WETLANDS

Director's Order 77-1: *Wetland Protection* (NPS 2011a) and NPS *Management Policies 2006* (NPS 2006a) provide direction on the protection of wetlands, stating that the long-term goal is the net gain of wetlands. Specifically, under Director's Order 77-1, the NPS has adopted a goal of "no net loss of wetlands" and established the policies, requirements, and standards through which the NPS will meet its responsibilities to protect and preserve wetlands. Director's Order 77-1 states, "Where natural wetland characteristics or functions have been degraded or lost due to previous or ongoing human activities, the NPS will, to the extent appropriate and practicable, restore them to pre-disturbance conditions." Disturbing human activities may include the introduction of invasive species as result of clearing wetlands and clearing the ROW near wetlands that will encourage invasive plant species growth and spread (Executive Order 13112, "Invasive Species"). Additionally, "Where appropriate and practicable, the NPS will not simply protect, but will seek to enhance natural wetland values by using them for educational, recreational, scientific, and similar purposes that do not disrupt natural wetland functions" (NPS 2011a).

Executive Order 11990, "Protection of Wetlands," directs all federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. In the absence of such alternatives, parks must modify actions to preserve and enhance wetland values and minimize degradation.

For the NPS, any area that is classified as a wetland according to the USFWS *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979) is subject to Director's Order 77-1. Under the Cowardin definition, a wetland must have one or more of the following three attributes:

- At least periodically, the land supports predominantly hydrophytes (wetland vegetation);
- The substrate is predominantly undrained hydric soil; and
- The substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979, 11).

The Cowardin wetland definition encompasses more aquatic habitat types than the definition and delineation manual used by the USACE for identifying wetlands subject to section 404 of the Clean Water Act. The Cowardin wetland definition includes USACE-defined wetlands, but also adds areas that, although lacking vegetation and/or soils due to natural physical or chemical factors such as wave action or high salinity, are still saturated or shallow, inundated environments that support aquatic life. The 1987 *Corps of Engineers Wetlands Delineation Manual* defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE 1987). The 1987 *Corps of Engineers Wetlands Delineation Manual* requires that all three of the parameters listed above (hydrophytic vegetation, hydric soil, wetland hydrology) be present in order for an area to be considered a wetland. Because soils have been dismissed as a stand-alone section in this document, discussions of wetland soil types (when known) and impacts resulting from soil compaction and subsequent changes to hydrology are encompassed in the "Wetlands" section of chapters 3 and 4.

State agencies have programs to protect and regulate wetlands under their jurisdiction. PADEP and USACE jointly regulate wetland activities in Pennsylvania. The federal Clean Water Act, section 404 (33 USC 1344), and chapter 105 under Pennsylvania's Dam Safety and Waterway Management Rules and Regulations govern wetland activities. PADEP has established the Wetland Protection Program to ensure

that wetland functions and values related to water quality, wildlife habitat, and public safety are preserved. The program provides wetland protection with a no net loss policy and implements a program to restore historical wetland losses, with the goal of generating a net gain in wetlands. PADEP describes wetlands in two categories, including "Exceptional Value Wetlands" (includes wetlands that deserve special protection) and "other wetlands" (includes wetlands not categorized as exceptional value wetlands but are considered ordinary wetlands). Wetlands which serve as habitat for fauna or flora listed as threatened or endangered under the ESA are considered Exceptional Value Wetlands (PA Code § 105.17 *Wetlands*) and are described where applicable in this section. Wetlands in the riparian buffer must be protected and maintained in a manner consistent with chapter 105 (relating to dam safety and waterway management). Additionally, PADEP chapter 102 requires minimum riparian buffers during construction activities, which protect perennial or intermittent rivers, streams, creeks, lakes, ponds, and reservoirs. Construction in areas that contain wetlands or water bodies may require joint permit applications.

In New Jersey, USACE and the NJDEP Division of Land Use Regulation program both have jurisdiction over tidal wetlands, navigable waters, and wetlands within 1,000 feet of navigable waterways. Wetlands are protected under the New Jersey Freshwater Wetlands Protection Act (NJSA 13:9B) and the federal Clean Water Act, section 404. NJDEP protects wetlands and transition areas as well as buffers under the New Jersey Freshwater Wetlands Protection Act. Similar to PA, the NJDEP Division of Land Use Regulation describes Exceptional Wetlands as those sites with documented habitat or presence of threatened or endangered species; these wetlands are described where applicable in this section. The permitting agencies (state and USACE) use the USACE manual to determine jurisdictional wetlands, but the NPS must meet standards using the Cowardin method (Cowardin et al. 1979).

WETLAND ASSESSMENT METHODOLOGY

Characterization of wetlands along the alternative alignments within the parks came from several sources, including field surveys conducted during 2010 and 2011 (NPS 2011b), National Wetlands Inventory (NWI) maps, environmental reports, previous wetland delineations, and aerial photography. The USFWS NWI produces information on the characteristics, extent, and status of the nation's wetlands and deepwater habitats. Wetlands on the maps are based on the Cowardin wetland definition and classification system (Cowardin et al. 1979), so wetlands depicted on NWI maps (normally subject to ground-truthing) are considered wetlands by the NPS. The following reports were also used to characterize wetlands: *Field Survey Report: Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request Environmental Impact Statement* (NPS 2011b) and *Susquehanna–Roseland 500-kV Transmission Line Project PPL Electric Utilities: Wetlands and Other Waters of the United States Findings Report Delaware Water Gap National Recreation Area Pike and Monroe Counties, Pennsylvania* (Berger 2010a). Areas that appeared to be wetlands or were areas of known wetlands along each alternative alignment were visited in the field. Wetlands (and waters of the United States) along the alternatives were mapped using both the USACE methodology (1987) and the delineation methodology supported by the NPS.

