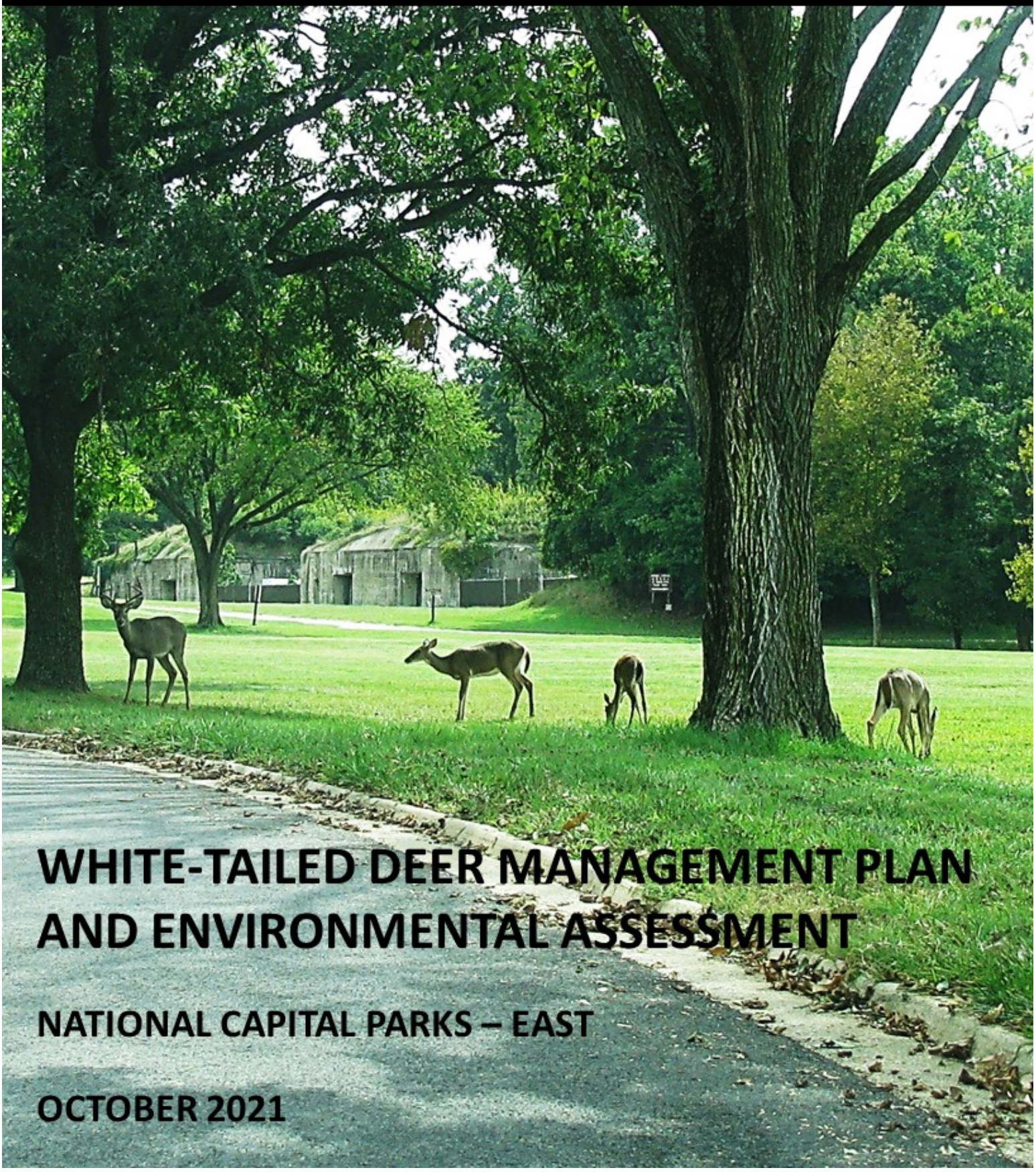
National Park Service
U.S. Department of the Interior

National Capital Parks – East



WHITE-TAILED DEER MANAGEMENT PLAN AND ENVIRONMENTAL ASSESSMENT

NATIONAL CAPITAL PARKS – EAST

OCTOBER 2021

Note to reviewers and respondents: Comments on this Deer Management Plan and EA may be submitted electronically at https://parkplanning.nps.gov/documentsOpenForReview.cfm?projectID=102432&parkID=428

You may mail written comments by November 5, 2021, to:

Superintendent
Attn: Deer Management Plan and EA Comments
National Capital Parks – East
1900 Anacostia Drive, SE
Washington, DC 20020

Before including personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

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ACRONYMS AND ABBREVIATIONS

APE	Area of Potential Effects
CCC	Civilian Conservation Corps
CFR	Code of Federal Regulations
CLI	Cultural Landscape Inventory
CLR	Cultural Landscape Report
CWD	Chronic Wasting Disease
DC	District of Columbia
DC HPO	District of Columbia Historic Preservation Office
DDOT	District Department of Transportation
DOEE	District Department of Energy and Environment
EA	Environmental Assessment
EIS	Environmental Impact Statement
IPaC	Information for Planning and Consultation
MD DNR	Maryland Department of Natural Resources
MDOT	Maryland Department of Transportation
MHT	Maryland Historical Trust
MIHP	Maryland Inventory of Historic Properties
M-NCPPC	Maryland – National Capital Park and Planning Commission
NCPC	National Capital Planning Commission
NCRN	National Capital Region Network
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
National Register	National Register of Historic Places
US	United States

USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service

PURPOSE AND NEED

The National Park Service (NPS), in cooperation with the District of Columbia Department of Energy and Environment (DOEE), proposes to implement a White-tailed Deer Management Plan (Plan) for several park units administered by National Capital Parks – East in Washington, DC, and Anne Arundel, Prince George's, and Charles counties in Maryland. The plan would guide future actions to manage white-tailed deer (*Odocoileus virginianus*) populations within National Capital Parks – East for at least the next 20 years. Implementation of the proposed Plan would manage deer populations to promote natural regeneration of forest vegetation and the restoration of cultural landscapes that have been detrimentally affected by deer overbrowsing. Deer management implementation areas are proposed within National Capital Parks – East at the following parks units. The locations of these parks within the region are provided on Figure 1.

Washington, DC

- Anacostia Park and Kenilworth Park and Kenilworth Aquatic Gardens
- Civil War Defenses of Washington Parks: Fort Dupont, Fort Davis, Fort Mahan, Fort Chaplin, Fort Stanton, Fort Ricketts, and Shepherd Parkway, including Fort Greble and Battery Carroll
- Oxon Run Parkway

Maryland

- Baltimore-Washington Parkway
- Greenbelt Park
- Suitland Parkway
- Oxon Cove Park*, including Oxon Hill Farm and Bald Eagle Hill
- Civil War Defenses of Washington Parks: Fort Foote Park
- Harmony Hall
- Fort Washington Park
- Piscataway Park, including Marshall Hall

  * Note – A portion of Oxon Cove Park, including Bald Eagle Hill, is within Washington, DC

The NPS prepared this Plan and Environmental Assessment (EA) to assess the potential environmental impacts of implementing white-tailed deer management activities at National Capital Parks – East in accordance with the National Environmental Policy Act (NEPA) (42 United States Code (USC) § 4332) and the Council on Environmental Quality implementing regulations effective September 14, 2020 (40 Code of Federal Regulations (CFR) §§ 1500-1508); US Department of the Interior NEPA regulations (43 CFR 46); NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-Making* (NPS 2011a); and the NPS NEPA Handbook (NPS 2015).

Figure 1. Parks where deer management is proposed within National Capital Parks – East

Purpose of and Need for Action

The purpose of the proposed action is to develop a white-tailed deer management strategy that supports long-term protection, preservation, and restoration of native vegetation and cultural landscapes within parks administered by National Capital Parks – East.

This Plan is **needed** because an overabundance of deer dominates the park's ecological systems, degrading vegetation and the habitats of other native wildlife. Deer overbrowsing causes unsustainable degradation of the parks' forests and natural resources that are important character-defining elements that contribute to the significance of cultural landscapes.

White-tailed deer are considered a significant stressor on forests of the National Capital Area. White-tailed deer densities throughout eastern deciduous forests increased rapidly during the latter half of the 20th century and are now at historically high levels. Deer populations in National Capital Parks – East are adversely affecting native forest vegetation and other wildlife. Deer browse on seedlings (young plants) in the understory of the forest. Without seedlings, there will not be young trees to replace the forest overstory if the overstory is removed by natural causes (e.g., wind, fire, disease, etc.) (Bates 2018).

Removal of the forest understory also potentially alters soil moisture levels, and deer can trample ephemeral ponds and create trails that can lead to erosion (Pauley et al. 2005). Deer preferentially browse native plants, allowing for the spread of nonnative invasive plants in areas where native vegetation is reduced. Invasive species create changes in habitat structure and composition of vegetation communities that can affect nutrient cycling, water resources, and habitat quality for wildlife (Walsh et al. 2016). Removal of the forest understory also affects the habitat of small mammals and forest nesting birds resulting in reductions in the populations of these species (Bates 2018).

Figure 2. Trees showing deer browse line at Fort Washington Park

National Capital Parks – East manages a variety of cultural landscapes consisting of historic, scenic, and natural resources. Many of these landscapes include forests and other natural plant communities, farms, orchards, and individual plants that are being adversely affected by deer. Distinct deer browse lines are evident within many of the National Capital Parks – East park units. These browse lines are a visual indication of the effects deer have on the forest components of cultural landscapes. Deer browse lines are most conspicuous at the forest edge, as shown on Figure 2, but also extend into the forest interior and up to 6 feet from the ground.

Research shows that deer densities of less than 20 per square mile (8 per square kilometer) are needed to allow for sufficient forest regeneration and that deer densities greater than 20 per square mile results in a decrease in many tree species (Horsley et al. 2003). Today, deer populations exceeding 20 deer per square kilometer (52 deer per square mile) are commonplace throughout

National Capital Parks - East (Bates 2018). NPS and DOEE conducts deer surveys at Greenbelt Park, Piscataway Park, and Fort Washington Park in Maryland, and at Fort Dupont in Washington, DC. These surveys consistently show deer densities substantially greater than the sustainable density of 20 deer per square mile.

Issues and Impact Topics Retained for Detailed Analysis

The NPS determined that the following issues and impact topics identified during scoping warranted further consideration and are therefore retained for detailed analysis in this EA.

Vegetation

Deer overabundance is affecting forest regeneration at National Capital Parks – East and is compromising efforts to restore the abundance, distribution, structure, and composition of native plant communities. Research shows that deer overbrowsing reduces understory diversity and promotes the growth of less desirable species. Deer overabundance can also indirectly affect the prevalence of nonnative invasive plants. These issues are analyzed under the *Vegetation* impact topic.

White-Tailed Deer

Deer are an important resource at National Capital Parks – East, but population surveys indicate an overabundance of deer that are affecting plants and other wildlife. Proposed management strategies are aimed at promoting a deer population that remains a dynamic component of a functioning ecosystem and not a main stressor. Maintaining a viable deer population includes the need to develop a strategy to respond to Chronic Wasting Disease (CWD) if observed in an individual or within a population. These issues are analyzed under the *White-Tailed Deer* impact topic.

Terrestrial Wildlife and Habitat

Studies link deer overabundance to a corresponding decreased density of other wildlife species, such as forest nesting birds and small mammals. Also, deer overbrowsing can alter habitat and decrease the heterogeneity of plant communities. Over the long-term, implementation of the proposed Deer Management Plan would be expected to promote forest regeneration and improve habitat. These issues are analyzed under the *Terrestrial Wildlife and Habitat* impact topic.

Cultural Landscapes

National Capital Parks – East consists of several NPS-designated cultural landscapes, and Cultural Landscape Inventories (CLI) identify features, such as vegetation, circulation, views and vistas, topography, natural systems and features, and structures, that contribute to the significance of these cultural landscapes. Any restoration efforts planned by NPS within cultural landscapes would be compromised by the current overabundance of deer. Implementation of the proposed Deer Management Plan would promote natural regeneration of park vegetation to more closely represent the plant communities that were present historically. These issues are analyzed under the *Cultural Landscapes* impact topic.

Visitor Use and Experience

Deer management activities would occur at night when most park amenities are closed to the public. However, deer management would require park areas such as the Greenbelt Park campground and some park roadways to be closed to the public for temporary periods, which could result in disruptions to visitor use and experience. These issues are analyzed under the *Visitor Use and Experience* impact topic.

Human Health and Safety

Implementation of the proposed Deer Management Plan would need to be conducted in a manner that is safe for park visitors, neighbors, and employees. In the eastern US, deer, along with other mammals, are hosts for ticks which are associated with 11 tick-borne diseases including Lyme disease. Also, vehicle collisions with deer can occur more frequently when local deer population density is high. Reduced deer densities would potentially result in an associated reduction in host animals for ticks, as well as deer-vehicle collision occurrences. These issues are analyzed under the *Human Health and Safety* impact topic.

Issues and Impact Topics Dismissed from Detailed Analysis

The following issues and associated impact topics have been dismissed from detailed analysis for the reasons provided.

Water Resources

An overabundance of deer within National Capital Parks – East may be resulting in localized water quality degradation from the loss of vegetative cover due to overbrowsing, and the potential for soil erosion and sedimentation along deer trails near streams and wetlands. However, it would be difficult to discern which impacts would be directly attributable to deer and which impacts would be associated with other sources. A reduced deer population density could result in slight water quality improvements as these potential impacts would be reduced. Implementation of the proposed Deer Management Plan would not require construction-related ground disturbance that would have the potential to cause erosion and sediment transport to streams or wetlands within National Capital Parks – East. Therefore, *Water Resources* was dismissed from further analysis.

Federally Listed Species

Federally listed species identified through consultation with the United States Fish and Wildlife Service (USFWS) would not be anticipated to be affected by deer management activities. Listed species with the potential to occur within National Capital Parks – East include the northern long-eared bat (*Myotis septentrionalis*) and the yellow lance mussel (*Elliptio lanceolata*). No federally threatened or endangered plants were identified. Because there are no known bat hibernacula within National Capital Parks – East, there would be no impacts to northern long-eared bats because proposed deer management activities would occur during the late fall and winter months when bats are hibernating outside the park. Anticipated regeneration of native tree species would benefit bats in the parks by improving summer roosting habitat. Implementation of the proposed Plan would not result in impacts to the yellow lance mussel because there are no known occurrences of the mussel

in National Capital Parks – East, and no in-water or ground disturbing activities would occur that could cause the discharge of sediment or other pollutants into waters where the mussel may be present. Therefore, *Federally Listed Species* was dismissed from further analysis.

Archaeological Resources

Implementation of the proposed Deer Management Plan would not require construction that would disturb intact soils where potential archaeological resources may be present. If not processed for donation or left on the surface to decay or be scavenged, deer entrails (internal parts) would be buried at locations within the parks where archaeological resources are known too not be present. Impacts on archaeological resources within National Capital Parks – East would be avoided; therefore, *Archaeological Resources* was dismissed from further analysis.

ALTERNATIVES

This EA analyzes the no-action alternative and the proposed action for white-tailed deer management within National Capital Parks – East. The elements of these alternatives are described in detail in this chapter. Impacts associated with the actions proposed under each alternative are outlined in "Chapter 4: Environmental Consequences." In addition, several strategies for deer management were dismissed from further consideration, which are described in this chapter under "Alternatives Considered but Dismissed."

It should be noted that much of the information used to develop the proposed alternatives for the White-Tailed Deer Management Plan developed for National Capital Parks – East was taken in part from other compliance documents completed in the National Capital Area, including White-Tailed Deer Management Plans prepared for Catoctin Mountain Park (NPS 2008), Rock Creek Park (NPS 2011b), Antietam and Monocacy National Battlefields and Manassas National Battlefield Park (NPS 2014b), and the Chesapeake and Ohio Canal and Harpers Ferry National Historical Parks (NPS 2017b). NPS regional staff involved in the preparation of this Plan, many of whom also participated in the planning of the Chesapeake and Ohio Canal and Harpers Ferry National Historical Park White-Tailed Deer Management Plan and EA, deemed much of the National Capital Region Network (NCRN) Inventory and Monitoring data and information to be relevant for National Capital Parks – East, particularly as it relates to the procedures and practices of deer management.

No-Action Alternative

Current management actions would continue under the no-action alternative. Deer population density and composition would continue to be monitored using spotlight surveys, conducted as part of distance sampling, and digital trail cameras. NPS would continue to conduct spotlight surveys at several National Capital Parks – East park units. DOEE would assist with these surveys within the District of Columbia. The locations and level of effort for these surveys could change over time depending on staffing, funding, or data needs. Forest survey plots would also continue to be used as part of the NPS Inventory and Monitoring Program to assess the effects of deer overbrowsing on forest regeneration.

NPS would continue to monitor for CWD in accordance with NPS Director's CWD Guidance Memorandum (NPS 2002) and the NPS Manager's Reference Notebook to Understanding Chronic Wasting Disease (NPS 2012). CWD is a transmissible neurological disease of deer that produces small lesions in the brains of infected animals that consequently results in death. Deer affected by CWD show loss of body condition and changes in behavior. Affected animals may demonstrate a variety of behavioral signs, including decreased fear of humans and isolation from other deer. Excessive drinking, urination, salivation, and drooling are common in the terminal stages (NPS 2017b). Although CWD has not been observed within the deer populations of National Capital Parks – East, the NPS continues to track known occurrences within the region and to monitor deer within the parks for possible signs of CWD during population density surveys. The nearest documented occurrence of CWD was found in 2020 in Loudon County, Virginia, less than 60 miles from the National Capital Parks – East parks (Virginia Division of Wildlife Resources 2021).

The NPS would continue to conduct opportunistic surveillance and sampling for CWD in deer found dead within the National Capital Parks – East. To date, National Capital Parks – East has collected one deer through opportunistic surveillance at Fort Washington that tested negative for CWD in January 2016. If a deer is exhibiting clinical signs consistent with CWD, the park would perform targeted surveillance, which involves lethal removal and testing. If there were positive test results from deer in or near the parks, National Capital Parks – East would coordinate with the NPS Washington Office – Biological Resources Division regarding increased surveillance and methods, sample sizes, testing, and results. Test results, whether positive or negative, would be provided to MD DNR and DOEE. If there were no positive results, NPS would continue to conduct opportunistic surveillance depending on the proximity of the nearest positive case to the parks. Any deer confirmed with CWD would be disposed of in accordance with NPS Public Health Service disposal guidelines, and NPS would coordinate with MD DNR and/or DOEE as appropriate. Carcasses that are CWD negative would either be allowed to decompose in place for ecological benefits or would be disposed of using traditional methods (i.e., on-site burial in previously disturbed areas, away from any visitor use areas, or in offsite landfills), depending on the circumstances (location, number of carcasses, etc.).

The NPS would continue to track research related to deer management, including the outcome of actions being taken in neighboring jurisdictions, and the latest research on various deer management methods, including non-lethal actions such as reproductive control. No actions would be taken to reduce the deer population within National Capital Parks – East or the effects of deer overbrowsing on forest regeneration and cultural landscapes.

White-Tailed Deer Management (Proposed Action and NPS Preferred Alternative)

Several national parks of Interior Region 1, in which the National Capital Area and National Capital Parks – East are located, have implemented adaptive management of white-tailed deer. White-tailed Deer Management Plans and associated EAs and Environmental Impact Statements (EIS) have been completed and are implemented at Gettysburg National Military Park, Eisenhower National Historic Site, and Valley Forge National Historical Park in Pennsylvania; Catoctin Mountain Park, Antietam National Battlefield, and Monocacy National Battlefield in Maryland; Manassas National Battlefield Park in Virginia; Rock Creek Park in Washington, DC; Harpers Ferry National Historical Park in Maryland and West Virginia; and Chesapeake and Ohio Canal National Historical Park, which consists of land in Maryland, Washington, DC, and West Virginia. Each of the parks use lethal deer management (i.e., sharpshooting) to reduce the deer population. No National Capital Area parks are currently using reproductive controls for deer management because no effective reproductive control agents are available that meet NPS-established criteria. The management plans, EAs, and EISs for these parks, along with lessons learned through implementation of these plans, was used in development of the proposed action for this Plan.

The proposed action includes the continuation of the current management actions described under the no-action alternative to document deer population density, monitor forest regeneration, and conduct opportunistic surveillance of the deer population for CWD. In addition to the continuation of these activities, the proposed action includes using lethal deer management actions to reduce the

deer population at National Capital Parks – East to a sustainable level with the primary goal of promoting forest regeneration in support of natural ecosystems and cultural landscapes.

Number of Deer Removed

Deer population survey data collected since 2010 at Greenbelt Park, Piscataway Park, and Fort Washington Park averaged 151, 67, and 168 deer per square mile, respectively. Deer population data collected from 2019 to 2020 in Fort Dupont, Kenilworth Park and Kenilworth Aquatic Gardens, Anacostia Park documented an average of 199.5 deer per night with a density of 62.4 to 175 deer per square mile deer per square mile (DOEE 2019, 2020). Under the proposed action, the number of deer to be removed annually would be determined based on recent population surveys and an initial deer density goal of 15 to 20 deer per square mile, as well as past and current experience of other deer management programs, technical feasibility, and success of forest regeneration in later years of plan implementation. However, this goal may be adjusted based on the results of vegetation and deer population monitoring. The NPS would determine if management actions are warranted on an annual basis based on the latest survey data for the implementation areas.

It is estimated that the desired deer density goal could be reached at National Capital Parks – East in approximately 5 to 10 years, though the timeframe would likely vary depending on the implementation area(s). This estimate is based on the technical, financial, and logistic feasibility of deer removal, and park deer populations' continued reproduction and immigration. Implementation areas could occur in the parks listed in the *Purpose and Need* chapter of this EA and would be adjusted from year-to-year based on need. Maps of implementation areas where controlled harvest programs would occur are included in Appendix A. Implementation areas would be reviewed in the field by NPS and adjusted, as necessary, prior to deer removal actions.

Sharpshooting

Lethal reduction of the deer population would be accomplished by sharpshooting by highly trained firearms experts experienced in conducting wildlife reduction operations. Sharpshooting would occur at night (between dusk and dawn) during the fall and winter months.

Sharpshooters would use high-powered, small-caliber rifles at close range in most of the implementation areas. Non-lead ammunition would be used to avoid contamination of the meat and potential intake by scavenging wildlife. Infrared heat scanners and night vision googles would be used to identify deer. Noise suppression devices would be used to reduce disturbance to the public. Additional safety measures include working away from populated areas and with safety buffers from the park boundary; temporarily closing roads; requiring commuters, including cyclists, to use alternate routes; stationing NPS personnel at closures; enforcing nighttime trail closures; posting signs on closed trails/roads and bulletin boards; coordinating with other law enforcement agencies, such as working with US Park Police and the Maryland-National Capital Park and Planning Commission (M-NCPPC) Park Police; using elevated positions to provide downward angled shots; always shooting toward the interior of the park; and using ammunition with a shorter travel distance. Lethal deer management activities would be conducted in compliance with NPS directives related to firearm use in parks and relevant firearm laws and regulations. Every effort would be made to make lethal deer management conducted in any form as humane as possible.

Experienced sharpshooters with the necessary qualifications, as determined by NPS, would be the primary method used for lethal removal activities. In areas where use of firearms is not appropriate due to safety or security concerns, the use of archery, or capture and euthanasia, would be considered as possible options in very limited circumstances and on a case-by-case basis. Sharpshooters would be certified in firearms training, specially trained in wildlife reduction, and would be required to pass a proficiency test to qualify to participate in reduction activities. Sharpshooters would also be provided park-specific safety training necessary to protect NPS personnel and visitors. In addition to shooting deer, the sharpshooters would locate, field dress the deer, and, if applicable, process the animals for meat donation.

Lethal removal activities would also allow for targeted surveillance and sampling for CWD by directing sharpshooters to shoot deer that appear ill or that are exhibiting clinical signs consistent with CWD. If CWD is confirmed within the deer population, the NPS would follow established CWD protocols, which may include focusing deer population density reduction efforts in the vicinity of any suspected or confirmed CWD cases, and evaluating if modified deer management strategies are warranted, such as further decreasing the desired deer density goal to reduce the possible spread of the disease.

Skilled volunteers may be considered as authorized agents for lethal removal activities. The use of skilled volunteers, as identified in an annual operations plan, would be subject to regional review and written concurrence of the Regional Director. If approved, the use of skilled volunteers would be at the park's discretion during any given year of implementation. Those skilled volunteers that qualify for participation would become part of a pool of available personnel that may supplement deer management teams. Skilled volunteers would be required to demonstrate through an NPS-application process the knowledge, skills, and abilities in the use of firearms and field dressing of animals. Skilled volunteers also would demonstrate a passing qualification with NPS-assigned firearms, be trained in NPS-specific deer operational and processing procedures and pass federal security screening. NPS would document a system of training and application for skilled volunteers. The Park would develop specific guidelines for firearms and archery use and would incur costs to develop volunteer training and provide supervision of volunteer performance.

Bait stations may be used to attract deer to safe removal locations that would consist of automated corn feeders or piles of corn, small grains, apples, hay, or other food attractants on the ground. Automated feeders and any unconsumed bait would be removed from affected areas once culling operations are completed. The stations would be placed in park-approved locations away from public use areas to maximize the efficiency and safety of the reduction program. The amount of bait placed in any one location would vary depending on the bait used and the number of deer in the immediate area.

The NPS would develop annual operations plans for deer management that would define the implementation areas, how lethal reduction activities would be conducted in those areas, that year's goals for removal, and plans for the disposition of the deer (donation of meat and/or disposal of waste or carcasses). The plans would also contain measures to ensure safety, including, but not limited to, timing, park closures, required staff, location maps of park neighbors, and other public information.

Disposal

The NPS may donate deer meat (e.g., to local charitable organizations, nonprofit food banks) as permitted by regulations and NPS guidelines (NPS 2012). If meat were suitable for donation, the animals would be field dressed in the parks by experienced sharpshooters. The entrails would be buried on-site in previously disturbed areas away from any visitor use areas or, if the location were particularly remote, entrails could be left on the surface to decay or be scavenged. If onsite disposal is not appropriate, remains would be taken to an offsite landfill.

NPS would follow current guidance from the NPS Office of Public Health and the Washington Office – Biological Resources Division regarding donation of meat from areas affected by CWD, in addition to state and local requirements. Because the parks are within 60 miles of a known CWD case, CWD testing would be conducted to the extent needed to have 99% confidence that CWD is not present at more than 1% prevalence (NPS 2012) before any carcasses are considered for donation. Field dressed animals would be stored in a refrigerated unit until any required CWD testing results are obtained and then transported to a butcher for processing.

If NPS is unable to donate the meat, they may place deer carcasses in remote portions of the parks away from roads and trails to naturally decompose or to be scavenged. Any deer carcasses that are not suitable for consumption or for surface disposal would be disposed of at an approved local landfill or other disposal facility that accepts deer carcasses.

Monitoring

Deer population numbers would be monitored through the ongoing monitoring efforts discussed under the no-action alternative. The parks would use distance sampling, wildlife cameras, or other methods to document trends in population size. NPS would also document the estimated age and gender of all deer removed from National Capital Parks – East to aid in defining the local population composition and to compare with composition data collected during park population surveys.

Vegetation monitoring is conducted by the NCRN to document any changes in forest regeneration that might result from a reduced deer population. Deer removal efforts would be maintained if park objectives are being met and forest regeneration is occurring successfully at initial deer density goals. However, it is anticipated that it would take up to 10 years for seedling numbers to respond to lower deer numbers, and this response would depend directly on how quickly the population is reduced. Likewise, the number of deer to be removed in subsequent years would be adjusted based on the success of previous removal efforts, projected population size, and vegetation and deer monitoring results. Park management could adjust the removal goal in either direction of the initial deer density goal depending on how well the parks' forest regeneration objectives are being met.

Opportunistic and targeted surveillance and sampling for CWD would be conducted on an ongoing basis, as well as population health monitoring to assess kidney fat, tissues toxicity, and parasite loads. The NPS would collaborate with DOEE and the Maryland Department of Natural Resources (MD DNR) to develop cohesive strategies to monitor and survey for CWD across jurisdictional boundaries if cases of CWD are confirmed in the vicinity of National Capital Parks – East.

Alternatives Dismissed from Further Consideration

The NPS objectively evaluated a reasonable range of both lethal and non-lethal alternatives for deer management within National Capital Parks – East. Numerous strategies have been evaluated by NPS to control free ranging deer populations without the use of sharpshooting; however, at the time this Plan and EA is being developed there are no known non-lethal controls that are effective, as well as feasible, for National Capital Parks – East to implement. The NPS would consider implementing non-lethal controls in the future that are deemed effective and feasible in combination with lethal controls or as part of a deer population density maintenance strategy.

A brief statement of the rationale for dismissal is provided below for each alternative deer management strategy considered but dismissed. Deer management strategies evaluated by NPS but dismissed from further consideration include:

Large-Scale Exclosures – The NPS considered the use of fencing to exclude deer from the implementation areas to allow for forest regeneration. A large deer exclosure is defined as a fenced area of 1 or more acres constructed for the purpose of excluding deer from entering. Fencing would need to be at least 8-feet high to prevent deer from jumping over the fencing. It was determined that large-scale exclosures would not be feasible due to the staff installation and maintenance that would be required to protect the large, forested areas within National Capital Parks – East and due to the potential impacts of placing fencing throughout cultural landscapes.

Electronic Fencing – The NPS considered electronic fencing for deer exclusion but dismissed the option due to visitor safety concerns, the reduced staff capacity for installation and maintenance that would be required, the need to install and maintain a power source for the fences in potentially inaccessible areas, and due to the ineffectiveness of the fence with adult deer being typically able to jump over the fencing.

Reproductive Control – The NPS considered but dismissed the use of surgical and nonsurgical reproductive control of both does and bucks due to issues related to effectiveness, animal treatment and long-term deleterious behavioral effects, and the cost, staff time, and management that would be required. Surgical control includes sterilization, while nonsurgical controls include the use of chemical reproductive control agents (i.e., immunocontraceptives) and contragestives.

The use of immunocontraception is complex because of timing of the application, the number of does that would need to be treated, the need to trap the deer to administer the first dose, and the need for consistent administration of subsequent doses and tracking of doses for each individual deer.

Contragestives were dismissed due to the need to trap does while they are pregnant on an annual basis, as well as timing of the application and the potential harm to the doe if administered too late in the pregnancy. Surgical sterilization was also dismissed due to the number of does and/or bucks that would need to be trapped and treated and the labor required to manage surgical sterilization particularly for does, stress to the animals, and long-term effects on population genetics and behavior.

