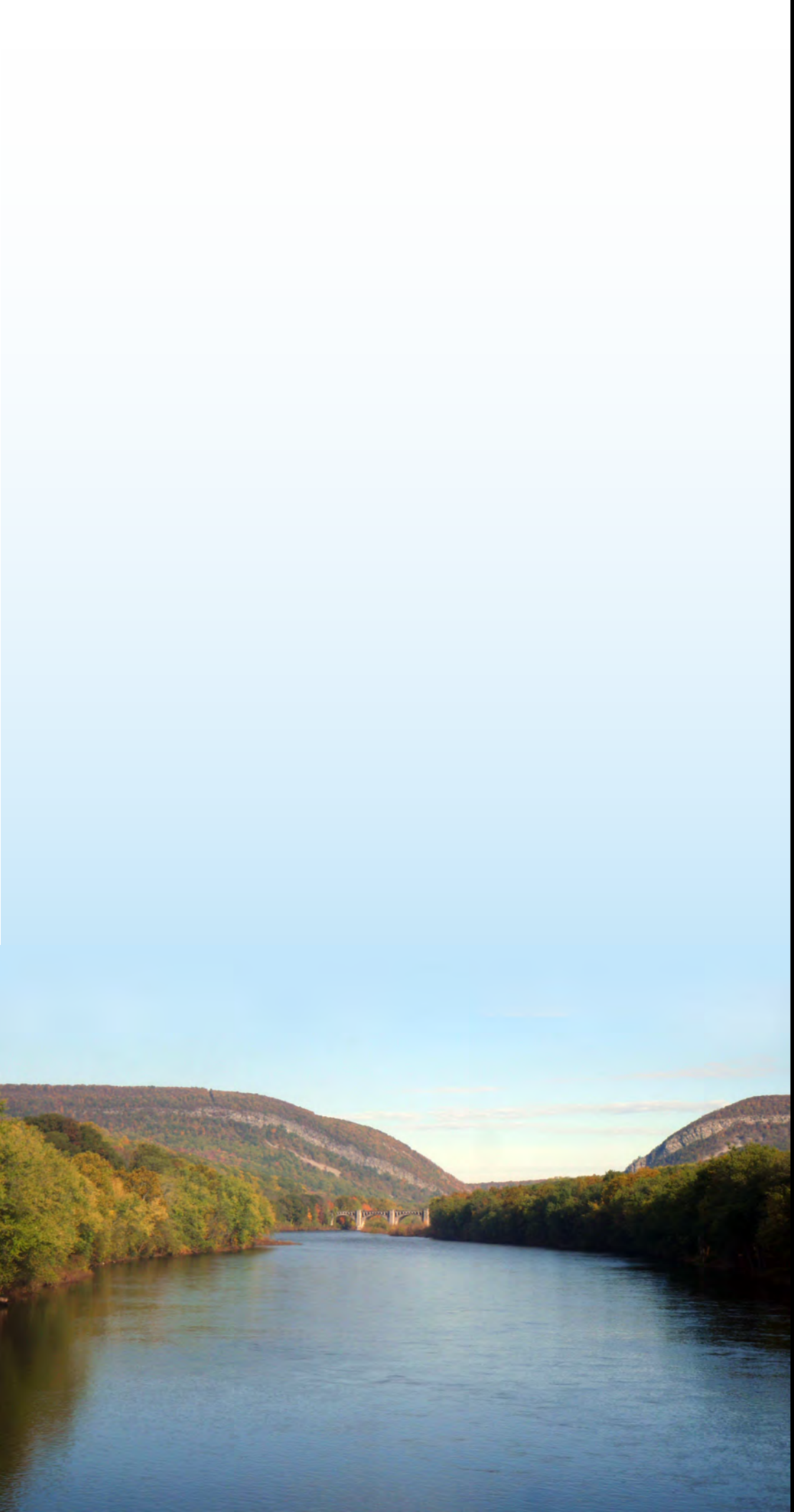


Chapter 4
Environmental Consequences

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes the potential environmental consequences of implementing any of the alternatives being considered. It is organized by resource topic and provides a standardized comparison among alternatives based on topics discussed in chapter 1 and further described in chapter 3. In accordance with the Council on Environmental Quality (CEQ) regulations, direct, indirect, and cumulative impacts are described and significance of the impacts is assessed in terms of context, intensity, and duration (40 CFR § 1502.16). Mitigating measures for adverse impacts are also described. The analysis for each impact topic includes the methods used to assess the type of impact. As required by the CEQ regulations implementing National Environmental Policy Act (NEPA), a summary of the environmental consequences for each alternative is provided in table 4, which can be found at the end of chapter 2. Because this document addresses compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), the analysis of cultural resources also contains an assessment of effect. Integration of the requirements of Section 106 of the NHPA into the NEPA process and documentation are accomplished by meeting the criteria set forth in 36 CFR § 800.8(c)(1)-(4). The information required by the criteria set forth at 36 CFR § 800.8(c)(1)(ii)-(v) is incorporated into the analysis in this chapter.

GENERAL METHODOLOGY FOR MEASURING IMPACTS BY RESOURCE

General Analysis Methods

The analysis of impacts follows CEQ guidelines and Director's Order 12 procedures (NPS 2011g). The analysis incorporates the best available scientific literature applicable to the region and setting, the species and areas being evaluated, and the actions being considered in the alternatives. For each resource topic addressed in this chapter, the applicable analysis methods are discussed, including assumptions.

Assumptions

Several guiding assumptions were made to provide context for this analysis. These assumptions are described below. Additional assumptions about construction and mitigation can be found in chapter 2 and "Appendix F: Mitigation Measures."

Analysis Period

Goals, objectives, and specific implementation actions needed to manage the parks are established for the next 15 years. All actions would be assessed for impacts up to 15 years, the period of analysis for this environmental impact statement (EIS); however, impacts that are deemed permanent would be defined as such, and are expected to last the duration of the transmission line's existence.

Geographic Area Evaluated for Impacts

The geographic study area for this EIS is defined in terms of visual split locations (VSLs). VSLs are the points outside the parks' boundaries beyond which the route chosen by the applicant could vary, as described in chapter 2 in the "Alternatives Development Process" section. The study area includes the areas inside the VSLs for each alternative (see figure 2 in chapter 2). The VSLs include portions of Delaware Water Gap National Recreation Area (DEWA), Middle Delaware National Scenic and

Recreational River (MDSR), and Appalachian National Scenic Trail (APPA) in Pennsylvania and New Jersey. Areas inside the VSLs are evaluated for direct impacts.

Outside the study area, only indirect impacts are evaluated, because the impacts related to constructing and operating the Susquehanna-to-Roseland (S-R Line) would not be caused by activities permitted by the National Park Service (NPS). This generally includes indirect impacts in the counties each alternative traverses, but may follow the specific alignment. But because the NPS cannot require the applicant to follow a certain route beyond the park boundary, the applicant would ultimately be responsible for the exact line routing from the Susquehanna Substation to the Roseland Substation. Specific impacts outside the study area generally cannot be determined because of the physical distance from NPS-authorized activities and the specific resources that would be affected by the transmission line outside the study area cannot be identified until the route is chosen by the applicant.

Study areas vary depending on the resource evaluated; therefore, the specific study area for each impact topic is defined at the beginning of each resource topic discussion.

Transmission Line Impacts

The following assumptions were factored into the impact analysis for the various transmission line alternatives.

- Construction staging locations would be located outside the study area. Therefore, no impacts would occur from staging areas inside the study area. Staging areas are only required during construction; therefore, impacts would be temporary. Staging areas would be located on existing developed or disturbed areas if possible, and if any undeveloped or undisturbed areas are used for staging areas they would be restored to original conditions following construction.
- Construction would include a double circuit line, which would be hung on the proposed new towers. Each circuit would be capable of carrying 500-kilovolt (kV).
- Pulling and splicing sites could be located inside or outside the study area and would require spur roads connecting to the associated tower inside the proposed right-of-way (ROW). These locations are considered temporary; therefore, most impacts would also be temporary. Impacts from tree clearing (loss of habitat) would be permanent. The pulling and splicing sites would be located on existing developed or disturbed areas, if possible. If undisturbed or undeveloped areas are used, restoration of these areas must commence after construction is completed. While complete recovery is not likely to occur, restoration efforts would be monitored to ensure that these areas recover to the greatest extent possible.
- Staging, tower, and pulling and splicing sites would be located to avoid wetlands and sensitive areas inside and outside the study area wherever possible. During planning, design engineers would work closely with park staff to avoid sensitive areas within park boundaries.
- New transmission towers would be permanent, resulting in impacts both inside and outside the study area.
- During construction, access roads would be 20 feet wide, located both inside and outside the study area, and composed of compacted dirt or gravel. Once construction is complete, the access roads would be narrowed to 15 feet wide. The wider width would be needed during construction to accommodate large construction vehicles. Access roads are considered permanent because they would be used for maintenance activities once construction is complete. Therefore, permanent impacts would occur from access roads inside and outside the study area.

- Spur roads (such as those for the pulling and splicing sites) would also be needed. These would be 20 feet wide and composed of compacted dirt or gravel. These roads are only needed during construction and would be restored to original conditions following construction.
- For alternatives 3 through 5, each ROW has an existing transmission line. The proposed alternatives would include existing facilities in addition to the proposed transmission towers and lines.
- Vegetation clearing for construction would comply with North American Electric Reliability Corporation (NERC) standards (NERC 2009).

Duration and Type of Impacts

The following definitions are used for all impact topics unless otherwise noted:

Beneficial: An impact that would result in a positive change to the resource when compared to the existing conditions.

Adverse: An impact that causes an unfavorable result to the resource when compared to the existing conditions.

Direct: Impacts that would occur as a result of the proposed action at the same time and place of implementation (40 CFR § 1508.8).

Indirect: Impacts that would occur as a result of the proposed action but later in time or farther in distance from the action (40 CFR § 1508.8).

Future Trends

Visitor use and demand are anticipated to follow trends similar to recent years. DEWA has generally received more than 5 million visitors per year in the last few years (NPS 2012c). In the absence of notable anticipated changes in facilities or access, this average visitation is expected to continue and be reflected across user groups.

Cumulative Impact Analysis Method

The CEQ regulations that implement NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR § 1508.7). As stated in the CEQ handbook, *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997), cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected and should focus on impacts that are truly meaningful. Cumulative impacts are considered for all alternatives, including alternative 1, the no-action alternative.

Cumulative impacts were determined by combining the impacts of the proposed alternative being considered and other past, present, and reasonably foreseeable actions that would also result in beneficial or adverse impacts. If the impacts of the proposed alternative being considered are major, the relative contribution to the cumulative impact would be greater. Therefore, it was necessary to identify other ongoing or reasonably foreseeable projects and plans at DEWA, MDSR, and APPA as well as in the

surrounding area. A complete list of past, present, and reasonably foreseeable actions is included in appendix H. The list is organized by type of project (e.g., infrastructure, restoration).

Adverse impacts from climate change may contribute to the adverse impacts expected from the proposed S-R Line on the different resources. Climate change may interact with and amplify the stress to resources from the construction and maintenance activities associated with the S-R Line. In addition, physical and natural resources are currently under pressure from a number of other stressors, including habitat loss and degradation, development, pollution, toxic chemicals, invasive species, pests, disease outbreaks, habitat fragmentation, and wildfires, making them highly vulnerable to additional impacts such as those from climate change (NABCI 2010, 44). Even though climate change may contribute to the adverse impacts from the proposed S-R Line, this increase would not be expected to change the intensity of the impact that was found for the various S-R Line alternatives presented in this chapter.

Assessing Impacts Using CEQ Criteria

The impacts of the alternatives are assessed using the CEQ definition of "significantly" (1508.27), which requires consideration of both context and intensity:

(a) Context – This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole.

(b) Intensity – This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

(1) Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect would be beneficial.

(2) The degree to which the proposed action affects public health or safety.

(3) Unique characteristics of the geographic area such as proximity to historic or cultural resources, parklands, prime farmlands, wetland, wild and scenic rivers, or ecologically critical areas.

(4) The degree to which the effects on the quality of the human environment are likely to be highly controversial.

(5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

(6) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

(7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

(8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places (National Register) or may cause loss or destruction of significant scientific, cultural, or historical resources.

(9) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

(10) Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

For each resource topic analyzed, the potential significance of the impacts is assessed in the conclusion section that follows the discussion of the impacts for each alternative.

Context includes both overall context and resource-specific context. Overall context is presented here in the "General Methodology for Measuring Impacts by Resource" section because it is based on purpose and significance of the three national park units and applies across all resource topics. Resource-specific context is presented in the "Methodologies" section under each resource topic and applies across all alternatives.

Intensity of the impacts is discussed using the applicable factors from the list in (b) above. Intensity factors that do not apply to a given resource topic and/or alternative are not discussed.

Overall Context for Assessing the Impacts of the Alternatives

The project proposed by the applicant would cross three separate units of the national park system. Alternatives being analyzed would cross various combinations of those units and some cross the newly established Cherry Valley National Wildlife Refuge (NWR). There are no action alternatives possible that would not cross the APPA.

DEWA, established by Public Law 89-158 on September 1, 1965, created what is now the second largest unit (measured by acreage) in the Northeast Region of the NPS and normally the eighth most visited unit of the entire system with twice as many visitors as many of the most famous parks in the nation. Its location in the most populated area of the United States makes it a destination within an easy drive of at least 50 million people. Located on both sides of the Delaware River in New Jersey and Pennsylvania and barely outside of New York State, it became a designated national park for the three states in this tri-state area.

In addition to providing outstanding nature based recreational opportunities and to administering the unit in accordance with the NPS Organic Act of 1916 (Organic Act) and the General Authorities Act, the NPS is charged specifically with "preservation of the scenic, scientific and historic features contributing to public enjoyment of such lands and waters" (PL 89-158). DEWA is one of the most important archeological areas in this nation and is culturally significant to several tribes that are closely associated with the lands. The Tribes work closely with the NPS on numerous issues.

Also contained within the DEWA boundaries are the MDSR and the globally important Appalachian Trail. For the more than 5 million visitors who enjoy these resources annually the park is a remarkable place where national heritage and spiritual replenishment are enhanced by a myriad of recreational opportunities. The Delaware River is the longest undammed river in the Eastern United States and portions of the Upper Delaware, Middle Delaware, and Lower Delaware Rivers are designated as scenic and recreational rivers under the Wild and Scenic Rivers Act. Combined, over three quarters of the non-tidal Delaware River are included in the national wild and scenic rivers system. The Wild and Scenic Rivers Act calls for protection of rivers that "possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural and other similar values" (16 USC §§ 1271, 1526). The Delaware River includes all of these attributes.

Since the establishment of DEWA and MDSR, the entire ecosystem has mostly reverted to forest. The adjacent New Jersey State lands enhance the overall opportunities for a natural experience and create a large area of contiguous habitat that is one of the largest and most intact in the Northeast Region of the United States. In conjunction with the public lands in Pennsylvania that are still connected to DEWA through private undeveloped lands and therefore New Jersey State lands, the contiguous habitat is nearly a half a million acres of wildlife habitat and watershed. There are little or no intrusions on the hiking and river experience on the MDSR and in DEWA or along the Appalachian Trail within DEWA. The rare opportunity for such a solitary experience in the mostly developed metropolitan complex of the Northeast is the core experience the NPS is trying to preserve. Tens of thousands of hikers, birders, and other natural and cultural enthusiasts flock to DEWA weekly to enjoy the Appalachian Trail in what is one of the most pristine areas in Pennsylvania, New Jersey, or nearby states. Places like Sunfish Pond, Crater Lake, and Camp Mohican create a memorable experience for the day hiker and the through hiker alike. The 32-mile long McDade Trail shadows the river through the woods providing cyclists, photographers, and birders a unique place to enjoy nature without traveling across the country or crossing excessively difficult terrain. The very nature of the parks makes it possible for children, the elderly, and physically limited people to enjoy experiences often denied to them. Partners in historic and cultural preservation and environmental education service hundreds of thousands of visitors. Swim beaches along the river are well used and busy anytime weather allows. Canoeists, kayakers, and others crowd the river and shoreline throughout the warm seasons. Never is there a time, however, when one cannot find solitude and scenic wonder on one of the cliff trails, especially in the Pennsylvania portion of the park.

The parks are part of a cultural landscape. This area is a tapestry woven of natural and cultural resources. Together these parks and the natural features are inextricably interwoven with the history and culture of the Delaware River Valley. Remnants of early Americans, the Dutch, the colonists, and the French and Indian War are found even today extending out from Old Mine Road in New Jersey and the River Road in Pennsylvania. Some of the oldest extant buildings in the area are found in the park and many villages are kept alive through the work of partner organizations. Tens of thousands of people attend the one weekend event known as Millbrook Days. On a daily basis, the parks provide educational opportunities for school children in history and culture.

Visitors and citizens of the United States, on whose behalf national park units are managed, have expectations that parks in the national park system are representative of the pristine remnants of the national heritage of our great and vast nation. Whether they never visit the parks or frequent them on a daily basis, they expect those places to hold a special meaning and to be unimpaired for them and for the future generations. The Organic Act guarantees that expectation. The park created by a movement of citizens has virtually the same vision as the internationally unique Appalachian Trail.

A natural landscape from the mountain top in Pennsylvania to the mountain top in New Jersey, with the longest undammed river in the eastern United States at its center, is what visitors expect when they visit DEWA.

People expect to come to a pristine place, and perhaps hike along one of the most famous trails in the world; to view the magnificent vistas, wildlife, waterfalls; and to escape the mundane trappings of civilization for a few hours, days, or weeks. Hunters, fishermen, hikers, windshield tourists, swimmers, canoeists, boaters, and other tourists expect to find and explore what they do not find in their everyday environments. They expect what the Organic Act, the enabling legislation of all three units, the Redwood Act amendments, and General Authorities Act dictate.

GEOLOGIC RESOURCES (GEOLOGY, PALEONTOLOGY, AND RARE AND UNIQUE GEOLOGIC FEATURES)

In this section, impacts on geologic resources are evaluated. Included in the overall analysis is an evaluation of the alternatives as they relate to impacts on geology in general, as well as potential impacts on topography, rare and unique geologic features, and paleontological resources.

METHODOLOGIES

Potential impacts on geologic resources are assessed based on the continued ability of natural geologic processes to proceed unimpeded, changes in the topography of the area, and disturbance to rare and unique geologic features that contain karst, shale, and limestone. Karst and shale may contribute to unique geologic features including sinkholes, sinking streams, springs, and small caves, while limestone formations contribute to the presence of some rare and unique plant communities. For a description of rare and unique geology, please see the "Geologic Resources" section of chapter 3. Impacts on paleontology were assessed based on the potential loss of this resource. Primary steps for assessing impacts on geologic resources include identifying

- potential changes in geology from construction activities, including drilling and excavation for structures (towers), access roads, temporary staging areas, temporary splicing and pulling areas, and the ROW itself
- potential changes to the local topography that would occur beyond that which would result from natural erosion and deposition
- potential changes to unique geologic features containing limestone, shale, and karst during construction activities
- potential direct or indirect loss of paleontological resources

Resource-specific context for assessing impacts of the alternatives to geologic resources includes the following:

- the uniqueness of the geologic formations found in the parks, including the regionally significant valley-and-ridge formations and the renowned feature of the Delaware Water Gap
- the presence of unique limestone formations, which are the foundation of many rare and unique vegetation communities that, in turn, support several special-status species
- the characteristics of geologic resources such as the tendency of limestone to fracture which can have effects on other resources such as groundwater

Geologic resources were identified based on available information and confirmed during geologic surveys. The alternatives were evaluated based on their potential to impact geologic resources.

STUDY AREA

The study area for geologic resources includes the ROWs for each alternative and any area outside the ROWs where necessary pulling and splicing sites, staging areas, and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, the indirect impacts on geologic resources cannot be evaluated per alternative.

The potential impacts outside the study area are generally addressed; however, further surveys by the applicant may be needed prior to construction of the S-R Line.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks can affect the geologic resources of the parks, including geology, topography, rare and unique geologic features, and paleontology. Projects that cause disturbance of these resources would include activities such as excavation, grading, or construction below grade. Past, present, and reasonably foreseeable activities that would have beneficial or adverse impacts on geologic resources inside and outside the study area are listed below. These projects were taken from a list of potential cumulative projects developed for the S-R Line that can be found in appendix H. Cumulative impacts were then determined by combining the impacts of the alternative being considered with the impacts from the projects listed below. An overall cumulative impacts analysis was determined for each alternative and is presented at the end of the impacts analysis discussion for each alternative.

Projects Inside the Study Area

Inside the study area, cumulative projects that would result in adverse impacts on geologic resources include the following road and utility projects: the Pennsylvania Department of Transportation (PADOT) SR 2001 road project, the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), and the Northeast Supply Link Expansion (Palmerton Loop gas pipeline). These projects would result in adverse impacts on geology from construction activities that would include the excavation of underlying geologic formations, the potential for fracturing, the grading of topography, and the potential disturbance of paleontological resources. The cumulative impacts on geologic resources inside the study area from these projects would be adverse. The cumulative impacts of these projects would depend on the extent of disturbance to geologic resources under these projects.

Projects Outside the Study Area

Outside the study area, cumulative projects that would result in adverse impacts on geologic resources include the following utility projects and wind projects: Marcellus shale natural gas drilling, the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), the Dominion/Allegheny Power Transmission Line Project (reconfiguration of the existing line), Pennsylvania Fish and Boat Commission (PFBC) natural gas leasing and water access programs, Blue Mountain Ski Resort community-scale wind turbines, and wind turbines in northeastern Pennsylvania. Proposed residential and commercial developments in New Jersey and Pennsylvania would also cause adverse impacts on geology. Adverse impacts on geologic resources would result from construction activities including the excavation of underlying geologic formations, the potential for fracturing, the grading of topography, and the potential disturbance of paleontological resources. Several land protection programs could provide beneficial impacts on geologic resources. The beneficial effects of many of these programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable. Although these projects could help conserve geologic resources, the beneficial impacts would not outweigh the adverse impacts from the above-mentioned projects. Cumulative impacts on geologic resources outside the study area would be adverse. The cumulative impacts of these projects would be dependent on the extent of disturbance to geologic resources under these projects.

IMPACTS OF THE ALTERNATIVES ON GEOLOGIC RESOURCES

Common to All Alternatives

Vegetation Maintenance: PPL and Public Service Electric and Gas Company (PSE&G), as separate utilities operating in different states, have separate vegetation management plans; however, vegetation management for both utilities would occur annually, at a minimum according to the new NERC standards. The details of vegetation management plans and techniques for clearing vegetation are explained in chapter 2. No impacts on geology or topography would be expected during maintenance activities because no excavation would be needed. Ground disturbance beyond the soil layer is unlikely. Vegetation maintenance would have adverse impacts on paleontological sites from an increase in accessibility and visibility following vegetation maintenance. Vegetation maintenance could result in increased collection or vandalism of resources; however, it is unlikely that this would result in a measurable change to the paleontological resources in the parks.

Mitigation Measures: Mitigation measures would be implemented to reduce impacts on geologic resources and are taken into consideration in the impact analysis. Mitigation measures are described in appendix F.

Outside the Study Area: Outside the study area, regardless of which action alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. Geologic formations underlying each county are described in appendix G-3.

Construction activities relating to the transmission line outside the study area would be consistent with those activities inside the study area. The direct impacts from the construction of the transmission line outside the study area cannot be determined, as described in the introduction of this chapter. Once a route is determined, a thorough subsurface investigation would be required before initiating construction activities. These investigations should include local geologic mapping, geotechnical test boring, and possible geophysical surveys to establish subsurface conditions. Impacts on geology and topography would be adverse. There is a potential for the siting of towers and associated crane pads, which would require drilling and excavation to be located in areas with slopes greater than 10% and may include unstable surfaces. There would be no impact on geologic features under the no-action alternative because there would be no ground disturbance beyond the initial soil layer.

There would be no impact on geologic resources outside the study area under the no-action alternative because there would be no ground disturbance beyond the soil layer. Under all action alternatives, potential adverse impacts on geologic resources would be expected. Although the exact route for the transmission line has not been decided, it is likely that some towers would be sited in areas with steep slopes or in unstable, weathered areas. A thorough subsurface investigation would be required before initiating construction activities.

Cumulative projects outside the study area would result in adverse impacts on geologic resources as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on geologic resources as a result of activities outside the study area are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 1: No Action

Geologic formations along the existing line in the study area are described in chapter 3 and are depicted in figure 11 (in chapter 3). Of these formations, the Buttermilk Falls limestone through Esopus formation, undivided, and the Decker formation through Poxono Island formation, undivided, are considered rare or unique geologic features due to the presence of limestone and shale. The Ridgeley formation through Coeymans formation, undivided, is considered unique due to the presence of limestone. Vegetation would continue to be managed within the existing ROW and no measurable effects on the geologic resource would take place under alternative 1.

There are several paleontological sites near the existing line. Particularly fossil-rich geologic formations found along alternative 1 include the Martinsburg formation, the Bloomsburg formation, the Decker formation, the Coeymans formation, the Buttermilk Falls formation, and the Mahantango formation. Fossil resources associated with these formations in DEWA are described in chapter 3. Additionally, two recognized paleontological sites, which included specimens, are located partially or completely within the existing ROW. Both sites included several brachiopods. Specimens were from smaller individuals. It is possible that vegetation maintenance could increase access to and visibility of paleontological specimens, particularly at previously identified sites. This could result in increased collection or vandalism of resources; however, it is unlikely that this would result in a measurable change to the paleontological resources in the parks.

Overall, there would be no impact or adverse impacts on geologic resources under alternative 1. Because no excavation or grading would be required during the maintenance of the existing line, geologic formations and topography would not be affected. Adverse impacts could result at paleontological sites from an increase in accessibility and visibility following vegetation maintenance.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When adverse impacts on paleontological resources as a result of alternative 1 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Under the no-action alternative, no impacts on geology and topography would be expected inside the study area; however, adverse impacts would be expected from increased accessibility and visibility after vegetation maintenance.

Alternative 1 would cross rare and unique geologic formations and paleontological sites but would not result in any changes to geology, topography, or the unique geologic features. Alternative 1 may result in loss of paleontological resources if the additional vegetation clearing exposes more paleontological resources to collection or attracts the attention of collectors or vandals. However, this risk is considered to be low because it is likely to involve relatively few individuals at a level of collection that would not threaten to destroy the resource nor diminish the resource to a point at which it would no longer serve as a source of scientific information. Thus, although alternative 1 may have adverse impacts to paleontological resources, the adverse impacts would not likely be significant and would be consistent with the purpose and significance of the park units and NPS conservation policies.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) include the removal of all or a portion of the Bushkill-to-Kittatinny Line (B-K Line) as described in chapter 2.

The removal of the existing transmission line would result in adverse impacts on geology. Some excavation would be required to remove the equipment associated with the transmission line, such as the counterpoise. Impacts would be minimized because the foundations of the towers would remain underground to reduce the amount of ground disturbance along the existing ROW.

Topography would also be adversely impacted by removal of the existing structures. Grading would occur to backfill over the foundations (which would be left in place) to create a natural cover; backfill would also be used to cover areas of disturbance caused by the removal of the towers, the counterpoise, and the ground wire. Although grading would occur, the change in topography would be slight and relatively undetectable.

Vegetation Clearing: The ROWs would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2 through 5. Alternatives 2, 3, 4, and 5 include clearing up to 350 feet; the ROW would be extended up to 175 feet from either side of the centerline of the existing ROW. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights. Clearing would be complete for all action alternatives, with the exception of the 50-foot buffer near intermittent streams/wetlands and the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7). During the clearing of vegetation, no impacts on geology or topography would be expected because no excavation would be needed. Ground disturbance beyond the soil layer would not be expected. Vegetation clearing would have adverse impacts on paleontological sites, from an increase in accessibility and visibility following clearing, which would increase exposure of paleontological sites. This could result in increased collection or vandalism of resources; however, it is unlikely that this would result in a measurable change to the paleontological resources in the parks.

Following the construction of the transmission line, the vegetation along the proposed ROW would be maintained on an annual basis at minimum, according to the new NERC standards. No impacts on geology or topography would be expected during maintenance activities because no excavation would be needed. Ground disturbance beyond the soil layer is unlikely.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect geologic resources include the construction of access roads, crane pads, tower foundations, wire pull locations, pulling and splicing sites, and staging areas. Access roads, wire pull locations, and pulling and splicing sites could impact paleontological resources, but geology and topography would not be altered. Staging areas would be located outside the study area on previously disturbed properties or abandoned parking lots. The construction staging areas would result in little to no ground disturbance and impacts would be undetectable. Construction of tower foundations and crane pads could result in adverse impacts to geology, topography, and paleontological resources due to construction and drilling activities and leveling areas of steep slope. This could have an adverse impact on geologic resources on steep slopes or areas of glacial till, which are more prone to landslides.

Alternative 2: Applicant's Proposed Route

The geologic formations that are considered rare and unique due to limestone and/or shale (the Buttermilk Falls limestone through Esopus formation, undivided, and the Decker formation through Poxono Island formation, undivided) and those considered rich in fossils (the Martinsburg formation, the Bloomsburg formation, the Decker formation, the Coeymans formation, the Buttermilk Falls formation, and the Mahantango formation) along alternative 2 would be the same as those described under alternative 1 and are described in detail in chapter 3. There are two recognized paleontological sites that include several brachiopod specimens located in the corridor of alternative 2, as described for alternative 1. The construction of new access roads would affect one of these sites.

The construction of transmission line components such as wire pulls and pulling and splicing sites would have adverse impacts on geology because ground disturbance would be expected. It is unlikely that the removal of material extending deeper than the soil layer would be needed; therefore, the underlying bedrock and geologic formations would remain unaltered by the construction of wire pulls, pulling and splicing sites, and access roads. There would be a low risk of ground disturbance associated with these activities, and disturbance of geologic formations that are considered rich in fossils is unlikely. The disturbance of the soil layer and the creation of access roads could result in increased access to and/or visibility of paleontological resources, which may result in increased collection or vandalism of resources. Access road construction would include grading activities, the addition of a gravel layer, and compaction.

During drilling and excavation for the construction of the tower foundations, it is important that excavation occur in competent bedrock and/or sound material. Geotechnical boring would determine the depth to the competent bedrock. Additionally, the planned placement of tower foundations in unstable, weathered material could result in unacceptable design criteria and the applicant would need to resite tower locations or to provide alternative foundation designs. The following formations located along the alternative 2 alignment are considered to have fair to poor stability where weathered or deeply weathered material occurs: Buttermilk Falls limestone, Ridgeley formation, and the Decker formation (appendix G-1). These three formations are located adjacent to the Delaware River in Pennsylvania (see figure 11 in chapter 3). Seven towers are proposed in these unstable areas (table 45). Geotechnical boring would be required to determine the appropriate depth to which to remove soils and weathered bedrock to reach sound material where the tower foundations would be installed.

TABLE 45: NUMBER OF TOWERS CONSTRUCTED IN RARE OR UNSTABLE FORMATIONS AND IN AREAS WITH SLOPES GREATER THAN 10%

Tower Location	Alternatives				
	2	2b	3	4	5
Rare or unique geologic features	7	7	11–15	0	0
Slope greater than 10%	12	12	25 or more	2	1
Unstable geologic formations	7	7	11–15	2	2

Several of the geologic formations crossed by alternative 2 are known for being rich in fossil resources. The discovery of highly sensitive paleontological sites has occurred in other areas near the parks in the same geologic formations as those found along alternative 2. Construction activities would occur in these same formations and could affect unknown paleontological resources. Drilling and excavation would also have impacts on a known paleontological site in the ROW for alternative 2. Additionally, increased soil erosion from ground disturbance associated with tower construction could result in increased access to and/or visibility of paleontological resources, which may result in increased collection or vandalism of resources.

The three unique geologic formations along the alternative 2 alignment belong to the Middle Devonian to Upper Silurian period and contain up to 1,500 feet of limestone, shale, siltstone, sandstone, and dolomite, with formations ranging from 3 to 180 feet in thickness (Epstein 2006, 3). The presence of limestone in an area creates unique habitat for both plants and wildlife. Limestone develops solution cavities that contain and yield groundwater for surface-water features such as streams and wetlands (PADCNR 2000, 2). Limestone creates potential construction problems (sinkhole and conduit development) due to the presence of solution cavities and bedrock irregularities (PADCNR 2000, 2). Sinkholes are subsidence features that are the result of water moving residual material and soil through subsurface pathways caused by the weathering process. The permeable nature of limestone also makes these formations natural conduits for conveying solid and liquid wastes, allowing contaminants to rapidly enter the groundwater system and travel underground (PADCNR 2000, 2).

Under alternative 2, seven towers would be constructed in rare or unique geologic features (table 45). The effects of drilling in limestone would create concern, especially the opportunity for ground vibrations to cause fracturing of the limestone. Fracturing of limestone from drilling could create additional solution cavities for surficial, or shallow, groundwater movement where none existed before construction. The required drilling has the potential to connect existing solution features in the limestone and possibly change the groundwater flow path. This, however, is considered unlikely since shallow drilling may not intercept the water table. The probability of boreholes intercepting solution features (which typically make up only 1% to 10% of the saturated rock mass, and usually closer to 1%) is extremely low, and a cross-connection over the short depth of the foundation drilling is unlikely to change the greater groundwater flow regime, especially since the boreholes will be filled by grouting. Groundwater withdrawal and diversion of surface water may cause aboveground and underground hydrologic systems to dry up (USGS 2001, 13). Drilling also creates the possibility of groundwater contamination.

Twelve of the proposed tower locations and associated crane pads are in areas with slopes ranging from 10% to 30% (table 45). Where slopes are greater than 10%, the areas would need to be leveled in order to provide a safe, level pad for large cranes to mobilize, set outriggers, and aid in the erection of transmission line towers. Additionally, leveled areas would be needed for the placement of the towers. Areas with higher slopes would require additional excavation of soil and bedrock because large cuts in the bench would be necessary for the level pads. Construction with large excavations and fill in mountainous areas creates the potential for landslides. Landslides occur primarily in areas with loose soil and debris on steep slopes. According to the USGS, glacial till is common throughout the area and landslides may be anticipated in areas where the bases of steep slopes are excavated (Epstein 2001). Following construction, excavated areas could not be restored to preconstruction conditions; therefore, the potential for landslides could exist because some slopes may be unstable. The remaining 14 towers and associated crane pads proposed under alternative 2 would be constructed in areas with a slope of less than 10%. Minor grading would be required in these areas for the placement of the crane pad. It is likely that excavation extending deeper than the soil layer would not be required.

After construction of the S-R Line, vegetation maintenance would occur annually, at minimum. Because no excavation or grading would be required during the maintenance of the existing line, geologic formations and topography would not be affected. Impacts on paleontological sites could result from an increase in accessibility and visibility following vegetation maintenance, potentially resulting in increased collection or vandalism of resources.

Overall, alternative 2 would result in adverse impacts on geology, topography, and paleontological resources.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on geologic resources as a result of alternative 2 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would not alter the level of impact.

Conclusion

Alternative 2 would result in adverse impacts on geologic resources from the following: installation of towers in areas with a high slope, in unstable or weathered areas, and in rare or unique geologic features; the potential for nearby surface-water or groundwater features to be affected; changes to slope and grade; leveling areas with steep slopes that could not be restored; the potential for changes or disturbance of paleontological resources from drilling and excavation activities; and the installation of towers in fossil-rich geologic formations. The adverse impacts from alternative 2, combined with the adverse impacts from past, present, and reasonably foreseeable projects on geologic resources, would result in adverse cumulative impacts.

Alternative 2 would cross the same rare and unique geologic formations and paleontological sites as alternative 1. Under alternative 2, drilling required to install towers has the potential to damage these geologic formations. There is an unknown risk of landslides from construction of towers on steep slopes in areas of glacial till where post-construction slopes cannot be made stable. Alternative 2 would likely result in increased loss of paleontological resources compared to alternative 1 due increased damage and exposure of known and unknown sites by vegetation clearing and access road construction. The uncertainty of the nature and extent of these potential impacts increases when considered cumulatively with the impacts of other projects that involve excavation of underlying geologic formations, the potential for fracturing, and grading in steep slopes. And the loss or damage of paleontological resources inside the parks may be more important because these resources may not receive the same level of protection elsewhere, or may not be protected at all. Geologic formations and paleontological sites are non-renewable resources and once lost or damaged, cannot be replaced or made whole. Due to the high potential for adverse impacts to rare and unique geologic features and paleontological resources, especially those that involve unknown risks from building, drilling, and landslides relating to construction activities, alternative 2 could result in significant impacts on geologic resources. While the loss of geologic resources under alternative 2 would not specifically violate a law, regulation, or policy, in the context of the purpose of DEWA and MDSR to protect and preserve the resources of the river valley, of which the geology is an integral component, the adverse impacts to geologic resources under alternative 2 would not further the park's purpose and significance.

Alternative 2b

The geologic formations, rare or unique geologic features, topography, and paleontological resources found along the alternative 2b alignment would be the same as those in alternative 2; these resources are described in detail in chapter 3.

The installation of temporary transmission line components (wire pulls, pulling and splicing sites, and spur roads) and access roads would result in the same impacts on geologic resources as under alternative 2. The underlying bedrock and geologic formations would remain unaltered. The disturbance of geologic formations that are considered rich in fossils is unlikely.

Although alternative 2b would require more towers than alternative 2, the same number would be required in rare or unique features, in areas with slopes greater than 10%, and in unstable geologic formations. Drilling and excavation under this alternative could have greater impacts from the need for a greater number of towers, which require the crushing and removal of more rock. The effects of drilling during the construction of tower foundations and associated crane pads could also result in a decrease in groundwater availability and quality, which could alter wetland habitat, though this is unlikely because shallow drilling may not intercept the water table; an increased potential for landslides; an increased potential for changes to or disturbance of paleontological resources; and disturbance to areas that could not be restored to preconstruction conditions after excavation.

As stated under alternative 1, vegetation maintenance would not require excavation or grading and would not affect geologic formations or topography. Due to an increase in accessibility and visibility, the amount of collection or vandalism could increase following vegetation maintenance; however, it is unlikely that this would result in a measurable change to the paleontological resources in the parks.

Overall, impacts on geologic resources from construction activities under alternative 2b would be adverse.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on geologic resources as a result of alternative 2b are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

Alternative 2b would result in adverse impacts on geology. Alterations to geology from construction of towers and associated crane pads would occur in areas with a 10% to 30% slope and in areas that are weathered or unstable. Additionally, tower foundations would be constructed in rare geologic features containing limestone. Impacts on geology may include tower failure; landform destruction; creation of additional conduits for groundwater, which may potentially lead to a decrease in groundwater availability and quality; and alteration of wetland habitats. Impacts on topography would be expected because slopes greater than 10% would be leveled and graded for the installation of towers and associated crane pads. These areas could not be returned to preconstruction conditions. Paleontological sites could be changed or disturbed during construction activities. When the adverse impacts from alternative 2b are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on geologic resources would be expected.

Alternative 2b would cross the same rare and unique geologic formations and paleontological resources as alternative 2 and would have the same adverse impacts and uncertainties. Therefore, alternative 2b could result in significant impacts due to the high potential for adverse impacts to rare and unique geologic features and paleontological resources, especially those impacts that involve unknown risks from building, drilling, and landslides relating to construction activities. With regard to geologic resources, alternative 2b would not further the purpose and significance of DEWA and the MDSR, of which the geology of the river valley is an integral component.

Common to Action Alternatives 3, 4, and 5

Restoration of the B-K Line: For alternatives 3, 4, and 5, the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be permanently removed and the ROW would be restored, as described in chapter 2. Impacts on geologic resources from the removal of the existing structures would be the same as those described under Common to All Action Alternatives. Restoration of the ROW would not have an impact on geologic resources.

Alternative 3

Inside the study area, the geologic formations including rare or unique geologic features and those considered rich in paleontological resources underlying the proposed alternative 3 ROW are the same as those described for alternative 2. Therefore, the construction of wire pulls, pulling and splicing sites, and access roads would have impacts on geology similar to those described for alternative 2. It is unlikely that the removal of material extending deeper than the soil layer would be needed; therefore, the underlying bedrock and formations would remain undisturbed by the construction of these S-R Line components.

Under alternative 3, approximately 11 to 15 tower foundations would be constructed in unstable formations (table 45). If these areas are not excavated to competent bedrock, drilling could fracture the rock, resulting in additional solution cavities for surficial groundwater movement where none existed before construction and a change or loss of surface-water features (USGS 2001, 4). The required drilling has the potential to connect existing solution features in the limestone and possibly change the groundwater flow path. This, however, is considered unlikely since shallow drilling may not intercept the water table. The same number of tower foundations would be installed in rare or unique geologic formations. Drilling and excavation would also have adverse impacts on paleontological resources, affecting unknown paleontological resources, as well as one known paleontological site in the ROW for alternative 3. Additionally, increased soil erosion from ground disturbance associated with tower construction could result in increased access to and/or visibility of paleontological resources, which may result in increased collection or vandalism of resources.

Most of the slopes along the alternative 3 corridor range from 10% to 30%; there are relatively few areas with a slope less than 10%. In addition, a few areas with a slope of 40% to 50% occur along the proposed transmission line route. More than 25 of the towers required for alternative 3 would be constructed in areas with a slope of greater than 10% (table 45). Excavation beyond the soil layer would be necessary to create level areas for these towers and associated crane pads. Impacts on geology and topography would be similar to those under alternative 2. Tower locations and associated crane pads must be located on level surfaces; therefore, additional excavation and grading would be needed in areas with slopes greater than 10%, which could result in unstable areas leading to landslides (PADCNR n.d., 1).

Vegetation maintenance would not affect geology, rare or unique geologic features, or topography; however, paleontological resources could be collected or vandalized due to increased visibility and ease of access after vegetation removal.

Overall, adverse impacts on geologic resources would result from the construction and maintenance of the S-R Line under alternative 3.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on geologic resources as a result of alternative 3 are

combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Alternative 3 would result in adverse impacts on geology due to the drilling and excavation activities associated with the installation of towers and associated crane pads. Impacts would occur because at least 25 towers and associated crane pads would be constructed in areas with slopes greater than 10% and because 11 to 15 towers would be sited in unstable areas. The same number of proposed towers would be constructed in rare or unique geologic features containing limestone. Impacts on geology may include tower failure, landform destruction, and creation of additional conduits; these impacts could lead to a decrease in groundwater availability and quality, and the alteration of wetland habitats. The installation of wire pulls, pulling and splicing sites, and access roads would not require excavation deeper than the soil layer. Overall impacts on paleontology from construction and clearing inside the study area would be due to direct damage, collection, or vandalism of paleontological sites. When the adverse impacts from alternative 3 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on geologic resources would be expected.

Alternative 3 would cross the same rare and unique geologic formations and paleontological resources as alternatives 1, 2, and 2b. The type of impacts that could occur are the same as described above for action alternatives 2 and 2b (i.e., fracturing in unexpected ways that affects groundwater movement, changing the flow of surface waters and wetlands, altering functions and changing habitat upon which rare and unique ecological communities depend, destabilization of underlying rock that increases risk of landslides, and loss or damage of rare geologic and paleontological resources). However, alternative 3 has much higher risk that these adverse impacts would occur or the adverse impacts would be more widespread because almost double the number of towers would be built in rare and unique geologic formations, in unstable formations, and on steep and very steep slopes that would likely remain unstable after construction. As previously noted, the uncertainty of impacts such as fracturing and landslides increases when considered cumulatively with the impacts of other projects that involve excavation of underlying geologic formations, the potential for fracturing, and grading in steep slopes. This is also true for cumulative impacts to paleontological resources and the loss or damage of paleontological resources inside the parks may be more important because these resources may not receive the same level of protection elsewhere, or may not be protected at all. Geologic formations and paleontological sites are non-renewable resources and once lost or damaged, cannot be replaced or made whole. Thus, alternative 3 is likely to result in significant impacts to the human environment with a much higher risk of such impacts occurring than the other action alternatives. With regard to geologic resources, alternative 3 would not further the purpose and significance of DEWA and the MDSR, of which the geology of the river valley is an integral component.

Alternative 4

The alternative 4 alignment contains three formations that are considered rich in fossils (the Martinsburg formation, the Bloomsburg formation, and the Mahantango formation), but no rare or unique geologic features. The number of rare or unique and fossil-rich geologic features are fewer than those underlying alternatives 1 through 3, but the types of impacts that would result from the construction and vegetation maintenance activities under alternative 4 would be similar to those previously described.

The construction of temporary transmission line features and access roads would not affect geologic formations because there would be a low risk of ground disturbance. However, disturbance of the soil layer and the creation of access roads could result in increased access to and/or visibility of paleontological resources, which may result in increased collection or vandalism of resources.

The majority of the towers (14) required for alternative 4 would be constructed in areas where the stability of the underlying geology is rated good. The basal portion of the Martinsburg formation contains limestone, which may contain solution openings. Drilling and excavation for two towers would occur in the Martinsburg formation (table 45). In DEWA, the thickness of the Martinsburg formation is approximately 12,000 feet and includes thick sequences of slate and greywacke (Epstein 2006, 3). If excavation and drilling occurs in limestone with solution openings, fracturing and changes to groundwater availability may occur; however, this is unlikely under this alternative because drilling and excavation would not extend deeper than 30 feet and would occur in slate and greywacke layers, and shallow drilling may not intercept the water table.

Increased soil erosion from ground disturbance associated with the construction of tower foundations could affect unknown paleontological resources and could result in increased access to and/or visibility of paleontological resources, which may result in increased collection or vandalism of resources.

The majority of the alternative 4 alignment is relatively flat with slopes of 0% to 10%. An increase in the slope (10% to 30%) occurs on the north and south side of APPA, which is located on Kittatinny Ridge. Of the 16 towers and associated crane pads proposed, two towers and associated crane pads would be installed in areas with slopes of greater than 10% (table 45). Additional excavation would occur to level and grade these areas for installation of the towers. Because few tower foundations would be constructed in areas with a slope of greater than 10%, the potential for landslides to occur would be low (PADCNR n.d., 1).

Similar to previous alternatives, vegetation maintenance would have a potential impact on paleontological resources due to collection and vandalism of sites; geology and topography would not be affected by vegetation maintenance.

Overall, adverse impacts on geologic resources would result under alternative 4.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on geologic resources as a result of alternative 4 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Alternative 4 would have adverse impacts on geology caused by the construction and installation of wire pulls, pulling and splicing sites, tower foundations and associated crane pads, and access roads. It is expected that approximately two towers would be sited in areas with a slope of greater than 10%; therefore, additional excavation to level the land would be necessary. The underlying formations for the tower locations are rated good for stability, and no towers would be constructed within rare or unique geology inside the study area. Impacts on paleontology from construction and clearing inside the study area would result from direct damage, collection, or vandalism of paleontological sites. When the adverse impacts from alternative 4 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on geologic resources would be expected.

Alternative 4 would cross three fossil-rich formations but no rare or unique geologic features, which is far fewer than alternatives 2, 2b, and 3. The adverse impacts of alternative 4 could be significant because of the loss of paleontological resources from construction activities; uncertainties associated with potential

impacts to undiscovered paleontological sites whose extent and importance is not known; and the inherent uncertainties of drilling and excavation in formations containing limestone and on steep slopes. However, the potential for significant impacts under alternative 4 is considerably less than that of alternatives 2, 2b, and 3 because alternative 4 would cross half as many fossil-rich formations, would require two towers located on steep slopes or areas with unstable geologic formations, and would not result any impacts to rare and unique geologic features. With regard to geologic resources, alternative 4 could result in significant impacts but with a low risk of occurrence such that alternative 4 may be considered to be in keeping with the purpose and significance of DEWA and the MDSR, of which the geology of the river valley is an integral component.

Alternative 5

The alignment for alternative 5 would follow the same route through DEWA and APPA as alternative 4, with the exception of the portion of the B-K Line from the Bushkill Substation to the western boundary of DEWA. Like alternative 4, alternative 5 would not cross any rare or unique geologic features. Alternative 5 would cross two of the three fossil-rich formations discussed for alternative 4: the Martinsburg formation and the Bloomsburg formation. Therefore, impacts for alternative 5 would be nearly identical to those described for alternative 4.

The construction of wire pulls, pulling and splicing sites, and access roads would not require excavation extending deeper than the soil layer; therefore, the underlying bedrock and formations would remain undisturbed. This construction would disturb the soil layer, which could result in increased access to and/or visibility of paleontological resources, potentially increasing collection or vandalism of resources.

For alternative 5, 8 of the 10 required towers would be in areas where the stability of the underlying geology is rated good. Drilling and excavation for two towers would occur in the Martinsburg formation (table 45). No substantial changes in topography or grade would result from the construction and installation of the new transmission line except for two areas on slopes leading to APPA. These areas would be leveled and would not return to preconstruction conditions. Only one tower and associated crane pad would be installed in areas with slopes of greater than 10%; the potential for landslides to occur would be low.

Adverse impacts on geologic resources would result from the construction and maintenance of the S-R Line under alternative 5.

Cumulative Impacts

Cumulative impacts on geologic resources inside the study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on geologic resources as a result of alternative 5 are combined with other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Under alternative 5, adverse impacts on geologic resources at DEWA and APPA would result mainly from drilling and excavation activities associated with the installation of tower foundations and associated crane pads. Under alternative 5, two tower foundations would be constructed in unstable geologic formations, and one would be constructed in an area with a slope greater than 10%. Impacts on paleontology from construction and clearing inside the study area would be due to direct damage, collection, or vandalism of paleontological sites. When the adverse impacts from alternative 5 are

combined with the impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on geologic resources would be expected.

Alternative 5 would cross two fossil-rich formations, which is fewer than alternative 4, and no rare or unique geologic features, which is the same as alternative 4 and far fewer than alternatives 2, 2b, and 3. As with alternative 4, the adverse impacts of alternative 5 could be significant because of the loss of paleontological resources from construction activities; uncertainties associated with potential impacts to undiscovered paleontological sites whose extent and importance is not known; and the inherent uncertainties of drilling and excavation on steep slopes. However, the potential for significant impacts under alternative 5 is somewhat less than alternative 4 and considerably less than that of alternatives 2, 2b, and 3 because alternative 5 would cross only two fossil-rich formations, would require two towers located on steep slopes, and would not result in any impacts to rare and unique geologic features. With regard to geologic resources, alternative 5 could result in significant impacts but with a low risk of occurrence such that alternative 5 may be considered to be in keeping with the purpose and significance of DEWA and the MDSR, of which the geology of the river valley is an integral component.

FLOODPLAINS

METHODOLOGIES

The evaluation of impacts on floodplains was based on both a quantitative (acreage affected) and a qualitative assessment of how each proposed alternative would affect floodplain function. Primary steps for assessing impacts on the floodplain included identifying the floodplain in areas likely to be affected by the proposed alternatives. The Federal Emergency Management Agency normally maps floodplains, although not typically on federal land. The NPS provided Geographic Information System (GIS) data and floodplains maps to use for impacts analysis calculations in this document, which is the best available data for the Delaware River within DEWA.

Resource-specific context for assessing impacts to floodplains includes the following:

- Executive Order 11988 directs all federal agencies to avoid long- and short-term impacts associated with occupancy, modification, and development of floodplains when possible.
- NPS Director's Order 77-2 implements Executive Order 11988 and established NPS policy to preserve floodplain values and minimize potentially hazardous conditions associated with flooding.
- The floodplain within DEWA and MDSR lies along the entire length of the Delaware River and at the confluences of larger tributaries to the Delaware River and is relatively intact with little development or manipulation.
- Floodplain functions and values (store floodwaters, minimize erosion of adjacent soils, provide riparian habitat, etc.) are intrinsic to floodplains and cannot be easily duplicated or replaced.

STUDY AREA

The study area for floodplains includes the ROW for each alternative and any area outside the ROWs where necessary pulling and splicing sites, staging areas, and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, general impacts outside the study area are also addressed, which includes the counties and surface waters with associated floodplains that the alternative alignments could traverse.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks can affect floodplains. Impacts on floodplains arise from development in the floodplain and actions that inhibit the natural flow of rivers and streams. Past, present, and reasonably foreseeable project activities that would have beneficial or adverse impacts on floodplains inside and outside the study area are listed below. These projects were taken from a list of potential cumulative projects developed for the S-R Line that can be found in appendix H. Cumulative impacts were then determined by combining the impacts of the alternative being considered with the impacts from the projects listed below. This cumulative impact analysis was completed for each alternative and is presented at the end of the impact analysis discussion for each alternative.

Projects Inside the Study Area

The study area is almost entirely within DEWA, and there would be few large development projects because the area is generally protected as part of the national park system, and floodplain mitigation is required by the NPS on NPS lands or through NPS-funded projects. As development continues outside the parks, a relatively undeveloped natural floodplain within NPS boundaries will become more important for maintaining river function as well as important habitat for native wildlife and vegetation. Inside the study area, cumulative projects that would result in adverse impacts on floodplains include the PADOT SR 2001 road project (road reconstruction), which may affect flood elevations as a result of increased pavement and bridges. The Kittatinny Point Visitor Center storm recovery (a project that involved removal of a building in the floodplain and construction of a new building on piers above flood elevation) would result in adverse impacts on floodplains. Beneficial impacts on floodplains are expected from the rehabilitation and repair of road bridges throughout the parks that specifically include the repair of failing Watergate Dam #10 and the US Route 209 rehabilitation and replacement of Toms Creek Bridge. These projects include elements to reduce flooding and erosion problems. The majority of these projects would protect floodplain functions, so the beneficial impacts are expected to outweigh the adverse impacts from the above-mentioned projects. Additionally, there are several land protection programs that could protect floodplain functions and values. The beneficial effects of many of these programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable. Cumulative impacts on floodplains inside the study area would be beneficial.

Projects Outside the Study Area

Outside the study area, adverse cumulative impacts on floodplains would be expected from residential, commercial, and transportation development of the area. Adverse cumulative impacts would result from these projects due to the continued growth and urbanization in the area outside the parks, which may reduce natural floodplain functions through direct impacts, such as the placement of structures in the floodplain, or indirect impacts, such as increased runoff due to increased impervious surfaces. Several land protection programs could provide beneficial impacts on floodplain functions. As stated above, the funding for these programs is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable. There would be adverse cumulative impacts on floodplains outside the study area.

IMPACTS OF THE ALTERNATIVES ON FLOODPLAINS

Common to All Alternatives

Vegetation Management: Vegetation would be cleared or managed in floodplain areas for all alternatives. PPL and PSE&G have separate vegetation management plans because they are distinct utility

companies working in different states. The details of the applicant's vegetation management plans and clearing techniques are explained in chapter 2. The periodic maintenance of the transmission line, specifically the clearing of vegetation in the ROW in the floodplain, would adversely affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). However, the periodic clearing of vegetation in the ROW in floodplain areas would not alter floodplain storage or obstruct floodwaters.

Mitigation Measures: Mitigation measures would reduce impacts from construction, operation, and maintenance activities for all action alternatives (as described in chapter 2 and appendix F). None of the mitigation measures would eliminate impacts on floodplains; however, measures would minimize the potential of flooding or adverse impacts on floodplains.

Outside the Study Area: Alternative 1 would require occasional removal of vegetation during maintenance activities, which could impact natural floodplain values. For all action alternatives (2, 2b, 3, 4, and 5), efforts would be made to avoid construction, clearing, and development in the floodplain outside the study area. However, if the construction of towers (and associated crane pads), access roads, and pulling and splicing sites in floodplains outside the study area cannot be avoided, adverse impacts on floodplain function would result. The Pennsylvania counties outside the study area, Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne, are rich with surface waters and associated floodplains. Within these counties, the S-R Line could cross major tributaries of the Delaware River basin, the Susquehanna River basin, and the Lehigh River. Some of these tributaries include Bushkill Creek, Cherry Creek, Lackawaxen River, and Marshall Creek in the Delaware River basin; Big Wapwallopen Creek, Lackawanna River, and the mainstem Susquehanna River in the Susquehanna River basin; and Jonas Creek, Pond Creek, and Stony Creek in the Lehigh River basin. Outside the study area in New Jersey, the route could cross the major tributaries of the Delaware River basin, the Passaic River basin, and the Raritan River basin. Some of these tributaries include the mainstem of the Delaware River, Paulins Kill, Pohatcong Creek, and Martins Creek in the Delaware River basin; Rockaway River, Delawanna Creek, and Whippany River in the Passaic River basin; and South Branch Raritan River and Lamington River in the Raritan River basin. The majority of these surface waters have associated floodplains and could be adversely impacted by the project outside of the study area. Although the exact route outside of the study area cannot be determined at this time, indirect adverse impacts on floodplains are unknown. When the indirect adverse impacts outside the study area are combined with the adverse impacts of other past, present, and future projects outside the study area, adverse cumulative impacts would result.

Alternative 1: No Action

Inside the study area, no widening of the ROW would occur as part of the no-action alternative. The existing line and ROW span approximately 700 feet of the floodplain of the Delaware River in DEWA (MDSR) and of Bushkill Creek in DEWA. Overhead transmission line crossings such as this have no impact on the floodplain. Two existing transmission line structures (approximately 30 feet by 30 feet) are in the floodplain. No new development or new structures would be placed in the floodplain under alternative 1. The periodic maintenance of the transmission line, specifically the clearing of vegetation in the ROW in the floodplain, would adversely affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). However, the periodic clearing of vegetation in the ROW in floodplain areas would not alter floodplain storage or obstruct floodwaters and no new development would occur in the floodplain under alternative 1.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from past, present, and reasonably foreseeable projects would be beneficial, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on floodplains as a result of alternative 1 are combined with the other projects in the study area, an overall beneficial cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Adverse impacts on the floodplains of water bodies in the study area would result under alternative 1 from vegetation clearing and maintenance to the extent of the existing ROW corridor. Cumulative impacts inside the study area would be beneficial when combined with other past, present, and future projects.

Alternative 1 crosses the floodplains of Bushkill Creek and the Delaware River, which are unique in the Northeast for being relatively intact in an otherwise highly developed region. Under alternative 1, vegetation clearing would result in adverse impacts on some floodplain functions and values such as an increase in bank erosion and changes in habitat composition but would not likely impede or reduce overall functions and values of the floodplains nor would alternative 1 change the relatively intact condition of the floodplains. In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 1 are not likely to be significant because the impacts would be localized, could be effectively mitigated through required consultation and permitting processes, and the largely unimpeded functions and values of the floodplains would continue.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) would involve the removal of the B-K Line from the Bushkill Substation to the eastern boundary of DEWA, as discussed in chapter 2. This would include removal of the B-K Line structures, but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require the construction of access roads (either permanent or temporary, depending on the alternative) along the B-K Line to allow access to and removal of the structures. The impacts of removing the structures are discussed under each alternative.

Vegetation Clearing: The ROWs would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2 through 5, which could affect floodplains. Alternatives 2, 3, 4, and 5 include clearing up to 350 feet; the ROW would be extended up to 175 feet from either side of the centerline of the existing ROW. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights. Clearing would be complete for all action alternatives, with the exception of the 50-foot buffer near intermittent streams/wetlands and the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7). The impacts of vegetation clearing are discussed under each alternative below.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect floodplains include the construction of access roads, tower foundations, crane pads, wire pull locations, pulling and splicing sites, and staging areas. All action alternatives would require drilling as

part of the construction process, but because drilling is unlikely to affect groundwater (see discussion in "Geologic Resources") it would not affect floodplains in the vicinity and is not discussed further. The impacts of construction components and acreages of floodplain impacts are discussed under each alternative below.

Alternative 2

Under alternative 2, vegetation clearing to prepare for construction could be nearly complete in the 350-foot corridor. Vegetation clearing would be avoided in sensitive areas such as riparian corridors along the Delaware River (PPL and PSE&G 2008, 7), which support floodplain vegetation. Specifically, vegetation would not be cleared in the floodplain in the 50-foot buffer near intermittent streams/wetlands or in the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7). Even so, some vegetation beyond the buffer areas would be cleared in the floodplain and would affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). A maximum of 14.3 acres of vegetation in the floodplain would potentially be maintained and could be removed if incompatible plant species exist.

The overhead transmission line for alternative 2 would cross approximately 700 feet of the floodplain of the Delaware River in DEWA (MDSR) and Bushkill Creek in DEWA. The overhead transmission line crossing would have no impact on the floodplain, but associated activities may adversely affect floodplains. An existing tower is partially located in the floodplain of Bushkill Creek and a second existing tower is partially located in the floodplain of Sand Hill Creek. The applicant would place two new, larger towers (including associated crane pads) in the same locations, over an area of approximately 0.002 acre. The construction of these support structures for the transmission line would not result in any increase in flood hazard either as a result of increased flood elevations or changes in flow carrying capacity of any of the streams being crossed by the overhead lines. However, portions of the access roads required for maintenance and construction purposes would be located in some floodplain areas. Access roads would affect 0.14 acre of the floodplain. Once the transmission line is operational, vegetation maintenance would be required in the new ROW, including floodplains as described for alternative 1. Overall, adverse impacts on floodplains would result from access roads, new crane pads, and vegetation clearing within floodplains. To minimize adverse impacts on natural and beneficial floodplain values, mitigation measures would be implemented as discussed previously, best management practices (BMPs) would be used during construction activities, and certain areas would be revegetated per the vegetation plans developed by the applicant and approved by the NPS to reduce erosion into streams, wetlands, and floodplains.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from other past, present, and reasonably foreseeable projects would be beneficial, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on floodplains as a result of alternative 2 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would contribute an appreciable adverse impact to the overall cumulative impact level.

Conclusion

Alternative 2 would have adverse impacts on the floodplains of water bodies inside the study area as a result of the loss of approximately 0.14 acre of floodplains for construction of tower pads and access roads plus the loss of approximately 14 acres of floodplain vegetation that would be cleared and

permanently maintained along the ROW corridor. Cumulative impacts inside the study area would be adverse when combined with the impacts of alternative 2.

Alternative 2 would cross the floodplains of the Bushkill Creek, Sand Hill Creek, and the Delaware River, which, as noted above, are unique because they are relatively intact. Vegetation clearing and maintenance under alternative 2 would result in the loss of some floodplain functions and values by reducing the amount of floodplain habitat or changing the composition of floodplain habitat and increasing the potential for soil erosion. The loss of these functions and values would be greater than the no-action alternative because of the larger ROW corridor and more clearing but would not likely impede or reduce overall functions and values of the floodplains. Nor would alternative 2 change the relatively intact condition of the floodplains. Some of the adverse impacts would be mitigated through consultation and permitting processes. Alternative 2 would result in the permanent loss of floodplain area due to construction of towers and access roads in floodplains; however, this is unlikely to reduce the overall function and value of the floodplains for controlling flood waters because the area would be very small (less than two-tenths of an acre). In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 2 are not likely to be significant because the impacts would be localized, could be effectively mitigated through required consultation and permitting processes, and the largely unimpeded functions and values of the floodplains would continue.

