Yadkin Project
FERC No. 2197

RARE, THREATENED AND ENDANGERED SPECIES SURVEY

FINAL STUDY REPORT

JUNE 2005

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FINAL STUDY REPORT

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Table of Contents

Page

List of Figures

Page

List of Tables

Page

SUMMARY

The Rare, Threatened and Endangered (RTE) Species Survey Final Study Report presents the results of a survey of RTE species and their habitats at the Yadkin Project. The study was conducted by Normandeau Associates, Inc. (NAI) as part of the Federal Energy Regulatory Commission (FERC) relicensing process for the Yadkin Project. The study was conducted in accordance with the Final RTE Study Plan that was developed by Alcoa Power Generating, Inc. (APGI) in consultation with the Wetlands, Wildlife and Botanical Issue Advisory Group (IAG). Specific objectives identified in the Final Study Plan included:

- Determine the RTE species that may occur in the Project area and that may be affected by Project operations, and conduct focused field searches for those species.
- Evaluate potential effects of Project operations on RTE species of concern and their habitats.

At the outset of the study, NAI worked closely with the Wetlands, Wildlife and Botanical IAG to develop a regional list of RTE species that was ultimately refined to include those species known to occur or likely to occur in the Yadkin Project area. In total, 36 species were included on the final search list. Most of the search list consisted of plant species, but the list also included mammals, reptiles, amphibians and dragonflies (odonates).

Three field surveys were conducted by NAI in 2004, one each in the spring, summer and fall. NAI was assisted in its field searches by several local experts including Peter Diamond and Mark Lewis from the North Carolina Zoological Park. The table below lists the RTE species that were found within the Yadkin Project during 2004.

RTE Species recorded in the Yadkin Project study area, 2004.

Plant Species	Common Name	RTE[1]	Location
Amorpha schwerinii	Piedmont Indigo-bush	SR-T	Falls Reservoir High Rock Reservoir Narrows Reservoir Tuckertown Reservoir
Baptisia alba	Thick-pod White Wild Indigo	SR-P	Falls Reservoir
Cirsium carolinianum	Carolina Thistle	SR-P	Falls Reservoir
Helianthus laevigatus	Smooth Sunflower	SR-P	Tuckertown Reservoir
Helianthus schweinitzii	Schweinitz's Sunflower	E	Falls Reservoir
Lotus helleri	Heller's Trefoil	SR-T, FSC	Fall Transmission Line
Porteranthus stipulatus (= *Gillenia stipulata*)	Indian Physic	SR-P	Tuckertown Reservoir
Ruellia purshiana	Pursh's Wild Petunia	SR-O	Falls Transmission Line
Solidago plumosa	Yadkin River Goldenrod	E, FSC	Falls Reservoir
Animal Species			
Crotalus horridus	Timber Rattlesnake	SC	Falls Transmission Line

[1] SR-T = Significant Rare Throughout (NC) SR-P = Significantly Rare Peripheral (NC)
SR-O = Significantly Rare Other (NC) E = Endangered in NC
SC = Special Concern (NC) FSC = Federal Special Concern

As shown, the rare species found at the Yadkin Project included nine plants and one reptile, the timber rattlesnake (*Crotalus horridus*). Most of the rare plant species found occurred in lightly forested to open, primarily herbaceous communities, often associated with steep slopes overhanging the water, or overhanging road cuts. *Amorpha schwerinii*, the piedmont indigo-bush, was the most abundant and widespread of the nine plant species.

The only non-plant species found in these surveys was the timber rattlesnake which was observed along the Falls transmission line corridor. However, it is known that the Project also supports several breeding pairs of bald eagle (*Haliaeetus leucocephalus*; Federally- and State-listed as Threatened) which were the subject of a separate survey and report entitled *An Assessment of the Bald Eagle and Great Blue Heron Breeding Populations Along the High Rock, Tuckertown, Narrows and Falls Reservoirs in Central North Carolina: 2004 Breeding Season.*

After reviewing the location of the rare species and their habitats within the Project area, NAI concluded that due to their upland locations, most of the rare species found would not be impacted by the operation of the project and the related changes in reservoir water levels. The exceptions are those species found in the tailwater areas including *Solidago plumosa*, *Amorpha schwerinii* and *Baptisia alba* which were all found on Falls Reservoir in the vicinity of the Narrows tailwater. These three species seem to benefit from periodic scouring associated with high flow releases from Narrows dam that help to remove competing vegetation. The effects of tailwater flows on *Solidago plumosa* (Yadkin River goldenrod) is the subject of a separate study being conducted by APGI as part of the ongoing relicensing.

1.0 INTRODUCTION

Alcoa Power Generating Inc. (APGI) is applying to the Federal Energy Regulatory Commission (FERC) for a new license for the Yadkin Hydroelectric Project. The Project consists of four reservoirs (High Rock, Tuckertown, Narrows, and Falls; Figure 1), and their associated dams, and powerhouses located on a 38-mile stretch of the Yadkin River in central North Carolina. The Project generates electricity to support the power needs of Alcoa's Badin Works and its other aluminum operations, or is sold on the open market.

To address concerns over potential impacts of Project operations on Rare, Threatened or Endangered (RTE) species a comprehensive survey for terrestrial and aquatic species was needed, particularly in light of the numerous new (post-1990) occurrences of listed species that have been documented in the Yadkin Project vicinity. Accordingly, an inventory was conducted of federal and state-listed RTE species potentially impacted by Yadkin Project operations. The study area included reservoir and tailwater shorelines, tributary mouths (at the confluence with the Project reservoirs), remnant riverine habitats (the upper end of High Rock) and other Project lands, including the transmission line corridors and areas around the dams and powerhouses. Previous survey work done by Natural Heritage Program and by other contractors served as a starting point for this study and was used to help identify the focus species.

2.0 BACKGROUND

As part of the relicensing process, APGI prepared and distributed an Initial Consultation Document (ICD; Alcoa 2002), which provided a general overview of the Project. Agencies, municipalities, non-governmental organizations and members of the public were given an opportunity to review the ICD and identify information and studies that were needed to address relicensing issues. To further assist in the identification of issues and data/study needs, APGI formed several Issue Advisory Groups (IAGs) to advise APGI on resource issues throughout the relicensing process. Through meetings, reviews and comments, the Wetlands, Wildlife and Botanical IAG assisted in developing the Study Plans for the various resource issues, and will further review and comment on the findings resulting from the implementation of the study plans. The Wetlands, Wildlife and Botanical IAG was interested in the current status of RTE species of terrestrial and aquatic plants and wildlife at the Yadkin Project under existing conditions, assessment of how these habitats could be affected by existing Project operations, and any changes that may occur as a result of altered Project operations, if proposed. This report presents the findings of the RTE Species survey, following implementation of the Final Study Plan, dated June 2003. Other groups of species not on the terrestrial RTE list were handled separately: birds (Center for Conservation Biology), and fish and aquatic invertebrates (Normandeau Associates, Fish and Aquatics group).

