Chapter III.E: Biological Resources – Fjord Trail North

A. INTRODUCTION

This chapter presents the existing conditions and assesses the Proposed Action's potential impacts on biological resources, including ecological communities, plants, wildlife, and threatened, endangered, and special concern species, within the Fjord Trail North Corridor. This chapter identifies measures to avoid and minimize potential impacts to these resources, and where applicable, identifies proposed mitigation measures. Chapter IV.E, "Biological Resources – Fjord Trail South," evaluates the proposed southern section, known as "Fjord Trail South."

B. METHODOLOGY

For purposes of this chapter, the Fjord Trail North Corridor represents the area within which the proposed trail and other project elements, such as trail banks or parking lots, may be located, as exact locations of these elements are subject to change as design progresses. Existing conditions for ecological communities, plants, wildlife, and threatened, endangered, and special concern species within or in the vicinity of the Fjord Trail North Corridor were characterized based on the following sources:

- U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) database of federally threatened, endangered, proposed, and candidate species.
- National Oceanic and Atmospheric Administration, NOAA Fisheries, Essential Fish Habitat (EFH) Mapper. https://www.habitat.noaa.gov/apps/efhmapper
- New York State Department of Environmental Conservation (NYSDEC) 2000–2005 New York State Breeding Bird Atlas and ongoing 2020–2024 Breeding Bird Atlas (BBA) and 1990–1999 Herp Atlas Project.
- New York Natural Heritage Program (NYNHP) Database: New York Natural Heritage Program. 2024. Element Occurrence Dataset. New York Natural Heritage Program, State University of New York College of Environmental Science and Forestry, Albany NY. (NYNHP 2024).
- NYNHP map of ecological communities in Hudson Highlands State Park Preserve (HHSPP) (NYNHP 2010)
- Biodiversity inventory reports and other sources of literature pertaining to natural resources of the area, as cited herein.
- Plant and animal species lists in the Final Master Plan/Final Environmental Impact Statement (EIS) for Clarence Fahnestock Memorial State Park and HHSPP (the HHSPP Final Master Plan/Final EIS) (NYS Office of Parks, Recreation, and Historic Preservation and New York Natural Heritage Program [OPRHP] 2010).
- Information on rare, threatened, or endangered species and rare ecological communities in HHSPP provided directly by OPRHP and NYNHP staff (OPRHP 2023, 2024, NYNHP 24c),

including the results of surveys by the NYNHP of rocky summit grassland natural communities within HHSPP (Ring 2018).

- Daytime visual encounter survey of birds, mammals, reptiles and amphibians conducted within and immediately surrounding the Fjord Trail North Corridor on October 19, 2016; between May 15 and 18; between October 28 and November 1, 2019; on September 15, 2021; and in September 2023.[1]
- Observations of plants and ecological communities within and immediately surrounding the Fjord Trail North Corridor during site reconnaissance conducted on October 19, 2016; between May 15 and 18, 2017; between October 28 and November 1, 2019; on November 9, 2021; and in September 2023.
- Incidental observations of ecological communities, plants, and wildlife during site visits on various occasions for other purposes.
- Additional species with the potential to occur within the Fjord Trail North Corridor based on their geographic range within New York State, common occurrence, habitat associations, area requirements, and sensitivity to human disturbance, as described in literature cited herein (e.g., DeGraaf and Yamasaki 2001, Mitchell et al. 2006, Gibbs et al. 2007, Billerman et al. 2020).

Impacts from construction and operation of Fjord Trail North to ecological communities, plants, wildlife, aquatic biota, and threatened, endangered, and special concern species within the Corridor were assessed by considering short-term temporary impacts due to construction such as land-clearing activities, construction noise, and vehicle movement, and long-term permanent impacts such as habitat loss, forest fragmentation, barriers to wildlife movement, and human disturbance from recreational activities. The assessment of potential impacts to aquatic biological resources considers the Protection of Waters permit issuance standards including that the project may not result in unreasonable damage to natural resources of the state, which include both regulated resources like endangered/ threatened species and unregulated resources such as Hudson River Submerged Aquatic Vegetation (SAV).

The potential for direct construction and operational impacts to biological resources were considered within the Fjord Trail North Corridor, as shown on Figure II-2. Where applicable, the potential for indirect impacts to these resources was considered within a Zone of Influence (ZOI), which represents the distance from either side of the Trail in which the Trail may alter or impact the surrounding wildlife behavior or habitat use (Colorado Trails, 2021). Potential indirect impacts within a ZOI include the incidental spread of invasive species, relocation of wildlife due to increased human activity, and trampling of plant species from humans deviating from the Trail Corridor. Portions of the Fjord Trail North Corridor would be in areas containing existing trails that already exhibit a zone of influence and associated indirect impacts. Changes to the existing indirect impacts as a result of the Fjord Trail North Corridor were also assessed. Wherever the Fjord Trail North Corridor is located near or adjacent to developed areas, such as roadways, parking lots, railroad tracks, etc., a ZOI was not evaluated as these areas are considered already disturbed.

[1] Surveys conducted for this project were mostly conducted during the spring and late fall and are not considered a full representation of all species present within and adjacent to the Fjord Trail North Corridor. Any required surveys to be conducted in the future will be targeted to the appropriate times of year for specific plants or animals at specific locations.

C. EXISTING CONDITIONS

DESIGNATIONS

Most of the Fjord Trail North Corridor is within HHSPP, which was established in 2010 when Hudson Highlands State Park was designated a Park Preserve as defined by Article 20 of the Parks, Recreation and Historic Preservation Law. This designation aims to conserve and protect park lands containing unique and rare wildlife, flora, scenic, historic, and archaeological sites in New York State (OPRHP 2010). In 2010, the majority of HHSPP was also designated as a Bird Conservation Area (BCA)[2] and as a Natural Heritage Area (NHA), defined at Article 11, Title 5, Section 0539 of the New York State Environmental Conservation Law. The BCA provides recognition of an area's elevated importance for bird habitat, particularly for migratory waterfowl, neo-tropical migratory songbirds, and state-listed species, and the NHA allows for the dedication of state-owned lands with rare species and/or significant natural communities.

The HHSPP BCA contains relatively large tracts of interior forest habitat that provides important stopover and breeding sites for forest-breeding species such as American redstart, yellow-throated vireo, and Acadian flycatcher. The forests adjacent to the Hudson River are important for two species of conservation concern: the cerulean warbler, which breeds in mature forests adjacent to the river, and the bald eagle, which uses forests along the river in the winter and the breeding season. Cliff communities provide breeding sites for peregrine falcon, and rocky summit communities, such as along Breakneck Ridge, provide early successional habitats important for breeding by species such as the prairie warbler. Management considerations include controlling invasive species, reducing deer overbrowsing, adjusting operations such as reducing human activities during the winter and the breeding season in areas regularly used by bald eagles, monitoring sensitive habitat areas to ensure that human activities are not negatively impacting these areas, educating visitors about the uniqueness of the plant and animal communities at these sites, and providing trail access that allows passive recreational opportunities while protecting plants and wildlife using these areas (OPRHP 2010).

The NHA designation provides additional recognition of the significant natural resources within an area but does not preclude the area from future development. Interpretation, education and outreach are key components of these designations. The BCA and NHA designations do not include Little Stony Point, Dockside, or Bannerman's Island, all located within or along the Fjord Trail Corridor.

The HHSPP Final Master Plan/Final EIS notes that "these designations recognize that these areas are invaluable and irreplaceable parts of the state's natural heritage and will provide additional natural resource protection as well as call for increased interpretation of those resources." It further identifies the vision for HHSPP: to connect people to the river and the unique history of the Hudson Valley while providing critical habitat for native plants and animals and supporting passive recreation while expanding and protecting open space and critical habitat in the Highlands region. HHSPP will also establish greater collaboration for environmental education and outreach to improve the connectivity of people with wildlife.

The Hudson River forms the western boundary of HHSPP in this area. It flows from the federal lock and dam in Troy to the ocean and has been noted by NYSDEC as the Hudson River Estuary Area of Biological Concern in the Hudson River Estuary Program's *Hudson River Estuary*

[2] https://dec.ny.gov/nature/animals-fish-plants/birds/conservation-area-program-and-sites

Wildlife and Habitat Conservation Framework – An Approach for Conserving Biodiversity in the Hudson River Estuary Corridor. This designation is due to the region's unique geologic setting of the Hudson River Valley which contributes to the great biological diversity found along the river valley. At the same time the Hudson River Estuary Area of Biological Concern is one of the most densely populated areas of the United States and one of New York's primary industrial centers. For that reason, open space areas and the plants and animals they support are declining and the large unbroken areas of forest and wetland are becoming fragmented (NYSDEC 2006).

ECOLOGICAL COMMUNITIES

The Fjord Trail North Corridor (approximately 114 acres total) covers several different ecological communities. Ecological communities are variable assemblages of interacting plant and animal populations that share a common environment (NYNHP 2024b). The ecological communities within the Fjord Trail North Corridor, which are best characterized by Edinger et al. (2014), include oak-tulip tree forest, successional southern hardwoods forest, and terrestrial cultural communities. Other ecological communities present include floodplain forests, shallow emergent marsh, brackish tidal marsh, brackish intertidal mudflats, Appalachian oak-hickory forest, tidal river, and floodplain grassland (see **Figures III.E-1a through III.E-1e**). **Table III.E-1** below lists the approximate areas (in acres) of ecological communities within the Corridor. Upland forest communities within or near the Fjord Trail North Corridor that are considered significant natural communities by NYNHP are the oak-tulip tree forest and Appalachian oak-hickory forest located east of NYS Route 9D at the Notch Trail and oak-tulip tree forest at the proposed Wade's Hill Lot and Connector Trail (see **Figures III.E-2a and III.E-2b**). Wetland communities in the Fjord Trail North Corridor that are considered significant natural communities by the NYNHP are brackish tidal marsh and brackish intertidal mudflats found at the mouth of Fishkill Creek, along the shoreline at Madam Brett Park and along the shoreline south of Fishkill Creek. The tidal river (a characterization that includes the Hudson River and Fishkill Creek) is also considered a significant natural community.

Table III.E-1
Approximate Areas of Ecological Communities within the Fjord Trail North Corridor

Ecological Community	Area in Acres
Oak-Tulip Tree Forest	61.0
Successional Southern Hardwoods	29.1
Floodplain Forest	6.0
Railroad	5.0
Unpaved Road/Path	4.1
Shallow Emergent Marsh	2.3
Paved Road/Path	2.1
Mowed Lawn	1.4
Brackish Tidal Marsh	0.8
Floodplain Grassland	0.7
Landfill/Dump	0.4
Tidal River	0.4
Urban Structure Exterior	0.2

Sources: NYNHP ecological community map (2010) of HHSPP and survey reports from the project team in 2021 and 2023. Surveys of plants and ecological communities within and immediately surrounding the Fjord Trail North Corridor by the project team on October 19, 2016; between May 15 and 18, 2017; between October 28 and November 1, 2019; on November 9, 2021; and in September 2023. Incidental observations of ecological communities, plants, and wildlife during site visits on various occasions for other purposes.

9.23.24

HUDSON HIGHLANDS FJORD TRAIL

Ecological Communities

Figure III.E-1a

9.23.24

Ecological Communities

HUDSON HIGHLANDS FJORD TRAIL

Figure III.E-1b

9.23.24

Ecological Communities

HUDSON HIGHLANDS FJORD TRAIL

Figure III.E-1c

9.23.24

Trail Corridor - Fjord Trail North
Floodplain Forest
Mowed Lawn
Oak-Tulip Tree Forest
Unpaved Road/Path
Urban Structure Exterior

HUDSON HIGHLANDS FJORD TRAIL

Ecological Communities

Figure III.E-1d

9.23.24

Ecological Communities

HUDSON HIGHLANDS FJORD TRAIL

Figure III.E-1e

11.26.24

Data source: New York Natural Heritage Program, 2019.

Trail Corridor
Fjord Trail North
Appalachian oak-hickory forest
Brackish intertidal mudflats
Brackish tidal marsh
Tidal river

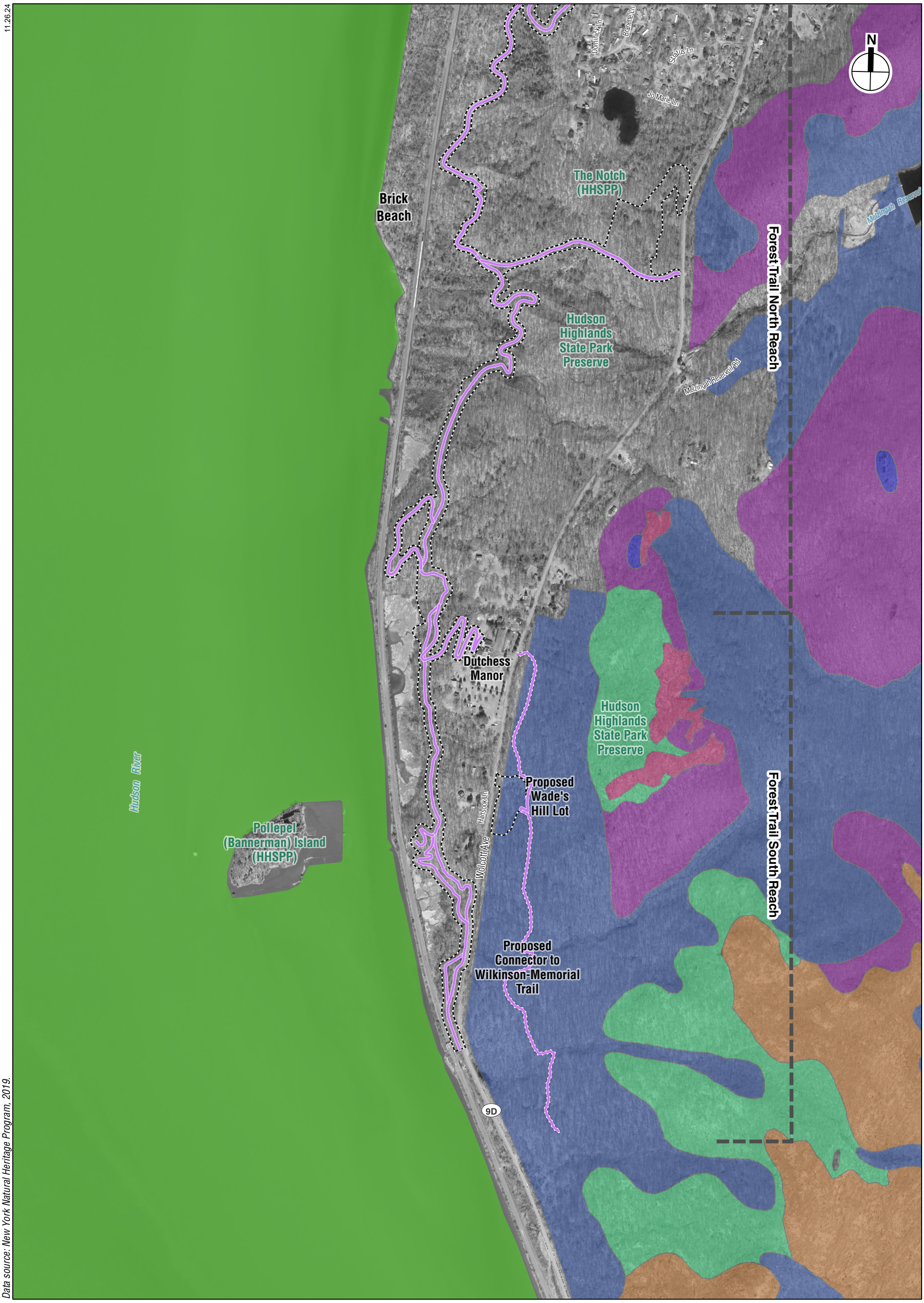
0 2,000 FEET

NYS Significant Natural Communities

HUDSON HIGHLANDS FJORD TRAIL

Figure III.E-2a

11.26.24



Data source: New York Natural Heritage Program, 2019.

NYS Significant Natural Communities

HUDSON HIGHLANDS FJORD TRAIL

Figure III.E-2b

Edinger et al. (2014) describes oak-tulip tree forest as a mesophytic hardwood forest that occurs on moist, well-drained sites in southeastern New York. This community occupies approximately 61 acres within the Fjord Trail North Corridor and includes northern red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), tulip tree (*Liriodendron tulipfera*), red maple (*Acer rubrum*), gray birch (*Betula populifolia*), and pignut hickory (*Carya glabra*) in the tree stratum; eastern hop-hornbeam (*Ostrya virginiana*), Maple-leaf viburnum (*Viburnum acerifolium*), spice bush (*Lindera benzoin*), and Japanese barberry (*Berberis thunbergii*) in the shrub stratum; Christmas fern (*Polystichum acrostichoides*), sedge (*Carex* sp.), and garlic mustard (*Alliaria petiolata*) in the herbaceous stratum; Asiatic bittersweet (*Celastrus orbiculatus*), Virginia creeper (*Parthenocissus quinquefolia*), and eastern poison ivy (*Toxicodendron radicans*) in the vine stratum. This ecological community is common within the Hudson Highlands region. Within the Fjord Trail North Corridor, the oak-tulip tree forest ranges from young stands to patches of medium-aged to mature forest. This community is abundant within the Fjord Trail North Corridor, south of the mouth of Fishkill Creek and on the east side of NYS Route 9D (see **Figures III.E-1a through III.E-1e**). This is a large and intact occurrence located in an extensive forested landscape with natural gradients and processes intact. Although abundant within the Hudson Highlands region, this ecological community is considered a state rare community type which is particularly susceptible to invasive species impacts, deer overbrowsing, and development pressures (NYNHP 2024k).

Edinger et al. (2014) describes successional southern hardwoods forest as a hardwood or mixed forest that occurs on sites that have been previously cleared or otherwise disturbed followed by regrowth of vegetation. This community occupies approximately 29 acres within the Fjord Trail North Corridor and includes box elder (*Acer negundo*), Norway maple (*Acer platanoides*), tree of heaven (*Ailanthus altissima*), red maple, black cherry (*Prunus serotina*), white oak (*Quercus alba*), northern red oak, and sassafras in the tree stratum. The understory in the successional southern hardwoods forest is commonly vegetated with invasive and/or ruderal species: Japanese barberry, honeysuckle (*Lonicera japonica*, *L. morrowii*, and *L. tatarica*), and multiflora rose (*Rosa multiflora*) in the shrub stratum; garlic mustard, mugwort (*Artemesia vulgaris*), Queen Anne's lace (*Daucus carota*), Japanese knotweed (*Reynoutria japonica*), Japanese stiltgrass (*Microstegium vimineum*), late goldenrod (*Solidago gigantea*), wrinkle-leaf goldenrod (*Solidago rugosa*), and common dandelion (*Taraxacum officinale*) in the herbaceous stratum; and Asiatic bittersweet, Virginia creeper, eastern poison ivy, and grape (*Vitis* sp.) in the vine stratum. This ecological community is common throughout the Hudson Highlands region. Within the Fjord Trail North Corridor, the successional southern hardwoods forest is characterized by disturbance due to its location along existing trails, old roadbeds, and railroad track and road rights-of-way, on the far edges of the more significant and intact areas of habitat, and colonization by invasive plant species (e.g., Norway maple, multiflora rose, and Japanese barberry). This community is present in the northern half of the Fjord Trail North Corridor (see **Figures III.E-1a through III.E-1e**).

Approximately 11 percent (13 acres) of the Fjord Trail North Corridor is categorized as terrestrial cultural communities as defined by Edinger et al. (2014), which include the paved road/path,[3]

[3] Edinger et al. (2014) describes this ecological community as "a road or pathway that is paved with asphalt, concrete, brick, stone, etc. There may be sparse vegetation rooted in cracks in the paved surface."

railroad,[4] unpaved road/path,[5] mowed lawn with trees,[6] mowed lawn,[7] landfill/dump,[8] and urban structure exterior[9] communities listed in **Table III.E-1**. Edinger et al. (2014) describes terrestrial cultural communities as those that are "either created and maintained by human activities; are modified by human influence to such a degree that the physical conformation of the substrate; or the biological composition of the resident community is substantially different from the character of the substrate or community as it existed prior to human influence." The landfill/dump ecological community identified within the Fjord Trail North Corridor has been developed into a solar farm. Terrestrial cultural ecological communities are common throughout the Hudson Highlands region and are present along the existing trails in the northern section of the Fjord Trail North Corridor, near the mouth of Fishkill Creek and Madam Brett Park, and in the vicinity of Dutchess Manor (see **Figures III.E-1a through III.E-1e**).

Edinger et al. (2014) describes floodplain forest as a hardwood forest that occurs on mineral soils on low terraces of river floodplains and river deltas characterized by their flood regime; low areas are annually flooded in spring and high areas are flooded irregularly. This community occupies approximately 6 acres within the Fjord Trail North Corridor and includes sugar maple, northern pin oak (*Quercus palustris*), red maple, and green ash in the tree stratum; spice bush and southern arrowwood (*Viburnum dentatum*) in the shrub stratum; garlic mustard and eastern poison ivy in the herbaceous stratum; and eastern poison ivy in the vine stratum. This ecological community is somewhat common within the Hudson Highlands region, but good examples are rare, and within the state, the number and acreage of floodplain forests have declined by about 50 percent from historical numbers (NYNHP 2024i). Within the Fjord Trail North Corridor, the floodplain forest is a small, mature forest in good condition. This community is present along the mouth of Fishkill Creek near Madam Brett Park and near Dutchess Manor (see **Figures III.E-1a through III.E-1e**).

Edinger et al. (2014) describes shallow emergent marsh as a marsh meadow community that occurs on mineral soil or deep muck soils (rather than true peat), that are permanently saturated and seasonally flooded. This community occupies approximately 3 acres within the Fjord Trail North Corridor and includes cattails (*Typha* spp.), sedges (*Carex* spp.), marsh fern (*Thelpteris palustris*), manna grasses (*Glyceria pallida, G. canadensis*), spikerushes (*Eleocharis palustris,*

[4] Edinger et al. (2014) describes this ecological community as "a permanent road having a line of steel rails fixed to wood ties and laid on a gravel roadbed that provides a track for cars or equipment drawn by locomotives or propelled by self-contained motors."

[5] Edinger et al. (2014) describes this ecological community as "a sparsely vegetated road or pathway of gravel, bare soil, or bedrock outcrop. These roads or pathways are maintained by regular trampling or scraping of the land surface."

[6] Edinger et al. (2014) describes this ecological community as "residential, recreational, or commercial land in which the groundcover is dominated by clipped grasses and forbs, and it is shaded by at least 30 percent cover of trees. Ornamental and/or native shrubs may be present, usually with less than 50 percent cover. The groundcover is maintained by mowing and broadleaf herbicide application."

[7] Edinger et al. (2014) describes this ecological community as "residential, recreational, or commercial land, or unpaved airport runways in which the groundcover is dominated by clipped grasses and there is less than 30 percent cover of trees. Ornamental and/or native shrubs may be present, usually with less than 50 percent cover. The groundcover is maintained by mowing and broadleaf herbicide application."

[8] Edinger et al. (2014) describes this ecological community as "a site that has been cleared or excavated, where garbage is disposed."

[9] Edinger et al. (2014) describes this ecological community as "the exterior surfaces of metal, wood, or concrete structures (such as commercial buildings, apartment buildings, houses, bridges) or any structural surface composed of inorganic materials (glass, plastics, etc.) in an urban or densely populated suburban area."

E. obtusa), and bulrushes (*Scirpus cyperinus, S. atrovirens, Schoenoplectus tabernaemontani*). This ecological community is common within the Hudson Highlands region. This community is present sporadically between the Notch and Madam Brett Park (see **Figures III.E-1a through III.E-1e**).

Edinger et al. (2014) describes floodplain grassland as a somewhat densely vegetated, tall grassland community that occurs on the floodplains along the upper reaches of larger confined rivers. This community occupies approximately 0.7 acres within the Fjord Trail North Corridor and includes grasses such as big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), switch grass (*Panicum virgatum*), little bluestem (*Schizachyrium scoparium*), reed canary grass (*Phalaris arundinacea*), deer tongue grass (*Dichanthelium clandestinum*), and freshwater cordgrass (*Spartina pectinata*). This ecological community is uncommon in New York state and the Hudson Highlands region and somewhat uncommon globally as well. This community is present along the northern portion of Fjord Trail North between Long Dock Park and Denning's Point (see **Figures III.E-1a through III.E-1e**).

Edinger et al. (2014) describes tidal river as the aquatic community of continuously flooded substrates that support no emergent vegetation. This community occupies approximately 0.4 acres within the Fjord Trail North Corridor within the Hudson River and Fishkill Creek and is considered a significant natural community by NYNHP (**Figures III.E-2a and III.E-2b**).

Edinger et al. (2014) describes brackish tidal marsh as a marsh community that occurs where water salinity ranges from 0.5 to 18.0 parts per thousand (ppt) and water is less than 2 meters (6 feet) deep at high tide. This community occupies approximately 0.8 acres within the Fjord Trail North Corridor and is considered a significant natural community by NYNHP **(Figure III.E-2a**). This community is present within Fishkill Creek (see **Figures III.E-1a through III.E-1e**).

PLANTS

As documented in the previous section, the area along and surrounding the Fjord Trail North Corridor supports a wide variety of ecological communities that support a diverse assemblage of trees, shrubs, and herbaceous species. The following section provides information on those plant species likely to be present within the Fjord Trail North Corridor. Documentation of threatened, endangered, and rare plant species and invasive species are included below. **Appendix III/IV.E-1,** Table III.E-1 lists the plant species identified within the Fjord Trail North Corridor during reconnaissance investigations.

