5.0 Natural Ecological Systems and Endangered Species

5.1. Introduction

This chapter defines the natural ecological systems and endangered species resources pertinent to the Long Bridge Project (the Project), and defines the regulatory context, methodology, and Affected Environment. For each Action Alternative and the No Action Alternative, this chapter assesses the potential short-term and long-term impacts on natural ecological systems and endangered species. This chapter also discusses proposed avoidance, minimization, and mitigation measures to reduce adverse impacts of the Project.

Natural ecological systems include natural upland and aquatic communities and ecosystems, inclusive of their plant and animal components. **Ecologically sensitive areas** refer to natural areas that the state or Federal government has designated for conservation purposes. At the Federal level, ecologically sensitive areas include designated National Wildlife Refuges and "critical habitat" areas. At the state level, ecologically sensitive areas include those designated by the Virginia Department of Conservation and Recreation (VDCR) and the District Department of Energy and Environment (DOEE) as Natural Area Preserves and Natural Community Areas.

The Endangered Species Act of 1973 (ESA) defines an **endangered species** as "any species which is in danger of extinction throughout all or a significant portion of its range."[1] The ESA also defines a **threatened species** as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

5.2. Regulatory Context and Methodology

This section describes the most pertinent regulatory context for evaluating impacts to natural ecological systems and endangered species and summarizes the methodology for evaluating current conditions and the probable consequences of the alternatives. This section also includes a description of the Study Area. **Appendix F1, Methodology Report**, provides the complete list of laws, regulations, and other guidance considered, and a full description of the analysis methodology.

5.2.1. Regulatory Context

Multiple Federal agencies play a role in the permitting, monitoring, restoring, and mapping of natural ecological systems, including the United States Army Corps of Engineers (USACE), the United States Environmental Protection Agency (EPA), the National Oceanic and Atmospheric Administration (NOAA), and the United States Fish and Wildlife Service (USFWS). USACE is responsible for overseeing the protection of wetlands and other waters of the US and issuing permits under Section 404 of the Clean Water Act of 1972, which are required for dredge and fill activities within jurisdictional wetlands and

[1] 16 USC 1531

waters.[2] The NOAA National Marine Fisheries Service (NMFS) has regulatory oversight of endangered or threatened marine mammals and fishes.

The USFWS is the Federal agency responsible for administration of the ESA, the Bald and Golden Eagle Protection Act of 1940,[3] and the Migratory Bird Treaty Act of 1918.[4] The ESA is the primary Federal legislation regulating threatened and endangered species. Per USFWS, states serve as "Chief Stewards" for wildlife within their borders and may suggest species for listing, monitor species, assess habitats, and designate critical habitat for any Rare, Threatened, and Endangered (RTE) or candidate species. In Virginia, the Virginia Department of Agriculture and Consumer Services, the Virginia Department of Game and Inland Fisheries (VDGIF), and VDCR's Division of Natural Heritage share responsibilities. The District acts in the role of a state government as well as a local government. The DOEE enforces local wildlife laws.

5.2.2. Methodology

5.2.2.1. Natural Ecological Systems

The Local Study Area for natural ecological systems (**Figure 5-1**) includes the immediate Project footprint and lands and waters within 500 feet of the Project Area. This Local Study Area would capture any potential direct or indirect impacts caused by the footprint of the No Action and Action Alternatives. The Local Study Area also includes immediately adjacent waters connected to resources within the Project footprint as well as resources that the Project may affect either directly or indirectly. For the assessment of impacts to submerged aquatic vegetation (SAV) in the Potomac River, the Local Study Area also includes a distance approximately 2,000 feet upstream and downstream to address the potential for scour and deposition to SAV beds. The analysis did not include a larger Regional Study Area for natural ecological systems, as widespread impacts are not anticipated for these resources due to the localized footprint of the No Action and Action Alternatives.

The analysis based the documentation of the Affected Environment for natural ecological systems on reviews of available reports and data, Geographic Information Systems (GIS) databases, maps, reports, modeling, fieldwork, and professional judgment.

The analysis assessed impacts of the No Action and Action Alternatives on sensitive habitats or ecosystems. Impact analysis included qualitative and quantitative methods to assess potential for direct and indirect impacts based on:

- Accessibility of habitat;
- Proximity of habitat and proximity to the Project; and
- Potential changes to important habitat characteristics (for example, water and air quality, noise and vibration), impacts to habitat, and ecological conditions.

[2] 33 USC 1251
[3] 16 USC 668-668d
[4] 16 USC 703-712; 50 CFR 10.13

Figure 5-1 | Natural Ecological Systems, RTE Species, and SAV Local Study Area

5.2.2.2. Endangered Species

The Local Study Area for RTE species (**Figure 5-1**) includes the immediate footprint of the proposed Project and lands and waters within 500 feet of the Project Area. For the part of the Project over the Potomac River, the Local Study Area also includes approximately 2,000 feet upstream and downstream to address the potential for scour and deposition to habitat for listed species. The analysis did not include a larger Regional Study Area for Endangered Species, as widespread impacts are not anticipated for these resources due to the localized footprint of the No Action and Action Alternatives.

Resources used to identify RTE species within the Local Study Area for the Affected Environment include the USFWS Information for Planning and Consultation (IPaC) system, NOAA Fisheries information, the VDGIF Fish and Wildlife Information Service (FWIS),[5] the VDCR Natural Heritage Data Explorer, and the District's *Wildlife Action Plan*.

The analysis consisted of qualitative and quantitative methods to analyze the direct and indirect impacts of the proposed Project's structures and operations on endangered species. The analysis identified the impacts by assessing the potential of the No Action and Action Alternatives to:

- Affect or disrupt habitat or designated critical habitats (structure placement, vegetation removal);
- Change habitat conditions and quality for listed species due to proximity to the Project;
- Impact areas of seasonal importance for RTE species (breeding grounds, stopover sites);[6] and
- Change migration patterns and accessibility of habitat to RTE species.

5.3. Affected Environment

This section summarizes the existing conditions of the natural ecological systems and endangered species resources. For a complete description of the Affected Environment, see **Appendix D2, Affected Environment Report**.

An initial screening using the USFWS IPaC system identified no Federally listed RTE species, critical habitats, refuge lands, or fish hatcheries within the Local Study Area. Therefore, the documentation of the Affected Environment did not include fieldwork.

5.3.1. Natural Ecological Systems

5.3.1.1. Terrestrial Vegetation

The entire Local Study Area's terrestrial habitat is developed and includes public and government lands interconnected by transportation uses, maintained lawn grasses and landscaping, and small areas of early-succession habitats. The urban nature of the landscape limits the extent and diversity of existing

[5] Note that the online FWIS uses a standard 3-mile radius search on a study area to generate a list of wildlife and endangered species that occur or could occur within the study area. Thus, the data from VDGIF include a larger study area than other resource agencies.

[6] The place where a migratory bird pauses between migratory flights is called a *stopover site.*

vegetation within the Local Study Area. Small areas of early-succession, disturbed forest exist in the southern portion of the Local Study Area, adjacent to the railroad corridor (**Figure 5-2**).

Two small deciduous forest areas are in the southern portion of the Local Study Area, east of the railroad corridor. Another area of early-succession forest exists west of the railroad corridor and encompasses two small excavated basins. North of these excavated basins, the landscape consists of upland scrub-shrub vegetation with scattered trees, indicative of old field transitioning toward an early-succession forest. In addition to these natural communities, narrow strips of maintained grass with scattered landscape trees are present on both sides of the Potomac River.

5.3.1.2. Wetland Vegetation

Because of its highly urbanized landscape, the Local Study Area mostly lacks vegetated wetlands, except for three tidal wetlands (Wetland 1, 2, and 3) in the southern portion of the Local Study Area associated with Roaches Run Waterfowl Sanctuary (**Figure 5-2**).[7] Wetland 1 (approximately 0.70 acres) is classified as palustrine scrub-shrub, broad-leaved deciduous, seasonally flooded tidal (PSS1R). Wetland 2 (approximately 1.27 acres) is classified as palustrine-forested, broad-leaved deciduous, seasonally flooded tidal (PFO1R). Wetland 3 is a freshwater marsh bisected by the southern Local Study Area boundary. Approximately 1.39 acres of this wetland occur within the Local Study Area, and the remainder of this wetland extends outside of the Local Study Area to the south. The National Wetlands Inventory classifies the wetland as an emergent system with persistent vegetation (PEM2R).

5.3.1.3. Submerged Aquatic Vegetation

SAV are vascular plants that grow completely underwater or up to the water surface in tidal and non-tidal waterways. SAV are ecologically important to the Chesapeake Bay region.[8] The analysis used data available through DOEE and the Virginia Institute of Marine Science (VIMS) (2013–2017) to identify documented locations of SAV within the SAV Local Study Area. SAV have been present over this time period in the Potomac River and in Roaches Run (**Figure 5-3**).[9] Most recent available data (2017) obtained from VIMS show that SAV beds are present in Roaches Run within the southern portion of the SAV Local Study Area and along the north shoreline of the Potomac River immediately upstream from Long Bridge.

[7] Wetlands are jointly defined by the EPA and USACE as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (33 CFR 329)

[8] Batiuk, R., Bergstrom, P., et al. 2000. Chesapeake Bay submerged aquatic vegetation water quality and habitat-based requirements and restoration targets: A second technical synthesis. CBP/TRS 245/00. EPA/903/R-00/014. Annapolis, MD: U.S. Environmental Protection Agency, Chesapeake Bay Program. Accessed from http://archive.chesapeakebay.net/pubs/sav/index.html. Accessed December 12, 2017.

[9] Orth, R.J., Wilcox, D.J., et al. 2015. 2015 Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay and Coastal Bays. VIMS Special Scientific Report Number 155. Final report to EPA, Chesapeake Bay Program, Annapolis, MD. Grant No. CB96321901-0. Accessed from http://www.vims.edu/bio/sav/sav14. Accessed December 12, 2017.

