Appendix I: Biological Resources Documents

1. Regulatory Summary
2. Habitat Assessment Report
3. Mussel Survey Approval and Survey Plan
4. Mussel Survey Report*
5. Determination Key for Tricolored Bat
6. Mussel Flow Report

* VADWR response is contained in Appendix E, Consultation Reference Number 27c.

Appendix I: Biological Resources Documents

1. Regulatory Summary

Regulatory Summary – Biological Resources

Federally-Protected Species; Critical Habitat; Essential Fish Habitat

The 1973 Endangered Species Act (ESA) (United States Environmental Protection Agency, 2023) directs all federal agencies to work to conserve federally-listed endangered and threatened species and to use their authorities to further the purposes of the ESA. The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS), in part through the Marine Mammal Protection Act, is primarily responsible for managing marine and anadromous species and their habitats, whereas the United States Fish and Wildlife Service (USFWS) is primarily responsible for managing terrestrial and freshwater species and their habitats. The Fish and Wildlife Coordination Act works through the USFWS to evaluate federal actions and the effects they may have on water resources so the USFWS can provide recommendations that reduce impacts to fish and wildlife. Section 7 of the ESA, titled "Interagency Cooperation," is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any federally-listed species.

In accordance with Section 7 of the ESA, as well as the 1976 Magnuson Stevens Fishery Conservation and Management Act (MSA) (United States Dept. of Commerce, National Oceanic and Atmospheric Administration, 2007), which governs marine fisheries management in United States federal waters, federal agencies are required to consult with NMFS on projects that adversely affect federally-listed marine or anadromous wildlife. In addition, consultation with NMFS is required on projects that adversely affect Essential Fish Habitat (EFH) (United States Dept. of Commerce, National Oceanic and Atmospheric Administration, 2022), which is defined under the MSA as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."

Endangered species are those which are in imminent danger of extinction throughout their range or a significant portion of their range because of a loss or change in habitat, over-exploitation, predation, disease, inadequacy of existing regulatory mechanisms, or other natural or manmade factors affecting their continued existence. Assistance is needed to prevent future extinction. Threatened species are those which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range if conditions surrounding them begin or continue to deteriorate. Candidate species are species for which the USFWS has sufficient information on the biological vulnerability and threats to support issuance of a proposal list, but issuance of a proposed rule is currently precluded by higher priority listing actions. Candidate species do not receive substantive or procedural protection under the ESA; however, federal agencies and other appropriate parties are encouraged to consider these species in the planning process.

Invasive species can be a factor in the loss or change of a habitat that ultimately leads to a species requiring protection. Invasive species are species that were not originally present in a region and now cause economic or environmental harm. EO 13112 orders the prevention of the introduction and spread of invasive species and provides for their control to reduce the harm they cause to the economy, ecological systems, and human health (United States Department of

Transportation, 1999). In conjunction with EO 13112, the CEQ Guidance Document on "Incorporating Biodiversity Considerations into Environmental Impact Analysis under the National Environmental Policy Act" mandates that federal actions consider and evaluate their impact to biodiversity (Council on Environmental Quality, 1993).

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act (MBTA) (United States Fish and Wildlife Service, n.d.) and the Bald and Golden Eagle Protection Act (United States Fish and Wildlife Service, n.d.), wherein "any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures." The MBTA is further implemented by EO 13186, whereby federal agencies must evaluate project impacts to migratory birds and reduce impacts as much as possible. EO 13186 outlines the process if a federal agency will have or is likely to have a significant negative impact on migratory birds, including establishing a Memorandum of Agreement (MOA) with the USFWS. Incidental "take" permits can only be issued for non-federal entities.

Migratory birds would be most impacted by the removal of trees, shrubs or grasslands that they may utilize. Migratory birds are likely to be transient through the Program Projects and adjacent areas. Certain practices are recommended to prevent a "take", which means to attempt to or to actually "pursue, hunt, shoot, wound, kill, trap, capture or collect" a protected species. Most commonly, the avoidance of project activities when migratory birds (March 15 to August 15) or eagles (December 15 through July 15 for nest sites, and May 15 through August 31 and December 15 through March 15 for bald eagle concentration areas and roost sites) are likely to be present and/or breeding in the project area (Virginia Department of Wildlife Resources, 2023) reduces the chance of a "take". Areas within 600 feet of a peregrine falcon nest or nestbox should be avoided between February 15 through July 15. Additional conservation measures include but are not limited to the following (United States Fish and Wildlife Service, 2024):

- Educating Site personnel on practices that protect wildlife;
- Proper evaluation of the necessity for a permit before the removal of nests or live or dead birds or their parts and reporting of a take;
- Proper disposal and management of non-hazardous solid waste, preventing the introduction of chemical contaminants and minimizing fire potential from project related activities;
- Protection of habitat by clearly marking project boundaries, maximizing use of disturbed land, preventing increases in lighting of native habitats, avoiding structures that may trap birds, preventing increases in noise, and minimizing prolonged human presence near nesting birds;
- Respecting buffer distances to wetlands or waterways;
- Implementing soil erosion and dust control;

- Scheduling of projects outside of peak bird breeding season and if work is required during peak breeding season, conducting surveys prior to scheduled activities to determine if active nests are present;
- Proper management of vegetation activities and schedules to avoid direct bird impacts and prevent the introduction of invasive plants; and
- Minimize collision risk.

State

In Virginia, the Department of Wildlife Resources (DWR) and the DCR's Natural Heritage Program maintain biodiversity databases with information regarding plants and animals that have conservation rankings and/or their sensitive habitats.

Virginia classifies species based on the greatest conservation need through the 2015 Virginia Wildlife Action Plan (WAP), which utilizes the Biota of Virginia (BOVA) databases to identify species that are in decline. A list of the Species of Greatest Conservation Need (SGCN) is available through the Virginia DWR. Species within the list are classified into four tiers as follows:

- Tier I: Critical Conservation Need – Species with a high risk of extinction or extirpation whereby populations are at critically low levels, face immediate threats, or have an extremely limited distribution range.
- Tier II: Very High Conservation Need – Species with a high risk of extinction or extirpation whereby populations occur at very low levels, face significant threats or have a very limited distribution.
- Tier III: High Conservation Need – Species with the possibility of extinction or extirpation whereby populations are in decline or have declined or occur in a restricted range.
- Tier IV: Moderate Conservation Need – Species may be rare in part of their range, typically near the edge of the range, and have exhibited a declining trend or are likely to obtain a higher Tier ranking based on current trends.

Within the four tiers, species are further assigned a "Conservation Opportunity Ranking" of A, B or C, defined as follows:

- Rank A: "On the ground" species or habitat management strategies have been identified that are expected to benefit the species and can be currently implemented (at least in part);
- Rank B: Research needs have been identified or "on the ground" actions cannot be implemented at this time; and
- Rank C: "On the ground" actions and research needs have not yet been identified that will have a benefit to the species.

Local

The airport's Wildlife Hazard Management Plan (Manassas Regional Airport, 2023) was developed to minimize wildlife populations on or around the airport that would pose a threat to

aviation safety and/or airport infrastructure. The proximity of the airport to waterways and wetlands (including ponds), sod farmland, and fast food restaurants increases the number of wildlife attracted to it. To reduce hazardous wildlife attractants, the airport seeks to maintain a 5,000 and 10,000 foot distance between the attractant and the nearest airport operation area (AOA) while also taking efforts to protect the airspace wtihin a five mile range. These maintenance efforts include but are not limited to maintaining grass heights on a routine basis, only allowing trees outside of the AOA and selecting those that do not generate high litter, avoid seed producing grasses within turf management areas, ensure no ponds, basins or stormwater outfalls contains water for more than 48 hours (and install drains or ditches to those that do), require an environmental impact study should disturbance to the Broad Run shoreline occur, prohibit the acculumlation of composted material within 1,200 feet of an AOA, and issue notices to airmen of any recent and notable wildlife activity. nder the plan, wildlife can be managed via various pyrotechnic techniques that create loud noises; via shotgun/rifle; habitat modification (grass cut to between 10" and 12"); live, lethal and nest trapping; food source reduction; canines, permimeter fencing and and authorized hunting. Due to the presence of bald eagles, the airport holds a special Eagle Depredation Permit (#MB037505-0) from the USFWS which allows non-lethal harrassment methods to be used to scare the bird from airport property (Manassas Regional Airport, 2023).

Significance Determination

A significance determination is made when the USFWS or NMFS determines that an action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat. The FAA has not established a significance threshold for non-listed species (FAA, 2015). Additional factors to consider include the following:

1. "A long-term or permanent loss of unlisted plant or wildlife species from an area;
2. Adverse impacts to special status species (state species of concern, species proposed for listing, migratory birds or bald and golden eagles) or their habitats;
3. Substantial loss, reduction, degradation, disturbance or fragmentation of native species' habitats or their populations; or
4. Adverse impacts on a species' reproductive success rates, natural mortality rates, non-natural mortality (e.g., road hills and hunting), or ability to sustain the minimum populations levels required for populations maintenance."

Appendix I: Biological Resources Documents

2. Habitat Assessment Report

DAVEY Resource Group

February 10, 2026

Peter Byrne, Director
Avion Solutions Group, LLC
244 5th Avenue
Suite P296
New York, NY 10001
email: pbyrne@avionsg.com

Re: Manassas Regional Airport (HEF) Habitat Assessment

Dear Mr. Byrne:

Please find enclosed a report summarizing Davey Resource Group's (DRG) field review of habitats present within fifteen potential project areas at Manassas Regional Airport (HEF) and an evaluation on the potential of those habitats to support endangered and threatened species. This assessment was conducted from March 11-14, 2024, June 4-5, 2025 and July 7-8, 2025, along with a wetland and stream delineation in support of a National Environmental Policy Act (NEPA) Environmental Assessment (EA). Please note that this field study reviewed potential project areas (the "Area of Investigation") in excess of those currently proposed for this effort and should be reviewed for habitat documentation purposes only. The report is intended to generally discuss how disturbance to these areas could impact endangered and threatened species and their habitats.

Please also be aware that the original boundary for Project Area #5 included a box that included land east of Cannon Branch where it flows south of Harry J. Parrish Blvd. Per discussion with Richard Allabaugh, Senior Airport Operations Officer at HEF, the Airport only controls land to the west of Cannon Branch, and thus all evaluations for Project Area #5 ended at the western top of bank of Cannon Branch. Should project area disturbance extend beyond this area, additional evaluation may be necessary.

If you have any questions regarding the information presented within this report or above, please do not hesitate to contact me via phone at 908-788-9676, extension 4895, or via email at Jamie.Morgan@Davey.com.

Sincerely,
Davey Resource Group, Inc.

Jamie Morgan, MS, CPSS, Certified Senior Ecologist,
State Certified Wetland Scientist - VA & NH
Project Manager

CC: Susan Quackenbush, PWS, DRG
Carol S. Weed, M.A., RPA

MANASSAS REGIONAL AIRPORT (HEF)

CITY OF MANASSAS AND PRINCE WILLIAM COUNTY
VIRGINIA

PROPOSED PROGRAM PROJECT AREAS

HABITAT ASSESSMENT REPORT

August 12, 2024
Revised February 10, 2026

Prepared for:

Avion Solutions Group, LLC
244 5th Avenue
Suite P296
New York, NY 10001
Attn: Peter Byrne, Director

DAVEY Resource Group

TABLE OF CONTENTS

TABLES

APPENDICES

1.0 INTRODUCTION

On behalf of Avion Solutions Group (ASG), LLC, Davey Resource Group, Inc. (DRG) conducted a habitat assessment at Manassas Regional Airport (HEF) (hereafter referred to as the "Site") in the City of Manassas and Prince William County, Virginia. DRG evaluated an approximate 100-foot buffer around sixteen areas within the Site where "Program Projects" were being considered, hereafter referred to as the "Area of Investigation" (AOI). These proposed projects include new/expanded parking areas and access drives; new paved pad areas; runway, ramp, and taxiway reconstruction, strengthening, widening and/or rehabilitation (including existing bridges); the demolition/construction of new buildings; and/or expansion of existing buildings.

The AOI that was evaluated does not necessarily have implications with respect to where a project is or is not occurring. The AOI solely represents the area investigated by DRG for the purposes of identifying wildlife habitat and species that may be utilizing these areas. The AOI for this investigation encompassed approximately 217-acres, not including Project Area #2, which consists solely of existing pavement used for active airport activities.

This habitat assessment was conducted along with a wetlands and waters delineation in support of an Environmental Assessment (EA) in accordance with the *National Environmental Policy Act* (NEPA), to be reviewed by the Federal Aviation Administration (FAA) as the lead agency. Findings provided in this report are representative of field conditions that were documented at the time of the investigation and were based on DRG's understanding of the project scope at that time.

2.0 METHODOLOGY

2.1 Field Assessment

The habitat assessment was conducted within the 217-acre AOI by DRG biologists on March 11-14, 2024, June 4-5, 2025 and July 7-8, 2025 during daylight hours. In preparation for the field investigation, DRG reviewed available information including United States Geological Survey (USGS) topographic mapping (**Appendix A**, **Figure 1**); United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping (**Appendix A**, **Figure 2**); USGS National Hydrography Dataset (NHD) streams (**Appendix A**, **Figure 2**); high detail aerial photography (**Appendix A**, **Figure 2**); the USFWS Information for Planning and Consultation (IPaC) data; the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) Essential Fish Habitat (EFH) and *Endangered Species Act* (ESA) Section 7 mapping; Virginia Department of Wildlife Resources (VDWR) Fish and Wildlife Information Service (VaFWIS) tool, and biological resources information presented in the EA prepared in support of the HEF West Corporate Development and East Parcel Development (dated March 30, 2018) (RS&H, Inc., 2018), which included previous input from the Virginia Department of Conservation and Recreation (VDCR) as well as other wildlife studies conducted in the area. A list of species to consider during the investigation was created by using this information. Conditions during the habitat evaluation were suitable for field work for these species (i.e., conducted during the growing season with no frozen ground, snow accumulation, flooding or drought).

Analysis of vegetation communities, including species composition, size, structure, invasive species and anthropogenic disturbance, was conducted and are depicted on **Figure 3** (**Appendix A**). Ecological factors including wildlife species observed, hydrological characteristics of wetlands, open waters, and soil

characteristics were noted. The general data collected was utilized in assessing habitats for all key species identified through state and federal data sources. General data requirements, such as vegetation composition or general hydrologic conditions, were collected in conjunction with the concurrent wetland delineation. The data collected was used to determine potential habitat conditions for rare, threatened and endangered species. Photographs of vegetative communities are enclosed in **Appendix B**.

2.2 Database Review

2.2.1 NOAA National Marine Fisheries Service

NMFS has developed an ESA Section 7 Mapper tool, which can be utilized by federal action agencies to preliminarily identify ESA-listed species and critical habitats relative to project action areas. Based on reports generated from this database on May 22, 2024 and again on September 15, 2025 (**Appendix C**), no habitat for NMFS-managed federal species or critical habitats occurs within or immediately adjacent to the Airport, and the Airport occurs 13.3 miles east of the nearest consultation area for Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*). The NMFS EFH Mapper is utilized to identify locations of EFH areas and habitat areas of particular concern (HAPC). Reports generated from the EFH Mapper (dated May 22, 2024 and April 28, 2025) did not identify any EFH or HAPC on or immediately adjacent to the Airport (**Appendix C**).

2.2.2 Natural Community Mapping

The Airport is within the Piedmont Plateau physiographic province of Virginia (Virginia Department of Conservation and Recreation, Division of Natural Heritage). The Piedmont Plateau lies between the Blue Ridge Mountains and the unconsolidated sandy deposits along the coast. The plateau is the largest of the Virginia physiographic provinces. Topographically, it is marked by rolling hills that vary from approximately 200 feet above mean sea level (msl) to approximately 1,000 feet above msl in elevation. The area surrounding the Airport consists of high density commercial and suburban development to the north, agricultural and rural residential development to the southwest, and forest and rural residential development to the southeast. The Airport currently encompasses 888 acres, of which approximately 75 percent has been developed with runways, taxiways, other roadways, parking lots, and numerous accessory buildings, including but not limited to the terminal, hangars, storage buildings, and the fuel farm. Among these areas, the majority of the ecological communities consist of maintained (mowed) grasslands, forest, small disturbed wetlands, riverine wetlands, ditches and concrete lined drainage channels interspersed within paved surfaces. The Nokesville, Virginia United States Geological Survey (USGS) 7.5' Topographic Quadrangle (1966, 10-foot contours) (Figure 1, **Appendix A**) indicates that the area of the existing Airport runways and taxiways has been leveled to approximately 170-185 feet above msl, whereas the surrounding topography consists of low hills that peak at approximately 250 feet above msl.

The VDCR classifies its natural communities into ecological groups that are ranked to maximize conservation, land protection and management. The natural areas within the AOI were evaluated with respect to the descriptions in *The Natural Communities of Virginia (*2021) (Fleming & Patterson, 2021) to note if species with sensitive state or global conservation rankings were present. All natural communities identified at the Airport are common and secure within the region and are not included in the VDCR's ranked ecological communities. The forest at the Airport does not match rare forest floodplain rankings based on the observed plant communities. Additionally, no sensitive aquatic or grassland communities were noted due to the heavy disturbance caused by the existing Airport.

The Virginia Natural Landscape Assessment (VaNLA) maps natural lands in Viriginia to identify continuous natural habitats referred to as "Ecological Cores". These include large patches of land with at least 100 acres of interior cover. Ecological Cores are ranked to reflect the benefit they provide, from C1 (Outstanding) to C5 (General). Two Ecological Core areas occur on the non-airport side of Broad Run and are displayed in Figure 3 (**Appendix A**). Both are mapped as C5, indicating the lowest level of ecological integrity.

The VDCR database maps the Broad Run through the Airport as having freshwater mussel predicted richness of "6", which indicates medium species richness and potential rare species. The database also maps Cannon Branch as having freshwater mussel predicted richness of "5", which indicates medium species richness and no rare species. Freshwater mussel habitat buffers are also mapped within the Airport along Broad Run as high priority for conservation, with some adjacent areas that are high priority for restoration. The woods adjacent to Cannon Branch has a Forest Conservation Value of "1", which is the lowest classification and indicates "average" value.

2.2.3 USFWS Information, Planning and Consultation

The USFWS's IPaC (United States Fish and Wildlife Service, n.d.) is a project planning tool that streamlines the environmental review process by identifying federally listed threatened and endangered species, critical habitat, migratory birds, and other natural resources that are known or expected to be on or in the vicinity of a project area, and thus potentially impacted by a project. Through IPaC, an Official Species List was initially obtained from the USFWS on January 24, 2024. To account for updates that had occurred to the USFWS species statuses and Project Areas, the IPaC Official Species List was obtained most recently on February 2, 2026. Both reports are included in **Appendix C**. Based on the Official Species Lists, the USFWS did not identify critical habitats within the Airport; however, the list did identify the species noted in **Table 1**. Differences between the 2024 report and the 2026 report are noted accordingly.

Table 1: Federally Threatened and Endangered Species Associated with the Program Projects

Common Name	Scientific Name	2024 Federal Status	2026 Federal Status	Class
Bat, northern long-eared	*Myotis septentrionalis*	Endangered	No Longer in IPaC[1] Species List	Mammalia (Mammals)
Bat, tricolored	*Perimyotis subflavus*	Proposed Endangered	Proposed Endangered	Mammalia (Mammals)
Butterfly, monarch	*Danaus plexippus*	Candidate	Proposed Threatened	Insecta (Insects)
Wedgemussel, dwarf	*Alasmidonta heterodon*	Endangered	No Longer in IPaC[1] Species List	Bivalvia (Mussels)

Migratory birds of conservation concern with potential to occur within the AOI, per the 2026 USFWS IPaC report, are listed in **Table 2**.

[1] These species were included in the first IPaC report and thus are discussed in this habitat assessment, even though they are no longer in the current IPaC report.

Table 2: Birds of Conservation Concern with Potential to Occur in the HEF Program Project Locations	
Species	**Breeding Season in Study Area[2]**
Bald eagle (*Haliaeetus leucocephalus*)	Breeds September 1 to July 31
Black-billed cuckoo (*Coccyzus erythropthalmus*)	Breeds May 15 to October 10
Cerulean warbler (*Setophaga cerulea*)	Breeds April 28 to July 20
Chimney swift (*Chaetura pelagica*)	Breeds March 15 to August 25
Grasshopper sparrow (*Ammodramus savannarum perpallidus*)	Breeds Jun 1 to August 20
Prairie warbler (*Setophaga discolor*)	Breeds May 1 to July 31
Prothonotary warbler (*Protonotaria citrea*)	Breeds April 1 to July 31
Red-headed woodpecker (*Melanerpes erythrocephalus*)	Breeds May 10 to September 10
Rusty blackbird (*Euphagus carolinus*)	Breeds elsewhere, present late fall until spring
Wood thrush (*Hylocichla mustelina*)	Breeds May 10 to August 31

2.2.4 Virginia Department of Game and Inland Fisheries

Virginia classifies species based on the greatest conservation need based on the Biota of Virginia (BOVA) databases. A list of the Species of Greatest Conservation Need (SGCN) is available through the VDWR. Species within the list are classified into four tiers as follows:

- Tier 1: Critical Conservation Need – Species with a high risk of extinction or extirpation whereby populations are at critically low levels, face immediate threats, or have an extremely limited distribution range.
- Tier 2: Very High Conservation Need – Species with a high risk of extinction or extirpation whereby populations occur at very low levels, face significant threats or have a very limited distribution.
- Tier 3: High Conservation Need – Species with the possibility of extinction or extirpation whereby populations are in decline or have declined or occur in a restricted range.
- Tier 4: Moderate Conservation Need – Species may be rare in part of their range, typically near the edge, and have exhibited a declining trend or are likely to obtain a higher Tier ranking based on current trends.

Additionally, species with Tier status are also assigned a 'Conservation Opportunity Ranking', as follows:
a — Managers have identified "on the ground" species or habitat management strategies expected to benefit the species; at least some of which can be implemented with existing resources and are expected to have a reasonable chance of improving the species' conservation status.
b — Managers have only identified research needs for the species or managers have only identified "on the ground" conservation actions that cannot be implemented due to lack of personnel, funding, or other circumstance.
c — Managers have failed to identify "on the ground" actions or research needs that could benefit this species or its habitat or all identified conservation opportunities for a species have been exhausted.

The VDWR VaFWIS review resulted in 24 species and/or varieties with a Tier/Rank Status in the two-mile radius of the Site, when reviewed in 2024 and again on August 11, 2025. A report of the most current database search from 2025 is enclosed in **Appendix C** and summarized in **Table 3** below.

[2] A listed breeding season implies the bird may breed in the project area within the timeframe specified, which is a very liberal estimate of the dates inside which the bird breeds across its entire range. "Breeds Elsewhere" indicates that the bird does not likely breed in the project area but may be present during the window indicated.

Table 3: Virginia Wildlife Action Plan (WAP) Tier Status Species Associated with the Airport.				
Tier/ Rank	**Common Name**	**Scientific Name**	**Status**	**Class**
Ia	Bat, little brown	*Myotis lucifugus*	State Endangered	Mammalia (Mammals)
Ia	Bat, northern long-eared	*Myotis septentrionalis*	Federal Endangered, State Endangered	Mammalia (Mammals)
Ia	Bat, tricolored	*Perimyotis subflavus*	Federal Proposed, State Endangered	Mammalia (Mammals)
IIIa	Butterfly, monarch	*Danaus plexippus*	Proposed Threatened	Insecta (Insects)
IIb	Cuckoo, black-billed	*Coccyzus erythropthalmus*	None	Aves (Birds)
IIa	Duck, American black	*Anas rubripes*	None	Aves (Birds)
Ia	Falcon, peregrine	*Falco peregrinus*	State Threatened	Aves (Birds)
Ib	Floater, brook	*Alasmidonta varicosa*	State Endangered	Bivalvia (Mussels)
Ia	Fritillary, regal	*Speyeria idalia idalia*	None	Insecta (Insects)
IIa	Lance, yellow	*Elliptio lanceolata*	Federal Threatened, State Threatened	Bivalvia (Mussels)
IIa	Night-heron, yellow-crowned	*Nyctanassa violacea violacea*	None	Aves (Birds)
Ic	Owl, northern saw-whet	*Aegolius acadicus*	None	Aves (Birds)
IIb	Rail, king	*Rallus elegans*	None	Aves (Birds)
IVa	Rattlesnake, timber	*Crotalus horridus*	Collection Concern	Reptilia (Reptiles)
Ia	Shiner, bridle	*Notropis bifrenatus*	None	Actinopterygii (Ray-finned Fish)
Ia	Shrike, loggerhead	*Lanius ludovicianus*	State Threatened	Aves (Birds)
N/A	Shrike, migrant loggerhead	*Lanius ludovicianus migrans*	State Threatened	Aves (Birds)
Ia	Sparrow, Henslow's	*Centronyx henslowii*	State Threatened	Aves (Birds)
Ib	Sturgeon, Atlantic	*Acipenser oxyrinchus*	Federal Endangered, State Endangered	Actinopterygii (Ray-finned Fish)
IIa	Tern, common	*Sterna hirundo*	None	Aves (Birds)
IIIa	Turtle, spotted	*Clemmys guttata*	Collection Concern	Reptilia (Reptiles)
IIa	Warbler, cerulean	*Setophaga cerulea*	None	Aves (Birds)
Ia	Warbler, golden-winged	*Vermivora chrysoptera*	None	Aves (Birds)
IIa	Woodcock, American	*Scolopax minor*	None	Aves (Birds)

2.3 Species Summaries

The following paragraphs provide brief descriptions of the habitat requirements for the threatened, endangered and candidate species identified above in **Tables 1 and 3**, alphabetized by class and then common name.

2.3.1 Actinopterygii (Ray-finned Fish)

2.3.1.1 Sturgeon, Atlantic

The Atlantic Sturgeon is one of the largest, longest-lived anadromous fish species in North America, reaching lengths of 10 feet, weighing up to 400 pounds, and living 60 years or more (Virginia Department of Wildlife Resources, 2024). The species' range extends along the Canadian and U.S. Atlantic Coast, with extant breeding populations in at least 22 rivers from Maine to Georgia and several more in Canada (National Oceanic and Atmospheric Administration, 2024). The Atlantic sturgeon spends most of its life in the ocean but may be found in any of Virginia's major rivers draining into the Chesapeake Bay and Atlantic Ocean. Two distinct spawning migrations have been documented within the State, with fish navigating Chesapeake Bay tributaries during the spring and fall months (Virginia Department of Wildlife Resources, 2024). Following egg-laying, adults return to the ocean, while the young drift to downstream estuaries, remaining there for one to five years before moving into nearshore coastal waters (National Oceanic and Atmospheric Administration, 2024). The Atlantic sturgeon is a benthic feeder, opportunistically consuming crustaceans, worms, mollusks, and bottom-dwelling fish, such as sand lance (National Oceanic and Atmospheric Administration, 2024).

2.3.2 Aves (Birds)

2.3.2.1 Falcon, Peregrine

Peregrine falcon populations were extirpated from eastern Virginia and most of the entire eastern United States by the mid-1960s. The initial decline of the species was due to the stealing of eggs by collectors and falconers and the hunting of adults that were seen as a nuisance (Beans & Niles, 2003). The pesticide dichloro-diphenyl-trichloroethane (DDT) was the final blow to this species whose numbers were already in decline, as it caused the formation of thin eggshells, resulting in high chick mortality. Peregrine falcons historically nested on cliffs, which limited their original occurrences to western Virginia. With human inhabitance, peregrine falcons began to use buildings and bridges for nesting, as well as artificial platforms erected in appropriate foraging habitats. These abundant structures mimic the falcon's native habitat and provide available prey species (primarily avian species, particularly pigeons), which have enabled the population to expand.

Due to a successful captive breeding and release program, the peregrine falcon has recovered, but since it still has a small population size and low numbers in the mountains, the species remains listed as 'threatened' in Virginia (Harding & Thomas, 2024). Peregrine falcons are anticipated to return to nest in the same area, if not the same precise location, year after year, particularly to nests that fledge young successfully. There is evidence that falcons can "readapt" to traditional nest sites and may again use cliffs as nesting sites.

Potential disturbances that may cause a peregrine nest to fail or to result in the abandonment of a nest include substantial changes to the noise level in close proximity to the nest and visual distractions, including the movement of people and equipment, particularly in the line of sight from the nest and nearby perches.