3.0 STUDY AREA

The RTE Species Study Area encompassed all four reservoirs under APGI management: High Rock, Tuckertown, Narrows, and Falls. Upstream project limits extended up the Yadkin River to approximately 1 mile north of Boone’s Cave State Park. On the South Branch of the Yadkin, the project limits occurred approximately 6 miles from its confluence with the Yadkin River. The downstream project limits extended approximately 1 mile below Falls Dam, which was estimated to

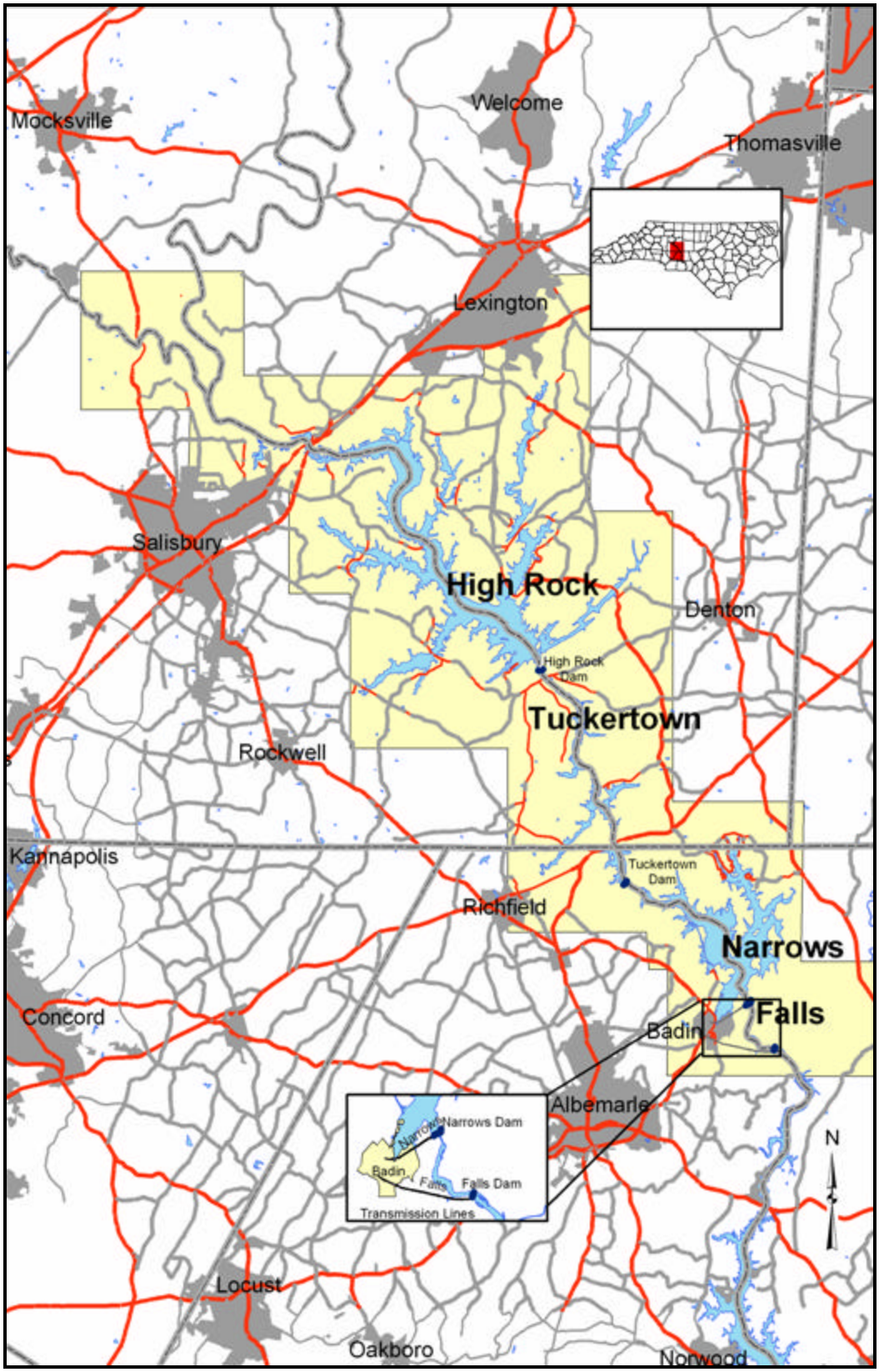

Figure 1. Locus of Yadkin Project.

be the maximum extent of riverine flow in the Falls dam tailrace during low water on Tillery Reservoir. All wetlands and riparian habitats within the zone of influence of reservoir operations were included in the study area, as well as all lands within 200 feet of the shoreline.

RTE species surveys were also performed on the Falls and Narrows transmission line corridors and project land within the vicinity of the four dams and powerhouses. The two transmission line corridors are approximately 4.6 miles in length. The survey included the maintained corridor plus an additional area extending 50 feet from either side. The land and facilities in the immediate area of the four dams, including parking lots and access roads were also included.

4.0 STUDY PURPOSE AND OBJECTIVES

On March 13, and April 25, 2003 the Wetlands, Wildlife and Botanical IAG discussed objectives for the RTE study. Over the course of those discussions the following objectives were identified for the study, as defined in the June 2003 Final Study Plan:

- Determine the RTE species that may occur in the Project area and that may be affected by Project operations, and conduct focused field searches for those species.
- Evaluate potential effects of Project operations on RTE species of concern and their habitats.

5.0 STUDY METHODS

5.1 DEVELOPMENT OF THE RARE, THREATENED AND ENDANGERED SPECIES LIST

A preliminary list of rare, threatened and endangered (RTE) species for the five counties in the project area was compiled from:

- the US Natural Heritage Program (NHP) County Lists as updated May 2003,
- the US Fish and Wildlife Service (FWS) North Carolina County Lists updated February 2003, and
- the FWS State TESS list updated September 2003.

Supplemental sources included several local inventories (Baranski 1993 and 1994), a Uwharrie National Forest draft list (Kaufman 2003), and consultation with experts on individual species or groups. The botanical experts consulted included Moni Bates, North Carolina Plant Conservation Program; Peter Diamond, Horticultural Taxonomist, North Carolina Zoo; and Alan Weakley, University of North Carolina Herbarium, University of North Carolina at Chapel Hill. Mary Kay Clark, NC State Museum of Natural Sciences, was consulted for her informed opinion on Rafinesque's Big-Eared Bat, as was Sarah McRae, NCNHP, regarding odonates.

Habitat and behavior data were collected for each species on the list and used to determine if the species should be included on the Yadkin Project RTE Search list. Criteria for inclusion on the list were the following:

Reservoir Species

- could occur within 200 feet of the reservoir full-pool boundary, *and*
- could be influenced by reservoir operations.

Transmission line Species

- could occur within 50 feet of the clearings for the Project's two transmission line corridors and four powerhouses.

Each species was given a ranking based on its geographic distribution and habitat requirements. This ranking was used to divide the list into the following categories: Priority, Secondary, Transmission Line, and Excluded. Species on the NC Plant Watch List were not included because, in general, these species are at a lower level of concern than those on the State and Federal rare species lists.

Definitions of Search List Categories

Priority –known to occur or likely to occur in Project Area; will be the object of intensive search efforts in likely habitats.

Secondary – not known to occur, but may be present; field biologists will be fully aware of plant features and habitat characteristics should the species or its habitats be encountered during field work.

Transmission line - known to occur or likely to occur in Project Area; will be the object of intensive search efforts in likely habitats.

Excluded– not likely to occur in project area, based on either geographic distribution or habitat requirements.

A draft of the RTE list was presented at the October 8, 2003, Wetland Wildlife and Botanical IAG meeting for review and comment. After incorporation of their recommendations and further discussion and input from the specialists, the list was circulated to the IAG February 3, 2004, for additional review and comment. The resulting list was considered final for the start of the April 2004 field survey. The final list had 14 Priority species, 17 Secondary species, 5 Transmission Line species, and 32 excluded species (Table 1).

5.2 PLAN AND SCHEDULE FOR CONDUCTING RTE FIELD STUDIES

Three field surveys were planned and undertaken during 2004. Each coincided with a different season (spring, summer, and fall), and lasted 10, 9 and 13.5 days respectively. Three NAI senior biologists participated, for a collective total of 55 person-days. For 2, 3 and 3 days respectively during each season, the NAI biologists were joined by a local botanist, Dr. Peter Diamond, from the North Carolina Zoological Park in Asheboro. Additional field surveys, specifically for reptiles and amphibians, were conducted between June and August by Mr. Mark Lewis, also of the North Carolina Zoological Park. Diamond and Lewis conferred with NAI at other times as well, both in print and in person.