NPS determined that reproductive control agents for does would be considered feasible when the following criteria are met:

1. The reproductive control agent is federally approved for application to free-ranging populations.

2. The agent provides multiple year (more than 3 years) efficacy. Studies show that the success of reproductive control agents to manage deer populations depends on multi-year persistence of the agent and that without multi-year efficacy, culling is more efficient (Hobbs, Bowden, and Baker 2000).

3. The agent can be administered through remote injection to reduce the frequency of stressful capture and/or drug delivery operations. Capture would be necessary for the initial application because the animals would need to be marked, but the agent should be able to be delivered remotely for any subsequent doses.

4. The agent would leave no residual in the meat (meat would be safe for human consumption).

5. There is substantial proof that the agent can be successful in reducing a free-ranging deer population based on scientific review. At this time, no study demonstrated that reproductive controls work to reduce deer numbers in free-ranging populations to the extent needed at the parks to allow for forest regeneration.

To date, no reproductive control agents are currently available that meet all these criteria. There is an agent available that meets criteria 1 and 4. This agent is federally approved for application to free-ranging populations and leaves no residual in the meat (meat would be safe for human consumption). However, agents are not available that also meet criteria 2, 3, and 5.

NPS would review the status of ongoing reproductive control research on a periodic basis through consultation with subject matter experts and review of new publications. When there are advances in technology that could benefit deer management in the parks, the choice of an appropriate agent would be determined based on how well the criteria were met, availability, cost, efficacy, duration, safety, and feasibility.

Managed / Public Hunting – The NPS considered managed/public hunting to control the deer population. However, public hunting is inconsistent with existing laws, policies, and regulations for National Capital Parks – East and all other units of the national park system where hunting is not authorized and was therefore dismissed from consideration.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment, which is intended to document existing environmental conditions and serves as a baseline for understanding the resources that could be impacted by implementation of the proposed action. The resource topics presented in this section correspond to the issues described in the *Purpose and Need* section.

This chapter also includes an analysis of the environmental consequences or "impacts" of the no-action alternative and proposed action immediately following the affected environment descriptions for each resource topic. The Council on Environmental Quality defines impacts as changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance from the proposed action or alternatives (40 CFR 1508.1(g)).

The impact analyses and conclusions in this chapter are based on the review of existing literature and field studies and the professional judgment of planners, resource specialists, and biologists who have experience with similar types of projects. The NPS deemed much of the affected environment described in the Chesapeake and Ohio Canal and Harpers Ferry National Historical Parks White-Tailed Deer Management Plan and EA, as it relates to the effects of deer overabundance on park resources as well as the impact analysis, to be relevant for National Capital Parks – East. Therefore, the Chesapeake and Ohio Canal and Harpers Ferry National Historical Parks White-Tailed Deer Management Plan and EA is referenced frequently in the remaining sections of this chapter.

Vegetation

Affected Environment

National Capital Parks – East encompasses a relatively large range in the District and Maryland. More plant species have been identified in these park units during vegetation monitoring and surveys than any other park in the National Capital Area.

Vegetation monitoring conducted as part of the NPS Inventory and Monitoring Program identified 94 species of trees, shrubs, herbs, and vines (Walsh et al. 2016). The majority of tree species identified during the vegetation monitoring are found throughout the park units, but some species are more common in some park units than in others. Virginia pine (*Pinus virginiana*), oak species, and black gum (*Nyssa sylvatica*) are common in the northernmost park units, such as Greenbelt Park and the Baltimore-Washington Parkway, which are mostly composed of upland forest. Species of ash (*Fraxinus* spp.), elm (*Ulmus* spp.), and sassafras spp. are more common along the Potomac River in the low-lying forests of Piscataway Park. Red maple (*Acer rubrum*) is the most common tree species throughout the National Capital Parks – East (Walsh et al. 2016).

The *Baseline Vegetation Mapping of National Capital Region Parks in Maryland, Virginia, West Virginia, and the District of Columbia* (NatureServe 2020) report describes the plant communities identified within NACE Parks from four major classes of vegetation, including Forest and Woodland Vegetation, Shrub and Herb Vegetation, Aquatic Vegetation, and Agricultural and Developed Vegetation. Vegetation within the first three classes include natural plant communities from seven distinct Formations, nine Divisions, 16 Macrogroups, 18 Groups, 29 Alliances, and 43 Associations, which reflects the biodiversity of National Capital Parks – East. The 43 natural vegetation associations identified at National Capital Parks – East are listed in Table 1. Thirty of the 43 natural vegetation associations are identified as Forest and Woodland Vegetation.

Table 1. Vegetation Associations documented at National Capital Parks – East

Vegetation Association	Association Common Name	Global Conservation Ranking
FOREST AND WOODLAND VEGETATION		
CEGL007216	Ruderal Sweetgum Forest	GNA
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	G5
CEGL006299	Central Appalachian-Northern Piedmont Chestnut Oak Forest	G5
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	G5
CEGL006919	Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest	G4
CEGL006055	Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest	G4
CEGL007748	North Atlantic Coastal Plain Dry Calcareous Forest	G1
CEGL006329	North Atlantic Coastal Plain Oak - Pine Forest	G2G3
CEGL006390	Mesic Coastal Plain Oak Forest	GNR
CEGL006490	Chesapeake Bay River Bluff Chestnut Oak Forest	G3
CEGL006599	Northeastern Ruderal Hardwood Forest	GNA
CEGL002591	Ruderal Virginia Pine Forest	GNA
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	GNA
CEGL007220	Ruderal Tuliptree Forest (Rich Type)	GNA
CEGL007279	Ruderal Black Locust Forest	GNA
CEGL006217	Piedmont-Central Appalachian Silver Maple Floodplain Forest	G4
CEGL004073	Piedmont-Central Appalachian Rich Floodplain Forest	G4
CEGL006548	Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest	G4
CEGL005033	Ruderal Box-elder Floodplain Forest	GNA
CEGL006976	Northern Coastal Plain Ruderal Floodplain Forest	GNA
CEGL006238	Southern Red Maple - Blackgum Swamp Forest	G3
CEGL006219	Fall-line Terrace Gravel Magnolia Bog	G1
CEGL006110	Sweetgum - Red Maple Swamp Forest	G3
CEGL006926	Pine Barrens Pitch Pine - Hardwood Swamp Forest	G2G3
CEGL006606	Chesapeake-Piedmont Red Maple / Lizard's tail Swamp Forest	G3G4
CEGL006603	Coastal Plain Streamside Forest	G3G4
CEGL006605	Coastal Plain Oak Floodplain Forest	G3G4
CEGL004418	Upper Southeast Sweetgum - Tuliptree Small Stream Forest	G4
CEGL006287	Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest	G3
CEGL007330	Ruderal Sweetgum Wet Forest	GNA
SHRUB AND HERB VEGETATION		
CEGL008568	Ruderal Chinese Wisteria Vineland	GNA

Vegetation Association	Association Common Name	Global Conservation Ranking
CEGL002026	Bulrush - Cattail - Bur reed Shallow Marsh	G4G5
CEGL006153	Eastern Cattail Marsh	G5
CEGL006349	Northeastern Woolgrass Wet Meadow	GNR
CEGL006069	Northeastern Buttonbush Shrub Swamp	G4G5
CEGL004141	Eastern Ruderal Common Reed Marsh	GNA
CEGL004187	Ruderal Tidal Common Reed Marsh	GNA
CEGL004472	Broadleaf Pond lily Tidal Marsh	G4G5
CEGL006833	Sweetflag Tidal Marsh	GNR
CEGL006325	Freshwater Tidal Mixed High Marsh	G3
CEGL004706	Green Arrow arum - Pickerelweed Tidal Marsh	G3G4
CEGL004188	Atlantic Coast Brackish Tidal Marsh	GNR
AQUATIC VEGETATION		
CEGL006048	Mixed Freshwater Subtidal Marsh	GNR
AGRICULTURAL AND DEVELOPED VEGETATION		
CST007179	Loblolly Pine Plantation	GNA
CST007452	Bald cypress Plantation	GNA

Source: NatureServe 2020
Notes: GNA = not applicable; GNR = not ranked; G1 = critically imperiled; G2 = imperiled; G3 = rare, uncommon, or threatened; G4 = not rare and apparently secure; G5 = demonstrably widespread, abundant, and secure.

The vegetation associations documented at each of the park units where deer management is proposed, as well as maps of the locations of the vegetation associations at the parks, are provided in Appendix B. Descriptions of the 43 natural vegetation associations found within the parks are also included in Appendix B. Although many of these vegetative communities are affected by deer overbrowsing to varying degrees, the Baseline Vegetation Mapping report identifies two forest associations where deer browsing is listed as evidence of disturbance. These include the Fall-line Terrace Gravel Magnolia Bog documented at Greenbelt Park and the Coastal Plain Oak Floodplain Forest documented within Baltimore-Washington Parkway and Piscataway Park (NatureServe 2020). The North Atlantic Coastal Plain Dry Calcareous Forest, found at Fort Washington Park and the Fall-line Terrace Gravel Magnolia Bog found at Greenbelt Park have been given a G1 global conservation ranking and are considered critically imperiled plant communities. The North Atlantic Coastal Plain Oak – Pine Forest and Pine Barrens Pitch Pine – Hardwood Swamp Forest have been given a G2G3 global conservation ranking and are considered in the range of imperiled (G2) and rare, uncommon, or threatened (G3) plant communities. The reason(s) for these G1 and G2G3 rankings are included within the vegetation association descriptions of the four plant communities in Appendix B. In addition, nine vegetation associations within National Capital Parks – East are considered rare, uncommon, or threatened (G3), or in the range of G3 and G4, not rare and apparently secure (see Table 1).

In addition, numerous DC-imperiled and MD-state vulnerable, imperiled, and critically imperiled plant species, as well as numerous globally vulnerable species, have been identified within National Capital Parks – East, including the following:

MD-State Vulnerable Species (7) – crowned beggarticks *(Bidens coronate)*, small beggarticks *(Bidens discoidea)*, white bear sedge (*Carex albursina)*, button sedge *(Carex bullata)*, Louisiana sedge *(Carex louisianica)*, halberdleaf rosemallow *(Hibiscus laevis),* largeseed forget-me-not *(Myosotis macrosperma)*

MD-State Critically Imperiled Species (6) – river bulrush *(Bolboschoenus fluviatilis*), false hop sedge *(Carex lupuliformis*), American spongeplant *(Limnobium spongia*), maroon Carolina milkvine *(Matelea carolinensis*), smallflower baby blue eyes *(Nemophila aphylla*), veiny skullcap *(Scutellaria nervosa*)

MD-State Imperiled Species (5) – green dragon *(Arisaema dracontium)*, glade fern *(Diplazium pycnocarpon*), largeseed forget-me-not *(Myosotis macrosperma*), Shumard oak *(Quercus shumardii*), bamboo vine *(Smilax pseudochina*)

DC-Imperiled Species (1) – bamboo vine *(Smilax pseudochina*) (Possible DC record)

Globally Vulnerable Species (29) - black baneberry *(Actaea racemosa*) , seaside alder *(Alnus maritima*), red milkweed *(Asclepias rubra*) (regionally rare), Delmarva beggarticks *(Bidens bidentoides)*, small mountain bittercress *(Cardamine clematitis*), ravine sedge *(Carex impressinervia*), Kral's sedge *(Carex kraliana*), variable sedge *(Carex polymorpha*), deepwoods horsebalm *(Collinsonia tuberosa*), spoonleaf sundew *(Drosera intermedia*) (regionally rare), tenangle pipewort (*Eriocaulon decangulare*) (regionally rare), low rough aster (*Eurybia radula)* (regionally rare), black huckleberry *(Gaylussacia baccata*), swamppink *(Helonias bullata*), Carolina alumroot *(Heuchera caroliniana*), dwarfflower heartleaf *(Hexastylis naniflora*), small whorled pogonia *(Isotria medeoloides*), Long's rush *(Juncus longyi*) (regionally rare), sheep laurel (*Kalmia angustifolia)* (regionally rare), pygmypipes (*Monotropsis odorata*), American ginseng *(Panax quinquefolius*), Small's beardtongue *(Penstemon smallii*), Coville's phacelia *(Phacelia covillei)*, bay starvine *(Schisandra glabra*), smooth rock skullcap *(Scutellaria saxatilis*), bog goldenrod (*Solidago uliginosa* var. *uliginosa*) (regionally rare), illscented wakerobin *(Trillium rugelii*), jeweled wakerobin *(Trillium simile*), Carolina hemlock *(Tsuga caroliniana*).

Numerous nonnative plant species are also found in the park units. Nonnative trees found in the parks include such as Chinese pear (*Pyrus pyrifolia*), Siberian elm (*Ulmus pumila*), white mulberry (*Morus alba*) and tree of heaven (*Ailanthus altissima*). Nonnative shrubs consist predominately of Amur honeysuckle (*Lonicera maackii*) but also include autumn olive (*Elaeagnus umbellata*) and burning bush (*Euonymus alatus*). Nonnative species found on the forest floor within the National Capital Parks – East include Japanese stiltgrass (*Microstegium vimineum*), oriental bittersweet (*Celastrus orbiculatus*), and English ivy (*Hedera helix*) (Walsh et al. 2016). Nonnative species can outcompete and displace native species, particularly in disturbed areas, and coupled with deer overbrowsing of native vegetation, can cause invasive species to colonize an area more rapidly.

Scientists at the US Forest Service developed a measure, called a “stocking index,” to determine if seedling levels are sufficient for regeneration (Marquis and Bjorkbom 1982). The stocking index considers three different aspects of forest regeneration: the number of seedlings and small saplings found, their size, and their distribution. More seedlings and small saplings are better for forest regeneration. Taller seedlings are more likely to survive than smaller seedlings, and a forest is more likely to successfully regenerate if the seedlings are spread out than if they are concentrated in only

a few places (Schmit and Nortrup 2013). Seedling and forest regeneration in National Capital Parks – East is sampled at 47 sites, grouped into four areas: Baltimore-Washington Parkway and Greenbelt Park; the middle portion of National Capital Parks – East, including Kenilworth Park and Kenilworth Aquatic Gardens, Suitland Parkway, and Oxon Cover Park; and Piscataway Park and Fort Washington. Data studied from 2010 to 2013 showed that the condition for seedling regeneration in National Capital Parks – East is very degraded. Only 3 survey plots or 6.4% had adequate stocking indexes for areas with over 8 deer per square kilometer or 20 deer per square mile[1] (Walsh et al. 2016). 2019 data show that none of the survey plots in the Baltimore-Washington Parkway and Piscataway Park had adequate stocking indexes, while a little over 20% of the plots in Greenbelt Park had adequate stocking indexes (NPS 2019).

About the Analyses

The analysis of impacts on vegetation under the proposed action assumes that deer population density goals would be reached within a span of approximately 5 to 10 years and that those populations would remain relatively consistent over the long-term through regular management actions. Although each implementation area would have its own specific controlled harvest program goals and objectives, the analysis of impacts on vegetation assumes that the proposed action alternative would have similar affects regardless of the implementation area.

Impacts of the No-Action Alternative

No actions would be taken to reduce deer populations within National Capital Parks – East under the no-action alternative. Deer populations at Greenbelt Park, Piscataway Park, and Fort Washington Park averaged 151, 67, and 168 deer per square mile, respectively, according to survey data collected between 2010 and 2020. Deer population data collected from 2019 to 2020 in Fort Dupont, Kenilworth Park and Kenilworth Aquatic Gardens, Anacostia Park documented an average of 199.5 deer per night with a density of 62.4 to 175 deer per square mile deer per square mile (DOEE 2019, 2020). It is expected that deer population densities within National Capital Parks – East would remain high and future survey data would continue to indicate that deer density exceeds 20 deer per square mile. The NPS would continue to conduct forest survey plots as part of the NPS Inventory and Monitoring Program to monitor seedling tree regeneration. It is expected that the stocking indexes of most of the 47 sampled sites in National Capital Parks – East would remain inadequate for seedling and forest

Figure 3. Invasive Japanese stiltgrass in the understory at Greenbelt Park

[1] The Stocking Index reference condition used in the NPS assessment was 151, above which a plot is considered to be adequately stocked at high densities of white-tailed deer. This threshold is used in forests with high deer density to take into account deer browse effects on seedling growth and survival. An entire park is considered to be adequately stocked if 67% of plots score above the threshold (Schmit and Nortrup 2013).

regeneration. Deer would continue to place heavy browsing pressure on seedlings, trees, shrubs, and herbaceous plants within the parks, which would affect forest regeneration and the abundance and diversity of vegetation. Deer overbrowsing would also continue to contribute to the spread of nonnative invasive species (see Figure 3).

Impacts of the Proposed Action

Lethal deer management actions would be used to reduce the deer population density to 15 to 20 deer per square mile within the implementation areas. It is expected that quickly reducing the deer population and associated browsing pressure on seedlings, trees, shrubs, and herbs would support an increase in plant reproduction that would lead to an increase in forest regeneration and in the abundance and diversity of native plants. Reducing the deer population would improve the number and survivability of tree seedlings, which would provide the necessary growth for natural forest regeneration over the long-term. Long-term vegetation plot monitoring data from other parks in the region demonstrate the success of deer culling activities on seedling regeneration. In 2020, seedling numbers continued to show steady improvements at Catoctin Mountain Park, Monocacy National Battlefield, and Rock Creek Park (NPS 2020a). At Rock Creek Park, tree seedling numbers have almost tripled since deer management began in 2013 (NPS 2020a). Since deer management began at Catoctin Mountain Park in 2010, there has been a 13-fold increase in seedlings dominated by white ash (*Fraxinus americana*). White ash, which is highly palatable to deer, made up almost 75% of all the seedlings within survey plots during initial years of deer management (Schmit et al 2020). In the last 4 years (2017 to 2020) though, other tree species are starting to regenerate (NPS 2020a). White ash now accounts for approximately 62% of all seedlings (NPS 2020a). The NPS would assess the stocking indexes of the 47 sites sampled in National Capital Parks – East to monitor the adequacy of seedling and forest regeneration. It is expected that it would take up to 10 years to achieve viable tree seedling regeneration within the numerous forested areas of the National Capital Parks – East.

At Catoctin Mountain Park, the nonnative invasive Japanese stiltgrass initially increased during the first 4 years of culling, but then decreased to the pre-cull level after 8 years, indicating that it may not be able to dominate the herbaceous layer without high deer density (Schmit et al. 2020). Studies show that Japanese stiltgrass may be suppressed by shade from a dense understory or canopy. Studies also show that the nonnative invasive garlic mustard (*Alliaria petiolate*) undergoes steep population declines in deer exclosures and may be dependent on deer for propagation (Kalisz et al., 2014). These studies demonstrate that the proposed action alternative may result in a decrease in nonnative invasive vegetation in the National Capital Parks – East.

Reduction in deer populations would also have beneficial impacts to the critically imperiled Fall-line Terrace Gravel Magnolia Bog plant community documented at Greenbelt Park, and Coastal Plain Oak Floodplain Forest plant community documented within Baltimore-Washington Parkway and Piscataway Park, which are listed in the Baseline Vegetation Mapping report as forest associations where deer browsing disturbance is event. The critically imperiled North Atlantic Coastal Plain Dry Calcareous Forest, found at Fort Washington Park, as well as the imperiled North Atlantic Coastal Plain Oak – Pine Forest and Pine Barrens Pitch Pine – Hardwood Swamp Forest vegetation associations are also expected to benefit from a reduce deer population.

White-Tailed Deer

Affected Environment

Figure 4. White-tailed deer

White-tailed deer are regarded as one of the most adaptable mammals in the world for their hardiness, reproductive capability, wide range of plant species accepted as food, and the tolerance deer express for close contact with humans (see Figure 4). Most abundant in the eastern woodlands of the United States, white-tailed deer are typically forest dwellers, but often frequent wetlands, woodland openings, forest edges, and farmlands while foraging. Their diet consists of twigs from shrubs and trees, as well as herbs during the spring and summer; and acorns, blackgum fruits, persimmons, and other fruits in late summer and fall. White-tailed deer tend to select native plant communities over nonnative invasive plants while foraging (NPS 2017b).

Although the biological carrying capacity for deer populations changes with the environmental setting, research by the US Forest Service indicates that deer densities above 20 deer per square mile (or approximately 8 per square kilometer) inhibit forest regeneration (Jones et al. 1993). The NPS, with support from DOEE, monitors deer population density and composition (e.g., sex ratios) at National Capital Parks – East using spotlight surveys, conducted as part of distance sampling, and using digital trail cameras. Deer surveys have been conducted at Greenbelt Park, Piscataway Park, and Fort Washington Park in Maryland (Table 2), and at Kenilworth Park and Kenilworth Aquatic Gardens, Shepherd Parkway, and Fort Dupont Park in Washington, DC.

Table 2. Deer per square mile at Greenbelt Park, Piscataway Park, and Fort Washington Park since 2010

Year	Greenbelt Park	Piscataway Park	Fort Washington Park
2010	171.43	78.04	228.8
2011	118.86	71.25	257.71
2012	189.82	66.23	117.25
2013	157	85	200
2014	212	44	238
2015	No Survey		
2016	187	30	165
2017	196	50	116
2018	183	59.7	215
2019	91.6	99.24	67
2020	28	85	76
2021	Unavailable	Unavailable	Unavailable
Data Average	151	67	168

DOEE conducted deer surveys in Fort Dupont in 2019 using remote camera surveys to detect deer numbers and calculate the population and density in the park. This survey documented an estimated population of 103 deer with a density of 175 deer per square mile (DOEE 2019).[2] In December 2019 and January 2020, DOEE conducted spotlight surveys in Fort Dupont, Kenilworth Park and Kenilworth Aquatic Gardens, Anacostia Park, and other National Capital Parks - East parks. This sampling documented an average of 199.5 deer per night which is a density of 62.4 deer per square mile (24.1 deer/km²; standard error = 0.033) (DOEE 2020).

About the Analyses

The analysis of impacts on white-tailed deer is based on a qualitative assessment of how an increase or decrease in browsing pressure would affect the deer population and quantitative assessments of forest habitats. The analysis assumes that eliminating individual deer by lethal means does not constitute an adverse impact if the overall health of the population improves and if the deer population at the parks remains a dynamic component of a functioning ecosystem and not a main stressor.

Impacts of the No-Action Alternative

No actions would be taken to reduce deer populations within National Capital Parks – East under the no-action alternative. The NPS would continue to monitor deer density and composition, in partnership with DOEE, using spotlight surveys and digital trail cameras. Opportunistic surveillance and sampling for CWD would also continue. It is expected that deer population densities within National Capital Parks – East would remain high, and that future survey data would continue to indicate that deer density greatly exceeds 20 deer per square mile. Deer overbrowsing would continue to have detrimental effects on vegetation, thereby reducing the quality of their habitat and potentially increasing the risk of diseases, such as CWD.

Impacts of the Proposed Action

Reducing the deer population density to 15 to 20 deer per square mile using lethal management actions would be expected to promote natural forest regeneration and plant abundance and diversity. Allowing vegetation to recover without excessive deer browsing would provide for better foraging and sheltering habitat for deer within the parks. Improving habitat conditions would also be expected to reduce winter stress on deer by increasing the abundance of suitable food sources. A reduced population density would also decrease the potential risk of diseases, such as CWD.

Quickly reducing the deer population within 5 years to the NPS goal in the initial stages of management would result in immediate impacts on the parks' deer populations. After the NPS goal is reached, continual deer management activities would be required to maintain the population at a sustainable level. Implementing continual deer management strategies would improve the overall

[2] There are several tracts, including Pope Branch, Fort Chaplin, and Anacostia Park, that are either directly adjacent to or easily accessible to deer in Fort DuPont. If these parks are added into calculations for the total acreage of the deer habitat, it would add another 50 to 150 acres, lowering the density to 132 deer per square mile (at 500 acres of habitat), still in great excess of target densities.

condition of the deer population by improving habitat and reducing the potential for nutritional stress and disease. Deer management would ensure that deer remain an important part of park ecosystems by reducing the stress that an overabundance of deer places on these ecosystems.

Terrestrial Wildlife and Habitat

Affected Environment

Thirty-nine species of native mammals have been documented at National Capital Parks – East. The white-footed mouse (*Peromyscus leucopus*) is the most common small mammal in National Capital Parks – East. Other small mammal species found in National Capital Parks – East are northern short-tailed shrew (*Blarina brevicauda*), masked shrew (*Sorex cinereus*), southeastern shrew (*Sorex longirostris*), eastern grey squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), striped skunk (*Mephitis mephitis*), southern flying squirrel (*Glaucomys volans*), meadow jumping mouse (*Zapus hudsonius*), and the nonnative invasive Norway rat (*Rattus norvegieus*) (Walsh et al. 2016). Deer can affect small mammal populations through competition for food such as acorns (McShea and Rappole 2000).

Forest breeding birds are monitored annually at 29 points in National Capital Parks – East as part of the NPS Inventory and Monitoring Program. 243 species of birds have been recorded within National Capital Parks – East as of 2016. Four regionally abundant species include the eastern tufted titmouse (*Parus bicolor*), northern cardinal (*Cardinalis cardinalis*), red-eyed vireo (*Vireo olivaceus*), and blue-gray gnatcatcher (*Polioptila caerulea*). During monitoring at Greenbelt Park between 2007 and 2010, 39 bird species were identified, including seven species of conservation concern. At Piscataway and Fort Washington Parks, 65 bird species were identified, 12 of conservation concern. Additionally, 52 bird species were recorded between 2007 and 2010 during monitoring at Oxon Cove Park and Anacostia Park, nine of which are species of conservation concern (Walsh et al. 2016). Alteration of the shrub layer by heavy deer browsing can eliminate nesting habitat for bird species.

Terrestrial habitat diversity provides foraging opportunities, breeding habitat, and shelter for a variety of wildlife. Many of these species depend on habitat that can be affected by deer overbrowsing, especially small mammals and forest breeding birds that use or inhabit the herbaceous and woody vegetation in the forest understory (NPS 2017b). Changes in habitat structure and composition of vegetation communities can affect nutrient cycling and habitat quality. The lack of shrubs and young trees caused by overbrowsing reduces availability of nesting habitat and consequently reduces populations of forest nesting birds. Forest bird monitoring conducted by the NCRN from 2007 to 2011 reported significant decreases in annual occupancy of ovenbird (*Seiurus aurocapilla*) and eastern towhee (*Pipilo erythrophthalmus*), birds that nest on the ground and/or in low-lying shrubs (Ladin and Shriver 2013).

Deer can also cause declines in populations of small mammals by reducing the availability of mast (e.g., fruits and nuts from trees and shrubs that accumulate on the forest floor). Declines in regeneration of oaks and other mast-producing trees affect small mammal populations that depend on mast as a food source (Bates 2018). By altering the plant community composition, deer impact native insects that rely on native plants, resulting in subsequent affects to birds and mammals that rely on insects as a food source.

About the Analyses

The analysis of impacts on terrestrial habitat is based on a qualitative assessment of how increases or decreases in deer overbrowsing would affect vegetation. Additionally, the analysis considers how changes to natural habitat conditions would affect the wildlife that potentially forage, nest, breed, or shelter in these areas. The analysis of impacts on terrestrial wildlife and habitat assumes that the alternatives would have similar affects regardless of the implementation area. Quantitative impacts to vegetation are measured and monitored by the NPS Inventory and Monitoring Program.

Impacts of the No-Action Alternative

Under the no-action alternative, no new impacts would occur to terrestrial wildlife. No actions would be taken to reduce deer populations within National Capital Parks – East under the no-action alternative, and the overabundance of deer would continue to result in less than optimal habitat conditions for foraging, breeding, and sheltering for other terrestrial wildlife species.

Impacts of the Proposed Action

Deer management activities could affect other mammals. Automated corn feeders or piles of corn on the ground used for bait could provide a temporary additional food source for some species. In addition, the presence of increased human activities and associated noise during specific time periods could result in temporary behavior changes and the avoidance of management areas.

Reducing the deer population density to 15 to 20 deer per square mile using lethal management actions would be expected to improve habitat conditions for wildlife. The reduced deer browsing pressure would increase native plant abundance and promote species diversity particularly in the herb and shrub layers, thereby improving foraging, nesting, breeding, and sheltering habitat for small mammals and ground and shrub-nesting birds. Additionally, natural forest regeneration would be expected to promote and maintain a natural tree canopy that would benefit species that live in the upper canopy, or tree bark or cavity nesters. Plant abundance and diversity would also be expected to increase the abundance of food sources for wildlife, such as acorns and other tree fruits.

Cultural Landscapes

Affected Environment

The Secretary of the Interior's *Standards for the Treatment of Historic Properties and the Guidelines for the Treatment of Cultural Landscapes* defines a cultural landscape as a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein), associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes (NPS 1992). Vegetation is identified as a contributing landscape characteristic of each of these cultural landscapes.

NPS identified the Area of Potential Effects (APE) for the proposed deer management plan as part of the Section 106 of the National Historic Preservation Act (NHPA) consultation process. The APE

was presented in the Section 106 consultation initiation letter dated April 27, 2021, and is comprised of each of the parks within the National Capital Parks – East being considered for deer management.

Anacostia Park and Kenilworth Park and Kenilworth Aquatic Gardens, Washington, DC

The NPS has completed a draft CLI for Anacostia Park. The 2010 CLI for Kenilworth Aquatic Gardens identified vegetation features that contribute to the cultural landscape including aged weeping willows on pond edges, willow oaks, a few bald cypress, individual holly, cherry, dogwood, mulberry, tulip poplar trees; and aquatic water lily, lotus, and other plant varieties listed in the Shaw Aquatic Gardens Catalog (NPS 2010).

Fort Circle Parks, Washington, DC

CLIs have not been prepared for Fort Davis, Fort Stanton, Fort Ricketts, Fort Greble, and Battery Carroll.

The 2013 CLI prepared for approximately 35.5 acres in the southeast corner of the Fort Dupont Park in which the historic Fort is located. The CLI identified landscape characteristics including topography, spatial organization, land use, buildings and structures, circulation, vegetation, views and vistas, and small cultural features. The open grassy area west and south of the earthwork is a contributing feature. The significance of features within the remainder of the Park has not yet been evaluated (NPS 2013a).

The 2013 CLI for Fort Mahan identified the following landscape characteristics: topography, spatial organization, land use, buildings and structures, circulation, vegetation, views and vistas, and small-scale features. Contributing vegetation includes mature trees, including the large willow oak and tulip poplar trees dispersed around the grassy areas at the bottom and top of the site, and the cleared grassy area on the hilltop (NPS 2013b).

The 2017 CLI prepared for Fort Chaplin identified contributing features including topography, spatial organization, land use, buildings and structures, circulation, vegetation, views and vistas, and small-scale features. According to the CLI, the vegetation is characterized by mature tree stands and a wooded understory. The site's vegetation protects the earthworks from future erosion and invasion by nonnative plants (NPS 2017a).

Shepherd Parkway has not been designated as a local or National Register historic district.