Alternative 2b

Under alternative 2b, vegetation would be cleared in the corridor of the proposed ROW under alternative 2b, except in sensitive areas such as the riparian buffer along the Delaware River (PPL and PSE&G 2008, 9) and buffers as described for alternative 2. However, some vegetation beyond the buffer areas would be cleared in the floodplain, which would affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). A maximum of 8.35 acres of vegetation in the floodplain would potentially be maintained and could be removed if incompatible plant species are present.

The overhead transmission line for alternative 2b would cross approximately 700 feet of the floodplain of the Delaware River in DEWA (MDSR) and the floodplain of Bushkill Creek in DEWA. Overhead transmission line crossings would have no impact on floodplains; however, structures, clearing, and access roads may adversely affect floodplains. An existing tower is partially located in the floodplain of Bushkill Creek and a second existing tower is partially located in the floodplain of Sand Hill Creek. Similar to alternative 2, the applicant would place two new, larger towers (including associated crane pads) in the same locations, over an area of approximately 0.002 acre. Additionally, the construction of access roads would affect approximately 0.14 acre of the floodplain under alternative 2b.

Floodplains would be adversely impacted as a result of construction of access roads, crane pads, and new tower foundations and vegetation clearing in floodplains under alternative 2b. To minimize adverse impacts on natural and beneficial floodplain values, BMPs would be used during construction activities as described for alternative 2.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from other past, present, and reasonably foreseeable projects would be beneficial, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on floodplains as a result of alternative 2b are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would contribute an appreciable adverse increment to the overall cumulative impact.

Conclusion

Alternative 2b would have adverse impacts on the floodplains of water bodies inside the study area as a result of the loss of 0.14 acre of floodplains for construction of tower pads and access roads plus the loss of approximately 8 acres of floodplain vegetation that would be cleared and permanently maintained along the ROW corridor. Cumulative impacts inside the study area would be adverse when combined with the impacts of alternative 2b.

As with alternative 2, alternative 2b crosses the floodplains of the Bushkill Creek, Sand Hill Creek, and the Delaware River, which, as noted previously, are unique because they are relatively intact. Vegetation clearing and maintenance under alternative 2b would be about half that of alternative 2 (more than 8 acres versus more than 14 acres) but would be greater than the no-action alternative, which would result in the loss of some floodplain functions and values by reducing the amount or changing the composition of floodplain habitat and increasing the potential for soil erosion. The loss of these functions and values would be greater than the no-action alternative because of the larger ROW corridor and more clearing but would not likely impede or reduce overall functions and values of the floodplains nor would alternative 2b change the relatively intact condition of the floodplains. Some of the adverse impacts would be mitigated through consultation and permitting processes. Alternative 2b would result in the permanent loss of floodplain area due to construction of towers and access roads in floodplains; however, this is unlikely to reduce the overall function and value of the floodplains for controlling flood waters because the area would be very small (less than two-tenths of an acre). In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 2b are not likely to be significant because the impacts would be localized, could be effectively mitigated through required consultation and permitting processes, and the largely unimpeded functions and values of the floodplains would continue.

Common to Action Alternatives 3 through 5

Restoration of the B-K Line: Under alternatives 3, 4, and 5, the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be permanently removed and the ROW would be restored, as described in chapter 2. Although the removal of this portion of the B-K Line would not be conducted in floodplain areas, floodplains would benefit from forest restoration (53 acres total), creating larger patches of contiguous habitat and reducing fragmentation in the core of the park. The ROW (approximately 53 acres within NPS boundaries) would be allowed to ultimately return to forested habitat over the long term. While natural communities would not return to mature conditions in the period of analysis of this EIS, the process would begin and would create a beneficial impact on floodplains.

Alternative 3

Construction and vegetation clearing would occur in floodplain zones under alternative 3. Vegetation would be cleared in the 350-foot corridor, except in sensitive areas such as riparian corridors along the Delaware River (PPL and PSE&G 2008, 9) as described for alternative 2. However, some vegetation would be cleared in the floodplain, which would affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). A maximum of 7.93 acres of vegetation in the floodplain would be cleared if incompatible plant species are present. Overhead transmission line crossings would have no impact on the floodplain, but associated activities may adversely affect floodplains. Approximately 0.06 acre within the floodplain would be cleared and adversely affected by proposed access roads in the study area for alternative 3. For alternative 3, tower foundations, crane pads, and pulling and splicing sites are unknown at this time.

In addition to the paragraph above, alternative 3 would also include the removal and upgrade of the B-K Line from the Bushkill Substation to the western boundary of DEWA would adversely affect floodplains.

The applicant would place two tower foundations, and associated crane pads within floodplains, totaling approximately 0.002 acre. The construction of these support structures for the transmission line would not result in any increase in flood hazard either as a result of increased flood elevations or changes in flow carrying capacity of any of the streams being crossed by overhead lines. Portions of access roads required for maintenance and construction purposes would be located in floodplain areas. Specifically, alternative 3 would require the development of two access roads by Bushkill Creek to remove and upgrade the B-K Line; these access roads would impact 0.16 acre in the floodplain.

Overall, a total of 0.222 acre of the floodplain (0.06 acre + 0.16 acre + 0.002 acre) would be affected by permanent access roads and new tower foundations and (crane pads); vegetation would be cleared in the floodplain under alternative 3. These activities would adversely impact floodplains, but BMPs would be used during construction activities as described in appendix F to minimize impacts on natural and beneficial floodplain values.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from other past, present, and reasonably foreseeable projects would be beneficial, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on floodplains as a result of alternative 3 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would contribute an appreciable adverse increment to the overall cumulative impact.

Conclusion

Alternative 3 would have adverse impacts on the floodplains of water bodies inside the study area as a result of the loss of approximately 0.2 acre of floodplains for construction of tower pads and access roads plus the loss of approximately 8 acres of floodplain vegetation that would be cleared and permanently maintained along the ROW corridor. Additional tower pads may need to be constructed in floodplains but these locations are not known at this time. Cumulative impacts inside the study area would be adverse when combined with the impacts of alternative 3.

Alternative 3 crosses the floodplains of the Bushkill Creek and the Delaware River, which, as noted previously, are unique in that they are relatively intact. Vegetation clearing and maintenance under alternative 3 would be greater than the no-action alternative and similar to alternative 2b, resulting in the loss of some floodplain functions and values by reducing the amount and/or changing the composition of floodplain habitat and increasing the potential for soil erosion. The loss of these functions and values would not likely impede or reduce overall functions and values of the floodplains nor would alternative 3 change the relatively intact condition of the floodplains. Some of the adverse impacts would be mitigated through consultation and permitting processes plus implementation of BMPs to minimize impacts during construction. Alternative 3 would also result in the permanent loss of floodplain area due to construction of two towers and possibly more, plus access roads; however, this is unlikely to reduce the overall function and value of the floodplains for controlling flood waters because the area of permanent encroachment for each pad is 0.0001 acre so that even with additional tower pads, the total area of floodplain permanently impacted would likely be small. In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 3 would not likely be significant because the impacts would be localized, could be effectively mitigated through required consultation and permitting processes, and the largely unimpeded functions and values of the floodplains would continue.

Alternative 4

Alternative 4 would adversely impact floodplains along the B-K Line from the Bushkill Substation to the western boundary of DEWA. The placement of the tower foundations, crane pads, and access roads would be the same as described for alternative 3, resulting in impacts to approximately 0.162 acre of floodplains.

Overall, approximately 0.162 acre of the floodplain (0.16 acre + 0.002 acre) would be affected by construction of access roads, tower foundations, and crane pads. To minimize adverse impacts on natural and beneficial floodplain values, BMPs would be used during construction activities as described in appendix F.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from other past, present, and reasonably foreseeable projects would be beneficial, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on floodplains as a result of alternative 4 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would contribute an appreciable adverse increment to the overall cumulative impact.

Conclusion

Alternative 4 would adversely impact a very small area of floodplains (less than two-tenths of an acre) within the boundaries of DEWA from construction of tower pads and access roads but there would be no clearing or maintenance of vegetation along the ROW. Cumulative impacts inside the study area would be adverse when the impacts of alternative 4 are combined with other past, present, and future projects.

Alternative 4 crosses the floodplain of the Delaware River but has no effect on floodplain functions and values because there would be no clearing. Alternative 4 would result in permanent loss of a small area of floodplains (less than two-tenths of an acre) from construction of tower pads and access road to upgrade the existing B-K Line; however, this impact would likely cause little or no loss of floodplain functions and values because the area would be very small, localized, and adverse impacts would be minimized by consultation and permitting processes and application of BMPs during construction. Overall, alternative 4 would likely result in less adverse impacts on floodplains than the no-action alternative, and much less than alternatives 2, 2b, or 3, because there would be no vegetation clearing or maintenance in floodplains. In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 4 would not likely be significant because the impacts would be localized, could be effectively mitigated through required consultation and permitting processes, and the largely unimpeded functions and values of the floodplains would continue.

Alternative 5

No construction or vegetation clearing would occur in any floodplain zones within the boundaries of DEWA, APPA, or MDSR under alternative 5. Impacts from vegetation maintenance along alternative 5 would occur as described above in the "Common to All Alternatives" section. The B-K Line from the Bushkill Substation to the western boundary of DEWA would be maintained periodically as described for alternative 1, but would not be part of the S-R Line. Specifically, clearing vegetation in the ROW in the floodplain would adversely affect natural floodplain values (which include vegetation) that contribute to ecosystem quality (NPS 2002b). However, the periodic clearing of vegetation in the ROW would not alter floodplain storage or obstruct floodwaters, and there would be no development in the floodplain.

Cumulative Impacts

Cumulative impacts on floodplains inside the study area from other past, present, and reasonably foreseeable projects would be beneficial, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on floodplains as a result of alternative 5 are combined with the other projects in the study area, an overall beneficial cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Alternative 5 would have some adverse impacts on the floodplains of water bodies in the study area from vegetation maintenance, similar to current vegetation maintenance described under alternative 1. Cumulative impacts inside the study area would be beneficial when the impacts from alternative 5 are combined with other past, present, and future projects.

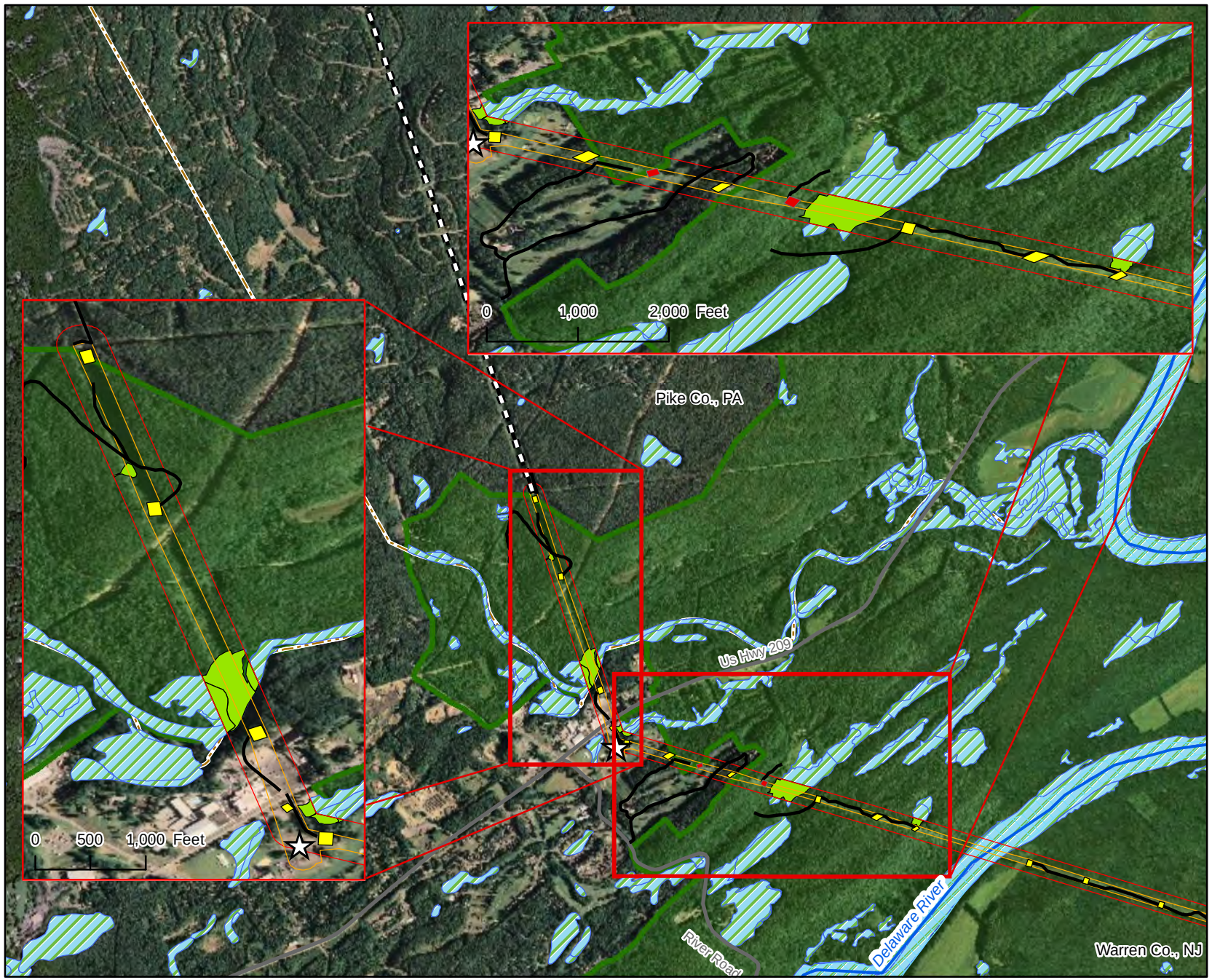
Overall, alternative 5 would likely result in adverse impacts to floodplains that are similar to that of the no-action alternative and much less than any of the other action alternatives because there would be no vegetation clearing or construction in floodplains. In the context of the laws and policies that govern protection of floodplains, the adverse impacts of alternative 5 would not likely be significant because the impacts would be localized and could be effectively mitigated through implementation of BMPs during maintenance, and the largely unimpeded functions and values of the floodplains would continue.

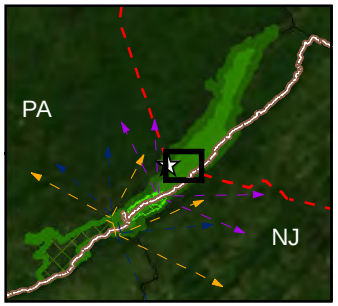
WETLANDS

METHODOLOGIES

The evaluation of impacts on wetlands was based on both a quantitative (acreage affected) and a qualitative assessment of how each proposed alternative would affect wetland functions. A detailed discussion of wetlands and descriptions of wetland types is included in chapter 3. Impacts were determined based on changes to wetland functions and values, including the ability of the wetland to support vegetation and wildlife. In addition, impacts were based on the quality of the existing wetland, including impacts on rare and unique wetland communities; changes to hydrology; impacts on water quality from runoff and sedimentation; stormwater impacts; changes to the abundance and diversity of wetland plant species and wildlife use; the size and type of wetland affected; the area of disturbance; and wetland connectivity to adjacent habitats.

All available information regarding wetland resources was reviewed, including previous reports and data, field surveys that were conducted along the alternative routes, and wetland resources mapped by the National Wetlands Inventory (NWI). The naming conventions used for wetlands correspond with either the names used to identify these wetlands in the Louis Berger report (2010a) or the names used previously by PSE&G (2009). Detailed wetland delineation methodologies are included in chapter 3. The impact analysis included a quantification of wetland habitat loss based on the Cowardin method (Cowardin et al. 1979) for impacts on wetlands and a determination of other potential direct and indirect effects. Maps of all wetland resources were overlaid with the alternative routes, and the area (acreage) of wetlands affected by each alternative was estimated and evaluated for the appropriate impact threshold (figures 64 through 69). In this section, permanent and direct impacts on wetlands are quantified by acre, whereas indirect impacts are described as part of the narrative. It should be noted that impacts include direct and indirect impacts on wetlands and wetland buffers (50 feet). Wetlands that are also considered rare and unique communities are analyzed under both resource topics.





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Delaware River
- Proposed Access Road
- Road
- Delaware Water Gap National Recreation Area
- Wetlands within 350ft buffer
- Wetlands
- County Line

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

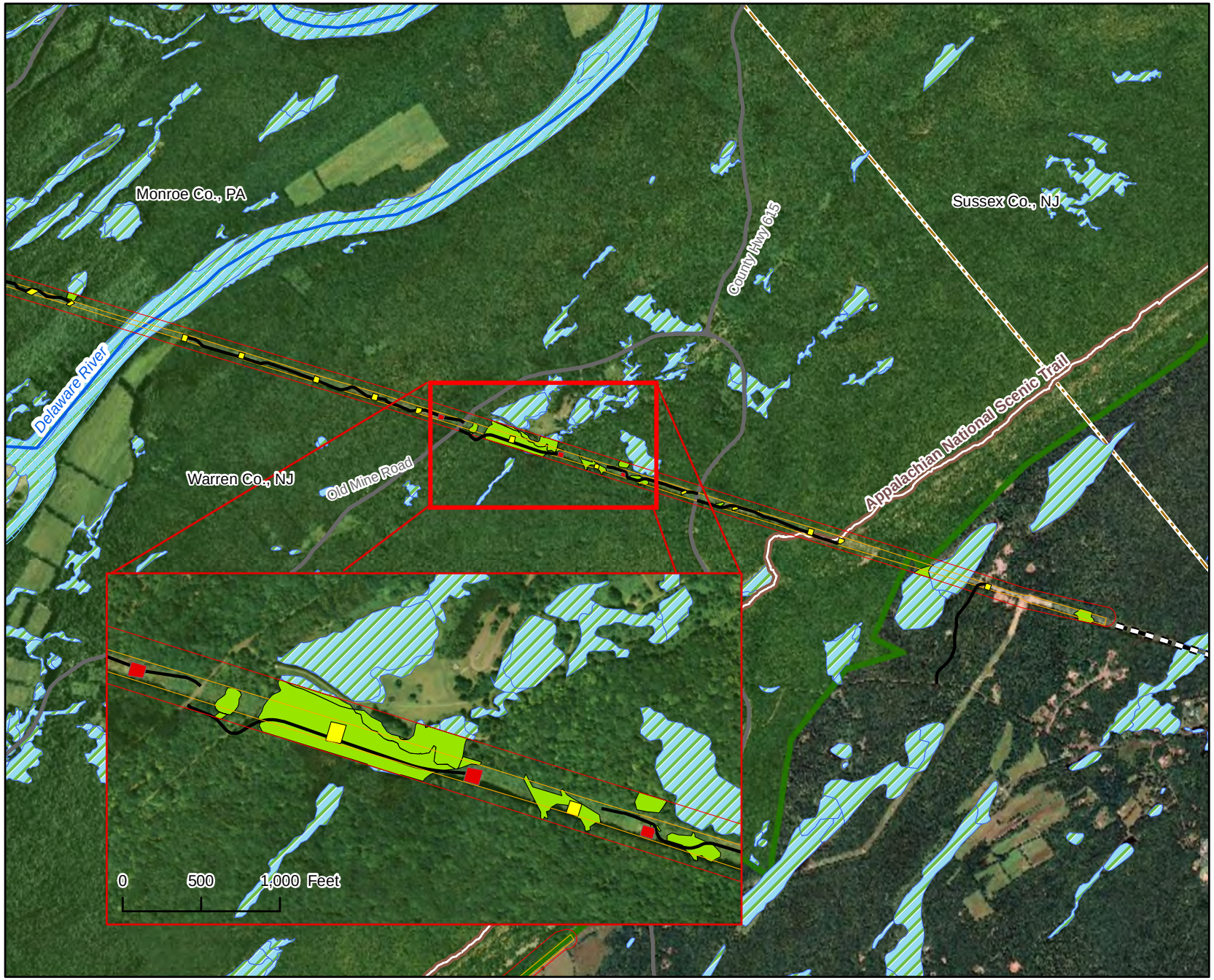
0 1,250 2,500
Feet

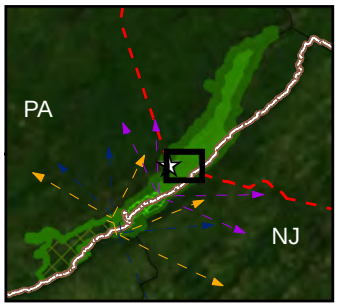
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 64
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: July 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- 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

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

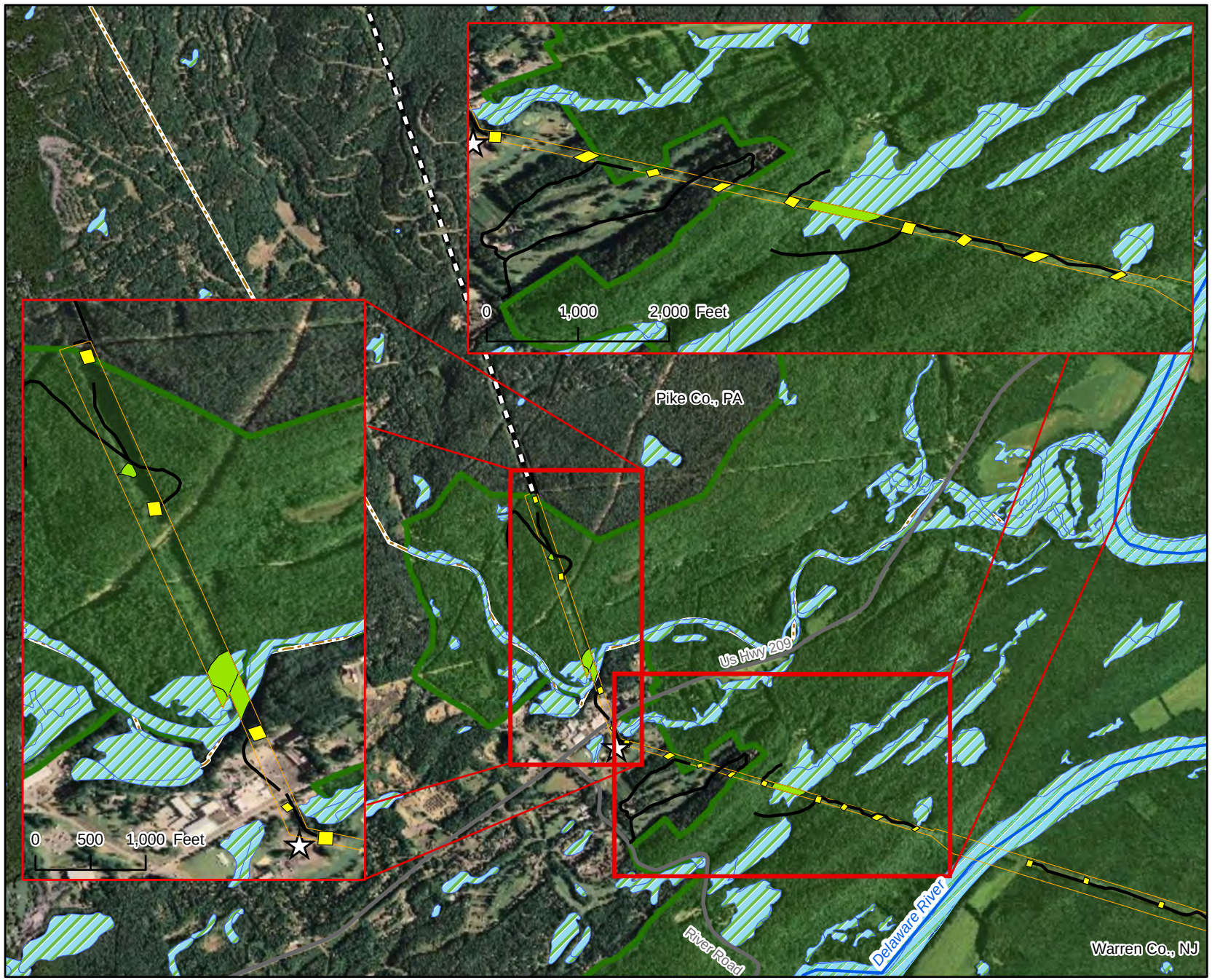
0 1,250 2,500
Feet

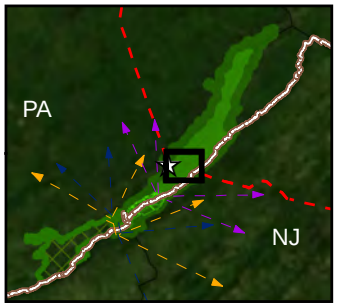
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 65
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: July 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- 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

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

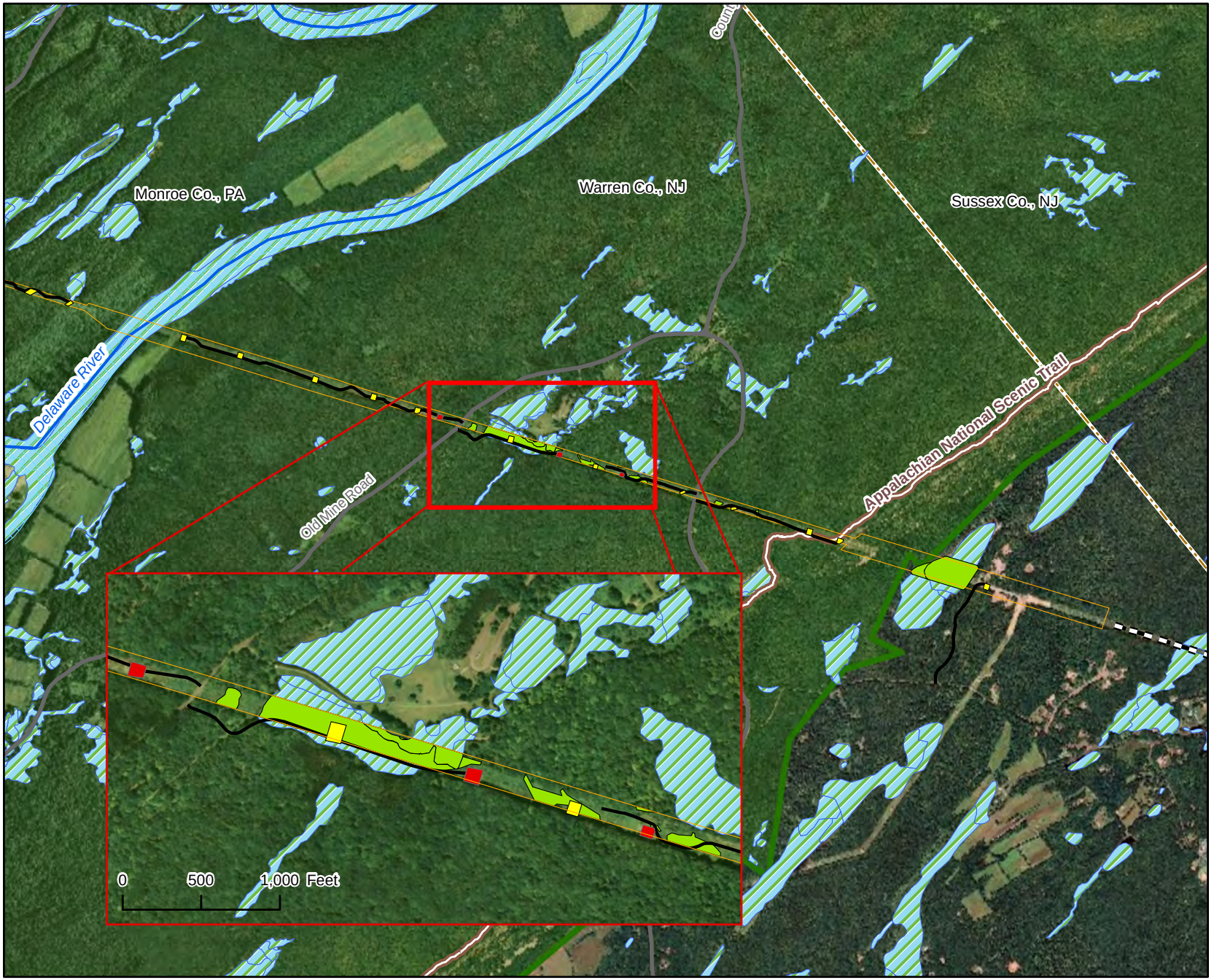
0 1,250 2,500
Feet

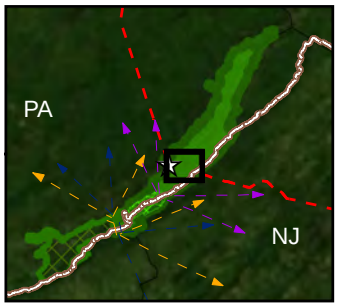
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 66
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: July 2012





Legend

- Substation
- Crane Pad for Proposed Tower*
- Crane Pad for Existing Tower Removal
- 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

** Crane pads for proposed towers will also be used for the removal of existing towers, where applicable*

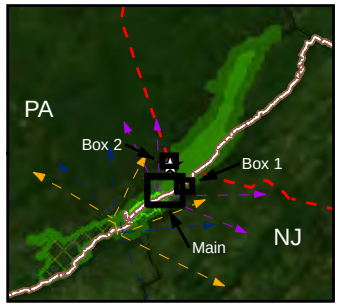
0 1,250 2,500
Feet

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

Figure 67
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: July 2012



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

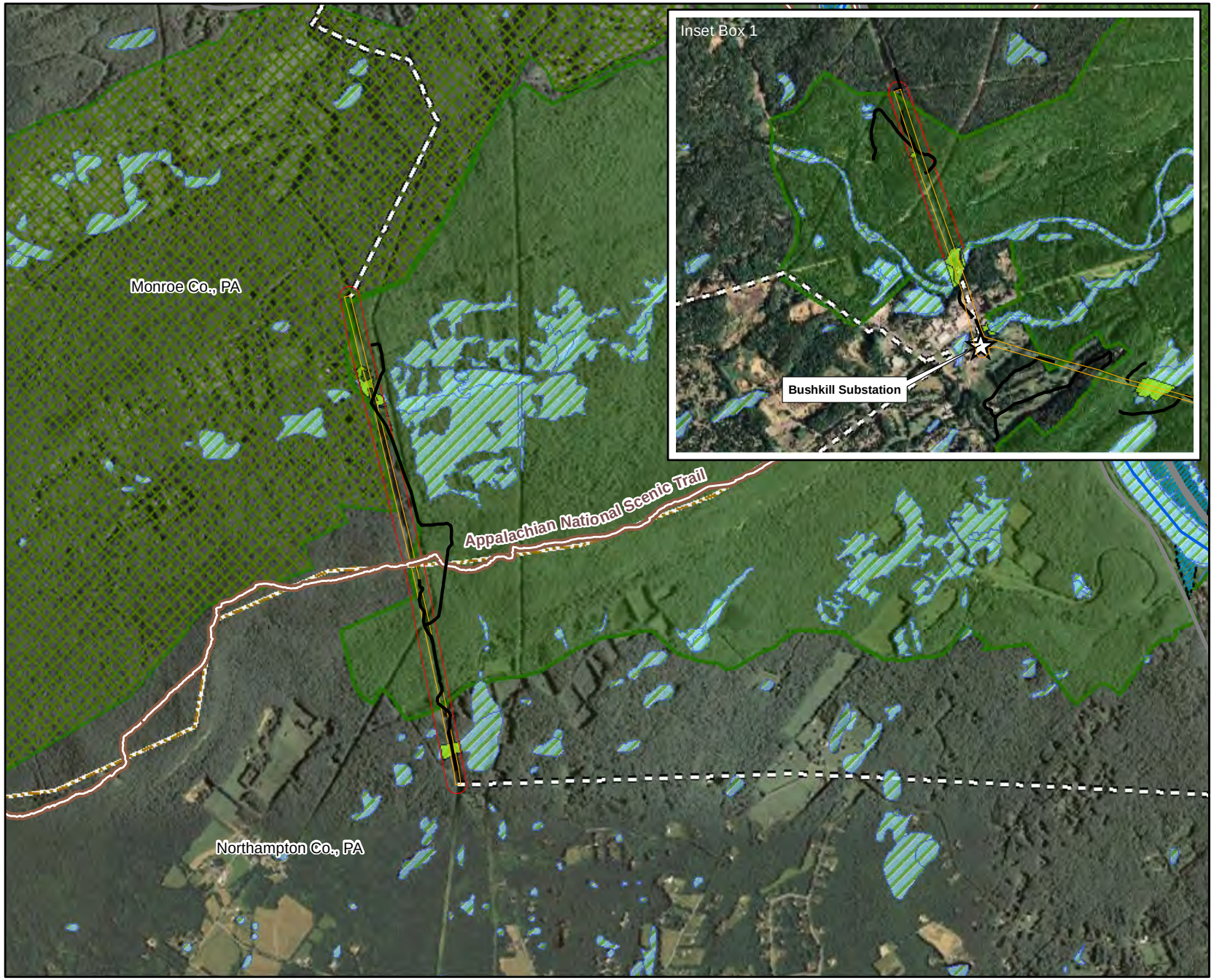
0 1,250 2,500
Feet
Scale applies to main frame and inset maps

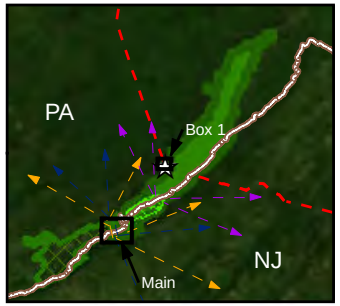
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

Figure 68
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: July, 2012





Legend

- Substation
- Outside Study Area
- Existing ROW in Study Area
- 350 ft Corridor
- Appalachian National Scenic Trail
- 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 1,250 2,500
Feet
Scale applies to main frame and inset maps

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

Figure 69
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: July, 2012

Resource-specific context for assessing impacts to wetlands includes the following:

- Executive Order 11990 directs the NPS 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.
- NPS Director's Order 77-1 adopts a goal of "no net loss of wetlands;" in addition, the NPS will strive to achieve a longer-term goal of net gain of wetlands.
- Wetlands have unique functions and values (groundwater recharge, stormwater storage and discharge, unique habitats, etc.) that are intrinsic to wetlands and cannot be easily duplicated or replaced.
- The quality of the particular wetland being impacted related to the functions and values performed by that wetland.

Consistent with Executive Order 11990 and Director's Order 77-1: *Wetland Protection* (NPS 2011a), the NPS has adopted a goal of "no net loss of wetlands." Director's Order 77-1 states that for new actions where impacts on wetlands cannot be avoided, proposals must include plans for compensatory mitigation that restores wetlands on NPS lands, at a minimum acreage ratio of 1:1. Therefore, any adverse impacts on wetlands described in this section require mitigation that would assure no net loss of wetlands. The exact ratio for compensation is determined on a project-specific basis in consultation with the NPS Water Resources Division. The U.S. Army Corps of Engineers (USACE) may require higher mitigation ratios, which would be determined at a later date following consultation and coordination as part of the permitting process. Whenever possible, every effort is made to assure that the same wetland restoration proposal meets the compensation requirements of both the NPS and the USACE processes to avoid any duplication of effort.

STUDY AREA

The study area for wetlands includes the ROW for each alternative and any area outside the ROWs where necessary pulling and splicing sites, staging areas, and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, the indirect impacts on wetlands cannot be evaluated per alternative. The potential impacts outside the study area are generally addressed; however, further surveys would be required prior to construction of the S-R Line.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks can affect wetlands. Wetland ecosystems are threatened by alterations and permanent loss from development and other habitat pressures. Wetlands provide crucial habitat for many plant and wildlife species and other key ecosystem functions. The establishment of nonnative invasive species that compete with or prey on native species is also a concern in wetland ecosystems. These pressures can alter species diversity and abundance as well type of wetland communities, sometimes resulting in the loss of wetland functions or values. Past, present, and reasonably foreseeable activities that would have beneficial or adverse impacts on wetland communities inside and outside the study area are included below. These projects were taken from a list of projects that could contribute to cumulative impacts developed for the S-R Line (appendix H). An overall cumulative impacts analysis was performed by combining the impacts from the projects below with the potential impacts of each alternative.

In DEWA, there are approximately 1,000 individually mapped wetlands (NPS 2008a). Cumulative impacts on wetlands, specifically forested wetlands, are a concern due to the historically high rate of forested wetland losses and the long period necessary to restore forested wetlands and their functions. Although the annual rate of forested wetland loss has declined since the 1970s, due in part to federal agriculture programs, the loss of forested wetland acreage continues; almost 300,000 acres of forested wetland were lost between 1998 and 2004 (Dahl 2006, 70). Freshwater forested wetlands have recently been affected by two processes: the conversion of forested wetland to and from other wetland types through cutting or maturation of trees, and the loss of forested wetlands where wetland hydrology has been destroyed (Dahl 2006, 70). Because forested wetlands function at different levels, functional losses in individual areas may not be great when viewed as separate and single events. However, the cumulative loss of functions on a regional basis and the continued loss of forested wetland acreage in the United States could have greater overall impacts even as a result of the loss or conversion of small individual areas.

Projects Inside the Study Area

Inside the study area, the following road and utility projects would result in adverse cumulative impacts on wetlands: the PADOT SR 2001 road project (road reconstruction), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), and the Northeast Supply Link Expansion (Palmerton Loop gas pipeline). These projects would result in adverse impacts on wetlands from vegetation clearing and trimming activities as well as disturbance of wetland areas. The parkwide invasive species control program for DEWA would have a beneficial impact on wetlands. This project would aid in the protection of threatened open-canopy wetlands that support rare plant communities along with marsh birds, small mammals, and special-status species. Additionally, there are several land protection programs that could protect wetlands functions and values. The beneficial effects of many of these programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable. Although these programs would protect wetland functions and values, the beneficial impacts would not outweigh the adverse impacts from the above-mentioned projects. Cumulative impacts on wetlands inside the study area from these projects would be adverse.

Projects Outside the Study Area

Outside the study area, the following road and utility projects would result in cumulative adverse impacts on wetlands: Marcellus shale natural gas drilling, the Columbia Gas Transmission Company pipeline (new gas pipeline), the PPL proposal for a 138/12-kV substation (which opens up additional areas to electric transmission), and transportation improvement and replacement projects in Pennsylvania and New Jersey. Proposed residential and commercial developments in New Jersey and Pennsylvania would also cause adverse impacts on wetlands. Adverse impacts on wetlands would result from vegetation clearing and trimming activities as well as the disturbance of wetland hydrology through impacts on groundwater quality and supply (specifically from gas drilling). Several land protection programs could provide beneficial impacts on wetlands functions and values. As stated above, these programs are dependent on the funding, which is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable. Although these programs would protect wetland functions and values, the beneficial impacts would not outweigh the adverse impacts from the above-mentioned projects. Cumulative impacts on wetlands outside the study area from these projects would be adverse.

IMPACTS OF THE ALTERNATIVES ON WETLANDS

Common to All Alternatives

Vegetation Maintenance: Vegetation would be cleared and managed in wetland areas for all alternatives. PPL and PSE&G have separate vegetation management plans because they are distinct utility companies working in different states. In general, all compatible plant species as well as all native grasses, ferns, and herbaceous plants would be preserved to the greatest extent possible (PPL 2010a, 8). Emergent wetlands (PEM) consist of low, herbaceous vegetation that does not require management, and are not likely to be affected by vegetation maintenance. However, incompatible trees and shrubs, trees that violate the wire zone, or trees that are considered danger trees would be removed from wetland areas. Wetlands characterized as scrub shrub wetlands (PSS) that support plant species not compatible with vegetation maintenance programs described in chapter 2 would be affected by vegetation management. Wetlands characterized as forested wetlands (PFO) would be affected by tree removal during vegetation management. Trees and small shrubs in wetland areas would not be removed by heavy equipment, but would be cleared using low-impact tree-clearing methods and would be felled by hand, which would require a chainsaw and operator on foot (PPL and PSE&G 2008, 7–8). Trees would be cut close to the ground and stumps and root systems would be left in the ground to naturally decompose over time, which would provide soil stability (PPL and PSE&G 2008, 7–8). Shrubs and trees felled by hand would be removed in wetland areas and all associated organic materials (with the exception of stumps) from tree cutting would be removed from the wetlands, wetland buffers, or water-body buffer areas and stored in upland areas. Herbicides would not be used in wetland areas in the parks. The only exception to herbicide use would be for stem-treating nonnative invasive plants. Appropriate herbicides would be approved for specific treatment use. The details of the vegetation management plans and techniques for clearing vegetation are explained in chapter 2. The NPS considers the applicant's current vegetation management plans to be insufficient, and the NPS would require a NPS-specific, NPS-approved vegetation management plan.

Mitigation Measures: Mitigation measures would be required to minimize impacts on wetlands both inside and outside the study area. To minimize adverse impacts, a park-specific plan would be developed by the applicant for review and approval by the NPS in consultation with the U.S. Fish and Wildlife Service (USFWS) to protect listed species and sensitive habitats at the park (wetlands, rare and unique communities). Numerous wetland mitigation practices have already been considered for the S-R Line and have been incorporated into the alternatives. None of these mitigation measures would eliminate impacts on wetlands; however, they would reduce the impacts on wetlands by decreasing the total loss of vegetation and diversity, controlling the spread of invasive species, and protecting native and sensitive wetland communities. In order to implement the "no net loss of wetlands" policy and the goal of net gain for wetlands, Director's Order 77-1 states that for new actions where impacts on wetlands cannot be avoided, proposals must include plans for compensatory mitigation that restores wetlands on NPS lands at a minimum acreage ratio of 1 to 1 for the preferred alternative. NPS Procedural Manual 77-1: *Wetland Protection* (NPS 2012d) requires a description of mitigation in a Statement of Findings for Wetlands (appendix I). Wetland mitigation measures for this project also include avoidance and minimization measures for bog turtles and their wetland habitat and/or in upland areas adjacent to bog turtle habitat as suggested in the *Bog Turtle (*Clemmys muhlenbergii*) Northern Population Recovery Plan* (USFWS 2001, 51). Specifically, the recommended conservation zones (Zones 1, 2, and 3) as described in chapter 3 and USFWS (2001, appendix A of the recovery plan) are based on the best scientific information available and are used as a template throughout the northern range of the bog turtle to ensure consistent and vigorous protection of extant bog turtle sites. More details concerning wetland mitigation measure are discussed in chapter 2 and appendix F as well as the biological assessment (BA) for the bog turtle.

Outside the Study Area: Regardless of which alternative is selected, the line could pass through Carbon, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. These counties are largely undeveloped and contain a variety of plant communities as well as developed areas, and could include wetland areas such as forested wetlands, riparian wetlands, bogs/fens, freshwater scrub shrub wetlands, and freshwater herbaceous wetlands. Impacts on wetlands as a result of clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described for inside the study area; however, because the NPS cannot dictate where the line would actually go, the exact nature of direct impacts from the construction and maintenance of the transmission line outside the study area cannot be determined. Additionally, the specific wetland resources that would be affected by the transmission line outside the study area cannot be identified until the route is chosen by the applicant. Upon this decision, wetland delineation surveys would be required to determine the wetland type and acreage that would be affected along the selected route. Wherever possible, staging areas would be placed outside wetland areas. Impacts on wetland areas outside the study area would generally be adverse because the majority of these impacts would be associated with periodic maintenance, including tree removal, similar to the impacts discussed for inside the study area. However, if wetland impacts are unavoidable, such as impacts from constructing access roads in wetland areas, adverse impacts could arise from a permanent loss in wetland functions or values. In particular, if rare or unique communities that support wetlands and/or *Exceptional Value Wetlands* are affected outside the study area, indirect impacts could result due to the sensitivity of these wetland resources. When the adverse impacts on wetlands outside the study area are combined with the adverse impacts from other past, present, and reasonably foreseeable projects outside the study area, overall adverse cumulative impacts would be expected.

Alternative 1: No Action

All adverse impacts on wetlands under alternative 1 are associated with vegetation management activities in existing wetland areas, which result in wetland habitat conversion as discussed in more detail in the paragraphs that follow and in table 46. Emergent wetlands (PEM) would not be affected under alternative 1 because they consist of low, herbaceous vegetation that does not require management or maintenance. Wetlands characterized as scrub shrub wetlands (PSS) with plant species not compatible with vegetation maintenance programs described in chapter 2 would be affected by vegetation management. Wetlands characterized as forested wetlands (PFO) would be affected by tree removal in the ROW under alternative 1. Herbicides would not be used in wetland areas in the parks. The only exception to herbicide use would be for stem-treating nonnative invasive plants. Appropriate herbicides would be approved for specific treatment use.

In Pennsylvania, a total of three wetlands are located along the current ROW and would be affected under alternative 1. Two of these wetlands include the Hogback Ridge wetlands and Arnott Fen, both characterized as rare or unique communities as well as *Exceptional Value Wetlands*. In New Jersey seven wetland areas are located along the current ROW and would be affected under alternative 1, including the Van Campen wetland complex, characterized as a rare and unique community as well as an *Exceptional Value Wetland*. The paragraphs below describe impacts to individual wetland areas under alternative 1.

TABLE 46: WETLAND IMPACTS BY TYPE AND ALTERNATIVE

Wetland Name	Type of Impact				
	Vegetation Removal — Shrubs/Trees (Acreage)	Permanent Road Impacts (Acreage)	Crane Pad Impacts[a] (Acreage)	Wetland Buffer Impacts (Acreage)[c]	Temporary Road Impacts (Acreage)
Alternative 1					
Wetland CC (PEM/PSS)	0.21	N/A			
Arnott Fen (PEM/PSS) EV	0.99[b]				
Hogback Ridge (PEM/PSS) EV	0.02[b]				
Van Campen (PEM/PSS) EV	4.45[b]				
Wetland 42 (PEM/PSS)	0.69[b]				
Wetland 45 (PEM/PSS)	0.86[b]				
Wetland 46 (PEM/PSS)	0.24[b]				
Wetland 47 (PEM/PSS)	0.05[b]				
Wetland 49 (PEM/PSS)	0.9[b]				
NWI-1 (PEM/PSS)	0.23[b]				
Alternative 1 Total	**8.64**	**N/A**	**N/A**	**N/A**	**N/A**
Alternative 2					
Wetland AA (PFO)	0.52	—	—	0.06	—
Wetland BB (PFO) EV	1.05	—	—	—	—
Wetland CC (PEM/PSS)	0.22	—	—	0.03	—
Arnott Fen (PEM/PSS) EV	4.1	—	—	—	—
Hogback Ridge (PEM/PSS) EV	0.47	—	—	—	—
Van Campen (PEM/PSS) EV	9.6	0.56	0.23	—	—
Wetland 42 (PFO)	0.04	—	—	—	—
Wetland 42 (PEM/PSS)	0.74	0.09	—	—	—
Wetland 45 (PEM/PSS)	1.09	—	0.12	—	—
Wetland 46 (PEM/PSS)	0.24	—	—	0.08	—
Wetland 47 (PEM/PSS)	0.08	0.02	—	—	—
Wetland 49 (PEM/PSS)	1.34	—	—	—	—
NWI-1 (PEM/PSS)	0.79	—	—	—	—
Alternative 2 Total	**20.28**	**0.67**	**0.35**	**0.17**	**—**
Alternative 2b					
Wetland AA (PFO)	—	—	—	—	—
Wetland BB (PFO) EV	0.21	—	—	—	—
Wetland CC (PEM/PSS)	0.21	—	—	0.03	—
Arnott Fen (PEM/PSS) EV	1.30	—	—	—	—
Hogback Ridge (PEM/PSS) EV	0.02	—	0.01	0.01	—

Wetland Name	Type of Impact				
	Vegetation Removal — Shrubs/Trees (Acreage)	Permanent Road Impacts (Acreage)	Crane Pad Impacts[a] (Acreage)	Wetland Buffer Impacts (Acreage)[c]	Temporary Road Impacts (Acreage)
Van Campen (PEM/PSS) [EV]	4.82	0.56	0.23	—	—
Wetland 42 (PFO)	0.04	—	—	—	—
Wetland 42 (PEM/PSS)	0.52	0.09	—	—	—
Wetland 45 (PEM/PSS)	0.75	—	0.10	0.01	—
Wetland 46 (PEM/PSS)	0.20	—	—	—	—
Wetland 47 (PEM/PSS)	0.08	0.02	—	—	—
Wetland 49 (PEM/PSS)	1.34	—	—	—	—
NWI-1 (PEM/PSS)	0.79	—	—	—	—
Alternative 2b Total	**10.28**	**0.67**	**0.34**	**0.05**	—
Alternative 3					
Wetland 8 (PEM)	—	0.02	—	—	—
Wetland 10 (PSS)	0.29	—	—	—	—
NWI-3 (PFO)	1.43	—	—	—	—
Wetland AA (B-K Line)	—	—	—	0.06	—
Wetland CC (B-K Line)	0.21			0.03	
Arnott Fen, Van Campen, 42, 47 (B-K Line removal)	—	—	—	—	0.67
Alternative 3 Total	**1.93**	**0.02**	**—**	**0.09**	**0.67**
Alternative 4					
Wetland 1 (PFO)	1.77	—	—	—	—
Wetland 2(PFO)	0.71	0.01	—	—	—
NWI-4 (PFO/PSS)	1.83	0.08	—	—	—
Wetland AA (B-K Line)	—	—	—	0.06	—
Wetland CC (B-K Line)	0.21	—	—	0.03	—
Arnott Fen, Van Campen, 42, 47 (B-K Line removal)	—	—	—	—	0.67
Alternative 4 Total	**4.52**	**0.09**	**—**	**0.09**	**0.67**
Alternative 5					
Wetland 1 (PFO)	1.77	—	—	—	—
Wetland 2(PFO)	0.71	0.01	—	—	—
NWI-4 (PFO/PSS)	1.83	0.08	—	—	—
Arnott Fen, Van Campen, 42, 47 (B-K Line removal)	—	—	—	—	0.67
Alternative 5 Total	**4.31**	**0.09**	**—**	**—**	**0.67**

a. Unknown for alternatives 3, 4, and 5.

b. These wetland areas total 8.43 acres and would be allowed to recover under alternatives 3, 4, and 5.

c. Buffer impacts are a result of permanent road impacts to the 50-foot wetland buffer only.

EV = Exceptional value wetland

Approximately 0.99 acre of the Arnott Fen wetland complex (characterized as a PEM/PSS wetland) is within the B-K Line ROW under alternative 1. In the existing ROW, Arnott Fen contains a diverse emergent vegetation community, including numerous special-status wetland plant species that are not found anywhere else in the study area (impacts are discussed in the "Special-status Species" section of this chapter) and is therefore considered an *Exceptional Value Wetland*. Vegetation control measures such as mowing and herbicide use are not currently employed in Arnott Fen and would not be necessary for maintenance under alternative 1. Many of the plant species in the fen in the ROW are herbaceous and compatible with the vegetation maintenance programs described in chapter 2, although incompatible shrubs / small trees such as red maple are also present in the fen and would be hand cleared as part of vegetation management.

Approximately 0.02 acre of the Hogback Ridge wetland (characterized as a PEM/PSS wetland) is in the B-K Line ROW under alternative 1. The wetland contains deciduous scrub shrub wetland vegetation and is considered an *Exceptional Value Wetland*. Some of the plant species in the wetland are compatible with the applicant's specifications for vegetation clearing and control; however, incompatible shrub and small tree species such as red maple would be removed by hand clearing.

Approximately 4.45 acres of the Van Campen wetland complex (characterized as a PEM/PSS wetland) is in the B-K Line ROW under alternative 1. The wetland contains emergent and scrub shrub wetland vegetation and is considered an *Exceptional Value Wetland*. Some of the plant species in the wetland are compatible with the applicant's specifications for vegetation clearing and control; however, incompatible shrub and any small tree species would be removed by hand clearing.

In addition to the three wetland areas described above, a total of approximately 3.18 acres of scrub shrub wetlands (wetlands CC, 42, 45, 46, 47, 49, and NWI-1) are located within the B-K Line ROW and would be affected by vegetation maintenance activities. It is possible that New Jersey Department of Environmental Protection (NJDEP) may identify existing wetlands along and within the ROW as *Exceptional Value Wetlands*, based on the recent discovery of wood turtle and timber rattlesnake habitat (these snakes can forage in wetland areas) in surveys conducted along alternative 2 (EcolSciences 2009b; 2011). Incompatible shrubs and small trees would be removed from these scrub shrub wetlands under alternative 1. The removal of vegetation would increase the amount of open areas of the shrub layer in the wetlands. Open areas facilitate the growth and spread of nonnative invasive plants and provide more sunlight to the understory, generally comprised of shade-tolerant plant species that cannot persist in full sun. The removal of incompatible shrubs or small trees from scrub shrub wetlands would result in their conversion to emergent wetlands and would cause the emergent understory to be fully exposed. For example, sphagnum moss and cinnamon fern are typical emergent wetland plants beneath the shrub layer that cannot persist in full sun once the shrub layer has been removed.

Although fill would not be placed in wetland areas during vegetation maintenance activities, habitat conversion is considered a wetland impact because some of the wetland functions and values would change (including fish and wildlife productivity and habitat, threatened and endangered species habitat, vegetation habitat, water purification, and streamflow). Shrub removal in the B-K Line corridor would change functions and values by reducing the vegetation canopy over these wetlands, which would reduce the biomass and change the species composition of the wetland. The reduction in biomass would potentially alter the vegetation and wildlife species that use that wetland. This shift in the vegetation type could lessen available resources for wildlife species that depend on the conditions currently found in the wetland. Therefore, measurable changes to the abundance and diversity of wetland vegetation would occur. These areas would continue to function as wetlands, but there would be changes in the abundance and diversity of wetland vegetation, which could directly affect the use of the area by wildlife and listed species and could allow invasive plant species to colonize wetland areas. Managed ROW corridors do not return to the original species composition or structure and succeed to different wetland types (Jordan et al.

n.d., 154). Because shrubs and small trees in the ROW under alternative 1 would continue to be maintained/removed, wetland areas within the ROW would not recover during the period of analysis to become fully functioning scrub shrub wetlands.

The regular maintenance and vegetation management in the ROW would cause disturbance to wetlands, including *Exceptional Value Wetlands* under alternative 1 throughout the period of analysis. Wetland functions and values that would change as a result of vegetation management include fish and wildlife productivity and habitat, threatened and endangered species habitat, vegetation habitat, water quality, and streamflow. Other wetland functions and values are unlikely to change as a result of alternative 1. The no-action alternative would result in impacts on a total of 8.64 acres of wetlands as a result of conversion to either emergent wetlands. Although vegetation removal and maintenance efforts would continue in rare and unique wetland communities, no new development or construction would be allowed under alternative 1. Overall, alternative 1 would result in adverse impacts on wetlands.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 1 are combined with the other projects in the study area, overall adverse cumulative impacts would be expected. Alternative 1 would not alter the level of impact.

Conclusion

The no-action alternative would impact a total of 8.64 acres of wetlands (including 5.46 acres of rare and unique wetland communities) as a result of conversion to either emergent or scrub shrub wetlands. Although vegetation removal and maintenance efforts would continue in rare and unique wetland communities, no new development, construction, or drilling would be allowed under alternative 1. Overall, alternative 1 would result in adverse impacts on wetlands. When the adverse impacts on wetlands as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, overall adverse cumulative impacts would be expected.

Alternative 1 crosses several unique wetland communities which, in turn, support rare, threatened, and endangered plants and animals and act as groundwater repositories. Alternative 1 would have adverse impacts to wetlands, including the unique wetland communities, associated with ongoing vegetation management activities that are changing from their historic pattern. The most severe adverse impact would be the conversion of forested wetlands to emergent or scrub shrub wetlands, which would substantially change the way the wetlands function as fish and wildlife habitat and to a lesser degree, some of the hydrological functions such as streamflow. The adverse impacts of alternative 1 would be confined to the limits of the present ROW and would not likely result in a noticeable reduction in wetlands functions and values. Adverse impacts to wetlands would be avoided and minimized through required consultation and permitting processes; thus, the impacts would be consistent with the laws and policies that govern these resources. In conclusion, the actions under alternative 1 would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws. Any cumulative impacts to wetlands would remain adverse primarily from other actions taken outside the study area. Although there are adverse impacts associated with the continued operation and maintenance of the existing B-K Line, the intensity of the adverse impacts in the context of wetlands would not likely result in significant impacts.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) would involve the removal of all or a portion of the B-K Line, as discussed in chapter 2. For all action alternatives, the B-K Line structures would be removed but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require constructing access roads (either permanent or temporary, depending on the alternative). Under alternatives 2 and 2b, the removal of the B-K Line would require constructing access roads, wire pull sites, and the removal of the line as described in chapter 2; wire pull sites would not be located in wetland areas. Because access roads would also be required for the construction and long-term maintenance of the new line, adverse impacts from removing the line would be the same as (or less than) the impacts discussed for construction of the S-R Line.

Vegetation Clearing: The ROWs would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2 through 5, which would affect wetlands. For the analysis of impacts on wetlands, it was assumed that a 350-foot corridor would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2, 3, 4, and 5. For alternatives 2, 3, 4, and 5, the corridor would be cleared 175 feet from the centerline of the existing ROW to either side. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights. Clearing would be complete for all action alternatives, with the exception of the 50-foot buffer near intermittent streams/wetlands and the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7).

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect wetlands if these areas cannot be avoided include site preparation and construction of access roads, tower foundations, crane pads, wire pull locations, and pulling and splicing sites, as well as the use of heavy equipment and staging areas. These activities would disturb wetland functions and values. Specifically, the construction of access roads would cause increased sedimentation in adjacent wetland areas, thus affecting water clarity and water quality; wetlands can also be affected by siltation and alteration of drainage patterns resulting from access road construction, particularly if access roads are in or next to sensitive wetland areas. Also, the use of heavy construction equipment such as forwarders, feller bunchers, and skidders during the removal of vegetation, as well as bulldozers and trucks during the construction and use of access roads, would contribute to the compaction of soil in and near wetland areas. Compaction can cause damage to soil structure, which determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity and growth (UM 2001, 1). Soil compaction would also increase runoff, thus increasing soil erosion. Soil compaction can also cause changes to hydrology, which would affect wetland function and possibly wildlife use (including bog turtle, a special-status species) of the wetland. In addition to direct effects from construction component, indirect effects to wetlands resulting from activities in the adjacent uplands as stated in the *Bog Turtle* (Clemmys muhlenbergii*) Northern Population Recovery Plan* (USFWS 2001, appendix A) include:

- changes in hydrology (from roads, detention basins, irrigation, increases in impervious surfaces, sand and gravel mining);
- degradation of water quality (due to herbicides, pesticides, oil and salt from various sources including roads, agricultural fields, parking lots and residential developments);

- acceleration of succession (from fertilizer runoff); and
- introduction of exotic plants (due to soil disturbance and roads).

Specified BMPs to protect wetlands from increased sedimentation and compaction would be used to minimize and mitigate these impacts, as described in appendix F. All action alternatives would require drilling as part of the construction process, but because drilling is unlikely to affect groundwater (see discussion in "Geologic Resources") it would not affect wetlands in the vicinity and is not discussed further.

Alternative 2

In Pennsylvania, a total of five wetlands would be affected under alternative 2. Two of these five wetlands include the Hogback Ridge wetlands and Arnott Fen, both characterized as rare or unique communities as well as *Exceptional Value Wetlands*. In New Jersey seven wetland areas would be affected under alternative 2, including the Van Campen wetland complex, characterized as a rare and unique community as well as an *Exceptional Value Wetland*. It is possible that NJDEP may identify additional wetlands along and within the ROW as *Exceptional Value Wetlands*, based on the recent discovery of wood turtle and timber rattlesnake habitat (these snakes can forage in wetland areas) in surveys conducted along alternative 2 (EcolSciences 2009b; 2011). The paragraphs below describe impacts to individual wetland areas under alternative 2.

Approximately 4.1 acres of the Arnott Fen wetland complex (characterized as a PEM/PSS wetland) is in the 350-foot construction corridor of the proposed ROW under alternative 2. As described in the vegetation maintenance programs in chapter 2, the majority of the existing herbaceous vegetation in the fen and a 50-foot buffer surrounding the fen includes compatible plant species, which would not be cleared to prepare for construction activities (PPL and PSE&G 2008, 7). Although the fen is dominated by emergent plant species, a very small portion of the outer edges of the fen does include some incompatible shrubs / small trees such as red maple exist in the fen and would be hand cleared for construction and as part of the vegetation maintenance programs.

Approximately 0.47 acre of the Hogback Ridge wetland (characterized as a PEM/PSS wetland) is located within the 350-foot construction corridor of the proposed ROW under alternative 2. The wetland contains some incompatible shrub / small tree species such as red maple that would be hand cleared as part of construction and vegetation maintenance activities. Access roads would not be constructed through the Hogback Ridge wetland. However, indirect adverse impacts could occur as a result of access road construction, tower construction, and vegetation clearing adjacent to the wetland. These adverse impacts include the potential for impeding the natural flow of water into or out of the wetland area and changes to the movement of wetland wildlife (such as turtles and salamanders) and the distribution of wetland plant seeds.

Approximately 9.6 acres of the Van Campen wetland complex (characterized as a PEM/PSS wetland) is located in the 350-foot construction corridor of the proposed ROW under alternative 2. Some of the plant species in the wetland are incompatible shrub / small tree species that would be removed by hand clearing for construction and maintenance activities. However, approximately 10,000 square feet (0.23 acre) of the wetland vegetation in the ROW is proposed for clearing under alternative 2 because the applicant's proposal includes a tower in the wetland area that would require a crane pad. Additionally, approximately 0.56 acre of PEM/PSS wetlands that are part of the Van Campen wetland complex would be directly and adversely affected by access roads. As stated under "Common to All Action Alternatives," site preparation and construction of the access roads as well as the use of heavy equipment would disturb wetland functions and values.

