OPTIMAL SURVEY WINDOWS AND NUMBER OF YEARS A SURVEY IS VALID FOR
NORTH CAROLINA'S FEDERALLY THREATENED, ENDANGERED, AND AT-RISK PLANT SPECIES

SCIENTIFIC NAME	COMMON NAME	STATUS	SURVEY WINDOW	YEARS SURVEY IS VALID
Aeschynomene virginica	sensitive joint-vetch	T	July – October (or before first tropical storm that causes overwash)	1
Amaranthus pumilus	seabeach amaranth	T	July - October	1
Amorpha georgiana var. *georgiana*	Georgia lead-plant	ARS	late April – October	2
Cardamine micranthera	small-anthered bittercress	E	April - May	1
Carex impressinervia	impressed-nerved sedge	ARS	April - May	2
Carex lutea	golden sedge	E	mid April - mid June	2
Dionaea muscipula	Venus flytrap	ARS	late May – June	2
Echinacea laevigata	smooth coneflower	E	late May – October	2
Fimbristylis perpusilla	Harper's fimbristylis	ARS	July – September	2
Geum radiatum	spreading avens	E	June – September	2
Gymnoderma lineare	rock gnome lichen	E	year round	2
Hedyotis purpurea var. *montana*	Roan Mountain bluet	E	June – July	2
Helianthus schweinitzii	Schweinitz's sunflower	E	late August – October	2
Helonias bullata	swamp pink	T	April – May	2
Hexastylis naniflora	dwarf-flowered heartleaf	T	March – May	2
Hudsonia montana	mountain golden heather	T	late May - early June	2
Isoetes microvela	thin-wall quillwort	ARS	April – July	1
Isotria medeoloides	small whorled pogonia	T	mid May - early July	1
Liatris helleri	Heller's blazing star	T	July – September	2
Lindera melissifolia	pondberry	E	February – March; September - October	2
Lindera subcoriacea	bog spicebush	ARS	March - August	2
Lobelia boykinii	Boykin's Lobelia	ARS	May – July	2
Ludwigia ravenii	Raven's seedbox	ARS	June - October	2
Lysimachia asperulaefolia	rough-leaved loosestrife	E	mid May – September	2
Macbridea caroliniana	Carolina birds-in-a-nest	ARS	July – November	2
Minuartia godfreyi	Godfrey's stitchwort	ARS	April – June	2
Oxypolis canbyi	Canby's dropwort	E	mid July – September	2
Platanthera integrilabia	white fringeless orchid	T	mid July - late August	2
Ptilimnium nodosum	harperella	E	July – early September (during low water)	1
Rhus michauxii	Michaux's sumac	E	May – October	2
Rhynchospora crinipes	hairy-peduncled beakrush	ARS	July – September	2
Rudbeckia heliopsidis	sun-facing coneflower	ARS	July – September	2
Sagittaria fasciculata	bunched arrowhead	E	mid May – July	2
Sarracenia oreophila	green pitcher-plant	E	late April – October	2
Sarracenia purpurea var. *montana*	mountain purple pitcher-plant	ARS	April – October	2
Sarracenia rubra ssp. *jonesii*	mountain sweet pitcher-plant	E	April – October	2

SCIENTIFIC NAME	COMMON NAME	STATUS	SURVEY WINDOW	YEARS SURVEY IS VALID
Schwalbea americana	American chaffseed	E	May - August (1-2 months after a fire)	2
Sisyrinchium dichotomum	white irisette	E	late May – July	2
Solidago plumosa	Yadkin River goldenrod	CCA	September – October	2
Solidago spithamaea	Blue Ridge goldenrod	T	July – September	2
Symphyotrichum georgianum	Georgia aster	CCA	October - mid November	2
Spiraea virginiana	Virginia spiraea	T	May - early July	2
Sporobolus teretifolius	wire-leaved dropseed	ARS	July – September (following fire)	2
Thalictrum cooleyi	Cooley's meadowrue	E	mid June - early July	2
Tsuga caroliniana	Carolina hemlock	ARS	year round	2

STATUS KEY:
E - Federally endangered
T - Federally threatened
ARS - Proposed for listing as threatened or endangered under the ESA, candidate species for listing, or petitioned by a third party for listing. ARS species listed above have "substantial" 90-day findings and are undergoing status reviews (awaiting 12-month findings).
CCA - Species subject to a candidate conservation agreement.

OTHER NOTES:
These survey windows were determined from species recovery plans, field observations, herbaria specimens, and NC Natural Heritage Program information. For additional information about these species, please visit the U.S. Fish and Wildlife Service Asheville Field Office webpage at https://www.fws.gov/asheville/ or the Raleigh Field Office webpage at https://www.fws.gov/raleigh/.

If suitable habitat for species is present in the proposed impact area, the U.S. Fish and Wildlife Service will likely request species surveys, conducted by a qualified biologist, during the optimal survey window. Projects are reviewed on a case-by-case basis and you are encouraged to contact a Section 7 coordinator early in the project planning process. To discuss your project and survey requirements with a Section 7 coordinator, please contact the Asheville Field Office at 828-258-3939 or the Raleigh Field Office at 919-856-4520

Version date: February 11, 2020

Federally Threatened and Endangered Animal Species (North Carolina): Survey Window and Responsibility

Common Name	Scientific Name	Recommended Survey Window*	Consulting Resource Agencies
AQUATIC MAMMALS			
Blue whale (E)**	*Balaenoptera musculus*	April - August	NMFS
Fin whale (E)**	*Balaenoptera physalus*	April - August	NMFS
Humpback whale (E)**	*Megaptera novaeangliae*	April - August	NMFS
North Atlantic right whale (E)**	*Eubalaena glacialis*	April - August	NMFS
Sei whale (E)**	*Balaenoptera borealis*	April - August	NMFS
Sperm whale (E)**	*Physeter macrocephalus*	April - August	NMFS
ARACHNIDS			
Spruce-fir moss spider (E)**	*Microhexura montivaga*	May - August	USFWS
BIRDS			
Bald eagle (BGPA)	*Haliaeetus leucocephalus*	Year round; November - March (optimal to observe birds and nest); February - May (optimal to observe active nesting)	USFWS
Piping plover (T&E)	*Charadrius melodus*	Year round	USFWS
Red-cockaded woodpecker (E)	*Picoides borealis*	Year round; November - early March (optimal)	USFWS
Roseate tern (E)	*Sterna dougallii*	June - August	USFWS
Rufa red knot (T)	*Calidris canutus rufa*	Year round	USFWS
Wood stork (T)	*Mycteria americana*	April 15 - July 15	USFWS
FISH			
Atlantic sturgeon (E)**	*Acipenser oxyrinchus oxyrinchus*	Not required; assume presence in appropriate waters	NMFS
Cape Fear shiner (E)	*Notropis mekistocholas*	April - June or periods of high flow (tributaries); Year round (large rivers)	USFWS
Giant manta ray (T)	*Manta birostris*	No survey window established at this time, per NOAA Southeast Fisheries Science Center.	NMFS
Oceanic whitetip shark (T)	*Carcharhinus longimanus*	No survey window established at this time, per NOAA Southeast Fisheries Science Center.	NMFS
Roanoke logperch (E)	*Percina rex*	Year round; April - June (optimal)	USFWS
Shortnose sturgeon (E)**	*Acipenser brevirostrum*	Not required; assume presence in appropriate waters	NMFS
Spotfin chub (T)	*Cyprinella monacha*	September - November (tributaries); Year round (large rivers)	USFWS
Waccamaw silverside (T)	*Menidia extensa*	Year round	USFWS
INSECTS			
Rusty patched bumble bee (E) **	*Bombus affinis*	May - September	USFWS
Saint Francis' satyr (E)	*Neonympha mitchellii francisci*	May 5 - June 6 and July 26 - August 21	USFWS
MAMMALS			
Carolina northern flying squirrel (E)	*Glaucomys sabrinus*	May - October (trapping); coldest days in coldest winter months (nest box surveys)	USFWS
Gray bat (E)	*Myotis grisescens*	Structure Checks: May 15 - August 15***	USFWS
MAMMALS (Continued)			

Federally Threatened and Endangered Animal Species (North Carolina): Survey Window and Responsibility

Common Name	Scientific Name	Recommended Survey Window*	Consulting Resource Agencies
Indiana bat (E)	*Myotis sodalis*	Structure Checks: May 15 - August 15***	USFWS
Northern long-eared bat (T)	*Myotis septentrionalis*	Structure Checks: **Divisions 1-8**: Coastal Plain†, April 15 - September 15; Piedmont†, May 1 - September 15; **Divisions 9-14**, May 15 - August 15***	USFWS
Red wolf (E)**	*Canis rufus*	Year round	USFWS
Virginia big-eared bat (E)	*Corynorhinus townsendii virginianus*	Structure Checks: May 15 - August 15***	USFWS
West Indian manatee (E)**	*Trichechus manatus*	Year round	USFWS
MUSSELS			
Appalachian elktoe (E)	*Alasmidonta raveneliana*	March 1 - November 1 (optimal)	USFWS
Carolina heelsplitter (E)	*Lasmigona decorata*	March 1 - November 1 (optimal)	USFWS
Cumberland bean pearlymussel (E)	*Villosa trabalis*	March 1 - November 1 (optimal)	USFWS
Dwarf wedgemussel (E)	*Alasmidonta heterodon*	March 1 - November 1 (optimal)	USFWS
James spinymussel (E)	*Pleurobema collina*	March 1 - November 1 (optimal)	USFWS
Littlewing pearly mussel (E)	*Pegias fabula*	March 1 - November 1 (optimal)	USFWS
Tan riffleshell (E)**	*Epioblasma florentina walkeri walkeri*	March 1 - November 1 (optimal)	USFWS or NCWRC must request survey
Tar River spinymussel (E)	*Elliptio steinstansana*	March 1 - November 1 (optimal)	USFWS
Yellow lance (T)	*Elliptio lanceolata*	March 1 - November 1 (optimal)	USFWS
REPTILES			
American alligator T(S/A)**	*Alligator mississippiensis*	Year round (only warm days in winter)	USFWS
Bog turtle T(S/A)**	*Glyptemys muhlenbergii*	April 1 - October 1 (visual surveys)	USFWS or NCWRC must request survey
Green sea turtle (T)**	*Chelonia mydas*	April - August for beach surveys	USFWS and NMFS
Hawksbill sea turtle (E)**	*Eretmochelys imbricata*	April - August for beach surveys	USFWS and NMFS
Kemp's Ridley sea turtle (E)**	*Lepidochelys kempii*	April - August for beach surveys	USFWS and NMFS
Leatherback sea turtle (E)**	*Dermochelys coriacea*	April - August for beach surveys	USFWS and NMFS
Loggerhead sea turtle (T)**	*Caretta caretta*	April - August for beach surveys	USFWS and NMFS
SNAILS			
Noonday globe snail (T)	*Petera clarki nantahala*	April - September (or prior to first fall frost); April - May (optimal)	USFWS

*Protected animal species surveys remain valid for two years, unless otherwise noted in the species' biological conclusion or agreed upon in consultation with the appropriate resource agency.

**NCDOT surveys are not regularly perform for these species. Species may be listed as T(S/A), or field surveys are too difficult or impractical (record searches and/or resource agency contact are used in lieu of field surveys).

***Mist netting and/or acoustic bat surveys are dependent on results of bat structure checks or USFWS requirements. Mist Netting Surveys: **Divisions 1-8**: Coastal Plain†, April 15 - September 15; Piedmont†, May 1 - September 15; **Divisions 9-14**, June 1 - August 15. Acoustic Surveys: Divisions 9-14, May 15 - August 15.