Figure 5-2 | Terrestrial and Wetland Vegetation Map

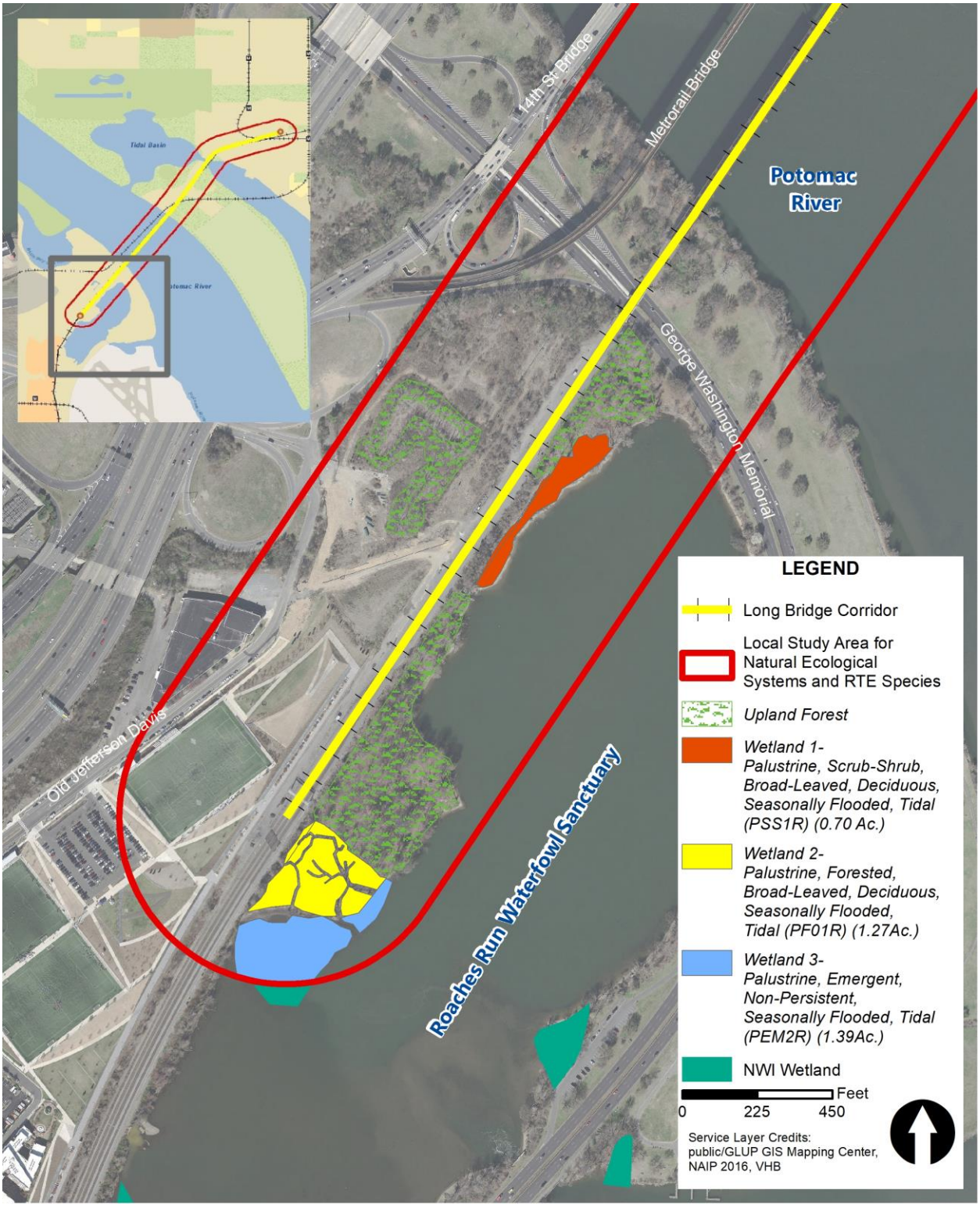
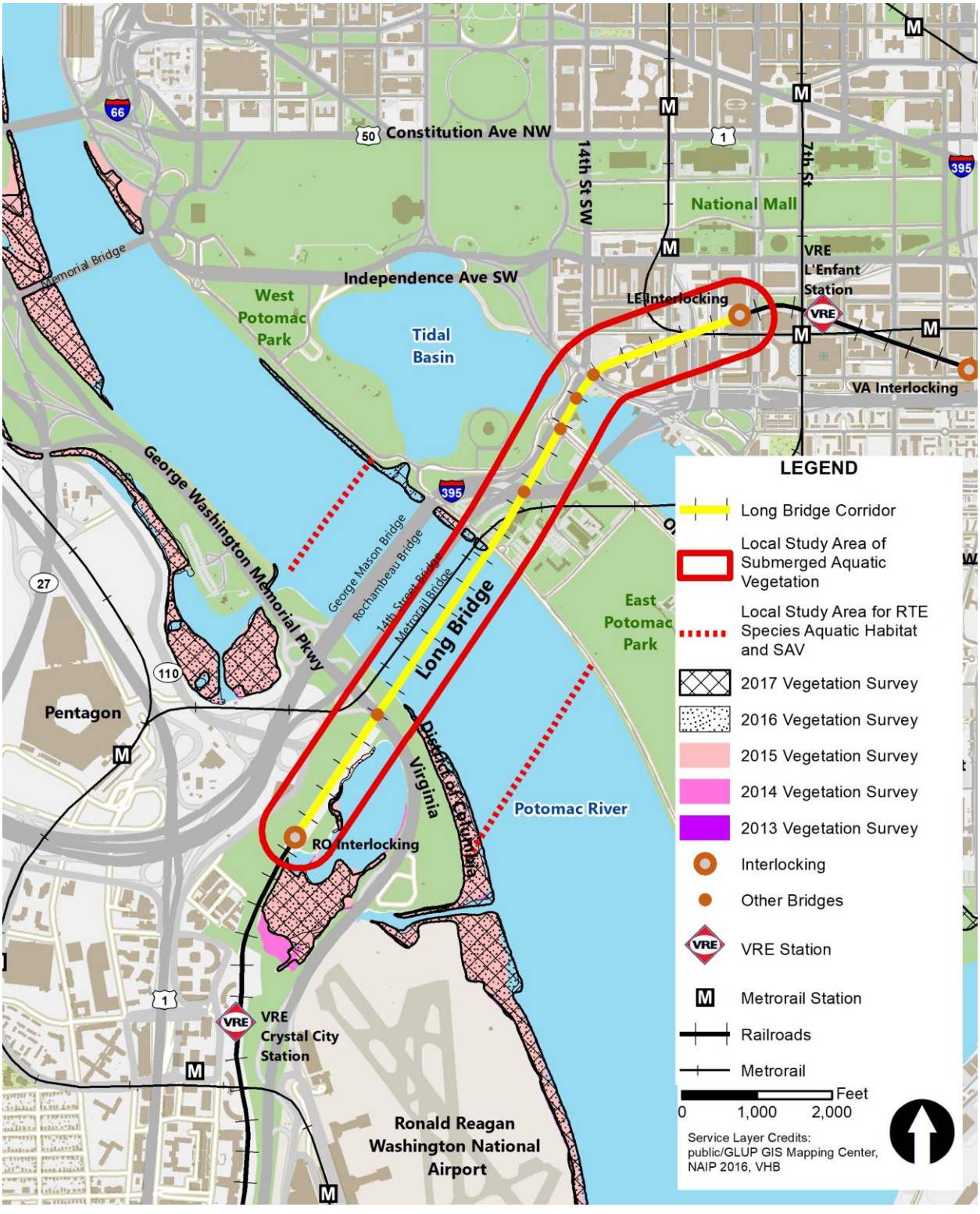


Figure 5-3 | Locations of Submerged Aquatic Vegetation from 2013–2017



5.3.1.4. Wildlife

The majority of the Local Study Area consists of open water or urban landscapes devoid of vegetation or containing primarily managed lawn and planted ornamental trees and shrubs. A lack of necessary food, water, cover, and shelter limits wildlife use of the developed landscapes. Smaller portions of the Local Study Area contain early-successional forest or scrub-shrub habitat with sufficient area to support species of wildlife adapted to disturbed or edge habitats.

Birds are the most widely represented wildlife species within the Local Study Area, as many species are aquatic or semi-aquatic and make use of the Potomac River, Washington Channel, Tidal Basin, and Roaches Run. Other bird species have adapted to disturbed or edge habitats present within the Local Study Area. While there may be limited numbers of breeding birds within the Local Study Area, other species may use habitats within the Local Study Area during the winter or as a temporary stopover habitat during spring and fall migration. Wildlife, especially wintering waterfowl, use the aquatic habitats provided by the Roaches Run Waterfowl Sanctuary. No eagle nests are known to occur within 600 feet of the Project Area. Terrestrial and aquatic mammals, amphibians, and reptiles within the Local Study Area are mostly represented by common species that are tolerant of some disturbance. The shoreline of the Potomac River on the Virginia side likely serves as a wildlife corridor, particularly where the Mount Vernon Trail (MVT) extends through the Local Study Area.

5.3.1.5. Aquatic Biota

The diversity and species composition of fish communities are often indicative of the health of the aquatic system. Anadromous, catadromous, estuarine, and tidal freshwater fish species use the part of the Potomac River that lies within the Local Study Area. Five DOEE fish monitoring sites are located within or near the Local Study Area—two near Ronald Reagan Washington National Airport, one near Roaches Run Waterfowl Sanctuary, one near the 14th Street Bridge, and one in the Washington Channel. Between 2010 and 2016, the DOEE documented 44 fish species within the Local Study Area, comprised of 29 genera and 14 families, including migratory and gamefish species. DOEE documents five invasive species within the Local Study Area: blue catfish, flathead catfish, common carp, goldfish, and snakehead.

The composition of the benthic macroinvertebrate community (that is, small aquatic animals and aquatic insect larvae that lack backbones) is commonly used as a gauge to determine the health of an aquatic system. Very little existing data on the benthic macroinvertebrate community within the Local Study Area are available. However, a study of aquatic snails from National Park sites in Northern Virginia documented several species in the Potomac River and in Roaches Run. Although none of the species are listed as rare, threatened, or endangered, *Gyraulus deflectus* was collected from Roaches Run, which is the first record for Arlington County. Other extant populations are known only from Accomack County.[10] The nearest monitoring site in the Potomac River, approximately 7.4 miles downstream of the Local Study Area, was sampled annually for the last 10 years and rated as Degraded or Severely Degraded.[11] Consultation with the District Department of Energy and Environment (DOEE) and NMFS

[10] Steury, Brent..*Aquatic Snails (Gastropoda) from National Park Sites in Northern Virginia and Adjacent Maryland, with an Updated Checklist of Regional Species*. Banisteria. 44. 13-18.
[11] Llanso, R. J., Zeveta, D., and Scott, L.C. 2015. *Chesapeake Bay Water Quality Monitoring Program: Long-term Benthic Monitoring and Assessment Component Level 1 Comprehensive Report*. Versar, Inc.

confirmed that no Essential Fish Habitat (EFH) exists within the Project Area (see **Appendix C, Project Correspondence**).

5.3.2. Rare, Threatened, and Endangered Species

On December 4, 2017, FRA and DDOT sent formal project review requests to the USFWS, NMFS, VDCR, and DOEE to obtain information on the potential occurrence of any RTE species and ecologically sensitive communities near the Local Study Area. In a January 2, 2018, project review email, the NOAA Fisheries Protected Resources Division indicated that the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostum*) are present in the Potomac River. Confirmation from DOEE regarding the presence of RTE species in the District identified that three Federally listed species are known to occur in or may occur in the District of Columbia: shortnose sturgeon, northern long-eared bat (*Myotis septentrionalis*), and Hay's spring amphipod (*Stygobromus hayi*). However, DOEE stated that according to current observations, surveys, and data derived from the District's *Wildlife Action Plan*, no listed species were found within the Local Study Area.[12] Based on an initial screening using the USFWS IPaC system, no other state or Federally listed species or critical habitats have been documented or are likely to occur within the RTE Local Study Area. Thus, additional coordination with USFWS regarding these resources is not necessary.

An official response from VDCR regarding the presence of natural heritage resources in Virginia was received on January 2, 2018. The VDCR letter indicates that the state-rare plants Davis's sedge (*Carex davisii*) and river bulrush (*Bolboschoenus fluviatilis*) have been documented within 2 miles of the Study Area. In addition, NPS indicates the presence of these plants within the wetlands associated with Roaches Run. Because these plant species are not state or Federally listed, detailed field surveys for these species were not conducted as part of this study; however, neither of these species were observed during the terrestrial or aquatic vegetation assessment fieldwork.