In addition to the *Exceptional Value Wetlands* discussed above, nine other wetlands would be adversely affected under alternative 2:

- Wetland AA is a PFO wetland near the Bushkill Substation and located outside of the NPS boundary. Impacts from clearing trees in the forested wetland would occur on 0.52 acre of wetland. Direct impacts from access roads would avoid wetland AA, but a very small portion (0.06 acre) of the proposed access road would be constructed in the 50-foot wetland buffer.
- Wetland BB has both PEM and PFO wetland portions that support incompatible plant species (red maple). This wetland is considered an *Exceptional Value Wetland* because it supports special-status species. Impacts from clearing trees in the forested wetland would occur on 1.05 acres of wetland; no direct impacts from access roads would be expected and impacts to the emergent (PEM) portion of the wetland are not expected.
- Wetland CC is a PEM/PSS wetland near the northern portion of the alignment. Generally, the wetland vegetation is considered compatible plant species, but clearing may result in impacts on 0.22 acres of the wetland. Direct impacts from access roads would avoid wetland CC, but a very small portion (0.03 acre) of the proposed access road would be constructed in the 50-foot wetland buffer.
- Wetland 42 has both PEM/PSS and PFO wetland areas partially located in the proposed ROW. Impacts from clearing trees would result on 0.04 acres of the forested (PFO) wetland in the proposed ROW and impacts from clearing shrubs would result on 0.74 acre of the PEM/PSS wetland in the proposed ROW. Access roads would directly and permanently affect approximately 0.09 acre of the PEM/PSS wetland.
- Wetland 45 is a PEM/PSS wetland in the ROW. Impacts from clearing of shrubs / small trees in the proposed ROW would occur on 1.09 acres of this wetland. The construction of the crane pads would affect 0.12 acre of this wetland.
- Wetland 46 is a PEM/PSS wetland that surrounds a pond in the ROW; impacts from clearing shrubs / small trees would occur on 0.24 acre of this wetland in the proposed ROW. Direct impacts from access roads would avoid wetland 46, but a very small portion (0.08 acre) of the proposed access road would be constructed in the 50-foot wetland buffer.
- Wetland 47 is a PEM/PSS wetland in the ROW; impacts from clearing shrubs / small trees in the wetland would occur on 0.08 acre of this wetland in the proposed ROW. Access roads would directly and permanently affect approximately 0.02 acre of this wetland.
- Wetland 49 is a PEM/PSS wetland in the ROW located outside the NPS boundary. Impacts from clearing shrubs / small trees in the proposed ROW would occur on 1.34 acres of this wetland.
- Wetland NWI-1 is a PEM/PSS wetland partially located in the ROW located outside the NPS boundary. Impacts from clearing shrubs / small trees in the proposed ROW would occur on 0.79 acres of this wetland.

The removal or felling of trees in forested wetland areas or shrubs in scrub shrub wetlands would increase the amount of open canopy in wetland areas. Open canopy facilitates the growth and spread of nonnative invasive plants, which spread into forested or scrub shrub wetland areas. Open canopy provides more sunlight to the understory and shade-tolerant plant species cannot persist in full sun. In addition to creating more open canopy, the increased potential for blowdowns or windthrow in forested wetlands also exists when trees are removed from forested wetlands. In forested wetlands, shallow-rooted species protect each other from potential wind damage; whenever trees are removed from a forested wetland, the possibility of blowdowns or windthrow (trees uprooted or broken by wind) increases (MIDNR 1992, LC-

3). Edge trees protect shallow-rooted species by shielding them from the prevailing wind; it is suggested that as many edge trees as possible be left on the prevailing wind side of the cleared area (MIDNR 1992, LC-3). Therefore, the removal of trees in the wetland and along the forested wetland edge would increase the open canopy and could cause an increased potential for blowdowns to occur, which could further adversely affect the wetlands where trees have been removed.

Tree removal in forested wetlands would result in the conversion of wetland habitat type from a forested wetland to an emergent or scrub shrub wetland. In addition, the removal of incompatible shrubs or small trees from scrub shrub wetlands would result in their conversion to emergent wetlands. The removal of the shrub layer from these PEM/PSS wetlands would result in fully exposing the emergent understory. For example, sphagnum moss and cinnamon fern are typical emergent wetland plants beneath the shrub layer of wetlands along alternative 2 that cannot persist in full sun once the shrub layer has been removed.

Although fill would not be placed in wetland areas during vegetation removal and maintenance activities, habitat conversion is considered a wetland impact because some of the wetland functions and values would change (including fish and wildlife productivity and habitat, threatened and endangered species habitat, vegetation habitat, water purification, and streamflow). It has been demonstrated that removing trees from a forested wetland does not interrupt the prevailing hydrology of the site (Cutlip 1986). However, tree removal in the B-K Line corridor and in forested wetlands would change functions and values by reducing the vegetation canopy over these wetlands, which would reduce the biomass and change the species composition of the wetland (Cutlip 1986). The reduction in biomass would potentially alter the vegetation and wildlife species that use that wetland. This shift in the vegetation type could lessen available resources for wildlife species that depend on the conditions currently found in the wetland. Therefore, there would be measurable changes to the abundance and diversity of wetland vegetation. These areas would continue to function as wetlands, but there would be changes in the abundance and diversity of wetland vegetation, which could directly affect the use of the area by wildlife and listed species and could allow invasive plant species to colonize wetland areas. Managed ROW corridors do not return to the original species composition or structure and succeed to different wetland types (Jordan et al. n.d., 154). Because northern forested wetlands may take 50 years to reach maturity (Kusler 2006, iii) and because trees and shrubs would be maintained/removed, those wetland areas allowed to revegetate after construction would not recover during the period of analysis to become fully functioning forested or scrub shrub wetlands.

Construction impacts described under alternative 2 would cause both permanent and temporary changes to wetland functions and values, including *Exceptional Value Wetlands*. Site preparation and construction of the access roads as well as the use of heavy equipment would degrade wetland functions and values. Heavy equipment operation in the ROW during the construction of access roads across a ROW in a forested wetland has been shown to interrupt the natural hydrologic regime of the forested wetland and cause the impoundment of water (Cutlip 1986). The use of heavy equipment in wetland areas can also result in the compaction of wetland soils, as discussed above under “Construction Components.”

The construction of access roads both adjacent to and through wetlands would fragment the wetlands, resulting in changes to hydrology and impeding water movement, ground-level wildlife movement, and the seed distribution of wetland plants. Access roads would also reduce the ability of wetlands to perform functions such as groundwater discharge/recharge, sediment/toxicant retention, nutrient removal, flood flow alteration and/or storage, and production export may be temporarily decreased due to temporary disturbance adjacent to the wetland. Access roads would also cause the wetlands’ stormwater/nutrient assimilative capacity to be lost and construction vehicles along the roads could introduce toxic substances (oil and grease). During construction activities, siltation/runoff into wetland areas could occur but would be contained with approved BMPs as discussed under “Common to All Action Alternatives.”

Overall, alternative 2 would require construction and vegetation clearing and maintenance activities that would affect 20.28 acres of wetlands through conversion to scrub shrub and/or emergent wetlands, including *Exceptional Value Wetlands*. Access roads and crane pads would affect 1.02 acres of wetlands. Approximately 0.17 acre of wetlands would be indirectly affected by vegetation clearing in the 50-foot wetland buffer. Overall, alternative 2 would result in adverse impacts on wetlands as a result of vegetation removal and maintenance, construction of access roads, tower foundations, and crane pads, portions of which would affect rare and unique wetland communities as well as *Exceptional Value Wetlands*.

Because alternative 2 is the preferred alternative, mitigation under NPS Procedural Manual 77-1: *Wetland Protection* (NPS 2012d) is discussed in detail in the Statement of Findings for Wetlands (appendix I). The exact ratio for compensation is determined on a project-specific basis.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 2 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would contribute an appreciable increment to the overall cumulative impact.

Conclusion

In the study area under alternative 2, adverse impacts on wetlands would result in impacts on wetlands because construction activities and vegetation clearing would result in converting 20.28 acres of forested wetlands to scrub shrub and/or emergent wetlands during ROW clearing. Access road, tower foundation, and crane pad construction would permanently impact 1.02 acres of wetlands, including wetlands that support rare and unique communities. Approximately 0.17 acres of wetlands would be indirectly affected by vegetation clearing in the 50-foot wetland buffer for access roads. For wetlands with limestone geology (Arnott Fen) in the study area of alternative 2, required drilling could create impacts on unique geologic formations and could lead to a decrease in groundwater availability and quality that could indirectly and adversely affect wetland functions and values. It is not entirely known how drilling would affect wetland areas along alternative 2 but drilling is unlikely to affect groundwater (see discussion in the "Geologic Resources" section). A drilling plan and postconstruction monitoring would be required to identify and monitor the potential impacts of drilling on wetlands. Access road construction adjacent to wetlands could have both direct and indirect adverse impacts on wetlands. Although the construction activities would be short term, the regular maintenance of the ROW and access roads would cause disturbance throughout the period of analysis. Cleared trees in wetland areas under alternative 2 would never be allowed to mature in the ROW and cleared wetland areas would not recover during the period of analysis to become a fully functioning forested wetland. When the adverse impacts on wetlands as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 2 would be located in a particularly sensitive area of DEWA containing high concentrations of many important and unique natural features including rare limestone formations that support unique calcareous wetlands such as Arnott Fen, the Delaware River riparian corridor, the Hogback Ridge wetlands and the Van Campen Brook riparian area. Arnott Fen, Hogback Ridge wetlands, and the Van Campen wetlands are characterized as rare and unique communities and classified as *Exceptional Value Wetlands* by Pennsylvania and New Jersey, meaning these wetlands are significant resources in park and regional contexts, making any impacts in these locations even more acute. Alternative 2 would impact the largest acreage of wetlands of any of the action alternatives; nearly twice as much as alternative 2b and up to 10 times the acreage of alternatives 3, 4, or 5. The adverse impacts of alternative 2, such as clearing,

ground disturbance and compaction, and changes in surface runoff from placement of fill material, pose a serious risk of harm to these wetlands due to the potential to introduce invasive species or alter wetland hydrology in unexpected ways that would disrupt and degrade the wetland values and functions. The long-term effects of construction activities on rare and unique communities are often difficult to predict accurately because of the nature of these communities. Cumulatively, wetlands are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. Considering the intensity of these adverse impacts in the context of wetlands laws and policies as well as the purpose and significance for which DEWA, APPA, and MDSR were established, alternative 2 would likely result in significant adverse impacts on wetlands.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2 would be significant.

Alternative 2b

In Pennsylvania, a total of four wetlands would be affected under alternative 2b. Two of these four wetlands include the Hogback Ridge wetlands and Arnott Fen, both characterized as rare or unique communities as well as *Exceptional Value Wetlands*. In New Jersey seven wetland areas would be affected under alternative 2b, including the Van Campen wetland complex, characterized as a rare and unique community as well as an *Exceptional Value Wetland*. The paragraphs below describe impacts to individual wetland areas under alternative 2b.

Approximately 1.30 acres of the Arnott Fen wetland complex (characterized as a PEM/PSS wetland) is located in the corridor of the proposed ROW under alternative 2b. Some incompatible shrubs / small trees such as red maple exist in the fen and would be hand cleared for construction and as part of the vegetation maintenance programs. No new access roads or tower foundations would be placed in the Arnott Fen wetland complex.

Approximately 0.02 acre of the Hogback Ridge wetland (characterized as a PEM/PSS wetland) is located in the corridor of the proposed ROW under alternative 2b. Because the wetland contains deciduous scrub shrub wetland vegetation, most of the plant species in the wetland would not be disturbed. Incompatible shrub / small tree species such as red maple exist in the wetland area and would be hand cleared as part of construction and vegetation maintenance activities. Access roads would not be constructed through Hogback Ridge wetland, but would be constructed in the wetland buffer, affecting approximately 0.01 acre. A crane pad would also be partially located in the wetland, affecting approximately 0.01 acre of the wetland. Indirect adverse impacts could result from access road construction and vegetation clearing adjacent to the wetland. These activities would adversely affect the wetland in the same manner as described in detail above for alternative 2.

Approximately 4.82 acres of the Van Campen wetland complex (characterized as a PEM/PSS wetland) is located in the corridor of the proposed ROW under alternative 2b. Some of the plant species in the wetland are incompatible shrub / small tree species that would be removed by hand clearing for construction and maintenance activities. Additionally, approximately 10,000 square feet (0.23 acre) of the wetland vegetation in the ROW is proposed for clearing under alternative 2b because the applicant's proposed plan includes a tower in the wetland area that would require a crane pad. Also, approximately 0.56 acre of PEM/PSS wetlands that are part of the Van Campen wetland complex would be directly and adversely affected by access roads. These activities would adversely affect the wetland in the same manner as described in detail above for alternative 2.

In addition to the rare or unique communities that support wetlands discussed above, nine other wetlands would be adversely affected under alternative 2b.

- Wetland BB is a PFO wetland in the proposed ROW under alternative 2b and is considered an *Exceptional Value Wetland*. Impacts from clearing trees in the forested wetland would occur on 0.21 acres of the wetland; no direct impacts from access roads would be expected.
- Wetland CC is a PEM/PSS wetland near the northern portion of the alignment. Generally, the wetland vegetation is comprised of compatible plants species, but clearing may result in impacts on 0.21 acres of the wetland. Direct impacts from access roads would avoid wetland CC, but a very small portion (0.03 acre) of the proposed access road would be constructed in the 50-foot wetland buffer.
- Wetland 42 has both PEM/PSS and PFO wetland areas partially located in the proposed ROW. Impacts from clearing trees would occur on 0.04 acres of the forested (PFO) wetland in the proposed ROW and impacts from clearing shrubs would occur on 0.52 acres of the PEM/PSS wetland in the proposed ROW. Access roads would directly and permanently affect approximately 0.09 acre of the PEM/PSS wetland.
- Wetland 45 is a PEM/PSS wetland in the ROW. Impacts from clearing shrubs / small trees would occur on 0.75 acre of this wetland. A crane pad would affect 0.10 acre of this wetland and a very small portion (0.01 acre) of the proposed access road would be constructed in the 50-foot wetland buffer.
- Wetland 46 is a PEM/PSS wetland that surrounds a pond in the corridor. Impacts from clearing shrubs / small trees would occur on 0.20 acre of this wetland.
- Wetland 47 is a PEM/PSS wetland in the ROW. Impacts from clearing shrubs / small trees would occur on 0.08 acre of this wetland; access roads would directly and permanently affect approximately 0.02 acre of this wetland.

- Wetland 49 is a PEM/PSS wetland in the ROW. Impacts from clearing shrubs / small trees would occur on 1.34 acre of this wetland.
- Wetland NWI-1 is a PEM/PSS partially located in the corridor. Impacts from clearing shrubs / small trees would occur on 0.79 acres of this wetland.

Overall, alternative 2b impacts on wetlands due to construction and associated activities and vegetation clearing would result in the loss of 10.28 acres of wetlands through conversion to scrub shrub and/or emergent wetlands, and impacts due to access roads and crane pads would permanently affect 1.01 acres of wetlands. Approximately 0.05 acre of wetlands would be indirectly affected by vegetation clearing in the 50-foot wetland buffer from access roads. The total impacts (acreage) of alternative 2b are less than the impacts for alternative 2 because the cleared corridor is narrower under this alternative. Rare or unique wetland communities as well as *Exceptional Value Wetlands* would be permanently altered by crane pad construction. Overall, adverse impacts on wetlands would occur under alternative 2b.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 2b are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

In the study area under alternative 2b, adverse impacts on wetlands would occur because construction activities and vegetation clearing would result in converting 10.28 acres of forested wetlands to scrub shrub and/or emergent wetlands during clearing activities in the proposed corridor; access roads and crane pads would permanently affect 1.01 acres of wetlands. Approximately 0.05 acre of wetlands would be indirectly affected by vegetation clearing in the 50-foot wetland buffer from access roads. Under alternative 2b, rare or unique wetland communities and *Exceptional Value Wetlands* would be adversely affected. The required drilling could affect unique geologic formations (Arnott Fen) and could lead to a decrease in groundwater availability and quality, which could indirectly and adversely affect wetland functions and values. It is not entirely known how drilling would affect wetland areas along the alternative 2b alignment but drilling is unlikely to affect groundwater (see discussion in the "Geologic Resources" section). A drilling plan and postconstruction monitoring would be required to identify and monitor the potential impacts of drilling on wetlands in the study area. Access road construction in and adjacent to wetlands could have both direct and indirect adverse impacts on wetlands. Although the construction activities would be short term, the regular maintenance of the ROW and the access roads would cause disturbance throughout the period of analysis. Cleared trees in wetland areas under alternative 2b would never be allowed to mature in the ROW; therefore, cleared wetland areas would not recover within the period of analysis to become a fully functioning forested wetland. Alternative 2b would have fewer impacts on forested wetlands as a result of tree removal compared to alternative 2; however, rare and unique communities and *Exceptional Value Wetlands* would be both directly and indirectly adversely affected under alternative 2b. When the adverse impacts on wetlands as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 2b would cross the same wetlands as alternative 2, including the same rare, high-quality wetlands, and would have the same types of adverse impacts on wetlands (i.e., clearing, ground disturbance and compaction, and changes in surface runoff from placement of fill material, all of which

could harm the wetlands by introducing invasive species or altering wetland hydrology). Alternative 2b would pose less risk of serious harm to wetlands than alternative 2 because it would affect less than half of the acreage of rare and unique wetland communities and *Exceptional Value Wetlands* and nearly half of the total acreage in wetlands. Alternative 2b would disturb much less acreage in Arnott Fen and the Hogback wetlands than would alternative 2, although any disturbance carries the risk of introducing invasive species which would be particularly serious given the rare nature of these wetlands. Alternative 2b would adversely impact the same acreage in the Van Campen wetlands which presents a high risk of degrading the functions and values of these rare, high-quality wetlands. As noted under alternative 2, cumulatively, wetlands are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. Considering the intensity of these adverse impacts in the context of wetlands laws and policies as well as the purpose and significance for which DEWA, APPA, and MDSR were established, alternative 2b would likely have significant adverse impacts on wetlands because although alternative 2b would affect less total acreage of wetlands, the adverse impacts would still have the potential to result in serious harm to rare and unique wetlands and *Exceptional Value Wetlands*.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Common to Action Alternatives 3 through 5

Restoration of the B-K Line: For alternatives 3, 4, and 5, the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be permanently removed and the ROW would be restored, as described in chapter 2. The ROW would be allowed to ultimately return to forested habitat over the long term, including wetlands that are currently maintained through vegetation clearing and tree removal. Approximately 8.4 acres of wetlands would be allowed to recover under these alternatives (includes wetland acreage in the existing B-K Line ROW at Arnott Fen, Hogback Ridge, Van Campen, and wetlands 42, 45, 46, 47, 49, and NWI-1) as shown in table 46. Spur roads would be required

on a temporary basis to remove the line and would affect between a maximum of 0.67 acre of wetlands (table 46). After the line is removed, the spur roads would be removed and returned to preconstruction conditions; there would be no permanent impacts on wetlands. No periodic maintenance would be required; after construction, wetland areas would no longer be impacted by tree removal from vegetation. Therefore, approximately 8.4 acres of wetlands in the B-K Line ROW would be expected to recover under alternatives 3, 4, and 5. Although the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be removed and revegetated, and all construction activities would be short term, the prior maintenance of the B-K Line ROW and the spur roads would cause disturbance to persist for the period of analysis. While the forested wetlands would not become a fully functioning in the period of analysis of this EIS, the process would begin and would be a beneficial impact.

Alternative 3

Numerous small emergent wetland areas exist in the existing transmission line ROW under alternative 3 but would generally not be affected by construction activities or vegetation maintenance because they are herbaceous plant species that are compatible with the applicant's specifications for vegetation clearing and control. Three wetland areas in the alternative 3 corridor would be adversely affected under this alternative:

- Wetland 8 is a small PEM wetland in the corridor that is vegetated predominantly with sphagnum moss. Adverse impacts would occur on 0.02 acre of wetland 8 because an access road would be constructed through the wetland. The hydrology of this wetland arises from a seep, so impacts on this wetland as a result of an alteration of hydrology from access roads and other construction activities in the wetland are possible due to ponding and/or impoundment of water. As stated under "Common to All Action Alternatives," site preparation and construction of the access roads as well as the use of heavy equipment would disturb the wetland functions and values.
- Wetland 10 is a PSS wetland in the corridor of alternative 3. Some of the plant species in the wetland are incompatible shrub / small tree species (red maple) that would be removed by hand clearing for construction and maintenance activities. Impacts from clearing shrubs / small trees would occur on 0.29 acre of the wetland.
- NWI-3 is a PFO wetland in the corridor of alternative 3 that supports evergreen and deciduous species. Approximately 1.43 acres of NWI-3 would be adversely affected as a result of vegetation clearing and tree removal. Removing trees in this wetland would convert it from a forested wetland to a scrub shrub and/or emergent wetland. Because this wetland is seasonally flooded, habitat conversion of this forested wetland could impact the hydrology of the wetland because fewer trees (biomass) would exist in this wetland.

In addition to wetland impacts in the alternative 3 corridor, wetland vegetation along the B-K Line corridor would be affected along the portion of alternative 3 from the Bushkill Substation to the western boundary of DEWA. Vegetation would be cleared and maintained, and access roads would be required to upgrade the line for alternative 3. Therefore, vegetation would be removed from wetland CC from an area in the ROW totaling approximately 0.21 acre. A very small portion (0.06 acre) of the proposed access road would be constructed in the 50-foot wetland AA buffer, and a very small portion (0.03 acre) would be constructed in the wetland CC buffer. There would be no direct impacts on wetland AA, but there would be indirect impacts to the wetland buffer as a result of construction of access roads adjacent to the wetland.

Under alternative 3, general impacts on wetland functions and values as a result of construction and removing shrubs/trees would be similar to those discussed in detail under alternative 2, although total impacts (acreage) would be far less. Overall, alternative 3 would adversely affect wetlands due to

vegetation clearing that would result in the loss of 1.93 acres of wetlands and due to the construction of access roads that would result in the loss of 0.02 acre of wetlands. Wetlands in rare or unique communities would not be affected under alternative 3. Indirect impacts on the 50-foot wetland buffer (0.09 acre) and temporary wetland impacts from spur roads (approximately 0.53 to 0.67 acre) would also occur under alternative 3. Approximately 8.4 acres of wetlands would be allowed to recover through the revegetation of the B-K Line. Although the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be removed and revegetated and all construction activities would be short term, the regular maintenance of the alternative 3 ROW and the access roads would cause disturbance to occur throughout the period of analysis. Therefore, the trees cleared under alternative 3 would never be allowed to mature in the ROW and would not recover during the period of analysis to return to a fully functioning forested wetland. Overall, alternative 3 would result in adverse impacts on wetlands.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 3 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

In the study area, alternative 3 would result in direct adverse impacts on forested wetlands through conversion to scrub shrub and/or emergent wetlands during ROW clearing and as a result of the construction of access roads in wetland areas. Overall, alternative 3 would cause adverse impacts on wetlands due to construction activities and vegetation clearing that would result in the loss of 1.93 acres of forested wetlands through conversion to scrub shrub and/or emergent wetlands during ROW clearing and due to the construction of access roads that would permanently impact 0.02 acre of wetlands. Wetlands in rare or unique communities or *Exceptional Value Wetlands* would not be permanently affected under alternative 3. When the adverse impacts on wetlands as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 3 would impact the least acreage of any of the action alternatives and would not permanently affect any rare and unique communities or *Exceptional Value Wetlands*. Alternative 3 would have adverse impacts to other wetlands such as loss of habitat functions due to removal of forest cover and possible changes in hydrology, and potential introduction of invasive species. However, the adverse impacts of alternative 3 would not likely be significant because of the relatively small area affected and because this alternative completely avoids rare, high-quality wetlands. Removal of the existing B-K Line under alternative 3 would have beneficial impacts by restoring rare and unique communities and *Exceptional Value Wetlands* to natural conditions, offsetting some of the adverse impacts to wetlands that would result from construction of the line along the alternative 3 route.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a

precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 4

Three wetland areas (wetland 1, wetland 2, and NWI-4) were identified in the study area for alternative 4 within the boundaries of DEWA and APPA.

Wetlands 1 and 2 are contiguous PFO wetlands in the proposed ROW. Approximately 1.77 acres of wetland 1 and 0.71 acre of wetland 2 would be adversely affected as a result of vegetation clearing and tree removal under alternative 4. Both wetlands support red maple, which is an incompatible shrub/tree species that would be cleared/removed. In addition, approximately 1.83 acres of wetland NWI-4 (a PFO/PSS wetland) would also be adversely affected by vegetation clearing and tree removal in the proposed ROW. Alternative 4 would adversely affect approximately 4.31 acres of forested wetlands (wetland 1, wetland 2, and NWI-4), not including wetlands affected by removal of the B-K Line from the Bushkill Substation to the western boundary of DEWA, as described below. In addition to vegetation clearing and tree removal, adverse impacts would occur on 0.01 acre of wetland 2 and 0.08 acre of wetland NWI-4 from access road construction activities in the wetlands. Other impacts from construction activities under alternative 4 would be similar to those discussed under "Common to All Action Alternatives," including specified BMPs to minimize impacts.

Additionally, the impacts to wetlands in the proposed ROW from the Bushkill Station to the western boundary of DEWA (along the B-K Line), would be the same as those described for alternative 3. Ultimately, 0.21 acre of wetland CC would be adversely affected by vegetation removal, and the construction of proposed access roads would affect 0.06 acre of the 50-foot wetland AA buffer and 0.03 acre of the wetland CC buffer.

General impacts on wetland functions and values as a result of construction and removing shrubs/trees for alternative 4 would be similar to those discussed in detail under alternative 2, although total impacts (acreage) would be less. Overall, alternative 4 would affect wetlands due to construction activities and vegetation clearing that would result in the total loss of 4.52 acres of wetlands through conversion to scrub shrub and/or emergent wetlands and due to access roads that would permanently affect 0.09 acre of wetlands. Wetlands in rare or unique communities would not be affected under alternative 4. Indirect impacts on the 50-foot wetland buffer (0.09 acre) and temporary wetland impacts from spur roads (approximately 0.53 to 0.67 acre) would also occur under alternative 4. Approximately 8.4 acres of wetlands would be allowed to recover through the revegetation of the B-K Line, which would move large infrastructure to the margins of DEWA. Although the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be removed and revegetated and all construction activities would be short term, the regular maintenance of the alternative 4 ROW and the access roads would cause disturbance to occur throughout the period of analysis. Therefore, the trees cleared under alternative 4 would never be allowed to mature in the ROW and would not recover during the period of analysis to become a fully functioning forested wetland. Overall, alternative 4 would result in adverse impacts on wetlands.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 4 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Inside the study area, alternative 4 would result in adverse impacts on wetlands due to conversion of forested wetlands to scrub shrub and/or emergent wetlands during ROW clearing and as a result of the construction of access roads in wetland areas. Overall, alternative 4 would affect wetlands due to construction activities and vegetation clearing that would result in the total loss of 4.52 acres of wetlands from conversion and due to access roads that would result in the loss of 0.09 acre of wetlands. Wetlands in rare or unique communities or *Exceptional Value Wetlands* would not be permanently affected under alternative 4. When the adverse impacts on wetlands as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 4 would result in changes in wetland functions and values by altering habitat types and may degrade some wetland functions by altering hydrology through construction activities. Alternative 4 would not permanently affect rare and unique wetland communities but would impact one *Exceptional Value Wetland* by converting existing vegetation to a different cover type, resulting in a change in functions and values that may affect the exceptional quality of the wetland. Thus, although alternative 4 would have considerably fewer adverse impacts than alternatives 2 or 2b, the adverse impacts of alternative 4 may also be significant because of the intensity of the impacts to an *Exceptional Value Wetland* when considered in the context of wetland protection laws and policies.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 5

Inside the study area, alternative 5 would follow the same route through DEWA and APPA as alternative 4, with the exception of the portion of the B-K Line from the Bushkill Station to the western boundary of DEWA. Alternative 5 would adversely affect approximately 4.31 acres of forested wetlands (wetland 1, wetland 2, and NWI-4). Additionally, the construction of access roads would adversely affect 0.09 acre of wetlands under alternative 5 (wetland 2 and NWI-4).

Overall, alternative 5 would affect wetlands due to construction activities and vegetation clearing that would result in the loss of a total of 4.31 acres of wetlands through conversion to scrub shrub and/or emergent wetlands and due to access roads that would permanently affect 0.09 acre of wetlands. Wetlands in rare or unique communities would not be affected under alternative 5. Although the B-K Line from the Bushkill Station to the eastern boundary of DEWA would be removed, all construction activities would be short term and 8.4 acres of wetlands would be allowed to recover. The regular maintenance of the alternative 5 ROW and the access roads would cause disturbance to occur throughout the period of analysis. Therefore, the trees cleared under alternative 5 would never be allowed to mature in the ROW, which would prevent these wetland areas from becoming a fully functioning forested wetland. Overall, alternative 5 would result in adverse impacts on wetlands.

Cumulative Impacts

Cumulative impacts on wetlands inside the study area from other past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on wetlands as a result of alternative 5 are combined with the other projects in the study area, an adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Overall, alternative 5 would result in adverse impacts on wetlands due to construction activities and vegetation clearing that would result in the total loss of 4.31 acres of wetlands through conversion to scrub shrub and/or emergent wetlands and due to access roads that would permanently affect 0.09 acre of wetlands. Wetlands in rare or unique communities or *Exceptional Value Wetlands* would not be affected under alternative 5. When the adverse impacts on wetlands as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 5 would affect slightly fewer acres of wetlands than alternative 4 but would result in similar changes in wetland functions and values by altering habitat types and may degrade some wetland functions by altering hydrology through construction activities. Alternative 5 would not affect any rare or unique wetland communities but, like alternative 4, would impact one *Exceptional Value Wetland* by converting existing vegetation to a different cover type, resulting in a change in functions and values that may affect the exceptional quality of the wetland. Thus, although alternative 5 would have slightly fewer adverse impacts than alternative 4 and considerably less adverse impacts than alternatives 2 or 2b, the adverse impacts of alternative 5 may also be significant because of the intensity of the impacts to an *Exceptional Value Wetland* when considered in the context of wetland protection laws and policies.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

VEGETATION

In this section, impacts on vegetation communities are evaluated. The overall analysis includes an evaluation of the potential for reduction of community diversity and vitality, as well as the potential for the spread of invasive species.

METHODOLOGIES

Maps showing vegetation cover in DEWA (PNHP 2006) were consulted, and vegetation studies (NPS 2011b) were conducted to identify baseline conditions and composition in the study area. The analysis of vegetation considered that changes in plant community size, integrity, or continuity could occur as a result of the implementation of various proposed activities. This analysis included an evaluation of the

potential for proposed actions to favor the establishment and/or expansion of invasive species. All proposed actions are described in detail in chapter 2, including initial vegetation clearing; construction, operation, and maintenance of the transmission line; and vegetation maintenance along the ROW.

Aerial images (ESRI 2008) were used to determine the following inside the study area: the acreages of maintained utility ROWs; the amount of forested habitat that would initially be removed to prepare for construction for the expanded ROWs; the amount of vegetation that would be permanently lost due to features of the transmission line; and the amount of mature forest that would be permanently replaced by maintained scrub shrub. Although mitigation measures would decrease the severity of impacts from construction, operation, and maintenance activities, plant communities would be subject to direct impacts, disturbance, and effects from invasive species.

Resource-specific context for assessing impacts to vegetation includes the following:

- Vegetation is part of the larger, continuous, diverse ecosystem within the Delaware River valley.
- Vegetation is the basis of the ecological community, meaning that other important resources depend on vegetation.

STUDY AREA

The study area for vegetation includes the ROW proposed for each alternative and any areas outside the corridors where necessary pulling and splicing sites, staging areas, and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, the indirect impacts on vegetation cannot be evaluated per alternative. The potential impacts outside the study area are generally addressed; however, further surveys may be needed prior to construction of the S-R Line.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks can affect native vegetation communities. Alterations to and permanent loss of vegetation communities can occur as a result of removal for construction, fire suppression, and the establishment or spread of nonnative, invasive species that compete with native plant species. These actions can alter the diversity and abundance of native vegetation communities and lead to loss of habitat continuity. Past, present, and reasonably foreseeable activities that have beneficial or adverse impacts on plants and vegetation communities inside and outside the study area are listed below and discussed under each alternative as applicable. A complete list of projects that may contribute to cumulative impacts both inside and outside the study area can be found in appendix H.

Projects Inside the Study Area

Inside the study area, projects that would result in adverse cumulative impacts on vegetation include the following visitor access, road, and utility projects: the New Jersey Swim Beach construction (construction of new facilities), the PADOT SR 2001 road project (road reconstruction), the US Route 209 rehabilitation and replacement of Toms Creek Bridge (road and bridge repair), the Appalachian Trail relocation near the Columbia Gas Pipeline Crossing (pipeline upgrade), the Metropolitan Edison enhanced vegetation management program (for transmission lines), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), Central Jersey Power and Light vegetation maintenance (for transmission lines), and the Northeast Supply Link Expansion (Palmerton Loop gas pipeline). Illegal activities such as off-road vehicle (ORV) use, flora collection, and woodcutting also adversely affect vegetation. These projects

and actions would result in adverse impacts on vegetation communities through ground disturbance, soil compaction, vegetation loss, alteration of habitat, fragmentation of habitat, alteration of the natural process of succession, potential colonization by invasive plant species, and the potential spread of invasive insect species. The full impact on vegetation and habitat from the Marcellus shale natural gas drilling is still unknown, but the project would likely cause the removal or disturbance of vegetation in some locations, depending on the area under development.

Projects inside the study area that could result in beneficial cumulative impacts on vegetation include construction projects, restoration projects, fire management, and agricultural leases. Construction projects (sustainable comfort stations, hazardous structure demolition/deconstruction, and Metropolitan Edison removal of unused power poles and transformers) would restore previously disturbed areas to natural conditions. Restoration projects inside the study area (the rehabilitation of Childs Park, the restoration of flood-damaged river campsites, the realignment of McDade Trail, parkwide invasive species control programs, the Wildlife Habitat Incentive Program, and important bird area / important mammal area [IBA/IMA] programs) would collectively work to restore areas to natural conditions, prevent further impacts on vegetation from human activity, preserve and improve critical habitat, and reduce the spread of invasive species. Agricultural permits could preserve open space and habitat. Prescribed burns could perpetuate native plant species, control invasive species, and maintain natural habitat. Additionally, several land protection programs could protect vegetation communities. The beneficial effects of many of the listed programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis: therefore, the level of benefit resulting from the implementation of any project is also variable.

Overall cumulative impacts on vegetation inside the study area from these projects/actions would be adverse.

Projects Outside the Study Area

Outside the study area, projects that would result in adverse cumulative impacts on vegetation include the following road and utility projects: the Marshalls Creek traffic relief project (new bypass route), the US Route 209 rehabilitation and replacement of Toms Creek Bridge (road and bridge repair), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), Marcellus shale natural gas drilling, the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), and the PFBC natural gas leasing and water access programs. Proposed residential and commercial developments in New Jersey and Pennsylvania would also cause adverse impacts on vegetation. The impacts on vegetation and habitat from the Marcellus shale natural gas drilling and the PFBC natural gas leasing and water access programs are still unknown.

Beneficial impacts on vegetation would result from the following projects: the DEWA prescribed-burn program, the Pennsylvania weed eradication program, the Wildlife Habitat Incentive Program, and IBA/IMA programs. Several land protection programs could provide beneficial impacts on vegetation. The implementation of these programs may be dependent on funding availability, which is uncertain and may vary from year to year throughout the period of analysis. As a result, the beneficial impacts expected from the implementation of these programs could also vary.

The impacts on vegetation from these projects would be the same as those described for projects inside the study area. Therefore, cumulative impacts on vegetation outside the study area would be adverse.

IMPACTS OF THE ALTERNATIVES ON VEGETATION

The construction and operation of the S-R Line could produce impacts on vegetation communities including the removal of vegetation, the maintenance of vegetation along the proposed ROW, and the facilitation of the establishment and spread of invasive species. Forest fragmentation is also a potential impact, and it is discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section.

Common to All Alternatives

Vegetation Maintenance: PPL and PSE&G, as separate utilities operating in different states, have separate vegetation management plans; however, vegetation management for both utilities would occur annually, at minimum. Vegetation maintenance sustains habitat in the existing ROW as scrub shrub using selective clearing. Additionally, vegetation maintenance would include removal of danger trees that could interfere with the transmission lines. The details of the vegetation management plans and techniques for clearing vegetation are explained in chapter 2. The NPS considers the applicant's current vegetation management plans to be insufficient, and the NPS would require a NPS-specific, NPS-approved vegetation management plan. The impacts of vegetation maintenance are discussed under each alternative.

Invasive Species: Under all alternatives, invasive plant and wildlife species have the potential to spread as a result of vegetation removal and disturbance. Additionally, new invasive species may colonize an area where they were previously absent. Across all 50 states, invasive plants spread at an estimated annual rate of 14 million acres (NWRA 2002, 4). In western federal lands, conservative estimates of aggregate invasive plant spread range from 10% to 15% per year (Asher and Dewey 2005.). The colonization and spread of invasive plant species causes considerable problems, including competing with native species, contributing to species extinctions, altering the structure of natural plant communities, and disrupting ecosystem functions.

Before the initiation of construction, the applicant would design management guidelines for invasive plant species to be included in their vegetation management plans (explained in detail in appendix F). These guidelines, which would include regular monitoring and treatment of key invasive plant species, would also require approval by the NPS prior to implementation. The invasive species management guidelines included in the applicant's vegetation management plans would be the primary mechanism for preventing and managing the spread of invasive plant species in and adjacent to the ROW.

In addition to the applicant's vegetation management plans, the Eastern Rivers and Mountains Network has an early detection monitoring program to provide early identification and treatment of invasive species before they become widespread in a park, as described in the "Invasive Plant Species" section of chapter 3.

Invasive plant species are currently present in the existing ROWs and surrounding habitats of each alternative alignment. The invasive species present and the abundance of those species vary depending on the conditions in the vegetation communities along the ROW of each alternative route. Revegetating cleared and disturbed areas with native plant seeds, continued monitoring through the applicant's vegetation management plans, and to a lesser degree, the Eastern Rivers and Mountains Network early detection program would help manage the spread of invasive species in cleared and disturbed areas; however, the vegetation communities would be adversely affected by the proposed actions.

Three invasive, nonnative terrestrial insect species have the potential to affect vegetation communities in the study area: hemlock woolly adelgid, European gypsy moth, and emerald ash borer. The hemlock wooly adelgid and the European gypsy moth are present within the study area; therefore, it is not likely that these species would be spread by maintenance activities. All life stages of the emerald ash borer, but

especially egg and larval stages, could be inadvertently spread during construction and maintenance activities, resulting in opportunities for new infestations throughout the study area. Mechanisms that could contribute to the spread of invasive insects include ground disturbance, mulching, the transport of mulch for use in other areas, and the transport of equipment used during vegetation removal. Trees that remain in place but are injured during construction activity could become more susceptible to new infestations of nonnative, invasive insect species. Management programs in place to minimize damage from infestations, such as the Eastern Rivers and Mountains Network early detection monitoring program, would reduce the adverse effects of nonnative, invasive insects; however, vegetation communities would be indirectly affected because of the periodicity and varying intensity of infestations.

Mitigation Measures: Mitigation measures would reduce impacts from construction, operation, and maintenance activities and are described in chapter 2 and appendix F. None of the mitigation measures would eliminate impacts on vegetation; however, they would reduce the impacts on vegetation communities by decreasing the loss of native vegetation, controlling the spread of invasive species, protecting native vegetation and sensitive communities, and restoring disturbed areas after construction.

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. These counties are largely undeveloped and contain a variety of habitats. Habitat types that could be encountered in these counties include forest and woodland vegetation communities, riparian and wetland systems, and land altered by human activities such as development or agriculture. These habitat types are described in detail according to dominant vegetation characteristics in the "Vegetation" section of chapter 3.

The clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described for inside the study area; however, the direct impacts outside the study area cannot be determined, as described in the introduction of this chapter. In addition, specific resource impacts outside the study area cannot be identified until the route is chosen by the applicant. Once this decision is reached, additional surveys would be required to determine the type of vegetation that would be affected along the selected route.

Vegetation communities outside the study area would be adversely affected by vegetation clearing, construction, the operation and maintenance of the transmission line, vegetation maintenance, and the potential spread of invasive species. Indirect impacts may vary in intensity depending on the location, the habitat type, the condition of the existing vegetation, and the extent of activity.

Cumulative impacts on vegetation outside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on vegetation as a result of activities outside the study area are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 1: No Action

All impacts on vegetation under alternative 1 would be associated with vegetation maintenance activities along the existing B-K Line ROW. Selective clearing to maintain vegetation would continue under alternative 1. Based on aerial photographs (ESRI 2008), the existing ROW ranges from approximately 80 to 100 feet wide and includes 84 acres in the study area, with 63 acres inside NPS boundaries; this area would continue to undergo selective clearing under alternative 1. The full impact of danger tree removal is uncertain because the number and location of danger trees cannot be estimated. Maintenance activities, including the removal of danger trees, would disturb vegetation, including vegetation in rare and unique communities. Vegetation maintenance by selective clearing would retain compatible species and remove

only those that would pose a risk to the security of the transmission lines; therefore, maintenance would not have an overall effect at the population level or on the viability of the plant communities.

Ground disturbance from maintenance activities, especially tree removal, could facilitate the spread of invasive plant species. Currently, the invasive species in the ROW are uncontrolled and spreading. The applicant would monitor invasive plant species through the NPS-approved vegetation management plan (described in appendix F). Overall, the impacts on vegetation under alternative 1 from vegetation maintenance, including tree removal, and the spread of invasive species would be adverse.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on vegetation as a result of alternative 1 are combined with the other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Under alternative 1 inside the study area, vegetation maintenance activities would have localized effects on vegetation but the functionality of the plant communities would not be affected. Additionally, indirect impacts would result from artificially maintaining scrub shrub habitat in the parks, which is inconsistent with NPS protection of natural, scenic, and recreational resources. Adverse impacts would result from the continued operation of the existing transmission line due to vegetation maintenance and from the spread of invasive plant species. The effects of past, present, and reasonably foreseeable projects, when combined with the adverse impacts on vegetation under alternative 1, would result in adverse cumulative impacts on vegetation inside the study area.

Under alternative 1, the only change would be the result of the applicant's new vegetation management standards, leading to more clearing of vegetation within the ROW than is the case now or has been the case historically. The majority of the adverse impacts of alternative 1 would be confined to the limits of the present ROW. However, under current ROW vegetation management activities the applicant is cutting danger trees. The applicant defines danger trees as those that, in falling, would either strike the conductor or pass within the minimum conductor clearance, which is 6 feet for 230-kV transmission lines and 10 feet for 500-kV transmission lines (PPL 2011, 7). The applicant contends that they can cut danger trees on federal land outside their deeded right. Disagreement over this issue between the NPS and PPL resulted in a court settlement in August 2010. This controversy is not, strictly speaking, a public one over the effects of the applicant's actions, but is an area of disagreement that would remain unresolved under alternative 1. Many of the adverse impacts and possibly the controversy associated with danger tree cutting may be reduced or eliminated with the development of a park-specific, NPS-approved vegetation management plan. Thus, while alternative 1 would result in adverse impacts on vegetation associated with the continued operation and maintenance of the existing B-K Line, the intensity of these impacts considered in the context of vegetation protection and management would likely not be significant.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives would involve the removal of all or a portion of the B-K Line, as discussed in chapter 2. For all action alternatives, the B-K Line structures would be removed but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require constructing access roads (either permanent or temporary, depending on the alternative). The removal of

the B-K Line would require constructing access roads, wire pull sites, and the removal of the line as described in chapter 2. Because access roads would also be required for the construction and long-term maintenance of the new line, adverse impacts from removing the line would be the same as (or less than) the impacts discussed for construction of the S-R Line.

Vegetation Clearing: For the analysis of impacts on vegetation, it was assumed that a 350-foot corridor would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2, 3, 4, and 5. For alternatives 2, 3, 4, and 5, the corridor would be cleared 175 feet from the centerline of the existing ROW to either side. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights.

In addition to vegetation clearing inside the ROW, areas outside of the ROW would also need to be cleared for all action alternatives to construct the access roads, spur roads, and pulling and splicing sites.

Areas cleared for access roads (inside and outside the ROW) and tower foundations (inside the ROW) would be maintained permanently and would result in a permanent loss of vegetation. All other cleared areas would be seeded after construction with an NPS-approved conservation seed mixture appropriate to the local conditions. The area within the ROW maintained for operation is less than that which would be cleared for construction. Areas both inside and outside the ROW that do not need to be maintained for operation of the S-R Line would be allowed to succeed to forested area over time. Because mature forest removed for construction would not be replaced within the 15-year analysis period covered by this EIS, the impacts would be considered permanent for the analysis in this EIS.

The successful restoration of the land temporarily cleared and/or disturbed for construction but not needed for the operation of the S-R Line could be hindered by impacts on soils sustained during the construction of the S-R Line, despite the regrading of the surface soils. The use of heavy construction equipment and the construction and use of access roads would compact the underlying soil. Compaction can cause damage to soil structure, which determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity and growth (UM 2001, 1). Additionally, the removal of near-surface soils may have unfavorable consequences on productivity, adversely affecting the successful revegetation of disturbed areas. Monitoring and maintenance of revegetated areas under the applicant's vegetation management plans would need to be implemented to ensure that vegetation restoration is successful.

The impacts from vegetation clearing are discussed for each alternative because the amount of clearing for each is different.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect vegetation include the construction of access roads, spur roads, tower foundations, crane pads, wire pull locations, pulling and splicing sites, and staging areas. Construction of these components would result in temporary or permanent loss of vegetation, as described above in "Vegetation Clearing."

Alternative 2

Inside the study area, clearing and construction activities along the alternative 2 alignment would result in ground disturbance, soil compaction, and the physical removal of vegetation. Vegetation clearing would be nearly complete in the 350-foot corridor, with exceptions in sensitive areas such as wetlands and the Delaware River riparian corridor, which would be avoided to the extent feasible (PPL and PSE&G

2008, 7). Vegetation clearing would be implemented as described in the "Vegetation Clearing" section of chapter 2. Once the vegetation is cleared, temporary and access roads, tower foundations, crane pads, and pulling and splicing sites would be constructed.

The approximate acreages of vegetation that would be affected by the construction of the S-R Line in the study area for all the action alternatives are presented in table 47. Approximately 240 acres would be cleared initially in the ROW under alternative 2, with approximately 129 acres of this identified as mature forest. Pulling and splicing sites would be constructed outside the 350-foot corridor, resulting in approximately 22 acres of forest cleared for these sites and the associated spur roads; trees surrounding the pulling and splicing sites would be trimmed but not removed (unless unavoidable) to allow for construction activities. Approximately 9.6 acres of vegetation would be permanently lost through the development of access roads under alternative 2. In areas of steep topography in Pennsylvania, access roads would extend outside the proposed ROW into forested areas due to the topography. The placement of the access roads outside of the ROW would also help to reduce impacts to sensitive resources, such as wetlands (e.g., Arnott Fen) and waterways (e.g., Van Campen Brook). Approximately 6.2 acres of access roads would be inside the 350-foot corridor and 3.4 acres would be outside the corridor (see figures 28 and 29 in chapter 3).

Inside the study area, 84 acres of scrub shrub habitat are currently maintained in the existing B-K Line ROW to avoid contact with the transmission lines. Under alternative 2, the expanded ROW would be maintained at an operational width of 200 feet, increasing the acreage of maintained scrub shrub habitat to approximately 129 acres. The area of maintained scrub shrub within NPS boundaries would increase approximately 43% (from 63 acres to 101 acres). Occasionally, trees in the ROW and danger trees outside the ROW would be removed, which would add to the area of maintained habitat. This maintenance program would result in adverse impacts on the 45 acres of previously forested area (38 acres of which is located inside the parks' boundaries) because the maintenance would prevent the vegetation from growing back to its original state. When the loss of forest from the expanded ROW is combined with the loss of forest from construction of access roads outside the ROW, 48 acres of forest would be permanently lost under alternative 2. Vegetation clearing and construction activities in the study area under alternative 2 would result in a net loss of vegetation. The effects from clearing and construction activities would be measurable and perceptible, and some reduction in the abundance, diversity, and quality of native vegetation would occur.

Alternative 2 would result in approximately 5.4 miles of disturbed land in the ROW and an additional 1.9 miles of disturbed area along the access roads outside the ROW. The expansion of the ROW would expose formerly interior trees and plants to edge conditions. This vegetation would be exposed to new conditions such as an increase in sunlight and temperature, especially along an east–west-oriented ROW that would be exposed to hot afternoon sun (Manitoba Hydro 1995, 13). The composition of vegetation along the edge would change to include more sun-tolerant species, which would include invasive species such as multiflora rose, and many invasive species that tolerate a wide range of conditions would be able to spread into shaded areas of forest. Additional edge habitat would be created by the construction of the access roads, and vegetation communities along the roads could be modified in the same manner as the vegetation in the ROW. Invasive species are often strongly associated with access roads (Mortensen et al. 2009). Seeds can be spread long distances during the construction and maintenance of access roads and vegetation maintenance activities. With the implementation of the vegetation management plan for plants and mitigation measures to protect against the spread of invasive insect species as described in chapter 2 and appendix F, the impacts on vegetation from invasive species under alternative 2 would be minimized.

TABLE 47: APPROXIMATE ACREAGES OF VEGETATION AFFECTED BY CONSTRUCTION AND OPERATION OF THE S-R LINE IN THE STUDY AREA

Impacts	Alternatives					
	1	2	2b	3	4	5
Acres of vegetation loss from expanding the ROW for construction (including area currently maintained)[a]	0	240	144	313	113	74
Acres of mature forest cleared in the expanded ROW	0	129	42	204	70	44
Acres of permanent vegetation loss from construction of access roads inside the ROW corridor	0	6.2	4.9	4.7	2.0	1.4
Acres of permanent vegetation loss from construction of access roads outside the ROW corridor	0	3.4	4.7	1.6	0.9	0.3
Acres of impacts from construction of pulling and splicing sites outside the ROW corridor[b]	0	22	22	99	55	55
Acres of forest in the ROW maintained as scrub shrub over the long term in the study area[c]	0	45	23–37	85–159	31–59	25–45
Total acres in the ROW maintained as scrub shrub in the study area over the long term[c]	84	129	107–121[d]	156–230	66–94	44–64
Acres of forest in the expanded ROW maintained as scrub shrub over the long term in NPS lands in the study area[c]	0	38	18–29[d]	66–117	22–41	16–28
Total area in the expanded ROW maintained as scrub shrub in NPS lands in the study area over the long term[c]	63	101	81–92[d]	94–145	42–61	30–42
Total acres maintained as scrub shrub in NPS lands in the study area over the long term with restoration of a portion of the B-K Line[e]	N/A	N/A	N/A	Increase in maintained scrub shrub of 41–92 acres	Decrease of 11 acres to increase of 8 acres in maintained scrub shrub	Decrease in maintained scrub shrub of 11–23 acres

a. The ROWs for alternatives 2, 3, 4, and 5 would be cleared to 350 feet and the alternative 2b ROW would be cleared up to 150 feet (100 feet where constrained by easement rights).

b. This total does not include vegetation removed for spur roads. The length and location of spur roads cannot be determined at this time. The area of vegetation removed from pulling and splicing sites is estimated based on the locations of the alignments where angles occur. Two sites are needed per angle and each site would be 400 feet × 600 feet outside the ROW.

c. The ROWs for alternatives 2b, 3, 4, and 5 would be maintained at 200 to 300 feet (except where the applicant's deeded rights restrain the ROW to a narrower width under alternative 2b), resulting in a range of potential impacts on vegetation. The applicant states that alternative 2 could be constructed within 200 feet; therefore, the impacts on vegetation are limited to 200 feet as the operational width.

d. Alternative 2b would be constructed within the applicant's deeded property rights. A 0.75-mile portion of the alignment is limited to 100 feet wide. Danger trees would be removed outside of the ROW in this area. The amount of tree removal cannot be estimated at this time; however, the amount of maintained scrub shrub is expected to increase.

e. Under alternatives 3 through 5, approximately 53 acres of the existing ROW along the B-K Line within park boundaries would be restored.

Numerous rare and unique communities are present in the alternative 2 alignment and would be subject to vegetation clearing and permanent alteration of habitat, and in several instances, access roads would extend directly into sensitive habitats. Impacts on sensitive resources are discussed in the "Rare and Unique Communities" section of this chapter.

After construction, those areas needed for construction but not for operation, and the rest of the new ROW would be seeded with an NPS-approved conservation seed mixture appropriate to the region unless otherwise specified by the NPS (PPL and PSE&G 2008, 8). The areas outside the operational ROW would be allowed to succeed to natural conditions; however, the full restoration to mature forest would not be complete within the analysis period of this EIS (15 years).

Inside the study area, alternative 2 would result in a net loss of vegetation, would increase the amount of habitat artificially maintained as scrub shrub, would alter habitat types in rare and unique communities, and would facilitate the spread of invasive species. Alternative 2 would result in the permanent loss and alteration of forested habitat. Overall, the actions of alternative 2 would have adverse impacts on vegetation in the study area.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. The adverse impacts on vegetation as a result of alternative 2, when combined with the other projects inside the study area, would be expected to result in an overall adverse cumulative impact. Alternative 2 would not alter the level of impact.

Conclusion

Under alternative 2, adverse impacts on vegetation inside the study area would result from vegetation clearing, the construction of the proposed double 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. Collectively, these impacts would reduce the abundance, diversity, and quality of native vegetation. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. However, the areas maintained by the applicant would be monitored and treated for invasive species. When the adverse impacts from alternative 2 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, the cumulative impacts on vegetation would be adverse.

Alternative 2 would cross in the center part of DEWA, including the MDSR. In general, this area is one of the most undeveloped areas of the park, containing large swaths of contiguous mature forest with few manmade intrusions. This part of the park is a particularly sensitive area because it contains high concentrations of many important and unique natural features including the Arnott Fen, the Delaware River riparian corridor, eastern hemlock forests, the Hogback Ridge, the Kittatinny Ridge, and the Van Campen Brook riparian area. The amount of clearing required under alternative 2 to construct and operate the new line would reduce the abundance, diversity, and quality of native vegetation in and around the alignment. There is a high risk of introducing and spreading invasive species although the risk can be reduced through the implementation of monitoring and controls. When considered in the context of NPS policies for protection and management of vegetation in the parks, the adverse impacts of alternative 2 on vegetation would likely be significant because of the location and quality of the resource and because converting one native habitat type into a different habitat type and artificially maintaining it for purposes that are not related to park purpose and significance is contrary to what the parks strive to achieve in managing vegetation resources.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2 would be significant.

Alternative 2b

The types of impacts in the study area along the alternative 2b alignment would be the same as those identified for alternative 2: ground disturbance, soil compaction, and the physical removal of vegetation. Vegetation clearing would be nearly complete in the existing ROW, with exceptions in sensitive areas, which would be avoided to the extent feasible (PPL and PSE&G 2008, 7).

Approximately 144 acres of vegetation would be cleared in the existing ROW under alternative 2b in preparation for construction. Included in this total is approximately 42 acres of mature forest. Approximately 22 acres of forest would be cleared for pulling and splicing sites that would be constructed outside the ROW. Additionally, 9.6 acres of vegetation would be permanently removed for the construction of the access roads. Approximately 4.9 acres of access roads would be constructed in the ROW corridor, and 4.7 acres would be outside the corridor (see figures 30 and 31 in chapter 3).

Inside the study area, 84 acres of scrub shrub habitat are currently maintained in the existing B-K Line ROW. Under alternative 2b, the final width of the ROW would be maintained at 200 to 300 feet, except where the applicant’s deeded property rights restrain the ROW to a narrower width. This operational width would maintain approximately 107 to 121 acres of vegetation as scrub shrub habitat with 81 to 92 acres of this inside NPS boundaries. Under alternative 2b, approximately 23 to 37 acres of currently mature forest would be converted into artificially maintained scrub shrub habitat; 18 to 29 acres of which is located within NPS boundaries. Additionally, the removal of danger trees is a part of the applicant’s vegetation maintenance plans. The loss of mature forest through the removal of danger trees is not accounted for because the loss cannot be accurately estimated. Approximately 0.75 mile of the existing ROW in Pennsylvania is 100 feet wide. It is anticipated that danger tree removal would occur in this area, which includes the heavily forested Hogback Ridge. Construction activities and the removal of danger trees in the study area along the alternative 2b alignment would result in a net loss of vegetation,

including rare and unique communities. The widening of the ROW to the deeded width and removal of danger trees along 5.4 miles inside the study area and construction of 2.6 miles of access roads outside of the ROW would expose formerly interior trees and plants to edge conditions, as discussed for alternative 2.

After the double 500-kV transmission line is constructed, the crane pads, pulling and splicing sites, and access roads would be removed and access roads would be reduced to 15 feet wide; these areas and the rest of the new ROW would be seeded with an NPS-approved conservation seed mixture containing native plant species appropriate to the region unless otherwise specified by the NPS (PPL and PSE&G 2008, 8). Due to soil compaction incurred during construction activities as described in the "Common to All Action Alternatives" section, restoration in these disturbed areas could be difficult despite tilling/regrading of the surface soils and would require monitoring as described in the applicant's vegetation management plans to ensure successful growth. As stated for alternative 2, the spread of invasive plant species can increase as a result of changes in vegetation composition after site clearing and access road construction and use. Although mitigation measures would be employed, there is a potential to spread invasive species along the disturbed land in the ROW (approximately 5.4 miles) and along the access roads (approximately 2.6 miles outside the ROW).

Fire hazards would exist from the operation of the double 500-kV transmission line in the existing 100-foot ROW. The 100-foot ROW is insufficient to meet the National Electric Safety Code (NESC) requirements (DEA 2010b), which state that transmission lines must not only be designed to provide adequate vertical clearance, but also to allow for adequate horizontal clearance at the edge of the ROW during high wind conditions for electrical and safety considerations. The safety clearance required around the conductors is determined by normal operating voltages, conductor temperatures, short-term abnormal voltages, windblown swinging conductors, and contamination of the insulators. Conductor displacement as a result of high winds is termed "conductor blowout." The minimum horizontal clearance to the edge of the ROW under high wind conditions to minimize the risks associated with conductor blowout was determined to be greater than 100 feet. Therefore, alternative 2b would not comply with ROW width standards for conductor blowouts. If trees are not removed beyond the 100-foot ROW, the double 500-kV transmission line could create fire hazards, especially if a conductor blowout occurs. Fires can increase the probability of recurring fires and impact biodiversity. After a fire, the dead trees fall and the remaining vegetation is open to direct sunlight, causing it to dry, thus increasing the chance of subsequent fires. Vegetation that is harmed during forest fires is more susceptible to colonization and infestation by insects, which could further disrupt the vegetation community (Nasi et al. 2002, 36).

Inside the study area, alternative 2b would result in a net loss of vegetation including areas of mature forest, would alter habitat types in rare and unique communities, and would facilitate the spread of invasive species. An unknown number of mature trees would be identified as danger trees and would be removed to ensure the reliability of the transmission line. In addition, the final operational width of the ROW is not in compliance with the NESC requirements and could increase the probability of fires. Overall, the actions of alternative 2b would have adverse impacts on vegetation in the study area.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. The adverse impacts on vegetation as a result of alternative 2b, combined with the other projects inside the study area, would be expected to result in an overall adverse cumulative impact. Alternative 2b would not alter the level of impact.

Conclusion

Under alternative 2b, adverse impacts on vegetation would result from vegetation clearing, the construction of the proposed double 500-kV transmission line, the potential spread of invasive species, and vegetation management (including the removal of danger trees) for the operation of the S-R Line. Collectively, these actions would reduce the abundance, diversity, and quality of native vegetation. Impacts would result from artificially maintaining scrub shrub habitat in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. Additionally, maintaining a portion of the ROW at a width of 100 feet would increase the risk of fire from the conductors coming in contact with vegetation in high wind situations. When the adverse impacts from alternative 2b are combined with the adverse impacts from past, present, and reasonably foreseeable projects, the cumulative impacts on vegetation would be adverse.

Although alternative 2b would result in fewer acres of permanent vegetation lost than would alternative 2, alternative 2b would cross the same high-quality, sensitive vegetation resources as alternative 2 and would have a high risk of adverse impacts from fire. Therefore, for these reasons and the reasons outlined under alternative 2, alternative 2b would likely result in significant adverse impacts on vegetation.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Common to Alternatives 3, 4, and 5

Restoration of the B-K Line: For alternatives 3, 4, and 5, the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be permanently removed and the ROW would be restored, as described in chapter 2. These alternatives would restore the forest along the B-K Line (53 acres total) and create larger patches of contiguous habitat, reducing fragmentation in the core of the park. Vegetation in the existing ROW would be cleared and spur roads would be constructed for the removal process. Inside the existing ROW, approximately 53 acres of land within NPS boundaries would

be cleared of vegetation. An additional 1.1 to 1.5 acres of vegetation within NPS lands but outside the ROW would be cleared to construct the access roads. Removal of the conductors and structures and chipping the foundations below ground surface would cause ground disturbance. The use of heavy machinery during all these activities would cause further ground disturbance and soil compaction.

Following deconstruction of the B-K Line, approximately 53 acres of land disturbed by clearing and construction of the spur roads and the ROW would be restored to original conditions to the greatest extent possible. These areas would be prepared by disking or tilling as needed to mitigate soil compaction. Following soil preparation, the areas would be seeded with an NPS-approved conservation seed mixture for native species appropriate to the region and allowed to succeed naturally into forested habitat over the long term; however, soil compaction could hinder the restoration process and complete restoration of the ROW into mature forest would not occur within the period of analysis of this EIS. Although the vegetation communities would not return to mature conditions in the period of analysis of this EIS, the process would begin over 53 acres of previously disturbed area and would counteract the effects of clearing and construction under alternatives 3, 4, and 5.

Alternative 3

Impacts on vegetation in the study area would result from ground disturbance, soil compaction, the physical removal of vegetation, and the potential spread of invasive species along the alternative 3 alignment. In preparation for construction, approximately 313 acres of vegetation would be removed in the expanded ROW; approximately 204 acres of this would be mature forest (table 47). Approximately 70 of the 313 acres of vegetation removed would be from within the boundaries of Worthington State Forest, and 51 of those acres would be mature forest. An additional 99 acres of mature forest would be cleared for pulling and splicing sites and spur roads outside the 350-foot corridor, and trees surrounding the pulling and splicing sites would be trimmed as necessary to allow for construction activities.

