ATTACHMENT A
Tech Memo Approval Form

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Document Review and Approval		
Originator:	Greg Smith	1/28/09
	Name/Position	Date
	*Note:	
	Signature	
Reviewer	Eric Woods/Task Manager	1/28/09
	Name/Position	Date
	*Note:	
	Signature	
Project Manager:	Scott Freeman/Technical Manager	1/28/09
	Name/Position	Approval Date
	*Note:	
	Signature	

*Note: Signed Original Maintained by CH2M HILL Document Control

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.nbii.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 date, 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.

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

TABLE 1. AMPHIBIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

Scientific Name	Common Name	Species Observed during Monitoring Program
Scaphiopus holbrookii	Eastern spadefoot	N
Rana catesbeiana	Bullfrog	Y
Rana clamitans	Green frog	Y
Rana palustris	Pickerel frog	Y
Rana sphenocephala	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	
Podilymbus podiceps	Pied-billed grebe	Y
Phalacrocorax auritus	Double-crested cormorant	Y
Ixobrychus exilis	Least bittern	N
Ardea herodias	Great blue heron	Y
Butorides virescens	Green heron	Y
Nyctanassa violacea	Yellow-crowned night-heron	N
Branta canadensis	Canada goose	Y
Aix sponsa	Wood duck	Y
Anas platyrhynchos	Mallard	Y
Lophodytes cucullatus	Hooded merganser	Y
Coragyps atratus	Black vulture	N
Cathartes aura	Turkey vulture	N
Pandion haliaetus	Osprey	Y
Haliaeetus leucocephalus	Bald eagle	Y
Accipiter striatus	Sharp-shinned hawk	N
Accipiter cooperii	Cooper's hawk	N
Buteo lineatus	Red-shouldered hawk	N
Buteo platypterus	Broad-winged hawk	N
Buteo jamaicensis	Red-tailed hawk	N
Falco sparverius	American kestrel	N
Meleagris gallopavo	Wild turkey	N
Colinus virginianus	Northern bobwhite	N
Rallus elegans	King rail	N
Charadrius vociferus	Killdeer	Y
Scolopax minor	American woodcock	N
Columba livia	Rock dove	N
Zenaida macroura	Mourning dove	N
Coccyzus americanus	Yellow-billed cuckoo	N
Tyto alba	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**	
Otus asio	Eastern screech-owl	N
Bubo virginianus	Great horned owl	N
Strix varia	Barred owl	N
Chordeiles minor	Common nighthawk	N
Caprimulgus carolinensis	Chuck-will's-widow	N
Caprimulgus vociferus	Whip-poor-will	N
Chaetura pelagica	Chimney swift	N
Archilochus colubris	Ruby-throated hummingbird	N
Ceryle alcyon	Belted kingfisher	N
Melanerpes erythrocephalus	Red-headed woodpecker	N
Melanerpes carolinus	Red-bellied woodpecker	N
Picoides pubescens	Downy woodpecker	N
Picoides villosus	Hairy woodpecker	N
Colaptes auratus	Northern flicker	N
Dryocopus pileatus	Pileated woodpecker	N
Contopus virens	Eastern wood-pewee	N
Empidonax virescens	Acadian flycatcher	N
Sayornis phoebe	Eastern phoebe	N
Myiarchus crinitus	Great crested flycatcher	N
Tyrannus tyrannus	Eastern kingbird	N
Eremophila alpestris	Horned lark	N
Progne subis	Purple martin	N
Tachycineta bicolor	Tree swallow	N
Stelgidopteryx serripennis	Northern rough-winged swallow	N
Petrochelidon pyrrhonota	Cliff swallow	N
Hirundo rustica	Barn swallow	N
Cyanocitta cristata	Blue jay	N
Corvus brachyrhynchos	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**	
Corvus ossifragus	Fish crow	N
Poecile carolinensis	Carolina chickadee	N
Baeolophus bicolor	Tufted titmouse	N
Sitta carolinensis	White-breasted nuthatch	N
Sitta pusilla	Brown-headed nuthatch	N
Thryothorus ludovicianus	Carolina wren	
Polioptila caerulea	Blue-gray gnatcatcher	N