NPS has reported the presence of nesting sites for Peregrine Falcons and Black-Crowned Night Heron on the north side of the Washington Channel along the existing railroad tracks, although no reports have been posted on eBird checklists and DOEE did not indicate their presence. While not RTE species, these species are on the District's list of Species of Greatest Conservation Need.[13] Prior to construction, the Virginia Department of Rail and Public Transportation (DRPT), as the project sponsor for final design and construction, would conduct a survey during nesting season to determine the species' presence.

5.4. Permanent or Long-Term Effects

This section discusses the permanent or long-term effects following the construction of the No Action Alternative and Action Alternatives on the natural ecological systems and endangered species resources within the Local and Regional Study Areas. For a complete description of the permanent or long-term effects, see **Appendix D3, Environmental Consequences Report**.

[12] DOEE. 2018. Section 7 Consultation, Coastal Resources, Inc., Long Bridge Project. December 6, 2018.
[13] DOEE. District of Columbia Wildlife Action Plan, 2015 Update. July 2015. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/00_2015WildLifeActionPlan_Chapters_07_31_2015_PublicVersion_0.pdf. Accessed May 20, 2019.

5.4.1. Natural Ecological Systems

5.4.1.1. Terrestrial Vegetation

No Action Alternative

The No Action Alternative may have some adverse permanent direct impact to natural ecological systems through the conversion of existing land coverage to railroad structures and maintained right-of-way. However, most of the land within the Local Study Area that would be affected by the projects in the No Action Alternative is already developed. In the No Action Alternative, the Long Bridge Corridor would continue to operate with two tracks crossing the Potomac River. The No Action Alternative presumes that Long Bridge remains in service, with continued maintenance as necessary. The No Action Alternative also presumes that DRPT and VRE would complete the other planned railroad projects that would expand capacity to four tracks on either side of the Long Bridge Corridor. These separate projects may result in some limited removal of terrestrial vegetation, particularly within the Virginia portion of the Local Study Area. The Long Bridge Park project will also result in the removal of some of the early-succession forest located to the west of the existing railroad alignment.

Action Alternative A (Preferred Alternative)

Action Alternative A would have minor permanent direct adverse impacts to terrestrial vegetation associated with the removal of vegetation required for the linear footprint of the additional two tracks. Permanent impacts would total 3.7 acres of narrow, short strips of terrestrial vegetation at Long Bridge Park, George Washington Memorial Parkway (GWMP), and East Potomac Park. **Table 5-1** shows the amount of permanent impacts to terrestrial vegetation. **Figures 5-4, 5-5**, and **5-6** depict the areas of permanent impacts to vegetated areas for Action Alternative A.

Table 5-1 | Permanent Impacts to Terrestrial Vegetation

	Action Alternative A (Preferred Alternative)	Action Alternative B
Forests	No direct impacts 0 sf (0 ac)	Minor adverse long-term direct impacts at Roaches Run and GWMP 2,135 sf (<0.1 ac)
Early Succession Field	Minor adverse long-term direct impacts where Long Bridge crosses GWMP and from construction 5,696 sf (0.1 ac)	Minor adverse long-term direct impacts where Long Bridge crosses GWMP and from construction 5,696 sf (0.1 ac)
Maintained Grass/ Landscape	Minor adverse long-term direct impacts within the Long Bridge Corridor and from construction 156,836 sf (3.6 ac)	Minor adverse long-term direct impacts within the Long Bridge Corridor and from construction 177,594 sf (4.07 ac)

Figure 5-4 | Action Alternative A Permanent and Temporary Impacts to Vegetated Areas, RO Interlocking to the Potomac River

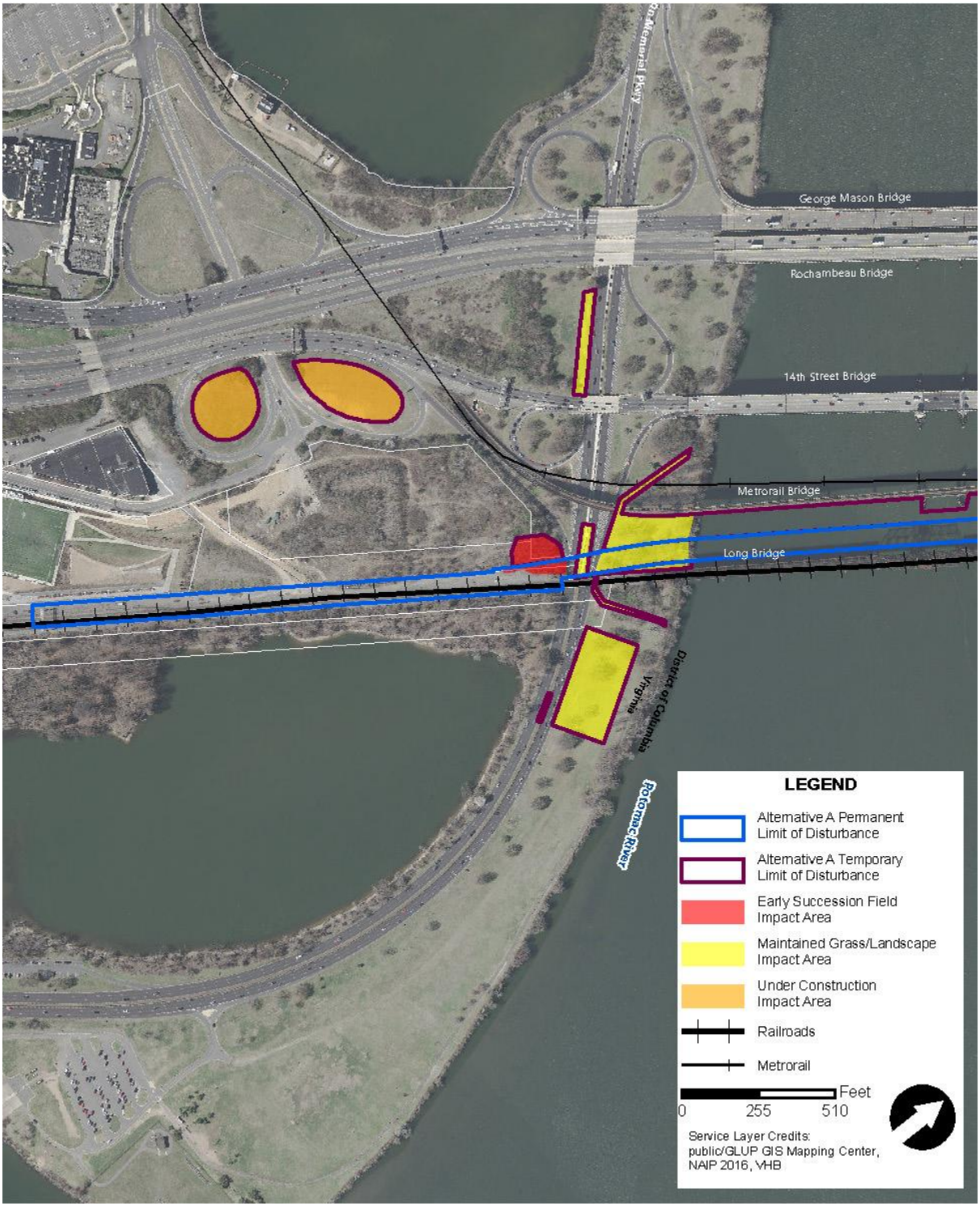


Figure 5-5 | Action Alternative A Permanent and Temporary Impacts to Vegetated Areas, Potomac River to Maine Avenue SW