Inside the study area, approximately 65 acres of scrub shrub habitat are currently maintained in the existing ROW for alternative 3, including 31 acres within NPS boundaries. The expanded ROW would be maintained at a width of 200 to 300 feet, increasing the acreage of maintained scrub shrub habitat to approximately 156 to 230 acres, including approximately 66 to 117 acres of currently forested area. The area of maintained scrub shrub within NPS boundaries would be increased from 31 acres to 94 to 145 acres. Access roads created in the New Jersey portion of the alternative 3 route would extend outside the proposed ROW into forested areas (see figure 32 in chapter 3) to accommodate large vehicles on steep terrain. Approximately 4.7 acres of the access roads would be located within the 350-foot corridor and 1.6 acres would be located outside the corridor. Approximately 85 to 159 acres of mature forest would be permanently altered and maintained as scrub shrub habitat after construction of the transmission line under the applicant's vegetation maintenance plans. With the loss of mature forest from the construction of the access roads outside the ROW, the total acreage of forest permanently altered to scrub shrub would increase by about 2 acres to 87 to 161 acres.

After construction, the crane pads, pulling and splicing sites, and spur roads would be removed and access roads would be reduced to 15 feet wide. These areas, those needed for construction but not for operation, and the rest of the new ROW would be seeded with an NPS-approved conservation seed mixture appropriate to the region unless otherwise specified by the NPS (PPL and PSE&G 2008, 8). The restoration of areas used only for construction would allow 50 to 150 feet of the cleared ROW to return to natural conditions. Under alternative 3, the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be decommissioned and removed, allowing the original corridor to succeed naturally into mature forest in the long term. Approximately 53 acres along the B-K Line within park boundaries would be restored. The restoration of these areas would result in a net increase in maintained scrub shrub of 41 to 92 acres under alternative 3. The full restoration to mature forest though the

restoration could be hindered by soil compaction and loss of near-surface soils, as described for alternative 2. Ultimately, the restoration of the B-K Line ROW and of areas temporarily disturbed during construction would not be complete within the analysis period of this EIS; however, the restoration process would begin, which would be valuable for the vegetation communities.

As stated for alternative 2, the spread of invasive species can increase from changes in vegetation composition after site clearing and access road construction and use. Although mitigation measures would be employed, alternative 3 would create a corridor approximately 6.9 miles long and approximately 200 to 300 feet wide that would contain newly disturbed land, which may provide favorable conditions for invasive species to spread. Additionally, new edge habitat would be created along the ROW and the 0.9 mile of access roads outside the ROW; edge effects would be the same as those described for alternative 2.

Inside the study area, alternative 3 would result in a net loss of vegetation, would increase the amount of habitat artificially maintained as scrub shrub, would alter habitat types in rare and unique communities, and would potentially facilitate the spread of invasive species over 6.9 miles. The alternative 3 alignment contains sensitive habitats that would be affected by the construction and operation activities of alternative 3; however, the variety and abundance of these habitats is less than those in the alignment for alternatives 1, 2, and 2b. Overall, the actions of alternative 3 would have adverse impacts on vegetation in the study area.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the adverse impacts on vegetation as a result of alternative 3 are combined with other projects inside the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Under alternative 3, adverse impacts on vegetation inside the study area would result from vegetation clearing, the construction of the proposed double 500-kV transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. These changes would result in a decline in the functionality of the plant communities by reducing biodiversity and possibly altering species composition. Adverse impacts would also result from artificially maintaining scrub shrub habitat in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. The removal of the existing B-K Line would reduce the net area of vegetation lost and maintained as scrub shrub; however, the full restoration of the area would not be complete in the period of analysis. When the adverse impacts from alternative 3 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, the cumulative impacts on vegetation would be adverse.

Alternative 3 would result in the greatest amount of permanent vegetation loss of any of the action alternatives, including the greatest loss of mature forest and conversion to scrub shrub cover. The clearing of vegetation and transition from mature forests to artificially maintained shrub scrub lands increases the potential for the spread of invasive species within the ROW and surrounding area and the parks. Mitigation measures would be implemented to help control the introduction and spread of invasive species but the extent of the clearing required for alternative 3 would greatly increase the risk that mitigation would be unsuccessful and invasive species would be spread into new areas, further impacting the vegetation communities within and surrounding the cleared areas. The restoration of the existing B-K Line would, in the long-term, have a beneficial impact on the region by restoring a large forested block

through a natural and wild area of the Middle Delaware River Valley; however, this beneficial impact does not outweigh the adverse impacts. Considered in the context of NPS policies for protection and management of vegetation in the parks, alternative 3 would likely have significant adverse impacts on vegetation.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 4

Vegetation clearing inside the study area in preparation for the construction of the S-R Line under alternative 4 would remove approximately 113 acres of vegetation initially in the expanded ROW; approximately 70 acres of this would be mature forest (table 47). An additional 55 acres of forest would be cleared for pulling and splicing sites and spur roads outside the 350-foot corridor, and trees surrounding the pulling and splicing sites would be trimmed to allow for construction activities as necessary.

Because alternative 4 is located along the edge of DEWA, the forests are more fragmented than those along other alternatives. Forested areas are bordered by developed areas, paralleled by another existing ROW, and bisected by existing paved roads. Overall, the existing habitat is lower quality and contains less value than the habitat along the alignments for alternatives 1, 2, 2b, and 3.

Vegetation removal and the expansion of successional habitat in the proposed ROW would occur and would permanently alter habitat along the route. Approximately 31 to 59 acres of former mature forest would be maintained as scrub shrub habitat following construction of the S-R Line, and approximately 22 to 41 acres of this would be within DEWA and APPA boundaries. Permanent vegetation loss would occur in the ROW where tower foundations and access roads are constructed. Approximately 2.9 acres of vegetation would be permanently eliminated by the access roads under alternative 4. In some areas inside the study area, access roads would extend outside the proposed ROW into forested areas (see figure 33 in chapter 3). Approximately 2.0 acres of the new access roads would be within the 350-foot corridor and 0.9 acre would be outside the corridor. With the clearing required for permanent access roads outside the ROW, the total amount of mature forest lost would increase to 32 to 60 acres.

Inside the study area, 35 acres of scrub shrub habitat are currently maintained within the existing ROW. Vegetation maintenance would result in adverse impacts on the 31 to 59 acres of previously forested area, because the maintenance would not allow trees to grow to maturity. Impacts would also result from the occasional removal of trees in the proposed ROW and danger trees outside the ROW. Under alternative 4, the expanded ROW would be maintained at a width of 200 to 300 feet, increasing the acreage of maintained scrub shrub habitat to approximately 66 to 94 acres, with 42 to 61 acres within NPS boundaries.

Inside the study area, alternative 4 would traverse 2.3 miles. Widening of the ROW would create new edge habitat, potentially resulting in a change in vegetation composition and the spread of invasive species. The same effects would be seen along the 0.9 mile of access roads outside of the ROW.

After construction, crane pads, pulling and splicing sites, and spur roads would be removed and permanent access roads would be reduced to 15 feet wide. These areas would be restored by tilling or regrading the soils and seeding with an NPS-approved conservation seed mix, as previously described. Additionally, the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be decommissioned and removed and this area would also be restored, allowing the corridor to succeed naturally into mature forest in the long term. Approximately 53 acres within NPS boundaries would be restored, resulting in a potential range in conditions from a net increase in maintained scrub shrub of 8 acres to a net decrease in maintained scrub shrub of 11 acres, based on a ROW width of 200 to 300 feet. All areas of restoration would be subject to impacts from soil compaction and the loss of surface soils, and the restoration would not be complete within the analysis period of this EIS.

Clearing, construction, and vegetation maintenance activities that would remove existing vegetation and disturb ground and soil surfaces could spread invasive species. As stated for alternative 2, the spread of invasive species can increase from disturbance from site clearing and access road construction and use. Although mitigation measures would be implemented, alternative 4 would result in approximately 2.3 linear miles of newly disturbed land within the ROW and an additional 0.5 linear mile along access roads outside the ROW that could facilitate the spread of invasive species.

Inside the study area, alternative 4 would result in a potential range in conditions from a net increase in maintained scrub shrub of 8 acres to a net decrease in maintained scrub shrub of 11 acres, could increase the amount of habitat artificially maintained as scrub shrub, would alter habitat types in rare and unique communities, and would facilitate the spread of invasive species. Overall, the actions of alternative 4 would have adverse impacts on vegetation in the study area.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. The adverse impacts on vegetation as a result of alternative 4, combined with the other projects inside the study area, would be expected to result in an overall adverse cumulative impact. Alternative 4 would not alter the level of impact.

Conclusion

Under alternative 4, adverse impacts on vegetation would result from vegetation clearing, the construction of the proposed double 500-kV transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. These adverse impacts would reduce the abundance, diversity, and quality of native vegetation. Additionally, impacts would result from artificially maintaining scrub shrub habitat in the parks, which is inconsistent with NPS protection of natural resources. The deconstruction of a portion of the B-K Line would allow a portion of the B-K Line ROW to revegetate. When the adverse impacts from alternative 4 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, the cumulative impacts on vegetation would be adverse.

Alternative 4 would result in a relatively large amount of permanent vegetation loss but the quality of the vegetation resources lost would be much lower than those found along alternatives 2, 2b, and 3. Alternative 4 would have the same risk of introducing and spreading invasive species as the other action

alternatives although the adverse impacts may be less severe under alternative 4 because the length of the corridor is relatively short compared to the other action alternatives, meaning that mitigation measures may be more successful when applied over a relatively smaller area. Although alternative 4 would result in permanent loss of mature forest and conversion to scrub shrub habitat, the acreages affected would be substantially less than those affected by alternatives 2, 2b and 3. Given the lower quality resources and fewer acres of vegetation loss and conversion, the adverse impacts of alternative 4 could be substantially offset by the beneficial impacts of removing the existing B-K Line and restoring high-quality forest in a relatively undeveloped area of the parks, creating larger patches of contiguous habitat and reducing fragmentation in the core of the park. The permanent loss and conversion of native vegetation is contrary to NPS policies for protection and management of vegetation resources in the parks; however, the adverse impacts of alternative 4 on vegetation may not rise to the level of significant, considering the lower quality of the resources impacted and the potential to restore a large, contiguous block of high-quality habitat.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 5

The alignments for alternatives 4 and 5 follow the same route through DEWA and APPA; however, the acreage affected by alternative 5 would be less than that for alternative 4 (table 47) because alternative 5 would take a different course outside the study area and would not reenter DEWA west of the Bushkill Substation.

Under alternative 5, approximately 74 acres of vegetation would be cleared initially to prepare for construction; approximately 44 acres of this is characterized as mature forest. The pulling and splicing sites would require the removal of an additional 55 acres of forest. After construction, access roads would encompass 1.7 acres, including 0.3 acres outside the ROW, resulting in a permanent loss of 1.4 acres of mature forest inside the ROW within the road footprint.

Inside the study area, 19 acres of scrub shrub habitat are currently maintained within the existing ROW. Under alternative 5, the expanded ROW would be maintained at a width of 200 to 300 feet, increasing the acreage of maintained scrub shrub habitat to approximately 44 to 64 acres. Approximately 30 to 42 acres of this land is within NPS boundaries, an increase from the current 19 acres of maintained scrub shrub.

Under alternative 5, areas used only during construction would be restored following the construction period. Additionally, the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be decommissioned and removed, allowing the corridor to succeed naturally into mature forest in the long term. Approximately 53 acres within NPS boundaries would be restored, resulting in a net decrease in maintained scrub shrub area along the alternative 5 alignment over the long term of 11 to 23 acres. As stated previously, restoration to mature forest could be hindered by soil compaction and loss of near-surface soils, and the restoration of the B-K Line and of areas temporarily disturbed during construction would not be complete within the analysis period of this EIS.

As stated for alternative 2, the spread of invasive species can increase from creating new edge habitat, which changes vegetation composition after site clearing and through the construction and use of permanent roads. Mitigation measures to manage the spread of invasive species would be employed; however, alternative 5 would result in approximately 1.7 linear miles of disturbed land within the ROW and an additional 0.2 mile along the access roads outside the ROW, which could facilitate the spread of invasive species.

Inside the study area, alternative 5 would result in a net gain of vegetation, would decrease the amount of habitat artificially maintained as scrub shrub, would alter habitat types in rare and unique communities, and would facilitate the spread of invasive species. Overall, the actions of alternative 5 would have adverse impacts on vegetation in the study area.

Cumulative Impacts

Cumulative impacts on vegetation from past, present, and reasonably foreseeable projects inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on vegetation as a result of alternative 5 are combined with the other projects in the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Under alternative 5, adverse impacts on vegetation inside the study area would result from vegetation clearing, the construction of the proposed double 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line, which would reduce the abundance, diversity, and quality of native vegetation. Additionally, adverse impacts would occur from artificially maintaining scrub shrub habitat in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. The removal of the existing B-K Line would result in a decrease in maintained scrub shrub habitat; however, the full restoration of the area would not be complete in the period of analysis. When the adverse impacts from alternative 5 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, the cumulative impacts on vegetation would be adverse.

Alternative 5 would have the same types of adverse impacts as the other action alternatives but alternative 5 would result in the least amount of permanent vegetation loss and conversation to other habitat types; therefore, the severity of the adverse impacts would be correspondingly less than the other action alternatives. Alternative 5 would also offer the potential for offsetting the adverse impacts with the substantial benefits of removing the existing B-K Line and restoring a large, contiguous block of high-quality habitat at the core of the parks. Thus, the adverse impacts of alternative 5 would not likely rise to the level of significant because of the lower quality of the resources affected; the relatively small acreage of permanent vegetation lost or converted to scrub shrub habitat; and the substantial benefit of restoring high-quality contiguous habitat through removal of the existing B-K Line.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a

precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

LANDSCAPE CONNECTIVITY, WILDLIFE HABITAT, AND WILDLIFE

Landscape connectivity is an important ecological component when evaluating the quality of a habitat. High quality habitat is critical for the health and viability of wildlife populations, which ultimately contribute to the overall health and functionality of these natural systems. The amount of connectivity among patches of habitat increases the quality of habitat because wildlife are able to freely move between the patches and maintain genetic diversity, leading to healthy populations; ease of travel varies depending on the species' mobility or ability to disperse (Wilderness Society 2004, 1–5). Many wildlife species currently have the ability to travel freely from Pennsylvania state lands across NPS lands and the Delaware River, and across New Jersey state lands in an uninterrupted complex of nearly half a million acres. Fragmentation of the habitat can create barriers for individuals of a species traveling between populations and can lead to isolation of a species (D'Eon et al. 2002). In some cases the large scale connectivity that presently exists is dependent upon undeveloped private property that has no long term protection status. The present condition is subject to fragmentation through potential development. As a result, every significant action that diminishes this aspect of the environment has increased importance.

DEWA, APPA, and MDSR form the backbone of the natural landscape in this region and as such provide the most important element in an ecosystem that crosses several states. Across the country similar connectivity projects have been focusing on these same issues and goals of protecting the ecological benefits of a landscape, such as Mojave Complex in the California desert, the Yellowstone to Yukon Project, and the Everglades Complex in Florida. Research programs such as NASA's Park Analysis and Monitoring Support program, which looks at land use change surrounding NPS lands on more of a landscape scale, have become more prevalent throughout the country. A national effort is underway through the Natural Resource Advisory Group (Advisory Group) to bring landscape-scale connectivity actions to the forefront of NPS programs. The Advisory Group has developed recommended action items, program elements, and products to meet NPS needs regarding landscape-scale connectivity.

The NPS has been working with state and local agencies and other nongovernmental conservation organizations in both Pennsylvania and New Jersey to identify priority areas and lands that connect state and federal lands. The focus of the private/public partnership on conservation is landscape connectivity at a regional scale.

METHODOLOGIES

The evaluation of wildlife, wildlife habitat, and landscape connectivity was based on a qualitative assessment of the expected alterations to habitats inside and outside the study area resulting from the implementation of each alternative. The assessment of landscape connectivity in its traditional sense of continuity of habitat on a regional scale cannot be accomplished in this analysis. Because the location of the S-R Line outside the study area cannot be determined at this time, a direct analysis of the impacts on landscape connectivity at the regional scale is not possible. Therefore, connectivity at the regional scale is discussed as a cumulative impact.

Inside the study area, the analysis focuses on contiguous habitat patches and the impact of the alternatives on these patches. The proposed project alignment for each alternative is based on an existing ROW; therefore, baseline conditions include some amount of existing fragmentation along the alignment for each alternative. Determination of habitat loss, alteration, or restoration was based on an analysis of likely vegetation changes resulting from each alternative.

A terrestrial study area, as described in the following section, was created to determine impacts on landscape connectivity within its perimeter. The amount of habitat fragmentation — and therefore the impacts on contiguous habitat patches — that would result was analyzed using NPScape, a landscape dynamics monitoring project (NPS 2010ad). NPScape uses GIS-based modeling and land cover data for NPS lands and the surrounding area to produce a suite of landscape-scale data sets, maps, reports, and other products to inform resource management and planning at local, regional, and national scales (NPS 2010ad). For the analysis in this EIS, contiguous habitat patches were determined for the existing conditions of the terrestrial study area using major and minor roads, trails, and existing ROWs as fragmenting features. The specifications of each alternative were used to create contiguous habitat patches for the proposed conditions. The modeled information was used to determine the impacts from the alternatives on contiguous habitat patches and therefore wildlife habitat. These analyses were then used to evaluate the impacts on wildlife and migratory birds that use the land in the terrestrial study area. It should be noted that because of the relatively narrow terrestrial study area, patches along the edges of the terrestrial study area boundary appear small, but the actual size of these patches is unknown. The terrestrial study area was designed to end at the VSL points.

The parks' wildlife species are directly affected by the natural abundance, biodiversity, and ecological integrity of their habitat. Wildlife groups analyzed in this section include aquatic species, terrestrial invertebrates, birds, reptiles and amphibians, and mammals. All rare, threatened, and endangered species are discussed in the "Special-status Species" section. The impact analysis for terrestrial wildlife species included an assessment of impacts on species associated with habitat types that would be altered with the implementation of each alternative.

Resource-specific context for assessing impacts to landscape connectivity, wildlife habitat and wildlife includes:

- Connectivity is essential for healthy wildlife populations, especially those species that are highly mobile and have large home-range requirements.
- DEWA and APPA together provide a mosaic of different habitat types that includes roads and utility rights of way with minimal fragmentation of the contiguous ecosystem which is rare in the Northeast.
- The connections between the parks and other public and undeveloped lands create a larger area for wildlife that provides a refuge amidst increasing development; important populations of animals already use these contiguous blocks of habitat (e.g., the Kittatinny Ridge flyway is an important raptor migration corridor).
- DEWA and APPA serve as regional green space, providing a contiguous connected green space between the parks and other public lands within the larger East Coast.
- Connectivity is a recreational asset (i.e., visitors have an opportunity for a "backcountry" experience away from the interruptions of daily life).
- DEWA, in particular, is positioned within the region to take advantage of connectivity opportunities that do not exist elsewhere.

TERRESTRIAL STUDY AREA

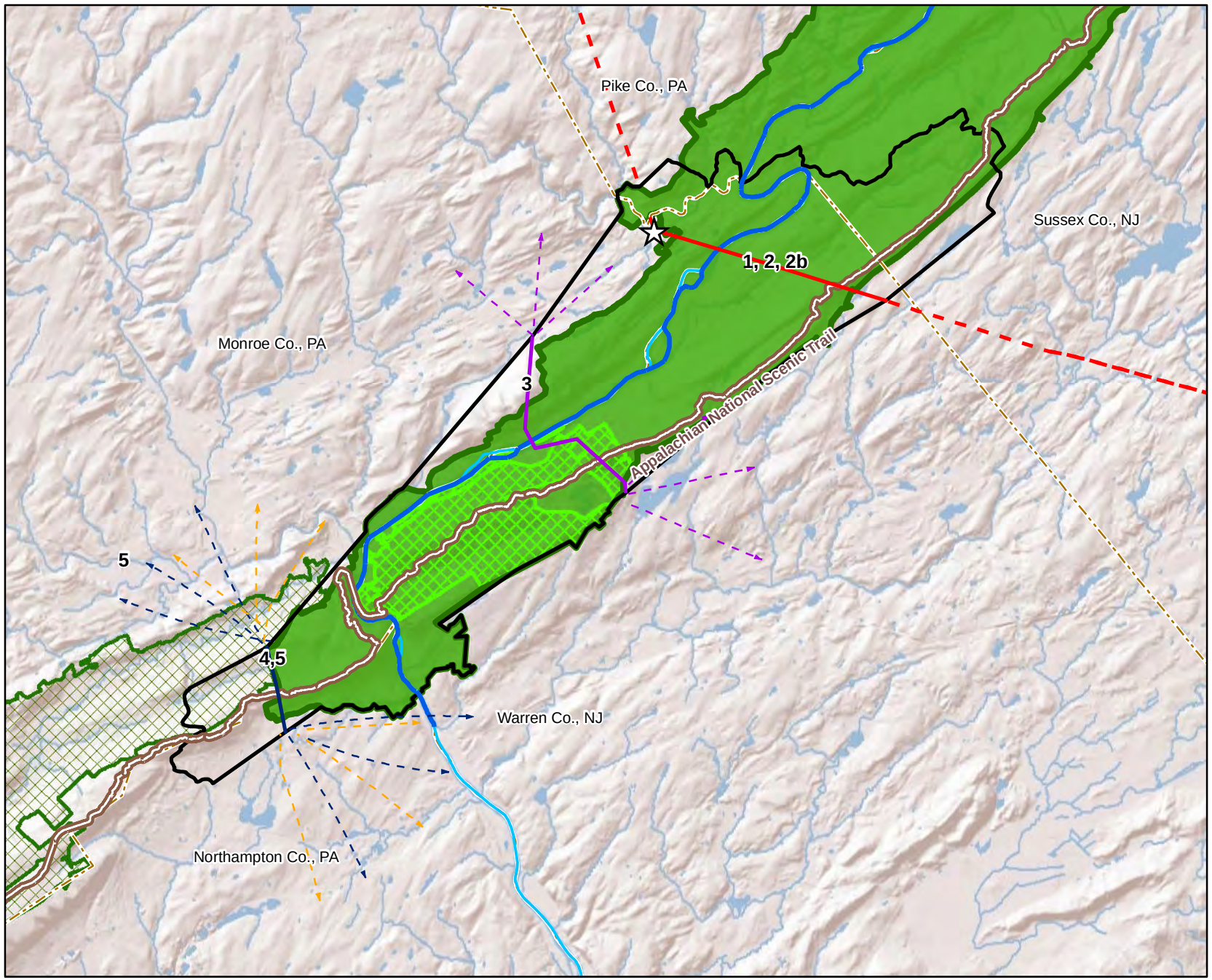
The terrestrial study area for landscape connectivity, wildlife habitat, and wildlife includes all portions of the parks between the VSLs for each alternative and is bounded in the north by the DEWA boundary and in the south by major roads south of DEWA (figure 70). This terrestrial study area was created because impacts from construction, operation, and maintenance activities would affect terrestrial resources beyond the corridors of the alternatives. Because the location of the S-R Line outside the terrestrial study area cannot be determined at this time, the indirect impacts on landscape connectivity, wildlife habitat, and wildlife cannot be evaluated per alternative. The potential impacts outside the study area are generally addressed; however, further surveys may be needed prior to construction of the S-R Line.

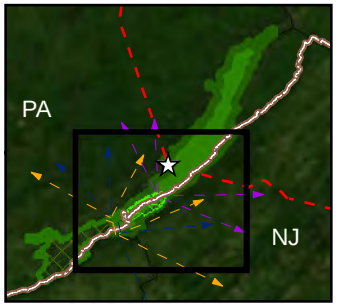
CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

Actions inside and outside the parks affect vegetation communities that provide habitat for wildlife. Alterations to and permanent loss of natural vegetation communities have occurred, are occurring, and will occur as a result of natural and unnatural successional changes and the establishment of invasive species. Forests in DEWA have been altered and are still regenerating from timber harvesting that has occurred more than a half century ago. The original forest has proceeded through a number of successional changes and is also subjected to the invasion of nonnative species. Other alterations and the loss of natural vegetation communities can result from many types of development, including agriculture, residential, commercial, industrial, and infrastructure; fire suppression; natural successional changes; and the establishment of nonnative invasive species resulting from actions and projects other than timber cutting.

Landscape Connectivity: Species response and migration as a result of climate change make the preservation of landscape connectivity in a large-region perspective key to the survival of many species in the future. Trends in the United States, and particularly the immediate project region, show an increase in low-density rural housing development and a resulting increase in impervious surface cover (Jantz 2009). This type of land use change leads to changes in the patterns of the natural landscape, isolating the pockets of natural areas and ultimately causing a decline in landscape connectivity. The pressures from residential development and the infrastructure to support the expanding communities and populated areas and the resulting fragmentation make the efforts to protect the connectivity between shrinking and more isolated natural areas increasingly difficult. As a result, the importance of the Appalachian Mountain chain as it runs through the densely populated northeast is critical in maintaining the connectivity between the isolated pockets of protected natural landscapes.

Studies conducted using remote sensing technologies have shown that DEWA and the surrounding undeveloped natural lands have areas of existing high density of connectivity based on the connections between protected lands and the proximity of the large protected lands to DEWA. Analysis of the biological integrity of the region show that the park lands have more natural landscape than the surrounding private lands (Goetz et al. 2011). Therefore, these public lands, such as DEWA and surrounding state land pockets, and natural corridors such as the one APPA follows along the ridges of the Appalachian Mountain chain, provide critical short- and long-distance paths that wildlife may follow to avoid the more densely human-developed areas (Goetz et al. 2011). These corridors connecting natural areas create critical migration pathways between the large intact habitat patches in the upper northeast and the Southern Appalachian Mountains. The increased isolation of the protected habitats decreases the chances for wildlife migration and could result in extinctions (Goetz et al. 2009) The resulting decline in landscape connectivity has both ecological and social consequences.





Legend

- Substation
- Alternative 1, 2, 2b
- Alternative 3
- Alternative 4
- Alternative 5
- Appalachian National Scenic Trail
- Delaware River
- Middle Delaware National Scenic & Recreational River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- Terrestrial Study Area
- County Line

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

0 1.5 3
Miles

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

Figure 70
Terrestrial Study Area

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

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

The pressures of population growth and the resulting growth in infrastructure increase the fragmentation of the natural areas, affecting both the local habitat continuity and the greater landscape connectivity (Goetz et al. 2009). For example, increases in impervious surface area can lead to greater runoff, affecting water quality and increasing the risk of flooding events (Goetz et al. 2011). Maintaining the ecological integrity of public lands such as DEWA and APPA and their linkages to other natural protected lands in the immediate and greater region helps slow the loss of connectivity and maintain these critical habitat corridors. Maintaining landscape connectivity in the heavily populated northeast is becoming more difficult and more important to the survival of many species. Figure 53 shows federal, state, and other conservation lands in Pennsylvania and New Jersey between the Susquehanna and Roseland substations. Each severed link isolates the protected natural areas and breaks the pathways, losing the critical regional landscape connectivity. The central position of the proposed S-R Line geographically could create two separate and distinct park land management areas.

Habitat Alteration and Development: Historically, in the northeastern United States woodlands were cleared in unregulated harvesting of timber to support agricultural activities, which resulted in the creation of large expanses of early successional habitat maintained by agricultural practices. However, in the past century, agricultural activities have decreased and forested areas have regrown, reducing the acreage of early successional habitat. Species that use early successional habitat, such as brown thrasher and golden-winged warbler, have exhibited population declines. Currently forested areas are second-growth forests, which contain mature hardwoods that are generally over 100 years old and produce valuable mast crops for a variety of wildlife. Mast crops are those which provide food for wildlife, such as oak trees that provide acorns. These forests represent a stable forest that will remain as such for another 100 years or more if left undisturbed. It is rare and valuable to have such a large contiguous block of undisturbed mature forest on the East Coast. Despite the alterations to the original eastern forests over the past 300 years, the large tracts of intact deciduous woodlands currently found in the eastern United States are known to support high densities of breeding songbirds, most of which migrate to the tropics for the winter. These eastern forests are also important for other migratory species that pass through on their way to and from their breeding grounds (Lebbin et al. 2010, 174). Inside and outside the terrestrial study area, development from residential and second-home construction, utility and infrastructure projects, and communications towers contributes to the incremental loss of forested lands or results in the alteration of habitats into maintained clearings and early successional habitat, which can also alter the abundance and composition of wildlife populations. Ultimately, the maintained and early successional habitat resulting from development benefits those species that can adapt to human-altered habitats (e.g., house sparrows, European starlings, raccoons, opossums, and gray squirrels) or those that prefer scrub shrub habitats (such as golden-winged warbler and brown thrasher), while species that are considered interior forest-dwelling species (e.g., wood thrush, scarlet tanager, and a variety of warblers and vireos) decline in abundance. As a result, large areas of protected intact woodlands inside and outside the terrestrial study area that provide habitat for many wildlife species, as described in chapter 3, are becoming increasingly important as a result of development and habitat fragmentation in the surrounding area. Lands protected by the NPS in the parks, New Jersey and Pennsylvania protected state-owned lands, and lands protected by other organizations such as land trusts, the National Audubon Society, and The Nature Conservancy (TNC) provide islands of natural habitat for wildlife, including insects and other invertebrates, migratory bird species, salamanders and frogs, small mammals, and black bear (see figure 53).

Communications Towers, Wind Turbines, and Transmission Lines: In addition to habitat alteration and development, the siting of communications towers, wind turbines, and transmission lines, especially on hilltops and ridgelines, can adversely affect wildlife through habitat fragmentation, loss, or alteration due to construction as well as through direct mortality of migrating bird and bat species. The USFWS conservatively estimates that between 4 and 5 million birds are killed each year at communications towers and a total of 200 to 500 million birds may die annually when communications tower collisions are combined with collisions with vehicles, buildings, windows, and high-tension lines (Erickson et al. 2001,

7–10). A review of studies on bird collisions with communications towers reported that individuals from 230 species have been killed; many of these species are nocturnal migrants, including Neotropical migrants such as the red-eyed vireo and warblers. Of those 230 species, 52 are of conservation concern and are listed on the USFWS Nongame Species of Management Concern List or Partners in Flight Watch List (Shire et al. 2000, 2). There are presently no cell towers within the boundaries of DEWA or any major transmission lines of the magnitude and intensity proposed here.

Collisions with high-tension lines have been documented since 1876 and can be a significant source of mortality, especially for ducks, geese, swans, herons, and cranes when lines are near open water sources or wetlands. Collisions with bulk transmission lines kill an estimated 130 million birds per year; however, there is a lack of standardized data, and the estimate is rudimentary (Erickson et al. 2005, 1033). When the lines are located in upland areas, raptors and passerines are more susceptible (Erickson et al. 2001, 10). Bird and bat species can be killed as a result of wind turbine developments, which are often sited in linear fashion along ridges and hilltops. Bird fatalities may result from collisions with the turbines and structures. Bird fatalities primarily involve nocturnal migrants, but in areas of large open grasslands, diurnal raptors such as hawks and eagles can also collide with wind energy structures. Current estimates place mortality of birds from wind turbines at approximately 33,000 birds per year; however, wind turbines are less abundant than other structures and newer design technology may reduce bird collisions (Erickson et al. 2001, 19). Bat mortality at wind turbines is associated with the sudden drop in air pressure near the turning blades of the turbines (which causes barotrauma, or internal hemorrhaging caused by a sudden drop in air pressure) and affects migratory bats, primarily during fall migration (Baerwald et al. 2009, 1077).

These actions can alter the distribution and abundance of wildlife and influence reproductive success and survival. Other projects may result in the protection, restoration, or enhancement of wildlife species inside and outside the parks. Past, present, and reasonably foreseeable activities that have beneficial or adverse impacts on wildlife and wildlife habitat in the parks inside and outside the terrestrial study area are summarized below. These projects were taken from the list of cumulative projects for the S-R Line in appendix H. Cumulative impacts were then determined by combining the impacts of the alternative being considered with the impacts from the projects listed below. This cumulative impact analysis was done for each alternative and is presented at the end of the impact analysis discussion for each alternative.

Projects Inside the Study Area

Inside the terrestrial study area, cumulative projects that have resulted or would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife include the following visitor access, road, and utility projects: the New Jersey Swim Beach construction (construction of new facilities), the PADOT SR 2001 road project (road reconstruction), the rehabilitation of River Road (road repair), the I-80 weigh station (facilities upgrade), the US Route 209 rehabilitation and replacement of Toms Creek Bridge (road and bridge repair), the repair of failing Watergate Dam #10, US Route 209 Raymondskill Creek Bridge rehabilitation, Pocono Environmental Education Center cabin replacement (rehabilitation and replacement of structures), the Appalachian Trail Relocation near the Columbia Gas Pipeline Crossing (pipeline upgrade), the Metropolitan Edison Enhanced Vegetation Management Program (for transmission lines), Central Jersey Power and Light vegetation maintenance (for transmission lines), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), and the Northeast Supply Link Expansion (Palmerton Loop gas pipeline). Nine utility lines cross Kittatinny Ridge in the terrestrial study area in Pennsylvania and New Jersey with aboveground conductors. Eight of the nine utility lines are power lines and one is a telephone line; each of these crossings presents a risk to migratory birds that use Kittatinny Ridge. Illegal activities such as ORV use, flora collection, hunting/poaching, and woodcutting also adversely affect wildlife habitat and wildlife. These projects and actions would result in adverse impacts through habitat loss,

alteration, and fragmentation and wildlife disturbance and mortality. The impacts on landscape connectivity, wildlife habitat, and wildlife from several projects, including the rehabilitation of River Road, the I-80 weigh station, and the repair of Watergate Dam #10, are still unknown.

Cumulative projects inside the terrestrial study area that have resulted or would result in beneficial impacts on landscape connectivity, wildlife habitat, and wildlife include construction projects, restoration projects, fire management, and agricultural permits. The construction projects (sustainable comfort stations, hazardous structure demolition/deconstruction, and Metropolitan Edison removal of unused power poles and transformers) would restore previously disturbed areas to natural conditions. The restoration projects inside the terrestrial study area (the rehabilitation of Childs Park, the restoration of flood-damaged river campsites, the realignment of McDade Trail, parkwide invasive species control programs, the Wildlife Habitat Incentive Program, and IBAs/IMAs) would help preserve sensitive habitat, avoid further impacts on habitat, and restore previously disturbed habitats. Agricultural permits would preserve open space and habitat. Prescribed burns would perpetuate native plant species and maintain natural habitat. Additionally, several land protection programs (as detailed in appendix B) could protect vegetation communities. The beneficial effects of many of these programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis; therefore, the level of benefit resulting from the implementation of any project is also variable.

Cumulative projects inside the terrestrial study area would result in adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife.

Projects Outside the Study Area

Outside the terrestrial study area, cumulative projects that have resulted or would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife include the following road and utility projects: the Marshalls Creek traffic relief project (new bypass route), the US Route 209 rehabilitation and replacement of Toms Creek Bridge (road and bridge repair), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Marcellus shale natural gas drilling, the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), the PFBC natural gas leasing and water access programs, Martins Creek Power Plant (contaminated water spill), the Federal Energy Regulatory Commission relicensing of Yards Creek Generating Station (relicensing power plant), and wind turbines in northeastern Pennsylvania. Proposed residential and commercial developments in New Jersey and Pennsylvania would also cause adverse impacts on landscape connectivity, wildlife habitat, and wildlife. The impacts from the Marcellus shale natural gas drilling and the PFBC natural gas leasing and water access programs are still unknown. Thirty-seven utility lines cross the Kittatinny Ridge outside the terrestrial study area in Pennsylvania and New Jersey with aboveground conductors; 2 of these are telephone lines and 35 are power lines. Each of these crossings presents a risk to migratory birds that use Kittatinny Ridge. Beneficial impacts on landscape connectivity, wildlife habitat, and wildlife have resulted or would result from the following projects: the DEWA prescribed burn program, Pennsylvania's weed eradication program, the Wildlife Habitat Incentive Program, and IBA/IMA programs. Nongovernmental organizations such as TNC work toward identifying and preserving land that contains rare or unique features or key habitat for plants and wildlife. The beneficial effects of many of the listed programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis; therefore, the level of benefit resulting from the implementation of any project is also variable. Despite land protection and conservation outside the terrestrial study area, land in the 10 counties of New Jersey and Pennsylvania that are part of this analysis are subject to continued development that would continue the loss, alteration, and fragmentation of habitat, including rare and unique communities. Projects outside the terrestrial study area would result in adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife.

IMPACTS OF THE ALTERNATIVES ON LANDSCAPE CONNECTIVITY, WILDLIFE HABITAT, AND WILDLIFE

Common to All Alternatives

Vegetation Maintenance: PPL and PSE&G have separate vegetation management plans because they are distinct utility companies working in two different states; however, vegetation management for both utilities would occur annually, at minimum. Vegetation maintenance sustains habitat in the existing ROW as scrub shrub using selective clearing. Additionally, vegetation maintenance would include removal of danger trees that could interfere with the transmission lines. The details of the applicant's vegetation management plans and clearing techniques are explained in chapter 2. The NPS considers the applicant's current vegetation management plans to be insufficient, and the NPS would require a NPS-specific, NPS-park approved vegetation management plan. The impacts of vegetation maintenance are discussed under each alternative.

Invasive Wildlife Species: Of the five invasive nonnative terrestrial wildlife species presented in chapter 3, three have the potential to affect vegetation communities that provide wildlife habitat: hemlock woolly adelgid, European gypsy moth, and emerald ash borer. Impacts from these invasive wildlife species are analyzed in the "Vegetation" section of this chapter.

Wintering Golden Eagles: The migration of golden eagles in the eastern United States is strongly tied to the Appalachian ridgelines. Every year golden eagles are observed at the Hawk Watch sites Hawk Mountain and Raccoon Ridge along APPA during fall migration. Golden eagles are also known to overwinter in the Appalachian range in areas with small forest openings along ridgelines (VADGIF 2011). Wintering golden eagles are present inside and outside the terrestrial study area.

Mitigation Measures: Mitigation measures would reduce impacts from operation and maintenance activities under the action alternatives and are described in chapter 2 and appendix F. None of the mitigation measures would eliminate impacts on landscape connectivity, wildlife habitat, or wildlife; however, they would reduce the impacts on these resources by decreasing the loss of habitat and preventing the take of bird nests and direct mortality of wildlife species.

Outside the Study Area: Landscape connectivity, wildlife habitat, and wildlife are currently under pressure from a number of stressors, including development, pollution, toxic chemicals, invasive species, pests, disease outbreaks, habitat fragmentation, and wildfires, making them highly vulnerable to additional impacts such as those from climate change (NABCI 2010, 44). Outside the terrestrial study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. These counties are largely undeveloped and contain a variety of habitats and developed areas. In general, the transmission lines outside the terrestrial study area could pass through a variety of habitats, including rare and unique communities, state wildlife management areas, and lands designated as IBAs and IMAs.

The clearing, construction, and vegetation maintenance activities outside the terrestrial study area would be consistent with those described for inside the terrestrial study area. However, the impacts outside the terrestrial study area would be indirect because the activities related to constructing and operating the S-R Line would not be caused by activities permitted by the NPS; the specific impacts cannot be determined because of the physical distance from NPS-authorized activities. Additionally, the specific resources that would be affected by the transmission line outside the terrestrial study area cannot be identified until the route is chosen by the applicant. Upon this decision, additional surveys would be required to determine the type of habitat that would be affected along the selected route.

There are more developed, residential, and agricultural lands outside the terrestrial study area than inside. However, large tracts of contiguous forest and wetland habitat outside the terrestrial study area remain because of the largely rural nature of the counties in New Jersey and Pennsylvania; these tracts could be further fragmented depending on the final route of the transmission line. The impacts on landscape connectivity outside the terrestrial study area would be expected to be less severe than those inside the terrestrial study area. The use of existing ROWs, road alignments, and other corridors could minimize the extent of permanent habitat loss, but it is likely that the width of the ROW outside the terrestrial study area would be increased by several hundred percent to accommodate the double 500-kV transmission lines.

The types of impacts on wildlife would be expected to be similar to those inside the terrestrial study area and would result from disturbance and direct mortality from clearing, construction, and maintenance activities and isolation due to fragmentation. The alignments for alternatives 4 and 5 would cross the Delaware River outside the terrestrial study area. Transmission lines transecting the Delaware River could affect raptors that forage along the river. In addition, migratory raptors may forage along newly established ROWs and could collide with transmission lines. Thirty-seven utility lines cross Kittatinny Ridge outside the terrestrial study area in Pennsylvania and New Jersey with aboveground conductors; 2 of these are telephone lines and 35 are power lines. Each of these crossings presents a risk to migratory birds that use Kittatinny Ridge. As stated for inside the terrestrial study area, the height and number of conductors would increase, raising the risk of collisions. A linear expanse of early successional habitat that could benefit some species such as golden-winged warblers, indigo buntings, the black rat snake, and small mammals would be maintained in the ROW. ROWs also function as movement corridors for species such as white-tailed deer and can function as foraging areas for raptors.

Outside the terrestrial study area, indirect adverse impacts on landscape connectivity, wildlife habitat, and wildlife would result from vegetation maintenance under the no-action alternative. Vegetation clearing, the construction of the transmission line, the operation and maintenance of the transmission line, and vegetation maintenance under the action alternatives would result in adverse impacts. Cumulative impacts on landscape connectivity, wildlife habitat, and wildlife outside the terrestrial study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section.

Alternative 1: No Action

Landscape Connectivity and Wildlife Habitat: The existing ROW represents a complete east–west fragmentation of the habitats. The habitat patches adjacent to the existing ROW range from approximately 1 acre to 5,301 acres, with the larger patches east of Community Drive. North of the alignment, the parks include roads and trails that do not interfere with wildlife movement to any real extent. However, to the south, existing ROWs also bisect the parks. An existing ROW (the alignment for alternative 3) laterally bisects the habitats of DEWA, MDSR, and APPA 5 miles south of the alternative 1 alignment.

The continued vegetation maintenance under alternative 1 would sustain the current fragmentation and artificially maintained scrub shrub habitat. Occasionally, danger trees would be removed from the edges of the adjacent forested areas, but this maintenance is not expected to notably increase the fragmentation along the alignment. Therefore, additional fragmentation of the habitat would not occur.

Within the ROW, the wire zone / border zone vegetation management employed by the applicant creates varying wildlife habitat, with a herbaceous layer in the wire zone and a shrub layer in the border zone. Vegetation maintenance completed in August 2010 has resulted in varying habitat conditions. In some areas, herbaceous and shrub habitats were retained; however, in other areas, only a herbaceous layer was left in the ROW, bordered by mature forest.

A variety of successional habitat stages provides habitat for a wide range of aquatic species, terrestrial invertebrates, birds, amphibians and reptiles, and mammals. Common wildlife species include white-tailed deer, small mammals (mice, voles, shrews, etc.), eastern cottontail, red and gray fox, raccoon, and songbirds, including Neotropical migrant bird species such as indigo bunting, eastern towhee, field sparrow, and song sparrow. Wetland areas and streams in the ROW provide habitat for a variety of frogs, toads, salamanders, and turtles. If the vegetation is trimmed to the herbaceous layer, the habitat would support fewer species of wildlife because the variety of habitat conditions and vegetation species would be more limited.

Disturbance provides the opportunity for invasive plant species to spread and colonize in new areas. As described in the "Vegetation" section, ground disturbance during vegetation maintenance and removal of danger trees could facilitate the spread of invasive species. Invasive species can alter the structure of natural plant communities and disrupt ecosystem functions, changing the habitat structure. If wildlife species cannot adapt to the changes, the habitat may become inhospitable.

Wildlife: The ROW is an artificially maintained habitat that is not natural to the parks and is not compatible with the surrounding natural habitats. In addition, the presence and periodic maintenance of the ROW is not consistent with NPS conservation of park resources and values, including wildlife and wildlife habitats and the processes that sustain them.

Existing conditions in the alternative 1 alignment contain vegetation in varying stages of succession. While two portions of forest are divided by the ROW, the vegetation in the ROW provides a significant amount of cover and a variety of habitats. Under the no-action alternative, the level and frequency of vegetation maintenance could be increased over historical levels, preventing the natural process of succession and limiting species variation and complexity. The ROW habitat is artificially maintained; however, it provides shelter, food, and nesting areas to species that use early successional habitat and provides a migratory corridor for large mammals, bats, and butterflies. Vegetation maintenance, which has been conducted sporadically in the past, could sustain a relatively open ROW. The largest impact on wildlife from the change in conditions would be the loss of cover as they move across the ROW from one adjacent patch of forest to another. The impacts on specific wildlife groups as a result of regular vegetation maintenance activities and the resulting change in habitat are discussed in the following paragraphs.

Aquatic Species: Maintenance activities would not be conducted in water bodies located along the existing transmission line. In addition, no measurable change to water quality parameters would result from maintenance activities because the increase in soil erosion would be undetectable and surface waters would have no increase in total suspended solids (TSS) levels. There would be no observable or measurable impacts on aquatic species, their habitats, or the natural processes sustaining them.

Terrestrial Invertebrates: Vegetation maintenance activities would have the potential to affect invertebrates through direct mortality. Less mobile invertebrate species, such as crawling insects, as well as invertebrate eggs, may suffer direct mortality as a result of their inability to escape during clearing activities. These impacts would result during maintenance activities but would not be expected to affect the viability of a species. However, the ROW could be used as a migratory corridor by invertebrate species such as butterflies and dragonflies, resulting in beneficial impacts.

Birds: All maintenance activities would have the potential to disturb and temporarily displace bird species in the vicinity. If maintenance were conducted during the breeding/nesting season, direct loss of eggs, nests, and less mobile young could result and adults may abandon eggs, nests, or young due to disturbance. Although impacts would occur within a relatively narrow and linear footprint, bird species that had nested in the ROW prior to the new vegetation maintenance plan and schedule could lose

portions of nesting territories or entire nesting territories and could be forced to relocate territories. Species that could be present in the ROW include ruffed grouse, American woodcock, black-billed and yellow-billed cuckoos, and woodpeckers, as well as many seasonally present Neotropical migrants; flycatchers, vireos, and warblers are known to nest in the parks (PEEC 2008, 1–6). Additionally, migratory waterfowl species use the Delaware River riparian corridor as breeding and foraging habitat. Location and defense of new nesting territories would require time and energy that would otherwise be used for producing young, and it is unlikely that all displaced individuals would be successful in establishing new territories; this could result in lower overall productivity of the population. However, impacts on birds during the breeding season would be minimized by the implementation of seasonal restrictions for maintenance activities, which the applicant has not agreed to observe to date.

The ROW and adjacent habitat would be used by species that prefer more open habitats, such as sparrows (field sparrow, song sparrow), eastern bluebird, eastern kingbird, tree swallow, and predatory raptors. During required maintenance clearing, brush piles should be left to provide cover and nesting habitat and shelter for species such as eastern towhee and gray catbird, as well as wintering white-throated sparrow and dark-eyed junco. Impacts from disturbance would result during maintenance activities; however, the viability of bird populations would not be affected.

The ROW creates edge habitat along the adjacent woodlands that is preferred by brown-headed cowbirds. As nest parasites, brown-headed cowbirds often parasitize Neotropical migrant species such as vireos and warblers. A high abundance of cowbirds in an area can result in multiple cowbird eggs in host nests (Smithsonian 2011). In addition, nest predators such as American crow, opossum, and raccoon may prey on eggs and young birds in nests in and adjacent to the ROW. The continued maintenance and operation of the ROW would maintain edge habitat, resulting in the continued potential for these parasitic and predatory species to find nests and young, which would have adverse impacts on nesting bird species in and adjacent to the ROW. Edge habitat may not remain consistent, because danger trees may be removed from the forested area adjacent to the ROW, increasing disturbance of the habitat and altering it.

Even though it has not been documented in the parks, there may be potential hazards (collisions and electrocutions) to birds from the existing transmission lines, despite adherence to BMPs and mitigation as described in appendix F. Raptors, including resident species, may attempt to perch on the towers, resulting in electrocution. The transmission lines that transect the Delaware River could also affect raptors that forage along the river (osprey and bald eagle). There is also a potential for bird collisions involving waterfowl and large wading birds, such as great blue heron, that are known to nest colonially in DEWA.

A known bald eagle roost and foraging area exists near the alternative 1 alignment. Impacts on bald eagles are discussed in the “Special-status Species” and “Rare and Unique Communities” sections of this chapter.

Amphibians and Reptiles: Vegetation maintenance has the potential to affect reptiles and amphibians through disturbance and direct mortality. Mobile species could be displaced during maintenance activities, but the impacts would be temporary and localized. If the maintenance of the ROW is conducted during the breeding season for amphibians and reptiles, direct mortality of large numbers of individuals of some species could result. Amphibians such as spring peeper, American toad, bullfrog, leopard frog, and spotted and tiger salamanders could be adversely affected. Many amphibian species migrate in large numbers, and some species, such as spotted and Jefferson salamanders, can travel from a few hundred feet to more than a quarter of a mile to their breeding habitats (NYSDEC n.d.). Seasonal restrictions on vegetation maintenance would be enforced if the activities are planned in a known amphibian migration route. Spring peepers, wood frogs, spotted salamanders, red spotted newts, and Jefferson salamanders are known to migrate in large numbers, crossing River Road at various sites, and the parks have enforced road closures to reduce mortality of these migrating amphibians (NPS 2003e). Reptiles such as snapping

turtle, painted turtle, and eastern box turtle could also be affected by direct mortality during their spawning season as they move from aquatic and wetland habitats to upland habitats to lay eggs. Impacts on reptiles and amphibians due to direct mortality during vegetation maintenance would not be expected to affect the viability of a species.

Amphibian species typically find shelter under moist leaves or logs. Continued vegetation maintenance in the ROW would result in an increase in sun exposure and reduced forest canopy; therefore, the availability of preferable habitat would be limited in the ROW. With reduced vegetation cover, predatory animals could hunt more effectively along the ROW, resulting in adverse impacts on prey species such as frogs, salamanders, and snakes because vegetation cover would be reduced immediately after maintenance; however, increased predation would not lead to population-level impacts.

Mammals: Larger mammals using habitats in and adjacent to the ROW would be affected by the periodic and localized disturbance from the activity and noise of vegetation maintenance along the ROW; however, displaced wildlife would be expected to return to the ROW and adjacent habitats when maintenance is completed. During vegetation maintenance activities, less mobile species, including small mammals, and denning or burrowing mammals (striped skunk, ground hog, moles, voles, mice, shrews) may suffer direct mortality as a result of their inability to escape during maintenance activities. Impacts from disturbance and direct mortality under the no-action alternative would not affect the viability of the species.

The existing ROW is surrounded and secluded by forest in most locations allowing it to function effectively as a wildlife corridor. Impacts at the population level would not be expected. The ROW would continue to act as a movement corridor for species such as white-tailed deer, black bear, coyote, and fox and would be used for hunting by fox, bear, and coyote, resulting in beneficial impacts for these species.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife under alternative 1 would result from the continued artificial maintenance of the habitat in the ROW, loss of habitat from removal of danger trees outside the ROW, and disturbance and direct mortality of wildlife.

Cumulative Impacts

Cumulative impacts inside the terrestrial study area from past, present, and reasonably foreseeable projects would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife as described previously in the “Cumulative Impacts” section. When the adverse impacts as a result of alternative 1 are combined with the impacts of other projects in the terrestrial area, an overall adverse cumulative impact would be expected. Alternative 1 would not increase the levels of impacts.

Conclusion

Although artificial maintenance of scrub shrub habitat in the parks is not consistent with NPS protection and national designations of natural, scenic, and recreational resources, alternative 1, the no-action alternative, would result in the continued maintenance of the ROW. The present situation would remain constant; however, edge habitat may change due to the removal of danger trees. The amount of artificially maintained habitat could increase from the removal of danger trees; however, because of the uncertain definition of danger trees, the impact cannot be measured. The structural stage of the habitat in the ROW may differ from current conditions, because some areas are being trimmed to the herbaceous layer during maintenance, eliminating the shrub layer and limiting the diversity of the habitat. A different regime of vegetation maintenance of alternative 1 could alter the available habitat.

The protection afforded wildlife species in the parks, including those that use the ROW, would continue under the implementation of resource management programs to protect and enhance wildlife habitat; however, the ROW would continue to be maintained as a managed habitat in the parks. The activities of alternative 1 would affect wildlife through disturbance, direct mortality, increased predation, and changes to the functional use of the habitat in the ROW. Impacts on wildlife would continue inside the terrestrial study area during maintenance activities, from continued long-term maintenance of the transmission line, and from potential hazards (electrocution and collision) to birds from the existing transmission lines.

The effects of past, present, and reasonably foreseeable future projects, when combined with the impacts under alternative 1, would result in adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife inside the terrestrial study area.

Alternative 1 would continue the existing fragmentation of what are, otherwise, expansive stretches of intact habitat and contiguous forest within the study area which create an important ecological hub upon which natural corridors can be developed to connect other protected lands adjacent or proximate to the parks. The only change would be the result of the applicant's new vegetation management standards, leading to more clearing of vegetation within the ROW than is the case now or has been the case historically, resulting primarily in creation of more edge habitat and more scrub shrub habitat. All of these adverse impacts would be confined to the limits of the present ROW and none of the adverse impacts change existing conditions with regard to the overall functions and values of the affected resources, including the ability to create larger protected corridors. Any cumulative impacts to resources would remain adverse primarily from other actions taken outside the study area. In conclusion, the adverse impacts of alternative 1 would not likely be significant because the impacts would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws and would not interfere with management goals for protecting and perpetuating wildlife and wildlife habitat.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives would involve the removal of all or a portion of the B-K Line, as discussed in chapter 2. For all action alternatives, the B-K Line structures would be removed but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require constructing access roads (either permanent or temporary, depending on the alternative). The removal of the B-K Line would require constructing access roads, wire pull sites, and the removal of the line as described in chapter 2. Because access roads would also be required for the construction and long-term maintenance of the new line, adverse impacts from removing the line would be the same as (or less than) the impacts discussed for construction of the S-R Line.

Vegetation Clearing: For the analysis of impacts on landscape connectivity, wildlife habitat, and wildlife, it was assumed that a 350-foot corridor would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2, 3, 4, and 5. For alternatives 2, 3, 4, and 5, the corridor would be cleared 175 feet from the centerline of the existing ROW to either side. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights.

In addition to vegetation clearing inside the ROW, areas outside of the ROW would also need to be cleared for all action alternatives to construct the access roads, spur roads, and pulling and splicing sites.

Areas cleared for access roads (inside and outside the ROW) and tower foundations (inside the ROW) would be maintained permanently and would result in a permanent loss of vegetation. All other cleared areas would be seeded after construction with an NPS-approved conservation seed mixture appropriate to the local conditions. The area within the ROW maintained for operation is less than that which would be cleared for constructions. Areas both inside and outside the ROW that do not need to be maintained for operation of the S-R Line would be allowed to succeed to forested area over time. Because mature forest removed for construction would not be replaced within the 15-year analysis period covered by this EIS the impacts would be considered permanent.

The successful restoration of the land temporarily cleared and/or disturbed for construction but not needed for the operation of the S-R Line could be hindered by impacts on soils sustained during the construction of the S-R Line, despite the regrading of the surface soils. The use of heavy construction equipment and the construction and use of access roads would compact the underlying soil. Compaction can cause damage to soil structure, which determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity and growth (UM 2001, 1). Additionally, the removal of near-surface soils may have unfavorable consequences on productivity, affecting the successful revegetation of disturbed areas. Monitoring and maintenance of revegetated areas under the applicant's vegetation management plans would need to be implemented to ensure that vegetation restoration is successful.

The impacts from vegetation clearing are discussed for each alternative because the amount of clearing for each is different.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect landscape connectivity, wildlife habitat, and wildlife include the construction of access roads (including turnaround areas), tower foundations, crane pads, wire pull locations, pulling and splicing sites, and staging areas. Wire pull locations, pulling and splicing sites, staging areas, and spur roads would create impacts because vegetation would be removed; however, these features are temporary and the disturbed areas would be restored, as described in chapter 2. Construction of these components would result in temporary or permanent loss of vegetation, as described above in "Vegetation Clearing." Restoration would not be complete within the period of analysis of this EIS; however, this section focuses on the activities that would produce permanent impacts (i.e., ROW expansion and the construction of access roads and tower foundations). All action alternatives would require drilling as part of the construction process, but because drilling is unlikely to affect groundwater (see discussion in "Geologic Resources") it would not affect aquatic species in the vicinity and is not discussed further.

Operational Noise and Electromagnetic Fields: Transmission lines produce noise once operational, but the noise is dependent on the size, voltage, and configuration of the lines, as well as the environmental conditions. The S-R Line would be constructed using a conductor configuration that reduces audible noise from the lines (PPL and PSE&G 2008, A10-8); however, the transmission lines would increase the level of noise currently in the parks. There is little conclusive evidence that transmission line noise significantly affects wildlife; however, increases in noise can affect communication, behavior, and ultimately survival. It is anticipated that noise from the operation of the proposed transmission lines would cause disturbance and would be localized.

Global research is ongoing to determine if there are effects on humans and wildlife from electromagnetic field (EMF). While most research is inconclusive as a whole, several studies have determined that EMF exposure has an effect on some bird species, and those effects are usually adverse. Fernie and Reynolds (2005) conducted a literature review and concluded that exposure to EMF can change behavior, physiology, the endocrine system, and immune functions of birds and these changes can lead to a decrease in reproductive success. Effects from EMF exposure appear to be species specific, as evidenced

by Doherty and Grubb (1998), where house wrens were essentially unaffected, but tree swallows endured a change in egg size and lower fledgling success.

Alternative 2

Landscape Connectivity and Wildlife Habitat: Permanent habitat loss under alternative 2 would result from the construction of access roads, the widening of the proposed ROW, and the construction of tower foundations, resulting in a loss of approximately 45 acres (table 47). Approximately 311 acres of utility ROWs currently exist in the terrestrial study area. This total includes all existing alternative alignments, as well as other ROWs not related to the S-R Line. Under alternative 2, the combined area of mechanically and/or chemically maintained corridors would increase to approximately 356 acres, with an additional 3.4 acres of access roads constructed outside the expanded ROW (table 47). The permanent loss of forest from access roads and from the alteration of forest to maintained scrub shrub habitat as a result of alternative 2 actions would represent an increase in artificially maintained area of 14%. The current ROW width ranges from approximately 80 to 150 feet; under alternative 2, this operation or final width would increase to 200 feet, representing a permanent increase in maintained habitat of 33% to 150%. The expansion of the ROW under alternative 2 would fragment the habitats that exist on either side of the corridor. All patches of habitat along the ROW would be reduced in size and some smaller patches would be eliminated completely (figure 71). Access roads would create new fragmentation under alternative 2. For example, three existing patches are each broken into two or three smaller patches by the construction of access roads. At the western boundary of DEWA, a patch of approximately 26.3 acres would be bisected by an access road, creating two patches of 2.5 acres and 18.6 acres. One patch south of the ROW that is currently 95 acres would be fragmented into three patches with acreages of 15, 24, and 48. Similarly, one patch south of the ROW in Pennsylvania is currently 163 acres. With the expansion of the ROW and construction of an access road, this patch would be reduced to 148 acres and a new 4.1 acre patch would be created. The largest contiguous patch in DEWA is currently 5,301 acres. This patch would be reduced to 5,272 acres by the ROW expansion, resulting in a loss of approximately 29 acres. Under alternative 2, the number of smaller patches (from 0 to 150 acres) would increase from 9 to 20. The number of larger patches would decrease from 10 to 9 patches, and patch sizes would be reduced. The largest patches adjacent to the alternative 2 alignment (those over 150 acres) would be reduced in size by 0.2% to 8%.

The impacts on wildlife habitat from fragmentation include the loss of habitat, reduced habitat patch size, increased edge, and increased isolation of patches (USDA 1999, 2–4). The alternative 2 alignment would be sited along an existing ROW; therefore, the habitat is already fragmented. The reduction of habitat and patch size from expansion of the ROW and construction of the access roads would have impacts on wildlife habitat. Widening the ROW would reduce the acreage of forest interior and could affect forest interior–dwelling species, such as wood thrush and scarlet tanager. Increased fragmentation from widening the ROW and access roads could become an obstruction to movement for less mobile species such as invertebrates, small mammals, reptiles, and amphibians (Peterken 2002, 5). The alternative 2 alignment would cut through areas of northern hardwood and eastern hemlock forests. Wildlife species that use these habitats likely travel throughout the extent of these forests. The expanded ROW would limit the ability for less mobile species to do so. Within smaller habitats such as the Van Campen Brook wetland, access roads that bisect the habitat could affect the dispersal of reptiles and amphibians. Additionally, the towers and access roads could impede the movement of some smaller wildlife species from one patch to the next. Loss of habitat connections across a landscape is one of the most severe threats to the survival of many wildlife species (Wilderness Society 2004, 1).

EXISTING CONDITIONS

Bushkill Substation

Monroe Co., PA

Pike Co., PA

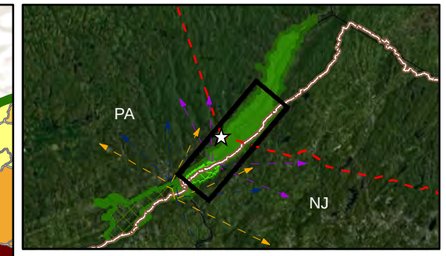
Warren Co., NJ

Sussex Co., NJ

2, 2b

Delaware River

Appalachian National Scenic Trail



RESTORED CONDITIONS

Bushkill Substation

Monroe Co., PA

Pike Co., PA

Warren Co., NJ

Sussex Co., NJ

Delaware River

Appalachian National Scenic Trail

Legend

- Substation
- Alternative 2,2b Existing Transmission Line
- Outside Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware Water Gap National Recreation Area
- Worthington State Forest
- CVNWR Boundary
- County Line

Habitat Patch Acreages

- 0 - 150 acres
- 150 - 500 acres
- 500 - 1,200 acres
- 1.200 - 3,200 acres
- 3,200 - 8,000 acres

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

0 1 2
Miles

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

Figure 71
Alternative 2,2b
Existing vs. Restored Conditions

Source: ESRI Streetmap 2009;
NPS 2011;
ArcGIS Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

The expansion of the ROW would not create more edge habitat; however, it would expose formerly shaded interior trees and plants to edge conditions of increased sunlight and temperature, especially along an east–west-oriented ROW that would be exposed to hot afternoon sun (Manitoba Hydro 1995, 13). The composition of vegetation along the edge would change to include more sun-tolerant species, thus changing the habitat. Additional edge habitat would be created by the construction of access roads, and habitats along the roads would be modified in the same manner.

Vegetation in the 100-foot riparian buffers would not be cleared for construction or during continued vegetation maintenance (PPL and PSE&G 2008, 7). The Delaware River riparian corridor could act as a travel corridor in which wildlife could move from one side of the ROW to the other. Retaining passageways such as these would benefit the wildlife, but would not reduce the level of impact from the widening of the ROW.