Scheduling of the field surveys throughout the growing season ensured that all plant species on the search list could be encountered, if present, in a reasonably detectable and identifiable condition during at least one life-history stage. Observations of listed animal species also benefited from the

Table 1. Final List of Rare, Threatened and Endangered Species for Yadkin Project Search for Terrestrial and Wetland Species only, Including Insects. Birds and Aquatic Wildlife were handled by others.

Scientific Name	Common Name	Source	State*	Federal**	County	Habitat Notes
Priority						
Amorpha schwerinii	Piedmont indigo-bush	1	SR-T		M, R, S, Dd	dry forests
Aster georgianus	Georgia aster	1,2	T	C1	M, R, S, Dd	open woods and roadsides
Aster mirabilis	Piedmont aster	1	SR-T		S	rich slopes and bottomlands
Baptisia alba	Thick-pod white wild indigo	1	SR-P		M, S	open woodland clearings
Baptisia albescens	Thin-pod white wild indigp	1	SR-P		M, R, S	open woodland clearings
Cardamine dissecta	Dissected toothwort	1	SR-P		M, R, Dd	rich woods, bottomlands
Carex impressinervia	Ravine sedge	1,2	SR-T	FSC	M	wet forests
Cirsium carolinianum	Carolina thistle	1	SR-P		M, R	forests, disturbed areas, basic soils
Helenium brevifolium	Littleleaf sneezeweed	1	E		M, R	bogs, seeps, riverbanks
Helianthus schweinitzii	Schweinitz's sunflower	1, 2, 3	E	E	M, R, S, Dd	open woods and roadsides
Plantago cordata	Heart-leaf plantain	1	E		Dd	beds of small, slate-bottomed perennial streams
Porteranthus stipulatus	Indian Physic	1	SR-P		M, Dd	forests and open woods, mainly over mafic rocks
Solidago plumosa	Yadkin River goldenrod	1,2	E	FSC	M, S	riverside rocks
Solidago radula var. radula	Western rough goldenrod	1	SR-P		S	dry woodlands over mafic rocks
Secondary						
Ambystoma talpoideum	Mole salamander	1	SC		M, R	fish-free semipermanent woodland ponds
Anemone berlandieri	Southern anemone/thimbleweed	1	SR-P		M, R, S	thin soils around rock outcrops
Carex bushii	Bush's sedge	1	SR-P		R	open wet areas
Collinsonia tuberosa	Piedmont horsebalm	1	SR-P		M	rich hardwood forests
Corynorhinus rafinesquii	Rafinesque's big-eared bat	***	E	FSC		old buildings, hollow trees, caves, mines, near water
Crotalus horridus	Timber rattlesnake	1	SC		M, S, Dd	rocky, upland forests
Fothergilla major	Large witch-alder	1	SR-T		M, S	dry ridgetop or bluff forests
Gomphus abbreviatus	Spine-crowned clubtail	1	SR		M	rivers
Gomphus fraternus	Midland clubtail	1	SR		S	rocky rivers
Hemidactylium scutatum	Four-toed salamander	1	SC		M	wetlands in hardwood forests
Hexalectris spicata	Crested coralroot	1	SR-P		S, Dd, D	dry or mesic woods on basic soils
Quercus austrina	Bluff oak	1	SR-P		M	bluff and bottomland forests
Ruellia purshiana	Pursh's wild-petunia	1	SR-O		M	glades, woodlands over mafic/calcareous rocks
Spartina pectinata	Freshwater cordgrass	1	SR-P		M	freshwater marshes
Stachys sp 1	Yadkin hedge nettle	1	SR-T		M	sandy edges of forested floodplains
Tradescantia virginiana	Virginia spiderwort	1	SR-P		M	rich woods on circumneutral soils
Verbena riparia	Riverbank vervain	1,2	SR-T	FSC	S	habitat not known
Transmission lines						
Echinacea laevigata	Smooth coneflower	1, 2, 3	E-SC	E	M	glades and open areas over mafic rocks
Gnaphalium helleri var helleri	Heller's rabbit tobacco	1	SR-P		M, R, Dd	dry woodlands, openings, glades over mafic rocks
Helianthus laevigatus	Smooth sunflower	1	SR-P		M, R, S	shaly open woods and roadsides

(continued)

Table 1. (Continued)

Scientific Name	Common Name	Source	State*	Federal**	County	Habitat Notes
Lotus helleri	Carolina birdfoot-trefoil/Heller's trefoil	1,2	SR-T	FSC	R, S, Dd, D	open woods over clay soils, roadsides
Parthenium auriculatum	Glade wild quinine	1	SR-T		M	glades and openings over mafic rocks
Excluded						
Arabis missouriensis	Missouri rockcress	1	SR-P		S	thin soils around basic rock outcrops
Aster laevis var concinnus	Narrow-leaf aster	1	SR-P		S	forests, woodland borders over mafic rocks
Baptisia minor	Prairie blue wild indigo	1	T		S	glades and open forests on basic soils
Clemmys muhlenbergii	Bog turtle	2, 3	T	T/SA	Dd	bogs, wet pastures
Cyperus houghtonii	Houghtons umbrella sedge	1	SR-P			dry soil
Desmodium ochroleucum	Cream ticktrefoil	1,2	SR-T	FSC	D	sandy/rocky woodland openings
Dicanthelium annulum	Ringed witch grass	1	SR-P			dry, sandy or rocky woods, borders of thickets
Dodecatheon meadia var meadia	Eastern shooting star	1	SR-P		S, Dd	rich rocky woods over mafic or calcareous rocks
Erynnis martialis	Mottled duskywing	1	SR		M	upland woods, needs Ceanothus americanus
Fixsenia favonius ontario	Northern oak hairstreak	1	SR		M	dry oak-dominated woods
Gomphus consanguis	Cherokee clubtail	1	SR		D	spring-fed streams
Helenium pinnatifidum	Dissected sneezeweed	1	SR-P		R	savannahs and open mucky sites
Ilex amelanchier	Sarvis holly	1	SR-P		M	blackwater swamps and riverbanks
Isoetes piedmontana	Piedmont quillwort	1	T		R	granite flatrocks and diabase glades
Isoetes virginica	Virginia quillwort	1,2	SR-L	FSC	R	upland depression swamp forests
Juglans cinerea	Butternut	2		FSC	S	coves, stream benches, rock ledges
Lilium canadense ssp editorum	Red Canada lily	1	SR-P		S	bogs, wet meadows
Lindera subcoriacea	Bog spicebush	1,2	E	FSC	M	streamhead pocosins, white cedar swamps, bogs
Masticophis flagellum	Coachwhip	1	SR		S	dry sandy woods, pine/oak sandhills
Matelea decipiens	Glade milkvine	1	SR-P		S, Dd	thin woodlands over mafic or calcareous rocks
Minuartia uniflora	Single-flowered sandwort	1	E		R	granite flatrocks
Oxypolis ternata	Savanna/Piedmont cowbane	***		FSC		wetlands, wet swales, bogs
Pellaea wrightiana	Wright's cliff-brake	1	E-SC		S	rock outcrops, mafic or with nutrient-rich seepage
Pituophis melanoleucus melanoleucus	Northern pinesnake	1,2	SC	FSC	M	dry, sandy woods, pine/oak sandhills
Platanthera integra	Yellow fringeless orchid	1	T		R	savannas
Portulaca smallii	Small's portulaca	1	T		R	granite flatrocks and diabase glades
Puma concolor couguar	Eastern cougar	1, 2, 3	E	E	M	needs open forest
Quercus prinoides	Dwarf Chinquapin oak	1	SR-P		S	dry, rocky slopes
Rhus michauxii	Michaux's sumac	1, 2, 3	E-SC	E	D	sandhills, sandy forests, woodlands and edges
Silphium terebinthinaceum	Prairie dock	1	SR-P		D	diabase glades, open/semi-open areas, mafic rocks
Sistrurus miliarius	Pigmy rattlesnake	1	SC		M	pine flatwoods, pine/oak sandhills
Solidago ptarmicoides	Prairie goldenrod	1	E		R	diabase glades

