolved minerals, primarily sulfates, which is responsible for a highly undesirable laxative effect. In the study area, ambient groundwater contains a mixture predominantly a calcium-magnesium-bicarbonate, derived from dissolution of calcite, gypsum and pyrite. Virginia Water Quality Standards that apply to ground water in the study area are summarized for the Piedmont physiographic province in **Table 3.19**.

**TABLE 3-19: GROUNDWATER QUALITY STANDARDS IN THE PIEDMONT PHYSIOGRAPHIC PROVINCE**

Criteria	pH	Ammonia Nitrogen	Nitrite Nitrogen	Nitrate Nitrogen
Standard	5.5-8.5	0.025 mg/L	0.025 mg/L	5 mg/L

Source: Virginia Water Quality Standards (9 VAC 25-260-220), 1997.

Most site-specific ground water contamination cases in Virginia are due to leaking underground storage tanks. One of these contaminated sites lies within the study area, however the established contamination zone lies outside of the study area and is migrating southeastwardly away from the study area and is moving vertically not laterally.

Groundwater quality is somewhat variable within the study area. In places it contains little dissolved mineral material and has an average dissolved solids concentration of about 250 milligrams per liter. Much of the groundwater is hard, slightly alkaline, and with variable mineral concentrations. Water from aquifers underlying the study area are generally suitable for drinking water, but locally within portions of Loudoun County, there are problems with excess concentrations for iron, sulfates, and manganese, which affect taste. Locally, elevated concentrations of nitrate exist in some groundwater wells from urbanization effects including fertilizers, animal wastes and sewage leaks.

Shallow aquifers are particularly vulnerable to well contamination from nitrates, but generally, the concentrations are not known to be a hazard to public health in the Potomac watershed in municipal drinking water. Nitrate concentrations in finished drinking water (which includes groundwater sources) in the study area have never had a measured threshold concentration violation. Nitrates in finished drinking water average 1.6ppm, and have not exceeded 4.4ppm since 1998 sampling. The chemical quality of groundwater in the shallow aquifers is variable, but is generally suitable for domestic, industrial, institutional, and irrigation use.

**3.11.4 Floodplains**

100-year frequency storm floodplains within the study area were identified from the Federal Emergency Management Agency’s digital Q3 Flood Data and digital floodplain mapping for surrounding municipalities, when available. Throughout the study area, regulatory (100-year) floodplains follow large-order streams and their major tributaries. **Figure 3-21** depicts the locations of floodplains in the study area.

**3.11.5 Biological Resources**

This subsection discusses biological resources and is organized according to terrestrial community types, major forested areas, wetland habitats, aquatic habitats, and wildlife resources.

**Terrestrial Community Types**

The Virginia Department of Conservation and Recreation-Division of Natural Heritage recently published a compendium of standardized vegetated community descriptions for natural habitats in Virginia. **Table 3-20** describes terrestrial plant communities that may be present in the study area and indicates in which counties they are known to occur. Further detailed assessment of these habitats, with special focus on locations of natural heritage resources (biota and communities) within them, are discussed in the Rare, Threatened, and Endangered Species section.

**TABLE 3-20: TERRESTRIAL COMMUNITY TYPES THAT MAY BE PRESENT WITHIN THE STUDY AREA**

Community Type	Description	Fairfax County	Loudoun County	Prince William County
Acidic Oak - Hickory Forest	Generally drier than the Basic Oak/Hickory Forest, this forest type is widespread within the Park and is found on low ridges and rolling to flat uplands in extremely acidic soils.			*
Basic Mesic Forest	Mixed hardwood forest at lower elevations on very fertile soils; usually in ravines or rich river terraces. Frequent.	*	*	

**TABLE 3-20: TERRESTRIAL COMMUNITY TYPES THAT MAY BE PRESENT WITHIN THE STUDY AREA**

<b>Community Type</b>	<b>Description</b>	<b>Fairfax County</b>	<b>Loudoun County</b>	<b>Prince William County</b>
Basic Oak-Hickory Forests	Mixed hardwood forest type that occurs throughout Piedmont on basic substrates. Diagnostic species include redbud, hop hornbeam, and flowering dogwood. Common.	*	*	*
Chestnut Oak Forests	Found on rocky, well-drained slopes. Contains mostly chestnut and other dry-area oaks, mixed hardwoods, and some evergreens. Localized.			*
Eastern Red Cedar Successional Forest	Short-lived/temporary forest type, which occurs around the park in former fields and clearings abandoned with the last 80 years.			*
Eastern Hemlock Forests	Found in isolated, north-facing river bluffs and ravines of the Piedmont. Hemlock is dominant, white oak and American beech are frequent associates with various laurels. Very localized.	*		
Eastern White Pine/Hardwood Forest	Eastern white pine forests typically occur with several mixed hardwood species locally in the Piedmont. Very localized. Natural stands only.			*
Low Elevation Basic Outcrop Barrens	Scrub and herbaceous vegetation of exposed, base-rich outcrops in the Piedmont. Vegetation is usually a patchwork of shrub thickets, herbaceous mats, and rock-hugging lichens. Localized.		*	
Mesic Mixed Hardwood Forests	Characterized by composition of mixed hardwood species including beech, oaks, tulip poplar, hickory, hornbeam, flowering dogwood, and American holly. Common.	*		*
Piedmont/Mountain Basic Woodlands	Dry rocky habitats that occur widely throughout Piedmont. Characterized by a mixture of hardwoods and evergreens. Characteristic species redbud, slippery elm, ninebark, and aromatic sumac. Uncommon in study area.	*		
Piedmont/Mountain Basic Cliff	Sparsely vegetated rock community on basic metamorphic stone including metabasalt and greenstone in western Piedmont. Localized.		*	
Piedmont Mountain/Bottomland Forest	Found on elevated terraces and floodplain levees bordering streams within the Park. With well-drained strongly acidic soils with high mineral content, they are occasionally inundated with water for brief periods.			*
Piedmont Mountain/Swamp	These wet forests occur in seasonally flooded sloughs and back swamps in the Bull Run floodplain north and			*

**TABLE 3-20: TERRESTRIAL COMMUNITY TYPES THAT MAY BE PRESENT WITHIN THE STUDY AREA**

Community Type	Description	Fairfax County	Loudoun County	Prince William County
Forest	south of US 29.			
Piedmont Prairie	Dominated by warm-season grasses, and several diagnostic herbs; restricted to Quantico MB, MNBP, and small patches in openings along maintained utility corridors. Rare and localized.			*
Pine-Oak/Heath Woodlands	Forest type associated where past disturbance has occurred. Characteristic species include conifers and mixed hardwoods, with a ground cover of fruit-producing low herbs and shrubs. Common.			*
Upland Depression Swamp	Found in shallow, seasonally flooded upland basins and along small stream bottoms such as Young's Branch.	*		*

Existing published documentation and resource agency data were reviewed for information on existing wildlife populations and their potentially affected habitats as well as for information about particular issues or concerns related to those wildlife populations and habitats. Terrestrial habitats were characterized during field reconnaissance conducted in 2003. The potential for particular wildlife species to utilize these habitats was determined based on habitat suitability patterns, special habitat requirements, historical range, territory/home range size, reproductive habits, foraging habits, agency database information, and scientific literature.