Oxon Run Parkway, Washington, DC

A formal evaluation has not been conducted to identify historic sites, districts, structures, landmarks, or archaeological sites within Oxon Run Parkway.

Baltimore-Washington Parkway, Anne Arundel and Prince George's Counties, MD

A Cultural Landscape Report (CLR) drafted for the Baltimore-Washington Parkway in 2021 documented infrastructure and small-scale features, along with forest vegetation and planning design (Kelsh et al. 2021). As noted in the CLR, the Baltimore-Washington Park is bordered by

forest for almost its entire length, and forest is the defining vegetation of the parkway and key to its historical significance. There are three forest types within the Parkway: upland, lowland, and swamp. These forested areas occur within three ages: shrubland, successional forest, and mature forest. Several planting designs have been implemented in the history of the parkway and include clusters of specimen overstory trees; clusters of specimen trees with flowering trees; edge planting; reforestation; evergreen screening; and native grass meadows.

Greenbelt Park, Prince George's County, MD

A CLI has not been prepared for Greenbelt Park. Vegetation in the park consists of woodland comprised of mixed pine and deciduous forest, with some small areas of grassy meadow (Robinson & Associates, Inc. 2019).

Suitland Parkway, Washington, DC, and Prince George's County, MD

A CLI has not been prepared for Suitland Parkway. The landscape is forested with numerous streams and wetlands.

Oxon Cove Park and Oxon Hill Farm, Prince George's County, MD

A CLI Update of Oxon Cove Park was completed in 2018. Contributing landscape characteristics identified for the property are spatial organization, land use, buildings and structures, circulation, vegetation, views and vistas, and small-scale features. (NPS 2018c). There is a large cluster of boxwood dating to at least the nineteenth century, and cedar trees located near the farmhouse may be among those documented in photographs from the 1890s. Woodlands surrounding the farm also contribute to its significance. Some sections of the North Woods possibly date to the 1860s. To the south of the house, beyond the entrance road, riparian vegetation has filled in what were open fields and orchard. Trees were cleared for landfilling operations along the cove, so the woodland west and north of the Middle Field only has minimal tree cover.

Fort Foote, Prince George's County, MD

Landscape characteristics identified in the 2014 CLI for Fort Foote are topography, spatial organization, land use, buildings and structures, circulation, vegetation, views and vistas, small-scale features, and archaeology (NPS 2014a). According to the CLI, the vegetation patterns at Fort Foote have retained partial integrity to the first and second periods of significance. The areas that have grown back since the site was abandoned in 1878 are a combination of native deciduous vegetation and invasive species. The biggest problem with invasive plants is in the cleared fort areas (NPS 2014a).

Harmony Hall, Prince George's County, MD

Contributing landscape characteristics identified for Harmony Hall are spatial organization, buildings and structures, circulation, vegetation, views and vistas, topography, and small-scale features. Contributing vegetation includes pine, boxwood, cedars north and south of the house, cypress walk, the west pasture, cypress row, a pine stand, and an apple tree (NPS 2018b).

Fort Washington Park, Prince George's County, MD

Contributing landscape characteristics identified for Fort Washington are buildings and structures, circulation, small-scale features, vegetation, and views and vistas. Among the landscape elements described in the CLI are open fields in the central portion of the park and the densely wooded "Fort Ravine" located east of the original Fort Washington. The Fort Ravine area includes a 32-acre Ecologically Sensitive Area defined by MD DNR as an "exceptional example of a mature, mesic, deciduous forest" (NPS 2018a).

Piscataway Park including Marshall Hall, Prince George's and Charles Counties, MD

The CLI for Piscataway found that contributing character-defining features include vegetation, views and vistas, buildings and structures, circulation features, and archaeological resources (NPS 2020b). Forested areas, agricultural areas, wetland/riparian vegetation, and museum plantings are considered contributing resources of the cultural landscape. According to the CLI, forests in the park are nearly entirely deciduous forest consisting of sycamore, sweetgum, black cherry, beech, ash, oaks, poplars, red maple, alder, and pawpaw. Wetland and riparian vegetation consist of wetland grasses, flowering plants, and shoreline shrub and tree buffers.

About the Analyses

This analysis includes a qualitative assessment of how increases or decreases in deer overbrowsing affects vegetation, and how these affects result in the degradation or restoration of cultural landscapes. The analysis of impacts on cultural landscapes assumes that the alternatives would have similar affects regardless of the implementation area.

Impacts of the No-Action Alternative

Hardwood forests, individual contributing plants or plantings, and orchards are the most likely affected cultural landscape features that contribute to the historic significance of the parks. Continued growth in the existing deer population and excessive deer browsing under the no-action alternative would continue to limit regeneration of native plant communities within the park. Without reductions in deer populations, deer would continue to place heavy browsing pressure on plants affecting tree seedling densities and forest regeneration. Without forest regeneration, character-defining vegetation, especially forests that are contributing features at Fort Foote, Fort Mahan, Fort Chaplin, Baltimore Washington Parkway, Greenbelt Park, Fort Washington, and Piscataway Park, would deteriorate. Deer browse lines and invasive species would continue to alter the vegetation within the parks in a manner not in keeping with the parks' periods of significance. In addition to being a contributing feature in some National Capital Parks – East parks, appropriate tree cover also preserves vistas and masks intrusive views of off-park development that diminish the feeling and association of historic resources with their period of significance.

Damage to earthworks at Fort Foote and Fort Dupont has been observed where deer have made trails which have then created social trails. Continued growth in the existing deer population would continue to affect earthworks and circulation in general throughout the cultural landscapes within NACE.

The overabundance of deer and the high browsing pressure on vegetation, along with effects on views and earthworks, would have an adverse effect on cultural landscapes under Section 106 of the NHPA.

Impacts of the Proposed Action

The proposed action includes the continuation of the current management actions described under the no-action alternative to document deer population density and the effects of overbrowsing on forest regeneration and cultural landscapes. In addition, the proposed action includes using lethal deer management actions to reduce the deer population at National Capital Parks – East to an acceptable level with the primary goal of promoting forest regeneration in support of natural ecosystems and cultural landscapes.

As stated above, hardwood forests, individual contributing plants or plantings, and orchards are the most likely affected cultural landscape features that contribute to the historic significance of the parks. In addition to being a contributing feature in some National Capital Parks – East parks, appropriate tree cover also preserves vistas and masks intrusive views of off-park development that diminish the feeling and association of historic resources with their period of significance.

It is expected that rapidly reducing the deer population and associated browsing pressure would allow the number of tree and shrub seedlings to increase and survive to saplings and into maturity, providing the necessary growth for natural forest regeneration. This forest regeneration would have a beneficial impact to the hardwood forests that are contributing features at Fort Foote, Fort Mahan, Fort Chaplin, Greenbelt Park, Fort Washington, and Piscataway Park. In addition, damage would be reduced to orchards, individual contributing plants, and plantings. Because native plant populations and cultural plantings are character-defining vegetation features of the park's cultural landscape, the re-establishment or rehabilitation of these features would have beneficial impacts.

Damage to earthworks at Fort Foote and Fort Dupont has been observed where deer have made trails which have then created social trails. Reduction of deer populations may reduce ongoing damage to earthworks and circulation in general throughout the cultural landscapes within NACE.

The proposed action alternative would have no adverse effect on vegetation that contributes to the cultural landscapes under Section 106 of the NHPA.

Visitor Use and Experience

Affected Environment

As stated in its Foundation Document, "National Capital Parks – East manages a diverse collection of urban park units located in all four quadrants of Washington, DC, as well as in Prince George's, Anne Arundel, and Charles Counties in Maryland. These park units protect a broad range of locally, regionally, and nationally important resources that engage a broad spectrum of the population. These parks are distributed among 98 locations and total more than 8,000 acres. Park resources consist of natural areas, recreation areas, cultural landscapes, historic homes, parkways, farms, archaeological sites, historic forts, environmental clean-up sites, and private properties under scenic easements" (NPS 2016).

The lands stewarded by National Capital Parks – East create vibrant green space in urbanized areas that allow for passive and active recreation and a wide array of educational programming. This broad and diverse range of sites allows the park to tell important stories that have shaped the Washington, DC, region, and the nation. The cultural resources of the parks particularly reflect America's ongoing story of civil rights and social justice, preserve archaeological evidence of tens of thousands of years of American Indian lifeways along the Anacostia and Potomac Rivers, and exemplify the last 225 years of the national capital region's growth and development. The natural resources of the parks promote biodiversity that encourages economic growth, enhances ecological resiliency, serves as dispersal corridors for plants and wildlife, and allows urban populations to connect with and understand nature. The disparate and dispersed, noncontiguous nature of these urban sites and their complexity creates a number of complicated issues for the park, including the pressures of competing jurisdictions and user groups and the sheer number of community partners, elected officials, and stakeholders (NPS 2016).

Many of the park sites are located along the Anacostia and Potomac Rivers, and provide important ecological buffers between heavily developed urban spaces and river watersheds to protect water quality and ecosystem resiliency. These park units provide respite from the urban environment for park visitors and contribute to the quality of life of the residents in the communities where they reside (NPS 2016).

About the Analyses

This analysis focuses on how proposed management actions would potentially effect visitor use and experience at the various park units where deer management is proposed. The analysis of impacts to park visitors assumes that the alternatives would have similar affects regardless of the implementation area, although specific measures would be needed to ensure human health and safety is maintained during lethal deer management actions at each of the parks.

Impacts of the No-Action Alternative

No actions would be taken to reduce deer populations within National Capital Parks – East under the no-action alternative. Some visitors may continue to notice the damage caused by deer overbrowsing on park vegetation. Otherwise, there would be no new impacts to visitor use and experience.

Impacts of the Proposed Action

The proposed action may result in temporary disruptions to park visitors, primarily from the closures that would be required to accomplish deer management activities safely. Implementing these closures would impact visitor use and experience while management activities are being conducted. However, these disruptions would be minimal because deer management activities would occur during the late fall and winter months when visitation is lower and at night when the parks are closed.

Potential closures at each park unit where deer management is proposed are briefly described below. Depending on the park location, closures would be coordinated with US Park Police, District Department of Transportation (DDOT), Maryland Department of Transportation (MDOT), M-NCPPC

Park Police, and County transportation agencies, as needed. Also, NPS personnel or their agents would be stationed at possible access points while deer management is occurring to prevent entry into the implementation areas.

Maryland

Baltimore-Washington Parkway – Closures and associated detours, if any, would be identified in the annual operations plan.

Greenbelt Park – The park would be closed at night in its entirety during deer management activities. Reservations for public use of the campgrounds would not be made available on Recreation.gov while deer management activities are scheduled. Daytime use of the park would not be affected.

Suitland Parkway – Closures and associated detours, if any, would be identified in the annual operations plan.

Oxon Cove Park, including Oxon Hill Farm – Oxon Cove Park is open from 8:00 a.m. to 4:30 p.m. Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors.

Fort Foote Park – Fort Foote is open from 9:00 a.m. to sunset., Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors.

Harmony Hall –The grounds of Harmony Hall are open during daylight hours. Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors.

Fort Washington Park, including Harmony Hall – Fort Washington Park is open from 8:00 a.m. to sunset. Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors. It is anticipated that the Fort Washington Marina would remain accessible during deer management activities.

Piscataway Park, including Marshall Hall – Piscataway Park is open from sunrise to sunset. Deer management activities would occur at night and additional advance notice of the temporary closure of the Marshall Hall Boat Ramp would be conducted prior to deer management activities to minimize disruption.

Washington, DC

Anacostia Park and *Kenilworth Park and Kenilworth Aquatic Gardens* – Anacostia Park is open from sunrise to sunset. Kenilworth Park and Kenilworth Aquatic Gardens is open from 8:00 a.m. to 4:00 p.m. Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors. NPS personnel or their agents would be stationed at park access points, such as the Anacostia Riverwalk Trail and Bladensburg Waterfront Park, to prevent cyclists and other trail users from entering the park during deer management activities.

Fort Dupont Park – Through traffic would be restricted on Fort Dupont Drive SE and Fort Davis Drive SE. Alternate routes would need to be used during deer management activities. Otherwise, Fort Dupont Park is open from sunrise to sunset so there would be no other effects on park visitors.

Fort Davis –Through traffic would be restricted on Fort Davis Drive SE between Pennsylvania Avenue SE and Massachusetts Avenue SE. Alternate routes would need to be used during deer management activities. Otherwise, Fort Davis is open from sunrise to sunset so there would be no other effects on park visitors.

Fort Mahan –Fort Mahan is open from sunrise to sunset. Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors.

Fort Chaplin – Fort Chaplin is open from sunrise to sunset. Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors.

Fort Stanton – Fort Stanton is open from sunrise to sunset. Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors.

Fort Ricketts – Fort Ricketts is open from sunrise to sunset. Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors.

Shepherd Parkway, including Fort Greble and Battery Carroll – Shepherd Parkway, Fort Greble and Battery Carroll are open from sunrise to sunset. Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors.

Oxon Run Parkway – Oxon Run Parkway is open from sunrise to sunset. Deer management activities would occur at night when the park is closed, so there would be no effect on park visitors.

Over the long-term, a reduced deer population density would be expected to improve habitat conditions within the parks, thereby increasing visitors' opportunity to experience an abundance and diversity of terrestrial wildlife. Damage to vegetation would be reduced, but these benefits may not be readily apparent to most visitors. Also, fewer deer may be observed while at the parks, which may detract from the experience for some visitors.

Human Health and Safety

Affected Environment

Deer, along with other mammals, serve as hosts for black-legged ticks (*Ixodes scapularis*), also known commonly as deer ticks, which carry Lyme disease and other tick-borne pathogens. Within National Capital Parks – East, complaints of high tick abundance have been received from visitors at Greenbelt Park, which in recent years has supported a deer population as great as 212 deer per square mile (82 deer per square kilometer) in 2014. Piscataway Park is also known to have particularly high tick populations according to park staff.

There is also a correlation between local deer population density and the frequency of deer-vehicle collisions on park roadways. Several studies show that deer-vehicle collisions increase as local deer populations increase (NPS 2017b). Deer-vehicle collisions are a threat to human safety and are one of the predominant sources of deer mortality. Data is not collected on vehicle-deer collisions in National Capital Parks – East. Often, vehicle-deer collisions go unreported to NPS. However, on the

Baltimore-Washington Parkway, deer collisions occur at least several times a week, based on the number of deer carcasses that are removed from the roadway by NPS maintenance crews.

About the Analyses

This analysis includes a qualitative assessment that focuses on how changes in deer population densities within National Capital Parks – East would potentially affect human health and safety. The analysis also considers how human health and safety would be maintained during lethal management actions. The analysis assumes that the alternatives would have similar affects regardless of the implementation area and that measures to ensure human health and safety would also be similar.

Impacts of the No-Action Alternative

High deer populations would continue to act as hosts, along with other mammals, for ticks that may carry Lyme and other diseases. Additionally, deer-vehicle collisions would continue to be a frequent occurrence on park roads, such as the Baltimore-Washington Parkway.

Impacts of the Proposed Action

Lethal deer management actions would be used to reduce the deer population density to 15 to 20 deer per square mile within the implementation areas. The reduction in the deer population would result in an associated reduction in host animals for tick populations. However, there are other mammals that also serve as hosts for ticks, so the possibility that visitors and employees may still encounter ticks and acquire Lyme disease or other tick-borne diseases would not be eliminated.

Lethal deer management activities would be expected to quickly reduce deer population density within the parks under the proposed action. With fewer deer in the parks, the risk of vehicle collisions with deer would be expected to decrease.

Risks to human health and safety would be minimal due to the numerous safety protocols put in place during lethal deer management activities to ensure the safety of the public. Prior to initiating deer management activities, the NPS would post advance notices within the parks and send press releases to local media outlets to inform the public of upcoming deer management activities. Deer management activities would occur only at night when the parks are closed; however, the NPS would temporarily close park roads and trails while deer management activities are underway. Signs would be posted and NPS personnel or their agents would be stationed at closed roads and trails to ensure that nighttime visitors do not enter active deer management areas. The NPS may also coordinate with law enforcement, such as with the US Park Police and M-NCPPC Park Police, to assist with enforcing road and trail closures.

Deer management activities would be conducted in a manner to ensure the safety of neighboring communities. Sharpshooting would not occur near park boundaries and would not occur near occupied buildings or congested areas. Only highly trained firearms experts experienced in conducting wildlife reduction operations would be used. Sharpshooters would use elevated positions to provide downward angled shots and would only shoot toward the interior of the park and away from buildings. Special non-lead ammunition with a shorter travel distance would also be used.

Sharpshooters would be required to use infrared heat scanners and night vision goggles to identify deer since they will be working at night. Finally, noise-suppressed weapons would be used to ensure that park neighbors are not disrupted during nighttime deer management activities.

CONSULTATION AND COORDINATION

NPS provided an opportunity for the public to comment on the proposed action during the NEPA process. Consultation and coordination with federal, District, and Maryland agencies, American Indian tribes, and other interested parties was also conducted to identify issues related to natural and cultural resources and concerns of park neighbors. This section provides a summary of the public involvement and agency consultation and coordination that occurred during preparation of the EA.

Public Involvement

As part of the NEPA process and to comply with the requirements of Section 106 of the NHPA, the NPS and DOEE involved the public in project scoping by holding a 30-day public comment period from June 15, 2021, to July 15, 2021. A virtual public meeting was also held on June 15, 2021, using the GoToWebinar platform. The scoping period and virtual meeting were announced by sending an email blast to agencies, stakeholders, and other potentially interested parties from a mailing list established for the Project. Scoping flyers were also posted at each of the parks where deer management activities are proposed. The presentation used during the virtual public meeting, a recording of the meeting, the scoping flyer, and a scoping information sheet are available at https://parkplanning.nps.gov/projectHome.cfm?projectID=102432.

During the public scoping period, comments regarding the purpose and need for the proposed project and alternatives to the proposed action were received:

- Purpose and need:
  - Questions about whether the proposed action is needed
  - Concern with the impact deer are having on forest ecology
  - Concerns with impacts deer have on neighboring communities
  - Concern about interactions between deer and humans
  - Concern about ticks and Lyme disease
  - Concern about the spread of nonnative, invasive species
  - Questions about the carrying capacity of habitat within the park for deer

- Alternatives:
  - Support for allowing public managed hunts and public archery/bow hunts
  - Support for non-lethal controls
  - Support for lethal controls as have been used at other NPS parks in the region
  - Support for donating meat

Agency Consultation and Coordination

Section 106 of the National Historic Preservation Act

Pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations (36 CFR Part 800) “Protection of Historic Properties”, NPS initiated consultation with the District of Columbia Historic Preservation Office (DC HPO) and the Maryland Historical Trust (MHT) in a letter dated April 27, 2021. The letter briefly described the project, defined an APE, and identified historic properties within the APE. MHT acknowledged receipt of the initiation letter on April 28, 2021, and the DC HPO acknowledged receipt of the letter on May 18, 2021.

NPS submitted an Assessment of Effects to the DC HPO and MHT which assessed whether the proposed undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify it for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association. Based on the Assessment of Effects, it was determined that the proposed undertaking would have no adverse effect on historic properties and no effect on archaeological resources.

Tribal Consultation

Consultation initiation letters were sent to the Delaware Nation, Cedarville Band of Piscataway Indians, Catawba Indian Nation, Piscataway Conoy Tribe, Piscataway Indian Nation, Pamunkey Indian Tribe, the Eastern Shawnee Tribe of Oklahoma, and the Shawnee Tribe of Oklahoma on April 27, 2021. MHT acknowledged receipt of the initiation letter on April 28, 2021, and the DC HPO acknowledged receipt of the letter on May 18, 2021. No comments were received from any of the Tribes.

Section 7 of the Endangered Species Act

An official species list was obtained using the USFWS Information for Planning and Consultation (IPaC) System on July 6, 2021, that identified the federally listed threatened northern long-eared bat and yellow lance mussel as potentially occurring in the vicinity of proposed deer management activities. The NPS determined that implementation of the proposed Plan may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the USFWS Programmatic Biological Opinion dated January 5, 2016. Therefore, NPS Section 7 responsibilities for implementation of the proposed Plan have been satisfied for the northern long-eared bat. In addition, the NPS determined deer management activities would have no effect on the yellow lance mussel. Therefore, no further consultation with USFWS is necessary. The official species list obtained through the IPaC System and USFWS verification of Final 4(d) Rule applicability are included in Appendix C.

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APPENDIX A

PROPOSED DEER MANAGEMENT IMPLEMENTATION AREAS

Existing 10' Contour

Anacostia Park Boundary

Notes

1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

0 1,000 2,000 Feet

(At original document size of 11x17)
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Project Location
1900 Anacostia Dr
Washington, DC 20020

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-1

Title
Anacostia Park - National Colonial Farm Deer Management Area Map

Existing 10' Contour

Anacostia Park Boundary

Notes

1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

MD iMAP, DoIT

0 1,000 2,000 Feet

(At original document size of 11x17)
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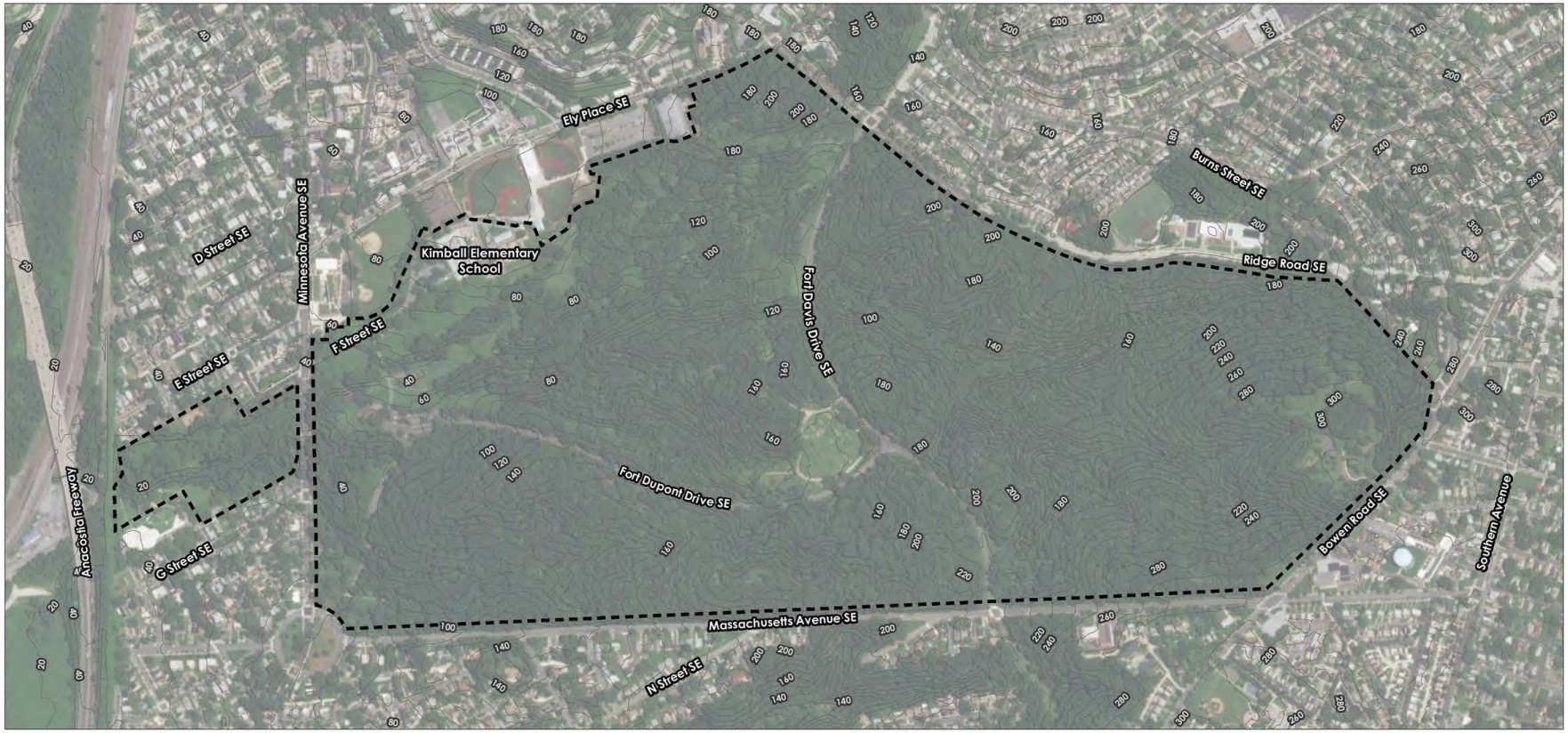
Project Location
1900 Anacostia Dr
Washington, DC 20020

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-2

Title
Anacostia Park - National Colonial Farm Deer Management Area Map



County Boundary
Existing 10' Contour
Fort Dupont Park Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,

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1:7,200

Project Location
Minnesota Ave SE
Washington, DC 20019

Prepared by DGV on 2021-01-21

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-3

Title
Fort Dupont Park
Deer Management Area Map

State Boundary
Existing 10' Contour
Fort Mahan Park Boundary

Notes:
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,

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1:3,600

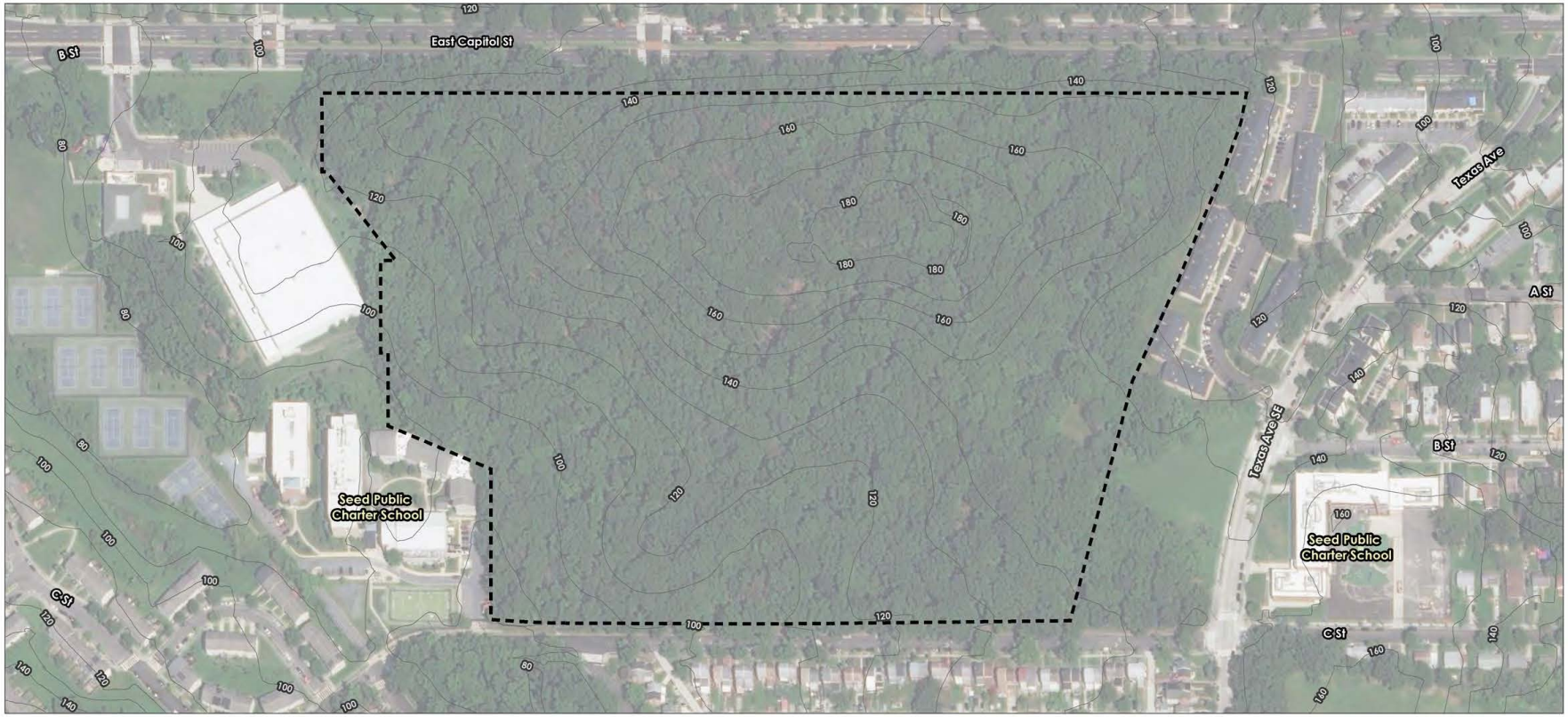
Project Location
Benning Rd NE
Washington, DC 20019

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-4

Title
Ft. Mahan Park
Deer Management Area Map



Existing 10' Contour

Fort Chaplin Park Boundary

Notes

1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,

N

0 200 400 Feet

(At original document size of 11x17)
1:2,400

Project Location
E Capitol St SE
Washington, DC 20019

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-5

Title
Ft. Chaplin Park
Deer Management Area Map

Notes:
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Existing 10' Contour
Fort Stanton Park Boundary

N

0 290 580 Feet
(At original document size of 11x17)
1:3,510

Project Location
1820 Erie St SE
Washington, DC 20020

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-6

Title
Ft. Stanton & Ft. Ricketts Park
Deer Management Area Map

State Boundary
Existing 10' Contour
Shepherd Parway Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

0 500 1,000 Feet
(At original document size of 11x17)
1:6,000

Project Location
Martin Luther King Jr Ave SW & Elmira St SW
Washington, DC 20032

Prepared by DGV on 2021-09-11

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-7

Title
Shepherd Parkway / Ft. Greble
Deer Management Area of Interest Map

State Boundary
Existing 10' Contour
Shepherd Parway Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

0 500 1,000 Feet
(At original document size of 11x17)
1:6,000

Project Location
Martin Luther King Jr Ave SW & Elmira St SW
Washington, DC 20032

Prepared by DGV on 2021-09-11

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-8

Title
Shepherd Parkway / Ft. Greble
Deer Management Area of Interest Map

State Boundary
Existing 10' Contour
Oxon Parkway Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,

N

0 400 800 Feet
(At original document size of 11x17)
1:4,800

Project Location
900 Mississippi Ave SE
Washington, DC 20032

Prepared by DGV on 2021-09-11

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-9

Title
Oxon Parkway
Deer Management Area Map

Existing 10' Contour

Baltimore-Washington Parkway Boundary

Notes

1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

0 1,000 2,000 Feet

(At original document size of 11x17)
1:12,000

Project Location

Baltimore-Washington Parkway

Prepared by DGV on 2021-09-10

Client/Project

National Park Service
NACE White-tailed Deer Management Plan

Figure No.