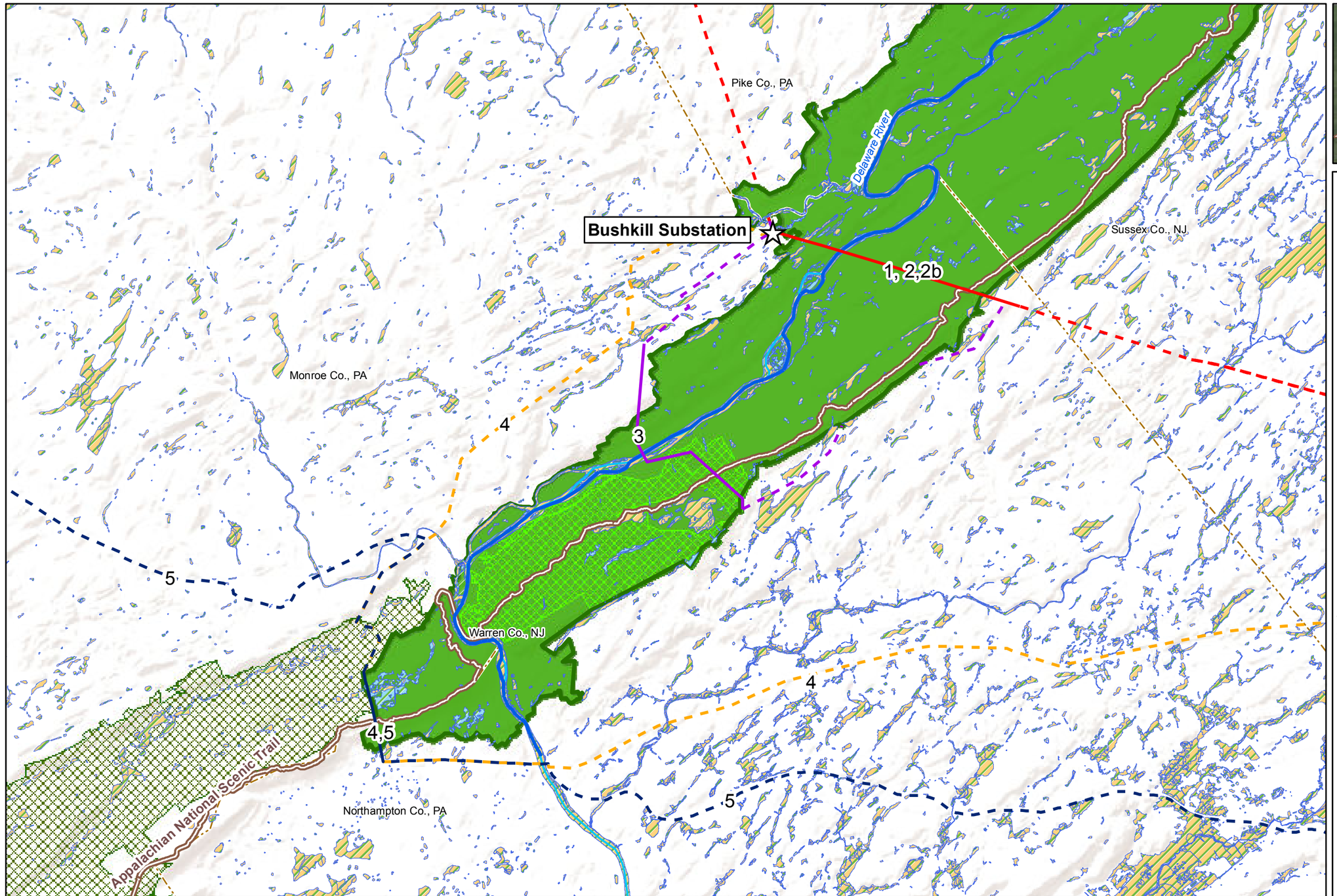
The paragraphs below describe general wetland communities that are present within the parks. Detailed descriptions of wetland systems and along the alignments for alternatives 1 through 5 and an evaluation of wetland functions and values follow the general discussion below. The detailed wetland descriptions for alternatives 1, 2, and 2b are based on surveys conducted by the applicant within NPS boundaries (Berger 2010a). These surveys were conducted between September 2008 and May 2009 and covered the existing ROW and proposed access roads. Surveys for alternatives 3, 4, and 5 are based primarily on the summer 2010 wetland surveys, which were conducted only within the boundaries of DEWA and APPA (NPS 2011b). The study area for the surveys along the alignments for alternatives 3, 4, and 5 (NPS 2011b) was limited to resources found along an alignment's centerline, within or intersected by a 200-foot corridor on either side of the centerline, or within proposed access roads and staging areas (where known). Where an

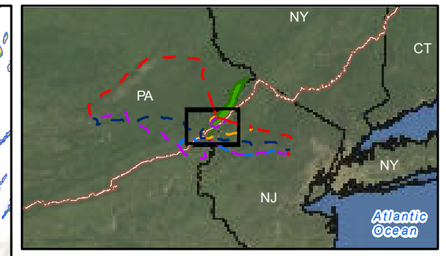
alternative alignment crossed APPA outside DEWA boundaries, the study area included a 500-foot corridor on either side of the trail in addition to the 400-foot alignment corridor (NPS 2011b). Portions of the alignments that fall within the study area but outside NPS boundaries are characterized with as much detail as possible from existing information, including previous reports and NWI maps, as described above.

Approximately 1,000 individually mapped wetland areas exist within the parks (figure 27). In general, wetland systems within the parks include palustrine, riverine, and lacustrine systems as well as special wetland systems such as fens, vernal pools and seeps, and peatlands.

Palustrine Wetlands: Palustrine wetland systems are nontidal wetlands that are dominated by trees, shrubs, persistent emergent species, lichens, or mosses (Cowardin et al. 1979). Palustrine wetlands are bordered entirely by upland areas or other wetland systems, and are commonly called marshes, bogs, swamps, or prairies. Cowardin subclasses and dominance types describe the type of vegetation present in the wetland. For example, within the parks, the palustrine systems that are present include emergent, forested, and scrub shrub systems. Specifically, there are large, complex, forested wetland systems that are on ridgetops bordering the Delaware River that flow downslope until they reach a broad floodplain. There are also broad expanses of wet meadows and freshwater marshes characterized by sedges. The following paragraphs describe general characteristics of the palustrine systems within the parks:

- **Palustrine Emergent Wetlands (PEM)**: Palustrine emergent wetlands are characterized by rooted herbaceous hydrophytes, which are commonly perennials and are present for most of the growing season of most years. Within the category of emergent wetlands, there are persistent and nonpersistent PEMs. In persistent PEMs, vegetation remains standing until the next growing season. Nonpersistent PEMs are dominated by species that fall below the water or to the surface at the termination of the growing season (Cowardin et al. 1979, 20). Palustrine emergent wetlands with persistent vegetation are referred to as PEM1 and with nonpersistent vegetation are PEM2.
- **Palustrine Emergent/Palustrine Scrub Shrub Wetlands (PEM/PSS)**: Palustrine scrub shrub wetlands (PSS) are wetlands where the woody vegetation is less than 6 meters tall, and is often composed of young trees, shrubby species, or species that exhibit stunted growth due to environmental conditions. These areas can be permanent, or the result of succession leading toward a forested wetland. The vegetation in this community can include broadleaf deciduous vegetation, needle-leaved evergreen vegetation, or dead vegetation (Cowardin et al. 1979, 20). Dead scrub shrub wetlands contain dead woody plants under 6 meters tall and are generally created due to disturbance such as landslides, beavers, fire, insect infestations, and air pollution (Cowardin et al. 1979, 20). The Cowardin classification of PEM/PSS refers to an area that exhibits both PEM and PSS wetland characteristics.
- **Palustrine Forested Wetlands (PFO)**: Palustrine forested wetlands have vegetation that is 6 meters or greater in height. These wetlands frequently are found in areas along rivers and streams, and in mountains where moisture is abundant. Generally, vegetation includes a canopy of trees, with an understory of younger trees and shrubs and an herbaceous layer. Palustrine broadleaf deciduous wetlands and palustrine needle-leaved evergreen forested wetlands can both be found in rich or decomposed organic soils. Also, dead forested wetlands have dead woody vegetation that is taller than 6 meters; these wetlands tend to be near beaver ponds or areas of human disturbance; these wetlands are caused by a variety of factors, including landslides, beavers, fire, or herbicides (Cowardin et al. 1979, 20–21).





