

**Bulavinetz, Richard**

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**From:** Bulavinetz, Richard  
**Sent:** Tuesday, August 03, 2010 2:30 PM  
**To:** Eccleston, Charles  
**Subject:** FW: Salem & Hope Creek - Terrest Sections  
**Attachments:** Table 2.2.7-2 T&E Terr & FW.doc; Sec 2.2.6 -Terrestrial Resources.doc; Sec 2.2.7 - T&E spp.docx; Sec 4.6 - Terrestrial Resources (2).doc; Sec 4.7 -T&E Species.docx; Sec 4.11.3 - Cumulative -Terrestrial&FW(2).doc

Charles:

Here are all of the most recent versions of aquatic and terrestrial sections from Steve Dillard. According to Steve, I believe these were previously sent to you.

Rich

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**From:** Dillard, Steve [<mailto:STEVE.DILLARD@aecom.com>]  
**Sent:** Tuesday, August 03, 2010 12:18 PM  
**To:** Bulavinetz, Richard  
**Subject:** RE: Salem & Hope Creek - Terrest Sections

D-113

*A-Birds*

**Table 2.2.7-2 Threatened and Endangered Terrestrial and Freshwater Aquatic Species Recorded in Salem County and Counties Crossed by Transmission Lines**

Scientific Name	Common Name	Status		County <sup>(c)</sup>	Habitat <sup>(d)</sup>
		Federal <sup>(a)</sup>	State <sup>(a),(b)</sup>		
<b>Mammals</b>					
<i>Lynx rufus</i>	bobcat	-	E	Salem	Rock outcrops, caves, swamps, bogs dense thickets of briars and conifers in contiguous forest and forests fragmented by agricultural areas <sup>(1)</sup>
<b>Birds</b>					
<i>Accipiter cooperii</i>	Cooper's hawk	-	T/T	Gloucester, Salem	Deciduous, coniferous, and mixed riparian or wetland forests; specifically remote red maple or black gum swamps <sup>(1)</sup>
<i>Ammodramus henslowii</i>	Henslow's sparrow	-	E	Gloucester	Open fallow fields with high, thick herbaceous vegetation (not woody) with a few scattered shrubs; and grassy fields between salt marsh and uplands along the Delaware Bay coast <sup>(1)</sup>
<i>A. savannarum</i>	grasshopper sparrow	-	T/S	Salem	Grasslands, pastures, agricultural lands, and other habitats with short- to medium-height grasses scattered with patches of bare ground <sup>(1)</sup>
<i>Bartramia longicauda</i>	upland sandpiper	-	E	Gloucester, Salem	Open meadows and fallow fields often associated with pastures, airports or farms with a mixture of tall and short grasses <sup>(1)</sup>
<i>Buteo lineatus</i>	red-shouldered hawk	-	E/T	Gloucester	Deciduous, riparian, or mixed woodlands in remote, old growth forests, hardwood swamps with standing water, or vast contiguous, freshwater

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					wetlands <sup>(1)</sup>
<i>Circus cyaneus</i>	northern harrier	-	E/U	Salem	Freshwater, brackish, and saline tidal marshes, emergent wetlands, fallow fields, grasslands, meadows, airports, and agricultural areas <sup>(1)</sup>
<i>Cistothorus platensis</i>	sedge wren	-	E	Salem	Wet meadows, freshwater marshes, bogs, and drier portions of salt or brackish coastal marshes <sup>(1)</sup>
<i>Dolichonyx oryzivorus</i>	bobolink	-	T/T	Salem	Hayfields, pastures, grassy meadows, and other low-intensity agricultural areas; may occur in coastal and freshwater marshes during migration <sup>(1)</sup>
<i>Falco peregrinus</i>	peregrine falcon	-	E	Camden, Gloucester, Salem	Nest on buildings, bridges, man-made structures and forage in open area near water <sup>(1)</sup>
<i>Falco sparverius</i>	American kestrel		SC	Camden, Gloucester, Salem	Open fields and pastures with scattered trees for perching and nesting sites, power line rights of way <sup>(24)</sup>
<i>Haliaeetus leucocephalus</i>	bald eagle	-	E	Gloucester, Salem	Large, perch trees in forested areas associated with water and tidal areas <sup>(1)</sup>
<i>Hylocichla mustelina</i>	wood thrush	-	SC/S	Camden, Gloucester, Salem	Moist woodlands, hillsides, parks, orchards, and woodlots in suburbs <sup>(21)</sup>
<i>Melanerpes erythrocephalus</i>	red-headed woodpecker	-	T/T	Camden, Gloucester, Salem	Upland and wetland open woods that contain dead or dying trees

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					and sparse undergrowth <sup>(1)</sup>
<i>Pandion haliaetus</i>	osprey	-	T/T	Gloucester, Salem	Dead trees or platforms near coastal/inland rivers, marshes, bays, inlets, and other areas associated with bodies of water that support adequate fish populations <sup>(1)</sup>
<i>Passerculus sandwichensis</i>	savannah sparrow	-	T/T	Salem	Open habitats such as alfalfa fields, grasslands, meadows, fallow fields, airports, along the coast and within salt marsh edges as well <sup>(1)</sup>
<i>Podilymbus podiceps</i>	pied-billed grebe	-	E/S	Salem	Freshwater marshes associated with bogs, lakes, or slow-moving rivers <sup>(1)</sup>
<i>Pooecetes gramineus</i>	vesper sparrow	-	E	Gloucester, Salem	Pastures, grasslands, cultivated fields containing crops, and other open areas <sup>(1)</sup>
<i>Strix varia</i>	barred owl	-	T/T	Gloucester, Salem	Remote, contiguous, old growth wetland forests, including deciduous wetland forests and Atlantic white cedar swamps associated with stream corridors <sup>(1)</sup>

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<b>Reptiles and Amphibians</b>					
<i>Ambystoma tigrinum</i>	eastern tiger salamander	-	E	Gloucester, Salem	Uplands and wetlands containing breeding ponds, forests, and burrowing-appropriate soil types such as old fields and deciduous or mixed woods <sup>(1)</sup>
<i>Bufo woodhousii fowleri</i>	Fowler's toad	-	SC	Camden, Gloucester, Salem	Wooded areas, river valleys, floodplains, agricultural areas, areas with deep friable soils; burrows underground or hides under rocks, plants, or other cover when inactive; eggs and larvae develop in shallow water of marshes, rain pools, ponds, lakes, reservoirs, and flooded areas <sup>(16)</sup>
<i>Clemmys guttata</i>	spotted turtle	-	SC	Camden, Gloucester, Salem	Wetlands with clean, shallow, slow-moving water with muddy or mucky bottoms including aquatic and emergent vegetation, shallow ponds, wet meadows, swamps, bogs, fens, sedge meadows, wet prairies, shallow cattail marshes, sphagnum seepages, small woodland streams and roadside ditches; during mating and nesting seasons: open fields and woodlands and along roads <sup>(12)</sup>
<i>Clemmys insculpta</i>	wood turtle	-	E	Gloucester	Forests, meadows, or open fields near freshwater streams, creeks, or relatively remote rivers <sup>(1)</sup>

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<i>C. muhlenbergii</i>	bog turtle	T	E DE: E	Camden, Gloucester, Salem, New Castle	Open, wet, grassy pastures or bogs with soft, muddy bottoms <sup>(1)</sup>
<i>Crotalus horridus horridus</i>	timber rattlesnake	-	E	Camden	Deciduous upland forests or pinelands habitats, often near cedar swamps and along streambanks <sup>(1)</sup>
<i>Hyla andersoni</i>	pine barrens treefrog	-	E	Camden, Gloucester, Salem	Specialized acidic habitats such as Atlantic white cedar swamps and pitch pine lowlands with open canopies, dense shrub layers, and heavy ground cover <sup>(1)</sup>
<i>Malaclemys terrapin terrapin</i>	northern diamondback terrapin	-	SC	Camden, Gloucester, Salem	Marshes bordering salt or brackish tidal waters, mudflats, shallow bays, coves, tidal estuaries with adjacent sandy uplands for nesting <sup>(22)</sup>
<i>Pituophis melanoleucus</i>	northern pine snake	-	T	Camden, Gloucester, Salem	Dry pine-oak forest types growing on infertile sandy soils <sup>(1)</sup>
<i>Terrapene carolina carolina</i>	eastern box turtle	-	SC	Camden, Gloucester, Salem	Forested habitats with sandy soils and a source of water such as a stream, pond, lake, marsh or swamp; thickets; old fields; pastures; vegetated dunes; nesting sites - sandy, open areas <sup>(12)</sup>
<b>Invertebrates</b>					
<i>Alasmidonta undulata</i>	triangle floater	-	T	Gloucester	Stable substrates in waters of moderate flow in small rivers and headwater streams <sup>(26)</sup>
<i>Callophrys irus</i>	frosted elfin	-	T	Camden	Dry clearings and open areas, savannas, power-line ROWs, roadsides <sup>(1)</sup>

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<i>Lampsilis cariosa</i>	yellow lampmussel	-	T	Gloucester	Medium to large rivers, lakes and ponds; substrate types - sand, silt, cobble, and gravel; larval hosts - white perch and yellow perch <sup>(22)</sup>
<i>Lampsilis radiata</i>	eastern lampmussel	-	T	Camden, Gloucester, Salem	Small streams, large rivers, ponds, and lakes; prefers sand or gravel substrates <sup>(22)</sup>
<i>Leptodea ochracea</i>	tidewater mucket	-	T	Camden, Gloucester	Freshwater water with tidal influence on the lower coastal plain, pristine rivers <sup>(32)</sup>
<i>Ligumia nasuta</i>	eastern pond mussel	-	T	Camden, Gloucester	Lakes, ponds, streams and rivers of variable depths with muddy, sandy, or gravelly substrates <sup>(32)</sup>
<i>Lycaena hyllus</i>	bronze copper		E	Salem	Brackish and freshwater marshes, bogs, fens, seepages, wet sedge meadows, riparian zones, wet grasslands, and drainage ditches <sup>(1)</sup>
<i>Nicrophorus americanus</i>	American burying beetle	E	E	Camden, Gloucester	Open areas, primarily coastal grassland/scrub <sup>(1)</sup>
<i>Pontia protodice</i>	checkered white	-	T	Camden	Open areas, savannas, old fields, vacant lots, power-line ROWs, forest edges <sup>(1)</sup>
<i>Pyrgus wyandot</i>	Appalachian grizzled skipper	-	E	Gloucester	Semi-open shale slopes with exposed crumbly rock or soil, sparse herbaceous vegetation, surrounded by scrub oak or oak-hickory woodlands; larval host plant - Canada cinquefoil ( <i>Potentilla canadensis</i> ); tufted grasses like broomsedge ( <i>Andropogon virginicus</i> ), spring beauty

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					( <i>Claytonia</i> spp.), phlox ( <i>Phlox subulata</i> ), and birdsfoot violet ( <i>Viola pedata</i> ) <sup>(22)</sup>
<b>Plants</b>					
<i>Aeschynomene virginica</i>	sensitive joint vetch	T	E	Camden, Gloucester, Salem	Fresh to slightly salty (brackish) tidal marshes <sup>(2)</sup>
<i>Aplectrum hyemale</i>	putty root	-	E	Gloucester	Moist, deciduous upland to swampy forests <sup>(3)</sup>
<i>Aristida lanosa</i>	wooly three-awn grass	-	E	Camden, Salem	Dry fields, uplands, pink-oak woods, primarily in sandy soil <sup>(4)</sup>
<i>Asimina triloba</i>	pawpaw	-	E	Gloucester	Shady, open-woods areas in wet, fertile bottomlands or upland areas on rich soils <sup>(5)</sup>
<i>Aster radula</i>	low rough aster	-	E	Camden, Gloucester, Salem	Wet meadows, open boggy woods, and along the edges or openings in wet spruce or tamarack forests <sup>(6)</sup>
<i>Bouteloua curtipendula</i>	side oats grama grass	-	E	Gloucester	Rocky, open slopes, woodlands, and forest openings up to an elevation of approximately 7,000 feet <sup>(5)</sup>
<i>Cacalia atriplicifolia</i>	pale Indian plantain	-	E	Camden, Gloucester	Dry, open woods, thickets, and rocky openings <sup>(6)</sup>
<i>Calystegia spithamea</i>	erect bindweed	-	E	Camden, Salem	Dry, open, sandy to rocky sites such as pitch pine/scrub oak barrens, sandy roadsides, riverbanks, and rights-of-way <sup>(7)</sup>
<i>Cardamine longii</i>	Long's bittercress	-	E	Gloucester	Shady tidal creeks, swamps, and mudflats <sup>(8)</sup>