2.3.2.2 Shrike, Loggerhead

The loggerhead shrike is a robin-sized predatory songbird that consumes insects, birds, small mammals, frogs, lizards, and even small turtles. It is known for impaling its catches on thorns, branches, and wires (Beans & Niles, 2003). The species is widely distributed in North America, though it is most abundant in the western and southeastern United States and Mexico (Virginia Department of Wildlife Resources,

2024). It occurs year-round in Virginia, with the largest populations located west of the Blue Ridge Mountains and smaller populations within the piedmont (Virginia Department of Wildlife Resources, 2024). A species of open countryside, the loggerhead shrike inhabits short-grass pastures, weedy fields, grasslands, agricultural areas, swampy thickets, orchards, and rights-of-way corridors (Beans & Niles, 2003). The loggerhead shrike has declined throughout the northeastern United States and is State listed as 'threatened' in Virginia.

Hunting occurs almost exclusively from perches, which include utility wires, fence posts, barbed wires, trees and shrubs, stumps, brush piles, and rocks (Virginia Department of Wildlife Resources, 2024). Nests are often situated in thorn-bearing trees or shrubs, such as hawthorn (*Crataegus* spp.), Osage orange (*Maclura pomifera*), and rambler rose (*Rosa multiflora*); however, eastern red cedar (*Juniperus virginiana*) may also be used (Beans & Niles, 2003). A New York-based study found that successful nesting pairs foraged over an area of 5.7 to 9.3 hectares, with the smallest area of active pasture in the nesting territory being about 5.5 hectares in size (Novak, 1989). A similar Missouri-based study identified an average territory size of 4.6 hectares, which increased significantly once the chicks had fledged (Brooks, 1988). Kridelbaugh (Kridelbaugh, 1983) found that nesting territories may be smaller in areas with a greater amount of good quality habitat.

The loggerhead shrike begins nesting in mid-spring; females incubate a clutch of five or six eggs over 16 to 20 days (Beans & Niles, 2003). The young leave the nest on foot 17 to 21 days after hatching, seeking cover in nearby vegetation. Fledging occurs at or around four weeks of age, though parental care will continue for an additional three to four weeks (Beans & Niles, 2003).

2.3.2.3 Sparrow, Henslow's

The Henslow's sparrow is a cryptic grassland bird that prefers to run on the ground under vegetative cover rather than fly. It is most often detected by its short, simple, high-pitched vocalizations (Virginia Department of Wildlife Resources, 2023). It occurs throughout eastern North America, with breeding populations occurring in eastern Virginia (NatureServe, 2024). The species inhabits open fields and meadows of grasses interspersed with weeds or shrubby vegetation, particularly within damp or low-lying areas (NatureServe, 2024). Beans & Niles (Beans & Niles, 2003) describes the species as preferring lush habitats, particularly fallow agricultural fields or ungrazed pastures containing high, dense herbaceous vegetation and a thick layer of ground litter, with little to no woody vegetation and few scattered shrubs. A study in New York (Peterson, 1983) found that Henslow's sparrows utilized large, ungrazed fields, often on hilltops, with a variety of moisture regimes and no woody invasion (NatureServe, 2024). It is thought that the species requires 10 to 100 hectares of suitable habitat for successful breeding (Samson, 1980).

Nesting occurs in loose colonies and pairs produce two broods per breeding season (Virginia Department of Wildlife Resources, 2023). A clutch of three to five eggs is incubated by the female for 9 to 11 days and the young fledge 9 to 10 days after hatching (New York Natural Heritage Program, n.d.).

The Henslow's sparrow is state-listed as 'threatened' in Virginia. Habitat loss is believed to be the primary cause of the species' decline throughout its range, as suitable habitat is ephemeral and often not available due to heavy human use (specifically, agricultural land/pastures not being permitted to idle (Robbins, Bystrak, & Geissler, 1986)) or succession to shrublands and forests (Smith, 1992).

2.3.3 Bivalvia (Mussels)

2.3.3.1 Floater, Brook

The brook floater is a small-bodied freshwater mussel occurring within the Atlantic Slope drainage. It was historically present from Nova Scotia south to South Carolina; however, the present distribution is spotty, particularly in Virginia (where it is known to occur in the Potomac drainage) and the Carolinas (Wicklow, 2004) (New York Natural Heritage Program, 2019) (Nedeau, McCollough, & Swartz, The Freshwater Mussels of Maine, 2000). The brook floater is a species of running-water habitats, particularly creeks and small rivers, where it is found among rocks in gravel substrates and in sandy shoals (Nedeau, McCollough, & Swartz, The Freshwater Mussels of Maine, 2000) (Nedeau, Freshwater mussels and the Connecticut River Watershed., 2008) (NatureServe, 2024). It is commonly found in nutrient poor conditions with low to moderate flow velocities and good water quality (Strayer & Jirka, 1997) (Nedeau, Freshwater mussels and the Connecticut River Watershed., 2008) (New York Natural Heritage Program, 2019).

Fertilization success may be related to population density, with a threshold density required for reproductive success to occur (New York Natural Heritage Program, 2014). Like many mussel species, brook floater larvae must attach to a suitable fish host for food and dispersal. It is thought that some brook floater populations are not recruiting due to an absence of such hosts (New York Natural Heritage Program, 2014). Possible fish host species include various dace species (Cyprinidae family), slimy sculpin (*Cottus cognatus)*, golden shiner (*Notemigonus crysoleucas)*, pumpkinseed (*Lepomis gibbosus*), yellow perch (*Perca flavescens*), margined madtom (*Noturus insignis*), and the tessellated darter (*Etheostoma olmstedi*) (Strayer & Jirka, 1997) (Nedeau, Freshwater mussels and the Connecticut River Watershed., 2008).

2.3.3.2 Lance, Yellow

The yellow lance is a bright yellow, elongate mussel approximately 3.4 inches (86 mm) in length, with a shell that is more than twice as long as tall (United States Fish and Wildlife Service, n.d.). Its range is restricted to the Atlantic slope of Maryland south to North Carolina, though it is now presumed extirpated from 25% of historically occupied watershed units (NatureServe, 2024). The USFWS has identified 11 watersheds as critical habitat "units" for the species. In the State of Virginia, these include the Rappahannock Subbasin (Rappahannock, Fauquier, and Culpeper Counties), Rapidan Subbasin (Madison and Orange Counties), South Anna River (Louisa County), Johns Creek (Craig County), and the Nottoway Subbasin (Nottoway, Lunenburg, Brunswick, and Dinwiddie Counties) (United States Fish and Wildlife Service, 2021). Neither the Broad Run nor the Cannon Branch occur in or drain to these watersheds.

The species' habitat typically includes high quality streams and rivers with sandy to coarse sandy areas (sometimes with gravel), with moderate flows and high dissolved oxygen content (United States Fish and Wildlife Service, 2018) (NatureServe, 2024). It is found in the wide main channels of drainages to streams as small as one meter across (NatureServe, 2024). Little is known of the life history of the yellow lance, and the species of host fish utilized by its glochidia have not yet been determined (North Carolina Wildlife Resources Commission, n.d.).

2.3.3.3 Wedgemussel, Dwarf

The dwarf wedgemussel is a federal listed endangered species that lives on sand, gravel, firm clay and firm muddy sand substrates in creeks and rivers of varying sizes. They prefer slow to moderate current and require silt-free, well oxygenated water that is free of pollutants. This species once thrived along the Atlantic coast but are now no longer found in Canada and appear to be declining in Virginia and North Carolina. Water pollution and the construction of impoundments are the greatest threat to this species.

Particularly, it is sensitive to elevated concentrations of certain metals, as well as pesticides, chlorine, nutrients and siltation (United States Fish and Wildlife Service, 2007).

In Virginia, the dwarf wedgemussel is known to occur in the Nottaway, Mattaponi, Lower Potomac, and Lower Rappahannock basins (NatureServe, 2024), with historical occurrences in the Pamunkey, Rapidon-Upper Rappahannock, and Maury basins (Ortmann, 1919) (Clark, 1981) (NatureServe, 2024). It is found in varying stream sizes, substrates, and flow conditions, and may occupy water depths from several inches to 20 feet (United States Fish and Wildlife Service, n.d.). Nedeau (Nedeau, Freshwater mussels and the Connecticut River Watershed., 2008) indicates that dwarf wedgemussel can be found in depositional areas and banks with large amounts of silt. The species can also be found amongst submerged aquatic vegetation and along stream banks beneath overhanging tree limbs (NatureServe, 2024) (New York Natural Heritage Program, 2014). Nedeau (Nedeau, Freshwater mussels and the Connecticut River Watershed., 2008) describes stable flow and substrate conditions as critical for the species.

During the late summer months, upstream males release sperm into the water, which is taken up by females via their siphons (New York Natural Heritage Program, 2014). Glochidia are subsequently released into the water column during the following spring and attach to a suitable host. Several fish species have been identified as possible glochidia hosts; however, recent published work suggests that tessellated darter is a preferred host. Tessellated darters' native range overlaps that of the Airport, as it occurs in all of northern and eastern Virginia (United States Geological Survey, 2024). Dwarf wedgemussel typically moves less than 100 meters during its life; therefore, it is likely that its dispersal ability to new, suitable habitats is low (McLain & Ross, 2005).

2.3.4 Insecta (Insects)

2.3.4.1 Butterfly, Monarch

Monarch butterflies occur in open habitats where milkweed (*Asclepias* spp.) and other wildflowers are available, such as fields, meadows, utility rights-of-way, and gardens. The species has declined throughout portions of its range due to loss of host plants and nectar sources, as well as illegal logging and forest fragmentation in its wintering grounds (Colella, 2015). To date, the monarch is proposed as federally threatened under the ESA by the USFWS.

2.3.5 Mammalia (Mammals)

2.3.5.1 Bat, Little Brown

Prior to the outbreak of white-nose syndrome, the little brown bat was one of the most common bat species found in North America. It has experienced severe declines, particularly in eastern North America, due to this disease and its status is currently under review by the USFWS (United States Fish and Wildlife Service, 2024). The little brown bat's summer range extends throughout Virginia, except for a few southeastern portions of the State. Its winter range encompasses the western parts of the State.

The species uses a wide range of habitats; foraging occurs in areas over water, along the margins of lakes and streams, and in woodlands near water (NatureServe, 2024). Winter hibernacula include caves, tunnels, abandoned mines, and similar sites, typically with a stable temperature of about 2 to 12 °C (Kunz & Reichard, 2010). Maternity colonies, which consist of two to more than 100 individual bats (United States Fish and Wildlife Service, n.d.) occur within warm sites in buildings and other man-made structures (NatureServe, 2024). Hollow trees are also infrequently utilized. During the summer months, males often roost under exfoliating bark, within tree trunks, and within the cavities of living and dead trees. Individuals

may also roost within human-made structures during the summer (United States Fish and Wildlife Service, n.d.). Bats constitute a minor component to wildlife collisions with aircrafts and in general, these incidents remain a low risk to civil aircraft (Biondi, Belant, Devault, Martin, & Wang, 2013).

To date, the little brown bat is not federally listed, proposed for federal listing, or designated as a candidate species for federal listing; however, the USFWS identifies the species' listing status as under review (United States Fish and Wildlife Service, n.d.).

2.3.5.2 Bat, Northern Long-eared

Northern long-eared bat is both federal and state-listed as endangered. Its wintering habitat (hibernacula) is restricted to certain caves or underground cave-like structures. Hibernacula are typically characterized by large open areas with cracks or crevices for roosting. These sites maintain consistent cool temperatures with very high humidity and minimal air currents (United States Fish and Wildlife Service, n.d.).

Northern long-eared bat summer habitat is typically hardwood or mixed interior forested habitats with a closed canopy (Sasse, 1996). They are rarely found in woodlands with significant edge habitat. Roosting habitat includes live or dead trees of $\geq$ 3 inches diameter at breast height (DBH) (United States Fish and Wildlife Service, n.d.). Roosts of female bats tend to be large diameter, tall trees, and in at least some areas located within a less dense canopy (Sasse, 1996). Single bats or groups of bats may roost in cracks, cavities, crevices, hollows, or under loose bark. Over 30 tree species have been identified as utilized by northern long-eared bat (United States Fish and Wildlife Service, n.d.). Isolated trees may be considered suitable roosting habitat if located within 1,000 feet of other suitable trees (United States Fish and Wildlife Service, n.d.). The species also occasionally roosts behind shutters, and under or within buildings, barns, bridges, and other man-made structures. Bats constitute a minor component to wildlife collisions with aircrafts and in general, these incidents remain a low risk to civil aircraft (Biondi, Belant, Devault, Martin, & Wang, 2013).

Northern long-eared bats feed exclusively on insects identified through echolocation. The species is adapted to gleaning in dense canopy locations for their prey, which primarily consists of beetles and moths. Foraging occurs within forested wetlands, upland woodlots, and linear forested corridors. Adjacent emergent wetlands, old fields, and pastures may also be utilized.

2.3.5.3 Bat, Tricolored

The tricolored bat is a Virginia state endangered species and is proposed for listing as endangered under the federal ESA. It is one of the smallest bats in North America, at about 3.5 inches long with a wingspan of just over 9 inches (Kentucky Department of Fish and Wildlife Resources, n.d.). The range of the tricolored bat includes much of the eastern and central United States, southern Canada, Mexico and Central America. Wintering (hibernacula) tricolored bats are found in caves and mines and have also been observed in road culverts in the southern United States.

Tricolored bats may be found throughout Virginia during the summer months, whereas overwintering occurs in caves and rock shelters in the mountains in the northern and western portions of the state (Virginia Department of Wildlife Resources, 2024). The species shows high site fidelity; maternal females will return year after year to their summer roosting locations (but will still switch trees regularly), and many individuals return year after year to the same hibernaculum (Kath, 2022) (United States Fish and Wildlife Service, n.d.).

The species roosts among clusters of dead and live leaves or living or recently dead deciduous hardwood trees, such as oaks (*Quercus* spp.), maples (*Acer* spp.), tulip poplar (*Liriodendron tulipifera*), and eastern cottonwood (*Populus deltoides*) (United States Fish and Wildlife Service, n.d.) (Kath, 2022); however, it has also been documented roosting among pine needles, within eastern red cedars, and within/under artificial structures such as barns, porch roofs, bridges, concrete bunkers, and, rarely, within caves (United States Fish and Wildlife Service, n.d.). The species forages at or above the tree canopy early in the evening, moving closer to the ground as the night progresses (United States Fish and Wildlife Service, n.d.). It often forages over waterways and along forest edges, generally within a five-mile radius of the roosting site.

3.0 RESULTS

3.1 Site Ecological Communities

3.1.1 Anthropogenic Upland Habitats

The AOI encompasses portions of existing active airport grounds, including runways, taxiways, access roads, parking lots, hangars, a terminal, and other infrastructure, interspersed with mowed grassland (**Appendix A**, **Figure 3**). The mowed grassland can be categorized as 'frequently mowed', in which the vegetation height ranged from approximately four to ten inches, and 'annually mowed', where tree and shrub growth was limited but taller herbaceous vegetation greater than 10 inches could establish. The 'frequently mowed' habitats were dominated by species such as broomsedge bluestem (*Andropogon virginicus*), yellow Indiangrass (*Sorghastrum nutans*), and other unidentified graminoid species. These portions of the project area are highly disturbed and degraded by human activity for the purposes of airport management and/or exclusion of wildlife that could be a nuisance to Airport operations via the Wildlife Hazard Management Plan (Manassas Regional Airport, 2023). The 'annually mowed' areas were dominated by goldenrod (*Solidago* spp.), reed canary grass (*Phalaris arundinacea*), Indian hemp (*Apocynum cannabinum*), Chinese lespedeza (*Lespedeza cuneata*), and broomsedge bluestem. These areas have the potential to provide transient habitat for a wide range of common wild mammal species, including but not limited to white-tailed deer, fox, raccoon, groundhog, squirrels and other rodents, eastern cottontail, and skunk. Habitat for birds (including owls and raptors) and invertebrates (insects, spiders, etc.) is also present as these species are more mobile.

3.1.2 Oak-hickory Upland Forest

The mixed hardwood forest canopy (**Appendix A**, **Figure 3**) is dominated by mockernut hickory (*Carya tomentosa*), American hornbeam (*Carpinus caroliniana*), eastern hophornbeam (*Ostrya virginiana*), pin oak (*Quercus palustris*), American elm (*Ulmus americana*), eastern red cedar, tree-of-heaven (*Ailanthus altissima*), and common hackberry (*Celtis occidentalis*). The shrub layer consists of blackhaw viburnum (*Viburnum prunifolium*), rambler rose, and American holly (*Ilex opaca*). The herb and woody vine stratum consists of Japanese stilt grass (*Microstegium vimineum*), Japanese honeysuckle (*Lonicera japonica*), sweet wood-reed (*Cinna arundinacea*), Virginia wildrye (*Elymus virginicus*), and bottlebrush grass (*Elymus hystrix*). The trees average approximately 4 to 18 inches DBH, some of which were dead snags, and others containing cracks or cavities. The majority of the forest had a closed canopy. A significant amount of invasive species was present in the understory, which is typical of fragmented forests in the northeastern United States.

The forested area in conjunction with adjacent wetlands and with extended offsite habitats would provide adequate summer roosting habitat for a variety of bat species and would additionally support a wide range of other wildlife species in the area, including but not limited to white-tailed deer, fox, raccoon,

groundhog, eastern cottontail, squirrels and other rodent species, skunk, bats, birds (as well as owls and raptors), reptiles (e.g. eastern box turtle), amphibians (wood frogs, toads and salamanders), and invertebrates (insects, spiders, etc.).

3.1.3 Open Water/Stream

Two perennial streams occur within the AOI, identified as Cannon Branch (Stream O) and Broad Run (Stream H) (**Appendix A**, **Figure 3**). Cannon Branch borders the AOI to the east, flowing from north to south, crossing beneath Harry J. Parrish Boulevard via a bridge/culvert, and merging with Broad Run farther downstream. Cannon Branch is approximately 25 feet wide with depths ranging from one to three feet of relatively clear water flowing over gravel/cobble substrate. The banks were approximately two to three feet deep with significant areas of undercutting and erosion observed. The canopy cover was approximately 90% and predominantly consisted of sweet birch (*Betula lenta*), American sycamore (*Platanus occidentalis*), tree-of-heaven, and common hackberry.

Multiple small intermittent channels (Streams OA, OB, OC, and OD) drain to Cannon Branch. These features average between two to four feet in width, with banks averaging two to three feet in height. At the time of the field investigation, water depths ranged from one to six inches. The streambeds typically contained a mix of silt, cobble, and organic material. All four streams averaged approximately 90% canopy cover, consisting of similar species observed along Cannon Branch. Streams OA, OC, and OD appeared to receive runoff from Wakeman Drive, further distributing water into downgradient wetlands before entering Cannon Branch.

Broad Run flows west to east through the center of the Airport where it is bridged/culverted underneath the airport runway and taxiway. The stream is approximately 40 to 50 feet wide, with depths of approximately three feet. The substrate is predominantly silt and the water was observed to be murky. The banks were approximately three to four feet deep with large stone armoring on the southern banks. The northern banks remained natural, consisting of sandy deposits. The canopy cover was approximately 20% and included species such as American sycamore and honey-locust (*Gleditsia triacanthos*). A small intermittent channel (Stream HB) drains into Broad Run from the north.

Broad Run has the potential to support fish, mussels, turtles, and amphibians, as well as to provide foraging corridors for a variety of birds (especially waterfowl) and small mammals. Additionally, the bridge structure conveying Broad Run under the runway and Taxiway B may provide summer roosting habitat for a variety of bat species.

3.1.4 Palustrine Forested Wetlands

Four palustrine forested wetlands (Wetlands A, P, R/S, and W) occur within mature oak-hickory forest, within the Cannon Branch floodplain (**Appendix A**, **Figure 3**). Wetland A receives stormwater input from the airport. Wetland A, along with Wetlands P and R/S, are adjacent to and hydrologically connected to Cannon Branch. Wetlands A and P are directly connected to Cannon Branch whereas Wetland R/S is connected by a small intermittent stream (Stream OB). Wetland W is a small, isolated depressional feature that likely formed due to past disturbance. The dominant tree canopy within these communities included red maple (*Acer rubrum*), American hophornbeam (*Ostrya virginiana*), and pin oak. The shrub stratumwas dominated by blackhaw viburnum, American hornbeam, and American holly. The dominant herb stratum included green arrow arum (*Peltandra virginica*), lamp rush (*Juncus effusus*), broad-leaf cat-tail (*Typha latifolia*), Japanese stilt grass, sweet wood reed, and manna grass (*Glyceria* spp.). The woody vine stratum contained Japanese honeysuckle and horsebrier (*Smilax rotundifolia*).

The aquatic habitats provide watering and foraging areas for mammals (e.g. white-tailed deer, fox, groundhog, eastern cottontail, squirrel and other rodents, raccoon, skunk, bats, etc.), birds, reptiles (turtles), and amphibians (frogs, toads, and salamanders), and support the base of the food web for invertebrates (insects, spiders, etc.). Further, the wetlands with more significant vegetation (Wetlands R/S, A and P) would provide areas of cover, nesting, and feeding for all of the aforementioned wildlife groups. Cannon Branch has the potential to support fish and mussels and to provide foraging corridors for a variety of birds as well as small mammals. The bridge structure that conveys Cannon Branch under Harry J. Parrish Boulevard may provide summer roosting habitat for bats.

3.1.5 Palustrine Emergent Wetlands

Three palustrine emergent wetlands (Wetlands V, U, and T) occur within the floodplain of the Cannon Branch (**Appendix A**, **Figure 3**) and one palustrine emergent wetland (Wetland X) occurs within the floodplain of Broad Run. Wetland T is a depressional swale that becomes a watercourse outside of the AOI. Wetland U receives stormwater input from the roadside. Both Wetland T and U are directly connected to Cannon Branch by way of small intermittent streams (Stream OA and Stream OC, respectively). Wetland V is a small, isolated depressional wetland likely formed due to disturbance. Species occurring within these wetlands are consistent with those within the herbaceous stratum of the onsite palustrine forested wetlands. Wetland X occurs within the floodway of the Broad Run and actively receives overflow during flood events.

Nine small disturbed palustrine emergent wetlands are located throughout depressional areas within the airport infields (Wetlands B, C, D, E, I, K, L, M and N) (**Appendix A**, **Figure 3**). These features contain species such as lamp rush, tapered rosette grass (*Dichanthelium acuminatum*), wand panic grass (*Panicum virgatum*), curly dock (*Rumex crispus*), large barnyard grass (*Echinochloa crus-galli*), and reed canary grass.

Three linear emergent wetlands (**Appendix A**, **Figure 3**) occur within the active airport grounds, including a roadside ditch (Wetland G), vegetated portions of a concrete-lined ditch containing flowing water (Wetland Q/Stream J) where broad-leaf cat-tail has established, and the wetland fringe of a riverine system (Wetland F) dominated by cottongrass bulrush (*Scirpus cyperinus*), with minor quantities of black elderberry (*Sambucus nigra*).

The aquatic habitats within the active airport grounds provide minimal habitat for wildlife due to frequent mowing and active airport management to prevent birds and mammals from accessing and disturbing the airport runways or taxiways.

3.2 Species Specific Evaluations and Recommendations

3.2.1 Actinopterygii (Ray-finned Fish)

3.2.1.1 Sturgeon, Atlantic

Based upon a review of existing published information, including the NMFS ESA Section 7 Mapper and the EFH Habitat Mapper (**Appendix C**), the Airport occurs well beyond the limits of known Atlantic sturgeon habitat. Cannon Branch and Broad Run are not considered major Virginia rivers, do not contain estuarine habitat, and do not share a direct hydrological connection to the Chesapeake Bay or Atlantic Ocean. Therefore, Atlantic sturgeon is not expected to be present within or near the Program Projects and thus no impacts to the species are anticipated. No further action specific to Atlantic sturgeon is recommended.

3.2.2 Aves (Birds)

3.2.2.1 Falcon, Peregrine

Peregrine falcons are not currently known to breed at the Airport and, due to ongoing disturbance associated with airport operations, nesting attempts are unlikely to occur. Falcons may attempt to forage within the grassy mowed areas within/along the runways and taxiways, but these would likely be transient individuals during migration to/from suitable breeding grounds. Therefore, Project related impacts to this species are not anticipated. If a peregrine falcon nest is observed, a timing restriction should be implemented between February 15 through July 15 for any activities within 600 feet of a nest or nestbox.

3.2.2.2 Shrike, Loggerhead

The loggerhead shrike is known to inhabit open habitats, including grasslands, particularly near thorny/shrubby edge habitat. Due to regular and short mowing, this species would not expected to be present within the grassy infield areas of the Airport; however, the less frequently mowed areas in and surrounding Wetland X may serve as potential habitat. Impacts to this species can be prevented by avoiding disturbance from April 1 to July 31 (Virginia Department of Wildlife Resources, 2023), the critical nesting period for this species in Virginia.

3.2.2.3 Sparrow, Henslow's

Although grassland habitat occurs on the Airport within/adjacent to the taxiways and runways, Henslow's sparrow's preferred habitat contains lush, high herbaceous vegetation with thick ground litter and little to no woody vegetation. Due to regular and short mowing, this species would not expected to be present within the grassy infield areas of the Airport; however, the less frequently mowed areas in and surrounding Wetland X may serve as potential habitat. Impacts to this species can be prevented by avoiding disturbance from April 1 to August 31 (Virginia Department of Wildlife Resources, 2023), the critical nesting period for this species in Virginia.

3.2.2.4 Migratory Birds and Bald Eagles

Of the bird species listed in **Table 2,** only grasshopper sparrow (*Ammodramus savannarum perpallidus*) was observed at or near the Airport during the field investigations in March 2024 and/or July 2025. No federally or state-listed threatened or endangered species noted in **Table 3** were observed. Bird species observed within the Project Areas were documented and are listed in **Appendix D**. Species observed included common species adapted to anthropogenic disturbances as well as five species with Virginia WAP tier status, including American woodcock (*Scolopax minor*), belted kingfisher (*Megaceryle alcyon*), eastern meadowlark (*Sturnella magna*), field sparrow (*Spizella pusilla*), and grasshopper sparrow.

Grasshopper sparrow, field sparrow, and eastern meadowlark were observed and/or heard calling within the mowed grassy habitat of the active airport grounds. Within the palustrine forested habitat along Cannon Branch, American woodcock was observed roosting and belted kingfisher was heard calling. The riparian forest on the eastern side of the AOI is likely already too fragmented to support the forest interior species noted in **Table 2**, notably cerulean warbler, prothonotary warbler, and wood thrush.

Per the Center for Conservation Biology (CCB) mapping portal, a bald eagle nest (PW1403) is located to the northeast of the Airport near the intersection of Wakeman Drive and Wakeman Court. This bald eagle nest is also discussed in the Airport's Wildlife Hazard Management Plan (Manassas Regional Airport), where it has been reported to be continuously attended by bald eagles and thus this species is known to occur within the Airport. As no active nests are known to occur within the Airport, no impacts to this

species are anticipated. If a nest is observed or a high concentration of bald eagles are noted utilizing the area for roosting or foraging, the VDGIF should be contacted for further guidance.

Overall, the AOI includes approximately 12.4 acres of forested areas and 130 acres of potential grassland habitat, of which a portion has the potential to be removed or altered during the implementation of the Program Projects. The *Migratory Bird Treaty Act* (MBTA) protects all migratory bird species, including adults, eggs, nests, or parts thereof. In order to avoid the 'taking' of migratory birds, impacts to their habitats should be reduced as much as possible and the vegetation disturbance/removal should be avoided during the breeding season (March 15 through August 15) (VADWR, 2026). Grassy areas are considered to be a hazardous wildlife attractant (United States Department of Transportation, Federal Aviation Administration, 2007), and thus avoidance of mowing airport infields is not compatible with standard airport operations and it is not held to the MBTA. However, areas that are less frequently mowed (such as the area surrounding Wetland X in the southwestern portion of the AOI), could support breeding actions by grassland species. In these and other areas that are not mowed prior to April 1, ensuring the areas remain free from disturbance between April 1 to August 31 reduces the chance of a take for grassland species. Following the above referenced protocols, no significant impacts to migratory birds or bald eagles are anticipated.

3.2.3 Bivalvia (Mussels)

3.2.3.1 Brook Floater, Yellow Lance and Dwarf Wedgemussel

Surveys for freshwater mussels and mussel habitat have been performed within and near the Airport in support of various projects. These efforts included a 1993 mussel survey of Broad Run (Neves, 1993) (Stevenson, 1993); a 1998 survey below the Route 28 crossing of Broad Run (approximately two miles upstream of the current Airport crossing of Broad Run) (Beaty & Neves, 1998); a collection and relocation survey in 2005 at the Route 28 crossing of Broad Run (Neves, Relocation of Freshwater Mussels at the Route 28 Crossing of Broad Run, Prince William County, Virginia, 2005); and a 2008 survey (Creek Laboratory, LLC, 2008) for the presence of rare mussels and potential habitat in support of proposed runway and taxiway improvements at the airport (which specifically focused on brook floater). Additionally, surveys for freshwater mussel habitat were performed on the Airport as part of the 2018 field investigations conducted in support of the Final EA for the West Corporate Development and East Parcel Development (RS&H, Inc., 2018).