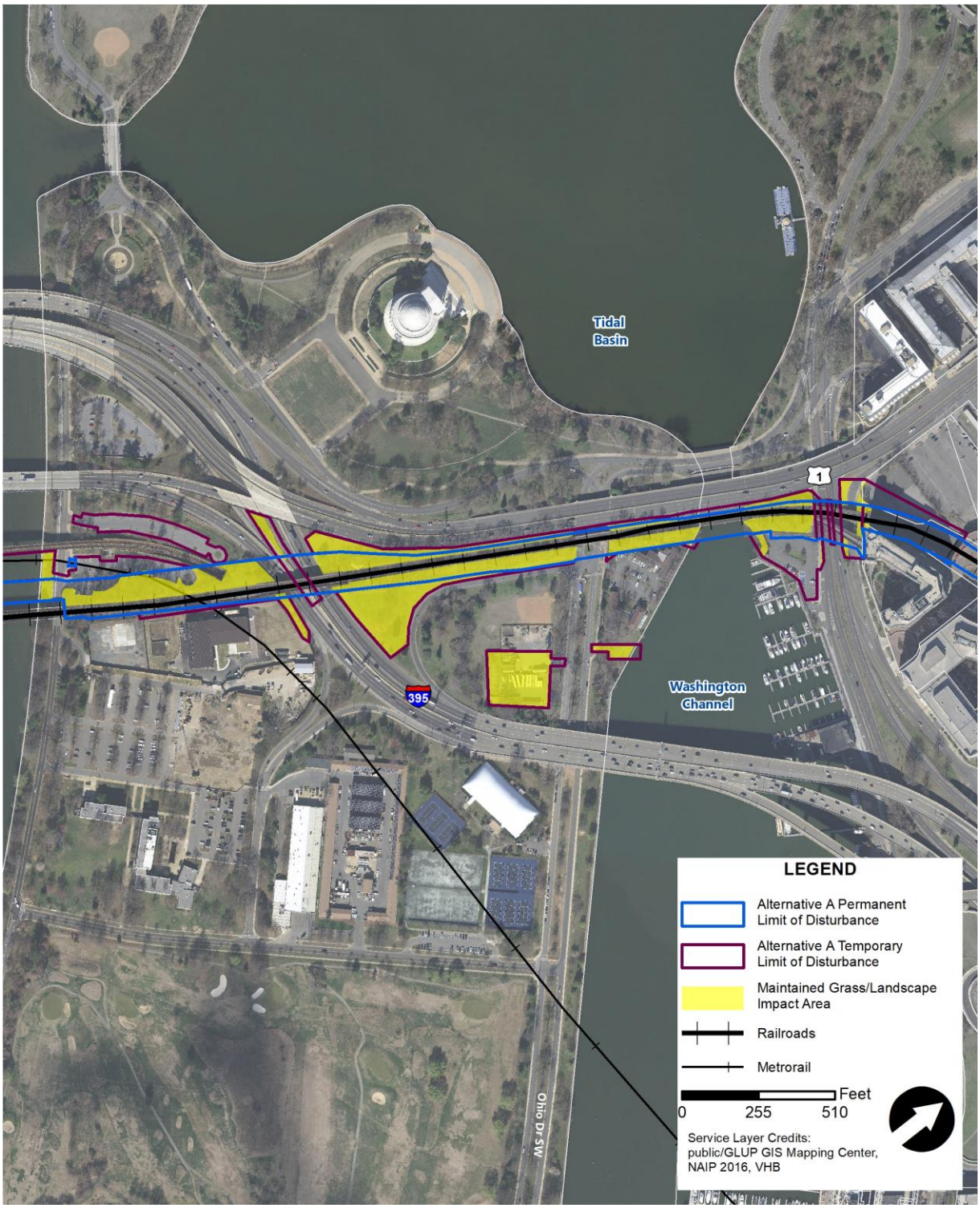
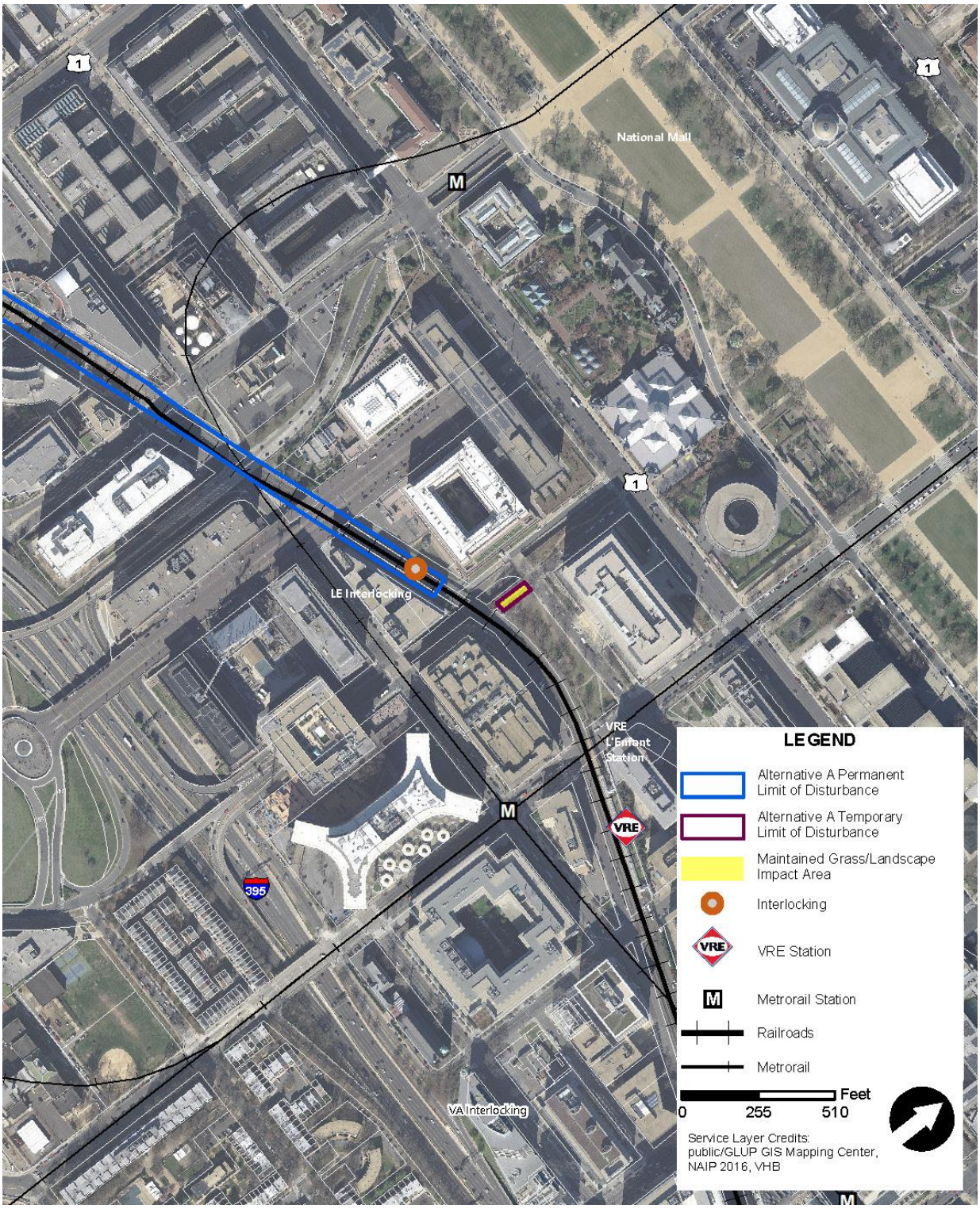


Figure 5-6 | Action Alternative A Permanent and Temporary Impacts to Vegetated Areas, Maine Avenue SW to LE Interlocking



At Long Bridge Park, near where the railroad bridge currently crosses the GWMP, impacts to 5,696 square feet (0.1 acre) of early succession scrub-shrub areas and small tree clusters would occur from the installation of the new bridge deck and support structures. Much of the woody vegetation at this location comprises non-native invasive species. The future phases of Long Bridge Park will clear and develop much of the remaining wooded area into more parkland.[14]

There would also be 156,836 square feet (3.6 acres) of permanent impacts to maintained or landscape areas within the Long Bridge Corridor that Action Alternative A would directly cross. These include several shade trees with maintained grass at the GWMP between the roadway and the Potomac River, as well as unmanaged patches of trees, vines, and shrubs adjacent to the existing tracks at the East Potomac Park.

Tree and vegetation removal or pruning from construction activities may result in permanent impacts to the overall plant community, including loss of species diversity. The risk of invasive species naturally replacing native vegetation would also increase. Even if construction activities do not directly remove trees, but rather require pruning or other alterations, improper tree care could result in tree degradation and death. Construction activities could result in delayed tree and vegetation impacts, as changes to surface water flow from compaction could impact the ability of trees to thrive. Similarly, if construction activities for Action Alternative A create new shaded areas and change sunlight pathways, vegetation could fail to thrive, resulting in mortality after construction is complete. In these circumstances, temporary impacts would become permanent. **Section 5.5, Temporary Effects**, provides the complete technical analysis of potential temporary impacts and discusses temporary impacts from tree and other vegetation removal during construction.

Action Alternative B

Action Alternative B would have minor permanent direct adverse impacts to terrestrial vegetation similar to Action Alternative A (**Table 5-1**). In addition, Action Alternative B would impact 2,135 square feet (<0.1 acre) of existing ash–leaf maple–black cherry forest between Roaches Run and the GWMP. Action Alternative B would also affect an additional 20,758 square feet (approximately 0.48 acres) of maintained or landscaped areas where it crosses the GWMP and East Potomac Park (**Figures 5-7** and **5-8**). Action Alternative B would have the same indirect impacts as those described for Action Alternative A.