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<i>Carex aquatilis</i>	water sedge	-	E	Camden	Swamps, bogs, marshes, very wet soil, ponds, lakes, marshy meadows and other wetland-type sites <sup>(9)</sup>
<i>C. bushii</i>	Bush's sedge	-	E	Camden	Dry to mesic grasslands and forest margins <sup>(3)</sup>
<i>C. cumulata</i>	clustered sedge	-	E	Camden	Damp, open rocky areas with shallow, sandy soils <sup>(8)</sup>
<i>C. limosa</i>	mud sedge	-	E	Gloucester	Fens, sphagnum bogs, wet meadows, and shorelines <sup>(3)</sup>
<i>C. polymorpha</i>	variable sedge	-	E	Gloucester	Dry, sandy, open areas of scrub, forests, swampy woods, and along banks and marsh edge <sup>(8)</sup>
<i>Castanea pumila</i>	chinquapin	-	E	Gloucester, Salem	High ridges and slopes within mixed hardwood forests, dry pinelands, and rights-of-way <sup>(5)</sup>
<i>Cercis canadensis</i>	redbud	-	E	Camden	Rich, moist wooded areas in the forest understory, streambanks, and abandoned farmlands <sup>(5)</sup>
<i>Chenopodium rubrum</i>	red goosefoot	-	E	Camden	Moist, often salty soils along the Atlantic coast <sup>(10)</sup>
<i>Commelina erecta</i>	slender dayflower	-	E	Camden	Along roadsides, streambanks, in gardens and prairies in sandy or clayey soils <sup>(5)</sup>
<i>Cyperus lancastricensis</i>	Lancaster flat sedge	-	E	Camden, Gloucester	Riverbanks, floodplains, and other disturbed, sunny or partly sunny places in mesic or dry-mesic soils <sup>(3)</sup>
<i>C. polystachyos</i>	coast flat sedge	-	E	Salem	Along shores, in ditches, and

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					swales between dunes <sup>(3)</sup>
<i>C. pseudovegetus</i>	marsh flat sedge	-	E	Salem	Open mesic forests, stream edges, swamps, moist sandy areas, and bottomland prairies <sup>(11)</sup>
<i>C. retrofractus</i>	rough flat sedge	-	E	Camden, Gloucester	Sandy, disturbed areas, openings of dry upland forests and prairies <sup>(11)</sup>
<i>Dalibarda repens</i>	robin-run-away	-	E	Gloucester	Swamps, moist woodlands, and other cool, wet areas <sup>(12)</sup>
<i>Diodia virginiana</i>	larger buttonweed	-	E	Camden	Wet meadows in wet soils, and pond margins <sup>(11)</sup>
<i>Draba reptans</i>	Carolina Whitlow-grass	-	E	Camden, Gloucester	Rocky or sandy soils in prairies and other disturbed areas <sup>(13)</sup>
<i>Eleocharis melanocarpa</i>	black-fruit spike-rush	-	E	Salem	Fresh, oligotrophic, often drying, sandy shores, ponds, and ditches <sup>(3)</sup>
<i>E. equisetoides</i>	knotted spike-rush	-	E	Gloucester	Fresh lakes, ponds, marshes, streams, and cypress swamps <sup>(3)</sup>
<i>E. tortilis</i>	twisted spike-rush	-	E	Gloucester	Bogs, ditches, seeps, and other freshwater, acidic places <sup>(3)</sup>
<i>Elephantopus carolinianus</i>	Carolina elephant-foot	-	E	Gloucester, Salem	Full sun to partial shade in dry to medium, sandy soils <sup>(14)</sup>
<i>Eriophorum gracile</i>	slender cotton-grass	-	E	Gloucester	Peaty, acidic substrates such as bogs, meadows, and shores <sup>(3)</sup>
<i>E. tenellum</i>	rough cotton-grass	-	E	Camden, Gloucester	Bogs and other wet, peaty substrates <sup>(3)</sup>
<i>Eupatorium capillifolium</i>	dog fennel	-	E	Camden	Coastal meadows, fallow fields,

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	thoroughwort				flatwoods, marshes, and disturbed sites <sup>(15)</sup>
<i>E. resinosum</i>	pine barren boneset	-	E	Camden, Gloucester	Tidal marshes, wetlands, open swamps, wet ditches, sandy acidic soils of grass-sedge bogs, pocosin-savannah ecotones, beaver ponds, shrub swamps <sup>(17)</sup>
<i>Euphorbia purpurea</i>	Darlington's glade spurge	-	E	Salem	Rich, cool woods along seeps, streams, or swamps <sup>(17)</sup>
<i>Glyceria grandis</i>	American manna grass	-	E	Camden	Grassy areas <sup>(6)</sup>
<i>Gnaphalium helleri</i>	small everlasting	-	E	Camden	Dry woods, often in sandy soil <sup>(13)</sup>
<i>Gymnopogon brevifolius</i>	short-leaf skeleton grass	-	E	Gloucester	Dryish clay-loam soils, calcareous glades, and relict prairies <sup>(23)</sup>
<i>Helonias bullata</i>	swamp pink	T	E	Camden, Gloucester, Salem, New Castle	Swamps and groundwater influenced, perennially water-saturated forested wetlands <sup>(17)</sup>
<i>Hemicarpha micrantha</i>	small-flower halfchaff sedge	-	E	Camden	Emergent shorelines; rarely freshwater tidal shores <sup>(3)</sup>
<i>Hottonia inflata</i>	featherfoil	-	E	Salem	Quiet, shallow water of pools, streams, ditches, occasionally in wet soil <sup>(20)</sup>
<i>Hydrastis canadensis</i>	golden seal	-	E	Camden	Mesic, deciduous forests, often on clayey soil <sup>(3)</sup>
<i>Hydrocotyle ranunculoides</i>	floating marsh-pennywort	-	E	Salem	Ponds, marshes, and wet ground <sup>(19)</sup>
<i>Hypericum adpressum</i>	Barton's St. John's-wort	-	E	Salem	Pond shore <sup>(7)</sup>
<i>Isotria meleoloides</i>	small-whorled	T	-	-	Mixed deciduous forests in

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	pogonia				second- or third-growth successional stages, coniferous forests; typically light to moderate leaf litter, open herb layer, moderate to light shrub layer, relatively open canopy, flats or slope bases near canopy breaks <sup>(3)</sup>
<i>Juncus caesariensis</i>	New Jersey rush	-	E	Camden	Borders of wet woods, wet springy bogs, and swamps <sup>(3)</sup>
<i>J. torreyi</i>	Torrey's rush	-	E	Camden	Edge of sloughs, wet sandy shores; along slightly alkaline watercourses; swamps; sometimes on clay soils, alkaline soils, and calcareous wet meadows <sup>(3)</sup>
<i>Kuhnia eupatorioides</i>	false boneset	-	E	Camden	Limestone edges of bluffs, rocky wooded slopes, rocky limestone talus <sup>(11)</sup>
<i>Lemna perpusilla</i>	minute duckweed	-	E	Camden, Salem	Mesotrophic to eutrophic, quiet waters with relatively mild winters <sup>(3)</sup>
<i>Limosella subulata</i>	awl-leaf mudwort	-	E	Camden	Freshwater marshes <sup>(18)</sup>
<i>Linum intercursum</i>	sandplain flax	-	E	Camden, Salem	Open, dry, sandplain grasslands or moors; sand barrens; mown fields; and swaths under powerlines, usually in small colonies <sup>(23)</sup>
<i>Luzula acuminata</i>	hairy wood-rush	-	E	Gloucester, Salem	Grassy areas <sup>(6)</sup>
<i>Melanthium virginicum</i>	Virginia bunchflower	-	E	Camden, Gloucester, Salem	Fens, bottomland prairies; mesic upland forests; mesic upland prairies; along streams, roadsides, and railroads <sup>(11)</sup>
<i>Micranthemum</i>	Nuttall's mudwort	-	E	Camden, Gloucester	Possibly extinct - last seen

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<i>micranthemoides</i>					anywhere in 1941; freshwater tidal shores of northeast and mid-Atlantic rivers, including Hudson, Delaware, Potomac, and Anacostia <sup>(16)</sup>
<i>Muhlenbergia capillaries</i>	long-awn smoke grass	-	E	Gloucester	Sandy, pine openings; dry praires; exposed ledges <sup>(6)</sup>
<i>Myriophyllum tenellum</i>	slender water-milfoil	-	E	Camden	Sandy soil, water to 5 ft deep <sup>(13)</sup>
<i>M. pinnatum</i>	cut-leaf water-milfoil	-	E	Salem	Floodplain marsh; associated with <i>Asclepias perrenis</i> , <i>Salix caroliniana</i> , and <i>Ludwigia repens</i> <sup>(16)</sup>
<i>Nelumbo lutea</i>	American lotus	-	E	Camden, Salem	Mostly floodplains of major rivers in ponds, lakes, pools in swamps and marshes, and backwaters of reservoirs <sup>(3)</sup>
<i>Nuphar microphyllum</i>	small-yellow pond-lily	-	E	Camden	Lakes, ponds, sluggish streams, ditches, sloughs, and occasionally tidal waters <sup>(3)</sup>
<i>Onosmodium virginianum</i>	Virginia false-gromwell	-	E	Camden, Gloucester, Salem	Sandy soil and dry open woods <sup>(10)</sup>
<i>Ophioglossum vulgatum pycnostichum</i>	southern adder's tongue	-	E	Salem	Rich wooded slopes, shaded secondary woods, forested bottomlands and floodplain woods, south of Wisconsin glaciations <sup>(3)</sup>
<i>Panicum aciculare</i>	bristling panic grass	-	E	Gloucester	Sandy, coastal plains that undergo rises and falls in water levels, coastal plain ponds, limestone depression ponds, and shallow cypress ponds <sup>(17)</sup>
<i>Penstemon laevigatus</i>	smooth beardtongue	-	E	Gloucester	Rich woods and fields <sup>(6)</sup>

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<i>Plantago pusilla</i>	dwarf plantain	-	E	Camden	Dry sand prairies, hill prairies, cliffs, rocky glades, sandy fields, and areas of gravel along railroads or roadsides <sup>(27)</sup>
<i>Platanthera flava flava</i>	southern rein orchid	-	E	Camden	Floodplain forests; white cedar, hardwood and cypress swamps; riparian thickets; wet meadows <sup>(3)</sup>
<i>Pluchea foetida</i>	stinking fleabane	-	E	Camden	Swamps, marshes, ditches, coastal savannahs <sup>(28)</sup>
<i>Polemonium reptans</i>	Greek-valerian	-	E	Salem	Moist, stream banks, deciduous woods <sup>(6)</sup>
<i>Polygala incarnate</i>	pink milkwort	-	E	Camden, Gloucester	Field, prairie, meadow <sup>(6)</sup>
<i>Prunus angustifolia</i>	chickasaw plum	-	E	Camden, Gloucester, Salem	Woodland edges, forest openings, open woodlands, savannahs, prairies, plains, meadows, pastures, roadsides, fence rows <sup>(6)</sup>
<i>Pycnanthemum clinopodioides</i>	basil mountain mint	-	E	Camden	Dry south or west facing slopes on rocky soils; open oak-hickory forests, woodlands, or savannas with exposed bedrock <sup>(11)</sup>
<i>P. torrei</i>	Torrey's mountain mint	-	E	Gloucester	Open, dry, including red cedar barrens, rocky summits, roadsides and trails, dry upland woods <sup>(8)</sup>
<i>Quercus imbricaria</i>	shingle oak	-	E	Gloucester	Rich bottomlands, dry to moist uplands <sup>(6)</sup>
<i>Q. lyrata</i>	overcup oak	-	E	Salem	Lowlands, bottoms, wet forests, streamside forests, periodically inundated areas <sup>(3)</sup>
<i>Rhododendron atlanticum</i>	dwarf azalea	-	E	Salem	Moist, flat, pine woods and savannas <sup>(6)</sup>
<i>Rhynchospora globularis</i>	coarse grass-like beaked-rush	-	E	Camden, Gloucester, Salem	Sandy and rocky stream banks, sink-hole ponds, upland prairies,

**Table 2.2.7-2 Threatened and Endangered Terrestrial and Freshwater Aquatic Species Recorded in Salem County and Counties Crossed by Transmission Lines**