In 1993, relict brook floater shells were found upstream and downstream of the Airport. During the 1998 survey, two live brook floaters were found below the Route 28 crossing of Broad Run, approximately two miles upstream of the Airport crossing of Broad Run. During the 2005 relocation survey, 193 yellow lance were found approximately 375 meters downstream of the Route 28 crossing. The last known study in 2008 (Creek Laboratory, LLC, 2008) did not locate dwarf wedgemussel and the most recent substrate evaluation conducted in 2018 concluded that suitable habitat conditions for dwarf wedgemussel were not present (RS&H, Inc., 2018). To date, no surveys have identified live dwarf wedgemussel, brook floater, or yellow lance on or immediately adjacent to the Airport.

During DRG's 2024 field investigation, a few eastern elliptio (*Elliptio complanata*) valves were observed along Cannon Branch, and numerous Asiatic clam (*Coribucula fluminea*) valves were seen along both the Cannon Branch and Broad Run. Both of these species are widespread and adaptable to a range of environmental conditions. In general, dwarf wedgemussel, yellow lance, and brook floater inhabit high quality streams with stable flow regimes. The heavily eroded banks along Cannon Branch and Broad Run suggest a degree of instability that likely does not provide suitable conditions for these listed mussel

species. The highest quality mussel habitat was observed in the most northern portion of the Cannon Branch evaluated, as this area contained clearer water and coarser substrate as compared to other stretches of this stream and of Broad Run.

No dwarf wedgemussel, yellow lance, nor brook floater (living or spent valves) were identified onsite during the 2018 field investigations conducted in support of the Final EA for the West Corporate Development and East Parcel Development. The most recent freshwater mussel survey conducted for the airport took place in October 2025 (BioSurvey Group, 2025) and covered an area beginning approximately 650 feet upstream of the runway bridge and extending downstream approximately 8,500 feet. Over 10,000 live mussels were qualitatively documented within the reach, of which 98.3% were identified as eastern elliptio, with the remainder represented by northern lance (*Elliptio fisheriana*). Neither of these species have threatened or endangered status.

3.2.4 Insecta (Insects)

3.2.4.1 Butterfly, Monarch

No milkweed (*Asclepias* spp.) plants were observed within or near the AOI. Regular mowing of the active Airport areas and heavy canopy cover in the forested areas reduces the availability of vegetation that would support the monarch butterfly. The greatest habitat present would be within the southern half the airport, where vegetation is allowed to grow much higher. Potential impacts to monarch butterfly could occur if disturbance were to occur to this area. Since impacts to this zone are currently proposed to be temporary, it is anticipated that any former habitat would be allowed to return and could be seeded specifically for *Asclepias* spp. to enhance the habitat further.

3.2.5 Mammalia (Mammals)

3.2.5.1 Little Brown Bat, Northern Long-eared Bat, and Tricolored Bat

The forest and forest edges within and adjacent to the AOI have potential to be utilized by foraging northern long-eared bats, little brown bats, and tricolored bats. Trees suitable for summer roosting (as described in the vegetation community descriptions) occur within the forested areas on the eastern side of the AOI. These include living and dead/dying trees with greater than three inches DBH, some of which contain cracks or cavities. No caves occur onsite; however, the bridge/culvert conveying Broad Run beneath the airport runway and Taxiway Bravo, as well as the bridge/culvert that conveys Cannon Branch under Harry J. Parrish Boulevard may provide suitable summer roosting habitat for these species. Furthermore, the buildings located within the AOI (particularly the terminal building and storage buildings) could also provide a source for roosting by this species.

If the proposed Program Project activities require tree clearing, a timing restriction for the clearing is recommended between April 1 - November 15 (United States Fish and Wildlife Service, n.d.) for northern long-eared bats and may vary depending on distance to known bat hibernacula. Currently, tricolored bat and little brown bat are State listed as 'endangered' in Virginia. Tree clearing within suitable habitat for these species is prohibited year-round in areas within 0.25 mile from known hibernacula and from June 1 to July 31 in areas within 150 feet from known occupied maternity roosts (Virginia Department of Wildlife Resources, 2023); however, no such habitats are known to occur within or near the AOI. Although the rule to federally list tricolored bat as 'endangered' has not yet been finalized, the USFWS has determined that the species now meets the definition of 'endangered' under the *Endangered Species Act*, and its listing is expected in the near future. The USFWS further indicates that the little brown bat's listing status is under review (United States Fish and Wildlife Service, n.d.). Requirements and mitigating measures for tricolored

bat and little brown bat are anticipated to be similar to those already in place for northern long-eared bat and may include time-of-year restrictions on tree-clearing or other activities that may affect roosting bats.

4.0 SUMMARY AND CONCLUSIONS

Potential habitat is present within the AOI for a variety of threatened and endangered species, including migratory birds. The following are recommended to gain further information and avoid impacts to the species before or during the implementation of the Program Projects:

- Implement a timing restriction on tree clearing from April 1 to November 15 to protect listed bat species.
- Implement an additional timing restriction on tree and brush clearing from March 15 to August 15 to protect migratory birds.
- If a peregrine falcon nest is observed, a timing restriction would be implemented between February 15 through July 15 for any activities within 600 feet of a nest or nestbox.
- If a bald eagle nest is observed or a high concentration of bald eagles are noted utilizing areas within the Airport for roosting or foraging, the VDGIF should be contacted for further guidance.
- Avoid mowing grassland habitat from April 1 to August 31, unless continuous mowing has occurred prior to April 1 and will continue until August 31.

5.0 REFERENCES

Beans, B. E., & Niles, L. (2003). *Endangered and Threatened Wildlife of New Jersey.* New Brunswick, NJ: Rutgers University Press.

Beaty, B. B., & Neves, R. J. (1998). *Abbreviated Survey of Freshwater Mussel Fauna at the Route 28 Crossing of Broad Run, Prince William County, Virginia.* Richmond, VA: Virginia Department of Transportation.

BioSurvey Group. (2025). *Manassas Regional Airport - Broad Run Mussel Survey Report.*

Brooks, B. L. (1988). *The breeding distribution, population dynamics, and habitat availability of an upper Midwest loggerhead shrike population.* Madison, WI: University of Wisconsin.

Clark, A. H. (1981). The tribe Alasmidontini (Unionidae: Anodontinae), Part I: Pegias, Alasmidonta, and Arcidens. *Smithsonian Contributions to Zoology*, Volume 326, pages 1-101.

Colella, M. (2015). *Conserve Wildlife Foundation.* Retrieved from Field Guide - Monarch.: http://www.conservewildlifenj.org/species/fieldguide/view/Danaus%20plexippus

Creek Laboratory, LLC. (2008, September 24). *Survey for Freshwater Mussel Fauna Adjacent to the Manassas Regional Airport in Broad Run, Prince William County, Virginia.*

Fleming, G., & Patterson, K. D. (2021). *The Natural Communities of Virginia: Ecological Groups and Community Types.* Richmond, Virginia: Virginia Department of Conservation and Natural Heritage.

Harding, S., & Thomas, M. (2024). *Virginia Department of Wildlife Resources*. Retrieved from Keeping up with the Peregrines: https://dwr.virginia.gov/blog/keeping-up-with-the-peregrines/

Kath, J. (2022). *Species status report for tricolored bat (Perimyotis subflavus). .* Illinois Department of Natural Resources, Division of Natural Heritage. .

Kentucky Department of Fish and Wildlife Resources. (n.d.). Retrieved from Tri-colored Bat: https://fw.ky.gov/Wildlife/Pages/Tricolored-Bat.aspx

Kridelbaugh, A. L. (1983). Nesting ecology of the loggerhead shrike in central Missouri. *Wilson Bulletin*, Volume 95, pp. 303-308.

Kunz, T. H., & Reichard, J. D. (2010). *Status review of the little brown myotis (Myotis lucifugus) and determination that immediate listing under the Endangered Species Act is scientifically and legally warranted.* Boston, MA: Boston University, Center for Ecology and Conservation Biology.

Manassas Regional Airport. (2023). *Wildlife Hazard Management Plan.*

Manassas Regional Airport. (2023). *Wildlife Hazard Management Plan.*

McLain, D. C., & Ross, M. R. (2005). Reproduction based on local patch size of Alasmidonta heterodon and dispersal by its darter host in the Mill River, Massachusetts, USA. *Journal of the American Benthological Society*, Volume 24, No. 1, pages 139-147.

National Oceanic and Atmospheric Administration. (2024, April 18). *Atlantic Sturgeon*. Retrieved from https://www.fisheries.noaa.gov/species/atlantic-sturgeon

NatureServe. (2024). *NatureServe Explorer*. Retrieved from https://explorer.natureserve.org/

Nedeau, E. J. (2008). *Freshwater mussels and the Connecticut River Watershed.* Greenfield, MA: Connecticut River Watershed Council.

Nedeau, E. J., McCollough, M. A., & Swartz, B. I. (2000). *The Freshwater Mussels of Maine.* Augusta, ME: Maine Department of Inland Fisheries and Wildlife.

Neves, R. J. (1993). *A survey for Freshwater Mussel Fauna at Proposed Route 234 Bypass Over Cannon Branch, Prince William County, Virginia.* Richmond, VA: Virginia Department of Transportation.

Neves, R. J. (2005). *Relocation of Freshwater Mussels at the Route 28 Crossing of Broad Run, Prince William County, Virginia.* Richmond, VA: Virginia Department of Transportation.

New York Natural Heritage Program. (n.d.). Retrieved from Henslow's Sparrow: https://guides.nynhp.org/henslows-sparrow/

New York Natural Heritage Program. (2014, February 25). *Species Status Assessment*. Retrieved from Brook Floater: https://extapps.dec.ny.gov/docs/wildlife_pdf/sgcnbrookfloater.pdf

New York Natural Heritage Program. (2014, February 25). *Species Status Assessment*. Retrieved from Dwarf wedgemussel: https://dec.ny.gov/docs/wildlife_pdf/sgcndwarfwedgemus.pdf

New York Natural Heritage Program. (2019, April 22). *Online Conservation Guides*. Retrieved from Brook Floater: https://guides.nynhp.org/brook-floater/

North Carolina Wildlife Resources Commission. (n.d.). Retrieved from Yellow Lance: https://www.ncwildlife.org/species/yellow-lance

Novak, P. G. (1989). *Breeding ecology and status of the loggerhead shrike in New York State.* Ithaca, NY: Cornell University.

Ortmann, A. E. (1919). Monograph of the naiades of Pennsylvania. Part III. Systematic account of the genera and species. *Memoirs of the Carnegie Museum*, Volume 8, pages 1-385.

Peterson, A. (1983). Observations on habitat selection by Henslow's sparrow in Broome County, New York. *Kingbird*, Volume 33, pp. 155-164.

Robbins, C. S., Bystrak, D., & Geissler, P. H. (1986). *The Breeding Bird Survey: its first fifteen years.* US Fish and Wildlife Service Resource Publications.

RS&H, Inc. (2018). *Final Environmental Assessment - West Corporate Development and East Parcel Development.*

Samson, F. B. (1980). Island biogeography and the conservation of nongame birds. *Transactions of the North American Wildlife and Natural Resources Conference.*, Volume 45, pp. 245-251.

Sasse, D. B. (1996). Summer roosting ecology of northern long-eared bats (Myotis septentrionalis) in the White Mountain National Forest. *Proceedings of the Bats and Forests* (pp. 91-101). Victoria, BC: Symposium of the British Columbia Ministry of Forest.

Smith, C. R. (1992). Henslow's sparrow. In K. J. Schneider, & D. M. Pence, *Migratory Nongame Birds of Management Concern in the Northeast* (pp. 315-330). Newton Corner, MA: US FIsh and Wildlife Service.

Stevenson, P. H. (1993). *A survey of freshwater mussel fauna in Broad Run, Prince William County, Virginia.* Chantilly, VA.

Strayer, D. L., & Jirka, K. J. (1997). The Pearly Mussels of New York State. *New York State Museum Memior*, Volume 26, 113pp.

United States Department of Transportation, Federal Aviation Administration. (2007, August 28). *Hazardous Wildlife Attractants on or Near Airports*. Retrieved from https://www.faa.gov/documentlibrary/media/advisory_circular/150-5200-33b/150_5200_33b.pdf

United States Fish and Wildlife Service. (n.d.). Retrieved from Northern long-eared bat fact sheet: https://www.fws.gov/sites/default/files/documents/508_NLEB%20fact%20sheet.pdf

United States Fish and Wildlife Service. (n.d.). Retrieved from Little Brown Bat: https://www.fws.gov/species/little-brown-bat-myotis-lucifugus

United States Fish and Wildlife Service. (n.d.). Retrieved from Information for Planning and Consultation: https://ipac.ecosphere.fws.gov/

United States Fish and Wildlife Service. (2007). *Dwarf Wedgemussel 5-Year Review: Summary and Evaluation.* Concord, NH: USFWS New England Field Office.

United States Fish and Wildlife Service. (2018). *Species status assessment report for the yellow lance, Version 1.3.* Raleigh, NC.

United States Fish and Wildlife Service. (2021, April 8). *Federal Register*. Retrieved from 50 CFR Part 17: https://www.govinfo.gov/content/pkg/FR-2021-04-08/pdf/2021-06736.pdf

United States Fish and Wildlife Service. (2024, May 23). Retrieved from National Listing Workplan.: https://www.fws.gov/project/national-listing-workplan

United States Fish and Wildlife Service. (n.d.). *Dwarf Wedgemussel (Alasmidonta heterodon) Recovery Plan Five Year Review*. Retrieved from https://ecos.fws.gov/ecp/species/784

United States Fish and Wildlife Service. (n.d.). *ECOS Environmental Conservation Online System*. Retrieved from Yellow lance (Elliptio lanceolata): https://ecos.fws.gov/ecp/species/4511

United States Fish and Wildlife Service. (n.d.). *Tricolored Bat*. Retrieved from https://www.fws.gov/species/tricolored-bat-perimyotis-subflavus.

United States Fish and Wildlife Service. (n.d.). *Virginia Ecological Services Field Office*. Retrieved from Northern Long-eared Bat Conservation Measures: https://www.fws.gov/office/virginia-ecological-services/virginia-field-office-online-review-process

United States Geological Survey. (2024, June 17). *Nonindigenous Aquatic Species*. Retrieved from Tessellated Darter: https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=816

Virginia Department of Conservation and Recreation, Division of Natural Heritage. (2021). *Overview of the Physiography and Vegetation of Virginia, Version 2.0.*

Virginia Department of Wildlife Resources. (2023, March 27). Retrieved from DWR Henslow's Sparrow Acoustic Survey Protocols: https://dwr.virginia.gov/wp-content/uploads/media/Henslows-Sparrow-Acoustic-Survey-Protocols.pdf

Virginia Department of Wildlife Resources. (2023, 29 September). *Time of Year Restrictions and Other Reccommendations*. Retrieved from Wildlife Information and Environmental Services: https://dwr.virginia.gov/wp-content/uploads/media/Time-of-Year-Restrictions.pdf

Virginia Department of Wildlife Resources. (2024, February 7). Retrieved from Loggerhead Shrike: https://dwr.virginia.gov/wildlife/information/loggerhead-shrike/

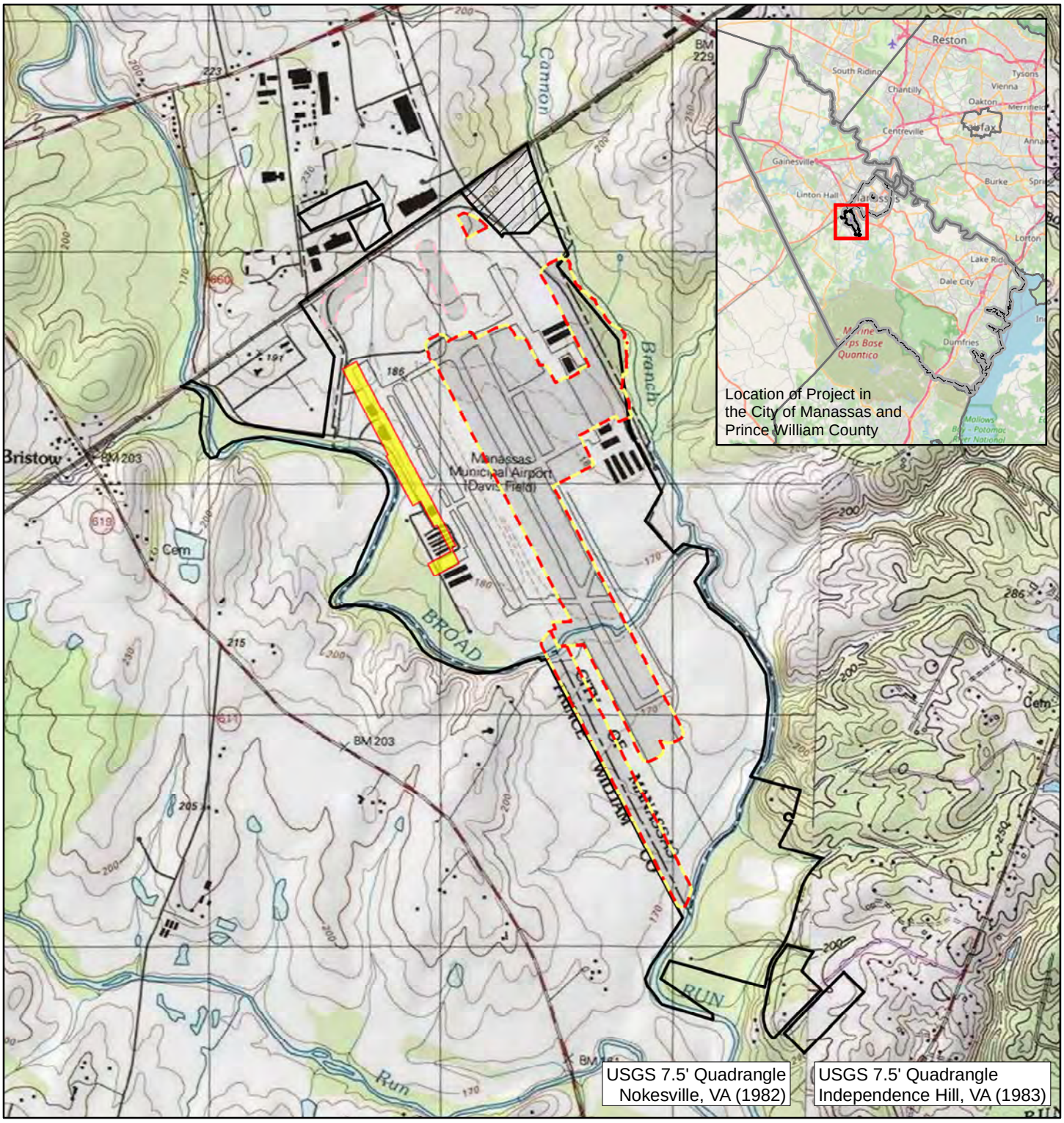
Virginia Department of Wildlife Resources. (2024, May 14). *Atlantic Sturgeon*. Retrieved from https://dwr.virginia.gov/wildlife/information/atlantic-sturgeon/

Virginia Department of Wildlife Resources. (2024). *Tri-colored bat*. Retrieved from https://dwr.virginia.gov/wildlife/information/tri-colored-bat/

Wicklow, B. J. (2004). Conservation and life history strategies of endangered and at risk species of Alasmidonta (Bivalvia, Unionidae). *Journal of Shellfish Research*, Volume 23, 316-317.

APPENDIX A

FIGURES



Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA
Copyright:© 2013 National Geographic Society, i-cubed

N

0 0.5 1 Kilometers

0 0.25 0.5 Miles

Project 23-98001.001, Version: 2/11/2026 @ 12:12:50 PM

LEGEND

- Airport Property
- Amazon Data Center Parcel
- Area of Investigation, Current Projects
- Former Projects, No Longer Active
- Paved Construction Area, No Assessment Required

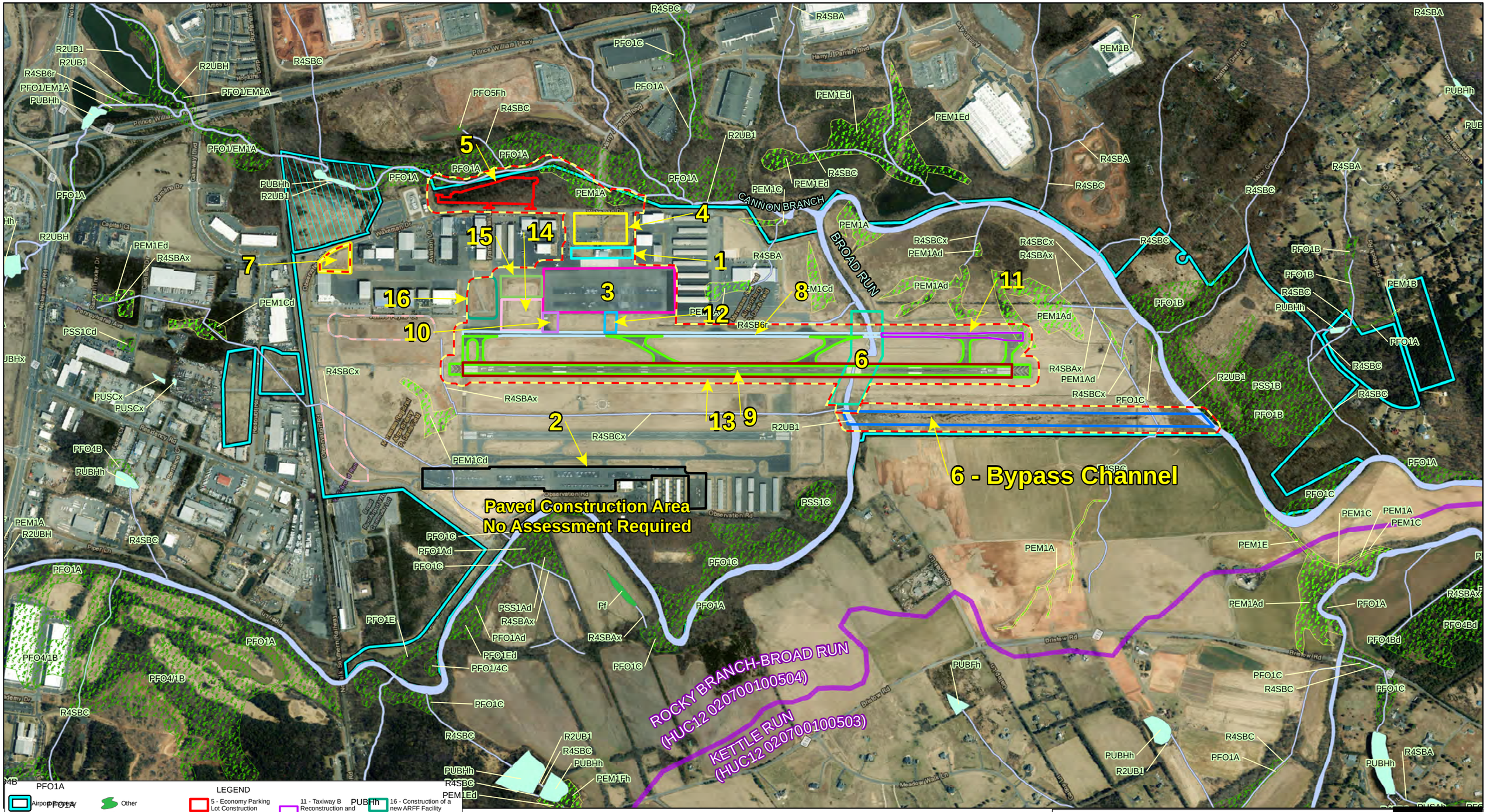
The Manassas Regional Airport (HEF) FAR 1 Part 139 Certification and Terminal Redevelopment Program

Prince William County and City of Manassas, Virginia

AVION SOLUTIONS GROUP LLC

Project Location
(USGS Nokesville 7.5-minute Quadrangle)

Figure **1**



LEGEND

- Airport Property
- Amazon Data Center Parcel
- Area of Investigation, Current Projects
- Former Projects, No Longer Active

NWI Wetlands

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Riverine
- Other
- HUC-12 Watershed Boundary

PEA Projects:

1. Terminal Building Expansion (north, south and west)
2. West Ramp GA Tie-Down Relocation
3. East Ramp Strengthening, Reconfiguration, and Rehabilitation
4. Terminal Parking Lot Rehabilitation and Expansion
5. Economy Parking Lot Construction
6. Bridge Rehabilitation R/W 16L-34R and Taxiway B
7. Construction of a new Snow Equipment (SRE) Storage Building
8. Taxiway Bravo Widening
9. Runway 16L/34R Reconstruction and Strengthening
10. Taxiway Echo Fillet Widening
11. Taxiway B Reconstruction and Strengthening (South of the Bridge)
12. Construction of a new East Ramp Taxiway
13. Runway 16L/34R Widening
14. Aircraft Deicing Pad and Apron Expansion between Taxiways D and E
15. Construction of new Expanded East Ramp and Taxilane between Taxiways Delta and Echo
16. Construction of a new ARFF Facility
- Project #6 - Bypass Channel

Wetland classification for NWI based on Cowardin, L.M., V. Carter V., F.C. Golet, and E.T. LaRoe.
1979 Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service Report No. FWS/OBS/- 79/31. Washington, D.C.

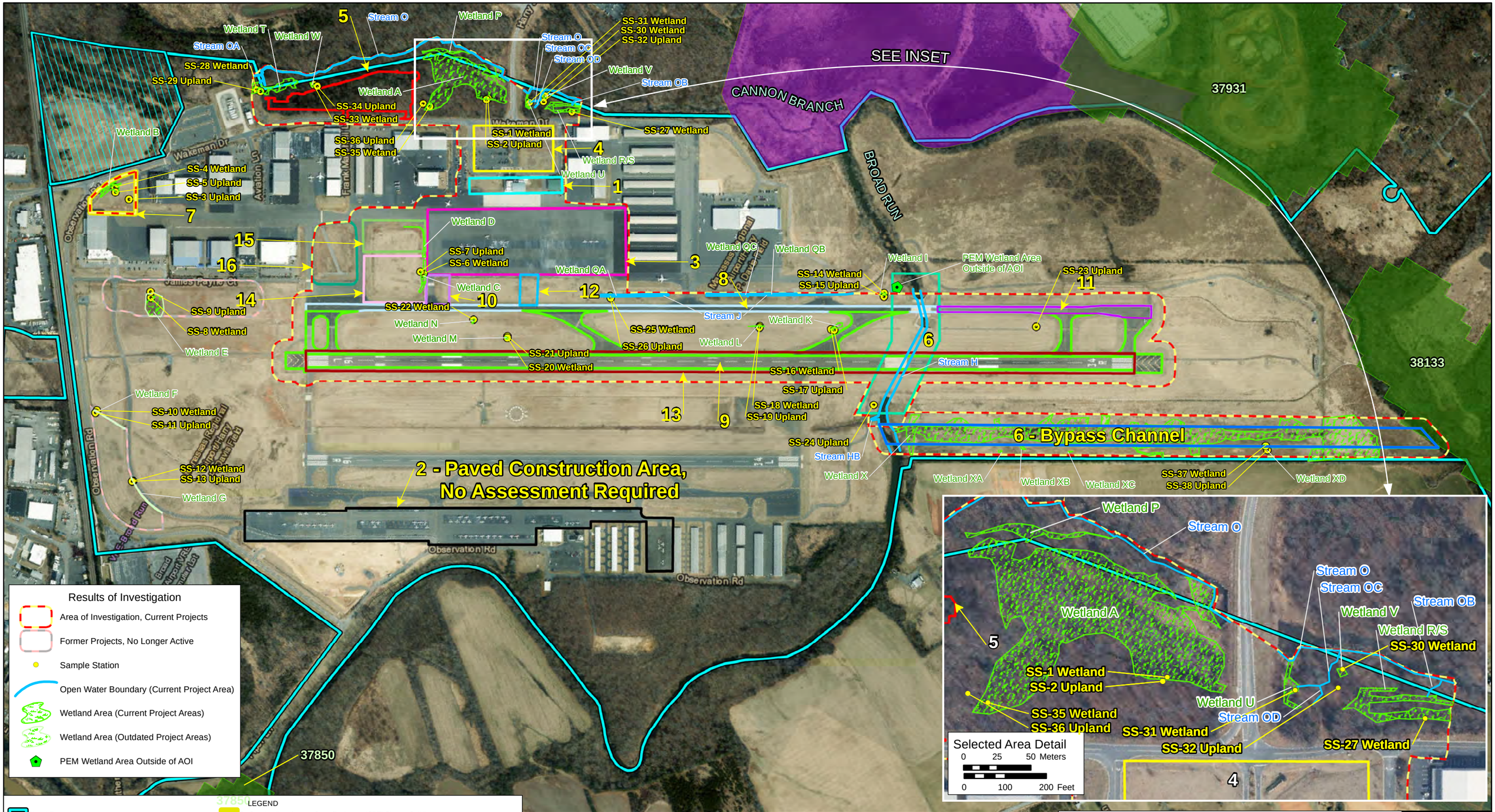
0 200 400 Meters
0 500 1,000 Feet

AVION SOLUTIONS GROUP LLC

Figure 2

Manassas Regional Airport PART 139 Certification and Terminal Redevelopment

NWI Water Features and Watersheds on the Airport



Results of Investigation

- Area of Investigation, Current Projects
- Former Projects, No Longer Active
- Sample Station
- Open Water Boundary (Current Project Area)
- Wetland Area (Current Project Areas)
- Wetland Area (Outdated Project Areas)
- PEM Wetland Area Outside of AOI

LEGEND

- Airport Property
- Amazon Data Center Parcel
- Ecological Core C5: General
- VDOT Wetlands Mitigation Bank

PEA Projects:

- 1 - Terminal Building Expansion (north, south and west)
- 2 - West Ramp GA Tie-Down Relocation
- 3 - East Ramp Strengthening, Reconfiguration, and Rehabilitation
- 4 - Terminal Parking Lot Rehabilitation and Expansion
- 5 - Economy Parking Lot Construction
- 6 - Bridge Rehabilitation R/W 16L-34R and Taxiway B
- 7 - Construction of a new Snow Equipment (SRE) Storage Building
- 8 - Taxiway Bravo Widening
- 9 - Runway 16L/34R Reconstruction and Strengthening
- 10 - Taxiway Echo Fillet Widening
- 11 - Taxiway B Reconstruction and Strengthening (South of the Bridge)
- 12 - Construction of a new East Ramp Taxiway
- 13 - Runway 16L/34R Widening
- 14 - Aircraft Deicing Pad and Apron Expansion between Taxiways D and E
- 15 - Construction of new Expanded East Ramp and Taxilane between Taxiways Delta and Echo
- 16 - Construction of a new ARFF Facility
- Project #6 - Bypass Channel

0 200 400 Meters

0 500 1,000 Feet

AVION SOLUTIONS GROUP LLC

Figure 3

Manassas Regional Airport (HEF) Proposed Part 139 Certification and Terminal Redevelopment Project Environmental Assessment

Delineated Features

APPENDIX B

PHOTOGRAPHS

Photograph 1. View of anthropogenic habitat consisting of existing, active airport infrastructure, including buildings, concrete drainages, runways (in background), and mowed grasses.