†for Coastal Plain and Piedmont delineation see attached map (per USFWS Raleigh Field Office)

Species surveys not required for species listed as Historic on USFWS county list. (https://www.fws.gov/raleigh/species/cntylist/nc_counties.html).

E = Endangered; T = Threatened; BGPA = Bald and Golden Eagle Protection Act.

USFWS = US Fish & Wildlife Service; NMFS = National Marine Fisheries Service; NCDMF = NC Division of Marine Fisheries; NCWRC = NC Wildlife Resource Commission

Recommended Survey Windows Approved By: NMFS on x 2019; USFWS (Raleigh Field Office) on August 8, 2019; and USFWS (Asheville Field Office) on March 22, 2019.

PLANTS

American chaffseed
USFWS Optimal Survey Window: May-August (1-2 months after a fire)

Habitat Description: American chaffseed generally occurs in habitats described as open, moist to dryish Mesic Pine Flatwoods and longleaf pine flatlands, Pine Savannas, Pine/Scrub Oak Sandhills, Sandhill Seeps, and other open grass/sedge-dominated communities. This herb also occurs in the ecotonal areas between peaty wetlands and xeric sandy soils and on the upper ecotones of, or sites close, to Streamhead Pocosins. The species prefers sandy peat or sandy loam, acidic, seasonally moist to dry soils in sunny or partly sunny areas subject to frequent fires in the growing season. The plant is dependent on factors such as fire, mowing, or fluctuating water tables to maintain its required open to partly-open habitat. Most extant occurrences, and all of the most vigorous occurrences, are in areas subject to frequent fire. This species is also known to occur on road cuts and power line rights-of-way that experience frequent mowing or clearing. Soil series that it is found on include Blaney, Candor, Gelead, Fuquay, Lakeland, and Vaucluse.

Biological Conclusion:

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1995. American Chaffseed (*Schwalbea americana*) Recovery Plan. Hadley, Massachusetts. 62 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. American Chaffseed in North Carolina. http://www.fws.gov/nc-es/plant/chaffseed.html. (Accessed: December 14, 2010).

Blue Ridge goldenrod
USFWS Optimal Survey Window: July-September

Habitat Description: Blue Ridge goldenrod, endemic to the Appalachian Mountains of North Carolina and Tennessee, occurs in the High Elevation Rocky Summit natural community generally at or above elevations of 4,600 feet above mean sea level along cliffs, ledges, balds, and dry rock crevices of granite outcrops of the higher mountain peaks. This early pioneer herb usually grows in full sun on generally acidic soils of shallow humus or clay loams that are intermittently

saturated. The encroachment of woody vegetation such as ericaceous shrubs can eliminate the goldenrod through competition and shading. Roan Mountain bluet, Heller's blazing star, and spreading avens are a few of its common associate species.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1985. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for *Solidago spithamaea* (Blue Ridge goldenrod). 50 FR 12306-12309.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. 2008. Information on Threatened and Endangered Species: Blue Ridge Goldenrod. http://www.fws.gov/asheville/htmls/listedspecies/Blue_Ridge_goldenrod.html. (Accessed: December 14, 2010).

Bunched arrowhead
USFWS Optimal Survey Window: mid May-July

Habitat Description: Bunched arrowhead, endemic to the southern Appalachian Mountains of North Carolina and upper Piedmont of South Carolina, is rooted in shallow water seepage areas of bogs, wooded swamps, and deciduous woodlands. This early-successional perennial herb occurs in Swamp Forest-Bog Complex (Typic Subtype) and Southern Appalachian Bog (Southern Subtype) natural communities. A known occurrence also occurs in a maintained power line right-of-way along the headwaters of a river. The plant requires a slight but continuous and steady flow of cool, clean water that saturates or floods but does not stagnate. The species typically occurs in sandy loam soils found underneath a 10-24 inch deep layer of muck, sand, and silt. Undisturbed occurrences are usually located

just below the origin of the seep on gently sloping terrain at the bluff-floodplain ecotone. While shaded areas contain the most vigorous plants, it will also grow in either full sun or partial shade beneath red maple, black gum, and alder at the base of steep slopes.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1979. Determination that *Sagittaria fasciculata* is an Endangered Species. 44 FR 43700-43701.

[USFWS] U.S. Fish and Wildlife Service. 1995. Endangered Species Information: Bunched Arrowhead. Asheville, NC. 2 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. 2008. Information on Threatened and Endangered Species: Bunched Arrowhead. http://www.fws.gov/asheville/htmls/listedspecies/bunched_arrowhead.html. (Accessed: December 14, 2010).

Canby's dropwort
USFWS Optimal Survey Window: mid August-September

Habitat Description: Canby's dropwort occurs in the Coastal Plain and Sandhills in moist habitat areas such as Cypress Savannas, wet meadows, wet pineland savannas, ditches, cypress-pine swamps or sloughs, grass-sedge dominated Carolina bays, and the shallows and edges of cypress/pine ponds. The most vigorous occurrences are found in open bays and ponds that are wet for most of the year with little or no canopy cover. Ideal soils for this perennial herb are acidic, deep, and poorly drained sandy loams or peat-mucks underlain by a clay layer, and have a medium to high organic content and high water table. Soil series that support

the species include Coxville, Grady, McColl, Portsmouth, Rains, and Rembert. The plant is restricted to a narrow, intermediate range of mean water depths where too much or too little water can adversely affect it. Evidence of infrequent and shallow inundations is also found at site occurrences.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1990. Canby's Dropwort Recovery Plan. Atlanta, Georgia. 25 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Canby's Dropwort in North Carolina. http://www.fws.gov/nc-es/plant/canbydrop.html. (Accessed: December 14, 2010).

Cooley's meadowrue
USFWS Optimal Survey Window: mid June-early July

Habitat Description: Cooley's meadowrue, documented in the Pine Savanna natural community, occurs in circumneutral soils in sunny, moist to wet grass-sedge bogs, wet-pine savannas over calcareous clays, and savannah-like areas, often at the ecotones of intermittent drainages or non-riverine swamp forests. This rhizomatous perennial herb is also found along plowed firebreaks, roadside ditches and rights-of-way, forest clearings dominated by grass or sedge, and power line or utility rights-of-way. The species requires some type of disturbance (*e.g.*, mowing, clearing, periodic fire) to maintain its open habitat. The plant typically occurs on slightly acidic (pH 5.8-6.6) soils that are loamy fine sand, sandy loam, or fine sandy loam; at least seasonally moist or saturated; and mapped as Foreston, Grifton, Muckalee, Torhunta, or Woodington series.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1994. Cooley's Meadowrue Recovery Plan. Atlanta, GA. 29 pp.

[USFWS] U.S. Fish and Wildlife Service. 2002. Endangered and Threatened Wildlife and Plants; Endangered Status for *Carex lutea* (Golden Sedge). 67 FR 3120-3126.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Cooley's Meadowrue (*Thalictrum cooleyi*). http://www.fws.gov/nc-es/plant/coolmeadow.html. (Accessed: December 14, 2010).

Dwarf-flowered heartleaf
USFWS Optimal Survey Window: March-May

Habitat Description: Dwarf-flowered heartleaf is endemic to the western Piedmont and foothills of North and South Carolina. This herbaceous evergreen is found in moist to rather dry forests along bluffs; boggy areas next to streams and creek heads; and adjacent hillsides, slopes, and ravines. Requiring acidic, sandy loam soils, the species is found in soil series such as Pacolet, Madison, and Musella, among others. Occurrences are generally found on a north facing slope. Undisturbed natural communities such as Piedmont/Coastal Plain Heath Bluff, Dry-Mesic Oak Hickory Forest, and Mesic Mixed Hardwood Forest hold the most viable occurrences. However, less viable remnant occurrences are found in disturbed habitats, including logged, grazed, mown, and residential/commercial developed lands; areas converted to pasture, orchards, and tree plantations; roadside rights-of-way; and on upland slopes surrounding manmade ponds or lakes.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Padgett, James Edward. 2004. Biogeographical, Ecological, Morphological, and Micromorphological Analyses of the Species in the *Hexastylis heterophylla* Complex. Appalachian State University, Boone, NC. 124 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1989. Endangered and Threatened Wildlife and Plants; Threatened Status of *Hexastylis naniflora* (Dwarf-flowered heartleaf). 54 FR 14964-14967.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. 2007. Dwarf-flowered Heartleaf (*Hexastylis naniflora*) 5-Year Review: Summary and Evaluation, Draft. Asheville, NC. 51 pp.

Golden sedge: Critical Habitat Designation

Critical Habitat Description: Critical habitat for golden sedge is found in eight separate units totaling approximately 202 acres in Onslow and Pender Counties, North Carolina. Watkins Savanna (Unit 1), Haws Run Mitigation Site (Unit 2), Maple Hill School Road Savanna (Unit 3), Southwest Ridge Savanna (Unit 4), Sandy Run Savannas (Unit 5), The Neck Savanna (Unit 6), Shaken Creek Savanna (Unit 7), and McLean Savanna (Unit 8) comprise the units. Units 1-3 and 5-7, found in either Onslow or Pender Counties, are within approximately 8.6 miles southeast of the intersection of NC 50 and NC 53. Unit 4, found in Pender County, is located approximately 9.1 miles southwest of the NC 50/NC 53 intersection. Unit 8, also found in Pender County, is situated approximately 16.4 miles south of the NC 50/NC 53 intersection and 2.1 miles east of NC 210. The eight units consist of power line rights-of-way, Pine Savanna, and/or ecotone habitats.

When designating Critical Habitat, the USFWS identifies physical and biological features (primary constituent elements) that are essential to the conservation of the species and that may require special management considerations or protection.

The primary constituent elements essential to the conservation of golden sedge are the Pine Savanna (Very Wet Clay Variant) natural plant community or ecotones that contain moist to completely saturated loamy fine sands, fine sands, fine sandy loams, and loamy sands soils with a pH of 5.5 – 7.2. This species requires an open to relatively open canopy that allows full to partial sunlight to penetrate to the herbaceous layer between savannas and hardwood forests. Areas of bare soil within 12 inches of mature golden sedge plants may be suitable for either germination or expansion of existing plant populations.

Critical Habitat Biological Conclusion:

[USFWS] United States Fish and Wildlife Service. 2011. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for *Carex lutea* (Golden Sedge). 76 FR 11086-11111.