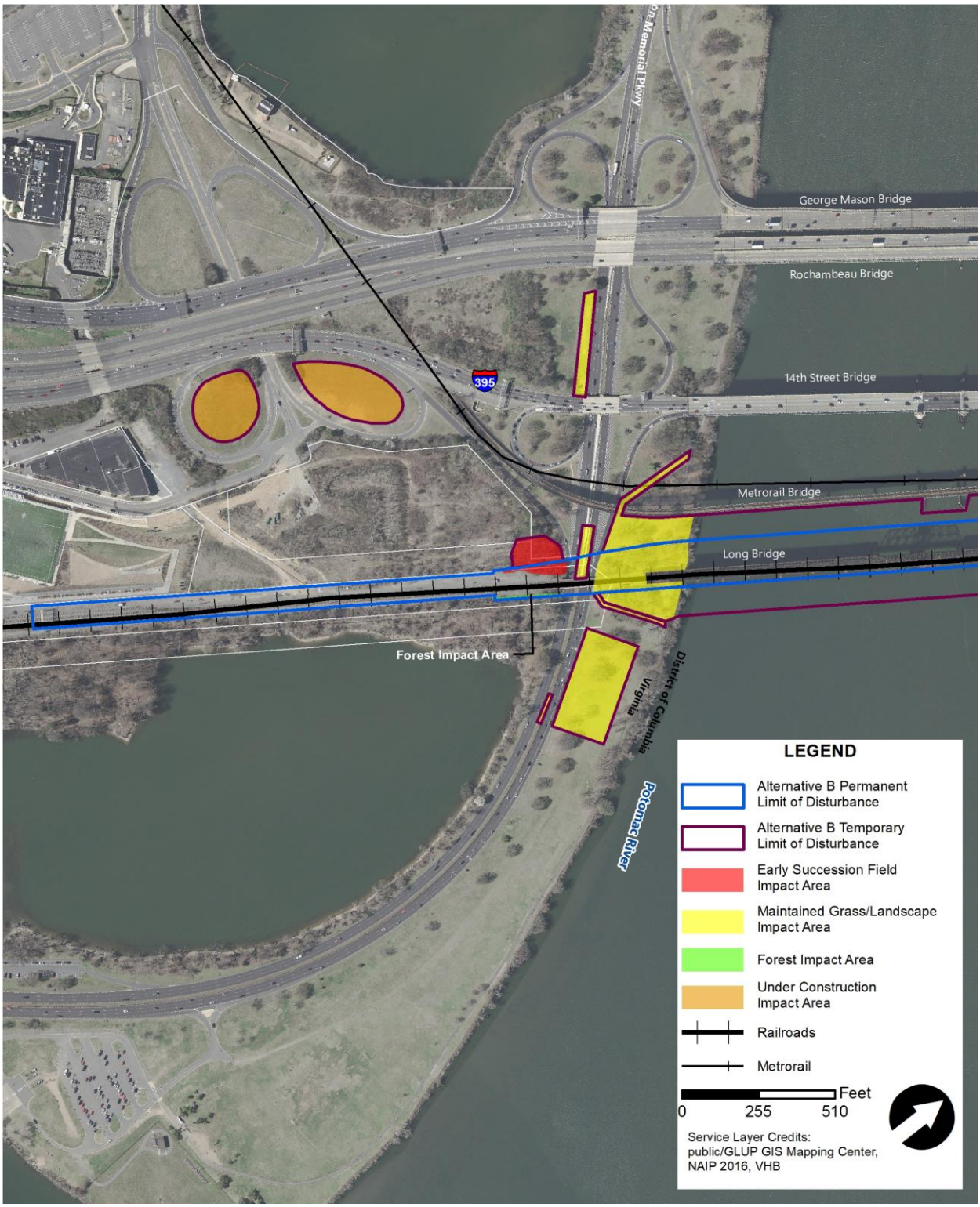
5.4.1.2. Wetland Vegetation

No Action Alternative

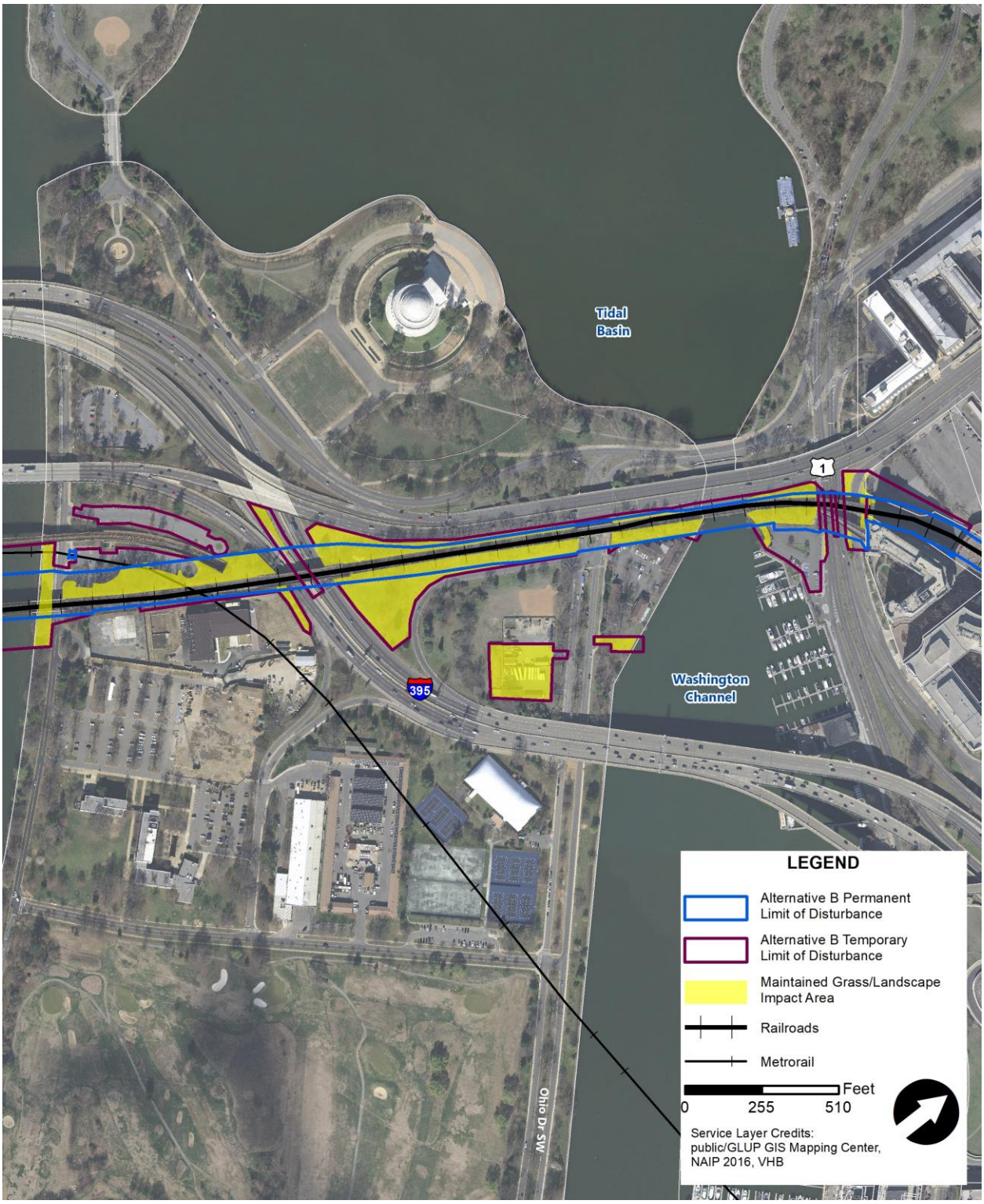
The No Action Alternative may have some adverse permanent direct impact to wetland vegetation through the conversion of existing land coverage to railroad structures and maintained right-of-way. However, most of the land within the Local Study Area that would be affected by the projects in the No Action Alternative is already developed. In addition, the majority of projects in the No Action Alternative are not located adjacent to wetlands.

[14] Note that all lands for Long Bridge Park are owned by Arlington County.

Figure 5-7 | Action Alternative B Permanent and Temporary Impacts to Vegetated Areas, RO Interlocking to the Potomac River



274 **Figure 5-8** | Action Alternative B Permanent and Temporary Impacts to Vegetated Areas, Potomac
275 River to Maine Avenue SW



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The DC2RVA Project would include work adjacent to Roaches Run, but as documented in the Final Environmental Impact Statement (FEIS) for that project, it would not affect that water body or its associated wetlands.[15] As noted in **Chapter 6, Water Resources and Water Quality**, the projects in the No Action Alternative would likely result in a slight increase in impervious area or conversion of a small area from previously disturbed vegetated area to rail ballast. However, the increased runoff would not be expected to be of sufficient volume to cause erosion of the wetlands nor carry enough sediment to fill in wetlands and cover vegetation.

Action Alternative A (Preferred Alternative)

Action Alternative A would have no permanent direct or indirect adverse impacts to wetland vegetation within the Local Study Area. None of the work associated with this alternative would extend into wetland areas such as Roaches Run. While Action Alternative A would cause slight increases in impervious surface as described in **Chapter 6, Water Resources and Water Quality**, the increased runoff would not be expected to be of sufficient volume to cause erosion of the wetlands nor carry enough sediment to fill in wetlands and cover vegetation.

Action Alternative B

Action Alternative B would have the same impacts on wetland vegetation as Action Alternative A, as the permanent footprint of the new bridge piers would be identical to the existing bridge piers. While Action Alternative B would cause slight increases in impervious surface as described in **Chapter 6, Water Resources and Water Quality**, the increased runoff would not be expected to be of sufficient volume to cause erosion of the wetlands nor carry enough sediment to fill in wetlands and cover vegetation.

5.4.1.3. Submerged Aquatic Vegetation

No Action Alternative

The No Action Alternative would have no direct impacts on SAV as none of the projects in the No Action Alternative would require construction within the Potomac River or Roaches Run that would cause additional shading of existing or potential SAV beds beyond the infrastructure already in place. In addition, the No Action Alterative would not cause increased sediment loads beyond current inputs that could result in sediment covering SAV and would not result in increased boat traffic that could negatively affect water clarity or cause propeller scarring of existing SAV beds.

[15] Virginia Department of Rail and Public Transportation. DC to Richmond Southeast High Speed Rail Final Environmental Impact Statement and Final Section 4(f) Evaluation, Updated Environmental Resource Mapbooks. May 2019. Accessed from http://dc2rvarail.com/files/4115/5380/5868/Part48b_Appendix_M1_Wetlands_Streams_Area1_-_Area2_Part1_DC2RVA_FEIS.pdf. Accessed July 16, 2019.

Action Alternative A (Preferred Alternative)

Action Alternative A would result in one pier encroaching into a SAV bed found along the northern shore of the Potomac River. This would result in minor permanent direct adverse impacts to SAV in the amount of 1,750 square feet associated with the 70-foot by 25-foot cofferdam construction of the pier structure (see **Figure 5-9**). Minor permanent impacts to SAV may occur over time via shading at this location caused by the new deck in the amount of 1,900 square feet, and minor permanent indirect adverse impacts could occur to downstream SAV beds in the Potomac River within the Local Study Area due to scour and deposition from installing the crossing piers.

Action Alternative B

Action Alternative B would have similar impacts on SAV as Action Alternative A. The new upstream bridge would be identical to the new bridge in Action Alternative A and would therefore have the same impacts. The piers for the replacement downstream bridge would be within the same footprint as the piers for the existing bridge and would therefore not have additional SAV impacts.

5.4.1.4. Wildlife

No Action Alternative

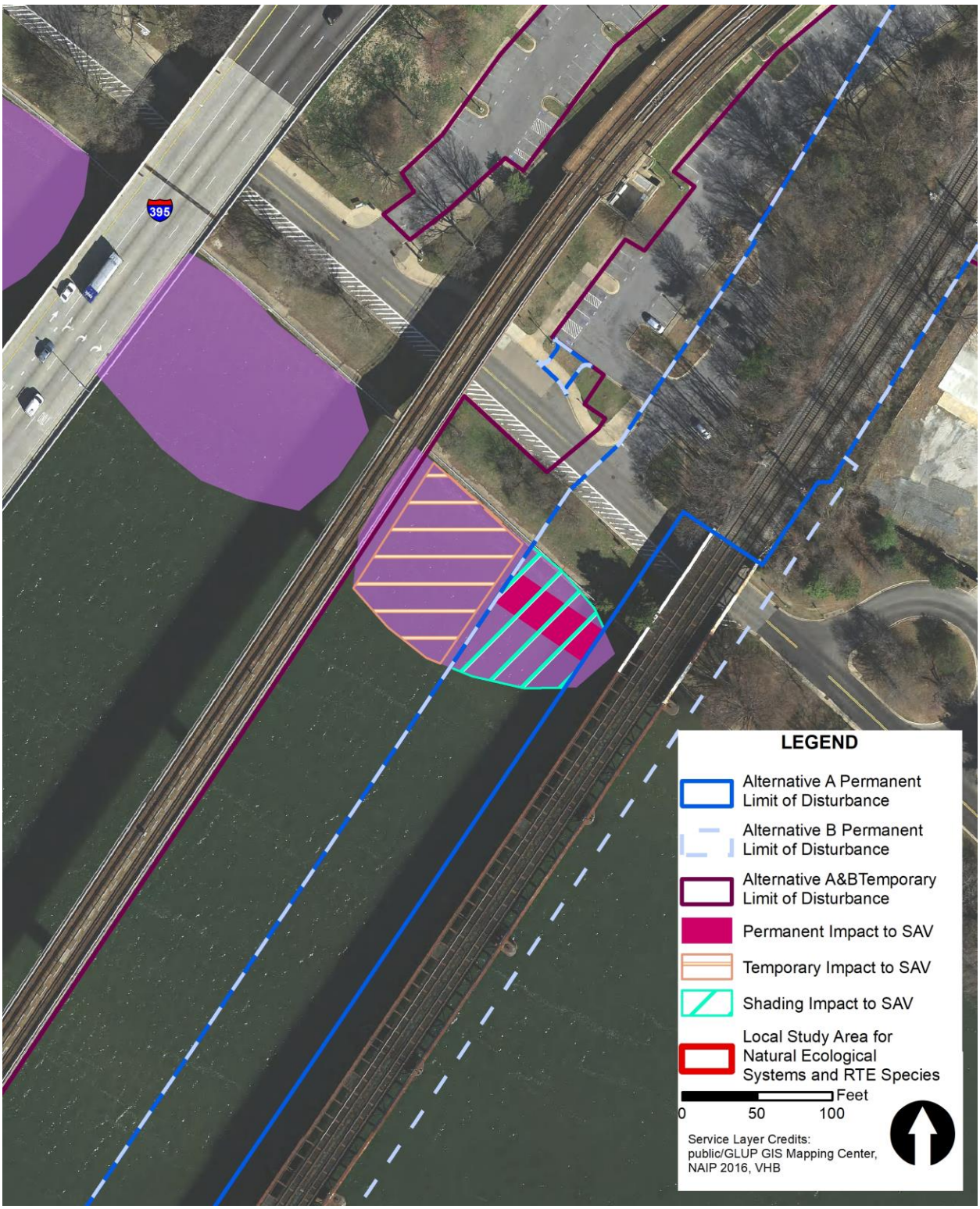
The No Action Alternative may have some adverse permanent direct impact to wildlife habitat through the conversion of existing land coverage to railroad structures and maintained right-of-way. However, most of the land within the Local Study Area that would be affected by the projects in the No Action Alternative is already developed.

Action Alternative A (Preferred Alternative)

Action Alternative A would cause minor permanent direct adverse impacts to wildlife habitat within the Local Study Area and therefore would cause negligible permanent indirect adverse impacts to wildlife in the region due to habitat loss. Action Alternative A would also cause a negligible permanent indirect beneficial impact to wildlife that use bridge structures due to an increase in available surface for plants and immobile wildlife to use as habitat and nesting sites for birds.

