

ATTACHMENT A

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North Carolina Gap Project Analysis for Affected Project Areas

Introduction

Progress Energy Carolinas, Inc. (PEC) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) for the addition of two new nuclear reactors at the Shearon Harris Nuclear Power Plant Unit 1 (HNP). The water level of Harris Lake will be raised to provide the water needed to meet HAR operation objectives and to allow for flexibility in meeting water requirements during drought conditions when withdrawal from the Cape Fear River may be curtailed. The proposed lake expansion would raise the normal pool elevation of Harris Lake from 220 feet (ft.) to 240 ft. to provide the anticipated needed water volume. Currently, Harris Lake covers approximately 3970 acres (ac.) (main body of Harris Lake and the Auxiliary reservoir) and the increase in pool elevation of Harris Reservoir would result in the inundation of approximately an additional 3570 ac. The North Carolina Gap Analysis Project (NC GAP) was used to evaluate species with potential to occur in the area of inundation.

The NC GAP Project is part of a national program to develop databases of biological diversity (<http://gapanalysis.nbi.gov/>). The specific goals of the North Carolina project are to map the land cover of North Carolina and the predicted distributions of terrestrial vertebrates that would be expected to use the identified habitats in the state during breeding (<http://www.basic.ncsu.edu/ncgap/>).

The project used the land cover class to predict individual species habitat distributions across the state. Range species limits were generated using observation data, published range maps, and expert review. Habitat relationship information for each species based on these range limits and the land cover class were then developed. This database of relationships was used to develop a predicted distribution for each species across North Carolina.

For North Carolina, this project developed predicted distribution of habitats for 414 terrestrial vertebrate species (193 species of breeding birds, 75 species of mammals, 76 species of amphibians, and 70 species of reptiles). These distributions were assessed for accuracy by comparison with available species lists for National Wildlife Refuges, National Seashores, National Parks, and North Carolina State Parks and Preserves (McKerrow et al. 2006). The accuracy was found to be relatively high (72 percent average agreement for birds, mammals, and reptiles), with most errors related to the inclusion of species that would not occur (average of 24 percent average commission error for birds, mammals, and reptiles) rather than omitting species that would occur (average of 4 percent average omission error for birds, mammals, and reptiles) (McKerrow et al. 2006). These data were used to estimate species that may occur in the area to be inundated. However, as indicated above, this

estimation is likely an overestimation of animal species in habitats in the area to be inundated due to the errors of commission.

Data Collection

Species data maintained by the National Biological Information Infrastructure is available through the North Carolina State University's 'NC Gap Analysis Project' web server (<http://www.basic.ncsu.edu/ncgap/DataServer.html>). These datasets are categorized by species type (i.e., Amphibian, Avian, Mammalian, and Reptilian) and presented in ESRI ArcInfo raster format. Data were downloaded from this webserver for use in this analysis in December 2008. In addition to this information, topographical data from the North Carolina Department of Transportation (<http://www.ncdot.org/it/gis/DataDistribution/>) and recent digital imagery from the Wake County GIS server (<http://lnweb02.co.wake.nc.us/gis/gismaps.nsf>) were downloaded in December 2008. These data were used in a geographic information systems analysis to delineate an area extending from the shoreline of Harris Lake, identified by the 220-ft contour line, to the 240-ft contour boundary for use in the analysis.

Data Processing

In order to obtain an inventory of species found within the impact area, each raster dataset required a series of geoprocessing tasks in the ESRI mapping environment prior to performing the analysis. The following list sets out the generalized steps required to process these datasets:

- Clip each individual species grid by the regional study area boundary.
- Reclassify each grid to create 'nodata' values.
- Convert clipped grids to point data in ArcInfo.
- Merge point data into a single dataset for each species type (e.g., all avian).

Once these datasets were prepared, a polygon created from the Harris Lake shoreline (220-ft contour) and the 240-ft contour boundary was used to extract those species within the area of impact. Final processing to create a catalog of potentially impacted species was performed in Microsoft Access and exported to Excel.