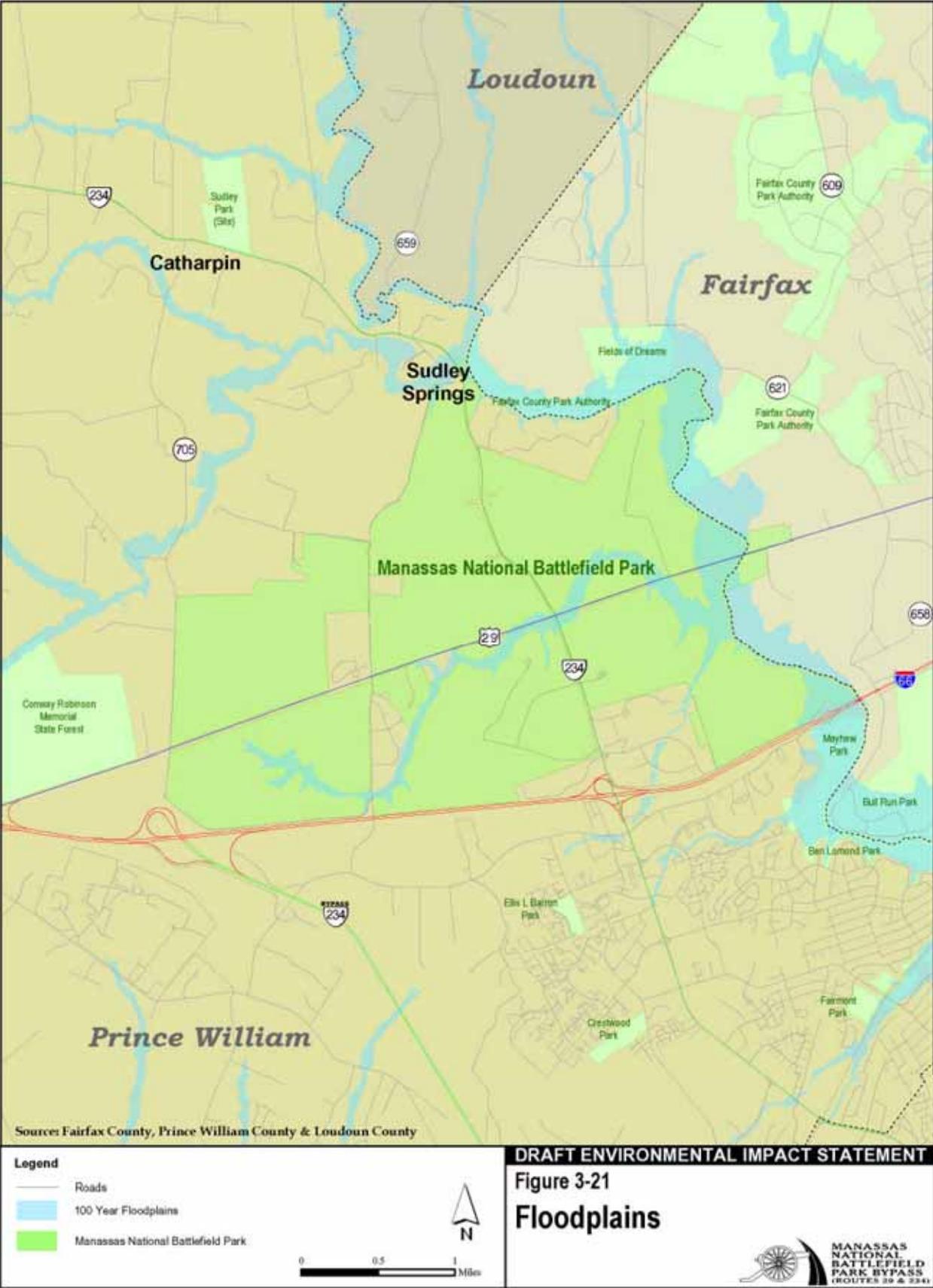
These habitats generally include deciduous forests, mixed forests, disturbed ecotones, edge habitats, brushy old fields, and open lands, including grassland types, in developed or developing areas. Habitat discontinuity is the result of existing urbanization effects, infrastructure, and surrounding residential and commercial development. Species use is based on habitat suitability characteristics, special habitat requirements, historical range, territory/home range size, reproductive habits, and foraging habits.

The existing wildlife assemblage within the study area has a variable degree of dependence on existing land use, vegetation cover, and other biotic and abiotic life history requirements. This includes a combination of species typically found in natural habitats, and species that are generally adaptable to disturbed, rapidly developing suburban areas. A relatively low number of species use the terrestrial and aquatic habitats in the developed areas within the study due to their small size, disturbed nature, unsuitable urbanized surroundings, lack of life history support characteristics, and distance from large, less developed habitats. Estimates of wildlife populations suggest low population densities, primarily owing to the patchiness and disturbed nature of habitats and the lack of contiguous habitat patches.

The common terrestrial habitats within the study area and the typical wildlife inhabiting each of them are described in more detail in the following text.

### Major Forested Areas

Forest cover is a dominant landscape feature within the study area. This community type is composed of two subtypes of habitat; one is a predominantly deciduous hardwood oak-hickory and mixed oak forest, and the



other is a mixed deciduous-coniferous type. While the trees, shrubs, saplings and herbs are typical of northern Virginia, geology, soils and moisture capacity affect the types of vegetation comprising specific forest stands.

Despite land-use changes (*e.g.*, decreases in agricultural acreages, expansions of human populations), the forested area of Virginia has remained relatively stable (declining less than 1 percent) since 1947 (VDGIF, 2003). However, the changes in forest composition and vegetation interspersions of the extant vegetation in a given forested tract may impact some wildlife populations in some areas. For instance, forest habitat diversity for forest-dwelling animals probably has been reduced on public lands due to decreased timber harvesting during the last 20 years on National Forest lands.

*State Forests.* The 440-acre Conway Robinson Memorial State Forest (CRMSF) is located in Prince William County just west of the Manassas NBP. CRMSF is used to promote forest stewardship and sustainable forest management through the use of Virginia Department of Forestry interpretive programs as an example of mixed older growth pine and mixed hardwood stands that provide a variety of wildlife and woodland habitats, as well as watershed protection and timber production. CRMSF supports a special 25-acre tract named the Fernstrom Forest, a memorial planting of loblolly pines completed as part of the Virginia Forestry Service's 1939 Jubilee Project. There are two other memorial plantings of American yew and a historical marker in the Fernstrom Forest.

The forest provides suitable habitat for many wildlife species. Timber harvesting is 'checkerboarded' to provide various age groups and diversity of tree species. Logging roads are stabilized and seeded upon completion of harvest. These roads are used for wildlife openings and they are mowed periodically to maintain the grass cover. Old house sites are cleared, leveled, and maintained for wildlife openings. Corridors are left along drainage areas and between stands for wildlife movement. Natural resource components are left in an undisturbed state to the extent practicable.

Many of the newly planted areas are strip-sown with exotic, but highly nutritious wildlife food plants including Korean lespedeza (*Lespedeza stipulacea*), sericea lespedeza (*L. cuneata*), bushy lespedeza (*L. bicolor*), sawtooth oak (*Quercus acutissima*), autumn olive (*Eleagnus pungens*), and Chinese chestnut (*Castanea mollissima*). Scattered throughout the forest are many openings ranging in size from one-half acre to five acres that are used for wildlife food patches. These are typically sown in orchard grass, sorghum, clover, wheat, sunflower, canola, or other wildlife food.