Scientific Name	Common Name	Status		County <sup>(c)</sup>	Habitat <sup>(d)</sup>
		Federal <sup>(a)</sup>	State <sup>(a),(b)</sup>		
					open rocky and sandy areas <sup>(11)</sup>
<i>R. knieskernii</i>	Knieskern's beaked-rush	T	E	Camden	Moist to wet pine barrens, borrow pits, sand pits <sup>(3)</sup>
<i>Sagittaria teres</i>	slender arrowhead	-	E	Camden	Swamps of acid waters and sandy pool shores, mostly along Atlantic Coastal Plain <sup>(3)</sup>
<i>Scheuchzeria palustris</i>	arrow-grass	-	E	Camden, Gloucester	Lake margins, bogs, and marshes <sup>(3)</sup>
<i>Schwalbea americana</i>	chaffseed	E	E	Camden	Acidic, sandy or peaty soils in open flatwoods, streamhead pocosins, pitch pine lowland forests, longleaf pine/oak sandhills, seepage bogs, palustrine pine savannahs, ecotonal areas between peaty wetlands and xeric sandy soils <sup>(17)</sup>
<i>Scirpus longii</i>	Long's woolgrass	-	E	Camden	Marshes <sup>(3)</sup>
<i>S. maritimus</i>	saltmarsh bulrush	-	E	Camden	Water body margins, marshes, alkali and saline wet meadows <sup>(6)</sup>
<i>Scutellaria leonardii</i>	small skullcap	-	E	Salem	Fields, meadows and prairies <sup>(6)</sup>
<i>Spiranthes laciniata</i>	lace-lip ladies' tresses	-	E	Gloucester	Primarily on coastal plain in marshes, swamps, dry to damp roadsides, meadows, ditches, fields, cemeteries, lawns; occasionally in standing water <sup>(3)</sup>
<i>Stellaria pubera</i>	star chickweed	-	E	Camden	Alluvial bottomlands, rich deciduous woods <sup>(3)</sup>
<i>Triadenum walteri</i>	Walter's St. John's wort	-	E	Camden	Buttonbush swamps, swamp woods, thickets and streambanks <sup>(21)</sup>
<i>Utricularia biflora</i>	two-flower bladderwort	-	E	Gloucester, Salem	Shores and shallows <sup>(13)</sup>
<i>Valerianella radiata</i>	beaked cornsalad	-	E	Gloucester	Pastures, prairies, valleys, creek beds, wet meadows, roadsides,

**Table 2.2.7-2 Threatened and Endangered Terrestrial and Freshwater Aquatic Species Recorded in Salem County and Counties Crossed by Transmission Lines**

Scientific Name	Common Name	Status		County <sup>(c)</sup>	Habitat <sup>(d)</sup>
		Federal <sup>(a)</sup>	State <sup>(a),(b)</sup>		
					glades, railroads <sup>(11)</sup>
<i>Verbena simplex</i>	narrow-leaf vervain	-	E	Camden, Gloucester	Fields, meadows, and prairies <sup>(6)</sup>
<i>Vernonia glauca</i>	broad-leaf ironweed	-	E	Gloucester, Salem	Dry fields, clearings, and upland forests <sup>(21)</sup>
<i>Vulpia ellioatea</i>	squirrel-tail six-weeks grass	-	E	Camden, Gloucester, Salem	Grass-like, grassy habitats <sup>(6)</sup>
<i>Wolffiella floridana</i>	sword bogmat	-	E	Salem	Quiet waters in warm-temperature regions with relatively mild winters, mesotrophic <sup>(3)</sup>
<i>Xyris fimbriata</i>	fringed yellow-eyed grass	-	E	Camden	Low pine savanna, bogs, seeps, peats and mucks of pond shallows, sluggish shallow streams <sup>(3)</sup>

**Table 2.2.7-2 Threatened and Endangered Terrestrial and Freshwater Aquatic Species Recorded in Salem County and Counties Crossed by Transmission Lines**

Scientific Name	Common Name	Status		County <sup>(c)</sup>	Habitat <sup>(d)</sup>
		Federal <sup>(a)</sup>	State <sup>(a),(b)</sup>		
<p>U.S. Fish and Wildlife Service (FWS). 2008. Sensitive Joint-vetch – Endangered Species Program species profile. Accessed at <a href="http://www.fws.gov/northeast/njfieldoffice/Endangered/jointvetch.html">http://www.fws.gov/northeast/njfieldoffice/Endangered/jointvetch.html</a> on May 13, 2010.</p> <p>Utah State University. 2010. Grass Manual on the Web. Accessed at <a href="http://herbarium.usu.edu/webmanual/default.htm">http://herbarium.usu.edu/webmanual/default.htm</a> on April 2, 2010.</p> <p>U.S. Department of Agriculture (USDA). 2006. Plants Database, Threatened and Endangered Plants of New Jersey, PLANTS Profile. Accessed at: <a href="http://plants.usda.gov/java/threat?statelist=states&amp;stateSelect=US34">http://plants.usda.gov/java/threat?statelist=states&amp;stateSelect=US34</a> on April 2, 2010.</p> <p>University of Texas at Austin. 2010. Lady Bird Johnson Wildflower Center, Native Plant Information Network (NPIN). Accessed at: <a href="http://www.wildflower.org/collections/collection.php?all=true">http://www.wildflower.org/collections/collection.php?all=true</a> on April 5, 2010.</p> <p>New England Wild Flower Society. 2003. New England Plant Conservation Program, <i>Calystegia spithamea</i> (L.) Pursh ssp. <i>Spithamea</i> Low Bindweed: Conservation and Research Plan for New England. December. Accessed at <a href="http://www.newenglandwild.org/docs/pdf/calystegiaspithamea.pdf">http://www.newenglandwild.org/docs/pdf/calystegiaspithamea.pdf</a> on April 5, 2010.</p> <p>New York Natural Heritage Program (NYNHP). 2010. Animal and Plant Guides. Accessed at <a href="http://www.acris.nynhp.org/plants.php">http://www.acris.nynhp.org/plants.php</a> on April 5, 2010.</p> <p><sup>9</sup> USDA Forest Service. 2010. Fire Effects Information Network, Plant Species Life Form. Accessed at <a href="http://www.fs.fed.us/database/feis/plants/">http://www.fs.fed.us/database/feis/plants/</a> on April 5, 2010.</p> <p><sup>10</sup> nearctica.com. 2010. The Natural History of North America, Coast Blite (<i>Chenopodium rubrum</i>). Accessed at <a href="http://www.nearctica.com/flowers/bandc/chenop/Crubrum.htm">http://www.nearctica.com/flowers/bandc/chenop/Crubrum.htm</a> on April 5, 2010.</p> <p><sup>11</sup> MissouriPlants.com. 2010. Photographs and Descriptions of the flowering and non-flowering plants of Missouri, USA. Accessed at <a href="http://www.missouriplants.com/">http://www.missouriplants.com/</a> on April 7, 2010.</p> <p><sup>12</sup> Michigan Natural Features Inventory. 2010. Michigan's Special Animals and Plants. Accessed at <a href="http://web4.msue.msu.edu/Mnfi/">http://web4.msue.msu.edu/Mnfi/</a> on April 7, 2010.</p> <p><sup>13</sup> University of Wisconsin. 2010. Stevens Point Freckmann Herbarium, Plants of Wisconsin. Accessed at <a href="http://wisplants.uwsp.edu/WisPlants.html">http://wisplants.uwsp.edu/WisPlants.html</a> on April 7, 2010.</p> <p><sup>14</sup> Missouri Botanical Gardens. 2010. Kemper Center for Home Gardening PlantFinder. Accessed at <a href="http://www.mobot.org/gardeninghelp/plantfinder/alpha.asp">http://www.mobot.org/gardeninghelp/plantfinder/alpha.asp</a> on April 7, 2010.</p>					

**Table 2.2.7-2 Threatened and Endangered Terrestrial and Freshwater Aquatic Species Recorded in Salem County and Counties Crossed by Transmission Lines**

Scientific Name	Common Name	Status		County <sup>(c)</sup>	Habitat <sup>(d)</sup>
		Federal <sup>(a)</sup>	State <sup>(a),(b)</sup>		
<p><sup>15</sup> Alabamaplants.com. 2010. Photographs and Information for the plants of Alabama, USA. Accessed at <a href="http://alabamaplants.com/">http://alabamaplants.com/</a> on April 7, 2010.</p>					
<p><sup>16</sup> NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life (Web application). Version 7.1. NatureServe, Arlington, VA. Accessed at <a href="http://www.natureserve.org/explorer/">http://www.natureserve.org/explorer/</a> in March 2010.</p>					
<p><sup>17</sup> Center for Plant Conservation (CPC). 2010. National Collection Plant Profile. Accessed at <a href="http://www.centerforplantconservation.org/collection/cpc_viewprofile.asp">http://www.centerforplantconservation.org/collection/cpc_viewprofile.asp</a> on April 8, 2010.</p>					
<p><sup>18</sup> Calflora: Information on California plants for education, research and conservation, based on data contributed by the Consortium of Calif. Herbaria and dozens of other public and private institutions and individuals. [web application]. 2010. Berkeley, California: The Calflora Database [a non-profit organization]. Accessed at <a href="http://www.calflora.org/cgi-bin/species_query.cgi?where-calreclnum=4845">http://www.calflora.org/cgi-bin/species_query.cgi?where-calreclnum=4845</a> on April 8, 2010.</p>					
<p><sup>19</sup> University of Washington Burke Museum of Natural History and Culture. 2006. Accessed at <a href="http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Hydrocotyle&amp;Species=ranunculoides">http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Hydrocotyle&amp;Species=ranunculoides</a> on April 8, 2010.</p>					
<p><sup>20</sup> Ohio Department of Natural Resources (DNR). Division of Natural Areas and Preserves. 1983. <i>Hottonia Inflata</i> Ell. Featherfoil Accessed at <a href="http://www.dnr.state.oh.us/Portals/3/Abstracts/Abstract_pdf/H/Hottonia_inflata.pdf">http://www.dnr.state.oh.us/Portals/3/Abstracts/Abstract_pdf/H/Hottonia_inflata.pdf</a> <i>Triadenum walteri</i> Gleason Walter's St. John's Wort <a href="http://www.dnr.state.oh.us/Portals/3/Abstracts/Abstract_pdf/T/Triadenum_walteri.pdf">http://www.dnr.state.oh.us/Portals/3/Abstracts/Abstract_pdf/T/Triadenum_walteri.pdf</a> on April 8, 2010.</p>					
<p><sup>21</sup> Pennsylvania Natural Heritage Program. 2007. Species Fact Sheets. Accessed at <a href="http://www.naturalheritage.state.pa.us/Factsheets.aspx">http://www.naturalheritage.state.pa.us/Factsheets.aspx</a> on April 8, 2010.</p>					
<p><sup>22</sup> Massachusetts Division of Fisheries and Wildlife. 2009. Natural Heritage Endangered Species Program. List of Rare Species in Massachusetts. Accessed at <a href="http://www.mass.gov/dfwele/dfw/nhesp/species_info/esa_list/esa_list.htm#PLANTS">http://www.mass.gov/dfwele/dfw/nhesp/species_info/esa_list/esa_list.htm#PLANTS</a> on April 8, 2010.</p>					
<p><sup>23</sup> Georgia Department of Natural Resources (DNR). 2008. Wildlife Resources Division. Special Concern Plant Species in Georgia. Accessed at <a href="http://georgiawildlife.dnr.state.ga.us/content/specialconcernplants.asp">http://georgiawildlife.dnr.state.ga.us/content/specialconcernplants.asp</a> on April 8, 2010.</p>					
<p><sup>24</sup> USDA NRCS. 1999. American Kestrel (<i>Falco sparverius</i>). Fish and Wildlife Habitat Management Leaflet. Accessed on 9 May 2010 at: <a href="ftp://ftp-fc.sc.gov.usda.gov/WHMI/WEB/pdf/kestrel(1).pdf">ftp://ftp-fc.sc.gov.usda.gov/WHMI/WEB/pdf/kestrel(1).pdf</a></p>					
<p><sup>25</sup> University of Georgia. 2010. Snakes of Georgia and South Carolina. Reptiles and Amphibians of South Carolina and Georgia. Accessed at: <a href="http://www.uga.edu/srelherp/index.htm#Reptiles">http://www.uga.edu/srelherp/index.htm#Reptiles</a> on 9 May 2010.</p>					
<p><sup>26</sup> South Carolina Department of Natural Resources. 2010. Species Descriptions. Accessed at: <a href="http://www.dnr.sc.gov/cwcs/species.html#T">http://www.dnr.sc.gov/cwcs/species.html#T</a> on 9 May 2010.</p>					
<p><sup>27</sup> Hilty, J. 2010. Illinois Wildflowers. Accessed at <a href="http://www.illinoiswildflowers.info/">http://www.illinoiswildflowers.info/</a> on 14 May 2010.</p>					
<p><sup>28</sup> Wernert, S.J. 1998. Reader's Digest North American Wildlife: An Illustrated Guide to 2,000 Plants and Animals. Accessed at</p>					