A-10

Title

Baltimore - Washington Parkway Deer Management Area Map

Existing 10' Contour

Baltimore-Washington Parkway Boundary

Notes

1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

0 1,000 2,000 Feet

(At original document size of 11x17)
1:12,000

Project Location — Prepared by DGV on 2021-09-10

Baltimore-Washington Parkway

Client/Project

National Park Service
NACE White-tailed Deer Management Plan

Figure No.

A-11

Title

Baltimore - Washington Parkway
Deer Management Area Map

Existing 10' Contour

Baltimore-Washington Parkway Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

0 1,000 2,000 Feet
(At original document size of 11x17)
1:12,000

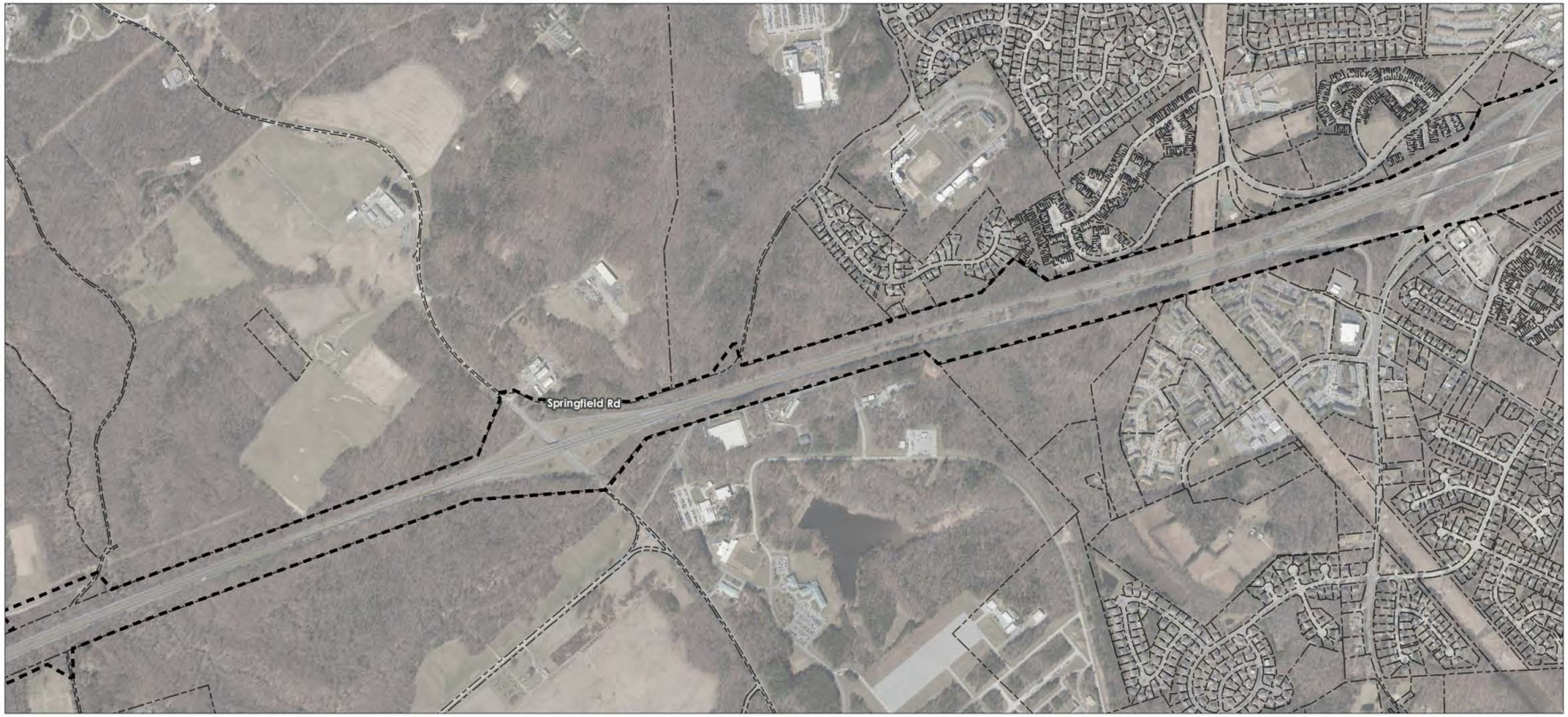
Project Location
Baltimore-Washington Parkway

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-12

Title
Baltimore - Washington Parkway Deer Management Area Map



Existing 10' Contour

Baltimore-Washington Parkway Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

0 1,000 2,000 Feet
(At original document size of 11x17)
1:12,000

Project Location
Baltimore-Washington Parkway

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-13

Title
Baltimore - Washington Parkway Deer Management Area Map

Parcel Boundary
Baltimore-Washington Parkway Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

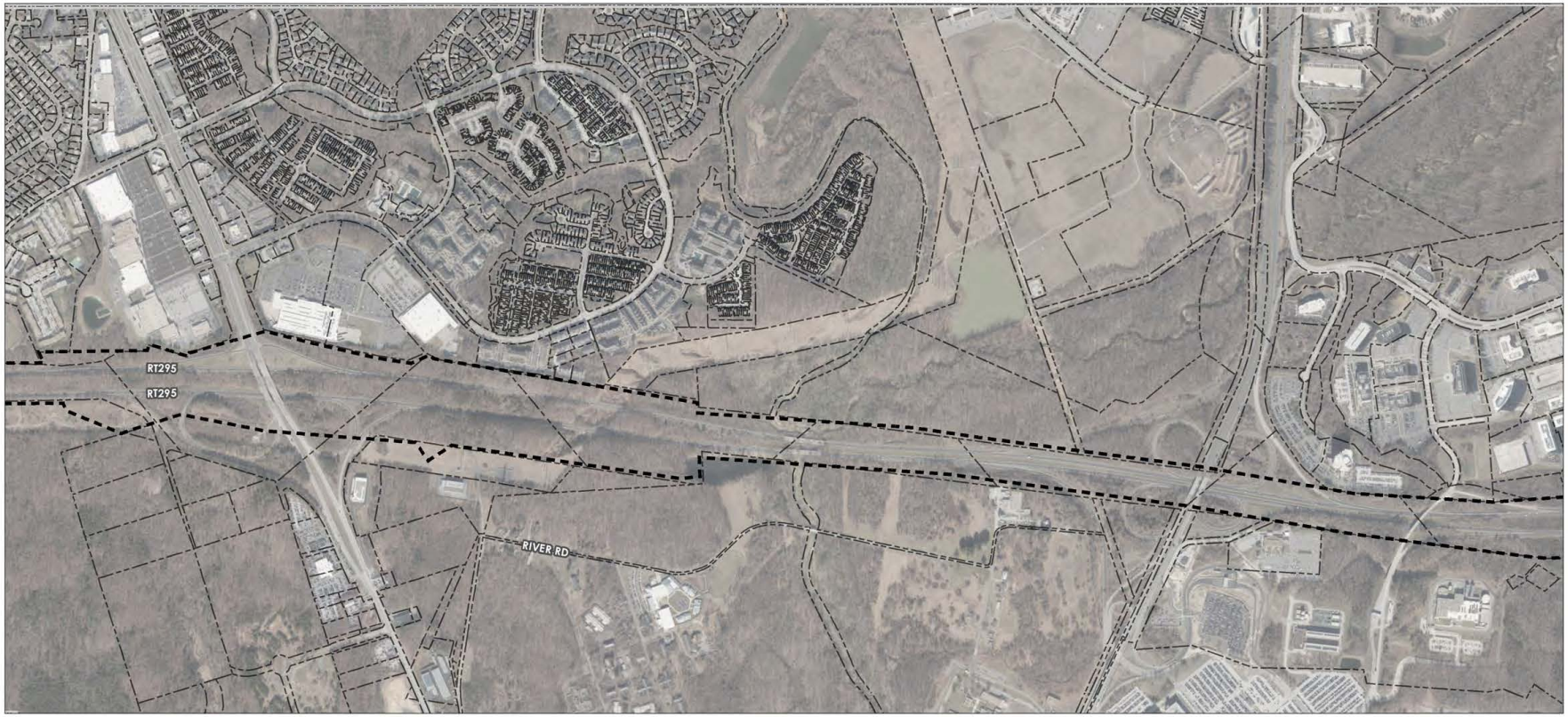
0 1,000 2,000 Feet
(At original document size of 11x17)
1:12,000

Project Location Prepared by DGV on 2021-09-10
Baltimore-Washington Parkway

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-14

Title
Baltimore - Washington Parkway
Deer Management Area Map



--- Parcel Boundary

▪▪▪ Baltimore-Washington Parkway Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

0 1,000 2,000 Feet
(At original document size of 11x17)
1:12,000

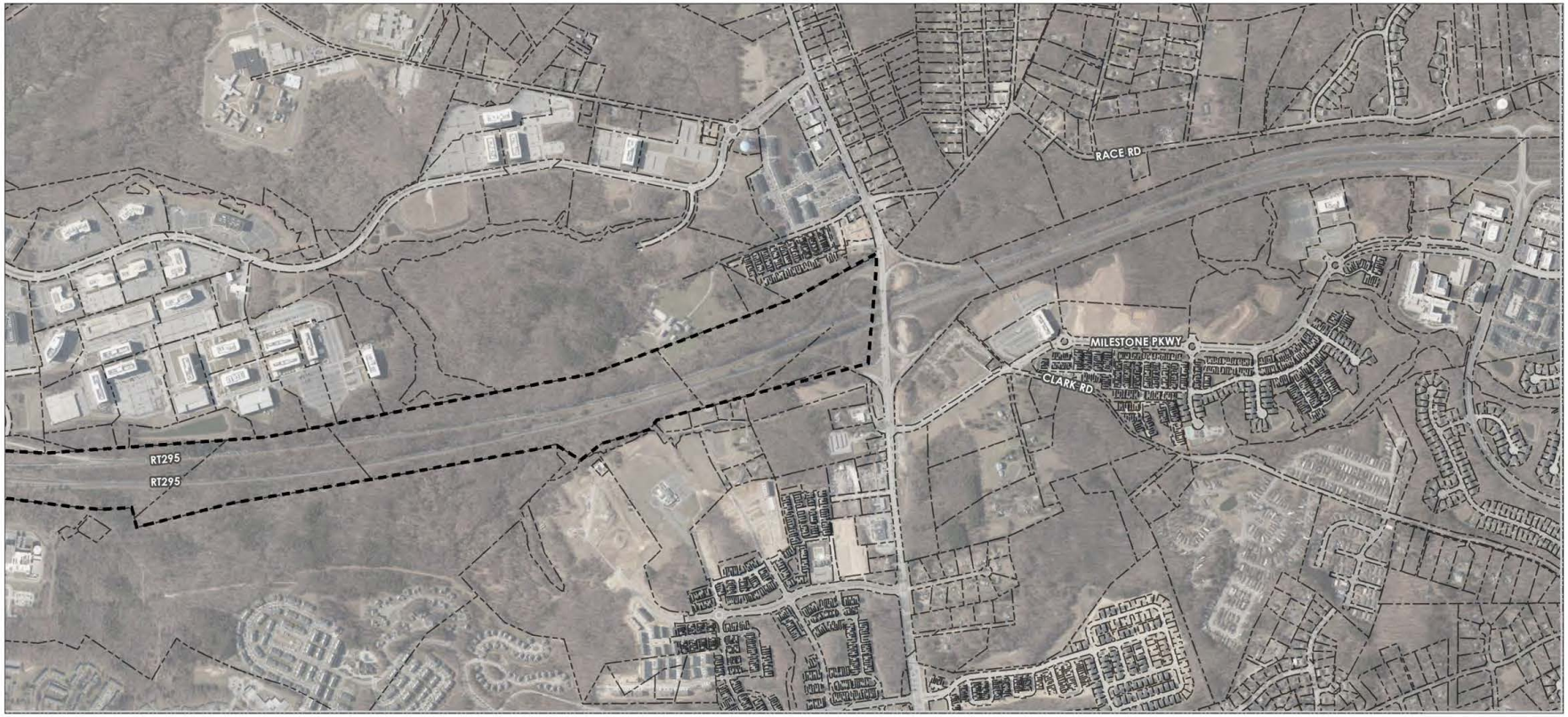
Project Location
Baltimore-Washington Parkway

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-15

Title
Baltimore - Washington Parkway Deer Management Area Map



--- Parcel Boundary

▪▪▪ Baltimore-Washington Parkway Boundary

Notes

1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

0 1,000 2,000 Feet

(At original document size of 11x17)
1:12,000

Project Location Prepared by DGV on 2021-09-10

Baltimore-Washington Parkway

Client/Project

National Park Service
NACE White-tailed Deer Management Plan

Figure No.

A-16

Title

Baltimore - Washington Parkway Deer Management Area Map

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD IMAP; DoIT

--- Parcel Boundary
Existing 10' Contour
- - - Greenbelt Park Boundary

0 1,000 2,000 Feet
(At original document size of 11x17)
1:12,200

Prepared by DGV on 2021-09-10

Project Location
6565 Greenbelt Rd
Greenbelt, MD 20770

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-17

Title
Greenbelt Park
Deer Management Area Map

Existing 10' Contour

Suitland Parkway Boundary

Notes

1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

N

0 1,000 2,000 Feet

(At original document size of 11x17)
1:12,000

Project Location Prepared by DGV on 2021-09-11

Suitland Parkway

Client/Project

National Park Service
NACE White-tailed Deer Management Plan

Figure No.

A-18

Title

Suitland Parkway
Deer Management Area Map

Existing 10' Contour

Suitland Parkway Boundary

Notes

1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

N

0 1,000 2,000 Feet

(At original document size of 11x17)
1:12,000

Project Location Prepared by DGV on 2021-09-11

Suitland Parkway

Client/Project

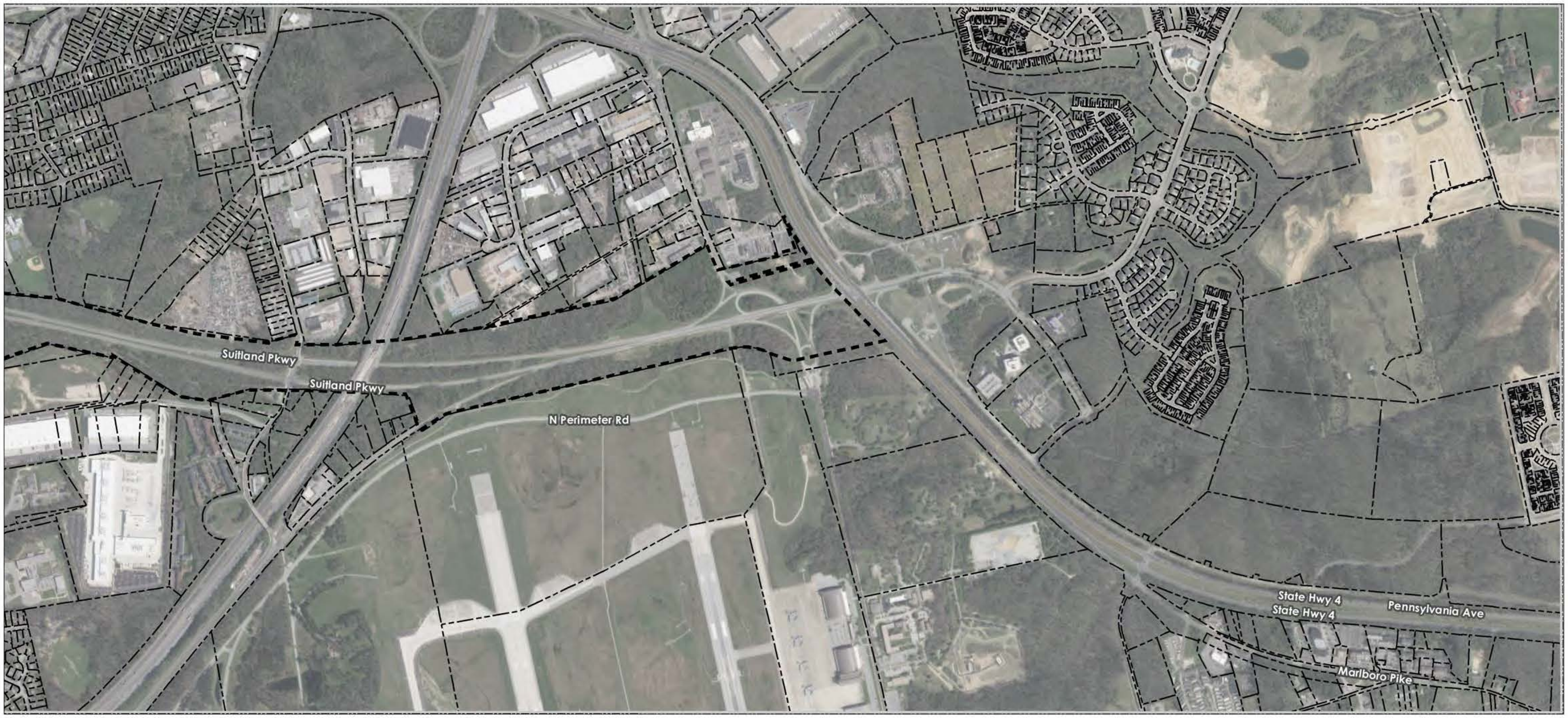
National Park Service
NACE White-tailed Deer Management Plan

Figure No.

A-19

Title

Suitland Parkway
Deer Management Area Map



- - - Parcel Boundary
▪ ▪ ▪ Suitland Parkway Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

N

0 1,000 2,000 Feet
(At original document size of 11x17)
1:12,000

Project Location Prepared by DGV on 2021-09-11
Suitland Parkway

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-20

Title
Suitland Parkway
Deer Management Area Map

- State Boundary
- Parcel Boundary
- Existing 10' Contour
- Oxon Cove Park Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

N

0 800 1,600 Feet

(At original document size of 11x17)
1:9,600

Project Location
6411 Oxon Hill Rd
Oxon Hill, MD 20745

Prepared by DGV on 2021-09-11

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-21

Title
Oxon Cove Park
Deer Management Area Map

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP; DoIT

--- Parcel Boundary
Existing 10' Contour
Fort Foote Park Boundary

N 0 300 600 Feet
(At original document size of 11x17)
1:3,600

Project Location
8915 Fort Foote Rd
Fort Washington, MD 20744

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-22

Title
Fort Foote Park
Deer Management Area Map

- - - Parcel Boundary
—— Existing 10' Contour
■ ■ ■ Harmony Hall Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

N

0 400 800 Feet
(At original document size of 11x17)
1:4,750

Project Location
Harmony Hall Park
Fort Washington, MD 20744

Prepared by DGV on 2021-01-21

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-23

Title
Harmony Hall
Deer Management Area Map

Parcel Boundary
Existing 10' Contour
Fort Washington Park Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

N

0 500 1,000 Feet
(At original document size of 11x17)
1:6,500

Project Location
13551 Fort Washington Rd
Fort Washington, MD 20744

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-24

Title
Fort Washington Park
Deer Management Area Map

- Parcel Boundary
- Existing 10' Contour
- Fort Washington Park Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP; DoIT

N

0 500 1,000 Feet
(At original document size of 11x17)
1:6,500

Project Location
13551 Fort Washington Rd
Fort Washington, MD 20744

Prepared by DGV on 2021-09-10

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-25

Title
Fort Washington Park
Deer Management Area Map

- Parcel Boundary
- Existing 10' Contour
- Piscataway Park Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

N

0 600 1,200 Feet

(At original document size of 11x17)
1:7,200

Project Location
3400 Bryan Point Rd
Accokeek, MD 20607

Prepared by DGV on 2021-09-11

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-26

Title
Piscataway Park
Deer Management Area Map

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD IMAP, DoIT

--- Parcel Boundary
Existing 10' Contour
--- Piscataway Park Boundary

N

0 600 1,200 Feet
(At original document size of 11x17)
1:7,200

Project Location
3400 Bryan Point Rd
Accokeek, MD 20607

Prepared by DGV on 2021-09-11

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-27

Title
Piscataway Park
Deer Management Area Map

- County Boundary
- Parcel Boundary
- Existing 10' Contour
- Piscataway Park Boundary

Notes
1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD iMAP, DoIT

N

0 600 1,200 Feet

(At original document size of 11x17)
1:7,200

Project Location
3400 Bryan Point Rd
Accokeek, MD 20607

Prepared by DGV on 2021-09-11

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-28

Title
Piscataway Park
Deer Management Area Map

County Boundary

Marshall Hall Park Boundary

Notes

1. Coordinate System: NAD 1983 CORS96 StatePlane Maryland FIPS 1900 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
MD IMAP; DoIT

N

0 1,000 2,000 Feet

(At original document size of 11x17)
1:12,000

Project Location
Marshall Hall Boat Ramp
Bryans Road, MD 20616

Prepared by DGV on 2021-09-2021

Client/Project
National Park Service
NACE White-tailed Deer Management Plan

Figure No.
A-29

Title
Marshall Hall Park
Deer Management Area Map

APPENDIX B

VEGETATION ASSOCIATIONS AT NATIONAL CAPITAL PARKS – EAST PARK UNITS PROPOSED FOR DEER MANAGEMENT AND US NATIONAL VEGETATION CLASSIFICATION DESCRIPTIONS

VEGETATION ASSOCIATIONS AT NATIONAL CAPITAL PARKS – EAST PARK UNITS PROPOSED FOR DEER MANAGEMENT

Table 1. Anacostia Park and Kenilworth Park and Aquatic Gardens

Vegetation Association	Association Common Name	Acreage
CEGL005033	Ruderal Box-elder Floodplain Forest	71.03
CEGL006287	Pumpkin Ash - Swamp Tupelo Freshwater Tidal Swamp	15.58
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	6.53
CEGL006548	Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest	4.49
CEGL006325	Freshwater Tidal Mixed High Marsh	3.40
CEGL006976	Northern Coastal Plain Ruderal Floodplain Forest	2.39
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	0.98

Table 2. Civil War Defenses of Washington - Ft. Mahan

Vegetation Association	Association Common Name	Acreage
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	3.61

Table 3. Civil War Defenses of Washington - Ft. Chaplin

Vegetation Association	Association Common Name	Acreage
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	7.27

Table 4. Civil War Defenses of Washington - Ft. Dupont

Vegetation Association	Association Common Name	Acreage
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	81.49
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	46.82
CEGL006919	Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest	45.18
CEGL006299	Central Appalachian-Northern Piedmont Chestnut Oak Forest	39.52
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	11.55
CEGL002591	Ruderal Virginia Pine Forest	2.78
CEGL004418	Upper Southeast Sweetgum - Tuliptree Small Stream Forest	2.59

Table 5. Civil War Defenses of Washington - Ft. Davis

Vegetation Association	Association Common Name	Acreage
CEGL006919	Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest	2.04

Table 6. Civil War Defenses of Washington - Ft. Stanton / Ft. Ricketts

Vegetation Association	Association Common Name	Acreage
No US National Vegetation Classification mapped at Ft. Stanton / Ft. Ricketts		

Table 7. Civil War Defenses of Washington - Battery Carroll / Ft. Greble / Shepherd Parkway

Vegetation Association	Association Common Name	Acreage
CEGL006055	Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest	20.62
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	13.69
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	1.83

Table 8. Civil War Defenses of Washington - Ft. Foote

Vegetation Association	Association Common Name	Acreage
CEGL006055	Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest	16.70
CEGL006490	Chesapeake Bay River Bluff Chestnut Oak Forest	6.99
CEGL007220	Ruderal Tuliptree Forest (Rich Type)	4.28
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	2.15
CEGL006287	Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest	1.74
CEGL005033	Ruderal Box-elder Floodplain Forest	1.06
CEGL004418	Upper Southeast Sweetgum - Tuliptree Small Stream Forest	0.66
CEGL006325	Freshwater Tidal Mixed High Marsh	0.61
CEGL006606	Chesapeake-Piedmont Red Maple / Lizard's tail Swamp Forest	0.49

Table 9. Oxon Run Parkway

Vegetation Association	Association Common Name	Acreage
CEGL006976	Northern Coastal Plain Ruderal Floodplain Forest	28.14
CEGL004418	Upper Southeast Sweetgum - Tuliptree Small Stream Forest	18.77
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	15.01
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	9.01
CEGL006919	Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest	4.70
CEGL006299	Central Appalachian-Northern Piedmont Chestnut Oak Forest	4.50
CEGL007220	Ruderal Tuliptree Forest (Rich Type)	4.01
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	3.92
CEGL006238	Southern Red Maple - Blackgum Swamp Forest	3.78
CEGL002591	Ruderal Virginia Pine Forest	2.26

Table 10. Baltimore-Washington Parkway

Vegetation Association	Association Common Name	Acreage
CEGL002591	Ruderal Virginia Pine Forest	150.07
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	123.20
CEGL007216	Ruderal Sweetgum Forest	32.03
CEGL006390	Mesic Coastal Plain Oak Forest	24.65
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	21.98
CEGL006976	Northern Coastal Plain Ruderal Floodplain Forest	21.46
CEGL006605	Coastal Plain Oak Floodplain Forest	21.37
CEGL007220	Ruderal Tuliptree Forest (Rich Type)	14.42
CEGL004418	Upper Southeast Sweetgum - Tuliptree Small Stream Forest	14.24
CEGL006548	Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest	12.92
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	10.92
CEGL006603	Coastal Plain Streamside Forest	9.26
CEGL006329	North Atlantic Coastal Plain Oak - Pine Forest	8.05
CEGL005033	Ruderal Box-elder Floodplain Forest	7.07
CEGL006287	Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest	2.22
CEGL006110	Sweetgum - Red Maple Swamp Forest	1.37
CEGL007330	Ruderal Sweetgum Wet Forest	0.91
CEGL004187	Ruderal Tidal Common Reed Marsh	0.67
CEGL006238	Southern Red Maple - Blackgum Swamp Forest	0.30

Table 11. Greenbelt Park

Vegetation Association	Association Common Name	Acreage
CEGL002591	Ruderal Virginia Pine Forest	367.07
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	228.99
CEGL006390	Mesic Coastal Plain Oak Forest	180.92
CEGL004418	Upper Southeast Sweetgum - Tuliptree Small Stream Forest	100.85
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	30.99
CEGL006238	Southern Red Maple - Blackgum Swamp Forest	13.19
CEGL007216	Ruderal Sweetgum Forest	3.47
CEGL006926	Pine Barrens Pitch Pine - Hardwood Swamp Forest	1.78
CEGL006219	Fall-line Terrace Gravel Magnolia Bog	1.24
CEGL006110	Sweetgum - Red Maple Swamp Forest	0.37

Table 12. Suitland Parkway

Vegetation Association	Association Common Name	Acreage
CEGL004418	Upper Southeast Sweetgum - Tuliptree Small Stream Forest	53.69
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	17.34
CEGL006976	Northern Coastal Plain Ruderal Floodplain Forest	14.35
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	14.12
CEGL007220	Ruderal Tuliptree Forest (Rich Type)	9.30
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	7.18
CEGL006919	Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest	5.05
CEGL002591	Ruderal Virginia Pine Forest	4.39

Table 13. Oxon Cove Park, including Oxon Hill Farm and Bald Eagle Hill

Vegetation Association	Association Common Name	Acreage
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	36.35
CEGL006287	Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest	19.79
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	13.64
CEGL006390	Mesic Coastal Plain Oak Forest	11.39
CEGL007220	Ruderal Tuliptree Forest (Rich Type)	8.85
CEGL006217	Piedmont-Central Appalachian Silver Maple Floodplain Forest	8.01
CEGL002591	Ruderal Virginia Pine Forest	7.16
CEGL005033	Ruderal Box-elder Floodplain Forest	5.26
CEGL006325	Freshwater Tidal Mixed High Marsh	3.63
CEGL006110	Sweetgum - Red Maple Swamp Forest	3.05
CEGL006976	Northern Coastal Plain Ruderal Floodplain Forest	1.27

Table 14. Harmony Hall

Vegetation Association	Association Common Name	Acreage
CEGL006287	Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest	5.74
CEGL006606	Chesapeake-Piedmont Red Maple / Lizard's tail Swamp Forest	4.51
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	3.97
CEGL006325	Freshwater Tidal Mixed High Marsh	2.66
CEGL002591	Ruderal Virginia Pine Forest	2.55
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	1.38
CEGL006603	Coastal Plain Streamside Forest	1.21

Table 15. Fort Washington Park

Vegetation Association	Association Common Name	Acreage
CEGL006055	Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest	207.51
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	43.05
CEGL007220	Ruderal Tuliptree Forest (Rich Type)	40.61
CEGL006603	Coastal Plain Streamside Forest	30.70
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	10.47
CEGL007748	North Atlantic Coastal Plain Dry Calcareous Forest	9.92
CEGL004073	Piedmont-Central Appalachian Rich Floodplain Forest	8.98
CEGL005033	Ruderal Box-elder Floodplain Forest	7.13
CEGL008521	Piedmont-Central Appalachian Mixed Oak / Heath Forest	6.70
CEGL006606	Chesapeake-Piedmont Red Maple / Lizard's tail Swamp Forest	6.28
CEGL002591	Ruderal Virginia Pine Forest	5.80
CEGL006490	Chesapeake Bay River Bluff Chestnut Oak Forest	1.47
CEGL006287	Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest	1.45
CEGL006325	Freshwater Tidal Mixed High Marsh	1.39
CEGL006919	Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest	1.20