(continued)

Table 1. (Continued)

Notes:
1 NC Natural Heritage Program County lists updated May 2003,
NHP List of Rare Animal Species 2001, and NHP list of Rare Plant Species, 2002
2 US Fish & Wildlife Service North Carolina County lists updated 2/2003
3 US Fish and Wildlife Service TESS State list updated 2/2004
* based on NCNHP County lists updated May 2003
** based on USFWS County lists updated 2/2003
*** State and/or Federally listed but not found in counties
C1 = Consideration for listing- no protected status
E = Endangered
E/PT = Endangered Potentially Threatened
E-SC = Endangered but available commercially
FSC = Federal Special Concern - no protected status
SC = Special Concern
SR = Significantly Rare
SR-L = Significantly Rare Limited
SR-O = Significantly Rare Other
SR-P = Significantly Rare Peripheral
SR-T = Significantly Rare Throughout
T = Threatened
T/SA = Threat. due to Similarity of Appearance -
no effect on land-management activities by private landowners

Counties
S Stanly
R Rowan
M Montgomery
Dd Davidson
D Davie

Expert Reviewers
Dr. Alan Weakley, Curator, UNC Herbarium, Chapel Hill, NC
Dr. Moni Bates, NC Plant Conservation Program
Dr. Peter Diamond, NC Zoological Park, Asheboro, NC
Sarah McRae, Natural Heritage Program, Raleigh, NC
Dr. Mary Kay Clark, NC Museum of Natural Sciences, Raleigh, NC
Mr. Mark Lewis, NC Zoological Park, Asheboro, NC
Dr. Dennis Herman, NC Museum of Natural Sciences, Raleigh, NC

same dispersed effort, as each species' behavior changed from season to season. The relatively large number of listed plant species, many with specialized habitat needs and markedly seasonal manifestations, required the continued services of the local botanist to help refine the survey team's search patterns.

5.3 FIELD SURVEYS

Access to each reservoir shoreline was attained primarily by boat, from a public access point, or occasionally from a private boat ramp with the owner's consent. Non-navigable headwaters were sampled from road crossings or private lands with the owners' permission. The immediate environs of each dam were reached, with ALCOA authorization, via a combination of boat, automobile, and walking. Narrows and Falls transmission line corridors were surveyed on foot, with one or more biologists walking in a zigzag pattern in the corridor and the forested edge. All known locations of listed species (North Carolina Center for Geographic Information and Analysis 2002) were revisited. Additional locations similar to those with records of occurrence were surveyed, possibly for the first time.

The search of new areas included consideration of the following criteria:

- Slope, including litter and soil depth;
- Aspect (especially north-facing and south-facing slopes);
- Surface drainage (e.g., seeps, swales, depressions, stream sides and bottoms);
- Soil chemistry (e.g., nutrient availability, basic/acidic characteristics);
- Outcrops; and
- Tree canopy closure.

These criteria were applied incidentally, wherever relevant, during all other survey components, including habitat evaluation, cover type ground-truthing, wetland inspection, the Water Willow-dock survey (Normandeau 2005a, b and c), and sample observations made in natural communities of the Yadkin River corridor as described by Baranski (1994).

A map of the State's relevant surficial geology (Goldsmith et al. 1988) provided a rough indication of the substrate conditions to be expected in the Project Area. Once at a particular location, investigators would rely on secondary but site-specific indicators of soil nutrient status. For example, rich woods are likely to support a forest cover dominated by trees that include notably Tulip Tree, Basswood, White Ash and Sugar Maple. Sites of lower nutrient status are likely to support a relatively high biomass of ericaceous shrubs (e.g. *Rhododendron* and *Vaccinium*). The common species thus prepare the investigator for the listed species that are most likely to occur with them in any given site. Within the site, attention would typically focus on the landscape anomalies: physical extremes of height, depth, steepness, wetness or drought, light or darkness. Openings in the prevailing Piedmont forest canopy would also receive special attention, whether these were the result of incidental events (e.g. flooding, fire or windthrow) or deliberate management (e.g. silviculture, agriculture, electric power transmission).

Plants at each sample site were sought by slow meander scans. This method additionally yielded incidental encounters with many reptiles and amphibians. The herpetofauna were also actively sought, primarily in and near wetlands, and under stones and woody debris. During spring and summer, many frog and toad species were identified by their vocalization. Some turtles were caught by hand, but most were identified at shoreline basking sites. Vernal pools were searched for amphibian egg masses and juveniles.

Incidental to other work, riverine and floodplain forest trees were noted for attributes that might support summer maternity and foraging roosts of Rafinesque's Big-eared Bat (*Corynorhinus rafinesquei*). Similarly incidental observations were made of adult odonates, in hopes of a listed dragonfly sighting: Spine-crowned Clubtail (*Gomphus abbreviatus*) and Midland Clubtail (*G. fraternus*).

6.0 SUMMARY OF EXISTING STUDIES AND INFORMATION ON THE PROJECT AREA

Baranski (1993, 1994) summarized the nature and extent of previous field studies in the Yadkin River corridor. He found that studies of three counties (Rowan, Davie and Davidson) during the previous 2 to 3 decades had resulted in the addition of 51 taxa to the listed flora for these counties. He concluded that relatively little botanical field work had been carried out in the region prior to 1968, the date of publication of *Manual of the vascular flora of the Carolinas* (Radford, Ahles and Bell). However, Baranski's 1993 work in the Yadkin River corridor added only a few new species to the then current list of plant rarities cited by Weakley (1990), and no listed animals. The plant list has since been updated by Amoroso and Finnegan (2002) for the NCNHP on a county-by-county basis. LeGrand, Hall and Finnegan (2001) have done the same for rare animal species. The latest updates are available electronically from the USFWS (2003) and NCNHP (2003). These updated species lists include most of the protected species reported in the Yadkin Project *Shoreline Management Plan* as occurring in the Project Area (Yadkin, Inc. 1999), with the exception of the buckthorn (*Bumelia lycioides*) and water parsnip (*Sium suave*). The protected species list in the Yadkin Project Relicensing *Initial Consultation Document* (ALCOA 2002) covers a larger geographic area than does the *Shoreline Management Plan*, and includes Watch List species, but also agrees closely with the agency updates.

Baranski noted the accumulation of sediment in the upper reaches of High Rock Reservoir, and the young plant communities associated with it. This dynamic process does not promote the unique microsite conditions that favor the establishment and survival of unusual species. Before the construction of dams in the study area, the deeply dissected Piedmont plateau would have provided a great variety of ravine habitats, often steep and rocky, running the gamut of hydrologic conditions from cool, moist, shady stream bottoms to hot, dry, sunny ridges, with all imaginable combinations of these factors in between. Permanent inundation of the original land-water interface along the Yadkin River and the lower reaches of its tributaries in the study area would have eliminated many of these habitats and their associated unusual plant communities. Much of botanical interest still remains in the natural areas described by Schafale and Weakley (1990) and identified on the ground by Baranski (1993, 1994), usually on slopes that by reason of their relative steepness have been spared intensive logging and management. Those steep slopes that escaped permanent inundation by the reservoirs provide many of the best locations for listed species, from the zone of intermittent floodwater scouring (now to be found only in dam tail-race areas) on up. Such conditions are most in evidence around Tuckertown and Falls Reservoirs (Diamond, pers. comm. 2004).