Golden sedge
USFWS Optimal Survey Window: mid April–mid June

Habitat Description: Golden sedge, a very rare endemic of the Atlantic Coastal Plain, grows in sandy soils overlying calcareous deposits of coquina limestone, where the soil pH, typically between 5.5 and 7.2, is unusually high for this region. The perennial prefers the ecotone between the pine savanna and adjacent wet hardwood or hardwood/conifer forest. Most plants occur in the partially shaded savanna/swamp where occasional to frequent fires favor an herbaceous ground layer and suppress shrub dominance. Soils supporting the species are very wet to periodically shallowly inundated. Other occurrences may occur on disturbed areas such as roadside and drainage ditches or power line rights-of-way, where mowing and/or very wet conditions suppress woody plants. Poorly viable occurrences may occur in significantly disturbed areas where ditching activities that lower the water table and/or some evidence of fire suppression threatens the species.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. 2002. Endangered and Threatened Wildlife and Plants; Endangered Status for *Carex lutea* (Golden Sedge). 67 FR 3120-3126.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

Green pitcher-plant
USFWS Optimal Survey Window: late April-October

Habitat Description: The habitat of green pitcher plant, found in North Carolina's Blue Ridge Province, varies from moderately to steeply sloped seepage bogs (Southern Appalachian Bog-Southern Subtype) and boggy stream banks in North Carolina and Alabama to poorly drained oak and oak-pine flatwoods with a high water table during the winter months in Georgia. Soils of all known occurrences are generally acidic and derived from sandstones or shales. Soils of the flatwood and seepage bog habitat sites are sandy clays or loams, while those of the stream bank habitat sites are almost pure sand. This carnivorous herb is dependent on some form of disturbance, often periodic fire, to keep its habitat in an early successional stage and reduce competition. Flooding also appears to maintain, and perhaps create, the plant's suitable habitat in its stream bank environment by eliminating competing species.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1994. Green Pitcher Plant Recovery Plan. Jackson, Mississippi. 23 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

Harperella
USFWS Optimal Survey Window: July-October in periods of low water

Habitat Description: Harperella, found in North Carolina's eastern Piedmont and western Coastal Plain, comprises occurrences that occupy both riverine and ponded habitats. In the riverine habitat, this annual herb occurs in the Rocky Bar and Shore natural community, and grows on rocky, sandy, or gravelly shoals and margins of clear, swift flowing reaches of seasonally flooded streams. It can also be in such fluvial habitats as crevices of exposed bedrock and, rarely, along sheltered muddy stream banks. The species, which can tolerate a lot of shade, is typically found in riverine microsites, such as the downstream side of large rocks or amidst thick clones of water willow, that are sheltered from the erosive effects

of swift water. In Harperella's ponded habitat, the species is found in the Coastal Plain along the edges of intermittent pineland ponds, damp meadows, and soggy ground around springs. These areas tend to be seasonally flooded and contain soils of a peat muck overlying sand or sandy silt. An occurrence in Georgia's Coastal Plain also occurs on a granite outcrop that is unrelated to its ponded habitat. In riverine and pond environments, the plant is restricted to a very narrow, intermediate range of mean water depths and moderate, periodic flooding. It is entirely absent from both the shallowest or driest areas as well as deep waters.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1990. Harperella (*Ptilimnium nodosum*) Recovery Plan. Newton Corner, Massachusetts. 60 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Harperella in North Carolina. http://www.fws.gov/nc-es/plant/harperella.html. (Accessed: December 14, 2010).

Heller's blazing star
USFWS Optimal Survey Window: July-September

Habitat Description: Heller's blazing star, endemic to the Blue Ridge Mountains of North Carolina, occurs in the High Elevation Rocky Summit natural community on high elevation ledges, rock outcrops, cliffs, and balds at elevations of 3,500–5,999 feet above mean sea level. This early pioneer, perennial herb grows in acidic and generally shallow humus or clay loams on igneous and metasedimentary rock. Known occurrences are intermittently saturated and excessively to moderately poorly drained. The plant generally occurs in full sunlight with grasses, sedges,

and other composites. Blue Ridge goldenrod, Roan Mountain bluet, and spreading avens are a few of its common associate species.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1999. Recovery Plan for *Liatrus helleri* Porter (Heller's Blazing Star). First Revision. Atlanta, GA. 25 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

Michaux's sumac
USFWS Optimal Survey Window: May-October

Habitat Description: Michaux's sumac, endemic to the inner Coastal Plain and lower Piedmont, grows in sandy or rocky, open, upland woods on acidic or circumneutral, well-drained sands or sandy loam soils with low cation exchange capacities. The species is also found on sandy or submesic loamy swales and depressions in the fall line Sandhills region as well as in openings along the rim of Carolina bays; maintained railroad, roadside, power line, and utility rights-of-way; areas where forest canopies have been opened up by blowdowns and/or storm damage; small wildlife food plots; abandoned building sites; under sparse to moderately dense pine or pine/hardwood canopies; and in and along edges of other artificially maintained clearings undergoing natural succession. In the central Piedmont, it occurs on clayey soils derived from mafic rocks. The plant is shade intolerant and, therefore, grows best where disturbance (*e.g.*, mowing, clearing, grazing, periodic fire) maintains its open habitat.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1993. Michaux's Sumac Recovery Plan. Atlanta, Georgia. 30 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Michaux's Sumac in North Carolina. http://www.fws.gov/nc-es/plant/michsumac.html. (Accessed: December 14, 2010).

Mountain golden-heather: Critical Habitat Designation

Critical Habitat Description: Burke County, North Carolina contains a Critical Habitat area designated for mountain golden-heather. This area occurs within Pisgah National Forest along the Linville Gorge Wilderness Boundary, Shortoff Mountain, Table Rock Mountain, and the 3,400 and 2,200-foot elevation contours.

Critical Habitat Biological Conclusion:

[USFWS] U.S. Fish and Wildlife Service. 1980. Endangered and Threatened Wildlife and Plants; Determination of *Hudsonia montana* to be a Threatened Species, With Critical Habitat. 45 FR 69360-69363.

Mountain golden-heather
USFWS Optimal Survey Window: late May-early June

Habitat Description: Mountain golden-heather, endemic to the Blue Ridge Mountains of North Carolina, occurs in Pine-Oak/Heath and Montane Acidic Cliff natural communities on rock cliffs and shrub balds at elevations of 2,800-4,000 feet above mean sea level. This needle-leaved perennial shrub prefers exposed, wind-swept quartzite or mica gneiss ledges in a sparsely vegetated ecotone between bare rock and sand myrtle-dominated heath balds that merge into a pine/oak forest. Plants require periodic fire to maintain its suitably open habitat, although they may survive for awhile in areas shaded by pine trees.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1980. Endangered and Threatened Wildlife and Plants; Determination of *Hudsonia montana* to be a Threatened Species, With Critical Habitat. 45 FR 69360-69363.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

Mountain sweet pitcher plant
USFWS Optimal Survey Window: April-October

Habitat Description: Mountain sweet pitcher plant, endemic to the Blue Ridge Mountains of North and South Carolina, is found along stream banks and in shrub/herb-dominated, seepage-fed mountain bogs (Southern Appalachian Bog-Southern Subtype). Both stream bank and bog habitats are usually situated along intermittently exposed to intermittently flooded level depressions associated with valley floodplains. These habitats, typically on soils of the Toxaway or Hatboro series, contain deep, poorly drained, saturated soils of loam, sand, and silt with a high organic matter content and medium to high acidity. A few occurrences of the pitcher plant also grow in cataract bogs, either in thin strips along the edges of waterfalls or on soil islands over granite rock faces, where sphagnum and other bog plant species line the sides. This early successional species relies on natural disturbance (*e.g.*, drought, water fluctuation, periodic fire, ice damage) to maintain its habitat by preventing the establishment of later successional woody seedlings.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1990. Mountain Sweet Pitcher Plant Recovery Plan. Atlanta, Georgia. 39 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

Pondberry or southern spicebush
USFWS Optimal Survey Window: February-October

Habitat Description: Pondberry occurs in seasonally flooded wetlands, sandy sinks, pond margins, and swampy depressions. This deciduous, aromatic shrub occurs in bottomland hardwood forests with perched water tables along inland areas of the southeastern United States. In the Coastal Plain of the Carolinas, the species occurs at the margins of limestone sinks and ponds and in undrained, shallow depressions of longleaf pine and pond pine forests. Known occurrences in North Carolina occur in the Small Depression Pocosin natural community, grow in soils with sandy sediments and high water table, contain high peat content in the subsurface, and include a prevalence of shrubs due to historically frequent or intense fires. It generally grows in somewhat shaded areas, but can tolerate full sun.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1993. Recovery Plan for Pondberry (*Lindera melissifolia*). Atlanta, Georgia. 56 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Pondberry (Southern Spicebush) in North Carolina. http://www.fws.gov/nc-es/plant/pondberry.html. (Accessed: December 14, 2010).

Roan Mountain bluet
USFWS Optimal Survey Window: June-July

Habitat Description: Roan Mountain bluet occurs on thin, gravelly talus slopes of grassy balds, cliff ledges, shallow soils in crevices of rock outcrops, and steep slopes with full sun at the summits of high elevations peaks of the southern Blue Ridge Mountains. The plant is found at elevations of 4,200-6,300 feet above mean sea level, and often has a north, northwest, south, or southwest aspect. Known occurrences typically grow in gravel-filled, acidic, and metamorphic-derived soil pockets between underlying mafic rock. Fraser fir and red spruce dominate the forests adjacent to known occurrences. Blue Ridge goldenrod, Heller's blazing star, and spreading avens are a few of its common associate species.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1996. Roan Mountain Bluet Recovery Plan. Atlanta, GA. 46 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Roan Mountain Bluet in North Carolina. http://www.fws.gov/nc-es/plant/rmbluet.html. (Accessed: December 14, 2010).

Rock gnome lichen
USFWS Optimal Survey Window: year round

Habitat Description: Rock gnome lichen occurs in high elevation coniferous forests (particularly those dominated by red spruce and Fraser fir) usually on rocky outcrop or cliff habitats. This squamulose lichen only grows in areas with a great deal of humidity, such as high elevations above 5,000 feet mean sea level where there is often fog, or on boulders and large outcrops in deep river gorges at lower elevations. Habitat is primarily limited to vertical rock faces where seepage water from forest soils above flows only at very wet times. The species requires a moderate amount of sunlight, but cannot tolerate high-intensity solar radiation. The lichen does well on moist, generally open sites with northern exposures, but requires at least partial canopy coverage on southern or western aspects because of its intolerance to high solar radiation.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1997. Recovery Plan for Rock Gnome Lichen (*Gymnoderma lineare*) (Evans) Yoshimura and Sharp. Atlanta, GA. 30 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Rock Gnome Lichen in North Carolina. http://www.fws.gov/nc-es/plant/rglichen.html. (Accessed: December 14, 2010).

Rough-leave loosestrife
USFWS Optimal Survey Window: mid May-June

Habitat Description: Rough-leaved loosestrife, endemic to the Coastal Plain and Sandhills of North and South Carolina, generally occurs in the ecotones or edges between longleaf pine uplands and pond pine pocosins in dense shrub and vine growth on moist to seasonally saturated sands and on shallow organic soils overlaying sand (spodosolic soils). Occurrences are found in such disturbed habitats as roadside depressions, maintained power and utility line rights-of-way, firebreaks, and trails. The species prefers full sunlight, is shade intolerant, and

requires areas of disturbance (*e.g.*, clearing, mowing, periodic burning) where the overstory is minimal. It can, however, persist vegetatively for many years in overgrown, fire-suppressed areas. Blaney, Gilead, Johnston, Kalmia, Leon, Mandarin, Murville, Torhunta, and Vaucluse are some of the soil series that the plant occurs on.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

[USFWS] U.S. Fish and Wildlife Service. 1995. Rough-leaved Loosestrife Recovery Plan. Atlanta, GA. 32 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Rough-leaf Loosestrife (*Lysimachia asperulifolia*). http://www.fws.gov/nc-es/plant/rllooses.html. (Accessed: December 14, 2010).

Schweinitz's sunflower
USFWS Optimal Survey Window: late August-October

Habitat Description: Schweinitz's sunflower, endemic to the Piedmont of North and South Carolina. The few sites where this rhizomatous perennial herb occurs in relatively natural vegetation are found in Xeric Hardpan Forests. The species is also found along roadside rights-of-way, maintained power lines and other utility rights-of-way, edges of thickets and old pastures, clearings and edges of upland oak-pine-hickory woods and Piedmont longleaf pine forests, and other sunny or semi-sunny habitats where disturbances (*e.g.*, mowing, clearing, grazing, blow downs, storms, frequent fire) help create open or partially open areas for sunlight. It is intolerant of full shade and excessive competition from other vegetation. Schweinitz's sunflower occurs in a variety of soil series, including Badin, Cecil, Cid, Enon, Gaston, Georgeville, Iredell, Mecklenburg, Misenheimer, Secrest, Tatum, Uwharrie, and Zion, among others. It is generally found growing on shallow sandy soils with high gravel content; shallow, poor, clayey hardpans; or shallow rocky soils, especially those derived from mafic rocks.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

[USFWS] U.S. Fish and Wildlife Service. 1994. Schweinitz's Sunflower Recovery Plan. Atlanta, GA. 28 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Schweinitz's Sunflower (*Helianthus schweinitzii*). http://www.fws.gov/nc-es/plant/schwsun.html. (Accessed: December 14, 2010).