**Table 2.2.7-2 Threatened and Endangered Terrestrial and Freshwater Aquatic Species Recorded in Salem County and Counties Crossed by Transmission Lines**

Scientific Name	Common Name	Status		County <sup>(c)</sup>	Habitat <sup>(d)</sup>
		Federal <sup>(a)</sup>	State <sup>(a),(b)</sup>		
<p><a href="http://books.google.com/books?id=YedAnP3k1IMC&amp;printsec=frontcover&amp;dq=reader's+digest+north+american+wildlife+susan+j+wernert&amp;source=bl&amp;ots=es2QFm3yqo&amp;sig=s1OpQWxalri3k_Gvcm0Efppytw&amp;hl=en&amp;ei=02TtS4NQhrKsB46qqJcG&amp;sa=X&amp;oi=book_result&amp;ct=result&amp;resnum=1&amp;ved=0CAYQ6AEwAA#v=onepage&amp;q=stinking%20fleabane&amp;f=false">http://books.google.com/books?id=YedAnP3k1IMC&amp;printsec=frontcover&amp;dq=reader's+digest+north+american+wildlife+susan+j+wernert&amp;source=bl&amp;ots=es2QFm3yqo&amp;sig=s1OpQWxalri3k_Gvcm0Efppytw&amp;hl=en&amp;ei=02TtS4NQhrKsB46qqJcG&amp;sa=X&amp;oi=book_result&amp;ct=result&amp;resnum=1&amp;ved=0CAYQ6AEwAA#v=onepage&amp;q=stinking%20fleabane&amp;f=false</a> on 14 May 2010.</p>					

## 4.6 Terrestrial Resources

The Category 1 issues related to terrestrial resources and applicable to Salem and HCGS are listed in Table 4.6-1. There are no Category 2 issues related to terrestrial resources. Section 2.2.6 provides a description of the terrestrial resources at the site of the Salem and HCGS facilities and in the surrounding area.

**Table 4.6-1.** Terrestrial Resources Issues Applicable to Salem and/or HCGS.

Issues	GEIS Section	Category
Cooling tower impacts on crops and ornamental vegetation <sup>(a)</sup>	4.3.4	1
Cooling tower impacts on native plants <sup>(a)</sup>	4.3.5.1	1
Bird collisions with cooling towers <sup>(a)</sup>	4.3.5.2	1
Power line right-of-way management (cutting and herbicide application) <sup>(b)</sup>	4.5.6.1	1
Bird collisions with power lines <sup>(b)</sup>	4.5.6.1	1
Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock) <sup>(b)</sup>	4.5.6.3	1
Floodplains and wetland on power line right-of-way <sup>(b)</sup>	4.5.7	1

<sup>(a)</sup>Applicable only to HCGS

<sup>(b)</sup>Applicable to Salem and HCGS

The NRC staff did not identify any new and significant information during the review of the Salem and HCGS ER documents (PSEG 2009a, PSEG 2009b), the staff's site audit, the scoping process, or the evaluation of other available information (including bird mortality surveys conducted for the HCGS cooling tower from 1984 to 1986). Therefore, the NRC staff concludes that there would be no impacts related to these issues beyond those discussed in the GEIS (NRC 1996). Regarding these issues, the GEIS concluded that the impacts are SMALL, and additional site-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

## 2.2.6 Terrestrial Resources

This section describes the terrestrial resources in the immediate vicinity of the Salem and HCGS facilities on Artificial Island and within the transmission line ROWs connecting these facilities to the regional power grid. For this assessment, terrestrial resources were considered to include plants and animals of non-wet uplands, as well as non-tidal wetlands and bodies of freshwater located on Artificial Island or the ROWs.

### 2.2.6.1 Artificial Island

As discussed above in the site description, Artificial Island, on which the Salem and HCGS facilities were constructed, is a man-made island approximately 3 mi (4.8 km) long and 5 mi (8 km) wide that was created by the deposition of dredge spoil material. All terrestrial resources on the island have become established since creation of the island began approximately 100 years ago. Consequently, Artificial Island contains poor quality soils and very few trees. Approximately 75 percent of the island is undeveloped and dominated by tidal marsh, which extends from the higher areas along the river eastward to the



**Figure X-X. Aerial showing the Boundaries of Artificial Island (dotted yellow), PSEG property (red dashed), and Developed Areas (solid blue)**

marshes of the former natural shoreline of the mainland (Figure X-X). The terrestrial, non-wetland habitats of the island consist principally of areas covered by grasses and other herbs, with some shrubs and planted trees present in developed areas. Small, isolated, freshwater impoundments and associated wetland areas also are present.

The Salem and HCGS facilities were constructed on adjacent portions of the PSEG property, which occupies the southwest corner of Artificial Island. The PSEG property is low and flat with elevations rising to about 18 ft (5.5 m) above the level of the river at the highest point. Developed areas covered by facilities and pavement occupy over 70 percent of the site (approximately 266 acres [108 ha]). Maintained areas of grass, including two baseball fields, cover about 12 acres (5 ha) of the site interior. The remaining 25 percent of the PSEG property (approximately 100 acres [40 ha]) consists primarily of marsh dominated by the common reed (*Phragmites australis*) and several cordgrass species (*Spartina* spp.) (PSEG 2009b). The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) classifies all land on the project site as Urban, while the soils on Artificial Island are Udorthents consisting of dredged fine material (NRCS 2010). The National Wetlands Inventory (NWI) identifies an inland marsh/swamp area on the periphery of the project site adjacent to Hope Creek Road and two small freshwater ponds immediately north of the Hope Creek reactor. NWI classifies the

rest of Artificial Island as estuarine emergent marsh, with the exception of the northernmost 1 mi (1.6 km) of the island, which is occupied by freshwater emergent wetlands and freshwater ponds (FWS 2010).

The site is within the Middle Atlantic coastal plain of the eastern temperate forest ecoregion (EPA 2007). The tidal marsh vegetation of the site periphery and adjacent areas is dominated by common reed, but other plants present include big cordgrass (*Spartina cynosuroides*), salt marsh cordgrass (*S. alterniflora*), saltmeadow cordgrass (*S. patens*), and saltmarsh bulrush (*Scirpus robustus*) (PSEG 2009b). Fragments of this marsh community exist along the eastern edge of the PSEG property. The non-estuarine vegetation on the undeveloped areas within the facilities consists mainly of small areas of turf grasses and planted shrubs and trees around buildings, parking lots, and roads.

The animal species present on Artificial Island likely are typical of those inhabiting estuarine tidal marshes and adjacent habitats within the Delaware Estuary. Tidal marshes in this region are commonly used by many migrant and resident birds because they provide habitat for breeding, foraging, and resting (PSEG 2004). In 1972, Salem pre-construction surveys conducted within a 6 km (4 mi) radius of the project site recorded 44 avian species, including many shorebirds, wading birds, and waterfowl associated with open water and emergent marsh areas of the estuary. During construction of the Salem facility, several avian species were observed on the project site, including the red-winged blackbird (*Agelaius phoeniceus*), common grackle (*Quiscalus quiscula*), northern harrier (*Circus cyaneus*), song sparrow (*Melospiza melodia*), and yellowthroat (*Geothlypis trichas*) (AEC 1973). HCGS construction studies reported the occurrence of 178 bird species within 16 km (10 mi) of the project site. Approximately half of these species were recorded primarily from tidal marsh and the open water of the Delaware River (habitat similar to the project site) and roughly 45 of the 178 total observed species were classified as permanent resident species (PSEG 1983). The osprey (*Pandion haliaeetus*) has been observed nesting on transmission line towers on Artificial Island (PSEG 1983, NRC 1984, NJDFW 2009). Resident songbirds, such as the marsh wren (*Cistothorus palustris*), and migratory songbirds, such as the swamp sparrow (*Melospiza georgiana*), have been observed using the nearby Alloway Creek Estuary Enhancement Program restoration site for breeding purposes (PSEG 2004). These and other marsh species likely occur in the marsh habitats on Artificial Island.

Mammals reported to occur on Artificial Island in the area of the Salem and HCGS facilities before their construction include the eastern cottontail (*Sylvilagus floridanus*), Norway rat (*Rattus norvegicus*), and house mouse (*Mus musculus*) (AEC 1973). Signs of raccoon (*Procyon lotor*) have been observed near Salem, and other mammals likely to occur in the vicinity of the two facilities include the white-tailed deer (*Odocoileus virginianus*), muskrat (*Ondatra zibethica*), opossum (*Didelphis marsupialis*), and striped skunk (*Mephitis mephitis*). Surveys conducted in association with the construction of HCGS identified 45 mammals that could be expected to occur within 16 km (10 mi) of the project site (PSEG 1983). Of the 45 species identified, eight were species associated with marsh habitats, such as the meadow vole (*Microtus pennsylvanicus*) and marsh rice rat (*Oryzomys palustris*).

Eight of 26 reptile species observed during surveys related to the early operation of HCGS were recorded from tidal marsh (PSEG 1983). Three species, the snapping turtle (*Chelydra serpentina*), northern water snake (*Natrix sipedon*), and eastern mud turtle (*Kinosternon subrubrum*), prefer freshwater habitats but also occur in brackish marsh. The northern diamondback terrapin (*Malaclemys terrapin*), inhabits saltwater and brackish habitats and could occur in tidal marsh adjacent to the project site.

Two Wildlife Management Areas (WMAs) managed by the New Jersey Division of Fish and Wildlife are located near Salem and HCGS:

- Abbotts Meadow WMA encompasses approximately 1000 acres (405 ha) and is located about 4 mi (6.4 km) northeast of HCGS.
- Mad Horse Creek State WMA encompasses roughly 9500 acres (3844 ha), of which the northernmost portion is situated approximately 0.5 mi (0.8 km) from the site. The southern portion of this WMA includes Stowe Creek, which is designated as an Important Bird Area (IBA) in New Jersey. Stowe Creek IBA provides breeding habitat for several pairs of bald eagles (*Haliaeetus leucocephalus*), which are State-listed as endangered, and the adjacent tidal wetlands support large populations of the northern harrier, which also is State-listed as endangered, as well as many other birds dependent on salt marsh/wetland habitats (National Audubon Society 2010).

### 2.2.6.2 Transmission Line ROWs

Section 2.2.1 describes the existing power transmission system that distributes electricity from Salem and HCGS to the regional power grid. There are four 500-kV transmission lines within three ROWs that extend beyond the PSEG property on Artificial Island. Two ROWs extend northeast approximately 40 mi (64 km) to the New Freedom substation south of Philadelphia. The other ROW extends north then west approximately 25 mi (40 km), crossing the Delaware River to end at the Keeney substation in Delaware (Figure 2-X – Figure of power transmission system).

In total, the three ROWs for the Salem and HCGS power transmission system occupy approximately 4,376 acres (1,771 ha) and pass through a variety of habitat types, including marshes and other wetlands, agricultural or forested land, and some urban and residential areas (PSEG 2009a). When the ROWs exit Salem and HCGS, they initially pass through approximately 3 mi (5 km) of estuarine emergent marsh east of the property boundary. The primary land cover type then crossed by the north and south New Freedom ROWs (approximately 30 mi [48 km]) within their middle segments is a mixture of agricultural and forested land. The Keeney ROW exits HCGS and heads north, traversing approximately 5 mi (8 km) of emergent marsh and swamp paralleling the New Jersey coast, before it crosses 8 mi (13 km) of agricultural, sparsely forested, and rural residential property. The Keeney corridor then continues west across the Delaware River for approximately 3.25 mi (5.25 km) until it reaches the Red Lion substation. From the substation, the Red Lion-Keeney portion of the line within the Keeney ROW remains exclusively within Delaware, crossing primarily highly developed, residential land.