Legend

- Substation
- Alternative 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Middle Delaware National Scenic and Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- NWI Wetlands
- Wetlands
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 2 4
Miles

Susquehanna to Roseland
Transmission Line Proposal
and
Right-of-Way Request EIS

Figure 27
Alternative Overview Map
Wetlands

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, NJOIT 2010, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: October, 2011

- **Fens, Seeps, and Vernal Pools**: Fens are defined as palustrine wetland communities in areas where the underlying bedrock is limestone. Seeps are defined as wetland areas that typically are found in sloping terrain, and are fed by groundwater. A typical vernal pool is a shallow depression on the forest floor that may or may not contain plants; it usually holds water from November to mid-June, and is dry the remainder of the year (NPS 2008a, 1).
- **Palustrine Nonvegetation Wetlands (PUBHx)**: This wetland is defined as a palustrine wetland with unconsolidated bottom that is permanently flooded and has been excavated.
- **Palustrine Emergent Wetlands (PEMB):** This palustrine wetland contains emergent vegetation and is saturated to the surface for extended periods during the growing season, although surface water is seldom present.
- **Riverine Wetlands**: In general, riverine wetland systems are composed of all wetland areas in a channel connecting two standing bodies of water, are not dominated by vegetation, and do not have ocean-derived salinity greater than 0.5 parts per thousand; springs that discharge into a stream or river are considered to be part of the riverine wetland (Cowardin et al. 1979). NWI maps characterize the Delaware River within the parks as a riverine, lower perennial, unconsolidated bottom, permanently flooded wetland. Lower perennial riverine wetlands have a low gradient and perennial flow, and the water movement is slow (Cowardin et al. 1979). Generally, the substrate of lower perennial wetlands is mainly mud or sand, and there may be a deficit of oxygen at some points in the year; these systems typically have a well-developed floodplain (Cowardin et al. 1979, 7–8).
- **Lacustrine Wetlands**: Lacustrine wetlands are described as being in a topographic depression or a dammed river channel, generally lacking vegetation (including trees, shrubs, persistent emergents, emergent mosses, or lichens), and generally larger than 20 acres (Cowardin et al. 1979). Additionally, lacustrine wetlands are bounded by upland habitat or a wetland containing trees, shrubs, persistent emergents, emergent mosses, or lichens. These wetlands include areas around lakes and reservoirs, as well as intermittent lakes (Cowardin et al. 1979, 9–10).

EVALUATION OF WETLAND FUNCTIONS AND VALUES

The existing wetland conditions were evaluated based on wetland functions and values described in NPS *Procedural Manual #77-1: Wetland Protection* (2011c). Functions and values of the wetlands are presented at locations where surveys occurred or where sufficient data on the wetlands were available. The wetland functions and values evaluation for the wetlands delineated at the parks included describing wetlands as Exceptional Value Wetlands (all other wetlands are considered ordinary wetlands) when applicable, as well as the following variables:

Functions

- **Groundwater Recharge/Discharge**: Recharge is the potential of a wetland to contribute water to an aquifer; discharge is the potential of a wetland to discharge groundwater to the surface. The wetland's ability to help maintain stream base flow has also been included in this variable.
- **Flood Attenuation/Alteration**: Flood attenuation/alteration functionality is evaluated based on the effectiveness of a wetland in reducing flood damage from prolonged periods of precipitation by storing and desynchronizing (i.e., gradually releasing at lower heights/velocities) floodwaters. The economic value of flood protection has also been included in this variable.

- **Fish/Shellfish Habitat**: Fish/shellfish habitat functionality is evaluated based on the effectiveness of seasonal or permanent watercourses associated with a wetland to provide habitat and the essentials necessary for life for a diversity of types and abundance of populations of fish/shellfish and other aquatic organisms. The economic value of the fishery was also considered in this variable. Both resident and migratory fish species were considered.
- **Sediment/Toxicant Retention**: Sediment/toxicant retention functionality is evaluated based on the effectiveness of a wetland to reduce or prevent degradation of water quality by acting as a trap for sediments or toxic substances in runoff water that could adversely affect aquatic and terrestrial life.
- **Nutrient Removal**: Nutrient removal functionality is evaluated based on the effectiveness of a wetland to serve as a trap for nutrients carried by runoff from surrounding uplands or contiguous wetlands, and the wetland's ability to process these nutrients into other forms. The wetland also functions to prevent the adverse effects associated with excess nutrients entering aquifers or surface waters, including streams, rivers, lakes, ponds, and estuaries.
- **Production Export**: Production export functionality is evaluated based on the effectiveness of a wetland to produce food or other usable products for living organisms (including humans). Detrital nutrient export to downstream systems has been included in this variable.
- **Sediment/Shoreline Stabilization**: Sediment/shoreline stabilization functionality is evaluated based on the effectiveness of a wetland to stabilize streambanks against shear stresses and/or protect shorelines against erosion by reducing forces caused by waves. Other erosion and sediment control functions, such as reduction of water velocities and binding of the soil, have been included in this variable.

Values

- **Wildlife Habitat**: Wildlife habitat value is evaluated based on the effectiveness of a wetland to provide habitat and the essentials necessary for life for a diversity of types and abundance of populations of wildlife species typically associated with wetlands, their associated water bodies, and the wetland edge. Both resident and migratory species were considered. Faunal (wildlife) productivity has also been included in this variable.
- **Recreation (Consumptive/Nonconsumptive) and Tourism**: Recreation and tourism value is evaluated based on the suitability of a wetland and associated watercourses to provide active and/or passive recreational opportunities for both local and nonlocal populations. Consumptive use includes activities such as hunting and fishing, which may diminish the plants, animals, or other resources that are intrinsic to the wetland. Nonconsumptive use includes activities such as hiking, bird-watching, boating, and canoeing, which do not diminish the resources of the wetland. The economic value of tourism has also been included in this variable.
- **Education/Scientific**: Education/scientific value is evaluated based on the suitability of a wetland to serve as an "outdoor classroom," as a "reference site" for scientific study or research on ecosystems, or for interpretation.
- **Uniqueness/Heritage**: Uniqueness/heritage value is evaluated based on the effectiveness of a wetland or its associated water bodies to provide certain wetland attributes or special functions related to aspects of public health, recreation, and habitat diversity. This may include the wetland's overall health and appearance, its role in the overall ecology of the area, or its relative importance as a typical wetland class for the geographic location.

- **Visual Quality/Aesthetic**: Visual quality/aesthetic value is evaluated based on the effectiveness of a wetland in contributing to the visual or aesthetic quality or pleasing nature of the surrounding landscape.
- **Endangered Species Habitat**: Endangered species habitat value is evaluated based on the suitability of a wetland to support and/or provide the habitat requirements specific to endangered species.

ALTERNATIVE 1 (NO ACTION), ALTERNATIVE 2, AND ALTERNATIVE 2b

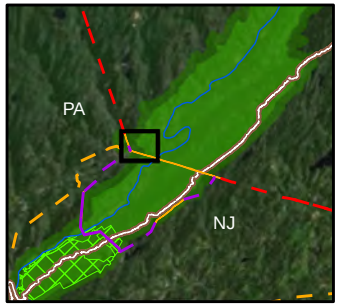
Inside the study area in Pennsylvania, a site investigation for the presence of jurisdictional waters of the United States, including wetlands, was conducted along the alignment for alternatives 1, 2, and 2b between September 2008 and May 2009. Additional wetland habitats were also determined based on the USFWS *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). The wetland delineation covered Pike and Monroe counties, Pennsylvania, within the parks (figures 28 through 31). The site investigation identified 11 wetlands and waters of the United States, including 5 PEMs and 3 PFOs, within the boundaries of the parks in Pennsylvania (Berger 2010a, 4). Rare and unique habitats that support wetland areas within the ROW are detailed in the paragraphs below; however, the entire community is discussed in detail in the "Rare and Unique Communities" section of this chapter.