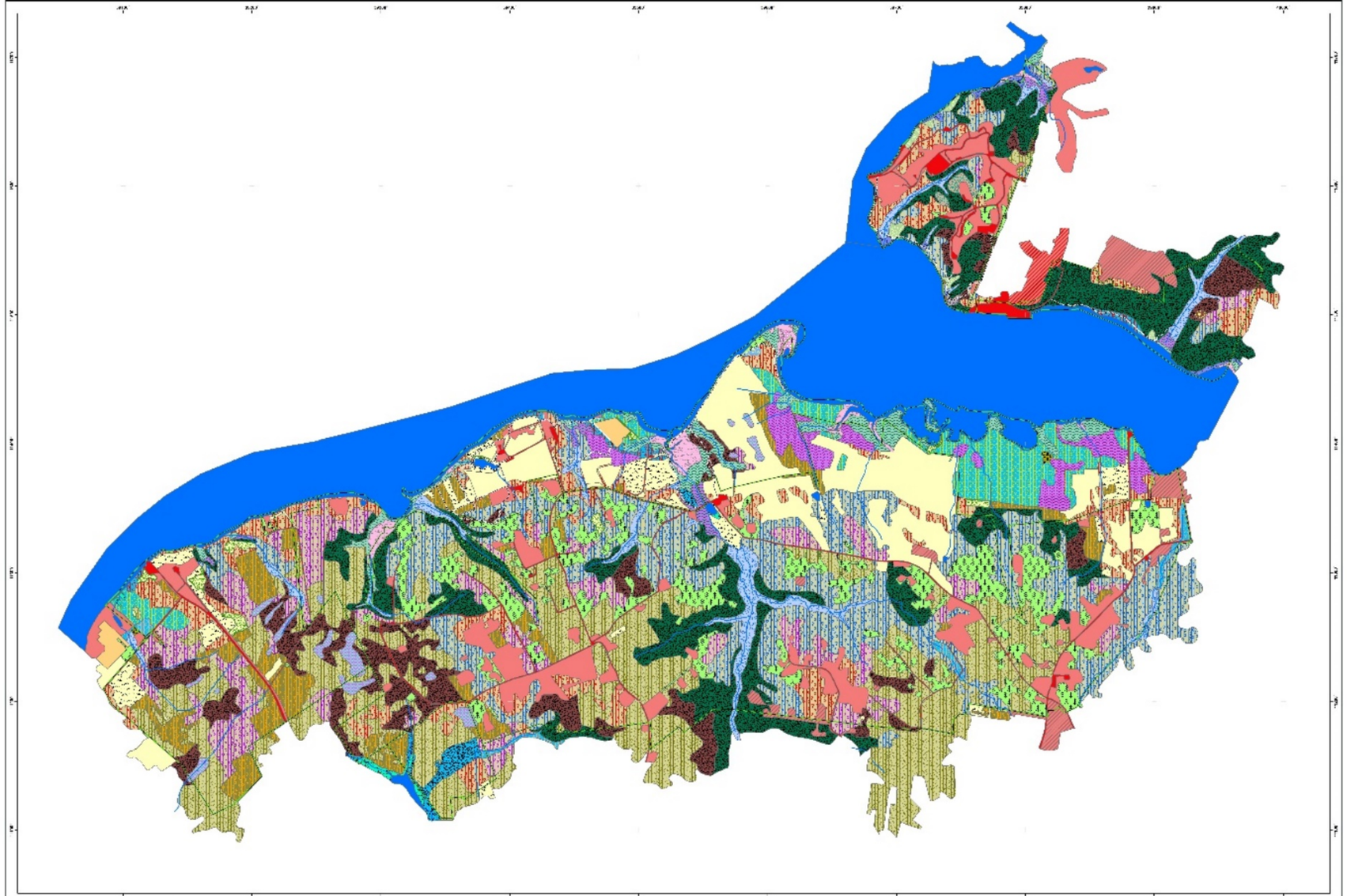
Table 16. Piscataway Park

Vegetation Association	Association Common Name	Acreage
CEGL007220	Ruderal Tuliptree Forest (Rich Type)	584.62
CEGL002591	Ruderal Virginia Pine Forest	524.71
CEGL006055	Coastal Plain Oak Floodplain Forest	279.07
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	188.70
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	152.04
CEGL007330	Ruderal Sweetgum Wet Forest	144.31
CEGL007216	Ruderal Sweetgum Forest	97.86
CEGL006605	Coastal Plain Oak Floodplain Forest	96.26
CEGL006287	Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest	92.06
CEGL006603	Coastal Plain Streamside Forest	76.77
CEGL006325	Freshwater Tidal Mixed High Marsh	35.11
CEGL006976	Northern Coastal Plain Ruderal Floodplain Forest	14.66
CEGL006606	Chesapeake-Piedmont Red Maple / Lizard's tail Swamp Forest	13.98
CEGL006110	Sweetgum - Red Maple Swamp Forest	11.30
CEGL005033	Ruderal Box-elder Floodplain Forest	9.56
CEGL004472	Broadleaf Pond lily Tidal Marsh	1.67
CEGL006217	Piedmont-Central Appalachian Silver Maple Floodplain Forest	1.51
CEGL004706	Green Arrow arum - Pickerelweed Tidal Marsh	0.36

Table 17. Marshall Hall

Vegetation Association	Association Common Name	Acreage
CEGL002591	Ruderal Virginia Pine Forest	132.96
CEGL007216	Ruderal Sweetgum Forest	111.69
CEGL007221	Ruderal Tuliptree Forest (Typic Type)	108.67
CEGL006075	Mid-Atlantic Mesic Mixed Hardwood Forest	76.03
CEGL006110	Sweetgum - Red Maple Swamp Forest	23.34
CEGL007330	Ruderal Sweetgum Wet Forest	20.85
CEGL007220	Ruderal Tuliptree Forest (Rich Type)	19.67
CEGL006603	Coastal Plain Streamside Forest	5.77
CEGL006055	Coastal Plain Oak Floodplain Forest	3.58
CEGL006976	Northern Coastal Plain Ruderal Floodplain Forest	3.09
CEGL005033	Ruderal Box-elder Floodplain Forest	2.29
CEGL006287	Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest	2.15
CEGL006606	Chesapeake-Piedmont Red Maple / Lizard's tail Swamp Forest	1.74

National Capital Parks - East
Piscataway and Ft. Washington
Vegetation Map



Legend

Park Boundary
Streams
Trails

Map Class

Map prepared by
Virginia Department of Conservation and Recreation,
Division of Natural Heritage, in cooperation with
NatureServe and the National Park Service.

DCR NatureServe

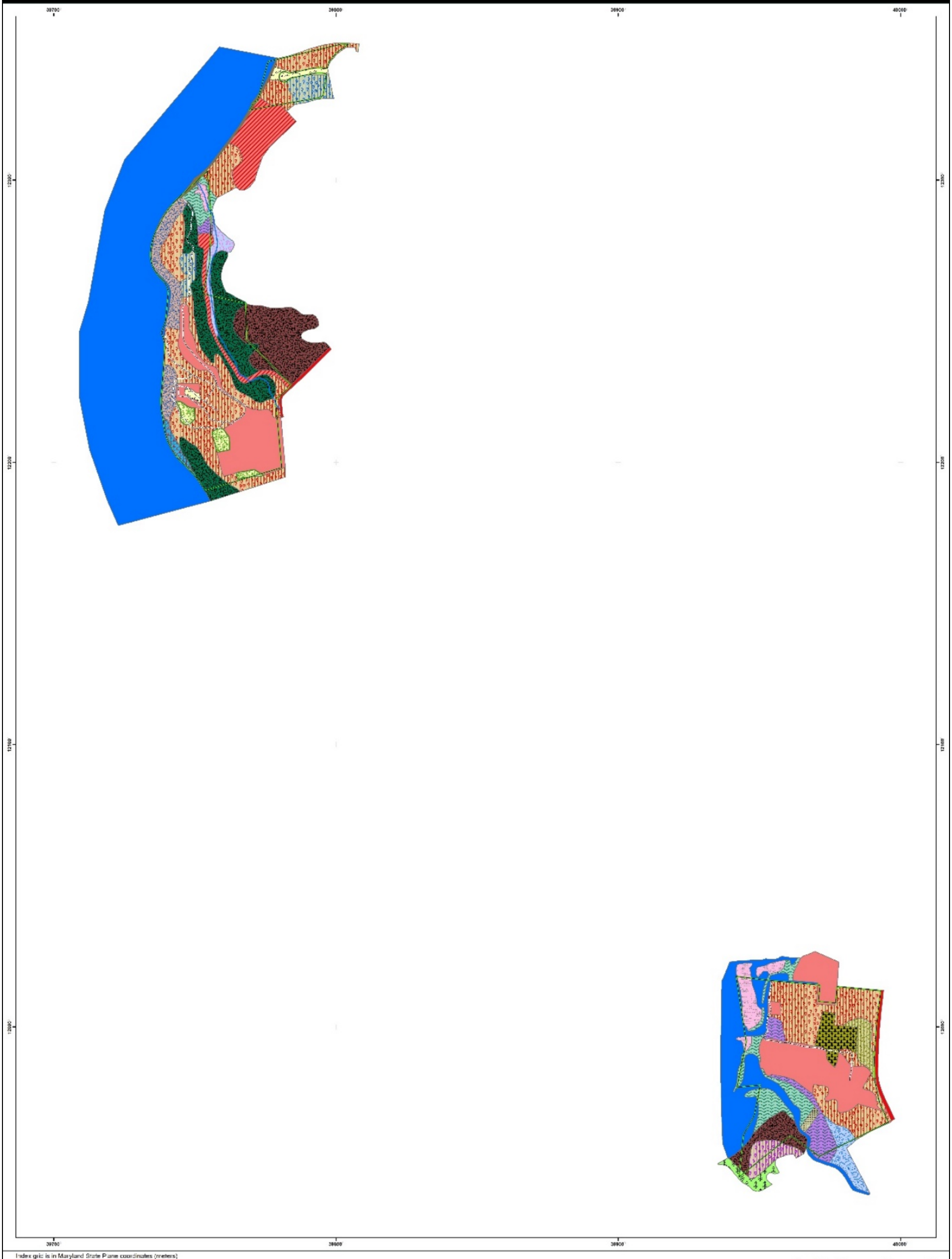
Map Date:
July 31, 2012

Background Imagery Date:
April 2004

Coordinate System:
Maryland State Plane meters;
North American Datum of 1983

Map 1 of 8

National Capital Parks - East
Fort Foote and Harmony Hall
Vegetation Map



Index grid: is in Maryland State Plane coordinates (meters)

Legend

- Streams
- Trails
- Park Boundary

Map Class

- River-Bluff Chestnut Oak Forest (CEGL006100)
- Mesic Mixed Hardwood Forest (CEGL006075)
- Basic Mesic Hardwood Forest (Coastal Plain / Piedmont Type; CEGL006055)
- Successional Mixed Deciduous Forest
- Successional Tuliptree Forest (Typic Type; CEGL007221)
- Successional Tuliptree Forest (Rich Type; CEGL007220)
- Successional Virginia Pine Forest (CEGL002591)
- Coastal Plain Streamside Forest (CEGL006603)
- Small Stream Sweetgum - Tuliptree Forest (CEGL007418)
- Successional Box elder Floodplain Forest (CEGL005033)
- Red Maple / Lizard's-tail Swamp (CEGL006006)
- Freshwater Tidal Swamp (CEGL006287)
- Freshwater Tidal Mixed High Marsh (CEGL006325)
- Planted Deciduous Forest
- Planted Evergreen Forest
- Successional Meadow / Grassland
- Successional Vine-Shrubland
- Forested Open Space
- Developed, Open Space
- Developed, Medium Intensity
- Developed, High Intensity
- Unconsolidated Shore
- Open Water

Map prepared by
Virginia Department of Conservation and Recreation, Division of Natural Heritage, in cooperation with NatureServe and the National Park Service.

DCR

NatureServe

0 0.05 0.1 0.2 0.3
Miles
1 Inch = 503 feet

N
W E
S

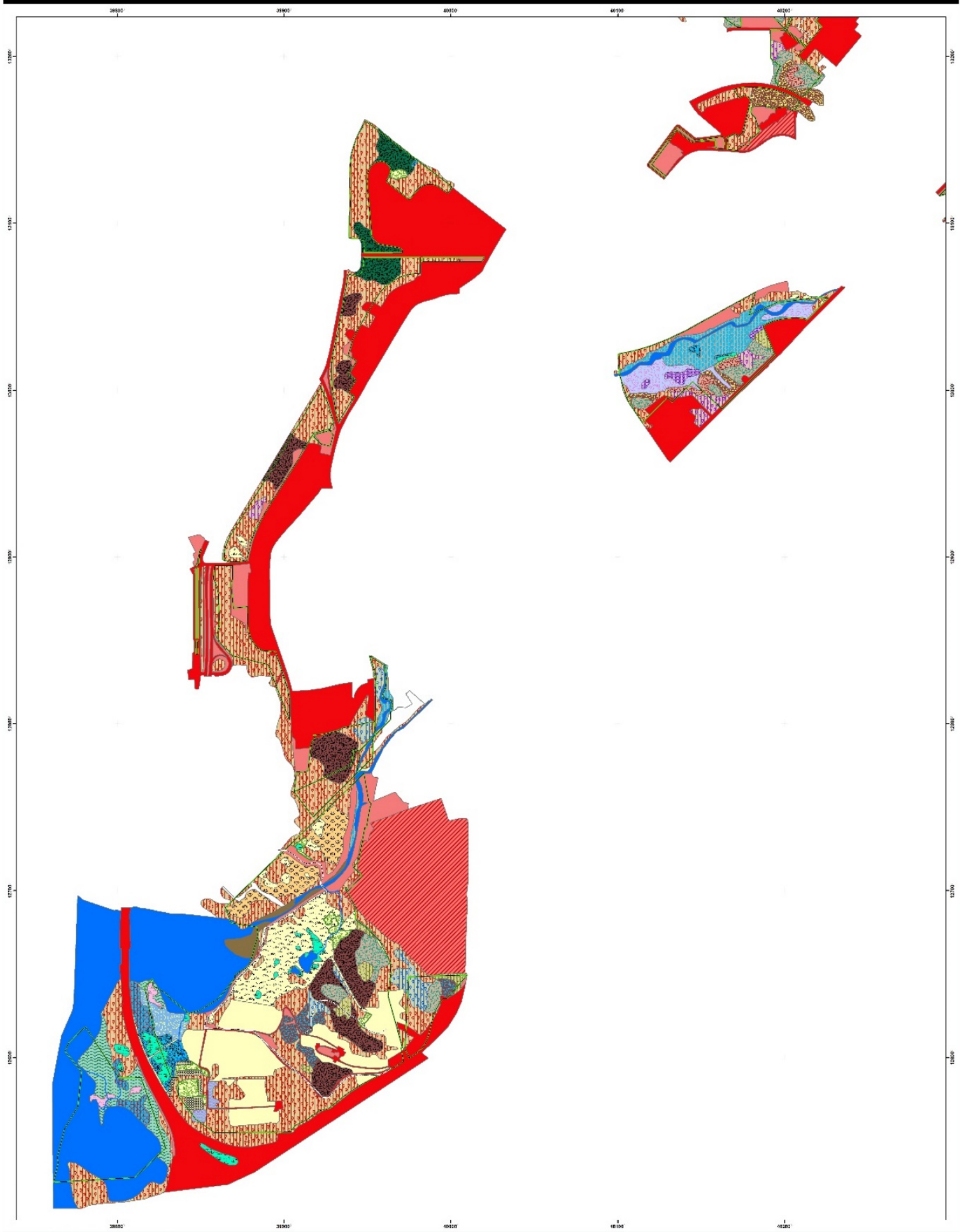
Map Date:
July 14, 2010

Background Imagery Date:
April 2004

Coordinate System:
Maryland State Plane (meters)
North American Datum of 1983

Map 2 of 8

National Capital Parks - East
Ft. Circle, Oxon Hill Farm Park, Oxon Run Parkway, and Shepherd Parkway
Vegetation Map



Index grid is in Maryland State Plane coordinates (meters)

Legend

- Streams
- Trails
- Park Boundary

Map Class

- Low-Elevation Mixed Oak / Heath Forest (CEGL006071)
- Chestnut Oak / Mountain Laurel Forest (CEGL006299)
- Mesic Mixed Hardwood Forest (CEGL006075)
- Oak - Beech / Heath Forest (CEGL006319)
- Coastal Plain Oak Forest (CEGL006390)
- Basic Mesic Hardwood Forest (Coastal Plain / Piedmont Type; CEGL006055)
- Successional Mixed Deciduous Forest
- Successional Tuliptree Forest (Tyaio Type; CEGL007221)
- Successional Tuliptree Forest (Rich Type; CEGL007220)
- Successional Virginia Pine Forest (CEGL002591)
- Silver Maple Floodplain Forest (CEGL006217)
- Small Stream Sweetgum - Tuliptree Forest (CEGL004418)
- Successional Box-elder Floodplain Forest (CEGL005053)
- Successional Red Maple Small River Floodplain Forest (CEGL006976)
- Red Maple - Blackgum Seepage Swamp (CEGL006238)
- Red Maple - Sweetgum Swamp (CEGL006110)
- Freshwater Tidal Swamp (CEGL006267)
- Freshwater Tidal Mixed High Marsh (CEGL006325)
- Planted Deciduous Forest
- Successional Meadow / Grassland
- Successional Mid-Shrubland
- Successional Woody Wetland
- Successional Herbaceous Wetland
- Pasture/Hay
- Orchards and Vineyards
- Developed, Open Space
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Unconsolidated Shore
- Open Water

Map prepared by
Virginia Department of Conservation and Recreation,
Division of Natural Heritage, in cooperation with
NatureServe and the National Park Service

DCR NatureServe

0 0.05 0.1 0.2 0.3 0.4 0.5
Miles
1 inch = 854 feet

N W E S

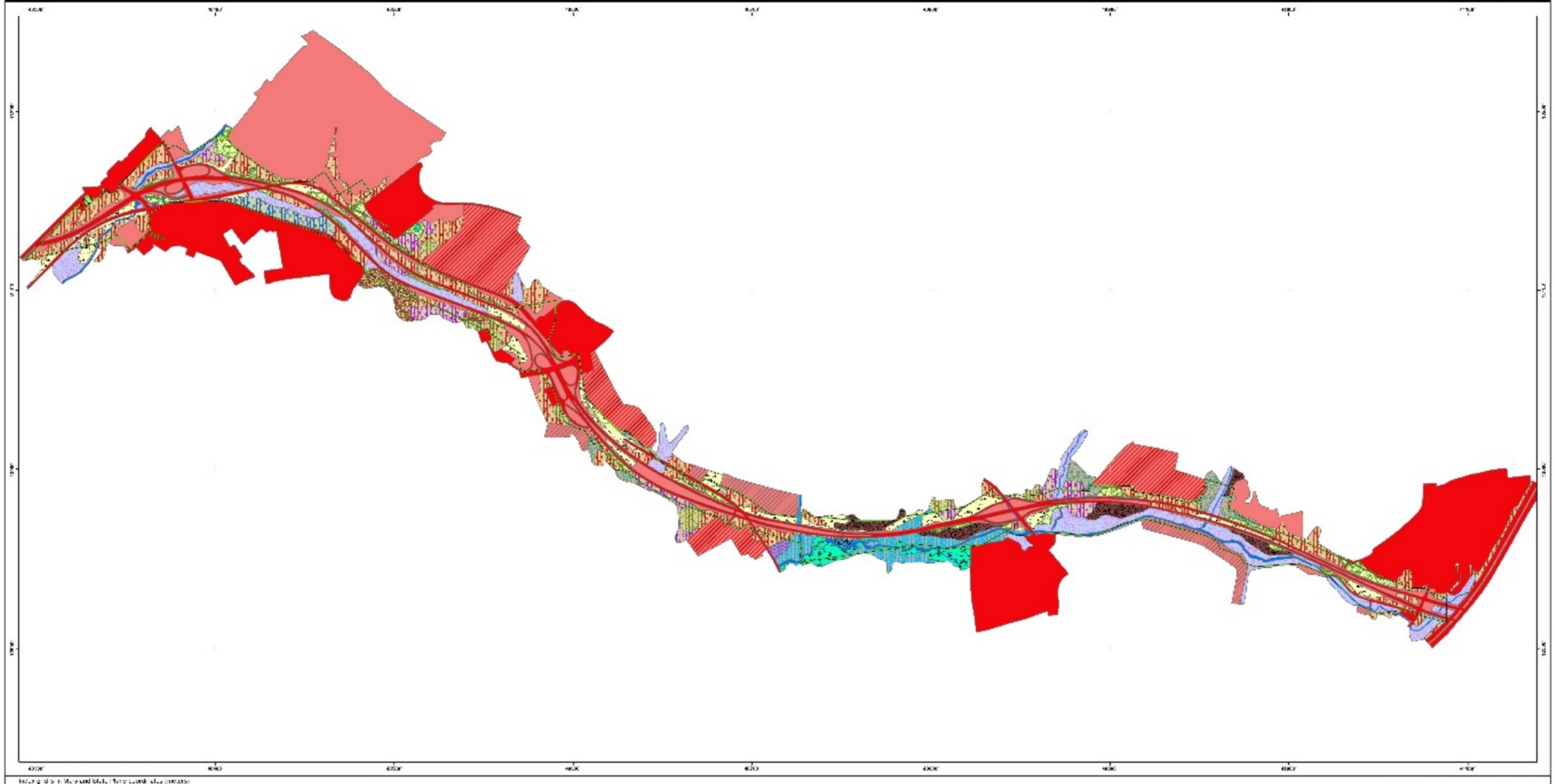
Map Date:
July 14, 2010

Background Imagery Date:
April 2004

Coordinate System:
Maryland State Plane (meters)
North American Datum of 1983

Map 3 of 8

National Capital Parks - East
Suitland Parkway
Vegetation Map



Legend

Map Class

Map prepared by:
Virginia Department of Conservation and Recreation, Division of Natural Heritage, in cooperation with NatureServe and the National Park Service.

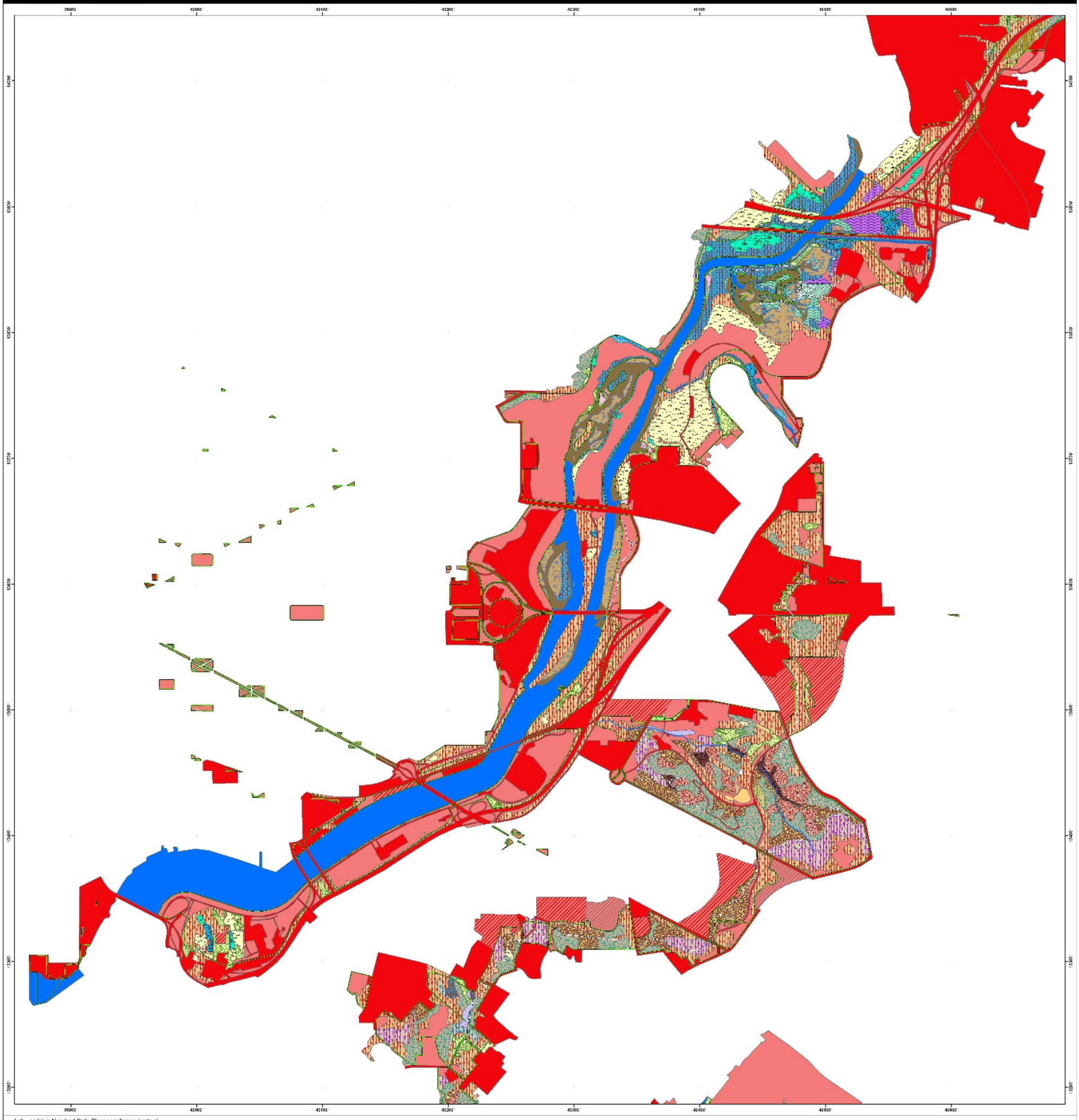
Map Date:

Background Imagery Date:

Coordinate System:

Map 4 of 8

National Capital Parks - East
Anacostia, Fort Dupont, Fort Circle Parks, and others
Vegetation Map



Index grid is in Maryland State Plane coordinates (meters)

Legend

- Streams
- Trails
- Park Boundary

Map Class

- Low-Elevation Mixed Oak / Heath Forest (CEGL006521)
- Chestnut Oak / Mountain Laurel Forest (CEGL006298)
- Mesic Mixed Hardwood Forest (CEGL006075)
- Oak - Beech / Heath Forest (CEGL006319)
- Coastal Plain Oak Forest (CEGL006360)
- Successional Mixed Deciduous Forest
- Successional Sweetgum Upland Forest (CEGL007216)
- Successional Tuliptree Forest (Typic Type; CEGL007221)
- Successional Tuliptree Forest (Rich Type; CEGL007220)
- Successional Virginia Pine Forest (CEGL002561)
- Small Stream Sweetgum - Tuliptree Forest (CEGL004418)
- Successional Hackberry Floodplain Forest (CEGL006093)
- Successional Red Maple-Birch River Floodplain Forest (CEGL006578)
- Maple-Ash Swamp Forest (CEGL006548)
- Freshwater Tidal Swamp (CEGL006267)
- Freshwater Tidal Mixed High Marsh (CEGL006525)
- Reed-grass Tidal Marsh (CEGL004187)
- Successional Meadow / Grassland
- Successional Vine-Shrubland
- Successional Woody Wetland
- Successional Herbaceous Wetland
- Forested Open Space
- Cultivated Crops
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Unconsolidated Shore
- Tidal Wetland Restoration and Experimental Area
- Aquatic Garden
- Open Water

Map prepared by
Virginia Department of Conservation and Recreation,
Division of Natural Heritage, in cooperation with
NatureServe and the National Park Service.

DCR — NatureServe

0 0.1 0.2 0.4 0.6 Miles
1 inch = 1,000 feet

N W E S

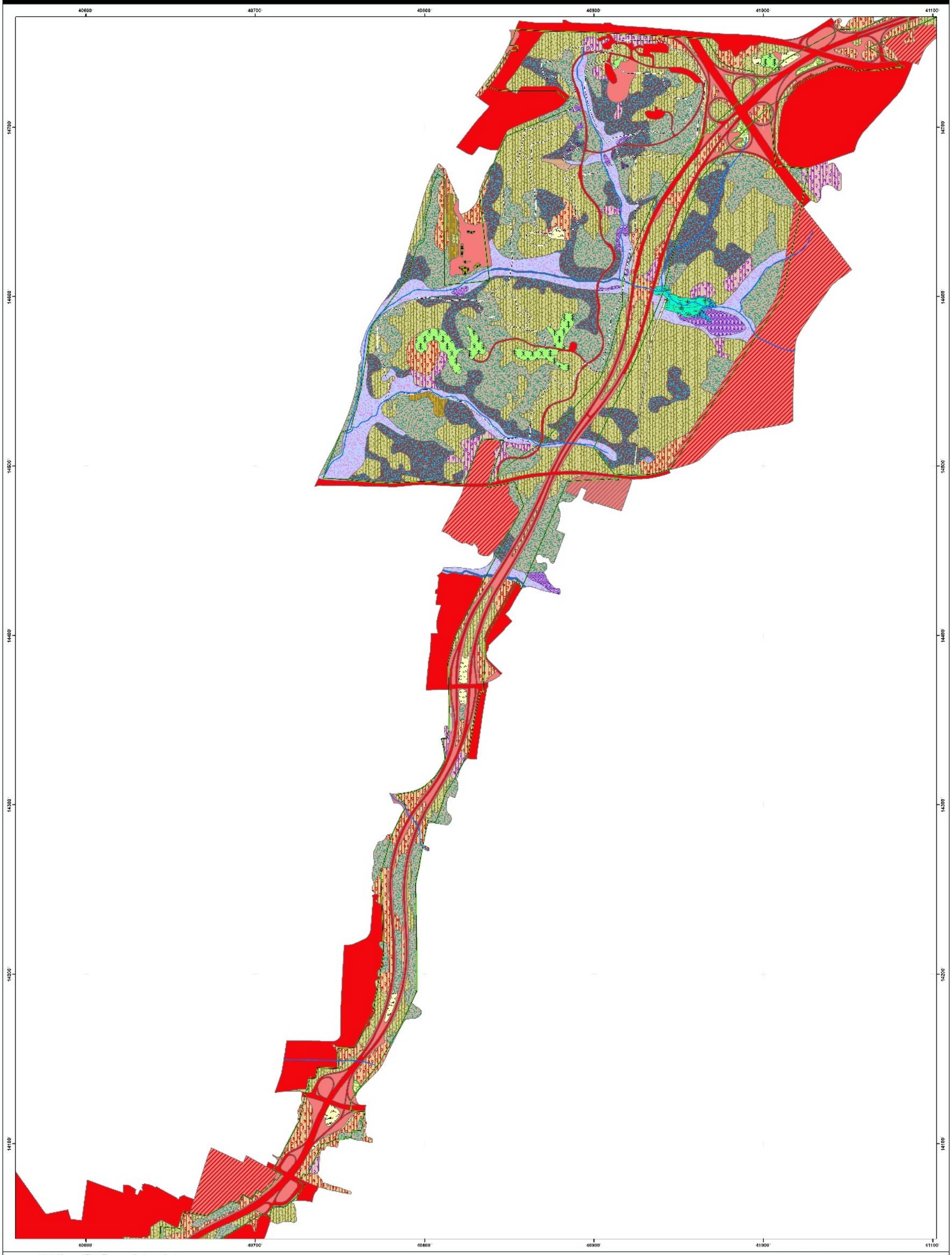
Map Date:
July 14, 2010

Background Imagery Date:
April 2004

Coordinate System:
Maryland State Plane (meters)
North American Datum of 1983

Map 5 of 8

National Capital Parks - East
Greenbelt Park and southern Baltimore-Washington Parkway
Vegetation Map



Index grid is in Maryland State Plane coordinates (meters)

Legend

- Streams
- Trails
- Park Boundary

Map Class

- Low-Elevation Mixed Oak / Heath Forest (CEGL006521)
- Coastal Plain Oak Forest (CEGL006390)
- Successional Mixed Deciduous Forest
- Successional Sweetgum Upland Forest (CEGL007216)
- Successional Tuliptree Forest (Typic Type: CEGL007221)
- Successional Virginia Pine Forest (CEGL002591)
- Small Stream Sweetgum - Tuliptree Forest (CEGL004418)
- Red Maple - Blackgum Seepage Swamp (CEGL006238)
- Magnolia Bog (CEGL006219)
- Pine Barrens Lowland Forest (CEGL006926)
- Red Maple - Sweetgum Swamp (CEGL006110)
- Planted Evergreen Forest
- Successional Meadow / Grassland
- Successional Vine-Shrubland
- Successional Woody Wetland
- Successional Herbaceous Wetland
- Forested Open Space
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Open Water

Map prepared by
Virginia Department of Conservation and Recreation, Division of Natural Heritage, in cooperation with NatureServe and the National Park Service.