For approximately the last one-quarter of the length, the New Freedom ROWs, before their termination at the New Freedom substation, traverse the New Jersey Pinelands National Reserve (PNR) (NPS 2006a). Temperate broadleaf forest is the major ecosystem type of the reserve, which was designated a U.S. Biosphere Reserve in 1988 by the United Nations Educational, Scientific and Cultural Organization (UNESCO). Biosphere Reserves are areas of terrestrial and coastal ecosystems with three complementary roles: conservation, sustainable development, and logistical support for research, monitoring, and education (UNESCO 2010). PNR is protected and its future development is guided by the Pinelands Comprehensive Management Plan, which is implemented by the New Jersey Pinelands Commission. The commission is also responsible for regulating the maintenance of all bulk electric transmission

(> 69 kV) ROWs in the Pinelands area and, therefore, oversees maintenance of the portions of the north and south Salem/HCGS New Freedom ROWs that fall within the PNR (New Jersey Pinelands Commission 2009). The two New Freedom corridors also cross the Great Egg Harbor River, a designated National Scenic and Recreational River located within the PNR. This 129-mi (208 km) river system (including 17 tributaries) starts in suburban towns near Berlin, NJ and meanders for approximately 60 mi (97 km), gradually widening as tributaries enter, until terminating at the Atlantic Ocean.

The Endangered and Nongame Species Program of the NJDFW identifies critical habitat for bald eagles, including areas the species uses for foraging, roosting, and nesting. All three ROWs traverse land classified as critical bald eagle foraging habitat (NJDEP 2006). Typical foraging habitat for this species consists of tall trees for perching near large bodies of water. The tideland marshes of southern New Jersey are particularly good locations for winter foraging (NJDFW 2010).

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## 4.7 Threatened or Endangered Species

Potential impacts to threatened or endangered species are listed as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The GEIS section and category for this issue are listed in Table 4.7-1.

**Table 4.7-1. Category 2 Issues Applicable to Threatened or Endangered Species During the Renewal Term**

Issue	GEIS Section	Category
Threatened or endangered species	4.1	2

This site-specific issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected by continued operation of the nuclear facility during the license renewal term. The presence of threatened or endangered species in the vicinity of the site of the Salem and HCGS facilities is discussed in Sections 2.2.7.1 and 2.2.7.2. In 2009, the NRC staff contacted the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS) to request information on the occurrence of threatened or endangered species in the vicinity of the site and the potential for impacts on those species from license renewal. NMFS identified in its response a species federally listed as endangered, the shortnose sturgeon (*Acipenser brevirostrum*), and a candidate species, the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), as having the potential to be affected by the proposed action (NMFS 2010a). Additionally, NMFS identified four Federally listed sea turtle species, the threatened loggerhead (*Caretta caretta*), and the endangered Kemp's ridley (*Lepidochelys kemp*), green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*), as having the potential to be adversely affected by the proposed action. These six species, their habitats, and their life histories are described in Section 2.2.7.1.

In correspondence between FWS and PSEG prior to the NRCs request for information on Federally listed species potentially affected by the proposed action, FWS indicated that there were no Federally listed species under its jurisdiction present on the Salem and HCGS site. FWS did identify two species Federally listed as threatened that potentially could occur along the transmission lines: the bog turtle (*Clemmys muhlenbergii*) and swamp pink (*Helonias bullata*) (FWS 2009a).

The NRC staff has prepared a Biological Assessment (BA) for NMFS that documents its review of the potential for the proposed action to affect the Federally listed species under the jurisdiction of NMFS. The BA is provided in Appendix D of this draft SEIS. During informal consultation with FWS regarding the potential for effects on terrestrial threatened or endangered species, the staff determined that a BA for FWS was not needed because there was no likelihood of adverse effects on potentially occurring Federally listed species under the jurisdiction of FWS.

### 4.7.1 Aquatic Threatened or Endangered Species of the Delaware Estuary

Pursuant to consultation requirements under Section 7 of the Endangered Species Act of 1973, the NRC staff requested in a letter to NMFS dated December 23, 2009 (NRC 2009) that NMFS provide information on federally listed endangered or threatened species, as well as proposed

or candidate species. In its response on February 11, 2010, NMFS stated that the shortnose sturgeon, the Atlantic sturgeon, and four sea turtle species are known to occur in the Delaware River and estuary in the vicinity of Salem and HCGS, and that no critical habitat is currently designated by NMFS near these facilities (NMFS 2010a).

Consultation between NMFS and NRC with regard to the cooling water intake system (CWIS) for Salem and HCGS has been ongoing since before each facility began operation. In 1980, a Biological Opinion issued by NMFS concluded that the continued operation of these facilities was not likely to jeopardize the shortnose sturgeon. After sea turtles were impinged on the intake trash bars at the Salem facility, consultation was reinitiated in 1988 to evaluate the effects of these takes on the sea turtle species involved. (Takes are considered to include mortalities as well as turtles that are impinged but removed alive and released.) In 1991, NMFS issued a Biological Opinion which found that continued operation of Salem and HCGS would affect threatened or endangered sea turtles but was not likely to jeopardize any populations, and an incidental take statement was issued for Kemp's ridley, green, and loggerhead turtles and shortnose sturgeon. The number of turtles impinged in 1991 was unexpectedly high, exceeding the incidental take allowed and resulting in additional consultation. An opinion issued in 1992 revised the incidental take statement. The impingement of sea turtles exceeded the allowable take in 1992 as well, prompting additional consultation with NMFS (NMFS 1999 and 2010b). A 1993 Biological Opinion required the tracking of all loggerhead sea turtles taken at the CWIS. Also in 1993, PSEG implemented a policy of removing the ice barriers from the trash racks on the intake structure during the period between May 1 and October 24, which resulted in substantially lower turtle impingement rates at Salem (one in 1993 and one in 1995).

In 1999, NRC requested that these studies be eliminated due to the reduction in the number of turtles impinged after the 1993 change in procedure regarding the removal of ice barriers. NMFS responded in 1999 with a letter and an incidental take statement stating that these studies could be discontinued because it appeared that the reason for the relatively high impingement numbers previously was the ice barriers that had been left on the intake structure during the warmer months (NMFS 1999). This letter allowed an annual incidental take of 5 shortnose sturgeon, 30 loggerhead sea turtles, 5 green sea turtles, and 5 Kemp's ridley sea turtles. In addition, the statement required ice barrier removal by May 1 and replacement after October 24, and it required that in the warmer months the trash racks must be cleaned weekly and inspected every other hour, and in the winter they should be cleaned every other week. The statement requires that if a turtle is killed, the racks must be inspected every hour for the rest of the warm season. Dead shortnose sturgeon are required to be inspected for tags, and live sturgeon are to be tagged and released (NMFS 1999).

No threatened or endangered species have been impinged at the Hope Creek intake structure, and NMFS does not require monitoring beyond normal cleaning operations for Hope Creek (NMFS 1993). Table 4.7-2 summarizes information on the incidental take by impingement at the Salem intakes of sturgeon and sea turtles during the monitoring period 1978 – 2008.

The NRC staff evaluated the potential effects of entrainment, impingement, and thermal discharges on these and other important species in Sections 4.5.2, 4.5.3, and 4.5.4. Based on an evaluation of entrainment data provided by PSEG, there is no evidence that the eggs or larvae of either sturgeon species are commonly entrained at Salem and HCGS. Neither of the sturgeon species is on the list of species that has been collected in annual entrainment monitoring during the 1978 – 2008 period (Table 4.5-6). The life histories of these sturgeon, described in Section 2.2.7.1, suggest that entrainment of their eggs or larvae is unlikely. Shortnose sturgeon spawn upstream in fresh reaches of the Delaware River and are most abundant between Philadelphia and Trenton. Their eggs are demersal and adhere to the substrate, and their juvenile stages tend to remain in freshwater or fresher areas of the estuary

for 3 to 5 years before moving to more saline areas such as the nearshore ocean. Thus, shortnose sturgeon eggs or larvae are unlikely to be present in the water column at the Salem or HCGS intakes well downstream of the spawning areas. Similarly, the life history of the Atlantic sturgeon makes entrainment of its eggs or larvae very unlikely.

Impingement data provided by the applicant suggest that both sturgeon and three of the four turtle species have been impinged at Salem (Table 4.7-2). Atlantic sturgeon were collected in impingement studies in a single year, 2006 (PSEG biological monitoring reports 1995-2006). Impingement data for the shortnose sturgeon show that from 1978 to 2008, 18 fish were impinged at the Salem intakes, of which 16 died. Between 1978 and 2008, 24 Kemp's ridley sea turtles were impinged, of which ten died. Three green turtles (one died) and 68 loggerhead turtles (25 died) also were impinged. Impingement of the turtles was greatest in 1991 and 1992 (Table 4.7-2). After PSEG modified its use of the ice barriers in 1993, turtle impingement numbers returned to levels much lower than in 1991. From 1994 through 2008, there were six sea turtles impinged (all loggerheads), and four of these died. Also during this 15-yr period, 11 shortnose sturgeon were impinged, of which eight died.

**Table 4.7-2.** Impingement data for shortnose sturgeon and three sea turtle species with recorded impingements at Salem intakes, 1978-2008.

Year	Impingement Numbers by Species <sup>(1)</sup>			
	Shortnose sturgeon	Kemp's ridley sea turtle	Green sea turtle	Loggerhead sea turtle
1978	2 (2)	0	0	0
1979	0	0	0	0
1980	0	1	1	2 (2)
1981	1 (1)	1 (1)	0	3 (2)
1982	0	0	0	1 (1)
1983	0	1 (1)	0	2 (2)
1984	0	1	0	2 (2)
1985	0	2 (1)	0	6 (5)
1986	0	1 (1)	0	0
1987	0	3 (1)	0	3
1988	0	2 (1)	0	8 (6)
1989	0	6 (2)	0	2
1990	0	0	0	0
1991	3 (3)	1	1	23 (1)
1992	2 (2)	4 (2)	1 (1)	10
1993	0	1	0	0
1994	2 (2)	0	0	1
1995	0	0	0	1 (1)
1996	0	0	0	0
1997	0	0	0	0
1998	3 (1)	0	0	1 (1)
1999	1	0	0	0
2000	1 (1)	0	0	2 (1)
2001	0	0	0	1 (1)

Year	Impingement Numbers by Species <sup>(1)</sup>			
	Shortnose sturgeon	Kemp's ridley sea turtle	Green sea turtle	Loggerhead sea turtle
2002	0	0	0	0
2003	1 (1)	0	0	0
2004	1 (1)	0	0	0
2005	0	0	0	0
2006	0	0	0	0
2007	1 (1)	0	0	0
2008	1 (1)	0	0	0
Total	18 (16)	24 (10)	3 (1)	68 (25)

(1) Numbers in parentheses indicate the number of individuals out of the yearly total shown that were either dead when found at the intakes or died afterward. Impingements of Atlantic sturgeon or leatherback sea turtles were not reported in the data on which this table was based.

Source: PSEG (2010).

The potential impacts of thermal discharges on the aquatic biota of the Delaware Estuary is discussed in Section 4.5.4, and impacts on fish and invertebrates, including those preyed upon by sturgeon and sea turtles, are expected to be minimal. The high exit velocity of the discharge produces rapid dilution, which limits high temperatures to relatively small areas in the zone of initial mixing in the immediate vicinity of the discharge. Fish and many other organisms are largely excluded from these areas due to high velocities and turbulence. Shortnose and Atlantic sturgeon and the four sea turtle species have very little potential to experience adverse effects from exposure to the temperatures at the discharge because of their life history characteristics and their mobility. Sturgeon spawning and nursery areas do not occur in the area of the discharge in the estuary, and adult sturgeon forage on the bottom while the buoyant thermal plume rises toward the surface. Sea turtles prefer warmer water temperatures, occur in the region only during warm months, and are unlikely to be sensitive to the localized area of elevated temperatures at the discharge. NMFS considered the possibility that the warm water near the discharge could cause sea turtles to remain in the area until surrounding waters are too cold for their safe departure in the fall, but it concluded that this scenario was not supported by any existing data (NMFS 1993).

The NRC staff reviewed information from the site audit, the applicant's Environmental Reports for Salem and HCGS, biological monitoring reports, other reports, and coordination with NMFS, FWS, and State regulatory agencies in New Jersey and Delaware regarding listed species. The NRC staff concludes that the impacts on federally listed threatened or endangered aquatic species of the Delaware Estuary during an additional 20 years of operation of the Salem and HCGS facilities would be SMALL.