Photograph 2. View of anthropogenic habitat, showing runways, hangars and aircraft parking areas, and mowed grasses.

Photograph 3. View of oak-hickory upland forest habitat along Cannon Branch.

Photograph 4. View of Cannon Branch, one of two perennial streams occurring onsite.

Photograph 5. View of Broad Run flowing beneath the airport runway.

Photograph 6. View of palustrine forested wetlands occurring within the Cannon Branch floodplain.

Photograph 7. View of an emergent wetland that drains to Cannon Branch.

Photograph 8. View of a disturbed emergent wetland located in a depressional area within an airport infield.

Photograph 9. View of a small disturbed emergent wetland located along Observation Road.

Photograph 10. Taller graminoid vegetation in the southwestern portion of the airport.

APPENDIX C

AGENCY DATABASE REVIEWS

EFH Mapper Report

EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

Greater Atlantic Regional Office
Atlantic Highly Migratory Species Management Division

Query Results

Degrees, Minutes, Seconds: Latitude = 38º 43' 30" N, Longitude = 78º 29' 7" W
Decimal Degrees: Latitude = 38.725, Longitude = -77.515

The query location intersects with spatial data representing EFH and/or HAPCs for the following species/management units.

*** W A R N I N G ***

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

No additional Essential Fish Habitats (EFH) were identified at the report location.

Pacific Salmon EFH

No Pacific Salmon Essential Fish Habitat (EFH) were identified at the report location.

Atlantic Salmon

No Atlantic Salmon were identified at the report location.

HAPCs

No Habitat Areas of Particular Concern (HAPC) were identified at the report location.

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data. ****For links to all EFH text descriptions see the complete data inventory: open data inventory -->**
All EFH species have been mapped for the Greater Atlantic region, **Atlantic Highly Migratory Species EFH**, Bigeye Sand Tiger Shark, Bigeye Sixgill Shark,

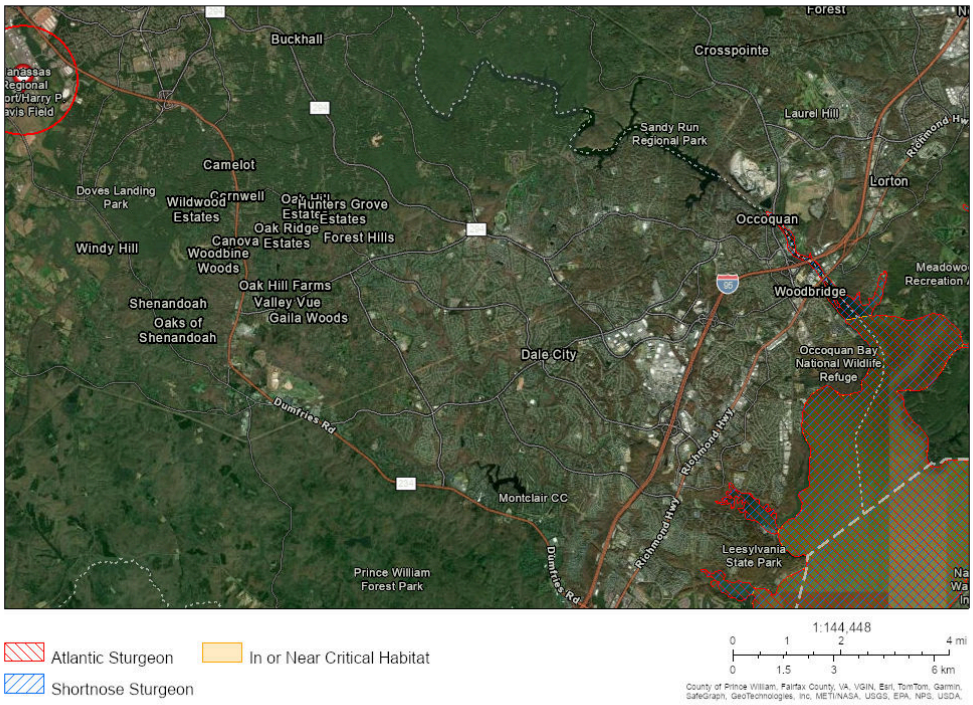
Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data. ****For links to all EFH text descriptions see the complete data inventory: open data inventory -->**
Caribbean Sharpnose Shark, Galapagos Shark, Narrowtooth Shark, Sevengill Shark, Sixgill Shark, Smooth Hammerhead Shark, Smalltail Shark

Drawn Action Area & Overlapping S7 Consultation Areas

Area of Interest (AOI) Information

Area : 2,009.02 acres

May 22 2024 9:06:21 Eastern Daylight Time



Manassas Regional Airport (HEF) Part 139 - Certification and Terminal Redevelopment, Prince William County, VA

Summary

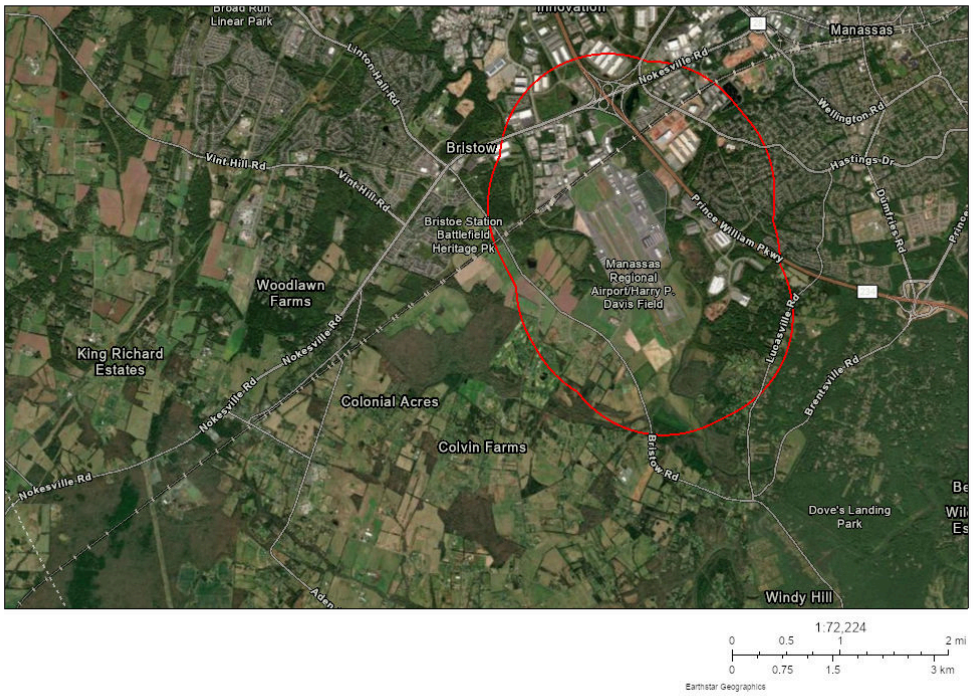
Name	Count	Area(acres)	Length(mi)
Atlantic Sturgeon	0	0	N/A
Shortnose Sturgeon	0	0	N/A
Atlantic Salmon	0	0	N/A
Sea Turtles	0	0	N/A
Atlantic Large Whales	0	0	N/A
In or Near Critical Habitat	0	0	N/A

Drawn Action Area & Overlapping S7 Consultation Areas

Area of Interest (AOI) Information

Area : 4,845.28 acres

Apr 28 2025 15:22:17 Eastern Daylight Time



Summary

Name	Count	Area(acres)	Length(mi)
Atlantic Sturgeon	0	0	N/A
Shortnose Sturgeon	0	0	N/A
Atlantic Salmon	0	0	N/A
Sea Turtles	0	0	N/A
Atlantic Large Whales	0	0	N/A
In or Near Critical Habitat	0	0	N/A

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032

In Reply Refer To:
Project Code: 2024-0040278
Project Name: HEF EA

January 24, 2024

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through IPaC by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see Migratory Bird Permit | What We Do | U.S. Fish & Wildlife Service (fws.gov).

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

PROJECT SUMMARY

Project Code: 2024-0040278
Project Name: HEF EA
Project Type: Airport - Maintenance/Modification
Project Description: For EA regarding airport upgrades.
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.72101685,-77.51447020297368,14z

Counties: Manassas and Prince William counties, Virginia

ENDANGERED SPECIES ACT SPECIES

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

CLAMS

NAME	STATUS
Dwarf Wedgemussel *Alasmidonta heterodon* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/784	Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency: County of Hunterdon
Name: Jamie Morgan
Address: 4 WALTER E FORAN BLVD # 209
City: Flemington
State: NJ
Zip: 08822
Email jamie.morgan@davey.com
Phone: 8622682712

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Aviation Administration

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694

In Reply Refer To: 02/02/2026 21:02:18 UTC
Project Code: 2025-0149429
Project Name: HEF - Manassas Regional Airport NEPA EA

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Project Code in the header of this

letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

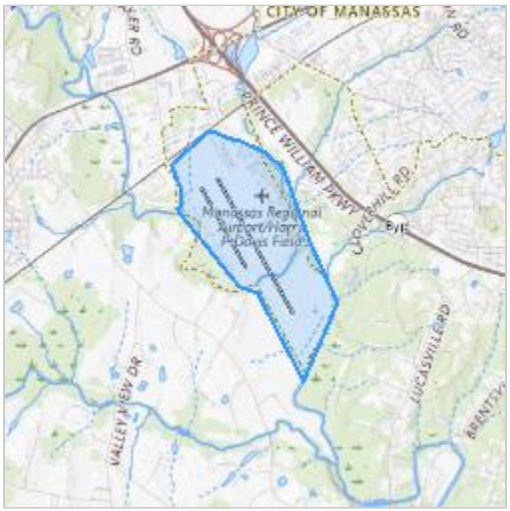
This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

PROJECT SUMMARY

Project Code: 2025-0149429
Project Name: HEF - Manassas Regional Airport NEPA EA
Project Type: Airport - Maintenance/Modification
Project Description: Programmatic EA for sixteen proposed airport upgrades.
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.7183314,-77.51122968449477,14z



Counties: Manassas and Prince William counties, Virginia

ENDANGERED SPECIES ACT SPECIES

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/ activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete
If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

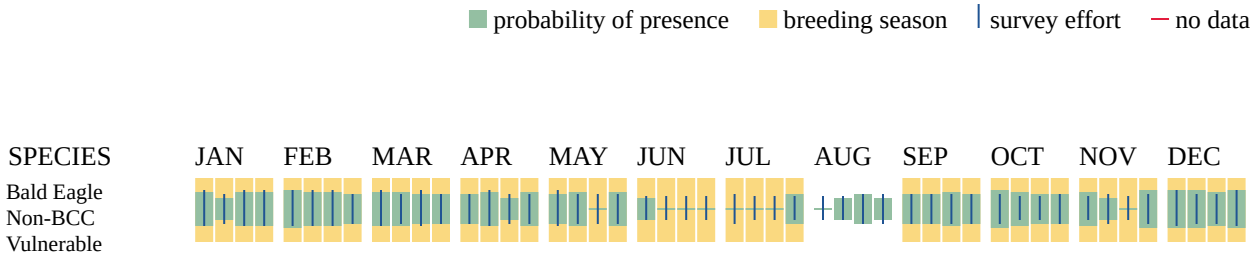
Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (▪)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Cerulean Warbler *Setophaga cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 28 to Jul 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Grasshopper Sparrow *Ammodramus savannarum perpallidus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8329	Breeds Jun 1 to Aug 20
Prairie Warbler *Setophaga discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9513	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9439	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9478	Breeds elsewhere

NAME	BREEDING SEASON
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

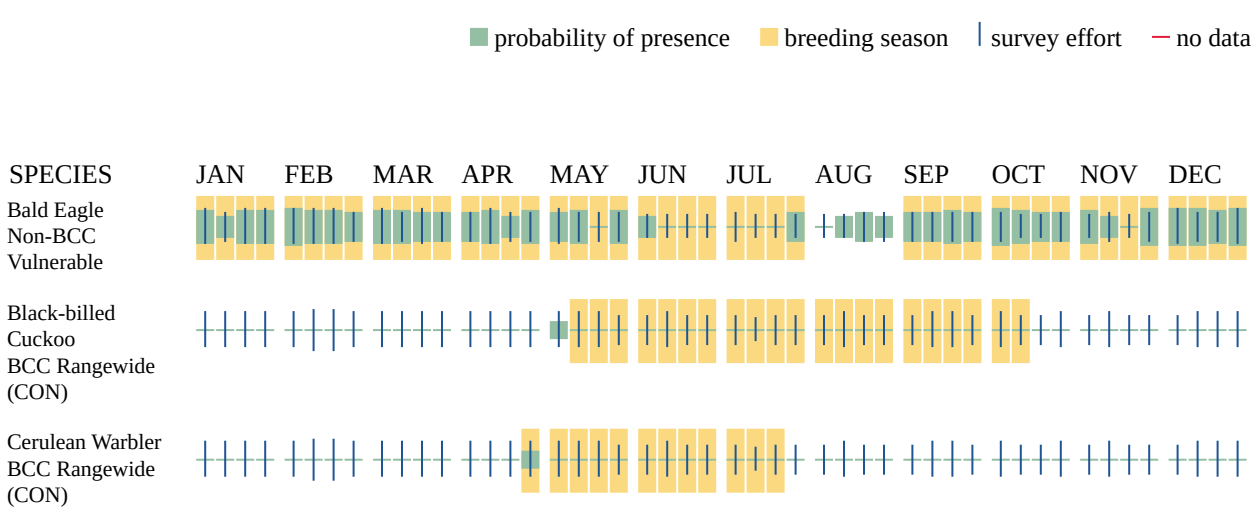
Probability of Presence (■)

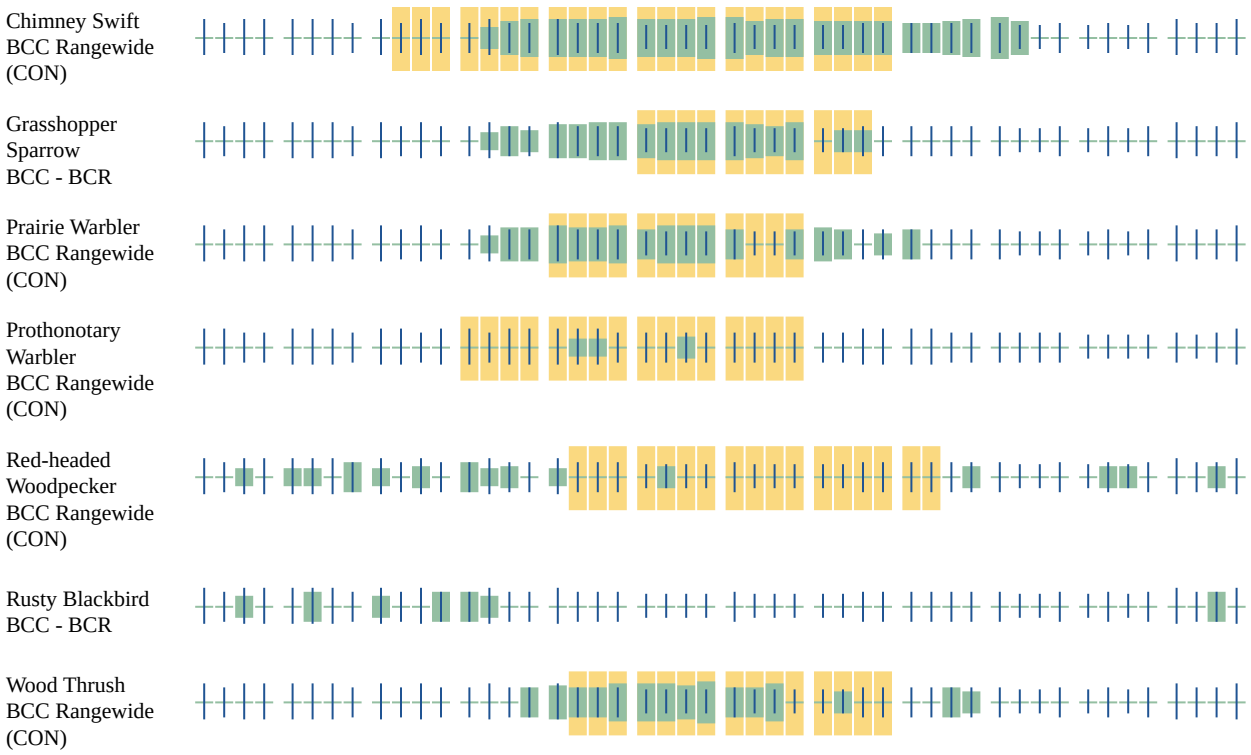
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.





Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Jamie Morgan
Address: 4 WALTER E FORAN BLVD # 209
City: Flemington
State: NJ
Zip: 08822
Email jamie.morgan@davey.com
Phone: 9087889676

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Aviation Administration

VaFWIS Initial Project Assessment Report Compiled on 8/11/2025, 10:08:18 AM

Help

Known or likely to occur within a **2 mile radius around point 38,43,19.1 -77,30,52.6** in **153 Prince William County, 683 Manassas City, VA**

View Map of Site Location

554 Known or Likely Species ordered by Status Concern for Conservation (displaying first 24) (24 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
050022	FESE	Ia	Bat, Northern Long-eared	Myotis septentrionalis		BOVA
010032	FESE	Ib	Sturgeon, Atlantic	Acipenser oxyrinchus		BOVA
060029	FTST	IIa	Lance, yellow	Elliptio lanceolata	Yes	BOVA,SppObs
050020	SE	Ia	Bat, little brown	Myotis lucifugus		BOVA
050027	FPSE	Ia	Bat, Tricolored	Perimyotis subflavus		BOVA
060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes	BOVA,TEWaters,Habitat,SppObs
040096	ST	Ia	Falcon, peregrine	Falco peregrinus		BOVA
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
040379	ST	Ia	Sparrow, Henslow's	Centronyx henslowii		BOVA
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
100248	FP	Ia	Fritillary, Regal	Speyeria idalia idalia		BOVA
100079	FP	IIIa	Butterfly, Monarch	Danaus plexippus		BOVA
030063	CC	IIIa	Turtle, spotted	Clemmys guttata		BOVA
030012	CC	IVa	Rattlesnake, timber	Crotalus horridus		BOVA
010077		Ia	Shiner, bridle	Notropis bifrenatus		BOVA
040306		Ia	Warbler, golden-winged	Vermivora chrysoptera		BOVA
040213		Ic	Owl, northern saw-whet	Aegolius acadicus		BOVA

040052		IIa	Duck, American black	Anas rubripes		BOVA
040036		IIa	Night-heron, yellow-crowned	Nyctanassa violacea violacea		BOVA
040181		IIa	Tern, common	Sterna hirundo		BOVA
040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA
040140		IIa	Woodcock, American	Scolopax minor		BOVA
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus		BOVA
040105		IIb	Rail, king	Rallus elegans		BOVA

To view **All 554 species** View 554

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Widlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.; b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.; c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

Bat Colonies or Hibernacula: **Not Known**

Anadromous Fish Use Streams

N/A

Colonial Water Bird Survey

N/A

Threatened and Endangered Waters (18 Reaches)

View Map of All Threatened and Endangered Waters

Stream Name	T&E Waters Species						View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name					
Broad Run (015607)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (016525)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (019062)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes

Broad Run (019494)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (020916)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (021994)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (022362)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (022431)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (022606)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (023568)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (024722)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (024825)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (025139)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (026195)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (026918)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (027949)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (029210)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Broad Run (06822)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes

Managed Trout Streams

N/A

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests

N/A

Habitat Predicted for Aquatic WAP Tier I & II Species (2 Reaches)

View Map Combined Reaches from Below of Habitat Predicted for WAP Tier I & II Aquatic Species

Stream Name	Tier Species						View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name					
Broad Run (20700102)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Kettle Run (20700102)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes
Kettle Run (20700102)	SE	060006	SE	Ib	Floater, brook	Alasmidonta varicosa	Yes

Habitat Predicted for Terrestrial WAP Tier I & II Species

N/A

Public Holdings:

N/A

Compiled on 8/11/2025, 10:08:18 AM I3969547.0 report=IPA searchType= R dist= 3218.688 poi= 38,43,19.1 -77,30,52.6

PixelSize=64; Anadromous=0.037614; BECAR=0.035781; Bats=0.031264; Buffer=0.132799; County=0.105376; Impediments=0.031545; Init=0.209482; PublicLands=0.039461; SppObs=0.741573; TEWaters=0.051745; TierReaches=0.084032; TierTerrestrial=0.053554; Total=1.952211; Tracking_BOVA=0.49214; Trout=0.032873

APPENDIX D

BIRD LIST

Manassas Regional Airport - DRG Bird Observation List						
Observed March 11, 2024 to March 14, 2024						
Common Name	**Species Name**	**Federal Status**	**State Status**	**Nearest Project Area**	**Habitat Used**	**Comments**
American crow	*Corvus brachyrhynchos*	MBTA	None	N/A	N/A	Small numbers of flyovers.
American kestrel	*Falco sparverius*	MBTA	None	4/5 and 12/13	Partially maintained fields	Observed foraging (including hovering) over fields adjacent to runways.
American robin	*Turdus migratorius*	MBTA	None	3	Forest/Forested Riparian habitat	Flying and vocalizing within forested habitat.
American woodcock	*Scolopax minor*	MBTA	Tier Iia	3	Forest/Forested Riparian habitat	Flushed from brushy area in woods near Cannon Branch, at east end of Project Area 3 (west of road)
Bald eagle	*Haliaeetus leucocephalus*	MBTA/BGEPA	None	N/A	N/A	Flyover; would likely utilize Broad Run for foraging.
Barred owl	*Strix varia*	MBTA	None	3	Forest/Forested Riparian habitat	Heard vocalizing in forest north of Cannon Run.
Belted kingfisher	*Megaceryle alcyon*	MBTA	Tier IIIb	3	Forested/open riparian habitat	Heard calling from Cannon Branch, west of Project Area 3.
Canada goose	*Branta canadensis*	MBTA	None	N/A	N/A	Small numbers of flyovers.
Carolina chickadee	Poecile carolinensis	MBTA	None	3	Forest/Forested Riparian habitat	Heard calling along Cannon Branch.
Carolina wren	*Thryothorus ludovicianus*	MBTA	None	3	Forest	Heard calling from forest in Project Area 3.
Common raven	*Corvus corax*	MBTA	None	N/A	N/A	Heard calling to the south of airport.
Common yellowthroat	*Geothlypis trichas*	MBTA	None	Bypass channel	Open habitats, wetland edges	Heard calling near Broad Run bypass channel.
Downy woodpecker	*Dryobates pubescens*	MBTA	None	3	Forest	Heard calling at various locations in forest habitat.
Eastern bluebird	*Sialia sialis*	MBTA	None	Various	Partially maintained fields	Observed foraging over fields and perching on runway infrastructure.
Eastern meadowlark	*Sturnella magna*	MBTA	Tier IVa	Various	Partially maintained fields, fences and powerlines	Observed foraging and singing throughout the open areas of the airport, with birds seen perching on telephone wires and fences at the west end of the airport.
Eastern phoebe	*Sayornis phoebe*	MBTA	None	3 and 4/5	Riparian habitat	Heard calling along Broad Run (near runway bridge crossing) and along Cannon Branch.
European starling	*Sturnus vulgaris*	None	None	Various	Maintained/landscaped areas	Seen utilizing towers, buildings, powerlines.
Field sparrow	*Spizella pusilla*	MBTA	Tier IVa	4/5	Partially maintained fields/Offsite fallow fields	Heard calling NE/E of 4 and 5 project area.
Grasshopper sparrow	*Ammodramus savannarum*	MBTA	Tier IVa	12	Partially maintained fields	Two birds (likely GRSP based on size, shape, color, and behavior) observed running on ground in an area of grass interspersed with bare ground, SE of Project Area 12.
Great blue heron	*Ardea herodias*	MBTA	None	5	Disturbed riparian habitat	Seen perching at water's edge to the south of the runway bridge crossing.
Horned lark	*Eremophila alpestris*	MBTA	None	12/13; 14/19	Maintained fields	Foraging/walking along grass field; also observed in flight.
Indigo bunting	*Passerina cyanea*	MBTA	None	Bypass channel	Shrubby fields and openings	Heard calling near Broad Run bypass channel.
Killdeer	*Charadrius vociferus*	MBTA	None	Adjacent to 4	Gravel driveway between partially maintained fields	Two birds demonstrating territorial behavior on gravel access road west of Broad Run, south of the runway.
Mourning dove	*Zenaida macroura*	MBTA	None	Adjacent to 8	Maintained/landscaped areas	Seen perching on powerline near railroad at west end of airport.
Northern cardinal	*Cardinalis cardinalis*	MBTA	None	3	Forest	Observed singing in upland forest habitat in Project Area 3.
Northern mockingbird	*Mimus polyglottos*	MBTA	None	8	Maintained/landscaped areas	Two birds demonstrating territorial behavior around Project Area 8; were perching on fence and telephone wires and in landscaped trees.
Red-bellied woodpecker	*Melanerpes carolinus*	MBTA	None	3	Forest	Foraging on snag at east end of Project Area 3; also heard calling elsewhere in forest habitat.
Red-winged blackbird	*Agelaius phoeniceus*	MBTA	None	4/5	Offsite fallow fields	Observed perching and singing on trees in offsite fallow fields NE of runways and Broad Run crossing.
Ruby-throated hummingbird	*Archilochus colubris*	MBTA	None	3	Forest/Forested Riparian habitat	Heard vocalizing in forest near Cannon Branch, at north end of project area.
Song sparrow	*Melospiza melodia*	MBTA	None	12, 4/5	Partially maintained fields/Offsite fallow fields	Observed perching on fence north of the runway, east of the Broad Run runway crossing. Also observed flying/landing in grass near project area 12.
Tufted titmouse	*Baeolophus bicolor*	MBTA	None	3	Forest/Forested Riparian habitat	Heard calling along/adjacent to Cannon Branch.
Turkey vulture	*Cathartes aura*	MBTA	None	N/A	N/A	Flyover.
Wilson's snipe	*Gallinago delicata*	MBTA	None	12	Ponded water edge in partially maintained field	Approx 30 birds flushed from around water edge- appeared to be ground-roosting. At least one additional bird observed flushing from wetland/floodplain northeast of Broad Run crossing, offsite.
Wood duck	*Aix sponsa*	MBTA	None	3	Forested riparian habitat	Flushed from Cannon Branch in forested riparian corridor at north end of project area.