DCR — Virginia Department of Conservation and Recreation

NatureServe — A Network Connecting Science With Conservation

0 0.05 0.1 0.2 0.3 0.4 0.5 Miles

1 Inch = 833 feet

N W E S

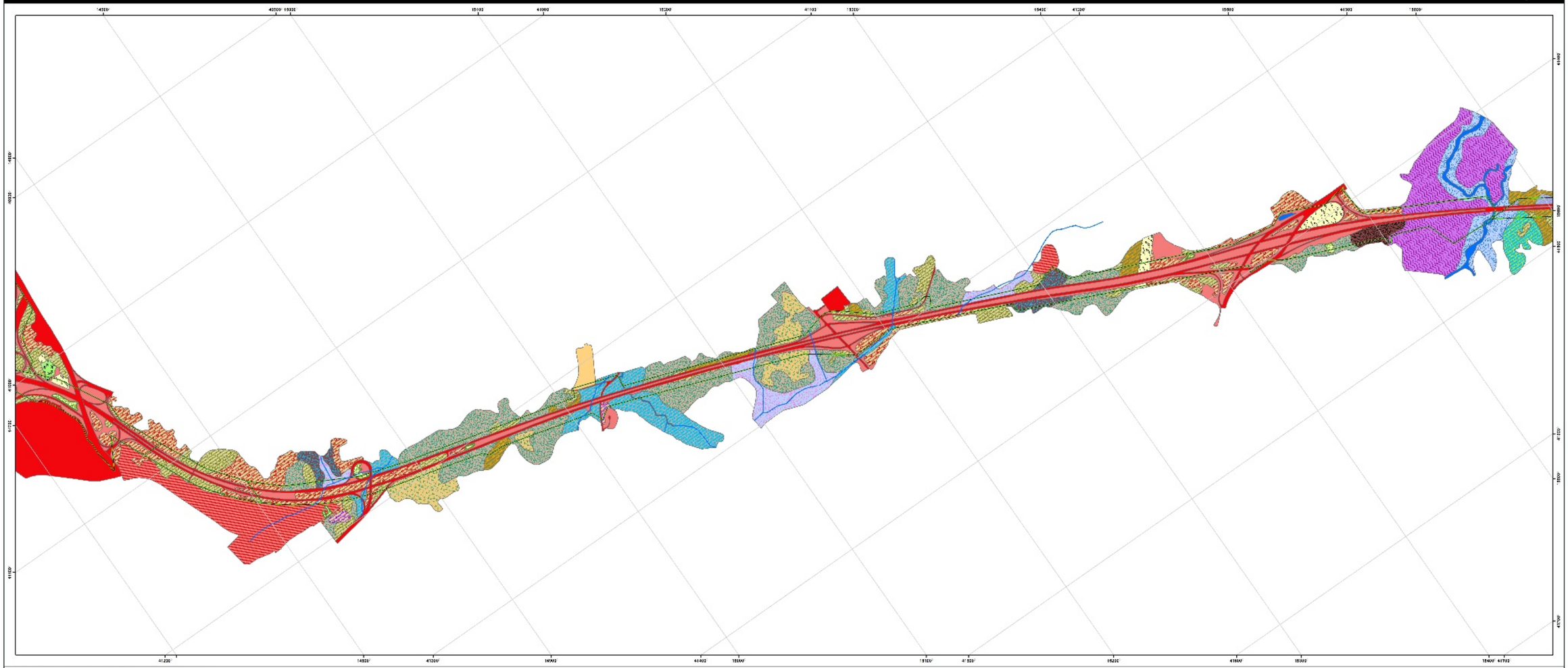
Map Date:
July 14, 2010

Background Imagery Date:
April 2004

Coordinate System:
Maryland State Plane (meters)
North American Datum of 1983

Map 6 of 8

National Capital Parks - East
Northern Baltimore-Washington Parkway
Vegetation Map



Index grid is in Maryland State Plane coordinates (meters). Map is rotated 55°.

Legend

- Streams
- Park Boundary

Map Class

- Low-Elevation Mixed Oak / Heath Forest (CEGL009821)
- Pine - Oak Woodland (CEGL 006370)
- Mesic Mixed Hardwood Forest (CEGL006075)
- Coastal Plain Oak Forest
- Successional Mixed Deciduous Forest
- Successional Sweetgum Upland Forest (CEGL 007215)
- Successional Tuliptree Forest (Typic Type; CEGL007221)
- Successional Virginia Pine Forest (CEGL 002661)
- Coastal Plain Streamside Forest (CEGL006003)
- Small Stream Sweetgum - Tuliptree Forest (CEGL004418)
- Successional Red Maple Small River Floodplain Forest (CEGL006978)
- Successional Sweetgum Headplain Forest (CEGL007220)
- Oak Floodplain Swamp (CEGL 006535)
- Red Maple - Sweetgum Swamp (CEGL006110)
- Successional Meadow / Grassland
- Successional Vine Shrubland
- Successional Woody Wetland
- Forested Open Space
- Cultivated Crops
- Developed, Open Space
- Developed, Medium Intensity
- Developed, High Intensity
- Open Water

Map prepared by
Virginia Department of Conservation and Recreation,
Division of Natural Heritage, in cooperation with
NatureServe and the National Park Service.

DCR — NatureServe

0 0.05 0.1 0.2 0.3 0.4 0.5
Miles
1 inch = 833 feet

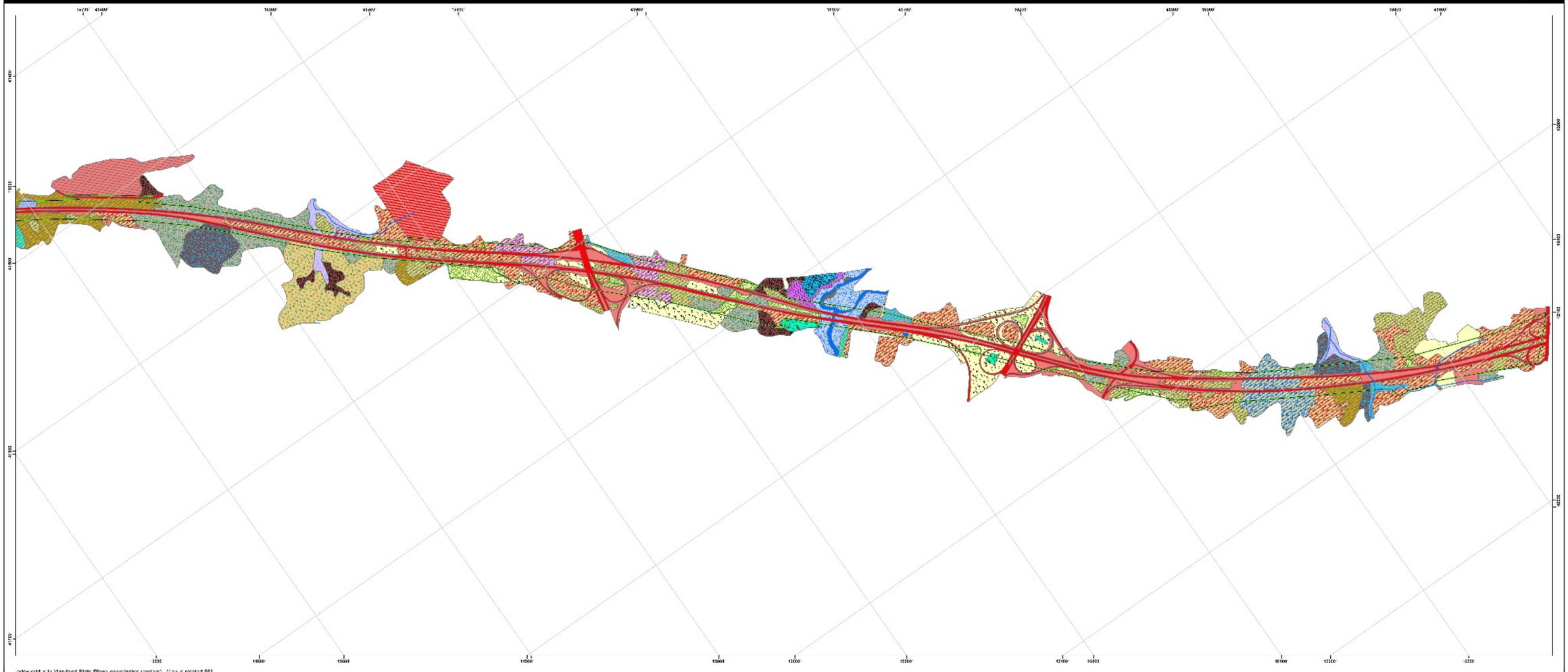
Map Date
July 14, 2010

Background Imagery Date:
April 2004

Coordinate System
Maryland State Plane (meters)
North American Datum of 1983

Map 7 of 8

National Capital Parks - East
Northern Baltimore-Washington Parkway
Vegetation Map



Index grid is in Maryland State Plane coordinates (meters). Map is rotated 65°

Legend

- Streams
- Park Boundary

Map Class

- Low-Elevation Mixed Oak / Heath Forest (CEGL006021)
- Pine - Oak Woodland (CEGL006329)
- Mesic Mixed Hardwood Forest (CEGL006375)
- Coastal Plain Oak Forest (CEGL006550)
- Successional Mixed Deciduous Forest
- Successional Sweetgum Upland Forest (CEGL007216)
- Successional Tuliptree Forest (Typic Type; CEGL007201)
- Successional Tuliptree Forest (Rich Type, CEGL007220)
- Successional Virginia Pine Forest (CEGL006591)
- Coastal Plain Streambank Forest (CEGL006000)
- Small Stream Sweetgum - Tuliptree Forest (CEGL004418)
- Successional Red Maple-Small River Floodplain Forest (CEGL006078)
- Successional Sweetgum Floodplain Forest (CEGL007330)
- Oak Floodplain Swamp (CEGL006606)
- Red Maple - Sweetgum Swamp (CEGL006110)
- Successional Meadow / Grassland
- Successional Vine Shrubland
- Successional Woody Wetland
- Successional Herbaceous Wetland
- Pasture/Hay
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Unconsolidated Shore
- Open Water

Map prepared by
Virginia Department of Conservation and Recreation,
Division of Natural Heritage, in cooperation with
NatureServe and the National Park Service

DCR NatureServe

Miles 0 0.05 0.1 0.2 0.3 0.4 0.5
1 inch = 833 feet

Map Date
July 14, 2010

Background Imagery Date
Apr. 2008

Coordinate System
Maryland State Plane (meters)
North American Datum of 1983

Map 8 of 8

US NATIONAL VEGETATION CLASSIFICATION DESCRIPTIONS

FOREST AND WOODLAND VEGETATION ASSOCIATIONS

[CEGL007216] Ruderal Sweetgum Forest
This early-successional upland forest of the southeastern U.S. occurs on a variety of environmental settings, resulting from succession following human activities such as logging and clearing or agriculture. Stands are dominated by *Liquidambar styraciflua* (sweetgum), sometimes to the exclusion of other species. *Pinus taeda* (loblolly pine) is a common associate. Other associated species are highly variable and depend on location and stand history.

[CEGL008521] Piedmont-Central Appalachian Mixed Oak / Heath Forest
This community is a matrix forest of dry, nutrient-poor uplands of the Mid-Atlantic Piedmont Plateau, occurring locally in similar low-elevation landscapes of the Northern Blue Ridge and Ridge and Valley, Cumberland Plateau and Mid-Atlantic Coastal Plain provinces. The type is well-documented across Virginia, and to a lesser extent in Tennessee, West Virginia and Maryland, but probably also occurs at similar sites in Pennsylvania. Stands are located between 30 and 700 m (100-2300 feet) elevation on rolling to sublevel sites of Piedmont and Inner Coastal Plain uplands, mountain valleys and lower mountain slope benches. In the mountains, many documented occurrences are located on ancient alluvial fan deposits, which are especially extensive along the western foot of the Blue Ridge. The vegetation is a closed to very open oak forest with mixed and variable canopy dominance by *Quercus alba* (white oak), *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), and *Quercus montana* (chestnut oak). Various *Pinus* (pine) spp., including *Pinus virginiana* (Virginia pine), *Pinus echinata* (shortleaf pine), *Pinus strobus* (eastern white pine), and *Pinus rigida* (pitch pine), are frequent overstory associates, particularly following fire or logging disturbances. *Quercus falcata* (southern red oak), *Quercus stellata* (post oak), *Carya glabra* (pignut hickory), and *Carya tomentosa* (mockernut hickory) are infrequent canopy trees. *Nyssa sylvatica* (blackgum), *Amelanchier arborea* (common serviceberry) and, in the southern part of the range, *Oxydendrum arboreum* (sourwood) attain exceptional abundance and stature in these forests, dominating the subcanopy layers and occasionally reaching the overstory. *Acer rubrum* (red maple) and *Sassafras albidum* (sassafras) are other common understory trees. In typical stands, the shrub layer is dominated by deciduous ericaceous species, herbaceous species are sparse, and species-richness is moderate to very low.

[CEGL006299] Central Appalachian-Northern Piedmont Chestnut Oak Forest
This chestnut oak forest occurs at relatively low elevations (mostly <900 m) in the Central Appalachians and adjacent areas (e.g., northern Piedmont), in association with dry, acidic, infertile soils on middle and upper slopes. The canopy, which may be rather short, is strongly dominated by *Quercus montana* (chestnut oak). The most characteristic canopy associates are *Quercus coccinea* (scarlet oak), which varies from sparse to codominant, and *Quercus rubra* (northern red oak). Minor associates frequently include *Quercus velutina* (black oak), *Quercus alba* (white oak), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), and/or *Robinia pseudoacacia* (black locust). Root sprouts of *Castanea dentata* (American chestnut) are present in some areas. *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) are often abundant in the understory tree layers. Tall shrubs include *Kalmia latifolia* (mountain laurel) (usually dominant), *Viburnum acerifolium* (mapleleaf viburnum), and *Rhododendron periclymenoides* (pink azalea). The short-shrub layer is well-developed and includes *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Gaylussacia baccata* (black huckleberry), any one of which can exhibit patch-dominance. The herb layer generally has sparse cover but sometimes includes scattered individuals of *Aureolaria laevigata* (entireleaf yellow false foxglove), *Chimaphila maculata* (striped prince's pine), *Comandra umbellata* (bastard toadflax), *Cypripedium acaule* (moccasin flower), *Danthonia spicata* (poverty oatgrass), *Epigaea repens* (trailing arbutus), *Gaultheria procumbens* (eastern teaberry), *Hieracium venosum* (rattlesnakeweed), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Medeola virginiana* (Indian cucumber), *Monotropa uniflora* (Indianpipe), *Pteridium aquilinum* (western brackenfern), and/or *Uvularia puberula* (mountain bellwort). Strong dominance of *Quercus montana* (chestnut oak) in the canopy, strong dominance of *Kalmia latifolia* (mountain laurel) in the tall-shrub layer, and *Vaccinium pallidum* (Blue Ridge blueberry) present and often abundant as a short shrub are diagnostics for this type.

[CEGL006075] Mid-Atlantic Mesic Mixed Hardwood Forest

This forest of mesic to submesic, well-drained soils occurs in the Piedmont and Coastal Plain of Virginia and Maryland, extending north to Long Island, New York on the Coastal Plain. It also occurs occasionally at low elevations of the Blue Ridge and adjacent Ridge and Valley in Virginia and Maryland. It is characteristically a mixed forest dominated by *Fagus grandifolia* (American beech), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), and *Liriodendron tulipifera* (tuliptree) in various proportions. Overstory associates over the range include *Quercus velutina* (black oak), *Quercus falcata* (southern red oak), *Quercus coccinea* (scarlet oak), *Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Carya tomentosa* (mockernut hickory), *Carya glabra* (pignut hickory), and *Fraxinus americana* (white ash). The subcanopy is characterized by young *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *Carpinus caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), and *Sassafras albidum* (sassafras). *Ilex opaca* (American holly) is particularly characteristic and abundant on the Coastal Plain. The shrub layer varies from very sparse to well-developed and can include *Asimina triloba* (pawpaw), *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum dentatum* (southern arrow-wood), and *Euonymus americanus* (bursting-heart). Heath shrubs, such as *Vaccinium corymbosum* (highbush blueberry) and *Vaccinium pallidum* (Blue Ridge blueberry), may be common but not abundant. Vines are common, including *Parthenocissus quinquefolia* (Virginia creeper), *Smilax glauca* (cat greenbrier), and *Toxicodendron radicans* (eastern poison-ivy). In the southern part of the range, *Oxydendrum arboreum* (sourwood) and *Vitis rotundifolia* (muscadine) may be conspicuous members of the understory. The herb layer is composed of *Polystichum acrostichoides* (Christmas fern), *Thelypteris noveboracensis* (New York fern), *Uvularia perfoliata* (perfoliate bellwort), *Cypripedium acaule* (moccasin flower), *Mitchella repens* (partridgeberry), *Tipularia discolor* (crippled cranefly), *Goodyera pubescens* (downy rattlesnake plantain), *Eurybia divaricata* (white wood aster), *Chimaphila maculata* (striped prince's pine), *Carex swanii* (Swan's sedge), *Medeola virginiana* (Indian cucumber), *Athyrium filix-femina* (common ladyfern), *Carex digitalis* (slender woodland sedge), *Carex willdenowii* (Willdenow's sedge), *Epifagus virginiana* (beechdrops), *Maianthemum canadense* (Canada mayflower), *Desmodium nudiflorum* (nakedflower ticktrefoil), *Polygonatum biflorum* (smooth Solomon's seal), *Podophyllum peltatum* (mayapple), *Arisaema triphyllum* (Jack in the pulpit), and *Maianthemum racemosum* (feathery false lily of the valley).

[CEGL006919] Northeastern Coastal Plain-Piedmont Oak - Beech / Heath Forest
This mixed forest of beech and oaks occurs on the Inner Coastal Plain and eastern Piedmont from New Jersey to southern Virginia. It is particularly common on steep ravine slopes and bluffs of dissected terrain with highly acidic soils. It occurs occasionally on short, steep bluffs of the Outer Coastal Plain, and occasionally occurs on elevated swamp islands with sandy, oligotrophic soils. The overstory is composed of *Fagus grandifolia* (American beech) with variable codominance by several oaks, particularly *Quercus montana* (chestnut oak), *Quercus alba* (white oak), and *Quercus velutina* (black oak). Minor associates include *Quercus coccinea* (scarlet oak), *Acer rubrum* (red maple), *Carya* (hickory) spp., and *Liriodendron tulipifera* (tuliptree). Typical subcanopy trees include *Sassafras albidum* (sassafras), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Cornus florida* (flowering dogwood), *Amelanchier arborea* (common serviceberry), and *Ilex opaca* (American holly), the latter frequently dominating in Coastal Plain stands. An evergreen shrub layer with strong dominance by *Kalmia latifolia* (mountain laurel) is characteristic, with low-cover associates of *Rhododendron periclymenoides* (pink azalea), *Vaccinium* (blueberry) spp., and *Gaylussacia baccata* (black huckleberry). Deciduous ericads alone are dominant in rare patches that lack *Kalmia latifolia* (mountain laurel). On northern exposures, *Fagus grandifolia* (American beech) tends to strongly dominate, and *Kalmia latifolia* (mountain laurel) may achieve >75% cover.

[CEGL006055] Northern Coastal Plain-Piedmont Basic Mesic Hardwood Forest
This association comprises luxuriant mesophytic forests of sheltered ravines and slopes with base-rich soils in the northern portions of the Coastal Plain and adjacent Piedmont. In the Piedmont, these soils are typically derived from amphibolite and other mafic rocks, or metasedimentary rocks with basic intrusions. Coastal Plain habitats are in ravines that have downcut into Tertiary shell deposits or limesands. *Fagus grandifolia* (American beech) and *Liriodendron tulipifera* (tuliptree) are the principal canopy dominants, with *Carya cordiformis* (bitternut hickory) and *Quercus rubra* (northern red oak) as constant associates. Additional trees that may be locally important are *Juglans nigra* (black walnut), *Ulmus rubra* (slippery elm), *Quercus alba* (white oak), *Quercus muehlenbergii* (chinquapin oak), and *Fraxinus americana* (white ash). Stands typically have dense understories dominated by *Asimina triloba* (pawpaw) and *Lindera benzoin* (northern spicebush). Herb layers are lush, but tend to be characterized by patch-dominance of clonal forbs and ferns. *Podophyllum peltatum* (mayapple), *Arisaema triphyllum* (Jack in the pulpit), *Circaea lutetiana ssp. canadensis* (broadleaf enchanter's nightshade), *Maianthemum racemosum ssp. racemosum* (feathery false lily of the valley), and *Polystichum acrostichoides* (Christmas fern) are widespread and abundant herbs. More locally abundant herbs include *Cystopteris protrusa* (lowland bladderfern), *Deparia*

acrostichoides (silver false spleenwort), *Diplazium pycnocarpon* (glade fern), *Actaea racemosa* (black baneberry), *Phegopteris hexagonoptera* (broad beechfern), *Nemophila aphylla* (smallflower baby blue eyes), and *Actaea pachypoda* (white baneberry). Many additional low-cover herbaceous species are present in plot-sampled stands.

[CEGL007748] North Atlantic Coastal Plain Dry Calcareous Forest
This dry, open, calcareous forest of the Coastal Plain of Virginia and Maryland is restricted to subxeric to xeric, fertile habitats over unconsolidated, calcareous deposits. These localized habitats are found on southeast- to southwest-facing, usually convex slopes of deep ravines or stream-fronting bluffs that have downcut into Tertiary shell deposits or limesands. Occurrences are small (typically <1 acre) and highly localized in dissected portions of the Virginia Inner Coastal Plain and Maryland Outer Coastal Plain. *Quercus muehlenbergii* (chinquapin oak) is a constant, codominant or dominant canopy tree and is the most characteristic tree of this type. Some stands tend toward a woodland physiognomy, with low-statured, gnarled trees and a very open canopy. The understory includes *Juniperus virginiana var. virginiana* (eastern red-cedar) and *Cercis canadensis var. canadensis* (eastern redbud). The herb layer is usually patchy but contains a diversity of species, including several long-range mountain disjuncts. Particularly abundant or noteworthy herbaceous species include *Erigeron pulchellus var. pulchellus* (robin's plantain), *Dichanthelium boscii* (Bosc's panicgrass), *Bromus pubescens* (hairy woodland brome), and *Aquilegia canadensis* (red columbine). Other locally important species are *Carex albicans* (whitetinge sedge), *Matelea carolinensis* (maroon Carolina milkvine), *Elymus hystrix var. hystrix* (eastern bottlebrush grass), *Elymus villosus* (hairy wildrye), *Solidago ulmifolia var. ulmifolia* (elmleaf goldenrod), *Symphyotrichum patens* (late purple aster), *Arabis laevigata* (smooth rockcress), *Verbesina virginica var. virginica* (white crownbeard), *Campanulastrum americanum* (American bellflower), *Smallanthus uvedalius* (hairy leafcup), *Silphium trifoliatum var. trifoliatum* (whorled rosinweed), *Desmodium pauciflorum* (fewflower ticktrefoil), *Hexalectris spicata* (spiked crested coralroot), and *Piptochaetium avenaceum* (blackseed speargrass).

Global Conservation Ranking G1; Reason: This community is restricted to dry, calcium-rich, shell-containing soils of the eastern Virginia and Maryland Coastal Plain. This community is naturally rare and restricted to a specialized edaphic situation that is regionally restricted and extremely rare within this region. Despite relatively intensive inventory, fewer than 30 scattered occurrences totaling less than 20 hectares are known. About 25% of the known patches are located on public lands, but many of these occur in a poor landscape context and are subject to encroachment by invasive weeds.

[CEGL006329] North Atlantic Coastal Plain Oak - Pine Forest
This pitch pine - oak woodland of dry sandy soils occurs in portions of the New Jersey Pine Barrens and the Cape May peninsula, with outliers occurring south of the Delaware Bay on the Maryland Inner Coastal Plain. Dominant trees include *Pinus rigida* (pitch pine) mixed with tree oaks, most frequently *Quercus falcata* (southern red oak) and *Quercus coccinea* (scarlet oak). Other associated oaks include *Quercus velutina* (black oak) and *Quercus alba* (white oak). *Pinus virginiana* (Virginia pine) sometimes occurs, and in New Jersey, *Pinus echinata* (shortleaf pine) may be an associate. Maryland occurrences may also include *Nyssa sylvatica* (blackgum) and *Liquidambar styraciflua* (sweetgum) in the canopy. The tall-shrub layer is characterized by *Quercus marilandica* (blackjack oak), *Quercus prinoides* (dwarf chinquapin oak), *Ilex opaca* (American holly), *Sassafras albidum* (sassafras), and occasionally *Kalmia latifolia* (mountain laurel). Maryland occurrences also support *Castanea pumila* (chinquapin), *Lyonia mariana* (piedmont staggerbush), and *Vaccinium fuscatum* (black highbush blueberry) in this layer. A short-shrub layer is dominated by *Gaylussacia frondosa* (blue huckleberry), *Gaylussacia baccata* (black huckleberry), and *Vaccinium pallidum* (Blue Ridge blueberry). The herbaceous or field layer is usually sparse and may include *Smilax glauca* (cat greenbrier), *Chimaphila maculata* (striped prince's pine), *Gaultheria procumbens* (eastern teaberry), *Carex pensylvanica* (Pennsylvania sedge), and *Cypripedium acaule* (moccasin flower).

Global Conservation Ranking G2G3; Reason: This community is associated with xeric, sublevel, sandy uplands. In Maryland, soils are unconsolidated sands of the Patuxent Formation and are extremely acidic with exceedingly low base cation and base saturation levels, indicating extreme infertility.

[CEGL006390] Mesic Coastal Plain Oak Forest
This community is a mesic oak forest of the central Atlantic Coastal Plain. In general, this vegetation borders wetlands and occurs in areas with a high water table or soils with high clay content. Canopy dominants include *Quercus falcata* (southern red oak), *Quercus phellos* (willow oak), *Quercus alba* (white oak), *Quercus michauxii*

(swamp chestnut oak), with *Liquidambar styraciflua* (sweetgum) and *Acer rubrum* (red maple) common associates. Pines may be present, including *Pinus rigida* (pitch pine) or *Pinus echinata* (shortleaf pine) in New Jersey, or *Pinus taeda* (loblolly pine) in Delaware and Maryland. *Pinus serotina* (pond pine) is reported in some Delaware examples of this community. A subcanopy is often present with *Ilex opaca* (American holly), *Vaccinium corymbosum* (highbush blueberry), and *Amelanchier canadensis* (Canadian serviceberry). *Gaylussacia frondosa* (blue huckleberry) forms a patchy shrub layer draped with *Smilax rotundifolia* (roundleaf greenbrier), and the herb layer is sparse with species such as *Chasmanthium laxum* (slender woodoats), *Osmunda regalis* (royal fern), and *Mitchella repens* (partridgeberry).

In New Jersey, this forest occupies peripheral parts of the Pinelands in the coastal oak-pine-holly subregion, and extends inland along the edges of major river estuaries. These forests are codominated by tree-oaks such as *Quercus falcata* (southern red oak), *Quercus phellos* (willow oak), *Quercus michauxii* (swamp chestnut oak), *Quercus coccinea* (scarlet oak), and *Quercus alba* (white oak), smaller amounts of *Liquidambar styraciflua* (sweetgum), *Acer rubrum* (red maple), *Pinus rigida* (pitch pine), *Pinus echinata* (shortleaf pine), and rarely in New Jersey *Pinus taeda* (loblolly pine), as well as local areas with codominance by *Fagus grandifolia* (American beech), *Carya* (hickory) spp., *Liriodendron tulipifera* (tuliptree), or other hardwoods. The multi-layered understory is often dense and evergreen, including *Ilex opaca* (American holly), *Cornus florida* (flowering dogwood), *Kalmia latifolia* (mountain laurel), *Vaccinium corymbosum* (highbush blueberry), and other heaths. This community can also be associated with oak-pine-holly forest (OPH) near the coast with similar understory structure and species diversity.

Oak-hardwood-holly mesic forests are concentrated in the coastal subregion of the Pinelands, typically on "perihydric" sites (i.e., adjacent to wetlands), and/or mesic to semi-hydric upland soils with a higher clay content relative to most Pinelands soils. Fire-return intervals of 150-200 years are suggested by its species composition which contains thin-barked, fire-sensitive hardwoods and holly and little or no pine, as well as its peripheral distribution in the Pinelands landscape. The interval between fires in this community has been great due to its location near both the coast and major wetlands, where the regional edge effect and fire shadow effect combine. The coastal influence on climate which moderates temperatures and expands growing season also enhances the abundance of southern-affinity holly, southern red oak, willow oak and swamp chestnut oak.

[CEGL006490] Chesapeake Bay River Bluff Chestnut Oak Forest
This association occurs on river-fronting slopes composed of unconsolidated sediments on the Inner Coastal Plain of Virginia, Maryland, and Delaware. Sites include both very steep, erosive, bluff-like slopes and more stable, gently convex upper slopes and bluff-tops underlain by coarse gravel deposits. In either case, the ground surface typically has a substantial amount of exposed mineral substrate, and soils are sandy, extremely acidic, and infertile. This vegetation is an open, somewhat stunted forest with strong overstory dominance by *Quercus montana* (chestnut oak). *Quercus rubra* (northern red oak), *Quercus alba* (white oak), *Quercus velutina* (black oak), *Quercus coccinea* (scarlet oak), and *Quercus stellata* (post oak) are variably present, minor associates. *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Sassafras albidum* (sassafras), *Amelanchier arborea* (common serviceberry), and *Fagus grandifolia* (American beech) are characteristic understory species. Isolated, individual shrubs of *Kalmia latifolia* (mountain laurel) often occur, but this species does not form dense stands. Patches of *Vaccinium pallidum* (Blue Ridge blueberry), *Vaccinium stamineum* (deerberry), and *Gaylussacia baccata* (black huckleberry) are typical in the open shrub layer, along with *Viburnum acerifolium* (mapleleaf viburnum), scrambling vines of *Smilax rotundifolia* (roundleaf greenbrier) and young recruitment of *Quercus montana* (chestnut oak). The herb layer is species-poor, with *Deschampsia flexuosa* (wavy hairgrass) common and *Solidago bicolor* (white goldenrod) frequent at low cover. Additional herbs may include *Danthonia spicata* (poverty oatgrass), *Polygonatum biflorum* (smooth Solomon's seal), *Carex tonsa* (shaved sedge), *Carex pensylvanica* (Pennsylvania sedge), *Hieracium venosum* (rattlesnakeweed), *Viola pedata* (birdfoot violet), and *Carex virescens* (ribbed sedge).