Table 2. RTE Species recorded in the Yadkin River study area, 2004.

Plant Species		RTE[1]	Location[2]	Number[3]	Regeneration[3]	Remarks
Amorpha schwerinii	Piedmont Indigo-bush	SR-T	F	15 (10 Fl&Fr)	V	2 populations; 3 disjunct individuals.
			HR	1,500 (150 Fl&Fr)	V, S	
			T	90 (40 Fl&Fr)	V	2 populations, 1 widely dispersed W shore.
Baptisia alba	Thick-pod White Wild Indigo	SR-P	F	17 Fl	V	
Cirsium carolinianum	Carolina Thistle	SR-P	F	10 (5 Fl&Fr)	V, S	
Helianthus laevigatus	Smooth Sunflower	SR-P	T	1	V	mown roadway verge.
Helianthus schweinitzii	Schweinitz's Sunflower	E	F	30 (5 Fl)	V, S	2 stands 100 feet apart.
Lotus helleri	Heller's Trefoil	SR-T, FSC	Ft	1 Fl&Fr	V	observations limited by recent logging.
Porteranthus stipulatus (= *Gillenia stipulata*)	Indian Physic	SR-P	T	52	V, S	
Ruellia purshiana	Pursh's Wild Petunia	SR-O	Ft	1 Fl&Fr	V	observations limited by recent logging .
Solidago plumosa	Yadkin River Goldenrod	E, FSC	F	275 (75 Fl)	V, S	3 populations, E & W banks, scoured by Narrows Dam tailrace.
Animal Species						
Crotalus horridus	Timber Rattlesnake	SC	Ft	1	gravid female	

[1] SR-T = Significant Rare Throughout (NC)
SR-P = Significantly Rare Peripheral (NC)
SR-O = Significantly Rare Other (NC)
E = Endangered in NC
SC = Special Concern (NC)
FSC = Federal Special Concern

[2] F = Falls Reservoir
Ft = Falls transmission line
HR = High Rock Reservoir
N = Narrows (Badin) Reservoir
T = Tuckertown Reservoir

[3] S = Seedling
Fl = Flower
FR = Fruit
V = Vegetative

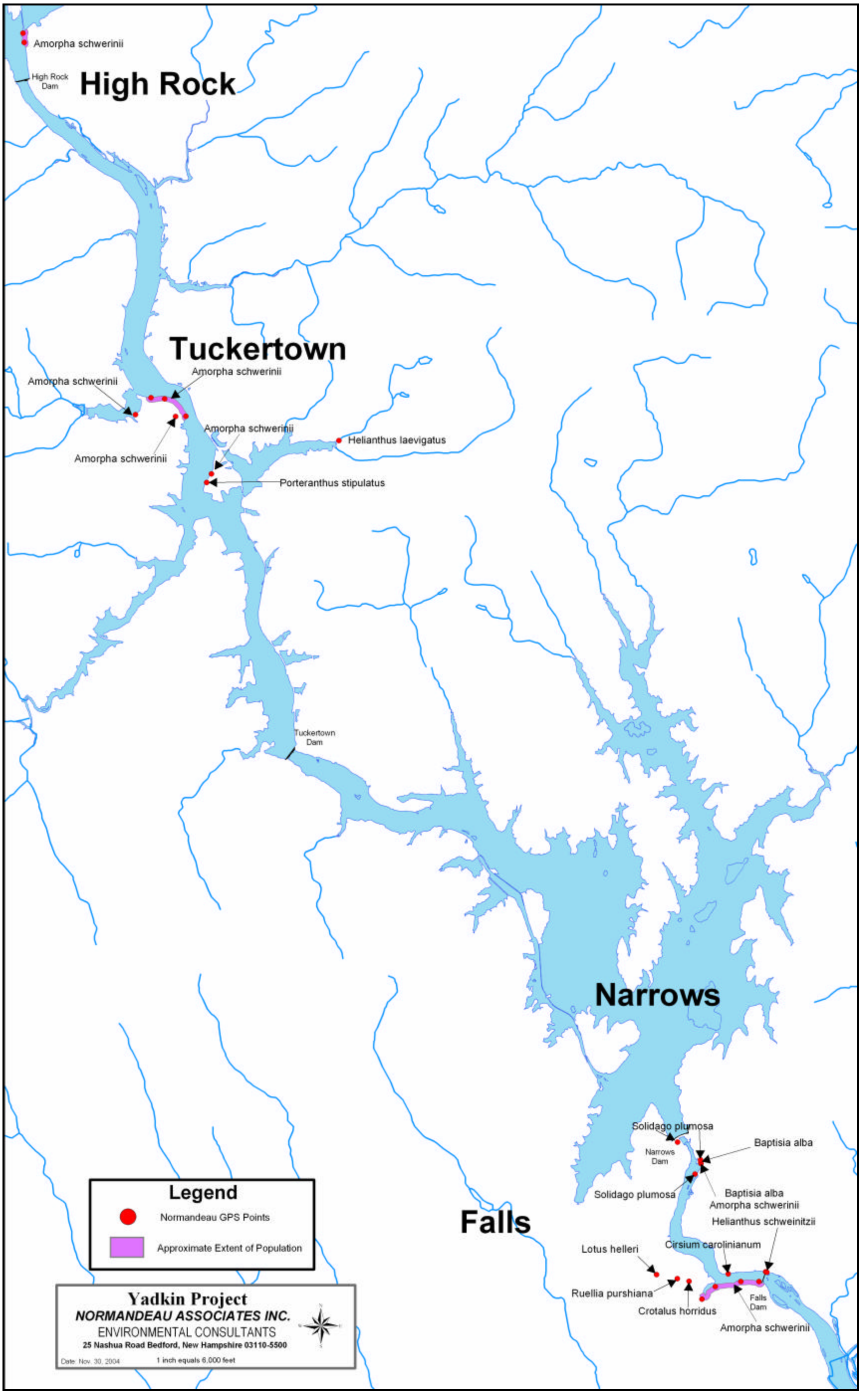

Figure 2. Approximate location of RTE findings during April through October field surveys on Yadkin Project Lands.

7.0 RESULTS OF FIELD SEARCHES

Table 1 lists the rare North Carolina plant and animal species considered by prior review (Section 5.1) to be most likely to occur in the study area. Table 2 shows which of these species were actually found during the 2004 field work, and where they occurred (Figure 2). Endangered and rare plant field survey forms for each rare species population were sent to the North Carolina Natural Heritage Program for inclusion in their database.

With the exception of *Porteranthus stipulatus* (*Gillenia stipulata*), the 8 other plant species of Table 2 occurred in lightly forested to open, primarily herbaceous communities. *Amorpha schwerinii*, the most abundant and widespread of all 9, showed a strong proclivity for forest edge locations, often on steep slopes overhanging water or road cuts. It could also grow in level uplands wherever the forest canopy was open enough. The largest population, along the east shore of High Rock Reservoir, grew mainly under forest cover that appeared to be in the process of suppressing *A. schwerinii* regeneration, as only about 10% of the estimated 1,500 plants had flower and fruit, and few plants of seedling size were observed. In unmanaged forest, this population might be expected to renew its vigor following the periodic reduction of tree density by wind or fire. In the Project Area, this and most of the other rarities listed may now depend largely on the forest clearings created by human activity.

Steep bedrock slopes afforded *A. schwerinii* additional openings of a semi-permanent nature because of the severe constraints on soil accumulation, water retention and hence on tree seed germination and seedling establishment. This kind of site supported species that were apparently even less tolerant of shade, i.e. *Baptisia alba*, *Cirsium carolinianum* and *Helianthus schweinitzii*. The *Baptisia* showed no sign of seedling regeneration and appeared somewhat suppressed by the invasive *Lonicera X bella*, a shrub honeysuckle. The *Cirsium* and *Helianthus* both had immature plants of future promise despite the small total number of individuals in their respective populations.