Sialia sialis	Eastern bluebird	N
Hylocichla mustelina	Wood thrush	N
Turdus migratorius	American robin	N
Dumetella carolinensis	Gray catbird	N
Mimus polyglottos	Northern mockingbird	N
Toxostoma rufum	Brown thrasher	N
Bombycilla cedrorum	Cedar waxwing	N
Lanius ludovicianus	Loggerhead shrike	N
Sturnus vulgaris	European starling	N
Vireo griseus	White-eyed vireo	N
Vireo solitarius	Blue-headed vireo	N
Vireo flavifrons	Yellow-throated vireo	N
Vireo olivaceus	Red-eyed vireo	N
Parula americana	Northern parula	N
Dendroica petechia	Yellow warbler	N
Dendroica dominica	Yellow-throated warbler	N
Dendroica pinus	Pine warbler	N
Dendroica discolor	Prairie warbler	N
Mniotilta varia	Black-and-white warbler	N
Setophaga ruticilla	American redstart	N
Protonotaria citrea	Prothonotary warbler	N
Helmitheros vermivorus	Worm-eating warbler	N
Limnothlypis swainsonii	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	
Seiurus aurocapillus	Ovenbird	N
Seiurus motacilla	Louisiana waterthrush	N
Oporornis formosus	Kentucky warbler	N
Geothlypis trichas	Common yellowthroat	N
Wilsonia citrina	Hooded warbler	N
Icteria virens	Yellow-breasted chat	N
Piranga rubra	Summer tanager	N
Piranga olivacea	Scarlet tanager	N
Cardinalis cardinalis	Northern cardinal	N
Guiraca caerulea	Blue grosbeak	N
Passerina cyanea	Indigo bunting	N
Spiza americana	Dickcissel	N
Pipilo erythrophthalmus	Eastern towhee	N
Spizella passerina	Chipping sparrow	N
Spizella pusilla	Field sparrow	N
Ammodramus savannarum	Grasshopper sparrow	N
Melospiza melodia	Song sparrow	N
Agelaius phoeniceus	Red-winged blackbird	N
Sturnella magna	Eastern meadowlark	N
Quiscalus quiscula	Common grackle	N
Molothrus ater	Brown-headed cowbird	N
Icterus spurius	Orchard oriole	N
Carpodacus mexicanus	House finch	N
Carduelis tristis	American goldfinch	N
Passer domesticus	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**	
Didelphis virginiana	Virginia opossum	Y
Sorex longirostris	Southeastern shrew	N
Blarina carolinensis	Southern short-tailed shrew	Y
Cryptotis parva	Least shrew	N
Scalopus aquaticus	Eastern mole	Y
Condylura cristata	Star-nosed mole	N
Myotis lucifugus	Little brown bat	N
Myotis austroriparius	Southeastern bat	N
Pipistrellus subflavus	Eastern pipistrelle	N
Eptesicus fuscus	Big brown bat	N
Lasiurus borealis	Eastern red bat	Y
Nycticeius humeralis	Evening bat	N
Tadarida brasiliensis	Brazilian free-tailed bat	N
Sylvilagus palustris	Marsh rabbit	N
Sylvilagus floridanus	Eastern cottontail	Y
Tamias striatus	Eastern chipmunk	N
Marmota monax	Woodchuck	N
Sciurus carolinensis	Eastern gray squirrel	Y
Sciurus niger	Eastern fox squirrel	Y
Glaucomys volans	Southern flying squirrel	N
Castor canadensis	American beaver	Y
Oryzomys palustris	Marsh rice rat	Y
Reithrodontomys humulis	Eastern harvest mouse	Y
Peromyscus leucopus	White-footed mouse	Y
Ochrotomys nuttalli	Golden mouse	Y
Sigmodon hispidus	Hispid cotton rat	Y
Microtus pennsylvanicus	Meadow vole	N
Microtus pinetorum	Woodland vole	N
Ondatra zibethicus	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**	
Rattus rattus	Black rat	N
Rattus norvegicus	Norway rat	N
Mus musculus	House mouse	Y
Zapus hudsonius	Meadow jumping mouse	N
Canis latrans	Coyote	N
Vulpes vulpes	Red fox	Y
Urocyon cinereoargenteus	Common gray fox	Y
Procyon lotor	Common raccoon	Y
Mustela frenata	Long-tailed weasel	N
Mustela vison	Mink	N
Mephitis mephitis	Striped skunk	N
Lutra canadensis	Northern river otter	Y
Lynx rufus	Bobcat	Y
Odocoileus virginianus	White-tailed deer	Y