Wildlife: Under alternative 2, wildlife would be affected by clearing and construction activities, the operation and maintenance of the proposed transmission line, and vegetation maintenance. Impacts on all animal groups due to vegetation maintenance are described in detail under alternative 1. The impacts from disturbance and direct mortality due to construction activities are the same as those described for vegetation maintenance; however, the impact levels may be different due to the intensity of disturbance or amount of activity. The additional miles of road and increased human access activity may impact wildlife and diminish contiguous habitat.

Aquatic Species: The degradation of water quality and habitat alterations would result in impacts on aquatic species. The increase of sediment loads and TSS due to soil erosion from the construction and use of access roads and crane pads would also contribute to adverse impacts. An increase in sediment loads and turbidity could adversely affect the habitat, reproduction, respiration, and survival of fish and benthic macroinvertebrates and could bury or smother aquatic vegetation. The installation of stream crossing structures associated with the access roads would affect aquatic organisms by potentially blocking access to spawning habitat, feeding areas, and shelter, and restricting the movement of organic material such as leaves and woody debris that provide food and shelter for aquatic organisms. Stream crossing structures would also alter the natural flow dynamics and sediment transport regimes, resulting in streambank erosion, streambed scour, and changes in sediment deposition. These geomorphic changes would alter existing habitat conditions and affect the community structure of fish and benthic macroinvertebrates. Construction along streams could also contribute to the spread of invasive vegetation, which frequently becomes established in construction areas and could have adverse impacts on aquatic species. Impacts on aquatic species and their habitats or on the natural processes sustaining these species could affect the overall amount, integrity, and connectivity of habitat in the terrestrial study area.

Terrestrial Invertebrates: Under alternative 2, invertebrates would be affected through disturbance and direct mortality during clearing and construction activities due to the use of large construction vehicles and the potential use of helicopters.

Birds: Impacts from disturbance during clearing activities would occur on birds in and near the construction corridor for the expanded ROW and roads. During migration, migratory Neotropical bird species would avoid areas adjacent to the ROW during site preparation, tree clearing, and construction activities. Direct loss of nests, eggs, and nestlings due to clearing, construction, and vegetation maintenance activities would be minimized by implementing seasonal restrictions (March 15–July 31) on activity.

Under alternative 2, the expanded ROW would maintain the same amount of edge habitat along the adjacent woodlands; however, edge habitat may change due to the removal of danger trees and would be increased along the access roads where they extend outside the ROW into forested habitat. It is expected

that over the long term, brown-headed cowbird nest parasitism and predation by opportunistic species such as American crow, opossum, and raccoon would increase. Many Neotropical migrant species that breed in the northeastern United States are ground-nesting species that build open nests; these species are therefore more susceptible to nest predation and brood parasitism and as a result are more sensitive to the fragmentation of habitat and creation of forest edges (Faaborg 2002, 8). The continued maintenance of the ROW would maintain or increase edge habitat and would continue the potential for parasitic and predatory species to find nests and young of breeding birds.

Over the long term, the creation and maintenance of early successional habitat in the new ROW footprint could favor species that prefer scrub shrub habitat for nesting, such as field and song sparrows, eastern bluebird, eastern kingbird, tree swallow, golden-winged warbler, and indigo bunting; predatory raptors, as previously mentioned, would be expected to resume using the ROW. Additionally, brush piles created after vegetation maintenance would provide shelter and potential nest sites for species such as eastern towhee and gray catbird, as well as wintering white-throated sparrow and dark-eyed junco.

The terrestrial study area is located along a major north–south fall migration corridor for raptors, and newly constructed transmission lines would create a bird collision hazard where they are oriented in an east–west direction. The configuration of the conductors for the S-R Line would be vastly different than that of the B-K Line. Instead of 6 lines, the S-R Line structures (which would be twice as tall as the B-K Line structures) would carry a total of 20 lines.

Raptors have acute eyesight and are daytime migrants, and would not be expected to collide with transmission lines or structures. However, raptors' flight strategies vary and many raptors forage along the riverbanks of the Delaware River, which would bring these birds to lower altitudes, increasing the potential for collisions. Additionally, hawks are known to use lower altitudes when gliding along ridgelines. Altitudes used by ridge-gliding migrant red-tailed hawks can be as low as 5 to 20 feet or as high as 600 feet above the treetops or ridgetop. When ridge gliding, efficiency is gained by maintaining altitude, especially when the ridge is oriented in the same alignment as the migration path (Kerlinger 1995, 166). Orienting tall structures perpendicular to the flight path of ridge-gliding raptors may result in collisions with wires if conditions are such that raptors are using lower altitudes along a ridge such as Kittatinny Ridge. Because Kittatinny Ridge is oriented north–south and provides ideal conditions for migratory hawks, especially in fall, the potential for collisions would exist. Raptors may also collide with wires when foraging along the ROW. Additionally, large birds of prey attempting to perch on poles can be electrocuted at wire-to-wire or conductor-to-ground connections.

Bird fatalities primarily involve nocturnal migrants because they generally fly at higher altitudes than diurnal migrants; however, the altitude of flight widely varies. Studies have recorded flight patterns from just above the surface of the water to approximately 20,000 feet. Generally, nocturnal migrants take flight after the sun sets. Maximum altitude is gained quickly and is maintained until midnight, after which the birds gradually descend until daylight (USGS 2006). Many migrant passerines use the habitats within the parks for critical food resources and shelter and could collide with the proposed transmission lines during their descent.

Bird collisions may also occur when a transmission line runs perpendicular to a flight path used by a concentration of birds, such as a flock of Canada geese, that move back and forth from feeding and roosting sites on a daily basis or when migrants are traveling at reduced altitudes (usually in inclement weather) and encounter structures. The Delaware River would be traversed by transmission lines under alternative 2, which could affect birds that forage along the river. The proposed transmission line would be routed through several wetland complexes, including the Van Campen Brook wetland complex. The current ROW is located along the same wetlands; however, the birds are generally transient in the area and would move out of and avoid areas of disturbance. Because of the large size of the new transmission

line towers, the height and configuration of the lines may increase the potential for collision with groups of waterfowl that migrate at night and may use the wetlands and open water areas associated with the wetlands.

The presence of higher transmission line structures and lines could adversely affect migratory bird species where the lines transect migratory and habitual flight paths to and from foraging or roosting areas. In a study of wind turbine impacts on migratory birds in Michigan, the majority of migratory birds were observed flying between the tree canopy and 328 feet (100 meters) above the canopy. Many raptors are equipped to use thermals to maximize their energy use during migration and average an altitude of 328 to 1,640 feet (100 to 500 meters) above the tree canopy. However, many other migrating birds are not physically capable of using thermals and often migrate at low altitudes, observed as flights just above the tree canopy (Paterson et al. 2010, 11). Currently, the transmission line conductors are generally at the height or below the top of the tree canopy. The height of the new towers would result in the conductors being considerably higher than the tree canopy. Additionally, the number of conductors would increase to approximately 20 lines under alternative 2. Where agricultural lands are traversed by the ROW, transmission lines and towers could create attractive perching areas from which raptors could discern prey, and towers could create a hazard for raptors foraging along the river, particularly ospreys and bald eagles. The conditions of the proposed alternative 2 transmission line would likely increase collisions. The proposed transmission line would be constructed according to Avian Power Line Interaction Committee (APLIC) standards and would use the best available technology for deterring raptors from using the transmission towers and lines. A sizable number of bird collisions is not expected; however, the effectiveness of the APLIC standards on a 500-kV line crossing DEWA, MDSR, and APPA is unknown.

Two known bald eagle nests, an important bald eagle roost, and a bald eagle foraging area exist near the alternative 2 alignment. Impacts on bald eagles are discussed in the “Special-status Species” and “Rare and Unique Communities” sections of this chapter.

Amphibians and Reptiles: Reptiles and amphibians would be affected through disturbance and direct mortality during clearing and construction activities under alternative 2. With the use of large construction equipment in a concentrated area, direct mortality from strikes by equipment and vehicles are expected. Construction activities could include the use of helicopters, which could result in an intense period of noise and disturbance over a wider area and would coincide with on-the-ground construction activity. Disturbance and displacement of wildlife species could result from the noise and activity surrounding the use of helicopters. Impacts from disturbance would have the potential to be widespread due to noise. As stated for alternative 1, many amphibians and reptiles migrate in large numbers, some over large distances. Direct mortality of individual animals would not affect the viability of the species, if seasonal restrictions on construction and vegetation maintenance during migration were enforced.

Predation could increase in the ROW under alternative 2 because the vegetation would be maintained at an early successional stage, which can expose species to predators because of less vegetation cover. In addition, as previously described, reduced forest canopy and an increase in sun exposure would reduce the amount of habitat available to amphibians.

Mammals: Clearing and construction activities under alternative 2 would disturb and displace large and mobile mammals; less mobile species could suffer direct mortality. As stated for amphibians and reptiles, the impacts from disturbance could be intensified by the use of helicopters during construction.

After construction, the expanded ROW would be maintained regularly, which could increase its use as a movement corridor by larger mammals but could also increase predation on small mammals as a result of less vegetation cover. Maintenance activities would result in disturbance and direct mortality. These impacts are discussed in detail under alternative 1.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife under alternative 2 would result from habitat loss, habitat alteration, the continued artificial maintenance of the habitat within in the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species.

Cumulative Impacts

Adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result inside the terrestrial study area from past, present, and reasonably foreseeable projects, as described previously in the "Cumulative Impacts Common to All Alternatives" section. Alternative 2 would impact resources inside the park that are also under pressure in the surrounding region. Multiple types of development outside of DEWA and APPA are quickly diminishing the Kittatinny migratory bird flyway and contiguous wildlife habitats on a broader scale. The reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections. Alternative 2 would contribute to the cumulative adverse impact on these resources, particularly with regard to fragmentation, loss of landscape connectivity, and hazard to migratory birds. When the adverse impacts as a result of alternative 2 are combined with the impacts from the other projects in the terrestrial study area, an overall adverse cumulative impact would be expected. Alternative 2 would not increase the levels of impacts.

Conclusion

Alternative 2 would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife. Inside the terrestrial study area, the habitat patches adjacent to the alternative 2 alignment would experience a reduction in size from the expansion of the ROW and further fragmentation from the construction of access roads. The number of patches from 0 to 150 acres would increase from 9 to 20 patches, due to access roads bisecting existing patches and creating several smaller patches. Reductions in the size of larger patches would range from 0.2% to 8%. The increases in habitat fragmentation would result in more isolation between the patches on either side of the ROW and could make some of the smaller patches uninhabitable for certain species. The expansion of the alternative 2 ROW would represent a 14% increase in the amount of maintained scrub shrub habitat in the terrestrial study area.

Although a transmission line ROW currently exists along the alternative 2 alignment, the expansion of the ROW under this alternative could create inhospitable conditions for some species, potentially isolating them on either side of the ROW. Wildlife species would be affected by the actions of alternative 2 throughout the period of analysis. Disturbance and direct mortality would begin with clearing activities and continue through the vegetation maintenance activities. Artificially creating and maintaining successional habitat often increases the number of wildlife species that inhabit the area; however, this local diversity has the potential to lead to the extinction of native species that require large areas of undisturbed habitat (Willyard et al. 2004, 16–17). The adverse impacts from alternative 2, when combined with the adverse impacts from past, present, and reasonably foreseeable projects, would result in adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife.

Alternative 2 would cross in the center part of DEWA, including the MDSR. In general, this area is one of the most undeveloped areas of the park, containing a high concentration of many important and unique natural features including large swaths of contiguous mature forest, rare limestone formations, Arnott Fen, the Delaware River riparian corridor, eastern hemlock forests, Hogback Ridge, Kittatinny Ridge, and Van Campen Brook riparian area. Several resources on this alignment are recognized for their biodiversity (e.g., Hogback Ridge and Arnott Fen) and are significant in both park and regional contexts, making any impacts in these locations even more acute.

When considered in the context of NPS policies for protecting and managing wildlife and wildlife habitat, including the importance of landscape-scale habitat connectivity, alternative 2 would have potential to result in significant adverse impacts. The clearing required to construct and operate the new line would reduce the abundance, diversity, and quality of native vegetation in and around the alignment contrary to the conditions the parks strive to maintain. The de facto permanent removal of vegetation from the corridor would create a new element of fragmentation in the landscape, which would inhibit the transit of certain wildlife and reduce opportunities to create future continuous green spaces. The new line would bisect a major migratory bird flyway and is adjacent to an important communal roost for wintering bald eagles that is one of only two known winter roosts in DEWA. The extent of mortality of migratory birds and bald eagles from collisions with the lines is uncertain. Cumulatively, the new transmission line would bisect a key protected land corridor and decrease connectivity on regional scale. It would also decrease future possibilities to connect adjacent lands to create contiguous green space corridors. For these reasons, the adverse impacts of alternative 2 are considered to be potentially significant.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2 would be significant.

Alternative 2b

Landscape Connectivity and Wildlife Habitat: Alternative 2b would result in a loss of approximately 23-37 acres of habitat loss due to clearing activities and construction of the components of the S-R Line. This alternative would increase the area of maintained utility ROWs in the terrestrial study area from 311 acres to 334 to 348 acres. The current ROW width ranges from approximately 80 to 100 feet; under alternative 2b, this width would increase to 200 to 300 feet where the ROW is not limited by the applicant’s deeded property rights. The widening of the ROW under alternative 2b represents a permanent increase in maintained habitat of 0% to 275%. The permanent loss of forest from access roads and from the alteration of forest to maintained scrub shrub habitat as a result of alternative 2b actions would represent an increase in artificially maintained area of 7% to 12%. Additionally, the removal of danger trees is a part of the applicant’s vegetation maintenance plans. This portion of vegetation maintenance

could involve the removal of individual trees or it could include larger patches of trees, if the trees are deemed to be a threat to the transmission line. A 0.75 mile portion of the existing ROW in Pennsylvania is 100 feet wide. It is anticipated that danger trees would be removed in this area, which includes the heavily forested Hogback Ridge community, and would result in a net loss of mature forest. The amount of danger trees that would be removed is unknown.

Under alternative 2b, the expansion of the ROW and construction of the S-R Line components would fragment the existing habitat in the same manner as described for alternative 2. Patches would be reduced in size and access roads would create new fragmentation. Access roads would be constructed outside the existing ROW and would cause the loss of 4.7 acres of forested land (table 47). The construction of access roads would increase the number of patches from 22 to 30. New patches that would be created by the access roads range from approximately 0.3 acre to 6.6 acres. In two instances, access roads would bisect larger patches, creating two or three smaller patches from each larger patch. For example, one 95-acre patch south of the ROW would be fragmented into three patches with acreages of approximately 17, 26, and 50. The removal of danger trees would also add to fragmentation; however, a definitive amount of deforestation cannot be determined until engineering plans and vegetation surveys are completed.

The wildlife habitat encountered under alternative 2b is the same as that described for alternatives 1 and 2. The construction of access roads would bisect microhabitats and isolate less mobile species on either side of the road. The removal of danger trees could result in a change in conditions along the alternative 2b alignment, depending on the number of trees removed. Newly exposed vegetation that was formerly in shaded areas would be affected by edge conditions such as increased temperature and sun exposure, which could change vegetation composition and habitat conditions.

Wildlife: Under alternative 2b, wildlife would be affected by clearing and construction activities, the operation and maintenance of the proposed transmission line, and vegetation maintenance. Impacts on all wildlife groups are described in detail under alternatives 1 (impacts from vegetation maintenance) and 2 (impacts from construction). The types of impacts from the construction and operation of the proposed transmission line under alternative 2b would be the same. The magnitude of impacts would be approximately the same as alternative 2 because both alternatives would be affecting a linear tract of approximately 5.6 miles within the study area.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife would result from habitat loss, habitat alteration, the continued artificial maintenance of the habitat in the ROW, the isolation of habitat patches, the disturbance and direct mortality of wildlife, and the isolation of some species.

Cumulative Impacts

Adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result inside the terrestrial study area from past, present, and reasonably foreseeable projects, as described previously in the “Cumulative Impacts Common to All Alternatives” section. Alternative 2b would impact resources inside the park that are also under pressure in the surrounding region. Multiple types of development outside of DEWA and APPA are quickly diminishing the Kittatinny migratory bird flyway and contiguous wildlife habitats on a broader scale. The reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections. Alternative 2b would contribute to the cumulative adverse impact on these resources, particularly with regard to fragmentation, loss of landscape connectivity, and hazard to migratory birds. When the adverse impacts as a result of alternative 2b are combined with the impacts from the other

projects in the terrestrial study area, an overall adverse cumulative impact would be expected. Alternative 2b would not increase the levels of impacts.

Conclusion

Alternative 2b would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife from artificially maintaining a ROW that bisects natural landscapes in the parks despite NPS protection and national designations of natural, scenic, and recreational resources. Inside the terrestrial study area, alternative 2b would result in the permanent loss of approximately 4.5 acres of mature forest through the construction of access roads. The access roads would increase the number of patches adjacent to the ROW from 19 to 33. A majority of the new patches created by construction of the access roads be small, from 0.03 to 6.5 acres. The removal of danger trees would cause the additional removal of mature forest, but the amount cannot be determined at this time.

Adverse impacts on wildlife would also result from these changes to landscape connectivity and wildlife habitat. Wildlife species would be affected by the actions of alternative 2b throughout the period of analysis. Disturbance and direct mortality would begin with clearing activities and would continue through vegetation maintenance activities. When the adverse impacts from alternative 2b are combined with the adverse impacts from past, present, and reasonably foreseeable future projects, adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result.

For the same reasons outlined for alternative 2, alternative 2b would likely result in significant adverse impacts on landscape connectivity, wildlife habitat, and wildlife.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Common to Alternatives 3, 4, and 5

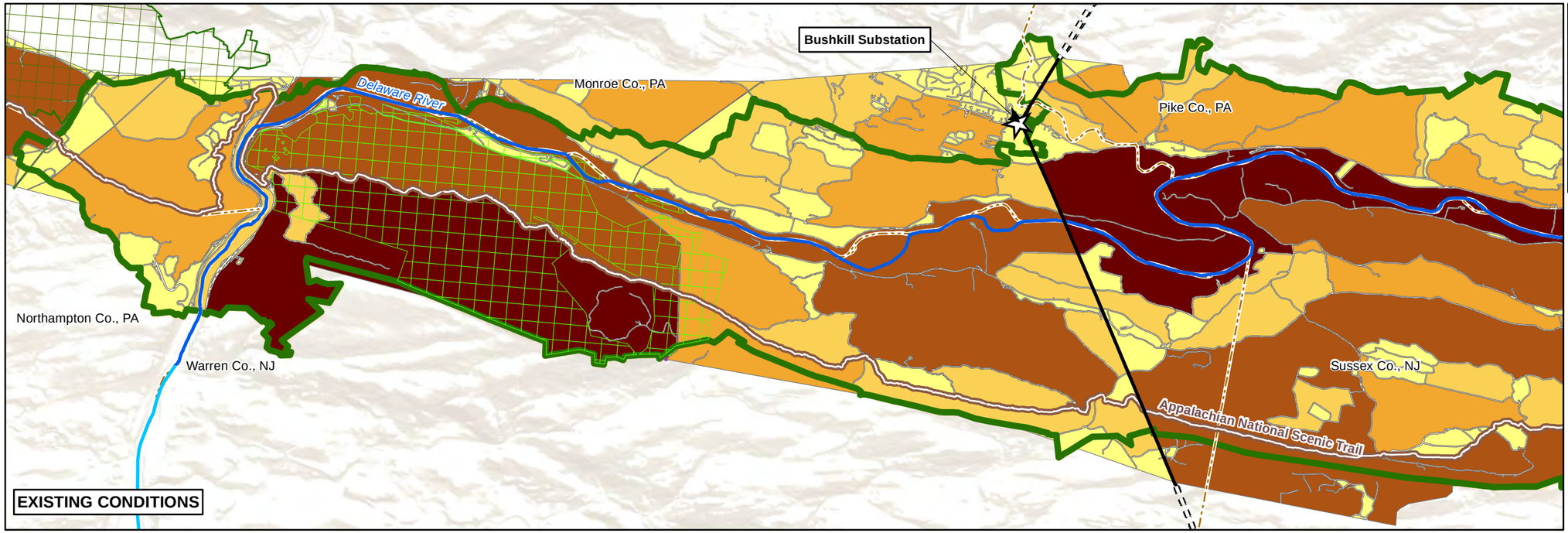
Restoration of the B-K Line: Alternatives 3, 4, and 5 would require the removal of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA. Wetlands, floodplains, and forest would be restored (53 acres total), creating larger patches of contiguous habitat and reducing fragmentation in the core of the park. This would ultimately result in the restoration of wildlife habitat with benefits to wildlife. The details of the removal and disposal of the existing conductors and structures are discussed in chapter 2. Vegetation in the existing ROW would be cleared and spur roads would be constructed for the removal process. In the existing ROW, approximately 53 acres of land within NPS boundaries would be cleared of vegetation. An additional 1.1 to 1.5 acres of vegetation within NPS lands and the terrestrial study area but outside the ROW would be cleared to construct access roads. These clearing and construction activities would remove wildlife habitat and disturb wildlife. Human presence and noise would disturb wildlife in the area and the use of heavy machinery during the deconstruction process would cause direct mortality of less mobile species.

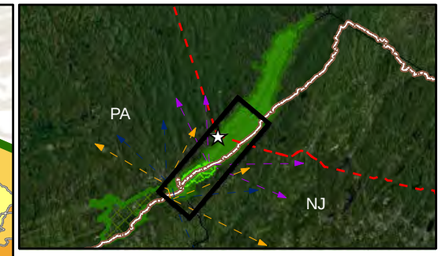
Following the deconstruction of the B-K Line, the access roads and the ROW would be restored to original conditions to the greatest extent possible. These areas would be disked or tilled as needed to mitigate soil compaction. After soil preparation, the areas would be seeded with an NPS-approved conservation seed mixture and allowed to succeed naturally into forested habitat over the long term; however, restoration of the ROW to mature forest would not be complete within the period of analysis of this EIS. Allowing the natural process of succession to reclaim the ROW as natural habitat would result in 53 fewer acres of utility ROW in the terrestrial study area (table 47). In the long term, the restoration would also create connectivity among large patches of habitat that are currently fragmented. The restoration would cause an increase in two patches (originally 4,031 and 1,786 acres) that are currently bisected by the B-K Line, resulting in an increase in size of 3.9% and 307% (for a total of 4,188 and 7,272 acres, respectively). The larger patch, which would generally follow MDSR, contains several rare and unique communities and would stretch approximately 18.3 miles through DEWA. The restoration of the B-K Line would allow two to three patches to join and create larger patches in five instances (figures 72 and 73). In the eastern portion of DEWA in New Jersey, two large habitat patches of 2,338 and 2,763 acres would gain connectivity with patches south of the B-K Line, creating patches of 2,393 acres and 3,053 acres. This area is separated into two patches by the Trail; however, the Trail a 3-foot wide earthen path that is well integrated into the environment.

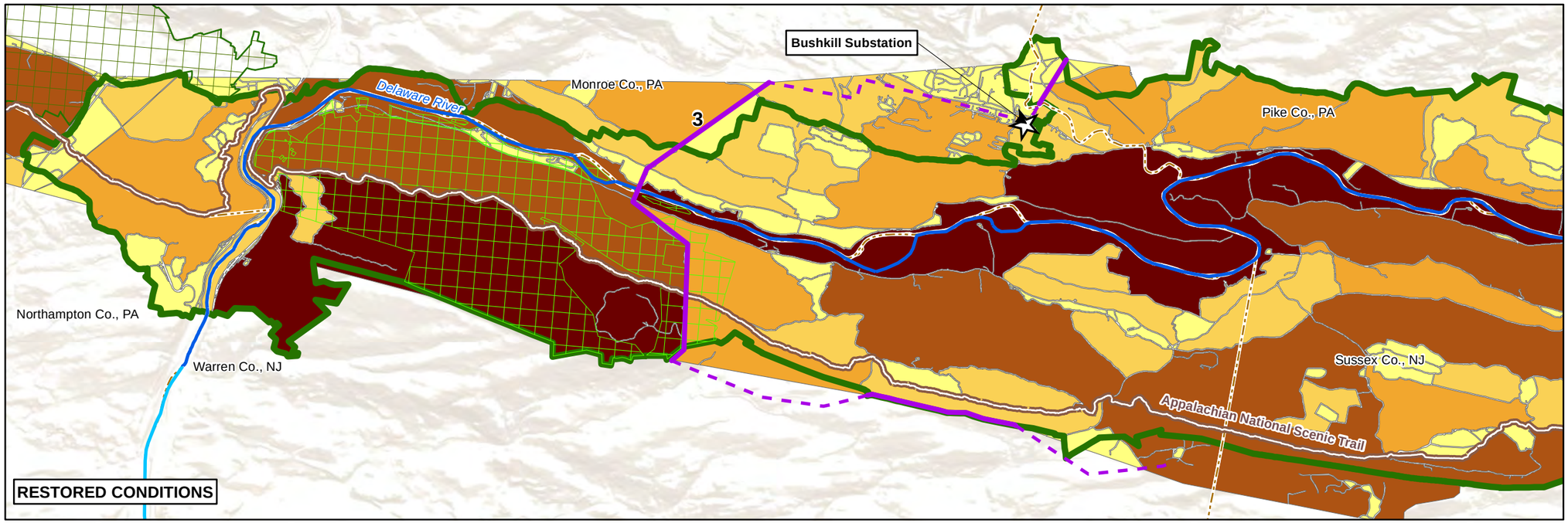
Alternative 3

Landscape Connectivity and Wildlife Habitat: The existing ROW along the alternative 3 alignment ranges from approximately 40 to 125 feet wide. The ROW proposed for alternative 3 would be expanded and permanently maintained at 200 to 300 feet wide, an increase of 60% to 650%. With the ROW expansion and the construction of access roads outside the ROW, approximately 87 to 161 acres of mature forest would be lost under alternative 3 (table 47). As stated for alternative 2, the fragmentation of the landscape and habitats would increase from widening the ROW, and the fragmentation and the amount of edge would increase from the construction of the access roads and the removal of danger trees.

The forest blocks through which the alternative 3 alignment would pass represent some of the larger contiguous forest stands in the parks; the largest patches along alternative 3 are within Worthington State Forest. Currently, 17 habitat patches exist adjacent to the alternative 3 alignment, ranging from 0.15 acre to 4,332 acres. Under alternative 3, the number of habitat patches would increase to 20, the sizes of which would range from 0.012 to 7,272 acres. The increase in the number of patches would be small, with the largest measuring 1.2 acres, and would result from the construction of access roads, which would extend outside the ROW. Ten of the larger patches (more than 150 acres) adjacent to the ROW of alternative 3 would experience a reduction in size ranging from 0.2% to 10%.







Legend

- Substation
- Alternative 3
- Alternative 3 (outside study area)
- Existing Transmission Line
- Outside Study Area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest
- County Line

Habitat Patch Acreages

- 0 - 150 acres
- 150 - 500 acres
- 500 - 1,200 acres
- 1.200 - 3,200 acres
- 3,200 - 8,000 acres

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

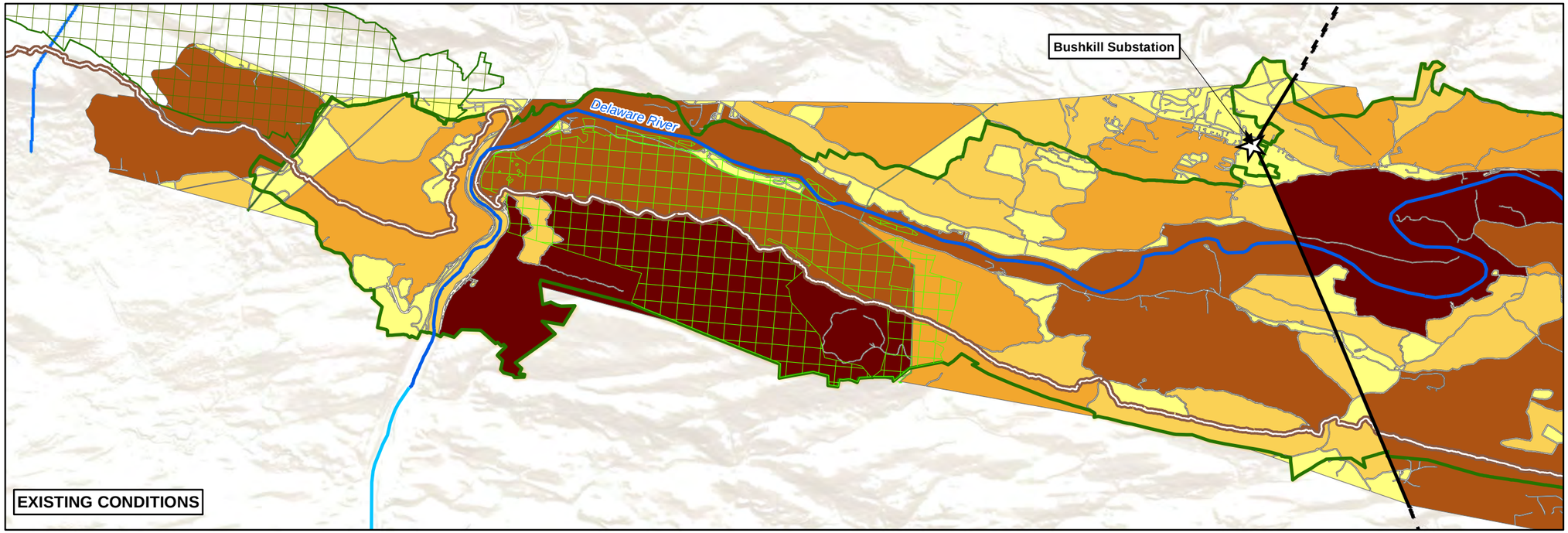
0 1 2
Miles

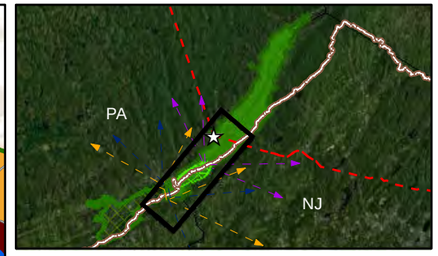
Susquehanna to Roseland Transmission Line Proposal and Right-of-Way Request EIS

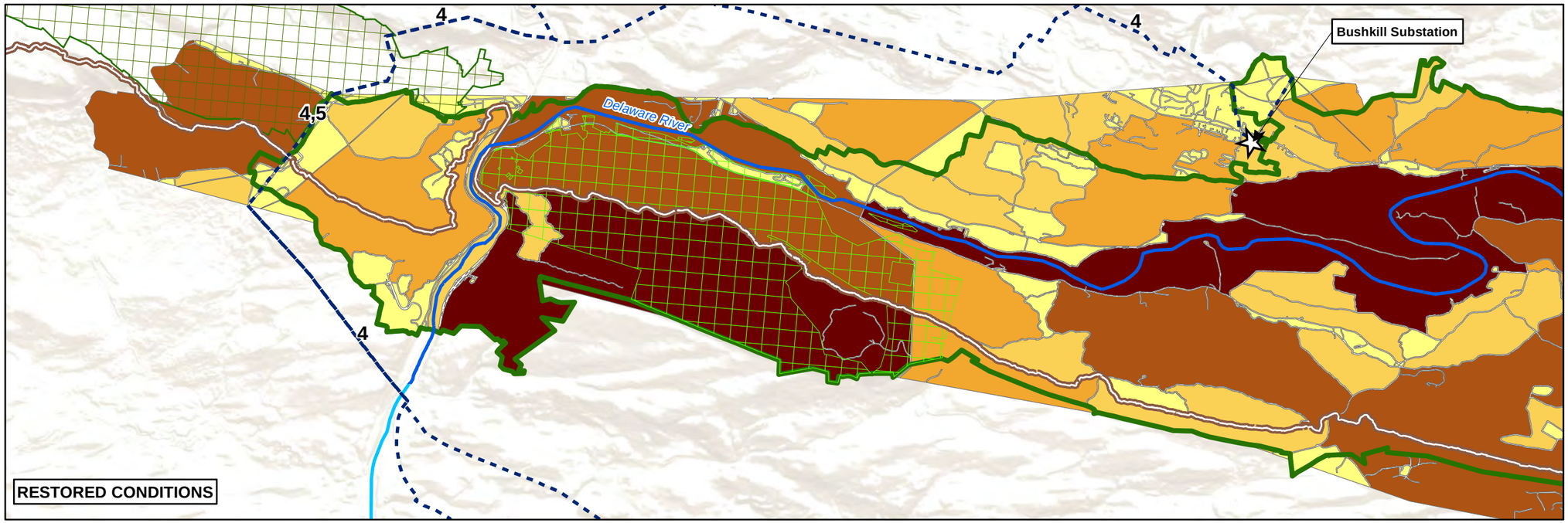
Figure 72
Alternative 3
Existing vs. Restored Conditions

Source: ESRI Streetmap 2009;
NPS 2011;
ArcGIS Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July, 2012







Legend

- Substation
- Alternative 4,5
- Alternative 4,5 (Outside study area)
- Existing Transmission Line
- Outside study area
- Appalachian National Scenic Trail
- Middle Delaware National Scenic & Recreational River
- Delaware River
- Delaware Water Gap National Recreation Area
- CVNWR Boundary
- Worthington State Forest

Habitat Patch Acreages

- 0 - 150 acres
- 150 - 500 acres
- 500 - 1,200 acres
- 1.200 - 3,200 acres
- 3,200 - 8,000 acres

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

0 1 2
Miles

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

Figure 73
Alternative 4/5
Existing vs. Restored Conditions

Source: ESRI Streetmap 2009;
NPS 2011;
ArcGIS Map Service 2010;

Projection: NAD 83 UTM Zone 18N
Date: July, 2012

Alternative 3 would include a portion of the existing B-K Line alignment from the Bushkill Substation to the western boundary of DEWA. This portion of DEWA is currently fragmented by other existing ROWs and roads. The patches of habitat in this area would be reduced in size and some smaller patches would be eliminated completely by the expansion of the ROW; access roads would also create new fragmentation. One patch that is currently 21.4 acres would be bisected by an access road, creating two patches of approximately 2.5 acres and 18.6 acres. The two patches larger than 100 acres would be reduced in size by approximately 0.2% to 1.8%.

Inside the terrestrial study area, there are currently 311 acres of utility ROWs that are maintained as scrub shrub habitat. The permanent loss of forest from access roads and the alteration of forest to maintained scrub shrub habitat as a result of alternative 3 actions would add to this total. The combined area of mechanically and/or chemically maintained corridors would amount to approximately 396 to 470 acres, with an additional 1.6 acres of access roads constructed outside the expanded ROW (table 47). However, while 87 to 161 acres of mature forest would be lost under alternative 3, approximately 53 acres of previously maintained habitat would be restored along the B-K Line, as described above in the "Common to Alternatives 3, 4, and 5" section. The restoration would create the largest habitat patch in DEWA, approximately 7,272 acres, which would generally follow MDSR for approximately 18.3 miles. In the long term, outside the analysis period of this EIS, the total area maintained in utility ROWs would be approximately 343 to 417 acres, resulting in an increase in maintained area of 10% to 34%.

The length of expanded and maintained ROW along the alternative 3 alignment in the parks is approximately 5.4 miles, while the length in the parks that would be restored is approximately 3.7 miles. With the restoration of the B-K Line, there would not be any other east–west feature that would completely linearly fragment habitats in DEWA north of the alternative 3 alignment. The restoration of most of the existing ROW along the B-K Line would counteract some of the impacts from implementing alternative 3; however, the reduction in habitat fragmentation and further habitat isolation would not completely mitigate the adverse effects of constructing, operating, and maintaining the S-R Line along the alternative 3 alignment.

The alternative 3 alignment contains a variety of habitats, including mature hemlock forests, riparian corridors, and abundant wetlands. Tree removal and the expansion of successional habitat in the ROW would permanently alter habitat, creating a wider expanse of successional habitat that would require maintenance for the period of analysis. The alternative 3 alignment is generally an east–west corridor, which would be susceptible to increased sun exposure, which can alter vegetation composition as discussed for alternative 2. Additionally, 100-foot riparian corridors would be retained as previously discussed, which could create wildlife movement corridors between the habitats on either side of the alignment.

Under alternative 3, the impacts on wildlife habitat from fragmentation would include the loss of habitat, reduced habitat patch size, increased edge, and the increased isolation of patches along 6.9 miles of the alignment. These impacts are described in detail under alternative 2. In addition to mature forests, agricultural fields would be affected under alternative 3. The agricultural fields are maintained habitat; however, these fields provide nesting and foraging habitat for a variety of wildlife species, including birds, reptiles, and mammals, and activities in the fields could disrupt these species.

The alternative 3 alignment would traverse 7.2 miles of the terrestrial study area and would affect a variety of habitats. Clearing, construction, and the continued maintenance of the expanded ROW would result in adverse impacts on landscape connectivity and wildlife habitat due to habitat fragmentation, loss, and alteration and further isolation of habitat patches. However, the beneficial impacts from the restoration of a portion of the existing B-K Line ROW would decrease these impacts somewhat.

Wildlife: All activities under alternative 3 (clearing and construction activities, the operation and maintenance of the proposed transmission line, and vegetation maintenance) would affect wildlife. Impacts on all animal groups are described in detail under alternatives 1 and 2. The types of impacts from the construction and operation of the proposed transmission line under alternative 3 would be the same as those described previously. The magnitude of impacts would be slightly higher than alternatives 2 and 2b because alternative 3 would affect an additional 1.3 miles within the study area.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife under alternative 3 would result due to habitat loss, habitat alteration, the continued artificial maintenance of the habitat in the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species.

Cumulative Impacts

Cumulative impacts on landscape connectivity, wildlife habitat, and wildlife inside the terrestrial study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. The transmission line at large would require other actions taken by the applicant to complete construction elsewhere along its expanse. These other actions would further fragment wildlife habitat and reduce landscape connectivity within the broader expanse of these resources in which the parks are located. Alternative 3 would persist as a non-conforming feature in the parks landscape and would remain for the life of the line. When the adverse impacts as a result of alternative 3 are combined with the impacts from the other projects in the terrestrial study area, an overall adverse cumulative impact would be expected. Alternative 3 would not increase the level of impact.

Conclusion

Alternative 3 would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife from artificially maintaining a ROW that bisects natural landscapes in the parks despite NPS protection and national designations of natural, scenic, and recreational resources. Inside the terrestrial study area, alternative 3 would result in an increase in ROW width of approximately 60% to 650% from current conditions. The implementation of alternative 3 would fragment the habitat patches adjacent to the ROW by the construction of access roads. Additionally, the patches would be reduced in size by the expansion of the ROW. However, under alternative 3, the B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be restored to natural conditions. In the long term, the restoration would allow habitat patches that are currently bisected by the ROW to reconnect, resulting in larger patches of contiguous habitat. The restoration would create the largest habitat patch in DEWA, approximately 7,272 acres, which would generally follow MDSR for approximately 18.3 miles. The restoration of the B-K Line ROW would offset some of the habitat fragmentation and further habitat isolation impacts of alternative 3, but it would not completely mitigate these impacts. The expansion of the alternative 3 ROW would represent a 10% to 34% increase in the amount of maintained scrub shrub habitat in the terrestrial study area.

These changes to landscape connectivity and wildlife habitat would also result in adverse impacts on wildlife. Wildlife species would be affected by the activities of alternative 3 throughout the period of analysis. Disturbance, direct mortality, and isolation would begin with clearing activities and would continue through the vegetation maintenance activities. When the adverse impacts from alternative 3 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result.

For many of the same reasons outlined for alternatives 2 and 2b, alternative 3 would likely result in significant adverse impacts on landscape connectivity, wildlife habitat, and wildlife. DEWA, MDSR, APPA, and Worthington State Forest are refuges within the densely populated east coast, and are the centerpieces for some of the largest continuous protected lands. While not the same concentration of high-quality resources as the area where alternatives 2 and 2b are located, alternative 3 would cross a diversity of habitats, including some of the largest areas of contiguous forest, and would be located along the same unique topography and geology of Kittatinny Ridge, Delaware River Riparian Corridor, and the mature undisturbed eastern hemlock forests which are the cornerstones of the geography in this region. Alternative 3 would further fragment these habitats, reducing the abundance, diversity, and quality of native vegetation in and around the alignment contrary to the conditions the parks strive to maintain. The additional fragmentation would further isolate wildlife populations and inhibit movement within and along habitat corridors. As with any of the action alternatives, the new line would bisect a major migratory bird flyway, creating potential for mortality of migratory birds as a result of collisions with the lines, the extent of which cannot be accurately predicted or effectively prevented. Cumulatively, the new transmission line would bisect a key protected land corridor and decrease connectivity on regional scale. It would also decrease future possibilities to connect adjacent lands to create contiguous green space corridors. Alternative 3 would have a potentially significant benefit on landscape connectivity, wildlife habitat, and wildlife as a result of the removal of the existing B-K Line and restoration of a large contiguous area of high-quality habitat in the heart of DEWA and the MDSR. This benefit would partially offset the adverse impacts of creating additional fragmentation along the alternative 3 alignment. Compared to alternatives 2 and 2b, the adverse impacts of alternative 3 would be somewhat less because the area crossed by alternative 3 contains fewer high quality resources and the adverse impacts would be offset to some degree by the benefit of removing and restoring the existing line; however, when considered in the context of NPS policies for protecting and managing wildlife and wildlife habitat, including the importance of landscape-scale habitat connectivity, the adverse impacts of alternative 3 would likely be significant.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 4

Landscape Connectivity and Wildlife Habitat: The alternative 4 alignment would be constructed along an existing ROW that varies in width from 70 to 120 feet. Expanding this corridor to 200 to 300 feet for alternative 4 would create a ROW approximately 67% to 328% wider than the existing ROW. Both fragmentation and edge habitat would be increased by clearing, construction, and vegetation maintenance activities under alternative 4.

The types of effects of habitat fragmentation, loss, and alteration and further isolation of habitat patches under alternative 4 would be the same as described in detail under alternative 2. The habitat available along the alternative 4 corridor is diverse; however, the forests surrounding the alternative 4 corridor have been fragmented by additional ROWs, permanent roads, and developed areas near the route (figure 73). Concentrating infrastructure at the edges of DEWA would reduce the amount of fragmentation by

preserving larger contiguous habitat patches. The habitat patches on both sides of the existing ROW that would be affected are generally smaller in size than those described for alternatives 2 and 3, ranging from approximately 1.2 to 945 acres. Currently, three habitat patches adjacent to the alternative 4 alignment contain more than 150 acres. Under alternative 4, these patches would be reduced by 0.2% to 1.8%. Because alternative 4 would mostly use existing access roads, no further fragmentation would result from access road construction.

The permanent loss of forest from access roads and the alteration of forest to maintained scrub shrub habitat as a result of alternative 4 actions would add to the 311 acres of maintained habitat currently in the terrestrial study area. The combined area of mechanically and/or chemically maintained corridors would amount to approximately 377 to 405 acres. While 31 to 59 acres of mature forest would be lost under alternative 4, with an additional acre lost outside the ROW from the construction of access roads, approximately 53 acres of previously maintained habitat would be restored along the B-K Line (table 47), as described in above in the "Common to Alternatives 3, 4, and 5" section. In the long term, outside the analysis period of this EIS, the total area maintained in utility ROWs would be approximately 324 to 352 acres. This range represents an increase of 4% to 13% in maintained areas.

The alternative 4 alignment contains mostly deciduous woodland communities with some wetlands. The types of impacts from habitat fragmentation, loss, and alteration and further isolation of habitat patches under alternative 4 would be expected to be similar in nature to those described under alternative 2. Because the alternative 4 alignment is oriented in a north–south direction, the effects of sun exposure would not be as severe as for east–west-oriented alignments.

Wildlife: Under alternative 4, wildlife would be affected by clearing and construction activities, the operation and maintenance of the proposed transmission line, and vegetation maintenance. Impacts on all wildlife groups are described in detail under alternatives 1 and 2. The types of impacts from the construction and operation of the proposed transmission line under alternative 4 would be the same. The magnitude of impacts would be less than alternatives 2, 2b and 3 because this alternative would affect approximately 2.3 miles within the study area.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife under alternative 4 would result due to habitat loss, habitat alteration, the continued artificial maintenance of the habitat in the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species.

Cumulative Impacts

Cumulative impacts on landscape connectivity, wildlife habitat, and wildlife inside the terrestrial study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. The transmission line at large would require other actions taken by the applicant to complete construction elsewhere along its expanse. These other actions would further fragment wildlife habitat and reduce landscape connectivity within the broader expanse of these resources in which the parks are located. Alternative 4 would persist as a non-conforming feature in the parks landscape and would remain for the life of the line. When the adverse impacts as a result of alternative 4 are combined with the impacts from the other projects in the terrestrial study area, an overall adverse cumulative impact would be expected. Alternative 4 would not increase the level of impact.

Conclusion

Alternative 4 would result in adverse impacts from a decrease in mature forest, an increase in edge habitat, increased habitat fragmentation, the disturbance and direct mortality of wildlife, increased predation, and the isolation of some species. Inside the terrestrial study area, alternative 4 would result in the permanent loss of mature forest through the widening of the existing ROW and the construction of access roads. The habitat patches along the alternative 4 alignment are currently fragmented by existing roads, other ROWs, and encroaching development, because this alignment is sited at the edge of the DEWA boundary. The habitat patches along the alignment (including the portion of the B-K Line from the Bushkill Substation to the western portion of DEWA) currently range from approximately 1.2 to 945 acres and the larger habitat patches would be reduced in size by approximately 0.4% to 1.2%. The restoration of the B-K Line ROW from the Bushkill Substation to the eastern boundary of DEWA would help offset the impacts from habitat fragmentation and further habitat isolation under alternative 4.

Wildlife would be affected by the adverse impacts on landscape connectivity and wildlife habitat. During all activities under alternative 4, wildlife could suffer direct mortality, disturbance, isolation, and an increase in competition for resources in remaining habitat patches. The development of early successional habitat along the ROW as a result of the long-term maintenance of vegetation inside the terrestrial study area would result in a long-term shift in species composition. When the adverse impacts from alternative 4 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result.

When considered in the context of NPS policies for protecting and managing wildlife and wildlife habitat, including the importance of landscape-scale habitat connectivity, the adverse impacts of alternative 4 would not be considered significant. The area crossed by alternative 4 is much more fragmented than the other alternatives and the additional clearing of the ROW and access roads would not greatly increase the fragmentation, unlike the other alternatives. More importantly, alternative 4 would benefit park management goals by concentrating infrastructure at the edges of DEWA which would help reduce the amount of fragmentation by preserving larger contiguous habitat patches and increasing the potential for opportunities to create future continuous green spaces. Alternative 4 would also have the potentially significant benefit of removing the existing B-K Line and restoring a large, contiguous area of high-quality habitat in the heart of DEWA and the MDSR. For these reasons, the adverse impacts of alternative 4 would not likely be considered significant.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 5

Landscape Connectivity and Wildlife Habitat: The alternative 5 alignment would be constructed along an existing ROW that varies in width from 70 to 100 feet. Under alternative 5, the ROW would undergo an increase in width of approximately 100% to 329%. Fragmentation and edge habitat would be increased under alternative 5.

The wildlife habitat along the alternative 5 alignment is the same as that described for alternative 4 and would be affected by the same habitat fragmentation and isolation impacts, with reductions in the size of the large habitat patches from 0.4% to 0.9% and no further fragmentation from the construction of access roads.

As a result of alternative 5 actions, the combined area of mechanically and/or chemically maintained corridors would amount to approximately 355 to 375 acres in the terrestrial study area, with an additional 0.3 acres of access roads constructed outside the expanded ROW (table 47). While 25 to 45 acres of mature forest would be lost under alternative 5 (including 16 to 28 acres of forest in the parks), approximately 53 acres of previously maintained habitat would be restored along the B-K Line, as described in above in "Common to Alternatives 3, 4, and 5." In the long term, outside the analysis period of this EIS, the total area maintained in utility ROWs would be approximately 302 to 322 acres, which would result in a decrease in maintained habitat of 3% to an increase of 4% from the current 311 acres. The adverse impacts on landscape connectivity and wildlife habitat under alternative 5 from clearing, construction, and the continued maintenance of the expanded ROW would not be completely mitigated by beneficial impacts from the restoration of the B-K Line.

Wildlife: Under alternative 5, wildlife would be affected by direct mortality, increased predation, and isolation through clearing and construction activities, the operation and maintenance of the proposed transmission line, and vegetation maintenance. Impacts on all wildlife groups are described in detail under alternatives 1 and 2. The types of impacts from the construction and operation of the proposed transmission line under alternative 5 would be the same. The magnitude of impacts would be less than the rest of the action alternatives because this alternative would affect the least amount of wildlife habitat within the study area.

Overall Impacts on Landscape Connectivity, Wildlife Habitat, and Wildlife: Adverse impacts on landscape connectivity, wildlife habitat, and wildlife under alternative 5 would result due to habitat loss, habitat alteration, the continued artificial maintenance of the habitat in the ROW, the isolation of habitat patches, increased edge habitat, the disturbance and direct mortality of wildlife, and the isolation of some species.

Cumulative Impacts

Cumulative impacts on landscape connectivity, wildlife habitat, and wildlife inside the terrestrial study area from past, present, and reasonably foreseeable projects would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. The transmission line at large would require other actions taken by the applicant to complete construction elsewhere along its expanse. These other actions would further fragment wildlife habitat and reduce landscape connectivity within the broader expanse of these resources in which the parks are located. Alternative 5 would persist as a non-conforming feature in the parks landscape and would remain for the life of the line. When the adverse impacts as a result of alternative 5 are combined with the impacts from the other projects in the terrestrial study area, an overall adverse cumulative impact would be expected. Alternative 5 would not increase the level of impact.

Conclusion

Alternative 5 would result in adverse impacts on landscape connectivity, wildlife habitat, and wildlife from artificially maintaining a ROW that bisects natural landscapes in the parks despite NPS protection and national designations of natural, scenic, and recreational resources. Inside the terrestrial study area, alternative 5 would result in the permanent loss of mature forest through the widening of the existing ROW.

Under alternative 5, the expansion of the existing ROW would decrease the size of the habitat patches and eliminate several small patches, which would increase habitat isolation. The larger habitat patches would be decreased by 0.4% to 0.9%. The restoration of the B-K Line from the Bushkill Substation to the eastern boundary of DEWA under alternative 5 would mitigate some of the adverse impacts of constructing, operating, and maintaining the S-R Line. In the long term, decommissioning the existing transmission line along the B-K Line and allowing the ROW to revegetate naturally would result in benefits to landscape connectivity; however, the existing ROW would not return to mature forest within the analysis period of this EIS.

These changes to landscape connectivity and wildlife habitat would also result in impacts on wildlife. Wildlife species would be affected by the actions of alternative 5 throughout the period of analysis. Disturbance and direct mortality would begin with clearing activities and would continue through the vegetation maintenance activities. When the adverse impacts from alternative 5 are combined with the adverse impacts from past, present, and reasonably foreseeable projects, adverse cumulative impacts on landscape connectivity, wildlife habitat, and wildlife would result.

For the same reasons outlined for alternative 4, the adverse impacts of alternative 5 would not likely be considered significant.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

SPECIAL-STATUS SPECIES (AQUATIC AND TERRESTRIAL)

In this section, impacts on federally and state-listed threatened and endangered species as well as candidate species described as present or with the potential to be found in the study area (see chapter 3) are analyzed and given equal consideration for analysis in this EIS. To date no critical habitat has been designated for any federally listed species in the study area. Included in the analysis is an evaluation of the alternatives as they relate to impacts on both aquatic and terrestrial special-status species.

METHODOLOGIES

The impact analysis for special-status species included a determination of species likely to inhabit areas potentially affected, a determination of habitat types that would be lost or altered (changed from one habitat type to another), and a discussion of other potential direct and indirect effects. Impacts on special-status species were assessed in terms of changes in the amount and connectivity of special-status species habitat, the integrity of the habitat (including past disturbance) and populations, and the potential for increased/decreased disturbance.

Specific impacts on special-status species are described in this section for listed species known to be present or with the potential to be found inside the study area (see chapter 3). In general, it is not known where and to what extent special-status species would be present outside the study area. Potential impacts that could occur outside the study area, including those that may affect listed special-status migratory bird

species, are discussed on a qualitative basis using best available information. Due to a lack of information and the uncertainty of impacts, a range is described for impacts outside the study area.

Inside the study area, impacts on special-status species are analyzed for the transmission line corridor as described for each alternative and any areas outside the corridor where necessary pulling and splicing sites and access road development, including spur roads, are proposed. Outside the study area, a possible route was plotted to the Susquehanna and Roseland substations. Because the NPS cannot dictate where the line would actually go, the direct impacts from the construction and maintenance of the transmission line outside the study area cannot be determined; however, indirect impacts are analyzed.

Resource-specific context for assessing impacts to special-status species includes the following:

- These species are protected by federal and state laws which means that protection of these species is significant on a national scale and/or regional scale (within the state).
- All federal agencies are specifically charged by the Endangered Species Act to conserve listed species and are prohibited from taking actions that would jeopardize the continued existence of these species; NPS *Management Policies 2006* and Director's Order 77 (Natural Resource Protection) also direct the NPS to treat state-listed species in the same way that federally listed species are treated to the extent practicable.
- The presence of special-status species in the parks is an important component of the visitor experience; bald eagles in particular offer visitors a highly valued opportunity for wildlife observation that is not commonly available in adjacent developed areas.
- Maintaining the integrity of local populations (occurrences) of state-listed and federally listed species, and their habitat, is important because these species are rare; have specialized habitat requirements; and because the parks serve as a refuge from surrounding habitat loss and alteration due to development pressure in the region.
- The effectiveness of mitigation measures or BMPs in reducing negative impacts to special-status species or their habitat, if such measures are implemented.
- Additional context for bald eagles is the USFWS National Bald Eagle Management Guidelines, which recommend "To avoid collisions, site wind turbines, communication towers, and high voltage transmission power lines away from nests, foraging areas, and communal roost sites." If these guidelines cannot be followed, a permit must be obtained from the USFWS to authorize "limited, non-purposeful take of bald eagles…in the course of conducting lawful activities…"
- The Kittatinny Ridge is an important migratory corridor for avian species protected under the Migratory Bird Treaty Act.
- Additional context for bats is the alarming decline in many bat populations throughout the Northeast due to white-nose syndrome. Some species may be in danger of extirpation because of white-nose syndrome. Any stressor should be evaluated as a possible contributing factor to overall local and regional population health.

STUDY AREA

The study area for special-status species includes the ROW for each alternative and any area outside the ROWs where necessary pulling and splicing sites, staging areas, and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, the indirect impacts on special-status species cannot be evaluated per alternative.

The potential impacts outside the study area are generally addressed; however, further surveys would be required prior to construction of the S-R Line.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

For this EIS, actions inside and outside the study area could affect vegetation and aquatic communities that provide habitat for special-status plant and wildlife species (including fish; aquatic and terrestrial invertebrates; migratory, breeding, and resident birds; amphibians and reptiles; and small and large mammals). Alteration, degradation, fragmentation, and permanent loss of vegetation communities that provide habitat for special-status plant and wildlife species could occur as a result of development projects, fire suppression, the loss of habitat continuity, water quality degradation, and the establishment of nonnative invasive species. These actions could alter the behavior, reproductive success, and survival of special-status species, which in turn could affect the distribution and abundance of species. In addition, climate change may alter species distribution as a result of the expansion or contraction of breeding ranges, changes in food resources, and the availability of seasonally used habitats. Specific to bats, the spread of white-nose syndrome could decimate communal winter roosts in hibernacula throughout the region, including outside the study area described for this EIS.

Other actions inside and outside the study area may result in the protection, restoration, or enhancement of natural resources that would result in benefits to special-status species and habitat. Past, present, and reasonably foreseeable activities that would affect special-status species inside and outside the study area are listed below and discussed under each alternative as applicable. A complete list of projects that may contribute to cumulative impacts both inside and outside the study area can be found in appendix H.

Projects Inside the Study Area

Inside the study area the cumulative projects with adverse impacts include the following road and utility projects: Old Mine Road South rehabilitation, US Route 209 Raymondskill Creek Bridge rehabilitation (bridge repair), Watergate Dam #10 (dam restoration), the Tennessee Gas Line Proposal (addition to an existing gas pipeline), the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), and the Northeast Supply Link Expansion (Palmerton Loop gas pipeline). The New Jersey Swim Beach (Turtle Beach) project, located on the Delaware River at the Coppermine Inn site, provides an accessible opportunity for protected swimming that meets visitor demand as recommended in the general management plan (GMP) for DEWA and MDSR (NPS 1987). Although this project may initially have an adverse impact on special-status species, the swim beach project has an overall beneficial effect through the closure of the informal swim beach that has evolved over time; the closure of the informal swim beach reduces (but does not eliminate) adverse impacts to special-status species. Although not a project, the illegal collection of special-status plants and animals in DEWA also has adverse impacts on listed species.

Beneficial impacts on special-status species are expected to occur from the McDade Trail realignment as well as from designating lands as IBAs or IMAs. The IBA and IMA designation helps preserve critical habitat and guide habitat management decisions for wildlife, including special-status species, as described in chapter 3. Additionally, there are several land protection programs, including county and township open space and conservation plans, which could protect special-status species and associated habitat. The beneficial effects of many of the listed programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis; therefore, the level of benefit resulting from the implementation of any project is also variable.

Although these projects would protect special-status species, the beneficial impacts would not reduce the adverse impacts from the above-mentioned development projects. Overall, cumulative impacts on special-

status species inside the study area from the actions of other past, present, and future projects are expected to be adverse.

Projects Outside the Study Area

Outside the study area, cumulative projects that could result in adverse impacts on special-status species include the following road and utility projects: Marcellus shale natural gas drilling, the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline), the PPL proposal for a 138/12-kV substation (which opens up additional areas to electric transmission), and transportation improvement and replacement projects in Pennsylvania and New Jersey. In addition, proposed and future residential and commercial developments in New Jersey and Pennsylvania could cause adverse impacts on special-status species through loss and fragmentation of habitat. Outside the study area, land can be protected by other agencies under federal, state, or private ownership. Nongovernmental organizations such as TNC work toward identifying and preserving land that contains rare or unique features or key habitat for plants and wildlife. The beneficial effects of many of these programs are dependent on the availability of funding for specific projects, which is uncertain and could vary throughout the period of analysis. Therefore, the level of benefit resulting from the implementation of any project cannot be predicted. Despite land protection and conservation programs, land would continue to be subject to development that would continue to cause the loss, alteration, and fragmentation of habitat. As a result, actions and activities in the past, present, and foreseeable future would contribute to the decline in the quality of habitat that may support special-status species. Overall, cumulative impacts on special-status species outside the study area would be adverse.

IMPACTS OF THE ALTERNATIVES ON SPECIAL-STATUS SPECIES

Due to their mobility, it is possible that the special-status aquatic, terrestrial invertebrate, bird, reptile and amphibian, or mammal species described in chapter 3 (tables 13, 15, 16, 17, and 18) could be present inside or outside the study area for any of the alternatives (1 through 5) where adequate appropriate habitat exists. This section focuses on the special-status species (both wildlife and plant species) that have been observed or otherwise documented and those with a high probability of being present inside or outside the study area, as applicable, for each alternative.

Common to All Alternatives

Vegetation Maintenance: Vegetation management would occur at least annually. The details of the applicant's vegetation management plans and techniques for clearing vegetation are explained in chapter 2. Vegetation maintenance activities would sustain habitat in the existing ROW as early successional scrub shrub. Maintenance activities would have the potential to temporarily disturb and/or displace special-status species foraging or nesting in and along the length of the existing ROW as a result of noise and human activity. The impacts from vegetation maintenance are discussed for each alternative, as applicable.

Invasive Plant Species Management: Nonnative, invasive plant species can compete with native species, including special-status species. While not all nonnative species are harmful, those that are invasive can have serious consequences for native habitats. Management of nonnative, invasive species in the study area can indirectly affect special-status species using habitats where management is conducted. Invasive species management programs in the study area are discussed in the "Invasive Plant Species" section of chapter 3 and would also be implemented through the applicant's NPS-approved vegetation management plans (see chapter 2 and appendix F).

Electrocutions with Existing Transmission Lines: Electrocution can occur when a bird simultaneously contacts electrical equipment elements, either phase to phase or phase to ground (APLIC 2006, ix). This normally occurs when a bird attempts to perch on a transmission tower/pole with insufficient clearance between these elements; birds such as raptors may also use the poles for nesting and could be electrocuted attempting to launch from or land in their nests. Bird electrocutions typically occur on power lines with voltages less than 60 kV because there is inadequate separation between energized conductors and hardware or between ground conductors and hardware (APLIC 2006, ix, 106). Because the existing B-K Line is 230 kV, it is unlikely that bird electrocution would occur regularly because the phase-to-phase and phase-to-ground separation is greater than 60 inches, the recommended separation for large raptors such as eagles (APLIC 2006, 60).

Recent literature indicates that electrocution continues to be a cause of mortality for various raptors in North America, particularly eagles, some hawks, and owls, although nonraptor electrocutions have also been documented (APLIC 2006, 10). Other bird electrocutions that have been reported include ospreys and great blue herons (APLIC 2006, 10) as well as barred owls (APLIC 2006, 31). Long-legged wading birds such as herons may be electrocuted on poles where there is insufficient vertical separation between conductors or between conductor and ground (APLIC 2006, 38). Smaller special-status bird species such as warblers are not expected to be electrocuted by the existing transmission lines because they cannot make simultaneous contact with the two elements of electrical equipment. Bald and golden eagles continue to be a focus of electrocution research in North America, with electrocution accounting for less than 1% to 25% of eagle deaths in various studies (APLIC 2006, 10). Habitat is a key factor influencing bird use of poles. For example, in open areas lacking natural perches, power poles provide sites for hunting, feeding, resting, roosting, or nesting (APLIC 2006, 23). In general, there are fewer reported raptor electrocutions in forested habitat versus open habitats (Switzer 1977; Benson 1981). It is possible that some special-status raptor species (e.g., American kestrel, barred owl, short-eared owl, and red shouldered hawk) could use power-line poles for perching, especially when foraging along ROWs. Bald eagles and ospreys are nesting with increasing frequency on artificial structures such as power poles and communication towers (APLIC 2011a; USFWS 2007a, 4). Other species of raptors, such as Cooper's hawk and northern goshawk, that typically inhabit forested areas may be more likely to perch in trees than on the exposed perches provided by electric transmission and distribution facilities (APLIC 2006, 23).