The construction of two additional railroad tracks for Action Alternative A would cause direct permanent loss of terrestrial habitat accessible to wildlife. Addition of the two new tracks would result in removal of several mature hardwood trees within the GWMP and minor encroachments to brushy and narrow strips of trees and small forested habitat south of the Potomac River.

334 **Figure 5-9** | Permanent and Temporary Impacts to Submerged Aquatic Vegetation



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Action Alternative A would not cause any impacts to the existing forest adjacent to Roaches Run. The new tracks would mostly be located within areas already disturbed and cleared of vegetation, creating only minor encroachment impacts to habitat and minimal affect to wildlife. An increase in invasive plant species following construction disturbance could cause long-term indirect effects, as invasive plants typically colonize disturbed ground. This potential effect would be negligible because, following construction, the disturbed ground would be stabilized with a native seed mix and restored, limiting the colonization by invasive plants. In addition, NPS will require the washing of equipment for all and any outside debris prior to entering the park lands or river. NPS will also require that any soils, sod, mulch, seed, or other organic matter be certified weed seed free.

Action Alternative A would not permanently affect waterfowl. The new bridge under Action Alternative A would increase available habitat for wildlife that use bridge structures.

Action Alternative B

Action Alternative B would cause similar negligible and minor permanent direct impacts to wildlife and wildlife habitat as Action Alternative A. Action Alternative B would also require additional forest clearing, permanently impacting approximately 2,135 square feet (<0.1 acre) of the forest adjacent to Roaches Run. The forest clearing would occur near the crossing of the replacement bridge over the GMWP. Forest within this area is already disturbed and made up of a mix of native and invasive trees and other plants. The small size and disturbed character of this existing forested area likely limits wildlife use, which also limits the opportunity for impacts to wildlife. Resident or transient wildlife would still have access to the remaining habitat adjacent to Roaches Run.

5.4.1.5. Aquatic Biota

No Action Alternative

The No Action Alternative would have no direct impacts on aquatic biota as none of the projects in the No Action Alternative would occur within the Potomac River or have impacts to fish habitat.

Action Alternative A (Preferred Alternative)

Action Alternative A would have minor permanent direct adverse impacts to aquatic biota. Action Alternative A would cause permanent impacts to aquatic biota from installing shaft foundations and pier structures in the Potomac River and Washington Channel. These activities would result in permanent loss or alteration of aquatic habitat. Impacts to benthic invertebrates, such as aquatic worms and crustaceans, would result from the disturbance of soft substrate habitat on the river bottom due to the installation of bridge piers. The bridge construction under the Preferred Alternative includes the installation of 22 piers in the Potomac River and replacing one pier in the Washington Channel/Tidal Impoundment with a larger pier, totaling 7,392 square feet (0.2 acre) and 1,115 square feet (<0.1 acre) of disturbed benthic habitat, respectively.

Impacts from habitat disturbance would have a minor, localized effect on benthic invertebrates due to the relative abundance of remaining available habitat within and adjacent to the Local Study Area. In addition to direct habitat disturbance, increased shading associated with the bridge deck may limit ecosystem productivity and benthic invertebrate density and diversity in areas that remain shaded for

most of the day.[16] Although construction activities in the Potomac River would not affect SAV beds, the increased shading associated with the additional two-track bridge may constrain the spread of adjacent beds, a high-quality habitat for benthic invertebrates, fish, and other aquatic biota.

Overall, Action Alternative A would cause negligible permanent direct impacts to fish, including migratory species. For navigation and hydraulic reasons, the additional 22 piers in the Potomac River would line up with the pier structures on the existing bridge, minimizing permanent impacts to migratory species. The Action Alternatives would cause no adverse long-term effects to EFH based on consultation with NMFS and the absence of EFH in the Local Study Area.

Action Alternative B

Action Alternative B would have the same direct permanent impacts to aquatic biota as Action Alternative A. Because the permanent footprint of the pier structures of the replaced bridge would be identical to the existing footprint, there would be no additional permanent impacts to aquatic biota.

5.4.2. RTE Species

5.4.2.1. No Action Alternative

The No Action Alternative may have some adverse permanent direct impact to RTE species through the conversion of existing land coverage to railroad structures and maintained right-of-way. However, most of the land within the Local Study Area that would be affected by the projects in the No Action Alternative is already developed.

5.4.2.2. Action Alternative A (Preferred Alternative)

Action Alternative A would have minor permanent direct adverse impacts to shortnose or Atlantic sturgeon. Permanent or long-term direct effects to sturgeon could occur from permanent changes to available habitat within the Local Study Area for the new two-track bridge crossing of the Potomac River.

As noted above, shortnose sturgeon is the most likely species of sturgeon to occur within the Project Area, but Atlantic sturgeon cannot be completely ruled out. One of the Atlantic sturgeon Critical Habitat components is availability of soft-bottom substrate for foraging within salinity ranges from 0 to 0.5 parts per thousand. The Local Study Area lies within this salinity range; therefore, bridge piers would permanently impact the soft-bottom substrate.[17,18] However, because of the availability of foraging and spawning habitat further upstream in the Potomac River, it is unlikely that sturgeon would use the Washington Channel/Tidal Impoundment. Thus, impacts to habitat as a result of pier placement in the Washington Channel/Tidal Impoundment would be minor.

[16] Struck, S.D., Craft, C.B., Broome, S.W, Sanclements, M.D. and Sacco, J.N. 2004. *Effects of bridge shading on estuarine marsh benthic invertebrate community structure and function*. Environmental Management 34(1):99-111.
[17] Shortnose Sturgeon Status Review Team. 2010. *A Biological Assessment of shortnose sturgeon (Acipenser brevirostrum)*. Report to National Marine Fisheries Service, Northeast Regional Office. November 1, 2010. 417 pp.
[18] Atlantic Sturgeon Status Review Team. 2007. *Status Review of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus)*. Report to National Marine Fisheries Service, Northeast Regional Office. February 23, 2007. 174 pp.

5.4.2.3. Action Alternative B

The permanent direct impacts to shortnose or Atlantic sturgeon under Action Alternative B would be the same as the impacts resulting from Action Alternative A.

5.5. Temporary Effects

This section discusses the direct or indirect temporary effects of the No Action Alternative and Action Alternatives during construction, based on conceptual engineering design. For a complete description of the temporary effects to natural ecological systems, see **Appendix D3, Environmental Consequences Report**.

5.5.1. Natural Ecological Systems

5.5.1.1. Terrestrial Vegetation

No Action Alternative

Projects included in the No Action Alternative may result in temporary direct adverse impacts due to limited removal of terrestrial vegetation for construction access and staging, particularly within the Virginia portion of the Local Study Area.

Action Alternative A (Preferred Alternative)

Action Alternative A would result in minor temporary direct adverse impacts to terrestrial vegetation. A number of the staging areas would be located in existing surface parking lots, where vegetation impacts are unlikely. For staging areas located in vegetated medians, tree densities would be low enough to avoid altogether, and impacts may be localized to only grass or herbaceous land cover. Temporary impacts stemming from the diversions of the MVT would impact lawns and could impact landscaped features within the park. An equipment storage yard used by NPS was set up within a ball field next to Ohio Drive SW for construction of NPS facilities. While this storage yard is no longer active, and the ballfield has been restored, the Long Bridge project will utilize this same yard as a staging area. Staging area impacts would occur on the grass cover affiliated with the ball field. Similarly, the proposed staging area on the other side of Ohio Drive SW is also vegetated and would experience impacts to the grass cover. All of these areas would be restored and reseeded post-construction to ensure the impacts to these areas are temporary. **Table 5-2** summarizes temporary vegetation impact areas for Action Alternative A, while **Figures 5-4 through 5-6** illustrate the impacts. Construction impacts would occur over approximately 5 years.

Table 5-2 | Temporary Impacts to Terrestrial Vegetation

	Action Alternative A (Preferred Alternative)	Action Alternative B
Forests	No temporary impacts 0 sf (0 ac)	No temporary impacts 0 sf (0 ac)
Early Succession Field	Minor adverse short-term effects due to construction staging access 13,717 sf (0.3 ac)	Minor adverse short-term effects due to construction staging access 13,717 sf (0.3 ac)
Maintained Grass/ Landscape	Minor adverse short-term effects due to construction staging access 269,311 sf (6.1 ac)	Minor adverse short-term effects due to construction staging access 289,165 sf (6.6 ac)

Action Alternative B

Action Alternative B would also result in minor temporary direct adverse impacts to terrestrial vegetation. Temporary impacts would be similar to Action Alternative A. However, temporary impacts to maintained landscape areas would increase to 289,165 square feet (approximately 6.6 acres). **Table 5-2** summarizes the temporary vegetation impact areas for Action Alternative B. **Figures 5-7** and **5-8** illustrate the impacts. Construction impacts would occur over approximately 8 years and 3 months.

5.5.1.2. Wetland Vegetation

No Action Alternative

The No Action Alternative may have adverse temporary impacts to wetland vegetation due to the potential for construction work adjacent to or within Roaches Run for the DC2RVA Project.

Action Alternative A (Preferred Alternative)

Action Alternative A would have no temporary adverse impacts to wetland vegetation within the Local Study Area because implementing the avoidance and minimization techniques detailed in **Section 5.6, Avoidance, Minimization, and Mitigation** would prevent construction work impacts such as runoff from extending into wetland areas.

Action Alternative B

Like Action Alternative A, Action Alternative B would have no temporary adverse impacts to wetland vegetation within the Local Study Area because implementing the avoidance and minimization techniques detailed in **Section 5.6, Avoidance, Minimization, and Mitigation** would prevent construction work impacts such as runoff from extending into wetland areas.

5.5.1.3. Submerged Aquatic Vegetation

No Action Alternative

The No Action Alternative would have no temporary impact on SAV because none of the projects in the No Action Alternative would require construction activities in the Potomac River or Roaches Run.

Action Alternative A (Preferred Alternative)

Action Alternative A would have minor temporary direct adverse impact on SAV in the amount of approximately 7,851 square feet associated with the temporary barge pier located along the northern shoreline of the Potomac River just upstream from Long Bridge. Minor temporary indirect adverse impacts could occur to the SAV beds further downstream from the construction zone within the Local Study Area due to temporary sedimentation from the installation of cofferdams. Turbidity curtains would minimize sediment releases from the installation of cofferdams. Construction impacts would occur over approximately 5 years.

Action Alternative B

Action Alternative B would have similar temporary impacts on SAV as Action Alternative A due to the temporary barge pier and potential downstream sediment from the cofferdams for the new bridge. Since no SAV occur underneath the existing bridge, no additional SAV would be directly impacted by demolition and replacement of the existing bridge. Action Alternative B, however, could cause temporary indirect adverse impacts to SAV beyond those shared with Action Alternative A due to temporary sedimentation caused by the installation of the cofferdams needed for the replacement bridge pile supports. With the use of turbidity curtains, the amount of sediment to downstream waters is expected to be low resulting in this alternative overall having minor impacts to SAV. Construction impacts would occur over approximately 8 years and 3 months.

5.5.1.4. Wildlife

No Action Alternative

The No Action Alternative would have no temporary impact on wildlife or habitat within the Local Study Area because construction activities for the projects included in the No Action Alternative would be distant from the Local Study Area.