Analysis and Results

After processing, all species whose predicted habitat occurred within the affected area (the area between the 220-ft and 240-ft contour lines around Harris Lake) were identified. These are species that have potential habitat within the affected area. This does not mean the species occurs or has been found during ground surveys in the affected area. The species that occur in North Carolina and within the affected project area are listed in Tables 1 through 4. Figures 1 through 4 were created to display the total number of predicted species for each spatially located grid cell. Colors increasing in intensity show higher concentrations of numbers of species that could occupy that specific habitat. For amphibians, 21 of the 76 species that may occur in North Carolina were predicted to have suitable habitat within the area to be inundated and could occur there. Figure 1 shows the predicted number of

amphibian species in the vicinity of the project area. Inundation of the areas will reduce the area of habitat for these species, but it will also likely create new habitats for this group of species to occupy. For avian species, 113 of the 193 species that may occur in North Carolina were predicted to have suitable habitat within the area to be inundated. Figure 2 shows the predicted number of avian species in the vicinity of the project. For bird species, inundation is unlikely to cause direct effects to species, given their ability to relocate during inundation. For waterfowl species, the inundated areas will likely provide similar types of habitats as currently exists. For other bird species, the inundated area will be a loss of habitat for the species. For mammals, 43 of the 75 species that may occur in North Carolina were predicted to have suitable habitat within the area to be inundated. Figure 3 shows the predicted number of mammalian species in the vicinity of the project. Similar to the bird species, the mammals on this list will likely relocate during the inundation itself, but the habitats they occupy will be lost. For reptiles, 46 of the 70 species that may occur in North Carolina were predicted to have suitable habitat within the area to be inundated. Figure 4 shows the predicted number of reptilian species in the vicinity of the project.

As discussed in the final report of the NC GAP project (McKerrow et al. 2006), the predicted habitats are based on the land cover data available. These data are over 10 years old, which limits the conclusions that can be reached. Additionally, the NC GAP project was intended to identify potential areas of habitat for species at a landscape scale and to assist in focusing detailed studies of species and their distributions. As described in *The North Carolina Gap Analysis Project: Final Report* (McKerrow et al. 2006):

GAP maps are produced at a nominal scale of 1:100,000 or better and are intended for applications at the landscape or "gamma" scale (heterogeneous areas generally covering 1,000 to 1,000,000 hectares and made up of more than one kind of natural community). Applications of these data to site- or stand-level analyses ... will likely reveal the limitations of this process to incorporate differences in habitat quality (e.g., understory condition) or necessary microhabitat features such as standing dead trees.

The lists of species in this TM are presented as possible lists of species that have the potential to have habitat in the affected project area. Any further conclusions on the presence or absence of individual species in the affected are difficult to make based on the level of detail and goals of the NC GAP Project.

TABLE 1. AMPHIBIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

		Species Observed during Monitoring Program
Scientific Name	Common Name	
<i>Ambystoma maculatum</i>	Spotted salamander	Y
<i>Ambystoma opacum</i>	Marbled salamander	Y
<i>Amphiuma means</i>	Two-toed amphiuma	N
<i>Desmognathus fuscus</i>	Dusky salamander	N
<i>Eurycea quadridigitata</i>	Dwarf salamander	N
<i>Eurycea cirrigera</i>	Southern two-lined salamander	N
<i>Eurycea guttolineata</i>	Three-lined salamander	N
<i>Hemidactylium scutatum</i>	Four-toed salamander	N
<i>Plethodon cinereus</i>	Redback salamander	N
<i>Plethodon glutinosus</i>	Slimy salamander	Y
<i>Pseudotriton montanus</i>	Mud salamander	N
<i>Pseudotriton ruber</i>	Red salamander	N
<i>Necturus punctatus</i>	Dwarf waterdog	N
<i>Notophthalmus viridescens</i>	Eastern newt	Y
<i>Siren lacertina</i>	Greater siren	N
<i>Bufo americanus</i>	American toad	Y
<i>Bufo terrestris</i>	Southern toad	Y
<i>Bufo fowleri</i>	Fowler's toad	Y
<i>Acris crepitans</i>	Northern cricket frog	Y
<i>Acris gryllus</i>	Southern cricket frog	N
<i>Hyla chrysoscelis</i>	Cope's gray treefrog	N
<i>Hyla cinerea</i>	Green treefrog	Y
<i>Hyla femoralis</i>	Pine woods treefrog	N
<i>Hyla gratiosa</i>	Barking treefrog	N
<i>Hyla squirella</i>	Squirrel treefrog	Y
<i>Pseudacris triseriata</i>	Upland chorus frog	Y
<i>Pseudacris crucifer</i>	Spring peeper	Y
<i>Gastrophryne carolinensis</i>	Eastern narrowmouth toad	Y