Arnott Fen is a PEM wetland along the alignment for alternatives 1, 2, and 2b. This fen occupies approximately 5.3 acres of the larger wetland complex in which it is found. Arnott Fen is unique in part due to the underlying limestone bedrock and is considered a rare and unique community as well as an Exceptional Value Wetland. Arnott Fen, a globally imperiled community, lies directly beneath the B-K Line along alternatives 1, 2, and 2b. The water supply of this PEM wetland flows through the underlying limestone bedrock, creating calcareous conditions. The hydrology of the fen influences the array of species living in this rare community and includes numerous special-status wetland plant species that are not found anywhere else in the study area and are discussed in more detail in the "Special-status Species" section. The soils at this site are hydric because a low chroma matrix was present.

Hogback Ridge is defined in the DEWA GMP and by Monroe County, Pennsylvania, as an outstanding natural feature significant to the diversity of the area (NPS 1987; PATNC 1991a, 14–25). Hogback Ridge contains woodlands as well as a wetland characterized as a PSS1E (palustrine, scrub shrub, broad- leaved deciduous, seasonally flooded/saturated wetland), which encompasses approximately 1.7 acres and is considered a rare and unique community as well as an Exceptional Value Wetland because this wetland supports endangered species habitat. Like Arnott Fen, the unique qualities of Hogback Ridge are a result of the limestone bedrock that forms the ridge. The wetland contains deciduous scrub shrub wetland vegetation and special-status wetland plant species that are not found anywhere else in the study area and are discussed in more detail in the "Special-status Species" section. The soils at this site are hydric because a low chroma matrix was present accompanied by low chroma redoximorphic (redox) features.

Other wetlands not considered rare or unique that were identified within the study area for alternatives 1, 2, and 2b during site investigations are described below as wetlands AA, BB, and CC (Berger 2010a). Acreages of these wetlands are generally not described because these wetland areas extend within and beyond the existing ROW. Additionally, wetlands data are generally not described in detail at proposed access roads. Function and value assessments of the wetlands delineated along the alignment for alternatives 1, 2, and 2b were also performed (table 6).

- Wetland AA is a PFO wetland near the Bushkill Substation, and the vegetation in wetland AA is unknown.



Legend

- Substation
- Crane Pad/ Tower Location
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands within 350ft buffer
- Wetlands
- County Line

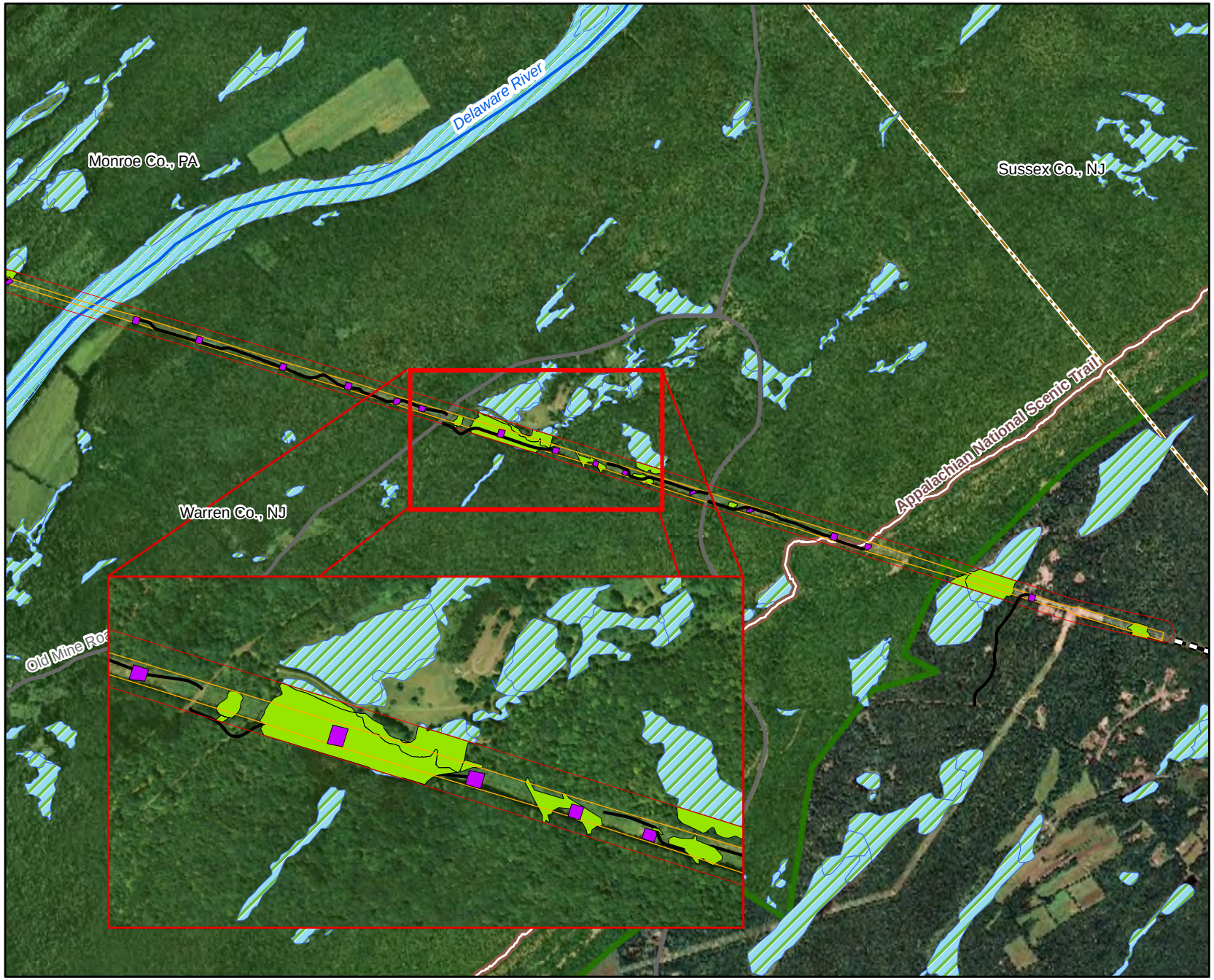
0 500 1,000
Feet

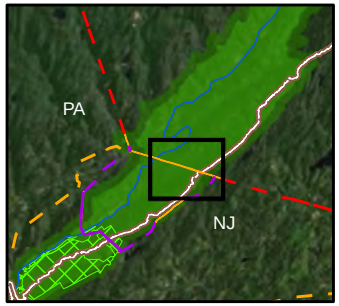
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 28
Alternative 2 Wetlands in Pennsylvania

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: October, 2011





Legend

- Substation
- Crane Pad/ Tower Location
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands within 350ft buffer
- Wetlands
- County Line

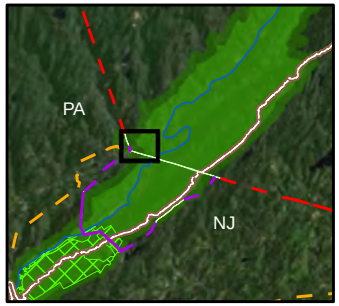
0 1,000 2,000
Feet

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 29
Alternative 2 Wetlands in New Jersey

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: October, 2011



Legend

- Substation
- Crane Pad/ Tower Location
- Outside Study Area
- Alternative 2b Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands in Alternative 2b Corridor
- Wetlands
- County Line