Action Alternative A (Preferred Alternative)

Action Alternative A would have minor temporary direct adverse impacts to wildlife and wildlife habitat. Temporary impacts to wildlife would occur during construction of Action Alternative A by slightly reducing the availability of habitat for wildlife and by causing temporary avoidance of areas by some wildlife species that are sensitive to noise and human presence. Action Alternative A would impact early succession scrub-shrub habitat just west of the GWMP, as well as individual landscape trees throughout the Long Bridge Corridor. These individual trees and habitats would not support many species of wildlife, except for a few common edge-loving bird species. Once construction is complete and temporarily

disturbed areas are restored, wildlife would return to the restored habitat. Construction impacts would occur over approximately 5 years.

Action Alternative B

Short-term adverse direct effects to wildlife and wildlife habitat would be similar to those of Action Alternative A, with the exception of slightly greater temporary impacts to maintained landscape areas. The demolition of the existing bridge would displace any nesting birds utilizing the existing bridge structure. These effects would be temporary, as the construction of the new bridge structure would provide new nesting habitat. Construction impacts would occur over approximately 8 years and 3 months.

5.5.1.5. Aquatic Biota

No Action Alternative

The No Action Alternative would have no temporary impact on aquatic biota in the Local Study Area as no construction activities would occur within the Potomac River.

Action Alternative A (Preferred Alternative)

Action Alternative A would have minor temporary direct adverse impacts to aquatic biota. Construction impacts would occur over approximately 5 years. Action Alternative A would involve installing 22 piers in the Potomac River and replacing one pier in the Washington Channel with a larger pier. It would also involve installing temporary finger piers and a spud barge. To install the shafts that would anchor each pier to the river bottom, the area surrounding the pier locations would be dewatered. The construction of each pier would involve installation of sheet piles to create enclosed cofferdams. Because bridge piers would be constructed in dry conditions, the installation of the cofferdams and subsequent dry conditions would result in mortality to benthic invertebrates, and potentially fish, as well as temporary habitat loss while dewatered. Temporary habitat loss resulting from Action Alternative A would total 31,358 square feet (approximately 0.7 acres) in the Potomac River and 1,635 square feet (<0.1 acre) in the Washington Channel/Tidal Impoundment. The dewatering would also result in a localized loss of prey for benthic foraging fish species. However, remaining benthic foraging habitat in adjacent parts of the Potomac River would still be relatively abundant. Following construction activities, all cofferdams and finger piers would be removed, allowing for recolonization of those habitats by aquatic biota. Recolonization of disturbed habitats by benthic invertebrates can occur in less than a year.[19] Overall, temporary effects to benthic invertebrate and fish communities from temporary habitat loss would be minor.

In addition to temporary direct loss of habitat, potential sediment releases during installation of the cofferdam sheet piles could impact aquatic biota in the surrounding area. Physical disturbances re-suspend and homogenize upper sediment layers, and, while physical disturbance is a factor in shaping and altering ecosystems, intense and prolonged physical disturbances can alter or deplete

[19] Blettler, M.C.M. and Marchese, M.R. 2005. Effects of bridge construction on the benthic invertebrates structure in the Parana River Delta. *Interciencia*. Vol. 30, No. 2, pp. 60-66.

benthic communities.[20, 21] Avoidance of areas with high suspended sediment levels has been observed in numerous fish species, including some migratory species.[22] According to the project schedule, each bridge pier will take approximately 3 months to construct, with the disturbance of installing the sheet piles lasting about 2 weeks. The disturbance of sediments for pile driving activities for bridge piers typically results in total suspended sediment concentrations of approximately 5.0 to 10.0 mg/L above background levels within approximately 300 feet of the pile driving location.[23] Therefore, only minor sediment releases would occur during pile driving.

While sedimentation can lead to mortality of fish eggs and larvae,[24] the level of suspended sediment shown to have adverse effects on the most sensitive species of fish is 580 mg/L, over 50 times higher than the maximum expected increase in suspended sediments from pile driving.[25] Although installation of sheet piles may suspend sediment, disturbance activities would only slightly increase suspended sediments above background levels and would disperse within about 300 feet from the pile being driven. It is likely that fish would avoid areas within 300 feet of pile driving because of the noise and vibration cause by the activity. Fish would likely move to other areas in the river away from construction noise and activity.

Action Alternative A would result in a temporary increase in vessel traffic on the Potomac River for barge access during the construction of the new bridge. This could increase the chance of vessel strikes with fish; however, any increase would be negligible given the slow barge speeds. Sufficient space is present within the Potomac River to allow migratory fish to circumvent disturbance areas. Therefore, temporary impacts to fish related to noise, vibration, and vessel traffic would be minor with the use of various techniques detailed in **Section 5.6, Avoidance, Minimization, and Mitigation**.

Action Alternative B

Short-term direct adverse effects to aquatic biota would be similar to those of Action Alternative A; however, Action Alternative B would install 22 additional bridge piers in the Potomac River for the reconstruction of the existing bridge. This would result in additional temporary river bed impacts for bridge pier construction of 31,108 square feet. As with Action Alternative A, remaining benthic foraging habitat in adjacent parts of the Potomac River would still be relatively abundant. Construction impacts would occur over approximately 8 years and 3 months.

Because Action Alternative B includes the demolition and replacement of the existing two-track bridge structure, the duration of construction would be longer and the total area of temporarily dewatered

[20] Bonsdorff, E. 1983. Recovery potential of macrozoobenthos from dredging in shallow brackish waters. *Oceanologica Acta*. Special Issue (0399-1784), pp. 27–32.
[21] Dernie, K. M., Kaiser, M. J., and Warwick, R. M. 2003. Recovery rates of benthic communities following physical disturbance. *Journal of Animal Ecology.* Vol. 72, pp. 1043–1056.
[22] Boubee, J.A.T., Dean, T.L., West, D.W., and Barrier, R.F.G. 1997. Avoidance of suspended sediment by the juvenile migratory stage of six New Zealand native fish species. *New Zealand Journal of Marine and Freshwater Research*. Vol. 31, No. 1, pp. 61-69.
[23] Tappan Zee Hudson River Crossing Project. Final Environmental Impact Statement. August 2012. Federal Highway Administration.
[24] Wilber, D.H. and Clarke, D. G. 2001. Biological effects of suspended sediments: a review of suspended sediment impacts on fish and shellfish with relation to dredging activities in estuaries. *North American Journal of Fisheries Management*. Vol. 21, pp. 855-875.
[25] Burton, W.H. 1993. Effects of bucket dredging on water quality in the Delaware River and the potential for effects on fisheries resources. Versar, Inc.

riverbed would be greater. The extent of temporary impacts to surrounding fish would depend on the demolition techniques used (for example, blasting versus cutting), which can result in varying degrees of noise, vibration, and sediment disturbance and related localized avoidance by fish. As noted in **Chapter 3.5.3, Action Alternative B Construction**, the Project plans to remove the existing bridge over the Potomac River piecemeal and transporting the piece offsite for disposal. The Project does not plan to demolish the bridge using blasting. However, if blasting is used, techniques exist to minimize the effects of the blast on fish within the adjacent water column (see **Section 5.6, Avoidance, Minimization, and Mitigation**).

With the demolition of the existing bridge, there would also be a temporary impact to the benthic invertebrate community that has colonized the existing bridge substructure and has attached itself to the pier structures. Following the construction of the new piers, however, colonization by similar organisms would occur, resulting in negligible impacts overall.

Following demolition of the existing bridge, construction of a new two-track bridge structure would proceed in a similar manner to that of the first new bridge. Although the new bridge would have the same footprint as the existing bridge, temporary construction impacts to aquatic biota would again include habitat loss and mortality of benthic invertebrates, as well as potential increases in suspended sediment, sound and vibration, and vessel strikes. Impacts to the surrounding biotic community would be minor with implementation of appropriate avoidance and minimization techniques.

5.5.2. RTE Species

5.5.2.1. No Action Alternative

The No Action Alternative would have no temporary impact on RTE species within the Local Study area as no construction activities would occur within the Potomac River.

5.5.2.2. Action Alternative A (Preferred Alternative)

Action Alternative A would have minor temporary direct adverse impacts to shortnose and Atlantic sturgeon or Atlantic sturgeon Critical Habitat with the use of specific minimization techniques outlined below. As noted previously, 22 piers in the water would support the new two-track bridge. The position of the new bridge piers would be in line with the existing bridge piers to minimize hydraulic impacts and reduce disruption to migrating sturgeon. Construction impacts would occur over approximately 5 years.

Potential temporary impacts to sturgeon would primarily occur during installation of the piers. Temporary impacts to potential sturgeon foraging habitat on the river bottom would total 31,108 square feet for construction of the bridge piers. These temporary effects are small in comparison to the total area of available river bottom habitat so would result in a minor adverse temporary effect on sturgeon.

Temporary impacts to sturgeon from installation of the piers could include increased sedimentation within the water column. If the turbidity caused by the sediment is high enough (generally greater than 1,000 mg/L), it could have a toxic effect on sturgeon. Temporary increases in vessel traffic on the Potomac River for barge access during construction of the new bridge would increase chances of collisions with sturgeon that may be present in the water column during spawning runs in the spring.

However, barges, once in the construction area, would mostly be stationary, thus reducing the chances of collision with sturgeon if present. Sufficient space is also present within the Potomac River to allow sturgeon to move away from disturbance areas. By implementing the avoidance and minimization techniques detailed in **Section 5.6, Avoidance, Minimization, and Mitigation**, the temporary adverse impacts related to noise, vibration, and vessel traffic resulting from Action Alternative A would be minor and would not likely adversely affect shortnose or Atlantic sturgeon.

5.5.2.3. Action Alternative B

Short-term adverse direct effects to shortnose and Atlantic sturgeon or Atlantic sturgeon Critical Habitat would be similar to those resulting from Action Alternative A. However, replacement of the existing bridge in addition to the new bridge would double the amount of temporary sturgeon river bottom habitat impacts. This would result in additional temporary river bed impacts for bridge pier construction totaling 62,466 square feet (approximately 1.43 acres). Even with double the amount of temporary river bed substrate impacted, there would be a large area of suitable sturgeon foraging habitat available within that section of the Potomac River. Construction impacts would occur over approximately 8 years and 3 months.

Construction of the replacement bridge would increase the number and duration of pile driving, which could prolong potential effects to sturgeon. However, the types of piles and driving techniques discussed under Action Alternative A would help to minimize these potential effects. Similarly, construction of the replacement bridge would increase the potential for sediment releases and would increase vessel traffic within the river. The increase in vessel traffic could increase the chances of sturgeon colliding with a vessel during spring spawning runs through the Local Study Area. However, as noted above, barges will generally be stationary during construction, reducing the opportunity for collisions with sturgeon. Sufficient space is also present within the Potomac River to allow sturgeon to circumvent disturbance areas. Therefore, temporary impacts to sturgeon related to noise, vibration, and vessel traffic would be minor with the use of various techniques detailed in **Section 5.6, Avoidance, Minimization, and Mitigation**.

If demolition uses blasting, there are potential adverse effects on any sturgeon within the vicinity of the blast. However, techniques exist to minimize the effects of the blast on sturgeon within the adjacent water column (see **Section 5.6, Avoidance, Minimization, and Mitigation**).