TABLE 1. AMPHIBIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

		Species Observed during Monitoring Program
Scientific Name	Common Name	
<i>Scaphiopus holbrookii</i>	Eastern spadefoot	N
<i>Rana catesbeiana</i>	Bullfrog	Y
<i>Rana clamitans</i>	Green frog	Y
<i>Rana palustris</i>	Pickerel frog	Y
<i>Rana sphenoccephala</i>	Southern leopard frog	Y

TABLE 2. AVIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

Habitat Predicted in North Carolina		Species Observed during Monitoring Program ¹
Scientific Name	Common Name	
<i>Podilymbus podiceps</i>	Pied-billed grebe	Y
<i>Phalacrocorax auritus</i>	Double-crested cormorant	Y
<i>Ixobrychus exilis</i>	Least bittern	N
<i>Ardea herodias</i>	Great blue heron	Y
<i>Butorides virescens</i>	Green heron	Y
<i>Nyctanassa violacea</i>	Yellow-crowned night-heron	N
<i>Branta canadensis</i>	Canada goose	Y
<i>Aix sponsa</i>	Wood duck	Y
<i>Anas platyrhynchos</i>	Mallard	Y
<i>Lophodytes cucullatus</i>	Hooded merganser	Y
<i>Coragyps atratus</i>	Black vulture	N
<i>Cathartes aura</i>	Turkey vulture	N
<i>Pandion haliaetus</i>	Osprey	Y
<i>Haliaeetus leucocephalus</i>	Bald eagle	Y
<i>Accipiter striatus</i>	Sharp-shinned hawk	N
<i>Accipiter cooperii</i>	Cooper's hawk	N
<i>Buteo lineatus</i>	Red-shouldered hawk	N
<i>Buteo platypterus</i>	Broad-winged hawk	N
<i>Buteo jamaicensis</i>	Red-tailed hawk	N
<i>Falco sparverius</i>	American kestrel	N
<i>Meleagris gallopavo</i>	Wild turkey	N
<i>Colinus virginianus</i>	Northern bobwhite	N
<i>Rallus elegans</i>	King rail	N
<i>Charadrius vociferus</i>	Killdeer	Y
<i>Scolopax minor</i>	American woodcock	N
<i>Columba livia</i>	Rock dove	N
<i>Zenaida macroura</i>	Mourning dove	N
<i>Coccyzus americanus</i>	Yellow-billed cuckoo	N
<i>Tyto alba</i>	Barn owl	N