*Manassas National Battlefield Park.* Several forest community types exist within the Park. The Park's management of the landscape for historic preservation purposes also involves protecting forests within the Park. A 2002 study done by the Virginia Department of Conservation and Recreation found several classified forest types within the park. They include: piedmont/mountain swamp forest, upland depression swamp, piedmont/mountain bottomland forest, basic mesic forest, basic oak-hickory forest, acidic oak/hickory forest, eastern white pine/hardwood forest, and eastern red cedar successional forest.

### **Wetland Habitats**

The COE and EPA jointly define wetlands as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas". The location, size and classification of wetland habitats in the study area were obtained from digital U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) maps.

Wetland habitats are classified using the USFWS system for wetlands and deepwater habitats. Lacustrine wetlands include wetlands and deepwater habitats that are situated in a large topographic depression (lake) or along fringes of a dammed river channel. Palustrine wetlands include non-tidal habitats dominated by trees, shrubs, and persistent emergent vegetation. Riverine wetlands include all wetlands and deepwater habitats contained within a defined natural or man-enhanced channel that have mostly non-persistent vegetation.

NWI maps indicate that approximately 1,204 acres of lacustrine, palustrine, and riverine wetlands are present within the study area, as summarized in **Table 3-21**. Calculations for NWI-mapped wetlands were not available for the portion of Fauquier County within the study area. This amount does not necessarily represent the amount of jurisdictional wetlands on the ground that would be subject to Section 404 permits for unavoidable project impacts. In fact, within northern Virginia, existing NWI mapping has been documented to actually under-estimate the amount of wetlands by approximately 33 percent. Ground-truthing is the only means available to verify the photo-interpretations and estimates derived using remotely sensed NWI mapping (Stolt and Baker, 1995).

**TABLE 3-21: WETLAND HABITATS WITHIN THE STUDY AREA**

Wetland Classification/Cover Type*	Fairfax County	Loudoun County	Manassas City & Manassas Park	Prince William County	Total for Study Area
Lacustrine (L)	48.3	0.0	0.0	0.0	48.3
Palustrine Emergent (PEM)	41.7	21.4	2.6	16.9	82.7
Palustrine Forested (PFO)	480.6	77.9	1.0	107.6	667.0
Palustrine Scrub-Shrub (PSS)	45.9	26.7	0.4	21.2	94.2
Palustrine Aquatic Bed/Unconsolidated Bottom/Unconsolidated Shore (PAB/UB/US)	95.3	93.2	6.2	25.4	220.1
Riverine Upper Perennial (R3)	52.4	0.0	0.0	39.1	91.5
Subtotal NWI Mapped Wetlands	764.3	219.3	10.2	210.2	1,204
Uplands (U)	13,602	17,032	2,600	7,280	40,514
Total Area Covered by NWI Maps	14,367	17,251	2,610	7,490	41,718
Percent of Study Area covered by NWI maps	85	91	91	11	37

Source: USFWS digital NWI maps for Arcola, Herndon, and Manassas USGS quadrangles. Field delineation of aquatic habitats using the 1987 Army Corps of Engineers *Wetlands Delineation Manual* is required to definitively determine what areas within the study area are subject to Section 404 regulation.

Wetland communities native to the region include Piedmont/mountain bottomland forests, Piedmont/mountain alluvial Forests, Piedmont/mountain semi-permanent impoundments, and mountain/Piedmont acidic seepage swamps. Bottomland forests occur in most river floodplain habitats of the Piedmont, and are typically

characterized by silver maple, box elder, hackberry, black walnut, American elm, and sycamore. Paw-paw and spicebush are common understory species. Several different rare wetland communities have been documented in Fairfax, Fauquier, and Prince William Counties, and some of these may be present in the study area.

**Table 3-22** includes a brief description of these communities and indicates in which counties they are known to occur.

The most common wetlands scattered throughout the study area are palustrine-forested systems (PFO), with broad-leaved deciduous vegetation associated with swamps or bottomland forests. The largest tracts of PFO wetlands are in parks and along major streams such as Bull Run. Some of these PFO wetlands are located on protected lands, such as county, state, or national parks. In the Fairfax County portion of the study area, nearly 60 percent of wetlands are located within county parks. In Prince William County, palustrine forested and emergent wetlands associated with Bull Run are located in Manassas National Battlefield Park, Mayhew Park, Copeland Park, and Ben Lomond District Park. However, the most wetlands in Prince William County are located on private property.

**TABLE 3-22: WETLAND COMMUNITIES THAT MAY OCCUR IN THE STUDY AREA TABLE**

Community Name	Description	County Location			
		Fairfax County	Fauquier County	Loudoun County	Prince William County
Coastal Plain/Piedmont Seepage Bog	Sites are scattered throughout the eastern Piedmont, typically on lower or toe slopes. Characterized by dense mats of Sphagnum mosses. Indicator species include sweetbay, poison sumac, highbush blueberry, possumhaw, and smooth alder. Twisted spikerush, beakrushes, and panic grasses.		Y		
Coastal Plain/Piedmont Acidic Seepage Swamp	Scattered throughout the outer Piedmont in habitats where seepage discharged at ground surface is sluggishly drained away. Common species are red maple, blackgum, tulip poplar, loblolly pine, sweetbay, sweet pepperbush, highbush blueberry, swamp azalea, and possumhaw.	Y			Y
Upland Depression Swamp	Seasonally flooded wooded depressions in nearly level Piedmont, and most numerous in Triassic basins. Characteristic canopy species in northern Virginia include pin oak, swamp white oak, red maple, and willow oak.	Y			Y
Piedmont/Mountain Swamp Forest	Seasonally flooded, deciduous forests occur along rivers and large streams in Triassic basins. Typical species are pin oak, willow oak, green ash, red maple, sweetgum, swamp white oak, hollies, elderberry, silky dogwood, and ironwood.				Y

Source: VDCR-DNH, 2000 (Natural Heritage Resources of Counties). Descriptions from Fleming *et al.*, 2001.

### **Aquatic Habitats**

Aquatic habitats within the project area include free-flowing (lotic) systems, which are primarily unvegetated intermittent and perennial habitats within streams, and restrictive-flow (lentic) systems, such as beaver ponds and small impoundments, including stormwater management facilities. Habitats within these systems have differing substrates and water chemistry that support different communities of aquatic biota. Typical aquatic biota includes fish and macroinvertebrates, including insects (and their larval forms), worms, mollusks, and crustaceans. Riverine habitats, stream bottoms, and other aquatic areas that have not been severely affected by erosion and sedimentation, intense urbanization, or deforestation typically support a wide range of benthic organisms.

### **Wildlife Resources**

Wildlife in the study area includes common species that are generally adaptable to disturbed, suburban areas. However, other animals are present that are more indicative of more-natural habitats, primarily within and on the outskirts of Manassas National Battlefield Park. The existing wildlife assemblage within the project area proper has a variable degree of dependence on existing land use and vegetation cover in the area, and further analyses are required to determine the degree to which wildlife is able to adapt to changes brought about by ongoing urbanization processes in the area.

A comprehensive list of wildlife, including fish, amphibians, reptiles, mammals and birds that are known to occur in the study area, is provided in Appendix C of the *Existing Conditions Report* (June 2, 2003).

In comparison, the Northern Virginia Regional Park Authority reports a total of 168 wildlife species likely to occur at Bull Run Regional Park. This list includes 117 birds, 24 mammals, 14 reptiles, and 13 amphibians. Invertebrates were not included in the inventory.