Seabeach amaranth
USFWS Optimal Survey Window: July-October

Habitat Description: Seabeach amaranth occurs on barrier island beaches where its primary habitat consists of overwash flats at accreting ends of islands, lower foredunes, and upper strands of noneroding beaches (landward of the wrack line). In rare situations, this annual is found on sand spits 160 feet or more from the base of the nearest foredune. It occasionally establishes small temporary populations in other habitats, including sound-side beaches, blowouts in foredunes, interdunal areas, and on sand and shell material deposited for beach replenishment or as dredge spoil. The plant's habitat is sparsely vegetated with annual herbs (forbs) and, less commonly, perennial herbs (mostly grasses) and scattered shrubs. It is, however, intolerant of vegetative competition and does not occur on well-vegetated sites. The species usually is found growing on a nearly pure silica sand substrate, occasionally with shell fragments mixed in. Seabeach amaranth appears to require extensive areas of barrier island beaches and inlets that function in a relatively natural and dynamic manner. These characteristics allow it to move around in the landscape, occupying suitable habitat as it becomes available.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and

Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1996. Recovery Plan for Seabeach Amaranth (*Amaranthus pumilius*) Rafinesque. Atlanta, Georgia.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Seabeach Amaranth (*Amaranthus pumilus*). http://www.fws.gov/nc-es/plant/seabamaranth.html. (Accessed: December 14, 2010).

Sensitive joint-vetch
USFWS Optimal Survey Window: mid July-October

Habitat Description: Sensitive joint-vetch grows in the mildly brackish intertidal zone where plants are flooded twice daily. This annual legume prefers the marsh edge at an elevation near the upper limit of tidal fluctuation, but can also be found in swamps and on river banks. Sensitive joint-vetch normally occurs in areas with high plant diversity where annual species predominate, and can grow in sand, mud, gravel, or peat substrates. Bare to sparsely vegetated substrates appear to be a microhabitat feature of critical importance to this plant. Such microhabitats may include accreting point bars that have not yet been colonized by perennial species, areas scoured out by ice, low swales within marshes, muskrat "eat outs" where this rodent removes all of the vegetation within a small portion of the marsh, storm damaged areas, and the saturated organic sediments of some interior marshes that have local nutrient deficiencies. In North Carolina, stable occurrences have been found in the estuarine meander zone of tidal rivers where sediments transported from upriver settle out and extensive marshes are formed. Additional North Carolina occurrences are also found in moist to wet roadside ditches and moist fields, but these are not considered stable populations.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and

Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1995. Sensitive Joint-Vetch (*Aeschynomene virginica*) Recovery Plan. Hadley, Massachusetts. 55 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Sensitive Joint-vetch (Virginia Joint-vetch) in North Carolina. http://www.fws.gov/nc-es/plant/sensjointv.html. (Accessed: December 14, 2010).

Small-anthered bittercress
USFWS Optimal Survey Window: April-May

Habitat Description: Small-anthered bittercress is endemic to the Dan River drainage of Roanoke River sub basin 03-02-01. This biennial or perennial herb occurs in moist, wet woods along small to intermittent sized streams, stream bank edges and seepages above the actual stream channel, wet rock crevices, and sand and gravel bars of small streams. This species prefers areas that are fully or partially shaded by shrubs and trees, but can occasionally be found in full sun. Soil series that it occurs on include Rion, Pacolet, and Wateree. Poorly viable occurrences may be found in disturbed areas subject to livestock trampling, silviculture, or encroachment by exotic, invasive species such as Japanese honeysuckle.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Radford, A.E., H.E. Ahles, and C.R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. University of North Carolina Press, Chapel Hill, NC. 1,183 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1991. Small-anthered Bittercress Recovery Plan. Atlanta, GA. 22 pp.

[USFWS] U.S. Fish and Wildlife Service. 2005. Surveys for *Cardamine micranthera*. Memorandum from Marella Buncick, USFWS, Asheville Office, to Karen Lynch, North Carolina Department of Transportation. 1 p.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. 2008. Information on Threatened and Endangered Species: Small-anthered Bittercress. http://www.fws.gov/asheville/htmls/listedspecies/small_anthered_bittercress.html. (Accessed: December 14, 2010).

Small whorled pogonia
USFWS Optimal Survey Window: mid May-early July

Habitat Description: Small whorled pogonia occurs in young as well as maturing (second to third successional growth) mixed-deciduous or mixed-deciduous/coniferous forests. It does not appear to exhibit strong affinities for a particular aspect, soil type, or underlying geologic substrate. In North Carolina, the perennial orchid is typically found in open, dry deciduous woods and is often associated with white pine and rhododendron. The species may also be found on dry, rocky, wooded slopes; moist slopes; ravines lacking stream channels; or slope bases near braided channels of vernal streams. The orchid, often limited by shade, requires small light gaps or canopy breaks, and typically grows under canopies that are relatively open or near features like logging roads or streams that create long-persisting breaks in the forest canopy.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1992. Small Whorled Pogonia (*Isotria medeoloides*) Recovery Plan, First Revision. Newton Corner, Massachusetts. 75 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. 2008. Information on Threatened and Endangered Species: Small-whorled Pogonia. http://www.fws.gov/asheville/htmls/listedspecies/small_whorled_pogonia.html. (Accessed: December 14, 2010).

Smooth coneflower
USFWS Optimal Survey Window: late May-October

Habitat Description: Smooth coneflower, a perennial herb, is typically found in meadows, open woodlands, the ecotonal regions between meadows and woodlands, cedar barrens, dry limestone bluffs, clear cuts, and roadside and utility rights-of-way. In North Carolina, the species normally grows in magnesium- and calcium- rich soils associated with gabbro and diabase parent material, and typically occurs in Iredell, Misenheimer, and Picture soil series. It grows best where there is abundant sunlight, little competition in the herbaceous layer, and periodic disturbances (*e.g.*, regular fire regime, well-timed mowing, careful clearing) that prevents encroachment of shade-producing woody shrubs and trees. On sites where woody succession is held in check, it is characterized by a number of species with prairie affinities.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1995. Smooth Coneflower Recovery Plan. Atlanta, GA. 31 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Smooth Coneflower (*Echinacea laevigata*). http://www.fws.gov/nc-es/plant/smooconefl.html. (Accessed: December 14, 2010).

Spreading avens
USFWS Optimal Survey Window: June-September

Habitat Description: Spreading avens occurs in areas exposed to full sun on high-elevation cliffs, outcrops, and bases of steep talus slopes. This perennial herb also occurs in thin, gravelly soils of grassy balds near summit outcrops. The species prefers a northwest aspect, but can be found on west-southwest through north-northeast aspects. Forests surrounding known occurrences are generally dominated by either red spruce-Fraser fir, northern hardwoods with scattered spruce, or high-elevation red oaks. Spreading avens typically occurs in shallow, acidic soil (such as the Burton series) in cracks and crevices of igneous, metamorphic, or metasedimentary rocks. Soils may be well drained but almost continuously wet, with soils at some known occurrences subject to drying out in summer due to exposure to sun and shallow depths. Known populations occur at elevations ranging from 4,296 to 6,268 feet above mean sea level. Blue Ridge goldenrod, Heller's blazing star, and Roan Mountain bluet are a few of its common associate species.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1993. Spreading Avens Recovery Plan. Atlanta, GA. 32 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Spreading Avens in North Carolina. http://www.fws.gov/nc-es/plant/spreadavens.html. (Accessed: December 14, 2010).

Swamp pink
USFWS Optimal Survey Window: April-May

Habitat Description: Swamp pink occurs in clonal clumps in a variety of groundwater-influenced wetland habitats including southern Appalachian bogs and swamps, Atlantic white cedar swamps, swampy forests bordering meandering small streams, boggy meadows, headwater wetlands, and spring seepage areas. The perennial herb requires a constantly saturated, but not flooded, water supply. The plant often grows on hummocks formed by trees, shrubs, and sphagnum moss, and exhibits varying degrees of shade tolerance. Swamp pink occurs in acidic soils that contain a very thin layer of decomposed organic matter over a dark silt loam and a subsoil of sand, loam, and gravel.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1991. Swamp Pink (*Helonias bullata*) Recovery Plan. Newton Corner, Massachusetts. 56 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Swamp Pink in North Carolina. http://www.fws.gov/nc-es/plant/swamppink.html. (Accessed: December 14, 2010).

Virginia spiraea
USFWS Optimal Survey Window: May-early July

Habitat Description: Virginia spiraea occurs in flood-scoured, high-gradient sections of rocky river banks of second and third order streams, often in gorges or canyons. This perennial shrub grows in sunny areas on moist, acidic soils, primarily over sandstone. The shrub tends to be found in thickets with little arboreal or herbaceous competition along early successional areas that rely on periodic disturbances such as high-velocity scouring floods to eliminate such competition. Virginia spiraea also occurs on meander scrolls and point bars, natural levees, and other braided features of lower stream reaches, often near the stream mouth. Scoured, riverine habitat sites are found where deposition occurs after high water

flows, such as on floodplains and overwash islands, rather than along areas of maximum erosion. Occurrences in depositional habitats are found among riparian debris piles, on fine alluvial sand and other alluvial deposits, or between boulders.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1992. Virginia Spiraea (*Spiraea virginiana* Britton) Recovery Plan. Newton Corner, Massachusetts. 47 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. Virginia Spiraea in North Carolina. http://www.fws.gov/nc-es/plant/vspiraea.html. (Accessed: December 14, 2010).

White irisette

USFWS Optimal Survey Window: late May-July

Habitat Description: White irisette, endemic to the upper Piedmont of North and South Carolina, is generally found on the southeast to southwest aspect of gentle to very steep, mid-elevation mountain slopes in thin-canopied, dry-mesic Basic Oak Hickory Forests that are mature, successional, or recently logged. Occurrences are also found in open, disturbed sites such as clearings, woodland edges, roadside embankments/rights-of-way, and power line rights-of-way. Known populations occur at elevations between 1,312 and 3,280 feet above mean sea level. The perennial herb prefers rich, basic soils, probably weathered from amphibolite, which are intermittently saturated with rain but well drained. The species occurs in a variety of soils, including the Ashe-Cleveland association; the Evard-Cowee complex; and Brevard, Cowee, Fannin, Greenlee, and Hayesville series. It may grow on shallow soil sites where down slope runoff removed the usual deep litter, humus, or mineral soil layers. Partial shade to direct sun is

preferred, and some form of disturbance (*e.g.*, mowing, clearing, grazing, periodic fire) is necessary to maintain its relatively open habitat.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 14, 2010).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1995. White Irisette Recovery Plan. Atlanta, Georgia. 22 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. http://www.fws.gov/nc-es/es/plant_survey.html. (Accessed: December 14, 2010).

[USFWS] U.S. Fish and Wildlife Service. White Irisette in North Carolina. http://www.fws.gov/nc-es/plant/whiteiris.html. (Accessed: December 14, 2010).

ARACHNIDS

Spruce-fir moss spider: Critical Habitat Designation

Critical Habitat Description: The critical habitat for this species is defined as all portions of the Pisgah National Forest in North Carolina and the Cherokee National Forest in Tennessee, bounded to the north and to the south of the North Carolina/Tennessee state line by the 5,400-foot contour, from the intersection of the 5,400-foot contour with the State line north of Elk Hollow Branch, Avery County, North Carolina, and southwest of Yellow Mountain, Carter County, Tennessee, west to the 5,400-foot contour at Eagle Cliff, Mitchell County, North Carolina. Within these areas, the primary constituent elements include (1) Fraser fir or fir-dominated spruce-fir forests at and above 5,400 feet mean sea level, and (2) moderately thick and humid, but not wet, moss (species in the genus *Dicranodontium*, and possibly *Polytrichum*) and/or liverwort mats on rock surfaces that are adequately sheltered from the sun and rain (by overhang and aspect) and include a thin layer of humid soil and/or humus between the moss and rock surface.