SUBMERGED AQUATIC VEGETATION (SAV)

The Hudson River in the vicinity of the Fjord Trail Corridor supports communities of SAV, which are rooted aquatic plants that grow completely under water. SAV beds are found in lower intertidal and shallow water habitats in water no more than six feet deep (Miller 2013). SAV improves water quality by increasing oxygen in the water and provides nursery habitat for young fish that may be more susceptible to predation in open waters. SAV beds also provide essential feeding and refuge habitat for many species and life stages of birds, turtles, and invertebrates. The most common native species of SAV in the Hudson River watershed is water celery (*Vallisneria americana*), which generally grows in water shallower than three meters (9.8 feet) due to light requirements. Other species include clasping leaved pondweed (*Potamogeton perfoliatus*) and the non-native plants curly pondweed (*Potamogeton crispus*) and Eurasian water milfoil (*Myriophyllum spicatum*, NYSDEC 2024b). There are documented discrete occurrences of SAV all along the Hudson River shoreline of the Hudson Highlands region (see **Figures III.E-3a-3b**). The only area of documented SAV within the Fjord Trail North Corridor is a small area within Fishkill Creek

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Data source: NYSDEC Submerged Aquatic Vegetation Habitats 2018

NYSDEC-mapped Areas of Submerged Aquatic Vegetation (SAV) in Hudson River

HUDSON HIGHLANDS FJORD TRAIL

Figure III.E-3a

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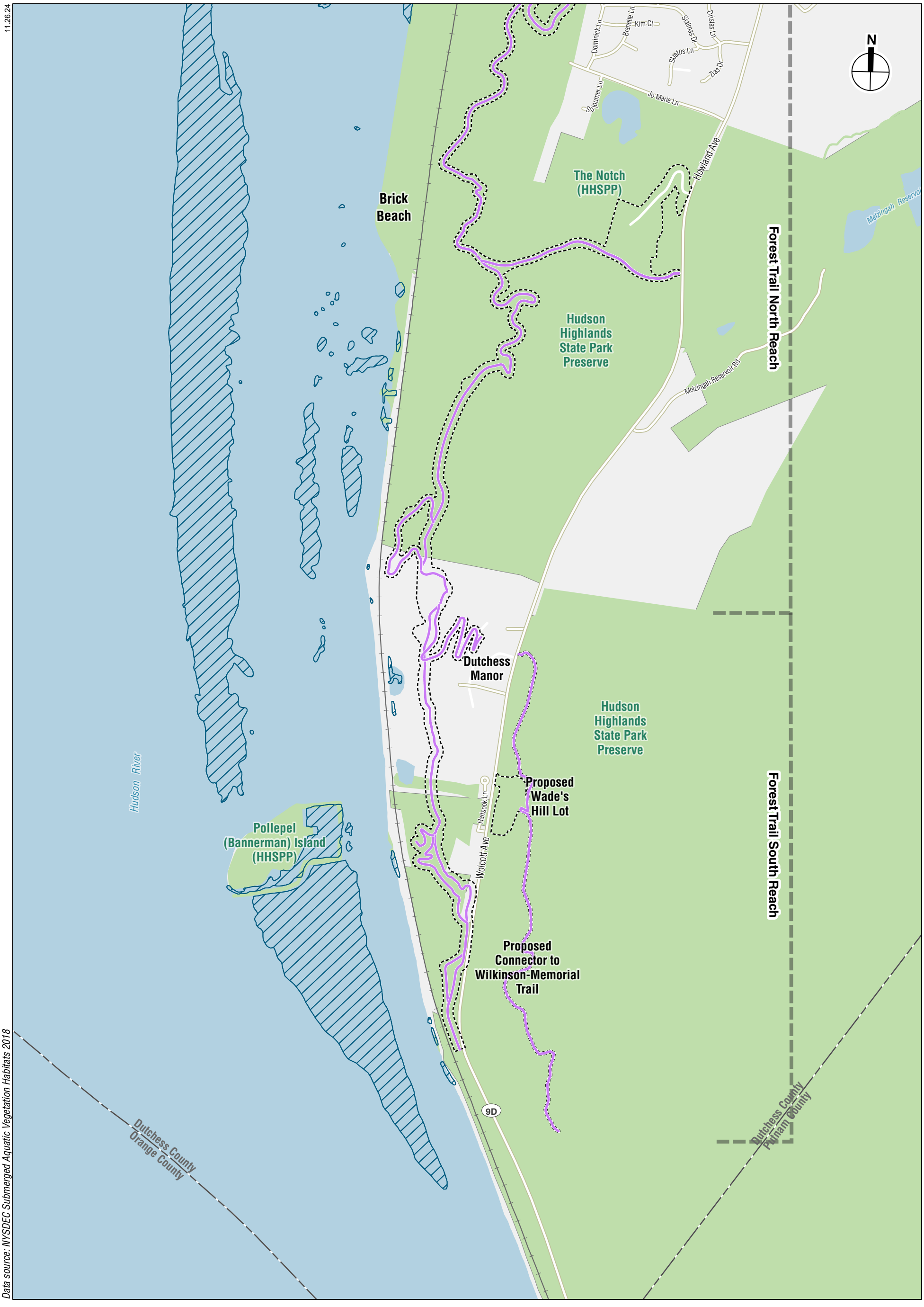

NYSDEC-mapped Areas of Submerged Aquatic Vegetation (SAV) in Hudson River

HUDSON HIGHLANDS FJORD TRAIL

Figure III.E-3b

just upstream from Madam Brett Park (see **Figure III.E-3a**). There are also documented SAV beds along the mouth of Fishkill Creek and within the Hudson River along the southern and eastern sides of Denning's Point.

RARE, THREATENED, AND ENDANGERED PLANT SPECIES

Federally Listed Plant Species

The IPaC (USFWS 2024) does not identify any federally listed plant species known to occur in the vicinity of the Fjord Trail North Corridor.

State-Listed Plant Species

State-listed plant species that have been identified during field surveys for the Fjord Trail or by the NYNHP as having the potential to occur within the Fjord Trail North Corridor include Davis' sedge (*Carex davisii),* Estuary beggar-ticks (*Bidens bidentoides*), Smooth bur-marigold (*Bidens laevis* (L.) B.S.P.), Long's bittercress (*Cardamine longii*), Clustered sedge (*Carex cumulata*), Spongy-leaved arrowhead (*Sagittaria montevidensis* ssp. *spongiosa*), Saltmarsh aster (*Symphyotrichum subulatum* var. *subulatum*), and Stiff flat-topped goldenrod (*Solidago rigida* var. *rigida*).

Davis' Sedge

Davis' sedge (*Carex davisii)* is a state-listed threatened species. It is a perennial species and grows densely clumped together. Davis' sedge is often found near rivers, and it is often found adjacent to the Hudson River. It grows in soils that vary from mesic to wet, and its habitats include mesic limestone, rich bottomland, wet meadows, gravel bars of large rivers, and floodplain forests. Davis' sedge is occasionally associated with disturbed areas, such as roads and paths. New York is the northeastern extent of its range (NYNHP 2024h). Davis' sedge was observed within the Fjord Trail North Corridor during site reconnaissance in June 2017 and September 2021.

Estuary Beggar-ticks

Estuary beggar-ticks (*Bidens bidentoides*), a state rare species, is an annual herb found in freshwater tidal mudflats and marshes, often at the border between mudflat and marsh, or along sandy or muddy openings within a marsh (NYNHP 2024d). Communities identified as freshwater tidal marsh or freshwater tidal mudflats may provide suitable habitat for the estuary beggar-ticks. Estuary beggar-ticks were observed within the Fjord Trail North Corridor during several site reconnaissance surveys.

Smooth Bur-marigold

Smooth bur-marigold (*Bidens laevis* [L.] B.S.P.), also known as smooth beggar ticks, is an annual herbaceous plant that is listed as threatened in New York. It is found primarily in freshwater and brackish tidal mud flats and tidal marshes, and it has strong associations with chair-maker's bulrush (*Schoenoplectus americana*), wild rice (*Zizania aquatica*), estuary beggar-ticks (*Bidens bidentoides*), smooth beggar ticks (*Bidens cernua*), pickerelweed (*Pontederia cordata*), and green arrow-arum (*Peltandra virginica*), alongside which the smooth-bur marigold is often found growing (NYNHP 2024e). This species was observed within the Fjord Trail North Corridor during a September 2021 site reconnaissance.

Long's Bittercress

Long's bittercress (*Cardamine longii*) is a state-threatened mustard relative that inhabits intertidal areas within tidal estuaries and backwater areas. It was once thought to be restricted only to Long Island but has recently been found along the Hudson River (NYNHP 2024f). Long's bittercress was not observed during site reconnaissance.

Clustered Sedge

Clustered sedge (*Carex cumulata*) is a state-threatened perennial species that inhabits dry, open oak-dominated woods and thin soil in full sun on west-facing slopes (NYNHP 2024g). Communities classified as oak-tulip tree forest or successional southern hardwoods may provide suitable habitat for this species. Clustered sedge was not observed during site reconnaissance.

Spongy-leaved Arrowhead

Spongy-leaved arrowhead (*Sagittaria montevidensis* ssp. *spongiosa*) is listed as a threatened species of annual herb in New York State. This species grows in tidally flooded areas, including freshwater to brackish intertidal mud flats and the adjacent marshes (NYNHP 2024l). It is often found growing with *Sagittaria subulata.* This species was observed within the Fjord Trail North Corridor during a September 2021 site reconnaissance.

Saltmarsh Aster

Saltmarsh aster (*Symphyotrichum subulatum* var. *subulatum*) is listed as threatened in New York State. Along the Hudson River, it is found in brackish marshes and brackish tidal drainages, as well as in some disturbed habitats adjacent to the marshes (NYNHP 2024n). It is the only annual aster native to New York. Much of the habitat throughout the species range has been damaged or destroyed. Threats to saltmarsh aster populations include the invasive common reed, purple loosestrife, alteration of hydrology, deer browsing, and habitat destruction. Saltmarsh aster was observed within the Fjord Trail North Corridor during a September 2021 site reconnaissance.

Stiff Flat-topped Goldenrod

Stiff flat-topped goldenrod (*Solidago rigida* var. *rigida*) is listed as threatened in New York State. It grows well in successional old fields and other grassland habitats. Its largest threats are development and highway construction and invasive species (NYNHP 2024m). Stiff flat-topped goldenrod was observed within the Fjord Trail North Corridor during a September 2021 site reconnaissance.

INVASIVE PLANT SPECIES

Invasive species are non-native species to a particular ecosystem that can cause harm to the environment, the economy, or human health. Depending on the species and context, some ecological benefits can be provided by invasive plants, including stormwater management, habitat for certain species, and soil stability because they are often adapted to grow in difficult conditions. However, overall invasive species can cause harm to the environment and are one of the greatest threats to New York's biodiversity (NYSDEC 2024c). Impacts from invasive species include habitat degradation and loss; loss of native fish, wildlife and tree species; loss of recreational opportunities and income; and risks to public safety. Invasive species generally reproduce quickly and in large numbers and, once introduced, are difficult to remove from an area.

Several invasive species are present within HHSPP, most notably black swallow-wort (*Cyanchum louiseae*), common reed (*Phragmites australis*), multiflora rose (*Rose multiflora*), Japanese barberry (*Berberis thunbergia*), and mile-a-minute weed (*Persicaria perfoliata)* (OPRHP 2010). Other invasive plant species observed within the Fjord Trail North Corridor include shrubby honeysuckles, Japanese honeysuckle, garlic mustard, Japanese knotweed, Asiatic bittersweet, Norway maple, Russian and autumn olive, and buckthorns.

The European water chestnut (*Trapa natans*) is an invasive aquatic plant that can be found along the shoreline of the Fjord Trail North Corridor. The leaves sit on top of the water and spread out in a circular pattern (ISC 2024). It can clog waterways, lakes, and ponds, adversely affecting aquatic ecosystem functions by forming dense mats of floating vegetation (NYIS 2019). These

dense mats can reduce oxygen levels beneath them and prevent native SAV from growing (NYSDEC 2024b).

ANIMALS

TERRESTRIAL WILDLIFE

The Hudson Highlands region represents one of New York State's least fragmented and most biodiverse forested landscapes (Penhollow et al. 2006, OPRHP 2010). The Fjord Trail North Corridor borders multiple habitat types of the eastern Highlands area, each supporting different assemblages of wildlife. These habitats range from manicured lawns and narrow forest fragments to large tracts of relatively unbroken forest, ridgetop heaths, and tidal wetlands. Some of Fjord Trail North would follow existing trails, old roadbeds, and railroad track and road rights-of-way, some of which are located in or adjacent to more developed areas (e.g., Klara Sauer Trail, Madam Brett Park) and on the edges of the more significant and intact areas of habitat. Conditions in these existing developed areas are degraded and persistently affected by human activity, thus supporting mainly disturbance-tolerant species of wildlife. Exceptions include much of the Forest Trail South and North Reaches, which intersect mature forest, and a portion of the Marsh Trail reach which intersects a freshwater wetland and borders the tidal wetland of Fishkill Creek Marsh (see **Figures III.E-1a through III.E-1e** for a depiction of the Fjord Trail Reaches). These areas support more diverse and intact wildlife communities that are found in proximity to the remainder of the Trail alignments.

Birds

The Hudson Highlands supports one of the highest levels of bird species richness in New York State (McGowan and Zuckerberg 2008). More than 200 species of birds occur in the region during the breeding season, winter, migration, or year-round (DeOrsey and Butler 2006). This is largely attributable to the region's large tracts of interior forest, varied topography, abundance of lakes and other freshwater systems, and the Hudson River itself. HHSPP and nearby Clarence Fahnestock Memorial State Park, which have been designated as Important Bird Areas by the National Audubon Society and as BCAs by OPRHP and NYSDEC, together represent more than 15,000 acres of forested habitat for birds in the eastern Highlands (Wells 1998). Characteristic breeding birds in these forests include red-shouldered hawk, broad-winged hawk, ruffed grouse, Acadian flycatcher, winter wren, blue-gray gnatcatcher, hermit thrush, blue-headed vireo, yellow-throated vireo, black-throated green warbler, cerulean warbler, worm-eating warbler, Louisiana waterthrush, hooded warbler, scarlet tanager, and wood thrush, among others (Wells 1998, Penhollow et al. 2006, OPRHP 2010). Peregrine falcons and common ravens nest on the high ridges and cliffs of HHSPP (Wells 1998).

The 2000–2005 BBA documented 104 species as confirmed, probable, or possible breeders in the three atlas blocks that are spanned by the Fjord Trail North Corridor (Blocks 5858A, 5859C, 5759D). The ongoing 2020–2024 BBA was also reviewed and compared with the 2000–2005 BBA species. The survey blocks from the 2020–2024 BBA do not correlate directly with the 2000–2005 BBA survey blocks and additional species may be included in the species log for all survey blocks as the 2020–2024 survey progresses. The atlas blocks for both BBAs are each nine square miles and cover some habitats that are not found in or representative of the Fjord Trail North Corridor's immediate surroundings. For example, deep interior forest, and ridgetop heath and grassland habitats associated with interior and high-elevation areas of HHSPP are not habitat types found in the vicinity of the Fjord Trail North Corridor. Several of the species documented in the atlas blocks are therefore not considered to have the potential to occur near or be affected

by the Fjord Trail North Corridor. The subset of species that are considered to have the potential to breed within the Fjord Trail North Corridor, based on their habitat associations, area requirements, and sensitivity to human disturbance (Billerman et al. 2020), are listed in **Appendix III/IV.E-1**, Table III.E-2.

Forest Trail North Reach and Forest Trail South Reach

Breeding birds in the wetlands along both Forest Trail Reaches and their margins likely include species such as red-winged blackbird, common yellowthroat, song sparrow, swamp sparrow, eastern kingbird, belted kingfisher, least flycatcher, willow flycatcher, yellow-throated vireo, blue-gray gnatcatcher, spotted sandpiper, mute swan, wood duck, mallard, and green heron. Two freshwater, ephemeral streams (Gordons Brook and Wades Brook) flow east to west through this woodland, providing riparian habitat that is potentially used for breeding by additional species such as American redstart, warbling vireo, and Louisiana waterthrush.

The Forest Trail North Reach contains larger areas of woodland that could provide breeding habitat for some forest-interior birds, such as veery, ovenbird, scarlet tanager, black and white warbler, and black-throated green warbler. Examples of other forest birds likely to nest in this area include red-eyed vireo, eastern wood pewee, eastern phoebe, great-crested flycatcher, wood thrush, ruby-throated hummingbird, cedar waxwing, pileated woodpecker, yellow-bellied sapsucker, barred owl, and great-horned owl, along with generalists like American robin.

Breeding birds in the woodland area intersected by the Forest Trail South Reach are expected to include common "backyard" species associated with narrow fragments, such as American robin, black-capped chickadee, blue jay, tufted titmouse, white-breasted nuthatch, northern mockingbird, and red-bellied woodpecker.

Marsh Trail Reach

Emergent vegetation within the Marsh Trail Reach near the mouth of Fishkill Creek is overwhelmingly dominated by non-native *Phragmites australis*, thus limiting the quality of the habitat for tidal marsh birds and other wildlife. Nevertheless, several species of bird's nest in *Phragmites*-dominated tidal marshes and have the potential to occur in this area and along Denning's Point, such as red-winged blackbird, common yellowthroat, swamp sparrow, song sparrow, marsh wren, Virginia rail, and green heron. American black duck and pied-billed grebe also have the potential to nest in the area. Wading birds, such as great egret, snowy egret, and great blue heron, associated with nesting colonies elsewhere, use the marsh's shallows for foraging. Ospreys from nesting sites elsewhere are also likely to forage for fish in the open waters of the creek mouth. Fishkill Creek Mouth is classified as a Winter Waterfowl Concentration Area by NYNHP for the abundance of wintering waterbirds in this area. The mouth of Fishkill Creek is also designated as Significant Coastal Fish and Wildlife Habitat, or SCFWH, (discussed in more detail below). It is an important spawning area for coastal migratory fishes, which provides productive feeding habitat for birds such as osprey and bald eagle (OPRHP 2010).

Upstream from the mouth, where the proposed bridge would be located, the forested riparian zone of Fishkill Creek is potentially used for nesting by species such as common yellowthroat, yellow warbler, swamp sparrow, song sparrow, tree swallow, barn swallow, warbling vireo, willow flycatcher, least flycatcher, eastern kingbird, American redstart, Louisiana waterthrush, spotted sandpiper, belted kingfisher, hooded merganser, wood duck, and Canada goose.

The remaining portion of the Marsh Trail Reach north of Fishkill Creek contains narrow forested habitat along with existing trails. The edge effects and disturbance from the railroad tracks, narrow width of the woodland, and high levels of human activity likely limit the breeding bird community

in this area to disturbance-tolerant generalists, such as American robin, blue jay, northern cardinal, and red-bellied woodpecker. Many of the birds that breed in the vicinity of the Fjord Trail North Corridor are migratory and do not occur in the region during winter. The winter bird community in terrestrial habitats along much of Fjord Trail North is expected to be composed of common year-round resident species, such as black-capped chickadee, tufted titmouse, American goldfinch, downy woodpecker, red-bellied woodpecker, northern cardinal, white-breasted nuthatch, mourning dove, and barred owl. White-throated sparrows and dark-eyed juncos are additional landbirds that are common and ubiquitous to the region during winter. The Hudson River and its associated bays and tidal wetlands are congregation areas for wintering waterfowl as well as bald eagles. Waterfowl and other waterbirds commonly found on the Hudson River during winter include American black duck, bufflehead, Canada goose, double-crested cormorant, canvasback, common goldeneye, common loon, common merganser, great black-backed gull, herring gull, hooded merganser, mallard, mute swan, pied-billed grebe, ring-billed gull, and ring-necked duck (Fowle and Kerlinger 2001, DeOrsey and Butler 2006, Bochnik 2011). Waterbirds such as mallards, black ducks, and Canada geese are also likely to occur during winter in the freshwater and tidal wetlands along the alignment. Bald eagles can commonly occur anywhere along the river's shoreline where there is unfrozen water, and the species is known to congregate in significant concentrations during winter around Denning's Point. The cove between Denning's Point and the Metro-North Commuter Railroad Company (MNR) tracks is likely used by similar wintering waterbirds as those listed above for the open waters of the main river channel. During spring and fall migration, large numbers of waterfowl, shorebirds, and birds of prey following the Atlantic Flyway overlap with the Hudson River. Broad-front migrants, such as warblers and other songbirds, which do not follow distinct flyways like these other groups of birds, migrate through the region in abundance as well.

Most species are more generalistic in their habitat preferences during migration than during the non-migratory periods, and thus, far more species can briefly occur along the alignment during spring and fall than at other times of year. Examples of migratory landbirds that are likely to occur in wooded portions of the Forest Trail North Corridor include common yellowthroat, scarlet tanager, red-eyed vireo, wood thrush, yellow warbler, American redstart, black-throated blue warbler, black-throated green warbler, magnolia warbler, Nashville warbler, northern parula, ovenbird, Swainson's thrush, hermit thrush, veery, white-throated sparrow, and yellow-rumped warbler, among others. The lower Hudson River is a significant migration corridor for birds of prey, which ride updrafts coming off the ridges. Turkey vultures, black vultures, ospreys, bald eagles, northern harriers, sharp-shinned hawks, Cooper's hawks, red-shouldered hawks, broad-winged hawks, red-tailed hawks, American kestrels, merlins, and peregrine falcons all commonly move along the river corridor during migration.

Birds were surveyed along portions of the Fjord Trail North Corridor on October 19, 2016, the end of fall migration/beginning of the wintering period for most birds of the region; and on September 15, 2021, at peak fall migration. Birds observed in the vicinity of the Marsh Trail Reach included: rock dove, northern flicker, white-throated sparrow, black-capped chickadee, great egret, great blue heron, osprey (flyover), northern cardinal, northern flicker, pileated woodpecker, European starling, song sparrow, white-throated sparrow, black-capped chickadee, American robin, red-breasted nuthatch, and blackpoll warbler.

Reptiles and Amphibians

Reptile and amphibian richness is high in the Hudson Valley due to the convergence of the range limits of many northern and southern species (Gibbs et al. 2007). In addition, the Highlands region

features unique, uncommon habitat types that are required by range-restricted habitat specialists, such as the timber rattlesnake (*Crotalus horridus*) and eastern fence lizard (*Sceloporus undulatus*) (Penhollow et al. 2006, Gibbs et al. 2007, OPRHP 2010). Thirty-three (33) of New York State's 73 amphibian and reptile species have been documented in HHSPP alone (OPRHP 2010; see **Appendix III/IV.E-1,** Table III.E-3).

The NYSDEC Herp Atlas Project was a 10-year survey (1990–1999) of the geographic distribution of reptiles and amphibians in New York State. Forty-two species were documented in the atlas block that covers the Forest Trail North Reach (*West Point* USGS quadrangle) (see **Appendix III/IV.E-1**, Table III.E-3). Most of these species have been documented within HHSPP specifically (OPRHP 2010; see **Appendix III/IV.E-1**, Table III.E-3). However, the atlas block and HHSPP contain habitats used by several of these species, that are not found in the vicinity of the Forest Trail North Reach, and therefore, several of the reptiles and amphibians listed in **Table III.E-3** in **Appendix III/IV.E-1** do not have the potential to occur in the Forest Trail North Reach. On the basis of their habitat associations (DeGraaf and Yamasaki 2001, Mitchell et al. 2006, Gibbs et al. 2007), 28 species of reptiles and amphibians are considered to have the potential to occur near one or more of the reaches of the Forest Trail North Corridor (see **Appendix III/IV.E-1**, Table III.E-3), and are discussed below.

Forest Trail North Reach and Forest Trail South Reach

Species with the potential to occur along any of the woodland edges with NYS Route 9D include red-backed salamander and garter snake, with additional species such as ringneck snake, eastern wormsnake, black rat snake, northern copperhead, milk snake, American toad, wood frog, and spring peeper potentially occurring in the wider fragments of upland forest.

Reptiles and amphibians expected to occur near the two freshwater streams and near freshwater wetlands that are located in the vicinity of the Forest Trail North and Forest Trail South Reaches include species such as painted turtle, spotted turtle, red-eared slider, snapping turtle, wood frog, green frog, bullfrog, spring peeper, gray treefrog, pickerel frog, American toad, eastern red-spotted newt, brown snake, ringneck snake, milk snake, eastern wormsnake, black rat snake, northern watersnake, and garter snake.

Reptiles or amphibians observed within the Forest Trail North and Forest Trail South Reaches on September 15, 2021 included American toad, wood frog, pickerel frog, green frog, and milk snake.

Marsh Trail Reach

Emergent vegetation at the mouth of Fishkill Creek is dominated by non-native *Phragmites australis*, thus limiting the quality of the habitat for reptiles and amphibians. Nevertheless, some species use *Phragmites*-dominated tidal marshes and have the potential to occur in this area. Examples include snapping turtle, garter snake, northern watersnake, American toad, bull frog, green frog, gray tree frog, spring peeper, and pickerel frog (Meyer 2003, Kiviat 2013, Tozer and Mackenzie 2019). Upstream from the mouth, where the stream crossing would be located, the open waters and/or riparian zone of Fishkill Creek are potentially used by species such as painted turtle, red-eared slider, snapping turtle, American toad, green frog, bull frog, spring peeper, pickerel frog, northern two-lined salamander, northern watersnake, garter snake, and eastern ribbon snake.

North of Fishkill Creek, the small size of the forest and human activity on the existing trails along the route of the Marsh Trail Reach limits reptiles and amphibians to species with small area requirements, such as garter snake, black rat snake, red-backed salamander, and American toad.

The shoreline areas of Denning's Point and/or the cove have been observed to provide habitat for painted turtle, red-eared slider, snapping turtle, spotted salamander, and wood frog.

Reptiles or amphibians observed within the Marsh Trail Reach on October 19, 2016 and September 15, 2021, included black rat snake and northern red-backed salamander.

Mammals

Similar to reptiles and amphibians, mammal species richness is high in the Hudson Valley due to the overlap of northern and southern species' ranges, and a wide diversity of habitat types. In addition, the Highlands region has some of the largest, intact tracts of forest remaining in New York State, which can support mammals with large area requirements, such as fisher, bobcat, and black bear. Some sections of the Fjord Trail North Corridor, however, would pass through small habitat fragments that are disturbed by their proximity to railroad tracks and NYS Route 9D and human activity on existing trails. This reduces the number of mammal species with the potential to occur in the vicinity of the reaches relative to the full community of mammals present in the more interior portions of HHSPP and other contiguous tracts of habitat in the Highlands region. Mammals that have been documented within HHSPP (OPRHP 2010) and the subset of those considered to have the potential to occur in the vicinity of the Fjord Trail North Corridor based on their habitat associations (Whitaker and Hamilton 1998, DeGraaf and Yamasaki 2001, and others cited below) are listed in **Appendix III/IV.E-1**, Table III.E-4.

Forest Trail North Reach and Forest Trail South Reach

Only disturbance-tolerant generalist species such as raccoon, woodchuck, white-tailed deer, striped skunk, and Virginia opossum would be expected to occur along portions of the Forest Trail Reaches that border the edge with NYS Route 9D.