TABLE 2. AVIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

Habitat Predicted in North Carolina		Species Observed during Monitoring Program ¹
Scientific Name	Common Name	
<i>Otus asio</i>	Eastern screech-owl	N
<i>Bubo virginianus</i>	Great horned owl	N
<i>Strix varia</i>	Barred owl	N
<i>Chordeiles minor</i>	Common nighthawk	N
<i>Caprimulgus carolinensis</i>	Chuck-will's-widow	N
<i>Caprimulgus vociferus</i>	Whip-poor-will	N
<i>Chaetura pelagica</i>	Chimney swift	N
<i>Archilochus colubris</i>	Ruby-throated hummingbird	N
<i>Ceryle alcyon</i>	Belted kingfisher	N
<i>Melanerpes erythrocephalus</i>	Red-headed woodpecker	N
<i>Melanerpes carolinus</i>	Red-bellied woodpecker	N
<i>Picoides pubescens</i>	Downy woodpecker	N
<i>Picoides villosus</i>	Hairy woodpecker	N
<i>Colaptes auratus</i>	Northern flicker	N
<i>Dryocopus pileatus</i>	Pileated woodpecker	N
<i>Contopus virens</i>	Eastern wood-pewee	N
<i>Empidonax virescens</i>	Acadian flycatcher	N
<i>Sayornis phoebe</i>	Eastern phoebe	N
<i>Myiarchus crinitus</i>	Great crested flycatcher	N
<i>Tyrannus tyrannus</i>	Eastern kingbird	N
<i>Eremophila alpestris</i>	Horned lark	N
<i>Progne subis</i>	Purple martin	N
<i>Tachycineta bicolor</i>	Tree swallow	N
<i>Stelgidopteryx serripennis</i>	Northern rough-winged swallow	N
<i>Petrochelidon pyrrhonota</i>	Cliff swallow	N
<i>Hirundo rustica</i>	Barn swallow	N
<i>Cyanocitta cristata</i>	Blue jay	N
<i>Corvus brachyrhynchos</i>	American crow	N

TABLE 2. AVIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

Habitat Predicted in North Carolina		Species Observed during Monitoring Program ¹
Scientific Name	Common Name	
<i>Corvus ossifragus</i>	Fish crow	N
<i>Poecile carolinensis</i>	Carolina chickadee	N
<i>Baeolophus bicolor</i>	Tufted titmouse	N
<i>Sitta carolinensis</i>	White-breasted nuthatch	N
<i>Sitta pusilla</i>	Brown-headed nuthatch	N
<i>Thryothorus ludovicianus</i>	Carolina wren	
<i>Poliophtila caerulea</i>	Blue-gray gnatcatcher	N
<i>Sialia sialis</i>	Eastern bluebird	N
<i>Hylocichla mustelina</i>	Wood thrush	N
<i>Turdus migratorius</i>	American robin	N
<i>Dumetella carolinensis</i>	Gray catbird	N
<i>Mimus polyglottos</i>	Northern mockingbird	N
<i>Toxostoma rufum</i>	Brown thrasher	N
<i>Bombycilla cedrorum</i>	Cedar waxwing	N
<i>Lanius ludovicianus</i>	Loggerhead shrike	N
<i>Sturnus vulgaris</i>	European starling	N
<i>Vireo griseus</i>	White-eyed vireo	N
<i>Vireo solitarius</i>	Blue-headed vireo	N
<i>Vireo flavifrons</i>	Yellow-throated vireo	N
<i>Vireo olivaceus</i>	Red-eyed vireo	N
<i>Parula americana</i>	Northern parula	N
<i>Dendroica petechia</i>	Yellow warbler	N
<i>Dendroica dominica</i>	Yellow-throated warbler	N
<i>Dendroica pinus</i>	Pine warbler	N
<i>Dendroica discolor</i>	Prairie warbler	N
<i>Mniotilta varia</i>	Black-and-white warbler	N
<i>Setophaga ruticilla</i>	American redstart	N
<i>Protonotaria citrea</i>	Prothonotary warbler	N
<i>Helmitheros vermivorus</i>	Worm-eating warbler	N
<i>Limnothlypis swainsonii</i>	Swainson's warbler	N