Appendix I: Biological Resources Documents

3. Mussel Survey Approval and Survey Plan

MANASSAS REGIONAL AIRPORT - MUSSEL SURVEY PROPOSAL

PRINCE WILLIAM COUNTY, VA

PREPARED FOR

Davey Resource Group, Inc.

DATE: 10/01/2025

BIOSURVEY GROUP

Table of Contents

Attachments

Introduction

BioSurvey Group appreciates the opportunity to provide this proposal to Davey Resource Group, Inc. (Davey) for mussel services associated with proposed work at the Manassas Regional Airport in Prince William County, Virginia. The project proposes reinforcing the bridge that holds the Manassas Airport runway. Construction for this project may result in instream impacts to Broad Run which may support freshwater mussel species including the Virginia state endangered Brook Floater (*Alasmidonta varicosa*).

Scope of Work

Task 1. Agency Coordination / Project Management

BioSurvey Group is coordinating with the Virginia Department of Conservation and Recreation (DCR) and Department of Game and Inland Fisheries (VDGIF) to determine the extent and methodology required for conducting a mussel survey and potential mussel salvage and relocation at the project location to secure the necessary permits for project progress. A copy of the draft mussel survey plan is provided as Attachment A. Task 1 will also be used to secure the necessary VA project specific collection permits / approvals, general project management throughout all mussel services, and development of a project specific health and safety plan.

Task 2. Mussel Survey & Report

All work conducted under this task will be performed in accordance with the mussel survey plan developed in consultation with VDGIF (Attachment A). If VDGIF determines that mussel survey activities are not required prior to initiation of this task, BioSurvey Group will refrain from billing Davey for any services under Task 2. In the event that this task is in process and determined unnecessary, BioSurvey Group will only bill for the percentage of work completed prior to the cancellation.

To support the successful execution of this task, BioSurvey Group has engaged a qualified subcontractor. Under the direction and oversight of BioSurvey Group, the subcontractor will assist with project implementation and help facilitate the collection permit process.

Costing

BioSurvey Group proposes to conduct the work outlined above based on the lump sum cost estimate below. This includes all travel, labor, equipment, and supplies necessary to complete each Task.

Manassas Regional Airport Mussel Survey	
Task	**Costing**
1. Agency Coordination / Project Management	$6,027.56
2. Mussel Survey & Report	$123,157.20
TOTAL	**$129,184.76**

Schedule

BioSurvey Group has started agency coordination under Task 1. The mussel survey season in Virginia runs from April 1 through October 31. All work will be completed prior to October 31, assuming weather conditions allow.

Attachment A.

MANASSAS REGIONAL AIRPORT - BROAD RUN MUSSEL SURVEY PLAN

PRINCE WILLIAM COUNTY, VA

PREPARED FOR

Davey Resource Group, Inc.

SUBMITTED TO

Virginia Department of Wildlife Resources

DATE: 10/01/2025

BIOSURVEY GROUP

Table of Contents

Figures

Introduction

Davey and their client, the Manassas Regional Airport (Airport), have contracted BioSurvey Group to conduct a freshwater mussel survey on Broad Run in Prince William County, Virginia (Figure 1). The proposed project involves improvements to the Airport runway bridge structure, which will require temporary in-stream impacts, including cofferdams and pump-around systems.

The impacts have been divided into three defined reaches:

- **Direct Impact Area 1**: 339 linear meters, representing the region to be fully dewatered.
- **Direct Impact Area 2**: 434 linear meters, representing the region cut off from flow and maintained by a pump-around system.
- **Indirect Impact Area**: 1,806 linear meters, representing the region supported by pump-around systems and inflows from Cannon Branch.

Broad Run is a tributary to the Occoquan River and is known to support freshwater mussels including the state endangered Brook Floater (*Alasmidonta varicosa*). The last survey completed in this reach of Broad run was completed in 2012 and failed to detect the presence of Brook Floater. Coordination with United States of Fish and Wildlife Service (USFWS) and Virginia Department of Wildlife Resources (DWR) has indicated that no federal listed species are anticipated and that a presence / absence and quantitative survey would be recommended to better understand the impacts the proposed project may have on freshwater mussel resources found in Broad Run.

Scope of Work

The proposed mussel survey methods have been adapted from a combination of established protocols and guidance documents, including the 2018 Freshwater Mussel Guidelines for Virginia (Guidelines) and the Survey Protocol for Assessment of Endangered Freshwater Mussels in the Allegheny River, Pennsylvania (Smith 2001). Including full survey buffers found in the Guidelines of 200 m upstream and 800 m downstream, to the proposed survey area has been delineated into five distinct areas detailed in Table 1 below.

Table 1. Manassas Regional Airport Mussel Survey Areas

Survey Area	Length (m)	Upstream Limit	Downstream Limit
Upstream Buffer	200	38.71565163, -77.51488183	38.71651347, -77.51293423
Direct Impact Area 1	339	38.71651347, -77.51293423	38.71737235, -77.50945602
Direct Impact Area 2	434	38.71737235, -77.50945602	38.72045357, -77.50651896
Indirect Impact Area	1806	38.72045357, -77.50651896	38.70692398, -77.50590718
Downstream Buffer	800	38.70692398, -77.50590718	38.70195597, -77.50437923
TOTAL	**3,579**		

Qualitative Mussel Survey

In total, the qualitative survey will cover 3,579 linear meters of Broad Run, divided into five delineated areas (Table 1). Following the assumptions outlined in Smith (2001), surveyors will target an effective search rate to achieve a sampling fraction of approximately 0.05. To meet this standard, surveyors will spend 40 minutes searching a 20 × 20 m cell. The size and placement of cells will be determined by the approved surveyor, with no single cell exceeding 100 linear meters in length. Cell sizes may vary based on available habitat, but the search effort applied per square meter will remain consistent. Search time can be calculated by multiplying the cell size (m²) by 0.05 (the effective sampling fraction) and then multiplying that value by 2 to reflect an effective search rate of 0.5 m² per minute.

All mussels located during the survey (qualitative or qualitative) will be scored as live, fresh dead, weathered dead, or sub-fossil. All live and fresh dead individuals will be measured. Mussels will not be exposed to air longer than necessary (no more than 5 minutes) for identification, measurement, and photographic documentation. Mussels will be placed back into the substrate from the location collected. If Virginia State endangered or threatened species are detected, DWR will be notified within 24 hours. If federally listed species are detected, the U.S. Fish and Wildlife Service Virginia Field Office will likewise be notified within 24 hours.

Quantitative Mussel Survey

BioSurvey Group proposes to excavate 184 quantitative samples at four undetermined locations for a total of 736 samples. The location of the quantitative surveys will be based on the results of the qualitative data, available habitat, and the discretion of the qualified surveyor onsite. The surveyor will prioritize the placement of one quantitative survey within the Direct Impact 1 area, one within the Direct Impact 2 area and two within the Indirect Impact area.

Using Smith 2001 calculations, this design assumes 1) a 90% detection probability, 2) rare species persist in Broad Run at a conservatively low-density estimate of 0.05 mussels per square meter, and 3) 100% of samples will be fully excavated.

$$n' = \frac{-4 \ln(B_0)}{\mu}$$

0.1 = Risk of detection failure (β0)

0.05 = Assumed species density (μ)

184.21 = Sample Size (*n'*)

Sampling will be conducted using a four-random-start methodology, with systematic placement of random starts adjusted to reflect site-specific conditions at each of the four selected locations. At each site, the sampling design will consist of four 0.25 m² quadrat samples collected at 5 m intervals along transects oriented perpendicular to streamflow within suitable habitat (Figure 2). Random starts will alternate laterally (left to right and right to left) on odd- and even-numbered transects to ensure representative spatial coverage. In the example shown in Figure 2 (120 samples), transects are spaced every 5 m and the stream is 25 m wide. These assumptions will

be adjusted to fit actual site conditions, with the design expanded as necessary to collect a minimum of 184 samples per site.

Each sample will consist of a 0.25 m² quadrat, excavated to a depth of 15 cm (6 in) or to hardpan. All samples will be fully excavated. When survey conditions allow (visibility > 50 cm), each quadrat will first receive an initial surface count. Surface and excavated data will be recorded separately for each sample and may be used later for calibration of future survey methods. Excavated material will be collected, brought to the surface, and carefully sorted to remove all live and dead shell material.

Reporting

BioSurvey Group will prepare a detailed report for submission to DWR. The report will include a full description of the project, a map illustrating the project location and survey area extent at each of the 5 areas, detailed survey methodology, a figure illustrating all appropriate mussel survey data, summary data tables for species collected, density estimates at each site, and habitat conditions, data sheets, photo vouchers of each species observed and photos of odd, questionably identified species, and a copy of the valid collection permits.

Schedule

Mussel surveys in Virginia are generally conducted from April 1 through October 31 per the Guidelines. BioSurvey Group is committed to completing this work during the 2025 field season and anticipates completing this work before October 31, 2025.

Surveys are typically conducted under the following conditions: low to moderate flows, a minimum visibility of 0.5 meters (50 cm, approximately 20 in).

Work Cited

Virginia Department of Wildlife Resources & U.S. Fish and Wildlife Service. Freshwater Mussel Guidelines for Virginia (Draft). November 16, 2018. Available at: https://dwr.virginia.gov/wp-content/uploads/media/Mussel-Survey-and-Relocation-Guidelines.pdf

Smith, D. R.; Villella R. F.; Lemarié, D. P. 2001. Survey Protocol for Assessment of Endangered Freshwater Mussels in the Allegheny River, Pennsylvania. Journal of the North American Benthological Society, 20(1):118-132.

Figures

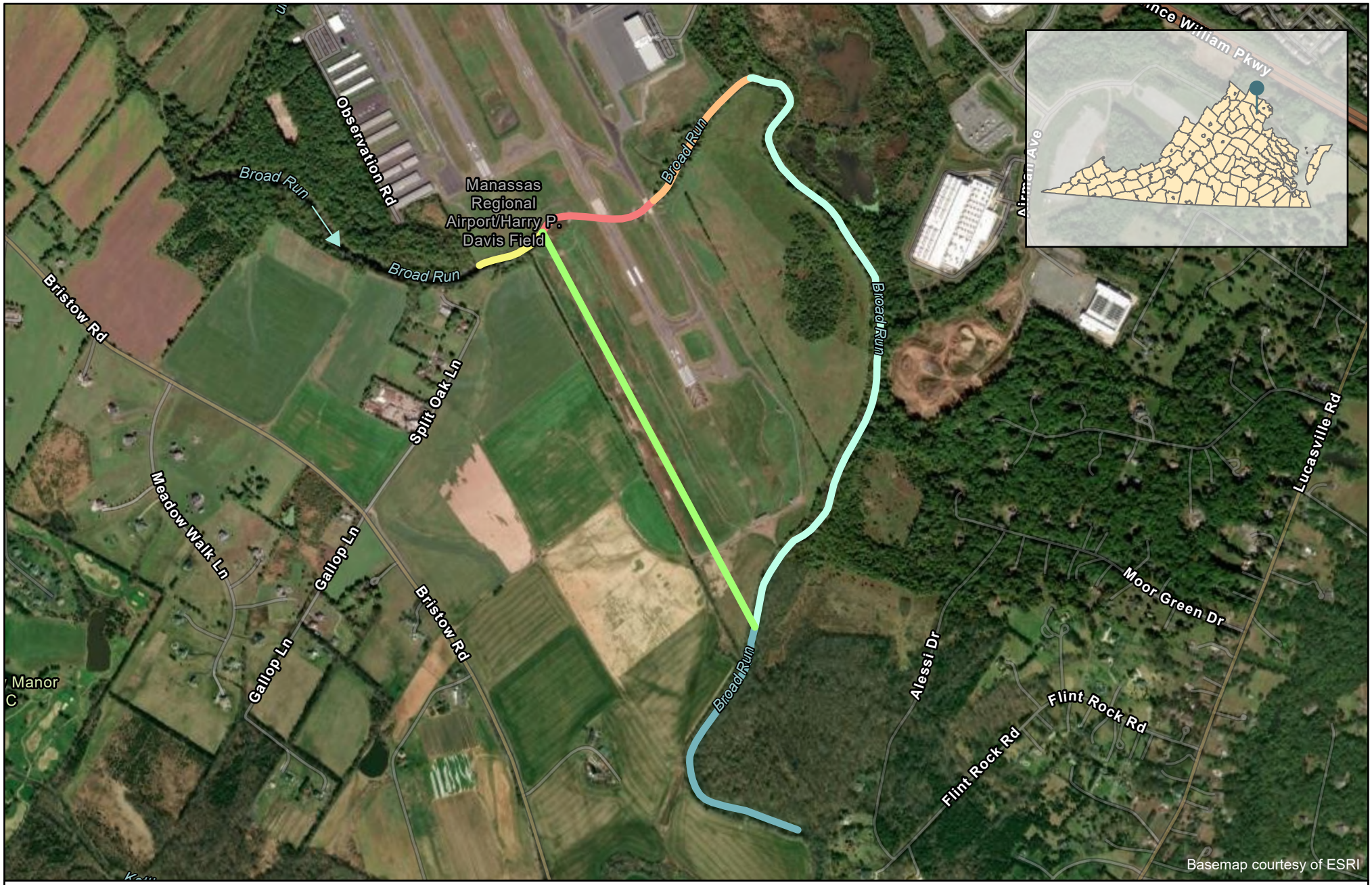
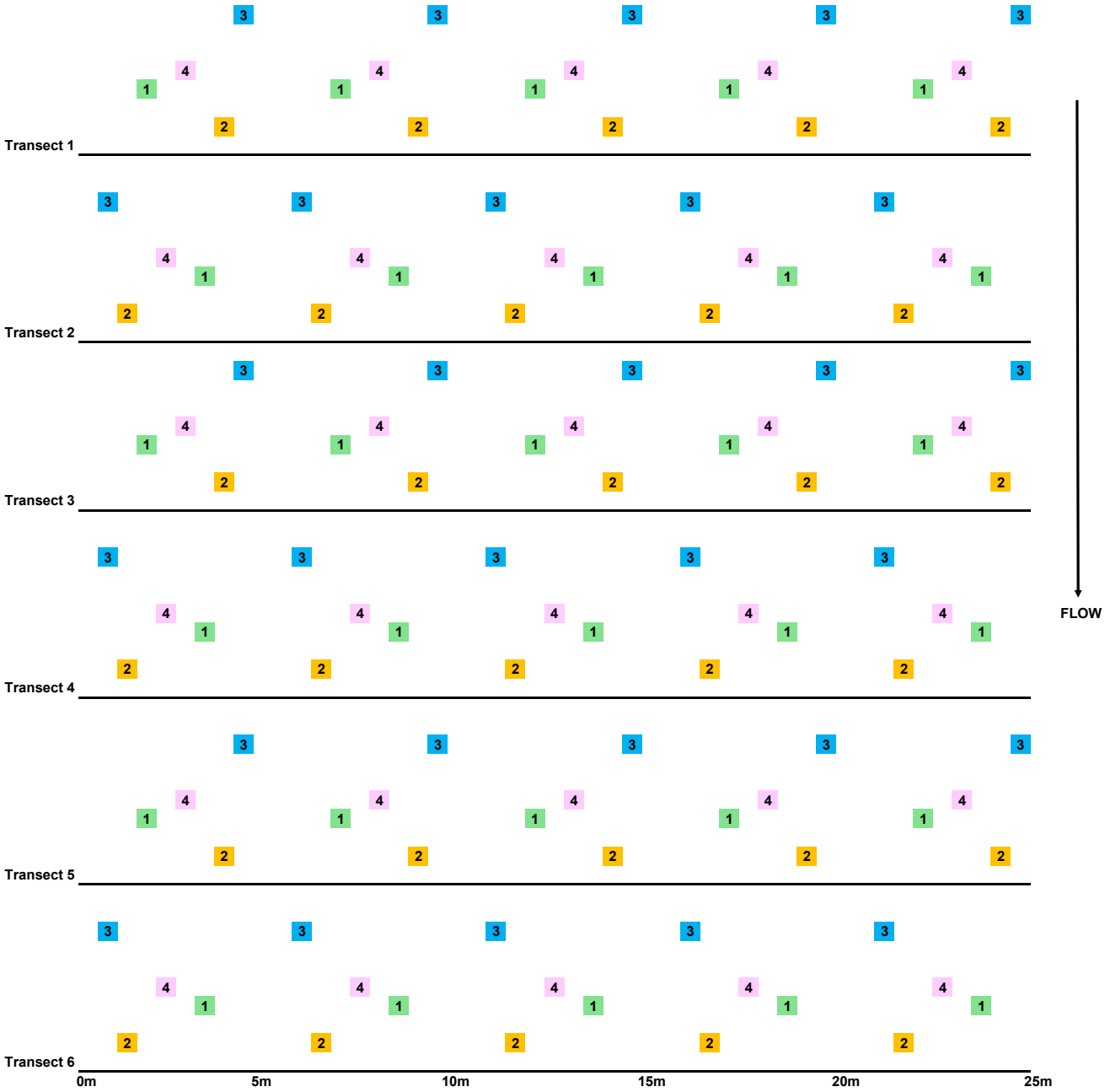


Figure 1. Project Location and Mussel Survey Design Map for the Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

BioSurvey Group

Figure 2. Quantitative Mussel Survey Design for the Broad Run Mussel Assessment Survey in Prince William County, Virginia.



Appendix I: Biological Resources Documents

4. Mussel Survey Report*

* VADWR response is contained in Appendix E, Consultation Reference Number 27c.

MANASSAS REGIONAL AIRPORT - BROAD RUN MUSSEL SURVEY REPORT

PRINCE WILLIAM COUNTY, VA

PREPARED FOR

Davey Resource Group, Inc.

SUBMITTED TO

Virginia Department of Wildlife Resources

DATE: 12/3/2025

BIOSURVEY GROUP

Table of Contents

Tables

Figures

Appendices

Appendix A – Virginia Collection Permit – Adam Benshoff

Appendix B – Manassas Regional Airport Mussel Survey Plan

Appendix C – Manassas Regional Airport – Mussel Survey Photo Log

Introduction

Davey and Avion Solutions Group (ASG), and their client, the Manassas Regional Airport (Airport), contracted BioSurvey Group to conduct a freshwater mussel survey on Broad Run in Prince William County, Virginia (Figure 1). The proposed PEA Project #6 involves strengthening the Runway 16L/34R and Taxiway Bravo over Broad Run. The strengthening will require temporary in-stream impacts, including cofferdams.

The impacts have been divided into three defined reaches:

- **Direct Impact Area 1**: 339 linear meters, representing the region to be fully dewatered.
- **Direct Impact Area 2**: 434 linear meters, representing the region cut off from flow and maintained by a pump-around system.
- **Indirect Impact Area**: 1,806 linear meters, representing the region supported by pump-around systems and inflows from Cannon Branch.

Broad Run is a tributary to the Occoquan River and is known to support freshwater mussels including the state endangered Brook Floater (*Alasmidonta varicosa*). The last survey in this reach of Broad Run was completed in 2012 and failed to detect the presence of Brook Floater. Coordination with United States of Fish and Wildlife Service (USFWS) and Virginia Department of Wildlife Resources (DWR) indicated that no federal listed species were anticipated and that a presence / absence and quantitative survey was recommended to better understand the impacts the proposed project may have on freshwater mussel resources found in Broad Run.

Methods

The proposed mussel survey methods were adapted from a combination of established protocols and guidance documents, including the 2018 Freshwater Mussel Guidelines for Virginia (Guidelines) and the Survey Protocol for Assessment of Endangered Freshwater Mussels in the Allegheny River, Pennsylvania (Smith, 2001). Including full survey buffers found in the Guidelines of 200 m upstream and 800 m downstream, the proposed survey area was delineated into five distinct areas detailed in Table 1 below.

Table 1. Manassas Regional Airport Mussel Survey Areas

Survey Area	Length (m)	Upstream Limit	Downstream Limit
Upstream Buffer	200	38.71565163, -77.51488183	38.71651347, -77.51293423
Direct Impact Area 1	339	38.71651347, -77.51293423	38.71737235, -77.50945602
Direct Impact Area 2	434	38.71737235, -77.50945602	38.72045357, -77.50651896
Indirect Impact Area	1,806	38.72045357, -77.50651896	38.70692398, -77.50590718
Downstream Buffer	800	38.70692398, -77.50590718	38.70195597, -77.50437923
TOTAL	**3,579**		

Qualitative Mussel Survey

In total, the qualitative survey covered 3,579 linear meters of Broad Run, divided into five delineated areas (Table 1). Following the assumptions outlined in Smith (2001), surveyors targeted an effective search rate to achieve a sampling fraction of approximately 0.05. To meet this standard, surveyors spent 40 minutes searching a 20 × 20 m cell. The size and placement of cells was determined by the approved surveyor, with no single cell exceeding 100 linear meters in length. Cell sizes varied based on available habitat, but the search effort applied per square meter remained consistent. Search time was calculated by multiplying the cell size (m²) by 0.05 (the effective sampling fraction) and then multiplying that value by 2 to reflect an effective search rate of 0.5 m² per minute.

Quantitative Mussel Survey

A total of 184 quantitative samples were excavated at four locations, for a total of 736 samples. The four quantitative survey locations were selected in the field based on the results of the qualitative data, available habitat, and the discretion of the qualified surveyor onsite. The surveyor prioritized the placement of one quantitative survey within the Direct Impact 1 area, one within the Direct Impact 2 area and two within the Indirect Impact area.

Using Smith (2001) calculations, this design assumed 1) a 90% detection probability, 2) rare species persist in Broad Run at a conservatively low-density estimate of 0.05 mussels per square meter, and 3) 100% of samples were fully excavated.

$$n' = \frac{-4 \ln(B_0)}{\mu}$$

0.1 = Risk of detection failure (β_0)

0.05 = Assumed species density (μ)

184.21 = Sample Size (n')

Sampling was conducted using a four-random-start methodology, with systematic placement of random starts adjusted to reflect site-specific conditions at each of the four selected locations. At each site, the sampling design consisted of four 0.25-m² quadrat samples collected at 5-m intervals along transects oriented perpendicular to streamflow within suitable habitat (Figure 2). In the example shown in Figure 2 (120 samples), transects are spaced every 5 m and the stream is 25 m wide. These assumptions were adjusted to fit actual site conditions, with the design expanded as necessary to collect a minimum of 184 samples per site.

Each sample consisted of a 0.25-m² quadrat, excavated to a depth of 15 cm (6 in) or to hardpan. All samples were fully excavated. When survey conditions allowed (visibility > 50 cm), each quadrat first received an initial surface count. Surface and excavated data were recorded separately for each sample and may be used later for calibration of future survey methods. Excavated material was collected, brought to the surface, and carefully sorted to remove all live and dead shell material.

Mussel Processing

All mussels located during the survey (qualitative or qualitative) were scored as live, fresh dead, weathered dead, or sub-fossil. A subset of live and fresh dead individuals was measured. Mussels were not exposed to air longer than necessary (no more than 5 minutes) for identification, measurement, and photographic documentation. Mussels were placed back into the substrate from the location collected. If Virginia State endangered or threatened species were detected, DWR was to be notified within 24 hours. If federally listed species were detected, the USFWS Virginia Field Office was to be notified within 24 hours.

Results

The project mussel survey was conducted from October 16 – October 20, 2025, led by permitted Malacologist Adam Benshoff. A copy of Mr. Benshoff's collection license is provided in Appendix A. Survey conditions were favorable throughout the survey window, with minimal precipitation, typically partly cloudy to clear skies, and visibility at depth averaging 2.0 ft. There are no USGS gages in the immediate watershed, but a gage at Keene Mill Road at Springfield, VA on Accotink Creek (01654670) showed discharge at or below the seasonal median for the survey dates. Flows appeared to be normal to low throughout the survey area. The water in Broad Run was stained but clear, and substrate was visible to bottom throughout large portions of the survey area. The reviewed and approved survey plan can be found in Appendix B. Site photos can be found in Appendix C.

Qualitative Mussel Survey

Mussels

A total of 10,227 live freshwater mussels representing two species were collected across all qualitative efforts at the survey site. Eastern Elliptio (*Elliptio complanata*) was the dominant species, representing 98.3% of the live mussel abundance, with the second species present being Northern Lance (*E. fisheriana*). No additional species were present live or represented by shell material. Very few (< 50) of observed or collected shells were fresh dead.

Live mussel abundance by survey area was highly variable, with the downstream buffer, Indirect Impact Area, and Direct Impact Area 2 all yielding greater than 1,000 live individuals, and Direct Impact Area 1 and the upstream buffer yielding seven and zero live individuals, respectively. The Indirect Impact Area had the highest yield of live mussels (6,631). Table 2 provides a breakdown of live mussel collections by species per qualitative sample site, and Figure Set 2 provides a visual representation of mussel abundance by qualitative survey cell.

Habitat

Across the four survey areas, habitat quality for freshwater mussels was highly variable. The downstream buffer and indirect impact area contained most of the highest quality habitat, with long stretches suitable for mussel colonization that were high in gravel, cobble, and/or sand. Several shallow pools were observed throughout the indirect impact area, likely due to beaver activity (see Digital Image 3). These pools were generally high in silt, sand, and woody debris. At the boundary of Direct Impact Area 2 and the Indirect Impact Area was the confluence of Cannon

Branch and Broad Run, which created a shallow pool with a heterogenous mix of substrates (Cell 134).

Within Direct Impact Area 2, the downstream half of the site was highly suitable for mussel colonization (high in gravel, cobble, and/or sand), with the upstream half yielding a higher composition of bedrock, boulder, and the presence of concrete pillows. This poor habitat composition continued throughout Direct Impact Area 1 and extended nearly to the boundary of Direct Impact Area 1 and the USB, with small stretches of suitable habitat intermixed. The entirety of the USB was one deep, contiguous pool (averaging 5.0 ft of depth) high in fine substrates such as silt, sand, and clay. Table 2 provides habitat data by survey cell, and Figure Set 3 presents substrate composition and depth data by survey cell.

Quantitative Mussel Survey

Four sites were selected based on the results of the qualitative survey effort: two sites within the Indirect Impact Area, and two sites within Direct Impact Area 2. On-site surveyors noted any quantitative survey efforts conducted in Direct Impact Area 1 (as originally proposed in the survey plan) would provide limited useful data, as only seven live mussels were collected and the majority of the area was high in bedrock, boulder, and concrete pillows substrates. For these reasons, two quantitative sites were sampled within Direct Impact Area 2.

Mussels

Across all four quantitative sites, a total of 299 live mussels were collected, representing two species, Eastern Elliptio and Northern Lance. No new species were observed via live or dead shell during the quantitative effort. Live mussel yields ranged from 45 – 104 individuals per site, and each site's dominant species was Eastern Elliptio (Table 4; Figure Set 4). Dividing by survey area, both the Indirect Impact and Direct Impact Area 2 yielded approximately 150 live individuals between their two quantitative efforts, though Northern Lance presence was higher within Direct Impact Area 2. The surface to benthic live mussel ratio across all sites was 141:158, respectively.

Habitat

All four quantitative sites were selected based on mussel and habitat data collected during the qualitative survey effort. Reaches that showed notable abundance of both species (Eastern Elliptio and Northern Lance) as well as high quality substrates (gravel, cobble, and/or sand) were selected for quantitative sampling. Depth was variable but averaged approximately 1.5 ft for all selected sites to allow for surface searches and thorough substrate collection. A photo of the targeted substrate can be found in Appendix C, Digital Image 13.

Additional Mussel Data

Length data of live mussels collected can be found in Table 5. Due to the high abundance of Eastern Elliptio, only a subset (approximately 350) of live measurements were recorded as to not interfere with the timeline of the project and daily airport operations. This data can be provided in another format upon request.

Discussion

A total of 10,526 live freshwater mussels were collected throughout the survey area across all survey methods, representing two species, Eastern Elliptio and Northen Lance. Both mussel abundance and habitat quality were poorest within the upstream-most portions of the surveyed area (USB and Direct Impact Area 1). Reaches within the middle and downstream portions of the survey area were comparable in both mussel abundance and habitat quality. The quantitative survey results depict a comparable mussel community between the Direct Impact Area 2 and Indirect Impact Area sites in abundance, with an increased presence of the non-dominant species, Northern Lance, occurring in the Direct Impact Area 2. No evidence of the state-listed Brook Floater was collected or observed during the survey efforts.