The coincidence of steep bedrock with periodic strong, high currents below the Narrows and Falls dams apparently promotes conditions that favor *Amorpha schwerinii* and *Baptisia alba* to some degree by removing or reducing the tree canopy. Nearest the water, only 1 of the 9 species, *Solidago plumosa*, appears capable of tolerating the scouring action in its severest degree: the virtual absence of soil and the scouring effects of currents and wave action created during spill events. Though *S. plumosa* was probably more widespread prior to dam construction, today it survives in the Project Area primarily in the Narrows Dam tailrace shoreline environment, clinging to rock fissures closer to the water than any other upland plant. This species is currently the object of separate study being conducted by APGI and is monitored by a local conservation group (Bates 2004). Beyond NAI's observation that it is apparently doing well in a few scour-zone sites, no attempt is made here to provide the more detailed information to be expected of the local *S. plumosa* task force in the ensuing year or two.

Helianthus laevigatus, *Lotus helleri* and *Ruellia purshiana* were recorded only in unforested locations: the first in an annually mown roadway verge near the Tuckertown Reservoir, the others in the Falls Dam transmission line right-of-way, which is subject to the suppression of woody regeneration by mowing or herbicide applications about once every three years. The natural habitat of all three includes open-canopy forest, but wildfire suppression in the Project Area probably affords them less opportunity than historically for widespread persistence outside the managed clearings

characteristic of transportation and power transmission systems. The robust growth habit of *H. laevigatus* (a potential height of 2.5 m) enables it to compete in relatively moist sites with rank vegetation (e.g. *Verbesina*, *Bidens*, *Solidago* and other *Helianthus* species). In contrast, the much shorter, weaker-stemmed *L. helleri* and *R. purshiana* do best in relatively dry sites, where drought-hardy and taller plants (e.g. *Andropogon virginicus*, *Apocynum cannabinum*) may be present but discontinuous in cover. Roadways and transmission lines maintain linear openings of varying soil moisture as they cut across a landscape's heights and hollows, exposing the primarily herbaceous community to sun at every angle for differing lengths of time. Conditions favorable to a great diversity of light-demanding herbaceous plant species therefore may be found within these artificial landscape features. Continual human disturbance of such features, however, does not necessarily work to the benefit of rare species. For instance, no trace of *H. laevigatus*, *L. helleri* and *R. purshiana* could be found in autumn following their initial discovery in June. The *Helianthus* had apparently been mown, and the others obliterated by the movement of heavy logging equipment along the transmission line right-of-way. These 3 species were assigned a token population count of 1 in Table 2.

The shade-tolerant, forest-dwelling *Porteranthus stipulatus* was found in only one place, a location of previous record constituting a steep, northwest-facing slope of young upland hardwoods bordering the Tuckertown Reservoir. This was a relatively moist site with moderate herbaceous and shrub cover owing to the lightly shading forest canopy overhead. It appeared that the steep slope might aid *Porteranthus* (evidently a successful species here) by promoting the periodic dislodgement downgradient of forest litter and consequent exposure of mineral soil patches for germination opportunities. Survival of this population might also depend on the occasional windthrow to provide small canopy gaps. The present canopy of oaks, hickories and Sugar Maple admits a modicum of sunlight that appears to favor the vigorous growth of seedlings.

Timber Rattlesnake (*Crotalus horridus*) was the only target animal species in Table 2 reported from the 2004 surveys. One gravid female was found in the Falls Dam transmission line right-of-way. This observation confirms anecdotal reports of other rattlesnake sightings in the vicinity of the Falls Dam transmission line as a result of logging operations carried out during the summer and autumn of 2004 (Olson 2004).

Rattlesnakes overwinter in a hibernaculum, which typically consists of deep outcrop fissures and boulder piles with a southern aspect. Several instances of this resource occur within or adjacent to the transmission line. Sunny locations near a rattlesnake hibernaculum provide the animals each spring with an important means of elevating body temperature efficiently after their period of winter quiescence. This opportunity for efficient thermoregulation is particularly important for gravid females, whose young develop faster and emerge sooner if provided with an optimal basking environment (Gardner 2004). In an otherwise forested landscape, electricity transmission lines afford this opportunity. A gravid female basking in the transmission line right-of-way probably indicates the presence of a hibernaculum in close proximity, one which the same female is likely to use for the duration of her life, especially with the continued availability of optimal basking locations (Lewis 2004).

The larger of the two emergent wetlands that cross the Falls Dam transmission line affords potentially suitable habitat for the two target amphibian species, Mole Salamander (*Ambystoma talpoideum*) and Four-toed Salamander (*Hemidactylium scutatum*). Although no salamander egg masses were observed there during 2004, one unidentified salamander larva was observed in October 2004.

Confirmation of the presence of these salamander species required revisitation of the wetland during winter or early spring to detect breeding activity. Set in an upland environment remote from the reservoirs, however, this wetland faces no impact from water-level management changes.

Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*) is not known to occur in the five counties within the Yadkin Project. However, it has never been the object of a specific survey, and given its nocturnal nature and forested habitat it could be present and simply have gone undetected. It has been described as widespread in distribution, but never abundant (Bat Conservation International 2002). Dr. Mary Kay Clark of the North Carolina State Museum of Natural Sciences has done the most extensive work to date on this species in North and South Carolina. She and others have found the bats to be most prevalent in Bald Cypress (*Taxodium distichum*) swamps, although the more general term "bottomland hardwood forest" is often listed (Clark 2000; Clark 2003). Key characteristics of this bat are that it roosts and feeds in forested wetlands near open water. Roost and nursery trees are large in diameter, with large cavities (several feet wide and 8-10 feet tall). Clark found that the preferred tree species was Tupelo (*Nyssa sylvatica*) within the sub-canopy under mature bald cypress, and that a single colony will use several roost trees in close proximity. Surveys have also noted that destruction of these trees often displaced the bats into man-made structures: old buildings, mines and cisterns. The bats spend most of their foraging time within the forest near their roost trees, feeding on small nocturnal insects, especially moths. Forest fragmentation impairs habitat quality for this species, as it appears unwilling to cross large open areas.

While it is possible that *C. rafinesquii* may occur within the Yadkin Project lands, several constraints merit the listing in Table 1 of this species as of secondary importance. One is that no mature cypress swamp habitat, or its ecological equivalent, is known to occur within the Project boundary. Most of the original Yadkin River floodplain, together with its bottomland hardwoods, disappeared under the Project reservoirs, to be displaced upgradient as relatively narrow riparian strips along each valley side. The resulting floodplain trees are consequently young and small; they constitute an insubstantial, disjunct fringe except in the upper High Rock Reservoir. A second habitat constraint of the Project area is the relative scarcity of suitable upland forest adjoining riverine and riparian vegetation. Most of this shoreline is either developed, too recently cut, or still subject to some form of forest management or agriculture, with the result that few if any trees of the large size suitable for maternity or foraging roosts occur with enough frequency to serve breeding or feeding group needs. This finding supports the initial assumption that habitat suitability in the Project Area was too low to justify the effort involved in a search for direct evidence of the bat's presence there.

The absence of Bog Turtle (*Clemmys muhlenbergi*) observations should come as no surprise, since many possible habitats in the Project Area have been searched by State and regional herpetologists without success. The one existing record for the study area, from the Abbotts Creek catchment in Davidson County, has turned out to belong to a neighboring county. The Bog Turtle may occur somewhere in the Yadkin River drainage, but the Davidson county record cannot be cited as proof (Herman 2004).