Collisions with Existing Transmission Lines: Bird collisions with power lines may occur when a transmission line runs perpendicular to a flight path used by birds that move back and forth from feeding and roosting or nesting sites on a daily basis or when migrant birds are traveling at reduced altitudes (usually in inclement weather) and encounter the structures. Migrating special-status raptors, such as osprey, Cooper's hawk, northern goshawk, red shouldered hawk, American kestrel, bald eagle, and golden eagle, can encounter transmission lines crossing their flight path if the lines are located along raptor migration corridors. Orientation of tall structures perpendicular to the flight path of ridge-gliding raptors may result in collisions with wires if weather conditions are such that raptors are using lower altitudes along a ridge such as Kittatinny Ridge. Raptors have acute eyesight and are daytime migrants, and would not be expected to collide with transmission lines or structures unless their flight brings them to lower altitudes because of foggy or rainy weather that reduces visibility or when foraging along the ROW.

Mitigation Measures: Mitigation measures would be implemented to minimize impacts on special-status species. Mitigation measures are considered to be integrated into each alternative as applicable for impact analysis. Mitigation measures that would avoid direct impacts on special-status species would be the most efficient measures and would include time-of-year restrictions, preconstruction surveys, construction monitoring, habitat preservation and habitat restoration components, and postconstruction monitoring. Preconstruction surveys in particular are expected to be efficient at reducing direct impacts on special-status species because surveys would identify the presence of special-status species before site

preparation and construction are initiated. Some mitigation measures, such as modifying the location of towers and access roads, may not be possible and other measures, such as road closures and/or patrols, may not be effective at some locations; however, mitigation measures would be implemented to the extent practical to avoid adverse effects on special-status species. The efficacy of mitigation techniques varies widely between mitigation measures, as described in chapter 2 and appendix F, and is considered based on best professional judgment when determining the impacts of each alternative on each special-status species. Mitigation measures proposed for each alternative are discussed below.

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. These counties are largely undeveloped and contain a variety of habitats, including forest, successional habitat, riparian areas, and wetlands, as well as land altered by human activities such as development or agriculture. Because the location of the S-R Line outside the study area cannot be determined at this time, the extent that special-status species or their habitats may be present is unknown. As a result, impacts are considered indirect. Outside the study area, there would be no impact on any special-status species if the species or its habitat is not present in the project ROW.

Special-status Aquatic Species: Impacts on special-status freshwater mussel species could occur if the construction of temporary stream crossings is required, due to the potential for direct mortality and alteration of habitat conditions. If special-status species are present, preconstruction relocation of freshwater mussels would minimize impacts. As a more mobile species, the bridle shiner would be expected to move away from disturbance caused by site preparation or construction activities in open water habitat. The removal of vegetation during the construction of the transmission line could temporarily disturb soils, increasing erosion and sedimentation into open water habitat and affecting water quality, which would indirectly affect special-status aquatic species. The project could be expected to result in an adverse impact on special-status aquatic species outside the study area.

Special-status Bird Species: The impacts on special-status bird species outside the study area would primarily occur from the loss of habitat as a result of clearing during construction activities and displacement and disturbance due to noise from construction and human activities. Habitat use by special-status bird species would likely resume after the cessation of activities and as habitat recovers. However, the use of the habitat in the permanent ROW could change because the habitat in the ROW would be maintained as scrub shrub. The presence of larger and higher transmission line structures and lines could cause collision and electrocution hazards for birds, including special-status species, migrating along the Kittatinny Ridge outside the study area. For all special-status bird species outside the study area, impacts would be adverse.

Special-status Reptile and Amphibian Species: For both Pennsylvania and New Jersey, special-status reptile and amphibian species have the potential to be present for all alternatives outside the study area, provided the proper habitat exists along the chosen route. Reptiles and amphibians would have a higher risk of direct mortality because these species are less mobile and often camouflage themselves in the surrounding substrate. The New Jersey Endangered and Nongame Species Program (NJENSP) reviewed records and data for New Jersey and NPS lands during early consultation (review did not include private lands outside of the study area), but the review did not indicate any known presence of special-status reptile or amphibian species (NJENSP 2010a). However, potential habitat for the bog turtle, a federally listed species, was identified in Morris and Sussex counties, New Jersey, during surveys (EcolSciences 2008, 8–15). If special-status reptile or amphibian species, especially the bog turtle, are present, adverse impacts could occur due to the possibility of direct mortality from construction equipment, the loss or alteration of habitat, and noise associated with construction activities and increased human activity. For all special-status reptile and amphibian species outside the study area, impacts would be adverse. USFWS

is working directly with the applicant to ensure that adequate conservation measures are implemented and adverse effects to the bog turtle and its habitat will be avoided outside of NPS units.

Special-status Mammal Species: Special-status mammal species that may be present include bats (including the federally listed Indiana bat) and the bobcat. For all alternatives outside the study area, habitat for bats (including the Indiana bat) may be affected by the clearing of vegetation, including dead standing trees that function as summer roost trees or trees that act as habitat for maternity colonies. Caves or mines are likely not to be physically affected by the construction of a transmission line; however, disturbance during hibernation could cause bats to abandon the hibernacula. Although no Indiana bats were found during mist netting surveys and no hibernacula were identified (Sanders 2009, 6; ESI 2011, 24), small-footed bats were caught during mist netting surveys outside the study area in Lackawanna, Monroe, and Pike counties, Pennsylvania (Sanders 2009, 6) and Morris County, New Jersey (ESI 2011, appendix B, net KM-47). If winter hibernacula or roost or maternity colony trees for bats are located in the proposed ROW, including the potential for use by Indiana bats, adverse impacts on bats could occur. USFWS is working directly with the applicant to ensure that adequate conservation measures are implemented and adverse effects to the Indiana bat will be avoided outside of NPS units. Mitigation projects such as the Hopatcong Forest Restoration Project (USFWS 2010b) are expected to offset the loss of forested habitat for bats.

Bobcats could be present in appropriate habitat outside the study area and would primarily be affected by disturbance from construction and human activity as well as from the regular maintenance of the ROW during operation. However, it is expected that impacts due to disturbance would be adverse. Daytime activities associated with the clearing and maintenance of the ROW would be expected to have minimal impacts on the bobcat due to the crepuscular/nocturnal nature of the animal. Bobcats could also use the ROW, when completed, as a corridor for movement and hunting and could be expected to maintain territories that may overlap with the ROW and the habitats along the transmission line. There is also the potential for bobcat den sites to be located in the alignment chosen for the ROW. Den sites could be unavoidably or unknowingly destroyed during construction activities but it is expected that den sites would not be encountered frequently. For all special-status mammal species outside the study area, impacts could be adverse.

Special-status Plant Species: Adverse impacts could occur on special-status plant species from construction activities and periodic maintenance. Ground-disturbing activities, including construction of towers and crane pads, the grading of new access roads and spur roads, and tower removal, have the potential to disturb or destroy special-status plant species. If special-status species are identified outside the study area prior to construction, the plants could be relocated prior to ground-disturbing activities. Following the initial clearing activities it would be possible for special-status plant species to reestablish, provided that the requisite habitat conditions remain in the corridor.

Conclusion: Outside the study area, there would be no impact on any special-status species if the species or its habitat are not present in the project's impact area. Adverse impacts on special-status wildlife species could occur from direct mortality, alteration of habitat, loss of habitat, disruption of foraging and nesting behaviors from disturbance due to construction noise and human activity. Adverse impacts on special-status plant species occur from ground-disturbing and maintenance activities.

Alternative 1: No Action

Special-status Aquatic Species: A total of four special-status (state-listed) aquatic species are known to be present or have the potential to be found in the existing ROW under alternative 1: three freshwater mussels (yellow lampmussel, creeper, and alewife floater) and one fish species, bridle shiner (NJENSP 2010a, 2; PFBC 2010a, 1; Horwitz et al. 2008, 75). Vegetation maintenance activities have the potential

to increase sedimentation and turbidity in surface waters by increasing soil erosion and runoff through the removal of stabilizing vegetation and the exposure of soil. Impacts on fish and mussels from increased sedimentation could include smothering, displacement, and a loss of suitable bottom habitat for species that prefer rocky or gravel bottom habitat. Increased turbidity and suspended solids associated with sedimentation could affect respiration and feeding of mussels and fish and could result in mortality. The removal of vegetation along smaller water bodies, such as tributary streams, could result in changes to water temperatures and light attenuation and could affect habitat conditions for some aquatic species, leading to displacement. The use of herbicides could indirectly affect fish and mussel species. The introduction of contaminants such as herbicides would result in acute or chronic effects on aquatic organisms including decreased growth, disturbed reproductive cycles, or increased mortality. Maintenance would not occur directly in surface waters and the use of BMPs, including erosion and sedimentation control practices, NPS-approved herbicides (including herbicides accepted for use near aquatic habitats), low-impact vegetation maintenance techniques, and water-body buffers, would minimize impacts on special-status aquatic species; however, impacts on special-status aquatic species would be adverse.

Special-status Terrestrial Invertebrate Species: Two special-status terrestrial invertebrate species, Arogos skipper and Mitchell's satyr, both butterfly species, have the potential to be present in the existing B-K Line ROW. The herbaceous plant communities and grasses associated with Arogos skipper habitat would be compatible with vegetation requirements for the ROW and may create additional suitable habitat for the Arogos skipper. It is possible that if the ROW could be colonized by the Arogos skipper and conservation measures could be implemented, a beneficial impact could occur.

Suitable wetland habitat (fens) for Mitchell's satyr, a federally listed endangered species, exists in the alternative 1 alignment; approximately 0.99 acre of the Arnott Fen wetland complex is located in the B-K Line ROW. Although it was historically found in New Jersey, Mitchell's satyr is undocumented in Pennsylvania where suitable fen habitat is found inside the study area and Mitchell's satyr was not observed during invertebrate surveys conducted along the ROW (EcolSciences 2009a). Mitchell's satyr is currently only found in 13 locations in Michigan and 2 locations in Indiana (USFWS 2010d, 1). As a result, no impact on Mitchell's satyr is expected under alternative 1. Vegetation maintenance to remove danger trees and incompatible vegetation species (generally tall-growing, nonherbaceous species) and continued NPS protection of the fen would maintain suitable habitat for Mitchell's satyr, should the butterfly find and colonize the habitat or should a program be considered to establish the species in the future.

Special-status Birds: A total of 17 special-status (state-listed) bird species have been observed or have the potential to be present in the ROW under alternative 1: great blue heron, osprey, bald eagle, northern harrier, Cooper's hawk, northern goshawk, red shouldered hawk, peregrine falcon, American kestrel, barred owl, short-eared owl, veery, black-throated green warbler, cerulean warbler, golden-winged warbler, vesper sparrow, and horned lark. Impacts on the bald eagle are discussed in the following section, although some notes are made here regarding general impacts on raptors. The ROW has been established for 80 years and alternative 1 would continue to maintain the existing conditions. Impacts are not expected from the continued presence of the line under alternative 1 except for impacts related to vegetation maintenance in the ROW, as described below.

If vegetation trimming or removal occurs during the nesting season, it is possible that the golden-winged warbler could be adversely affected. During vegetation clearing, nests could be destroyed or become more exposed to scavenging or predation, leading to mortality of eggs and young or abandonment by adults. The gradual reestablishment of successional habitat in the ROW following clearing activities could benefit this species, but this habitat would not be available immediately. Forested and emergent wetlands, as well as riparian areas adjacent to the Delaware River, exist in the ROW and can be used by the

following state-listed bird species: great blue heron, osprey, bald eagle, and red shouldered hawk. Barred owls may use forested wetlands and riparian areas along the Delaware River. Migrant and resident individuals of special-status raptor species such as Cooper's hawk, northern goshawk, American kestrel, and barred owl may hunt along the ROW and would continue to use the ROW and edge habitat under alternative 1. In addition, wetlands in the ROW under alternative 1 would continue to provide breeding and nesting habitat for such special-status bird species as the great blue heron. Other bird species, such as the osprey, bald eagle, and red shouldered hawk, would continue to use the wetland habitat in the Arnott Fen community. Maintenance activities could impact the golden-winged warbler could occur under alternative 1 if they occur during the breeding season, but the possible creation of additional habitat may also occur in the ROW. Potential habitat for other passerine species such as veery, black-throated green warbler, cerulean warbler, vesper sparrow, and horned lark exists along alternative 1. In general, special-status bird species would continue to use requisite habitats available along the existing B-K Line under alternative 1.

Bald Eagle: The alternative 1 alignment bisects an important communal winter eagle roost known as the Hogback Ridge winter roost (USFWS 2010b). No other communal winter roost site for bald eagles has been documented in the southern portion of DEWA. The majority of eagles using the roost fly back and forth through the existing transmission line corridor to forage downriver. Because bald eagles rely on established roost sites based on their proximity to sufficient food sources, the Bald Eagle Guidelines note that ongoing, existing uses may proceed; however, the guidelines recommend against placing transmission lines near communal roost sites (USFWS 2007a, 15). Because no new transmission lines would be placed near communal roost sites under alternative 1, this alternative would be consistent with the Bald Eagle Guidelines (USFWS 2007a, 10).

No studies have been conducted to determine impacts from the existing 230-kV transmission line, but its presence has not appeared to limit the development of both wintering and breeding populations of the bald eagle; the wintering population and winter roost developed with the presence of the transmission line. Because alternative 1 would not result in any changes to the existing transmission line, it is unlikely to adversely affect the bald eagle winter roosting site along the Delaware River. Additionally, no habitat used by bald eagles that is beyond the existing ROW would be removed or altered under alternative 1. Impacts from disturbance and activities associated with maintenance activities would occur primarily during daytime hours and individual eagles may temporarily avoid areas of activity; however, the winter roost would still be available as a nocturnal roost site and minimal additional habitat would be cleared; the bald eagle population could continue to roost and nest along the Delaware River in the study area under alternative 1.

Because the existing power line is 230 kV, it is unlikely that bird electrocution would occur regularly because the phase-to-phase and phase-to-ground separation is greater than 60 inches, the recommended separation for large raptors such as eagles (APLIC 2006, 60). Bird electrocution could occur in the ROW under alternative 1, but it has not been documented in the study area and is considered to be unlikely and infrequent.

The Delaware River is traversed by transmission lines under alternative 1; however, the lines have been in place for 80 years and although they may affect special-status raptors such as ospreys and bald eagles that forage along the river, no observations of collisions with the existing lines have been documented. The Bald Eagle Guidelines note that ongoing, existing uses may continue. Therefore, alternative 1 would be consistent with the Bald Eagle Guidelines (USFWS 2007a, 10). Other special-status bird species include passerine species such as the veery, horned lark, vesper sparrow, and three species of warblers, which would generally not be at risk for power line collisions because these birds migrate at altitudes higher than power lines. The potential for bird collisions with the existing transmission lines exists but collisions

are considered to be unlikely due to the height and structure of the transmission line, which does not present a serious hazard to migrating raptors.

Overall, adverse impacts on the great blue heron, osprey, bald eagle, Cooper's hawk, Northern goshawk, red-shouldered hawk, American kestrel, short-eared owl, and barred owl would occur as a result of electrocution from and collision with the existing transmission line under alternative 1.

Special-status Reptiles and Amphibians: A total of seven special-status (one federally listed and six state-listed) reptiles and amphibians have been observed or have the potential to be present in suitable habitats in the existing ROW of alternative 1: bog turtle, timber rattlesnake, northern fence lizard, wood turtle, eastern box turtle, northern copperhead, and longtail salamander. Maintenance activities have the potential to disturb and temporarily displace northern fence lizards (in Pennsylvania) and all turtle and snake species that may use the existing scrub shrub habitat in the existing ROW, due to noise and increased human activity. Basking, foraging, birthing, and nesting activities could be disturbed during maintenance activities. Conservation measures would be required to reduce the impacts from maintenance to avoid the likelihood of take. Protection measures that include the use of handheld equipment instead of machinery and the implementation of seasonal restrictions during nesting and birthing seasons for turtle and snake species (typically between March and September) would be implemented. However, inadvertent crushing of nests, turtles, or snakes by workers could still occur but conservation measures would be implemented to reduce and/or avoid impacts. Impacts on all special-status reptile and amphibian species are expected to be adverse.

Special-status Mammals: A total of four special-status mammal species have been observed or have the potential to be present in the ROW habitats that have been mapped in the alternative 1 corridor: the bobcat, the small-footed bat, and the northern myotis (state-listed species) and the Indiana bat (a federally listed endangered species).

The ROW would continue to act as a corridor for movement and hunting for bobcats but regular maintenance of the transmission line and ROW vegetation has the potential to disturb and temporarily displace bobcats due to disturbance from noise and increased human activity. Daytime activities associated with the clearing of the ROW would be expected to have minimal impacts on the bobcat due to the crepuscular/nocturnal nature of the animal. Overall, regular maintenance of the ROW would cause disturbance to the bobcat occur along the entire length of the ROW.

Indiana bats are known to hibernate in nearby counties, and it is possible that individuals from these wintering sites are present in DEWA during the breeding season (April through September). In addition, summer foraging or roosting habitat for special-status bats occurs in the alternative 1 corridor. Annual maintenance of vegetation would occur during daylight hours, which would reduce the potential for impacts on bats. If trees that could provide habitat for summer roosts or maternity colonies are in need of removal, surveys would be conducted prior to removal to ensure that no bats are using the trees. As a result, adverse impacts on the Indiana bat, the small-footed bat, and the northern myotis are anticipated under alternative 1.

Overall, adverse impacts on all special-status mammals are expected under alternative

Impacts on Special-status Plants: A total of 12 special-status (state-listed) plant species have been observed or could be present in the existing B-K Line ROW for alternative 1: A-sedge, downy willow-herb, small-headed rush, brook lobelia, Carolina grass-of-Parnassus, bog goldenrod, shrubby cinquefoil, Clinton's wood fern, reed meadowgrass, marsh bedstraw, stiff club moss, and white heath aster.

Listed plant species that have been documented or could be present in suitable open canopy wetland habitat include A-sedge, downy willow-herb, small-headed rush, brook lobelia, Carolina grass-of-Parnassus, bog goldenrod, and shrubby cinquefoil (Mellon 2010a). As low-growing and herbaceous species, these special-status plant species should not require vegetation maintenance, which primarily targets incompatible plant species (generally tall-growing, nonherbaceous species) and danger trees. Disturbance to listed plant species may occur during vegetation management through the removal of incompatible species. Impacts on the above-listed special-status wetland plant species would be adverse.

Suitable habitat for Clinton's wood fern is known from one location outside the existing ROW. Plant surveys for this species did not reveal Clinton's wood fern in the existing transmission line corridor (Mellon 2010a). It is unlikely that this species would be affected by maintenance activities occurring under alternative 1 because the species was only identified in an area outside the ROW that would not undergo vegetation maintenance under alternative 1. Although numerous wetlands have been delineated in the parks, Clinton's wood fern was not observed during the surveys conducted in 2010 (Mellon 2010a).

Reed meadowgrass was observed during surveys conducted in 2010 (Mellon 2010a, 2010b) and marsh bedstraw was observed during vegetation surveys conducted in 2011 (NPS 2011b) in an emergent wetland area bisected by the existing transmission line. As stated for other herbaceous special-status plant species, reed meadowgrass and marsh bedstraw should not require vegetation maintenance, but disturbance may occur during vegetation management for other, incompatible plant species. Impacts on reed meadowgrass and marsh bedstraw would be expected to be adverse under alternative 1.

Stiff club moss was observed during vegetation surveys conducted in 2011 (NPS 2011b) in scrub shrub and forested wetland habitat in the ROW. As a low-growing species, stiff club moss should not require vegetation maintenance, but disturbance may occur during vegetation management for other, incompatible plant species. Impacts on stiff club moss would be adverse under alternative 1.

The white heath aster has been documented along the Delaware River (NPS 1986, 106) but communications with DEWA park staff indicate that the white heath aster is located near but not in the study area (Mellon 2010a, 8). The species was not detected during the field surveys conducted along the alternative 1 alignment (Mellon 2010a; NPS 2011b) and it is unlikely that this plant species is present in the existing B-K Line ROW.

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the beneficial and adverse impacts on special-status species as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, an adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

Operation and maintenance activities associated with alternative 1 could have potential for adverse impacts on federally endangered bog turtles and Indiana bats from disturbance and habitat alteration. These impacts could be effectively minimized by implementing appropriate protection and conservation measures in consultation with the USFWS; therefore, the impacts of alternative 1 are "***not likely to adversely affect***" federally listed threatened and endangered species.

Operation and maintenance activities would adversely impact state listed species including three freshwater mussels and bridle shiner due to increases in sedimentation and turbidity in surface waters;

however, the use of BMPs would minimize impacts on aquatic species. If vegetation clearing and maintenance activities are conducted during the nesting and breeding season of the golden-winged warbler, adverse impacts could occur, but the creation of additional habitat may also benefit this species. Adverse impacts to state-listed reptiles and amphibians are expected from the disruption of basking, foraging, and nesting behavior, as well as the introduction of invasive plant species.

There is some potential for unknown risks to wintering bald eagles. The wintering population of eagles in DEWA is a mix of resident eagles and winter migrants. The winter residents are nesting eagles that remain in DEWA through the winter. The winter migrants consist of eagles from the northern states and Canada who migrate to DEWA and spend the majority of the winter within the park plus additional eagles that migrate through the Delaware River valley, spending a shorter amount of time in DEWA. The total number of eagles that use the communal winter roost even for a short period each year is unknown. The potential for eagles to collide with power lines is also dependent on the visibility of the lines. The present lines do not have mitigation measures installed to increase the visibility of the lines but the height of the lines are at or below tree level and are therefore not in the direct flight path of eagles flying to and from the roost. There is a possibility that some collisions with the power lines have occurred and gone undetected. However, this risk is comparatively low, and, given that the lines are at or below tree level and given that the power line has been in place for many years, it is likely that the winter roost developed with the existing power line already present.

In the context of laws and policies that protect special-status species, the adverse impacts of alternative 1 would not likely be significant because it is unlikely that the impacts would adversely affect population viability or overall habitat quality. Adverse impacts to special-status species would be avoided and minimized through required consultation and permitting processes; thus, the impacts would be consistent with the laws and policies that govern these resources.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives (2, 2b, 3, 4, and 5) would involve the removal of all or a portion of the B-K Line, as described in chapter 2. For all action alternatives, the B-K Line structures would be removed but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require constructing access roads (either permanent or temporary, depending on the alternative). The removal of the B-K Line would require constructing access roads, wire pull sites, and the removal of the line as described in chapter 2. Because access roads would also be required for the construction and long-term maintenance of the new line, adverse impacts from removing the line would be the same as (or less than) the impacts discussed for construction of the S-R Line.

Vegetation Clearing: The ROWs would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2 through 5, which would affect wetlands. Alternatives 2, 3, 4, and 5 would include clearing for construction up to 350 feet; the ROW would be extended up to 175 feet from either side of the centerline of the existing ROW. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights. Clearing would be complete for all action alternatives, with the exception of the 50-foot buffer near intermittent streams/wetlands and the 100-foot buffer near perennial waterways such as the Delaware River (PPL and PSE&G 2008, 7). The impacts from vegetation clearing are discussed for each alternative because the amount of clearing for each is different.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect listed species if these areas cannot be avoided include site preparation; construction of access roads, tower foundations, crane pads, wire pull locations, and pulling and splicing sites; and the use of heavy equipment and staging areas. These activities could disturb special-status species directly as well as affecting existing and potential habitat that supports special-status species. All action alternatives would require drilling as part of the construction process, but because drilling is unlikely to affect groundwater (see discussion in "Geologic Resources") it would not affect special-status species in the vicinity, and drilling impacts to groundwater are not discussed further.

Avian Protection Plan: As recommended by the New Jersey USFWS Field Office, the applicant has drafted an Avian Protection Plan to address electrocution, collision, and other impacts. The finalization of the APP will include input from all affected natural resource agencies.

Illegal Collection: Illegal collection of special-status plants and animals currently poses a threat to these species. Construction and maintenance of access roads could provide access to areas that contain these species, allowing for a greater threat of collection and creating adverse impacts to special-status species.

Alternative 2

Special-status Aquatic Species: A total of four special-status (state-listed) aquatic species are known to be present or have the potential to be found in the proposed ROW under alternative 2: three freshwater mussels (yellow lampmussel, creeper, and alewife floater) and one fish species, bridle shiner (NJENSP 2010a, 2; PFBC 2010a, 1; Horwitz et al. 2008, 75). These aquatic species could be affected by vegetation removal and construction activities. The removal of vegetation near surface waters could alter habitat conditions by reducing land-based food sources, increasing water temperatures, changing light attenuation, and exposing streambanks and shorelines to erosion. Excavation and grading activities could increase runoff in the watershed, resulting in increased inputs of sediment to surface waters inhabited by special-status aquatic species. Impacts on the bridle shiner and special-status mussels from increased sedimentation, including turbidity and suspended solids in the water column, could alter and thereby reduce bottom habitat, smother mussels as well as the eggs and larvae of bridle shiner, and interrupt the feeding, respiration, or reproductive activities of bridle shiner and mussels. The use of construction equipment could result in the introduction of contaminants such as fuel or oil to surface waters due to leaks or spills, which could result in acute or chronic effects on special-status species including decreased growth, disturbed reproductive cycles, or mortality. The construction of access roads and spur roads that could necessitate stream crossing structures could result in adverse impacts on mussels located directly in the construction area as a result of direct mortality from crushing by vehicles and equipment. Freshwater mussels, including downstream populations, could also be affected because stream crossing structures could block access to host-fish species, restrict the transport of food particles, and alter geomorphic and hydraulic processes that provide suitable habitat conditions. Stream crossing structures could be installed in the tributary streams in the alternative 2 alignment, including Big Bushkill Creek, Sand Hill Creek, and Van Campen Brook. Preconstruction surveys would be necessary to determine whether any special-status mussel species exist in these tributaries and any mussels found could be relocated out of the construction zone prior to construction activity. The construction of the transmission line across the Delaware River (MDSR) would not include stream crossing structures.

Following construction, activities would include maintenance of vegetation at least annually according to the applicant's NPS-approved vegetation management plans. Impacts to special-status aquatic species would be the same as described for alternative 1, increased sedimentation and turbidity. Under alternative 2, control of invasive plant species near surface waters would include the use of NPS-approved herbicides safe for application in aquatic environments. To minimize impacts from construction activities, forested

buffers around streams and other water bodies would generally be left intact, sediment control devices would installed, and disturbed areas would be revegetated following construction activities.

Special-status Terrestrial Invertebrate Species: Two butterfly species, the Arogos skipper and the Mitchell's satyr, could be present along alternative 2. Clearing and construction activities along the alternative 2 alignment would result in the physical removal of vegetation that could include plant communities that could support the Arogos skipper. Vegetation clearing would be nearly complete in the 350-foot corridor during construction activities as well as for the access roads and spur roads, tower foundations, crane pads, and pulling and splicing sites that would be constructed. Avoidance of sensitive areas, as described in the "Vegetation Clearing" section of chapter 2, would occur to the extent practicable. During the period of analysis for this EIS, the vegetation maintenance of the ROW would occur at least annually to maintain low vegetation growth, which may result in the creation of additional habitat suitable for colonization by the Arogos skipper. If these areas become colonized by the Arogos skipper and conservation measures are implemented, a beneficial impact could occur.

The Arnott Fen wetland complex contains suitable habitat for the Mitchell's satyr. However, this butterfly was not known to occur historically in Pennsylvania, and has been extirpated from its historical range in northern New Jersey. This species is now only found in 13 locations in Michigan and 2 locations in Indiana (USFWS 2010d, 1); therefore, it is unlikely to be present in the study area. No new towers would be placed in the Arnott Fen wetland complex, new towers would be constructed on either side of the fen. The greatest threat to the Mitchell's satyr is habitat destruction, including invasion by nonnative, invasive plants that threaten the fens on which the butterfly depends (USFWS 2010d, 1).

Special-Status Birds: A total of 17 special-status (state-listed) bird species have been observed or have the potential to be affected under alternative 2: great blue heron, osprey, northern harrier, bald eagle, Cooper's hawk, northern goshawk, red shouldered hawk, peregrine falcon, American kestrel, short-eared owl, barred owl, veery, black-throated green warbler, cerulean warbler, golden-winged warbler, vesper sparrow, and horned lark.

Neotropical migrant species and special-status raptor species that use forested habitat could be adversely affected by the loss of trees as a result of linear clearing beyond the width of the existing ROW, including the loss of potential nesting habitat. Migrant and potential summer resident species such as veery, cerulean warbler, and black-throated green warbler could be adversely affected by the clearing of forested habitat. Nests may be lost due to clearing, abandoned by adults because of disturbance, or found by scavengers or predators when exposed as a result of clearing; however, this would be minimized though the seasonal restriction on tree cutting.

Nine raptor species (osprey, northern harrier, Cooper's hawk, northern goshawk, red shouldered hawk, American kestrel, peregrine falcon, short-eared owl, and barred owl) could be present as migrant, resident, or seasonally present species in habitats being cleared under alternative 2. As forest-dwelling and potentially forest-nesting species, Cooper's hawk, northern goshawk, red shouldered hawk, and barred owl could all nest in forested tracts along the length of the ROW. The amount of forest edge habitat would effectively remain the same and opportunistic predators and passerine brood parasites (brown-headed cowbirds) could be expected to continue to affect nesting success for nesting species present along edge habitat. In addition, as edge effects extend further into the undisturbed forest, the area of interior forest habitat (i.e., far enough away to be free of edge effects) is expected to decrease, with the potential to incrementally decrease the forest's carrying capacity for interior-nesting bird species. The northern harrier and short-eared owl are ground-nesting species that use densely vegetated fields or marsh habitat, although it is primarily a migrant through the study area. A 1,000-foot buffer surrounding identified nest areas would be established prior to construction activities to minimize adverse impacts.

The corridor, as proposed under alternative 2, would provide a slightly larger foraging area for all migrant, resident, or seasonally present special-status raptor species.

If the corridor, as proposed under alternative 2, was maintained as scrub shrub habitat and not grassland habitat, it could expand the amount of successional habitat for golden-winged warbler, resulting in a beneficial impact. Although ROW clearing would not occur during the nesting season, adverse impacts on the golden-winged warbler would occur from disturbance as described in alternative 1. These impacts would be offset by the creation of additional scrub shrub habitat available to this species in the new ROW, although this habitat may not be immediately available. The clearing of vegetation would also benefit the vesper sparrow and horned lark, as these species prefer open areas.

Forested and emergent wetland areas as well as riparian areas adjacent to the Delaware River are present in the ROW and would be avoided to the extent practicable under alternative 2. Forested wetlands, emergent wetlands, and riparian areas can be used by state-listed bird species. The great blue heron is known to nest in wetlands and areas adjacent to wetlands along the alternative 2 alignment. If vegetation in these areas, especially tall trees that offer the potential for use by great blue herons, is removed, the great blue heron would be adversely affected. In addition to the loss of habitat, during site preparation and the construction of the transmission line under alternative 2, all special-status bird species may be affected by noise and construction activities, which would result in temporary disturbance or displacement from habitats. Construction-related activity in the area could affect bird behavior, including foraging and breeding, in the ROW and adjacent habitats. Helicopters would potentially be used during construction activities to string the transmission line, as described in chapter 2. Due to the linear nature of the project, helicopter activities in most cases would move frequently and would occur in a limited section of the ROW, so noise would not continue for lengthy periods at any one tower location. Individual birds may temporarily avoid areas during helicopter use but the majority of the special-status bird species could be expected to return to their usual habitats when helicopter activity has ceased. In addition, in the context of the regional abundance of habitat outside the study area that may be used by special-status bird species, the short duration of helicopter use at any one location would attenuate adverse effects. Any temporary noise impacts on special-status bird species that may occur from helicopter-aided construction would not be expected to reduce the populations below self-sustaining levels in or adjacent to the project area. In addition to noise from construction activities, the presence of project personnel could result in the disruption of breeding or nesting behavior such as incubating eggs or tending to nestlings. If birds attempt to relocate nesting territories during construction activities, they would expend time and energy in locating and defending new nesting territories that would otherwise be used for reproduction; this could result in lower productivity and nesting success until individuals establish new territories, which may not occur until the following nesting season. A seasonal restriction on tree clearing from March 15 through August 31 would prevent unauthorized take of nests and unfledged young protected under the Migratory Bird Treaty Act (USFWS 2010b); however, the seasonal restriction does not incorporate the nesting dates for bald eagles, which are discussed under “Bald Eagle” in this section. Because the seasonal restriction on tree clearing would be observed, the permanent and seasonally present nesting special-status species should not be forced to abandon nests or young. Any noise or disturbance impacts on special-status bird species that may occur from construction would not be expected to reduce the populations below self-sustaining levels in or adjacent to the project area.

Maintenance activities have the potential to disturb and temporarily displace special-status bird species using habitat in or near the ROW for nesting and/or foraging. The annual maintenance of the ROW would cause disturbance to occur throughout the period of analysis; however, it is expected that maintenance would not occur simultaneously along the entire length of the ROW.

Bald Eagle: The bald eagle is known to nest, roost, and forage along the Delaware River where the alternative 2 alignment crosses the river. The USFWS has stated in a 2010 letter that several active bald

eagle nests are located along the eastern end of alternative 2 (USFWS 2010b), but there is also the potential for inactive or alternate nests (not used for breeding by eagles in a given breeding season) to be used (USFWS 2007a, 17). Additionally, a communal wintering eagle roost is located along the alternative 2 corridor (USFWS 2010b, 5) and the alignment also crosses bald eagle foraging habitat (USFWS 2010b). The implementation of alternative 2 would not be consistent with the Bald Eagle Guidelines.

Direct impacts on nesting bald eagles would primarily occur as a result of clearing and construction activities required to implement alternative 2. During the breeding season, bald eagles may be sensitive to human activities; however, not all eagles react in the same manner to disturbance. Some eagles may continue nesting activity while others may abandon nesting. Bald eagles may also react to disturbance differently at different stages of the breeding season (USFWS 2007a, 7). The most sensitive period is considered the time when bald eagles are courting and nest building. Clearing and construction during this period (generally the beginning of December to the end of February) could result in nest abandonment. During egg laying and incubation (generally the end of January to the end of April), the prolonged absence of adults can jeopardize eggs or young. From four to eight weeks after hatching, nest abandonment is less likely, but nestlings may miss feedings, potentially affecting their survival (end of March to end of June). From mid-May to the end of August, young eagles begin to gain flight capability and disturbance from clearing and construction in the vicinity of the nest may cause the young to flush from the nest prematurely, causing injury and death (USFWS 2007a, 8).

If nesting activity is observed before or during construction, additional protections of the nest site would occur as required in the Bald Eagle Guidelines (USFWS 2007a, 12). Specifically, to avoid disturbing nesting bald eagles, the guidelines recommend (1) keeping a distance between the activity and the nest (distance buffers), (2) maintaining preferably forested (or natural) areas between the activity and around nest trees (landscape buffers), and (3) avoiding certain activities during the breeding season. These guidelines would minimize potential impacts on nesting bald eagles. The distance and landscape buffers serve to minimize visual and auditory impacts and would be large enough to protect existing nest trees and provide replacement nest trees. The size and shape of the buffers vary depending on topography and other site characteristics, as well as on the historical tolerance by eagles of human activities in the area. The height of the nest above ground may also reduce the impacts from human activities; eagles with nests at higher elevations may be less prone to disturbance. Specific guidance for disturbance and landscape buffers should be determined through contact with the USFWS and would minimize potential impacts on nesting bald eagles (USFWS 2007a, 10). Nesting of bald eagles in the New Jersey and Pennsylvania area can generally be said to occur between December 1 and August 31; however, nesting chronology in the area would be verified through contact with the regional USFWS office and through NPS biologists (USFWS 2007a, 17).

Bald eagles have used the communal wintering roost site historically, as documented in records, and this roost site may be an important attribute contributing to the suitability of DEWA as a wintering area for bald eagles. Bald eagles rely on established roost sites because of their proximity to sufficient food sources. The Bald Eagle Guidelines recommend against placing transmission lines near communal roost sites (USFWS 2007a, 15); therefore, the implementation of alternative 2 would not be consistent with the Bald Eagle Guidelines and would result in the presence of taller towers and lines that could increase the potential for collision or electrocution of eagles moving to and from the existing roost site. Roosting eagles may also be affected by the removal of trees and disturbance from construction activities, including noise and human presence. Human activity near bald eagles can force eagles to abandon the immediate area, preventing local foraging and causing unnecessary expenditure of energy to forage elsewhere. Repeated intrusions into their wintering habitat can result in physiologic stress at a time when cold weather and reduced foraging opportunities can weaken individuals, making them susceptible to disease, and can lower the reproductive success of adults (USFWS 2007a, 8–9). Measures to protect roosting eagles would be adapted as needed. Consultation with USFWS would ensure that adverse impacts on roosting bald eagles

would be avoided whenever possible. However, even though mitigation measures would be implemented responsibly, adverse impacts on the bald eagle are possible during construction activities that occur in the wintering eagle roost area and in foraging areas. Impacts would occur because individuals may temporarily avoid areas and the potential for negative impacts on feeding, reproduction, and resting would exist and could affect local population levels. Although the new double 500-kV transmission line would be constructed using APLIC standards and the best available deterrence technology to reduce the potential for impacts, alternative 2 is likely to adversely affect the daily foraging movements and winter roosting of bald eagles along the Delaware River.

Electrocution: As stated in alternative 1, eagles, hawks, barred owls, ospreys, and great blue herons have been electrocuted by transmission lines (APLIC 2006, 10, 31). Because the power lines proposed under alternative 2 are two 500-kV lines, it is unlikely that bird electrocution would occur. Bird electrocution typically occurs on power lines with voltages less than 60 kV, as described under "Common to All Alternatives" (APLIC 2006, ix). In order to minimize the potential for bird electrocution as a result of alternative 2, the applicant would meet or exceed the 2006 APLIC recommendations for reducing bird risks by employing the recommended horizontal and vertical separation as described in the Avian Protection Plan (ERM 2010) and using the current best available technology for minimizing the potential for electrocution. Therefore, the likelihood of electrocutions occurring at the proposed voltage, which is over 60 kV, would be considered low (APLIC 2006, 60). The proposed S-R Line would be constructed with the minimum clearances between phase conductors or between phase conductors and grounded hardware, which are sufficient to protect even the largest special-status bird species in the vicinity, including bald eagles, as recommended by APLIC (2006).

Power Line Collisions: Alternative 2 is not consistent with the Bald Eagle Guidelines, which state that communication towers and high-voltage transmission power lines should be sited away from bald eagle nests, foraging areas, and communal roost sites (USFWS 2007a, 15). Although the transmission lines would span the Delaware River under alternative 2 in the same area as the existing ROW, the new lines could affect special-status raptors (ospreys and bald eagles) that forage along the river due to the higher and more numerous transmission lines proposed under this alternative. Heavy-bodied, less agile birds or birds in flocks may lack the ability to quickly negotiate obstacles, making them more vulnerable to power-line collisions (APLIC 2011b). Additionally, the location of transmission lines close to bald eagle nesting areas would increase the likelihood of collisions for younger individuals that are less experienced fliers. Collisions most often occur with the overhead static wire, which may be less visible than energized conductors due to its smaller diameter (APLIC 2011b). To reduce bird collisions, a variety of mitigation techniques are proposed to make the proposed double 500-kV transmission line more visible to birds. In order to minimize the potential for bird collisions as a result of alternative 2, the applicant would develop an approved bird protection plan and through that document, meet or exceed the 2006 APLIC recommendations for reducing bird risks by employing various mitigation measures that are described in the bird protection plan. Kittatinny Ridge, as described in chapter 3, is a major north–south fall migration corridor for raptors and because of its north–south orientation provides ideal conditions for migrating hawks. Under alternative 2 larger, taller transmission lines crossing Kittatinny Ridge nearly perpendicularly in the study area could create a bird collision hazard. Electrocution and collision with the new, higher line would be possible, for the bald eagle, northern harrier, osprey, great blue heron, barred owl, short-eared owl, peregrine falcon, American kestrel, Cooper's hawk, northern goshawk, and red shouldered hawk.

Special-status Reptiles and Amphibians: The special-status reptile and amphibian species that may be affected by alternative 2 include bog turtle, timber rattlesnake, northern fence lizard, wood turtle, eastern box turtle, northern copperhead, and longtail salamander. In general, removing vegetation along the corridor, the construction of access roads and spur roads, and the construction of the transmission line could adversely affect the listed reptiles and amphibians. The removal of vegetation, specifically clearing

of forested areas that would increase sun exposure and reduce forest canopy, would destroy or reduce preferred habitat of special-status reptile and amphibian species; habitat fragmentation would also result from vegetation clearing and access road construction. Reptiles and amphibians are typically active from March through November and most breeding occurs in early spring or summer, but they are generally not very mobile species and individuals (or eggs) may be crushed or killed as a result of their inability to avoid contact with construction vehicles, equipment, and materials during vegetation clearing and construction activities. During the heat of the day many reptiles and amphibians seek shelter under logs, rocks, or piles of leaves; therefore, the presence of individuals on site could be overlooked by equipment operators. Reptiles and amphibians are also small and typically camouflage themselves or blend in with the surrounding substrate. Specific impacts analyses by species are included in the discussions below.

Wood turtles and eastern box turtles are listed species in New Jersey and use forested, scrub shrub, and wetland habitats during different behaviors or stages of their life. Both species were observed in the alternative 2 corridor during the 2008–2011 surveys and have been documented foraging and nesting in or near the existing ROW. Wood turtles have varied home ranges across their geographic range, from less than 7 acres (3 hectares) to more than 69 acres (28 hectares), with smaller ranges being noted in Pennsylvania than in the northern limits of the species range in Canada (CRACM 2004, 5). Wood turtles mate underwater; once impregnated, the female travels away from the wetland area and excavates a nest in an upland site with scant vegetation and abundant sunlight. Nesting activities typically occur in May or June and hatchlings typically emerge in September. Wood turtles also use forested and scrub shrub habitat for foraging and basking and return to streams or other aquatic habitats to hibernate from November through March (CRACM 2004, 1). The New Jersey Landscape Project identified numerous areas of potential habitat for wood turtles along the proposed ROW and NJENSP (2010a) also identified the wood turtle as present in the proposed ROW. Eastern box turtles spend most of their lives in upland areas foraging, feeding, and nesting, but can sometimes be found in wetland areas. Nesting usually occurs in June or July, with hatchlings emerging in September. During the winter months eastern box turtles hibernate a few inches below the soil in forested areas (NHESP 2007, 1). The use of heavy machinery and other construction equipment and/or soil excavation activities may destroy turtle nests and crush or kill hibernating eastern box turtles; however, this would be kept to a minimum through the implementation of preconstruction surveys. Other protection measures would be implemented, including the use of handheld equipment instead of machinery and the implementation of seasonal restrictions during nesting and birthing seasons for turtles (typically between March and September); however, inadvertent crushing of nests or turtles by workers could still occur. Specifically for wood turtles, the use of barrier fencing along streams could also be implemented during construction to keep the turtles from entering construction sites. These mitigation measures would further reduce the risk of mortality during the winter months when wood turtles are in hibernation along streambanks away from construction areas.

The NJDEP identified the timber rattlesnake and northern copperhead as present along the proposed ROW inside the study area; both species were observed during 2008–2011 surveys. Timber rattlesnakes can be found in the forested, scrub shrub, or rocky outcrops habitat along the alternative 2 alignment. Northern copperheads occupy a variety of habitats during the warm months, including emergent wetlands, areas along streams, and upland areas where foraging and basking occurs. For both snake species, a potential for direct mortality exists if individuals are struck by construction vehicles and equipment during construction in the ROW, although preconstruction surveys, construction monitoring, seasonal restrictions, exclusion fencing, and postconstruction habitat restoration and monitoring would reduce this risk. Drilling activities required for the installation of tower foundations have the potential to adversely affect den sites in the rocky outcrops; however this potential is relatively low. The applicant would be required to develop a buffer zone, an area beyond which drilling activities would not impact the geology and the dens. Preconstruction surveys and seasonal restrictions (no drilling between September and April, when timber rattlesnakes occupy dens) would also be implemented. Following construction, the dens would be monitored to determine whether dens were affected by construction activities. If impacts are

documented during monitoring, additional mitigation could be required, including relocation of rattlesnakes, in consultation with the NPS. There is one known timber rattlesnake den location in the alternative 2 ROW inside the study area (Boder et al. 2005). The den is located close to the construction zone for a proposed tower and it is likely that snakes would be disturbed by the vibrations and noise associated with the drilling activities. If empty dens are destroyed by drilling activities it could result in eventual mortality for timber rattlesnakes or northern copperheads, because these species return to the same dens year after year and may be unable to find suitable overwintering areas if their original dens have been destroyed.

Northern fence lizards prefer open wooded areas, sunny grassy areas, and rock outcroppings for foraging and basking. Northern fence lizards are typically active May through September and this species was observed during the 2010-2011 vegetation surveys (NPS 2011b). During late spring, females lay eggs in loose soil. Impacts on northern fence lizards would result from the direct mortality of individuals from construction equipment. The removal of forested areas would destroy the preferred habitat of the northern fence lizard. In addition, the excavation of soil has the potential to destroy lizard nests.

Longtail salamanders and bog turtles spend the majority of their time in wetland habitats and have been observed in calcareous wetlands along the alternative 2 ROW inside the study area. Bog turtles inhabit a variety of wetland types throughout their range, but are usually found in small, open canopy, herbaceous sedge meadows and fens bordered by wooded areas. These wetlands are a mosaic of microhabitats that include dry pockets, saturated areas, and areas that are periodically flooded. Bog turtles depend on this diversity of microhabitats for foraging, nesting, basking, hibernation, and shelter (USFWS 2001, 12). Bog turtles typically spend most of their time in the wetland areas, using the upland areas only as travel corridors. Longtail salamanders and other amphibians sometimes travel to upland areas and find cover under moist logs or leaf piles. Calcareous wetland habitats are highly vulnerable to degradation from direct disturbance and from activities in nearby upland areas. Runoff from road surfaces, disruption of groundwater flow by nearby excavation, sedimentation from construction activity, or direct physical disturbance can lead to changes in the character of the wetland habitat, including a decline in overall plant diversity and invasion by non-native species and tall shrubs. Such changes could render the habitat unsuitable for the bog turtle and longtail salamander. Additional impacts would also occur if bog turtles or longtail salamanders travel in the upland community, where there is a risk of direct mortality from contact with construction vehicles and equipment.

Additional habitat fragmentation resulting from the widening of the existing ROW inside the study area (as described in detail in previous sections of chapter 4) would occur from the removal of the forested habitat; however, vegetation would become reestablished and would be managed as permanent scrub shrub habitat in the ROW. Habitat along the edge of the ROW not required for the maintenance of the ROW would be allowed to revegetate and succeed to mature forest over time, but this would not occur within the period of analysis. Seasonal restrictions and other mitigation measures could be implemented to protect reptiles and amphibians from impacts during hand clearing of vegetation such as inadvertent crushing of nests, reptiles, or amphibians by workers.

Projects in and adjacent to bog turtle habitat can cause habitat destruction, degradation, and fragmentation. For example, soil compaction in wetland areas can affect hydrology and wetland function, and can degrade bog turtle habitat. Alternative 2 could result in direct and indirect adverse impacts on bog turtles within wetlands; however, avoidance of bog turtle habitat is reflected in the current routing described in alternative 2. Adverse effects to the bog turtle have also been minimized through the adoption of conservation measures such as pre-construction surveys, avoidance, time of year restrictions, fencing and monitoring during constructions, steps to limit increased visitor access via new access roads, and a NPS-approved vegetation management plan. These conservation measures are consistent with the generalized recommendations and bog turtle conservation zones, developed by USFWS, as described in

the recovery plan for this species (USFWS 2001, appendix A) and in chapter 3. A BA was completed to evaluate the likely effects of alternative 2 on the bog turtle and its habitat. Given the adopted conservation measures, the BA concluded that alternative 2 "***may affect, but is not likely to adversely affect***" the bog turtle. The USFWS concurred with this determination on July 6, 2012.

Special-status Mammals: Four special-status mammal species, the bobcat and three bats (Indiana bat, small-footed bat, and northern myotis), have the potential to be present in the corridor of alternative 2. The Pennsylvania Game Commission has stated that alternative 2 is located outside the buffers (habitat that could support the bat) of the northern myotis (PGC 2010c).

If bobcat dens are near new areas being cleared, bobcats may temporarily or permanently leave their territories to avoid construction activity. This could lead to perceptible or measurable changes in behavior, den use, or the location or size of a territory. Adverse impacts on bobcats that may occupy territory (dens) in the area would occur due to habitat disturbance during site preparation and construction activities. The regular maintenance of the ROW could cause periodic disturbance throughout the period of analysis. Bobcats would avoid the areas of activity and disturbance during maintenance but would continue to use the existing ROW as a corridor for movement and hunting and could be expected to maintain territories that may overlap with the ROW and the habitats along the transmission line.

No bat hibernacula were found that could be used by small-footed or Indiana bats (Sanders 2009). Indiana bats are known to hibernate in nearby counties, and it is possible that individuals from these wintering sites are present in DEWA during the breeding season (April through September). Summer habitat for special-status bat species is available along the corridor of alternative 2, and surveys conducted in the alignment of alternative 2 documented northern myotis but failed to detect the Indiana bat (Sanders 2009, 6). An observation of small-footed bats during field studies along the alternative 2 corridor provides the possibility that small-footed bats could be foraging in the area or using rock crevices as habitat in the area. As nocturnal foragers, bats feed mainly in the forest canopy, grabbing flying insects, and may concentrate in the open space of ROWs, trails, or over streams that provide travel and foraging corridors. Transmission line construction at several river and stream crossings under alternative 2 would be expected to have few impacts on bat foraging habitat. Summer habitat and foraging habitat for all three species of bats is present in the study area and could be affected by the removal of trees, which may contain roost sites or maternity colonies, during clearing and construction activities. The foraging activities of special-status bats would not be affected unless construction activities occurred at night. If construction occurred at night, noise and activity could deter foraging; however, the use of lights could attract bats to the arc of lighting in order to feed on insects attracted to the light.

Due to potential impacts on summer habitat for special-status bat species, the applicant has specified that conservation measures would be implemented to ensure that the project would not be likely to adversely affect the Indiana bat (or the small-footed bat or the northern myotis). For example, seasonal restrictions would be followed, as described in the BA, to reduce and avoid any unforeseen disturbance or injury to roosting Indiana bats from the construction of the project. Seasonal restrictions for the cutting of potential roost trees (trees with a diameter at breast height greater than 5 inches [12.7 centimeters]) would prohibit cutting between April 1 and September 30, when Indiana bats could be present. Both the small-footed bat and the northern myotis would also likely benefit from the seasonal restrictions for the protection of the Indiana bat. Mitigation that has been specified for impacts on forested habitat could also offset loss of forested bat habitat. Projects include the Hopatcong Forest Restoration Project and mitigation proposed along the Passaic River (USFWS 2010b). Mitigation is expected to benefit the Indiana bat as well as the small-footed bat and the northern myotis. Impacts associated with the loss of forest would be offset by the Hopatcong Forest Restoration Project (USFWS 2010b). The implementation of mitigation measures would minimize adverse effects to the Indiana bat, resulting in a NPS determination in the BA that

alternative 2 "***may affect but is not likely to adversely affect***" the Indiana bat. The USFWS concurred with this determination on July 6, 2012.

Special-status Plants: A total of 12 special-status (state-listed) plant species have been observed or have the potential to be present in the habitats that have been mapped in the alternative 2 ROW and are described by habitat or presence in this section: A-sedge, downy willow-herb, small-headed rush, brook lobelia, Carolina grass-of-Parnassus, bog goldenrod, shrubby cinquefoil, Clinton's wood fern, reed meadowgrass, marsh bedstraw, stiff club moss, and white heath aster.

Suitable habitat and special-status plant species (including A-sedge, downy willow-herb, small-headed rush, brook lobelia, Carolina grass-of-Parnassus, bog goldenrod, and shrubby cinquefoil) have been identified in open canopy wetland areas within the corridor of alternative 2 but has not been found at other locations in the alternative 2 study area during surveys (Mellon 2010a). The wetland habitats in the ROW have the potential to support a number of listed special-status plant species. Indirect adverse impacts on these special-status plants could occur from clearing and construction. These activities could facilitate the spread of invasive species through forest clearing and access road construction, and drilling could adversely affect wetland functionality through erosion and alteration of hydrology.

Plant surveys did not document the presence of Clinton's wood fern in the study area under alternative 2 (Mellon 2010a); however, suitable habitat for Clinton's wood fern is present in wetland areas that would be bisected by the alternative 2 alignment. Clinton's wood fern has been found in the past in wetland areas surrounded by eastern hemlock in the study area (NPS 2009g, 2, 4) and could also be found outside wetland areas. It is possible that this species could be affected by the implementation of alternative 2 because some suitable habitat containing mature mixed forests may potentially be cleared. Mixed forest areas could contain the habitat requirements for Clinton's wood fern. The development of access roads and the installation of towers would not affect the wetland area where suitable habitat is found, and vegetation maintenance would occur throughout the period of analysis; however, Clinton's wood fern is low growing and therefore would be compatible with the applicant's vegetation management plans. The loss of mature tree species that provide a canopy for this understory fern would particularly affect habitat for this species and would facilitate the spread of invasive species. However, following the initial clearing activities, it is possible that Clinton's wood fern could be established in the corridor if suitable forested areas remain intact.

Reed meadowgrass was observed during surveys conducted in 2010 (Mellon 2010a, 2010b) and marsh bedstraw was observed during vegetation surveys conducted in 2011 (NPS 2011b) near wetland areas in the ROW. Reed meadowgrass was found in the ROW in a seepage area with other herbaceous wetland plants (Mellon 2010b). It is likely that both of these species would be directly affected under alternative 2 because the emergent wetland habitat, including the seepage area that supports reed meadowgrass and marsh bedstraw, is in an area that may be cleared to allow the construction of a tower. Indirect impacts on both plants could occur through vegetation maintenance, adjacent forest clearing, and access road construction, which may increase erosion in these areas and affect the functionality of the wetlands that support both species.

Stiff club moss was observed in scrub shrub and forested wetland habitat in the ROW during vegetation surveys conducted in 2011 (NPS 2011b). During construction and the widening of the ROW, vegetation removal (including incompatible species and trees) and ground disturbance could affect existing stems of stiff club moss and the surrounding habitat. Stiff club moss would also be disturbed by the construction of an access road that would be constructed through the species' habitat. Regular maintenance of the ROW is required to maintain low vegetation growth, including the removal of incompatible plant species.

White heath aster, although reported to be rare, has been found to be locally common in dry spots along the Delaware River, particularly in limestone ledge areas (NPS 1986, 106). This species has also been observed on limestone rocks in the forest adjacent to wetland areas (Mellon 2010a, 13). Communications with DEWA indicate that white heath aster grows near, but not in, the study area (Mellon 2010a, 8) and the species was not found during the field surveys conducted along the alternative 2 corridor (Mellon 2010a; NPS 2011b).

For all listed plant species, mitigation as described in appendix F would be employed to minimize and avoid impacts. Such mitigation includes monitoring areas to be avoided during construction, as identified during preconstruction surveys, and minimizing fugitive dust and runoff from construction sites (reducing sedimentation), which would reduce the potential adverse impacts on special-status plant species. Although mitigation techniques would be employed, adverse impacts on listed plants would still occur.

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the beneficial and adverse impacts on special-status species as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would not alter the level of impact.

Conclusion

Alternative 2 would cross in the center part of DEWA, including the MDSR. In general, this area is one of the most undeveloped areas of the park and is a particularly sensitive area because it contains high concentrations of many important and unique natural features, including rare limestone formations, the Arnott Fen, the Delaware River riparian corridor, eastern hemlock forests, the Hogback Ridge, the Kittatinny Ridge, and the Van Campen Brook riparian area, all of which provide unique and important high-quality habitat for special-status species. In addition, under alternative 2, the transmission line would bisect a major migratory bird flyway and is adjacent to an important communal roost for wintering bald eagles that is one of only two known winter roosts in DEWA.

Alternative 2 has the potential for adverse impacts on federally threatened bog turtles. Adverse impacts to bog turtles would be minimized through implementation of appropriate mitigation and conservation measures in consultation with the USFWS; therefore, alternative 2 may affect, but is not likely to adversely affect the bog turtle and bog turtle habitat (pursuant to Section 7 of the Endangered Species Act).

There is potential for adverse impacts on federally endangered Indiana bats from tree clearing and construction activities that could interfere with bat foraging and could result in the removal of trees that may contain roost sites or maternity colonies. These impacts would be minimized by implementing appropriate mitigation and conservation measures in consultation with the USFWS; therefore, alternative 2 may affect but is not likely to adversely affect Indiana bats (pursuant to Section 7 of the Endangered Species Act).

There is also some potential for adverse impacts on federally listed freshwater mussels from vegetation clearing and construction activities. These impacts would be minimized by implementing appropriate mitigation and conservation measures in consultation with the USFWS; therefore, alternative 2 may affect but is not likely to adversely affect freshwater mussels (pursuant to Section 7 of the Endangered Species Act).

he transmission line would be oriented perpendicular to a major flyway for migratory birds, creating an aerial hazard and increasing the risk of bird collisions. It is not possible to predict the percentage of migrating birds that might be killed or injured from colliding with the wires or towers but the height of the towers and number of conductors are believed to greatly increase the potential for bird collisions and resulting mortality or injury. In addition, the transmission line would be located next to one of only two known communal roosts for wintering bald eagles and collision risk would be especially high as eagles move to and from the roost. The roost developed with the existing, lower transmission line in place and there have been no known instances of eagle collisions, although some may have occurred; however, the taller towers and more numerous wires directly in the flight path of wintering eagles that use the communal roost on a regular basis presents an extremely high risk of collisions resulting in loss or injury of bald eagles. Bird diverters would be used to make the wires more visible to migrating birds and eagles but the effectiveness of these devices is uncertain. The high risk of bird collisions as a result of creating an aerial hazard on a major migratory flyway coupled with the unknown extent of the potential mortality of and injury to migrating birds and the uncertainty as to the effectiveness of mitigation measures is counter to the protection afforded migratory birds under Migratory Bird Treaty Act. The siting of a transmission line adjacent to a bald eagle roost is counter to the recommendations in the National Bald Eagle Management Guidelines and mitigation of the risk of eagles colliding with the lines is uncertain; therefore, it is likely that the potential loss of eagles through collisions would require a permit from the USFWS for "take" of bald eagles associated with operation of the transmission line. "Take" of bald eagles, meaning killing or injury, would occur for as long as the transmission line remains.

Overall, the significance of the impacts of alternative 2 is a result of two considerations: the particularly resource-rich area through which the alternative crosses, and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. This is especially important when considering that many of these resources, such as migratory birds, are under threat by other actions and outside pressure. The context of the function of the parks as an "oasis" or refuge within the highly developed east coast elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the adverse impacts of alternative 2 are likely to be significant when considering the intensity of the impacts in the context of the laws and policies for protection of special-status species.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Alternative 2b

Special-status Aquatic Species: A total of four special-status (state-listed) aquatic species (bridle shiner and three mussels: yellow lampmussel, creeper, and alewife floater) are known to be present or have the potential to be found in the proposed ROW for alternative 2b, as discussed under alternative 2. Due to the

similar amount of access roads, impacts on habitat for aquatic species from the construction of access roads and crane pads would be similar to those under alternative 2. Impacts on the bridle shiner and freshwater mussel species include changes in water quality, alteration of bottom habitat, decreased growth, and interruption of feeding, respiration, and reproductive activities; freshwater mussels could also be smothered by sediment deposition, whereas bridle shiners should be able to relocate out of the construction area. Structures associated with proposed stream crossings could result in adverse impacts on special-status mussels from direct mortality of mussels in the construction area. Because the bridle shiner would be able to avoid construction areas, adverse impacts are expected as a result of sedimentation and alteration of water quality. Stream crossing structures could affect special-status freshwater mussels by potentially blocking access to host-fish species, restricting the transport of food particles, and altering geomorphic and hydraulic processes that provide suitable habitat conditions. Preconstruction surveys would be necessary to determine whether any special-status mussel species exist in the tributaries and any mussels found could be relocated out of the construction zone prior to construction activity to minimize impacts. Mitigation measures described in appendix F would include the use of BMPs to minimize soil erosion and sedimentation that could affect water quality and habitat suitability for aquatic special-status species. Construction of the transmission line across the Delaware River (MDSR) would not include stream crossing structures and would not affect freshwater mussel species.

Following construction, maintenance activities would be performed but would not occur in surface waters in the ROW and would generally not include the removal of vegetation near water bodies; it is also expected that bridle shiners could avoid temporary disturbances to surface water conditions. In addition, control of invasive plant species near surface waters would include the use of NPS-approved herbicides safe for application in aquatic environments. To minimize impacts from construction activities, forested buffers around the Delaware River would be left intact, sediment control devices would be installed, and disturbed areas would be revegetated.

Special-status Terrestrial Invertebrate Species: Clearing beyond the current ROW would not be required under alternative 2b, but regular maintenance of the ROW would be required to maintain low vegetation growth. The herbaceous plant communities and grasses associated with Arogos skipper habitat would be compatible with vegetation requirements for the ROW and in the long term maintenance of the ROW may create additional suitable habitat for the Arogos skipper. It is possible that the ROW could be colonized by the Arogos skipper and conservation measures could be implemented for this species, resulting in a beneficial impact. As stated above for alternative 2, new towers would be constructed on either side of Arnott Fen, which is potential habitat for Mitchell's satyr. The greatest threat to the Mitchell's satyr is habitat destruction, including invasion by nonnative plants that threaten the fens on which the butterfly depends (USFWS 2010d, 1). However, because this butterfly is extirpated from its historical range in New Jersey and is only found in 13 locations in Michigan and two locations in Indiana (USFWS 2010d, 1), it is unlikely to be present in the alignment for alternative 2b.