Critical Habitat Biological Conclusion:

[USFWS] United States Fish and Wildlife Service. 2001. Designation of Critical Habitat for the Spruce-fir Moss Spider. 66 FR 35547 35566.

Spruce-fir moss spider

USFWS Recommended Survey Window: May-August

Habitat Description: This species is known only from spruce-fir forests in the Appalachian mountains of North Carolina and Tennessee. The spruce-fir moss spider occurs in well-drained moss and liverwort mats growing on rocks or boulders. These mats are found in well-shaded areas in mature, high elevation ($\geq$ 5,000 feet mean sea level) Fraser fir and red spruce forests. The spruce-fir moss spider is very sensitive to desiccation and requires environments of high and constant humidity. The need for humidity relates to the moss mats, which cannot become too parched or else the mats become dry and loose. Likewise, the moss mats cannot be too wet because large drops of water can also pose a threat to the spider. The spider constructs its tube-shaped webs in the interface between the moss mat and the rock surface. Some webs have been found to extend into the interior of the moss mat.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 18, 2010).

[USFWS] United States Fish and Wildlife Service. Spruce-fir Moss Spider in North Carolina. http://www.fws.gov/nc-es/spider/sprummoss.html. (Accessed: October 18, 2010).

[USFWS] Spruce-fir moss spider fact sheet. http://www.fws.gov/asheville/pdfs/Spruce%20Fir%20Moss%20Spider.pdf. (Accessed: October 18, 2010).

BIRDS

Piping plover: Critical Habitat Designation

Critical Habitat Description: *There are too many individual units of critical habitat designated by USFWS to list here. See the Federal Register (cited below) for a description of each designated unit. Note: Units 1, 2, 4, and 5 (including portions of Dare and Hyde Counties) of the designated Critical Habitat were vacated by court order and remanded to the USFWS. Thus, these units no longer exist.* ***Tailor the critical habitat description for this species to the unit(s) closest to the project.***

Primary constituent elements of wintering piping plover habitat include sand and/or mud flats with no or very sparse emergent vegetation. In some cases, these flats may be covered or partially covered by a mat of blue-green algae. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also essential, especially for roosting piping plovers. Such sites may have debris, detritus (decaying organic matter), or micro-topographic relief (less than 20 inches above substrate surface) offering refuge from high winds and cold weather. Essential components of the beach/dune ecosystem include surf-cast algae for feeding of prey, sparsely vegetated back beach (beach area above mean high tide seaward of the dune line, or in cases where no dunes exist, seaward of a delineating feature such as a vegetation line, structure, or road) for roosting and refuge during storms, spits (a small point of land, especially sand, running into water) for feeding and roosting, salterns (bare sand flats in the center of mangrove ecosystems that are found above mean high water and are only irregularly flushed with sea water) and washover areas for feeding and roosting. Washover areas are broad, unvegetated zones with little or no topographic relief that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action. Several of these components (sparse vegetation, little or no topographic relief) are mimicked in artificial habitat types used less commonly by piping plovers, but that are considered critical habitat (*e.g.*, dredge spoil sites).

Critical Habitat Biological Conclusion:

[USFWS] United States Fish and Wildlife Service. 2001. Final Determination of Critical Habitat for Wintering Piping Plovers. 66 FR 36038-36136.

Piping plover
USFWS Recommended Survey Window: year round

Habitat Description: The piping plover breeds along the entire eastern coast of the United States. North Carolina is uniquely positioned in the species' range, being the only State where the piping plover's breeding and wintering ranges overlap and the birds are present year-round. They nest most commonly where there is little or no vegetation, but some may nest in stands of beach grass. The nest is a shallow depression in the sand that is usually lined with shell fragments and light-colored pebbles.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 18, 2010).

[USFWS] United States Fish and Wildlife Service. Piping plover (*Charadrius melodus*) Species Profile. http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B079. (Accessed: October 18, 2010).

Red-cockaded woodpecker
USFWS Recommended Survey Window: year round; November-early March (optimal)

Habitat Description: The red-cockaded woodpecker (RCW) typically occupies open, mature stands of southern pines, particularly longleaf pine (*Pinus palustris*), for foraging and nesting/roosting habitat. The RCW excavates cavities for nesting and roosting in living pine trees, aged 60 years or older, which are contiguous with pine stands at least 30 years of age to provide foraging habitat. The foraging range of the RCW is normally no more than 0.5 miles.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 18, 2010).

[USFWS] United States Fish and Wildlife Service. Red-cockaded Woodpecker (*Picoides borealis*). http://www.fws.gov/rcwrecovery/rcw.html. (Accessed: October 18, 2010).

Roseate tern
USFWS Recommended Survey Window: June-August

Habitat Description: In North Carolina, the roseate tern is most likely to be seen on a barrier island as it passes through the area to and from northern breeding grounds. March through May and August through October are the most likely times to see these birds. Although sight records of this species exist for June, July, and August, these are likely non-breeding males. Only one nesting record for this species has been documented for the state within the past twenty years. However, if this species expands its range it is likely to choose coastal areas of the state for nesting. The roseate tern nests on isolated, less disturbed coastal islands in areas characterized by sandy, rocky, or clayey substrates with either sparse or thick vegetation. Eggs are usually laid such that grasses or overhanging objects provide shelter. They may also nest in marshes, but it is an uncommon occurrence.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 18, 2010).

[USFWS] United States Fish and Wildlife Service. Roseate Tern (*Sterna dougallii dougallii*) Species Profile. http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B07O. (Accessed: October 18, 2010).

Rufa Red Knot: Critical Habitat Designation

Critical Habitat Description: *As of late 2014, USFWS was reviewing a critical habitat designation for the red knot.*

Rufa Red Knot
USFWS Recommended Survey Window: TBD

Habitat Description: The rufa red knot is one of the six recognized subspecies of red knots, and is the only subspecies that routinely travels along the Atlantic coast of the United States during spring and fall migrations. It is known to winter in North Carolina and to stop over during migration. Habitats used by red knots in migration and wintering areas are similar in character: coastal marine and estuarine habitats with large areas of exposed intertidal sediments. In North America, red knots are commonly found along sandy, gravel, or cobble beaches, tidal mudflats, salt marshes, shallow coastal impoundments and lagoons, and peat banks. Ephemeral features such as sand spits, islets, shoals, and sandbars, often associated with inlets can be important habitat for roosting.

Biological Conclusion:

[USFWS] Rufa Red Knot Ecology and Abundance, Supplement to: Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for the Rufa Red Knot (Calidris canutus rufa) http://www.fws.gov/northeast/redknot/pdf/20130923_REKN_PL_Supplement02_Ecology%20Abundance_Final.pdf. (Accessed: February 23, 2015.)

Wood stork

USFWS Recommended Survey Window: June-September

Habitat Description: Wood storks are known to occur in several coastal North Carolina counties, and records indicate that they have been breeding in North Carolina since 2005. Wood storks typically construct their nests in medium to tall trees that occur in stands located either in swamps or on islands surrounded by relatively broad expanses of open water. In many areas, bald cypress and red mangrove trees are preferred. During the nonbreeding season or while foraging, wood storks occur in a wide variety of wetland habitats, including freshwater marshes and stock ponds, shallow, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs. Because of their specialized feeding behavior, the most attractive feeding areas are swamp or marsh depressions where fish become concentrated during dry periods.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 18, 2010).

[USFWS] United States Fish and Wildlife Service. Wood stork (*Mycteria americana*) Species Profile. http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06O. (Accessed: October 19, 2010).

FISH

Atlantic sturgeon: Critical Habitat Designation

Critical Habitat Description: *NMFS will propose critical habitat by Nov. 30, 2015, and publish final rules a year after that.*

Atlantic sturgeon
USFWS/NMFS Recommended Survey Window: surveys not required; assume presence in appropriate waters

Habitat Description: The Atlantic sturgeon is a large fish that occurs in major river systems along the eastern seaboard of the United States. It is an anadromous species that migrates to moderately-moving freshwater areas to spawn in the spring; in some southern rivers a fall spawning migration may also occur. Spawning occurs in moderately flowing water in deep parts of large rivers, usually on hard surfaces (e.g., cobble). Juveniles usually reside in estuarine waters. Subadults and adults live in coastal waters and estuaries when not spawning, generally in shallow nearshore areas dominated by gravel and sand substrates.

Biological Conclusion:

[NMFS] Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus). http://www.nmfs.noaa.gov/pr/species/fish/atlanticsturgeon.htm. (Accessed: February 23, 2015.)

Cape Fear shiner: Critical Habitat Designation

Critical Habitat Description: For the Cape Fear Shiner, designated critical habitat areas are defined as:

1. Chatham County, NC. Approximately 4.1 miles of the Rocky River from North Carolina State Highway 902 Bridge downstream to Chatham County Road 1010 Bridge;

2. Chatham and Lee Counties, NC. Approximately 0.5 river mile of Bear Creek, from Chatham County Road 2156 Bridge downstream to the Rocky River, then downstream in the Rocky River (approximately 4.2 river miles) to the Deep River, then downstream in the Deep River (approximately 2.6 river miles) to a point 0.3 river mile below the Moncure, North Carolina, U.S. Geological Survey Gaging Station; and,

3. Randolph and Moore Counties, NC. Approximately 1.5 miles of Fork Creek, from a point 0.1 river mile upstream of Randolph County Road 2873 Bridge downstream to the Deep River then downstream approximately 4.1 river miles of the Deep River in Randolph and Moore Counties, North Carolina, to a point 2.5 river miles below Moore County Road 1456 Bridge.

Primary constituent elements are physical and biological features of the designated critical habitat essential to the conservation of the species. Primary constituent elements are physical and biological features of the designated critical

habitat essential to the conservation of the species. The constituent elements for the Cape Fear shiner include: clean streams with gravel, cobble, and boulder substrates with pools, riffles, shallow runs; slack water areas with large rock outcrops; and side channels and pools with water of good quality and relatively low silt loads.

Critical Habitat Biological Conclusion:

[USFWS] United States Fish and Wildlife Service. Cape Fear shiner **(***Notropis mekistocholas*). http://www.fws.gov/nc-es/fish/cfshiner.html. (Accessed: February 21, 2008).

[USFWS] United States Fish and Wildlife Service. 1987. Determination of Endangered Species Status and Designation of Critical Habitat for Cape Fear Shiner. 52 FR 36034-36039.

Cape Fear shiner

USFWS Recommended Survey Window: April-June (tributaries); year round (large rivers)

Habitat Description: The Cape Fear shiner is known only from the Cape Fear River watershed. In general, habitat occurs in streams with clean gravel, cobble, or boulder substrates. It is most often observed inhabiting slow pools, riffles, and slow runs associated with water willow (*Justicia americana*) beds, which it uses for cover. Juveniles can be found inhabiting slackwater, among large rock outcrops and in flooded side channels and pools. Spawning occurs May through June, when water temperatures reach 66 degrees Fahrenheit.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. Cape Fear shiner **(***Notropis mekistocholas*). http://www.ncwildlife.org/Wildlife_Species_Con/WSC_EndFish_1.htm. (Accessed: October 18, 2010).

[NCWRC] North Carolina Wildlife Resources Commission. Cape Fear shiner **(***Notropis mekistocholas*). http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1b1_1.htm. (Accessed: February 18, 2008)

[USFWS] United States Fish and Wildlife Service. Cape Fear Shiner. http://www.fws.gov/nc-es/fish/CFS_Fact_Sheet1.pdf. (Accessed: October 18, 2010).