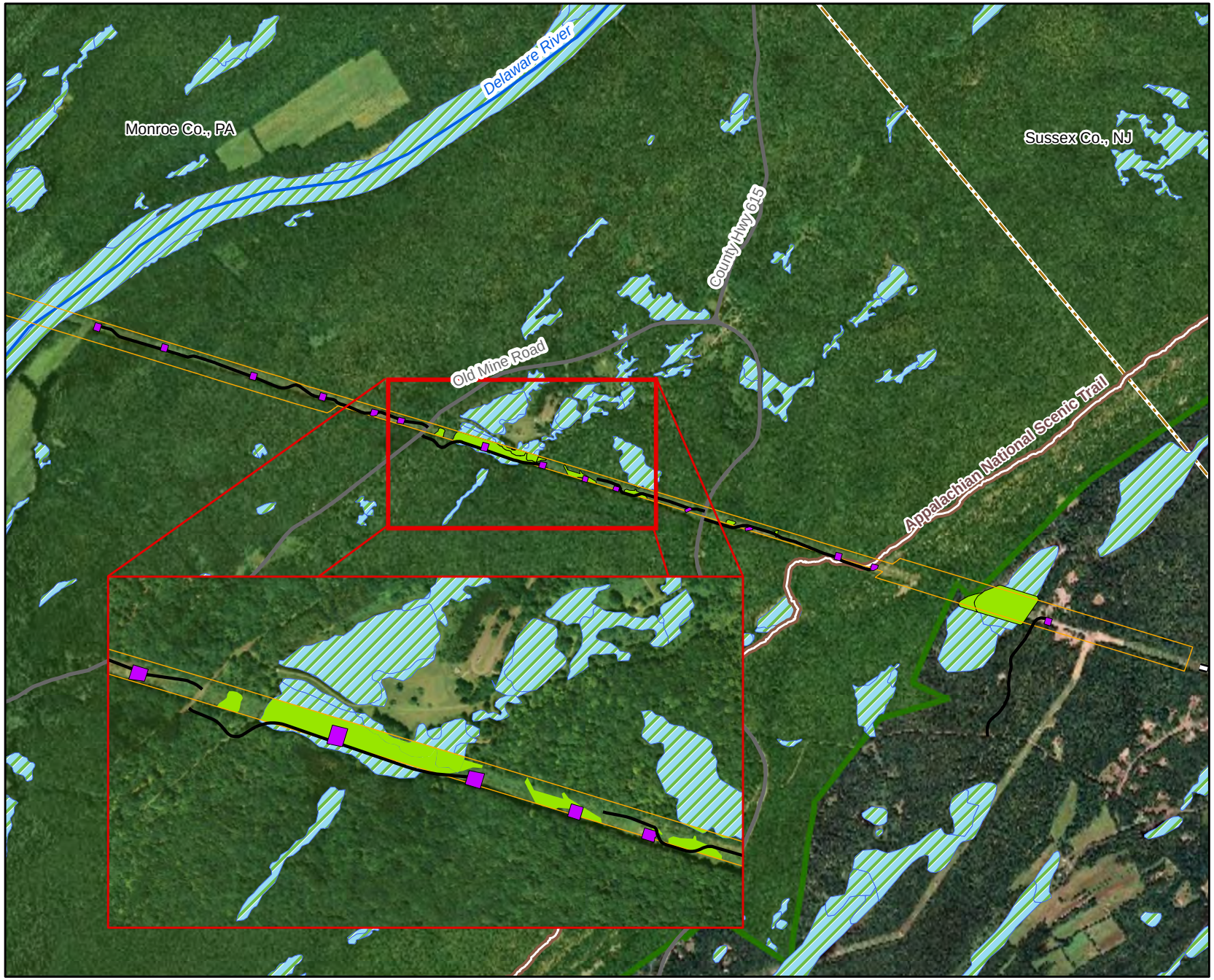
0 500 1,000
Feet

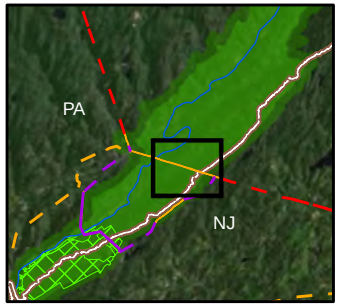
Susquehanna to Roseland
Transmission Line Proposal
and
Right-of-Way Request EIS

Figure 30
Alternative 2b Wetlands in Pennsylvania

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: October, 2011





Legend

- Substation
- Crane Pad/ Tower Location
- Outside Study Area
- Alternative 2b Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands in Alternative 2b Corridor
- Wetlands
- County Line

0 1,000 2,000
Feet

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 31
Alternative 2b Wetlands in New Jersey

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: October, 2011

- Wetland BB lies within the floodplain of Bushkill Creek and contains both PEM and PFO portions of the wetland. Forested wetlands along this portion of the line are dominated by upright sedge, arrowwood (*Viburnum dentatum*), red maple, red osier dogwood (*Cornus sericea*), and multiflora rose. In the emergent portion of the wetland, plant species found include red maple, upright sedge, sensitive fern, and purple willow-herb. Wetland BB is located just north of Bush Kill Creek, which is characterized as a wild trout stream, stocked trout stream, and wetland greater than 10 acres in size. Therefore, wetland bb is considered an Exceptional Value Wetland because it located in the floodplain of waters listed as Exceptional Value under Chapter 93 (relating to water quality) in PA State Code (§ 105.17 *Wetlands*). In addition, wetland BB supports the value endangered species habitat, as presented in table 6, which also characterizes this wetland as an Exceptional Value wetland. The soils at this site are hydric because a low chroma matrix was present accompanied by low chroma redox features.
- Wetland CC is a PEM wetland in the northwestern portion of the study area. It is dominated by goldenrod species, rice cutgrass (*Leersia oryzoides*), tearthumb (*Polygonum perfoliatum*), hay-scented fern (*Dennstaedtia punctilobula*), and Japanese stiltgrass (*Microstegium vimineum*). The soils at this site are hydric because a low chroma matrix was present accompanied by low chroma redox features.

TABLE 6: FUNCTIONS AND VALUES OF ALTERNATIVE 1, 2, AND 2B WETLANDS

Wetland	Arnott Fen	Hogback Ridge	Van Campens[a]	Wetland BB[b]	Wetland CC[b]
Functions					
Groundwater recharge/discharge	X		X	X	X
Flood attenuation/alteration	X	X		X	X
Fish/shellfish habitat			X	X	
Sediment/toxicant retention	X			X	X
Nutrient removal	X			X	X
Production export	X			X	X
Sediment/shoreline stabilization				X	
Values					
Wildlife habitat	X	X	X	X	X
Recreation and tourism			X		
Education/scientific	X			X	
Uniqueness/heritage	X	X		X	
Visual quality/aesthetic	X			X	X
Endangered species habitat	X	X	X	X	

Source: Berger 2010a.

Note: Wetland AA functions and values are expected to be similar to those of wetland BB.

a. Adapted from NPS 2009c; Mellon 2010a

b. Wetlands AA, BB, and CC along the B-K Line are also found in alternatives 3 and 4

The Van Campens Brook riparian area, like Hogback Ridge, is an outstanding natural feature of DEWA and is discussed in detail in the "Rare and Unique Communities" section of this chapter. This riparian area includes a category one stream, a popular recreation area, and an outstanding wetland complex. The Van Campens wetland complex (also referred to as the Watergate wetland) is within the ROW along the

B-K Line of alternatives 1, 2, and 2b. The ROW would cross the watershed areas for the Van Campens Brook and wetland area, characterized as PEM/PSS wetlands (PSE&G 2009b). The wetland contains emergent and deciduous scrub shrub wetland vegetation and is a rare and unique community as well as an Exceptional Value Wetland because this wetland supports a special-status (state endangered) plant species.