Special-status Birds: Alternative 2b would remain inside the existing ROW, as described for alternative 1; impacts are analyzed for a total of 17 special-status (state-listed) bird species that have been observed or have the potential to be present in the ROW habitats. Neotropical migrant species and special-status raptor species that use forested habitat could be adversely affected by the loss of forested habitat as a result of clearing beyond the existing ROW, but the permanent loss of forested habitat would be considered small (4.5 acres) compared to other alternatives. Additional trees would be removed as danger trees if they are determined by the applicant to be a threat to the transmission line; however, the number of trees cannot be estimated, so impacts are unknown. Five forest-dwelling and potentially forest-nesting raptor species, the northern harrier, Cooper's hawk, northern goshawk, red shouldered hawk, and barred owl, could be present as migrant, resident, or seasonally present species in habitat being cleared under alternative 2b. The amount of forest edge habitat would effectively remain the same and opportunistic predators and passerine brood parasites (brown-headed cowbirds) could be expected to affect nest sites

along the newly created edge habitat. Adverse impacts on the golden-winged warbler would also occur in scrub shrub habitat in the ROW during vegetation clearing if clearing occurs during the nesting season; current practices do not have a seasonal restriction. These impacts could be offset by the use of seasonal restrictions on clearing. The clearing of vegetation may benefit the American kestrel, short-eared owl, vesper sparrow, and horned lark, because these species prefer open areas.

Forested and emergent wetland areas as well as riparian areas adjacent to the Delaware River are present in the ROW and would be avoided to the extent practicable under alternative 2b; very little forested habitat would be lost through vegetation clearing as a result of construction activities under alternative 2b. The great blue heron is known to nest in and adjacent to wetlands along the alternative 2b corridor. No access roads are proposed in the wetland where these species are present, but one tower would be placed in an herbaceous wetland area that could be used by great blue heron for foraging. Disturbance during vegetation maintenance could occur from human presence and activity, resulting in the temporary relocation of any foraging herons. In addition to the loss of habitat, during site preparation and the construction of the transmission line under alternative 2b, all special-status bird species may be disturbed by noise and activities associated with construction that would result in temporary disturbance or displacement from habitats. Activity from construction in the area could disrupt bird behavior, including foraging and breeding, in the ROW and adjacent habitats. Helicopters would potentially be used during construction activities to string the transmission line, as described in chapter 2 and in alternative 2 in this chapter. Maintenance activities have the potential to disturb and temporarily displace special-status bird species using habitat in or near the ROW for nesting and/or foraging. Annual maintenance of the ROW would cause disturbance along the entire line and throughout the period of analysis.

Bald Eagle: The bald eagle is known to nest, roost, and forage along the Delaware River where the alternative 2b alignment crosses the river (the same location as for alternatives 1 and 2). As described for previous alternatives in this section, a communal wintering eagle roost is located along the alternative 2b ROW (USFWS 2010b, 5) and the ROW crosses bald eagle foraging habitat (USFWS 2010b). Like alternative 2, alternative 2b would be inconsistent with the Bald Eagle Guidelines because the larger, higher line would be located adjacent to bald eagle nest, foraging, and roost sites. Adverse impacts on the bald eagle would occur during construction activities in the area of the wintering eagle roost and foraging areas; individuals may temporarily avoid areas undergoing demolition and construction. Potential negative impacts from disturbance that would result in disruption of feeding, reproduction, and resting could occur and may affect local population levels. Maintenance would not require heavy equipment and the disturbance from maintenance activities would be less than that from clearing and construction activities. Bald eagles would be expected to respond negatively to construction and demolition activities under alternative 2b because disturbance from activities and human presence would affect foraging, roosting, resting, and potentially nesting behaviors, affecting local population levels. Overall, as a result of vegetation clearing and construction/demolition activities, adverse impacts on the bald eagle would be possible in the wintering eagle roost area and in foraging areas. The permanent presence and maintenance of the transmission line along the bald eagle roost site would result in impacts on the bald eagle and would be inconsistent with Bald Eagle Guidelines.

Electrocution: The potential for electrocution of special-status bird species such as the bald eagle, great blue heron, barred owl, and red shouldered hawk under alternative 2b would be similar to the potential under alternative 2. Under alternative 2b, the proposed transmission line would be completed according to APLIC (2006) standards and would use the current best available technologies for minimizing the potential for electrocutions. However, the potential for electrocution would still exist and could result in impacts on the bald eagle, osprey, great blue heron, barred owl, American kestrel, peregrine falcon, short-eared owl, and special-status hawk species (Cooper’s hawk, northern goshawk, northern harrier, and red shouldered hawk).

Power Line Collisions: The alternative 2b alignment is located along a major north–south fall migration corridor for raptors and the newly constructed transmission lines would create a bird collision hazard where they are oriented in an east–west direction, nearly perpendicular to the line of flight. Migratory and resident special-status raptor species that could be affected by power line collisions include osprey, bald eagle, northern harrier, northern goshawk, Cooper's hawk, red shouldered hawk, American kestrel, peregrine falcon, short-eared owl, and barred owl. Great blue herons could also be affected by power line collisions. Additionally, the location of transmission lines close to bald eagle nests may increase the likelihood of collisions for younger individuals that are less experienced fliers. Bird collisions with power lines can be reduced and minimized through a variety of mitigation measures, including the application of bird-safe designs to new construction and retrofitting existing lines, as described in the APP (APLIC 2006, 7).

Electrocution and collision with the new, higher line would be possible for the following bird species: bald eagle, northern harrier, osprey, great blue heron, barred owl, Cooper's hawk, northern goshawk, American kestrel, peregrine falcon, short-eared owl, and red shouldered hawk.

Special-status Reptiles and Amphibians: As described for alternative 2, a total of seven special-status reptiles and amphibians have been observed or have the potential to be present or use suitable habitats along the ROW that would also provide the alignment for alternative 2b. In general, impacts on the special-status species reptiles and amphibians as a result of alternative 2b would be less than those under alternative 2 because very little forested habitat would be permanently disturbed (4.5 acres) and minimal permanent wetland impacts would occur from tower foundation and crane pad construction. Destruction of wood turtle, northern fence lizard, and eastern box turtle nests could occur during excavation activities. Special-status reptile and amphibian species in areas near construction activities may be disturbed by the increase of noise and activity and individuals of some species would avoid areas that may have been habitually used for basking, foraging, breeding, and nesting. Impacts on bog turtles and longtail salamanders would be adverse due to the risk of mortality from clearing and construction activities as well as from equipment and vehicle strikes. Specifically for wood turtles, the use of barrier fencing along streams could be implemented during construction to keep the turtles from entering construction sites.

There is one timber rattlesnake den location in the ROW for alternative 2b (Boder et al. 2005). Because the snake den is close to the proposed tower location, where drilling would occur, it is likely that snakes would be disturbed by the vibrations and noise associated with the drilling activities. Drilling activities would not occur between September and April when timber rattlesnakes occupy dens. However, if empty dens are destroyed by drilling activities, it could result in eventual mortality for timber rattlesnakes as this species returns to the same dens year after year and may be unable to find suitable overwintering areas if their original dens have been destroyed.

Additional impacts on special-status reptiles and amphibians would occur from habitat fragmentation, as described under alternative 2, but these impacts would be less under this alternative because the majority of access roads and spur roads would be constructed in the existing ROW. Habitat fragmentation would create adverse impacts on the longtail salamander because the habitat required by the salamander provides cover and moisture; the maintenance of the ROW would result in more open and potentially drier conditions, limiting habitat for the longtail salamander. Protection measures, including the use of handheld equipment instead of machinery and the implementation of seasonal restrictions during nesting and birthing seasons for turtles and snake species (typically between March and September), could be implemented; however, inadvertent crushing of nests, turtles, or snakes by workers could still occur.

Special-status Mammals: The four mammal species (bobcat and three bats) previously discussed under alternative 2 have the potential to be present under alternative 2b. Impacts on bobcat as a result of alternative 2b would be the same as those described for alternative 2.

Summer habitat for all three species of bats is present in the study area; however, due to the small amount of forest habitat that would be removed (4.5 acres), the loss of trees and/or maternity colonies in trees would not be considered large enough to be adverse under alternative 2b.

Special-status Plants: As stated in chapter 3, suitable habitat for A-sedge, downy willow-herb, small-headed rush, brook lobelia, Carolina grass-of-Parnassus, bog goldenrod, and shrubby cinquefoil has been identified in open canopy wetland areas near the ROW used for the implementation of alternative 2b. No direct impacts from access roads would occur because the access road under alternative 2b was designed to entirely avoid this wetland area. It is possible that indirect impacts on these plant species could occur under alternative 2b from adjacent forest clearing and access road construction, which may increase erosion. Soil movement from erosion could affect the functions of the wetland that supports these species.

Clinton's wood fern was not found in the existing ROW (Mellon 2010a), as described in alternative 2. Clinton's wood fern has been found in the past in wetland areas surrounded by eastern hemlock (NPS 2009g, 2, 4) but could also be found outside wetland areas. Because the same ROW would be used for alternative 2b, it is unlikely that this species would be affected under this alternative. Some wetland vegetation in the ROW may require maintenance, but access roads and installation of towers would not affect the wetland area where suitable habitat is present. The loss of mature tree species in the ROW that provide a canopy for this understory fern could affect habitat for this species and would facilitate the spread of invasive species.

Reed meadowgrass was observed during surveys conducted in 2010 (Mellon 2010a, 2010b) and marsh bedstraw was observed during vegetation surveys (NPS 2011b) near wetland areas in the corridor of alternative 2b. Reed meadowgrass was found in the corridor tucked in a seepage area with other herbaceous wetland plants (Mellon 2010b). It is likely that this species would be directly affected under alternative 2b because the emergent wetland habitat that supports the reed meadowgrass and marsh bedstraw is in an area that may be cleared to allow the construction of a tower in the wetland area. Indirect impacts on both plant species could occur as a result of adjacent forest clearing, access road construction, and vegetation management, which may increase erosion and affect wetland functions in the habitat that supports reed meadowgrass and marsh bedstraw.

As described in alternatives 1 and 2, stiff club moss was observed during vegetation surveys conducted in 2010 and 2011 (NPS 2011b) in scrub shrub and forested wetland habitat in the ROW and would be similarly affected by vegetation removal and tree removal under alternative 2b. Stiff club moss would be disturbed by an access road that would be constructed through the habitat that supports this plant species. The regular maintenance of the ROW required to maintain low vegetation growth may affect this species, but the species is low growing and compatible with the applicant's approved vegetation management plans.

Although white heath aster has been documented along the Delaware River and has been found to be locally common in dry spots along the Delaware River and on limestone rocks in the forest adjacent to wetland areas (Mellon 2010a, 13), it was not detected during surveys conducted in the alternative 2b ROW (Mellon 2010a; NPS 2011b). Communications with DEWA indicate that white heath aster grows near, but not in, the study area (Mellon 2010a, 8). It is unlikely that this plant species is present in the ROW for alternative 2b.

For all listed plant species, mitigation as described in appendix F would be employed to minimize and avoid impacts. Such mitigation includes monitoring areas to be avoided during construction, as identified during preconstruction surveys, and minimizing fugitive dust and runoff from construction sites (reducing sedimentation), which would reduce the potential adverse impacts on special-status plant species. Although mitigation techniques would be employed, impacts on listed plants would still occur.

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the beneficial and adverse impacts on special-status species as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

Alternative 2b would follow the same existing corridor as alternative 2 and would present the same hazards and adverse impacts to migratory birds and bald eagles due to the height of the towers and orientation of the transmission line perpendicular to a major migratory flyway and adjacent to a bald eagle communal roost. For the same reasons outlined for alternative 2, alternative 2b would likely result in significant adverse impacts to special-status species.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an "oasis" or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Common to Action Alternatives 3, 4, and 5

Restoration of the B-K Line: For alternatives 3, 4, and 5, the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be permanently removed and the ROW would be restored, as described in chapter 2. Although natural communities would not return to mature conditions in the period of analysis of this EIS, the process would begin and would create a beneficial impact.

Special-Status Terrestrial Invertebrate Species: Because no habitat for or presence of special-status terrestrial invertebrates exists along the alignments for alternatives 3, 4 and 5, special-status invertebrate species will not be discussed for these alternatives.

Alternative 3

Special-status Aquatic Species: Three special-status freshwater mussel species (yellow lampmussel, creeper, and alewife floater) have the potential to be present in open water areas in the proposed ROW under alternative 3; however, during consultation, PFBC did not specify the species as present in the Delaware River (PFBC 2010a, 1). Although no stream crossing structures would be constructed under alternative 3, vegetation removal and the construction of the transmission line could adversely affect freshwater mussels through changes in water quality, the alteration of bottom habitat (sedimentation), the smothering of mussels, decreased growth, and the interruption of feeding, respiration, and reproductive activities. Annual vegetation maintenance activities would not occur in surface waters in the ROW and would generally not include the removal of vegetation near water bodies. In addition, any control of invasive plant species near surface waters would include NPS-approved herbicides safe for application in aquatic environments. To minimize impacts from construction activities, forested buffers around the Delaware River would be left intact, sediment control devices would be installed, and disturbed areas would be revegetated.

Special-status Birds: The NJENSP identified four special-status bird species with the potential to be present in appropriate habitat along alternative 3: great blue heron, Cooper's hawk, red shouldered hawk, and barred owl. Only the great blue heron was observed in alternative 3 during the 2010 and 2011 vegetation surveys (NPS 2011b, 29). Documented bald eagle foraging areas along the Delaware River have been mapped in the vicinity of alternative 3 and are analyzed for impacts below. Additionally, special-status bird species discussed under alternative 2 that could be affected similarly by alternative 3 include the following: northern harrier, short-eared owl, peregrine falcon, American kestrel, vesper sparrow, and horned lark which could be present in open habitat such as the agricultural fields located adjacent to the Delaware River, particularly during migration; osprey, which could use riparian habitat along the Delaware River; northern goshawk, which could use forested areas in the alternative 3 corridor; and Neotropical migrants such as veery, cerulean warbler, and black-throated green warbler, which would also use forested areas as migrants and potentially as breeding species. The New Jersey Landscape Project also identified habitat for the golden-winged warbler along alternative 3 (Niles et al. 2008).

The alternative 3 ROW would traverse the Delaware River and Worthington State Forest inside DEWA. Tree removal and the expansion of successional habitat in the new ROW would permanently alter habitat along the route in Worthington State Forest. The widening of the ROW would further increase the fragmentation of habitat but would not significantly increase the amount of forest edge because the configuration would follow the edge of the existing ROW. After construction is completed, an undetermined portion of the ROW could be allowed to revegetate and only the width of the ROW necessary to maintain access roads and the transmission line would continue to be maintained. A portion of alternative 3 would also pass between two mowed/maintained agricultural areas on the western side of the Delaware River. The ROW in this area is currently 100 feet wide and the additional expansion of the ROW for alternative 3 could eliminate the wooded hedgerow between the fields, creating one large open expanse of maintained habitat. This enlarged open area may benefit the northern harrier, short-eared owl, American kestrel, vesper sparrow, and horned lark which forage in open fields. Special-status raptors that may hunt along the ROW, including the agricultural land, would continue to use these areas. These resident and migrant special-status raptor species include Cooper's hawk, red shouldered hawk, American kestrel, short-eared owl, and barred owl. Riparian habitat composed of mature forest is present in alternative 3 and could support foraging and nesting habitat for the cerulean warbler; other forested areas could support the black-throated green warbler.

Forested and emergent wetland areas as well as riparian areas adjacent to the Delaware River are present in the study area and would be avoided to the extent practicable under alternative 3. However, great blue heron, bald eagle, red shouldered hawk, and cerulean warbler could be adversely affected by forest clearing in areas adjacent to the Delaware River and wetlands that are currently used for foraging or nesting. Black-throated green warbler could be adversely affected by the loss of forested habitat in more upland areas of alternative 3.

The existing B-K Line between the Bushkill Substation and the eastern boundary of DEWA would be removed and the ROW would be restored, as described in chapter 2. During site preparation and the construction of the transmission line under alternative 3, all special-status bird species may be disturbed by noise and construction activities that could result in temporary displacement from habitats. Helicopters could be used during construction activities to string the transmission line, as described in chapter 2. Construction impacts on special-status bird species would be the same as those under alternative 2 because individuals may temporarily avoid areas and there is a potential that noise would affect feeding, reproduction, resting, or other behavioral factors that may affect local population levels. Barred owls are particularly loyal to their territory year-round; therefore, if construction occurs in their territory, disturbance and displacement would adversely affect barred owls. A seasonal restriction on tree clearing from March 15 through July 31 would be in place under alternative 3 that would prevent unauthorized take of nests and unfledged chicks protected under the Migratory Bird Treaty Act (USFWS 2010b). Additionally, impacts on special-status bird species inside the study area would be expected from maintenance activities (including annual vegetation maintenance) that would occur throughout the period of analysis; localized disturbance from noise and activity would be expected to cause temporary disturbance to birds near the activity.

Bald Eagle: Bald eagles are known to nest along the Delaware River close to where alternative 3 crosses the river. An active bald eagle nest is located within 0.2 mile (1,056 feet) of the alternative 3 alignment (USFWS 2010b). There is no known wintering bald eagle communal roost in or near the alternative 3 ROW. To avoid collisions, the Bald Eagle Guidelines state that communications towers and high-voltage transmission power lines should be sited away from bald eagle nests, foraging areas, and communal roost sites (USFWS 2007a, 15). Because of the nearby nest, the new transmission line corridor would not be consistent with the Bald Eagle Guidelines. However, if nesting activity is observed before or during the proposed construction, additional protections of the nest site would occur as required in the Bald Eagle Guidelines (USFWS 2007a, 12). These guidelines would minimize the potential take of bald eagles, which could occur because human activity within 1,312 feet (400 meters) of eagles can force them to abandon the immediate area (Anthony and Isaacs 1989). Impacts from construction activities and noise would adversely affect nesting bald eagles; impacts on the bald eagle from habitat loss would be similar to those for other raptor species.

Electrocution: The potential for electrocution of special-status bird species such as the bald eagle, great blue heron, barred owl, and red shouldered hawk under alternative 3 would be similar to the potential for electrocution discussed under alternative 2. Under alternative 3, the proposed transmission line would be completed according to APLIC (2006) standards and would use the current best available technologies for minimizing the potential for electrocutions.

Power Line Collisions: Similar to alternative 2, alternative 3 would be located along a major north–south fall migration corridor for raptors, and the newly constructed transmission lines would create a bird collision hazard where they are oriented in an east–west direction. Migratory and resident special-status raptor species could be affected by power line collisions. Bird collisions with power lines can be reduced and minimized through a variety of mitigation measures that include applying bird-safe designs to new construction and retrofitting existing lines according to APLIC standards (APLIC 2006, 7) in the draft Avian Protection Plan.

Overall, electrocution and collision with the lines would be possible to the following bird species: bald eagle, osprey, great blue heron, barred owl, Cooper's hawk, northern goshawk, red shouldered hawk, peregrine falcon, short-eared owl, American kestrel, and northern harrier.

Special-status Reptiles and Amphibians: The special-status species that may be present in suitable habitat along the alternative 3 alignment include the same seven species of reptiles and amphibians described under alternative 2: bog turtle, wood turtle, eastern box turtle, northern fence lizard, northern copperhead, timber rattlesnake, and longtail salamander. The USFWS New Jersey Field Office states that potential habitat for the bog turtle is present in the proposed ROW for alternative 3 (USFWS 2010b). This was confirmed in the 2011 Phase I field study (NPS 2012a, 12). The New Jersey Landscape Project also identified areas of potential habitat for longtail salamander, northern copperhead, wood turtle, and eastern box turtle along the proposed alternative 3 alignment (Niles et al. 2008). Timber rattlesnakes were observed during the 2010 and 2011 vegetation surveys along a wetland area in the proposed ROW. There are several known timber rattlesnake den locations along the Kittatinny Ridge. However, no dens are located in the corridor of alternative 3; the closest den is located over 1,000 feet from the proposed corridor.

Generally, impacts on the special-status reptile and amphibian species would be similar to those under alternative 2. Species near construction areas during construction would be disturbed by the increased noise and activity in their vicinity. Some species could be restricted to certain habitats, which may alter basking, foraging, breeding, and nesting behaviors. For example, bog turtles typically spend most of their time in wetland areas, using upland areas as travel corridors only, and longtail salamanders sometimes travel in wetland areas and find cover under moist logs and leaves. Impacts on special-status reptile and amphibian species from disturbance, potential strikes from construction vehicles and equipment, and (for bog turtles and longtail salamanders) from restricted movement would occur and the risk of mortality would also occur. Additional impacts on special-status reptiles and amphibians would occur from habitat fragmentation, as described under alternative 2. Habitat fragmentation would specifically and adversely affect the longtail salamander because more open canopy scrub shrub habitat would be created, thus exposing salamanders to increased sun exposure and possibly drier conditions.

Under alternative 3, impacts on listed reptiles and amphibians from drilling are unknown because the locations of dens (timber rattlesnake and northern copperhead) and the locations of towers are currently unknown for alternative 3, and the extent of the underground den system at identified dens in DEWA is unknown. Surveys would be conducted for the timber rattlesnake prior to construction. To the extent possible, the placement of towers would avoid known locations of dens. The areal extent and intensity of vibrations caused by drilling depends on several factors, including rock type and techniques. Prior to construction, a detailed drilling plan would be developed that describes the areal extent of impact from drilling and proposes measures to minimize the impact of vibrations caused by drilling. The applicant would be required to develop a buffer zone, an area beyond which drilling activities would not impact the geology and the dens. Preconstruction surveys and seasonal restrictions (no drilling) between September and April, when timber rattlesnakes occupy dens, would also be implemented. Following construction, the dens would be monitored to determine whether dens were affected by construction activities. If impacts are documented during monitoring, additional mitigation could be required, including relocation of rattlesnakes, in consultation with the NPS. If empty dens are destroyed by drilling activities, it could result in eventual mortality for timber rattlesnakes or northern copperheads, because these species return to the same dens year after year and may be unable to find suitable overwintering areas if their original dens have been destroyed.

Annual vegetation maintenance would result in localized disturbance to any special-status reptile or amphibian species. Protection measures, including the use of handheld equipment instead of machinery and the implementation of seasonal restrictions during nesting and birthing seasons for turtle and snake

species (typically between March and September), could be implemented; however, inadvertent crushing of nests, turtles, or snakes by workers could still occur. Specifically for wood turtles, the use of barrier fencing along streams could also be implemented during construction to keep the turtles from entering construction sites.

Alternative 3 could result in direct and indirect adverse impacts on bog turtles within wetlands; however, avoidance of bog turtle habitat through the implementation of mitigation measures such as pre-construction surveys, avoidance, and time of year restrictions along with a NPS-approved vegetation management plan would minimize impacts to bog turtle and potential bog turtle habitat. Detailed conservation measures and bog turtle conservation zones have been identified, with the intent of protecting and recovering known bog turtle populations within the northern range of this species as described in the recovery plan for this species (USFWS 2001, appendix A) and in chapter 3. Therefore, alternative 3 *"**may affect, but is not likely to adversely affect**"* the bog turtle and bog turtle habitat.

Impacts could also include the destruction of turtle and lizard nests and snake dens used for hibernation during construction. During annual maintenance activities, impacts on special-status reptiles and amphibians would occur but only handheld equipment would be used; individuals of some species may be disturbed by noise and human activities.

Special-status Mammals: Four special-status mammal species, the bobcat and three bat species (Indiana bat, small-footed bat, and northern myotis), have the potential to be present in the corridor considered under alternative 3. Bobcats were observed in the alternative 3 corridor during the 2010 and 2011 vegetation surveys (NPS 2011b). Impacts on bobcats as a result of alternative 3 would be similar to those under alternative 2; bobcats that may occupy territory in or travel through the area would be affected by habitat disturbance during site preparation and construction activities. Daytime construction activities associated with vegetation clearing in the study area would be expected to have minimal impacts on the bobcat due to the crepuscular/nocturnal nature of the animal. Bobcats would continue to use the existing ROW as a corridor for movement and hunting and could be expected to maintain territories that may overlap with the ROW and the habitats along the transmission line.

It is likely that summer habitat for all three species of bats exists in the study area and would be affected through loss of trees and/or maternity colonies in trees. Suitable roosting and foraging habitat for the Indiana bat was determined to be present within and adjacent to alternative 3 during the 2012 habitat assessment (NPS 2012b, 13). The closest potential Indiana bat cave, known as Coppermine (upper and lower), is approximately 1.7 miles from the centerline of the proposed ROW of alternative 3 and would not be affected by this project. Both small-footed bats and northern myotis were caught during mist netting surveys in Monroe County, Pennsylvania; northern myotis were also captured during mist netting surveys in Warren County, Pennsylvania (Sanders 2009, 6). The Pennsylvania Game Commission has stated that alternative 3 is located outside the buffers (habitat that could support the bat) of the northern myotis (PGC 2010c). Seasonal restrictions would be implemented to reduce and avoid any unforeseen disturbance or injury to roosting Indiana bats (USFWS 2010b). Both the small-footed bat and the northern myotis could also benefit from the seasonal restrictions described above for the Indiana bat. The construction of the transmission line under alternative 3 would be unlikely to affect bat foraging habitat because activities associated with construction would take place during daytime hours and there would be no disturbance to foraging bats. Disturbance to summer roost and maternity colony habitat could result from forest clearing during construction. Impacts on bat hibernacula would not be expected because no known hibernacula are present inside the study area for alternative 3. Alternative 3 "***may affect, but is not likely to adversely affect***" the three species of bats inside the study area.

Special-status Plant Species: There are six special-status plant species that could be affected by alternative 3: the netted chainfern, prickly-pear cactus, marsh bedstraw, stiff club moss, American

bittercress, and shore aster. The netted chainfern is proposed for listing as a Pennsylvania threatened species and was observed in the corridor of alternative 3 during surveys conducted in 2010 and 2011 (NPS 2011b). The Pennsylvania Department of Conservation and National Resources (PADCNR) has suggested that the prickly-pear cactus, a Pennsylvania state rare species, has the potential to be present in alternative 3, although neither this plant nor potential habitat in the corridor was observed during the surveys conducted in 2010 and 2011 (NPS 2011b; PADCNR 2010f). NPS records have indicated that American bittercress and shore aster have been documented in the vicinity of alternative 3 and suitable habitat for both marsh bedstraw and stiff club moss was observed during vegetation surveys (NPS 2011b).

The netted chainfern could be affected under alternative 3 because the plant was observed in an area that would be cleared beyond the existing ROW and soil compaction resulting from construction activities could restrict the regeneration of the netted chainfern. The loss of mature tree species that provide a canopy for this understory fern would affect habitat for the fern by opening the canopy; however, following the initial clearing activities it is possible that netted chainfern could reestablish in the corridor.

Adverse impacts on prickly-pear cactus would be expected because suitable habitat may exist in areas that may be affected by clearing, construction activities, and vegetation maintenance; preconstruction surveys would avoid/minimize any unforeseen impacts from construction activities, including soil compaction and clearing. Because prickly-pear cactus is low growing, it would be compatible with the applicant's vegetation maintenance programs.

Habitat that supports American bittercress, marsh bedstraw, stiff club moss, or shore aster could be cleared beyond the ROW under alternative 3. For all listed plant species, mitigation as described in appendix F would be employed to minimize and avoid impacts. Such mitigation includes monitoring areas to be avoided during construction, as identified during preconstruction surveys, and minimizing fugitive dust and runoff from construction sites (reducing sedimentation), which would reduce the potential adverse impacts on special-status plant species. Although mitigation techniques would be employed, impacts on listed plants would still occur.

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on special-status species as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Alternative 3 is located in an area with less concentration of special-status species and suitable habitat than alternatives 2 and 2b. However, alternative 3, like all of the action alternatives, crosses the Kittatinny Ridge, which is a major flyway for bird migration and the combination of the ridge and Delaware River valley provides crucial resting and foraging habitat for a wide variety of migratory birds. As with all the action alternatives, the transmission line under alternative 3 would be oriented perpendicular to a major flyway for migratory birds, increasing the risk of bird collisions. It is not possible to predict what percentage of migrating birds might be killed or injured from colliding with the wires or towers but the height of the towers and number of wires are believed to greatly increase the potential for bird collisions and resulting mortality or injury. Bird diverters would be used to make the wires more visible but their effectiveness is not known.

Alternative 3 would have adverse impacts on federally endangered bog turtles including increased potential for illegal collection of individuals as a result of the establishment and maintenance of access roads and potential for direct mortality from contact with construction vehicles and equipment. Adverse impacts to bog turtles would be minimized through implementation of appropriate mitigation and conservation measures in consultation with the USFWS. It is unlikely that any mortality of bog turtles as a result of alternative 3 would rise to the level of jeopardizing the continued existence of the species. Therefore, alternative 3 "***may affect, but is not likely to adversely affect***" the bog turtle and bog turtle habitat.

Alternative 3 would also have potential for adverse impacts on federally endangered Indiana bats from tree clearing and construction activities that could interfere with bat foraging and could result in the removal of trees that may contain roost sites or maternity colonies. There is also some potential for adverse impacts on federally listed freshwater mussels from vegetation clearing and construction activities. These impacts would be minimized by implementing appropriate mitigation and conservation measures in consultation with the USFWS and are not likely to adversely affect Indiana bats or freshwater mussels.

Alternative 3 would have some adverse impacts on bald eagles, primarily disturbance of nesting and foraging eagles and some risk of injury through collision with wires during foraging activities. There are no known communal roosts in the vicinity of alternative 3, meaning that alternative 3 poses less risk of injury to bald eagles in the river valley than do alternatives 2 and 2b; however, the National Bald Eagle Management Guidelines recommend against siting transmission lines in proximity to bald eagle nests; thus, alternative 3 is not in keeping with the recommendations. Alternative 3 would have some beneficial impacts to bald eagles because of the removal of the existing B-K Line adjacent to the known communal roost. Although no known injuries to bald eagles have occurred from the existing line, the removal of the line would be furthering the recommendations of the National Bald Eagle Management Guidelines.

When considered in the context of the laws and policies that protect special-status species, alternative 3 is likely to have significant adverse impacts primarily because it would result in an aerial hazard in a major migratory flyway with a great deal of uncertainty about the number of migrants that may be killed or injured and how effective mitigation measures would be. This situation does not follow the purposes of the Migratory Bird Treaty Act, NPS conservation and protection mandates and policies, and the purposes for which the three units were established. Alternative 3 contributes to cumulative adverse impacts on migratory birds, as well as other special-status species, because development and reduced protection in the region surrounding the parks increases the importance of that protection inside the parks. Alternative 3 offers some benefits due to the removal of the existing line; however, these do not outweigh the potentially significant negative impacts.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 4

Special-status Aquatic Species: Inside the study area, the proposed ROW under alternative 4 crosses Mountain Run, a first order intermittent stream (contains water seasonally). Because Mountain Run is not a perennial stream that would support aquatic special-status species, no federally or state-listed aquatic species are expected to be present in the study area.

Special-status Birds: The alternative 4 corridor provides potential habitat for ten resident and migratory special-status bird species due to the deciduous habitat and forested wetlands located along the ROW. These species include the bald eagle, Cooper's hawk, northern goshawk, red shouldered hawk, peregrine falcon, and barred owl. Additionally, the veery and three species of warblers (golden-winged warbler, black-throated green warbler, and cerulean warbler) could be migrants that would use suitable habitat in the alternative 4 alignment. No federally listed bird species have been identified or have the potential to be present in the corridor for alternative 4.

Because alternative 4 is located along the edge of DEWA, the forests are more fragmented by adjacent land use and infrastructure than those that border other alternatives. Tree removal and the expansion of successional habitat in the new ROW would further increase the fragmentation of habitat; however, it would not significantly increase the amount of forest edge because the configuration would follow the existing ROW edge. As stated above for alternatives 2 and 3, golden-winged warbler could benefit from the early successional stages of the revegetation process. Special-status raptor species that may hunt along the ROW would continue to use these areas. Mature forests are present in alternative 4 and could support Neotropical migrants (special-status warbler species) as well as summer resident special-status species. The use of forested habitat by special-status bird species for resting, foraging, or nesting could be adversely affected by the loss of forested habitat as a result of clearing to widen the existing ROW. No documented nests or roosts for special-status bird species are known to be present in the alternative 4 alignment; however, as forest-dwelling species, red shouldered hawk, Cooper's hawk, barred owl, and Neotropical migrant warblers could nest in the forested areas along the existing alignment, and the disturbance and clearing associated with alternative 4 could affect nest success and the viability of the young of these special-status bird species. Seasonal restrictions (March 1 to July 31) recommended by USFWS should protect the special-status bird nests, eggs, and young and prevent the unauthorized take of nests, eggs, and unfledged chicks protected under the Migratory Bird Treaty Act (USFWS 2010b). No direct mortality of eggs, young, or adults would occur as a result of clearing activities because trees would not be removed during the nesting season. The clearing of vegetation could benefit transient species such as American kestrel, short-eared owl, vesper sparrow, and horned lark by creating open area habitat.

The existing B-K Line from the Bushkill Substation to the eastern boundary of DEWA would be removed and restored, as described in chapter 2. Similar to the impacts described under alternatives 2 and 3, adverse impacts under alternative 4 would occur from the noise and human activity associated with construction activities. Helicopters could be used during construction activities to string the transmission line, as described in chapter 2. Noise and activity could alter bird behavior, including foraging, roosting, and breeding, in the ROW and adjacent habitats. Birds are highly mobile and can avoid or leave an area to forage elsewhere; however, additional expenditure of energy is involved. Nonetheless, because the disturbance would be localized and temporary and habitat for foraging is widely available, construction activities would not be expected to adversely affect special-status bird species. The majority of the special-status bird species would have the ability to return to the area when the construction activity has ended, resulting in only limited disturbance. In addition, impacts from maintenance activities (including annual vegetation maintenance) would occur throughout the period of analysis; localized disturbance from noise and activity would be expected to cause temporary disturbance to birds near the activity.

Bald Eagle: The alternative 4 alignment would not cross the Delaware River inside the study area and would not affect known winter roost, foraging, or nest areas for the bald eagle. Therefore, this alternative would be consistent with the Bald Eagle Guidelines (USFWS 2007a). If bald eagle nesting activity is observed before or during construction, additional protection of nest sites would be required according to the Bald Eagle Guidelines (USFWS 2007a, 12). Therefore, similar to the other birds described above, adverse impacts from habitat loss and from construction would occur as a result of alternative 4.

Electrocution: The potential for the electrocution of special-status bird species such as the bald eagle, barred owl, and red shouldered hawk under alternative 4 would be similar to the potential for electrocution described under alternatives 2 and 3. The potential for electrocution of special-status bird species as resident, seasonally present, or migrant species from perching on poles/wires would still exist, but the transmission line would be constructed to APLIC guidelines as described under alternative 2.

Power Line Collisions: The transmission line route proposed in alternative 4 would have a generally north–south trending orientation and as such would be unlikely to affect migrating birds because the lines are parallel to, rather than perpendicular to, the north–south line of flight for seasonal migrants. The alternative 4 alignment inside the study area does not cross the Delaware River where there are known bald eagle winter roost, nest, or foraging sites and is consistent with Bald Eagle Guidelines (USFWS 2007a). As a result, there would be less opportunity for bald eagles to collide with power lines. Migrating raptors could encounter transmission lines crossing their flight path along Kittatinny Ridge in the study area. Under alternative 4, there is less potential for collisions with transmission lines compared to alternatives 2 and 3 for the bald eagle, Cooper's hawk, northern goshawk, and barred owl.

Electrocution and collision with the line would be possible but unlikely for the bald eagle, barred owl, Cooper's hawk, northern goshawk, peregrine falcon, and red shouldered hawk due to the north–south orientation of the transmission line, which would be parallel (not perpendicular) to the flight path of most migrating birds.

Special-status Reptiles and Amphibians: Inside the study area of alternative 4, only two special-status reptiles and amphibians are considered for analysis because the proposed line would be in Pennsylvania only. These species include the northern fence lizard and timber rattlesnake. The impacts on and presence of the New Jersey state-listed reptile and amphibian species, including wood turtle, eastern box turtle, northern copperhead, and longtail salamander, along alternative 4 are generally discussed under reptiles and amphibians in the "Landscape Connectivity and Wildlife" section because the study area for the transmission line proposed under alternative 4 is not in New Jersey.

Northern fence lizards were observed along alternative 4 during the 2010 and 2011 vegetation surveys (NPS 2011b). PFBC identified the timber rattlesnake as having the potential to be present within the boundaries of NPS lands in appropriate habitat crossed by alternative 4; however, no dens are known to be present inside the study area (PFBC 2010a). Surveys would be conducted for the timber rattlesnake prior to construction. Wetland habitat along the proposed ROW could contain preferred habitat for the bog turtle. Surveys would be conducted to confirm the presence of the species prior to construction.

During construction activities, similar to alternatives 2, 2b, and 3, adverse impacts on the northern fence lizard and timber rattlesnake could occur from the implementation of alternative 4. Impacts would result from the direct mortality of individuals in habitats undergoing clearing and construction due to the use of construction vehicles and equipment that could inadvertently crush individuals. Additional impacts on the northern fence lizard would occur from the destruction of nests resulting from soil excavation.

To the extent possible, the placement of towers would avoid known locations of timber rattlesnake dens. All mitigation and monitoring measures described for alternatives 2, 2b, and 3 would be implemented

under alternative 4. If impacts are documented during monitoring, additional mitigation could be required, including the relocation of rattlesnakes, in consultation with the NPS.

Following construction, the operation and maintenance of the transmission line would include the maintenance of vegetation at least annually at regular intervals. Maintenance activities would include the trimming of vegetation using hand tools such as chainsaws and pruners. Temporary localized disturbance from maintenance activities and human presence would occur on special-status reptiles and amphibians; however, inadvertent crushing of nests, reptiles, or amphibians by workers could still occur.

Special-status Mammals: Four special-status mammals have the potential to be present in the study area for alternative 4: the bobcat and three species of bats (Indiana bat, small-footed bat, and northern myotis). Of these four mammal species, only the northern myotis has been documented in the vicinity of the alternative 4 alignment. Impacts on bobcat under alternative 4 would result from temporary noise disturbance associated with construction and human activities. If bobcat dens are in the vicinity of new areas being cleared, bobcats may temporarily or permanently leave their territories to avoid construction activity. This could lead to perceptible or measurable changes in the behavior of bobcats and changes to bobcat dens or habitat but would not be expected to reduce the populations in or adjacent to the project area below self-sustaining levels.

Northern myotis were caught during mist netting surveys in Monroe County, Pennsylvania; however, the survey did not include Northampton County (Sanders 2009, 6). The closest potential Indiana bat cave, known as Cold Air Cave, is located approximately 2.4 miles from the centerline of the proposed ROW of alternative 4 and would not be affected by this project. (Previous surveys also identified a male small-footed bat at the Cold Air Cave). The Pennsylvania Game Commission has stated that the alternative 4 corridor is located within the buffer of the northern myotis (PGC 2010c), and northern myotis have been captured in the study area for alternative 4. A deep mine portal was located in the vicinity of alternative 4; however; this portal was assessed and deemed not suitable for winter populations of Indiana bats. Suitable roosting and foraging habitat for the Indiana bat was determined present within and adjacent to alternative 4 during 2012 habitat assessment surveys.

Transmission line construction at stream crossings under alternative 4 would be unlikely to affect bat foraging habitat because activities associated with construction would occur during daytime hours and no disturbance to foraging bats would occur. Disturbance to summer roost and maternity colony habitat could occur as a result of forest clearing during construction. Impacts on bat hibernacula would not be expected because no known hibernacula are present inside the study area for alternative 4. Alternative 4 is not likely to adversely affect the Indiana bat inside the study area. Detailed mitigation measures for bats under alternative 4 have not yet been determined, but would likely include seasonal restrictions for tree clearing because summer roost and maternity colony habitat could exist in forested areas.

Special-status Plants: There are seven special-status plant species that could be affected by alternative 4 in the study area: pasture rose, American holly, Susquehanna sand cherry, marsh bedstraw, stiff club moss, willow oak, and swamp dog-hobble. Pasture rose, observed in the ROW in DEWA during seasonal surveys conducted in 2010 (NPS 2011b), currently has an undetermined status in Pennsylvania, as this species is believed to be in danger of decline in Pennsylvania. Marsh bedstraw and willow oak were observed during vegetation surveys (NPS 2011b); stiff club moss was not identified during surveys but potential habitat exists along alternative 4. The remaining three special-status plant species were not observed in the study area but have the potential to be present at Totts Gap Natural Heritage Site (part of which is in the ROW for alternative 4).

Pasture rose, marsh bedstraw, and willow oak could be affected under alternative 4 during clearing to widen the existing ROW. If areas where these species have been observed (or where there is suitable

habitat for stiff club moss) cannot be avoided or if soil compaction occurs that could affect a species' ability to recover after construction, adverse impacts to these plants are possible.

The western portion of Totts Gap Natural Heritage Site could be affected under alternative 4 because vegetation in this area would be cleared beyond the ROW. Totts Gap, composed of Totts Gap Natural Heritage Site and Totts Gap Swamp and it supports the Pennsylvania threatened American holly and the proposed Pennsylvania threatened Susquehanna sand cherry and swamp dog-hobble (Totts Swamp) (PATNC 2005a, 131). Although American holly, Susquehanna sand cherry, and swamp dog-hobble were not observed during vegetation surveys conducted in 2010 and 2011 (NPS 2011b), these special-status plant species do have the potential to be present in the alternative 4 ROW at Totts Gap and could be adversely affected by clearing and construction activities. Following the initial clearing activities it may be possible for these species to be reestablished in the ROW if present at Totts Gap Natural Heritage Site and if soil compaction does not occur. However, some specimens of these species may be subject to vegetation maintenance (cutting and trimming) because of their growth pattern as small shrubs and/or trees. The impacts as a result of clearing and construction activities as well as the maintenance and presence of the transmission line could be elevated if an entire listed plant population is lost during clearing activities because they may be subject to vegetation maintenance (cutting and trimming).

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the beneficial and adverse impacts on special-status species as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Alternative 4 would have adverse impacts to special-status species, including crushing of individuals by heavy equipment; destruction of foraging habitat, roosts, nests, and hibernacula; electrocution and collision with conductors; habitat degradation from fragmentation and introduction of exotic and invasive species; soil compaction; and disturbance from noise or to habitat resulting in reduced nesting success and viability of young. For the most part, the adverse impacts would be limited to the period of construction and to a lesser degree, during periodic maintenance activities. Mitigation measures such as seasonal restrictions would be implemented to avoid and minimize adverse impacts on special-status species.

Alternative 4 would have potential for migratory birds to collide with power lines; this is dependent on the visibility of the lines. The effectiveness of mitigation measures to reduce long-term impacts from collisions to raptors and other migratory birds using the Kittatinny flyway is uncertain. The alternative 4 alignment would not affect known winter roost, foraging, or nest areas for the bald eagle. Therefore, alternative 4 would have less potential for eagle collisions than alternatives 2, 2b, or 3, and would be in keeping with the recommendations of the National Bald Eagle Management Guidelines (USFWS 2007a).

Alternative 4 would offer the same benefits as alternative 3 through removal of the existing B-K Line. These benefits may balance the adverse effects of construction, operation and maintenance of alternative 4. When considered in the context of the laws and policies for protection of special-status species, the adverse impacts of alternative 4 would not likely be significant; the adverse impacts would be of limited duration and could be mitigated by seasonal restrictions and other measures implemented in consultation with the USFWS; and the adverse impacts could be offset by the beneficial impacts of removing the intrusion of the existing B-K Line in an area of high-quality habitat that supports a higher concentration of special-status species.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 5

Alternative 5 would follow the same route through DEWA and APPA as alternative 4; however, alternative 5 does not include the portion of the B-K Line from the Bushkill Substation to the western boundary of DEWA. This portion of the B-K Line does not have specific presence of special-status species and would have the same impacts as alternative 4. Therefore, impacts on special-status species under alternative 5 would be the same as those described above for alternative 4.

Cumulative Impacts

Cumulative impacts on special-status species inside the study area would be adverse, as described previously in the “Cumulative Impacts Common to All Alternatives” section. When the beneficial and adverse impacts on special-status species as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

The impacts on special-status species under alternative 5 would be the same as those for alternative 4; therefore, the adverse impacts of alternative 5 would also not likely be significant for the same reasons as outlined for alternative 4.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

RARE AND UNIQUE COMMUNITIES

In this section, impacts on rare and unique communities are evaluated. A rare or unique community is a subset of an ecosystem that is recognized for its contribution to biological diversity—locally, regionally, or globally. Rare and unique communities include sites identified by the DEWA GMP (NPS 1987), county natural areas inventories, and state natural heritage programs. Rare and unique communities often support more than one rare species.

A rare or unique natural community results from a combination of physical and biotic features that create a distinct site. The geology and hydrology of a site determine the vegetation that grows there, which in turn influences the wildlife that use the habitat. Because all the components of a rare or unique community are interconnected, impacts on one resource, such as geology, would affect the entire community and change its composition and viability. The elimination of any rare or unique community would represent a considerable loss with far-reaching consequences.

METHODOLOGIES

Rare and unique communities were identified through various resources, including the DEWA GMP (NPS 1987), NJDEP GIS layers for natural heritage priority sites (NJDEP 2007), and natural area inventories for Monroe, Northampton, and Pike counties, Pennsylvania (PATNC 1990, 1991a, 1999, 2005a). An impact on any one resource of a community has the potential to create a chain reaction and affect other resources in the community. Therefore, rare and unique communities were assessed from the ground up. This means that impacts on the resources that create or influence the characteristics of the community were analyzed first. The effects of these impacts were then used to assess the impacts on other resources in the community. Because rare and unique communities can encompass nearly all types of natural resources, the evaluation of impacts on rare and unique communities considered potential effects on natural resources, such as the interruption of geologic processes, the loss of vegetation, the spread of invasive plant and animal species, changes in ecological integrity, the loss of or changes in wetland functions, and changes in population integrity. Specific impacts on individual resources may be found in the appropriate sections of this chapter. Impacts on rare and unique communities reflect impacts on applicable resources found in a specific rare or unique community.

Topic-specific context for assessing impacts on rare and unique communities includes the following:

- The parks encompass a variety of unique ecosystems and geographic sites, resulting in an unusual concentration of resources with varying scope of importance.
- Contiguous habitat between the parks and with surrounding lands results in a nexus with other individual resources.
- Rare and unique communities are subject to special management treatment needed to maintain their viability; this is recognized by multiple agencies and is important to broad interests.
- Areas designated as state natural heritage sites contribute to biodiversity which warrants this special recognition.

STUDY AREA

The study area for rare and unique communities includes the ROW for each alternative and any area outside the ROWs where necessary pulling and splicing sites and access road development are proposed or would be expected. Because the location of the S-R Line outside the study area cannot be determined at this time, the indirect impacts on rare and unique communities cannot be evaluated per alternative. The potential impacts outside the study area are generally addressed; however, further surveys would be required prior to construction of the S-R Line.

CUMULATIVE IMPACTS COMMON TO ALL ALTERNATIVES

The rare and unique communities in NPS lands are protected from major development and are maintained through NPS programs. However, existing ROWs, roads, and trails fragment the habitats, thereby reducing the quality of the habitat. Although the B-K Line predates the establishment of DEWA, the

stricter vegetation maintenance standards put forth by NERC have increased the impact on vegetation from the maintenance of the ROW. Additionally, rare and unique communities are currently under pressure from a number of stressors, including habitat loss and degradation, development, pollution, toxic chemicals, invasive species, pests, disease outbreaks, habitat fragmentation, and wildfires, making them highly vulnerable to additional impacts such as climate change (NABCI 2010, 44). Actions and activities in the foreseeable future contribute to the decline of rare and unique communities through ground disturbance, the temporary and permanent removal of vegetation, the disturbance and mortality of wildlife, and the potential colonization by invasive species. Past, present, and reasonably foreseeable activities that would have beneficial or adverse impacts on rare and unique communities inside and outside the study area are listed below and discussed under each alternative as applicable. Projects with the potential to have cumulative impacts both inside and outside the study area are described in detail in appendix H.

Projects Inside the Study Area

Because rare and unique communities are individual, distinct microhabitats within larger habitats, cumulative impacts are analyzed based on the projects that have affected, are affecting, or would affect the rare and unique communities directly. Several projects, described below, could affect one or more of the rare and unique communities inside the study area, because these projects are parkwide. Additionally, adverse impacts on rare and unique communities could result from illegal activities such as ORV use, plant and wildlife collection, hunting/poaching, and woodcutting. These activities could create ground disturbance, the direct loss or mortality of plants and wildlife, and the loss of habitat. Beneficial impacts would result from parkwide invasive species control programs, the DEWA prescribed burn program, and the Wildlife Habitat Incentive Program. These programs work to control invasive species and improve or restore wildlife habitat.

Arnott Fen: The present parkwide activities and programs inside the study area would result in adverse cumulative impacts on Arnott Fen. No other past, present, or reasonably foreseeable projects in the study area have affected, are affecting, or would affect Arnott Fen.

Delaware River Riparian Corridor: Current parkwide activities and programs and the past, present, and reasonably foreseeable recreational improvement, development, and utility projects listed below would result in adverse cumulative impacts in the Delaware River riparian corridor inside the study area.

- Delaware River bridge projects would improve the Delaware Water Gap Toll Bridge and would create beneficial impacts on water resources through erosion control measures.
- The I-80 weigh station would upgrade the weigh station, resulting in the disturbance of wetland areas for construction and long-term stormwater management and erosion control measures.
- The Metropolitan Edison removal of unused power poles and transformers would benefit the Delaware River riparian corridor by allowing previously cleared and maintained areas to revegetate and succeed naturally, which would reduce habitat fragmentation and increase interior habitat.
- Metropolitan Edison vegetation management and tree removal would maintain utility ROWs, which would resist the natural process of succession, reduce available interior habitat, alter natural habitat, and aid in the colonization of invasive plant species.

- The construction of facilities for Turtle Beach produced adverse impacts on soils, vegetation, and water quality. This project would reduce, but would not eliminate, impacts to special-status species.
- The restoration of flood damaged river campsites would prevent soil erosion and compaction and restore habitat, resulting in beneficial impacts.

Eastern Hemlock Stands: Current parkwide activities and programs and the following current habitat preservation project would result in adverse cumulative impacts on eastern hemlock stands inside the study area.

- The management of hemlock stands in DEWA works to control invasive plant species and control infestations of invasive insect species, resulting in beneficial impacts on eastern hemlock stands.

Hogback Ridge: Current parkwide activities and programs and the following past recreational improvement project would result in adverse cumulative impacts on Hogback Ridge inside the study area.

- The McDade Trail realignment dismissed the alternative of routing the McDade Trail over Hogback Ridge. An alternate alignment was chosen to avoid the Hogback's sensitive wildlife and vegetation, and parking areas and social trails were eliminated to reduce visitor use that would adversely impact these resources.

Kittatinny Ridge: Current parkwide activities and programs and the following past and present utility and habitat protection projects would result in adverse cumulative impacts on the Kittatinny Ridge inside the study area.

- The relocation of the Appalachian Trail near the Columbia Gas Transmission Company pipeline crossing resulted in vegetation clearing, which fragmented habitat and disturbed wildlife.
- The Columbia Gas Transmission Company pipeline upgraded an existing natural gas pipeline that traverses DEWA, affecting natural resources through ground disturbance, vegetation loss, habitat fragmentation, the alteration of habitat, the disturbance of wildlife, and potential colonization by invasive plant species.
- Current IBA and IMA programs are working to protect critical habitat, benefiting wildlife and reducing loss of vegetation and habitat fragmentation.

Minsi Lake / Bear Swamp: Current parkwide activities and programs inside the study area would result in adverse cumulative impacts. No projects in the study area have affected, are affecting, or would affect Minsi Lake / Bear Swamp.

Totts Gap Natural Heritage Site: Current parkwide activities and programs and the following past utility project would result in adverse cumulative impacts on Totts Gap Natural Heritage Site inside the study area.

- The Columbia Gas Transmission Company pipeline upgraded an existing natural gas pipeline that traverses DEWA, affecting natural resources through ground disturbance, vegetation loss, habitat fragmentation, the alteration of habitat, the disturbance of wildlife, and potential colonization by invasive plant species.

Van Campen Brook Riparian Area: Current parkwide activities and programs and the following reasonably foreseeable development projects would result in adverse cumulative impacts on the Delaware River riparian corridor inside the study area.

- The Old Mine Road South rehabilitation would repair pavement along Old Mine Road and would improve sediment and erosion control.
- The repair of failing Watergate Dam #10 would rehabilitate the dam and would decrease impacts on water and aquatic resources through sediment and erosion control.

Overall, the effects of past, present, and reasonably foreseeable projects would result in overall adverse cumulative impacts on rare and unique communities inside the study area.

Projects Outside the Study Area

Outside the study area, projects that would result in adverse cumulative impacts on rare and unique communities could include any that would have impacts on any of the elements of these communities, such as geology, vegetation, hydrology, and connectivity. Cumulative projects that could adversely affect rare and unique communities outside the study area include the following road and utility projects: the Marcellus shale natural gas drilling; the Columbia Gas Transmission Company pipeline (replacement of an existing gas pipeline); the Tennessee Gas Line Proposal (addition to an existing gas pipeline); the FERC relicensing of Yards Creek Generating Station (relicensing power plant); the Marshalls Creek traffic relief project (new bypass route); the PFBC natural gas leasing and water access programs; the PPL proposal for a 138/12 kV substation (opens up additional areas to electric transmission); the US Route 209 rehabilitation and replacement of Toms Creek Bridge (road and bridge repair); Martins Creek Power Plant (contaminated water spill); wind turbines in northeastern Pennsylvania; and transportation improvement and replacement projects in Pennsylvania and New Jersey.

Proposed residential and commercial developments in New Jersey and Pennsylvania would also cause adverse impacts on rare and unique communities. Beneficial impacts would result from the following projects: the DEWA prescribed burn program; Pennsylvania's weed eradication program; the Wildlife Habitat Incentive Program; and IBA/IMA programs. Nongovernmental organizations such as TNC work toward identifying and preserving land that contains rare or unique features or key habitat for plants and wildlife. The beneficial effects of many of the listed programs are dependent on the availability of funding for specific projects, which could vary throughout the period of analysis; therefore, the level of benefit resulting from implementation of any project is also variable. Despite land protection and conservation outside the study area, land in the 10 counties of New Jersey and Pennsylvania that are part of this analysis is subject to continued development that would result in further loss, alteration, and fragmentation of habitat, including rare and unique communities. Cumulative impacts on rare and unique communities outside the study area would be adverse.

IMPACTS OF THE ALTERNATIVES ON RARE AND UNIQUE COMMUNITIES

Common to All Alternatives

Vegetation Maintenance: PPL and PSE&G have separate vegetation management plans because they are distinct utility companies working in two states; however, vegetation maintenance would occur annually at a minimum. Vegetation maintenance sustains habitat in the existing ROW as scrub shrub using selective clearing. Additionally, vegetation maintenance would include removal of danger trees that could interfere with the transmission lines. The details of the vegetation management plans as well as clearing

techniques are explained in chapter 2. The impacts of vegetation maintenance are discussed under each alternative.

Invasive Species: Under all action alternatives, invasive plant and wildlife species have the potential to spread and colonize as a result of vegetation removal, disturbance, and the spread of cleared vegetation through mulching. Monitoring programs for invasive plant species and mitigation for invasive wildlife species are described in the "Vegetation" section of this chapter.

Natural Heritage Programs: New Jersey Natural Heritage Program (NJNHP) and Pennsylvania Natural Heritage Program (PNHP) were created to identify critically important areas to support the conservation of biological diversity. These programs are based on the occurrence and locations of native plant and animal, natural community, and geologic resources, with a focus on rare and endangered species. While natural heritage sites do not cover the entire known habitat for endangered and threatened species, they work to conserve critical habitat (NJDEP 2008e; PNHP n.d.)

Mitigation Measures: Mitigation measures would help reduce impacts from construction, operation, and maintenance activities both inside and outside the study area. Mitigation measures for rare and unique communities include those measures that would protect the resources within the community. The complete list of mitigation measures for physical and natural resources are discussed in chapter 2 and appendix F.

Outside the Study Area: Outside the study area, regardless of which alternative is selected, the transmission line could pass through Carbon, Lackawanna, Luzerne, Monroe, Northampton, Pike, and Wayne counties in Pennsylvania and Morris, Sussex, and Warren counties in New Jersey. These counties are largely undeveloped and contain a variety of rare and unique communities. The counties in Pennsylvania contain 58 types of communities that range from vulnerable to critically imperiled, and the counties in New Jersey contain 22. The rare and unique communities are presented in appendix C. Additionally, TNC protects eight preserves in Pennsylvania and eight in New Jersey. TNC restricts the activities that are allowed on the preserves, which adds to the conservation of rare and unique communities outside the study area.

The clearing, construction, and vegetation maintenance activities outside the study area would be consistent with those described for inside the study area; however, the direct impacts outside the study area cannot be determined, as described in the introduction of this chapter. In addition, specific resource impacts outside the study area cannot be identified until the route is chosen by the applicant. Once this decision is reached, additional surveys would be required to determine the impacts of the selected route on rare and unique communities.

Outside the study area, indirect adverse impacts on rare and unique communities from vegetation clearing, the construction of the transmission line, the operation and maintenance of the transmission line, vegetation maintenance, and the potential spread of invasive species would be adverse.

Cumulative impacts on rare and unique communities outside the study area would be adverse, as described previously in the "Cumulative Impacts Common to All Alternatives" section. When the adverse impacts on rare and unique communities outside the study area are combined with other past, present, and reasonably foreseeable projects outside the study area, an overall adverse cumulative impact would be expected.

Alternative 1: No Action

Rare and unique communities that exist along the alternative 1 alignment include Arnott Fen, Delaware River riparian corridor, eastern hemlock forests, Hogback Ridge, Kittatinny Ridge (including talus slope), and Van Campen Brook riparian area. These communities are discussed in the following sections. To arrive at an overall impact and an overall cumulative impact for all the communities in each alternative, the impact on each community as well as the diversity and extent of rare and unique community types along each alternative was considered.

Arnott Fen: As stated in the "Rare and Unique Communities" section of chapter 3, Arnott Fen is a globally imperiled community that is unique in part due to the underlying limestone bedrock. Because no construction activities would be included under alternative 1, there would be no impacts on the geologic features and the groundwater associated with Arnott Fen.

In the existing ROW, Arnott Fen and the surrounding wetland complex area contain a diverse vegetation community including species of conservation concern. Most of the plant species in the ROW are herbaceous and are compatible with the applicant's specifications for vegetation clearing and control (PPL 2010a, 12). Vegetation control measures such as mowing and herbicide use are not currently employed in Arnott Fen and would not be necessary for maintenance under alternative 1. However, incompatible shrubs and small trees such as red maple are also present in the fen and would be hand cleared as part of vegetation management. This maintenance would affect Arnott Fen both beneficially (by keeping the fen open and controlling succession into a wooded wetland) and adversely (by damaging plant species, facilitating the spread of invasive species, and affecting wildlife species through disturbance or direct mortality). Conservation measures would be employed to protect the rare species, such as seasonal restrictions, herbicide restrictions, and the implementation of the invasive species guidelines from the vegetation maintenance plans.

Under alternative 1, the Arnott Fen community would continue to provide suitable habitat for a range of wildlife, including several wildlife species of conservation concern, because the habitat would be maintained by the applicant through NPS-approved vegetation maintenance and would not be altered by construction activities. Mobile wildlife species may be adversely affected by noise and human activity during vegetation management in adjacent areas. Mobile species could be driven out of the habitat, but it is expected that individuals of these species would return to the fen and the surrounding habitats when maintenance is complete. Additionally, nests and eggs of wildlife could be damaged or destroyed during maintenance activities; however, these impacts could be mitigated through seasonal restrictions, as described in appendix F.

Impacts on the Arnott Fen community would result from vegetation maintenance and indirect adverse impacts on wildlife under alternative 1, the no-action alternative.

Delaware River Riparian Corridor: The Delaware River riparian corridor extends approximately 0.25 mile on either side of MDSR. For alternative 1, the Delaware River riparian corridor includes a buffer along the western shore of the Delaware River in Pennsylvania at the base of Hogback Ridge. Because steep slopes occur on either side of the Delaware River, the existing towers are positioned on the tops of the ridges and the transmission lines span the river. The Delaware River riparian corridor is recognized as critical habitat for breeding, wintering, and/or migrating songbirds, waterfowl, and wading birds (NPS 2009g, 5). The riparian corridor contains an active bald eagle communal winter roost and provides important foraging habitat for bald eagles (NPS 2009g, 6).

Vegetation would be maintained throughout this area, except for a 100-foot buffer adjacent to the river on both sides (PPL and PSE&G 2008, 7), resulting in adverse impacts to floodplain forest. Vegetation

maintenance would halt the natural succession of the vegetation communities in the ROW, resulting in adverse impacts. Additionally, noise and human activity in adjacent areas during maintenance could disturb wildlife. Mobile wildlife species may be displaced from the Delaware River riparian corridor during vegetation management activities, but it is expected that individuals of these species would return to the area when maintenance is complete.

Due to impacts on wildlife, adverse impacts would be expected on the Delaware River riparian corridor community under alternative 1.

Eastern Hemlock Forests: Along the alternative 1 alignment, eastern hemlocks grow in habitats designated as eastern hemlock forests, eastern hemlock / northern hardwood forests, and dry eastern hemlock / oak forests; occasionally, eastern hemlock trees are found in eastern white pine forests. Because of current vegetation management along the alternative 1 alignment, eastern hemlocks only grow in the forests that border the ROW, not in the ROW itself. Vegetation management would continue under alternative 1, preventing the trees from growing in the ROW. Continued vegetation management would occasionally remove trees from the ROW and remove of danger trees from outside the ROW, adversely affecting hemlock forests. While certain species of plants are associated with hemlock forests, the removal of an occasional tree would not affect population viability. Ground disturbance sustained during vegetation maintenance, especially removal of danger trees, would facilitate the spread of invasive plant species, such as Japanese barberry. Under the applicant's current vegetation management plans, invasive species are not controlled and their spread is not monitored. Additionally, if the pruning of mature eastern hemlocks is done incorrectly, it would cause damage to the trees, potentially allowing the hemlock woolly adelgid and elongate hemlock scale to establish in pruned trees and damage them. Despite monitoring programs, the invasive hemlock woolly adelgid has caused damage to the eastern hemlocks of DEWA and infestation levels were high in 2007 and 2008, causing decline, mortality, and low growth levels (NPS 2008g, IV-83).

Direct mortality and disturbance to wildlife associated with eastern hemlocks would result from the occasional removal of these trees during vegetation management, but the impact would not be great enough to threaten the viability of a population. Indirect impacts on wildlife species that use eastern hemlock forests would result during vegetation maintenance from human disturbance and noise.

Adverse impacts on the eastern hemlock forest community under alternative 1 would result from effects on vegetation and wildlife.