Mammals with the potential to occur in the freshwater wetlands along the Forest Trail Reaches and their forested margins include muskrat, mink, southern red-backed vole, ermine, long-tailed weasel, New England cottontail, gray squirrel, southern flying squirrel, eastern chipmunk, woodchuck, white-footed mouse, deer mouse, short-tailed shrew, big brown bat, little brown bat, eastern red bat, hoary bat, raccoon, striped skunk, Virginia opossum, bobcat, beaver, gray fox, and white-tailed deer. Mammals with the potential to occur in the slightly wider woodlands along the Forest Trail Reaches include gray squirrel, southern flying squirrel, eastern chipmunk, woodchuck, white-footed mouse, deer mouse, short-tailed shrew, big brown bat, little brown bat, eastern red bat, hoary bat, raccoon, striped skunk, Virginia opossum, white-tailed deer, red fox, eastern coyote, bobcat, and occasionally black bear. New England cottontail, a species proposed to be state-listed, are known to occur widely throughout this area (NYNHP 2024j).

Mammals observed within the Forest Trail Reaches on September 15, 2021 included gray squirrel, white-tailed deer (tracks), and raccoon (tracks).

Marsh Trail Reach

The southern portion of the Marsh Trail Reach would follow a wooded riparian zone along the south side of Fishkill Creek. Emergent vegetation at the mouth of Fishkill Creek is dominated by non-native *Phragmites australis*. Mammals that use Phragmites-dominated tidal marshes and have the potential to occur in this area include species such as muskrat, Norway rat, white-footed mouse, deer mouse, meadow jumping mouse, meadow vole, and northern short-tailed shrew (Meyer 2003, Kiviat and MacDonald 2004, Crain 2008). Upstream from the mouth, where the proposed bridge would be located, Fishkill Creek and its wooded riparian zones are potentially used by mammals such as muskrat, beaver, mink, gray squirrel, southern flying squirrel, eastern chipmunk,

woodchuck, white-footed mouse, deer mouse, short-tailed shrew, big brown bat, little brown bat, eastern red bat, hoary bat, raccoon, striped skunk, Virginia opossum, and white-tailed deer.

The remainder of the Marsh Trail Reach (northern section) contains small, forested areas affected by trains on the railroad tracks and human activity on the existing trails. This likely limits the mammal community to disturbance-tolerant species such as gray squirrel, eastern chipmunk, white-footed mouse, raccoon, and white-tailed deer. Bats, such as big brown bat, little brown bat, eastern red bat, and hoary bat have the potential to roost on Denning's Point and forage along its shorelines.

Mammals observed within the Marsh Trail Reach on October 19, 2016 and September 15, 2021, included gray squirrel and white-tailed deer (tracks).

AQUATIC BIOTA

As discussed in Chapter III.D, "Water – Fjord Trail North," the Fjord Trail North Corridor is located within the Lower Hudson River Watershed, which comprises the rivers and streams that flow to the Hudson River, including any ponds, lakes, and reservoirs in their path. The Fjord Trail North Corridor crosses through two sub-watersheds of the larger Lower Hudson River Watershed: Breakneck Brook-Hudson River and Wiccopee Creek-Fishkill Creek (see Figure III.D-6). Rivers and streams along the Fjord Trail North Corridor include the Hudson River, Wades Brook, Gordons Brook, Fishkill Creek, and the lakes or ponds that are connected to these stream systems (see Figure III.D-5a and 5b).

Hudson River

As described in Chapter III.D, "Water – Fjord Trail North," the Hudson River is tidally influenced from the Battery in Manhattan to the Federal Dam at Troy, New York. The Fjord Trail North Corridor follows the Mid-Hudson River Estuary near Hudson River Mile 55, a portion of the river that provides significant spawning, migratory, and nursery habitat for anadromous, estuarine, and freshwater fish (Penhollow et al. 2006). This section of the Hudson River is relatively narrow and deep (up to 200 feet deep) with strong currents and a rocky bottom substrate. Striped bass spawn in the Hudson River in the vicinity of the Fjord Trail North in May and June. The adults leave this area shortly after spawning and after the eggs have hatched, larval fish begin moving downstream to nursery areas in the more brackish portion of the Hudson River (NYSDOS 2020). Because the salt front moves up through this area, a variety of marine species, such as bluefish, anchovy, silversides, and blue crab may also be found. As discussed later in this chapter under "Rare, Threatened, or Endangered Species," Atlantic sturgeon (*Acipenser oxyrhynchus*, federally endangered, state high priority species of greatest conservation need) and shortnose sturgeon (*Acipenser brevirostrum*, federally and state endangered) travel through the deeper waters of the river in this area during migration.

Essential Fish Habitat

EFH is defined by National Marine Fisheries Service (NMFS) as waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. NMFS designates EFH within marine waters. **Table III.E-2** lists the species and life stages of fish that NMFS has identified as having EFH in this portion of the Hudson River.

Table III.E-2
Essential Fish Habitat Designated Species within Fjord Trail North Vicinity

Species	Eggs	Larvae	Juvenile	Adult
Winter flounder	X	X	X	X
Little Skate			X	X
Atlantic Herring		X	X	X
Red Hake	X	X	X	X
Windowpane Flounder	X	X	X	X
Winter skate			X	X
Clearnose Skate			X	X
Longfin Inshore Squid	X			
Bluefish			X	X
Atlantic Butterfish		X		
Summer Flounder		X	X	X

Source: https://www.habitat.noaa.gov/apps/efhmapper/efhreport
* The Fjord Trail North Corridor is within a region-wide area designated as a Habitat Area of Particular Concern (HAPC) for Summer Flounder SAV. Local mapping would be required for presence confirmation.

Significant Coastal Fish and Wildlife Habitat

Portions of the Fjord Trail North Corridor would be within or adjacent to the Hudson Highlands SCFWH and the Fishkill Creek SCFWH (see Figure X.A-1). The Hudson Highlands SCFWH comprises the stretch of the Hudson River from just west of Denning's Point in Beacon south to Stony Point in Rockland County and Verplanck in Westchester County, NY (Hudson River Miles 44-56). This section of the Hudson River is very narrow and deep (up to 200 feet deep) with strong currents and a rocky bottom substrate. Its SCFWH designation is due largely to a significant concentration of wintering bald eagles, presence of spawning area for striped bass, presence of nursery and summering areas for Atlantic sturgeon, and the presence of migration routes for both Atlantic and shortnose sturgeon. The Fishkill Creek SCFWH is located just south of Beacon where Fishkill Creek drains to the Hudson River and includes Denning's Point. The Fishkill Creek SCFWH designation is due primarily to a significant concentration of osprey during spring migration and year-round foraging by bald eagles. It also provides an important spawning area for anadromous fishes and contains extensive areas of mudflats, emergent marsh, and subtidal beds of aquatic vegetation.

Gordons Brook, Wades Brook, and Fishkill Creek

The Fjord Trail North Corridor would include trail crossings of Wades Brook, Gordons Brook, and Fishkill Creek. Wades Brook and Gordons Brook flow roughly east to west from higher elevations in the Hudson Highlands (HHSPP) to the Hudson River. Gordons Brook, along with Wades Brook, feed into the NWI-mapped freshwater forested/shrub wetland located west of NYS Route 9D before reaching the Hudson River. NYSDEC identifies Wades Brook and Gordons Brook as "High Condition" streams, which indicates high quality based on calculated land cover, habitat, connectedness, and infrastructure indices. These streams are warmwater, meaning they do not provide suitable habitat for trout and trout spawning, but they do serve as important nursery and foraging habitat for anadromous fish in the lower reaches.

Fishkill Creek flows through Beacon and joins the Hudson River east of Denning's Point. It feeds several NWI- and NYSDEC-mapped wetlands near this confluence. NYSDEC identifies Fishkill Creek as a "Low Condition" stream, based on low ratings related to land cover, connectedness

and damming, and trout habitat suitability. However, brown trout do occur in the lower reaches of Fishkill Creek.

RARE, THREATENED, AND ENDANGERED WILDLIFE SPECIES

The USFWS IPaC system list of federally threatened, endangered, candidate, or proposed species with the potential to occur in the Fjord Trail North Corridor includes Indiana bat (U.S. endangered, NYS endangered), tri-colored bat (U.S. proposed endangered), northern long-eared bat (U.S. threatened, NYS endangered), and monarch butterfly (U.S. candidate) (see **Appendix III/IV.E-2**). Federally and/or state-listed species documented in HHSPP include northern long-eared bat, bald eagle (NYS threatened), timber rattlesnake (NYS threatened), eastern fence lizard (NYS threatened), eastern wormsnake (NYS special concern), eastern hognose snake (NYS special concern), pied-billed grebe (NYS threatened), least bittern (NYS threatened), peregrine falcon (NYS endangered), and New England cottontail (NYS special concern) (OPRHP 2010, NYNHP 2024j). Federally and/or state-listed species of which NYNHP has non-historical records, specifically in the area of the Fjord Trail North Corridor, include bald eagle, timber rattlesnake, shortnose sturgeon (federally and state endangered), Atlantic sturgeon (federally endangered, state high priority species of greatest conservation need), eastern fence lizard, New England cottontail, peregrine falcon, pied-billed grebe, and eastern wormsnake.

State-listed bird species that were documented by the 2000–2005 BBA in census blocks 5858A, 5859C, and 5759D, and in the ongoing 2020–2024 BBA census blocks and are considered to have the potential to breed in the vicinity of the Fjord Trail North Corridor on the basis of their habitat requirements and sensitivity to human disturbance (DeGraaf and Yamasaki 2001, Billerman et al. 2020) include: peregrine falcon, pied-billed grebe, least bittern, bald eagle, osprey (NYS special concern), and cerulean warbler (NYS special concern).

Federally or state-listed reptiles or amphibians documented by the Herp Atlas Project in the West Point USGS quadrangle and considered to have the potential to occur in the area of the Fjord Trail North Corridor on the basis of their habitat associations and area requirements (Klemens 1993, DeGraaf and Yamasaki 2001, Mitchell et al. 2006, Gibbs et al. 2007, others cited below) include: timber rattlesnake (NYS threatened), eastern hognose snake (NYS special concern), eastern wormsnake, eastern fence lizard, spotted turtle (NYS special concern), and eastern box turtle (NYS special concern).

Bald eagle and osprey were the only federally or state-listed species of wildlife observed in the vicinity of the Fjord Trail North Corridor during the October 19, 2016 and September 15, 2021 wildlife surveys.

Federally Listed Wildlife Species

Indiana Bat

Habitats used by Indiana bats (U.S. endangered, NYS endangered) outside of their winter hibernation period are varied and include riparian, bottomland/floodplain, and upland forests (Humphrey et al. 1977, Britzke et al. 2006, Watrous et al. 2006), often within agricultural landscapes (Murray and Kurta 2004, Watrous et al. 2006, USFWS 2007a). They typically roost near forest gaps or edges, where trees receive direct sunlight for much of the day (Callahan et al. 1997, Menzel et al. 2002), and forage along forest edges or over fields and other large open habitats. The Indiana bat is listed by the USFWS IPaC System as potentially present near the Fjord Trail North Corridor. NYNHP has no records of the species near the Fjord Trail North Corridor and Indiana bats are not known to occur anywhere within HHSPP (OPRHP 2010, 2021a), but Indiana bats have not specifically been surveyed for in this area of HHSPP. The closest known

occurrences of Indiana bats are within approximately 3 to 4 miles of the northern end of the Fjord Trail North Corridor. Based on the woodland habitat present in the vicinity of the Fjord Trail North Corridor and the presence of Indiana bats in the general landscape surrounding HHSPP, Indiana bats are considered to have the potential to occur along the Fjord Trail North Corridor.

Northern Long-eared Bat

Habitat of the northern long-eared bat (U.S. threatened, NYS endangered) generally includes mature, closed-canopy, deciduous or mixed forest within heavily forested landscapes (Owen et al. 2003, Carter and Feldhammer 2005, Ford et al. 2005). The northern long-eared bat is considered a forest-dependent species that is sensitive to fragmentation and requires interior forest for both foraging and breeding (Foster and Kurta 1999, Broders et al. 2006, Henderson et al. 2008). Roost trees are usually in intact forest, close to the core and away from large clearings, roads, or other sharp edges (Menzel et al. 2002, Owen et al. 2003, Carter and Feldhammer 2005). Foraging activity is greatest in interior areas with a tall and closed canopy (Owen et al. 2003, Patriquin and Barclay 2003, Adams 2013), often on forested hillsides and ridges (Harvey et al. 2011).

Northern long-eared bats are expected to occur in HHSPP (OPRHP 2010), which contains a vast tract of preferred forest interior habitat and is within five miles of a hibernaculum on the west side of the river (NYNHP 2021). Northern long-eared bats also have the potential to occur elsewhere in HHSPP, albeit with less likelihood because of their aversion to fragmentation and edges. This includes wooded areas along the Fjord Trail North Corridor, such as the woodlands surrounding the Forest Trail North and South Reaches and the Marsh Trail Reach.

Tri-colored Bat

The tri-colored bat is currently proposed to be listed by USFWS under the Endangered Species Act due to impacts of white-nose syndrome. Like the Indiana bat and northern long-eared bat, the tri-colored bat is a hibernating species of bat that emerges from its hibernaculum in the spring, with females dispersing to form maternity colonies and males remaining solitary until the end of the summer. The tri-colored bat is a forest generalist, inhabiting a variety of forest types across its broad geographic range, which spans most of the continental U.S., southeastern Canada, Mexico, and Central America (USFWS 2022). Tri-colored bats roost mostly within leaf clusters on live, dying, or dead hardwood trees, and occasionally in coniferous trees and artificial structures (e.g., barns, porch eves, bridges) (Veilleux et al. 2003, Perry and Thill 2007, Thames 2020, USFWS 2022). Female tri-colored bats usually return each year to the same roosting area but switch roost trees frequently (daily to semi-daily; Veilleux and Veilleux 2004, Quinn and Broders 2007, Poissant et al. 2010) over an area of up to a few acres throughout the maternity season (Veilleux and Veilleux 2004). Tri-colored bats forage at or above canopy height, over open water, and along forest edges (Barbour and Davis 1969, Mumford and Whitaker 1982, Hein et al. 2009). Foraging areas are usually within 3 miles of roost sites for females and 7 miles for males (Veilleux et al. 2003, Thames 2020). Wetlands and surface waters are important foraging habitats and sources of drinking water (USFWS 2022).

The tri-colored bat has experienced local population declines of 90–100 percent across 59 percent of its geographic range due to white-nose syndrome (Cheng et al. 2021). The range-wide population is predicted to decline by 89 percent over the next few years, resulting in a 65 percent reduction in spatial distribution (USFWS 2021a, 2022). Mortality caused by wind-energy facilities is the second greatest contributor to tri-colored bat population declines (USFWS 2022), with another 19-21 percent decrease expected to result under current wind-energy development scenarios (Wiens et al. 2022, Whitby et al. 2022). In contrast to these stressors, USFWS (2021, 2022) considers the impact of habitat loss on tri-colored bat population sizes to currently be low.

Habitat availability is not believed to be currently limiting tri-colored bat abundance and is not expected to be a limiting factor in the near future (USFWS 2022). However, while tri-colored bat populations are perilously low, they are vulnerable to local extirpations caused by the cumulative effects of habitat loss and other stressors that compound the broader impacts of white-nose syndrome and wind-energy mortality (USFWS 2022). Although tri-colored bats were likely never common in NYS, which is adjacent to their core range, statewide population numbers have declined approximately 96 percent from 2007 to 2015 (NYNHP 2024c). Therefore, the Fjord Trail North Corridor is unlikely to contain tri-colored bat, but supporting habitat does exist.

Monarch Butterfly

The monarch butterfly is a migratory insect that has experienced recent population declines and is currently being reviewed by the USFWS as a candidate for listing under the U.S. Endangered Species Act (ESA). Despite these declines, the monarch butterfly is widespread and ubiquitous across North America, and can be found in nearly any open habitat, including within heavily modified urban and agricultural landscapes (Mawdsley and Rubinoff 2020). They migrate from eastern and central North America to winter in montane forests in Mexico and then return north in spring to breed. After breeding throughout the summer, multiple generations iteratively move southwards again to Mexico (Brock and Kaufman 2003). Monarchs are dependent on milkweeds as their larval host plant, which grows in a variety of conditions, including disturbed and degraded habitats such as old fields, roadside margins, residential properties, and city parks. Given the ubiquity of monarch butterflies to open habitats, they have the potential to occur any time from spring through fall in open areas of the Fjord Trail North Corridor.

Shortnose sturgeon

The shortnose sturgeon is a federally and state-listed endangered species that can occur in riverine, estuarine, and marine environments along the Atlantic coast of North America. The only known New York population of shortnose sturgeon occurs in the Hudson River. In rivers on the northern end of their range (including the Hudson River), shortnose sturgeon are amphidromous—i.e., they spawn in fresh water but regularly enter saltwater habitats during their life. In general, adult shortnose sturgeon primarily occur in either saline estuarine waters or, more rarely, coastal waters, between spawning cycles, while juveniles tend to remain in the estuary. The Hudson River shortnose sturgeon population currently appears to be stable and has recovered from a significant decline that was due to overfishing and habitat degradation.[10]

Shortnose sturgeon are also known to occur at a wide range of depths. A minimum depth of 0.6 meters (approximately 2 feet) is necessary for the unimpeded swimming by adults. Shortnose sturgeon are known to occur at depths of up to 30 meters (98.4 feet) but are generally found in waters less than 20 meters (65.5 feet) (Dadswell et al. 1984; Dadswell 1979). Shortnose sturgeon typically occur in the deepest parts of rivers or estuaries where suitable oxygen and salinity values are present (Gilbert 1989); however, shortnose sturgeon forage on vegetated mudflats and over shellfish beds in shallower waters when suitable forage is present (NMFS 2018).

Atlantic Sturgeon

The New York Bight Distinct Population Segment of the Atlantic sturgeon, which includes sturgeon from the Hudson River, is federally listed as endangered and is on the state's list of high priority species of greatest conservation need. Juvenile Atlantic sturgeon could potentially occur

[10] Transactions of the American Fisheries Society, Volume 136, "Year-Class Strength and Recovery of Endangered Shortnose Sturgeon in the Hudson River, New York," by R.J. Woodland and D.H. Secor, 2007, pages 2–81.

in the vicinity of the Fjord Trail North Corridor at any time throughout the year; however, sub-adult and adult Atlantic sturgeon and early life stages occur in the Hudson River seasonally during the late spring to fall months and potentially occur near the Fjord Trail North Corridor during those months. Atlantic sturgeon spend most of their lives in marine waters along the Atlantic coast. Adults migrate from the ocean upriver to spawn in fresh water above the salt front in the Hudson River from late April to early July. The primary spawning area for Atlantic sturgeon is near Hyde Park (Dutchess County) (River Mile 83), upriver from the Fjord Trail North Corridor (River Mile 55 to 62).[11] The NMFS has designated critical habitat for Atlantic sturgeon along the length of the tidal Hudson River. NYSDEC annual monitoring of juvenile Atlantic sturgeon shows a significant increase in relative abundance in the Hudson River since 2004, but they are still at risk of mortality from fisheries bycatch, vessel strikes, and habitat loss and degradation (Pendleton and Adams 2021).

State-Listed Wildlife Species

Bald Eagle

The bald eagle is listed as threatened in New York State and federally protected under the Bald and Golden Eagle Protection Act. The bald eagle was removed from the U.S. Endangered Species List in 2007 because of a significant recovery from population declines that had occurred throughout the prior century. The trend has since continued, with the national population more than quadrupling in size in just a 10-year period between 2009 and 2019 (USFWS 2020). The bald eagle population in New York State has grown dramatically in recent decades, from approximately 50 breeding pairs in 2000 to more than 400 in 2017 (Nye 2010, NYNHP 2024a). Numbers of wintering eagles in the state have also sharply risen (Nye 2010). As a result, NYSDEC has also proposed down-listing the state status of the bald eagle from threatened to special concern. The recovery of bald eagles throughout their range is largely attributable to decades of generational, increasing habituation to human activity and land-use change (Johnson 2010, Guinn 2013) along with successful reintroduction and management efforts, and the ban of dichlorodiphenyltrichloroethane (DDT) (Buehler 2020).

Denning's Point is a significant congregation area of bald eagles during the winter. There are also active nest locations along the Fjord Trail North Corridor. During both the winter and the breeding period, bald eagles have the potential to perch elsewhere along the shoreline of the Hudson River, adjacent to much of the proposed alignment for Fjord Trail North, while foraging for fish. As such, bald eagles are known to be present in the area year-round.

Pied-billed Grebe

The pied-billed grebe, listed as New York State threatened, is a small waterbird that breeds in marshes or on ponds or other still or slow-moving waterbodies, where it builds a floating nest within dense stands of emergent vegetation (McGowan 2008). Pied-billed grebes will nest in both freshwater and brackish habitats, usually of at least 12.5 acres (Muller and Storer 2020). During winter and migration, pied-billed grebes use saltwater bays and estuaries where there is open water for foraging. Pied-billed grebes are rare breeders in southeastern New York (McGowan 2008) and are most commonly found around the lower Hudson River during winter and late spring (DeOrsey and Butler 2006). The NYNHP has records of the pied-billed grebe breeding near Denning's Point. Pied-billed grebe was also documented as a confirmed breeder by the 2000–2005 Breeding Bird Atlas in census block 5759D, which covers a portion of the Forest Trail North Reach. This is the only atlas record of pied-billed grebe confirmed breeding on the lower Hudson River (McGowan

[11] Ibid.

2008). The only suitable breeding habitat for pied-billed grebe within that atlas block is the marsh in the extreme southeastern corner of the block, north of Pollepel Island, east of the MNR tracks, and west of Dutchess Manor. The northern end of the Forest Trail South Reach and southern end of the Forest Trail North Reach would be immediately adjacent to this marsh's eastern edge. Additional areas of marsh that represent potential breeding habitat for pied-billed grebes occur between the MNR tracks and the southern ends of the Forest Trail South Reach and Forest Trail North Reach, along the northern end of the Forest Trail North Reach to the west of Fairways Lane, and in Fishkill Creek Marsh.

Least Bittern

The least bittern, listed as New York State threatened, is a secretive marshbird whose preferred breeding habitat in New York includes freshwater marsh with tall emergent vegetation, particularly cattail, interspersed with open water. Least bitterns in New York and elsewhere also breed in brackish marshes and, less commonly, saltmarshes (Kennedy 2008, Poole et al. 2020). They prefer equal ratios of open water to emergent vegetation (Gibbs and Melvin 1992). Least bitterns can be found breeding in *Phragmites*-dominated marshes, but *Phragmites* is considered a significant source of habitat degradation and threat to least bitterns, and least bittern abundance is negatively related to *Phragmites* invasion intensity (Benoit and Askins 1999, Robichaud and Rooney 2017, Poole et al. 2020; but see Meyer et al. 2010). The least bittern has been documented within HHSPP (OPRHP 2010) and NYNHP has a record of the species likely breeding in the Fishkill Creek area marshes, based on an historic least bittern Breeding Bird Atlas record from 1983, given the potentially suitable habitat here that falls within that Breeding Bird Atlas Block. The most suitable breeding habitat for least bitterns in the vicinity of Fjord Trail North includes the marshes (1) east of Pollepel Island, along (west of) the northern end of the Forest Trail South Reach and southern end of the Forest Trail North Reach, (2) along the northern end of the Forest Trail North Reach, to the west of Fairways Lane and south of Fishkill Creek Marsh, and (3) in the mouth of Fishkill Creek (i.e., Fishkill Creek Marsh). However, the marshes in this area are heavily invaded by *Phragmites*, which diminishes their quality for breeding habitat by least bitterns (Benoit and Askins 1999, Robichaud and Rooney 2017).

Peregrine Falcon

The high ridges of the lower Hudson River corridor historically supported numerous peregrine falcon eyries before the species' widespread decline in the mid-1900s, primarily due to reproductive failure caused by the widespread use of DDT. By the 1960s, peregrine falcons had all but disappeared from this area (Herbert and Herbert 1969). Due to successful re-introduction programs, the ban of DDT, and the species' gradual adaptation to urban environments and usage of tall artificial structures as surrogates for natural nest sites, the Lower Hudson Valley has once again become a stronghold for peregrine falcons and an epicenter of population recovery in New York State and the Northeast (Loucks 2008). Because of this significant recovery, NYSDEC has proposed down-listing peregrine falcon from endangered to a species of special concern (NYSDEC 2019). Peregrine falcons nest in HHSPP on exposed ledges overlooking the river, along the Fjord Trail North Corridor in proximity to the Forest Trail South Reach (Wells 1998; OPRHP 2010, 2021a). Peregrine falcons are aerial predators that hunt on the wing, also high in the air (White et al. 2020). Except for the nearby nesting area, peregrine falcons would not be expected to occur on or along any portion of the Fjord Trail North Corridor, but for infrequent potential occurrences of birds perched along the shoreline for brief periods between hunting bouts.

Osprey

Osprey (*Pandion haliaetus*) is listed as a special concern species by New York State. Listed as endangered in 1976 due to impacts from DDT on reproductive output, its status was downgraded to threatened in 1983 and further downgraded to special concern in 1999 (NYSDEC 2024d). Osprey populations in the U.S., including New York State, have recovered significantly in recent decades after steep, range-wide declines that occurred throughout the mid-1900s (Nye 2008, Poole et al. 2020). Due to this strong recovery in New York State, NYSDEC has proposed to fully de-list the osprey from its current status as a species of special concern (NYSDEC 2019). Ospreys nest in dead trees and on a variety of artificial structures such as utility poles, buoy towers, and platforms erected specifically for use by ospreys. Ospreys breed along coastal and inland shorelines where fish prey can be easily accessed in shallow water. The osprey is documented as a "confirmed" breeder in two of the 2020–2024 Breeding Bird Atlas blocks that span the Fjord Trail North Corridor. Ospreys most commonly nest on inland ponds and lakes rather than rivers, and their occurrence along the Hudson River is primarily limited to spring and fall migration (DeOrsey and Butler 2006), but confirmed nesting is documented on a navigation structure in the nearby Hudson River. Ospreys may also forage for fish over the open waters of the Hudson River, its marshes, and the mouth of Fishkill Creek.