#### 4.7.2 Terrestrial and Freshwater Aquatic Threatened or Endangered Species

Two terrestrial or freshwater aquatic species that are Federally listed have the potential to occur near the Salem and HCGS facilities and their associated transmission line ROWs: the bog turtle and swamp pink. The characteristics, habitat requirements, and likelihood of occurrence of these species are discussed in Section 2.2.7.2. Coordination correspondence between PSEG and FWS indicates that no Federally listed species occur on the site of the Salem and

HCGS facilities, but that the bog turtle and swamp pink potentially could occur within the transmission line ROWs (FWS 2009a).

FWS coordinated with PSEG to review all of its transmission line spans in New Jersey and transmitted to PSEG the known locations of the presence or potential presence of Federally listed species along each span. FWS also recommended to PSEG conservation measures for each Federally listed species that potentially could occur along its transmission line spans (FWS 2009a). In October 2009, PSEG confirmed to FWS its commitment to protecting both Federally and State listed threatened or endangered species along PSEG transmission line ROWs, and it adopted the conservation measures recommended by FWS for each species (PSEG 2009). Based on PSEG's adoption of these conservation measures, FWS in November 2009 concurred that "continued vegetation maintenance activities within the transmission system are not likely to adversely affect federally listed or candidate species." (FWS 2009b) Thus, the Federally listed species potentially occurring in the transmission line ROWs for Salem and HCGS in New Jersey would not be adversely affected by future vegetation maintenance activities. The FWS New Jersey Field Office also coordinated with the FWS Chesapeake Bay Field Office regarding the transmission line ROW from HCGS that crosses the river and traverses New Castle County in Delaware. FWS concluded that "no proposed or federally listed endangered or threatened species are known to exist" within that ROW area (FWS 2009b).

The ROW maintenance procedures agreed upon for protection of the bog turtle include: use of a certified bog turtle surveyor to examine spans containing known or potential habitat, to flag areas of potential habitat plus a 150-ft buffer, and to be on site during maintenance activities in flagged areas; performance of maintenance activities by hand in flagged areas, including selective use of specific herbicides; no use of herbicide in known nesting areas, which include all flagged areas around extant occurrences; timing restrictions to avoid disturbance during nesting season; and provision of the surveyor's reports to FWS (PSEG 2009). The ROW maintenance procedures agreed upon for protection of the swamp pink include: use of a qualified botanist to survey suitable forested wetland habitat on and adjacent to the ROW for the plant; flagging of a 200-ft radius area around any identified populations of swamp pink; avoidance of any maintenance activities within the flagged areas without FWS approval; limitation of herbicide use within 500 ft of a population to manual applications to woody stumps only; and provision of the surveyor's reports to FWS (PSEG 2009).

The NRC staff reviewed information from the site audit, Environmental Reports for Salem and HCGS, other reports, and coordination with FWS and State regulatory agencies in New Jersey and Delaware regarding listed species. The NRC staff concludes that the impacts on Federally listed terrestrial and freshwater aquatic species from an additional 20 years of operation and maintenance of the Salem and HCGS facilities and associated transmission line ROWs would be SMALL.

#### **References:**

Delaware Department of Natural Resources and Environmental Control (DNREC). 2009. Letter from E. Stetzar, biologist/environmental review coordinator, Natural Heritage and Endangered Species, Division of Fish and Wildlife, to E. J. Keating, PSEG Nuclear LLC. Letter responded to request from PSEG for information on rare, threatened, and endangered species and other significant natural resources relevant to operating license renewal for Salem and HCGS, and it specifically addressed the ROW alignment extending from Artificial Island, NJ across the Delaware River to end in New Castle County, DE. April 21. Copy of letter provided in Appendix C of Applicant's Environmental Report for Salem (PSEG 2009a).

PSEG Nuclear, LLC (PSEG). 2009a. Salem Nuclear Generating Station, Units 1 and 2, License Renewal Application, Appendix E - Applicant's Environmental Report – Operating License Renewal Stage. Lower Alloways Creek Township, New Jersey. August, 2009. ADAMS Nos. ML092400532, ML092400531, ML092430231.

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National Marine Fisheries Service (NMFS). 2010. Letter to Bo Pham, Chief, Project Branch 1. Division of License Renewal, Office of Nuclear Reactor Regulation, regarding information on the presence of species listed as threatened or endangered by NOAA's National Marine Fisheries Service in the vicinity of Salem and Hope Creek generating stations.

New Jersey Department of Environmental Protection (NJDEP). 2008. Letter from H. A. Lord, data request specialist, Natural Heritage Program, to L. Bryan, Tetra Tech NUS, Inc. Letter responded to request for rare species information for the Salem and HCGS site and transmission line ROWs in Camden, Gloucester, and Salem Counties.

New Jersey Department of Environmental Protection (NJDEP). 2009. Letter from C. D. Jenkins, Chief, Endangered and Nongame Species Program, to E. J. Keating, PSEG Nuclear LLC, Hancocks Bridge, NJ. Letter responded to request from PSEG for information on listed species or critical habitat at the Salem and Hope Creek Generating Stations and along associated transmission corridors. April 2.

PSEG Nuclear, LLC. 2009. Letter from PSEG, Newark, NJ to W. Walsh, U. S. Fish and Wildlife Service, New Jersey Field Office, Pleasantville, NJ regarding PSEG freshwater wetlands permit no. 000-02-0031.2 and endangered species compliance during electric transmission right-of-way vegetation maintenance activities.

PSEG Nuclear, LLC. 2010. Tables summarizing impingement data for shortnose sturgeon, Atlantic sturgeon, and loggerhead, green, and Kemp's ridley sea turtles. Provided by PSEG on May 3 in response PSEG-4 to NRC request for additional information (RAI) dated April 16, 2010.

U.S. Fish and Wildlife Service (FWS). 2009a. Letter from New Jersey Field Office, Pleasantville, NJ to E. J. Keating, PSEG Nuclear LLC, Hancocks Bridge, NJ in response to PSEG request for information on the presence of federally listed endangered and threatened species in the vicinity of the existing Salem and Hope Creek Generating Stations located on Artificial Island in Lower Alloways Creek Township, Salem County, NJ. September 9.

U.S. Fish and Wildlife Service (FWS). 2009b. Letter from New Jersey Field Office, Pleasantville, NJ to R. A. Tripodi, Manager, Corporate Licenses and Permits, PSEG Services Corporation, Newark, NJ in response to PSEG letter of October 23, 2009 confirming commitment by PSEG to ROW vegetation maintenance procedures protective of listed species and recommended by FWS. November 4.

U.S. Nuclear Regulatory Commission (NRC). 2009. Letter to NMFS regarding: Request for List of Protected Species within the Area Under Evaluation for the Salem and Hope Creek Nuclear Generating Stations License Renewal Application Review.

## 2.2.7 Threatened and Endangered Species

This discussion of threatened and endangered species is organized based on the principal ecosystems in which such species may occur in the vicinity of the Salem and HCGS facilities and the associated transmission line ROWs. Thus, Section 2.2.7.1 discusses aquatic species that may occur in adjacent areas of the Delaware Estuary, and Section 2.2.7.2 discusses terrestrial species that may occur on Artificial Island or the three ROWs, as well as freshwater aquatic species that may occur in the relatively small streams and wetlands within these terrestrial areas.

### 2.2.7.1 Aquatic Species of the Delaware Estuary

There are five aquatic species with a federal listing status of threatened or endangered that have the potential to occur in the Delaware Estuary in the vicinity of the Salem and HCGS facilities. These species include four sea turtles and one fish (Table 2.2.7-1). In addition, there is one fish species that is a federal candidate for listing (NMFS 2010a; FWS 2010). These six species also have a State listing status of threatened or endangered in New Jersey and/or Delaware (NJDEP 2008; Delaware Department of Natural Resources and Environmental Control [DNREC] 2008). These species are discussed below.

**Table 2.2.7-1.** Threatened and Endangered Aquatic Species of the Delaware Estuary

Scientific Name	Common Name	Status <sup>1</sup>		
		Federal	New Jersey	Delaware
<b>Reptiles</b>				
<i>Caretta caretta</i>	loggerhead sea turtle	T	E	E
<i>Chelonia mydas</i>	green sea turtle	T	T	E
<i>Lepidochelys kempii</i>	Kemp's ridley sea turtle	E	E	E
<i>Dermochelys coriacea</i>	leatherback sea turtle	E	E	E
<b>Fish</b>				
<i>Acipenser brevirostrum</i>	shortnose sturgeon	E	E	-
<i>A. oxyrinchus oxyrinchus</i>	Atlantic sturgeon	C	-	E

<sup>1</sup> E = Endangered; T = Threatened; C = Candidate

#### Kemp's Ridley, Loggerhead, Green, and Leatherback Sea Turtles

Sea turtles are air-breathing reptiles with large flippers and streamlined bodies. They inhabit tropical and subtropical marine and estuarine waters around the world. Of the seven species in the world, six occur in waters of the U.S., and all are listed as threatened or endangered. The four species identified by NMFS as potentially occurring in the Delaware Estuary are the threatened loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) and the endangered Kemp's ridley (*Lepidochelys kempii*), and leatherback (*Dermochelys coriacea*) sea turtles. Kemp's ridley, loggerhead, and green sea turtles have been documented in the Delaware Estuary at or near the Salem and HCGS facilities, while the leatherback sea turtle is less likely to occur in the vicinity (NMFS 2010a).

Kemp's ridley, loggerhead, and green sea turtles have a similar appearance, though they differ

in maximum size and coloration. The Kemp's ridley is the smallest species of sea turtle; adults average about 100 pounds (45 kilograms [kg]) with a carapace length of 24 to 28 inches (61 to 71 centimeters [cm]) and a shell color that varies from gray in young individuals to olive green in adults. The loggerhead is the next largest of these three species; adults average about 250 pounds (113 kg) with a carapace length of 36 inches (91 cm) and a reddish brown shell color. The green is the largest of the three; adults average 300 to 350 pounds (136 to 159 kg) with a length of more than 3 feet (1 meter [m]) and brown coloration (its name comes from its greenish colored fat). The leatherback is the largest species of sea turtle and the largest living reptile; adults can weigh up to about 2000 pounds (907 kg) with a length of 6.5 feet (2 m). The leatherback is the only sea turtle that lacks a hard, bony shell. Instead, its carapace is approximately 1.5 inches (4 cm) thick with seven longitudinal ridges and consists of loosely connected dermal bones covered by leathery connective tissue. The Kemp's ridley has a carnivorous diet that includes fish, jellyfish, and mollusks. The loggerhead has an omnivorous diet that includes fish, jellyfish, mollusks, crustaceans, and aquatic plants. The green has a herbivorous diet of aquatic plants, mainly seagrasses and algae, that is unique among sea turtles. The leatherback has a carnivorous diet of soft-bodied, pelagic prey such as jellyfish and salps (NMFS 2010b).

All four of these sea turtle species nest on sandy beaches; none nest on the Delaware River (NMFS 2010b). They are distributed generally in tropical and subtropical waters worldwide, and there is evidence that they return to their natal beaches to nest. The leatherback has the widest distribution of all the species, as it has physiological adaptations that allow survival and foraging in much colder water than the other species (NMFS and FWS 2007c). Major threats to these sea turtles include the destruction of beach nesting habitats and incidental mortality from commercial fishing activities. Sea turtles are killed by many fishing methods, including longline, bottom and mid-water trawling, dredges, gillnets, and pots/traps. The required use of turtle exclusion devices has reduced bycatch mortality. Additional sources of mortality due to human activities include boat strikes and entanglement in marine debris (NMFS and FWS 2007a, 2007b, and 2007c; NOAA 2010a).

### Shortnose Sturgeon

The shortnose sturgeon (*Acipenser brevirostrum*) is a primitive fish, similar in appearance to other sturgeon (NOAA 2010b), and has not evolved significantly for the past 120 million years (Northeast Fisheries Science Center [NEFSC] 2006). This species was not specifically targeted as a commercial fishery species, but has been taken as bycatch in the Atlantic sturgeon and shad fisheries. As they were not easily distinguished from Atlantic sturgeon, early data is unavailable for this species (NMFS 1998). Furthermore, since the 1950s, when the Atlantic sturgeon fishery declined, shortnose sturgeon data has been almost completely lacking. Due to this lack of data, the USFWS believed that the species had been extirpated from most of its range; reasons noted for the decline included pollution and overfishing. Later research indicated that the construction of dams and industrial growth along the larger rivers on the Atlantic coast in the late 1800s also contributed to their decline due to loss of habitat.