This list is augmented by the Bull Run Park Natural Resources Inventory and the Appendix E document prepared by Mitchell Ecological Research (2002). Mitchell's provisional checklist of reptiles and amphibians reports the total number of species potentially present at Bull Run Regional Park as 51, to include 18 species of snakes, 11 species each of frogs and salamanders, and 8 and 4 species of turtles and lizards, respectively. However, only 8 species were actually observed during the field survey. The total number of wildlife species excluding insects and crustaceans, at Bull Run Regional Park may approach 192. Additionally, the NPS (2003) reports 273 species, including 168 birds, 26 mammals, 23 reptiles, 19 amphibians, and 37 fish species within the MNBP.

A number of aquatic fauna and habitat investigations have been completed within the study area. Aquatic macrobenthic organisms and fish within a 270 square mile area of the proposed Fairfax County Parkway (FCP) project area were sampled for 19 water bodies within the Fairfax County and Loudoun County portions of the project area (FHWA, 1984). A total of 181 separate macrobenthic taxa, consisting of no unique or unusual species, were identified. Additionally, the studies identified 43 fish taxa, including numerous minnows, game fish and anadromous fishes (in coastal plain stream reaches only).

Although not technically considered "wildlife", other species of insects and crustaceans are known from the MNBP. There were 65 taxa of macrobenthic organisms reported at MNBP sampled within five streams in 1987-88. Chazal (2000) reported 48 species of butterflies and skippers, and 210 species of moths at MNBP in 1997-1998 sampling.

In the Cub Run and Bull Run watersheds in Fairfax County, a total of 31 fish species were identified. Of these, green sunfish, fantail darter, redbreast sunfish, bluegill, swallowtail shiner, bluntnose minnow, largemouth bass, and longnose dace were found at most of the stream sampling sites in these watersheds.

Twelve aquatic mollusk species are present within the study area watersheds

### 3.11.6 Threatened and Endangered Species

Laws and regulations applicable to Federal and State endangered and threatened species include the following:

- Endangered Species Act of 1973 (16 U.S.C. 1531-1544);
- Virginia Endangered Plant and Insect Act (Section 3.1-1020 through 1030, *Code of Virginia*);
- Virginia Endangered Species Act (Section 29.1-564 through 570, *Code of Virginia*); and
- Virginia Natural Area Preserves Act (Section 10.1-209-217, *Code of Virginia*).

USFWS is responsible for listing, protecting, and managing Federally listed endangered and threatened species under the Endangered Species Act of 1973, as amended. Under the Virginia Endangered Species Act, VDGIF has regulatory responsibility for the listing and protection of the state's endangered and threatened animals (excluding the Class Insecta). VDCR-DNH maintains information of the occurrence of endangered, threatened, and rare species in the Commonwealth. The Office of Plant Protection within the Virginia Department of Agriculture and Consumer Services (VDACS) has regulatory responsibility for the listing and protection of the state's insects and plants under the Virginia Endangered Plant and Insect Act. The National Marine Fisheries Service (NMFS) has responsibility for protecting Federal listed threatened and endangered marine species.

18 animal species are Federally- or State listed as threatened, endangered, or special concern. **Table 3-23** lists rare, threatened, endangered, and special concern species documented and/or expected within in the FWIS-defined study area, categorized by their corresponding legal status and jurisdiction of occurrence within the project area.

The NPS checklist also contains presence records for bird species at MNBP considered rare by the Audubon Society including Acadian flycatcher (*Empidonax virens*), black-throated blue warbler (*Dendroica caerulescens*), golden-winged warbler (*Vermivora chrysoptera*), hooded warbler (*Wilsonia citrina*), wormeating warbler (*Helmitheros vermivorus*), prairie warbler (*Dendroica discolor*), Kentucky warbler (*Oporornis formosus*), prothonotary warbler (*Protonotaria citrea*), summer tanager (*Piranga rubra*), yellow-throated vireo (*Vireo flavifrons*), eastern wood pewee (*Contopus virens*), northern parula (*Parula americana*), field sparrow (*Spizella virens*), woodthrush (*Hylocichla mustelina*), Louisiana waterthrush (*Seiurus motacilla*), king rail (*Rallus elegans*), and short-eared owl (*Asio flammeus*).

No rare insect species (NHRs) were collected at the Park. In 1999, 44 species of odonates (dragonflies and damselflies) were documented from the Park, with no rare NHRs collected.

### Federally Listed Species

USFWS has indicated that 4 Federally listed endangered, proposed for listing, or threatened species could be present within the counties comprising the study area. Dwarf wedgemussel and small whorled pogonia are other legally protected Federally listed species with the additional potential to occur in the study area, although the presence of neither has been documented. Both the bald eagle and the cerulean warbler (*Dendroica cerulea*), a

small colorful woodland songbird, have been reported at MNBP. There does exist the somewhat remote potential for the Federally endangered harperella within the study area.

**TABLE 3-23: RARE, THREATENED, AND ENDANGERED SPECIES DOCUMENTED OR EXPECTED WITHIN THE STUDY AREA**

Federal Status	State Status	Common Name	Scientific Name	Documented	Expected	Fairfax Co.	Fauquier Co.	Loudoun Co.	Prince William Co.	Manassas
LT/PDL	LE	Eagle, bald	<i>Haliaeetus leucocephalus</i>	*	*	*	*	*	*	
SOC	LE	Brook floater mussel	<i>Alasmidonta varicosa</i>	*		*			*	
SOC	LT	Sparrow, Henslow's	<i>Ammodramus henslowii</i>	*				*	*	
NL	LT	Sandpiper, upland	<i>Bartramia longicauda</i>	*		*	*	*	*	*
NL	LT	Shrike, loggerhead	<i>Lanius l. ludovicianus</i>	*		*	*	*	*	*
PT	SC	Cerulean warbler	<i>Dendroica cerulea</i>	*	*			*	*	
LT	LE	Small whorled pogonia	<i>Isotria medeoloides</i>	*					*	
LE	LE	Dwarf wedgemussel	<i>Alasmidonta heterodon</i>				*			
LE	NL	Harperella	<i>Ptilimnium nodosum</i>	<b>N</b>		<b>U</b>	<b>U</b>	<b>U</b>	<b>U</b>	<b>U</b>
NL	ST	Wood Turtle	<i>Clemmys insculpta</i>	*		*		*		
SOC	SC	Yellow lance mussel	<i>Elliptio lanceolata</i>	*		*	*	*	*	*
NL	SC	Green floater mussel	<i>Lasmigona subviridis</i>			*	*			
SOC	SC	Yellow lamp mussel	<i>Lampsilis cariosa</i>	*				*		
NL	SC	Northern saw-whet owl	<i>Aegolius acadicus</i>		*	*		*	*	*
NL	SC	Migrant loggerhead shrike	<i>Lanius ludovicianus migrans</i>					*		
NL	SC	Great egret	<i>Ardea alba egretta</i>	*		*	*		*	*
NL	SC	Purple finch	<i>Carpodacus purpureus</i>	*		*	*	*	*	*
NL	SC	Hermit thrush	<i>Catharus guttatus</i>	*	*	*	*	*	*	*
NL	SC	Brown creeper	<i>Certhia americana</i>	*	*	*	*	*	*	*
NL	SC	Northern harrier	<i>Circus cyaneus</i>	*	*	*	*	*	*	*
NL	SC	Alder flycatcher	<i>Empidonax alnorum</i>	*	*				*	
NL	SC	Golden-crowned kinglet	<i>Regulus satrapa</i>	*	*	*	*	*	*	*
NL	SC	Red-breasted nuthatch	<i>Sitta canadensis</i>	*	*	*	*	*	*	*