TABLE 4. REPTILIAN SPECIES POTENTIALLY WITHIN THE AFFECTED AREA.

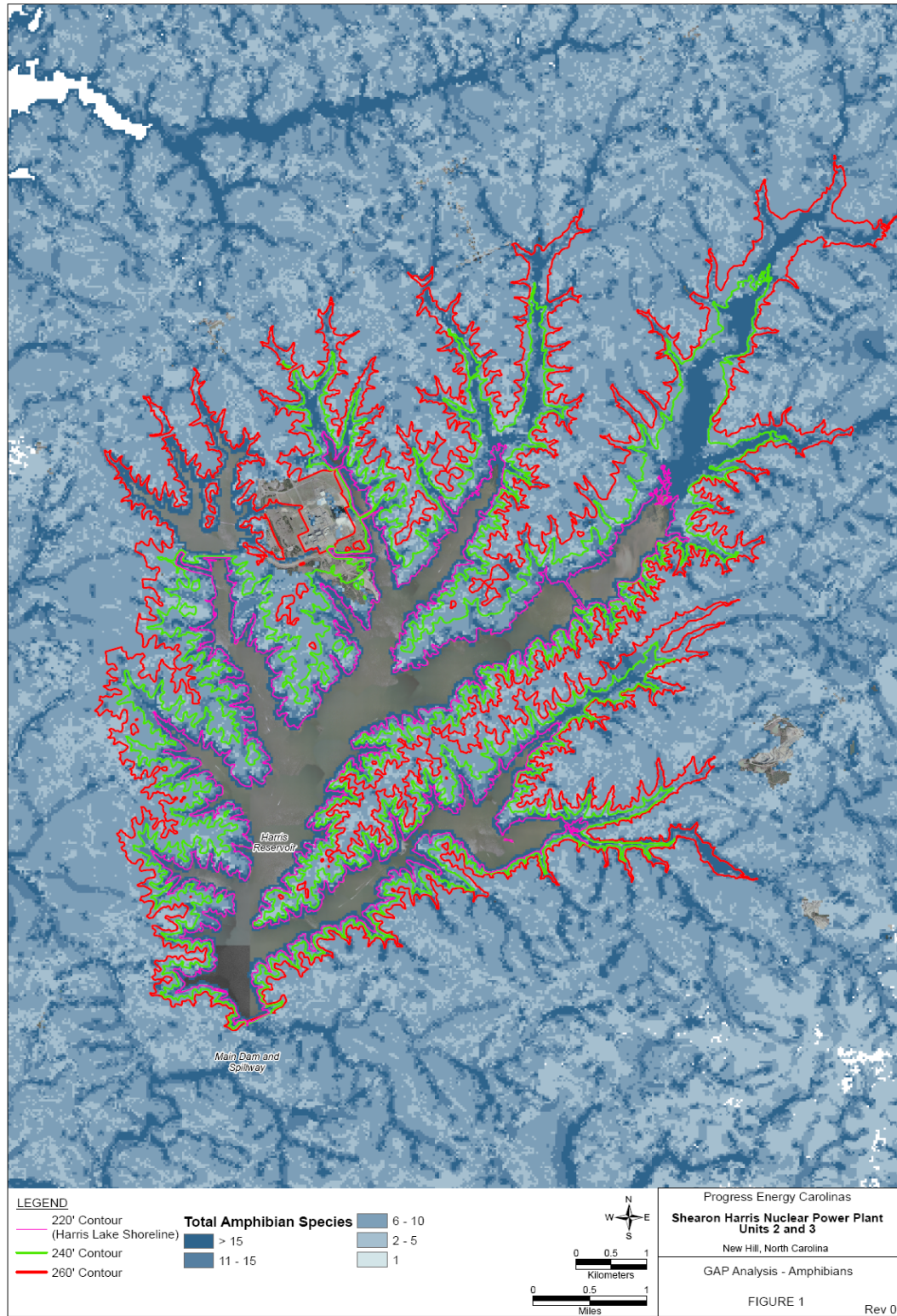| Habitat Predicted in North Carolina		Species Observed during Monitoring Program
Scientific Name	**Common Name**	
Chelydra serpentina	Snapping turtle	Y
Chrysemys picta	Painted turtle	Y
Clemmys guttata	Spotted turtle	Y
Pseudemys concinna	River cooter	Y
Pseudemys floridana	Florida cooter	Y
Terrapene carolina	Eastern box turtle	Y
Trachemys scripta	Yellowbelly slider	Y
Kinosternon baurii	Striped mud turtle	N
Kinosternon subrubrum	Eastern mud turtle	Y
Sternotherus odoratus	Common musk turtle	N
Ophisaurus attenuatus	Slender glass lizard	N
Anolis carolinensis	Green anole	Y
Sceloporus undulatus	Eastern fence lizard	Y
Eumeces fasciatus	Five-lined skink	Y
Eumeces inexpectatus	Southeastern five-lined skink	Y
Eumeces laticeps	Broadhead skink	Y
Scincella lateralis	Ground skink	Y
Cnemidophorus sexlineatus	Six-lined racerunner	Y
Carphophis amoenus	Worm snake	Y
Cemophora coccinea	Scarlet snake	N
Coluber constrictor	Racer	Y
Diadophis punctatus	Ringneck snake	Y
Elaphe guttata	Corn snake	Y
Elaphe obsoleta	Rat snake	Y
Farancia abacura	Mud snake	N
Heterodon platirhinos	Eastern hognose snake	Y
Heterodon simus	Southern hognose snake	N
Lampropeltis calligaster	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**	
Lampropeltis getula	Common kingsnake	Y
Lampropeltis triangulum	Milk snake	N
Nerodia erythrogaster	Redbelly water snake	Y
Nerodia fasciata	Banded water snake	N
Nerodia sipedon	Northern water snake	Y
Opheodrys aestivus	Rough green snake	Y
Regina septemvittata	Queen snake	N
Storeria dekayi	Brown snake	Y
Storeria occipitomaculata	Redbelly snake	N
Tantilla coronata	Southeastern crowned snake	N
Thamnophis sauritus	Eastern ribbon snake	N
Thamnophis sirtalis	Common garter snake	N
Virginia striatula	Rough earth snake	Y
Virginia valeriae	Smooth earth snake	N
Micrurus fulvius	Eastern coral snake	N
Agkistrodon contortrix	Copperhead	Y
Agkistrodon piscivorus	Cottonmouth	N
Sistrurus miliarius	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.