Cerulean warbler

The cerulean warbler is a Neotropical migratory songbird that breeds in mature forests of the eastern U.S. and overwinters in South America. Cerulean warblers historically bred in western New York State and then in the mid-20th century, expanded their range eastward, including to the Hudson Highlands (Rosenberg 2008). The species is listed as a species of special concern (NYSDEC 2024a). Cerulean warblers are most associated with forested wetlands and riparian corridors dominated by sycamore, cottonwood, silver and red maple, and green ash, and north- and east-facing dry ridgetops and hillsides with mature oak/hickory-dominated forest (Rosenberg et al. 2000, Buehler et al. 2020). Cerulean warblers are considered highly sensitive to forest fragmentation, although their area requirements appear to vary geographically and be lowest in the eastern extent of their range (Buehler et al. 2020). Loss and fragmentation of mature forest breeding habitat is considered the greatest threat to the conservation of cerulean warbler populations (Robbins et al. 1992). The species' sensitivity to direct human disturbance is undescribed (Buehler et al. 2020).

Breeding cerulean warblers have been documented by OPRHP within the Fjord Trail North Corridor at Denning's Point and in the vicinity of Sugarloaf Mountain, near the proposed Wade's Hill Lot, and Bull Hill, and the species is a "confirmed" breeder in two of the 2020–2024 BBA atlas blocks that span the Fjord Trail North Corridor. Cerulean warblers are also considered to have the potential to breed in the woodland through which the Forest Trail South and North Reaches would be located.

New England Cottontail

The New England cottontail is one of only two rabbit species native to the northeastern U.S. and is a species of special concern in New York State and is proposed for listing as New York State threatened by NYSDEC. Its geographic range is estimated to have contracted more than 80 percent since the 1960s (Litvaitis et al. 2006), and the number of known, occupied sites has declined by 50 percent in just the last decade (Rittenhouse and Kovach 2020). In New York, the New England cottontail's range is limited to areas east of the Hudson River in Columbia, Dutchess, Putnam, and Westchester Counties (Litvaitis et al. 2006, Tash and Litvaitis 2007). The decline of the New England cottontail has been driven primarily by habitat loss, fragmentation, and degradation, as well as competition from the introduced eastern cottontail (Litvaitis et al. 2006, 2008; Cheeseman

et al. 2019). The New England cottontail is an early successional habitat specialist, preferring thickets and shrublands provided by regenerating forests (Cheeseman and Cohen 2019), but will also use mature woodlands with up to 75 percent canopy closure, as long as there is a dense understory (Cheeseman et al. 2018, Cheeseman and Cohen 2019). Loss of early successional habitat due to forest maturation, and urban and suburban development with the associated expansions of road networks have also greatly reduced and fragmented New England cottontail habitat (Litvaitis et al. 2008), isolating populations and reducing gene flow needed to maintain populations of this species (Amaral et al. 2016, Cheeseman et al. 2019). Dispersal distances of New England cottontails rarely exceed one kilometer, making close connectivity of habitats critical to population viability (Cheeseman and Cohen 2019). Habitat size is also important, as patches less than five hectares (12.4 acres) tend to be population sinks due to high levels of predation (Barbour and Litvaitis 1993) and resource competition. The Fjord Trail North Corridor is located within the West Putnam County New England Cottontail Conservation Focus Area, as delineated by the New England Cottontail Technical Committee (Fuller and Tur 2012).

Winter pellet surveys have documented the presence of New England cottontails throughout much of the woodland where the proposed Notch portion of the Forest Trail North Reach would be located (OPRHP 2021, NYNHP 2010, 2024j). New England cottontail surveys only reflect winter use (due to limitations of how the species can be surveyed and DNA verified) so it is possible they use other areas nearby in the rest of the season. The New England cottontails in this area may be part of a metapopulation that also includes a small number of rabbits documented at a site east of NYS Route 9D, and perhaps others occurring elsewhere to the east, although it is likely that NYS Route 9D represents a significant barrier that limits dispersal and gene flow between habitats on east and west sides of the road (Tash and Litvaitis 2007, Amaral et al. 2016, Cheeseman et al. 2019).

Timber Rattlesnake

The timber rattlesnake is a New York State threatened species that once ranged throughout most forested, hilly portions of New York State, but is now limited to remnant, isolated populations in the Hudson Valley, Catskills, Southern Tier, and eastern edge of the Adirondacks. Slow maturation rates and low reproductive output hinder population recovery, and illegal collection for the pet trade and indiscriminate killing are a continual problem (Klemens 1993, Gibbs et al. 2007). Timber rattlesnakes are typically found in deciduous forests containing thick understory vegetation, large woody debris, and rock outcrops or talus slopes, often near surface waters. They may also occur in edge habitats (Gibbs et al. 2007, Ulev 2008). Hibernation dens are typically on south-facing, rocky slopes with closed-canopy forest that has nearby gaps or other openings that receive abundant sunlight (Ulev 2008).

Timber rattlesnakes occur within HHSPP (OPRHP 2010), and NYNHP has records of the species in the general area of the Fjord Trail North Corridor (OPRHP 2021, NYNHP 2010, 2024o). However, while timber rattlesnakes are tolerant of small forest fragments (Wittenberg 2012, Wittenberg and Beaupre 2014), none of the woodland bordering the Fjord Trail North Corridor on the west side of NYS Route 9D provides the species' preferred habitat features for birthing rookeries, hibernation dens or basking (e.g., western- to southern-facing rocky slopes, rock outcrops), with the possible exception of Breakneck Ridge, located between but not in the Fjord Trail North and South Corridors, where OPRHP documents foraging and basking habitat within the hardwood forest/rocky summit habitats on Breakneck Ridge (Jaycox 2021). Western-facing talus slopes on the east side of NYS Route 9D, near the proposed Wade's Hill parking lot, driveway, and trail connection, provide potential overwintering habitat. There is a higher likelihood for human-snake interactions on the eastern side of NYS Route 9D due to its proximity to, and unimpeded vegetated landscape from, known occurrences.

Timber rattlesnakes are known to travel up to 2.5 miles or more in forested habitats from hibernation dens for foraging and other activities during the active season (NYNHP 2024o). Therefore, the entire Fjord Trail North Corridor south of Fishkill Creek is potentially suitable for foraging, and especially areas east of NYS Route 9D including the proposed Wade's Hill parking lot, driveway, and trail connection.

NYS Route 9D isolates the woodlands along Fjord Trail North Corridor from the farther-inland (eastern), core areas of HHSPP, where higher-quality habitat for timber rattlesnakes is present. Timber rattlesnakes avoid roads, which represent significant barriers to movement and gene flow (Steen et al. 2007, Clarke et al. 2010), although OPRHP has noted multiple instances of snake road mortality along NYS Route 9D indicating that snakes do attempt to cross this highway. The woodlands to the west of NYS Route 9D are unlikely to support birthing rookeries, hibernation dens or basking areas but may be foraging areas for Timber rattlesnakes. Areas on the east side of NYS Route 9D, including the proposed Wade's Hill parking lot, are closer to known hibernation dens and have a higher likelihood of snake encounters.

Eastern Fence Lizard

The eastern fence lizard is listed as threatened in New York State, which represents the northernmost extent of its geographic range (Gibbs et al. 2007). Eastern fence lizards prefer xeric hardwood and conifer forests with rocky outcrops or talus slopes and can also be found in grasslands and old fields (Mitchell et al. 2006, Gibbs et al. 2007). They have been documented within HHSPP (OPRHP 2010) and the NYNHP has records of the species in the general area of Fjord Trail North Corridor (OPRHP 2021). The most appropriate known habitat for eastern fence lizards in the vicinity of the Fjord Trail North Corridor is on Breakneck Ridge, roughly one-half mile south of the Fjord Trail North Corridor, but other areas haven't been surveyed for habitat.

Eastern Wormsnake

The eastern wormsnake's range within New York is limited to the Albany area, a few counties in the southeastern part of the state, and on Long Island (Gibbs et al. 2007). It is uncommon in New York relative to other northeastern states (DeGraaf and Yamasaki 2001, Gibbs et al. 2007) and is listed as a species of special concern. Eastern wormsnakes are most closely associated with damp forests with mesic, loose soils into which they can burrow, but they are also found in dry forests and a variety of other woodland habitat types (DeGraaf and Yamasaki 2001, Mitchell et al. 2006, Gibbs et al. 2007), where macrohabitat selection can be highly variable and generalistic (Orr 2006, Diefenbacher and Pauley 2014). They are not considered highly sensitive to fragmentation, as they can occur in small habitat islands, including in urban areas (Klemens 1993, Russell and Hanlin 1999, Herrera and Cove 2020). Eastern wormsnakes have been documented within HHSPP (OPRHP 2010) and based on their habitat associations, are considered to have the greatest potential to occur in the vicinity of the Fjord Trail North Corridor in the woodland surrounding the Forest Trail South and North Reaches, and in the woodland on Denning's Point (in the Marsh Trail Reach).

Eastern Hognose Snake

The eastern hognose snake, a species of special concern in New York State, inhabits a wide variety of habitat types, including open forests, old fields, marshes, forested wetlands, coastal shrublands, and beaches (DeGraaf and Yamasaki 2001, Mitchell et al. 2006, Gibbs et al. 2007). They are most often found in open habitats like fields and open forests, and seldom occur in dense woods (Klemens 1993). In all habitat types that they use, eastern hognose snakes require loose, sandy, well-drained soils through which they can travel belowground (Klemens 1993, DeGraaf and Yamasaki 2001, Gibbs et al. 2007), although they can sometimes be found aboveground on rocky

slopes and other firm ground. In New Hampshire, eastern hognose snakes have been associated with active or abandoned sand and gravel operations because of the preferred sandy deposits and mix of sandy openings and patches of shrubs surrounded by forest (NHDFG 2015). Eastern hognose snakes are known to occur in HHSPP (OPRHP 2010). The margins of the wetlands in the vicinity of the Forest Trail South Reach and the open forest and wetland margins along the Forest Trail North Reach are the most suitable habitats for eastern hognose snakes, and where they have the potential to occur. Eastern hognose snakes share common habitat associations and often co-occur with New England cottontails in early successional habitats (Litvaitis et al. 1999, LaGory et al. 2009); areas along the Forest Trail North Reach in which New England cottontails are known to occur may therefore also be inhabited by eastern hognose snakes.

Eastern Box Turtle

The eastern box turtle is relatively common in New York, but populations are in decline and the species is listed as special concern (Gibbs et al. 2007). Eastern box turtles prefer open forests, forest edges, and successional shrublands, often near water. They can also be found in thickets, stream riparian zones, and low-lying coastal habitats (DeGraaf and Yamasaki 2001, Gibbs et al. 2007). Suitable habitat for eastern box turtles is present throughout the Fjord Trail North. Given the high levels of human activity on the existing trails located within the Fjord Trail North corridor, box turtles would be highly vulnerable to removal by collectors, a persistent threat to box turtles due to their value in the pet trade (Levell 2000). Their presence near the Fjord Trail North corridor suggests possible persistence of a local population despite collection pressures.

Spotted Turtle

The spotted turtle, a species of special concern in New York State, is typically found in vernal pools in spring, upland forest for part of the summer, and wet meadows, forested swamps, or bogs for overwinter hibernation. During the spring and early summer active periods, they can sometimes also be found in other small, unmoving waterbodies, including ditches, ponds, bogs, swamps, and other similar wetlands (Gibbs et al. 2007). The wetlands to the west of the Forest Trail South Reach and at the north end of the Forest Trail North Reach could represent potentially suitable aquatic habitat for spotted turtles, although they do not appear to provide optimal habitat, and spotted turtles have not been documented in these wetlands or elsewhere in the vicinity of the proposed trail. Spotted turtles are therefore considered to have limited potential to occur in each of these aquatic habitats along the Fjord Trail North Corridor and in their immediately surrounding upland forests.

INVASIVE ANIMAL SPECIES

Invasive species are non-native species that can cause harm to an environment when they are introduced (NYSDEC 2021b). Several invasive pests are of concern throughout this region of New York State, including emerald ash borer (*Agrilus planipennis*), hemlock woolly adelgid (*Adelges tsugae*), and spotted lanternfly (*Lycorma delicatula*). Emerald ash borer is native to Asia and is responsible for the destruction of North American ash trees (*Fraxinus* sp.). Hemlock woolly adelgid is an aphid-like insect that can cause extensive damage to North American hemlock trees. Both emerald ash borer and hemlock woolly adelgid are listed as prohibited invasive species by 6 NYCRR Part 575, which states that "no person shall sell, import purchase, transport, introduce or propagate, or have the intent to take any of these actions on the regulated species, unless issued a permit by NYSDEC for research, education, or other approved activity." Spotted lanternfly was only discovered in the United States in 2014 but has since spread rapidly, feeding on a wide variety of plants, and causing concerns over forest health and agricultural and tourism industries. Spotted

lanternfly has been confirmed in Dutchess and Putnam Counties and in the counties surrounding the Fjord Trail North Corridor (Cornell CALS 2021).

The zebra mussel (*Dreissena polymorpha*) is a small bivalve introduced to North America in the mid-1980s and has since become a problematic species within the Hudson River. Zebra mussels are suspension feeders that eat phytoplankton, small zooplankton, large bacteria, and organic detritus by filtering the water (CIES 2021). Because they can filter large quantities of water, populations of plankton, which form the base of the aquatic food web upon which many animals depend, have declined by 70 to 80 percent in the Hudson River (CIES 2021). They also colonize at extensive rates and can easily outcompete native mussels. Zebra mussels have been documented in the Hudson River and the mouth of Fishkill Creek in the vicinity of the Fjord Trail North Corridor (NYIS 2019).

D. FUTURE WITHOUT THE PROPOSED ACTION

ECOLOGICAL COMMUNITIES

In the future without the proposed Fjord Trail North, ecological communities and habitats in the area would be expected to remain largely the same as the current condition with the exception of any changes due to climate change and sea level rise.

PLANTS

In the future without the proposed Fjord Trail North, no vegetation clearing would be proposed. Vegetation and species composition in the area would be expected to remain largely the same as the current condition with the exception of any changes due to climate change and sea level rise.

ANIMALS

In the future without the proposed Fjord Trail North, habitats in the area would be expected to remain largely the same as the current condition with the exception of any changes due to climate change. Increases in temperature, changes in precipitation patterns, sea level rise, and extreme storms associated with climate change all have the potential to adversely affect wildlife gradually over time.[12] As such, wildlife communities and aquatic biota around the Fjord Trail North Corridor would be expected to largely remain unchanged and composed of the same species as under existing conditions, at least in the near term.

E. FUTURE WITH THE PROPOSED ACTION

DESIGN PHILOSOPHY TO AVOID AND MINIMIZE EFFECTS

Early in the planning and design processes for the proposed Fjord Trail, considerations were made to avoid and minimize effects on biological resources to the greatest extent possible. The HHSPP Final Master Plan/Final EIS did not contemplate the proposed Hudson Highlands Fjord Trail. Nevertheless, during the early design of the Fjord Trail, local biological resources were taken into consideration due to the Trail's alignment through and adjacent to HHSPP. Biological resources identified in the HHSPP Final Master Plan/Final EIS were reviewed as a resource. Multiple biological field surveys were conducted. The Ecological Working Group was developed, as described in Chapter I, "Introduction," providing input on planting and landscape restoration

[12] https://dec.ny.gov/environmental-protection/climate-change/effects-impacts#:~:text=Other%20Impacts%20of%20Climate%20Change%20Around%20New%20York%20State&text=Warmer%20temperatures%20are%20altering%20the,that%20are%20destroying%20native%20ecosystems.

strategies along the Trail Corridor and lending their expertise related to ecological communities, flora, and fauna that may be in and around the proposed Fjord Trail. Additionally, efforts were made to incorporate the vision and management goals identified in the HHSPP Final Master Plan/Final EIS for providing opportunities for passive recreation and connection with the Hudson River while protecting native plants and animals. These goals include but are not limited to: protecting and maintaining areas important as habitat for rare, threatened, endangered or protected species; improving the ecological connectivity between disjoint parcels and with other nearby protected lands; designing and locating recreational and interpretive facilities to assure that they do not exceed the parkland's capacity to withstand use or infringe on important natural habitats and are compatible with the protection of park resources; applying the principles of ecosystem-based management to operational and resource protection activities within the park, and providing and maintaining vistas to the Hudson River using topography or existing clearings whenever possible.

The HHSPP Final Master Plan/Final EIS identifies measures associated with recreational trails to protect sensitive resources. In line with these measures, the conceptual design for Fjord Trail North has, and the final design will, limit trail disturbance primarily to the required width within the Trail Corridor and follow trail standards and guidelines identified in the HHSPP Final Master Plan/Final EIS, as applicable. Where possible, the Trail alignment was sited along existing trails and old roadbeds. Proposed removals of mature trees and clearing and grubbing of vegetation would be minimized.

Ecological enhancements would be incorporated wherever feasible, such as planting native vegetation suited for the conditions within the Fjord Trail North Corridor and restoration of SAV beds. Trail and facility design would keep limits of disturbance as narrow as possible while meeting Accessibility needs and other design requirements. To reduce the impact to wetlands and interior forest, parking areas would be designed to be close to NYS Route 9D, keeping to the edge of the forested habitat, as feasible.

During design of the Fjord Trail, the area of the Notch was shifted and reduced in size to minimize potential impacts to New England cottontail habitat. In addition, to facilitate animal movement through their habitats, wildlife crossings would be included at points along Meanders and the Main Trail to allow safe passage for animals. These may include elevated trail sections and wildlife culverts under the Trail. In ecologically sensitive areas, the design may include vegetative buffers to keep users on the Main Trail and out of the landscape. Designs would ensure any buffers are porous and contain breaks, so as not to impede wildlife passage.

ECOLOGICAL COMMUNITIES

CONSTRUCTION

Construction of Fjord Trail North would result in the clearing of vegetation within multiple terrestrial ecological communities. Existing trails and old roadbeds would be incorporated into the design as feasible to reduce the amount of vegetation removal. Tree clearing, in general, would be minimized to the extent possible. Large trees would be avoided to the extent practicable upon final trail and facility (e.g., parking lots, restrooms) design and layout. The majority of tree removals by area would occur within the oak-tulip tree forest ecological community, located south of Fishkill Creek. Fewer tree removals and impacts to ecological communities would occur around the Klara Sauer Trail, Madam Brett Park, and Denning's Point because existing trails would be incorporated into the Fjord Trail North alignment where possible in these areas. Impacts to vegetation on steep slopes would also be minimized. Trail and facility design would keep limits of disturbance as narrow as possible while meeting Accessibility needs and other design

requirements. The trail surface near or in wetlands, to the degree possible, would be elevated to minimize impacts to wetland communities including the use of helical piles. All construction within wetlands would utilize marsh mats and other temporary protection measures to prevent soil compaction and permanent impacts to wetland flora. Best management practices (BMPs), such as visual inspection and cleaning of equipment/vehicles prior to entering or exiting a work site to prevent transport of invasive species, would be implemented during construction and as part of the Invasive Species Management Plan. Tree protection measures would include radial trenching (3-foot offset from trunk), and the use of tree protection fencing with signage and mulch. Aeration of roots via soil injection or fertilizer would be performed prior to and after construction by a certified arborist, if approved by OPRHP.

OPERATION

As described above, the full Trail Corridor represents the area within which Fjord Trail North elements may be located and actual disturbances would be less than the areas presented in **Table III.E-1**. Based on current assumptions of trail widths and locations of other elements, Fjord Trail North would result in the permanent loss of approximately 45.4 acres of the existing ecological communities as listed in **Table III.E-1**, including about 32.3 acres of oak-tulip tree forest, 4.6 acres of successional southern hardwoods, 5.1 acres of terrestrial cultural communities, 1.1 acres of floodplain forest, 0.7 acres of shallow emergent marsh, 0.4 acres of floodplain grassland, and 1.2 acres of railroad ecological community (areas categorized as the railroad ecological community include portions of the Fjord Trail North Corridor that are outside of the 25-foot minimum setback from the centerline of closest MNR tracks, but are characterized by conditions influenced by the proximity of the MNR tracks). As discussed under Section C, "Existing Conditions," in some instances, the oak-tulip tree forest, tidal river, brackish tidal marsh, and brackish intertidal mudflats ecological communities within the Fjord Trail North Corridor are classified as significant natural communities by NYNHP. Significant natural communities directly impacted by Fjord Trail North are the oak-tulip tree forest associated with the proposed construction of the Wade's Hill parking lot and connector to the Wilkinson Memorial Trail and the tidal river and brackish tidal marsh associated with the proposed construction in Madam Brett Park and Fishkill Creek. To reduce impacts to these communities, trail and facility design would keep limits of disturbance as narrow as possible while meeting Accessibility needs and other design requirements. The Wade's Hill parking lot would be constructed close to NYS Route 9D to reduce interior forest impacts. The trail surface near or in water resources, to the degree possible, would be elevated to minimize impacts to aquatic communities including the use of helical piles. To help reduce the impact and mitigate the loss of this area and of other terrestrial natural communities, large trees would be protected to the extent feasible and suitable native plantings would be incorporated into the design of the Trail and facilities.

Operation of the proposed Fjord Trail North may indirectly impact ecological communities by increasing and introducing new recreational activity, human disturbance, and invasive species into previously isolated habitats. However, in some areas, the zone of influence for the proposed Fjord Trail North would be limited by existing development (e.g., MNR tracks, local streets, residential properties). Use of existing trails (e.g., the Klara Sauer Trail, on part of Denning's Point, and in Madam Brett Park) currently affects surrounding ecological communities with their zone of influence, and thus would not contribute a new zone of influence to the potential effects of the proposed Fjord Trail North. The proposed trails and facilities located south of Fishkill Creek, including the Notch and the Wade's Hill parking lots, would include a new zone of influence in these areas, which would contribute to edge effects, fragmentation, and other indirect effects on ecological communities. Restoration of vegetation and invasive species management protocols

would mitigate some of the effects on vegetated ecological communities during construction. Plans for restoration of native vegetation would consider the resilience, vigor, site specificity, habitat value, and aesthetic value of the species that would be planted. BMPs, such as visual inspection and cleaning of equipment/vehicles prior to entering or exiting the Trail Corridor to prevent transport of invasive species, would be implemented during operation/maintenance activities and as part of the Invasive Species Management Plan. Educational signage would be installed to alert trail users about invasive species and the sensitive resources surrounding the Trail with encouragement to remain on trails. Bike-cleaning stations and boot scrubbers may be installed at key locations to encourage trail users to remove any invasive species from their bikes or shoes. In ecologically sensitive areas, the design will include buffers, such as boulders, logs, or low fences to keep users on the Main Trail and out of the landscape. In upland areas, native tree, shrub, and herbaceous species that are resilient to climate change would be planted. In the floodplain, native tree, shrub, and herbaceous species that can withstand ice scour would be planted. Vegetation management plans would be developed for the native plantings to assure survival and stabilization. The Applicant would consult with NYSDEC and OPRHP with respect to invasive plant species management and with OPRHP on proposed native species plant lists.

PLANTS

This section describes potential construction and operation impacts from the Proposed Action on plants in the Fjord Trail North Corridor in general and avoidance, minimization, and mitigation measures, as appropriate, to address these potential impacts. Rare, threatened, and endangered plant species are discussed in detail further below.

CONSTRUCTION

As discussed above, existing trails and old roadbeds would be incorporated into the design, as feasible. Tree clearing would be minimized to the extent possible. Large trees would be avoided to the extent practicable upon final trail and facility (e.g., parking lots, restrooms) design and layout. Impacts to vegetation on steep slopes would also be minimized, as feasible. Trail and facility design would keep limits of disturbance as narrow as possible while meeting Accessibility needs and other design requirements. The trail surface near or in wetlands, to the degree possible, would be elevated, including the use of helical piles, to minimize impacts to wetland plants. All construction within wetlands would utilize marsh mats and other temporary protection measures to prevent soil compaction and permanent impacts to wetland flora. BMPs, such as visual inspection and cleaning of equipment/vehicles prior to entering or exiting a work site to prevent transport of invasive species, would be implemented during construction and as part of the Invasive Species Management Plan. Tree protection measures would be implemented during construction to avoid disturbance to selected mature trees within the Fjord Trail North Corridor. Additionally, tree replanting, control and/or removal of invasive plant species, educational signage, and development of a vegetation management plan, would be implemented as strategies to avoid, minimize, and mitigate project-related impacts.

OPERATION

As described above, Fjord Trail North would result in the permanent loss of individual plants and assemblages of plant species that are cleared for trail construction and facility development within the Fjord Trail Corridor. Potential indirect impacts would include changes in the ecological communities' structure and function, increased competition from both native and non-native disturbance adapted species surrounding the proposed trails and facilities, and the indirect effects of human disturbance caused by the recreational usage of the trails. However, in some areas, the

zone of influence for the proposed Fjord Trail North would be limited by existing development (e.g., MNR tracks, local streets, residential properties). Existing trails (e.g., the Klara Sauer Trail, on part of Denning's Point, and in Madam Brett Park) currently affect surrounding plants with their zone of influence, and thus would not contribute a new zone of influence to the potential effects of the proposed Fjord Trail North. In addition, design elements (e.g., boulders, logs, small fencing) would be incorporated to prevent people from leaving the trails and entering sensitive natural areas, thereby further avoiding and minimizing impacts on plants. The proposed trails and facilities located south of Fishkill Creek, including the Notch and the Wade's Hill parking lot, would include a new zone of influence in these areas, which would contribute to edge effects, fragmentation, and other indirect effects on plants.

BMPs, such as visual inspection and cleaning of equipment/vehicles prior to entering or exiting the Trail Corridor to prevent transport of invasive species, would be implemented during operation/maintenance activities and as part of the Invasive Species Management Plan. Educational signage would be installed to alert trail users about invasive species and the sensitive resources surrounding the Trail with encouragement to remain on trails. Bike-cleaning stations and boot scrubbers may be installed at key locations to encourage trail users to remove any invasive species from their bikes or shoes. In upland areas, native tree, shrub, and herbaceous species that are resilient to climate change would be planted. In the floodplain, native tree, shrub, and herbaceous species that can withstand ice scour would be planted. Vegetation management plans would be developed for the native plantings to assure survival and stabilization. The Applicant would consult with NYSDEC and OPRHP with respect to invasive plant species management and with OPRHP on native species plant lists.

SUBMERGED AQUATIC VEGETATION (SAV)

Construction

The only documented SAV within the Fjord Trail North Corridor trail alignment is where the Trail would cross Fishkill Creek with a new pedestrian/bicycle bridge (see **Figure III.E.-3a**). The pedestrian/bicycle bridge to be installed across Fishkill Creek would involve installing piles, which would be done during specific times of year to avoid impacts to terrestrial and aquatic species. Prior to construction activities within Fishkill Creek, a survey for species of SAV would be conducted in cooperation with NYSDEC. Erosion and sediment control measures would be implemented during construction to prevent the discharge of materials into potential SAV habitat and Fishkill Creek in general.