**TABLE 3-23: RARE, THREATENED, AND ENDANGERED SPECIES DOCUMENTED OR EXPECTED WITHIN THE STUDY AREA**

Federal Status	State Status	Common Name	Scientific Name	Documented	Expected	Fairfax Co.	Fauquier Co.	Loudoun Co.	Prince William Co.	Manassas
NL	SC	Dickcissel	<i>Spiza americana</i>	*		*	*	*	*	*
NL	SC	Winter wren	<i>Troglodytes troglodytes</i>	*	*	*	*	*	*	*
NL	SC	Barn owl	<i>Tyto alba pratincola</i>	*	*	*	*	*	*	*
NL	SC	Regal fritillary butterfly	<i>Speyeria idalia</i>	*			*	*	*	
NL	SC	Elusive clubtail dragonfly	<i>Gomphus notatus</i>	*				*		
NL	SC	Butternut	<i>Juglans cinerea</i>	*			*	*		
NL	SC	Bog bluegrass	<i>Poa paludigena</i>		*	*				
NL	SC	Auriculate false-foxglove	<i>Tomanthera auriculata</i>	*	*				*	

Source: VDGIF FWIS search conducted on June 12, 2003. Key: LE = Listed Endangered; LT = Listed Threatened; PT = Finding to Propose as Threatened; PDL=Proposed for De-listing; SOC=Federal Species of Concern; SC = State Special Concern (not a legal category); NL=Not Listed

Only 3 of the 11 Federal special concern species (Henslow's sparrow, brook floater mussel, and yellow lance mussel) have been documented in the 10-mile radius study area since 1980. Because these resources are also state-listed, Henslow's sparrow and the brook floater data are summarized in the following section.

The bald eagle has been documented in the study area, but the presence/location of nests or foraging areas around MNBP is not known. The USFWS issued a proposed rule to remove ESA protection to the bald eagle within the study area population, but a final rule has not yet been published. The cerulean warbler is currently being evaluated by the USFWS to determine if the proposed species listing as Federal threatened is warranted. On October 31, 2000, the USFWS found the 1999 petition contained information indicating there may be a need to list the bird as a candidate threatened species. Because of the uncertain outcomes regarding these listing actions, combined with positive verification that both species are known from the study area, both the bald eagle and cerulean warbler are tentatively considered protected species in this EIS analyses.

Small whorled pogonia (*Isotria medeoloides*) is documented within Prince William County outside the study area at Prince William Forest Park, on several sites along Powell's Creek and Cedar Run, and at Quantico Marine Corps Base in northern Stafford County. In 2001, Donna Ware conducted a survey at Bull Run Regional Park, just beyond the eastern terminus of the study area, with negative results. At present, no known populations of small whorled pogonia exist within the study area, but it is possible that the species exists in appropriate habitat within the study area.

Dwarf wedgemussel (*Alasmidonta heterodon*) is documented in northern Virginia in Stafford County and Fauquier Counties. It is not currently known to inhabit streams within Prince William County. However, the potential for dwarf wedge mussels exists within the study area since other similar Unionid mussels are found in

Prince William County waters (*i.e.*, brook floater and yellow lance), and the fact there are higher quality, second-order streams in undeveloped rural portions of the study area that were not surveyed for mussels in 1995-97 by DCR-DNH zoologists. However, unsuccessful searches for the dwarf wedge mussel were conducted in the study area region.

### State-Listed Species

State-listed species documented in the study area include 1 species of aquatic mollusk and 4 bird species. Several other species could be present (Table 3-18). According to the VDGIF Fish and Wildlife Information Service (FWIS) geographic database search report for the study area, two state-endangered animal species, the bald eagle and the brook floater mussel, have been documented as occurring within the FWIS-defined study area. The wood turtle, a threatened species, is known recently from Fairfax County in Cub Run (northeast of the study area), and is reported from Loudoun County, north of the study area near Ashburn and Lucketts. In addition, the state-threatened Henslow's sparrow (*Ammodramus henslowii*), upland sandpiper (*Bartramia longicauda*), and loggerhead shrike (*Lanius ludovicianus ludovicianus*) are known to inhabit the counties comprising the study area, but none of these birds are verified as resident to the MNBP or Bull Run Regional Park.

The brook floater (*Alasmidonta varicosa*) inhabits clean-running streams free of excess siltation, and prefers sandy to gravelly substrates. It is known to inhabit several reaches of Broad Run from the U.S. 28 crossing upstream to County Route 619 (Linton Hall Road), in Prince William County, and has been also found in Fairfax County, both within the Nokesville USGS quadrangle (VDGIF, 2003f). Within the study area, no new populations brook floater, and no live or fresh dead valves found in Broad Run or Bull Run sites found during 1995-1996 surveys. Specific sites where brook floater was surveyed by Roble (1998b), but not found recently include Broad Run (at Route 28 (two crossings), at County Route 692 and at Manassas Airport), Kettle Run (Route 646), Bull Run (at Sudley Church, at County 659), and Little Bull Run (at VA 234). Sites that were identified as potential candidate locations that were not surveyed include Little Bull Run (crossings at County Route 704 and 705) and Bull Run (at County Route 705).

Primary threats to populations wherever present is environmental degradation by erosion, siltation, and inadequate sewage treatment and contaminated upland runoff.

The wood turtle (*Clemmys insculpta*) is very rare in Virginia, with only 18 sites reported in Virginia and only two wood turtle records/reports in the VDNH-BCD database as of February 1990 for the vicinity of the study area. On-the-ground status of wood turtles in the study area is uncertain and poorly documented in the literature. Only Loudoun County areas north of Middleburg and well north of the study area and within small, protected parklands in eastern and northwestern Fairfax County (*i.e.*, Cub and Sugarland Runs) may represent the most suitable areas for intensive surveys. Viable populations of wood turtle may not exist in suburbanized and degraded habitats within Prince William, Manassas, Manassas Park and Fauquier County areas.

Henslow's sparrow (*Ammodramus henslowii*) is a rare transient in the Virginia piedmont, but is an uncommon transient and local summer resident in Loudoun County. The bird uses ground gleaning in grasses usually two or more feet in height, to forage for insects (summer) and seeds (winter), and it has a small (one to three acres) territory. Breeding distribution of Henslow's Sparrow in the United States and southern Canada, based on 1985-1996 Breeding Bird Survey data, did not include the study area counties, so a viable breeding population within the study area may not actually currently exist. Within the study area, Henslow's sparrow could inhabit savannah-like, open woods, neglected, idle, or abandoned agricultural fields and pastures, wet meadows, and occasionally may forage, but not nest or breed in dry, overgrown uplands adjacent to grasslands. NPS (1994)

and VDGIF (1995) reported that Henslow's Sparrow habitat could be present in MNBP, but the bird is not included in the Park's official checklist of birds, indicating no verified sightings or reports.