Other wetlands not considered rare or unique that were identified during surveys included the following (PSE&G 2009b, section 8A):

- Wetland 45 is a PSS wetland within the ROW for alternatives 1, 2, and 2b near Van Campens Brook and wetland complex. Along this portion of the ROW, PSS vegetation was generally composed of smaller trees, including red maple, American elm, and cottonwood. The shrubby layer generally includes species like spicebush (*Lindera benzoin*), silky dogwood, and swamp rose as well as invasive shrubby species, including Japanese barberry and multiflora rose. The herbaceous layer in this wetland may include reed canarygrass, arrow-leaved tearthumb, deertongue grass, and sphagnum moss, among many others.
- Wetland 42 is a PFO wetland that contains largely needle-leaved coniferous species. This wetland is within the proposed corridor for alternatives 1, 2, and 2b and is found on either side of the current ROW. Hydrology for this wetland arises from a seep within the ROW. Forested wetlands along this portion of the ROW often include red maple, yellow birch, white ash, gray birch, white oak, and cottonwood. The understory likely includes saplings and highbush blueberry, spicebush, and smooth alder. The herbaceous layer often contains cinnamon fern, sensitive fern, jack-in-the-pulpit (*Arisaema triphyllum*), and sphagnum moss as well as other herbaceous species.
- Wetland 46 surrounds a pond within the ROW and is a PEM/PSS wetland. Vegetation is unknown.
- Wetland 47 lies within the ROW, slightly uphill of wetland 46. Vegetation is unknown.
- Wetland NWI-1 is a PEM/PSS wetland surrounding wetland NWI-2, Sand Pond, which is a PUBH wetland. PUBH wetlands are palustrine systems or ponds, with less than 30% vegetation and an unconsolidated bottom. Sand Pond and the wetlands surrounding it are outside the boundaries of DEWA but are within the study area.
- Wetland 49 is a PEM/PSS wetland outside the park boundaries but still within the study area. Vegetation is unknown.

In addition to the wetlands site investigation, a vernal habitat assessment was conducted for the wetland systems along the proposed access roads along the ROW of alternatives 1, 2, and 2b within the New Jersey segment of the parks. The assessment took place from March 2009 to July 2009 and was conducted in accordance with the NJDEP freshwater wetlands vernal habitat protocols (EcolSciences 2010a, 1). The assessment resulted in the identification of one wetland area as potentially containing vernal habitat (EcolSciences 2010a, 1). The vernal pool was observed in a confined basin depression with standing water but without a permanent flowing outlet and featured evidence of breeding by more than one species of animal (spotted salamander egg masses, marbled salamander larvae, and wood frog vocalization and egg masses were noted).

ALTERNATIVE 3

Within the study area, wetlands along the alternative 3 alignment were field-delineated, and function and value assessments of the wetlands delineated along the alignment were performed (NPS 2011b) (table 7, figure 32). Within the boundaries of DEWA, five wetlands were found along the alternative 3 ROW (wetlands 3, 4, 5/6, 8, and 10) and are described in more detail below. Acreages of these wetland areas are generally not described because these wetland areas extend beyond the existing ROW. There is also one wetland along alternative 3 outside park lands. There are no rare and unique communities known as wetland areas along the alternative 3 alignment. A more detailed description of each of the wetlands follows:

- Wetland 3 is within the ROW of alternative 3, east of the Delaware River, in New Jersey. This wetland is classified as a PEMY (palustrine, emergent, saturated/semipermanent/seasonal wetland) and consists of a seep that flows from fractured shale and drains to an intermittent stream channel. Wetland 3 is vegetated predominantly with Japanese barberry, an invasive species, and is subdominated by hydrophytic plant species. No appreciable soil accumulation was present within the wetland, precluding soil profile analysis.
- Wetland 4 is within the ROW of alternative 3, northeast of wetland 3. This wetland is classified as a PEMY wetland and consists of a seep that flows from fractured shale and drains to an intermittent stream channel. This emergent wetland is vegetated predominantly with steeplebush. No appreciable soil accumulation was present within the wetland, preventing soil profile analysis.
- Wetland 5/6 is a wetland complex adjacent to the ROW of alternative 3, east of the Delaware River, in New Jersey. This wetland is classified as a PEMY wetland and consists of a seep that flows from glacial till and drains to an intermittent stream channel. This emergent wetland is sparsely vegetated with New York fern, cinnamon fern, large leaved violet (*Viola blanda*), and sedge species (*Carex* spp.). No appreciable soil accumulation was present within the wetland, preventing soil profile analysis.
- Wetland 8 is within the ROW of alternative 3, east of the Delaware River, in New Jersey. This wetland is classified as a PEMB wetland and consists of a seep that flows from fractured shale and drains to a perennial stream channel. This emergent wetland is vegetated predominantly with sphagnum moss. The soil matrix within this wetland had a chroma value of 2 or less with redox concentrations and depletions, thus indicating hydric soils.
- Wetland 10 is along alternative 3 in New Jersey where the ROW follows the boundary of DEWA. This wetland is classified as a PSS wetland that is seasonally flooded. Wetland 10 is vegetated mainly with highbush blueberry, cinnamon fern, and red maple saplings. The soil matrix within this wetland had a chroma value of 2 or less with redox concentrations and depletions, thus indicating hydric soils.
- NWI-3 is a PFO4/1E (palustrine, forested, needle-leaved evergreen/broad-leaved deciduous seasonally flooded/saturated wetland) outside the boundaries of DEWA but within the study area. This wetland is along the existing alternative 3 ROW where it runs alongside the boundary for DEWA. The wetland is vegetated with a mix of needle-leaved evergreen species and broadleaf deciduous species and is seasonally flooded.
- In addition to the wetlands described above, wetlands AA, BB, and CC, as previously described above in alternatives 1, 2, and 2b also exist along the alignment for alternative 3.