TABLE 2. AVIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

Habitat Predicted in North Carolina		Species Observed during Monitoring Program ¹
Scientific Name	Common Name	
<i>Seiurus aurocapillus</i>	Ovenbird	N
<i>Seiurus motacilla</i>	Louisiana waterthrush	N
<i>Oporornis formosus</i>	Kentucky warbler	N
<i>Geothlypis trichas</i>	Common yellowthroat	N
<i>Wilsonia citrina</i>	Hooded warbler	N
<i>Icteria virens</i>	Yellow-breasted chat	N
<i>Piranga rubra</i>	Summer tanager	N
<i>Piranga olivacea</i>	Scarlet tanager	N
<i>Cardinalis cardinalis</i>	Northern cardinal	N
<i>Guiraca caerulea</i>	Blue grosbeak	N
<i>Passerina cyanea</i>	Indigo bunting	N
<i>Spiza americana</i>	Dickcissel	N
<i>Pipilo erythrophthalmus</i>	Eastern towhee	N
<i>Spizella passerina</i>	Chipping sparrow	N
<i>Spizella pusilla</i>	Field sparrow	N
<i>Ammodramus savannarum</i>	Grasshopper sparrow	N
<i>Melospiza melodia</i>	Song sparrow	N
<i>Agelaius phoeniceus</i>	Red-winged blackbird	N
<i>Sturnella magna</i>	Eastern meadowlark	N
<i>Quiscalus quiscula</i>	Common grackle	N
<i>Molothrus ater</i>	Brown-headed cowbird	N
<i>Icterus spurius</i>	Orchard oriole	N
<i>Carpodacus mexicanus</i>	House finch	N
<i>Carduelis tristis</i>	American goldfinch	N
<i>Passer domesticus</i>	House sparrow	N

Notes:

¹ Indicates only waterfowl species observed in conjunction with the environmental monitoring program results 1979 through 2006

TABLE 3. MAMMALIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

Habitat Predicted in North Carolina		Species Observed during Monitoring Program
Scientific Name	Common Name	
<i>Didelphis virginiana</i>	Virginia opossum	Y
<i>Sorex longirostris</i>	Southeastern shrew	N
<i>Blarina carolinensis</i>	Southern short-tailed shrew	Y
<i>Cryptotis parva</i>	Least shrew	N
<i>Scalopus aquaticus</i>	Eastern mole	Y
<i>Condylura cristata</i>	Star-nosed mole	N
<i>Myotis lucifugus</i>	Little brown bat	N
<i>Myotis austroriparius</i>	Southeastern bat	N
<i>Pipistrellus subflavus</i>	Eastern pipistrelle	N
<i>Eptesicus fuscus</i>	Big brown bat	N
<i>Lasiurus borealis</i>	Eastern red bat	Y
<i>Nycticeius humeralis</i>	Evening bat	N
<i>Tadarida brasiliensis</i>	Brazilian free-tailed bat	N
<i>Sylvilagus palustris</i>	Marsh rabbit	N
<i>Sylvilagus floridanus</i>	Eastern cottontail	Y
<i>Tamias striatus</i>	Eastern chipmunk	N
<i>Marmota monax</i>	Woodchuck	N
<i>Sciurus carolinensis</i>	Eastern gray squirrel	Y
<i>Sciurus niger</i>	Eastern fox squirrel	Y
<i>Glaucomys volans</i>	Southern flying squirrel	N
<i>Castor canadensis</i>	American beaver	Y
<i>Oryzomys palustris</i>	Marsh rice rat	Y
<i>Reithrodontomys humulis</i>	Eastern harvest mouse	Y
<i>Peromyscus leucopus</i>	White-footed mouse	Y
<i>Ochrotomys nuttalli</i>	Golden mouse	Y
<i>Sigmodon hispidus</i>	Hispid cotton rat	Y
<i>Microtus pennsylvanicus</i>	Meadow vole	N
<i>Microtus pinetorum</i>	Woodland vole	N
<i>Ondatra zibethicus</i>	Muskrat	Y

TABLE 3. MAMMALIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

Habitat Predicted in North Carolina		Species Observed during Monitoring Program
Scientific Name	Common Name	
<i>Rattus rattus</i>	Black rat	N
<i>Rattus norvegicus</i>	Norway rat	N
<i>Mus musculus</i>	House mouse	Y
<i>Zapus hudsonius</i>	Meadow jumping mouse	N
<i>Canis latrans</i>	Coyote	N
<i>Vulpes vulpes</i>	Red fox	Y
<i>Urocyon cinereoargenteus</i>	Common gray fox	Y
<i>Procyon lotor</i>	Common raccoon	Y
<i>Mustela frenata</i>	Long-tailed weasel	N
<i>Mustela vison</i>	Mink	N
<i>Mephitis mephitis</i>	Striped skunk	N
<i>Lutra canadensis</i>	Northern river otter	Y
<i>Lynx rufus</i>	Bobcat	Y
<i>Odocoileus virginianus</i>	White-tailed deer	Y