Hogback Ridge: The woodlands of Hogback Ridge encompass 216 acres of forest that are bisected by the existing 230-kV transmission line. The uniqueness of the Hogback results from a combination of limestone bedrock, topographic features, and landscape setting overlooking the Delaware River. Hogback Ridge supports a diversity of vegetation, including eastern hemlock / northern hardwood forest and rare lichens, which are uncommon in DEWA. The Hogback was considered such an important area for the park, that the NPS relocated the McDade Trail at large cost to protect it from increased intrusion. Under alternative 1, the vegetation in the existing ROW through Hogback Ridge is currently, and would continue to be, maintained as scrub shrub habitat, which is not the natural condition for this unique natural community. Therefore, the vegetation in Hogback Ridge would remain bisected by the existing ROW, and periodic maintenance would keep the ROW in an early successional stage. Historically, very little maintenance has taken place and the existing ROW is surrounded by forested areas limiting the impact of the cleared ROW especially in Pennsylvania.

Hogback Ridge contains priority hemlock stands that are treated under an NPS program to suppress invasive plant species (NPS 2007e, I-10–I-11). Under the applicant's current vegetation management plans, the spread of invasive species is not monitored; without further control, invasive species would

continue to grow and spread. Vegetation maintenance would create some disturbance in the ROW, which could facilitate the spread of invasive species.

The woodlands of Hogback Ridge support an abundance of wildlife, including red-headed woodpecker, spotted turtle, northern ringneck snake, wood frog, upland chorus frog, and several species of conservation concern (NPS 2009g, 3; NPS 2011c; NPS 2005e). Wildlife that use Hogback Ridge would be affected by vegetation maintenance as described in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter: increased predation following maintenance activities when the ROW is cleared of vegetation; mortality of less mobile species; increased nest predation; and disturbance from human activity and noise. These impacts on wildlife and migratory birds from continued operation and vegetation management under alternative 1 would be adverse. Conversely, some species prefer edge and scrub shrub habitats and would benefit from the continued maintenance of the ROW as scrub shrub habitat.

Alternative 1 would adversely impact the Hogback Ridge community through the continued operation and maintenance of the transmission line, which would affect the geology, vegetation, and wildlife resources in the community.

Kittatinny Ridge: Under alternative 1, the existing ROW cuts through Kittatinny Ridge perpendicularly along the alternative 1 alignment; the vegetation in the existing ROW is currently, and would continue to be, maintained as scrub shrub habitat that bisects mature forest habitat, which is not the natural condition for this unique community. Without maintenance, the existing ROW would succeed to one continuous forest. Continued periodic maintenance of the existing ROW under alternative 1 would continue to result in a linear scrub shrub community bisecting the forested area of Kittatinny Ridge.

Periodic vegetation maintenance would not likely be necessary in the talus slope community during the period of analysis due to the sparseness of vegetation growth. However, the applicant would have the right to maintain vegetation in the ROW if necessary for the safety of the line. Vegetation maintenance in talus slope communities would adversely affect the vegetation through disturbance and displacement of soils and plants during clearing activities. Talus slope habitat by nature is unstable and the vegetation communities in talus slope communities are easily disturbed and delicate due to the thin and dry soils.

While vegetation maintenance would create disturbance in the ROW, impacts from further colonization by invasive species would be minimized when the mitigation measures discussed in appendix F are employed.

Wildlife species observed in the talus slope community include reptiles such as common garter snake, five-lined skink, and one species of conservation concern (NPS 2005e). A variety of small mammals, birds, and invertebrates are also expected to use the habitat. Wildlife that use the habitat of Kittatinny Ridge and talus slope communities would be affected by vegetation maintenance as described for Hogback Ridge: increased predation following maintenance activities when the ROW is cleared of vegetation; mortality of less mobile species; increased nest predation; and disturbance from human activity and noise. Conversely, some species prefer edge and scrub shrub habitats and would benefit from continued maintenance of the ROW as scrub shrub habitat. Detailed descriptions of impacts on wildlife are described in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter.

The existing transmission lines present the potential of bird collisions for migrating raptors. Raptors may also collide with wires when foraging along the ROW. Additionally, large birds of prey attempting to perch on poles can be electrocuted by wire-to-wire or conductor-to-ground connections.

As a result of the continued periodic maintenance of the existing ROW, the soils, vegetation, and wildlife of Kittatinny Ridge, and therefore the talus slope community, would be adversely affected under the continued operation and maintenance of alternative 1.

Van Campen Brook Riparian Area: Van Campen Brook riparian area, like Hogback Ridge, is an outstanding natural feature of DEWA. The ROW for alternative 1 intersects floodplain forest and associated wetlands that support special status wildlife. Some of the plant species in the Van Campen wetland complex and surrounding the stream are compatible with the applicant's specifications for vegetation clearing and control; however, incompatible shrub and any small tree species would be removed by hand clearing. Periodic maintenance in the wetland complex would be required to maintain compliance with the NERC standards for vegetation maintenance. Land disturbance would result from vegetation maintenance; therefore, there would be potential impacts from further colonization by invasive plant species. Impacts would be minimized by mitigation measures described in appendix F.

The Van Campen Brook riparian area would continue to support animal species such as wild trout, Baltimore checkerspot butterfly, and three reptile and amphibian species of concern, because the habitat would not be altered by vegetation maintenance or construction activities. As described for Arnott Fen, these mobile wildlife species may be affected indirectly and adversely by human disturbance and noise during vegetation management in adjacent areas; however, it is expected that individuals of these species would return to the riparian area once maintenance is complete.

Under alternative 1, adverse impacts on the Van Campen Brook riparian area community would result due to indirect impacts on wildlife.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. When the overall adverse impacts on rare and unique communities as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 1 would not alter the level of impact.

Conclusion

When considering the diversity of communities along the alternative 1 alignment as a whole, overall adverse impacts on the rare and unique communities under the no-action alternative would result. These adverse impacts would result from artificially maintaining scrub shrub habitat in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. Additionally, there would be adverse effects on soils and wildlife. When the adverse impacts on rare and unique communities as a result of alternative 1 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 1 would cross a number of unique ecosystems that comprise priority sites at the parks and regionally for their contributions to biodiversity. Alternative 1 would have adverse impacts on these sites but the impacts would be confined to the limits of the present ROW and none of the adverse impacts change existing conditions with regard to the overall functions and values of the affected resources. Alternative 1 would not change any of the unique characteristics of these areas and in some cases, would benefit rare and unique communities, such as the Arnott Fen, by keeping these areas open and controlling succession into woodlands. In conclusion, the actions under alternative 1 would be in keeping with the parks' enabling legislations, NPS *Management Policies 2006*, and all other applicable federal and state laws. Any cumulative impacts to resources would remain adverse primarily from other actions taken outside the study area. Thus, while alternative 1 would have some adverse impacts associated with the

continued operation and maintenance of the existing B-K Line, the impacts would not be considered significant.

Common to All Action Alternatives

Removal of Existing Structures: All action alternatives would involve the removal of all or a portion of the B-K Line, as discussed in chapter 2. For all action alternatives, the B-K Line structures would be removed but the foundations for these structures would remain in place. For alternatives 2 and 2b, the S-R Line would be constructed along the same alignment. The removal of the structures would require constructing access roads (either permanent or temporary, depending on the alternative). The removal of the B-K Line would require constructing access roads, wire pull sites, and the removal of the line as described in chapter 2. Because access roads would also be required for the construction and long-term maintenance of the new line, adverse impacts from removing the line would be the same as (or less than) the impacts discussed for construction of the S-R Line.

Vegetation Clearing: For the analysis of impacts on rare and unique communities, it was assumed that a 350-foot corridor would be cleared of vegetation for the construction of the new double 500-kV transmission line for alternatives 2, 3, 4, and 5. For alternatives 2, 3, 4, and 5, the corridor would be cleared 175 feet from the centerline of the existing ROW to either side. Under alternative 2b, the applicant proposes to operate the S-R Line within the existing ROW. The NPS anticipates that the applicant would require additional area for construction; therefore, it is estimated that under alternative 2b, the applicant would expand the ROW to the extent of their deeded property rights, which ranges from 100 feet to 380 feet. For alternative 2b, the ROW would be cleared on either side of the centerline to an appropriate width based on the deeded property rights.

In addition to vegetation clearing inside the ROW, areas outside of the ROW would also need to be cleared for all action alternatives to construct the access roads, spur roads, and pulling and splicing sites. Areas cleared for access roads (inside and outside the ROW) and tower foundations (inside the ROW) would be maintained permanently and would result in a permanent loss of vegetation. All other cleared areas would be seeded after construction with an NPS-approved conservation seed mixture appropriate to the local conditions. The area within the ROW maintained for operation is less than that which would be cleared for constructions. Areas both inside and outside the ROW that do not need to be maintained for operation of the S-R Line would be allowed to succeed to forested area over time. Because mature forest removed for construction would not be replaced within the 15-year analysis period covered by this EIS the impacts would be considered permanent.

The impacts from vegetation clearing are discussed for each alternative because the amount of clearing for each is different.

Construction Components: Construction activities are described in detail in chapter 2; the activities that would affect rare and unique communities include the construction of access roads, tower foundations, crane pads, wire pull locations, pulling and splicing sites, and staging areas. Construction of these components would result in temporary or permanent loss of vegetation, as described above in “Vegetation Clearing.” All action alternatives would require drilling as part of the construction process, but because drilling is unlikely to affect groundwater (see discussion in “Geologic Resources”) it would not affect rare and unique communities in the vicinity and is not discussed further.

Alternative 2

Impacts on rare and unique communities in the study area would result from clearing and construction activities along the alternative 2 alignment such as drilling, excavation and grading, soil compaction,

noise, and the physical removal of vegetation. Because alternative 2 would use the existing ROW discussed in alternative 1, the rare and unique communities that exist along the alternative 2 alignment are the same: Arnott Fen, Delaware River riparian corridor, eastern hemlock forests, Hogback Ridge, Kittatinny Ridge (including talus slope), and Van Campen Brook riparian area (see figure 43 in chapter 3). These communities encompass approximately 52% of the route in the study area are discussed in the following sections relative to alternative 2.

Arnott Fen: Approximately 4.1 acres of the 10.5-acre Arnott Fen would lie in the 350-foot corridor that would be cleared for construction under alternative 2. As described previously, the existing compatible plant species in the fen and a 50-foot buffer surrounding the fen would not be cleared to prepare for construction activities. However, some incompatible shrubs / small trees, such as red maple, exist in the fen and would be hand cleared for construction and as part of the vegetation maintenance programs. Under alternative 2, new towers would be placed in uplands on either side of the fen and an access road would travel south of the fen outside of the ROW. One of these towers would be placed in the ROW approximately 120 feet from the perimeter of the fen. In order to install tower foundations, which may extend below grade 15 to 30 feet or more with a diameter of 6 to 9 feet, extensive excavation and drilling would be necessary. Because Arnott Fen exists as a distinct combination of physical and biotic features, if groundwater flow to the fen or function of the fen is altered, it would affect habitat supporting the unique vegetation and special-status plants and wildlife using this wetland. In turn, this shift in the vegetation would reduce the available resources for wildlife species that depend on the conditions currently found in the fen, including species of conservation concern.

Wildlife species that inhabit Arnott Fen may be adversely affected by noise and human activity associated with clearing, construction, and periodic vegetation management; however, disturbance from noise would be temporary, and direct mortality would be avoided by employing the mitigation measures described in appendix F.

Under alternative 2, adverse impacts on the Arnott Fen community would result from clearing, construction, and maintenance activities. Geology, wetland functions and values, vegetation, and wildlife would be affected.

Delaware River Riparian Corridor: Under alternative 2, new transmission towers would be placed atop the ridges on either side of the Delaware River and the lines would span the river. However, the riparian corridor extends approximately 0.25 mile on either side of MDSR, and two towers would be constructed in the riparian corridor. A 100-foot buffer on either side of the Delaware River would not be cleared in preparation for construction; however, the majority of the riparian corridor in the proposed ROW (approximately 19.6 acres) would require vegetation clearing.

Construction activities for the towers, access roads, and crane pads in the riparian corridor would result in impacts on geology, as described previously in this chapter. Construction on the Pennsylvania side of MDSR would take place in the fragile limestone bedrock of Hogback Ridge; impacts from construction in this area are discussed in detail for Hogback Ridge below.

During the operation of the transmission line, vegetation maintenance would be required in the new ROW. Under alternative 2, approximately 4.5 acres of previously mature forest would be maintained by mechanical and chemical means as scrub shrub habitat. Construction activities and vegetation maintenance would also create an avenue for the spread of invasive species; however, mitigation measures should minimize the impacts of invasive species. The portions of the ROW that required clearing only for construction would be restored; however, the restoration would not be complete within the analysis period of this EIS and would be hindered by soil compaction sustained during construction activities, as described in the “Vegetation” section.

Generally, wildlife would be affected by clearing and construction activities and vegetation maintenance through mortality, increased predation, and disturbance where wildlife inhabits the Delaware River riparian corridor. The details of impacts on wildlife are discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter.

The Delaware River riparian corridor along the alternative 2 alignment includes portions of a communal winter roost and foraging area for bald eagle. Bald eagles have recently built two new nests near the alternative 2 alignment; however, the alignment is located outside of the required nest buffers. Disturbance from clearing and construction activities and maintenance activities would deter eagles from using the roosting site and the foraging area, but following the end of the disturbance, the eagles would likely return to the area. The S-R Line would contain more conductors and would be directly in the flight line used by eagles flying between the roost site and foraging area. Additionally, the transmission lines would bisect a winter roost. The removal of roost trees would result in displacement of bald eagles that could be permanent, depending on the amount of disturbance. See the "Special-status Species" section of this chapter for details on the effects of disturbance to bald eagles during clearing and construction activities and for potential mitigation measures.

Adverse impacts on the Delaware River riparian corridor community under alternative 2 would be expected, because geology, soils, vegetation, aquatic resources, water resources, wildlife, and special-status species in the riparian corridor would be affected.

Eastern Hemlock Forests: Approximately 19.1 acres of forest containing eastern hemlocks would be removed during the clearing of the 350-foot construction corridor under alternative 2. Most of the eastern hemlock forests are found along Hogback Ridge in eastern hemlock / northern hardwood forests that border the existing ROW. Along the alternative 2 alignment, eastern hemlock forests span the ROW in Hogback Ridge and the Van Campen Brook riparian area. The proposed ROW would further fragment these forests. The "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter details the impacts of fragmentation from clearing for the proposed ROW. The development of access roads would cause a loss of vegetation and although the applicant's proposed access roads would remain mostly in the proposed ROW, approximately 0.23 mile of access road would cut through undisturbed forest, resulting in an additional loss of approximately 0.45 acre of eastern hemlock forest.

After the double 500-kV transmission line is constructed, approximately 15.3 acres of mature eastern hemlock forest would be permanently altered and maintained as scrub shrub habitat. Cleared areas needed for construction but not for operation would be seeded with an NPS-approved conservation seed mixture and allowed to revegetate naturally; however, the restoration would not be complete within the analysis period of this EIS and would be hindered by soil compaction sustained during construction activities, as described in the "Vegetation" section.

Once the transmission line is operational, vegetation maintenance would be required in the new ROW, as previously described. This maintenance program would result in adverse impacts on the vegetation in the ROW because a permanently maintained scrub shrub habitat would continue.

All activities under alternative 2 would facilitate the spread of invasive plant species throughout eastern hemlock forests, especially clearing and construction because these activities would result in a significant amount of ground disturbance. However, with the mitigation measures described in appendix F, impacts would be limited. The invasive hemlock woolly adelgid and elongate hemlock scale are also a concern in hemlock forests. These insects could be inadvertently spread through mulching, the transport of mulch for use in other areas, and the transport of equipment used during vegetation removal. Trees that remain in place but are injured during construction activity would become more susceptible to new infestations.

Monitoring and treatment (as part of the applicant's vegetation management plans) would minimize the damage from infestations and would reduce the adverse affects of invasive insect species.

Any decline in the stability of hemlock forests would indirectly impact the aquatic resources of the parks. Eastern hemlock forests that border the ROW of alternative 2 extend to the edges of water bodies — eastern hemlock forests border Big Bushkill Creek for approximately 0.35 mile and Van Campen Brook for approximately 0.18 mile, and hemlocks also surround the wetlands of Hogback Ridge. If hemlock stand vitality decreases from the effects of invasive insect species, these water bodies would be indirectly affected by factors such as changes in temperature and a decline in the diversity of species.

Clearing and construction activities would directly and indirectly impact wildlife species through mortality, increased predation, and disturbance where wildlife inhabits eastern hemlock forests. Vegetation maintenance activities have the potential to disturb and temporarily displace wildlife species. Additionally, the removal of pure hemlock forests decreases the amount of habitat available to those wildlife species that prefer hemlocks. Competition for territory in areas of reduced hemlock-dominated habitat may permanently displace individuals of some wildlife species to other areas.

Under alternative 2, the construction, operation, and maintenance of the proposed double 500-kV transmission line would result in adverse impacts on the eastern hemlock forest community along the ROW, including impacts on geology, vegetation, aquatic resources, and wildlife resources in the community.

Hogback Ridge: Approximately 17.6 acres of Hogback Ridge would be encompassed by the 350-foot corridor for the construction of the proposed ROW under alternative 2, and nearly all of this acreage would initially be cleared in preparation for construction activities. Approximately 11.8 acres of mature forest would be cleared, the majority of which is eastern hemlock / northern hardwood forest, which is rare in DEWA. This clearing would further fragment Hogback Ridge. The Hogback Ridge woodlands cover approximately 216 acres but are part of a larger expanse of forested habitat that encompasses approximately 893 acres. The proposed ROW and continual vegetation maintenance would completely bisect the habitat in the Hogback Ridge woodlands, creating two sections of woodlands and reducing interior forest habitat. This fragmentation would affect forest interior–dwelling species such as wood thrush and scarlet tanager. Further details of fragmentation are discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter. The development of access roads would cause a permanent loss of vegetation along the linear routes of the roads. The applicant's proposed access roads would remain mostly in the proposed ROW; however, 0.3 mile of access road would cut through undisturbed forest, resulting in an additional loss of approximately 0.7 acre of forest. This central location within the parks could essentially create a divided park into a north and south section.

Construction activities would include the installation of temporary features, such as crane pads and pulling and splicing sites, and permanent features, such as tower foundations and access roads. The placement of new tower foundations would require drilling and excavation, which would damage the underlying limestone bedrock of Hogback Ridge. Two towers are planned in the existing ROW on Hogback Ridge. The drilling and excavation of the limestone-based formations that underlie Hogback Ridge could cause the limestone to fracture from ground vibrations and the removal of rocks and minerals, which can ultimately lead to landform destruction. The effects of the construction activities of new towers on these formations are described in detail in the "Geology" section of this chapter. Although the impacts would be localized, soils would be permanently excavated and removed and the natural function of the soils would be lost in the selected areas.

The installation of temporary features such as crane pads and pulling and splicing sites would not require drilling; therefore, no impacts on the geologic formations of Hogback Ridge would be expected from the

construction of these components. These features, as well as the construction of access roads and spur roads, would require excavation, grading, the placement of geotextile fabric, and installing and compacting gravel. Impacts would include soil compaction, the loss of some soil function, and an increase in soil erosion from grading, placing compacted gravel over the soil, and using heavy equipment and large vehicles on the access roads. After the double 500-kV transmission line is constructed, the proposed transmission line would require a 200-foot ROW to operate; therefore, approximately 4.9 acres of mature forest, including eastern hemlock forest, would be permanently altered and maintained as scrub shrub habitat. Impacts on eastern hemlock stands from alternative 2 activities are discussed in the previous section.

Following construction, all temporary sites disturbed during construction would be returned to preconstruction conditions and would be seeded with an NPS-approved conservation seed mixture and allowed to succeed back to forested habitat over time. However, the mature forest that would be removed for construction would not be replaced within the 15-year analysis period covered by this EIS and would be hindered by soil compaction sustained during construction activities, as described in the "Vegetation" section.

Once the transmission line is operational, vegetation maintenance would be required in the new ROW. Vegetation maintenance procedures would include pruning, herbicide application (with prior NPS approval), and occasional tree removal. This maintenance program would result in the permanent alteration of vegetation in the ROW and would permanently bisect forested areas on Hogback Ridge, contributing to the fragmentation of the wooded areas and the maintenance of an unnatural linear scrub shrub habitat along Hogback Ridge.

Vegetation maintenance would create some disturbance in the ROW, but impacts from further colonization by invasive species would be minimal because the mitigation measures described in appendix F would be implemented.

Clearing and construction activities would directly and indirectly impact wildlife species, including one amphibian and two bird species of conservation concern, through mortality, increased predation, and disturbance in the clearing and construction area in Hogback Ridge. The clearing of vegetation for construction and during maintenance activities has the potential to disturb and temporarily displace wildlife species. It is expected that mobile species would return to the area after activities have ceased and habitat has returned to the preferred condition. Impacts on wildlife would be minimized by mitigation measures such as seasonal restrictions and others discussed in appendix F.

The natural resources (geology, soils, vegetation, and wildlife) of Hogback Ridge would be adversely impacted with the implementation of alternative 2.

Kittatinny Ridge: Under alternative 2, mature forest would be cleared to prepare for construction, increasing fragmentation. Access roads would remain in the corridor in this area and would not require the removal of additional vegetation. The "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter details the impacts of fragmentation from clearing for the proposed ROW.

Impacts on geology from constructing features such as tower foundations and wire pull sites would be minimal because the underlying geologic formations are stable. Impacts on soils would be localized; however, the drilling required for installation of this tower could indirectly affect the talus slope community. Disturbances to areas above talus slopes may change hydrologic regimes and increase sedimentation on the slopes (UMass 2000, 33). Adverse impacts to the talus community would also adversely affect special-status species and other wildlife that depend upon the specialized habitat afforded by this community.

The talus slope community on Kittatinny Ridge along alternative 2 would likely not require clearing because the transmission line would span the community. If vegetation maintenance were needed in talus slope communities, it would adversely affect the vegetation through disturbance and displacement of soils and plants during clearing activities. Additionally, access roads would not be constructed in the talus slope community.

Vegetation maintenance would result in a permanently maintained scrub shrub habitat where mature forest currently stands. Due to the sparse vegetation growing in the talus and the steep topography, vegetation maintenance likely would not be needed in the talus slope community during the period of analysis. Maintenance would facilitate the spread of invasive species in and adjacent to the ROW along Kittatinny Ridge; however, this spread would be minimized if the mitigation measures outlined in appendix F are followed.

Each year, migratory Neotropical birds, especially raptors, use the air currents that form above Kittatinny Ridge for migration and use the habitats on the ridge for breeding, as described in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter. The disturbance from construction and maintenance activities would deter birds from using Kittatinny Ridge for resting, feeding, and nesting; however, following the end of the disturbance the birds would likely return to the area. Migratory birds would be affected by the loss of habitat and disturbance from construction and maintenance activities. The modification to taller transmission structures with an increased number of conductors under alternative 2 has the potential to affect migrating raptors by increasing the risk of injury or mortality from collisions or electrocutions; however, the transmission line is proposed to be constructed using APLIC standards and would use the best available deterrence technology to minimize impacts.

Clearing and construction activities would directly and indirectly impact the wide variety of wildlife species that may use habitats along Kittatinny Ridge (including talus slope) through direct mortality, increased predation, loss of habitat, and disturbance, as previously discussed. In addition, periodic vegetation maintenance activities have the potential to disturb and temporarily displace wildlife species. It is expected that most individuals would return to the area after disturbance ceases and the appropriate habitat returns.

The Kittatinny Ridge community would be adversely impacted by the implementation of alternative 2 because geology, soils, vegetation, and wildlife would be affected.

Van Campen Brook Riparian Area: Approximately 9.6 acres of Van Campen Brook riparian area and wetland complex lie in the 350-foot construction corridor under alternative 2. Some of the plant species in the wetland are incompatible shrub / small tree species that would be removed by hand clearing for construction and maintenance activities and the construction of a new tower foundation and crane pad would result in the clearing of 0.3 acre of wetland vegetation. Van Campen Brook riparian area is underlain by Bloomsburg red beds, which is rated good for foundation stability; therefore, impacts on the geology of Van Campen Brook riparian area from drilling would be expected to be minimal. Additionally, as proposed, an access road would be built through the wetland. The road would result in 0.56 acre of permanent wetland impacts resulting from the placement of fill in order to construct the access road. A permanent loss in wetland functions or hydrology is expected.

In addition to the access road through the wetland complex in the ROW, another access road would be placed south of the ROW corridor, connecting Old Mine Road to the corridor; this road would require a crossing over Van Campen Brook. An existing bridge would need to be reinforced and widened to accommodate larger construction vehicles. The construction of new access roads would include grading, placing geotextile fabric, installing and compacting gravel, and using heavy machinery. Impacts would include soil compaction, the loss of some soil function, and an increase in soil erosion from grading,

placing compacted gravel over the soil, and using heavy equipment and large vehicles on the access roads. Vegetation, including vegetation in the riparian corridor and the wetlands complex associated with Van Campen Brook, would be cleared to construct the road, resulting in a permanent loss of vegetation. Water quality and aquatic resources in Van Campen Brook, a wild trout spawning stream, would be indirectly affected by the removal of the vegetation buffering the brook, which would result in higher water temperatures and increased sedimentation.

Once the transmission line is operational, periodic vegetation maintenance would be required in the newly expanded ROW. Vegetation maintenance would require periodic cutting of non-compatible vegetation and danger trees, which would adversely affect special-status species (as discussed in that section). Effects would be reduced through implementation of an NPS-approved vegetation management plan.

Access road construction activities under alternative 2 and periodic maintenance activities upon completion of construction would facilitate the potential spread of invasive species throughout Van Campen Brook riparian area, especially clearing and construction because these activities would result in a significant amount of ground disturbance. Impacts would be minimized if the mitigation measures outlined in appendix F are followed.

Clearing and construction activities would impact wildlife, including special-status species, through mortality, increased predation, and disturbance. Vegetation maintenance activities have the potential to disturb and temporarily displace wildlife species. Individuals would be expected to return to the area as disturbance ceases and appropriate habitat returns.

Alternative 2 would result in adverse impacts on the Van Campen Brook riparian area community, with impacts on geology, vegetation, wetland functions and values, and wildlife resources in the community.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. Alternative 2 would impact resources, such as rare and unique communities, inside the park that are also under pressure in the surrounding region. Multiple types of development outside of DEWA and APPA are quickly diminishing rare and unique ecosystems on a broader scale. The reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections. Alternative 2 would contribute to the cumulative adverse impact on rare and unique ecosystems. When the overall adverse impacts on rare and unique communities as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2 would not alter the level of impact.

Conclusion

Alternative 2, the applicant’s proposed route, would create adverse impacts on rare and unique communities inside the study area. These adverse impacts would result from vegetation clearing, the construction of the proposed 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for operation of the S-R Line. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat by means of mechanical equipment and herbicides in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. When the adverse impacts on rare and unique communities as a result of alternative 2 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 2 would cross in the center part of DEWA, including the MDSR. This part of the park is a particularly sensitive area because it contains a high concentration of many important and unique natural features. Several resources on this alignment are recognized for their superlative biodiversity (e.g., Hogback Ridge and Arnott Fen) and are significant in both park and regional contexts, making any impacts in these locations even more acute. The long-term effects of construction activities in the areas where rare and unique communities are located are difficult to predict accurately because of the nature of these communities (e.g., Arnott Fen exists as a distinct combination of physical and biotic features and seemingly small changes in hydrology, such as placing fill material to construct a permanent access road), may result in disproportionately, unpredictably large changes in the fen system from alterations in the composition of fen vegetation which, in turn, impacts the associated wildlife. The risks are heightened further for this crossing because of the unique characteristics at stake in this location.

When considered in the context of protection of rare and unique communities, alternative 2 would likely result in significant adverse impacts because of the particularly resource-rich area through which the alternative crosses, and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to rare and unique communities, many of which are of regional or national importance. Similarly, these resources are non-renewable, which makes any impacts to them all the more serious as they cannot be replaced if lost. Further, rare and unique communities such as those found in the parks are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the adverse impacts of alternative 2 would likely be significant.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Alternative 2b

Inside the study area, alternative 2b, the applicant’s alternate route, would follow the same alignment as alternative 2. As with alternative 2, rare and unique communities encompass approximately 52% of the route in the study area and include Arnott Fen, Delaware River riparian corridor, eastern hemlock forests,

Hogback Ridge, Kittatinny Ridge (including talus slope), and Van Campen Brook riparian area (see figure 44 in chapter 3). The impacts on these rare and unique communities under alternative 2b would result from the same activities as those described for alternative 2; however, alternative 2b would require less vegetation clearing and the construction of two additional tower foundations and the access road locations are slightly different (see figure 6 in chapter 2). The additional towers and continued dispute over ROW rights could lead to more severe adverse impacts from this alternative. The impacts on rare and unique communities from alternative 2b are discussed in the following sections.

Arnott Fen: Approximately 1.5 acres of the 10.5-acre Arnott Fen complex would lie in the existing ROW under alternative 2b. As described previously, only the incompatible shrubs / small trees (e.g., red maple) in Arnott Fen would be cleared for construction; all compatible herbaceous species would be retained in the fen and the surrounding 50-foot buffer. Under alternative 2b, new towers would be placed in uplands on either side of the fen. One of the two additional tower foundations would be placed approximately 156 feet west of Arnott Fen; to the east, a tower would be constructed approximately 207 feet from the perimeter of the fen. As described for alternative 2, the drilling required for the installation of the tower foundations could affect groundwater availability and quality, which would indirectly and adversely affect the wetland functions and values of Arnott Fen. This, however, is considered unlikely, as described in the "Geologic Resources" section. Access roads were designed to avoid impacts on Arnott Fen under alternative 2b; therefore, no impacts from sedimentation during access road construction are expected. The impacts on vegetation and wildlife would be the same as those described for alternative 2.

Alternative 2b is expected to have adverse impacts on the Arnott Fen community from clearing, construction, and maintenance activities. Geology, wetland functions and values, vegetation, and wildlife would be affected.

Delaware River Riparian Corridor: Under alternative 2b, clearing for construction would remove approximately 14.7 acres of riparian corridor vegetation, including floodplain forest. The placement of the tower foundations, crane pads, and access roads in the Delaware River riparian corridor and their impacts would be the same as those described for alternative 2.

During the operation of the S-R Line, vegetation maintenance would be required in the new ROW. Under alternative 2b, approximately 3.1 to 5.2 acres of previously mature forest would be maintained by mechanical and chemical means as scrub shrub habitat. The removal of danger trees is a part of the applicant's vegetation maintenance plans. This portion of the vegetation maintenance could involve the removal of individual trees or larger patches of trees if they are determined to be a threat to the transmission line. The applicant's deeded property rights are limited to 100-feet wide for one-tenth of a mile within the Delaware River riparian corridor. It is anticipated that trees adjacent to the ROW in this area would be removed; however, the amount, and thus, the impact on the riparian corridor from this clearing cannot be determined at this time.

Construction activities and vegetation maintenance would also create an avenue for the spread of invasive species; however, mitigation measures should minimize the impacts of invasive species. The portions of the ROW that required clearing only for construction would be restored; however, the restoration would not be complete within the analysis period of this EIS and would be hindered by soil compaction sustained during construction activities, as described in the "Vegetation" section.

Generally, wildlife would be affected by clearing and construction activities and vegetation maintenance through mortality, increased predation, and disturbance where wildlife inhabits the Delaware River riparian corridor. The details of impacts on wildlife are discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter.

Impacts on wildlife (including roosting and foraging bald eagles) from construction, vegetation maintenance, and the number and configuration of the new lines would also be the same as alternative 2.

Under alternative 2b, adverse impacts on resources in the Delaware River riparian corridor would be expected. Geology, soils, vegetation, aquatic resources, water resources, wildlife, and special-status species in the riparian corridor would be affected.

Eastern Hemlock Forests: Under alternative 2b, the locations of the forests containing eastern hemlocks are the same as those described for alternative 2; approximately 5.0 acres of forest containing eastern hemlocks would be removed during the clearing in preparation for construction. The proposed access roads under alternative 2b would not require the removal of additional eastern hemlocks.

After the double 500-kV transmission line is constructed, approximately 1.1 to 2.5 acres of mature eastern hemlock forest would be permanently altered and maintained as scrub shrub habitat. Cleared areas needed for construction but not for operation would be seeded with an NPS-approved conservation seed mixture and allowed to revegetate naturally; however, the restoration would not be complete within the analysis period of this EIS and would be hindered by soil compaction sustained during construction activities, as described in the "Vegetation" section. The impacts on eastern hemlock forests from vegetation maintenance and the potential spread of invasive species would be the same as those described for alternative 2. The indirect adverse effects on aquatic resources and wildlife from removal of eastern hemlock forests would also be the same as previously described.

Any decline in the stability of hemlock forests would indirectly impact the aquatic resources of the parks. Eastern hemlock forests that border the ROW of alternative 2 extend to the edges of water bodies — eastern hemlock forests border Big Bushkill Creek for approximately 0.35 mile and Van Campen Brook for approximately 0.18 mile, and hemlocks also surround the wetlands of Hogback Ridge. If hemlock stand vitality decreases from the effects of invasive insect species, these water bodies would be indirectly affected by factors such as changes in temperature and a decline in the diversity of species.

Under alternative 2b, the construction, operation, and maintenance of the proposed double 500-kV transmission line would result in adverse impacts on the eastern hemlock forest community along the ROW, including impacts on geology, vegetation, aquatic resources, and wildlife resources in the community.

Hogback Ridge: Approximately 6.5 acres of Hogback Ridge would be encompassed by the existing ROW, which would be cleared of vegetation for construction activities under alternative 2b. The ROW is 100-feet wide along most of the length of Hogback Ridge, except where is widens near the Delaware River. Approximately 1.0 acre of mature forest would be removed during clearing activities under alternative 2b. The features of the transmission line under alternative 2b would differ from alternative 2 in Hogback Ridge; there would be an additional tower foundation and the access road locations would be different. The impacts from the construction, operation, and maintenance of the transmission line and vegetation maintenance would be the same as those described for alternative 2. The two alternatives would differ in the amount of area affected. The applicant's proposed access roads under alternative 2b would remain mostly in the proposed ROW; however, 0.1 mile of access road would cut through undisturbed forest, resulting in an additional loss of approximately 0.2 acre of mature forest. Additionally, danger tree maintenance could result in the removal of a considerable number of trees along the edge of the ROW through Hogback Ridge where the ROW is 100 feet wide. The impact from removal of danger trees in this area cannot be determined at this time.

The implementation of alternative 2b would result in adverse impacts on natural resources (geology, soils, vegetation, and wildlife) of Hogback Ridge.

Kittatinny Ridge: Alternative 2b would require the clearing of vegetation along Kittatinny Ridge in the existing corridor for construction; however, less than an acre of mature forest would be cleared during this phase of the project. The features of the transmission line under alternative 2b would be the same as those described for alternative 2. The impacts would also be same. However, the removal of danger trees could affect a considerable number of trees, as the ROW through Kittatinny Ridge is limited to 150-feet wide.

The talus slope community on Kittatinny Ridge along alternative 2b would likely not require clearing because the transmission line would span the community. If vegetation maintenance were needed in talus slope communities, it would adversely affect approximately 5.8 acres of the vegetation through disturbance and displacement of soils and plants during clearing activities. Additionally, the impacts to wildlife, including migratory birds, would be the same as those described for alternative 2.

Adverse impacts on the Kittatinny Ridge community would result from the implementation of alternative 2b because geology, soils, vegetation, and wildlife would be affected.

Van Campen Brook Riparian Area: Approximately 6.7 acres of Van Campen Brook riparian area and wetland complex lie in the corridor under alternative 2b. The impacts from alternative 2b would be the same as those described for alternative 2, as the tower placements and the location of the access roads are the same in this area.

Adverse impacts on Van Campen Brook riparian area would be expected, with impacts on geology, vegetation, and wildlife resources in the community.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. Alternative 2b would impact resources, such as rare and unique communities, inside the park that are also under pressure in the surrounding region. Multiple types of development outside of DEWA and APPA are quickly diminishing rare and unique ecosystems on a broader scale. The reduction of these resources in the region surrounding the parks would increase their scarcity and sensitivity inside the parks, where they are afforded special protections. Alternative 2b would contribute to the cumulative adverse impact on rare and unique ecosystems. When the overall adverse impacts on rare and unique communities as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 2b would not alter the level of impact.

Conclusion

Under alternative 2b, adverse impacts on individual rare and unique communities would result from vegetation clearing, the construction of the proposed 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat by means of mechanical equipment and herbicides in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. When the adverse impacts on rare and unique communities as a result of alternative 2b are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 2b follows the existing alignment of the B-K Line and would cross the same rare and unique communities as alternative 2. The adverse impacts of alternative 2b would be similar to those of alternative 2b with somewhat less clearing within the ROW but more disturbance near Arnott Fen for

tower construction and the ongoing dispute over cutting of danger trees outside of the ROW. Thus, the adverse impacts of alternative 2b would also likely be significant for the same reasons outlined for alternative 2.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. The location of this particular crossing through the center of DEWA could make such a precedent even more potent. Installing the S-R Line on this alignment may invite future utilities proposing to follow the same route.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy. Additionally, construction at this particular location in DEWA is likely to accentuate the controversy due to the unique characteristics presented here and high visitor traffic to the area.

Overall, the significance of the impact of alternative 2b is a result of two considerations: the particularly resource-rich area through which the alternative crosses and the potential to inflict harm to those resources because of the magnitude and duration of the adverse impacts. Although it is true that not all impacts can be predicted with great certainty, in the context of the purpose and significance for which DEWA, APPA, and MDSR were established and NPS mandates to specifically preserve the natural, cultural, and scenic resources within them, additional precautions are warranted when considering risks to these resources, many of which are of national importance. Similarly, certain resources are non-renewable, which makes any impacts to them all the more serious because they cannot be replaced if lost. And some resources are under threat by other actions and outside pressure, which in the context of the function of the parks as an “oasis” or refuge within the highly developed east coast, elevates the need to preserve and protect these scarce, sensitive resources. For these reasons, the environmental consequences of alternative 2b would be significant.

Common to Alternatives 3, 4, and 5

Restoration of the B-K Line: Alternatives 3, 4, and 5 would require the removal of the portion of the B-K Line between the Bushkill Substation and the eastern boundary of DEWA. This portion of the line would be permanently removed and the ROW would be restored. The details of the removal and disposal of the existing conductors and structures are discussed in chapter 2. Vegetation in the existing ROW would be cleared and spur roads would be constructed for the removal process. In the existing ROW, approximately 53 acres of land within NPS boundaries would be cleared of vegetation. An additional 1.1 to 1.5 acres of vegetation in NPS lands but outside the ROW would be cleared to construct the access roads. The removal of the conductors and structures and chipping the foundations below the ground surface would cause ground disturbance. The use of heavy machinery during all these activities would cause further ground disturbance and soil compaction.

Following the deconstruction of the B-K Line, approximately 53 acres of land disturbed by clearing and construction of the spur roads and the ROW would be restored to original conditions to the greatest extent possible. Rare and unique communities that occur along the B-K Line corridor would benefit from this restoration, including Arnott Fen, Delaware River riparian corridor, eastern hemlock forests, Hogback Ridge, Kittatinny Ridge, and Van Campen Brook riparian area. The B-K Line currently bisects Hogback Ridge, eastern hemlock forests, Delaware River riparian corridor, talus slope communities, and Van Campen Brook riparian area; these communities would benefit most from the removal of the B-K Line. Additionally, a tower would be removed from the Van Campen Brook riparian area.

The areas targeted for restoration would be prepared by disking or tilling as needed to mitigate soil compaction. Following soil preparation, the areas would be seeded with an NPS-approved conservation seed mixture containing native species appropriate to the region and allowed to succeed naturally into forested habitat over the long term; however, soil compaction could hinder the restoration process and complete restoration of the ROW into mature forest would not occur within the period of analysis of this EIS. Although the natural communities would not return to mature conditions in the period of analysis of this EIS, the process would begin over 53 acres of previously disturbed area and would counteract the effects of clearing and construction under alternatives 3, 4, and 5.

Alternative 3

Rare and unique communities that exist along the alternative 3 alignment include the Delaware River riparian corridor, eastern hemlock forests, and Kittatinny Ridge (including talus slope) (see figure 45 in chapter 3). These communities are discussed in the following sections.

Delaware River Riparian Corridor: The alternative 3 alignment would cross the Delaware River approximately 5.3 miles south of the alternative 2 alignment and would affect the riparian area. The riparian corridor extends approximately 0.25 mile on either side of MDSR. Because of the route alternative 3 would follow, the Delaware River riparian corridor encompasses approximately 1.1 miles of the alignment.

A 100-foot buffer on either side of the Delaware River would not be cleared to prepare for construction; however, approximately 26.5 acres of mature forest would be cleared in the riparian area, including eastern hemlock forest (described in the following section). Construction activities would affect geology and soils through drilling, excavation, grading, and compaction. The Pennsylvania side of MDSR would include construction on fragile limestone bedrock. The details of impacts on geology are discussed earlier in this chapter.

Once the transmission line is operational, vegetation maintenance would be required in the new ROW, as described previously. Approximately 12.2 to 21.6 acres of mature forest would be maintained as scrub shrub habitat, halting natural succession. Generally, wildlife would be affected by clearing and construction activities and vegetation maintenance through mortality, increased predation, and disturbance where wildlife inhabits the Delaware River riparian corridor. The details of impacts on wildlife are discussed in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter.

The Delaware River riparian corridor along the alternative 3 alignment includes bald eagle foraging areas. The disturbance from construction activities and maintenance activities would deter eagles from using the foraging areas, although following the end of the disturbance the eagles would likely return to the area. Approximately 0.83 mile of the proposed ROW in New Jersey parallels the Delaware River within 0.28 mile of the river. Activities in this portion of the ROW would further affect the bald eagles' use of foraging habitat. The new, taller transmission lines bisect eagle foraging areas along the river, increasing

the potential for mortality or injury from collisions. Although federal guidelines for bald eagles would be followed, all aspects of alternative 3 would result in adverse impacts on the population of bald eagles that use the Delaware River riparian corridor. See the "Special-status Species" section of this chapter for federal guideline details. The impacts on the bald eagle under alternative 3 differ from those under alternatives 2 and 2b because alternative 3 is not located adjacent to a bald eagle winter communal roost.

Adverse impacts on the Delaware River riparian corridor community under alternative 3 would occur because vegetation, aquatic resources, water resources, wildlife, and special-status species in the riparian corridor would be affected.

Eastern Hemlock Forests: Approximately 13.4 acres of eastern hemlock forests would be removed during the clearing of the 350-foot corridor under alternative 3. The applicant's proposed access roads would remain mostly in the proposed ROW; however, 0.1 mile of access road would cut through undisturbed eastern hemlock forest, resulting in an additional loss of approximately 0.02 acre.

Impacts on eastern hemlock forests would be the same as those described for alternative 2. These forest communities would be affected by maintaining previously mature forest as scrub shrub; approximately 6.7 to 11.1 acres of mature eastern hemlock forest would be lost under alternative 3, which could adversely affect wildlife that use the habitat, including aquatic wildlife. Impacts would also result from the potential spread of invasive species and continued disturbance.

Under alternative 3, the construction, operation, and maintenance of the proposed double 500-kV transmission line would result in adverse impacts on the eastern hemlock forest community in the parks.

Kittatinny Ridge: The alternative 3 alignment would cross Kittatinny Ridge and talus slope habitat perpendicularly near APPA in Worthington State Forest and travel parallel to APPA along the portion of the alignment that borders DEWA on the east side of the park (see figure 45 in chapter 3). The talus slope habitats along the alternative 3 alignment contain mature forest with a nearly complete canopy. Approximately 17.8 acres of forested talus slope habitat would be cleared as part of the 350-foot corridor.

The impacts under alternative 3 would be similar to those for alternative 2. Localized adverse impacts on geology and soils would result from tower foundation and crane pad installation. However, talus slope communities may be permanently affected by drilling and the use of heavy equipment in this delicate habitat, especially in the portion of the alignment that runs along the border of DEWA in New Jersey. Indirect impacts on vegetation resulting from changes in soils would occur in the talus slope forests, but not in the remainder of Kittatinny Ridge. Direct adverse impacts on vegetation would result from clearing the 350-foot corridor, the construction of temporary and permanent transmission line features, vegetation maintenance, and the threat of invasive species. Mature forest in the corridor through Kittatinny Ridge, including talus forests, would be permanently altered and would be maintained as scrub shrub habitat after the construction of the transmission line.

The alternative 3 alignment would pass just south of the Hawk Watch site at Raccoon Ridge. Migratory birds would be affected by the loss of habitat during migration and the breeding season, especially by disturbance from construction and maintenance activities, and increased potential for collisions with the transmission line; however, the transmission line would be constructed according to APLIC standards and the best available deterrence technology would be used. Other wildlife that use Kittatinny Ridge would be directly and indirectly affected through mortality, increased predation, and disturbance, as described for alternative 2.

Alternative 3 would adversely affect the soils, geology, vegetation, and wildlife of Kittatinny Ridge and talus slope communities.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. When the overall adverse impacts on rare and unique communities as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 3 would not alter the level of impact.

Conclusion

Under alternative 3, adverse impacts on rare and unique communities would be expected and would result from vegetation clearing, the construction of the proposed 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat by means of mechanical equipment and herbicides in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. When the impacts on rare and unique communities as a result of alternative 3 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Alternative 3 crosses fewer rare and unique communities that alternatives 2 and 2b; however, the unique topography and geology of Kittatinny Ridge, Delaware River Riparian Corridor, and the mature undisturbed eastern hemlock forests are the cornerstones of the geography in this region, providing a unique scenic setting through which alternative 3 would cross. The talus slopes of Kittatinny Ridge provide prime habitat for state-listed timber rattlesnakes and many other wildlife species. The largely intact Delaware River riparian corridor within DEWA, rare in the highly developed east, contributes to a functioning floodplain that helps protect the qualities of the river that contribute to its designation as the MDSR. This large, undisturbed area of high quality riparian habitat provides crucial habitat for migratory birds, as noted above, as well as important breeding and foraging habitat for a wide variety of wildlife. The eastern hemlock forests are a unique ecosystem, found in specific locations along the slopes adjacent to the Delaware River, that support plant and animal communities not found anywhere else because of the specific combination of shading, temperature and soil characteristics created by the dense hemlock growth. There are uncertainties in predicting the extent of the adverse impacts to these communities due to the instability of the underlying geologic formations that support them and are critical to their character. For many of the same reasons outlined for alternatives 2 and 2b, alternative 3 would likely have significant adverse impacts to rare and unique communities. Conversely, alternative 3 would result in significant beneficial impacts to rare and unique communities by removing and restoring the area of the existing B-K Line which crosses a particularly high concentration of these resources. However, these benefits do not entirely outweigh the adverse impacts to the rare and unique communities along the alternative 3 alignment; thus, the adverse impacts are considered to be potentially significant.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility

crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 4

Rare and unique communities that exist along the alternative 4 alignment include eastern hemlock forests, Kittatinny Ridge (including talus slope), Minsi Lake / Bear Swamp, Totts Gap Natural Heritage Site, and Totts Gap Swamp (see figure 46 in chapter 3). These communities are discussed in the following sections.

Eastern Hemlock Forests: There are eastern hemlock forests along the B-K Line from the Bushkill Substation to the western boundary of DEWA under alternative 4. Approximately 1.9 acres of this forest would be cleared in preparation for construction activities. This eastern hemlock forest would not be affected by access roads, tower foundations, crane pads, wire pulls, or pulling and splicing sites.

The eastern hemlock forest borders Big Bushkill Creek for approximately 0.35 miles in the expanded ROW under alternative 4. Approximately 1.3 acres of hemlock forest would be removed during the initial clearing, and approximately 0.32 to 1.0 acre of mature eastern hemlock forests would be permanently altered and maintained as scrub shrub habitat after the construction of the transmission line. Impacts on the hemlock forests in this portion of alternative 4 would result from the initial clearing and annual vegetation maintenance and would be similar to those discussed for alternative 2. However, a smaller area would be affected and construction activities would not be performed in the immediate area of the eastern hemlock forests.

Under alternative 4, the construction, operation, and maintenance of the proposed double 500-kV transmission line would result in adverse impacts on the eastern hemlock forest community along the ROW, including impacts on vegetation and wildlife resources in the community.

Kittatinny Ridge: The alternative 4 alignment would cross Kittatinny Ridge and talus slope perpendicularly near APPA. The impacts would be similar to those for alternative 2. Localized adverse impacts on geology and soils would result from tower foundation and crane pad installation. Due to the instability of the talus slope soils, any activity that disturbs the talus slope communities would potentially damage the soils and alter the vegetation community. Direct adverse impacts on vegetation would result from clearing the 350-foot corridor, the construction of temporary and permanent transmission line features, vegetation maintenance, and the colonization by or spread of invasive species. Mature forest in the ROW through Kittatinny Ridge would be permanently altered and maintained as scrub shrub habitat after the construction of the transmission line. Migratory birds would be affected by the loss of habitat during migration and the breeding season, especially by disturbance from construction and maintenance activities, and increased potential for collisions with the transmission line; however, the transmission line would be constructed according to APLIC standards, and the best available deterrence technology would be used. Other wildlife that uses Kittatinny Ridge would be directly and indirectly affected through mortality, increased predation, and disturbance (see the “Landscape Connectivity, Wildlife Habitat, and Wildlife” section of this chapter for details on impacts on wildlife).

The Kittatinny Ridge and talus slope communities would experience adverse impacts with the implementation of alternative 4 because the geology, soils, vegetation, and wildlife in the communities would be affected.

Minsi Lake / Bear Swamp: Inside the study area, the alternative 4 alignment would cross through two portions of Minsi Lake / Bear Swamp along the boundary. These two natural areas of statewide

significance encompass 4,099 acres and make up a corridor that contains valuable wildlife habitat. The alternative 4 alignment would traverse approximately 0.74 mile of Minsi Lake / Bear Swamp, resulting in the clearing of approximately 19.5 acres of forest in this community in preparation for construction activities.

Geology and soils would be affected during construction activities; these impacts have been described in the respective sections of this chapter. Vegetation would be affected through clearing and construction activities as well as vegetation maintenance activities. Approximately 8.51 to 15.9 acres of mature forest would be permanently altered and maintained as scrub shrub habitat after the construction of the transmission line. Cleared areas needed for construction but not operation would be seeded with an NPS-approved conservation seed mixture and allowed to revegetate naturally; however, the restoration would not be complete within the analysis period of this EIS.

All clearing, construction, and vegetation maintenance activities would directly and indirectly impact wildlife species through mortality, increased predation, and disturbance in Minsi Lake / Bear Swamp. The impacts on wildlife are described in detail in the "Landscape Connectivity, Wildlife Habitat, and Wildlife" section of this chapter. Minsi Lake / Bear Swamp provides excellent breeding habitat for amphibians in and around the vernal pools. Due to the increase in sun exposure and reduced forest canopy after clearing and construction, preferable amphibian habitat would be reduced. The vegetation clearing could also prevent amphibians from migrating to breeding locations. Because the alternative 4 alignment would traverse Minsi Lake / Bear Swamp near the outer edges of the community, the impacts on amphibian habitat would be expected to be minimal. However, forest fragmentation would cause degradation of the habitat.

The natural resources (vegetation, landscape connectivity, and wildlife) of Minsi Lake / Bear Swamp would experience adverse impacts with the implementation of alternative 4.

Totts Gap: Totts Gap is composed of Totts Gap Natural Heritage Site and Totts Gap Swamp in Northampton County, Pennsylvania (PATNC 2005a, 43), and encompasses approximately 893 acres. Approximately 10.9 acres of this would be cleared as part of the proposed ROW. Under alternative 4 Totts Gap Road, which runs through Totts Gap, would be used to gain access to the ROW, and widening of the road would not be necessary. No impacts from the use of the road would be expected. Approximately 0.31 mile of new access roads would extend into Totts Gap, resulting in 0.58 acre of permanent vegetation loss.

The construction of temporary and permanent transmission line features would adversely affect Totts Gap. Impacts on geology from constructing features such as tower foundations and wire pull sites would be minimal because the underlying geologic formation, Shawangunk formation, is stable. Excavation impacts on soils would be localized. The proposed transmission line would require a 200- to 300-foot ROW to operate; therefore, approximately 5.7 to 9.7 acres of the Totts Gap forest would be permanently altered and maintained as scrub shrub habitat by mechanical and chemical means after construction of the double 500-kV transmission line.

Following construction, all temporary sites disturbed during construction, as well as unnecessary portions of the access roads, would be returned to preconstruction conditions, revegetated with an NPS-approved conservation seed mixture, and allowed succeed back to the forested habitat over time. However, the mature forest that would be removed for construction would not be replaced within the 15-year analysis period covered by this EIS and would be hindered by soil compaction sustained during construction activities, as described in the "Vegetation" section.

During the operation of the S-R Line, periodic vegetation maintenance would be required in the new ROW, as previously described. This maintenance program would result in adverse impacts on the vegetation in the ROW because the maintenance would continue to contribute to the unnatural condition of a permanently maintained scrub shrub habitat.

No invasive species have been recorded in Totts Gap in the proposed 350-foot ROW. The implementation of the mitigation measures outlined in appendix F would reduce the potential for invasive species to colonize the area.

Wildlife species observed in Totts Gap in the proposed ROW of alternative 4 include various birds, raptors, amphibians, reptiles, and invertebrates (NPS 2011b). Clearing and construction activities would directly and indirectly affect wildlife species through mortality, increased predation, and disturbance throughout Totts Gap. Vegetation maintenance activities have the potential to disturb and temporarily displace wildlife species.

Under alternative 4, the construction, operation, and maintenance of the proposed double 500-kV transmission line would adversely impact Totts Gap Natural Heritage Site and Totts Gap Swamp.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. When the overall adverse impacts on rare and unique communities as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 4 would not alter the level of impact.

Conclusion

Under alternative 4, adverse impacts on the individual rare and unique communities inside the study area would be expected from vegetation clearing, the construction of the proposed double 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for the operation of the S-R Line. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat by means of mechanical equipment and herbicides in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. When the adverse impacts on rare and unique communities as a result of alternative 4 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

Actions associated with alternative 4 would adversely affect Kittatinny Ridge and Minsi Lake Corridor – two unique ecosystems intersected by the study area. Alternative 4 would have adverse impacts on key resources contributing to the uniqueness of these ecosystems. Kittatinny Ridge is an important bird migratory corridor and provides breeding habitat for forest-dependent wildlife. Minsi Lake Corridor provides over 1,000 acres of high quality habitat for vernal pool dependent wildlife and a special-status plant. These rare and unique communities affected by clearing, habitat fragmentation, loss of wetlands and floodplains, and potential spread of invasive exotics. There is less uncertainty associated with these impacts because alternative 4 would be built in areas where the stability of the underlying geology is rated good and the slopes are relatively flat. Alternative 4 would include the restoration of the existing B-K Line which would have a long-term beneficial impact on the region by restoring a large forested block through a natural and wild area of the Middle Delaware River Valley. This benefit could potentially balance the adverse impacts of construction, operation, and maintenance of alternative 4; however, the adverse impacts of alternative 4 would likely be considered significant because the adverse impacts would

occur immediately or within the life of the project whereas the benefit of removing the existing B-K Line would not likely be realized until sometime after the period of analysis.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

Alternative 5

Alternatives 4 and 5 would follow the same route through DEWA and APPA, with the exception of the 0.89-mile section from Bushkill Substation to the western boundary of DEWA; therefore, alternative 5 would not affect eastern hemlock forests. The alternative 5 alignment would cross Kittatinny Ridge (including talus slope), Minsi Lake / Bear Swamp, Totts Gap Natural Heritage Site, and Totts Gap Swamp, and the impacts would be the same as those described for alternative 4, adverse.

Cumulative Impacts

Cumulative impacts on rare and unique communities inside the study area would be adverse. When the overall adverse impacts on rare and unique communities as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected. Alternative 5 would not alter the level of impact.

Conclusion

Under alternative 5, adverse impacts on the individual rare and unique communities inside the study area would be expected from vegetation clearing, the construction of the proposed 500-kV transmission line, the deconstruction of the existing transmission line, the potential spread of invasive species, and vegetation management for operation of the S-R Line. Additionally, adverse impacts would result from artificially maintaining scrub shrub habitat by means of mechanical equipment and herbicides in the parks, which is not consistent with NPS protection of natural, scenic, and recreational resources. When the impacts on rare and unique communities as a result of alternative 5 are combined with other past, present, and reasonably foreseeable projects in the study area, an overall adverse cumulative impact would be expected.

For the same reasons outlined for alternative 4, alternative 5 would likely result in significant adverse impacts to rare and unique communities although these adverse impacts could eventually be balanced by the significant benefit of restoring the corridor along the existing B-K Line.

Public attention surrounding this project is high. There is likely to be a high degree of controversy over any effects on park resources that are particularly popular with the public, such as scenery, visitor use and experience, rare and unique communities, cultural landscapes, and historic structures, for any of the alternatives. The inherent uncertain nature of predicting the true degree of some of these impacts would likely heighten this controversy.

Permitting the project would adversely affect multiple protected resources inside the parks, in some instances irreversibly. Allowing such adverse effects in order to facilitate private infrastructure expansion would be contrary to NPS practice and principle of protecting and improving these resources, and of removing incompatible infrastructure to do so. This could establish precedent that may invite similar proposals by other applicants in the future, and create an expectation of like treatment for those proposals; it may make it difficult to deny such proposals. DEWA and APPA both contain numerous other utility crossings, which makes the risk of such precedent particularly concerning for these parks. Furthermore, as units of the national park system, wherein all parks are entitled to equal protection, creating such a precedent could have ramifications for parks nationwide. However, it would also set a precedent for routing utilities around MDSR and to the edges of DEWA.

CULTURAL RESOURCES

This section discusses the impacts from the alternatives on the cultural resources in the study area, including archeological resources, historic structures, and cultural landscapes. Impacts on cultural resources are analyzed under NEPA; in addition, this section also analyzes the project's effects on historic properties under the NHPA.

Federal actions that have the potential to affect cultural resources are subject to a variety of laws. The NHPA is the principal legislative authority for managing cultural resources associated with federal projects. Generally, section 110 of the act requires federal agencies to establish preservation programs for the identification, evaluation, and nomination of historic properties to the National Register. Section 106 of the act requires all federal agencies to consider the effects of their actions on cultural resources listed on or determined eligible for listing on the National Register. Such resources are termed historic properties. Federal agencies must seek to avoid, minimize, or mitigate harm to historic properties that would be adversely affected by a federal undertaking. Agreement on how to resolve adverse effects on historic properties is reached through consultation with the State Historic Preservation Officer (SHPO), the Tribal Historic Preservation Officer, if applicable, the Advisory Council on Historic Preservation (ACHP) as necessary, and other consulting parties.

Section 110 of the NHPA charges the NPS to manage historic properties in its custody in a way that considers the preservation and protection of such resources (16 USC §§ 470h-2(a)(1)-(2)). This is further implemented through Director's Order 28: Cultural Resource Management and its supplement, Director's Order 28A, Archeology (NPS 1998b); NPS *Management Policies 2006* (NPS 2006a); and the 2008 "Servicewide Programmatic Agreement among the NPS, the Advisory Council, and the National Conference of State Historic Preservation Officers." These documents charge NPS managers with avoiding, or minimizing to the greatest degree practicable, adverse impacts on park resources and values. Although the NPS has the discretion to allow certain impacts in parks, that discretion is limited by the statutory requirement that park resources and values remain unimpaired, unless a specific law directly provides otherwise. Because the NPS has elected to integrate compliance with Section 106 of the NHPA into the NEPA process and documentation pursuant to 36 CFR § 800.8(c), this impact analysis is designed to meet both statutory requirements. See 36 CFR § 800.8(c)(1)(ii)-(iii).

ACHP regulations for implementing section 106 require that effects on historic properties be identified and evaluated by determining the area of potential effects (APEs), or the area of geographic study;

identifying cultural resources present in the APE that are either listed on or eligible for listing on the National Register; applying the criteria of adverse effect on these historic properties; and considering ways to avoid, minimize, or mitigate adverse effects on them. Identification of historic resources and assessment of effect is being completed in accordance with 36 CFR §§ 800.4 and 800.5.

Under the ACHP regulations a determination of no effect, no adverse effect, or adverse effect must be made for National Register-listed or National Register-eligible historic properties located in the APE. A determination of no effect is made when it is found that no historic properties are present or there are historic properties present but the undertaking would have no effect upon them. A determination of no adverse effect results when there is an effect on a resource but it would not diminish the characteristics of the historic property that qualify it for inclusion in the National Register. An adverse effect occurs when an impact alters any characteristic of an historic property that qualifies it for inclusion in the National Register in a manner that would diminish the integrity of its location, design, setting, materials, workmanship, feeling, or association. (36 CFR § 800.5(a)(1)). Adverse effects also include reasonably foreseeable effects caused by the proposal that would occur later, be farther removed in distance, or be cumulative (36 CFR Part 800).

In addition to the analysis under NHPA, the NPS is required to analyze impacts to cultural resources under NEPA. Under NEPA, impacts to cultural resources are assessed as either adverse or beneficial. Section 106 of the NHPA requires assessments of effects as either adverse or not adverse (see above discussion). Under both laws, adverse effects are those that negatively affect the integrity of elements important to the significance of a cultural resource. An impact on a cultural resource under NEPA is not necessarily equivalent to an effect on a historic property under the NHPA. In this section, discussion of *impacts* is specific to NEPA, while that of *effects* is specific to Section 106 of the NHPA.

CEQ regulations and Director's Order 12 call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact. Any resultant reduction in the intensity of an impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. Cultural resources are nonrenewable resources, and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss if integrity of the resource that can never be recovered. Through consultation with identified consulting parties, the NPS will develop measures that may avoid, minimize, or mitigate adverse effects to historic properties. The NPS will describe the identified proposed measures associated with the alternatives in this EIS. The NPS will incorporate such measures in further detail in the Record of Decision, assuming there is a decision other than the no action alternative, and the measures will be included as a binding commitment in any permit that might be granted. Therefore, although actions determined to have an adverse effect under section 106 of the NHPA may be mitigated, the effect remains adverse.

A section 106 summary is included in the impact analysis section for archeological resources, historic structures and cultural landscapes. The section 106 summary is an assessment of the effect of the undertaking (implementation of the alternative) only on cultural resources listed on or eligible for the National Register, based on the criteria of effect and criteria of adverse effect found in the regulations of the Advisory Council. For further information on the section 106 consultation, please see appendix M.

Federally recognized Indian tribes hold the bald eagle to be important culturally, and bald eagles are considered a cultural resource. However, effects to bald eagles are discussed within the "Special-status Species" section of this chapter.