After demolition, the sections of the existing bridge would need to be removed from the area by barge and transported to an offsite disposal area. The exact location and number of potential barge trips to dispose of the existing bridge are not yet known. Disposal would be to an approved upland disposal location. These additional barge trips would increase the potential for collisions with sturgeon within the Potomac River. Because of the potential effects to sturgeon from demolition and reconstruction of the existing bridge, Action Alternative B would have greater effects on sturgeon than Action Alternative A. However, with the use of minimization methods outlined in **Section 5.6, Avoidance, Minimization, and Mitigation**, these additional effects would still be minor.

5.6. Avoidance, Minimization, and Mitigation

This section describes proposed mitigation for the impacts to resources.

5.6.1. Natural Ecological Systems

5.6.1.1. Terrestrial Vegetation

FRA and DDOT have made efforts to avoid and minimize effects to natural resources, including terrestrial vegetation impacts, throughout Project Development by reducing the Project footprint to the extent practicable, given existing infrastructure and landowner impact constraints. These efforts include the removal of a culvert extension at Roaches Run included in earlier draft plans. DRPT would continue efforts to avoid and minimize impacts to terrestrial vegetation through later phases of the Project as design and construction details are refined. Proposed mitigation measures include:

- During final design, DRPT would adjust temporary access and staging areas to avoid trees and vegetation during refinement of the disturbance limits to ensure that vehicles and materials are only stored on vegetated surfaces when absolutely necessary.
- DRPT would require the contractor to employ tree protection measures and measures to prevent or limit equipment access to adjacent forested areas through protective fencing; these measures would minimize impacts to trees and vegetated areas. DRPT would require the contractor to protect both forest areas and individual trees within construction staging and access areas prior to construction, under the supervision of a licensed arborist or other qualified professional to be approved by NPS. The arborist would also perform any necessary pruning in ways that would maximize tree survival both during and following bridge construction. Any removal, cutting, or pruning of trees or shrubs would follow all NPS rules, including timing restrictions windows.
- DRPT would require the contractor to wash all equipment prior to entering NPS lands to be free of all and any debris, to minimize the spread or introduction of invasive species.
- DRPT would require that all introduced organic material such as soil, mulch, and seed be certified weed seed free, to minimize the spread or instruction of invasive species.
- DRPT would require the contractor to install fencing, mulch, and planking to reduce injury and compaction when vegetated surfaces are the only option for staging near the Project. DRPT would reestablish terrestrial vegetation removed for both permanent and temporary construction activities where possible and in coordination with any reforestation requirements.
- Following construction completion, DRPT would restore areas to their pre-construction function and appearance, either through reseeding or replanting of woody vegetation using native species.

5.6.1.2. Wetland Vegetation

FRA and DDOT have made efforts to avoid and minimize impacts to wetland vegetation throughout the planning process and DRPT would continue to do so as the Project moves forward to more detailed stages of design. The selection of an upstream alignment for the new bridge, rather than a downstream alignment has minimized potential impacts to wetland vegetation. This alignment allows the tracks to

expand westward rather than encroaching on Roaches Run, which supports numerous wetlands. Additional coordination with the DC2RVA project at RO Interlocking has allowed for the elimination of a culvert extension into Roaches Run, which would have caused impacts to vegetated wetlands. Wetland vegetation only occurs on the eastern side of the railroad corridor associated with adjacent wetlands to Roaches Run. The railroad improvements in both Action Alternatives would avoid these areas.

DRPT would require the contractor to employ erosion control and stormwater management measures during construction to reduce disturbance to wetland vegetation from erosive forces, such as stormwater runoff.

5.6.1.3. Submerged Aquatic Vegetation

SAV beds are located along the northern shoreline of the Potomac River just upstream of Long Bridge. One SAV bed would be impacted by the Action Alternatives associated with the northernmost bridge pier and the temporary barge pier. While FRA and DDOT have made efforts to minimize impacts to SAV throughout the planning process, complete avoidance of SAV is not possible. During construction, steps to mitigate SAV impacts would include protecting water quality around the work area by keeping suspended sediments from leaving the construction zone via silt curtains. In addition, the construction contractor would be advised of SAV locations and required to avoid boat traffic within shallow water areas where SAV could be damaged by boat motor propellers. Once the new railroad bridge is built under each Action Alternative and the temporary barge pier is removed, it is expected that SAV will become re-established within this shallow water shelf where it resides now.

Lining up the new piers with existing piers will help to minimized potential impacts to SAV by decreasing the number and footprint of new piers within areas that SAV could occupy in the future. By eliminating the downstream bridge alignments from consideration, FRA and DDOT have developed alternatives that expand the tracks westward rather than encroaching on Roaches Run. Additional coordination with DC2RVA at RO Interlocking has allowed for the elimination of a culvert extension into Roaches Run, which would have impacted a small area of SAV.

DRPT would require the contractor to employ erosion control and stormwater management measures during construction to reduce disturbance to downstream SAV from erosive forces and sedimentation resulting from stormwater runoff.

5.6.1.4. Wildlife

FRA and DDOT have made efforts to avoid and minimize terrestrial wildlife, including a reduction in the overall footprint of the Action Alternatives where practicable. This has led to a reduction in forest impacts, reducing effects to wildlife that may occur within the forested areas. The construction of the new tracks on the side of the existing tracks away from Roaches Run would minimize wildlife impacts resulting from the Action Alternatives. Likewise, the elevated overland extension of the new bridge that would carry the two new railroad tracks over the Potomac River would help to minimize disturbance to lands on the approaches to the bridge. While the area beneath the bridge likely would not provide much habitat, it would maintain potential wildlife passage along the banks of the Potomac River.

DRPT would require that the contractor use Best Management Practices and currently acceptable design and construction procedures would reduce or eliminate anticipated undesirable effects resulting from

construction. DRPT would plan construction activities to minimize unnecessary disturbance of wildlife habitat. For example, where appropriate and practicable, construction crews would perform activities affecting avian wildlife during months when migratory birds are not nesting. The contractor would also conduct a survey for nesting birds prior to starting construction. Erosion control and stormwater management during construction would reduce disturbance to wildlife habitat from erosive forces, such as stormwater runoff.

5.6.1.5. Aquatic Biota

Avoidance and minimization of construction impacts can include construction methods to reduce noise, vibration, sedimentation, or turbidity, and time-of-year restrictions to protect areas of seasonal importance for migratory species. Depending upon the specific construction methods for the proposed Project, DRPT would investigate various techniques to avoid or minimize impacts to aquatic biota. A survey would be conducted prior to construction to gather additional data on benthic macroinvertebrates. Proposed minimization and mitigation measures include:

- Avoiding dredging to extent practicable. The current construction plan proposes no dredging. The avoidance of dredging would minimize overall impacts to existing riverbed habitats as well as minimize sedimentation and resuspension of sediment into the water column. DRPT would avoid dredging to the extent practicable.
- Reducing turbidity. To reduce turbidity from potential sediment releases during construction of the new bridge piers, the contractor would perform work behind cofferdams. This would allow pile driving of the pier supports in the dry, avoiding releases of sediment that can occur if pile driving occurs in water. Installation of the sheet piles for the cofferdam can create minor sediment releases, but these are typically installed using a vibratory hammer, which minimizes the disturbance to the bottom sediments. Additional pile driving for the temporary finger piers and to anchor the spud barge are proposed in the wet. Turbidity curtains would be used around all in-water pile driving operations. Turbidity curtains may also be used during installation of the cofferdam sheet piles if sediment releases appear to be more than minimal.
- If installation of the piles requires an impact hammer, the contractor would use noise attenuating tools such as a cushion block to reduce those levels below injury or behavioral modification thresholds for fish. Contractors would also make several light taps at the start of pile driving to warn fish to leave the area before the heavier pile driving begins. Sufficient space is present within the Potomac River to allow fish to escape the area prior to the start of potentially harmful sound and pressure waves.
- During installation of cofferdams, contractors would net and remove fish as the space within the cofferdam gets down to the last 3 to 4 feet of water.
- Regulatory agencies would require time-of-year restrictions on in-stream construction work to avoid impacting migratory fish species during specific periods when they are most likely to be present in the Project Area. Sufficient space is present within the Potomac River to allow migratory fish to circumvent disturbance areas, assuming that construction activities are staggered, and work is not occurring across the entire river at one time.

Avoidance and minimization techniques for Action Alternative B would be the same as for Action Alternative A. However, Action Alternative B would require demolition of the existing bridge prior to its replacement. DRPT would minimize impacts during demolition of the existing bridge by using saws rather than blasting to remove the existing bridge piers. If blasting is required, techniques, such as bubble curtains, would be used to attenuate sound and pressure waves to sub-lethal levels to fish. Bubble curtains serve as a pneumatic barrier that releases gas below the water surface and breaks the propagation of waves and spreading of particles.

5.6.2. RTE Species

Avoidance and minimization of construction impacts include construction methods to reduce noise, vibration, sedimentation, or turbidity, and time-of-year restrictions to protect areas of seasonal importance. Depending upon the specific construction methods used, DRPT would investigate various techniques during later phases of design to avoid or minimize impacts to sturgeon or Atlantic sturgeon Critical Habitat. Techniques include:

- To reduce turbidity from potential sediment releases during construction of the new bridge piers, contractors would work behind cofferdams. This would allow pile driving of the pier supports in the dry, avoiding releases of sediment that can occur if pile driving were to occur in water. Installation of the sheet piles for the cofferdam can create minor sediment releases, but contractors would install these using a vibratory hammer, which minimizes the disturbance to the bottom sediments. Installation of the temporary finger piers and spud barge anchorage will require the drilling of smaller steel piles. DRPT would require the contractor to use turbidity curtains to minimize sediment releases.
- If installation of the cofferdam sheet piles and temporary finger pier and spud barge steel piles require an impact hammer, contractors may use a cushion block and other noise attenuating tools to reduce noise levels below sturgeon injury or behavioral modification thresholds. Contractors would also make several light taps at the start of pile driving to warn fish to leave the area before the heavier pile driving begins. Sufficient space is present within the Potomac River to allow fish, including sturgeon, to escape the area prior to the start of potentially harmful sound and pressure waves.
- Regulatory agencies would require time-of-year restrictions on in-stream construction work to avoid impacting sturgeon during specific periods when they are most likely to be present in the area. Based upon recent capture information, the most likely time for adult shortnose sturgeon to be present within the Project Area would be during the spring spawning run, between mid-March and mid-May. However, the likelihood of sturgeon being within the Project Area is so low that use of other avoidance and minimization measures may preclude the need for time-of-year restrictions. Additional informal consultation with NMFS further along in the design process would be necessary to confirm whether Action Alternative A is not likely to adversely affect sturgeon. Additional coordination with NMFS would also be necessary in later phases of design to confirm potential construction restrictions.

Avoidance and minimization techniques for Action Alternative B would be the same as for Action Alternative A. However, Action Alternative B would require demolition of the existing bridge prior to its replacement. DRPT would minimize impacts during demolition of the existing bridge by using saws

rather than blasting to remove the existing bridge piers. If blasting is required, techniques, such as bubble curtains, would be used to attenuate sound and pressure waves to sub-lethal levels to fish. Bubble curtains serve as a pneumatic barrier that releases gas below the water surface and breaks the propagation of waves and spreading of particles.