[CEGL006599] Northeastern Ruderal Hardwood Forest
This early-successional woody vegetation of the northeastern United States occurs on sites that are becoming reforested after having been cleared for agriculture or otherwise heavily modified in the past. Environmental setting varies, but generally sites are dry-mesic to mesic, with small seepage inclusions in some examples. Physiognomy of this vegetation is highly variable, ranging from closed forest, open forest, tall dense shrubland, to more open tall shrubland. Early-successional woody species dominate the canopy in a widely variable mix, depending on geographic location. In the Central Appalachians and Mid-Atlantic Piedmont, many stands represent decadent forests that were once dominated by *Robinia pseudoacacia* (black locust) but are now mixed with various mid-successional hardwoods; other stands in this region regenerated as mixed stands. Tree species often include

some combination of *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Robinia pseudoacacia* (black locust), and *Acer rubrum* (red maple). Other associates can include *Juglans nigra* (black walnut), *Sassafras albidum* (sassafras), *Betula populifolia* (gray birch), *Juniperus virginiana* (eastern red-cedar), *Acer negundo* (box-elder), *Acer saccharinum* (silver maple), *Ailanthus altissima* (tree of heaven), *Ulmus americana* (American elm), *Quercus* (oak) spp., *Betula lenta* (sweet birch), *Amelanchier* (serviceberry) spp., *Pinus strobus* (eastern white pine), and *Populus grandidentata* (bigtooth aspen). Other woody species may contribute to the canopy or form a tall-shrub layer, including *Lindera benzoin* (northern spicebush) and *Carpinus caroliniana* (American hornbeam). The low-shrub layer, if present, is usually characterized by the presence of *Rubus* (blackberry) spp. such as *Rubus flagellaris* (northern dewberry), *Rubus allegheniensis* (Allegheny blackberry), *Rubus phoenicolasius* (wine raspberry), or *Rubus hispidus* (bristly dewberry). This layer is often dominated by exotic species such as *Lonicera tatarica* (Tatarian honeysuckle), *Lonicera morrowii* (Morrow's honeysuckle), *Rhamnus cathartica* (common buckthorn), *Crataegus* (hawthorn) spp., *Rosa multiflora* (multiflora rose), and *Berberis thunbergii* (Japanese barberry). The herbaceous layer is variable, often containing grasses and forbs of both native and exotic origin. Common species include *Ageratina altissima var. altissima* (white snakeroot), *Polygonum persicaria* (spotted ladysthumb), *Impatiens capensis* (orange jewelweed), *Glechoma hederacea* (ground ivy), *Polystichum acrostichoides* (Christmas fern), *Calystegia sepium ssp. sepium* (hedge false bindweed), *Galium aparine* (stickywilly), *Oxalis stricta* (common yellow oxalis), *Polygonum virginianum* (jumpseed), *Dennstaedtia punctilobula* (eastern hayscented fern), *Arisaema triphyllum* (Jack in the pulpit), *Allium vineale* (wild garlic), and *Veronica officinalis* (common gypsyweed), among many others. The invasive species *Alliaria petiolata* (garlic mustard), *Microstegium vimineum* (Nepalese browntop), and *Polygonum cespitosum* (oriental ladysthumb) can be abundant in this disturbed forest type. Vines can be absent or abundant. In stands with high vine cover, the vegetation structure can be altered by the weight of the vines pulling down trees and shrubs. Common vines include *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison-ivy), *Vitis labrusca* (fox grape), and the invasive vines *Celastrus orbiculatus* (oriental bittersweet) and *Lonicera japonica* (Japanese honeysuckle). These forests are often young and resulted from the colonization of old agricultural fields by woody species. Recent disturbance or abundant invasive species give these forest stands a weedy character. It is unlikely that these stands will succeed to a natural plant community dominated by native species.

[CEGL002591] Ruderal Virginia Pine Forest

This ruderal Virginia pine forest of the southeastern states occurs in areas where canopy removal has created dry, open conditions and bare mineral soil, allowing for the establishment of *Pinus virginiana* (Virginia pine). These habitats include old fields, old pastures, clearcuts, and eroded areas; soils are typically dry, acidic, and infertile. It is common on abandoned farmland. This forest typically has a very dense canopy of *Pinus virginiana* (Virginia pine) and little understory vegetation. The dense canopy may also include admixtures of other *Pinus* (pine) species (e.g., *Pinus taeda* (loblolly pine), *Pinus echinata* (shortleaf pine), *Pinus rigida* (pitch pine), *Pinus strobus* (eastern white pine)) or other early-successional deciduous trees (e.g., *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Prunus serotina* (black cherry), *Liriodendron tulipifera* (tuliptree), *Fraxinus americana* (white ash), *Nyssa sylvatica* (blackgum)). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species. Shrub and herb layers are frequently very sparse. Stands are short-lived, generally less than 75 years.

[CEGL007221] Ruderal Tuliptree Forest (Typic Type)

This broadly defined ruderal or successional community is one of several described upland associations dominated by *Liriodendron tulipifera* (tuliptree). It ranges from the southern Cumberland Plateau, Piedmont, and Interior Low Plateau of the southeastern U.S. north to the northern Piedmont of New Jersey. These successional forests often follow cropping, clearcut logging, or other severe disturbance, and are successional to mixed oak-hickory forests. Examples are common across large areas of the upland landscape which have previously been disturbed. Soils usually exhibit evidence of disturbance and may have little to no organic horizon development. They are typically acidic and well-drained, dry to moist sand, sandy loam, sandy clay loam, or silt loam. Environmental setting is variable, ranging from level to gently sloping uplands to well-drained floodplains and stream terraces. Species found in stands attributable to this type may include a fairly diverse and varied composition. *Acer rubrum* (red maple), *Quercus* (oak) spp., *Betula lenta* (sweet birch), *Oxydendrum arboreum* (sourwood), *Acer saccharum* (sugar maple), and occasionally *Liquidambar styraciflua* (sweetgum), *Ilex opaca* (American holly), or *Robinia pseudoacacia* (black locust) may be common in stands of this type. Where oaks are present, they are frequently multi-stemmed, resulting from coppicing. The conifer *Tsuga canadensis* (eastern hemlock) is abundant in the understories of some stands. Shrub composition is variable but may include *Sambucus nigra ssp. canadensis* (American black elderberry),

Rhododendron maximum (great laurel), *Hamamelis virginiana* (American witch-hazel), and *Vaccinium pallidum* (Blue Ridge blueberry). Herbs are likewise variable; West Virginia samples feature *Dioscorea quaternata* (fourleaf yam), *Lysimachia quadrifolia* (whorled yellow loosestrife), *Maianthemum racemosum* (feathery false lily of the valley), *Solidago curtisii* (mountain decumbent goldenrod), *Symphyotrichum prenanthoides* (crookedstem aster), *Polystichum acrostichoides* (Christmas fern), *Dryopteris intermedia* (intermediate woodfern), *Arisaema triphyllum ssp. triphyllum* (Jack in the pulpit), *Packera aurea* (golden ragwort), *Amphicarpaea bracteata* (American hogpeanut), *Thelypteris noveboracensis* (New York fern), *Lycopodium digitatum* (fan clubmoss), and *Geranium maculatum* (spotted geranium).

[CEGL007220] Ruderal Tuliptree Forest (Rich Type)
This ruderal or successional community dominated by *Liriodendron tulipifera* (tuliptree) occurs in the Ridge and Valley of Tennessee and Virginia, the Interior Low Plateau of Kentucky, and the Central Appalachians, Piedmont and Inner Coastal Plain regions of Virginia, West Virginia, Pennsylvania, and Maryland. Plots attributable to this type are also known from the Piedmont of Georgia. It may also occur in similar regions of Delaware. It is distinguished from other upland communities dominated by *Liriodendron tulipifera* (tuliptree) by the presence of species associated with soils with moderately high base saturation levels (rich soils). Species found in stands attributable to this type may be fairly diverse and result in a varied composition. In addition to *Liriodendron tulipifera* (tuliptree), other canopy species may include *Liquidambar styraciflua* (sweetgum), *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Platanus occidentalis* (American sycamore), *Quercus rubra* (northern red oak), *Acer rubrum* (red maple), *Robinia pseudoacacia* (black locust), *Juglans nigra* (black walnut), *Halesia tetraptera* (mountain silverbell), *Fraxinus americana* (white ash), *Fagus grandifolia* (American beech), *Magnolia acuminata* (cucumber-tree), *Ulmus rubra* (slippery elm), *Quercus imbricaria* (shingle oak), *Quercus muehlenbergii* (chinquapin oak), and *Carya ovata* (shagbark hickory). Species often found in the subcanopy include *Acer saccharum* (sugar maple), *Cercis canadensis* (eastern redbud), *Ulmus alata* (winged elm), *Fraxinus americana* (white ash), *Morus rubra* (red mulberry), and *Cornus florida* (flowering dogwood). Shrubs include saplings of the subcanopy and canopy species, as well as *Lindera benzoin* (northern spicebush), *Symphoricarpos orbiculatus* (coralberry), *Asimina triloba* (pawpaw), *Staphylea trifolia* (American bladdernut), *Acer negundo* (box-elder), and *Juniperus virginiana var. virginiana* (eastern red-cedar). Exotic shrubs, including *Rosa multiflora* (multiflora rose), *Rubus phoenicolasius* (wine raspberry), and *Lonicera japonica* (Japanese honeysuckle), are present at some sites. Herb-layer species include the exotics *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (garlic mustard), and *Veronica hederifolia* (ivyleaf speedwell), as well as *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax tamnoides* (bristly greenbrier), *Actaea racemosa* (black baneberry), *Caulophyllum thalictroides* (blue cohosh), *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Hydrophyllum canadense* (bluntleaf waterleaf), *Adiantum pedatum* (northern maidenhair), *Polygonatum pubescens* (hairy Solomon's seal), *Verbesina alternifolia* (wingstem), *Amphicarpaea bracteata* (American hogpeanut), and *Polystichum acrostichoides* (Christmas fern).

[CEGL007279] Ruderal Black Locust Forest
This black locust ruderal forest is found locally throughout the eastern United States. Stands often establish on old fields abandoned after agricultural cropping or pasturing or around old homesites. In some areas it occurs on post-agricultural floodplain terraces. This vegetation has also become established following the planting of *Robinia pseudoacacia* (black locust) to stabilize and enrich nutrient-poor soils that are subject to erosion. The vegetation is dominated by *Robinia pseudoacacia* (black locust). Associated woody species vary from site to site and include *Prunus serotina* (black cherry), *Juniperus virginiana* (eastern red-cedar), *Ulmus americana* (American elm), *Ulmus rubra* (slippery elm), *Carya ovata* (shagbark hickory), *Celtis occidentalis* (common hackberry), *Juglans nigra* (black walnut), *Quercus rubra* (northern red oak), *Ulmus rubra* (slippery elm), and in some areas *Acer platanoides* (Norway maple) or *Ailanthus altissima* (tree of heaven). Understory vegetation is highly variable depending on site history and often includes *Toxicodendron radicans* (eastern poison-ivy); *Lindera benzoin* (northern spicebush) is sometimes present. The invasive non-native *Rosa multiflora* (multiflora rose) may be present as a shrub, along with the non-native bramble *Rubus phoenicolasius* (wine raspberry). Non-native species such as *Alliaria petiolata* (garlic mustard), *Chelidonium majus* (celandine), *Glechoma hederacea* (ground ivy), and *Convallaria majalis* (European lily-of-the-valley) can characterize the herb layer, which may also have a native component.

[CEGL006217] Piedmont-Central Appalachian Silver Maple Floodplain Forest
This is a forested community of large river floodplains in the Mid-Atlantic states of Maryland, Virginia, West Virginia, and Pennsylvania. These forests occupy banks and first bottoms of major rivers with nutrient-rich silt loams, sand

loams, and sands that are temporarily inundated, annually or less often, in major flood events. Canopies are closed and dominated by *Acer saccharinum* (silver maple), with *Acer negundo* (box-elder) dominating a subcanopy layer. Other minor overstory and understory associates include *Populus deltoides* (eastern cottonwood), *Platanus occidentalis* (American sycamore), *Celtis occidentalis* (common hackberry), *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), and *Juglans nigra* (black walnut). The shrub layer ranges from sparse to dense but is usually dominated by *Lindera benzoin* (northern spicebush). Characteristic species of the herb layer are *Ageratina altissima* (white snakeroot), *Laportea canadensis* (Canadian woodnettle), *Impatiens pallida* (pale touch-me-not), *Viola sororia* (common blue violet), *Leersia virginica* (whitegrass), *Verbesina alternifolia* (wingstem), *Urtica dioica ssp. dioica* (stinging nettle), *Elymus virginicus* (Virginia wildrye), *Elymus riparius* (riverbank wildrye), *Geum canadense* (white avens), *Pilea pumila* (Canadian clearweed), *Rudbeckia laciniata* (cutleaf coneflower), and *Cryptotaenia canadensis* (Canadian honewort). Vines of *Toxicodendron radicans* (eastern poison-ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are common. Early-successional stands are usually strongly dominated by even-aged *Acer saccharinum* (silver maple).

[CEGL004073] Piedmont-Central Appalachian Rich Floodplain Forest
This association occupies the higher elevations of floodplains, floodplain berms, and low terraces of major Mid-Atlantic rivers (e.g., Potomac, Shenandoah, Monocacy, James) and as the main floodplain vegetation on medium-sized rivers draining areas of nutrient-rich substrates (e.g., Antietam Creek, Bull Run). Soil texture is variable, ranging from silty-clay loams to loams over much of the range, and samples collected from plots had high base status. This vegetation type is a closed forest with mixed overstory dominance by *Platanus occidentalis* (American sycamore), *Juglans nigra* (black walnut), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), *Ulmus americana* (American elm), and, locally, *Fraxinus pennsylvanica* (green ash), *Liriodendron tulipifera* (tuliptree), and *Quercus shumardii* (Shumard oak). *Acer saccharinum* (silver maple) is codominant in a minority of stands but absent or unimportant in many others. *Acer negundo* (box-elder) is strongly dominant in the subcanopy. *Asimina triloba* (pawpaw) and/or *Lindera benzoin* (northern spicebush) dominate a moderately dense to dense shrub layer. The herb layer is rich in spring ephemerals and other nutrient-demanding species, including *Mertensia virginica* (Virginia bluebells), *Asarum canadense* (Canadian wildginger), *Chaerophyllum procumbens* (spreading chervil), *Hydrophyllum canadense* (bluntleaf waterleaf), *Viola striata* (striped cream violet), *Phlox divaricata* (wild blue phlox), *Podophyllum peltatum* (mayapple), *Erythronium americanum* (dogtooth violet), *Dicentra canadensis* (squirrel corn), *Sanicula odorata* (clustered blacksnakeroot), *Packera aurea* (golden ragwort), *Claytonia virginica* (Virginia springbeauty), *Festuca subverticillata* (nodding fescue), *Carex jamesii* (James' sedge), *Carex grisea* (inflated narrowleaf sedge), *Floerkea proserpinacoides* (false mermaidweed), *Osmorhiza longistylis* (longstyle sweetroot), and *Ranunculus abortivus* (littleleaf buttercup). Invasive exotics, especially *Alliaria petiolata* (garlic mustard), *Veronica hederifolia* (ivyleaf speedwell), *Duchesnea indica* (Indian strawberry), *Urtica dioica ssp. dioica* (stinging nettle), *Microstegium vimineum* (Nepalese browntop), and *Glechoma hederacea* (ground ivy), are usually abundant.

[CEGL006548] Northern Piedmont-Central Appalachian Maple - Ash Swamp Forest
This swamp forest ranges from New Jersey and Pennsylvania, south to West Virginia and Kentucky, primarily in the Lower New England / Northern Piedmont, Piedmont, and Central Appalachian ecoregions. It occupies poorly drained backswamps, sloughs, abandoned oxbows, and depressions of large-stream and river floodplains. Soils are flooded at least early in the growing season, and water may be ponded in shallow hollows for most of the year. The overstory is dominated by variable combinations of *Fraxinus pennsylvanica* (green ash), *Acer rubrum* (red maple), and *Acer saccharinum* (silver maple), with *Ulmus americana* (American elm) as a common overstory and understory associate. In Virginia and Maryland, *Acer saccharinum* (silver maple) is most characteristic of large-river (e.g., the James and Potomac) floodplains, where *Acer rubrum* (red maple) is nearly absent. On the smaller order streams that support this type, *Acer saccharinum* (silver maple) is usually absent. In central Kentucky, *Platanus occidentalis* (American sycamore) may also be a canopy component. The shrub layer is typically very sparse or absent, but *Cephalanthus occidentalis* (common buttonbush) may be a component of this stratum. Vines, especially *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis* (grape) spp., are common. The herb layer is usually moderately dense or dense except in deeper hollows. *Boehmeria cylindrica* (small-spike false nettle), *Impatiens capensis* (orange jewelweed), *Cinna arundinacea* (sweet woodreed), *Geum canadense* (white avens), *Glyceria striata* (fowl mannagrass), *Leersia virginica* (whitegrass), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum punctatum* (dotted smartweed), *Pilea pumila* (Canadian clearweed), *Lobelia cardinalis* (cardinalflower), *Saururus cernuus* (lizard's-tail), *Commelina virginica* (Virginia dayflower), *Carex stipata* (awlfruit sedge), *Carex grayi* (Gray's sedge), *Carex tribuloides* (blunt broom sedge), *Carex crinita* (fringed sedge),

and *Carex lupulina* (hop sedge) are characteristic species. In the northern part of the range, examples may contain patches of *Symplocarpus foetidus* (skunk-cabbage).

[CEGL005033] Ruderal Box-elder Floodplain Forest
This semi-open to closed-canopy ruderal forest is found on disturbed sites in floodplains in the southern, eastern, and midwestern United States. Stands occur on large rivers in the active floodplain and on sandbars, and may form farther from the riverfront following disturbance. Occurrences are mostly on higher floodplain terraces with less rocky soils which were used for agriculture or habitation. They are typically temporarily flooded in the spring. These ruderal forests are dominated by *Acer negundo* (box-elder). Other characteristic species include *Platanus occidentalis* (American sycamore), *Celtis laevigata* (sugarberry), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), *Robinia pseudoacacia* (black locust), *Liquidambar styraciflua* (sweetgum), *Acer saccharinum* (silver maple), *Ulmus alata* (winged elm), *Ulmus rubra* (slippery elm), *Carya cordiformis* (bitternut hickory), *Fraxinus pennsylvanica* (green ash), *Juglans nigra* (black walnut), *Carpinus caroliniana* (American hornbeam), *Morus rubra* (red mulberry), and *Populus deltoides* (eastern cottonwood). The shrub and herb layers range from sparse to relatively lush, and the vine component often is heavy. The herb layer consists of a mixture of weedy exotics and native floodplain species, including *Rhamnus cathartica* (common buckthorn) and various invasive *Lonicera* species.

[CEGL006976] Northern Coastal Plain Ruderal Floodplain Forest
This ruderal floodplain forest ranges from central Virginia to New Jersey on the Coastal Plain and, in some areas, the eastern edge of the Piedmont. The sites occupied by this community are typically recovering from disturbances such as logging or undergoing natural succession from open wetland to forest. Habitats are temporarily flooded to somewhat seasonally flooded alluvial floodplains of small to large streams. Soils are relatively nutrient-poor, have high silt or clay content, and vary from well-drained to somewhat poorly drained. The vegetation is mostly closed-canopy forest dominated by *Acer rubrum* (red maple), solely or in combination with *Betula nigra* (river birch). On some sites, *Liquidambar styraciflua* (sweetgum) and/or *Platanus occidentalis* (American sycamore) are important in the overstory mixtures. Potential successor trees, such as *Ulmus americana* (American elm), *Liriodendron tulipifera* (tuliptree), *Quercus phellos* (willow oak), *Quercus palustris* (pin oak), *Quercus michauxii* (swamp chestnut oak), *Nyssa sylvatica* (blackgum), and *Fraxinus pennsylvanica* (green ash), occur as minor overstory or understory associates. The shrub and herb layers are variable. On very disturbed sites, near-monocultures of the exotic grass *Microstegium vimineum* (Nepalese browntop) may dominate the herb layer.

[CEGL006238] Southern Red Maple - Blackgum Swamp Forest
This acidic swamp forest of the eastern middle-latitude states is a nutrient-poor wetland forest occurring in groundwater-saturated stream bottoms and poorly drained depressions. Soils are typically moderately deep to deep muck over mineral soil, with pools of standing water at the surface. Acidic waters originate from groundwater seepage, with little to no overland seasonal flooding. Most sites can be characterized as "groundwater slope wetlands" (*sensu* Golet et al. 1993) with a flow-through hydrology. This community is characterized by *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum) in the canopy, which may be quite open in some examples. Canopy associates include *Magnolia virginiana* (sweetbay), *Liquidambar styraciflua* (sweetgum), and *Persea palustris* (swamp bay), plus occasional incidental *Liriodendron tulipifera* (tuliptree) or *Pinus taeda* (loblolly pine). Upland trees may occur on drier hummocks. The shrub layer is characterized by *Vaccinium corymbosum* (highbush blueberry), as well as *Clethra alnifolia* (coastal sweet-pepperbush), *Ilex verticillata* (common winterberry), *Ilex opaca* (American holly), *Viburnum nudum var. nudum* (possumhaw), *Lindera benzoin* (northern spicebush), and *Rhododendron viscosum* (swamp azalea). The herbaceous layer varies from dense to sparse and may include *Symplocarpus foetidus* (skunk-cabbage), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Osmunda regalis var. spectabilis* (royal fern), *Woodwardia areolata* (netted chainfern), *Carex folliculata* (northern long sedge), *Carex lonchocarpa* (southern long sedge), *Carex collinsii* (Collins' sedge), *Carex atlantica* (prickly bog sedge), *Bartonia paniculata* (twining screwstem), *Parnassia asarifolia* (kidneyleaf grass of Parnassus), *Helonias bullata* (swamppink), *Chelone glabra* (white turtlehead), *Oxypolis rigidior* (stiff cowbane), and *Osmunda cinnamomea* (cinnamon fern). *Sphagnum* (sphagnum, peatmoss) spp. and other mosses are common.

[CEGL006219] Fall-line Terrace Gravel Magnolia Bog
This saturated woodland is known from a limited area at and just east of the Fall Line in Maryland, the District of Columbia, and northern Virginia. It occurs on saturated toeslopes of fluvial-estuarine terraces where sands and gravels of the Cretaceous-aged Potomac Formation are exposed. Irregular microtopography with abundant groundwater seepage forming braided channels, *Sphagnum* (sphagnum, peatmoss)-covered hummocks, and mucky depressions are characteristic. Historic accounts of this vegetation describe these areas as "bogs" with

Magnolia virginiana (sweetbay) and various shrubs fringing and forming clumps within a more open center dominated by herbaceous plants. Historic vegetation included *Nyssa sylvatica* (blackgum), *Toxicodendron vernix* (poison-sumac) (abundant), *Gaylussacia frondosa* (blue huckleberry), *Viburnum nudum var. nudum* (possumhaw), *Pinus rigida* (pitch pine), and *Eriocaulon decangulare* (tenangle pipewort) (abundant), *Lycopodiella appressa* (southern bog clubmoss), *Carex bullata* (button sedge), *Asclepias rubra* (red milkweed), *Helianthus angustifolius* (swamp sunflower), *Rhynchospora gracilenta* (slender beaksedge), *Xyris torta* (slender yelloweyed grass), *Pogonia ophioglossoides* (snakemouth orchid), and *Utricularia* (bladderwort) spp. Today, remaining examples exist mostly as open woodlands with very dense shrubs (averaging 80% cover) and very small, scattered herbaceous patches. *Nyssa sylvatica* (blackgum) is the most dominant species, followed by *Magnolia virginiana* (sweetbay), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), and *Ilex opaca var. opaca* (American holly). Shrub cover includes *Rhododendron viscosum* (swamp azalea), *Vaccinium* (blueberry) spp., *Smilax rotundifolia* (roundleaf greenbrier), *Gaylussacia frondosa* (blue huckleberry), *Viburnum nudum var. nudum* (possumhaw), *Eubotrys racemosa* (swamp doghobble), *Aronia arbutifolia* (red chokeberry), *Ilex verticillata* (common winterberry), *Amelanchier canadensis* (Canadian serviceberry), *Ilex laevigata* (smooth winterberry), and *Toxicodendron vernix* (poison-sumac). The only herbs that have significant cover are *Osmunda cinnamomea* (cinnamon fern) and *Dichanthelium dichotomum var. dichotomum* (cypress panicgrass), while many others have low cover. Regionally uncommon or rare "bog" species persisting at one or a few sites include *Solidago uliginosa var. uliginosa* (bog goldenrod), *Eurybia radula* (low rough aster), *Eriocaulon decangulare* (tenangle pipewort), *Juncus longii* (Long's rush), *Drosera intermedia* (spoonleaf sundew), *Asclepias rubra* (red milkweed), and *Kalmia angustifolia* (sheep laurel). Historically, fire may have been an important factor in maintaining herbaceous patches and limiting the growth of shrubs and trees, but the geohydrologic conditions and effects of permanently saturated soils ("root pruning") that cause blowdowns of large trees (except *Pinus rigida* (pitch pine) and *Nyssa sylvatica* (blackgum)) have also been observed to be prominent factors. Ice storms, which are frequent over time in the natural range of this community, also maintain an open mosaic in these wetlands. This community has always had a limited distribution in the Mid-Atlantic fall-line zone and has probably always been rare. Today, less than 20 sites remain in very small patches degraded by hydrologic disturbance, non-native invasive plants, woody succession, fire exclusion, and various anthropogenic impacts. This community has similarities with the bog vegetation of the New Jersey Pine Barren region, but is likely distinguished by species with southern affinities.

Global Conservation Ranking G1; Reason: This association is currently extant at less than 20 sites rangewide and occurs in very small patches subject to multiple disturbances, including hydrologic alterations, grazing, sand mining, and development. This community has always had a limited distribution in the Mid-Atlantic fall-line zone and has probably always been rare. However, many historically documented occurrences have been destroyed by development of the District of Columbia metropolitan area and the few remaining examples have been degraded by hydrologic disturbance, non-native invasive plants, possible fire exclusion, woody succession, and various other anthropogenic impacts.

[CEGL006110] Sweetgum - Red Maple Swamp Forest

This association is a seasonally flooded forest of shallow basins and other depressions of the Coastal Plain of the Chesapeake Bay region. The substrate is characterized by mineral soils, generally acidic, gleyed to mottled, sandy or clay loams. Characteristic tree species include *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), and *Nyssa sylvatica* (blackgum), which are nearly constant in the canopy. Associates include *Ilex opaca* (American holly), *Magnolia virginiana* (sweetbay), *Nyssa biflora* (swamp tupelo), *Sassafras albidum* (sassafras), *Quercus palustris* (pin oak), *Pinus taeda* (loblolly pine), and *Quercus phellos* (willow oak), and occasionally *Quercus falcata* (southern red oak), *Quercus lyrata* (overcup oak), or *Betula nigra* (river birch). The shrub layer is characterized by *Eubotrys racemosa* (swamp doghobble), *Vaccinium corymbosum* (highbush blueberry), *Clethra alnifolia* (coastal sweet-pepperbush), *Lindera benzoin* (northern spicebush), *Ilex verticillata* (common winterberry), and *Rhododendron viscosum* (swamp azalea). *Smilax rotundifolia* (roundleaf greenbrier) is a particularly characteristic vine. The herbaceous layer is generally sparse but may include *Mitchella repens* (partridgeberry), *Osmunda cinnamomea* (cinnamon fern), *Chasmanthium laxum* (slender woodoats), *Woodwardia areolata* (netted chainfern), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Carex albolutescens* (greenwhite sedge), *Carex debilis var. debilis* (white edge sedge), *Scirpus cyperinus* (woolgrass), *Juncus effusus* (common rush), and *Polygonum* (knotweed) spp. *Carex joorii* (cypress swamp sedge) is inconstant but locally abundant in some stands in the southern part of the range.

[CEGL006926] Pine Barrens Pitch Pine - Hardwood Swamp Forest
This Pine Barrens lowland forest occurs on saturated sandy soils along braided streams or in depressions in southern New Jersey and on the Coastal Plain of Maryland. The canopy is a mixture of *Pinus rigida* (pitch pine), *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), with *Liquidambar styraciflua* (sweetgum) in New Jersey. The canopy ranges from mixed deciduous-evergreen to deciduous. The subcanopy is characterized by *Magnolia virginiana* (sweetbay), with occasional *Ilex opaca* (American holly). Typical shrubs include *Clethra alnifolia* (coastal sweet-pepperbush), *Eubotrys racemosa* (swamp doghobble), *Gaylussacia frondosa* (blue huckleberry), and *Vaccinium corymbosum* (highbush blueberry). There is often significant cover of *Smilax rotundifolia* (roundleaf greenbrier) vines. The herbaceous stratum includes *Osmunda cinnamomea* (cinnamon fern) and *Gaultheria procumbens* (eastern teaberry). Other species of the herbaceous layer may include *Woodwardia areolata* (netted chainfern), *Chasmanthium laxum* (slender woodoats), *Carex folliculata* (northern long sedge), *Bartonia paniculata* (twining screwstem), *Carex atlantica* (prickly bog sedge), *Carex seorsa* (weak stellate sedge), *Glyceria striata* (fowl mannagrass), and *Lycopus virginicus* (Virginia water horehound).

Global Conservation Ranking G2G3; This association is restricted to groundwater seepage areas associated with sandy uplands of the Pine Barrens of New Jersey and the Inner Coastal Plain of Maryland.

[CEGL006606] Chesapeake-Piedmont Red Maple / Lizard's-tail Swamp Forest
This red maple swamp community of the Mid-Atlantic Coastal Plain of the Chesapeake Bay and Piedmont regions occurs on poorly drained to very poorly drained soils on flats and along watercourses that are seasonally to semipermanently flooded. The organic horizon is of variable depth and overlies sandy or silt clay loam soils. This swamp has pronounced hummock-and-hollow microtopography. The tree canopy is closed to partially open and dominated by *Acer rubrum* (red maple) and *Fraxinus pennsylvanica* (green ash). Other canopy associates may include *Nyssa sylvatica* (blackgum), *Liquidambar styraciflua* (sweetgum), *Ulmus americana* (American elm), *Quercus lyrata* (overcup oak), *Quercus phellos* (willow oak), *Quercus lyrata* (overcup oak), and *Populus heterophylla* (swamp cottonwood). The shrub layer includes *Lindera benzoin* (northern spicebush), *Eubotrys racemosa* (swamp doghobble), *Ilex verticillata* (common winterberry), *Viburnum* (viburnum) spp., and *Fraxinus pennsylvanica* (green ash) saplings. The herb layer is characterized by *Saururus cernuus* (lizard's-tail), *Peltandra virginica* (green arrow-arum), *Boehmeria cylindrica* (small-spike false nettle), *Triadenum walteri* (greater marsh St. Johnswort), *Cinna arundinacea* (sweet woodreed), *Pilea pumila* (Canadian clearweed), *Impatiens capensis* (orange jewelweed), *Osmunda regalis* (royal fern), *Leersia oryzoides* (rice cutgrass), *Leersia virginica* (whitegrass), *Glyceria striata* (fowl mannagrass), *Commelina virginica* (Virginia dayflower), *Rumex verticillatus* (swamp dock), *Carex* (sedge) spp., and *Polygonum arifolium* (halberdleaf tearthumb).