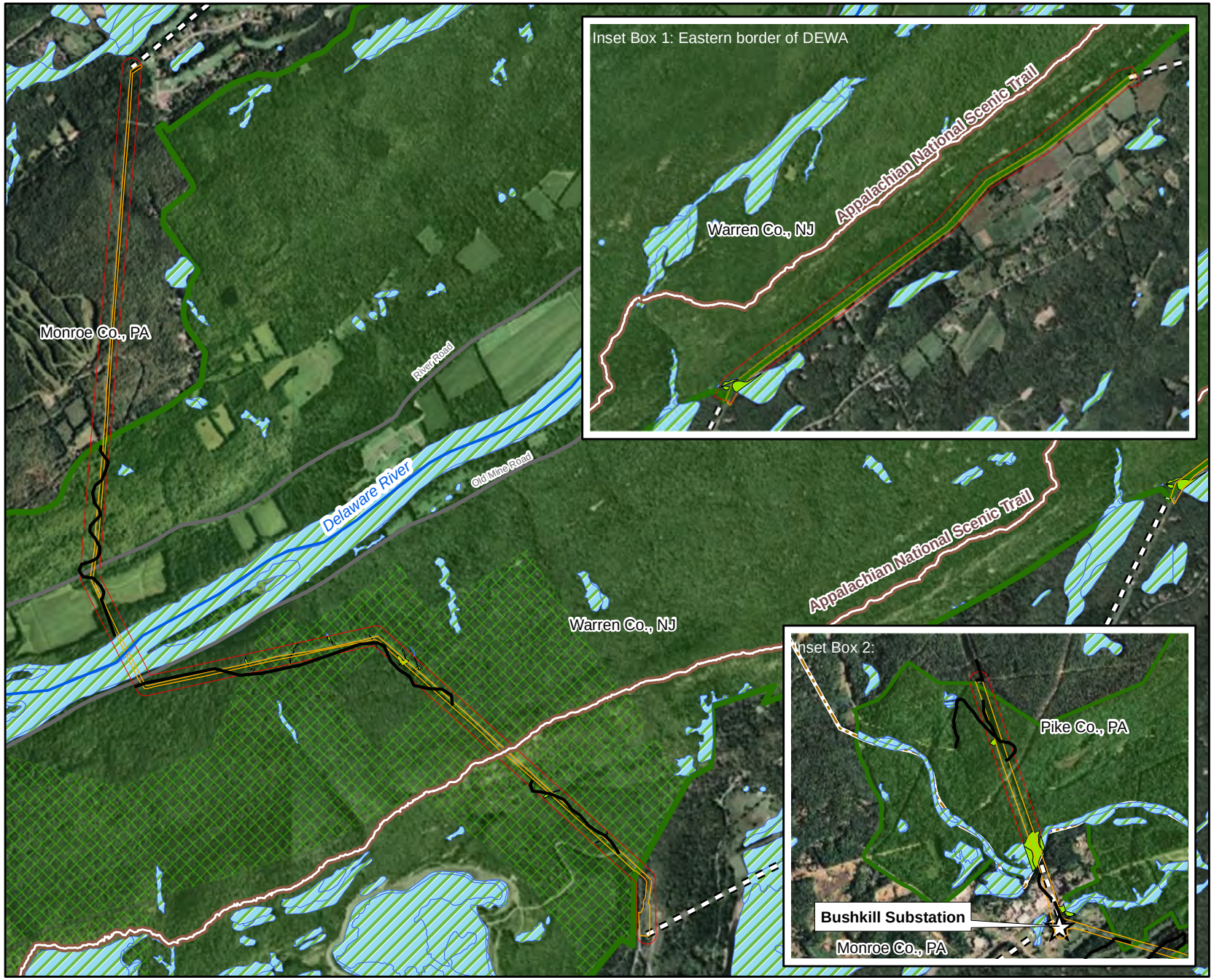
TABLE 7: FUNCTIONS AND VALUES OF ALTERNATIVE 3 WETLANDS

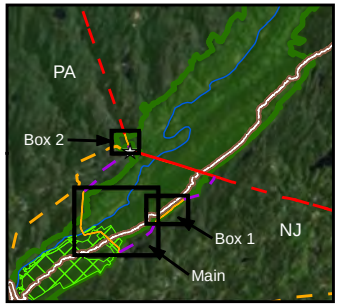
Wetland	Wetland 3 PEMY	Wetland 4 PEMY	Wetlands 5/6 PEMY	Wetland 8 PEMB	Wetland 10 PSS
Functions					
Groundwater recharge/discharge	X	X	X	X	X
Flood flow alteration				X	
Fish and shellfish habitat					
Sediment/toxicant retention				X	X
Nutrient removal					X
Production export	X	X	X	X	X
Sediment/shoreline stabilization				X	
Values					
Wildlife habitat	X	X	X	X	X
Recreation					
Educational value					
Uniqueness/heritage					
Visual quality/aesthetics	X	X	X	X	X
Endangered species habitat					

Source: NPS 2011b.

Note: Functions and values of wetland NWI-3 were not available; wetlands outside park boundaries were not surveyed.

Wetland values for AA, BB, and CC are addressed in table 6.





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- Wetlands within 350ft buffer
- Wetlands
- County Line

0 1,800 3,600
Feet
Scale applies to main frame and inset maps

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 32
Alternative 3 Wetlands

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: October, 2011

ALTERNATIVE 4

Inside the study area, wetlands along the alternative 4 alignment were field-delineated in the summer of 2010 (NPS 2011b), and function and value assessments of the wetlands delineated along the alternative 4 ROW were performed table 8, figure 33). Within the boundaries of DEWA, two wetlands were found along the alternative 4 alignment and are described as wetlands 1 and 2. Acreages of these wetland areas are generally not described because these wetland areas extend beyond the existing ROW. An additional wetland was identified within the ROW but outside the boundary of the park. The wetland systems identified along alternative 4 are characterized as PFOs. More detailed descriptions of the wetlands follow:

- Wetland 1 is a forested wetland system east of Totts Gap Road and south of Mountain Road. This wetland is classified as a PFO and consists of a bowl-shaped depression within the floodplain of an unnamed stream channel. This forested wetland is dominated by red maple, willow oak (*Quercus phellos*), American hornbeam (*Carpinus caroliniana*), and silver maple (*Acer saccharinum*) in the canopy and understory. Japanese stiltgrass, an invasive species, and jack-in-the-pulpit were identified as dominant groundcover species. The soil matrix within this wetland had a chroma value of 2 or less with mottling of the matrix, thus indicating hydric soils.
- Wetland 2 is on the opposite side of the ROW from wetland 1, adjacent to the alternative 4 ROW. This wetland is classified as a PFO and is on a slope above the floodplain of an unnamed tributary to Cherry Creek. This forested wetland is dominated by red maple, willow oak, and silver maple in the canopy with an understory of spicebush. Japanese stiltgrass, an invasive species, was identified as the dominant groundcover species. The soil matrix within this wetland had a chroma value of 2 or less with mottling of the matrix, thus indicating hydric soils.