Operation

The proposed bridge crossing over Fishkill Creek would result in piles within the creek and overwater coverage in an area with documented SAV habitat (see **Figure III.E-3a**). Installation of piles would directly displace SAV if it occurs within the footprint of the piles and could adversely impact SAV in the vicinity due to increases in suspended sediment. Operation of the bridge is expected to have limited impacts on the SAV as the shading will move slowly across the habitat throughout the day. The exact pile footprint and overwater coverage would be determined as design progresses, and in coordination with NYSDEC, to minimize the impacts to SAV.

RARE, THREATENED, AND ENDANGERED PLANT SPECIES

As described under Section C, "Existing Conditions," no federally listed plant species are known to occur within the area of the Fjord Trail North. As described above, there are known state rare, threatened, and endangered plant species located within the Trail Corridor. Avoidance of rare plant

species would be considered during the design of the final trail alignment and would be informed by future rare plant surveys conducted at the appropriate times of year. Efforts to avoid or minimize impacts to rare plant species which may be encountered during construction would be made prior to construction as part of the preparation and implementation of a protection plan developed in coordination with OPRHP, NYNHP, and NYSDEC, as appropriate.

INVASIVE PLANT SPECIES

As discussed above, there are multiple invasive plant species documented in the Fjord Trail North Corridor. The locations of existing invasive plant species would be considered upon final design. The Applicant would consult with OPRHP and NYSDEC, as appropriate, and would prepare an Invasive Species Management Plan to control and/or remove invasive plant species to prevent them from growing or spreading during and after construction. BMPs such as visual inspection and cleaning of equipment/vehicles prior to entering or exiting a work site to prevent transport of invasive species, would be implemented during construction and operation/maintenance and as part of the Invasive Species Management Plan. As feasible, topsoil and other material planned to be delivered to the project site would be inspected for invasive species prior to delivery. Educational signage would be installed, and development of a vegetation management plan would be implemented as additional strategies to avoid, minimize, and mitigate project-related impacts.

ANIMALS

TERRESTRIAL WILDLIFE

This section describes potential construction and operation impacts from the Fjord Trail North on terrestrial wildlife in general and avoidance, minimization, and mitigation measures, as appropriate, to address these potential impacts. Rare, threatened, and endangered wildlife species are discussed in detail further below.

Construction

Construction of Fjord Trail North would have the potential to disturb approximately 45 acres of land, the majority of which would be forested ecological communities, within the larger 113-acre Trail Corridor. Existing trails and old roadbeds would be incorporated into the design as feasible to reduce the amount of required vegetation removal, thereby reducing the amount of habitat loss and fragmentation.

Marsh Trail Reach

The Marsh Trail Reach would largely involve improvements and enhancements to existing trails and other infrastructure, and as such, would require limited land disturbance and have minor construction-related impacts to wildlife in the area. Construction of the Marsh Trail Reach would not remove significant amounts of habitat for wildlife and would mostly be limited to areas with existing trails and other infrastructure. Habitat quality in these areas is generally low and existing levels of human activity are high; the wildlife communities are therefore mostly composed of disturbance-tolerant species. Habitat lost to the construction is not expected to significantly impact populations of any species currently inhabiting those areas.

Construction noise would result in temporary impacts to wildlife in adjacent areas, including Fishkill Creek, Fishkill Creek Marsh, the northern end of Denning's Point cove, and the woodland on Denning's Point. The temporary impacts would likely include displacement and physiological stress of wildlife. High baseline levels of human disturbance from the MNR tracks and recreational activity in Madam Brett Park, on Denning's Point, and along the Klara Sauer Trail would be expected to dampen the responses of wildlife in adjacent areas due to long-term habituation to

those disturbances and the effect those disturbances have had over time in shaping the composition of the species present. Relatively sensitive species with the potential to occur in Fishkill Creek, Fishkill Creek Marsh, the northern end of Denning's Point cove, and/or the western side of the woodland on Denning's Point, such pied-billed grebe, green heron, and wood thrush, would likely be temporarily displaced for the duration of construction, while disturbance-tolerant species such as American robin, red-winged blackbird, Canada goose, eastern gray squirrel, and white-footed mouse would likely remain. Following construction, displaced species would be expected to return because the construction would not cause permanent changes to the habitat for wildlife in those areas.

Forest Trail North Reach

The conceptual design for the Forest Trail North Reach involves the Main Trail, as well as a Meander and several Connectors within the forest that extend north from Dutchess Manor to the marshes on the south side of Fishkill Creek and includes the Notch. Construction would cause temporary noise and visual disturbances to wildlife in the woodlands and marshes throughout this Reach, likely displacing all but the most disturbance-tolerant species. The fitness and survivorship of some individuals unable to relocate to alternate habitat nearby would likely be reduced, but construction is not expected to result in significant adverse impacts at the population level.

Forest Trail South Reach

Construction impacts within the Forest Trail South Reach would also include temporary noise and visual disturbances to wildlife in forested areas. Although the forested area between NYS Route 9D and the MNR tracks is narrower in the Forest Trail South Reach than in the Forest Trail North Reach, there are two marshes west of the alignment that are presently undisturbed that would likely be affected by construction activities. Additionally, the proposed Connector from the Wade's Hill lot to the Wilkinson Memorial Trail would cause temporary noise and visual disturbances to previously undisturbed interior forest habitat.

Completing tree clearing during winter, outside of sensitive breeding and nesting periods and when fewer species (e.g., migratory birds) are present, would reduce potential impacts to wildlife from construction activity. Following construction, more disturbance-tolerant species would be expected to return.

Operation

Potential permanent impacts of Fjord Trail North to wildlife include the direct effects of habitat loss and fragmentation caused by the new trail, and the indirect effects of human disturbance caused by the construction and subsequent recreational usage of the trails, as discussed further in the following sections.

Zone of Influence

Some elements of Fjord Trail North have greater potential to impact wildlife than others due to differences not only in location, but also the extent of change from existing conditions. Trail sections that would only slightly enlarge and improve existing recreational trails would have less potential impact to wildlife than new trails and associated features that would have a new or larger development footprint. For example, the Notch and the Wade's Hill Lot and the proposed Connector to the Wilkinson Memorial Trail have a higher potential to impact wildlife due to habitat loss and significant changes in human activity given the lack of development in these areas.

Main Trail Option 1 for the Forest Trail North Reach would have a larger zone of influence due to the introduction of human disturbance to a sensitive marsh habitat that is presently undisturbed. It would directly introduce human disturbance to a habitat in which there presently is none, likely

reducing the breeding bird community to only highly disturbance-tolerant species, such as red-winged blackbird and song sparrow. Any additional species, such as willow and least flycatcher, eastern kingbird, and green heron, that currently have the potential to breed in the marsh would have a much lower potential to occur. The habitat loss, combined with disturbance from recreational usage of the Trail would further shift, or potentially entirely limit, the wildlife community to disturbance-tolerant generalists through the displacement of more sensitive species.

Main Trail Option 2 for the Forest Trail North Reach would be located farther inland and would require a larger footprint of disturbance to construct the Trail along steeper slopes, but its zone of influence would have less impact on sensitive marsh habitat. Much of the area within the Forest Trail South Reach experiences some level of disturbance due to its location between the MNR tracks and NYS Route 9D, but the Main Trail through this area would further fragment the forest and introduce a wider zone of influence. The existing marshes that closely border the Forest Trail South Reach alignment already experience some level of disturbance from passing trains on the MNR tracks but the introduction of human activity on the trail would increase the existing zone of influence.

In contrast, the proposed design features for the Klara Sauer Trail and Long Dock Park sections of the Marsh Trail Reach, for example, would have no new zone of influence because they have little potential to further impact wildlife due to their developed surroundings, high levels of human activity, and urban-adapted wildlife communities.

The effects of nature-based recreation on wildlife have been studied extensively (reviewed by Gaines et al. 2002; Steven et al. 2011; Larson et al. 2016, 2019; Dertien et al. 2021). Contrary to common perception, nonmotorized recreational activities where people are present on foot, like hiking, tend to cause greater disturbance to wildlife than motor vehicles (Larson et al. 2016). The impacts of recreational trails are also driven more so by the presence of humans (and dogs) than the physical change in the habitat caused by the trails (Botsch et al. 2018). Impact severity is positively related to the intensity of trail use (number of people per unit of time) and the spatial extent of a trail relative to the size of its surrounding habitat (Gaines et al. 2002).

Many animal species perceive humans as a predation risk, so disturbance from recreational trails can force wildlife to choose risk avoidance over beneficial activities such as foraging or caring for young (Larson et al. 2016). The most common impacts to wildlife from nonmotorized recreational trails are displacement and avoidance, altered predator-prey dynamics, physiological stress, disturbance during critical life-history periods (e.g., nest abandonment), and declines in abundance, occupancy, and species diversity (Miller et al. 1998, Gaines et al. 2002, Gutzwiller et al. 2002, Banks and Bryant 2007, Reed and Merenlender 2008, Larson et al. 2016). In turn, recreational trails significantly diminish habitat suitability for many species, with reptiles, amphibians, and birds of prey tending to be the taxonomic groups most negatively affected (Larson et al. 2016, Dertien et al. 2021). Impacts extend well beyond trail borders. For example, nonmotorized recreational trails in Colorado were found to negatively affect the species composition of a breeding bird community for 100 meters (328 feet) into the surrounding forest (Miller et al. 1998). A recent meta-analysis of the impacts of multi-use, nonmotorized, recreational trails to wildlife found threshold distances to average around 100 meters for both birds and mammals, but to vary considerably within and among taxonomic groups (Dertien et al. 2021).

Habituation can reduce the negative responses of wildlife to human presence (Baudains and Lloyd, 2007, Ellenberg et al. 2009), but species differ in initial tolerance thresholds (Dertien et al. 2021) as well as their ability to habituate to novel disturbances (e.g., Comly et al. 1998). Species differences in habituation are likely to largely account for changes in wildlife community

composition that are caused by recreational trails, as the species with a relatively strong ability to habituate to the introduction of, or a significant change in, human disturbance remain while the others that cannot are displaced. The species composition of the wildlife communities that currently occur in the vicinity of the Fjord Trail North Reaches has thus been largely shaped by the degree of human disturbance under past and present conditions.

Marsh Trail Reach

Following construction, recreational activity on the Marsh Trail Reach would not be expected to increase levels of human disturbance significantly above existing conditions to the extent that there would be a significant change in wildlife community composition. There would be limited tree clearing along the existing trails and within an inactive rail right-of-way required to widen the Trail to be Accessible. The Marsh Trail Reach is primarily limited to improvements to existing trails and associated infrastructure, in areas where current levels of recreational activity are high due to the ease of access and popularity of Madam Brett Park, the Klara Sauer Trail, and Long Dock Park. From Denning's Point to the terminus in Long Dock Park, the Marsh Trail Reach would follow an existing trail that runs north-south through a narrow woodland corridor between rail tracks and the river's edge. The edge effects and disturbance from the rail tracks, narrow width of the woodland, and high levels of human activity limit the breeding bird community in this area to disturbance-tolerant generalists, such as American robin, blue jay, northern cardinal, and red-bellied woodpecker. A 0.3-mile portion of the Meander along Dennings Point would be a new 10-foot-wide trail, introducing approximately 16,000 square feet of new disturbance. Therefore, the existing zone of influence along the Marsh Trail Reach would remain largely unchanged except for the Meander and a small new trail section in Denning's Point. The proposed Meander at Madam Brett Park would travel very close, and potentially through, the tidal marsh area along Fishkill Creek (pending future field verifications, as needed). Although the tidal marsh is dominated by the non-native *Phragmites australis*, these wetlands provide nesting and foraging habitat for many different marsh birds and habitat for other wildlife. The Meander would directly introduce human disturbance to these marshes in which there presently is little, reducing the wildlife and breeding bird communities to disturbance-tolerant species.

Forest Trail North Reach

Impacts to wildlife from the Forest Trail North Reach would include habitat loss and fragmentation caused by the Main Trail, trail banks, Meanders, and a proposed parking lot at the Notch, disturbance from light pollution, and a significant increase in human activity throughout much of the forest that extends from Dutchess Manor to the mouth of Fishkill Creek. Although there are existing undesignated trails/carriage roads in some areas of this woodland, they are dirt, unmaintained, and seldom used. Thus, habitat fragmentation and human disturbance from the existing trails is minor. In contrast, the conceptual design for the Forest Trail North Reach would widen and resurface existing trails, further fragment the forest with the construction of new trails and associated features in new areas and significantly elevate levels of human activity, thus creating new and expanding existing zones of influence. These changes would be expected to alter the current composition of the forest's wildlife communities, increase nest predation and parasitism rates, and increase permeability to invasive species (Hickman 1990, Miller et al. 1998, Larson et al. 2019). In the intact interior forest areas, such as where the Notch and the proposed Wade's Hill parking lot and Connector to the Wilkinson Memorial Trail would be located, sensitive species with the potential to occur under existing conditions would likely be replaced by edge-associated, human-adapted species (Hickman 1990; Miller et al. 1998; Glennon and Kretser 2013, Glennon et al. 2015). Species such as veery, ovenbird, scarlet tanager, and great-horned owl would have a much lower potential to occur in the community while common, human-adapted

species that are tolerant of small habitat fragments, such as American robin, blue jay, gray squirrel, white-footed mouse, and eastern cottontail would increase in abundance through resource subsidies, decreased interspecific competition, and/or immigration from other areas. This shift in wildlife community composition would likely extend throughout the forest given the forest's size relative to the spatial extent of the Forest Trail North's conceptual design, and the distances of 100 meters (328 feet) or more up to which nonmotorized, multi-use trails typically impact birds and other wildlife (Miller et al. 1998, Dertien et al. 2021).

At its northern end, the Forest Trail North Reach would pass through woodland between MNR tracks to the west and a housing subdivision to the east, south of Fishkill Creek. Potential impacts to bald eagles associated with an active nest in this area are discussed below. South of the new crossing at Fishkill Creek, Main Trail Option 1 of the Forest Trail North Reach would run along the shoreline between Fishkill Creek and a freshwater marsh, then heading south would closely border and surround the freshwater marsh and cross directly through another freshwater marsh via construction of elevated boardwalks to the south. Main Trail Option 2 of the Forest Trail North Reach would circumvent this marsh to the west rather than cross it, but would require a larger area of disturbance on the steep slopes.

During operation of the Forest Trail North Reach, recreational activity on boardwalks through or around the edge of the southern marsh under Option 1 would directly introduce human disturbance to a habitat in which there presently is none, likely reducing the breeding bird community to only highly disturbance-tolerant species, such as red-winged blackbird and song sparrow. Any additional species, such as willow and least flycatcher, eastern kingbird, and green heron, that currently have the potential to breed in the marsh would have a much lower potential to occur. Similar impacts would be expected in the other marsh along the Option 1 alignment because of how closely the Trail would border the marsh, and the amount of upland adjacent area that would be deforested to construct the Trail. The habitat loss, combined with disturbance from recreational usage of the Trail would further shift, or potentially entirely limit, the wildlife community to disturbance-tolerant generalists through the displacement of more sensitive species.

Forest Trail South Reach

The Forest Trail South Reach would be located in a woodland fragment that is east of the MNR tracks and west of NYS Route 9D and in a more interior forested area along the proposed Connector to the Wilkinson Memorial Trail. Freshwater wetlands closely border much of the alignment, to the west, and at its northern end, the Trail is located west of Dutchess Manor. Operation of the proposed connector to the Wilkinson Memorial Trail would have the potential to significantly elevate levels of human activity in an area previously undisturbed. Operation of the southern portion of the Forest Trail South Reach would clear and introduce disturbance to low-quality forest that is degraded due to its proximity to NYS Route 9D to the east and the MNR tracks to the west. However, this would greatly reduce (by approximately half) the width of this forest that currently provides a buffer between NYS Route 9D and the southernmost of the two marshes west of the alignment. With less forest to buffer vehicle noise from NYS Route 9D, and the encroachment of the Trail alignment to within close distance of the marsh's eastern side, there would be an increase in levels of disturbance affecting the marsh—first from construction and then from recreational usage following completion. The periods of greatest recreational activity (warmer months) would coincide with the breeding period of most birds and based on use of popular existing trails in HHSPP, could bring an average 630 visitors per day, and as high as almost 2,300 visitors per day on a peak day (see Chapter III.L, "Traffic"). This would likely displace species that are sensitive to the presence of humans by creating conditions that are suitable only for disturbance-tolerant species. This effect would be intensified by the periods of heaviest

recreational usage of the Trail (i.e., warm months) coinciding with the most sensitive time of year for most wildlife (i.e., breeding). Birds such as least bittern, green heron, and pied-billed grebe, for example, would have a much lower potential to breed there while common, urban-adapted, marshbirds like red-winged blackbird and common yellowthroat would remain. Other birds such as eastern kingbird, least flycatcher, willow flycatcher, yellow-throated vireo, blue-gray gnatcatcher, and spotted sandpiper, which have the potential to breed around the wetland's margins, would also no longer be expected there due to the tree clearing and recreational disturbance from the Trail. Similar impacts to the marsh farther north would be expected to occur. The proposed trail would be located adjacent to the marsh's eastern and northern sides, with minimal vegetated buffer attenuating the noise and visual disturbances to the marsh from construction and recreational usage of the Trail. Both marshes are already exposed to disturbance from train passage on the MNR tracks to their west, which is likely to have partially shifted the composition of their wildlife communities towards disturbance-tolerant species and those that have greater abilities to habituate to a repeated disturbance than others. However, a recreational trail in this area would introduce a novel and more disruptive form of human disturbance that would be likely to further homogenize the wildlife community towards dominance by disturbance-tolerant species.

Other Potential Impacts

The proposed Fjord Trail North includes installation of new lighting in limited areas, such as for safety and wayfinding lighting at the parking areas, restroom buildings, and Main Trail entrances. Light pollution has the potential to adversely affect certain wildlife species. The lighting would potentially alter bat community composition by favoring light-tolerant species, such as eastern red bat and hoary bat, while displacing light-averse species, such as little brown bat and big brown bat (Seewagen and Adams 2021), for an expected distance of approximately 50 meters (164 feet) beyond each illuminated area (Azam et al. 2018). The lighting would potentially affect other nocturnal mammals in these areas as well, by inhibiting foraging and increasing predation risk (Beier 2006). Amphibians, such as wood frogs, would potentially be attracted to the light and experience heightened mortality from vehicles or predators (Longcore and Rich 2004). To minimize the potential for any such impacts, the lighting would be strategically placed, shielded and downward directional (dark sky compliant) to limit trespass on natural areas and turned on only during dusk/evening hours to facilitate safe egress and wayfinding by trail users. This would greatly limit both the spatial and temporal extent of any effects on wildlife in the remnant forest surrounding the parking areas, restroom buildings, and Main Trail entrances.

As potential mitigation for impacts to wildlife, the Applicant will coordinate with MNR and NYSDOT with respect to existing culverts beneath the railroad tracks and NYS Route 9D regarding stormwater and animal movement. In the future, when replacement or upgrades of culverts are proposed, the Applicant would work with these entities to maintain and/or enhance wildlife connectivity through the culverts while meeting stormwater management requirements.

Overall, operation of the Fjord Trail North Corridor has the potential to displace the more sensitive wildlife species in areas that previously were not as affected by human activity.

AQUATIC BIOTA

Construction

Portions of Fjord Trail North where construction would have the potential to impact aquatic biota would include the proposed crossings over Fishkill Creek, Gordons Brook, and Wades Brook, where a bridge or boardwalk would be required. All in-water work would be conducted in

accordance with time-of-year restrictions to protect aquatic biota. The pedestrian/bicycle bridge to be installed across Fishkill Creek would likely require the installation of piles because a clear span bridge may not be feasible at this location. It is expected that Fjord Trail North would be constructed using land-based equipment wherever practicable, such as at Gordons Brook and Wades Brook, to minimize the impacts during construction. Erosion and sediment control measures would be implemented to prevent discharge of materials into the Hudson River, Fishkill Creek, Gordons Brook and Wades Brook. Installation of piles within Fishkill Creek, which is an area designated as EFH and SCFWH, would impact aquatic biota due to increases in suspended sediment and increased noise during construction of the proposed bridge, particularly installation of the piles, but these impacts would be minimal, local, and temporary and not likely to adversely impact local benthic macroinvertebrate and fish species. The temporary loss of habitat for fish and other aquatic biota during construction would not result in a significant adverse impact to these biota as similar habitat would be available adjacent to areas undergoing construction. Additionally, construction would be sequenced such that some portion of Fishkill Creek would remain open for passage at all times. Installation of piles would not occur throughout the construction day but would instead be expected to have periods of rest when in-water construction activities do not occur. A pre-construction SAV survey would be conducted in coordination with NYSDEC to determine exact locations of SAV beds, which provide important habitat for a variety of aquatic organisms, in the vicinity of Fjord Trail North.

The Applicant would seek a permit from the appropriate regulatory agency(s) for in-water activities. Coordination with NMFS with respect to potential impacts to EFH would be conducted during the permitting process.

Operation

Fjord Trail North would result in overwater coverage resulting in shading of aquatic habitat from the crossings over Fishkill Creek, Wades Brook, and Gordons Brook. Fjord Trail North would be designed to avoid impacts to waterbodies to the extent possible, limiting over-water components to areas where the Trail must avoid existing infrastructure or steep slopes, or to maintain the Main Trail grade for Accessibility purposes. The loss of bottom habitat in the footprint of the piles that would support the pedestrian/bicycle bridge over Fishkill Creek is likely to be minimal compared with the abundance of habitat remaining within the creek. The bridge would not adversely affect the movement of aquatic biota, such as striped bass and anadromous fish species through this reach of Fishkill Creek.

Minimization of potential impacts to surface waters could also include the incorporation of culverts and/or elevated trail sections (boardwalk) at Wades Brook or Gordons Brook. Existing culverts along the alignment would be maintained, where streamflow is facilitated beneath the railroad and roadways to the Hudson River, and hydrologic connections between the river and brooks would not be altered, thus protecting movement of fish and other aquatic biota.

Significant Coastal Fish and Wildlife Habitat

As discussed above in Section C, "Existing Conditions," the Hudson Highlands SCFWH designation is due largely to a significant concentration of wintering bald eagles, presence of spawning area for striped bass, presence of nursery and summering areas for Atlantic sturgeon, and the presence of migration routes for both Atlantic and shortnose sturgeon. The Fishkill Creek SCFWH designation, which includes Denning's Point, is due primarily to a significant concentration of osprey during spring migration and year-round foraging by bald eagles. A discussion of potential impacts to these species is provided in the section below under "Rare,

Threatened, and Endangered Species." A discussion of the potential impacts to SAV and invasive species in the areas designated SCFWH are also provided in sections below.

RARE, THREATENED, AND ENDANGERED WILDLIFE SPECIES

Indiana Bat (U.S. Endangered, NYS Endangered)

As discussed under Section C, "Existing Conditions," NYNHP has no records of Indiana bats in the Fjord Trail North Corridor, and Indiana bats are not known to occur anywhere within HHSPP (OPRHP 2010, 2021a); however, Indiana bats have not specifically been surveyed for in this area. The closest known occurrences of Indiana bats are within approximately 3 to 4 miles of the northern end of the Fjord Trail North Corridor. Based on the woodland habitat present in the vicinity of the Fjord Trail North Corridor and the presence of Indiana bats in the general landscape surrounding HHSPP, Indiana bats are considered to have the potential to occur along the Fjord Trail North Corridor. As such, all tree clearing (3-inch diameter at breast height [dbh] or larger) to construct Fjord Trail North would be limited to the winter hibernation period (November 1–March 31) to avoid any potential for direct impacts to Indiana bats during the active seasons. All trees slated to be cut during winter would also be inspected by a trained observer for nesting birds of prey (hawks, eagles, and owls) prior to cutting, to avoid impacts to these federally protected species during their breeding and nesting seasons. The potential disturbance of approximately 38 acres of forested habitat (oak-tulip tree forest, successional southern hardwoods, and floodplain forest) has the potential to reduce available habitat for Indiana bats. The Applicant would consult with OPRHP, NYSDEC, and USFWS, as appropriate, to discuss any additional measures required to minimize and/or mitigate potential impacts to the Indiana bat.

Northern Long-eared Bat (U.S. Endangered, NYS Threatened)

Northern long-eared bats are expected to occur in HHSPP (OPRHP 2010), which contains a vast tract of forest interior habitat and is within five miles of a hibernaculum on the west side of the river (OPRHP 2021, NYNHP 2010, 2021). Northern long-eared bats also have the potential to occur elsewhere in HHSPP, albeit with less likelihood because of their aversion to fragmentation and edges. This includes wooded areas along the Fjord Trail North Corridor, such as the woodlands surrounding the Forest Trail North and South Reaches and the Marsh Trail Reach. As a precautionary measure, all tree clearing (3-inch dbh or larger) to construct Fjord Trail North would be limited to the winter hibernation period (November 1–March 31). This would avoid any potential for direct impacts to northern long-eared bats during the active and pup-rearing seasons. Overall, by limiting tree clearing to the winter hibernation period, construction of Fjord Trail North would not be likely to adversely affect the northern long-eared bat. All trees slated to be cut during winter to avoid impacts to bats would also be inspected by a trained observer for nesting birds of prey (hawks, eagles, and owls) prior to cutting, to avoid impacts to these federally protected species during their breeding and nesting seasons.

Following construction, the woodland habitat loss and fragmentation caused by the Fjord Trail North Reaches would not be expected to significantly impact the northern long-eared bat because habitat availability is currently unlikely to be a limiting factor in the regulation of northern long-eared bat population sizes. Even prior to the recent loss of more than 90 percent of northern long-eared bats on the landscape due to the disease white-nose syndrome, it was uncertain whether summer roosting habitat availability was limiting population sizes of tree-roosting bat species (Sedgeley and O'Donnell, 1999, Crampton and Barclay 1998, Kunz and Lumsden, 2003, Hayes and Loeb 2007). As white-nose syndrome has greatly reduced the size of bat populations, unoccupied roosting habitat has become abundantly available for remaining bats (USFWS 2016).