Tables

Table 2 - Depth, Habitat, and Live Mussels by Survey Cell

Cell	Survey Area	Depth (ft)	% Silt	% Wood	% Sand	% Gravel	% Cobble	% Boulder	% Bedrock	Live Mussels
1	DSB	1.5	0	0	20	50	20	10	0	0
2	DSB	0.5	0	0	30	60	10	0	0	0
3	DSB	0.5	0	0	20	80	0	0	0	10
4	DSB	1.0	0	20	20	30	30	0	0	8
5	DSB	1.0	0	20	20	30	30	0	0	8
6	DSB	1.0	0	20	20	30	30	0	0	13
7	DSB	1.0	0	20	20	30	30	0	0	4
8	DSB	0.5	0	10	0	70	20	0	0	7
9	DSB	0.5	0	0	0	30	10	0	60	0
10	DSB	0.5	0	0	0	10	20	0	70	1
11	DSB	1.0	0	0	0	20	20	0	60	1
12	DSB	0.5	0	0	0	10	0	10	80	0
13	DSB	0.5	0	0	0	20	10	0	70	4
14	DSB	1.0	0	0	0	10	20	0	70	18
15	DSB	1.0	0	0	0	20	20	0	60	5
16	DSB	1.0	0	0	0	10	10	0	80	0
17	DSB	1.5	0	0	10	20	10	0	60	2
18	DSB	1.5	0	0	10	20	10	0	60	4
19	DSB	1.5	0	0	10	20	10	0	60	6
20	DSB	1.0	20	0	20	30	10	0	20	5
21	DSB	0.5	10	0	20	20	20	0	30	1
22	DSB	0.5	10	0	30	20	20	0	20	6
23	DSB	0.5	10	0	20	40	30	0	0	5
23	DSB	0.5	10	0	20	40	30	0	0	28
24	DSB	0.5	10	0	20	40	30	0	0	40
25	DSB	0.5	0	0	10	70	20	0	0	20
26	DSB	0.5	0	0	10	70	20	0	0	203
27	DSB	2.0	0	0	10	70	20	0	0	158
28	DSB	2.5	10	0	10	60	20	0	0	49
28	DSB	2.5	10	0	10	60	20	0	0	89
29	DSB	2.0	0	0	10	70	20	0	0	145
30	DSB	2.0	0	0	10	70	20	0	0	145
31	DSB	2.0	0	0	10	70	20	0	0	111
32	DSB	2.0	0	0	10	70	20	0	0	195
33	DSB	2.0	0	0	20	60	20	0	0	159
34	DSB	2.5	0	0	30	50	20	0	0	109
35	DSB	2.0	0	0	30	40	30	0	0	153
36	DSB	2.5	10	0	20	40	30	0	0	121
37	DSB	2.0	10	0	40	30	20	0	0	85
38	DSB	1.5	10	0	30	40	20	0	0	60
39	DSB	1.5	10	0	30	40	20	0	0	66
40	DSB	1.5	10	0	30	40	20	0	0	128
41	Indirect	1.5	20	0	0	60	20	0	0	3
42	Indirect	1.5	20	0	10	50	20	0	0	258
43	Indirect	1.5	20	0	10	50	20	0	0	167
44	Indirect	1.5	20	0	10	50	20	0	0	78
45	Indirect	2.0	20	0	10	50	20	0	0	59
46	Indirect	2.0	20	0	10	50	20	0	0	52
47	Indirect	2.0	20	0	10	50	20	0	0	81
48	Indirect	1.5	10	0	10	70	10	0	0	102

Table 2 - Depth, Habitat, and Live Mussels by Survey Cell

Cell	Survey Area	Depth (ft)	% Silt	% Wood	% Sand	% Gravel	% Cobble	% Boulder	% Bedrock	Live Mussels
49	Indirect	1.5	10	0	10	70	10	0	0	31
50	Indirect	0.5	10	0	20	60	10	0	0	1
51	Indirect	1.5	20	0	20	60	0	0	0	27
52	Indirect	2.0	20	0	20	60	0	0	0	1
53	Indirect	1.5	20	0	10	40	20	10	0	6
54	Indirect	2.0	10	0	20	40	20	10	0	7
55	Indirect	1.5	10	0	20	40	20	10	0	0
56	Indirect	1.0	20	10	20	40	10	0	0	0
57	Indirect	0.5	10	0	20	60	10	0	0	13
58	Indirect	1.0	10	0	20	60	10	0	0	8
59	Indirect	0.5	10	0	10	80	0	0	0	0
60	Indirect	1.0	10	0	20	70	0	0	0	21
61	Indirect	1.0	10	0	10	70	10	0	0	20
62	Indirect	1.0	20	0	10	50	20	0	0	1
63	Indirect	1.0	20	0	10	50	20	0	0	42
64	Indirect	1.5	20	20	40	20	0	0	0	4
65	Indirect	0.5	20	0	20	50	10	0	0	198
66	Indirect	0.5	30	0	10	50	10	0	0	4
67	Indirect	1.0	20	0	50	20	10	0	0	161
68	Indirect	1.5	20	20	20	30	10	0	0	2
69	Indirect	2.5	20	20	30	20	10	0	0	96
70	Indirect	2.5	40	30	20	10	0	0	0	92
71	Indirect	2.5	40	20	30	10	0	0	0	141
72	Indirect	3.0	40	30	20	10	0	0	0	54
73	Indirect	2.5	40	30	20	10	0	0	0	64
74	Indirect	1.5	20	0	40	20	20	0	0	85
75	Indirect	2.0	10	0	30	20	10	10	20	1
76	Indirect	2.0	10	0	10	30	20	0	30	292
77	Indirect	2.0	10	10	10	30	20	10	10	137
78	Indirect	1.5	10	0	30	10	10	20	20	83
79	Indirect	1.0	20	0	50	20	10	0	0	182
80	Indirect	0.5	20	10	50	20	0	0	0	212
81	Indirect	1.5	20	0	60	10	0	0	10	289
82	Indirect	1.5	30	10	30	20	10	0	0	217
83	Indirect	2.0	30	0	30	20	20	0	0	4
84	Indirect	2.0	30	10	30	20	10	0	0	169
85	Indirect	2.0	30	10	30	20	10	0	0	156
86	Indirect	2.0	30	10	20	30	10	0	0	238
87	Indirect	1.0	30	20	30	20	0	0	0	10
88	Indirect	1.0	30	10	30	30	0	0	0	64
89	Indirect	1.0	30	0	20	40	10	0	0	135
90	Indirect	1.0	20	0	30	40	10	0	0	218
91	Indirect	1.0	20	0	30	40	10	0	0	161
92	Indirect	1.5	20	10	30	30	10	0	0	155
93	Indirect	1.5	20	0	30	40	10	0	0	152
94	Indirect	1.0	20	0	20	50	10	0	0	149
95	Indirect	1.5	20	0	20	50	10	0	0	181
96	Indirect	1.0	10	0	20	50	20	0	0	138
97	Indirect	1.0	10	0	20	50	20	0	0	6
98	Indirect	1.0	20	0	20	50	10	0	0	91

Table 2 - Depth, Habitat, and Live Mussels by Survey Cell

Cell	Survey Area	Depth (ft)	% Silt	% Wood	% Sand	% Gravel	% Cobble	% Boulder	% Bedrock	Live Mussels
99	Indirect	1.5	20	0	20	50	10	0	0	38
100	Indirect	1.5	20	0	20	50	10	0	0	30
101	Indirect	1.0	10	0	30	50	10	0	0	4
102	Indirect	0.5	10	0	20	60	10	0	0	148
103	Indirect	0.5	10	0	10	70	10	0	0	257
104	Indirect	1.0	10	0	10	70	10	0	0	160
105	Indirect	1.0	10	0	10	70	10	0	0	71
106	Indirect	0.5	10	0	10	70	10	0	0	1
107	Indirect	0.5	10	10	10	70	0	0	0	22
108	Indirect	1.0	10	0	20	60	10	0	0	11
109	Indirect	0.5	0	0	10	70	20	0	0	13
110	Indirect	0.5	10	0	10	30	30	20	0	6
111	Indirect	0.5	10	0	10	30	30	20	0	7
112	Indirect	0.5	0	0	10	20	30	30	10	12
113	Indirect	0.5	0	0	0	20	30	40	10	50
114	Indirect	0.5	0	0	0	0	10	20	70	34
115	Indirect	0.5	0	0	0	0	30	30	40	13
116	Indirect	0.5	0	0	0	10	30	30	30	21
117	Indirect	0.5	0	0	0	20	20	30	30	18
118	Indirect	0.5	0	0	0	20	20	30	30	24
119	Indirect	0.5	0	0	0	20	20	40	20	32
120	Indirect	1.0	0	0	10	40	30	20	0	14
121	Indirect	1.5	10	0	20	30	20	20	0	4
122	Indirect	2.0	10	0	20	30	20	20	0	0
123	Indirect	0.5	0	0	10	10	50	30	0	0
124	Indirect	0.5	0	0	0	20	40	40	0	0
125	Indirect	0.5	0	0	0	0	20	50	30	0
126	Indirect	1.0	0	0	0	0	20	30	50	0
127	Indirect	0.5	0	0	0	0	10	20	70	4
128	Indirect	0.5	0	0	0	0	30	10	60	0
129	Indirect	0.5	10	0	0	0	30	30	30	1
130	Indirect	0.5	0	0	0	50	20	20	10	116
131	Indirect	1.0	20	0	10	50	20	0	0	7
132	Indirect	1.0	10	0	10	60	20	0	0	205
133	Indirect	1.5	10	0	20	60	10	0	0	105
134	Impact 2	2.0	10	10	30	40	10	0	0	125
135	Impact 2	2.5	20	10	30	30	10	0	0	1
136	Impact 2	2.0	10	0	30	40	20	0	0	132
137	Impact 2	2.0	20	0	40	30	10	0	0	159
138	Impact 2	2.0	10	10	40	30	10	0	0	152
139	Impact 2	2.0	20	0	40	30	10	0	0	386
140	Impact 2	2.0	10	10	40	30	10	0	0	1
141	Impact 2	2.0	20	0	30	40	10	0	0	307
142	Impact 2	1.5	10	0	30	50	10	0	0	1
143	Impact 2	1.0	20	0	20	30	10	20	0	28
144	Impact 2	1.0	20	0	20	30	10	20	0	3
145	Impact 2	0.5	10	0	10	40	20	20	0	1
146	Impact 2	0.5	20	0	20	40	0	20	0	3
147	Impact 2	0.5	10	10	20	40	20	0	0	0
148	Impact 2	1.0	10	0	10	50	10	10	10	0

Table 2 - Depth, Habitat, and Live Mussels by Survey Cell

Cell	Survey Area	Depth (ft)	% Silt	% Wood	% Sand	% Gravel	% Cobble	% Boulder	% Bedrock	Live Mussels
149	Impact 2	0.5	20	10	20	40	10	0	0	0
150	Impact 2	0.5	10	0	0	30	50	10	0	1
151	Impact 2	0.5	10	0	0	20	40	20	10	1
152	Impact 2	1.0	0	0	0	10	20	30	40	0
153	Impact 2	1.0	10	0	0	0	0	20	70	1
154	Impact 2	1.5	0	0	0	0	10	30	60	0
155	Impact 1	1.0	0	0	10	0	20	70	0	0
156	Impact 1	1.0	10	0	0	0	10	80	0	0
157	Impact 1	1.0	10	0	0	0	0	50	40	0
158	Impact 1	1.0	10	0	0	0	0	60	30	0
159	Impact 1	1.0	10	0	0	10	0	80	0	0
160	Impact 1	1.5	10	0	0	10	0	80	0	0
161	Impact 1	3.0	10	0	0	10	0	80	0	0
162	Impact 1	4.0	10	0	0	10	0	80	0	0
163	Impact 1	3.5	10	0	0	10	0	80	0	0
164	Impact 1	3.5	10	0	0	10	0	80	0	0
165	Impact 1	3.5	10	0	0	10	0	80	0	0
166	Impact 1	3.0	10	0	0	10	0	80	0	0
167	Impact 1	3.0	10	0	0	10	0	80	0	6
168	Impact 1	2.5	20	10	30	20	0	20	0	0
169	Impact 1	2.0	30	20	20	20	0	20	0	0
170	Impact 1	2.0	40	20	30	10	0	0	0	0
171	Impact 1	1.0	40	30	30	0	0	0	0	0
172	Impact 1	0.5	20	10	70	0	0	0	0	0
173	USB	1.0	20	10	50	20	0	0	0	0
174	USB	3.0	10	0	40	30	20	0	0	0
175	USB	4.5	10	0	40	20	20	10	0	0
176	USB	5.5	30	10	30	20	10	0	0	0
177	USB	5.5	30	10	20	10	0	10	20	0
178	USB	6.0	30	10	20	10	0	10	20	0
179	USB	6.0	30	10	20	0	0	10	30	0
180	USB	6.0	30	0	20	10	0	10	30	0
181	USB	5.5	30	0	20	10	0	10	30	0

Table 3 – Live Mussel Collections by Species per Qualitative Sample Site.

Species	Common Name	Downstream Buffer	Indirect Impact Area	Impact Area 2	Impact Area 1	Upstream Buffer	Grand Totals
Elliptio complanata	Eastern Elliptio	1,953	6,490	1,605	7	0	10,055
Elliptio fisheriana	Northern Lance	25	141	6	0	0	172
Total		**1,978**	**6,631**	**1,611**	**7**	**0**	**10,227**

Table 4 – Total Number of Live Mussels by Species Collected from the Quantitative Efforts by Survey Area.

Survey Area	Site #	US Coordinate	DS Coordinate	# Quadrat Samples	# Live E. complanata	# Live E. fisheriana	Total Live Mussels	Mussel Density (Live/m^2)
Indirect Impact Area	1	38.71572, -77.50253	38.71508, -77.50234	184	97	7	104	2.26
Indirect Impact Area	2	38.71347, -77.50231	38.71296, -77.50235	184	44	1	45	0.98
Direct Impact Area 2	1	38.71973, -77.50752	38.72013, -77.50705	184	45	14	59	1.28
Direct Impact Area 2	2	38.71922, -77.50795	38.71968, -77.50757	184	79	12	91	1.98
Total					**265**	**34**	**299**	**1.63**

Table 5 – Length Measurements of Live Mussels.

Area	Species	Length (mm)	Area	Species	Length (mm)
DSB	*Elliptio complanata*	70	DSB	*Elliptio complanata*	101
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	86
DSB	*Elliptio complanata*	88	DSB	*Elliptio complanata*	65
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	68
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	71
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	78
DSB	*Elliptio complanata*	78	DSB	*Elliptio complanata*	84
DSB	*Elliptio complanata*	97	DSB	*Elliptio complanata*	86
DSB	*Elliptio complanata*	72	DSB	*Elliptio complanata*	91
DSB	*Elliptio complanata*	67	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	81	DSB	*Elliptio complanata*	82
DSB	*Elliptio complanata*	82	DSB	*Elliptio complanata*	81
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	67
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	82
DSB	*Elliptio complanata*	78	DSB	*Elliptio complanata*	86
DSB	*Elliptio complanata*	82	DSB	*Elliptio complanata*	68
DSB	*Elliptio complanata*	68	DSB	*Elliptio complanata*	72
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	74
DSB	*Elliptio complanata*	92	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	77
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	92	DSB	*Elliptio complanata*	88
DSB	*Elliptio complanata*	83	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	92	DSB	*Elliptio complanata*	92
DSB	*Elliptio complanata*	84	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	61
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	81
DSB	*Elliptio complanata*	80	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	68	DSB	*Elliptio complanata*	84
DSB	*Elliptio complanata*	97	DSB	*Elliptio complanata*	63
DSB	*Elliptio complanata*	92	DSB	*Elliptio complanata*	90

Table 5 – Length Measurements of Live Mussels.

Area	Species	Length (mm)	Area	Species	Length (mm)
DSB	*Elliptio complanata*	88	DSB	*Elliptio fisheriana*	68
DSB	*Elliptio complanata*	89	DSB	*Elliptio fisheriana*	61
DSB	*Elliptio complanata*	84	DSB	*Elliptio fisheriana*	57
DSB	*Elliptio complanata*	82	DSB	*Elliptio fisheriana*	64
DSB	*Elliptio complanata*	90	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	74	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	82
DSB	*Elliptio complanata*	88	DSB	*Elliptio complanata*	80
DSB	*Elliptio complanata*	98	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	94	DSB	*Elliptio complanata*	88
DSB	*Elliptio complanata*	98	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	96	DSB	*Elliptio complanata*	78
DSB	*Elliptio complanata*	84	DSB	*Elliptio complanata*	75
DSB	*Elliptio complanata*	94	DSB	*Elliptio complanata*	84
DSB	*Elliptio complanata*	72	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	95	DSB	*Elliptio complanata*	74
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	78	DSB	*Elliptio complanata*	84
DSB	*Elliptio complanata*	74	DSB	*Elliptio complanata*	89
DSB	*Elliptio fisheriana*	58	DSB	*Elliptio complanata*	91
DSB	*Elliptio complanata*	62	DSB	*Elliptio complanata*	93
DSB	*Elliptio complanata*	67	DSB	*Elliptio complanata*	109
DSB	*Elliptio complanata*	82	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	92	DSB	*Elliptio complanata*	90
DSB	*Elliptio complanata*	93	DSB	*Elliptio complanata*	91
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	94
DSB	*Elliptio complanata*	96	DSB	*Elliptio complanata*	82
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	15
DSB	*Elliptio complanata*	74	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	67
DSB	*Elliptio complanata*	78	DSB	*Elliptio complanata*	84
DSB	*Elliptio fisheriana*	73	DSB	*Elliptio complanata*	84
DSB	*Elliptio fisheriana*	59	DSB	*Elliptio complanata*	85

Table 5 – Length Measurements of Live Mussels.

Area	Species	Length (mm)	Area	Species	Length (mm)
DSB	*Elliptio fisheriana*	67	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	101	DSB	*Elliptio complanata*	94
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	67
DSB	*Elliptio complanata*	71	DSB	*Elliptio complanata*	74
DSB	*Elliptio complanata*	68	DSB	*Elliptio complanata*	77
DSB	*Elliptio complanata*	75	DSB	*Elliptio complanata*	81
DSB	*Elliptio complanata*	78	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	98	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	96	DSB	*Elliptio complanata*	94
DSB	*Elliptio complanata*	84	DSB	*Elliptio complanata*	86
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	75
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	88	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	94	DSB	*Elliptio complanata*	86
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	92
DSB	*Elliptio complanata*	72	DSB	*Elliptio complanata*	91
DSB	*Elliptio complanata*	97	DSB	*Elliptio complanata*	84
DSB	*Elliptio complanata*	95	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	79	DSB	*Elliptio complanata*	71
DSB	*Elliptio complanata*	93	DSB	*Elliptio complanata*	68
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	75
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	78
DSB	*Elliptio complanata*	89	DSB	*Elliptio complanata*	98
DSB	*Elliptio complanata*	84	DSB	*Elliptio complanata*	96
DSB	*Elliptio complanata*	83	DSB	*Elliptio complanata*	84
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	94	DSB	*Elliptio complanata*	86
DSB	*Elliptio complanata*	78	DSB	*Elliptio complanata*	92
DSB	*Elliptio complanata*	79	DSB	*Elliptio complanata*	91

Table 5 – Length Measurements of Live Mussels.

Area	Species	Length (mm)	Area	Species	Length (mm)
DSB	*Elliptio complanata*	84	DSB	*Elliptio complanata*	84
DSB	*Elliptio complanata*	83	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	92
DSB	*Elliptio complanata*	92	DSB	*Elliptio complanata*	94
DSB	*Elliptio complanata*	94	DSB	*Elliptio complanata*	80
DSB	*Elliptio complanata*	80	DSB	*Elliptio complanata*	77
DSB	*Elliptio complanata*	77	DSB	*Elliptio complanata*	81
DSB	*Elliptio complanata*	81	DSB	*Elliptio complanata*	82
DSB	*Elliptio complanata*	82	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	56
DSB	*Elliptio complanata*	56	DSB	*Elliptio complanata*	84
DSB	*Elliptio complanata*	84	DSB	*Elliptio complanata*	83
DSB	*Elliptio complanata*	83	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	86
DSB	*Elliptio complanata*	86	DSB	*Elliptio complanata*	88
DSB	*Elliptio complanata*	88	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	89	DSB	*Elliptio complanata*	94
DSB	*Elliptio complanata*	94	DSB	*Elliptio complanata*	102
DSB	*Elliptio complanata*	102	DSB	*Elliptio complanata*	100
DSB	*Elliptio complanata*	100	DSB	*Elliptio complanata*	97
DSB	*Elliptio complanata*	97	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	89	DSB	*Elliptio complanata*	88
DSB	*Elliptio complanata*	88	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	88
DSB	*Elliptio complanata*	88	DSB	*Elliptio complanata*	92
DSB	*Elliptio complanata*	92	DSB	*Elliptio complanata*	91
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	96
DSB	*Elliptio complanata*	96	DSB	*Elliptio complanata*	98

Table 5 – Length Measurements of Live Mussels.

Area	Species	Length (mm)	Area	Species	Length (mm)
DSB	*Elliptio complanata*	98	DSB	*Elliptio complanata*	90
DSB	*Elliptio complanata*	93	DSB	*Elliptio complanata*	91
DSB	*Elliptio complanata*	93	DSB	*Elliptio complanata*	96
DSB	*Elliptio complanata*	75	DSB	*Elliptio complanata*	97
DSB	*Elliptio complanata*	93	DSB	*Elliptio complanata*	94
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	97
DSB	*Elliptio complanata*	95	DSB	*Elliptio complanata*	96
DSB	*Elliptio complanata*	90	DSB	*Elliptio complanata*	98
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	84
DSB	*Elliptio complanata*	89	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	89	DSB	*Elliptio complanata*	86
DSB	*Elliptio complanata*	89	DSB	*Elliptio complanata*	88
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	91
DSB	*Elliptio complanata*	94	DSB	*Elliptio complanata*	94
DSB	*Elliptio complanata*	88	DSB	*Elliptio complanata*	92
DSB	*Elliptio complanata*	89	DSB	*Elliptio complanata*	85
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	98
DSB	*Elliptio complanata*	82	DSB	*Elliptio complanata*	89
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	76	DSB	*Elliptio complanata*	74
DSB	*Elliptio complanata*	88	DSB	*Elliptio complanata*	83
DSB	*Elliptio complanata*	95	DSB	*Elliptio complanata*	90
DSB	*Elliptio complanata*	95	DSB	*Elliptio complanata*	94
DSB	*Elliptio complanata*	87	DSB	*Elliptio complanata*	90
DSB	*Elliptio complanata*	93	DSB	*Elliptio complanata*	87
DSB	*Elliptio complanata*	80	DSB	*Elliptio complanata*	92
DSB	*Elliptio complanata*	92	DSB	*Elliptio complanata*	102
DSB	*Elliptio complanata*	69	DSB	*Elliptio complanata*	88
DSB	*Elliptio complanata*	102	DSB	*Elliptio complanata*	93
DSB	*Elliptio complanata*	85	DSB	*Elliptio complanata*	91
DSB	*Elliptio complanata*	89	DSB	*Elliptio complanata*	94
DSB	*Elliptio complanata*	90	DSB	*Elliptio complanata*	100

Table 5 – Length Measurements of Live Mussels.

Area	Species	Length (mm)	Area	Species	Length (mm)
DSB	*Elliptio complanata*	94	DSB	*Elliptio complanata*	90
DSB	*Elliptio complanata*	91	DSB	*Elliptio complanata*	71
DSB	*Elliptio complanata*	89	DSB	*Elliptio complanata*	84
DSB	*Elliptio complanata*	85	Indirect	*Elliptio fisheriana*	56
DSB	*Elliptio complanata*	85	Indirect	*Elliptio fisheriana*	58
DSB	*Elliptio complanata*	78	Indirect	*Elliptio fisheriana*	47
DSB	*Elliptio complanata*	82	Indirect	*Elliptio fisheriana*	51
DSB	*Elliptio complanata*	90	Indirect	*Elliptio fisheriana*	61
DSB	*Elliptio complanata*	87	Indirect	*Elliptio fisheriana*	63
DSB	*Elliptio complanata*	90	Indirect	*Elliptio fisheriana*	65
DSB	*Elliptio complanata*	86	Indirect	*Elliptio fisheriana*	66
DSB	*Elliptio complanata*	85	Indirect	*Elliptio fisheriana*	62
DSB	*Elliptio complanata*	82	Indirect	*Elliptio fisheriana*	54
DSB	*Elliptio complanata*	95	Indirect	*Elliptio fisheriana*	66
DSB	*Elliptio complanata*	77	Indirect	*Elliptio fisheriana*	63
DSB	*Elliptio complanata*	87	Indirect	*Elliptio fisheriana*	64
DSB	*Elliptio complanata*	90	Indirect	*Elliptio fisheriana*	63
DSB	*Elliptio complanata*	91	Indirect	*Elliptio fisheriana*	55
DSB	*Elliptio fisheriana*	71	Indirect	*Elliptio fisheriana*	52
DSB	*Elliptio fisheriana*	62	Indirect	*Elliptio fisheriana*	55
DSB	*Elliptio fisheriana*	35	Indirect	*Elliptio fisheriana*	59
DSB	*Elliptio fisheriana*	50	Indirect	*Elliptio fisheriana*	55
DSB	*Elliptio fisheriana*	57	Indirect	*Elliptio fisheriana*	51
DSB	*Elliptio fisheriana*	56	Indirect	*Elliptio fisheriana*	62
DSB	*Elliptio fisheriana*	55	Indirect	*Elliptio fisheriana*	73
DSB	*Elliptio fisheriana*	62	Indirect	*Elliptio fisheriana*	62
DSB	*Elliptio fisheriana*	63	Indirect	*Elliptio fisheriana*	67
DSB	*Elliptio fisheriana*	59	Indirect	*Elliptio fisheriana*	65
DSB	*Elliptio fisheriana*	63	Indirect	*Elliptio fisheriana*	66
DSB	*Elliptio fisheriana*	59	Indirect	*Elliptio fisheriana*	72
DSB	*Elliptio fisheriana*	63	Indirect	*Elliptio fisheriana*	61
DSB	*Elliptio fisheriana*	60	Indirect	*Elliptio fisheriana*	60

Table 5 – Length Measurements of Live Mussels.

Area	Species	Length (mm)	Area	Species	Length (mm)
DSB	*Elliptio fisheriana*	53	Indirect	*Elliptio fisheriana*	67
DSB	*Elliptio fisheriana*	62	Indirect	*Elliptio fisheriana*	68
DSB	*Elliptio fisheriana*	61	Indirect	*Elliptio fisheriana*	62
DSB	*Elliptio fisheriana*	61	Indirect	*Elliptio fisheriana*	62
Indirect	*Elliptio fisheriana*	60	Indirect	*Elliptio fisheriana*	65
Indirect	*Elliptio fisheriana*	60	Indirect	*Elliptio fisheriana*	41
Indirect	*Elliptio fisheriana*	51	Indirect	*Elliptio fisheriana*	52
Indirect	*Elliptio fisheriana*	54	Indirect	*Elliptio fisheriana*	54
Indirect	*Elliptio fisheriana*	57	Indirect	*Elliptio fisheriana*	59
Indirect	*Elliptio fisheriana*	61	Indirect	*Elliptio fisheriana*	61
Indirect	*Elliptio fisheriana*	62	Indirect	*Elliptio fisheriana*	63
Indirect	*Elliptio fisheriana*	62	Indirect	*Elliptio fisheriana*	72
Indirect	*Elliptio fisheriana*	68	Indirect	*Elliptio fisheriana*	70
Indirect	*Elliptio fisheriana*	67	Indirect	*Elliptio fisheriana*	41
Indirect	*Elliptio fisheriana*	71	Indirect	*Elliptio fisheriana*	44
Indirect	*Elliptio fisheriana*	72	Indirect	*Elliptio fisheriana*	58
Indirect	*Elliptio fisheriana*	69	Indirect	*Elliptio fisheriana*	62
Indirect	*Elliptio fisheriana*	65	Indirect	*Elliptio fisheriana*	65
Indirect	*Elliptio fisheriana*	66	Indirect	*Elliptio fisheriana*	62
Indirect	*Elliptio fisheriana*	50	Indirect	*Elliptio fisheriana*	72
Indirect	*Elliptio fisheriana*	66	Indirect	*Elliptio fisheriana*	67
Indirect	*Elliptio fisheriana*	51	Indirect	*Elliptio fisheriana*	54
Indirect	*Elliptio fisheriana*	54	Indirect	*Elliptio fisheriana*	58
Indirect	*Elliptio fisheriana*	71	Indirect	*Elliptio fisheriana*	59
Indirect	*Elliptio fisheriana*	63	Indirect	*Elliptio fisheriana*	61
Indirect	*Elliptio fisheriana*	66	Indirect	*Elliptio fisheriana*	64
Indirect	*Elliptio fisheriana*	67	Indirect	*Elliptio fisheriana*	62
Indirect	*Elliptio fisheriana*	67	Indirect	*Elliptio fisheriana*	68
Indirect	*Elliptio fisheriana*	71	Indirect	*Elliptio fisheriana*	68
Indirect	*Elliptio fisheriana*	67	Indirect	*Elliptio fisheriana*	68
Indirect	*Elliptio fisheriana*	68	Indirect	*Elliptio fisheriana*	68
Indirect	*Elliptio fisheriana*	60	Indirect	*Elliptio fisheriana*	62

Table 5 – Length Measurements of Live Mussels.