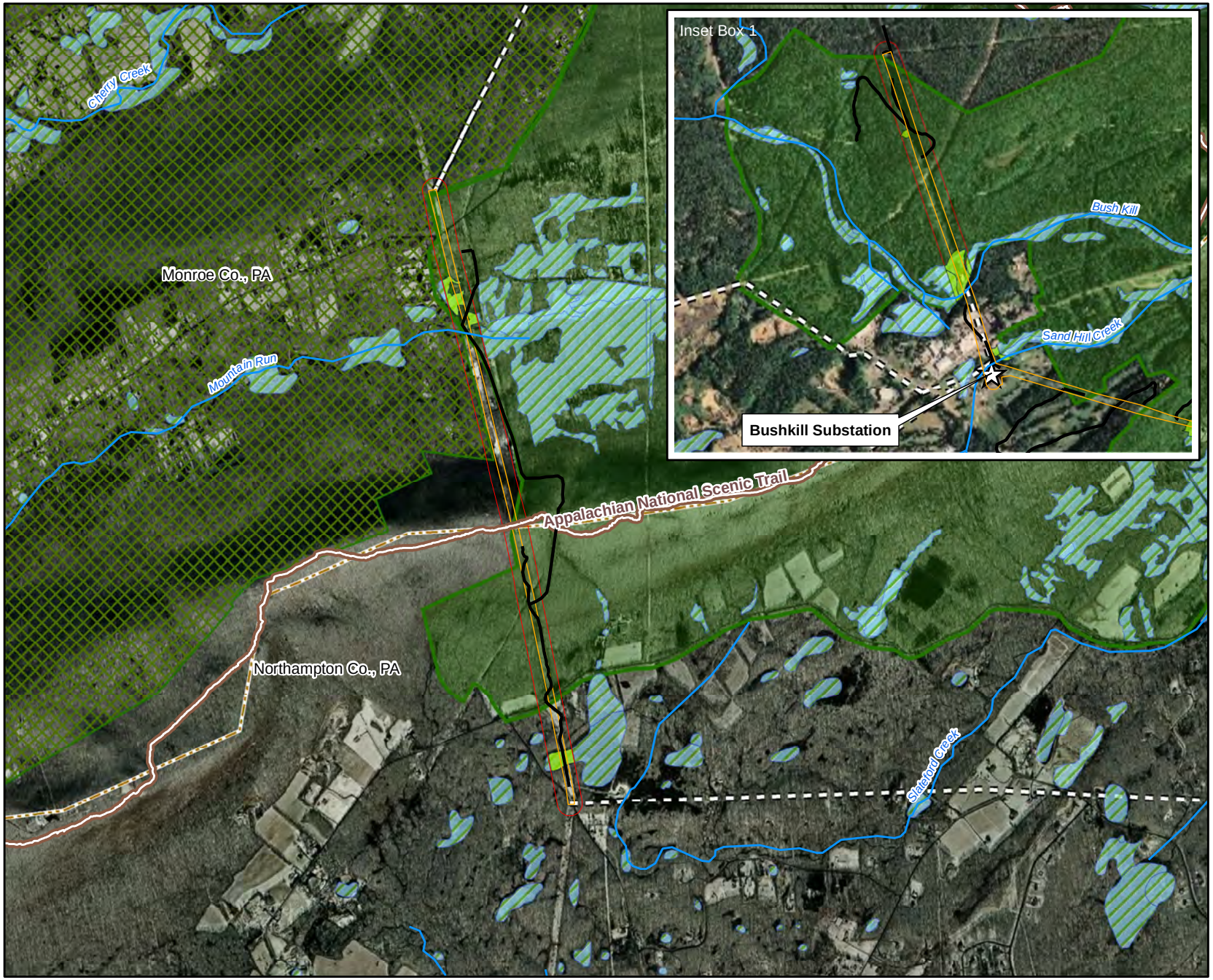
TABLE 8: FUNCTIONS AND VALUES OF ALTERNATIVES 4 AND 5 WETLANDS

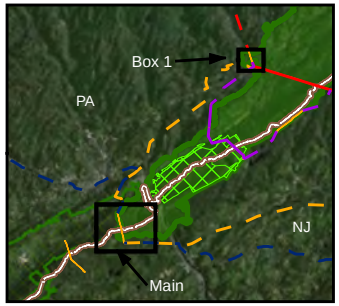
Wetland	Wetland 1 PFO	Wetland 2 PFO
Functions		
Groundwater recharge/discharge	X	X
Flood flow alteration	X	X
Fish and shellfish habitat		
Sediment/toxicant retention		X
Nutrient removal		X
Production export	X	X
Sediment/shoreline stabilization		X
Values		
Wildlife habitat	X	X
Recreation		
Educational value	X	
Uniqueness/heritage	X	
Visual quality/aesthetics	X	X
Endangered species habitat		

Source: NPS 2011b.

Note: Functions and values of wetland NWI-4 were not available; wetlands outside park boundaries were not surveyed.

Wetland values for AA, BB, and CC are addressed in table 6.





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- River/Stream
- Proposed Access Road
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Wetlands within 350ft buffer
- Wetlands
- County Line

Note: Designated boundary of CVNWR is depicted, not all property is owned within the boundary

0 1,000 2,000
Feet
Scale applies to main frame and inset maps

Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 33
Alternative 4/5 Wetlands

Source: ESRI Streetmap 2006, Penn State 2010, ESRI ArcGISonline Map Service 2010, PennDOT 2011, USGS 2006, NJ DEP 2008, NWI 1977

Projection: NAD 83 UTM Zone 18N
Date: October, 2011

- Wetland NWI-4 is outside the boundaries of DEWA but within the study area. This wetland is a PSS1E/PFO1E wetland. This forested and scrub shrub wetland area is dominated by broadleaf deciduous vegetation. This wetland area is seasonally flooded.
- In addition to the wetlands described above, wetlands AA, BB, and CC, as previously described above in alternatives 1, 2, and 2b also exist along the alignment for alternative 4.

ALTERNATIVE 5

Inside the study area, wetlands along the alternative 5 alignment were field-delineated during the summer of 2010 (NPS 2011b), and function and value assessments of the wetlands delineated along the alternative 5 ROW were performed (table 8, figure 33). Two wetlands were found along alternative 5 within the boundaries of DEWA, and one was found outside the boundaries of the park; these wetlands are the same wetlands as described above for alternative 4 (wetlands 1, 2, and NWI-4). Unlike alternative 4, alternative 5 does not include wetlands along the B-K Line (wetland AA, wetland BB, and wetland CC). The wetland systems identified along the alternative 5 ROW inside the park are characterized as PFOs. Wetland 1 is part of Totts Gap, which consists of Totts Gap Natural Heritage Site and Totts Gap Swamp; this wetland and the PFO/PSS NWI-4 wetland are described in more detail under alternative 4.

OUTSIDE THE STUDY AREA

Outside the study area in Pennsylvania, the S-R Line could pass through Pike, Monroe, Carbon, Northampton, Wayne, Lackawanna, and Luzerne counties. Although these counties are largely undeveloped, they are some of the fastest growing and developing counties within Pennsylvania, particularly Monroe and Pike counties (Commonwealth of PA 2005a, 2005b, 2005c, 2005d, 2005e, 2005f, 2005g). As more and more land is developed, the park lands will become increasingly important natural areas. Development within the counties in and around the parks is discussed in the "Socioeconomics" section of this chapter. All seven counties contain a combination of private and public lands. More than 20,000 acres of Monroe County have been designated as the Cherry Valley NWR, although not all 20,000 acres are under current ownership or management of the USFWS. In Pike County, which contains a large portion of DEWA, wetlands compose between 6% and 7% of the county land (Tiner 1990, 25). Pike County wetlands are mainly forested and forested scrub shrub, and freshwater ponds, lacustrine wetlands (along lakes), and riverine wetlands are also found within the county (USFWS 2010a; Tiner 1990, 73, 80). Northampton County contains less undeveloped land than the other counties (approximately 62%) (Commonwealth of PA 2005f, 1), and only about 1.2% of the land in Northampton County is wetland areas (mainly forested wetlands) (Tiner 1990, 76). Carbon County contains about 1.2% wetlands, the majority of which are forested wetland areas (Tiner 1990, 41). Approximately three-quarters of Carbon County is undeveloped, due in large part to the rugged terrain, and contains both private and public lands and a portion of APPA (Commonwealth of PA 2005g, 1). In Wayne, Lackawanna, and Luzerne counties between 3% and 5% of the land area is covered by wetlands (Tiner 1990, 25). The types of wetlands found within these counties are similar to those found in Pike County, although Luzerne and Wayne counties have more emergent wetland areas (USFWS 2010a; Tiner 1990, 63, 68, 92).

Outside the study area in New Jersey, the S-R Line could pass through Morris, Sussex, and Warren counties. About 14% of the land in Sussex County is wetland areas, with about 9% being forested wetlands and 5% being herbaceous, agricultural, or disturbed wetland areas, including known limestone fen communities (Morris Land Conservancy 2003, 20). In Warren County, roughly 10% of the land is wetland areas (Warren County Planning Board 2008, 53). Lastly, in Morris County, roughly 13% to 14% of the land is wetland areas (Tiner 1985, 21). The wetlands found in these counties are similar to those found within the Pennsylvania counties. Additionally, Morris County includes agricultural wetland areas (USFWS 2010a).