Figure 1

LEGEND

220' Contour (Harris Lake Shoreline)
240' Contour
260' Contour

Total Amphibian Species
> 15
11 - 15
6 - 10
2 - 5
1

Progress Energy Carolinas

Shearon Harris Nuclear Power Plant Units 2 and 3

New Hill, North Carolina

GAP Analysis - Amphibians

FIGURE 1   Rev 0

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Figure 2

LEGEND

220' Contour
(Harris Lake Shoreline)

240' Contour

260' Contour

Total Avian Species

> 15

11 - 15

6 - 10

2 - 5

1

Harris
Reservoir

Main Dam and
Spillway

N
W — E
S

0   0.5   1
Kilometers

0   0.5   1
Miles

Progress Energy Carolinas

**Shearon Harris Nuclear Power Plant
Units 2 and 3**
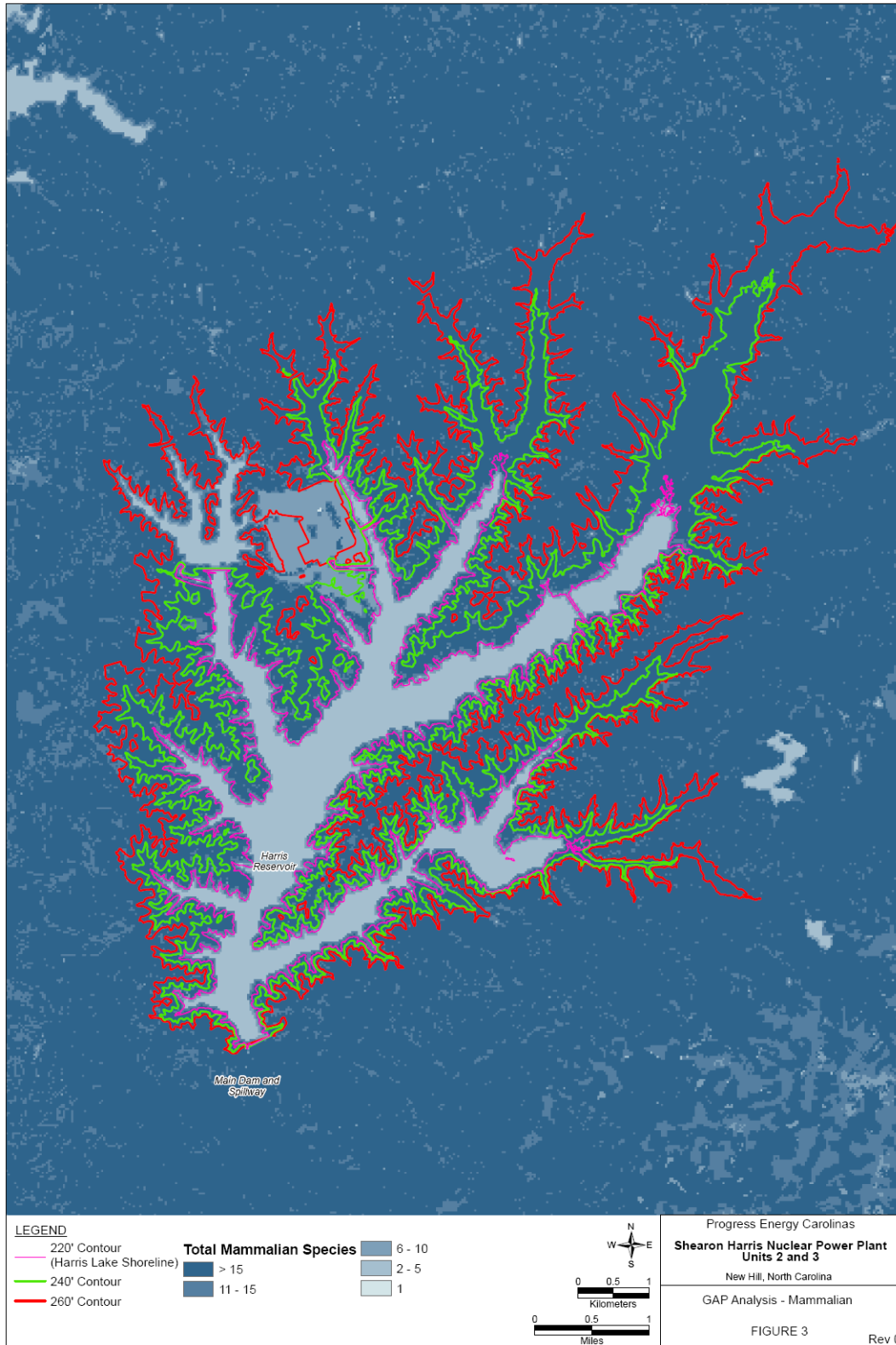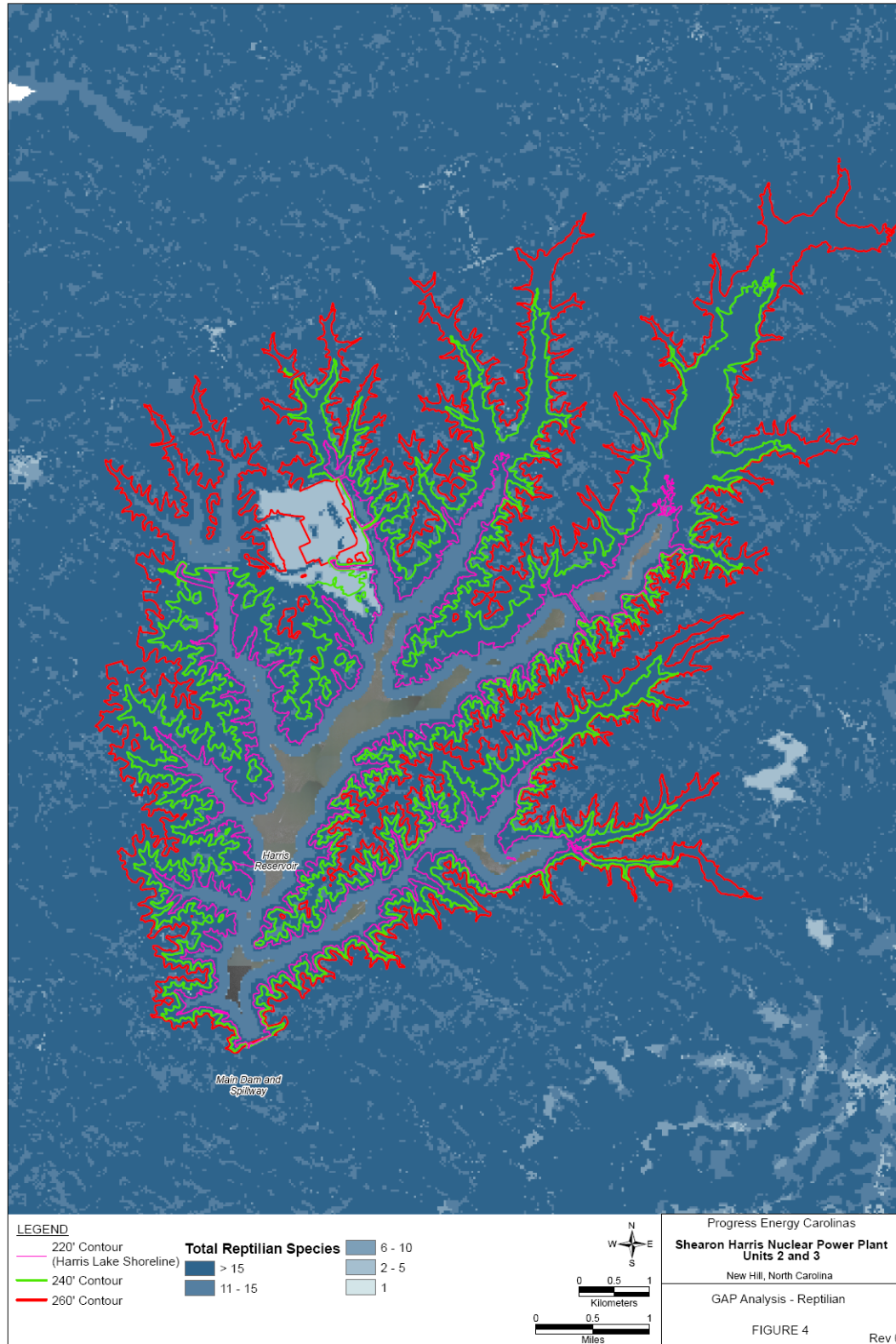
New Hill, North Carolina