The upland sandpiper (*Bartramia longicauda*) has been documented in Prince William, northern Loudoun, Fauquier, and western Fairfax counties, where it is a rare transient or locally uncommon summer resident. Breeding populations within the general area are known from only northern Loudoun and Prince William Counties. The bird lives and breeds almost exclusively in a variety of mostly open agricultural areas, in habitats including grasslands, fallow and plowed cultivated fields, pastures, meadows, domestic hay fields, disturbed highway right-of-ways, and other types of open country. It is also known to breed near developed open areas such as airports, golf courses, institutional/educational/office campuses, and parklands. Its territory is large (20-30 acres). Like other declining grassland bird populations, the upland sandpiper is threatened by direct habitat loss or land use conversion.

The loggerhead shrike or butcher bird (*Lanius ludovicianus*) is an uncommon permanent native resident in the northern Virginia Piedmont region, where it is at its northern limit in the mid-Atlantic. Two subspecies, the resident form (*Lanius l. ludovicianus*) and the migratory southern form (*Lanius l. migrans*), are known from the region, and while distinguishable, most of the distributional records combine the two taxa. Only *Lanius l. ludovicianus* is known to breed in the Piedmont, (VDGIF, 2003e), where the birds is most vulnerable to population declines. The shrike inhabits open fields, meadows and farms where it can be seen perched on exposed places like wires, fenceposts, and treetops and it concentrates its hunting efforts in areas with extensive short grassland. Home range for these territorial birds varies between 4.6 and 12 hectares (11 to 30 acres). Populations, wherever they may occur, are in serious decline in the Virginia Piedmont primarily due to open field and fencerow habitat conversion and crop or field rotation processes. Loggerhead shrike has not been verified in the immediate study area and the distributional data in the literature do not indicate whether either of the subspecies has been recently observed (since 1986) within all counties surrounding the project area. Field investigations in 2003 suggest that suitable habitat for shrikes exists in the study area.

### 3.11.7 Special Jurisdictions

The following subsections describe resources within the study area that are regulated as special jurisdictions. These special jurisdictions include coastal zones, essential fish habitats, Chesapeake Bay preservation areas, wild and scenic rivers, agricultural and forestal districts, and invasive species management.

#### Coastal Zones

The Coastal Zone Management Act of 1972, as amended, enabled the Commonwealth of Virginia to develop programs that implement the policies of the Act. The Virginia Coastal Resources Management Program (CRMP) was established in 1986 to preserve, protect, develop, and restore coastal resources. The VDEQ serves as the lead agency in the network of agencies and coastal localities that administer the laws and policies regarding dunes management, wetlands management, subaqueous lands management, fisheries management, point and nonpoint source water pollution control, point source air pollution control, shoreline management; and coastal lands management.

The CRMP uses existing legislation and regulations to handle land use issues in the coastal zone. Federal agencies and applicants for Federal approvals and funding must consider and comply with the Virginia CRMP. Within the study area, the CRMP applies to all of Fairfax and Prince William Counties, including the Cities of Manassas and Manassas Park.

### **Essential Fish Habitats**

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (P. L. 104-267), requires all Federal agencies to consult with the National Marine Fisheries Service (NMFS) on all actions, or proposed actions, that are permitted, funded, or undertaken by the agency which may adversely affect essential fish habitat (EFH). EFH is not designated for any waterways within the project area.

### **Chesapeake Bay Preservation Areas**

The Chesapeake Bay Preservation Act of 1988, as amended, authorizes tidewater localities to develop and adopt local programs designed to protect water quality in the Chesapeake Bay and its tributaries. Fairfax and Prince William Counties established Resource Protection Areas (RPAs) to deal with development activities in environmentally sensitive areas of the Chesapeake Bay watershed. RPAs are lands at or near the shoreline that have intrinsic water quality value for ecological and biological processes, or that are sensitive to significant water quality degradation impacts. The RPA designation includes tidal wetlands, tidal shores, non-tidal wetlands that are connected by surface flow and contiguous to tidal wetlands or tributary streams, and a minimum 100-foot (30-meter) buffer landward along both sides of any tributary stream. Resource Management Areas (RMAs) designated by Fairfax County include floodplains, highly erodible soils, steep slopes, highly permeable soils, and non-tidal wetlands not designated in RPA zones.

In the Fairfax County portion of the study area, RPAs are located along Cub Run and its tributaries, including Elklick Creek, Big Rocky Run, Cain Branch, and Flatlick Branch, as well as Bull Run and its tributaries. RPAs are also designated along major streams and tributaries in Prince William County. **Figure 3-22** depicts the locations and extent of RPAs within the study area in Fairfax and Prince William Counties.

Public roads and appurtenant structures are conditionally exempt from Chesapeake Bay Preservation Act regulations as long as encroachment in the RPA is minimized and approved erosion and sediment control and stormwater management plans are implemented. Both types of resource protection plans will be developed for this project in accordance with the applicable state and local regulations.