Area	Species	Length (mm)	Area	Species	Length (mm)
Indirect	*Elliptio fisheriana*	57	Indirect	*Elliptio fisheriana*	64
Indirect	*Elliptio fisheriana*	66	Indirect	*Elliptio fisheriana*	68
Indirect	*Elliptio fisheriana*	69	Indirect	*Elliptio fisheriana*	70
Indirect	*Elliptio fisheriana*	64	Indirect	*Elliptio fisheriana*	71
Indirect	*Elliptio fisheriana*	72	Indirect	*Elliptio fisheriana*	71
Indirect	*Elliptio fisheriana*	67	Indirect	*Elliptio fisheriana*	62
Indirect	*Elliptio fisheriana*	74	Indirect	*Elliptio fisheriana*	65
Indirect	*Elliptio fisheriana*	67	Indirect	*Elliptio fisheriana*	66
Indirect	*Elliptio fisheriana*	67	Indirect	*Elliptio fisheriana*	61
Indirect	*Elliptio fisheriana*	72	Indirect	*Elliptio fisheriana*	65
Indirect	*Elliptio fisheriana*	74	Indirect	*Elliptio fisheriana*	61
Indirect	*Elliptio fisheriana*	76	Indirect	*Elliptio fisheriana*	53
Indirect	*Elliptio fisheriana*	78	Impact 2	*Elliptio fisheriana*	64
Indirect	*Elliptio fisheriana*	68	Impact 2	*Elliptio fisheriana*	67
Indirect	*Elliptio fisheriana*	81	Impact 2	*Elliptio fisheriana*	63
Indirect	*Elliptio fisheriana*	64	Impact 2	*Elliptio fisheriana*	61
Indirect	*Elliptio fisheriana*	60	Impact 2	*Elliptio fisheriana*	61
Indirect	*Elliptio fisheriana*	63	Impact 2	*Elliptio fisheriana*	65
Indirect	*Elliptio fisheriana*	70	Impact 2	*Elliptio fisheriana*	66
Indirect	*Elliptio fisheriana*	71	Impact 2	*Elliptio fisheriana*	54
Indirect	*Elliptio fisheriana*	68	Impact 2	*Elliptio fisheriana*	60
Indirect	*Elliptio fisheriana*	57	Impact 2	*Elliptio fisheriana*	58
Indirect	*Elliptio fisheriana*	61	Impact 2	*Elliptio fisheriana*	66
Indirect	*Elliptio fisheriana*	64			
Indirect	*Elliptio fisheriana*	65			
Indirect	*Elliptio fisheriana*	59			
Indirect	*Elliptio fisheriana*	66			
Indirect	*Elliptio fisheriana*	41			
Indirect	*Elliptio fisheriana*	47			
Indirect	*Elliptio fisheriana*	58			
Indirect	*Elliptio fisheriana*	62			
Indirect	*Elliptio fisheriana*	65			

Figures

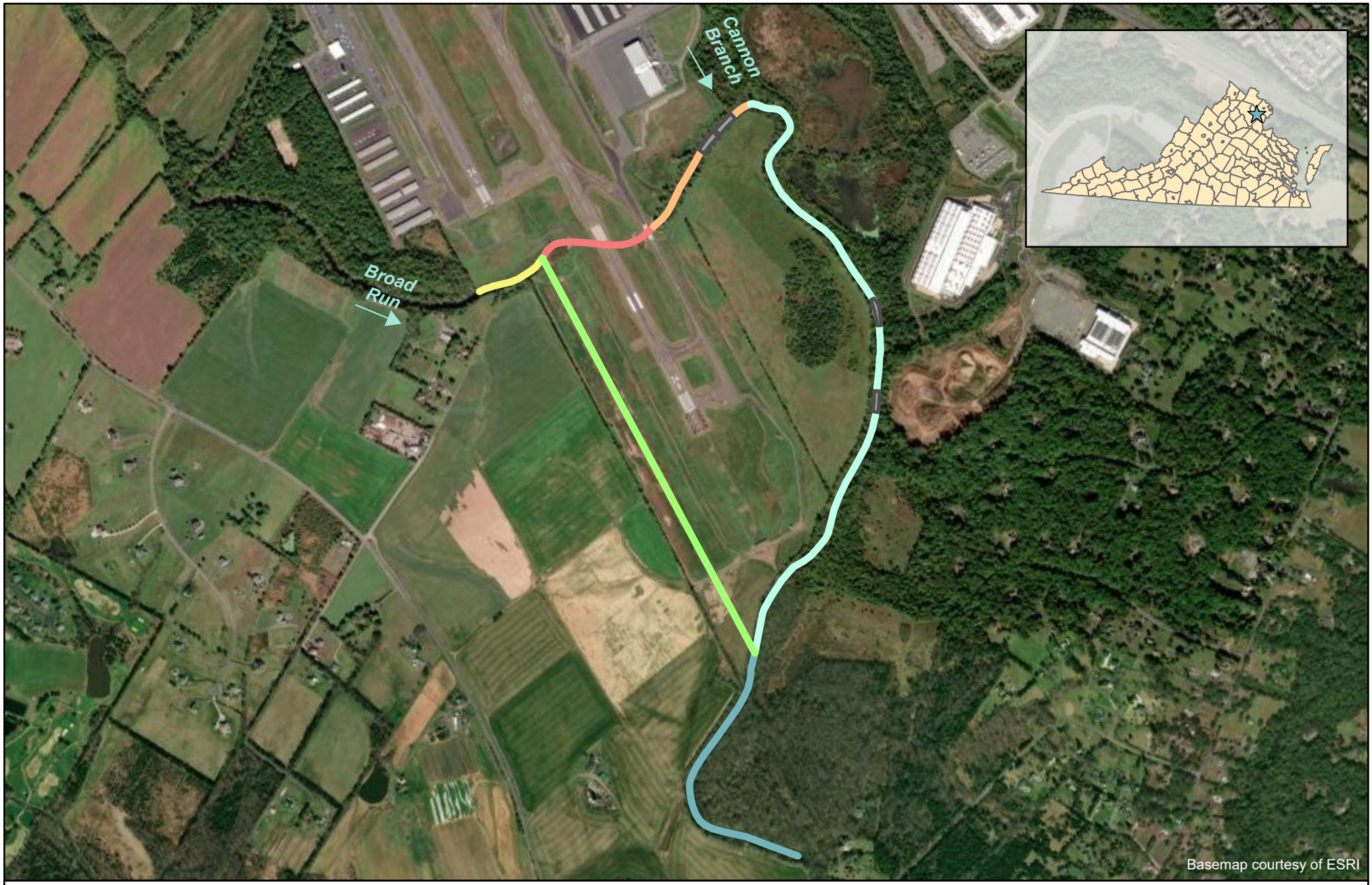


Figure 1. Project Location and Mussel Survey Design Map for the Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Figure 2a. Mussel Abundance in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

Figure 2b. Mussel Abundance in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

Figure 2c. Mussel Abundance in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

Figure 2d. Mussel Abundance in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

Figure 2e. Mussel Abundance in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

Figure 2f. Mussel Abundance in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

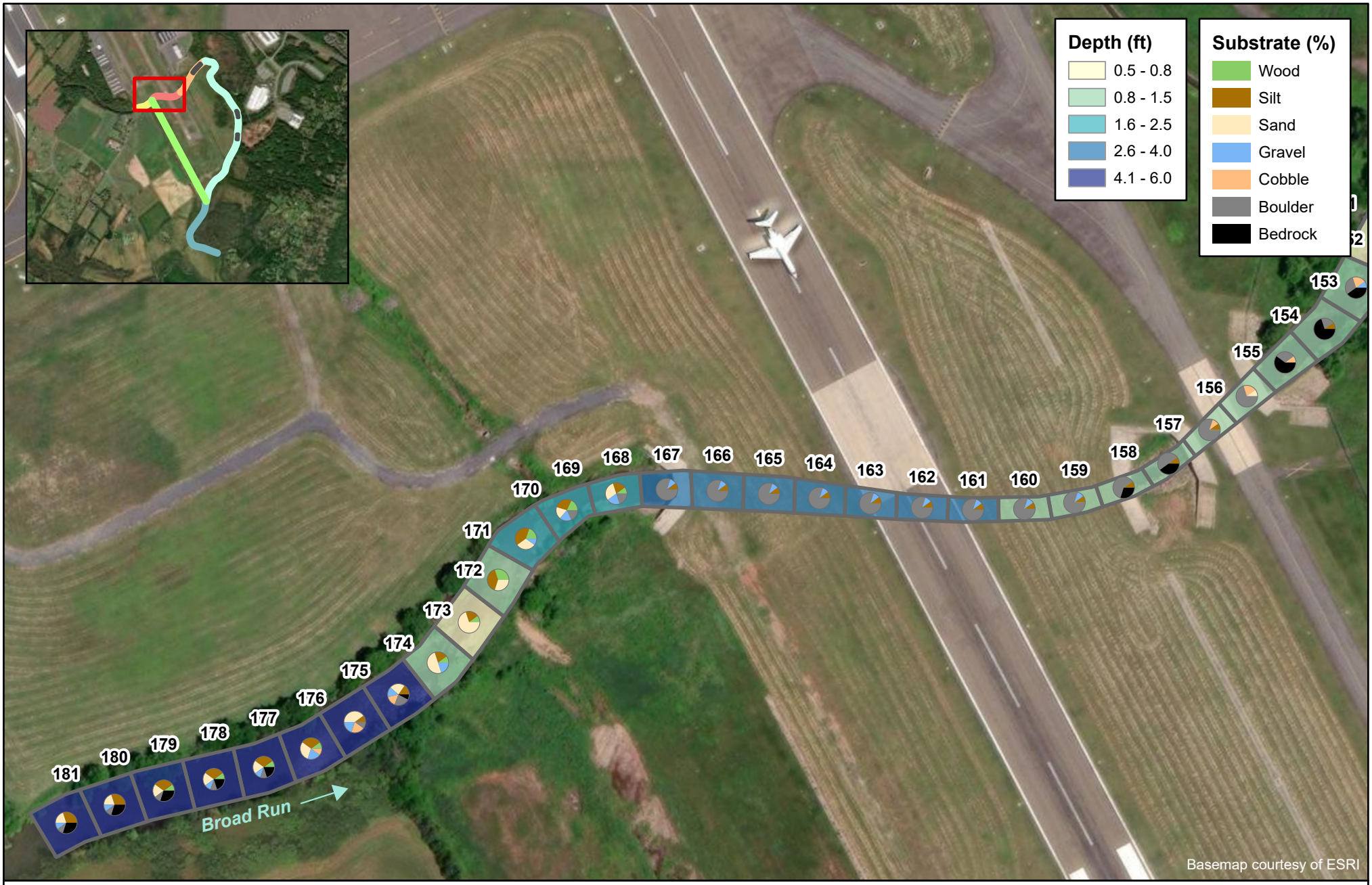


Figure 3a. Substrate and Depth in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

Figure 3b. Substrate and Depth in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

Figure 3c. Substrate and Depth in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

Figure 3d. Substrate and Depth in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

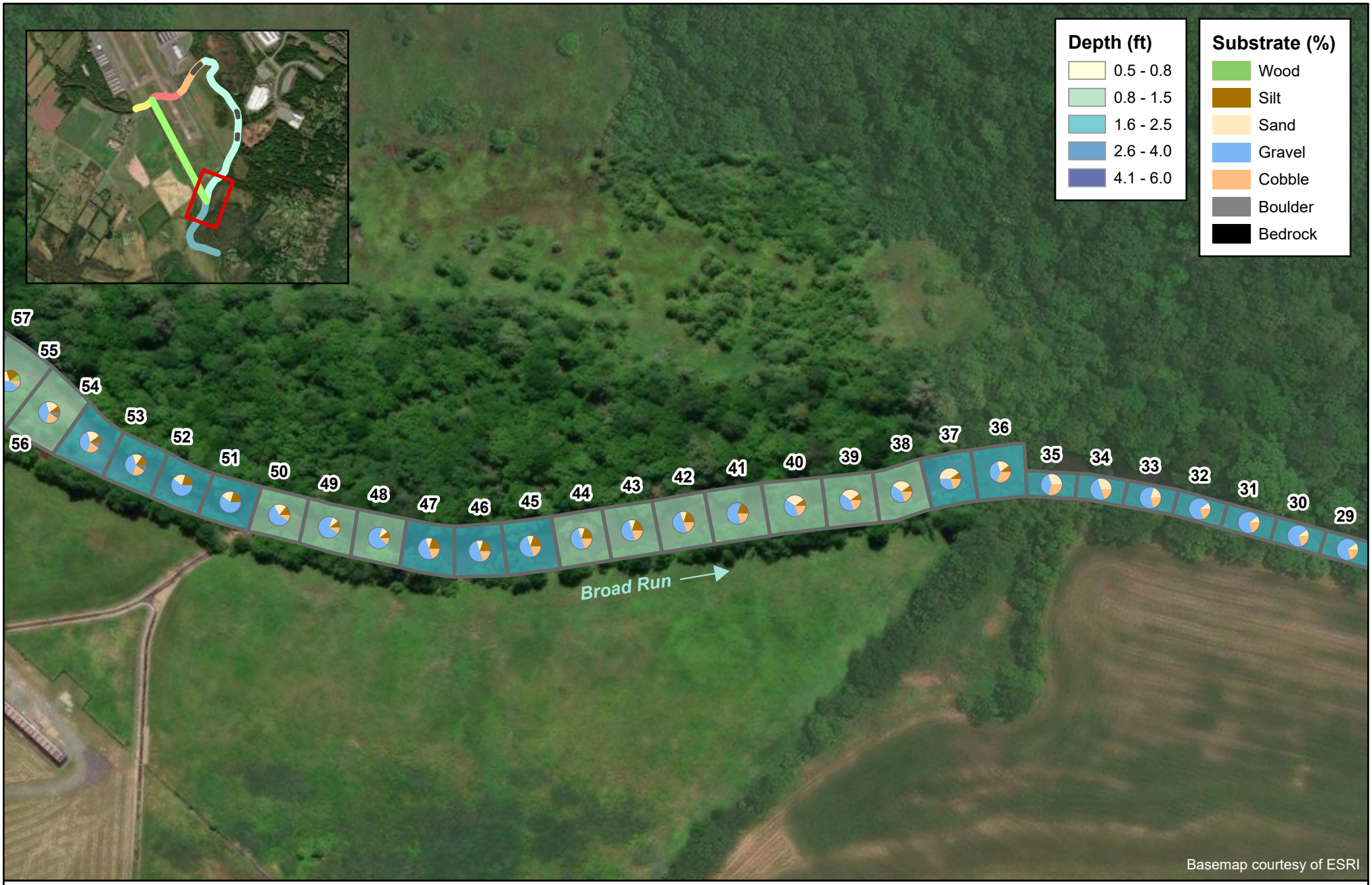


Figure 3e. Substrate and Depth in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

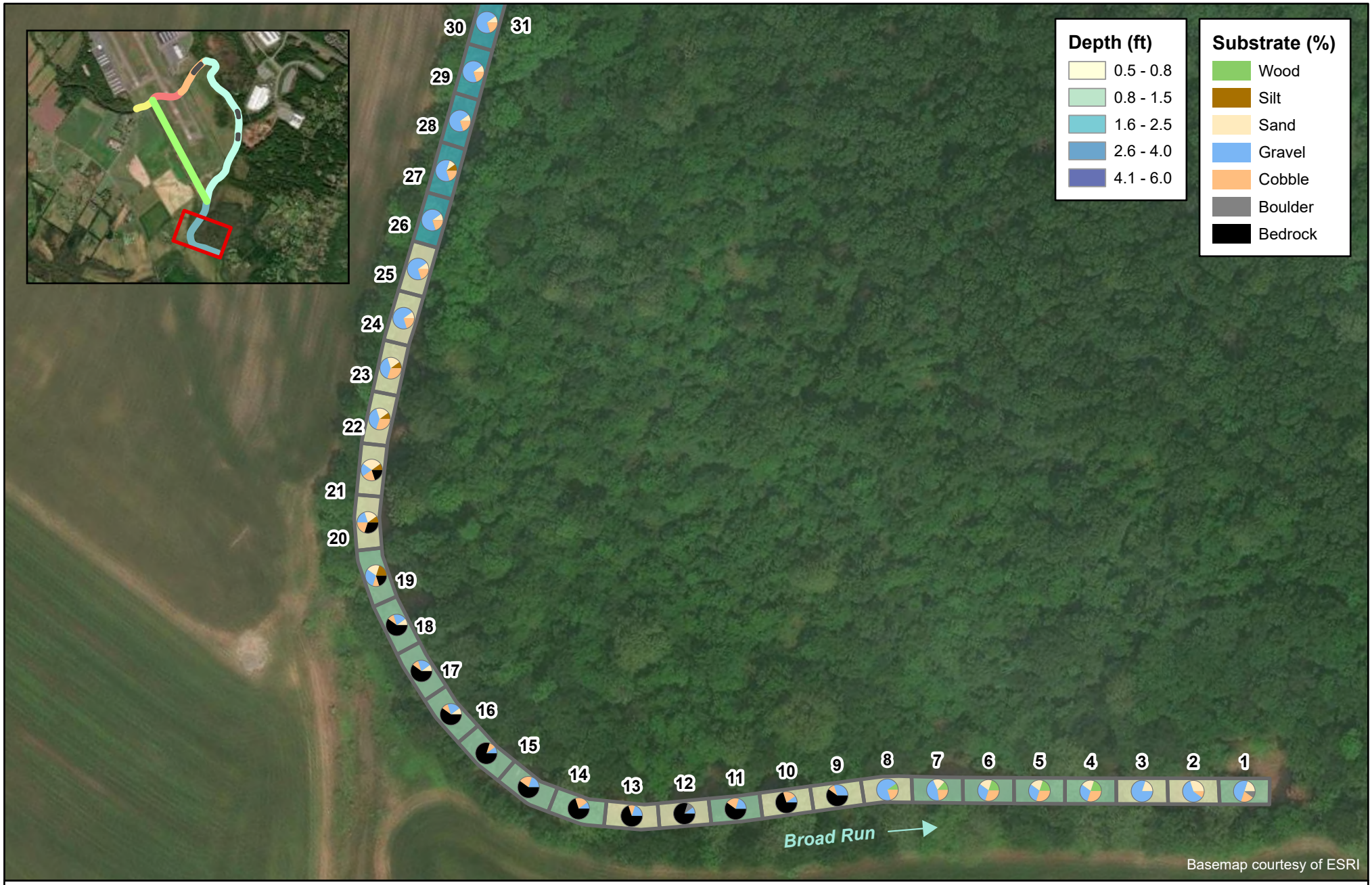


Figure 3f. Substrate and Depth in Qualitative Survey Cells, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Survey Cells

N

0 20 40 80 m

BioSurvey Group

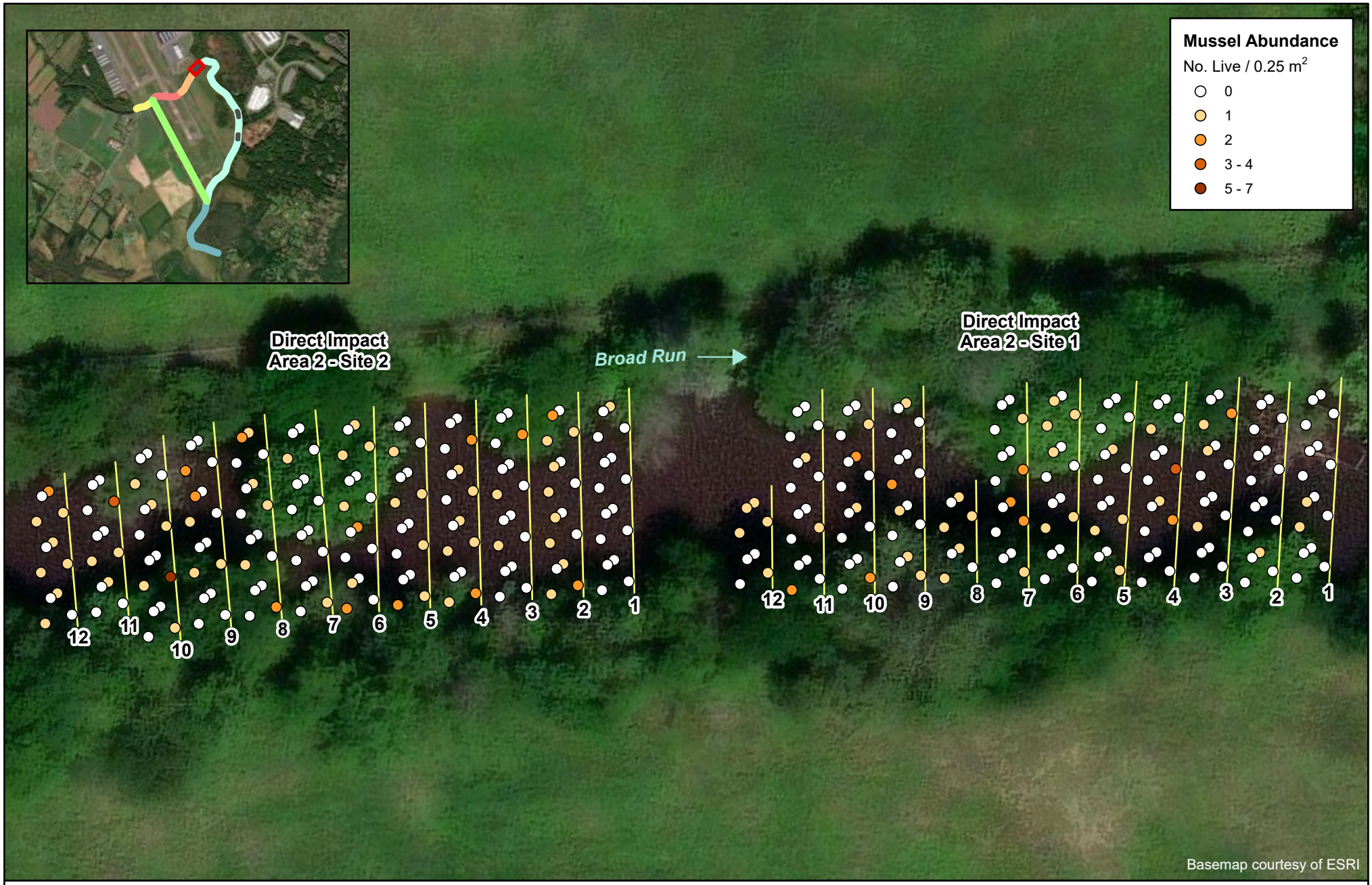


Figure 4a. Live Mussels in Direct Impact Area 2 Quantitative Samples, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Quantitative Transects

N

0 5 10 20 m

BioSurvey Group

Figure 4b. Live Mussels in Indirect Impact Area Quantitative Samples, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Quantitative Transects

N

0 5 10 20 m

BioSurvey Group

Figure 4c. Live Mussels in Indirect Impact Area Quantitative Samples, Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

Quantitative Transects

N

0 5 10 20 m

BioSurvey Group

Appendix A.

Virginia Collection Permit – Adam Benshoff

Virginia Department of Wildlife Resources
7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228-0778
(804) 367-1000 (V/TDD)
Under Authority of Title 29.1, Chapter 4, Code of Virginia

Scientific Collection Permit

Customer ID:	2557330	Mobile: (304)479-3268	
Permittee:	DAVID ALLEN FOLTZ II	City/County: Out of State	
Mailing Address:	3713 Morgan Dr Weirton, WV 26062-4418		
Email:	dafoltz@edge-es.com		

Contract Species Survey/ Research/ Volunteer Species Survey

Affiliation:

Affiliation Address: 3713 Morgan Dr Weirton, WV 26062-4418

Authorized County/Cities:

Alleghany; Appomattox; Craig; Franklin; Giles; Louisa; Montgomery; Pittsylvania; Prince William; Roanoke; Wise

Authorized Terrestrial Collection Methods: Collection by Hand; Lures (Baits/Light/Cover Boards); Nocturnal (i.e. shining w/ high power spot light); Visual Encounter (turning over rocks/logs/etc)

Authorized Aquatic Collection Methods: Collection by Hand; Dip Net; Electrofishing; HOOKA (Third Lung); Nets-Trap (Fyke/Hoop/D-Frame); Scuba (Proof of Certification required); Seine Nets; Snorkel; Traps (Minnow/Pot/Bell); View Scope

Authorized Water Body: [redacted] ADDED 10/3/2025 Broad Run & Tributaries (Prince William Conty)

Permittee MUST notify DWR within the 7 day period prior to each sampling event. Notification must be made via email to: collectionpermits@dwr.virginia.gov Report Due: 31 January 2025, 31 January 2026 ANNUAL REPORTS MUST BE SUBMITTED VIA: https://services.dwr.virginia.gov/collection_permits/ STANDARD CONDITIONS ATTACHED APPLY TO THIS PERMIT.

Authorized Species: Crayfish; Fish; Freshwater Mussels; Macroinvertebrate Water Quality Sampling;

Authorized Sub-Permittees: [redacted] Adam Benshoff; ADDED 7/26/2024 [redacted]

Conditions: [redacted] Project ADDED 10/3/2025 Stream & Wetland Mitigation Bank Survey Manassas Regional Airport (Prince William County)

Applicants may appeal permit decisions within 60 days of issuance. The appeal must be in writing to the Director, Department of Wildlife Resources.

Issued By: The Virginia Department of Wildlife Resources

Date: 2/20/2024

Permit Effective: 2/20/2024 through 12/31/2025

Appendix B.

Manassas Regional Airport Mussel Survey Plan

MANASSAS REGIONAL AIRPORT - BROAD RUN MUSSEL SURVEY PLAN

PRINCE WILLIAM COUNTY, VA

PREPARED FOR

Davey Resource Group, Inc.

SUBMITTED TO

Virginia Department of Wildlife Resources

DATE: 10/01/2025

BIOSURVEY GROUP

Table of Contents

Figures

Introduction

Davey and their client, the Manassas Regional Airport (Airport), have contracted BioSurvey Group to conduct a freshwater mussel survey on Broad Run in Prince William County, Virginia (Figure 1). The proposed project involves improvements to the Airport runway bridge structure, which will require temporary in-stream impacts, including cofferdams and pump-around systems.

The impacts have been divided into three defined reaches:

- **Direct Impact Area 1**: 339 linear meters, representing the region to be fully dewatered.
- **Direct Impact Area 2**: 434 linear meters, representing the region cut off from flow and maintained by a pump-around system.
- **Indirect Impact Area**: 1,806 linear meters, representing the region supported by pump-around systems and inflows from Cannon Branch.

Broad Run is a tributary to the Occoquan River and is known to support freshwater mussels including the state endangered Brook Floater (*Alasmidonta varicosa*). The last survey completed in this reach of Broad run was completed in 2012 and failed to detect the presence of Brook Floater. Coordination with United States of Fish and Wildlife Service (USFWS) and Virginia Department of Wildlife Resources (DWR) has indicated that no federal listed species are anticipated and that a presence / absence and quantitative survey would be recommended to better understand the impacts the proposed project may have on freshwater mussel resources found in Broad Run.

Scope of Work

The proposed mussel survey methods have been adapted from a combination of established protocols and guidance documents, including the 2018 Freshwater Mussel Guidelines for Virginia (Guidelines) and the Survey Protocol for Assessment of Endangered Freshwater Mussels in the Allegheny River, Pennsylvania (Smith 2001). Including full survey buffers found in the Guidelines of 200 m upstream and 800 m downstream, to the proposed survey area has been delineated into five distinct areas detailed in Table 1 below.

Table 1. Manassas Regional Airport Mussel Survey Areas

Survey Area	Length (m)	Upstream Limit	Downstream Limit
Upstream Buffer	200	38.71565163, -77.51488183	38.71651347, -77.51293423
Direct Impact Area 1	339	38.71651347, -77.51293423	38.71737235, -77.50945602
Direct Impact Area 2	434	38.71737235, -77.50945602	38.72045357, -77.50651896
Indirect Impact Area	1806	38.72045357, -77.50651896	38.70692398, -77.50590718
Downstream Buffer	800	38.70692398, -77.50590718	38.70195597, -77.50437923
TOTAL	**3,579**		

Qualitative Mussel Survey

In total, the qualitative survey will cover 3,579 linear meters of Broad Run, divided into five delineated areas (Table 1). Following the assumptions outlined in Smith (2001), surveyors will target an effective search rate to achieve a sampling fraction of approximately 0.05. To meet this standard, surveyors will spend 40 minutes searching a 20 × 20 m cell. The size and placement of cells will be determined by the approved surveyor, with no single cell exceeding 100 linear meters in length. Cell sizes may vary based on available habitat, but the search effort applied per square meter will remain consistent. Search time can be calculated by multiplying the cell size (m²) by 0.05 (the effective sampling fraction) and then multiplying that value by 2 to reflect an effective search rate of 0.5 m² per minute.