Moreover, colonies and social networks of northern long-eared bats have been shown to be robust to the loss of roost trees, which is likely due to the ephemeral nature of the dead and dying trees that they usually use as roost sites (Silvis et al. 2014). For these reasons, tree removal to construct Fjord Trail North would not be likely to affect summer roosting habitat availability for northern long-eared bats or impact the size or viability of their populations. The Applicant would consult with OPRHP, NYSDEC, and USFWS, as appropriate, to discuss any additional measures required to minimize or mitigate potential impacts to the northern long-eared bat.

Tri-colored Bat (U.S. Proposed Endangered)

As discussed under Section C, "Existing Conditions," the tri-colored bat is currently proposed to be listed by USFWS as endangered under the ESA. NYNHP has no records of tri-colored bats in the Fjord Trail North Corridor, and tri-colored bats are not known to occur anywhere within HHSPP (OPRHP 2024); however, they have not specifically been surveyed for in this area. Tri-colored bats are considered to have limited potential to occur along the Fjord Trail North Corridor. Regardless, the same protections provided to Indiana bats and northern long-eared bats would extend to tri-colored bats. These include limiting all tree clearing (3-inch diameter at breast height [dbh] or larger) to the winter hibernation period (November 1–March 31) to avoid any potential for direct impacts to tri-colored bats during the active seasons. All trees slated to be cut during winter would also be inspected by a trained observer for nesting birds of prey (hawks, eagles, and owls) prior to cutting, to avoid impacts to these federally protected species during their breeding and nesting seasons. During operation, the woodland habitat loss and fragmentation caused by the Fjord Trail North Reaches would not be expected to significantly impact tri-colored bats because habitat availability is currently unlikely to be a limiting factor in the regulation of tri-colored bat population sizes. As discussed above, the main threat to their population is from white-nose syndrome. It is expected that the tri-colored bat would be listed as endangered before construction of Fjord Trail North would begin. Therefore, Applicant would consult with OPRHP, NYSDEC, and USFWS, as appropriate, to discuss any additional measures required to minimize or mitigate potential impacts to the tri-colored bat.

Monarch Butterfly (U.S. Candidate Species)

As discussed under Section C, "Existing Conditions," monarch butterflies are widespread and ubiquitous, and outside of winter, have the potential to occur in any open habitats along the Fjord Trail North Corridor. Following construction, roughly the same amount of marginal habitat would be present for monarch butterflies in these areas, just in potentially different configurations. The Applicant would consider a post-construction planting plan that would feature milkweeds for larval development and native wildflowers for foraging, potentially improving habitat conditions for monarch butterflies from the present and creating a pollinator pathway connecting pollinator plant communities to the extent possible. Monarch butterflies are tolerant of high levels of human activity, and as such, would not be impacted by operation of the Fjord Trail North Corridor through areas in which monarch butterflies could occur. Overall, construction and operation of Fjord Trail North would be unlikely to adversely affect monarch butterfly populations.

Shortnose (U.S. and NYS Endangered) and Atlantic Sturgeon (U.S. Endangered, NYS High Priority Species of Greatest Conservation Need)

Construction of Fjord Trail North would involve some in-water work within Fishkill Creek upstream of where shortnose and Atlantic sturgeon occupy adjacent deepwater habitat (NYSDOS 2020). Erosion and sediment control measures would be implemented during construction of the pedestrian bridge over Fishkill Creek and Main Trail Option 1 of the Forest Trail North Reach along Fishkill Creek to prevent the discharge of materials into the waterbodies that could affect

sturgeon downstream. Therefore, the Fjord Trail North Corridor would not be expected to result in significant adverse impacts to the federally endangered shortnose or Atlantic sturgeons.

Bald Eagle (U.S. Protected, NYS Threatened)

As discussed under Section C, "Existing Conditions," there are four active bald eagle nests in the vicinity of the Fjord Trail North Corridor. Brick Breach and Denning's Point are also included within a significant concentration area for bald eagles during the non-breeding/wintering period and these areas are used for perching and foraging for both non-breeding and breeding bald eagles associated with nearby nests.

Throughout their range, bald eagles have shown dramatic generational adaptation to disturbance and development over the past few decades (Johnson 2010, Guinn 2013). This has partly led to the national population more than quadrupling in size in recent times (USFWS 2020). The breeding pairs in the vicinity of the Fjord Trail North Corridor are expected to have a moderate level of human disturbance.

Federal and state guidelines recommend that non-motorized recreational activity be no closer than 330 feet from active nests with a visual buffer such as trees and topography and 660 feet from active nests without a visual buffer to avoid disturbance to nesting bald eagles (USFWS 2007b). Although construction of Fjord Trail North, including the operation of heavy machinery, may take place within 330 feet of active nests, construction activities in these areas would be scheduled during the non-breeding period (October to December), when the nests would be inactive, thereby avoiding any potential disturbance to an active nest.

At its northern end, Option 1 of the Forest Trail North Reach would pass through an area containing an active bald eagle nest (as of 2024). As design of Fjord Trail North advances, proximity to active eagles' nests will inform the specific location of Option 1 of the Forest Trail North Reach so that it can be aligned to maintain a minimum of 330 feet of wooded, intervening topography between the Trail and the nest, in accordance with federal guidelines for avoiding disturbance to nesting bald eagles from non-motorized recreational activity (USFWS 2007b). Construction of either Option for the Forest Trail North Reach may require limits of disturbance closer than 330 feet to the nest to operate the heavy machinery needed to remove trees and other plants and construct the main trail and a trail bank. This could cause significant disturbance to this nest site, resulting in abandonment, interference with foraging and provisioning, or premature fledging because of the high levels of noise and human activity the construction would generate within relatively close proximity. For these reasons, as mentioned above, construction of Option 1 or 2 of the Forest Trail North Reach would be limited to the non-breeding period (October to December), when the nest would be inactive. With this measure in place, no construction impacts to nesting bald eagle would be expected to occur. As the design of the Forest Trail North Reach develops and the anticipated construction schedule is known, the Applicant will coordinate with OPRHP, NYSDEC and USFWS to develop measures to minimize impacts to overwintering bald eagles during construction.

Once constructed, Option 1 of the Forest Trail North Reach would create a linear, north-south band of disturbance separating the nest site from the eagles' foraging area on the river, which is inconsistent with federal guidelines (USFWS 2007b). As such, there is some potential for Option 1 of the Forest Trail North Reach to interfere with the breeding activity of the pair of eagles associated with this nest, depending on their level of tolerance of human disturbance. Option 2 of the Forest Trail North Reach is farther inland and would be farther from the Hudson River and

active bald eagle nests. Therefore, recreational use of this trail would have less potential to disturb nesting bald eagles.

Bald eagles exhibit high individual variation in disturbance sensitivity, which is usually due to geographical differences in land-use patterns across their range; bald eagles in remote landscapes have lower thresholds for human disturbance than those in more developed landscapes (Johnson 2010, Guinn 2013). Throughout their range, however, bald eagles have shown dramatic generational adaptation to disturbance and development over the past few decades (Johnson 2010, Guinn 2013). This has partly led to the national population more than quadrupling in size in recent times (USFWS 2020). Prior to this rapid acclimation, bald eagles in all parts of their range were considered extremely sensitive to human disturbance, even outside of the breeding season (e.g., Stalmaster and Kaiser 1997). Bald eagles are now increasingly occurring, and even nesting, in areas with heavy levels of human activity where they would almost never have been found only a few decades ago (Millsap et al. 2004, Guinn 2013). This includes recent nesting of bald eagles within major metropolitan areas, such as New York City, Washington D.C., Philadelphia, and Pittsburgh (Sullivan 2016).

The closest existing sources of human disturbance to the bald eagle nests in the vicinity of the Forest Trail North Reach are a single-family home (< 330 feet), a residential subdivision (< 660 feet), and the MNR tracks (< 660 but >330 feet). Commercial and recreational boating activity on the river are sources of disturbance to these eagles during foraging. Otherwise, development in the surrounding landscape is low due to the extensive amount of state-protected land, and levels of human activity in close proximity of these nest sites are minimal. As such, the nesting pairs of eagles are likely to have a moderate tolerance of human disturbance based on existing uses in the area. A wooded buffer of at least 330 feet between either Option of the Forest Trail North Reach and the nest would be expected to adequately protect these nesting pairs from recreational activity on the Trail.

The breeding pair of eagles at the southern end of the Forest Trail North Reach is not currently within the vicinity of any trail or developed area, other than the MNR tracks, which are less than 150 feet away. Because no other disturbance factors are in the vicinity of this nest, it is unclear how disturbance-tolerant this pair would be to construction and operation/use of this stretch of the proposed Forest Trail North Reach, which is between 300 and 400 feet from the nest. As design of Fjord Trail North advances, the Applicant would ensure this portion of the proposed Trail would be at least 330 feet, with a visual buffer, from the active nest. Due to the presence of a regularly used trail in the area (approx. 350 feet), the breeding pair of eagles associated with the nest in the vicinity of Denning's Point is expected to have a moderate level of disturbance tolerance based on existing uses in the area, similar to the aforementioned pairs that nest near the proposed Forest Trail North Reach.

In addition to locating Fjord Trail North at least 330 feet away from any active bald eagle nests, the trail on Denning's Point would continue to be closed during the bald eagle breeding period to reduce the potential for impacts to bald eagles. To avoid impacts to wintering eagles that primarily congregate on Denning's Point, the current seasonal closures of Denning's Point from December 15 to March 15 would be applied to the Denning's Point Meander to continue to avoid potential disturbance to wintering eagles from recreational activity in this area.

Pied-billed Grebe (NYS Threatened)

As discussed above under Section C, "Existing Conditions," the NYNHP has records of the pied-billed grebe breeding in the vicinity of the Marsh Trail Reach, near Denning's Point cove. Pied-billed grebe was also documented as a confirmed breeder by the 2000–2005 Breeding Bird Atlas

in census block 5759D, which covers a portion of the Forest Trail North Reach. The only suitable breeding habitat for pied-billed grebe indicated within that atlas block is the marsh in the extreme southeastern corner of the block, north of Pollepel Island, east of the MNR tracks, and west of Dutchess Manor. The northern end of the Forest Trail South Reach, and southern end of the Forest Trail North Reach would be immediately adjacent to this marsh's eastern edge. Additional areas of marsh that represent potential breeding habitat for pied-billed grebes occur between the MNR tracks and the southern ends of the Forest Trail South Reach and Forest Trail North Reach, along the northern end of the Forest Trail North Reach to the west of Fairways Lane, and in Fishkill Creek Marsh.

The Marsh Trail Reach would involve mostly improvements to existing trails on the north side of Fishkill Creek Marsh, including the Klara Sauer Trail, the Main Trail in Madam Brett Park, and the Meander down the western shoreline of Denning's Point. The Meander within Madam Brett Park would introduce a new trail section close to the shoreline of Fishkill Creek and the tidal marsh that has the potential to provide habitat for pied-billed grebe. Option 1 of the Forest Trail North Reach would cross one of the freshwater marshes south of Fishkill Creek Marsh via construction of elevated boardwalks, and then closely border and surround the adjacent marsh to the north before joining the Marsh Trail Reach at Fishkill Creek. Option 2 would be farther inland and constructed on grade farther away from the marshes. Both Options for the Forest Trail North Reach would involve construction of new trails and/or the expansion or improvements to undesignated trails/carriage roads. The Forest Trail South Reach would involve construction of all new trails within or in immediate proximity to multiple marshes that are potential breeding habitat for pied-billed grebes.

In all, marshes that have potential breeding habitat include the three marshes that are between the MNR tracks and the Forest Trail North and South Reaches, the two marshes at the north end of the Forest Trail North Reach, and Fishkill Creek Marsh and Denning's Point Cove along the Marsh Trail Reach. Construction of the Marsh Trail Reach (particularly the Meander in Madam Brett Park), Forest Trail North Reach, and Forest Trail South Reach in the vicinity of these marshes/wetlands would generate significant noise and visual disturbances to potential breeding areas of pied-billed grebe. To minimize potential adverse impacts to nesting pied-billed grebes, construction would be scheduled outside of the summer breeding period.

Alteration and loss of wetland breeding habitat is the greatest cause of pied-billed grebe population declines in the Northeast (Gibbs and Melvin 1992, Muller and Storer 2020). Human disturbance during the breeding period (approximately March to July) is another significant threat. The presence of recreationists in marshes disrupts the nest attendance and incubation behaviors of female pied-billed grebes, sometimes causing nest failure (Davis et al. 1985, Forbes and Ankney 1988, Gibbs and Melvin 1992, Anderle and Carroll 1998, Muller and Storer 2020). Protecting wetland breeding habitat and restricting recreational activity in marshes during the nesting season are therefore considered the most effective conservation measures for the pied-billed grebe (Gibbs and Melvin 1992, Muller and Storer 2020).

After construction, levels of human activity on existing trails north of Fishkill Creek Marsh would be expected to increase following completion of the Marsh Trail Reach, further elevating levels of disturbance above existing conditions. Because the Marsh Trail Reach on Denning's Point would be limited to its western shoreline, no changes to the suitability of Denning's Point Cove as breeding habitat for pied-billed grebes would be expected to result from the construction or usage of the Marsh Trail Reach. Option 1 of the Forest Trail North Reach, combined with the improvements to the existing trails and construction of new trail on the north side of Fishkill Creek

for the Marsh Trail Reach, would potentially eliminate the suitability of Fishkill Creek Marsh as breeding habitat for pied-billed grebes. Compared to existing conditions, Fishkill Creek Marsh would be exposed to human activity on two sides (north and south) rather than one (north only), and in close proximity, thus greatly reducing the extent to which birds in the marsh can currently distance themselves from people. Option 2 would align the Forest Trail North Reach upland heading south and significantly reduce the amount of proposed trail along the southern shoreline of Fishkill Creek. Further, Option 2 would pull the trail alignment farther away from the marshes located south of Fishkill Creek, thereby allowing for a buffer area.

Recreational usage of the two Forest Trail Reaches would directly introduce human disturbance to marshes in which the only current potential disturbance is train activity on the MNR tracks. The periods of greatest recreational activity (warmer months) would coincide with the breeding period of pied-billed grebes. This introduction of human disturbance into the marshes from overlooks, boardwalks, and trail sections that would encroach into and on the marsh borders would be expected to be too substantial for pied-billed grebes to tolerate or habituate to.

Given the sensitivity of breeding pied-billed grebes to wetland alteration and recreational activity (Davis et al. 1984, Forbes and Ankney 1988, Gibbs and Melvin 1992, Anderle and Carroll 1998, Muller and Storer 2020), construction and recreational usage of Fjord Trail North would be expected to greatly reduce the potential for the marshes in their vicinity to provide suitable nesting habitat. The extents of the marshes/wetlands within and adjacent to the Fjord Trail North Corridor would be confirmed as design advances and further refinements to shift the trail farther from the edges of wetlands would reduce the impact on nesting pied-billed grebes. Further design refinements could incorporate direct in and out trails with fences and wildlife blinds in place of Meanders that fully border the marsh areas (e.g., Madam Brett Park) to maintain adequate riparian buffers and reduce the impact of human disturbance from trail usage.

Efforts to avoid, minimize, and mitigate impacts—including modifications to the Fjord Trail North Corridor and seasonal construction and use restrictions—would be coordinated with NYSDEC and OPRHP.

Least Bittern (NYS Threatened)

As discussed under Section C, "Existing Conditions," the NYNHP has an historic least bittern Breeding Bird Atlas record from 1983, suspected to be in the Fishkill Creek Marsh, based on the potentially suitable habitat within that Breeding Bird Atlas Block in the vicinity of the Forest Trail North and Marsh Trail Reaches. No subsequent surveys have been conducted for this species at this or other nearby tidal marsh locations to the south. Least bitterns prefer breeding in freshwater or brackish tidal marshes that have roughly equal ratios of tall emergent vegetation and open water (Gibbs and Melvin 1992, Poole et al. 2020). Construction would occur outside of the summer breeding period (May to July) to minimize impacts to nesting least bitterns. Following construction, recreational use of Fjord Trail North may not reduce the current suitability of these marshes as potential breeding habitats for least bitterns given their high tolerance of human activity (Gibbs and Melvin 1992, Poole et al. 2020). Least bitterns even breed in urban areas, where levels of human disturbance are often great, if suitable emergent marsh habitat is present (Gibbs and Melvin 1992, Fowle and Kerlinger 2001, Poole et al. 2020). As such, the least bittern would be expected to have the potential to occur in marshes in the vicinity of the Marsh Trail, Forest Trail North, and Forest Trail South Reaches following completion of the Fjord Trail North.

Peregrine Falcon (NYS Endangered)

Peregrine falcons nest on the exposed ledges of HHSPP that overlook the Hudson River. No portion of the proposed Fjord Trail North alignment would be constructed in high-elevation areas that are known or potential nesting sites for peregrine falcons. Peregrine falcons have become highly adapted to human-dominated landscapes in recent decades (Cade et al. 1996, White et al. 2020) and are tolerant of almost any level of human activity taking place below their nest, provided that the nest is inaccessible (Ratcliffe 1972). The nearest known nesting site is over 0.5 miles from the Fjord Trail North Main Trail with topographic and vegetative buffers. Peregrine falcons would not be expected to occur along the shoreline or along Fjord Trail North except for infrequent potential occurrences of birds perched for brief periods between hunting bouts. Due to the distance and intervening landscape, project construction would not be expected to impact nesting peregrine falcons which are already exposed to noise and movement from motor vehicle, commuter rail activity, and recreational use of the existing trails in the area. To further minimize the potential for any impacts to this species, any need for work to be performed during the restricted period (February 1 through July 31) would be undertaken only after consultation with NYSDEC and in compliance with any required mitigation measures. The tops of any tall construction equipment would be marked with flagging to prevent peregrine falcons from landing on them. Due to the distance and buffer between Fjord Trail North and known nest sites and existing human use near the sites, operation and recreational use of the Trail is not expected to impact peregrine falcons.

Osprey (NYS Special Concern)

Osprey occurrence on the Hudson River is most common during spring and fall migration (DeOrsey and Butler 2006). Migrating ospreys or ospreys from nesting sites outside of the project area have the potential to occur in the vicinity of the Fjord Trail North Corridor when foraging for fish over the open waters of the Hudson River, Denning's Point Cove, Fishkill Creek Marsh, and Fishkill Creek. Construction would have the potential to displace ospreys from nearshore portions of these foraging areas, but any such effect would be temporary and limited in spatial scale. An abundance of comparable open water foraging habitat would remain available and unaffected elsewhere in the area during project construction, such that no to minimal adverse impacts to osprey foraging success or energetic condition would be expected to occur. Similarly, recreational use of the sections of Fjord Trail North that would be near water would not be expected to elevate levels of human disturbance above existing conditions to the extent that ospreys would experience a significant reduction in the amount of undisturbed open water foraging habitat available to them in the area. Ospreys are known for a high tolerance of human disturbance and, even during nesting, habituate easily to human activity (Poole 1989, Bierregaard et al. 2020). For these reasons, construction and operation of Fjord Trail North is expected to have no to minimal adverse impact on osprey.

Cerulean Warbler (NYS Special Concern)

As discussed under Section C, "Existing Conditions," cerulean warblers are area-sensitive and intolerant of high degrees of forest fragmentation. Impacts to cerulean warblers from Fjord Trail North would therefore potentially result from habitat loss and fragmentation caused by the Main Trail, trail banks, Meanders, and parking facilities, mainly in the woodlands that would be intersected by the Forest Trail South, including the Wade's Hill parking lot and Forest Trail North Reaches. Construction of Fjord Trail North in these areas would be expected to simplify the current composition of the woodlands' breeding bird communities, increase nest predation and parasitism rates, and increase permeability to invasive species (Hickman 1990, Miller et al. 1998, Larson et al. 2019). Forest-interior, area-sensitive species with the potential to occur under existing

conditions, like cerulean warbler, would be largely replaced by edge-associated, human-adapted species (Hickman 1990; Miller et al. 1998; Glennon and Kretser 2013, Glennon et al. 2015). The segment of the Marsh Trail Reach that would be constructed on Denning's Point would not be expected to affect future use of Denning's Point for nesting by cerulean warblers given that the construction would largely be confined to the existing western trail and other disturbed areas. Human activity is, and would continue to be, limited to the western shoreline of Denning's Point, leaving the peninsula's interior and eastern side relatively free of disturbance for use by cerulean warblers.

Within the approximately 96 acres of forested area (oak-tulip tree forest, floodplain forest, and successional southern hardwoods) within the currently proposed Fjord Trail North Corridor, an estimated 38 acres of forested habitat may be permanently disturbed as a result of the Main Trail, Meanders, Connectors, and parking lots. Existing trails and old roadbeds would be incorporated into the design as feasible to reduce the amount of required vegetation removal, thereby reducing the amount of habitat loss and fragmentation. Large trees would be avoided to the extent practicable upon final trail and facility (e.g., parking lots, restrooms) design and layout to maintain forest canopy. Trees would be removed outside of the breeding season. Future surveys to ascertain the presence of cerulean warblers and other breeding birds may include a breeding bird survey, flora survey, biodiversity assessment, and an assessment looking at height, dbh, tree species, and determining habitat suitability for canopy nesting warblers and other avian species. Surveys would be conducted at appropriate times of the year in these various areas to help document nesting pairs, identify resources, assess potential impacts, guide design details, and help to develop a management plan for the area. At that time, additional avoidance, minimization, and mitigation measures would be determined. These may include changes in design and trail alignment to reduce loss of habitat, new forest edges and fragmentation.

New England Cottontail (NYS Special Concern)

As discussed under Section C, "Existing Conditions," New England cottontails (NEC) have been documented throughout much of the woodland where the Forest Trail North Reach, including the Notch, would be located (OPRHP 2021, NYNHP 2010, 2021). This area contains a regenerating clearing, shrubby wetlands, and forest canopy gaps that provide dense, woody cover for NEC. Peripheral areas around these patches, where there is up to 75 percent canopy closure and a dense understory (Cheeseman et al. 2018, Cheeseman and Cohen 2019), are additional portions of the woodland in which NEC have been documented or are expected to occur. Construction and operation of Fjord Trail North would have the potential to cause fragmentation of the forest and isolate the primary, occupied patches of NEC habitat from each other with an inhospitable matrix of development and recreational activity. Habitat disturbance would favor non-native eastern cottontails, which are also present in this area, and result in resource competition with any remnant NEC. NEC in small and isolated habitat patches tend to be in poor physical condition, nutritionally stressed, vulnerable to inbreeding, and at high risk for predation, which together result in severely reduced survival rates (Barbour and Litvaitis 1993, Villafuerte et al. 1997, Weidman and Litvaitis 2011, Cheeseman et al. 2019). The status of NEC in this area west of NYS Route 9D is already expected to be tenuous due to the small size of the habitat patches and the limited connectivity to additional populations to the east.

Design changes to date have reduced the extent of the Fjord Trail North Corridor over known NEC occupied winter habitat. Existing trails and old roadbeds would be incorporated into the final design as feasible to reduce the amount of vegetation removal. To facilitate animal movement through their habitats, wildlife crossings would be included at points along Meanders and the Main

Trail to allow safe passage for animals. These may include elevated trail sections and wildlife culverts under the trail. In ecologically sensitive areas, the design may include vegetative buffers to keep users on the Main Trail and out of the landscape. These buffers would contain breaks to allow wildlife passage.

Trail and facility design, especially in the Notch, will continue to be advanced in consultation with OPRHP, NYSDEC, NYNHP, and others as appropriate, to minimize impacts to the New England cottontail and its habitat. Minimizing removal of habitat, habitat management/restoration planning, and creation of additional habitat in the Trail Corridor and/or elsewhere in the NEC West Putnam County Focus Area to help maintain and enhance connectivity would likely be part of minimization and mitigation measures for the protection of this species. Future specific surveys of the area, such as flora surveys and biodiversity assessments, would further identify resources, assess potential impacts, guide design details, and help to develop a management plan for the area.

Timber Rattlesnake (NYS Threatened)

Timber rattlesnakes occur within HHSPP (OPRHP 2010) with records of the species in the general area of the Fjord Trail North Corridor. NYNHP primarily maintains records only on dens, with limited records on birthing rookeries, basking, and foraging habitats. Timber rattlesnakes are known to travel up to 2.5 miles or more in forested habitats from hibernation dens for foraging and other activities during the active season (NYNHP 2024o). As discussed under Section C, "Existing Conditions," the Fjord Trail North Corridor on the west side of NYS Route 9D lacks suitable habitat containing the species' preferred features for denning (southern- to western-facing, rocky slopes) and birthing rookeries, although potential foraging habitat is available. Western-facing talus slopes on the east side of NYS Route 9D, near the proposed Wade's Hill parking lot, driveway, and trail connection, provide potential overwintering habitat. Potential foraging and basking habitat is located on Breakneck Ridge, roughly one half mile south of the Fjord Trail North Corridor, with additional foraging habitat present on the east side of NYS Route 9D near the proposed Wade's Hill parking lot and trail connection.

Concerns for this species pertain to habitat removal and direct impact to individuals. Construction of the Forest Trail North and South Reaches would generate disturbance that would potentially displace any timber rattlesnakes in the area from the immediate vicinity of the construction activity, although the impact would be temporary and not all sections of the Forest Trail North and South Reaches would be under construction simultaneously. This would be expected to allow timber rattlesnakes to avoid areas with active construction without significant adverse impacts to their fitness or survivorship. Protection measures that would be implemented at the Wade's Hill area, and possibly areas on the west side of NYS Route 9D to reduce potential impacts to timber rattlesnakes during construction include tree clearing outside of the active seasons (between November 1 and March 31), using an on-site NYSDEC-licensed monitor during construction activities if during the active season (April 1 to October 31), and developing and implementing an Education and Encounter Plan in coordination with NYSDEC, if required. Future consultation with NYSDEC is required to determine appropriate mitigation measures for the different sections of the Forest Trail North and South Reaches.

To facilitate animal movement through their habitats, wildlife crossings would be included at points along Meanders and the Main Trail to allow safe passage for animals. These may include elevated trail sections and wildlife culverts under the trail. In ecologically sensitive areas, the design may include vegetative buffers to keep users on the Main Trail and out of the landscape. Designs will ensure any buffers are porous and contain breaks, so as not to impede wildlife passage. The Trail design will consider placement of rocks and boulders along the Trail edge so

as not to create crevices that would attract snakes and where snakes would likely hide, such as embedding boulders and filling in voids with permanent material.