[USFWS] United States Fish and Wildlife Service. Cape Fear shiner **(***Notropis mekistocholas*). http://www.fws.gov/nc-es/fish/cfshiner.html. (Accessed: October 18, 2010).

Roanoke logperch

USFWS Recommended Survey Window: year round; April – June (optimal)

Habitat Description: In North Carolina, the logperch is known from the upper Roanoke River basin. The fish typically inhabits warm, usually clear, small to medium-sized rivers. These waterways have a moderate to low gradient, and the fish usually inhabit riffles and runs, with silt-free sandy to boulder-strewn bottoms. Young are usually found in slow runs and pools with clean sandy bottoms. In winter, logperch may be more tolerant of silty substrates, and may also inhabit pools. Spawning occurs in April or May in deep runs over gravel and small cobble. Males are associated with shallow riffles during the reproductive period; females are common in deep runs over gravel and small cobble, where they spawn. The upper Roanoke River population is threatened by urbanization, industrial development, water supply and flood control projects, and agricultural runoff in the upper basin.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 18, 2010).

[USFWS] United States Fish and Wildlife Service. Roanoke Logperch (*Percina rex*) http://www.fws.gov/northeast/virginiafield/pdf/endspecies/fact_sheets/roanoke%20logperch.pdf. (Accessed: October 18, 2010).

[USFWS] United States Fish and Wildlife Service. 1991. Roanoke logperch (PERCINA REX) recovery plan. Agency draft. U.S. Fish and Wildl. Serv., Newton Corner, Massachusetts. 31 pp.

Shortnose sturgeon

USFWS/NMFS Recommended Survey Window: surveys not required; assume presence in appropriate waters

Habitat Description: Shortnose sturgeon occur in most major river systems along the eastern seaboard of the United States. The species prefers the near shore marine, estuarine, and riverine habitat of large river systems. It is an anadromous species that migrates to faster-moving freshwater areas to spawn in the spring, but spends most of its life within close proximity of the river's mouth. Large freshwater rivers that are unobstructed by dams or pollutants are imperative to successful reproduction. Distribution information by river/waterbody is lacking for the rivers of North Carolina; however, records are known from most coastal counties.

Biological Conclusion:

[NMFS] National Marine Fisheries Service. 1998. Recovery Plan for the Shortnose Sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 104 pages.

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Shortnose sturgeon (*Acipenser brevirostrum*) http://www.nmfs.noaa.gov/pr/species/fish/shortnosesturgeon.htm. (Accessed: February 15, 2008).

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 19, 2010).

Spotfin chub (=turquoise shiner): Critical Habitat Designation

Critical Habitat Description: In North Carolina, Macon and Swain Counties, critical habitat is designated as the Little Tennessee River, main channel from the backwaters of Fontana Lake upstream to the North Carolina-Georgia state line.

Critical Habitat Biological Conclusion:

[USFWS] United States Fish and Wildlife Service. 1977. Final Threatened Status and Critical Habitat for Five Species of Southeastern Fishes. 42 FR 47840-47845.

Spotfin chub (= turquoise shiner)

USFWS Recommended Survey Window: September – November (tributaries); year round (large rivers)

Habitat Description: The spotfin chub occurs in the Little Tennessee River drainage system. This minnow typically inhabits moderate to large streams, 49-230 feet in width. However, they have been documented utilizing smaller tributaries in the fall. These streams should have a good current, clear water, cool to warm temperatures, and pools alternating with riffles. Specimens of spotfin chub have been taken from a variety of substrates but rarely from significantly silted substrates. This species has been observed spawning under loose rocks over bedrock.

Biological Conclusion:

[NCWRC] North Carolina Wildlife Resources Commission. Spotfin Chub (*Cyprinella monacha*). http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1b1_2.htm. (Accessed: October 19, 2010).

[USFWS] United States Fish and Wildlife Service. Spotfin Chub. 2008. http://www.fws.gov/asheville/htmls/listedspecies/spotfin_chub.html. (Accessed: October 19, 2010).

Waccamaw silverside (= skipjack or glass minnow)
USFWS Recommended Survey Window: year round

Habitat Description: The Waccamaw silverside is found only in the Waccamaw River watershed. The required habitat for the Waccamaw silverside to survive is high quality, neutral pH water with a clean sandy substrate. Waccamaw silversides inhabit the surface over shallow, dark bottomed areas. Spawning occurs in April through June and peaks when water temperatures reach 68-72 degrees Fahrenheit.

Biological Conclusion:

[NCWRC] North Carolina Wildlife Resources Commission. Waccamaw Silverside (*Menidia extensa*). http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/pg7b1b1_3.htm. (Accessed: October 19, 2010).

[USFWS] United States Fish and Wildlife Service. Waccamaw Silverside in North Carolina. http://www.fws.gov/nc-es/fish/waccsilver.html. (Accessed: October 19, 2010).

INSECTS

Saint Francis' satyr
USFWS Recommended Survey Window: May 5-June 6 and July 26-August 21

Habitat Description: The Saint Francis' satyr butterfly is only known from the Sandhills of North Carolina, although its historic range may have been much larger. This butterfly is known to inhabit wide, wet meadows dominated by sedges and other wetland graminoids. These wetlands are often relicts of beaver activity and are boggy areas that are acidic and ephemeral. These sites must be continually maintained to persist as open areas. The larval host of the Saint Francis' satyr is thought to be grasses, sedges and rushes.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 19, 2010).

[USFWS] United States Fish and Wildlife Service. Saint Francis Satyr in North Carolina. http://www.fws.gov/nc-es/insect/stfrancis.html. (Accessed: October 19, 2010).

[USFWS] United States Fish and Wildlife Service. 1996. Saint Francis' Satyr Recovery Plan. Atlanta, GA. 27 pp.

[DOA] Department of the Army, Endangered Species Branch. 2010. St. Francis' Satyr Monitoring and Studies. http://www.bragg.army.mil/esb/SFSMgmt.htm. (Accessed: October 19, 2010).

MAMMALS

Carolina northern flying squirrel

USFWS Recommended Survey Window: May -October; coldest days in coldest winter months (nest box surveys)

Habitat Description: There are several isolated populations of the Carolina northern flying squirrel in the mountains of North Carolina. This nocturnal squirrel prefers the ecotone between coniferous (red spruce, Fraser fir, or hemlock) and mature northern hardwood forests (beech, yellow birch, maple, hemlock, red oak, and buckeye), typically at elevations above 4,500 feet mean sea level. In some instances, the squirrels may be found on narrow, north-facing valleys above 4,000 feet mean sea level. Both forest types are used to search for food and the hardwood forest is used for nesting sites. Mature forests with a thick evergreen understory and numerous snags are most preferable. In winter, squirrels inhabit tree cavities in older hardwoods, particularly yellow birch.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 19, 2010).

[NCWRC] North Carolina Wildlife Resources Commission. 2005. Northern Flying Squirrel Fact Sheet. http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/nongame_noflysquirrel_lores.pdf. (Accessed: February 18, 2008).

[USFWS] United States Fish and Wildlife Service. Carolina northern flying squirrel. http://www.fws.gov/asheville/htmls/listedspecies/Carolina_northern_flying_squirrel.html (Accessed: October 19, 2010).

Gray bat

USFWS Recommended Survey Window: May 15-August 15 (summer); January 15-February 15 (winter)

Habitat Description: Gray bats are known mainly from the cave regions of the Southeast and Midwest. They live in colonies in caves, utilizing different caves for summer roosting and winter hibernating. Summer caves are usually within one half mile of a river or reservoir, which provides foraging habitat. During the summer, females give birth and rear the young in maternity caves, while males and yearlings roost in separate bachelor caves. Caves preferred for hibernation are typically deep, vertical caves with a temperature between 42 and 52 degrees Fahrenheit. Gray bats are highly selective in choosing suitable caves, and nine known caves are thought to provide hibernation space for 95 percent of the population. Migration from summer to winter caves begins in September and is mainly complete by the beginning of November.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 19, 2010).

[USFWS] United States Fish and Wildlife Service. Gray Bat in North Carolina. http://www.fws.gov/nc-es/mammal/graybat.html. (Accessed: October 19, 2010).

Indiana bat

USFWS Recommended Survey Window: May 15-August 15 (summer); January 15-February 15 (winter)

Habitat Description: The range of the Indian bat centers on cavernous limestone regions in the eastern United States. The Indiana bat has different summer and winter habitat requirements. Winter habitat is in caves and abandoned mines that usually have standing water on the floor. The bats migrate to the winter habitat between September and November; they stay there with occasional periods of activity until they emerge in mid-March to early May. Hibernation only occurs in regions where winter temperatures are stable and around 40 degrees Fahrenheit. Suitable summer habitat includes roosting, foraging, and commuting areas. Summer roosting habitat includes forests and woodlots containing potential roost trees, which have exfoliating bark, cracks, or crevices in trees (alive or dying) or snags that are > 3 inches diameter-at-breast height (dbh). Roosting habitat may contain dense or loose aggregates of trees with variable amounts of canopy closure. (While any tree greater than 3" dbh has the potential to be Indiana bat summer roosting habitat, solid stands of 3" dbh and smaller trees are not considered suitable roosting habitat; suitable roosting habitat would generally consist of

forest patches with larger trees also present.) Bridges are occasionally used for roosting by Indiana bats in the summer.

Foraging habitat consists of forested patches, wooded riparian corridors, and natural vegetation adjacent to these areas. Commuting habitat includes wooded tracts, tree-lines, wooded hedgerows, streams or other such pathways that are within or connected to roosting or foraging areas. Streams that have been stripped of their riparian vegetation do not appear to offer suitable foraging habitat. Rivers as foraging areas and as migration routes are extremely important to this species.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 16, 2012).

[USFWS] Rangewide Indiana Bat Summer Survey Guidance, Draft. February 3, 2012. http://www.fws.gov/midwest/Endangered/mammals/inba/DraftINBASurveyGuidanceFeb2012.html.

[USFWS] United States Fish and Wildlife Service. 2005. The Indiana Bat in Western North Carolina: A Status Summary Update-April 2005. http://www.fws.gov/nc-es/mammal/Aprilbat.pdf. (Accessed: October 19, 2010).

[USFWS] United States Fish and Wildlife Service. Indiana bat in North Carolina. http://www.fws.gov/nc-es/mammal/indianabat.html. (Accessed: October 19, 2010).

Do not include the following in an NRTR. Adding it here for informational purposes only:

NOTES for the reviewer:

1. NHP records need to be checked at least 10 miles out from the project. Bats will travel several miles in a night just to forage.

2. Although caves and old mines are essentially only a concern for counties with winter occurrences of I-bats, *any time a cave or mine is going to be affected in a project, it should be mentioned in the NRTR*. (Gray bats and Virginia big-eared bats only roost in caves, mines and potentially bridges.)

3. *Bridges always need to be checked for evidence of roosting bats* for any county that has a federally listed bat species, *unless* the bottom of the bridge is <5ft above the water's surface. Bats won't roost that low as it leaves them vulnerable to predation.

4. Summer counties for Indiana bats (trees and bridges are the primary concern): Cherokee, Clay, Graham, Haywood, Macon and Swain.

5. Winter counties for Indiana bats (bridges, caves and mines are a concern): Graham Jackson, Haywood, Rutherford, Mitchell.

6. In North Carolina, *optimal* I-bat roosting trees are large snags, typically with full sun exposure. The trees are usually dead pines, although other trees, such as dead hemlocks, may be used.