The ecology of two target dragonfly species, which appear on the secondary-priority search list, is poorly understood. The Spine-crowned Clubtail (*Gomphus abbreviatus*) and Midland Clubtail (*G. fraternus*) both have historical listings in one of the five counties composing the study area. Both were found within the Yadkin River basin, but on smaller streams many miles from the mainstem (Cuyler 2004). Mr. Duncan Cuyler, who is responsible for the county records for both species, is of the opinion that *G. abbreviatus* may occur on the Project Area, and possibly *G. fraternus*. According

to Mr. Cuyler, *G. abbreviatus* is widespread in the NC Piedmont, and is abundant in the Rocky River west of Pittsboro, outside the 5 counties of the Project (Cuyler 2004). We were unable to reach Mr. Cuyler until after the May window of opportunity for both species, so did not have the benefit of his field expertise for the survey.

Larval habitat for both odonate species reportedly ranges from rocky, moderate- to fast-flowing rivers to sandy/silty backwaters and lakes with emergent vegetation (Brown 2004, Western Pennsylvania Conservancy 1994, Dunkel 2000). Reservoir construction has probably reduced the amount of suitable riverine habitat, but some tributary inlets immediately above the zone of reservoir slack water may provide sufficient flow combined with shallows extensive and sheltered enough to support a suitable vegetated habitat complex. Fast flow still occurs below each dam, and if the flow extremes are not excessive could serve larval life history needs, as confirmed anecdotally for other dams by some odonate specialists (SaintOurs 2004, Brown 2004, McShaffrey 2004). However, the extreme nature of this habitat in terms of flow rates and frequencies, and rapid changes in water levels would likely prevent use of these waters by these species. Odonate observations incidental to other work performed by NAI throughout the 2004 growing season yielded no definitive rare gomphid sightings.

8.0 DISCUSSION AND CONCLUSIONS

In all, 10 listed species were found in the Yadkin Project Area during the 2004 survey, 9 of them plants and 1 of them an animal (Table 2). To a varying degree, all of them indicated a positive correlation with light intensity. At one extreme is *Solidago plumosa*, on bare lakeshore rock with little soil and no competition; at the other *Porteranthus stipulatus*, a woodland species that seems to regenerate well under the filtered shade of a young, open tree canopy. The other plant species occupy small niche habitats that balance between strong sunlight and relatively intense interspecific competition. The Timber Rattlesnake depends on open sites for thermoregulation, particularly in the spring for gravid females. All of the rare species observed in 2004 (Table 2) are dependent on upland habitat, not on aquatic or wetland habitat, although the Timber Rattlesnake may make seasonal use of wetlands as a foraging area.

The Project area's history of land use helps explain its generally low habitat suitability for many of the species listed in Table 2, as well as others that could possibly occur but were not found. The shoreline forest comprises relatively small trees, less than a century in age, the legacy of past logging and agriculture. Ongoing silvicultural activity around much of the study area shoreline removes many old and/or misshapen trees that could provide maternity and foraging roosts for Rafinesque's Big-eared Bat. A program of wildfire prevention protects the crop trees and also applies in all developed shoreline areas, with a consequent reduction in the occurrence of early-succession fields and open-canopy glades that plants with a prairie or savanna affinity could use. Due to the permanent inundation of the reservoirs, floodplain habitat is limited, and many species that would be expected to occupy such habitats have moved upgradient, where they can, on relatively steep valley sides. Vernal pools that typically would form in floodplain backwater depressions are also very limited in the Project area, along with all dependent amphibians. Similarly, the riffle reaches of river suitable as larval habitat for the listed clubtail dragonfly species are also generally limited in the Project area to short stretches of free-flowing habitat located below each of the Project dams. Areas of dense wet-meadow and emergent growth that could support Bog Turtle lie in relatively small, disjunct patches upstream on some tributaries. In addition, the unseasonal changes in reservoir water levels that are a

part of ongoing Project operations limit the establishment and survival of many herbaceous wetland plants.

Due to the upland locations of most of the listed species found in the Project Area, current operation of the reservoirs and the resulting water level fluctuations and river flows would have no direct impact on these species. The one exception would be the possible effect of potential changes in tailwater discharge below Narrows Dam, where current and wave scour during extreme high flow events appear to serve to periodically purge the shoreline of robust woody vegetation and mineral fines, and promote conditions favorable to *Solidago plumosa* and *Baptisia alba*, and perhaps *Amorpha schwerinii*. However, the magnitude and periodicity of tailwater discharge that could be considered optimal for the support of these three species has not been determined, nor is it known how any proposed modifications to project operations would change the hydrologic conditions (magnitude, timing, duration and periodicity) below Narrows Dam. This issue is expected to be explored more full in a separate investigation of *Solidago plumosa.* Absent additional information, the assumption here is that any change from current Project operations that would modify tailwater releases below Narrows dam, could be deleterious to these three species. Ultimately, if changes to Project operations are proposed that would result in a change in tailwater release practices, downstream populations of *Solidago plumosa*, *Amorpha schwerinii* and *Baptisia alba* should be monitored to determine the nature and extent of any effects that could be attributed to these changes. If the effects appear in any way adverse, the tailwater release practices should be reviewed and modified accordingly.

Section 7.0 also documents the very important effect that other Project Area activities can have on rare species: maintenance of early-succession plant communities in a landscape reverting to forest. Maintenance of the transmission line corridors through periodic mowing, clearing, and herbicide application by APGI promotes biodiversity in the Project Area and region (Normandeau 2005b). The corridors keep open tracts of undeveloped land that otherwise would grow up uniformly to forest. Without the herbaceous strips under the transmission lines, many of the Project Area rarities would be markedly rarer, specifically *Helianthus laevigatus*, *H. schweinitzii*, *Lotus helleri*, and *Ruellia purshiana*; probably also *Cirsium carolinianum, Baptisia alba* and the rattlesnake, *Crotalus horridus*. Here, routine removal of woody-plant regeneration on a cycle of 3 years or less provides enough stability and space to maintain many light-demanding herbaceous species of the savanna and prairie and forest gap. To a certain extent, some of these same species may also respond well to the ephemerally open habitats created by logging, especially the two *Helianthus* sunflowers, which have the potential to compete with other robust plants of forest clearings, e.g. *Erechtites hieracifolia*, *Eupatorium capillifolium* and *Baccharis halimifolia*.

The widening of both transmission line corridors in 2004 has improved the likelihood that several listed species will either maintain or expand their presence in the Project Area for the indefinite future. A widened transmission line corridor, especially one that has been recently cleared, will reduce or eliminate the crossing movements of some animals (e.g. small birds and mammals) that now may include both forested edges in one territory (Chasko and Gates 1992; Gates 1991; Wilcove 1988). However, degradation of the habitat important to many area-sensitive species, particularly those with a need for large, intact forest, has already occurred. Much of the adjoining forest is routinely logged in large clear-cuts. Before that, forested land was fragmented by agriculture, more intensively than it is now. Area-sensitive species, including those with current or near-RTE status,

would have undergone the preponderant impacts of forest fragmentation centuries ago, and more recently at the time the original transmission lines were cut out of the newly regenerating forest.

Assuming that APGI's current operation and maintenance practices along the transmission line corridors remains unchanged, there would be no additional adverse impacts to RTE species associated with continued project operations. There would, however, be opportunities for enhancing current management practices to further protect RTE species and their habitats. For example, the ideal time to conduct logging in Timber Rattlesnake habitat is during the winter months, when the animals are safely underground. Additionally, heavy equipment should avoid contact with possible hibernacula and vulnerable wetland soils, either during passage or the actual logging. A vegetated buffer "no-go" zone should be observed around wetland areas at all times.