The construction footprint would represent a negligible reduction in wooded foraging habitat available to timber rattlesnakes in the area, and fragmentation caused by the addition of new trails and associated facilities (i.e., parking lots) in areas where there are currently none would not be expected to significantly diminish habitat quality for timber rattlesnakes given their tolerance of fragmentation (Wittenberg 2012, Wittenberg and Beaupre 2014).

Because timber rattlesnakes persist in other areas of HHSPP where there is extensive recreational activity on existing trails, operational usage of Fjord Trail North would be unlikely to displace timber rattlesnakes from potentially foraging in the Trail's vicinity. Use of the Trail and its associated facilities would increase the potential for negative human-snake interactions and indiscriminate killings of timber rattlesnakes, in the event any are present in the area, but this would be mitigated with educational signage and similar outreach measures about protection efforts for protected species. Overall, construction and recreational use of Fjord Trail North would not be expected to result in a significant adverse impact to the local population of timber rattlesnakes in HHSPP.

Eastern Fence Lizard (NYS Threatened)

Eastern fence lizards have been documented within HHSPP (OPRHP 2010), and the NYNHP has records of the species in the general area of the Fjord Trail North Corridor. As discussed under Section C, "Existing Conditions," the most appropriate known habitat for eastern fence lizards in the vicinity of the Fjord Trail North Corridor is on Breakneck Ridge, roughly one-half mile south of the Fjord Trail North Corridor; however, other areas have so far not been surveyed for habitat. As design advances, surveys for habitat for the eastern fence lizard, such as areas with rocky outcrops or talus slopes, along the proposed trail alignment would be conducted. If appropriate habitat is found, avoidance and minimization measures would be incorporated, to the extent feasible, to limit impact to the habitat. Measures that would be implemented to reduce potential impacts to eastern fence lizard during construction include tree clearing outside of the active seasons (between November 1 and March 31), using an on-site NYSDEC-licensed monitor during construction activities if during the active season, and developing and implementing an Education and Encounter Plan in coordination with NYSDEC, as required. Consultation with NYSDEC would determine any additional mitigation measures.

Eastern Wormsnake (NYS Special Concern)

Eastern wormsnakes occur in HHSPP (OPRHP 2010) and have been documented in the general area of the Fjord Trail North Corridor (OPRHP 2021, NYNHP 2010, 2021). They are generalistic in their habitat associations, occurring in a variety of woodland habitat types (Klemens 1993, Russell and Hanlin 1999, Orr 2006, Diefenbacher and Pauley 2014). As discussed under Section C, "Existing Conditions," eastern wormsnakes are considered to have the greatest potential to occur in the vicinity of the Fjord Trail North Corridor in the woodland surrounding the Forest Trail South and North Reaches, and in the woodland on Denning's Point (Marsh Trail). Construction activities such as grading and other ground disturbance would have the potential to result in the direct mortality of eastern wormsnakes within the limits of disturbance. Where appropriate, similar protection measures to those proposed for timber rattlesnakes and eastern fence lizards would be implemented to protect eastern wormsnake, including tree clearing outside of the active season between November 1 and March 31, using an on-site NYSDEC-licensed

monitor during construction activities if during the active season, and developing and implementing an Education and Encounter Plan.

To facilitate animals' movements through their habitats, wildlife crossings would be included at points along Meanders and the Main Trail to allow safe passage for animals. These may include elevated trail sections and wildlife culverts under the trail. In ecologically sensitive areas, the design may include vegetative buffers to keep users on the Main Trail and out of the landscape. Designs will ensure any buffers are porous and contain breaks, so as not to impede wildlife passage.

The permanent clearing of trees and other vegetation along the Fjord Trail North Corridor for the Main Trail, Meanders, and associated facilities would reduce the amount of wooded habitat available for eastern wormsnakes. This reduction in habitat availability would inherently reduce the current carrying capacity of the forest for any eastern wormsnake population potentially present, and, if present, thus potentially reduce eastern wormsnake abundance. Given the species' tolerance of small and urban habitat fragments (Klemens 1993, Russell and Hanlin 1999, Herrera and Cove 2020), it is likely that the large amount of woodland that would remain around the Forest Trail Reaches would continue to support eastern wormsnakes following project construction. Eastern wormsnakes have small area requirements and strong home range fidelity (Barbour et al. 1969, Orr 2006), making it likely they would remain in the unaffected areas of the forest (assuming they are present now).

Eastern Hognose Snake (NYS Special Concern)

As discussed under Section C, "Existing Conditions," eastern hognose snakes inhabit a wide variety of habitat types, including open forests, old fields, marshes, forested wetlands, coastal shrublands, and beaches (DeGraaf and Yamasaki 2001, Mitchell et al. 2006, Gibbs et al. 2007). Eastern hognose snakes have large area requirements (Plummer and Mills 2000, LaGory et al. 2009, NHDFG 2015) and are reluctant to cross roads (Robson 2011). This may reduce the likelihood of their crossing NYS Route 9D. There remains a lack of data for eastern hognose snake west of NYS Route 9D along the Trail Corridor.

The woodland along the proposed Forest Trail North Reach (both Main Trail Options) contains a regenerating clearing, shrubby wetlands, forest canopy gaps, and similar habitats that are known to be occupied by New England cottontails and may therefore also support eastern hognose snakes because of their similar habitat preferences and frequent cooccurrence (Litvaitis et al. 1999, LaGory et al. 2009).

Construction of the Trail would directly eliminate potential eastern hognose snake habitat, and recreational use would introduce human disturbance to an area where there is presently little to none. The combined effect of the habitat loss and human disturbance would likely reduce the potential to provide suitable habitat for eastern hognose snakes in these areas. The levels of anticipated recreational activity would also increase the likelihood of negative human-snake interactions and indiscriminate killings of snakes, in the event any are present near these wetlands. Signage and educational information would be placed along the Trail to inform the public about measures to take when snakes are encountered to reduce the potential for negative human-snake interactions. During construction, where appropriate, similar protection measures to those proposed for timber rattlesnakes and eastern fence lizards could be implemented to protect eastern hognose snake, including tree clearing outside of the active season between November 1 and March 31, using an on-site NYSDEC-licensed monitor during construction activities if during the active season, and developing and implementing an Education and Encounter Plan.

The habitat loss and fragmentation caused by the Forest Trail North Reach would reduce potential habitat availability for eastern hognose snakes in that area and isolate the patches of preferred habitat where they have greatest potential to occur with a matrix of development and recreational activity. Although there are existing undesignated trails/carriage roads in some areas of this woodland, they are dirt, unmaintained, and seldom used. Thus, habitat fragmentation and human disturbance under existing conditions is minor. Physical changes caused by the Forest Trail North Reach, followed by extensive levels of recreational activity throughout the area, would be expected to greatly reduce the likelihood of eastern hognose snakes occurring there. The recreational activity would also increase chances of negative human-snake interactions and indiscriminate killings of snakes, if any are currently present in the area and remain following construction.

The sections of the Fjord Trail North Corridor that are near several freshwater wetlands contain potential habitat for eastern hognose snakes in the wetland margins. The design would include vegetated buffers around wetlands to the degree possible to protect these sensitive areas. Use of elevated trail sections (e.g., boardwalks) would reduce direct habitat loss and allow for movement under the Trail. To facilitate animal movement through their habitats, wildlife crossings would be included at points along Meanders and the Main Trail to allow safe passage for animals. These may include elevated trail sections and wildlife culverts under the Trail.

Eastern Box Turtle (NYS Special Concern)

Eastern box turtles prefer open forests, forest edges, and successional shrublands, often near water, and can also be found in thickets, stream riparian zones, and low-lying coastal habitats (DeGraaf and Yamasaki 2001, Gibbs et al. 2007). Suitable habitat for eastern box turtles is present in the woodlands surrounding Fjord Trail North.

Construction of the Trail may eliminate potential eastern box turtle habitat, and recreational use would introduce human disturbance to an area where there is presently little to none. The combined effect of the potential habitat loss and human disturbance may reduce the potential to provide suitable habitat for eastern box turtles in this area. To reduce potential impacts during construction, protective fencing may be installed around construction areas to prevent turtles from passing through and getting injured. Similar to timber rattlesnakes and eastern fence lizards, protection measures would include using an on-site NYSDEC-licensed monitor during construction activities if during the active season and developing and implementing an Education and Encounter Plan.

To facilitate animal movement through their habitats, wildlife crossings would be included at points along Meanders and the Main Trail to allow safe passage for animals. These may include elevated trail sections and wildlife culverts under the trail. In ecologically sensitive areas, the design may include vegetative buffers to keep users on the Main Trail and out of the adjacent landscape. These buffers would contain breaks at various points to allow wildlife passage.

Collectively, the loss and alteration of potential habitat followed by extensive levels of recreational activity that would result from Fjord Trail North would be expected to reduce the likelihood of eastern box turtles occurring near the proposed trail. There would potentially be significant collection pressure in areas without existing trails by large numbers of people. Interpretive signage and educational information would be placed along Fjord Trail North regarding protected species in general to dissuade collection.

Spotted Turtle (NYS Special Concern)

Spotted turtles are considered to have the potential to occur in freshwater wetlands and their adjacent uplands. However, none of the wetlands in the vicinity of the Fjord Trail North Corridor appear to provide optimal habitat for spotted turtles, and spotted turtles have not been documented in these wetlands or elsewhere in the vicinity of the proposed trail. Their presence is therefore considered possible but unlikely. In the event spotted turtles are present in these areas, potential impacts from Fjord Trail North would include loss and fragmentation of upland forest habitat during construction, and disturbance from recreational activity in and around wetland and upland habitats during operation. Trail and facility design will keep limits of disturbance as narrow as possible while meeting Accessibility needs and other design requirements. The trail surface near or in wetlands, to the degree possible, would be elevated to minimize impacts to wetland communities including the use of helical piles. Vegetative buffers around wetlands would be incorporated into trail design. Protective fencing may be installed around construction areas to prevent turtles from passing through and getting injured. Similar to timber rattlesnakes and eastern fence lizards, protection measures would include using an on-site NYSDEC-licensed monitor during construction activities if during the active season and developing and implementing an Education and Encounter Plan.

To facilitate animal movement through their habitats, wildlife crossings would be included at points along Meanders and the Main Trail to allow safe passage for animals. These may include elevated trail sections and wildlife culverts under the trail. In ecologically sensitive areas, the design may include vegetative buffers to keep users on the Main Trail and out of the landscape. Designs will ensure any buffers are porous and contain breaks, to not impede wildlife passage.

Increased human activity in these areas during operation of Fjord Trail North could increase collection pressure on any spotted turtles potentially present in the area. Interpretive signage and educational information would be placed along Fjord Trail North regarding protected species in general to dissuade collection.

INVASIVE ANIMAL SPECIES

The Applicant would prepare a comprehensive Invasive Species Management Plan that may include the following measures: properly disposing of trees and other vegetation cleared during construction to prevent the spread of infested materials, implementing invasive species management measures to control the spread of emerald ash borer, hemlock woolly adelgid, and spotted lantern fly within the Fjord Trail North Corridor, cleaning and inspection of construction equipment before entering and leaving the Corridor would be taken to ensure invasives species do not spread both on land and in water. Fjord Trail North may also incorporate educational materials throughout the Trail to alert visitors to the threat of both terrestrial and aquatic invasive animal species and ways for individuals to help contain their spread. OPRHP has standard educational signage about aquatic invasive species that can be installed at kayak launches along Fjord Trail North.

F. MITIGATION

ECOLOGICAL COMMUNITIES AND PLANTS

Minimization and mitigation strategies for ecological communities and individual plant species that would be proposed and coordinated with OPRHP, NYSDEC, and NYNHP, as appropriate, may include tree protection measures during construction; native tree, shrub and herbaceous replanting; control or removal of invasive species; development of a vegetation management plan;

educational and interpretive signage; or a combination of these methods. Tree protection measures would include radial trenching (3-foot offset from trunk), and the use of tree protection fencing with signage and mulch. Aeration of roots via soil injection or fertilizer would be performed prior to and after construction by a certified arborist, if approved by OPRHP.

BMPs, such as visual inspection and cleaning of equipment/vehicles prior to entering or exiting a work site to prevent transport of invasive species, would be implemented during construction and as part of the Invasive Species Management Plan. Educational signage would be installed to alert trail users about invasive species and the sensitive resources surrounding the Trail with encouragement to remain on trails. Bike-cleaning stations and boot scrubbers may be installed at key locations to encourage trail users to remove any invasive species from their bikes or shoes. In addition, design elements (e.g., boulders, logs, small fencing, etc.) would be incorporated to prevent people from leaving the trails and entering sensitive natural areas.

Any proposed management of vegetation to be conducted as mitigation within HHSPP would be assessed in accordance with the OPRHP Policy on Management of Trees and Other Vegetation and the OPRHP Policy on Native Plants in State Parks and Historic Sites. An Invasive Species Management Plan may also be required. Protection and mitigation strategies would be developed in coordination with OPRHP and NYNHP for populations of state-listed plant species that would have the potential to be affected by construction of Fjord Trail North. During the development of the final design, efforts would be made to avoid impacts to mature trees, state-listed species, and other sensitive resources.

Trail and facility design would keep limits of disturbance as narrow as possible while meeting Accessibility needs and other design requirements. The trail surface near or in wetlands, to the degree possible, will be elevated to minimize impacts to aquatic communities including the use of helical piles or micropiles to support boardwalk structures to maintain existing drainage patterns, such as along Option 1 of the Forest Trail North Reach. To reduce the impact to the more interior forest areas, the Notch parking area and the Wade's Hill lot would be designed to be close to NYS Route 9D keeping to the edge of the forested habitat, as feasible. To help reduce the impact and mitigate the loss of this area and of other terrestrial natural communities, large trees would be protected to the extent feasible and native plantings would be incorporated into the design of the Trail and facilities. Plans for restoration of native vegetation would consider the resilience, vigor, site specificity, habitat value, and aesthetic value of the species that would be planted. During the final design process, OPRHP may also require additional plant surveys, and OPRHP stewardship staff would have final review and approval of planting lists to assure native plant species are used.

ANIMALS

The Applicant would consult with NYSDEC, USFWS, and NMFS as appropriate, with respect to terrestrial and aquatic species protected in designated EFH, under the ESA, and under Article 11 of the Environmental Conservation Law.

Avoidance, minimization and mitigation strategies that may be implemented to protect aquatic biota, including threatened and endangered species, include following restricted construction windows for the protection of anadromous species migration (March 1 to June 30), implementing sediment and erosion control measures to prevent discharges of sediment from upland construction from entering the Hudson River, Fishkill Creek, Gordons Brook, and Wades Brook, and restoring SAV habitat in areas determined to be suitable for restoration.

To protect Indiana bats, northern long-eared bats, and tri-colored bats, all tree clearing for Fjord Trail North would be limited to the winter hibernation period (November 1 to March 31). This

would also offer protection to the cerulean warbler, timber rattlesnake, eastern fence lizard, eastern wormsnake, and eastern hognose snake, breeding birds, and other wildlife by focusing this type of land disturbance on the non-active or non-breeding and nesting seasons for these species. All trees slated to be cut during winter to avoid impacts to bats would also be inspected by a trained observer for nesting birds prior to cutting, to avoid impacts to these federally protected species during their breeding and nesting seasons. In addition, future design would consider modifications to reduce spatial footprints and/or avoid sensitive habitats. Ongoing coordination with OPRHP, NYSDEC, USFWS, and NMFS, as appropriate, will continue as the project advances to ensure that all protected species that have the potential to use the Fjord Trail North Corridor and surrounding habitats are provided adequate protection.

The tops of cranes and any other tall construction equipment would be marked with flagging to prevent bald eagles, peregrine falcons, and osprey from landing on them. For construction, due to the proximity of nesting peregrine falcons and the potential for other birds of prey to be present, a noise impact assessment may be required by NYSDEC.

The proposed Notch and Wade's Hill parking lots would be designed to be as close to NYS Route 9D as feasible, keeping to the edge of the forested habitat to reduce the impacts to more interior forest. Large trees would be avoided to the extent practicable upon final trail and facility (e.g., parking lots, restrooms) design and layout to maintain forest canopy. In addition, to facilitate animal movement through their habitats, wildlife crossings will be included at points along Meanders and the Main Trail to allow safe passage for animals. These may include elevated trail sections and wildlife culverts under the Trail. In ecologically sensitive areas, the design may include vegetative buffers to keep users on the Main Trail and out of the landscape. Designs will ensure any buffers are porous and contain breaks, to not impede wildlife passage. These design elements (i.e., siting of parking lots, inclusion of wildlife crossings, and vegetative buffers) would help to avoid and minimize potential effects to reptiles (e.g., timber rattlesnake, eastern fence lizard, eastern wormsnake, eastern hognose snake, eastern box turtle, and spotted turtle) and other species sensitive to fragmentation (e.g., cerulean warbler). During construction, protective fencing may be installed around construction areas to prevent snakes and turtles from passing through and getting injured.

Signage and educational information would be installed to inform the public about measures to take when snakes are encountered to reduce the potential for negative human-snake interactions. In addition, developing and implementing an Education and Encounter Plan in coordination with NYSDEC, would occur as required to avoid and minimize potential effects on sensitive species. An Invasive Species Management Plan would also be developed in consultation OPRHP and NYSDEC.

If impacts to threatened and endangered species cannot be fully addressed, then mitigation and net conservation benefit to the species will be required through the Incidental Take Permit process. Mitigation measures may include, among others: aligning the Trail away from sensitive habitat areas; design considerations including incorporating direct in and out trails with fences and wildlife blinds; adjusting the timing and phasing of construction to minimize impacts on wildlife, especially during critical periods of higher biological activity, such as breeding seasons; seasonal Trail section closures; and consideration in siting locations of staging areas. On-going monitoring of sensitive species may be required as well.

Article 20, "New York State Park Preserve System," Section 20.02, indicates the OPRHP Commissioner shall maintain the integrity of the parkland and resources within designated park preserves, shall provide personnel trained in natural sciences to staff park preserves, shall establish

environmental education classes for the public to be conducted by naturalists, and shall develop a written stewardship plan for each park preserve.

In addition, as noted above, the lands and waters through which the proposed Fjord Trail Corridor is located have multiple designations related to biological resources. These include: HHSPP Bird Conservation Area, HHSPP Natural Heritage Area, Hudson River Estuary Area of Biological Concern, Significant Coastal Fish and Wildlife Habitats, Essential Fish Habitat, and Winter Waterfowl Concentration Area.

In consideration of these together, the Applicant acknowledges the creation of the Trail would increase human presence in some otherwise relatively undisturbed areas. The Applicant will work closely with OPRHP staff to make additional resources available toward mitigation in the form of providing personnel trained in natural sciences, establishing environmental education classes for the public, and developing a written stewardship plan for HHSPP.

G. REFERENCES

Adams, A.M. 2013. Assessing and analyzing bat activity with acoustic monitoring: challenges and interpretations. Ph.D. Dissertation, University of Western Ontario, London, Canada. Available from: http://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=2679&context=etd

Amaral KE, Palace M, O'Brien KM, Fenderson LE, Kovach AI. 2016. Anthropogenic habitats facilitate dispersal of an early successional obligate: implications for restoration of an endangered ecosystem. PLoS One 11(3):e0148842.

Azam, C., Le Viol, I., Bas, Y., Zissis, G., Vernet, A., Julien, J. F., & Kerbiriou, C. 2018. Evidence for distance and illuminance thresholds in the effects of artificial lighting on bat activity. Landscape and Urban Planning 175:123–135.

Banks PB, Bryant JV. 2007. Four-legged friend or foe? Dog walking displaces native birds from natural areas. Biology Letters 3:611–613.

Barbour RW, Harvey MJ, Hardin JW. 1969. Home range, movements, and activity of the eastern worm snake, *Carphophis amoenus amoenus*. Ecology 50(3):470–6.

Barbour, R.W. and W.H. Davis. 1969. Bats of America. University of Kentucky Press, Lexington.

Barbour, M.S. and J.A. Litvaitis. 1993. Niche dimensions of New England cottontails in relation to habitat patch size. Oecologia 95:321–327.

Baudains, T. P. and Lloyd, P. 2007. Habituation and habitat changes can moderate the impacts of human disturbance on shorebird breeding performance. Animal Conservation 10:400–407.

Beier P. 2006. Effects of artificial night lighting on terrestrial mammals. In: Ecological Consequences of Artificial Night Lighting (C. Rich and T. Longcore, Eds.). Island Press, New York, NY.

Benoit LK, Askins RA. 1999. Impact of the spread of Phragmites on the distribution of birds in Connecticut tidal marshes. Wetlands 19(1):194–208.

Bierregaard, R. O., A. F. Poole, M. S. Martell, P. Pyle, and M. A. Patten. 2020. Osprey (Pandion haliaetus). In: Birds of the World. Cornell Lab of Ornithology, Ithaca, NY. https://doi.org/10.2173/bow.osprey.01

Billerman, S.M., B. K. Keeney, P. G. Rodewald, and T. S. Schulenberg (Eds). 2020. Birds of the World. Cornell Laboratory of Ornithology, Ithaca, NY. https://birdsoftheworld.org/bow/home

Bochnick, M. 2011. A guide to the birds of Westchester County. Hudson River Audubon Society, Yonkers, NY. Available from: http://www.hras.org/birdguide.html.

Brehme CS, Tracey JA, McClenaghan LR, Fisher RN. 2013. Permeability of roads to movement of scrubland lizards and small mammals. Conservation Biology 27(4):710–20.

Britzke, E.R., A.C. Hicks, S.L. Von Oettingen, S.R. Darling. 2006. Description of spring roost trees used by female Indiana bats in the Lake Champlain Valley of Vermont and New York. American Midland Naturalist 155:181–187.

Brock, J.P. and K. Kaufman. 2003. Butterflies of North America. Houghton Mifflin Press, New York.

Buehler, D. A. 2020. Bald Eagle (*Haliaeetus leucocephalus*). In Birds of the World. Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.baleag.01

Buehler, D. A., P. B. Hamel, and T. Boves (2020b). Cerulean Warbler (*Setophaga cerulea*), version 1.0. In Birds of the World (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.cerwar.01

Cade, T.J, M. Martell, P. Redig, G. Septon, and H. Tordoff. 1996. Peregrine falcons in urban North America. In: D.M. Bird, D. Varland, and J. Negro (Eds.), Raptors in human landscapes: adaptations to built and cultivated environments. Academic Press, San Diego, CA.

Callahan, E.V., R.D. Drobney and R.L. Clawson. 1997. Selection of summer roosting sites by Indiana bats (Myotis sodalis) in Missouri. Journal of Mammalogy 78:818–825.

Carter, T.C., and G.A. Feldhamer. 2005. Roost tree use by maternity colonies of Indiana bats and northern long-eared bats in southern Illinois. Forest Ecology and Management 219:259–268.

Cheeseman, A.E. and J. Cohen. 2019. Best management practices for the New England cottontail in New York. SUNY College of Environmental Science and Forestry, Syracuse, NY.

Cheeseman AE, Cohen JB, Whipps CM, Kovach AI, Ryan SJ. 2019. Hierarchical population structure of a rare lagomorph indicates recent fragmentation has disrupted metapopulation function. Conservation Genetics 20(6):1237–49.

Cheeseman AE, Ryan SJ, Whipps CM, Cohen JB. 2018. Competition alters seasonal resource selection and promotes use of invasive shrubs by an imperiled native cottontail. Ecology and Evolution 8(22):11122–33.

Cheng, T.L., Reichard, J.D., Coleman, J.T., Weller, T.J., Thogmartin, W.E., Reichert, B.E., Bennett, A.B., Broders, H.G., Campbell, J., Etchison, K. and Feller, D.J. 2021. The scope and severity of white-nose syndrome on hibernating bats in North America. Conservation Biology 35:1586–1597.

Clark RW, Brown WS, Stechert R, Zamudio KR. 2010. Roads, interrupted dispersal, and genetic diversity in timber rattlesnakes. Conservation Biology 24(4):1059–69.

Colorado Trails with Wildlife in Mind Taskforce (Colorado Trails). 2021. Colorado's Guide to Planning Trails with Wildlife in Mind. Prepared by Wellstone Collaborative Strategies and Rocky Mountain Innovation Lab. Project supported by Colorado Parks and Wildlife in collaboration with land managers in City, County, State, and Federal government across the State of Colorado. 58pp.

Cornell College of Agriculture and Life Sciences (Cornell CALS). 2021. New York State Integrated Pest Management. Spotted Lanternfly Integrated Pest Management Overview. Available from: https://nysipm.cornell.edu/environment/invasive-species-exotic-pests/spotted-lanternfly/

Crain CM. 2008. Interactions between marsh plant species vary in direction and strength depending on environmental and consumer context. Journal of Ecology 96(1):166–73.

Crampton, L.H. and R.MR. Barclay. 1998. Selection of roosting and foraging habitat by bats in different-aged aspen mixedwood stands. Conservation Biology 12:1347–1358.

Dadswell, M.J. 1979. Biology and population characteristics of the shortnose sturgeon, Acipenser brevirostrum LeSueur 1818 (*Osteichthyes: Acipenseridae*), in the Saint John River estuary, New Brunswick, Canada. Canadian Journal of Zoology 57:2186–2210.

Dadswell, M.J., B.D. Taubert, T.S. Squiers, D. Marchette, and J. Buckley. 1984. Synopsis of biological data on shortnose sturgeon, *Acipenser brevirostrum Lesueur* 1818. NOAA Technical Report, NMFS 14, National Marine Fisheries Service. October 1984 45 pp.

Davis TA, Platter-Reiger MF, Ackerman RA. 1984. Incubation water loss by pied-billed grebe eggs: adaptation to a hot, wet nest. Physiological Zoology 57(4):384–91.

DeGraaf, R. and M. Yamasaki. 2001. New England Wildlife: Habitat, Natural History, and Distribution. University Press of New England.

DeOrsey, S. and B.A. Butler. 2006. The birds of Dutchess County New York today and yesterday: a survey of current status with historical changes since 1870. Ralph T. Waterman Bird Club Inc., Poughkeepsie, NY.

Diefenbacher, E.H. and Pauley, T.K. 2014. Notes on the distribution and natural history of the eastern wormsnake (*Carphophis amoenus amoenus*) in West Virginia. Reptiles and Amphibians 21:120–124.

Dertien JS, Larson CL, Reed SE. 2021. Recreation effects on wildlife: a review of potential quantitative thresholds. Nature Conservation 44:51–68.