Northern long-eared bat
USFWS Recommended Survey Window: June 1 – August 15

Habitat Description: In North Carolina, the Northern long-eared bat (NLEB) occurs in the mountains, with scattered records in the Piedmont and coastal plain. In western North Carolina, NLEB spend winter hibernating in caves and mines. Since this species is not known to be a long-distance migrant, and caves and subterranean mines are extremely rare in eastern North Carolina, it is uncertain whether or where NLEB hibernate in eastern North Carolina. During the summer, NLEB roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees (typically ≥3 inches dbh). Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat also been found, rarely, roosting in structures like barns and sheds, under eaves of buildings, behind window shutters, in bridges, and in bat houses. Foraging occurs on forested hillsides and ridges, and occasionally over forest clearings, over water, and along tree-lined corridors. Mature forests may be an important habitat type for foraging.

Biological Conclusion:

Natureserve. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, VA. http://explorer.natureserve.org. (Accessed: September 24, 2014.)

[USFWS] http://www.fws.gov/midwest/endangered/mammals/nlba/nlbaFactSheet.html. (Accessed: February 20, 2015.)

[USFWS]. 2014. Northern Long-Eared Bat Interim Conference and Planning Guidance. USFWS Regions 2, 3, 4, 5 & 6. http://www.fws.gov/midwest/endangered/mammals/nlba/pdf/NLEBinterimGuidance6Jan2014.pdf. (Accessed: February 20, 2015.)

Red wolf
USFWS Recommended Survey Window: year round

Habitat Description: Red wolves were extirpated from North Carolina and most other southeastern states by the 1920's. In the mid 1980's, the United States Fish and

Wildlife Service reintroduced the species to the Alligator National Wildlife Refuge in eastern North Carolina. Since that time, the wolves have expanded their range outside the refuge. Red wolves are generally crepuscular predators, preying on deer, nutria, raccoon, rabbits, and other small mammals. Any area that provides sufficient size, adequate food, water, and the basic cover requirement of heavy vegetation, should be suitable habitat for the red wolf. Telemetry studies indicate that red wolf home range requirements vary from about 25 to 50 square miles.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Red wolves in North Carolina. http://www.fws.gov/nc-es/mammal/redwolf.html. (Accessed: October 20, 2010).

Virginia big-eared bat

USFWS Recommended Survey Window: May 15-August 15 (summer); January 15-February 15 (winter)

Habitat Description: Virginia big-eared bat has been recorded in the Appalachian mountains of North Carolina. They occupy caves in the summer and winter. Hibernating colonies are typically located in deep cave passageways that have stable temperatures and air movement, the temperature in these hibernacula may be lower than that tolerated by other bats. Roost sites are generally located in mines or caves in oak-hickory forests. They will use alternate roost sites but there is no record of long migrations. They are nocturnal and leave their roost to forage on moths, beetles, and other insects. This species feeds mostly over open pasture, corn, and alfalfa fields, and around the crowns of trees.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Virginia big-eared bats in North Carolina. http://www.fws.gov/nc-es/mammal/vbigear.html. (Accessed: October 20, 2010).

West Indian manatee

USFWS Recommended Survey Window: year round

Habitat Description: Manatees have been observed in all the North Carolina coastal counties. Manatees are found in canals, sluggish rivers, estuarine habitats, salt water bays, and as far off shore as 3.7 miles. They utilize freshwater and marine habitats at shallow depths of 5 to 20 feet. In the winter, between October and April, manatees concentrate in areas with warm water. During other times of the year habitats appropriate for the manatee are those with sufficient water depth, an adequate food supply, and in proximity to freshwater. Manatees require a source of freshwater to drink. Manatees are primarily herbivorous, feeding on any aquatic vegetation present, but they may occasionally feed on fish.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. West Indian Manatees in North Carolina. http://www.fws.gov/nc-es/mammal/manatee.html. (Accessed: October 20, 2010).

MUSSELS

Appalachian elktoe: Critical Habitat Designation

Critical Habitat Description: Critical habitat for the Appalachian elktoe has been designated in 144.3 total river miles in six distinct units:

1. Encompasses approximately 24 miles of the main stem of the Little Tennessee River from the Lake Emory Dam in Franklin, Macon County, NC, downstream to the backwaters of Fontana Reservoir in Swain County, NC.

2. Encompasses approximately 26 miles of the main stem of the Tuckasegee River, from NC State Route 1002 bridge in Cullowhee, Jackson County, NC, downstream to the NC 19 bridge north of Bryson City, Swain County, NC.

3. Encompasses approximately 9.1 miles of the main stem of the Cheoah River from the Santeelah Dam downstream to its confluence with the Little Tennessee River, in Graham County, NC.

4. Encompasses approximately 4.7 miles of the main stem of the Little River (French Broad River Basin) from the Cascade Lake Power Plant, downstream to its confluence with the French Broad River in Transylvania County, NC.

5. Encompasses approximately 11.1 miles of the main stem of the West Fork Pigeon River (French Broad River Basin) from the confluence with the Little East Fork Pigeon River downstream to the confluence with the East Fork Pigeon River, and the main stem of the Pigeon River from the confluence of the East Fork Pigeon River and West Fork Pigeon River downstream to the NC 215 crossing, south of Canton, Haywood County, NC.

6. Encompasses approximately 3.7 miles of the main stem of the North Toe River, Yancey and Mitchell counties, NC, from the confluence with Big Crabtree Creek, downstream to the confluence of the South Toe River; approximately 14.1 miles of the main stem of the South Toe River, Yancey County, NC, from the NC State Route 1152 crossing, downstream to its confluence with the North Toe River; approximately 21.6 miles of the main stem of the Toe River, Yancey and Mitchell counties, NC, from the confluence of the North Toe River and South Toe River, downstream to the confluence of the Cane River; approximately 16.5 miles of the main stem of the Cane River, Yancey County, NC, from the NC State Route 1381 crossing, downstream to its confluence with the Toe river; and approximately 13.5 miles of the main stem of the Nolichucky River from the confluence of the Toe River and the Cane River in Yancey County and Mitchell County, NC downstream to the US 23/19W crossing, southwest of Erwin, Unicoi County, TN.

When designating Critical Habitat, the USFWS identifies physical and biological features (primary constituent elements) that are essential to the conservation of the species and that may require special management considerations or protection. The primary constituent elements essential for the conservation of the Appalachian elktoe are:

1) Permanent, flowing, cool, clean water;
2) Geomorphically stable stream channels and banks;
3) Pool, riffle, and run sequences within the channel;
4) Stable sand, gravel, cobble, and boulder or bedrock substrates with no more than low amounts of fine sediment;
5) Moderate to high stream gradient;
6) Periodic natural flooding; and
7) Fish hosts, with adequate living, foraging, and spawning areas for them.

Although there are specific sites within the six units that do not contain all of the primary constituent elements, these elements are found consistently throughout the designated river reaches and are present at the sites containing the "healthiest" of the occurrences.

Critical Habitat Biological Conclusion:

[USFWS] United States Fish and Wildlife Service. 2002. Designating Critical Habitat for the Appalachian Elktoe. 67 FR 61016-61040.

Appalachian elktoe
USFWS Recommended Survey Window: year round

Habitat Description: The Appalachian elktoe is known from the French Broad River watershed in North Carolina. The Appalachian elktoe has been observed in moderate- to fast-flowing water, in gravelly substrates often mixed with cobble and boulders, in cracks of bedrock and in relatively silt-free, coarse, sandy substrates. Apparently, stability of the substrate is critical to this species, as it is seldom found in stream reaches with accumulations of silt or shifting sand, gravel, or cobble.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: http://www.ncwildlife.org/Wildlife_Species_Con/WSC_Mussel_2.htm. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Appalachian elktoe Fact Sheet. http://www.fws.gov/asheville/pdfs/AppalachianElktoe.pdf. (Accessed: October 20, 2010).

Carolina heelsplitter
USFWS Recommended Survey Window: year round

Habitat Description: The Carolina heelsplitter was historically known from several locations within the Catawba and Pee Dee River systems in North Carolina and the Pee Dee and Savannah River systems, and possibly the Saluda River system in South Carolina. In North Carolina, the species is now known only from a handful of streams in the Pee Dee and Catawba River systems. The species exists in very low abundances, usually within 6 feet of shorelines, throughout its known range. The general habitat requirements for the Carolina heelsplitter are shaded areas in large rivers to small streams, often burrowed into clay banks between the root systems of trees, or in runs along steep banks with moderate current. The more recent habitat where the Carolina heelsplitter has been found is in sections of streams containing bedrock with perpendicular crevices filled with sand and gravel, and with wide riparian buffers.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed October 20, 2010)

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: http://www.ncwildlife.org/wildlife_species_con/WSC_Mussel_4.htm. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Carolina heelsplitter in North Carolina. http://www.fws.gov/nc-es/mussel/carolheel.html. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Carolina heelsplitter fact sheet. http://www.fws.gov/asheville/htmls/listedspecies/Carolina_heelsplitter.html. (Accessed: October 20, 2010).

Cumberland bean
USFWS Recommended Survey Window: year round

Habitat Description: Historically, the Cumberland bean was known from ten river systems in the Cumberland and Tennessee River basins in Alabama, Georgia, Kentucky, Tennessee, and Virginia. The Cumberland bean currently survives in only three of those systems. A relatively strong population exists in a short reach of the Hiwassee River downstream of the North Carolina/Tennessee State line in Polk County, Tennessee. Although no specimens have been collected in North Carolina, it is likely that the species occurs in small numbers in the North Carolina portion of the in the Hiwassee River, where the habitat appears suitable below the Appalachia Dam, Cherokee County. The Cumberland bean typically inhabits medium-sized streams to small rivers 15-65 feet in width. The species is found in silt-free sand, gravel, and cobble substrates in waters with moderate to fast currents and depths less 3 feet. It frequently occurs in the transition zone between gravel and sand substrates.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: http://www.ncwildlife.org/wildlife_species_con/WSC_Mussel_36.htm. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Cumberland Bean Pearlymussel (*Villosa trabalis*): http://ecos.fws.gov/docs/life_histories/F000.html. (Accessed: October 20, 2010).

Dwarf wedgemussel
USFWS Recommended Survey Window: year round

Habitat Description: In North Carolina, the dwarf wedgemussel is known from the Neuse and Tar River drainages. The mussel inhabits creek and river areas with a slow to moderate current and sand, gravel, or firm silt bottoms. Water in these areas must be well oxygenated. Stream banks in these areas are generally stable with extensive root systems holding soils in place.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: http://www.ncwildlife.org/wildlife_species_con/WSC_Mussel_1.htm. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Dwarf wedgemussel fact sheet. http://www.fws.gov/asheville/htmls/listedspecies/dwarf_wedgemussel.html. (Accessed: October 20, 2010).

James spinymussel
USFWS Recommended Survey Window: year round; April-June (optimal)

Habitat Description: The James spinymussel was once found throughout the main stem of the James River and all of its major tributaries upstream of Richmond VA. The species has experienced a precipitous decline over the past two decades and now exists only in small, headwater tributaries of the upper James River basin in Virginia and West Virginia and the upper Roanoke River drainage of Virginia and North Carolina. The James spinymussel is found in waters with slow to moderate current and relatively hard water on sand and mixed sand-gravel substrates that are free from silt.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. James spinymussel in NC: http://www.fws.gov/nc-es/mussel/jamesspiny.html. (Accessed: October 20, 2010).

Littlewing pearly mussel
USFWS Recommended Survey Window: year round

Habitat Description: In North Carolina, the littlewing pearly mussel is known from the Little Tennessee River watershed. It inhabits small to medium-sized streams with low turbidity, cool water, and a high to moderate gradient. This mussel can be found buried in gravel or beneath boulders and slabrock, or lying on top of the substratum in riffles. It can also be found partly buried or on the surface of the substratum in the transition zone between long pools and riffles. It has been suggested that the best times to find this mussel are in late spring and in the late fall, when they are on top or partly buried in the substratum during spawning.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: http://www.ncwildlife.org/wildlife_species_con/WSC_Mussel_5.htm. (Accessed: October 20, 2010).