In 1967, the shortnose sturgeon was listed as endangered under the recently implemented Endangered Species Preservation Act of 1966. After the Endangered Species Act was passed in 1973, NMFS assumed responsibility for the species in 1974. NMFS established a recovery plan in 1998 listing actions that would assist in increasing population sizes (NOAA 2010b). The overall objective of the recovery plan is to maintain genetic diversity and avoid extinction of the species (NEFSC 2006). The recovery plan recognizes 19 different populations along the Atlantic Coast due to the fact that sturgeon in each population return to their natal rivers to spawn, making genetic intermingling unlikely. The populations are still managed together, however, as not enough data currently exist to definitively separate the breeding populations

(NMFS 1998). The ASMFC currently manages the shortnose sturgeon along with the Atlantic sturgeon under a management plan that was implemented in 1990. An amendment was added in 1998 prohibiting all sturgeon harvesting in response to a rapid decline in abundance. This amendment requires 20 year classes of females to be present in any population before any fishing is considered. As of 2006, no shortnose sturgeon had been caught in the NMFS bottom trawl survey program (NEFSC 2006).

The shortnose sturgeon is found along the Atlantic coast from Canada to Florida in a variety of habitats. They occur in fast-flowing riverine waters, estuaries, and, in some locations, offshore marine areas over the continental slope. They are anadromous, spawning in coastal rivers and later migrating into estuaries and nearshore environments during the non-spawning periods. They do not appear to make long distance offshore migrations like other anadromous fishes (NOAA 2010b). Migration into freshwater to spawn occurs between late winter and early summer, dependent on latitude (NEFSC 2006). Spawning occurs in deep, rapidly flowing water over gravel, rubble, or boulder substrates (USFWS 2001). Eggs are deposited on hard surfaces to which they adhere before hatching after 9 to 12 days. The yolk sac is absorbed in an additional 9 to 12 days (NMFS 1998). Juveniles remain in freshwater or the fresher areas of estuaries for 3 to 5 years, then they move to more saline areas, including nearshore ocean waters (NEFSC 2006). Shortnose sturgeon can live up to 30 years (males) to 67 years (females), can grow up to 4.7 ft (143 cm) long, and can reach a weight of 51 pounds (23 kg). Age at sexual maturity varies within their range from north to south, with individuals in the Delaware Bay area reaching maturity at 3 to 5 years for males and approximately 6 years for females (NOAA 2010b). Shortnose sturgeon are demersal and feed on benthos. Juveniles feed on benthic insects such as *Hexagenia* sp., *Chaoborus* sp., *Chironomus* sp., and small crustaceans (*Gammarus* sp., *Asellus* sp., *Cyathura polita*) (NMFS 1998). Adults feed over gravel and mud substrates, in deep channels and nearshore ocean waters (USFWS 2001), where they consume mostly mollusks and larger crustaceans (NOAA 2010b). Prey species for adults include *Physa* sp., *Heliosoma* sp., *Corbicula manilensis*, *Ammicola limnosa*, *Valvata* sp., *Pisidium* sp., *Elliptio complanata*, *Mya arenaria*, *Macoma balthica*, gammarid amphipods, and zebra mussels (*Dreissena polymorpha*) (NMFS 1998). Additional food items for both juveniles and adults include worms, plants, and small fish (NEFSC 2006).

In the Delaware Estuary, shortnose sturgeon most often occur in the Delaware River and may be found occasionally in the nearshore ocean. Their abundance is greatest between Trenton, New Jersey and Philadelphia, Pennsylvania. Adults overwinter in large groups between Trenton and Bordentown, New Jersey, but little is known of the distribution of juveniles in the Delaware estuary (USACE 2009). A review of the status of the shortnose sturgeon was initiated in 2007 and was still underway as of 2008, when the latest biennial report to Congress regarding the Endangered Species Act was completed. Due to its distinct populations, the status of the species varies depending on the river in question. The population estimate for the Delaware Estuary (1999-2003) was 12,047 adults. Current threats to the shortnose sturgeon also vary among rivers. Generally, over the entire range, most threats are related to dams, pollution, and general industrial growth in the 1800s. Drought and climate change are considered aggravators of the existing threats due to lowered water levels which can reduce access to spawning areas, increase thermal injury and concentrate pollutants. Additional threats include discharges, dredging or disposal of material into rivers, development activities involving estuaries or riverine mudflats and marshes, and mortality due to bycatch in the shad gillnet fishery. The Delaware River population is most threatened by dredging operations and water quality issues (NMFS 2008).

## Atlantic Sturgeon

Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) are an evolutionarily ancient fish, remaining relatively unchanged for the past 70 million years. They were originally considered a junk fish, used as fertilizer and fuel. As the demand for caviar grew, they were harvested for human consumption. By 1870, a large commercial fishery for Atlantic sturgeon was established. This fishery crashed in approximately 100 years due to overfishing, exacerbated by the fact that this species takes a very long time to reach sexual maturity. They were caught for many reasons: their flesh and eggs were processed for human consumption, their skin was made into leather products such as book bindings, and their swim bladders were used to make gelatin and small windows. Landings at the turn of the century averaged seven million pounds per year. They declined to 100,000 to 250,000 pounds by the 1990s. The ASMFC adopted a Fishery Management Plan (FMP) in 1990 that implemented harvest quotas. The FMP was amended in 1998 with a coast-wide moratorium on Atlantic sturgeon harvest that will remain in place until 2038. This moratorium was mirrored by the federal government in 1999, prohibiting harvest in the exclusive economic zone offshore (ASMFC 2009g). Recommendations in the FMP with respect to habitat conservation include identifying, characterizing, and protecting critical spawning and nursery areas, identifying critical habitat characteristics of spawning staging and oceanic areas, determining environmental tolerance levels (dissolved oxygen, pH, temperature, river flow, salinity, etc.) for all life stages, and determining the effects of contaminants on all life stages, especially eggs, larvae, and juveniles (ASMFC 2010f).

The current status of the Atlantic sturgeon stock is unknown due to little reliable data. In 1998, a coast wide stock assessment determined that biomass was much lower than it had been in the early 1900s. This assessment resulted in the coast wide moratorium in an effort to accumulate 20 years worth of breeding stock. Concurrent with the assessment, it was decided that listing the Atlantic sturgeon as threatened or endangered was not warranted. The NMFS reviewed the status again in 2005 and concluded that the stock should be broken into five distinct populations, the Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic stocks. Three of these are likely to become endangered (Carolina, Chesapeake Bay, and New York Bight). The other two populations have a moderate chance of becoming endangered. Due to a lack of appropriate data, the NMFS could not list the species as threatened or endangered at that time. Threats to the Atlantic sturgeon and its habitat include bycatch mortality, poor water quality, lack of adequate state and/or federal regulatory mechanisms, dredging activities, habitat impediments (dams blocking spawning areas) and ship strikes (ASMFC 2009g). As of 2009, the Atlantic sturgeon over its entire range is listed as a species of concern and a candidate species by the NMFS. Reasons for the listing include genetic diversity (distinct populations) and lack of population size estimates (only the Hudson and Altamaha River populations are adequately documented) (NOAA 2009a).

Atlantic sturgeon are found along the Atlantic coast in the ocean, large rivers, and estuaries from Labrador to northern Florida. They have been extirpated from most coastal systems except for the Hudson River, the Delaware River, and some South Carolina systems (ASMFC 2010f). They are anadromous, migrating inshore to coastal estuaries and rivers to spawn in the spring. A single fish will only spawn every 2 to 6 years (ASMFC 2009g). Spawning is accomplished by broadcasting eggs in fast-flowing, deep water with hard bottoms (ASMFC 2010f). Eggs are demersal and stick to the substrate after 20 minutes of dispersal time. Larvae are pelagic, swimming in the water column, becoming benthic juveniles within 4 weeks (ASMFC 2009h). Juveniles remain where they hatch for 1 to 6 years before migrating to the ocean to complete their growth (ASMFC 2009g). Little is known about the distribution and timing of juveniles and their migration, but aggregations at the freshwater/saltwater interface suggest that these areas are nurseries (ASMFC 2010f). At between 30 and 36 inches (76 to 91

cm) in length, juveniles move offshore (NOAA 2009a). Data are lacking regarding adult and sub-adult distribution and habitats in the open ocean (ASMFC 2010f). Atlantic sturgeon can live for up to 60 years and can reach 14 ft (4.3 m) long and 800 lbs (363 kg). Sexual maturity is reached by females between 7 and 30 years of age and by males between 5 and 24 years (ASMFC 2009g).

Atlantic sturgeon are benthic predators and feed on mussels, worms, shrimps, and small fish (ASMFC 2009g). Juveniles are known to consume sludgeworms, annelid worms, polychaete worms, isopods, amphipods, chironomid larvae, mayfly and other insect larvae, small bivalve mollusks, mysids, and amphipods. Little is known of the adult and subadult feeding habits in the marine environment, but some studies have found that these life stages consume mollusks, polychaetes, gastropods, shrimps, amphipods, isopods, and small fish. Juveniles and adults may compete for food with other benthic feeders such as shortnose sturgeon, suckers (*Moxotoma* sp.), winter flounder (*Pleuronectes americanus*), tautog (*Tautoga onitis*), cunner (*Tautoglabrus adspersus*), porgies (Sparidae), croakers (Sciaenidae), and stingrays (*Dasyatis* sp.). Juveniles are preyed upon by sea lampreys (*Petromyzon marinus*), gar (*Lepisosteus* sp.), striped bass, common carp (*Cyprinus carpio*), northern pikeminnow (*Ptychocheilus oregonensis*), channel catfish (*Ictalurus punctatus*), smallmouth bass (*Micropterus dolomieu*), walleye (*Sander vitreus*), fallfish (*Semotilus corporalis*), and grey seal (*Halichoerus grypus*) (ASMFC 2009h).

The Delaware River and associated estuarine habitats may have historically supported the largest Atlantic sturgeon stock on the east coast. Juveniles were once caught as bycatch in numbers large enough to be a nuisance in the American shad fishery. It has been estimated that over 180,000 females spawned annually in the Delaware River before 1870. Juveniles have more recently been captured in surveys near Trenton, New Jersey. Gill net surveys by the DNREC have captured juveniles frequently near Artificial Island and Cherry Island Flats. The DNREC also tracks mortality during the spawning season. In 2005 and 2006, 12 large adult fish carcasses were found with severe external injuries, presumed to be caused by boat strikes (ASMFC 2009h).

### **2.2.7.2 Terrestrial and Freshwater Aquatic Species**

There are seven terrestrial species with a federal listing status of threatened or endangered that have recorded occurrences or the potential to occur either in the county in Salem County, in which the Salem and HCGS facilities are located, or the additional counties crossed by the three ROWs (Gloucester and Camden Counties in New Jersey, New Castle County in Delaware). These species include a turtle, a beetle, and five plants (Table 2.2.7-2) (FWS 2010). Six of these species (all except one plant) also have a State listing status of endangered in New Jersey, and the turtle has a state status of endangered in both states (NJDEP 2008; DNREC 2008). In letters provided in accordance with the consultation requirements under Section 7 of the Endangered Species Act, FWS confirmed that no federally listed species under their jurisdiction are known to occur in the vicinity of the Salem and HCGS facilities (FWS 2009a and 2009b). However, two of the species federally listed as threatened were identified by the New Jersey Field Office of FWS (FWS 2009a) as having known occurrences or other areas of potential habitat along the New Freedom North and South transmission line ROWs: the bog turtle (*Clemmys mühlenbergii*) and the swamp pink (*Helonias bullata*). These species are discussed below.

#### **Bog Turtle**

The bog turtle (now also referred to as *Glyptemys mühlenbergii*) has two discontinuous populations. The northern population, which occurs in Connecticut, Delaware, Maryland,

Massachusetts, New Jersey, New York, and Pennsylvania, was federally listed as threatened in 1997 under the ESA (16 USC 1531 *et seq.*). The southern population was listed as threatened due to its similarity of appearance to the northern population. The southern population occurs mainly in the Appalachian Mountains from southern Virginia through the Carolinas to northern Georgia and eastern Tennessee. The bog turtle was federally listed due to declines in abundance caused by loss, fragmentation, and degradation of early successional wet-meadow habitat, and by collection for the wildlife trade (FWS 2001). The northern population was listed as endangered by the state of New Jersey in 1974 (NJDFW 2010c). In New Jersey, bog turtles are mainly restricted to rural areas of the state, including Salem, Sussex, Warren, and Hunterdon Counties. Nevertheless, New Jersey is home to one of the largest strongholds in the bog turtle's range, and as of 2003, there were over 200 individual wetlands that supported this species (NJDFW 2010a).