[CEGL006603] Coastal Plain Streamside Forest
This Inner Coastal Plain streamside forest of the Mid-Atlantic region occurs along braided and intermittent streams on active and former stream channels. Flooding frequency is annual, and soils are alluvial clay loams or sandy clay loams. The tree canopy is dominated by *Platanus occidentalis* (American sycamore), *Liquidambar styraciflua* (sweetgum), *Betula nigra* (river birch), *Liriodendron tulipifera* (tuliptree), and *Acer rubrum* (red maple). Less frequent associates may include *Quercus michauxii* (swamp chestnut oak), *Ulmus americana* (American elm), and *Quercus phellos* (willow oak). The subcanopy is of variable cover and is characterized by *Asimina triloba* (pawpaw), *Carpinus caroliniana* (American hornbeam), *Lindera benzoin* (northern spicebush), and *Ilex opaca* (American holly), with *Cornus florida* (flowering dogwood) found less frequently. Typical vines include *Toxicodendron radicans* (eastern poison-ivy), *Parthenocissus quinquefolia* (Virginia creeper), and *Smilax rotundifolia* (roundleaf greenbrier). The most abundant herbs are *Boehmeria cylindrica* (small-spike false nettle) and *Arisaema triphyllum* (Jack in the pulpit). Other herbaceous associates include *Geum virginianum* (cream avens), *Carex debilis* (white edge sedge), *Lycopus virginicus* (Virginia water horehound), *Impatiens capensis* (orange jewelweed), *Pilea pumila* (Canadian clearweed), *Claytonia virginica* (Virginia springbeauty), *Ranunculus abortivus* (littleleaf buttercup), and *Cardamine concatenata* (cutleaf toothwort). The vine *Campsis radicans* (trumpet creeper) may also be present.

[CEGL006605] Coastal Plain Oak Floodplain Forest
This floodplain swamp forest occurs in backswamps and topographic depressions within alluvial floodplains of large streams and small rivers. Along smaller headwater streams, it may occur in low, poorly drained floodplains with braided channels and depressions. Standing water is present for much of the year on loam or clay loam soils. The overstory is dominated by variable mixtures of *Quercus phellos* (willow oak), *Quercus palustris* (pin oak), *Quercus michauxii* (swamp chestnut oak), *Liquidambar styraciflua* (sweetgum), and *Acer rubrum* (red maple). The proportion of the latter two species typically increases with disturbance. The understory is commonly quite open and contains

young *Acer rubrum* (red maple), several climbing vines, *Carpinus caroliniana* (American hornbeam), *Ilex opaca var. opaca* (American holly), *Asimina triloba* (pawpaw), *Viburnum dentatum* (southern arrow-wood), *Ilex verticillata* (common winterberry), and other species. The herb layer is usually well-developed, with a prominent graminoid component. Common herbaceous patch-dominants include *Cinna arundinacea* (sweet woodreed), *Carex debilis var. debilis* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Glyceria striata* (fowl mannagrass), and *Carex tribuloides* (blunt broom sedge).

[CEGL004418] Upper Southeast Sweetgum - Tuliptree Small Stream Forest
These low-elevation forests develop along relatively acidic soils on small streams in the Coastal Plain of Maryland and Virginia, extending west across the Virginia and North Carolina Piedmont to the Cumberland Plateau and Ridge and Valley. The topographic features of floodplains can heavily influence the makeup of individual examples of this association. The canopy, subcanopy, shrub, and herbaceous layers often are well-developed. Dominant canopy species always include *Liquidambar styraciflua* (sweetgum) and *Liriodendron tulipifera* (tuliptree), while *Acer floridanum* (southern sugar maple) (in the eastern part of the range), *Platanus occidentalis* (American sycamore), and *Acer rubrum var. rubrum* (red maple) may also make up significant amounts of the canopy. This community type exists as a continuum between two subtypes, i.e., the tuliptree subtype and the sweetgum subtype. In some examples, only one or the other dominates the canopy, but in many examples, both are equally dominant. Common species in the canopy and understory include *Ilex opaca var. opaca* (American holly), *Aesculus sylvatica* (painted buckeye), *Betula nigra* (river birch), *Carpinus caroliniana ssp. caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Carya cordiformis* (bitternut hickory), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Halesia tetraptera var. tetraptera* (mountain silverbell), *Juglans nigra* (black walnut), *Juniperus virginiana var. virginiana* (eastern red-cedar), *Morus rubra var. rubra* (red mulberry), *Nyssa sylvatica* (blackgum), *Ostrya virginiana* (hophornbeam), *Oxydendrum arboreum* (sourwood), *Pinus echinata* (shortleaf pine), *Prunus serotina var. serotina* (black cherry), *Quercus alba* (white oak), *Quercus rubra var. rubra* (northern red oak), *Ulmus rubra* (slippery elm), *Ulmus americana* (American elm), and *Ulmus alata* (winged elm). *Euonymus americanus* (bursting-heart), *Asimina triloba* (pawpaw), *Lindera benzoin var. benzoin* (northern spicebush), and *Corylus americana* (American hazelnut) are common in the shrub layer. The herbaceous layer is species-rich and often has good sedge development. The exotics *Microstegium vimineum* (Nepalese browntop), *Glechoma hederacea* (ground ivy), *Rosa multiflora* (multiflora rose), *Ligustrum sinense* (Chinese privet), and *Lonicera japonica* (Japanese honeysuckle) are common in this community.

[CEGL006287] Pumpkin Ash - Swamp Tupelo Freshwater Tidal Forest
This open- to closed-canopy swamp forest occurs on fresh tidal rivers from Delaware to Virginia and is best developed in the Chesapeake Bay drainage. It occurs at the upper reaches of tidal influence (and somewhat beyond in some cases) and generally receives diurnal or irregular tidal flooding. The canopy is dominated by few tree species, generally *Fraxinus profunda* (pumpkin ash), *Fraxinus pennsylvanica* (green ash), and *Nyssa biflora* (swamp tupelo). Other canopy associates vary among occurrences and often include *Nyssa sylvatica* (blackgum), *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Magnolia virginiana* (sweetbay), *Ulmus americana* (American elm), and *Pinus taeda* (loblolly pine). The shrub layer is well-developed and includes *Lindera benzoin* (northern spicebush), *Clethra alnifolia* (coastal sweet-pepperbush), *Eubotrys racemosa* (swamp doghobble), *Ilex verticillata* (common winterberry), *Ilex opaca* (American holly), *Ilex laevigata* (smooth winterberry), *Alnus serrulata* (hazel alder), *Rhododendron viscosum* (swamp azalea), *Viburnum dentatum* (southern arrow-wood), *Viburnum nudum* (possumhaw), *Viburnum recognitum* (southern arrow-wood), *Viburnum prunifolium* (blackhaw), *Amelanchier canadensis* (Canadian serviceberry), *Morella cerifera* (wax-myrtle), *Vaccinium corymbosum* (highbush blueberry), *Vaccinium fuscatum* (black highbush blueberry), *Itea virginica* (Virginia sweetspire), *Rosa palustris* (swamp rose), *Magnolia virginiana* (sweetbay), and *Cornus foemina* (stiff dogwood). *Alnus maritima* (seaside alder) is also characteristic in Outer Coastal Plain stands in Maryland and Delaware. Vines may be dense and include *Smilax rotundifolia* (roundleaf greenbrier), *Smilax laurifolia* (laurel greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Apios americana* (groundnut), *Parthenocissus quinquefolia* (Virginia creeper), *Bignonia capreolata* (crossvine), and *Dioscorea villosa* (wild yam). The herbaceous layer is variable in composition and richness. Common associates include *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Peltandra virginica* (green arrow-arum), *Saururus cernuus* (lizard's-tail), *Carex bromoides* (brome-like sedge), *Impatiens capensis* (orange jewelweed), *Boehmeria cylindrica* (small-spike false nettle), *Carex intumescens* (greater bladder sedge), *Leersia oryzoides* (rice cutgrass), *Commelina virginica* (Virginia dayflower), *Cicuta maculata* (spotted water hemlock), *Arisaema triphyllum* (Jack in the pulpit), *Thalictrum pubescens* (king-of-the-meadow), *Thelypteris palustris* (eastern marsh fern), *Woodwardia areolata* (netted chainfern), *Carex stricta* (upright sedge), *Zizania aquatica*

(annual wildrice), *Cinna arundinacea* (sweet woodreed), *Osmunda cinnamomea* (cinnamon fern), and *Osmunda regalis* (royal fern). The invasive exotic *Murdannia keisak* (wartremoving herb) can also occur in this association. In addition, stands that have suffered significant loss of canopy trees (presumably due to stress from sea-level rise) may be intermediate in appearance and composition between swamp forest and herbaceous marsh. This association is differentiated from tidal swamps to the north by the presence of species of southern affinity, including *Magnolia virginiana* (sweetbay), *Nyssa biflora* (swamp tupelo), and *Pinus taeda* (loblolly pine).

[CEGL007330] Ruderal Sweetgum Wet Forest
This widespread association of the southeastern United States is dominated by *Liquidambar styraciflua* (sweetgum), but can be dominated by *Liriodendron tulipifera* (tuliptree) in some cases, and occurs on heavily disturbed sites such as wetland old fields that have been recovering for the past 10-60 years. This is a successional community that develops following clearcutting or other disturbance along floodplains of major creeks and other temporarily flooded areas. As this community ages, it often begins to approach the composition of more natural *Liquidambar styraciflua - Liriodendron tulipifera / Lindera benzoin / Arisaema triphyllum* Floodplain Forest (CEGL004418). This association is known from the Piedmont, Interior Low Plateau, Inner South Atlantic Coastal Plain, Upper East Gulf Coastal Plain, and possibly other provinces. *Acer rubrum* (red maple) may be a major component of the canopy and subcanopy and may even partially dominate in some instances. In more mature examples, other canopy/subcanopy species which may occur to a lesser extent and often as scattered emergents are *Quercus alba* (white oak), *Quercus phellos* (willow oak), *Quercus nigra* (water oak), *Nyssa sylvatica* (blackgum), and *Cornus florida* (flowering dogwood). Stands in the Inner Coastal Plain of South Carolina typically contain *Persea palustris* (swamp bay) and *Magnolia virginiana* (sweetbay). Some stands, as on the Chattahoochee River in Georgia, may contain *Acer negundo* (box-elder) as a codominant canopy/subcanopy component. The shrub layer can contain *Carpinus caroliniana* (American hornbeam), *Itea virginica* (Virginia sweetspire), *Vitis rotundifolia* (muscadine), *Parthenocissus quinquefolia* (Virginia creeper), *Smilax rotundifolia* (roundleaf greenbrier), and/or *Rubus* (blackberry) sp., in addition to canopy/subcanopy species. *Lonicera japonica* (Japanese honeysuckle) is often abundant in the understory. On disturbed sites, the shrub layer is often dominated by *Ligustrum sinense* (Chinese privet), and the ground layer is typically solid *Microstegium vimineum* (Nepalese browntop) or a tangle of *Smilax rotundifolia* (roundleaf greenbrier) and *Rubus* (blackberry) sp. The herbaceous layer may include *Chasmanthium laxum* (slender woodoats), *Carex* (sedge) spp., *Boehmeria cylindrica* (small-spike false nettle), and *Botrychium biternatum* (sparselobe grapefern), sometimes growing on hummocks in standing water.

SHRUB AND HERB VEGETATION ASSOCIATIONS

CEGL008568] Ruderal Chinese Wisteria Vineland
This vine-dominated vegetation is dominated by *Wisteria sinensis* (Chinese wisteria) or *Wisteria floribunda* (Japanese wisteria), or most often hybrids of the two fast-growing vines native to Asia. The community is most commonly seen in fragmented landscapes near old homesteads and other areas. The oldest colonies may consist of *Wisteria sinensis* (Chinese wisteria) or *Wisteria floribunda* (Japanese wisteria) and little else since the wisteria slowly overtops and kills all other plants It has the potential to occur in most southeastern states.

[CEGL002026] Bulrush - Cattail - Bur-reed Shallow Marsh
This shallow marsh mixed emergent community ranges broadly over the midwestern United States and adjacent Canada. It is found in basin-like depressions, backwater areas of floodplains, and shallow margins of lakes or ponds. Soils are shallow to deep, very poorly drained, consisting of peats, mucks, or mineral materials, often found in alluvium. Vegetation varies from zones dominated by tall emergents 1-2 m tall to those with hydrophytic annual and perennial forbs <1 m tall. In the tall emergent zone, *Schoenoplectus acutus* (hardstem bulrush), *Bolboschoenus fluviatilis* (river bulrush), *Schoenoplectus tabernaemontani* (softstem bulrush), *Typha angustifolia* (narrowleaf cattail), and *Typha latifolia* (broadleaf cattail) may dominate, mixed with a variety of other herbaceous species, such as *Eleocharis palustris* (common spikerush), *Juncus* (rush) spp., *Leersia oryzoides* (rice cutgrass), and *Sparganium* (bur-reed) spp. The hydrophytic annual and perennial forb zone is dominated by *Alisma subcordatum* (American water plantain), *Alisma triviale* (northern water plantain), *Sagittaria latifolia* (broadleaf arrowhead), *Sparganium eurycarpum* (broadfruit bur-reed), *Pontederia cordata* (pickerelweed), along with *Bacopa rotundifolia* (disk water-hyssop) and *Heteranthera limosa* (blue mudplantain). Occasional floating-leaved aquatics are sometimes present, including *Azolla caroliniana* (Carolina mosquitofern), *Lemna* (duckweed) spp., *Spirodela polyrrhiza* (common duckmeat), and *Utricularia macrorhiza* (common bladderwort).

[CEGL006153] Eastern Cattail Marsh
These tall emergent marshes are common throughout the northeastern United States and adjacent Canadian provinces. They occur in permanently flooded basins, often as part of a larger wetland mosaic and associated with lakes, ponds, or slow-moving streams. The substrate is muck over mineral soil. Lacustrine cattail marshes typically have a muck-bottom zone bordering the shoreline, where cattails are rooted in the bottom substrate, and a floating mat zone, where the roots grow suspended in a buoyant peaty mat. Tall graminoids dominate the vegetation; scattered shrubs are often present (usually totaling less than 25% cover) and are frequently shorter than the graminoids. Trees are absent. Bryophyte cover varies and is rarely extensive; bryophytes are mostly confined to the hummocks. *Typha angustifolia* (narrowleaf cattail), *Typha latifolia* (broadleaf cattail), or their hybrid *Typha x glauca* (blue cattail) dominate, either alone or in combination with other tall emergent marsh species. Associated species vary widely; sedges, such as *Carex aquatilis* (water sedge), *Carex lurida* (shallow sedge), *Carex pellita* (woolly sedge), *Carex rostrata* (beaked sedge), *Carex stricta* (upright sedge), *Scirpus cyperinus* (woolgrass), and bulrushes, such as *Schoenoplectus americanus* (chairmaker's bulrush) and *Schoenoplectus acutus* (hardstem bulrush), occur along with patchy grasses, such as *Calamagrostis canadensis* (bluejoint). Broad-leaved herbs include *Asclepias incarnata* (swamp milkweed), *Calla palustris* (water arum), *Impatiens capensis* (orange jewelweed), *Onoclea sensibilis* (sensitive fern), *Sagittaria latifolia* (broadleaf arrowhead), *Scutellaria lateriflora* (blue skullcap), *Sparganium eurycarpum* (broadfruit bur-reed), *Symplocarpus foetidus* (skunk-cabbage), *Thelypteris palustris* (eastern marsh fern), and *Verbena hastata* (swamp verbena). Floating aquatics, such as *Lemna minor* (common duckweed), may be common in deeper zones. Shrub species vary across the geographic range of this type; in the northern part of its range, *Myrica gale* (sweetgale), *Ilex verticillata* (common winterberry), and *Spiraea alba* (white meadowsweet) are common. The invasive exotic plants *Lythrum salicaria* (purple loosestrife) and *Phragmites australis* (common reed) may be abundant in parts of some occurrences. This association is distinguished from other northeastern freshwater marshes by the strong dominance of *Typha* (cattail) spp.

[CEGL006349] Northeastern Woolgrass Wet Meadow
This seasonally flooded marsh occurs in the northeastern United States. It is dominated or characterized by *Scirpus cyperinus* (woolgrass), but composition is variable. Associates include *Glyceria* (mannagrass) spp. and *Thelypteris palustris* (eastern marsh fern), as well as other species of *Scirpus* (bulrush), including *Scirpus microcarpus* (panicled bulrush) and *Scirpus atrovirens* (green bulrush).

[CEGL006069] Northeastern Buttonbush Shrub Swamp
This buttonbush swamp occurs in the northeastern United States. These swamps experience prolonged or semipermanent flooding for much of the growing season, with water tables receding below the soil surface only during drought or very late in the growing season. They occur in a variety of environmental settings, including backwater sloughs or oxbow ponds, wet swales in floodplains, pond and lake borders, and small, isolated depressions where water levels recede very slowly, such as those with perched water tables. The substrate is typically loose muck. *Cephalanthus occidentalis* (common buttonbush) is dominant and often monotypic. Occasional associates depend on the environmental setting and most often occur in drier areas. They include *Vaccinium corymbosum* (highbush blueberry), *Rhododendron viscosum* (swamp azalea), *Acer rubrum* (red maple), *Cornus* (dogwood) spp. closer to upland borders, or *Acer saccharinum* (silver maple), *Fraxinus pennsylvanica* (green ash), and *Viburnum dentatum* (southern arrow-wood) where adjacent to floodplains, or *Decodon verticillatus* (swamp-loosestrife), *Chamaedaphne calyculata* (leatherleaf), and *Spiraea alba var. latifolia* (white meadowsweet) in more stagnant basins. Herbaceous species tend to be sparse but can include *Glyceria canadensis* (rattlesnake mannagrass), *Dulichium arundinaceum* (threeway sedge), *Carex stricta* (upright sedge), *Scirpus cyperinus* (woolgrass), *Thelypteris palustris* (eastern marsh fern), *Leersia oryzoides* (rice cutgrass), *Acorus calamus* (calamus), *Alisma plantago-aquatica* (European water plantain), *Polygonum* (knotweed) spp., *Sparganium* (bur-reed) spp., and floating or submerged aquatic species such as *Lemna minor* (common duckweed), *Potamogeton natans* (floating pondweed), and *Nuphar variegata* (variegated yellow pond-lily). Bryophytes, if present, cling to shrub bases and include *Warnstorfia fluitans* (warnstorfia moss), *Drepanocladus aduncus* (drepanocladus moss), or *Sphagnum fallax* (sphagnum). In disturbed areas, these wetland may be invaded by *Lythrum salicaria* (purple loosestrife).

[CEGL004141] Eastern Ruderal Common Reed Marsh
This reed marsh type is found across the east-temperate regions of the United States and Canada. Stands occur in semipermanently flooded marshes, ditches, impoundments, etc., that have often been disturbed by human activity. The vegetation is variable, as *Phragmites australis* (common reed) will often invade into existing natural or

semi-natural communities present on the site. Once firmly established, this community is usually strongly dominated by *Phragmites australis ssp. australis* (European common reed), with few or no other vascular plants present.

[CEGL004187] Ruderal Tidal Common Reed Marsh
This community is a dense tall grassland indicative of disturbance. It occurs in a range of tidal wetland habitats from fresh to brackish in salinity. It is characterized by dense stands of *Phragmites australis ssp. australis* (European common reed), an exotic taxon which tends to grow in colonies of tall, stout, leafy plants often to the exclusion of all other vascular plant species. Associated species are highly variable, depending on the community that has been invaded. Spreading in large colonies, *Phragmites* (reed) eventually dominates disturbed areas at coverage up to 100%. More typically, though, scattered individuals of other species may occur, such as sparse *Morella cerifera* (wax-myrtle) shrubs, *Kosteletzkya virginica* (Virginia saltmarsh mallow), *Calystegia sepium* (hedge false bindweed), *Boehmeria cylindrica* (small-spike false nettle), *Typha angustifolia* (narrowleaf cattail), *Apocynum cannabinum* (Indianhemp), *Rosa palustris* (swamp rose), *Polygonum* (knotweed) sp., and *Mikania scandens* (climbing hempvine). Vines of *Toxicodendron radicans* (eastern poison-ivy) are also frequent, but typically occur at low cover. This community has a broad geographic range, including coastal areas of the eastern and southeastern United States and Canada.

[CEGL004472] Broadleaf Pond-lily Tidal Marsh
This association comprises submerged freshwater tidal mudflats of coastal rivers along the Atlantic coast that are dominated by *Nuphar advena* (yellow pond-lily). This association occurs at low elevations within freshwater tidal marshes, within tidal range but beyond the influence of salinity. It generally occurs below mean low-water level where water depth is approximately 1-3 m or less. It receives a relatively long duration of flooding and is infrequently exposed at only the lowest tides. The association occurs on unconsolidated tidal mudflats and submerged point bars of large coastal river meanders adjacent to open water of river or tidal creek channels. Substrate is silty alluvial mud that is reported to be high in organic matter content at some sites; soil samples from 10 Virginia sites for this vegetation vary in humic matter content from 2 to 26% (mean = 11.5%). Vegetation of this association is characterized by large clonal stands of dense leafy forbs dominated by *Nuphar advena* (yellow pond-lily). Associated species tend to occur as scattered individuals and include *Peltandra virginica* (green arrow-arum), which can also be locally codominant, *Pontederia cordata* (pickerelweed), *Zizania aquatica* (annual wildrice), *Sagittaria latifolia* (broadleaf arrowhead), *Bidens laevis* (smooth beggarticks), *Acorus calamus* (calamus), and/or *Bolboschoenus fluviatilis* (river bulrush). *Nuphar advena* (yellow pond-lily) forms nearly monotypic stands early in the growing season. Associated species emerge later in the season and can eventually overtop *Nuphar* (pond-lily) plants, which senesce and tend to become insect-infested in late summer. Submerged aquatic species can occur in this association, including *Potamogeton epihydrus* (ribbonleaf pondweed), *Ceratophyllum demersum* (coon's-tail), and the invasive exotic *Hydrilla verticillata* (waterthyme).

[CEGL006833] Sweetflag Tidal Marsh
This is an association of tidal freshwater marsh dominated by *Acorus calamus* (calamus) that occurs in fresh to oligohaline reaches of tidal rivers along the Atlantic Coast from Massachusetts to Virginia. This association is best developed in higher, irregularly flooded elevations within freshwater tidal marshes but can occur in areas with a wide tidal range. Substrate is generally fine-particled, but varies from silts and silty mucks to peats and sands. The setting within the tidal marsh tends to be poorly drained; tidal flooding is ponded and of longer duration than adjacent areas. *Acorus calamus* (calamus) is dominant, generally comprising at least 50% cover, over extensive patches within the interior of high marshes. *Peltandra virginica* (green arrow-arum) is a frequent associate. Other associated species are variable and can include *Bolboschoenus fluviatilis* (river bulrush), *Sagittaria latifolia* (broadleaf arrowhead), *Polygonum punctatum* (dotted smartweed), and *Impatiens capensis* (orange jewelweed). Species that can occasionally occur include *Pontederia cordata* (pickerelweed), *Zizania aquatica* (annual wildrice), *Leersia oryzoides* (rice cutgrass), *Typha latifolia* (broadleaf cattail), *Polygonum arifolium* (halberdleaf tearthumb), *Bidens coronata* (crowned beggarticks), *Hibiscus moscheutos* (crimson-eyed rosemallow), and other *Schoenoplectus* (bulrush) spp. *Murdannia keisak* (wartremoving herb) has been noted in the southern portion of the range. *Acorus calamus* (calamus) is conspicuously dominant in spring and early summer. Later in the season, culms tend to lodge and form mats and be overtopped by other species.

[CEGL006325] Freshwater Tidal Mixed High Marsh
This association occupies the higher elevation zone of freshwater to slightly oligohaline marshes along the Atlantic coast from Maine to Virginia. In the southern part of the range (northern Virginia, Maryland, and Delaware), this is the principal mixed freshwater tidal marsh community, forming extensive patches. The vegetation is typically mixed

and dense, with highly variable species composition and patch dominance. *Impatiens capensis* (orange jewelweed), *Peltandra virginica* (green arrow-arum), *Polygonum* (knotweed) spp. (*Polygonum arifolium* (halberdleaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Polygonum punctatum* (dotted smartweed), *Polygonum hydropiperoides* (swamp smartweed)), *Bolboschoenus fluviatilis* (river bulrush), and *Typha angustifolia* (narrowleaf cattail) are characteristic and often abundant. Other species that may be abundant in a given stand include *Leersia oryzoides* (rice cutgrass), *Hibiscus moscheutos* (crimson-eyed rosemallow), *Mikania scandens* (climbing hempvine), *Sagittaria latifolia* (broadleaf arrowhead), *Amaranthus cannabinus* (tidalmarsh amaranth), *Zizania aquatica* (annual wildrice), *Bidens laevis* (smooth beggarticks), *Bidens coronata* (crowned beggarticks), *Pontederia cordata* (pickerelweed), *Typha latifolia* (broadleaf cattail), *Onoclea sensibilis* (sensitive fern), and *Carex comosa* (longhair sedge). Additional associates include *Boehmeria cylindrica* (small-spike false nettle), *Acorus calamus* (calamus), *Cicuta maculata var. maculata* (spotted water hemlock), *Cuscuta gronovii var. gronovii* (scaldweed), *Apios americana* (groundnut), *Schoenoplectus tabernaemontani* (softstem bulrush), *Bolboschoenus novae-angliae* (New England bulrush), *Echinochloa walteri* (coast cockspur grass), *Lycopus americanus* (American water horehound), *Pilea fontana* (lesser clearweed), *Eleocharis palustris* (common spikerush), *Iris versicolor* (harlequin blueflag), and *Sium suave* (hemlock waterparsnip). In the northern portion of the range, *Carex stricta* (upright sedge) is also common. On the Connecticut River, *Impatiens capensis* (orange jewelweed) is less important, and a levee is often present in the high marsh supporting such species as *Carex lacustris* (hairy sedge), *Ambrosia trifida* (great ragweed), and *Eupatorium perfoliatum* (common boneset).

[CEGL004706] Green Arrow-arum - Pickerelweed Tidal Marsh
This freshwater tidal marsh occurs from Maine to Virginia, excluding Rhode Island and New Hampshire. It is codominated by leafy forbs *Peltandra virginica* (green arrow-arum) and *Pontederia cordata* (pickerelweed). Associated species can include *Zizania aquatica* (annual wildrice), *Sagittaria latifolia* (broadleaf arrowhead), *Acorus americanus* (sweetflag), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum sagittatum* (arrowleaf tearthumb), and *Bidens* (beggarticks) spp. Species occurring less frequently can include *Typha* (cattail) spp. and *Impatiens capensis* (orange jewelweed). At the southern end of the range in Virginia, there is a well-marked variant in which *Nuphar advena* (yellow pond-lily) is codominant with *Peltandra virginica* (green arrow-arum) and *Pontederia cordata* (pickerelweed) in variable mixtures. This variant differs from the almost monospecific *Nuphar advena* (yellow pond-lily) Tidal Marsh (CEGL004472) in that it occurs on slightly higher landscape positions where the duration of inundation is shorter, supports higher mean species richness, and contains a number of taxa absent from the low intertidal portions of mudflats.

[CEGL004188] Atlantic Coast Brackish Tidal Marsh
This association occurs on fresh to brackish, mid-tidal, sandy/gravelly rivershores along the north and mid-Atlantic coast. It occurs in low areas where there is a longer duration of flooding. Wave and ice scour can have a significant influence on the year-to-year appearance of the vegetation, which tends to be sparse. This vegetation often occurs in nearly pure stands of *Schoenoplectus pungens* (common threesquare) but can be intermixed with *Spartina alterniflora* (smooth cordgrass) or *Spartina cynosuroides* (big cordgrass) in more brackish areas. Species diversity tends to be low due to winter storm scour, but associates can include *Amaranthus cannabinus* (tidalmarsh amaranth), *Polygonum punctatum* (dotted smartweed), *Cyperus bipartitus* (slender flatsedge), and *Bidens* (beggarticks) spp. *Sagittaria graminea* (grassy arrowhead), *Sagittaria latifolia* (broadleaf arrowhead), *Eleocharis palustris* (common spikerush), *Gratiola virginiana* (roundfruit hedgehyssop), *Elatine americana* (American waterwort), *Isoetes riparia* (shore quillwort), and *Cyperus bipartitus* (slender flatsedge) can occur, but are absent in the northern part of the range. As the salinity decreases *Zizania aquatica* (annual wildrice) can also be an associate.

AQUATIC VEGETATION ASSOCIATIONS

[CEGL006048] Mixed Freshwater Subtidal Marsh
This association comprises mixed freshwater subtidal aquatic beds of the mid-Atlantic coast. It occurs in fresh reaches of upper bays and tributaries within estuarine systems. Species composition is variable and includes *Vallisneria americana* (American eel-grass), *Ceratophyllum demersum* (coon's-tail), *Heteranthera dubia* (grassleaf mudplantain), *Elodea canadensis* (Canadian waterweed), *Najas guadalupensis* (southern waternymph), *Najas gracillima* (slender waternymph), *Najas minor* (brittle waternymph), *Potamogeton pusillus* (small pondweed), *Stuckenia pectinata* (sago pondweed), and others. There is often a strong component of exotic species that can be locally or extensively dominant, including *Myriophyllum spicatum* (Eurasian watermilfoil), *Hydrilla verticillata*

(waterthyme), and *Potamogeton crispus* (curly pondweed). This association can have dramatic seasonal fluctuations in species composition and biomass.

CITATION:

NatureServe. 2020. International Ecological Classification Standard: Terrestrial Ecological Classifications Covering Vegetation Associations and Ecological Systems. NatureServe Central Databases. Arlington, VA. U.S.A. 2I. National Capital Parks-East (NACE) in Baseline Vegetation Mapping of National Capital Region Parks in Maryland, Virginia, West Virginia, and the District of Columbia. Data current as of 3 September 2020.

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