TABLE 4. REPTILIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

Habitat Predicted in North Carolina		Species Observed during Monitoring Program
Scientific Name	Common Name	
<i>Chelydra serpentina</i>	Snapping turtle	Y
<i>Chrysemys picta</i>	Painted turtle	Y
<i>Clemmys guttata</i>	Spotted turtle	Y
<i>Pseudemys concinna</i>	River cooter	Y
<i>Pseudemys floridana</i>	Florida cooter	Y
<i>Terrapene carolina</i>	Eastern box turtle	Y
<i>Trachemys scripta</i>	Yellowbelly slider	Y
<i>Kinosternon baurii</i>	Striped mud turtle	N
<i>Kinosternon subrubrum</i>	Eastern mud turtle	Y
<i>Sternotherus odoratus</i>	Common musk turtle	N
<i>Ophisaurus attenuatus</i>	Slender glass lizard	N
<i>Anolis carolinensis</i>	Green anole	Y
<i>Sceloporus undulatus</i>	Eastern fence lizard	Y
<i>Eumeces fasciatus</i>	Five-lined skink	Y
<i>Eumeces inexpectatus</i>	Southeastern five-lined skink	Y
<i>Eumeces laticeps</i>	Broadhead skink	Y
<i>Scincella lateralis</i>	Ground skink	Y
<i>Cnemidophorus sexlineatus</i>	Six-lined racerunner	Y
<i>Carphophis amoenus</i>	Worm snake	Y
<i>Cemophora coccinea</i>	Scarlet snake	N
<i>Coluber constrictor</i>	Racer	Y
<i>Diadophis punctatus</i>	Ringneck snake	Y
<i>Elaphe guttata</i>	Corn snake	Y
<i>Elaphe obsoleta</i>	Rat snake	Y
<i>Farancia abacura</i>	Mud snake	N
<i>Heterodon platirhinos</i>	Eastern hognose snake	Y
<i>Heterodon simus</i>	Southern hognose snake	N
<i>Lampropeltis calligaster</i>	Mole kingsnake	Y

TABLE 4. REPTILIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

Habitat Predicted in North Carolina		Species Observed during Monitoring Program
Scientific Name	Common Name	
<i>Lampropeltis getula</i>	Common kingsnake	Y
<i>Lampropeltis triangulum</i>	Milk snake	N
<i>Nerodia erythrogaster</i>	Redbelly water snake	Y
<i>Nerodia fasciata</i>	Banded water snake	N
<i>Nerodia sipedon</i>	Northern water snake	Y
<i>Opheodrys aestivus</i>	Rough green snake	Y
<i>Regina septemvittata</i>	Queen snake	N
<i>Storeria dekayi</i>	Brown snake	Y
<i>Storeria occipitomaculata</i>	Redbelly snake	N
<i>Tantilla coronata</i>	Southeastern crowned snake	N
<i>Thamnophis sauritus</i>	Eastern ribbon snake	N
<i>Thamnophis sirtalis</i>	Common garter snake	N
<i>Virginia striatula</i>	Rough earth snake	Y
<i>Virginia valeriae</i>	Smooth earth snake	N
<i>Micrurus fulvius</i>	Eastern coral snake	N
<i>Agkistrodon contortrix</i>	Copperhead	Y
<i>Agkistrodon piscivorus</i>	Cottonmouth	N
<i>Sistrurus miliarius</i>	Pigmy rattlesnake	N

References

McKerrow, A.J., S.G. Williams, J.A. Collazo. 2006. *The North Carolina Gap Analysis Project: Final Report*. North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Raleigh, North Carolina.