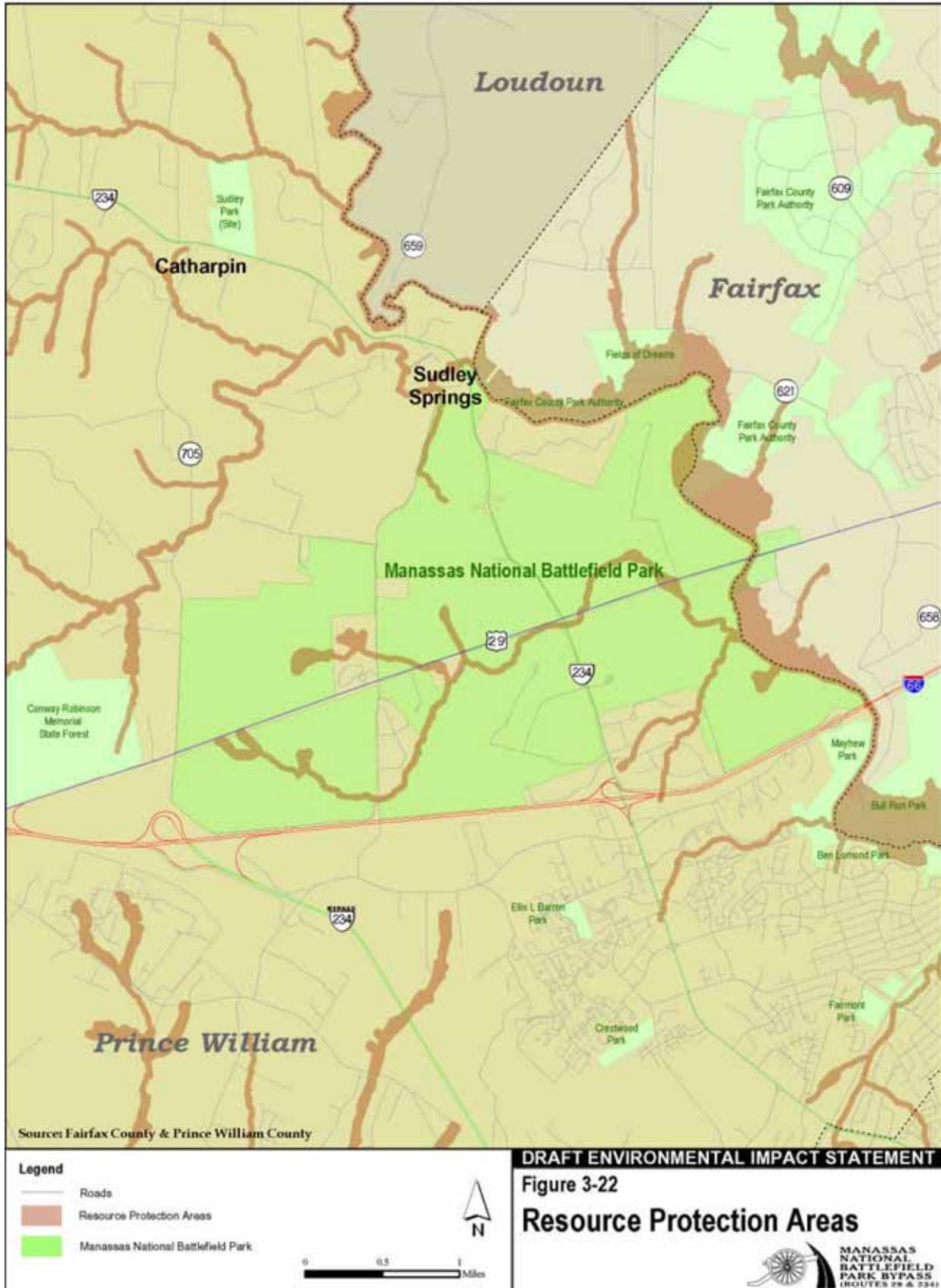
### **Wild and Scenic Rivers**

The Wild and Scenic Rivers Act of 1968 (Pub. L. 90-542 as amended; 16 U.S.C. 1271-1287) was enacted to preserve remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values along certain rivers or segments of rivers. The National Wild and Scenic River System program is intended to preserve the free-flowing condition of these rivers, in order to protect their water quality and promote the conservation of other resources. Eligible rivers or segments of rivers must be free of impoundments and be generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. There are no rivers in Virginia that have been designated as a National Wild and Scenic River.

In Virginia, the Scenic Rivers Act (§ 10.1-400 *et seq.* of the Code of Virginia) protects rivers or sections of rivers, including their shores and natural environs, which possess scenic, recreational, or historic attributes or natural beauty. There are no State Scenic Rivers designated within the study area. Within the Potomac River basin, portions of Goose Creek and Catoctin Creek are designated as Scenic Rivers.

### **Agricultural and Forestal Districts**

The Agricultural and Forestal Districts Act (Code of Virginia §§ 15.2-4300 through 15.2-4314) and the Local Agricultural and Forestal Districts Act (Code of Virginia §§ 15.2-4400 through 15.2-4407) were enacted in



1977 and 1982, respectively, to allow the creation of agricultural and forestal districts. These districts are intended to conserve and to encourage the development and improvement of the Commonwealth's agricultural and forestal lands for the production of food and other agricultural and forestal products. In addition, the districts conserve and protect agricultural and forestal lands as valued natural and ecological resources which provide essential open spaces for clean air sheds, watershed protection, wildlife habitat, as well as for aesthetic purposes (Code of Virginia, *op.cit.*).

Loudoun, Fauquier, Fairfax, and Prince William Counties all have designated agricultural and forestal districts. Additionally, the Virginia Department of Agriculture and Consumer Services (VDACS) has confirmed that there are protected agricultural lands located in the project area. Loudoun County and Fairfax County have agricultural and forestal districts located within the study area. Neither the City of Manassas nor the City of Manassas Park has any agricultural and forestal districts. The two agricultural and forestal districts located in Loudoun County within the study area are Supercal and Pretty Chicks. Both are part of Ticonderoga Farms, which includes a nursery and an agricultural preservation zone located east of Gum Spring Road (Route 659) and south of Braddock Road (Route 620). Ticonderoga Road crosses the two districts between Gum Spring Road and Braddock Road.

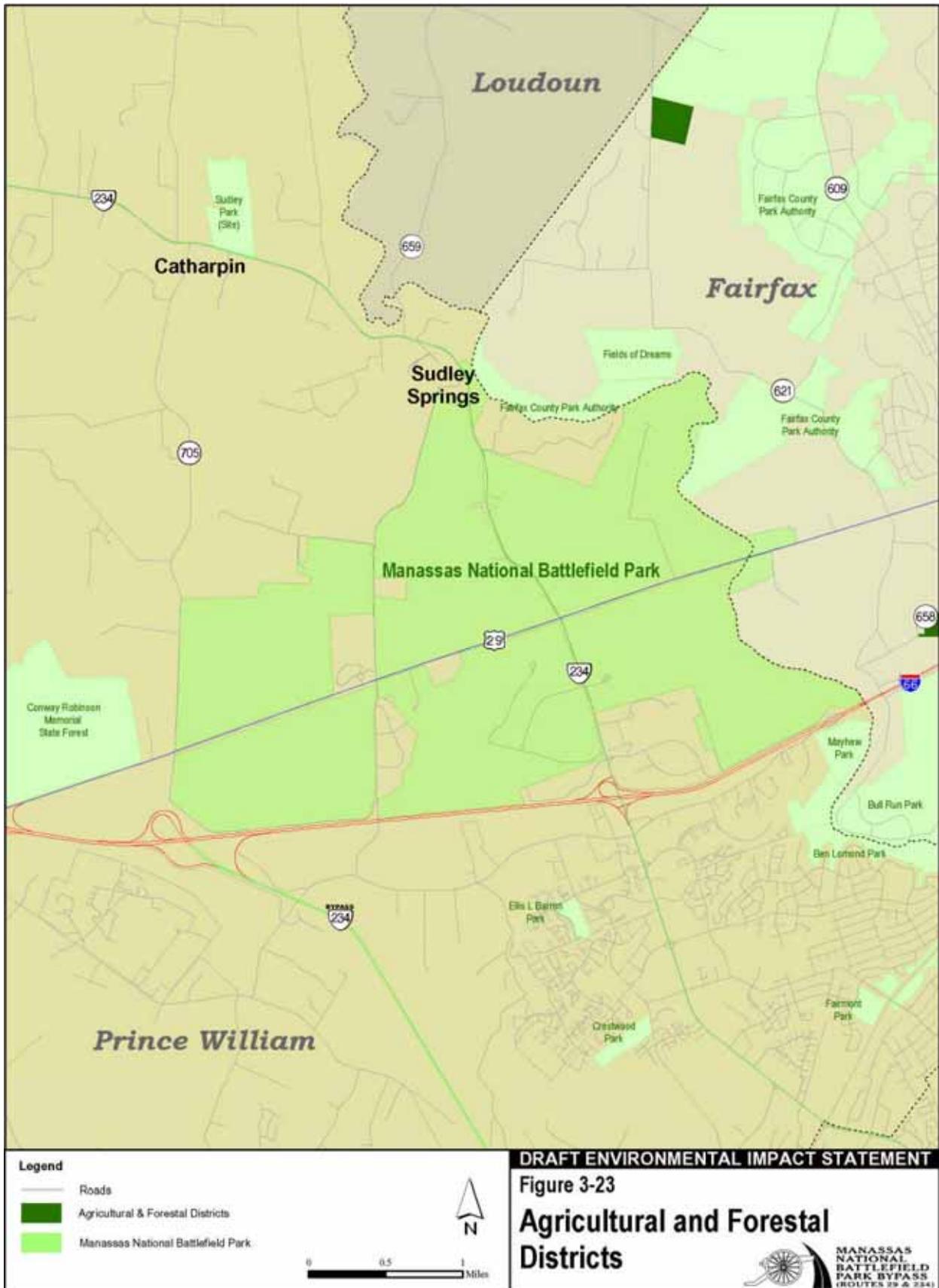
In Fairfax County, four agricultural and forestal districts are located within the study area. In combination, these districts occupy more than 450 acres of land. The largest of the four is approximately 272 acres in size and is located on both sides of Bull Run Post Office Road, just east of Manassas National Battlefield Park. Another district, encompassing 40 acres, is also located on Bull Run Post Office Road near the Loudoun County border. A 113-acre district is located west of the intersection of Braddock Road and Pleasant Valley Road. The smallest of the four districts is located between Compton Road and I-66. In Fairfax County, local agricultural and forestal districts are created and/or renewed for 8 years at a time, while most of the state districts are reviewed and/or renewed on a 10-year basis. Agricultural and forestal districts in the study area are depicted in **Figure 3-23**.