GAP Analysis - Avian

FIGURE 2   Rev 0
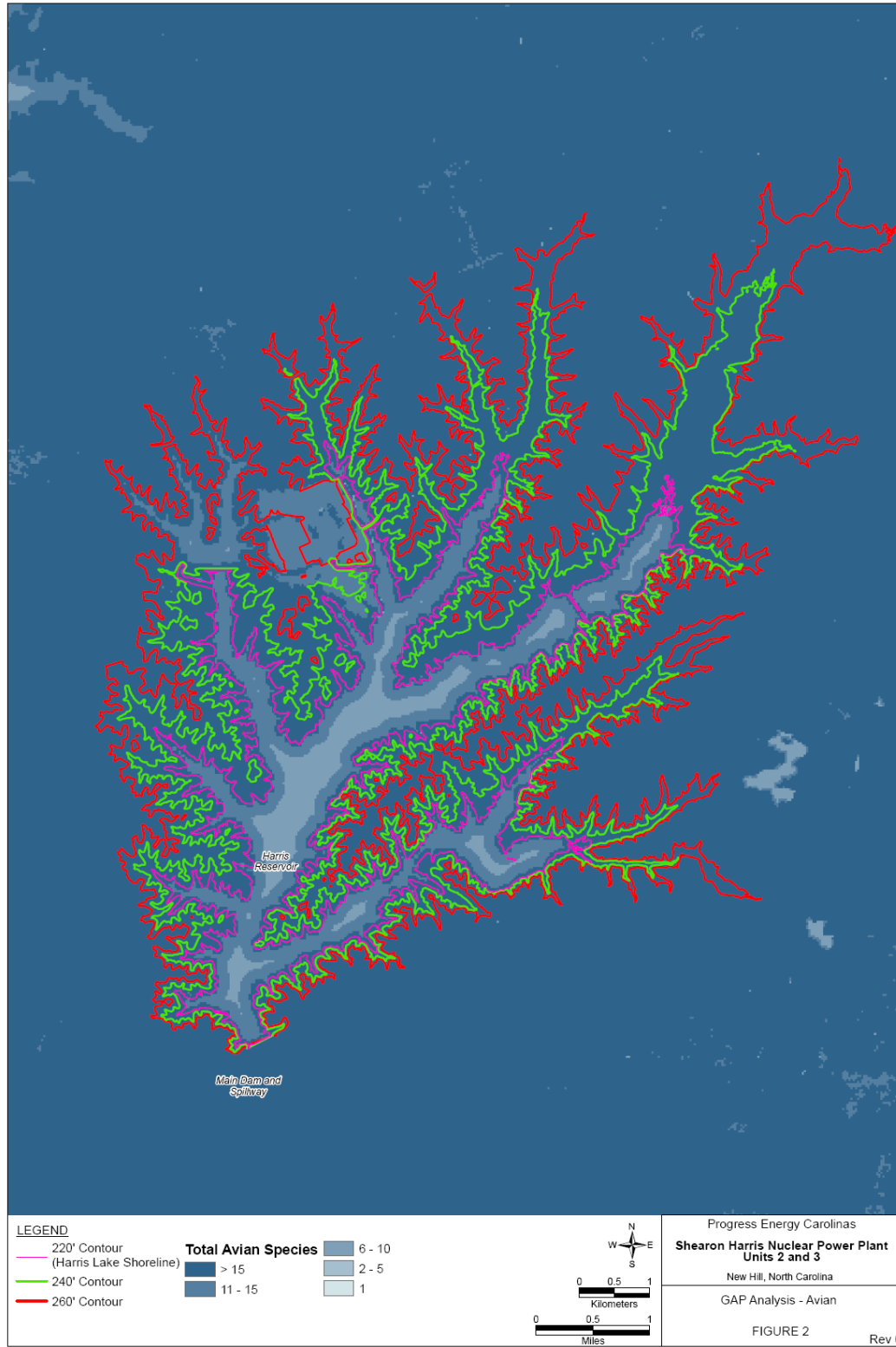
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Figure 3

LEGEND

———	220' Contour (Harris Lake Shoreline)
———	240' Contour
———	260' Contour

Total Mammalian Species

	6 - 10
	> 15
	2 - 5
	11 - 15
	1

Progress Energy Carolinas

Shearon Harris Nuclear Power Plant Units 2 and 3

New Hill, North Carolina

GAP Analysis - Mammalian

FIGURE 3   Rev 0

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Figure 4

LEGEND
220' Contour (Harris Lake Shoreline)
240' Contour
260' Contour

Total Reptilian Species
> 15
11 - 15
6 - 10
2 - 5
1

Progress Energy Carolinas
Shearon Harris Nuclear Power Plant Units 2 and 3
New Hill, North Carolina
GAP Analysis - Reptilian
FIGURE 4   Rev 0

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