The bog turtle is one of the smallest turtles in North America. Its upper shell is 3 to 4 inches (7.6 to 10.2 cm) long and light brown to black in color, and each side of its black head has a distinctive patch of color that is red, orange, or yellow. Its life span is generally 20 to 30 years, but may be 40 years or longer. In New Jersey, the bog turtle usually is active from April through October (mating occurs mostly between May and June) and hibernates the remainder of the year, often within the ground water-washed root systems of woody plants (USFWS 2004, NJDFW 2010a). Hibernation usually occurs in more densely vegetated areas in the interfaces between open areas and wooded swamps with small trees and shrubs such as alder, gray birch, red maple, and tamarack. After mating, the female turtle typically digs a hole in which to deposit her eggs, though in some areas, eggs are laid on top of the ground in sedge tussocks. Clutches vary from one to five eggs, and hatchlings usually emerge in September, but there is evidence that the eggs also can overwinter and hatch the next spring (USFWS 2001).

The bog turtle is diurnal and semi-aquatic, and forages on land and in water for its varied diet of plants (seeds, berries, duckweed), animals (insect larvae, snails, beetles), and carrion. The most abundant and preferred food source found in their habitat is the common slug (USFWS 2001, USFWS 2004 and NJDFW 2004). Northern bog turtles primarily inhabit wetlands fed by groundwater or associated with the headwaters of streams and dominated by emergent vegetation. These habitats typically have shallow, cool water that flows slowly and vegetation that is early successional, with open canopies and wet meadows of sedges (*Carex* spp.). Other herbs commonly present include spike rushes (*Eleocharis* spp.) and bulrushes (*Juncus* spp. and *Scirpus* spp.) (FWS 2001). Bog turtle habitats in New Jersey are typically characterized by native communities of low-lying grasses, sedges, mosses, and rushes; however, many of these areas are in need of restoration and management due to the encroachment of woody species and invasive species such as common reed (*Phragmites australis*), cattail (*Typha* spp.), and Japanese stiltgrass (*Microstegium vimineum*) (NJDFW 2010b). Later successional species may discourage bog turtle occupation as they shade the basking areas in a habitat. Livestock grazing maintains the early successional stage, providing favorable conditions for bog turtles (NJDFW 2010c).

Bog turtles once existed in 18 counties in New Jersey but are now known from only 13 (FWS 2001). There were 168 known bog turtle populations in New Jersey in 2001, and 28 of these were considered metapopulations, which are defined as two or more bog turtle colonies that are connected by a complex of wetlands or other suitable habitat. These populations are extremely important as they can provide pathways for the recovery of the species through dispersal, gene flow, and colonization of adjacent habitats. Current conservation efforts in New Jersey include developing positive relationships with private landowners, acquiring sites threatened by adjacent land uses, habitat management practices protective of the turtles, and community outreach (NJDFW 2010a).

## Swamp pink

Swamp pink historically occurred between New York State and the southern Appalachian Mountains of Georgia. It currently is found in Georgia, North Carolina, South Carolina, Delaware, Maryland, New Jersey, New York, and Virginia, but the largest concentrations are found in New Jersey (Center for Plant Conservation 2010). Swamp pink was federally listed as a threatened species in 1988 due to population declines and threats to its habitat (FWS 1991). It also was listed as endangered by the State of New Jersey in 1991 and currently is also designated as endangered in Delaware and six other states (Center for Plant Conservation 2010). New Jersey contains 70 percent of the known populations of swamp pink, most of which are on private lands. Swamp pink continues to be threatened by direct loss of habitat to development, and by development adjacent to populations, which can interfere with hydrology and reduce water quality (FWS 2010).

Swamp pink is a member of the lily family and has smooth evergreen leaves that are shiny when young and can turn purplish when older. The flower stem is 1 to 3 feet (30 to 91 cm) tall and has small leaves along it. Swamp pink flowers in April and May. The flowers are clustered (30 to 50 flowers) at the top of the stalk and are pink with blue anthers (FWS 2010). Fruits are trilobed and heart shaped, with many ovules. Seeds are linear shaped with fatty appendages that are presumably eaten by potential distributors, or aid with flotation for water-based dispersal (Center for Plant Conservation 2010 and FWS 1991). Seeds are released by June (FWS 2010 and Center for Plant Conservation 2010). Swamp pink is not very successful at dispersing through seeds, however, and rhizomes are the main source of new plants. During the winter, the leaves of the plant lie flat on the ground, often covered by leaf litter, and the next year's flower is visible as a bud in the center of the leaf rosette (FWS 1991). Swamp pink exhibits a highly clumped distribution where it is found, possibly due to the short distance over which its seeds are dispersed because of their weight or to the prevalence of non-sexual propagation. Populations could also be considered colonies due to the rhizomatous connections, possibly allowing physiological cooperation within a colony. Populations can vary from a few individuals to several thousand plants (FWS 1991).

Swamp pink is a wetland plant that is thought to be limited to shady areas. It needs soil that is saturated but not persistently flooded. It usually grows on hummocks in wetlands, which keep the roots moist but not submerged. Specific habitats include Atlantic white-cedar swamps, swampy forested wetlands that border small streams, meadows, and spring seepage areas. It is most commonly found with other wetland plants such as Atlantic white cedar (*Chamaecypa tisthyoides*), red maple (*Acer rubrum*), sweet pepperbush (*Clethra alnifolia*), sweetbay magnolia (*Magnolia virginiana*), sphagnum moss (*Sphagnum* spp.), cinnamon fern (*Osmunda cinnamomea*), skunk cabbage (*Symplocarpus foetidus*), pitch pine (*Pinus rigida*), American larch (*Larix laricina*), black spruce (*Picea mariana*), and laurel (*Kalmia* spp.). The overstory plants can also provide some protection from grazing by deer (FWS 2010 and Center for Plant Conservation 2010).

As of 1991, when a recovery plan for swamp pink was completed, New Jersey supported over half the known populations of the species, with 139 records and 71 confirmed occurrences. It was considered locally abundant in Camden County, with most of the occurrences on the coastal plain in pinelands fringe areas in the Delaware River drainage. Fifteen sites were confirmed in Delaware, also in the coastal plain province in the counties of New Castle, Kent, and Sussex (FWS 1991). A five year review was completed in 2008 to assess progress on the recovery plan. Due to field investigations, there are now 227 known occurrences of swamp pink; however, several prior populations are now considered historic and many of the new and previously existing populations are now ranked poorly and many are in decline. New Jersey completed several preserve designs or conservation plans to conserve 21 existing populations

between 1991 and 2001. In addition, 11 agreements with landowners have been reached between FWS and individuals in New Jersey, though these agreements do not provide permanent protection (FWS 2008).

As of 2008, Salem County had 20 confirmed occurrences of swamp pink, Gloucester County had 13, and Camden County had 28. There is one recognized occurrence of swamp pink in New Castle County, Delaware. Delaware does not have any regulations specifically for threatened or endangered plant species (FWS 2008).

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### 4.11.3 Cumulative Impacts on Terrestrial and Freshwater Resources

This section addresses past, present, and future actions that could result in adverse cumulative impacts on terrestrial resources, including resources associated with uplands, wetlands, and bodies of freshwater other than the Delaware River (discussed in Section 4.11.2). For the purpose of this analysis, the geographic area of interest includes the Salem and HCGS site on Artificial Island and the associated transmission line ROWs identified in Section 2.1.5.

Impacts on terrestrial and freshwater resources in the area began with historical development. Colonial settlement of the Delaware River area of southern New Jersey began in 1638 with a group of Swedish and Finnish settlers who sought high quality agricultural land across the river from Wilmington, Delaware. During the 1640s, they built Fort Elfsborg as a fortification for the colony in an area that was mostly swampland between Salem and Alloway Creek in the present day township of Elsinboro. Dutch and English groups also were early settlers in the area. As settlement by Europeans, including Dutch and English, progressed, forested regions in this part of southern New Jersey were cleared for towns, farming, and lumber. Industrial development, beginning with the glassmaking industry in the early 1700s, continued through the 1800s (Morris Land Conservancy, 2006). Land use changes brought about by the Industrial Revolution and other historical trends continued the loss of terrestrial communities of native vegetation and wildlife.

The Salem and HCGS facilities are located on 300 ha (740 ac) of PSEG property on Artificial Island. Construction of Salem and HCGS converted 151 ha (373 ac; 220 ac for Salem and 153 ac for HCGS) in the southwest corner of Artificial Island to facilities and industrial uses. Artificial Island was originally created by deposition of hydraulic dredge material in the early 20th century, and all terrestrial resources on the island have become established since then. Before the historical clearing of land at the Salem and HCGS sites, the terrestrial communities of the island consisted mainly of typical coastal plant species, including salt-tolerant grasses such as cordgrass (*Spartina* spp.) and common reed (*Phragmites australis*), which could survive in the brackish habitats. There was no known previous development or use of Artificial Island prior to the construction of Salem and HCGS. Currently, the Salem and HCGS sites are developed and maintained for operation of the facilities. The remainder of Artificial Island consists mainly of undeveloped areas of tidal marsh with poor quality soils and very few trees. Non-wetland areas are vegetated mainly with grasses, small shrubs, and planted trees in developed areas (PSEG, 2009a; PSEG, 2009b).

Construction of the transmission line ROWs maintained by PSEG for Salem and HCGS resulted in subsequent changes to the wildlife and plant species present within the vicinity of Artificial Island and along the length of the transmission line ROWs. The transmission lines ROWs have a total length of approximately 240 km (149 mi) and occupy approximately 1,771 ha (4,376 ac). The three ROWs for the Salem and HCGS power transmission system pass through a variety of habitat types, including marshes and other wetlands, agricultural or forested land, and some urban and residential areas (PSEG, 2009a; PSEG, 2009b). Fragmentation of the previously contiguous forested, agricultural, and swamp areas that the transmission ROWs traverse likely resulted in edge effects such as changes in light, wind, and temperature; changes in abundance and distribution of interior species; reduced habitat ranges for certain species; and an increased susceptibility to invasive species. ROW maintenance is likely to continue to have future impacts on terrestrial habitat, such as prevention of natural succession stages within the ROWs, increases in edge species, decreases in interior species, and increases in invasive species.

Land use data provide an indication of the impacts on terrestrial resources that have resulted from historical and ongoing development. Current land uses in the region are discussed by county in Section 2.2.8.3 of this draft SEIS. In Salem County, based on 2008 data, farmland under active cultivation is the predominant type of land cover (42 percent), followed by tidal and freshwater wetlands (30 percent), forests (12 percent), residential/commercial/industrial uses (13 percent), and other undeveloped natural areas (3 percent) (Morris Land Conservancy, 2008). In the two adjacent counties in New Jersey (Cumberland and Gloucester), agriculture accounts for 19 and 26 percent of the land cover, and urban land use in the two counties was 12 percent and 26 percent, respectively (DVRPC, 2009; Gloucester County, 2009). Thus, commercial and industrial facilities, including the Salem and HCGS site and ROWs, have had a smaller impact on the loss of native terrestrial forest and wetland habitats in the region compared to agricultural development.

Although development of PSEG property on Artificial Island has contributed minimally to impacts on terrestrial resources from historical and ongoing development in the region, portions of both PSEG land and the island have been protected from development. Approximately 25 percent (40 ha [100 ac]) of PSEG property and approximately 80 percent (485 ha [1200 ac]) of Artificial Island remain undeveloped. These areas consist predominantly of estuarine marsh and freshwater emergent marsh, wetlands, and ponds. The U.S. government owns the portions of the island adjacent to Salem and HCGS (to the north and east), while the State of New Jersey owns the rest of the island as well as much nearby inland property (LACT, 1988a; LACT, 1988b; PSEG 2009a; PSEG, 2009b). In conjunction with the Artificial Island wetlands, public lands in the region also preserve forest and wetland habitat and have a beneficial cumulative impact on terrestrial resources.

PSEG has indicated the possibility of constructing a new reactor unit at the Salem and HCGS site on Artificial Island (PSEG, 2010). It would be primarily located on previously disturbed land adjacent to the existing Salem and HCGS units. It is not known at this time whether new transmission lines would be constructed. If additional ROW needs to be cleared, terrestrial habitats and the wildlife they support could potentially be affected in the areas it would traverse.

The NRC staff concludes that cumulative impacts from past, present, and reasonably foreseeable future actions on terrestrial resources in the region are MODERATE relative to predevelopment conditions, while the incremental contribution of continued operation of Salem and HCGS would be SMALL.

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