### **3.11.8 Prime Farmlands and Farmland Protection Policy Act of 1981 Compliance**

The USDA, through the NRCS Division, administers the Farmland Protection Policy Act of 1981 (FPPA), whose provisions minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses, and to assure that Federal programs are compatible with state, local, and private programs and policies to protect farmland.

Prime and Unique Farmlands are classified by NRCS according to soil type, physical condition, and management variables. The USDA defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oil seed crops, and is also available for these purposes. Prime farmland can be cropland, pastureland, forestland, or other land, but not urban land or water. Land designated as prime farmland has the soil quality, growing season, and moisture supply to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods.

Agency coordination included contact with appropriate NRCS District Conservationists and offices/departments of planning/GIS mapping in Fairfax, Prince William, and Loudoun Counties in order to ascertain the status and location of prime farmland soils and/or the presence and location of any unique farmlands, or farmlands of statewide or local importance for FPPA compliance. It was determined that there are 28 Prime and Unique Farmland soil series or named complexes within the study area. All of the soils considered prime farmland soils subject to FPPA compliance are summarized in **Table 3-24**.



**TABLE 3-24: PRIME FARMLAND SOIL**

Soil Name	County	Symbol	Number	Limitations/Remarks
Allegheny silt loam	Loudoun	N/A	94B	flooding, seasonal water table
Arcola silt loam	Prince William	N/A	4B	none
Bermudian silt loam	Fairfax	Bc	11	none
	Prince William	N/A	7A	none
Birdsboro silt loam	Fairfax	Bd	91B1/B2	eroded und. phase only
Bucks silt loam	Fairfax	Bn/Bo	71/72	eroded und. phase
Bucks loam				undulating phase
Buckhall loam	Prince William	N/A	10B	low strength
Comus silt loam	Loudoun	N/A	3A	flooding hazard
Croton silt loam	Fairfax	Ck	80A+/A1	drained phase only; hydric
Dulles silt loam	Prince William	N/A	17A	seasonal wetness, shrink-swell
Elsinboro sandy loam	Prince William	N/A	20B	seasonal wetness
Enon silt loam	Fairfax	Eg	69B2	eroded und. phase, asbestos
Fairfax silt loam	Fairfax	Fa	32B1/B2	fragipan present, perched water table
Goresville gravelly silt loam	Loudoun	N/A	95B	none
Haymarket silt loam	Prince William	N/A	28B	shrink-swell, erosion hazard
Jackland silt loam	Prince William	N/A	30B	severe shrink- swell, seasonal wetness (drained phases only)
Jackland-Haymarket complex	Prince William	N/A	31B	severe shrink- swell, seasonal wetness
Leedsville cobbly silt loam	Loudoun	N/A	70B/70C	stony
Legore-Oakhill complex	Prince William	N/A	33B	erosion hazard, low strength, shallow hard bedrock
Lloyd loam	Fairfax	Lc	66B1/B2	eroded und. phase
Manassas silt loam	Fairfax	Ma	14B	seasonal wetness
	Prince William	N/A	35B	seasonal wetness
Marumsclo loam	Prince William	N/A	37A	shrink-swell, low strength
Meadowville s. loam	Fairfax	Mp	20B	low strength
Meadowville loam	Prince William	N/A	38B	low strength
Middleburg silt loam	Loudoun	N/A	17B	seasonal water table

**TABLE 3-24: PRIME FARMLAND SOIL**

Soil Name	County	Symbol	Number	Limitations/Remarks
Montalto silty clay	Prince William	N/A	40B	severe shrink-swell, low strength
Panorama silt loam	Prince William	N/A	46B	shallow bedrock, reddish-brown
	Loudoun	N/A	71B	
Rowland silt loam	Fairfax	Rg	12	hydric
Sudley-Oatlands complex	Loudoun	N/A	76B	shallow bedrock
	Prince William	N/A	52B	shallow bedrock
Sycoline-Kelly complex	Prince William	N/A	53B	shrink swell, seasonal water table

Sources: Fairfax County NRCS Office, 2001 (NASIS Database); Department of Public Works and Env. Services, 2001; Loudoun County Cooperative Extension Office, 1998; Elder, 1989.

### 3.12 HAZARDOUS MATERIALS

Hazardous substances include materials that pose a threat to human health and or the environment. These wastes are generated as residues or byproducts of industrial, institutional, or residential activities that can pose a substantial or potential hazard to human health or the environment when mismanaged. Federal, state and local agency database was reviewed to determine locations in the general study area where hazardous materials-related activities were reported. Federal and state databases searched included:

- Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), July 2001.
- National Priority List (NPL), July 2001.
- Resource Conservation and Recovery Act Information Systems (RCRIS), June 2000.
- Large Quantity Generators (LQG), June 2000.
- Small Quantity Generators (SQG), June 2000.
- Treatment, Storage & Disposal Facilities (TSD), June 2000.
- Corrective Action Reports (CORRACTS), June 2000.
- Emergency Response Notification System (ERNS), December 2000.
- State Active Voluntary Remediation Program Sites (SCL), January 2000.
- Solid Waste Disposal Facilities/Landfill Sites (SWLFs), September 2000, July 2001.
- Industrial landfills (SWLF), September 1998.
- Underground Storage Tanks (UST),
- Leaking Underground Storage Tanks (LUST), including Active Recovery Sites, VDEQ regional (PIED and NR) LUST lists, Piedmont Region LUST lists, and Inactive Archive, February 1999-August 2001.
- Above Ground Storage Tanks (AST), August 2001.
- Virginia Pollution Compliant Database (SPILLS), including Incident Response Archives, Northern Region PREP Database, March 1994-August 2001.

Many of the mapped hazardous materials sites are concentrated along or near major roadways are storage tanks at gas stations and convenience stores that sell automotive fuel. Numerous sites represent reported incidents associated with regulated waste generation, storage or disposal activities on public properties. Several private property entries were documented, but the majority is not located near any of the alternatives. Of these 402 records within the preliminary study area, only 4 were identified as possible Oil Hazardous Materials (OHM) source sites on each of the candidate build alternatives. These 4 sites represent locations with the highest potential risk of project area contamination from OHM sources. Locations of hazardous waste sites are illustrated in **Figure 3-24**. Many of these sites, particularly those within the boundaries of The Park, once investigated would likely be found to no longer be hazardous.

Ten additional sites with potential OHM contamination sources were observed within Candidate Build Alternatives alignments during field reconnaissance. None of these identified sites were identified in the records search. Eight other small sites, representing additional, but minor environmental risk sources (promiscuous dumps or OHM storage areas), were also identified during field reconnaissance. The eight minor sites are not considered significant public health risks based on their transient nature, the relative age, type and weathering of materials found, and/or the ability for each site to be eliminated as an environmental threat using proper disposal methods prior to, or during construction.