Dovel, W.L., A.W. Pekovitch, and T.J. Berggren. 1992. Biology of the shortnose sturgeon (*Acipenser brevirostrum Lesueur*, 1818) in the Hudson River estuary, New York. In: C.L. Smith (ed.) Estuarine Research in the 1980s, pp. 187–216. State University of New York Press, Albany, New York.

Ellenberg, U., Mattern, T., and Seddon, P. J. 2009. Habituation potential of yellow-eyed penguins depends on sex, character and previous experience with humans. Animal Behavior 77:289-296.

Forbes M.R. and C.D. Ankney. 1988. Nest attendance by adult Pied-billed Grebes, *Podilymbus podiceps* (L.). Canadian Journal of Zoology 66(9):2019–23.

Ford, W.M., M.A. Menzel, J.L. Rodrigue, J.M. Menzel, and J.B. Johnson. 2005. Relating bat species presence to simple habitat measures in a central Appalachian forest. Biological Conservation 126: 528–539.

Foster, R.W. and A. Kurta, A. 1999. Roosting ecology of the northern bat (Myotis septentrionalis) and comparisons with the endangered Indiana bat (*Myotis sodalis*). Journal of Mammalogy 80: 659–672.

Fuller, S. and A. Tur. 2012. Conservation Strategy for the New England Cottontail (*Sylvilagus transitionalis*).

Fuller, T.K. and S. DeStefano. 2003. Relative importance of early successional forests and shrubland habitats to mammals in the northeastern United States. Forest Ecology and Management 185:75–79.

Gaines, W.L., P.H. Singleton, R.C. Ross. 2002. Assessing the Cumulative Effects of Linear Recreation Routes on Wildlife Habitats on the Okanogan and Wenatchee National Forests. Gen. Tech. Rep. PNW-GTR-XXX. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Gibbs, J. P. and S. M. Melvin. 1992. Migratory nongame birds of management concern in the Northeast (K. J. Schneider and D. M. Pence, Eds.). U.S. Fish and Wildlife Service, Newton Corner, MA.

Gibbs, J.P., A.R. Breisch, P.K. Ducey, G. Johnson, J.L. Behler, and R.C. Bothner. 2007. The amphibians and reptiles of New York State. Oxford University Press, New York.

Gilbert, C.R. 1989. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Mid-Atlantic Bight) Atlantic and shortnose sturgeons. U.S. Fish and Wildlife Service Biological Report 82(11.122). 28 pp.

Glennon MJ, Kretser HE, Hilty JA. 2015. Identifying common patterns in diverse systems: effects of exurban development on birds of the Adirondack Park and the Greater Yellowstone Ecosystem, USA. Environmental Management 55(2):453–66.

Glennon MJ, Kretser HE. 2013. Size of the ecological effect zone associated with exurban development in the Adirondack Park, NY. Landscape and Urban Planning 112:10-17.Graham, C. and E. Kiviat. 2021. Flora Survey and Biodiversity Assessment of Little Stony Point, Hudson Highlands State Park, New York. Report from Hudsonia Inc. to Hudson Highlands Fjord Trail Inc., September 2, 2021.

Guinn, J.E. 2013. Generational habituation and current bald eagle populations. Human–Wildlife Interactions 7:69–76.

Gutzwiller KJ, Riffell SK, Anderson SH. 2002. Repeated human intrusion and the potential for nest predation by gray jays. Journal of Wildlife Management 66:372–380.

Harvey, M.J., J.S. Altenbach, and T.L. Best. 2011. Bats of the United States and Canada. Johns Hopkins University Press, Baltimore.

Hein, C.D., Castleberry, S.B. and Miller, K.V. 2009. Site-occupancy of bats in relation to forested corridors. Forest Ecology and Management 257:1200–1207.

Henderson, L.E., L.J. Farrow, and H.G. Broders. 2008. Intraspecific effects of forest loss on the distribution of the forest-dependent northern long-eared bat (*Myotis septentrionalis*). Biological Conservation 141:1819–1828.

Herbert, R.A. and K.G.S. Herbert. 1969. The extirpation of the Hudson River peregrine falcon population. In: J.J. Hickey (ed.), Peregrine falcon populations: their biology and decline. University of Wisconsin Press, Madison, WI.

Herrera DJ, Cove MV. Camera trap serendipity and citizen science point to broader effects of urban heat islands on food webs. Food Webs 25:e00176.

Hickman, S. 1990. Evidence of edge species attraction to nature trails within deciduous forest. Natural Areas Journal 10:3–5.

Humphrey, S.R., A.R. Richter, J.B. Cope. 1977. Summer habitat and ecology of the endangered Indiana bat, *Myotis sodalis*. Journal of Mammalogy 58:334–346.

Jaycox, J.W. 2021. Breakneck Connector and Bridge Project, Timber Rattlesnake and Eastern Fence Lizard Habitat Assessment. Report from NYS Office of Parks, Recreation and Historic Preservation, October 7, 2021.

Johnson, N.P. 2010. Nesting bald eagles in urban areas of southeast Alaska. In: Bald Eagles in Alaska (B.A. Wright and P. Schempf, Eds.). Hancock House Publishing, Blaine, WA.

Kennedy, H.B. 2008. Least bittern. In: The Second Atlas of Breeding Birds of New York State. Cornell University Press, Ithaca, NY.

Kiviat E. 2013. Ecosystem services of Phragmites in North America with emphasis on habitat functions. AoB Plants 5:plt008.

Kiviat, E. and K. MacDonald. 2004. Biodiversity patterns and conservation in the Hackensack Meadowlands, New Jersey. Urban Habitats 2:28–61.

Klemens, M.W. 1993. Amphibians and reptiles of Connecticut and adjacent regions. State Geological and Natural History Survey of Connecticut Bulletin 112.

LaGory, K. E., L. J. Walston, C. Goulet, R. A. Van Lonkhuyzen, S. Najjar, and C. Andrews. 2009. An examination of scale-dependent resource use by eastern hognose snakes in southcentral New Hampshire. Journal of Wildlife Management 73:1387–1393.

Lacki, M.J., Hayes, J.P., and Kurta, A., eds.). Bats in forests: Conservation and Management. Johns Hopkins Press, Baltimore, MD.

Larson CL, Reed SE, Merenlender AM, Crooks KR. 2019. A meta-analysis of recreation effects on vertebrate species richness and abundance. Conservation Science and Practice 1(10):e93.

Larson CL, Reed SE, Merenlender AM, Crooks KR. 2016. Effects of recreation on animals revealed as widespread through a global systematic review. PloS One 11(12):e0167259.

Levell JP. 2000. Commercial exploitation of Blanding's Turtle, *Emydoidea blandingii*, and the Wood Turtle, *Clemmys insculpta*, for the live animal trade. Chelonian Conservation and Biology 3(4):665–74.

Litvaitis, J.A., M.S. Barbour, A.L. Brown, A.I. Kovach, M.K. Litvaitis, J.D. Oehler, B.R. Probert, D.F. Smith, J.P. Tash and R. Villafuerte. 2008. Testing multiple hypotheses to identify causes of the decline of a lagomorph species: the New England cottontail as a case study. In: Lagomorph Biology: Ecology, Evolution, Conservation (P.C. Alves, N. Ferrand, K. Hacklander, Eds). Springer-Verlag, The Netherlands.

Litvaitis, J.A., J.P. Tash, M.K. Litvaitis, M.N. Marchand, A.I. Kovach and R. Innes. 2006. A range-wide survey to determine the current distribution of New England cottontails. Wildlife Society Bulletin 34:1190–1197.

Litvaitis JA, Wagner DL, Confer JL, Tarr MD, Snyder EJ. 1999. Early successional forests and shrub-dominated habitats: land-use artifact or critical community in the Northeastern United States. Northeast Wildlife 54:101–18.

Longcore, T. and C. Rich. 2004. Ecological light pollution. Frontiers in Ecology and the Environment 2:191–198.

Loucks. B. 2008. Peregrine falcon. In: The Second Atlas of Breeding Birds of New York State. Cornell University Press, Ithaca, NY.

Lundgren, J., E, Cheadle, D.J. Evans, and H. Krahling. 2021. Ecological community delineations of selected State Parks, New York State, 2021 Revision. GIS file: nynhp_parks_fullcomm.shp, compiled 10/2021. New York Natural Heritage Program, Albany NY.

Mawdsley, J.R., Simmons, T. and Rubinoff, D., 2020. Voluntary conservation, not regulation, will be key to monarch butterfly recovery. Wildlife Society Bulletin *44*:585–589.

McGowan, K. 2008 Pied-billed grebe. In: The Second Atlas of Breeding Birds of New York State. Cornell University Press, Ithaca, NY.

Meyer, S.W. 2003. Comparative use of Phragmites australis and other habitats by birds, amphibians, and small mammals at Long Point, Ontario. M.S. thesis, University of Western Ontario, London, ON, Canada.

Meyer SW, Badzinski SS, Petrie SA, Ankney CD. 2010. Seasonal abundance and species richness of birds in common reed habitats in Lake Erie. Journal of Wildlife Management 74(7):1559–66.

Menzel, M.A., S.F. Owen, W.M. Ford, J.W. Edwards, P.B. Wood, B.R. Chapman, and K.V. Miller. 2002. Roost tree selection by northern long-eared bat (*Myotis septentrionalis*) maternity colonies in an industrial forest of the central Appalachian mountains. Forest Ecology and Management 155:107–114.

Miller, S. G., Knight, R. L., and Miller, C. K. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162–169.

Millsap B, Breen T, McConnell EL, Steffer T, Phillips L, Douglass N, Taylor S. 2004. Comparative fecundity and survival of bald eagles fledged from suburban and rural natal areas in Florida. Journal of Wildlife Management 68(4):1018–31.

Mitchell, J.C., A.R. Breisch, K.A. Buhlmann. 2006. Habitat management guidelines for amphibians and reptiles of the northeastern United States. Partners in Amphibian and Reptile Conservation Technical Publication HMG-3. Montogomery, AL.

Muller, M. J. and R. W. Storer. 2020. Pied-billed Grebe (*Podilymbus podiceps*). In: Birds of the World. Cornell Lab of Ornithology, Ithaca, NY. https://doi.org/10.2173/bow.pibgre.01

Mumford, R.E. and J.O. Whitaker. 1982. Mammals of Indiana. Indiana University Press, Bloomington, Indiana.

Murray, S.W. and A. Kurta. 2004.Nocturnal activity of the endangered Indiana bat (*Myotis sodalis*). Journal of Zoology 262:197–206.

National Marine Fisheries Service (NMFS). 2018. Endangered Species Action Section 7 Consultation Biological Opinion – Tappan Zee Bridge Replacement NER–2018-14953. 247 pp.

New Hampshire Department of Fish and Game (NHDFG). 2015. Wildlife Action Plan, Appendix A: Reptiles. Available from: https://www.wildlife.state.nh.us/wildlife/documents/wap/appendixa-reptiles.pdf

New York Invasive Species Information (NYIS). 2019. Water Chestnut. Cornell University Cooperative Extension and Sea Grant, New York. Accessed on October 22, 2021 from: http://nyis.info/invasive_species/water-chestnut/#Origin

New York Natural Heritage Program (NYNHP). 2024a. Bald eagle guide. Available from: https://guides.nynhp.org/bald-eagle/

New York Natural Heritage Program (NYNHP). 2024b. Ecological Communities. Available from https://www.nynhp.org/ecological-communities/. Accessed March 13, 2024.

New York Natural Heritage Program. 2024c. Element Occurrence Dataset. New York Natural Heritage Program, State University of New York College of Environmental Science and Forestry, Albany NY. Accessed 3/2024.

New York Natural Heritage Program (NYNHP). 2024d. Online Conservation Guide for Bidens bidentoides. Available from: https://guides.nynhp.org/delmarva-beggar-ticks/

New York Natural Heritage Program (NYNHP). 2024e. Online Conservation Guide for Bidens laevis. Available from: https://guides.nynhp.org/smooth-beggar-ticks/. Accessed September 7, 2021.

New York Natural Heritage Program (NYNHP). 2024f. Online Conservation Guide for Cardamine longii. Available from: https://guides.nynhp.org/longs-bittercress/

New York Natural Heritage Program (NYNHP). 2024g. Online Conservation Guide for Carex cumulate. Available from: https://guides.nynhp.org/clustered-sedge/

New York Natural Heritage Program (NYNHP). 2024h. Online Conservation Guide for Carex davisii. Available from: https://guides.nynhp.org/davis-sedge/. Accessed September 7, 2021.

New York Natural Heritage Program (NYNHP). 2024i. Online Conservation Guide for Floodplain Forest. Available from: https://guides.nynhp.org/floodplain-forest/.

New York Natural Heritage Program (NYNHP). 2024j. New England Cottontail. Available from: https://guides.nynhp.org/new-england-cottontail/

New York Natural Heritage Program (NYNHP). 2024k. Online Conservation Guide for Oak-tulip tree forest. Available from: https://guides.nynhp.org/oak-tulip-tree-forest/.

New York Natural Heritage Program (NYNHP). 2024l. Online Conservation Guide for Sagittaria montevidensis ssp. spongiosa. Available from: https://guides.nynhp.org/spongy-arrowhead/. Accessed September 7, 2021.

New York Natural Heritage Program (NYNHP). 2024m. Online Conservation Guide for Solidago rigida var. rigida. Available from: https://guides.nynhp.org/stiff-flat-topped-goldenrod/

New York Natural Heritage Program (NYNHP). 2024n. Online Conservation Guide for Symphyotrichum subulatum var. subulatum. Available from: https://guides.nynhp.org/annual-saltmarsh-aster/. Accessed September 7, 2021.

New York Natural Heritage Program (NYNHP). 2024o. Timber Rattlesnake. Available from: https://guides.nynhp.org/timber-rattlesnake/

New York Natural Heritage Program (NYNHP). 2024p. Tri-colored bat. Available from: https://guides.nynhp.org/tri-colored-bat/ (Accessed June 4, 2024).

New York State Department of Environmental Conservation (NYSDEC). 2019. Draft List Under Part 182.5 Pre-proposal—October 2019. Available from: https://www.dec.ny.gov/docs/wildlife_pdf/masterlistpropreg.pdf.

New York State Department of Environmental Conservation (NYSDEC). 2024a. Cerulean Warbler. Available from: https://dec.ny.gov/nature/animals-fish-plants/cerulean-warbler

New York State Department of Environmental Conservation (NYSDEC). 2024b. Submerged Aquatic Vegetation. Available from: https://www.dec.ny.gov/lands/87648.html.

New York State Department of Environmental Conservation (NYSDEC). 2024b. Invasive Species. Available from: https://www.dec.ny.gov/animals/265.html

New York State Department of Environmental Conservation (NYSDEC). 2024d. Osprey. Available from: https://dec.ny.gov/nature/animals-fish-plants/osprey

New York State Department of State (NYSDOS). 2020 Coastal Fish and Wildlife Assessment Form: Fishkill Creek. Available from: https://dos.ny.gov/system/files/documents/2020/03/fishkill_creek_final.pdf

Nye, P.E. 2010. New York State Bald Eagle Report 2010. Albany, NY: New York State Department of Environmental Conservation. Available from: http://www.dec.ny.gov/docs/wildlife_pdf/baea2010.pdf.

Nye, P.E. 2008. Osprey. In: The Second Atlas of Breeding Birds of New York State. Cornell University Press, Ithaca, NY.

Office of Parks, Recreation, and Historic Preservation (OPRHP). 2010. Final Master Plan/Final Environmental Impact Statement for Clarence Fahnestock Memorial State Park and Hudson Highlands State Park Preserve. New York State Office of Parks, Recreation, and Historic Preservation, December 15, 2010.

Office of Parks, Recreation, and Historic Preservation (OPRHP). 2021. Electronic mail communication from Nancy Stoner, Office of Parks, Recreation, and Historic Preservation to Chris Robbins, AKRF Inc. on October 8, 2021 Re: Fjord Trail – NHP data request.

Orr, J.M. 2006. Microhabitat use by the eastern worm snake, *Carphophis amoenus*. Herpetological Bulletin 97:29–35.

Owen, S.F., M.A. Menzel, W.M. Ford, B.R. Chapman, K.V. Miller, J.W. Edwards, and P.B. Wood. 2003. Home-range size and habitat used by the northern myotis (*Myotis septentrionalis*). American Midland Naturalist 150:352–359.

Patriquin, K.J. and R.M.R. Barclay. 2003. Foraging by bats in cleared, thinned, and unharvested boreal forest. Journal of Applied Ecology 40:646–657.

Penhollow, M.E., P.G. Jensen, and L.A. Zucker. 2006. Wildlife and habitat conservation framework: An approach for conserving biodiversity in the Hudson River Estuary Corridor. New York State Department of Environmental Conservation. Available from: https://www.dec.ny.gov/docs/remediation_hudson_pdf/hrebcf.pdf

Perry, R.W. and Thill, R.E., 2007. Tree roosting by male and female eastern pipistrelles in a forested landscape. Journal of Mammalogy 88:974–981.

Plummer, M. V, and N.E. Mills. 2000. Spatial ecology and survivorship of resident and translocated hognose Snakes (*Heterodon platirhinos*). Journal of Herpetology 34: 556–575.

Poissant, J.A., H.G. Broders, and G.M. Quinn. 2010. Use of lichen as a roosting substrate by *Perimyotis subflavus*, the tricolored bat, in Nova Scotia. Ecoscience 17(4):372–378.

Poole, A. F., P. E. Lowther, J. P. Gibbs, F. A. Reid, and S. M. Melvin. 2020. Least Bittern (*Ixobrychus exilis*). In: Birds of the World. Cornell Lab of Ornithology, Ithaca, NY. https://doi.org/10.2173/bow.leabit.01

Poole, A. 1989. Ospreys: a natural and unnatural history. Cambridge Univ. Press, Cambridge, UK.

Quinn, G.M. and Broders, H.G., 2007. Roosting and foraging ecology of eastern pipistrelle (*Perimyotis subflavus*) bats in SW Nova Scotia. Unpublished report to Nova Scotia Habitat Conservation Fund c/o NS Department of Natural Resources. Available from https://www.novascotia.ca/natr/wildlife/habfund/Proposal/bats04.pdf.

Ratcliffe, D.A. 1972. The peregrine population in Great Britain in 1971. Bird Study 19:117–156.

Reed, S. E. and Merenlender, A. M. 2008. Quiet, nonconsumptive recreation reduces protected area effectiveness. Conservation Letters 1:146–154.

Rittenhouse CD, Kovach AI. 2020. Assessment of alternative sampling designs for range-wide monitoring of New England cottontail. Wildlife Society Bulletin 44(4):798–806.

Robbins, C. S., J. W. Fitzpatrick and P. B. Hamel. (1992b). "A warbler in trouble: *Dendroica cerulea*." In Ecology and conservation of Neotropical migrant landbirds., edited by J. M. Hagan Iii and D. W. Johnston, 549–562. Washington, D.C: Smithson. Inst. Press.

Robichaud CD, Rooney RC. 2017. Long-term effects of a Phragmites australis invasion on birds in a Lake Erie coastal marsh. Journal of Great Lakes Research 43(3):141–9.

Robson, L.E. 2011. The spatial ecology of Eastern Hognose Snakes (*Heterodon platirhinos*): habitat selection, home range size, and the effect of roads on movement patterns. M.S. thesis, University of Ottawa, Ottawa, ON, Canada.

Rosenberg, K.V. 2000. An atlas of cerulean warbler populations: final report to USFWS: 1997–2000 breeding seasons. Cornell Lab of Ornithology, Ithaca, NY.

Rosenberg, K.V. 2008. Cerulean warbler. Pp. 508-509 in: The second breeding bird atlas of New York State. Cornell University Press, Ithaca.

Russell KR, Hanlin HG. 1999. Aspects of the ecology of worm snakes (*Carphophis amoenus*) associated with small isolated wetlands in South Carolina. Journal of Herpetology 33(2):339–44.

Sedgeley, J.A. and C.F.J. O'Donnell. 1999. Factors influencing roost cavity selection by a temperate rainforest bat (*Chalinolobus tuberculatus, Vespertilionidae*) in New Zealand. Journal of Zoology 249:437–446.

Seewagen, C.L. and Adams, A.M. 2021. Turning to the dark side: LED light at night alters the activity and species composition of a foraging bat assemblage in the northeastern United States. Ecology and Evolution 11:5635–5645.

Silvis A, W.M. Ford, E.R. Britzke, and J.B. Johnson. 2014b. Association, roost use and simulated disruption of *Myotis septentrionalis* maternity colonies. Behavioral Processes 103: 283–290.

Stalmaster MV, Kaiser JL. 1997. Flushing responses of wintering bald eagles to military activity. Journal of Wildlife Management 61:1307–13.

Stalmaster MV, Gessaman JA. 1984. Ecological energetics and foraging behavior of overwintering bald eagles. Ecological Monographs 54(4):407–28.

Steen, D. A., L. L. Smith, L. M. Conner, J. C. Brock, and S. K. Hoss. 2007. Habitat use of sympatric rattlesnake species within the Gulf Coastal Plain. Journal of Wildlife Management 71:759–764.

Steven, R., Pickering, C. and Castley, J.G. 2011. A review of the impacts of nature-based recreation on birds. Journal of Environmental Management 92(10):2287-2294.

Sullivan, G.L. 2016. Bald eagles are adapting to city living. Washington Post, February 29, 2016. https://www.washingtonpost.com/national/health-science/bald-eagles-are-adapting-to-city-living/2016/02/29/97df78be-d5ad-11e5-be55-2cc3c1e4b76b_story.html?noredirect=on&utm_term=.73c6b955b477

Tash, J.P. and J.A. Litvaitis. 2007. Characteristics of occupied habitats and identification of sites for restoration and translocation of New England cottontail populations. Biological Conservation 137:584–598.

Thames, D.B. 2020. Summer foraging range and diurnal roost selection of tricolored bats. M.S. thesis, University of Tennessee, Knoxville.

Tozer DC, Mackenzie SA. 2019. Control of invasive Phragmites increases marsh birds but not frogs. Canadian Wildlife Biology and Management 8(2):66–82.

Ulev, E. 2008. *Crotalus horridus*. In: Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available from: http://www.fs.fed.us/database/feis/[2012]

U.S. Fish and Wildlife Service (USFWS). 2016. Endangered and Threatened Wildlife and Plants; 4(d) Rule for the Northern Long-Eared Bat. Federal Register 81(9):1900–1922.

U.S. Fish and Wildlife Service (USFWS). 2007a. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision, April 2007. USFWS Great Lakes-Big Rivers Region - Region 3, Fort Snelling, MN.

U.S. Fish and Wildlife Service (USFWS). 2007b. National bald eagle management guidelines. https://www.fws.gov/southdakotafieldoffice/NationalBaldEagleManagementGuidelines.pdf

U.S. Fish and Wildlife Service (USFWS). 2020. U.S. Fish and Wildlife Service Final Report: Bald Eagle Population Size: 2020 Update. Available from: https://www.fws.gov/migratorybirds/pdf/management/bald-eagle-population-size–2020.pdf

U.S. Fish and Wildlife Service. 2021b. Species Status Assessment Report for the Tricolored Bat (*Perimyotis subflavus*), Version 1.1. December 2021. Hadley, MA.

U.S. Fish and Wildlife Service (USFWS). 2022. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Tricolored Bat. Federal Register 87(177): 56381–56393.

Veilleux, J.P. and Veilleux, S.L. 2004. Intra-annual and interannual fidelity to summer roost areas by female eastern pipistrelles, *Pipistrellus subflavus*. The American Midland Naturalist 152:196–200.

Veilleux, J.P., Whitaker, J.O. and Veilleux, S.L., 2003. Tree-roosting ecology of reproductive female eastern pipistrelles, *Pipistrellus subflavus*, in Indiana. Journal of Mammalogy 84:1068–1075.

Villafuerte, R., J.A. Litvaitis and D.F. Smith. 1997. Physiological responses by lagomorphs to resource limitations imposed by habitat fragmentation: implications to condition-sensitive predation. Canadian Journal of Zoology 75:148–151.

Watrous, K.S., T.M. Donovan, R.M. Mickey, S.R. Darling, A.C. Hicks, S.L. Von Oettingen. 2006. Predicting minimum habitat characteristics for the Indiana bat in the Champlain Valley. Journal of Wildlife Management 70:1228–1237.

Weidman, T. and J.A. Litvaitis. 2011. Can supplemental food increase winter survival of a threatened cottontail rabbit? Biological Conservation 144:2054–2058.

Wells, J.V. 1998. Important Bird Areas in New York State. National Audubon Society, Albany, NY.

Whitaker, J.O. and W.J. Hamilton. 1998. Mammals of the eastern United States. Cornell University Press, Ithaca, NY.

Whitby, M., B.J. Udell, A.M. Wiens, T. Cheng, W. Frick, B.E. Reichert, and J.D. Reichard. 2022. Summer Mobile Acoustic Transect Analysis for Little Brown, Northern Long-eared, and Tricolored Bat Species Status Assessment. Chapter C in Straw, B.R., J.A. Martin, J.D. Reichard, and B.E. Reichert, editors. Analytical Assessments in Support of the U.S. Fish and Wildlife Service 3-Bat Species Status Assessment. Cooperator Report prepared in cooperation with the U.S. Geological Survey, United States Fish and Wildlife Service and Bat Conservation International. https://doi.org/10.7944/P9B4RWEU.

White, C. M., N. J. Clum, T. J. Cade, and W. G. Hunt. 2020. Peregrine Falcon (*Falco peregrinus*). In: Birds of the World. Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.perfal.01

Wiens, A.M., J. Szymanski, B.J. Udell, and W.E. Thogmartin. 2022. Winter Colony Count Data Assessment and Future Scenarios for the Little Brown, Northern Long-eared, and Tricolored Bat Species Status Assessment. Chapter E in Straw, B.R., J.A. Martin, J.D. Reichard, and B.E. Reichert, editors. Analytical Assessments in Support of the U.S. Fish and Wildlife Service 3-Bat Species Status Assessment. Cooperator Report prepared in cooperation with the U.S. Geological Survey, United States Fish and Wildlife Service and Bat Conservation International. https://doi.org/10.7944/P9B4RWEU.

Wittenberg RD. 2012. Foraging ecology of the timber rattlesnake (*Crotalus horridus*) in a fragmented agricultural landscape. Herpetological Conservation and Biology 7:449–61.

Wittenberg RD, Beaupre SJ. 2014. Growth of timber rattlesnakes (*Crotalus horridus*) in an agriculturally fragmented and a contiguously forested habitat. Herpetologica 70:171–83. ✶