Overall, however, the transmission line plant community cannot be expected to support a given species in an easily predictable way. Plant populations are dynamic, responsive to changes in microsite conditions, interspecific and intraspecific competition, herbivory and herbicide, perhaps in repeating cycles over several years, decades or more. Maintaining early-succession plant communities in a transmission line corridor may be considered a goal in itself, however, periodic monitoring of the plants present may yield valuable insights. A pattern in the occurrence of certain target species may emerge, prompting recommendations for improving current management practices in specific ways. Research under way elsewhere on these or similar species may inspire additional changes in vegetation management. With sufficient information, it may prove feasible to introduce new rare plant species to suitable sites within the right-of-way, as a contribution to regional biodiversity. Consultation with experts in the RTE species of interest is recommended in order to develop appropriate management practices.

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APPENDIX A

RTE Species Survey—Yadkin Project: reptiles and amphibians. Report on herpetological field survey, June-August 2004. Survey performed by Mark Lewis, North Carolina Zoological Park, Asheboro, North Carolina.

RTE Species Survey – Yadkin Project

Reptiles & Amphibians

Conducted by Mark Lewis on behalf of Normandeau Associates

Objective:
To attempt to locate three specific RTE species by conducting field searches at locations most likely to support those species within the Project area.

Survey Period:
June – August 2004

Species Surveyed:

1. Mole Salamander *Ambystoma talpoideum*
2. Four-toed Salamander *Hemidactylium scutatum*
3. Timber Rattlesnake *Crotalus horridus*

Survey Methods:

1. Bodies of water – perimeters were skirted by kayak; when likely habitat was found, I disembarked, headed inland 200 feet, then turned and paralleled the shore for distances of 100-300 feet, depending upon habitat, drainage areas and topography. I then returned directly to shore at the most distant point reached, and continued my survey along the shoreline on foot on my way back to the boat.

2. Transmission lines – I followed a zigzag pattern along the transmission line, penetrating 50 feet into the trees on each side.

3. In all visited habitat, I turned rocks and other suitable cover sites (either man-made or naturally occurring). Binoculars were used to extend the coverage area.

Locations Surveyed:

1. High Rock Lake
2. Tuckertown Lake
3. Narrows Lake
4. Falls Lake
5. Narrows transmission line
6. Falls transmission line

Species Found by Location:

1. High Rock Lake
    - Yellowbelly Slider *Trachemys scripta* - Common
    - Bullfrog *Rana catesbeiana* - Common
    - Gray Treefrog *Hyla chrysoscelis* - Common

2. Tuckertown Lake
    - Copperhead *Agkistrodon contortrix* - Common
    - Yellowbelly Slider *Trachemys scripta* - Common
    - Five-lined Skink *Eumeces fasciatus* - Common
    - Green Frog *Rana clamitans* - Common
    - Gray Treefrog *Hyla chrysoscelis* - Common

3. Narrows Lake
    - Northern Watersnake *Nerodia sipedon* - Common
    - Yellowbelly Slider *Trachemys scripta* - Common
    - Painted Turtle *Chrysemys picta* - Uncommon
    - Box Turtle *Terrapene carolina* - Common
    - Green Anole *Anolis carolinensis* - Abundant
    - Broadhead Skink *Eumeces laticeps* - Uncommon
    - Five-lined Skink *Eumeces fasciatus* - Common
    - Fence Lizard *Sceloporus undulates* – Uncommon / common
    - Green Frog *Rana clamitans* - Common
    - Gray Treefrog *Hyla chrysoscelis* - Common
    - Slimy Salamander *Plethodon glutinosus* – Uncommon / common

4. Falls Lake
    - Brown Watersnake *Nerodia taxispilota* - Rare
    - Northern Watersnake *Nerodia sipedon* - Common
    - Queen Snake *Regina septemvittata* – Uncommon / common
    - Copperhead *Agkistrodon contortrix* - Common
    - Yellowbelly Slider *Trachemys scripta* - Common
    - Painted Turtle *Chrysemys picta* - Uncommon
    - Box Turtle *Terrapene carolina* - Common
    - Green Anole *Anolis carolinensis* - Abundant
    - Five-lined Skink *Eumeces fasciatus* - Abundant
    - Green Frog *Rana clamitans* - Common
    - Bullfrog *Rana catesbeiana* - Common
    - Gray Treefrog *Hyla chrysoscelis* - Common

5. Narrows transmission line
    - No species found

6. Falls transmission line
    - Eastern Hognose Snake *Heterodon platirhinos* - Uncommon
    - **Timber Rattlesnake** *Crotalus horridus* – **Target species - Uncommon**
    - Six-lined Racerunner *Cnemidophorus sexlineatus* - Abundant

Additional Information:

1. An extensive upland ephemeral pond, dry at the time of the survey, was located at the Falls transmission line. This is a possible breeding location for the two target amphibian species. A return visit in late winter or early spring is recommended, when the pond is likely to be full and breeding is taking place.

2. The large colony of Race Runners located at the Falls transmission line is quite unusual for this area. Because of the thermo-regulation needs of this species (they like it hot), the presence of this colony is a likely indicator that this area has a large solar window and is thus an area likely to be used by gravid reptiles, which require a greater amount of heat.

3. The Timber Rattlesnake found at the Falls transmission line appeared to be a gravid female. Studies have shown that this species is site-loyal (hibernaculum, summer feeding areas, giving birth, etc.); this individual probably uses this area each time she becomes gravid.

4. The population of Brown Watersnakes at Falls Lake is more than likely a disjunct one, since this is not an expected species in the piedmont.

Signed: _____Date: _____
Mark D. Lewis

APPENDIX B

Comment Response Table

Appendix B: RTE Comment Response Table

Copies of the Rare, Threatened and Endangered (RTE) Species Study Draft Report were distributed to the Wetlands, Wildlife and Botanical Issues Advisory Group (IAG) on March 2, 2005. The Draft Report was then summarized and discussed at the meeting, and comments and recommendations were made. Additionally, the IAG was given until April 1, 2005 to submit additional comments. Table 1 below is a summary of the comments received and responses to the comments.

TABLE 1: SUMMARY OF COMMENTS AND RESPONSES

Source of Comment	Comment	Response
Andy Abramson, The Land Trust for Central North Carolina, 3/24/05 email	RTE study as designed is "inadequate for the purposes of the FERC relicensing process."	Development of the Final RTE Study Plan was an iterative process, including discussion and input from the Wetlands, Wildlife and Botanical IAG, as reflected in meeting minutes from this group. The Final Report meets all the study plan objectives, as defined by the WWB IAG.
Andy Abramson, The Land Trust for Central North Carolina, 3/24/05 email	The study area definition of 200 feet of the shoreline is too limited	The extent of the study area was defined as part of the Final Study Plan, developed with input from the Wetlands, Wildlife and Botanical IAG, which included agencies with responsibility for RTE species management.
Andy Abramson, The Land Trust for Central North Carolina, 3/24/05 email	Report is missing data from NHP and NCDENR county inventories	NCDENR and NCNHP were consulted and database searches were conducted for all 5 relevant counties; those site occurrences within the Project Area were noted and investigated during site reconnaissance. Other relevant records were reviewed as noted in Sections 5.1 and 9.0.
Todd Ewing, 4/15/05 email	Page 3, "NC Fish and Wildlife Service County Lists" inaccurate, no such entity	This has been corrected to read "US Fish and Wildlife Service (FWS) North Carolina County Lists"
Todd Ewing, 4/15/05 email	RTE habitat improvement not discussed and a management/monitoring plan not proposed	Although not a separate section, some recommendations for habitat improvement and/or preservation are included in Section 8.0, and consultation with RTE experts is recommended to develop appropriate management practices. Specific recommendations for future RTE species management at the Yadkin Project would best be addressed in a separate RTE species management plan.