All mussels located during the survey (qualitative or qualitative) will be scored as live, fresh dead, weathered dead, or sub-fossil. All live and fresh dead individuals will be measured. Mussels will not be exposed to air longer than necessary (no more than 5 minutes) for identification, measurement, and photographic documentation. Mussels will be placed back into the substrate from the location collected. If Virginia State endangered or threatened species are detected, DWR will be notified within 24 hours. If federally listed species are detected, the U.S. Fish and Wildlife Service Virginia Field Office will likewise be notified within 24 hours.

Quantitative Mussel Survey

BioSurvey Group proposes to excavate 184 quantitative samples at four undetermined locations for a total of 736 samples. The location of the quantitative surveys will be based on the results of the qualitative data, available habitat, and the discretion of the qualified surveyor onsite. The surveyor will prioritize the placement of one quantitative survey within the Direct Impact 1 area, one within the Direct Impact 2 area and two within the Indirect Impact area.

Using Smith 2001 calculations, this design assumes 1) a 90% detection probability, 2) rare species persist in Broad Run at a conservatively low-density estimate of 0.05 mussels per square meter, and 3) 100% of samples will be fully excavated.

$$n' = \frac{-4 \ln(B_0)}{\mu}$$

0.1 = Risk of detection failure (β0)

0.05 = Assumed species density (μ)

184.21 = Sample Size (*n'*)

Sampling will be conducted using a four-random-start methodology, with systematic placement of random starts adjusted to reflect site-specific conditions at each of the four selected locations. At each site, the sampling design will consist of four 0.25 m² quadrat samples collected at 5 m intervals along transects oriented perpendicular to streamflow within suitable habitat (Figure 2). Random starts will alternate laterally (left to right and right to left) on odd- and even-numbered transects to ensure representative spatial coverage. In the example shown in Figure 2 (120 samples), transects are spaced every 5 m and the stream is 25 m wide. These assumptions will

be adjusted to fit actual site conditions, with the design expanded as necessary to collect a minimum of 184 samples per site.

Each sample will consist of a 0.25 m² quadrat, excavated to a depth of 15 cm (6 in) or to hardpan. All samples will be fully excavated. When survey conditions allow (visibility > 50 cm), each quadrat will first receive an initial surface count. Surface and excavated data will be recorded separately for each sample and may be used later for calibration of future survey methods. Excavated material will be collected, brought to the surface, and carefully sorted to remove all live and dead shell material.

Reporting

BioSurvey Group will prepare a detailed report for submission to DWR. The report will include a full description of the project, a map illustrating the project location and survey area extent at each of the 5 areas, detailed survey methodology, a figure illustrating all appropriate mussel survey data, summary data tables for species collected, density estimates at each site, and habitat conditions, data sheets, photo vouchers of each species observed and photos of odd, questionably identified species, and a copy of the valid collection permits.

Schedule

Mussel surveys in Virginia are generally conducted from April 1 through October 31 per the Guidelines. BioSurvey Group is committed to completing this work during the 2025 field season and anticipates completing this work before October 31, 2025.

Surveys are typically conducted under the following conditions: low to moderate flows, a minimum visibility of 0.5 meters (50 cm, approximately 20 in).

Work Cited

Virginia Department of Wildlife Resources & U.S. Fish and Wildlife Service. Freshwater Mussel Guidelines for Virginia (Draft). November 16, 2018. Available at: https://dwr.virginia.gov/wp-content/uploads/media/Mussel-Survey-and-Relocation-Guidelines.pdf

Smith, D. R.; Villella R. F.; Lemarié, D. P. 2001. Survey Protocol for Assessment of Endangered Freshwater Mussels in the Allegheny River, Pennsylvania. Journal of the North American Benthological Society, 20(1):118-132.

Figures

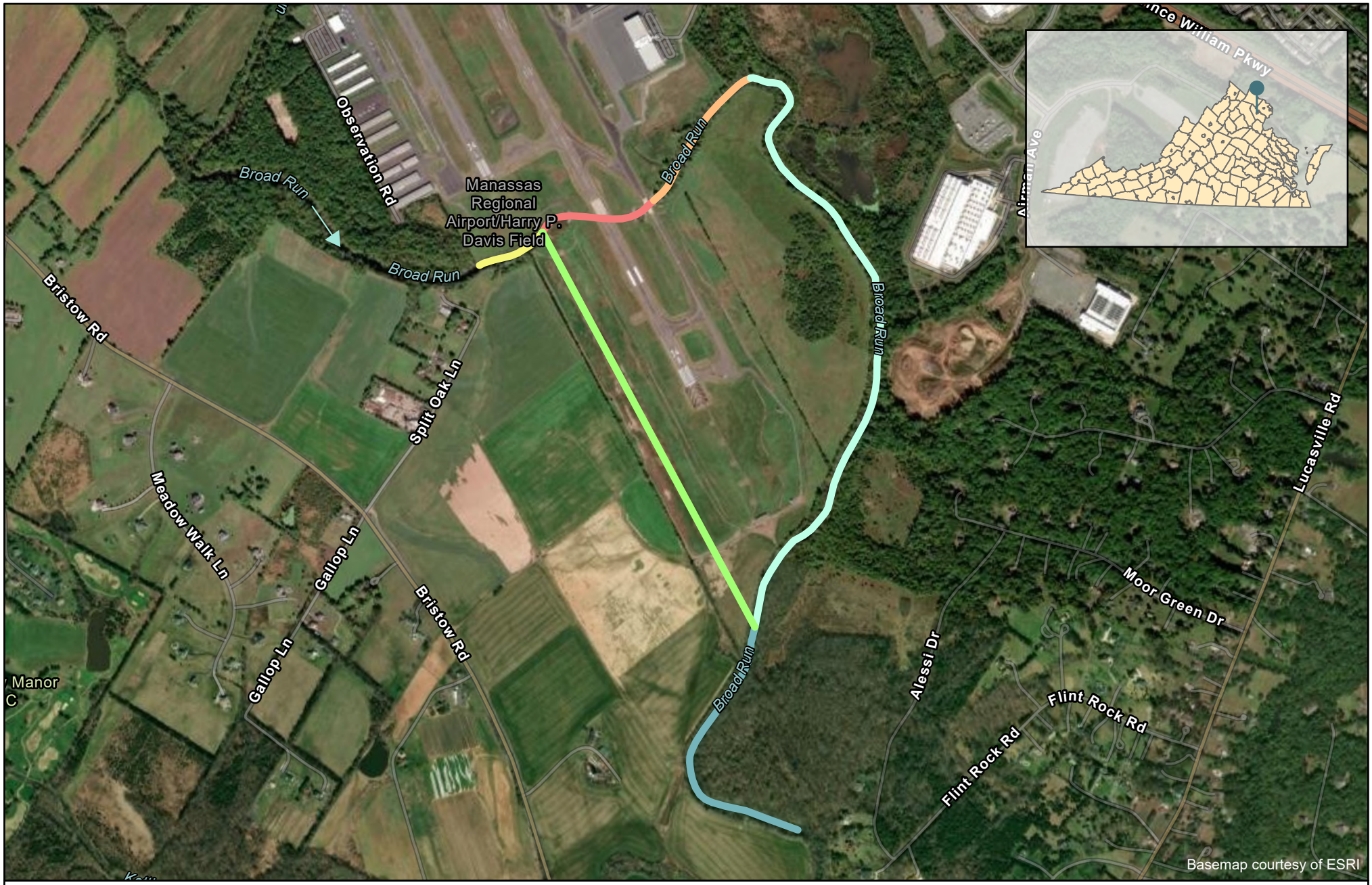
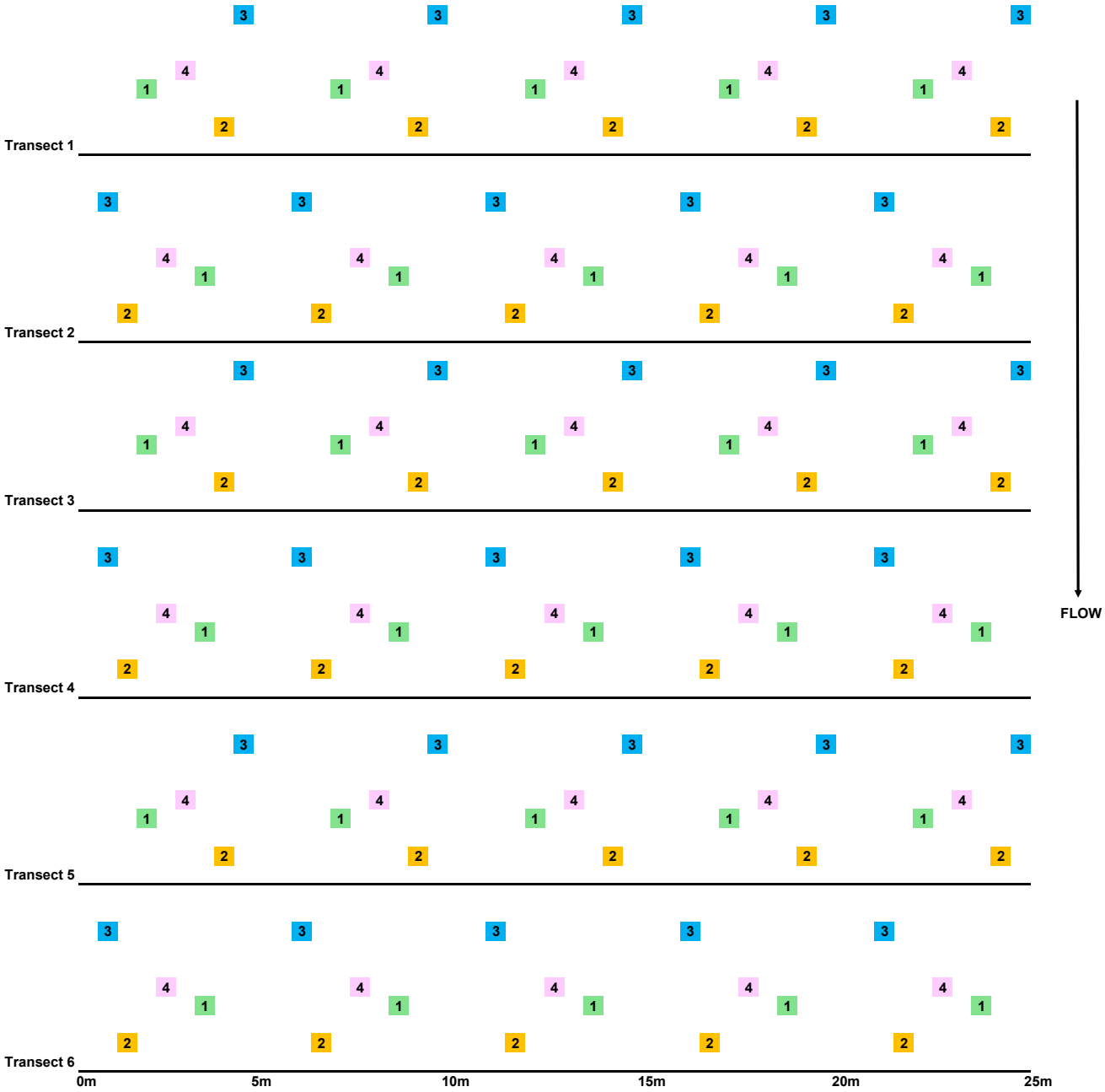


Figure 1. Project Location and Mussel Survey Design Map for the Manassas Regional Airport Project on Broad Run, Manassas, Virginia.

BioSurvey Group

Figure 2. Quantitative Mussel Survey Design for the Broad Run Mussel Assessment Survey in Prince William County, Virginia.



Appendix C.

Manassas Regional Airport Mussel Survey Photo Log

Manassas Airport Project – Mussel Survey Photo Log

Digital Image 1. View of Broad Run from the downstream extent of the survey area.

Digital Image 2. View of the right-descending bank of Broad Run, within the downstream buffer of the survey area.

Manassas Airport Project – Mussel Survey Photo Log

Digital Image 3. View of the right-descending bank of Broad Run and beaver activity, within the indirect impact area.

Digital Image 4. View of Broad Run looking downstream at the confluence with Cannon Branch, at the survey area border of the Indirect Impact Area and Direct Impact Area 2.

Digital Image 5. Direct view of the confluence of Broad Run with Cannon Branch.

Digital Image 6. View of Broad Run looking upstream at the confluence with Cannon Branch, at the survey area border of the Indirect Impact Area and Direct Impact Area 2.

Manassas Airport Project – Mussel Survey Photo Log

Digital Image 7. View of Broad Run looking downstream from the Direct Impact Area 1 and 2 boundary.

Digital Image 8. View of Broad Run looking upstream from the Direct Impact Area 1 and 2 boundary.

Digital Image 9. View of Broad Run within Direct Impact Area 1.

Digital Image 10. View of Broad Run looking downstream from the Upstream Buffer and Direct Impact Area 1 boundary.

Digital Image 11. View of Broad Run looking downstream from within the Upstream Buffer.

Digital Image 12. View of Broad Run looking upstream from within the Upstream Buffer.

Digital Image 13. View of the typical quadrat sample collected within Direct Impact Area 2.

Digital Image 14. Valve view of a live Eastern Elliptio (*Elliptio complanata*) collected from the survey area.

Digital Image 15. Umbo view of a live Eastern Elliptio (*Elliptio complanata*) collected from the survey area.

Digital Image 16. Valve view of a live Northern Lance (*Elliptio fisheriana*) collected from the survey area.

Digital Image 17. Umbo view of a live Northern Lance (*Elliptio fisheriana*) collected from the survey area.

Digital Image 18. Valve view of a juvenile Eastern Elliptio (*E. complanata*) collected from a quadrat within the survey area.

Appendix I: Biological Resources Documents

5. Determination Key for Tricolored Bat

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694

In Reply Refer To: 02/03/2026 17:15:30 UTC
Project code: 2025-0149429
Project Name: HEF - Manassas Regional Airport NEPA EA

Federal Nexus: yes
Federal Action Agency (if applicable): Federal Aviation Administration

Subject: Technical assistance for 'HEF - Manassas Regional Airport NEPA EA'

Dear Jamie Morgan:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on February 03, 2026, for 'HEF - Manassas Regional Airport NEPA EA' (here forward, Project). This project has been assigned Project Code 2025-0149429 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project. **Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key (Dkey), invalidates this letter.**

Determination for the Northern Long-Eared Bat and Tricolored Bat

Based on your IPaC submission and a standing analysis completed by the Service, you determined the proposed Project will have the following effect determinations:

Species	Listing Status	Determination
Tricolored Bat (*Perimyotis subflavus*)	Proposed Endangered	May affect

Federal agencies must consult with U.S. Fish and Wildlife Service under section 7(a)(2) of the Endangered Species Act (ESA) when an action *may affect* a listed species. Tricolored bat is proposed for listing as endangered under the ESA, but not yet listed. For actions that may affect a proposed species, agencies cannot consult, but they can *confer* under the authority of section 7(a)(4) of the ESA. Such conferences can follow the procedures for a consultation and be adopted as such if and when the proposed species is listed. Should the tricolored bat be listed, agencies must review projects that are not yet complete, or projects with ongoing effects within the tricolored bat range that previously received a NE or NLAA determination from the key to confirm that the determination is still accurate. Projects that receive a may affect determination for tricolored bat through the key, should contact the appropriate Ecological Services Field Office if they want to conference on this species.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination key for the northern long-eared bat and tricolored bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Monarch Butterfly *Danaus plexippus* Proposed Threatened

You may coordinate with our Office to determine whether the Action may cause prohibited take of the species listed above.

Conclusion

Consultation with the Service is not complete. Further consultation or coordination with the Service is necessary for those species or designated critical habitats with a determination of “May Affect.” A “May Affect” determination in this key indicates that the project, as entered, is not consistent with the questions in the key. Not all projects that reach a “May Affect” determination are anticipated to result in adverse impacts to listed species. These projects may result in a “No Effect”, “May Affect, Not Likely to Adversely Affect”, or “May Affect, Likely to Adversely Affect” determination depending on the details of the project. Please contact our Virginia Ecological Services Field Office to discuss methods to avoid or minimize potential adverse effects to those species or designated critical habitats.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

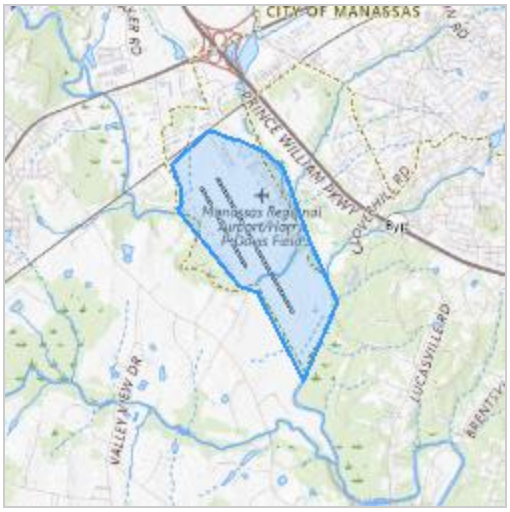
HEF - Manassas Regional Airport NEPA EA

2. Description

The following description was provided for the project 'HEF - Manassas Regional Airport NEPA EA':

> Programmatic EA for sixteen proposed airport upgrades.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.7183314,-77.51122968449477,14z



DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of “may affect” for a least one species covered by this determination key.

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of listed bats or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. Is the action area wholly within Zone 2 of the year-round active area for northern long-eared bat and/or tricolored bat?

   Automatically answered
   No

3. Does the action area intersect Zone 1 of the year-round active area for northern long-eared bat and/or tricolored bat?

   Automatically answered
   No

4. Does any component of the action involve leasing, construction or operation of wind turbines? Answer 'yes' if the activities considered are conducted with the intention of gathering survey information to inform the leasing, construction, or operation of wind turbines.

   No

5. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Note for projects in Pennsylvania: Projects requiring authorization under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act would be considered as having a federal nexus. Since the U.S. Army Corps of Engineers (Corps) has issued the Pennsylvania State Programmatic General Permit (PASPGP), which may be verified by the PA Department of Environmental Protection or certain Conservation Districts, the need to receive a Corps authorization to perform the work under the PASPGP serves as a federal nexus. As such, if proposing to use the PASPGP, you would answer ‘yes’ to this question.

   Yes

6. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

   No

7. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

   Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

   Yes

8. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

   No

9. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

   No

10. [Semantic] Is the action area located within 0.5 miles of a known bat hibernaculum or winter roost? Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your state wildlife agency.

    Automatically answered

    No

11. Does the action area contain any winter roosts or caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating bats?

    No

12. Will the action cause effects to a bridge?

    Note: Covered bridges should be considered as bridges in this question.

    Yes

13. Has the local Service Field Office confirmed that bridge surveys are not needed because project activities are not expected to impact bats, or because NLEBs and TCBs are not using bridges within the action area?

    Yes

14. Will the action result in effects to a culvert or tunnel at any time of year?

    No

15. Are trees present within 1000 feet of the action area?

    Note: If there are trees within the action area that are of a sufficient size to be potential roosts for bats answer "Yes". If unsure, additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

16. Does the action include the intentional exclusion of bats from a building or building-like structure? **Note:** Exclusion is conducted to deny bats' entry or reentry into a building. To be effective and to avoid harming bats, it should be done according to established standards. If your action includes bat exclusion and you are unsure whether northern long-eared bats or tricolored bats are present, answer "Yes." Answer "No" if there are no signs of bat use in the building/structure. If unsure, contact your local Ecological Services Field Office to help assess whether northern long-eared bats or tricolored bats may be present. Contact a Nuisance Wildlife Control Operator (NWCO) for help in how to exclude bats from a structure safely without causing harm to the bats (to find a NWCO certified in bat standards, search the Internet using the search term "National Wildlife Control Operators Association bats"). Also see the White-Nose Syndrome Response Team's guide for bat control in structures.

    No

17. Does the action involve removal, modification, or maintenance of a human-made building-like structure (barn, house, or other building) **known or suspected to contain roosting bats?**

    No

18. Will the action cause construction of one or more new roads open to the public?

    For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

    No

19. Will the action include or cause any construction or other activity that is reasonably certain to increase average night-time traffic permanently or temporarily on one or more existing roads? **Note:** For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.). .

    Yes

20. Will the increased vehicle traffic occur on any road that lies between any two areas of contiguous forest that are each greater than or equal to 10 acres in extent and are separated by less than 1,000 feet? Bats may cross a road by flying between forest patches that are up to 1,000 feet apart.

    Note: "Contiguous forest" of 10 acres or more may includes areas where multiple forest patches are separated by less than 1,000 feet of non-forested area if the forested patches, added together, comprise at least 10 acres.

    Yes

21. For every 1,000 feet of road where increased traffic is expected, will there be at least one place where bats could cross the road corridor by flying less than 33 feet (10 meters) between trees whose tops are at least 66 feet (20 meters) higher than the road surface?

    No

22. Will the proposed Action involve the creation of a new water-borne contaminant source (e.g., leachate pond, pits containing chemicals that are not NSF/ANSI 60 compliant)?

    Note: For information regarding NSF/ANSI 60 please visit https://www.nsf.org/knowledge-library/nsf-ansi-standard-60-drinking-water-treatment-chemicals-health-effects

    No

23. Will the proposed action involve the creation of a new point source discharge from a facility other than a water treatment plant or storm water system?

    No

24. Will the action include drilling or blasting?

    No

25. Will the action involve military training (e.g., smoke operations, obscurant operations, exploding munitions, artillery fire, range use, helicopter or fixed wing aircraft use at night)?

    No

26. Will the proposed action involve the use of herbicides or pesticides (e.g., fungicides, insecticides, or rodenticides)?

    No

27. Will the action include or cause activities that are reasonably certain to cause chronic or intense nighttime noise (above current levels of ambient noise in the area) in suitable summer habitat for the northern long-eared bat or tricolored bat during the active season?

    Chronic noise is noise that is continuous or occurs repeatedly again and again for a long time. Sources of chronic or intense noise that could cause adverse effects to bats may include, but are not limited to: road traffic; trains; aircraft; industrial activities; gas compressor stations; loud music; crowds; oil and gas extraction; construction; and mining.

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    No

28. Does the action include, or is it reasonably certain to cause, the use of permanent or temporary artificial lighting within 1000 feet of suitable northern long-eared bat or tricolored bat roosting habitat?

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

29. Will the action cause an increase in the extent of suitable forested habitat exposed to artificial lighting?

    No

30. Will the action include tree cutting or other means of knocking down or bringing down trees, tree topping, or tree trimming?

    Yes

31. Is the project related to the production of coal, including projects that support the mining of coal, as well as the production and/or distribution of energy produced from coal?

    No

32. Will the proposed action occur exclusively in an already established and currently maintained utility right-of-way?

    No

33. Does the action include emergency cutting or trimming of hazard trees in order to remove an imminent threat to human safety or property? See hazard tree note at the bottom of the key for text that will be added to response letters

    Note: A "hazard tree" is a tree that is an immediate threat to lives, public health and safety, or improved property.

    No

34. Does the project intersect with the 0- 9.9% forest density category?

    Automatically answered
    No

35. Does the project intersect with the 10.0- 19.9% forest density category map?

    Automatically answered
    No

36. Does the project intersect with the 20.0- 29.9% forest density category map?

    Automatically answered
    Yes

37. Does the project intersect with the 30.0- 100% forest density category map?

    Automatically answered
    No

38. Will the action cause trees to be cut, knocked down, or otherwise brought down across an area greater than 40 acres in total extent?

    No

39. Will the proposed action result in the use of prescribed fire?

    Note: If the prescribed fire action includes other activities than application of fire (e.g., tree cutting, fire line preparation) please consider impacts from those activities within the previous representative questions in the key. This set of questions only considers impacts from flame and smoke.

    No

40. Does the action area intersect the tricolored bat species list area?

    Automatically answered
    Yes

41. Is the action area located within 0.5-mile of radius of an entrance/opening to any known tricolored bat hibernacula or winter roost?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your state wildlife agency.

    Automatically answered
    No

42. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats? **Note:** The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

43. Has a presence/probable absence bat survey targeting the tricolored bat and following the Service's Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines been conducted within the project area?

    No

44. Is suitable summer habitat for the tricolored bat present within 1000 feet of project activities?
(If unsure, answer ""Yes."")

Note: If there are trees within the action area that may provide potential roosts for tricolored bats (e.g., clusters of leaves in live and dead deciduous trees, Spanish moss (Tillandsia usneoides), clusters of dead pine needles of large live pines) answer ""Yes."" For a complete definition of suitable summer habitat for the tricolored bat, please see Appendix A in the Service's Range-wide Indiana Bat and Northern long-eared Bat Survey Guidelines.

Yes

45. Do you have any documents that you want to include with this submission?

Yes

SUBMITTED DOCUMENTS

- *USFWS - Scoping Response Email chain 08-04 to 11-14-25.pdf https://ipac.ecosphere.fws.gov/project/6HMKZU7D5RAZRGGGWKHF34JN6Q/projectDocuments/176199175*

PROJECT QUESTIONNAIRE

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

12.4

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Jamie Morgan
Address: 4 WALTER E FORAN BLVD # 209
City: Flemington
State: NJ
Zip: 08822
Email jamie.morgan@davey.com
Phone: 9087889676

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Aviation Administration

Appendix I: Biological Resources Documents

6. Mussel Flow Report

MANASSAS REGIONAL AIRPORT - BROAD RUN FLOW MEASUREMENTS

PRINCE WILLIAM COUNTY, VA

PREPARED FOR

Davey Resource Group, Inc.

DATE: 12/12/2025

BIOSURVEY GROUP

Table of Contents

Tables

Introduction

To support the environmental commitments of the project team and protect freshwater mussels during the upcoming bridge construction activities at the Manassas Regional Airport, BioSurvey Group conducted a series of wading-discharge measurements on Broad Run. These measurements were collected to establish a defensible minimum-flow threshold engineers can use to design and manage bypass pumping, cofferdam dewatering, and other instream construction activities.

A recent mussel survey completed for the Airport documented a large mussel community downstream of the project area, which included the collection of more than 10,500 live mussels (BioSurvey Group, Manassas Regional Airport – Broad Run Mussel Survey Report, 12/5/2025). Because mussels are sensitive to dewatering, maintaining an appropriate minimum discharge during construction is essential.

Methods

Five flow measurement sites were evaluated on Broad Run on December 9, 2025 using a Hach FH950 Portable Flow Meter. Weather conditions were overcast with air temperatures in the low 30's F. All measurements employed the procedures outline in the HACH FH950 Edition 4 User Manual. Field work was completed by biologists Brad Novak and Ben Ebert.

Results

Measured discharge ranged from 6.53 - 7.82 ft^3/s among the five sampling cross section locations, with an average of 7.48 ft^3/s. Coordinates for each of the sampling cross section locations are provided in the table below; sites were concentrated near the downstream extent of the project proposed direct impact area. Substrates were dominated by concrete and boulder, except for Site 1, which contained a sand bar.

Table 1. Broad Run Discharge Measurement Summary (December 9, 2025)

Site	Coordinates	Stream Width (ft)	Mean Depth (ft)	Discharge (ft^3/s)
MANAS 1	38.7176375, -77.5089452	42.50	0.61	6.53
MANAS 2	38.7173309, -77.5094401	27.00	1.56	7.79
MANAS 3	38.7171959, -77.5096131	26.00	1.15	7.64
MANAS 4	38.7185128, -77.5086707	14.00	1.00	7.82
MANAS 5	38.7180432, -77.5089295	15.00	1.09	7.64

Discussion

Broad Run does not have an established flow / stage / discharge gauge, so discharge values were compared to the nearest active USGS gage (Cedar Run [USGS 01656000]), near Catlett, VA 13.3 km (8.3 mi) which recorded discharge of 3.96 to 4.27 ft^3/s during the same time period (December 9th - 9am- 3pm), representing extremely low-flow conditions. Slightly lower flows occurred in mid- to late October, when Cedar Run briefly dropped below 1 ft^3/s.

Informal coordination with DWR indicated that flows near those observed on December 1st would represent a reasonable and conservative minimum discharge value for mussel protection. On that date, Cedar Run measured 3.96 ft^3/s, nearly identical to the low-flow conditions documented on December 9th.

Based on the measurements collected on Broad Run and the low-flow patterns observed on Cedar Run, a minimum discharge of 7.48 ft^3/s should be maintained during all instream construction activities. Maintaining this flow will prevent mussels from becoming stranded and provides a conservative, scientifically supported minimum-flow benchmark for construction.