Tan riffleshell
USFWS Recommended Survey Window: year round

Habitat Description: Historic occurrences of the Tan riffleshell are known from the French Broad and Hiawassee Rivers in North Carolina. Currently, the only known viable population of this species is located in Tazwell County, Virginia. Individuals are typically found in headwaters, riffles, and shoals in sand and gravel substrates.
Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Tan riffleshell (*Epioblasma florentina walkei*). http://ecos.fws.gov/docs/life_histories/F010.html. (Accessed: February 14, 2008).

Tar River spinymussel
USFWS Recommended Survey Window: year round

Habitat Description: The Tar spinymussel is endemic to the Tar and Neuse River drainage basins in North Carolina. This mussel requires a stream with fast flowing, well-oxygenated, circumneutral pH water. The bottom should be composed of unconsolidated gravel and coarse sand. The water needs to be relatively silt-free, and stream banks should be stable, typically with many roots from adjacent riparian trees and shrubs.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NCWRC] North Carolina Wildlife Resources Commission. North Carolina Mussel Atlas: http://www.ncwildlife.org/wildlife_species_con/WSC_Mussel_3.htm. (Accessed: February 14, 2008).

[NCNHP] North Carolina Natural Heritage Program. Tar Spinymussel: http://www.ncnhp.org/Images/65.pdf. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Tar spinymussel fact sheet. http://www.fws.gov/asheville/htmls/listedspecies/Tar_spinymussel.html. (Accessed: October 20, 2010).

REPTILES

American alligator
USFWS Recommended Survey Window: year round (only warm days in winter)

Habitat Description: In North Carolina, alligators have been recorded in nearly every coastal county, and many inland counties to the fall line. The alligator is found rivers, streams, canals, lakes, swamps, and coastal marshes. Adult animals are highly tolerant of salt water, but the young are apparently more sensitive, with salinities greater than 5 parts per thousand considered harmful. The American alligator remains on the protected species list due to its similarity in appearance to the Endangered American crocodile.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. American alligator **(***Alligator mississippiensis*) species profile. http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=C000. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. American alligators in North Carolina. http://www.fws.gov/nc-es/reptile/alligat.html. (Accessed: October 20, 2010).

Bog turtle

USFWS Recommended Survey Window: April 1 – October 1 (visual surveys); April 1-June 15 (optimal for breeding/nesting); May 1-June 30 (trapping surveys)

Habitat Description: Bog turtle habitat consists of open, groundwater supplied (spring fed), graminoid dominated wetlands along riparian corridors or on seepage slopes. These habitats are designated as mountain bogs by the North Carolina Natural Heritage Program, but they are technically poor, moderate, or rich fens that may be associated with wet pastures and old drainage ditches that have saturated muddy substrates with open canopies. These habitats, found between 700 and 4,500 feet above mean sea level in the western Piedmont and mountain counties of North Carolina, often support sphagnum moss and may contain carnivorous plants. Soil types (poorly drained silt loams) from which bog turtle habitats have been found include Arkaqua, Chewacla, Dellwood, Codorus complex, Hatboro, Nikwasi, Potomac – Iotla complex, Reddies, Rosman, Tate – Cullowhee complex, Toxaway, Tuckasegee – Cullasaja complex, Tusquitee, Watauga, and Wehadkee.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NCWRC] North Carolina Wildlife Resources Commission. Bog Turtle Fact Sheet. 2006. http://www.ncwildlife.org/pg07_wildlifespeciescon/nongame_bogturtle_lores.pdf. (Accessed: February 22, 2008).

[USFWS] United States Fish and Wildlife Service. Bog Turtles in North Carolina. http://www.fws.gov/nc-es/reptile/bogtur.html. (Accessed: February 22, 2008).

Green sea turtle

USFWS/NMFS Recommended Survey Window: April-August

Habitat Description: The green sea turtle is found in temperate and tropical oceans and

seas. Nesting in North America is limited to small communities on the east coast of Florida requiring beaches with minimal disturbances and a sloping platform for nesting (they do not nest in NC). The green sea turtle can be found in shallow waters. They are attracted to lagoons, reefs, bays, mangrove swamps and inlets where an abundance of marine grasses can be found, as this is the principle food source for the green turtle.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Green Turtle (*Chelonia mydas*). http://www.nmfs.noaa.gov/pr/species/turtles/green.htm. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Green Sea Turtles in North Carolina. http://www.fws.gov/nc-es/reptile/greensea.html. (Accessed: October 20, 2010).

Hawksbill turtle
USFWS/NMFS Recommended Survey Window: April-August

Habitat Description: Hawksbill sea turtles are found in tropical and subtropical oceans. Sightings have been reported on the east coast of the U.S. as far north as Massachusetts, although rarely north of Florida. Sightings have been recorded from a handful of counties in North Carolina, but the turtle is not known to breed here. Adult hawksbills are found in coastal waters, especially around coral reefs, rocky outcrops, shoals, mangrove bays, and estuaries. Juveniles are often seen offshore, in floating mats of seaweed. This species nests on a wide range of beach types and substrates, using both low- and high-energy beaches on islands and mainland sites. The nest is typically placed near or under some vegetation.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Hawksbill Turtle (*Eretmochelys imbricata*). http://www.nmfs.noaa.gov/pr/species/turtles/hawksbill.htm. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Hawksbill Sea Turtles in North Carolina. http://www.fws.gov/nc-es/reptile/hawksbill.html. (Accessed: October 20, 2010).

Kemp's ridley sea turtle
USFWS/NMFS Recommended Survey Window: April-August

Habitat Description: Kemp's ridley sea turtle is the smallest of the sea turtles that visit North Carolina's coast, and has been sighted in most coastal counties. While the majority of this sea turtle's nesting occurs in Mexico, the species is known to nest on North Carolina beaches infrequently. Sightings of the species exist for most coastal counties. Kemp's ridley sea turtle can lay eggs as many as three times during the April to June breeding season. Kemp's ridley sea turtles prefer beach sections that are backed up by extensive swamps or large bodies of open water having seasonal narrow ocean connections and a well defined elevated dune area. The species prefers neritic areas with sandy or muddy bottoms.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NCNHP] North Carolina Natural Heritage Program. *Lepidochelys kempii* - Atlantic Ridley. http://149.168.1.196/nhp/makeMap.php?sciName=Lepidochelys%20kempii. (Accessed: October 20, 2010).

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Kemp's Ridley Turtle *(Lepidochelys kempii).* http://www.nmfs.noaa.gov/pr/species/turtles/kempsridley.htm. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Kemp's Ridley Sea Turtles in North Carolina. http://www.fws.gov/nc-es/reptile/ridley.html. (Accessed: October 20, 2010).

Leatherback sea turtle
USFWS/NMFS Recommended Survey Window: April-August

Habitat Description: Leatherbacks are distributed world-wide in tropical waters of the Atlantic, Pacific, and Indian oceans. They are generally open ocean species, and may be common off the North Carolina coast during certain times of the year. However, in northern waters leatherbacks are reported to enter into bays, estuaries, and other inland bodies of water. Major nesting areas occur mainly in tropical regions. In the United States, primary nesting areas are in Florida, however nests are known from Georgia, South Carolina, and North Carolina as well. Nesting occurs from April to August. Leatherbacks need sandy beaches backed with vegetation in the proximity of deep water and generally with rough seas. Beaches with a relatively steep slope are usually preferred.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Leatherback Turtle *(Dermochelys coriacea)*. http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.htm. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Leatherback Sea Turtles in North Carolina. http://www.fws.gov/nc-es/reptile/leather.html. (Accessed: October 20, 2010).

Loggerhead turtle
USFWS/NMFS Recommended Survey Window: April-August

Habitat Description: The loggerhead is widely distributed within its range, and is found in three distinct habitats during their lives. These turtles may be found hundreds of miles out in the open ocean, in neritic areas, or on coastal beaches. In North Carolina, this species has been observed in every coastal county. Loggerheads occasionally nest on North Carolina beaches, and are the most common of all the sea turtles that visit the North Carolina coast. They nest nocturnally, at two to three year intervals, between May and September, on isolated beaches that are characterized by fine-grained sediments. In near shore areas, loggerheads have been observed in bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and shipwrecks are often used as foraging areas.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[NOAA] National Oceanic and Atmospheric Administration. Fisheries, Office of Protected Resources. Loggerhead Turtle *(Caretta caretta*). http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.htm. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Loggerhead Sea Turtles in North Carolina. http://www.fws.gov/nc-es/reptile/logger.html. (Accessed: October 20, 2010).

SNAIL

Noonday globe

USFWS Recommended Survey Window: April-September (or prior to first fall frost); April-May (optimal)

Habitat Description: The noonday globe is restricted to a small area within the Nantahala gorge in western North Carolina, where it is found in association with high, steep, wet, calcareous cliffs. (Calcium is vital to snails because it is a major component of their shells.) The forest in this area is mature, with many large trees and a diverse plant community, and a forest floor with a thick, rich humus layer. The biology of this species is largely unknown. During warm months, these snails can be found on wet surface vegetation. In dryer times, the snails often reside under leaf litter. They are active both day and night. It is thought that noonday snails feed on vegetation and fungal mycelia.

Biological Conclusion:

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 20, 2010).

[USFWS] United States Fish and Wildlife Service. Noonday Globe in North Carolina. http://www.fws.gov/nc-es/snail/noonglobe.html. (Accessed: October 20, 2010).

NCDOT Guidelines to Assess Potential Project Impacts to the Bald Eagle and Survey Protocols

The bald eagle has been delisted as of August 8, 2007 from the Endangered Species Act. The bald eagle will still be protected under the Bald and Golden Eagle Protection Act. Surveys may still need to be conducted. The USFWS has issued guidance in the National Bald Eagle Management Guidelines. The following are NCDOT bald eagle survey protocols based on the National Bald Eagle Management Guidelines. See the National Bald Eagle Management Guidelines for life history.

- All projects are to be assessed for bald eagle nests within NC
- A bald eagle survey area consists of the study area and a 660 feet radius from the edge of the study area (this is the bald eagle survey area)
- First assess if the bald eagle survey area is within 1.0 mile from a feeding source (large body of water large enough to support fish, or commercial fishing ponds) (2 acres is a guideline, but can depend on the quality of the pond, use best professional judgement)
- If no feeding/water source within 1.0 mile of the bald eagle survey area then no survey necessary
- If feeding/water source within 1.0 mile then survey needed within the bald eagle survey area in appropriate habitat
- If bald eagle nest found within survey area and contact USFWS for coordination. Consultants, contact the ECAP project manager.

These are only guidelines so always use your best professional judgement. Call USFWS with any questions on the Act or the National Bald Eagle Management Guidelines. Look up NHP data (on GIS) and contact WRC and USFWS for known eagle nests. Not all known locations are located on NHP.

- Surveys can be done year round but the optimal time to survey is November to early March when the leaves have fallen off the deciduous trees. The most likely time to see bald eagles on a nest is January to May.
- Have a pair of binoculars when surveying
- If habitat is of high quality for nesting and foraging, then a helicopter survey may be needed. Talk with your supervisor to determine if a helicopter survey is needed. Consultants, discuss with ECAP Regional Manager before scoping.

If a nest is found within the survey area:

- Mark location on aerial photo.
- GPS nest
- Watch nest to see if any eagles return to nest (if during nesting season).
- Note if any eagles seen near the nest or around the area.
- Contact USFWS

See NRTR example for standard language to use for in NRTR and other documents.